

# sinumerik & simodrive



**SIEMENS**

Automation Systems  
for Machine Tools

## Related catalogs

### **SINUMERIK & SINAMICS**

Automation systems for  
Machine Tools

NC 61

Order No.:  
E86060-K4461-A101-A2-7600



### **SIMATIC**

Products for Totally Integrated  
Automation and Micro Automation

ST 70

Order No.:  
E86060-K4670-A101-B2-7600



### **SIMATIC HMI**

Human Machine  
Interface Systems

ST 80

Order No.:  
E86060-K4680-A101-B6-7600



### **SIMATIC NET**

Industrial Communication

IK PI

Order No.:  
E86060-K6710-A101-B6-7600



### **SITOP**

Power supplies  
SITOP and LOGO!Power

KT 10.1

Order No.:  
E86060-K2410-A101-A6-7600



### **SITRAIN**

Training for Automation and  
Industrial Solutions

ITC

Order No.:  
E86060-K6850-A101-B9<sup>1)</sup>



### **The Offline Mall**

CA 01

Order No.:  
E86060-D4001-A510-C7-7600



### **The Online Mall**

Internet:  
[www.siemens.com/automation/mall](http://www.siemens.com/automation/mall)



<sup>1)</sup> Language: German.

# SINUMERIK & SIMODRIVE

## Automation Systems for Machine Tools

### Catalog NC 60 · 2009

Supersedes:  
Catalog NC 60 · 2006

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

Contact your local Siemens  
representative for further  
information

© Siemens AG 2009

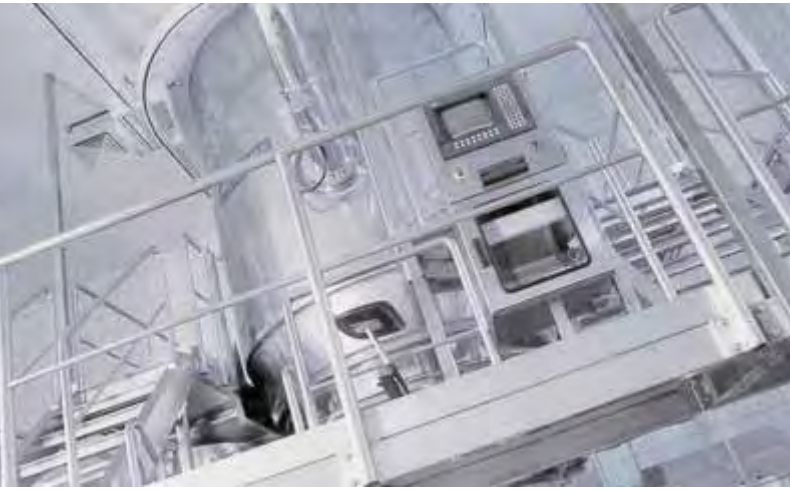


*The products and systems described in this catalog are distributed under application of a certified quality and environmental management system in accordance with DIN EN ISO 9001 (Certified Registration No. 001258 QM) and DIN EN ISO 14001 (Certified Registration No. 001258 UM). The certificates are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



# SIEMENS

<b>Introduction</b>		<b>1</b>
<b>Overview of functions</b>	Export information CNC controls Positioning modules	<b>2</b>
<b>Operator components</b>	Operator panels Handheld units Machine control panels Keyboards, Storage devices Housing systems	<b>3</b>
<b>HMI software</b>	Operator control and programming Open Architecture Motion Control Information System Tools SINUMERIK Solution Partners	<b>4</b>
<b>Basic components</b>	SINUMERIK 802S/802C SINUMERIK 810D/840D FM 353/FM 354/FM 357-2	<b>5</b>
<b>Synchronous motors</b>	1FT6/1FT7/1FK7/1FN3/ 1FW6/1FE1/2SP1 Gearboxes Geared motors 1FK7-DYA CAD CREATOR	<b>6</b>
<b>Asynchronous motors</b>	1PH7/1PH4/1PM4/1PM6/1PH2 Gearboxes	<b>7</b>
<b>Measuring systems SIMODRIVE sensor</b>	Incremental encoders Absolute encoders	<b>8</b>
<b>Converter system</b>	SIMODRIVE 611	<b>9</b>
<b>Connection system MOTION-CONNECT</b>	Power cables Signal cables MPI bus cables Length codes	<b>10</b>
<b>Services</b>	Mechatronics Support Virtual Production Repair service contract Retrofit Training/Documentation	<b>11</b>
<b>Appendix</b>	Approvals Indexes	<b>12</b>





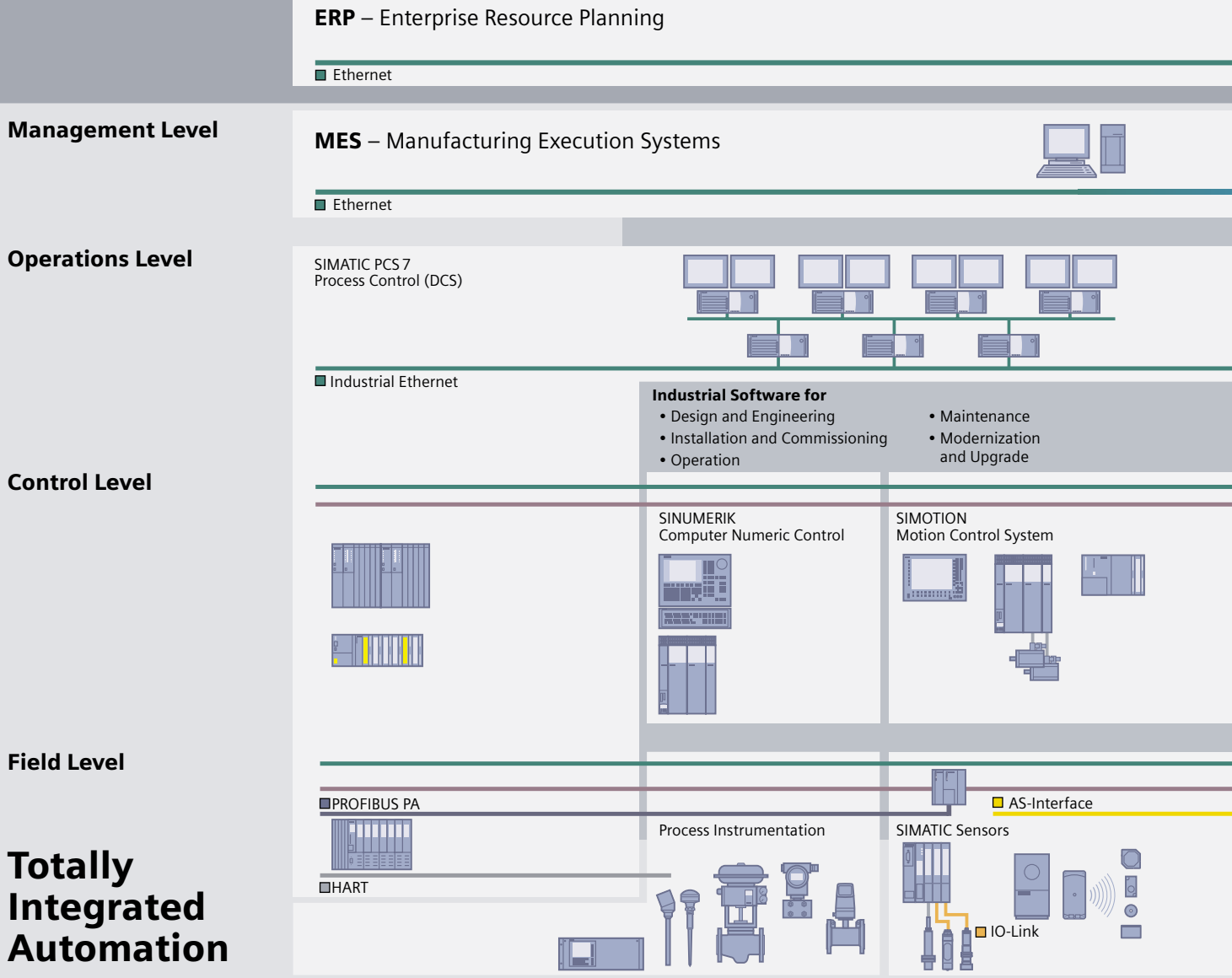
## Answers for Industry.

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

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

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

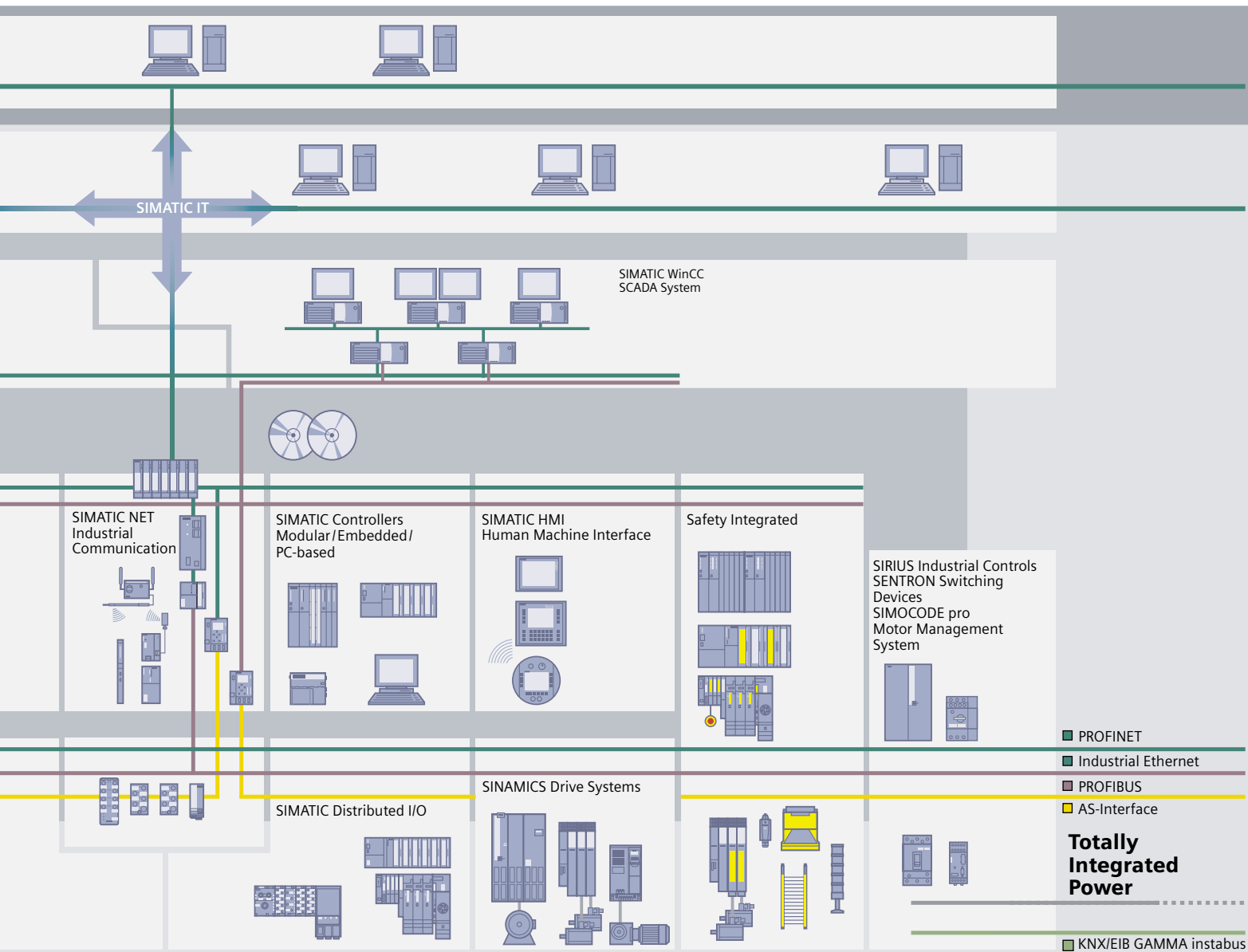
Check out the opportunities our automation and drive solutions provide. And discover how you can sustainably enhance your competitive edge with us.



## Setting standards in productivity and competitiveness.

**Totally Integrated Automation.**

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



**TIA is characterized by its unique continuity.**

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

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

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





# Introduction



1/2	Tool making and mold making
1/2	SINUMERIK & SIMODRIVE
1/3	Shopfloor manufacturing ShopMill and ShopTurn
1/4	Solutions for Powertrain TRANSLINE
1/6	Virtual prototyping
1/7	ePS Network Services
1/8	Motion Control Information System MCIS
1/9	NCSD configurator SINUMERIK & SIMODRIVE
1/10	The total system

# 1 Introduction

## Tool making and mold making

### How to get things in shape

Only those who know what is required in practice can develop custom-made products and systems to meet a wide variety of requirements. Siemens is able to offer innovative and industry-specific control solutions for all types of tool making and mold making applications under the slogan "Productivity in Motion". Speed, precision and perfect surface quality without the need for time-consuming remachining are the main aims in tool making and mold making.

High-speed cutting (HSC) is a particularly powerful technology to solve challenging and complex production tasks.

Siemens automation technology has defined an entirely new vision for CNC technology. The control provides all the prerequisites for the highly-productive tool and mold making industry. These include:

- High-speed machining with Look ahead
- Following-error-free traversing with feedforward control
- Acceleration with jerk limitation
- NURBS interpolation
- State-of-the-art 5-axis functions proven in practice
- Active vibration damping
- Compensation of mechanical errors
- CAD/CAM integration
- Integration of internal measuring systems
- Extensive safety routines
- Optimum overall solution with SIMODRIVE 611 converter system

#### *Fit for all sectors thanks to SINUMERIK & SIMODRIVE*

- Automotive industry
- Die manufacture
- Aviation and space travel
- Consumer goods industry
- Power engineering

In addition to these, Siemens Motion Control systems are also proving their excellence in other key sectors, such as mechanical engineering, electrical engineering, process engineering, medical engineering, and materials handling.

## SINUMERIK & SIMODRIVE

### The complete range for all requirements

- SINUMERIK 840D powerline
- SIMODRIVE converter system
- Synchronous/asynchronous motors

The modern control concept has a consistent, modular design and allows users to rapidly and efficiently select their controls for various customer requirements and technologies.

The compact modular SIMODRIVE 611 drive system with digital coupling provides a high power density with minimum installation space requirements.

The modular system permits the combination of regulated feed drives and main spindle drives to create a drive group.

1FN linear motors that perfectly interact with SINUMERIK 840D powerline and SIMODRIVE 611 enable the axis speed and acceleration of machine tools to be taken to new heights.

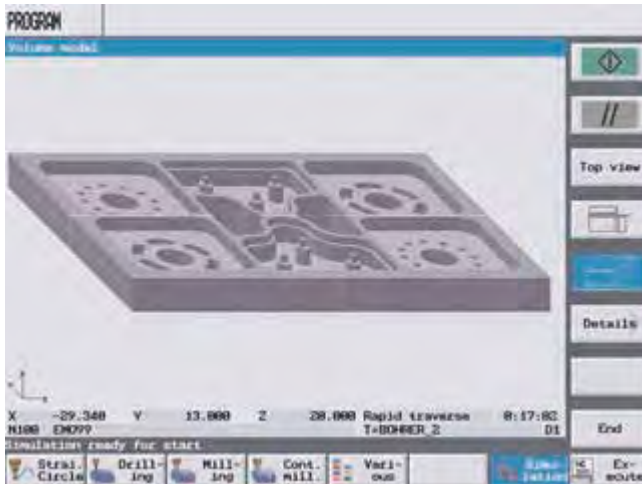


SINUMERIK 810D powerline with SIMODRIVE 611 digital



SINUMERIK 840D powerline with SIMODRIVE 611 digital

## Powerful software for milling and turning

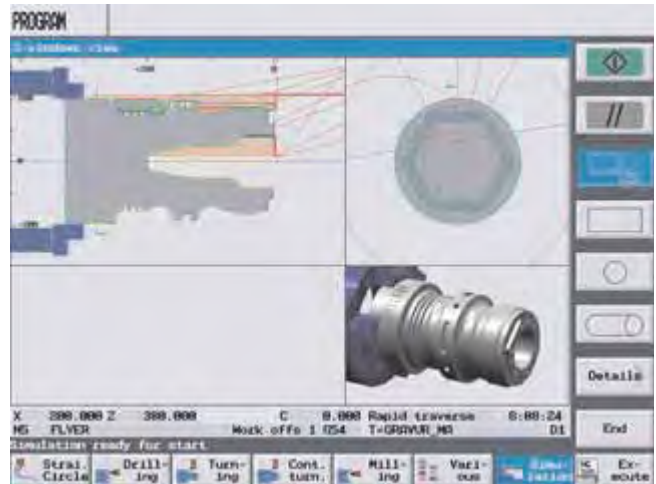
**ShopMill –  
Powerful software on a strong platform.**

ShopMill is the shopfloor- and production-oriented user and programming interface for milling and drilling.

Three different program variants are available:

- CAD/CAM system G code programs
- G code programs created directly on the machine and
- ShopMill machining step programming

Machining step and G code programs are suitable for 2D to 2½D machining; for 3D machining, use CAD/CAM system G code programs.

**ShopTurn –  
Practical software on the latest SINUMERIK platform.**

ShopTurn is the patent remedy for increased productivity on your shopfloor. Lay the foundations for your success on this shopfloor- and production-oriented operator software for turning and milling.

ShopTurn combines a user-friendly introduction to CNC technology with full CNC availability.

Easy-to-follow programming sequences in practical dialog format – without DIN. The entire knowledge base of our skilled workers has gone into ShopTurn. This means that it can be used by anyone – without a great deal of programming overhead and without detailed knowledge of CNC.

All programming functions feature graphics-based support, and motion commands are entered in plain text. Step-by-step programming of your workpiece couldn't be easier and you can check your entries simultaneously on the screen.

# Introduction

## Solutions for Powertrain TRANSLINE

### System solution for high volume production

#### *The system solution offers*

- An integrated control concept for:
  - Transfer lines
  - Flexible production lines
  - Assembly lines
  - Rotary transfer machines
  - CNC machines
  - PLC-controlled machines
  - Handling systems
- Distributed, digital control and drive concept
- Optimized integration of hardware and software
- Standardized software structures and communication
- Selected components from the SIMATIC, SINUMERIK, and SIMODRIVE system families

As the market leader in control technology for Powertrain solutions, we have already been able to underline our system competence for automation solutions in numerous projects. Our customers include all the leading automobile manufacturers worldwide.

Our worldwide service, sound advice, excellent training, and the fact that you are always dealing with an experienced, reliable partner, are further good reasons for contacting us.

#### *Distributed, digital control and drive concept.*

Solutions for Powertrain TRANSLINE support distributed configurations on a digital basis.

Distributed configurations mean, in particular, lower costs thanks to standardization, fast commissioning, and service-friendly and maintenance-friendly machines.

#### *Optimized integration of hardware and software.*

This means that you can achieve an optimal automation solution for all control tasks. From the simple PLC unit to the integrated high-speed machining module.

The uniform design of SINUMERIK and SIMATIC S7-300 makes it easy to expand the system on the modular principle.

#### *Standardized software structures and communication via PROFIBUS DP and Industrial Ethernet.*

All PLCs can be programmed using graphical programming methods such as S7-Graph. This permits uniform PLC and CNC diagnostics at main operator panels and unit operator panels.

For operators and machine manufacturers, we offer a transparent graphical user interface on our Solutions for Powertrain TRANSLINE HMI operator panels.

The stations communicate via PROFIBUS DP.

Connections to control systems are made using Industrial Ethernet interfaces. Interfacing to the management level is ensured when using this industrial standard.

The Motion Control Information System MCIS function blocks and the ePS Network Services can be used within the scope of this concept without any problems.

#### *Benefits*

- Standardized protocol
- Start-up, diagnostics, data backup
- Direct coupling of
  - SINUMERIK and SIMATIC S7
  - ET 200 distributed I/O
  - AS-Interface components

#### *Selected components from the SIMATIC, SINUMERIK, and SIMODRIVE system families.*

To keep spare parts inventories as small as possible and therefore to minimize the costs for maintaining a stock of spare parts for the machine user, selected components from the SIMATIC, SINUMERIK and SIMODRIVE system families are used.



### System solution for high volume production

#### Standardized control units significantly reduce the processing time.

With Solutions for Powertrain TRANSLINE, you can configure an automation solution that matches your task precisely.

For machine manufacturers, the benefits are:

- Lower configuring costs and shorter project engineering times
- The option of prefabrication
- Considerably lower cabling outlay and therefore enhanced reliability of wiring and operational reliability
- Shorter start-up times thanks to advanced commissioning and commissioning of smaller units in parallel for greater transparency.

Conclusion:

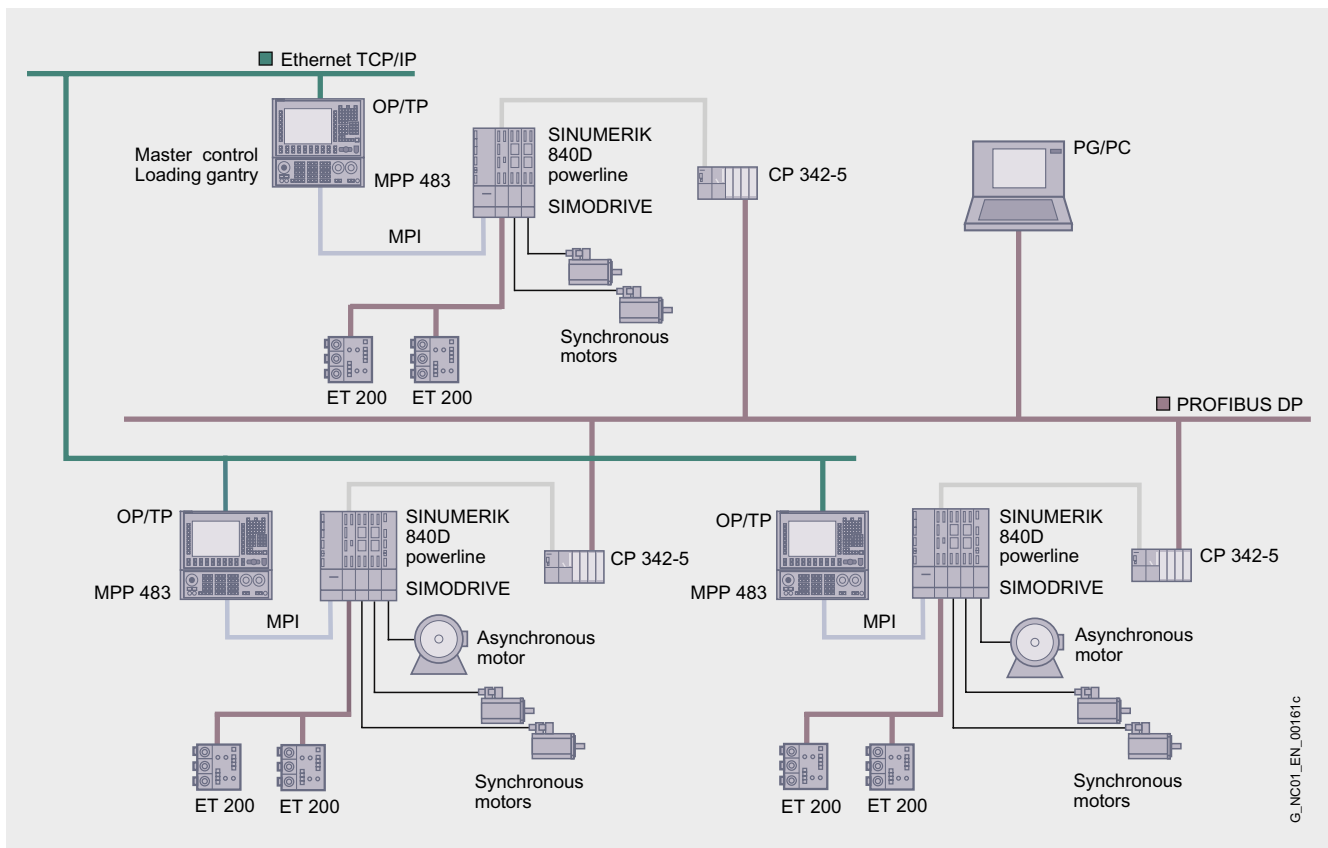
The time taken to complete a project is considerably reduced.

#### Economical production thanks to higher availability.

If you are a machine operator, a distributed configuration will allow you to significantly increase the availability and productivity of your production lines and therefore to improve their efficiency.

This is achieved by:

- Fast localization of sources of error, since all components are designed according to a uniform standard
- Service-friendliness and maintenance-friendliness through simple, recurring programs
- Shorter start-up and acceptance times thanks to modular software
- Shorter machine training times
- Reduced, cost-cutting stocking of spare parts

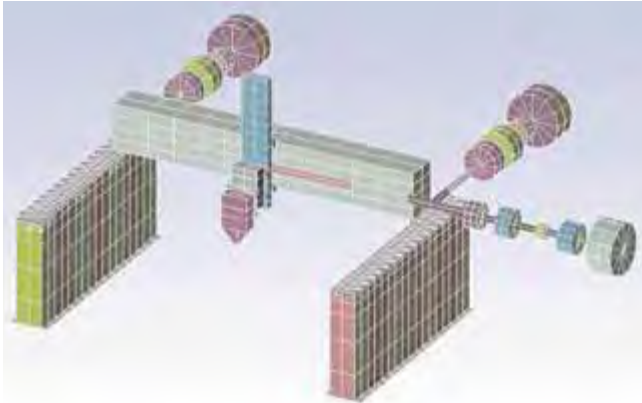


# 1 Introduction

## Virtual prototyping

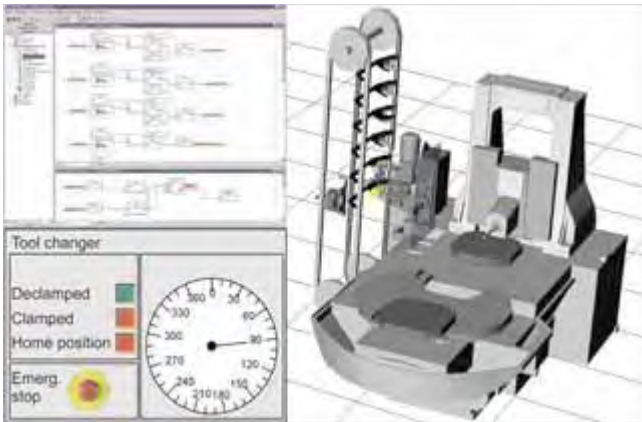
**Bundled expertise – the faster and more efficient route to perfect machines and optimized workpieces**

### *Mechatronics Support*



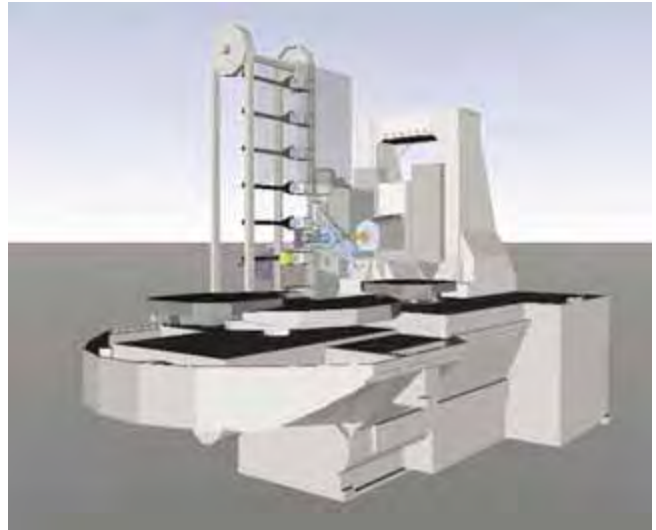
- Improving the productivity and accuracy of existing production machines
- Virtual analysis of new ideas and feasibility studies for new machine concepts
- Virtual optimization of machine concepts

### *Machine Simulator*



- Run in a machine without actually building it
- Test the interaction of CNC and PLC programs

### *Virtual Production*



- Simulate processing procedures without interrupting active production
- Identify and exploit hidden potential in respect of productivity

### Benefits

- Shorter development and processing times – faster time to market
- Increased development security
- Creative concepts
- Only one virtual prototype instead of numerous actual prototypes
- Improved quality – increased productivity

Innovation potential for servicing  
and maintenance

The objective of ePS Network Services is to increase the productivity and availability of machines and to optimize global service and maintenance processes.

The services operate on an Internet-based platform. They support company-wide service and support processes.

To minimize the occurrence of faults, ePS Network Services provide maintenance departments and machine manufacturers with services that enable the status of machines and individual components to be evaluated cyclically. Parts subject to wear, such as bearings and guides, are of particular relevance.

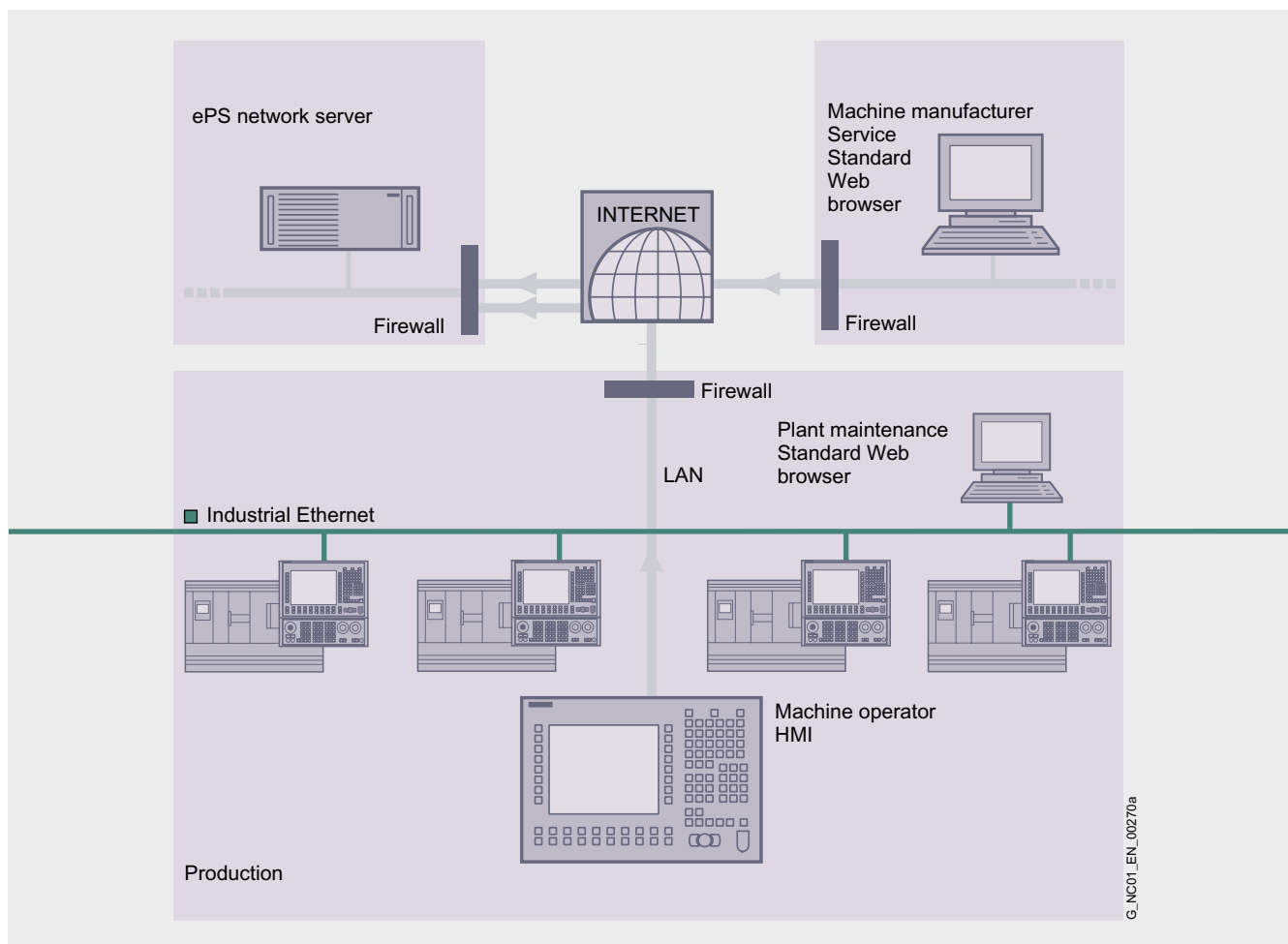
Unscheduled downtimes can be significantly reduced. Test procedures based on standards, such as circularity and synchronization tests, can be used in this context.

The trend analysis evaluates the test results throughout the life cycle of a machine.

This ongoing evaluation means that maintenance measures can be scheduled on a predictive and selective basis and that inspection and maintenance procedures can be optimized. On the basis of process or utilization, the maintenance department can determine which spare parts will be needed when and where on site.

Benefits

- Reduced maintenance costs
- Increased system availability
- Increased productivity
- Reduction of life cycle costs



# 1 Introduction

## Motion Control Information System MCIS

### The key to increased productivity

The Motion Control Information System MCIS provides a comprehensive range of powerful software modules for production machines. These programs optimize the integration of your machines into your EDP environment.

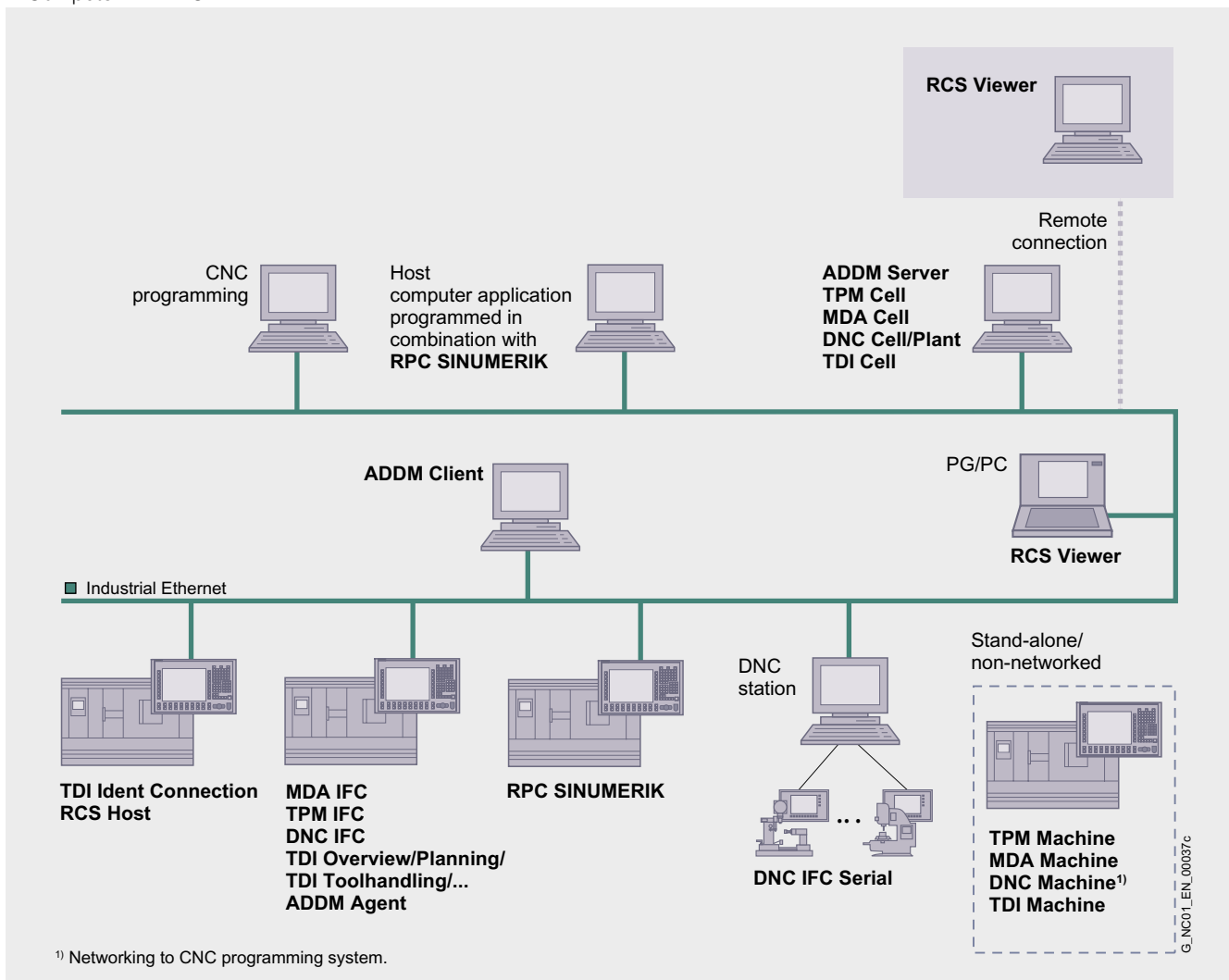
They also support a wide range of diverse functional areas:

- Production data management MDA/PMT/PDA
- CNC program management DNC
- Tool management TDI
- Maintenance management TPM
- Data backup and archiving ADDM
- Service management RCS
- Computer link RPC

With the Motion Control Information System MCIS you'll increase the productivity and reliability of your machine tools by means of the perfect integration of the machines into the process chain.

For your production, this means:

- Smooth coordination of planning, disposal and execution
- Shorter setup times and enhanced efficiency
- Reduced machine downtimes
- Simplified fault analyses

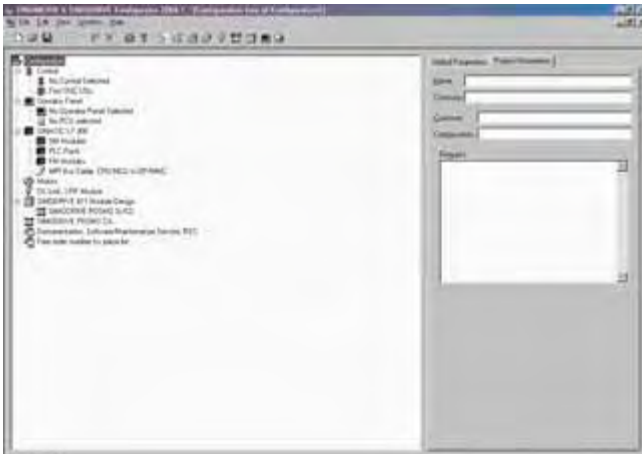




# Introduction

## NCSD configurator SINUMERIK & SIMODRIVE

### Intelligent selection aid for configuring SINUMERIK and SIMODRIVE components



Customized systems can be assembled easily and quickly starting from the selection of the CNC control through to assigning operator components right up to configuring the drives.

#### Benefits

- Simple tree structure and clear navigation
- Variable module selection and sequence
- Configuration of sub-components and complete systems
- Order optimization thanks to automatic recalculation when the configuration is modified
- Constant testing of all selected components for consistency and reliability of interaction
- Generated parts lists can be loaded into the interactive CA 01 catalog.
- Parts list is completed by freely entering order numbers
- 10 languages: Chinese simplified, Czech, English, French, German, Italian, Polish, Russian, Spanish and Swedish

The CNC, operator components, HMI software, SIMATIC S7-300 I/Os, converter system, motors and measuring system are all selected in the same manner.

Motors can be selected using the order number or by means of a motor wizard based on speed, torque or output. The matching power section and appropriate cables are automatically assigned to the motor. The cable lengths can then be specified application-specifically. Creation of special motors is supported. Linear motors can be connected in parallel to improve output performance.

The NCSD configurator provides up-to-date information, for example, about:

- Design of the SINUMERIK components
- Design of the interconnected SIMODRIVE system
- Motor data and options for motor core types
- DC link power and capacitance
- Assessment factors (electronic points and activation points)
- Power loss calculation for control cabinet components

Software update service, repair service contract, documentation and maintenance contracts for individual components are also implemented in the NCSD configurator.

You can obtain the NCSD configurator:

- Together with the interactive CA 01 catalog or
- Always up-to-date on the Internet at:



[www.siemens.com/sinumerik](http://www.siemens.com/sinumerik)



# Introduction

## The total system

### SINUMERIK and SIMODRIVE – two powerful partners

Our SINUMERIK controls and the SIMODRIVE converter system are state-of-the-art-systems capable of fulfilling all your needs totally and enabling you to manufacture your products more flexibly and more cost-effectively.

#### Overview of functions

- SINUMERIK 802S/802C
- SINUMERIK 810D powerline
- SINUMERIK 840D powerline
- Positioning modules

2



#### Operator components for CNC controls

- Operator panels
- Handheld units
- Machine control panels
- Keyboards
- Storage devices
- Housing systems

3



#### HMI software for CNC controls

- Operator control and programming
- Open Architecture
- Motion Control Information System
- Tools
- SINUMERIK Solution Partners

4



#### Basic components

- SINUMERIK 802S/802C
- SINUMERIK 810D powerline
- SINUMERIK 840D powerline
- SINUMERIK I/O modules
- FM 353/FM 354/FM 357-2
- Supplementary components

5



#### Synchronous motors

- 1FT6/1FT7/1FK7 motors
- Gearboxes
- 1FK7-DYA geared motors
- 1FN3 linear motors
- 1FW6 torque motors
- 1FE1 built-in motors
- 2SP1 motor spindles

6



#### CD-ROM for Catalog NC 60

In the CD-ROM that accompanies Catalog NC 60 · 2009 you will find further information:

- Planning and configuration
- Dimension drawings
- Glossary
- Catalog NC 60 · 2009 in PDF format

#### Asynchronous motors

- 1PH7 motors
- 1PH4 motors
- 1PM4/1PM6 motors
- 1PH2 built-in motors
- Gearboxes

7



#### Measuring systems SIMODRIVE sensor

- Built-in optoelectronic rotary encoders
  - Incremental encoders
  - Absolute encoders

8



#### SIMODRIVE 611 converter system

- Line interfaces
- Infeed modules
- Line filters
- Drive modules
- Supplementary system components

9



#### Connection system MOTION-CONNECT

- Power cables
- Signal cables
- MPI bus cables

10



#### Services

- Mechatronics Support
- Virtual Production
- Machine Simulator
- Service & Support
- Retrofit
- Fire extinguishing system for machine tools
- Control cabinets
- Logistics services for our customers
- Components for CNC basic and further training
- Training/Training equipment
- Documentation

11



#### Appendix

- Approvals
- Indexes

12



Catalog NC 60 contains the ordering data for electrical components for the automation of machine tools and general positioning units.

To ensure smooth functioning of the total system, use only original Siemens accessories.

# Overview of functions



## 2/2 SINUMERIK CNC controls

- 2/2 General Information
- 2/2 Export control information, Standard/export versions

---

- 2/4 Control structure/configuration
- 2/8 Measuring systems that can be connected
- 2/10 CNC functionality:
  - 2/10 Program functions
  - 2/10 Axis functions
  - 2/12 Spindle functions
  - 2/14 Interpolations
  - 2/14 Couplings
  - 2/18 Transformations
  - 2/18 Measuring Technologies
  - 2/20 Motion-synchronous actions
- 2/22 Open Architecture
- 2/24 CNC programming:
  - 2/24 Language
  - 2/26 Cycles
  - 2/28 Program support
- 2/28 Parameters
- 2/30 Simulation
- 2/30 Operating modes
- 2/32 Tools
- 2/38 Communication
- 2/38 ePS Network Services
- 2/38 Motion Control Information System MCIS
- 2/40 Data management
- 2/40 Operation
- 2/44 Axis monitoring functions
- 2/44 Compensations
- 2/46 PLC area
- 2/48 Monitoring functions
- 2/48 Safety functions
- 2/48 Startup
- 2/50 Diagnostic functions
- 2/50 Tools

2/52 Overview of options for SINUMERIK 810D powerline/840D powerline

2/53 Overview of options for SINUMERIK 802S/802C

The information in the function overview of SINUMERIK control systems is based on the following software versions:

CNC control	Software version
SINUMERIK 802S/802C	4.x
SINUMERIK 810D powerline	6.x
SINUMERIK 840D powerline	7.x

## 2/54 Positioning modules

- 2/54 Structure/application
- 2/54 Measuring systems that can be connected

---

- 2/54 Functionality
- 2/55 CNC programming
- 2/56 Communication
- 2/56 Operation
- 2/56 Operating modes and machine functions
- 2/57 Compensations and reference points
- 2/57 Axis monitoring functions
- 2/58 PLC area
- 2/58 Diagnostic functions
- 2/58 Startup/parameterization



# Overview of functions

## SINUMERIK CNC controls

### General Information

#### Overview

##### *SINUMERIK CNC controls*

The function overview lists the most important functions of the SINUMERIK 802S base line, SINUMERIK 802C base line, SINUMERIK 810D powerline and SINUMERIK 840D powerline, allowing you quick and selective access to individual functions.

When complete order numbers are given in the list, they must be specified in the order with the appropriate quantities.

The order numbers of the hardware components and other options can be found in the relevant chapters.

##### *Positioning modules*

The Overview of functions lists the major functions of the FM 353, FM 354, FM 357-2L/LX/H and SIMODRIVE 611 universal HRS, allowing you quick and selective access to individual functions.

In the case of FM 353/FM 354, the functions for application as an autonomous PLC auxiliary axis are specified.

### Export control information

#### Standard/export versions

#### Overview

As a consequence of the prevailing export restrictions applicable to the system software of numerical controls, in relation to particular control functions in accordance with the European/German Export List (AL item 2D002), SINUMERIK 810D powerline and SINUMERIK 840D powerline are available in two versions.

In the case of SINUMERIK 810D powerline, this applies to CCU components with integrated system software and with SINUMERIK 840D powerline to NCU system software.

The **standard versions** of SINUMERIK 810D powerline and SINUMERIK 840D powerline offer the full scope of control functions, but require **official approval** when exported to countries outside the EU.

The **export versions** SINUMERIK 802S base line, SINUMERIK 802C base line, SINUMERIK 810DE powerline and SINUMERIK 840DE powerline have restricted functionality in accordance with the export list restrictions and therefore do not require **official approval** as a result of their "Type" in accordance with EU or German law.

Functional restrictions are documented in the table below.

The approval status for the complete CNC system is correspondingly dependent on the hardware or software version used.

##### *Important export information*

Export of standard versions of components or systems is subject to a time-consuming official authorization process, so it is recommended that the **export version** is used where applicable.

"Information on List of Items (Auskunft zur Güterliste (AZG))" pertaining to the official export authorization process is available for each export version (e.g. Federal Office of Economics and Export Control (BAFA), Customs). You can obtain a copy of this list from your local Siemens sales office.

When the standard variant is used, it is important to note that official authorization is also required for the export of components subject to export approval within the framework of service provision, the supply of spare parts and for delivery of software updates and upgrades. This is especially relevant in cases where the control is exported after the machine manufacturer has installed it in a machine tool. The lengthy official approval procedure can severely restrict after-sales service.

When an application for an export permit for a system is submitted, we therefore recommend that spare parts supplies for any components requiring approval are included in the application as a matter of course to avoid future delays.

If the control is to be exported as an installed component in a machine tool, we recommend that machine manufacturers include any components requiring approval in the export permit application for the machine. If the machine itself does not require official export approval, but contains components which do, we recommend that an export permit for the replacement supply of such components is applied for in advance.

Spare parts supplies requiring official approval can then be exported quickly and easily by the machine manufacturer himself, or by Siemens if the manufacturer can make the original export permit available to Siemens.

##### General information:

*If any particular components require official re-export approval according to US law, this must be duly filed for.*

*Information about official approval requirements for supplied components is given in the delivery documentation: Goods labeled here with "AL not equal to N" are subject to European or German export authorization when they are exported out of the EU. Goods labeled with "ECCN not equal to N" are subject to US re-export authorization. Even if goods are not labeled or labeled with "AL:N" or "ECCN:N", they may still be subject to export authorization due to the final destination and end use of the goods.*

*If a purchase contract is concluded, it shall be discharged by Siemens with the proviso that performance of the contract shall not be hindered by national or international legal requirements and especially by export control regulations.*

### Overview

#### Functional restrictions for export versions

Function	Order No.	802S base line 802C base line	810DE power- line	840DE power- line
Linear interpolation	●	–	☐ <sup>1)</sup>	☐ <sup>1)</sup>
Helical interpolation 2D+6	●	–	–	–
Synchronized actions	●	–	☐ <sup>2)</sup>	☐ <sup>2)</sup>
SINUMERIK NCK Runtime OA	<b>6FC5251-0AA20-0AA0</b>	–	–	–
Multi-axis interpolation (> 4 interpolating axes)	<b>6FC5251-0AA16-0AA0</b>	–	–	–
Master-value coupling and curve table interpolation	<b>6FC5251-0AD06-0AA0</b>	–	☐ <sup>3)</sup>	☐ <sup>3)</sup>
Generic coupling CP Basic	<b>6FC5251-0AG01-0AA0</b>	–	–	☐ <sup>3)</sup>
Generic coupling CP Comfort	<b>6FC5251-0AG02-0AA0</b>	–	–	☐ <sup>3)</sup>
Generic coupling CP Expert	<b>6FC5251-0AG03-0AA0</b>	–	–	☐ <sup>3)</sup>
Electronic gear unit	<b>6FC5251-0AE00-0AA0</b>	–	–	☐ <sup>3)</sup>
Machining package milling	<b>6FC5251-0AG00-0AA0</b>	–	–	–
Machining package 5 axes	<b>6FC5251-0AA10-0AA0</b>	–	–	–
Handling transformation package	<b>6FC5251-0AD07-0AA0</b>	–	–	–
Transformation TRICEPT, 5 axes: Root	<b>6FC5251-0AE50-0AA0</b>	–	–	–
Transformation TRICEPT, 5 axes: DMS	<b>6FC5251-0AE51-0AA0</b>	–	–	–
Transformation TRICEPT, 5 axes: 6th axis	<b>6FC5251-0AE53-0AA0</b>	–	–	–
Transformation Dynamic Swivel Tripod (DST)	<b>6FC5251-0AE60-0AA0</b>	–	–	–
Transformation Dynamic Swivel Tripod (DST): 6th axis	<b>6FC5251-0AE61-0AA0</b>	–	–	–
HEXAPOD transformation 6 axes	<b>6FC5251-0AF75-0AA0</b>	–	–	–
Electronic transfer	<b>6FC5250-0AD05-0AA0</b>	–	–	☐ <sup>3)</sup>
Synchronized actions stage 2	<b>6FC5251-0AD05-0AA0</b>	–	☐ <sup>4)</sup>	☐ <sup>4)</sup>
Clearance control, 1D/3D in position control cycle	<b>6FC5251-0AC05-0AA0</b>	–	☐ <sup>5)</sup>	☐ <sup>5)</sup>
Sag compensation, multi-dimensional	<b>6FC5251-0AB15-0AA0</b>	–	☐ <sup>6)</sup>	☐ <sup>6)</sup>

● Basic version

☐ Restricted functionality of the export versions.

– Not possible

The designation "E" in the name of the control indicates that it is the export variant, i. e. the relevant control software is classified as not requiring official approval (AL=N) with the functional restrictions specified in the table according to AL item 2D002.

For further details on "restricted functionality" for the export versions, see the Glossary on the CD-ROM for Catalog NC 60 or go to:  
[www.siemens.com/automation/mall](http://www.siemens.com/automation/mall)

<sup>1)</sup> The number of simultaneously interpolating axes is restricted to four.

<sup>2)</sup> Only one active synchronous function (SYNFACT) is possible at a time. The number of simultaneously traversing axes is restricted to four (path and positioning axes).

<sup>3)</sup> The number of simultaneously traversing axes is restricted to four.

<sup>4)</sup> The number of simultaneously traversing axes is restricted to four (path and positioning axes).

<sup>5)</sup> 1D distance control only in the position control cycle, and the number of simultaneously interpolating axes is restricted to four.

<sup>6)</sup> The correctable tolerance band is restricted to 1 mm (0.04 in).

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### Control structure/configuration

#### Structure

- SIMODRIVE 611
- SINUMERIK PCU

See Converter system

See Operator components

#### Drives

- SIMODRIVE 611 digital
- SIMODRIVE 611 universal HRS<sup>1)</sup>

See Converter system

- Power control for stepper motors

On request

#### Mode groups (MGs)

- 1 MG
- Maximum configuration  
NCU 561.5/571.5  
NCU 572.5/NCU 573.5
- Each additional MG

**6FC5251-0AD00-0AA0**

#### Machining channels

- Maximum configuration  
NCU 561.5/571.5  
NCU 572.5/NCU 573.5
- Each additional machining channel

**6FC5251-0AA07-0AA0**

#### Additional axis/spindle + channel

- NCU 561.5
- NCU 571.5/572.5/573.5

**6FC5251-0AD08-0AA0**

CNC main memory (buffered) for programs and data in MB  
(SINUMERIK 810D/840D: max. 0.3 MB allocated to Siemens technological cycles/  
an additional 0.25 MB (in total) is allocated to Siemens measuring cycles)

#### Expansion of CNC main memory by 1 MB

**6FC5251-0AD02-0AA0**

CNC main memory, maximum configuration

<sup>1)</sup> Activation via analog or PROFIBUS interface.  
<sup>2)</sup> For positioning tasks using the PLC.

<sup>3)</sup> With NCU system software:  
2/6 axes: max. 2 mode groups/2 channels  
12 axes: max. 2 mode groups/4 channels (software version 7.2 or higher)  
31 axes: max. 10 mode groups/31 channels.

# Overview of functions SINUMERIK CNC controls

2

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline												
802S base line	802C base line			810DE power-line	810D power-line			840DE power-line	840D power-line	Note on operating software Blank field: Function is not dependent on operating software						
										HMI-Advanced	HMI-Embedded	Shop Mill		Shop Turn	HT 6	
-	-			●	●			●	●							
●	●			-	-			-	-							
-	-			●	●			●	●							
-	●			○ <sub>2)</sub>	○ <sub>2)</sub>			○ <sub>2)</sub>	○ <sub>2)</sub>							
○	-			-	-			-	-							
●	●			●	●			●	●							
1	1			2	2					10	10	1		1	10	
								2	2							
								10 <sup>3)</sup>	10 <sup>3)</sup>							
-	-			○	○			○	○	-	-	-		-		
●	●			●	●			●	●							
1	1			1	1			1	1							
1	1			2	2					10	10	1		1	10	
								2	2							
								10 <sup>3)</sup>	10 <sup>3)</sup>							
-	-			○	○			○	○							
-	-			-	-											
								○	-							
								-	-							
●	●			●	●			●	●							
0.25	0.25			0.5	0.5			3	3							
-	-			○	○			○	○							
0.25	0.25			2.5	2.5			6	6							

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### Control structure/configuration (continued)

Axes/spindles or positioning axes/auxiliary spindles

- Maximum configuration of axes

NCU 561.5

NCU 571.5

NCU 572.5/573.5

- Maximum configuration of spindles

NCU 561.5

NCU 571.5

NCU 572.5/573.5

- Maximum configuration of axes and spindles

NCU 561.5

NCU 571.5

NCU 572.5/573.5

- Configuration per channel axes  
incl. spindles

NCU 561.5

NCU 571.5

NCU 572.5/573.5

Each additional interpolation axis/spindle<sup>1)</sup>

NCU 561.5

NCU 571.5/572.5/573.5

Each additional positioning axis (axis-specific feed) or auxiliary spindle  
(spindle-specific speed)<sup>1)</sup>

NCU 561.5

NCU 571.5/572.5/573.5

Enabling of internal drive control of 6th axis for positioning tasks  
(contains additional positioning axis or auxiliary spindle)

**6FC5451-0AF01-0AA0**

Enabling of internal drive control of 6th axis for interpolation tasks  
(contains additional interpolation axis/spindle)

**6FC5451-0AF02-0AA0**

Additionally as a package: 2nd machining channel and maximum memory configuration

**6FC5451-0AF03-0AA0**

Additionally as a package: 4 machining channels and 13 axes

**6FC5251-0AD01-0AA0**

NCU 561.5/571.5

NCU 572.5/573.5

Connection of FM 354 as PLC positioning axis

See Basic components

Connection of FM 353 as PLC positioning axis

See Basic components

<sup>1)</sup> Option: If number of axes + spindles > 5.

<sup>2)</sup> Display of max. 5 axes + 1 spindle.



# Overview of functions SINUMERIK CNC controls

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline											
802S base line	802C base line			810DE power-line	810D power-line			840DE power-line	840D power-line	Note on operating software Blank field: Function is not dependent on operating software					
										HMI-Advanced	HMI-Embedded	Shop Mill		Shop Turn	HT 6

4	4			5	5			5	5							
3	3			6	6					31	31	12		12	31	
								2	2							
								6	6							
								31	31							
1	1			2	2					31	31	1		3+2C	31	
								2	2							
								6	6							
								31	31							
4	4			6	6					31	31	12 <sup>2)</sup>		12 <sup>2)</sup>	31	
								2	2							
								6	6							
								31	31							
4	4			6	6					12	12	12		12	12	
1	1			2	2					12	12	1		3	12	
								2	2							
								6	6							
								12	12							
-	-			o	o											
								-	-							
								o	o							
-	-			o	o											
								-	-							
								o	o							
-	-			o	o											
								-	-							
								-	-							
								o	o							
-	-			•	•			•	•							
-	-			•	•			•	•							

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### Measuring systems that can be connected

Max. number

NCU 561.5

NCU 571.5

NCU 572.5/573.5

Incremental rotary measuring system with RS 422 (TTL)

Linear incremental encoder with current signals

- Via external EXE

- Via SIMODRIVE 611 digital closed-loop control module

Linear incremental encoder with sin/cos 1 V<sub>pp</sub>

- On-board

- Via external EXE

- Via SIMODRIVE 611 digital closed-loop control module

- Via SIMODRIVE 611 universal HRS incremental shaft encoder output

- Via SIMODRIVE 611 universal HRS (linear axis)

Linear incremental encoder with distance-coded reference marks

- On-board

- Via SIMODRIVE 611 digital closed-loop control module

- Via SIMODRIVE 611 universal HRS closed-loop control module

Rotary measuring systems with distance-coded reference marks

- On-board

- Via SIMODRIVE 611 digital closed-loop control module

- Via SIMODRIVE 611 universal HRS closed-loop control module

Absolute value encoder connection with SSI interface

Absolute value encoder connection with EnDat linear/rotary

- On-board

- Via SIMODRIVE 611 digital closed-loop control module

- Via SIMODRIVE 611 universal HRS closed-loop control module

Absolute value/incremental encoder installed in 1FT6/1FT7/1FK

- On-board

- Via SIMODRIVE 611 digital closed-loop control module

- Via SIMODRIVE 611 universal HRS closed-loop control module

<sup>1)</sup> For spindle only.

<sup>2)</sup> SINUMERIK 810D measuring channels and via SIMODRIVE 611 digital closed-loop control module.

<sup>3)</sup> Two measuring systems per axis.

<sup>4)</sup> For positioning tasks.

<sup>5)</sup> Not as motor measuring system, only for spindles or rotary axes for direct position sensing.

# Overview of functions SINUMERIK CNC controls

2

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline											
802S base line	802C base line			810DE power- line	810D power- line			840DE power- line	840D power- line	Note on operating software Blank field: Function is not dependent on operating software					
										HMI- Ad- van- ced	HMI- Em- bed- ded	Shop Mill		Shop Turn	HT 6

1	4			12 <sup>2)</sup>	12 <sup>2)</sup>											
								4 <sup>3)</sup>	4 <sup>3)</sup>							
								12 <sup>3)</sup>	12 <sup>3)</sup>							
								62 <sup>3)</sup>	62 <sup>3)</sup>							
● 1)	●			–	–			–	–							
–	●			–	–			–	–							
–	–			●	●			●	●							
–	–			●	●			–	–							
–	●			–	–			–	–							
–	–			●	●			●	●							
–	●			–	–			–	–							
–	–			○ 4)	○ 4)			○ 4)	○ 4)							
–	–			●	●			–	–							
–	–			●	●			●	●							
–	–			○ 4)	○ 4)			○ 4)	○ 4)							
–	–			●	●			–	–							
–	–			●	●			●	●							
–	–			○ 4)	○ 4)			○ 4)	○ 4)							
–	–			●	●			–	–							
–	–			●	●			●	●							
–	–			○ 4)	○ 4)			○ 4)	○ 4)							
–	–			●	●			–	–							
–	–			●	●			●	●							
–	–			○ 4)	○ 4)			○ 4)	○ 4)							

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### Measuring systems that can be connected (continued)

Incremental encoder with sin/cos 1 V<sub>pp</sub>

- On-board
- Via SIMODRIVE 611 digital closed-loop control module
- Via SIMODRIVE 611 universal HRS closed-loop control module

Resolver installed in 1FT6/1FK

- Via SIMODRIVE 611 universal HRS closed-loop control module

### CNC functionality: Program functions

Dynamic preprocessing memory (FIFO)

Look ahead

Program preprocessing

**6FC5251-0AC02-0AA0**

Axis/spindle replacement

Geometry axes, switchable online in the CNC program

Frame concept

Inclined-surface machining with frames

### CNC functionality: Axis functions

Feedrate override of 0 ... 200 %

Feedrate override, axis-specific of 0 ... 200 %

Traversing range ± 9 decades

Rotary axis, turning endlessly

Measuring systems 1 and 2, selectable

Velocity, max. 300 m/s

Acceleration with jerk limitation

Programmable acceleration

Feedrate interpolation

Separate path feed for corners and chamfers

Travel to fixed stop

**6FC5255-0AB02-0AA0**

Follow-up mode

Analog axis

Setpoint exchange

**6FC5251-0AE76-0AA0**

Tangential control

**6FC5251-0AB11-0AA0**

NCU 561.5

NCU 571.5/572.5/573.5

Path switch signals/cam controller

**6FC5251-0AB07-0AA0**

1) For positioning tasks.

2) Number of traversing blocks cannot be parameterized.

3) Configuring with closed-loop control module HLA/ANA.

# Overview of functions SINUMERIK CNC controls

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline												
802S base line	802C base line			810DE power- line	810D power- line			840DE power- line	840D power- line	Note on operating software Blank field: Function is not dependent on operating software						
										HMI- Ad- van- ced	HMI- Em- bed- ded	Shop Mill		Shop Turn	HT 6	
-	-			●	●			-	-							
-	-			●	●			●	●							
-	●			○ <sub>1)</sub>	○ <sub>1)</sub>			○ <sub>1)</sub>	○ <sub>1)</sub>							
-	●			○ <sub>1)</sub>	○ <sub>1)</sub>			○ <sub>1)</sub>	○ <sub>1)</sub>							
●	●			●	●			●	●							
● <sub>2)</sub>	● <sub>2)</sub>			●	●			●	●							
-	-			○	○			○	○							
-	-			●	●			●	●							
-	-			●	●			●	●							
-	-			●	●			●	●							
-	-			●	●			●	●							
120	120			●	●			●	●							
-	-			●	●			●	●							
●	●			●	●			●	●							
-	-			●	●			●	●							
-	-			●	●			●	●							
12	●			●	●			●	●							
-	-			●	●			●	●							
●	●			●	●			●	●							
-	-			●	●			●	●							
-	-			○	○			○	○							
-	●			●	●			●	●							
-	-			-	-			● <sub>3)</sub>	● <sub>3)</sub>							
-	-			-	-			○	○							
-	-			○	○			-	-							
-	-			○	○			○	○							
-	-			○	○			○	○							

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### CNC functionality: Axis functions (continued)

Link axis <sup>1)</sup>	<b>6FC5251-0AD10-0AA0</b>
NCU 561.5/571.5/572.5	
NCU 573.5	
Axis container	<b>6FC5251-0AE01-0AA0</b>
NCU 561.5/571.5/572.5	
NCU 573.5	
Setpoint linkage for multiple NCUs <sup>1)</sup>	<b>6FC5251-0AF02-0AA0</b>
NCU 561.5/571.5/572.5	
NCU 573.5	
Fast interpolation link <sup>1)</sup>	<b>6FC5251-0AF03-0AA0</b>
NCU 561.5/571.5/572.5	
NCU 573.5	
Advanced Position Control APC	<b>6FC5251-0AF04-0AA0</b>

### CNC functionality: Spindle functions

Analog spindle speed	
Digital spindle speed	
Spindle speed, max. programmable value range: REAL ± 3.4028 ex 38 (display: ± 999 999 999.9999)	
Spindle override of 0 ... 200 %	
5 gear stages	
Automatic gear stage selection	
Oriented spindle stop	
Spindle speed limitation (min. and max.)	
Constant cutting rate	
Spindle control via PLC (positioning, oscillation)	
Changeover to axis mode	
Axis synchronization on-the-fly	
Thread run-in and run-out programmable	
Thread cutting with constant or variable pitch	
NCU 561.5	
NCU 571.5/572.5/573.5	
Tapping with compensating chuck/rigid tapping	

<sup>1)</sup> Precondition: Link module.

<sup>2)</sup> Value range: 999 999.999

<sup>3)</sup> Only SPOS and basic functions.

# Overview of functions SINUMERIK CNC controls

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline											
802S base line	802C base line			810DE power-line	810D power-line			840DE power-line	840D power-line	Note on operating software Blank field: Function is not dependent on operating software					
										HMI-Advanced	HMI-Embedded	Shop Mill		Shop Turn	HT 6

-	-			-	-			-	-							
								o	o							
-	-			-	-			-	-							
								o	o							
-	-			-	-			-	-							
								o	o							
-	-			-	-			-	-							
								o	o							
-	-			-	-			o	o							

•	•			-	-			-	-							
-	-			•	•			•	•							
• 2)	• 2)			•	•			•	•							
120	120			•	•			•	•							
•	•			•	•			•	•							
•	•			•	•			•	•							
•	•			•	•			•	•							
•	•			•	•			•	•							
-	-			•	•			•	•							
• 3)	• 3)			•	•			•	•							
-	-			•	•			•	•							
•	•			•	•			•	•							
•	•			•	•			-	-							
								•	•							
•	•			•	•			•	•							

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### CNC functionality: Interpolations

Universal interpolator NURBS (non-uniform rational B-splines)

Continuous-path mode with programmable rounding clearance

Linear interpolation axes

- Maximum

NCU 561.5

NCU 571.5/572.5/573.5

Multi-axis interpolation (> 4 interpolating axes)

**6FC5251-0AA16-0AA0**

Circle via center point and end point

NCU 561.5

NCU 571.5/572.5/573.5

Circle via interpolation point

NCU 561.5

NCU 571.5/572.5/573.5

Helical interpolation

NCU 561.5

NCU 571.5/572.5/573.5

Spline interpolation (A, B and C splines/compressor) for 3-axis machining

**6FC5251-0AF14-0AA0**

NCU 561.5

NCU 571.5/572.5/573.5

Spline interpolation (A, B and C splines/compressor) for 5-axis machining

**6FC5251-0AA14-0AA0**

NCU 561.5

NCU 571.5/572.5/573.5

Polynomial interpolation

**6FC5251-0AA15-0AA0**

NCU 561.5

NCU 571.5/572.5/573.5

Involute interpolation

**6FC5251-0AF01-0AA0**

NCU 561.5

NCU 571.5/572.5/573.5

Continue machining at the contour (retrace support)

**6FC5251-0AE72-0AA0**

### CNC functionality: Couplings

Trailing axes TRAIL

Synchronous spindle/multi-edge turning COUP<sup>2)</sup>

**6FC5255-0AB01-0AA0**

NCU 561.5

NCU 571.5/572.5/573.5

<sup>1)</sup> Only tapping: Axis + spindle.

<sup>2)</sup> Not simultaneously with generic couplings CP.



# Overview of functions SINUMERIK CNC controls

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline											
802S base line	802C base line			810DE power-line	810D power-line			840DE power-line	840D power-line	Note on operating software Blank field: Function is not dependent on operating software					
										HMI-Advanced	HMI-Embedded	Shop Mill		Shop Turn	HT 6

-	-			●	●			●	●							
-	-			●	●			●	●							
●	●			●	●			●	●							
3	3			4	4			4	4							
3	3			4	6											
								2 <sup>1)</sup>	2 <sup>1)</sup>							
								4	12							
-	-			-	○			-	○							
●	●			●	●			-	-							
								●	●							
								-	-							
								●	●							
2D+1	2D+1			2D+2	2D+2			-	-							
								2D+2	2D+6							
-	-			○	○			-	-							
								○	○							
-	-			○	○			-	-							
								○	○							
-	-			○	○			-	-							
								○	○							
-	-			○	○			-	-							
								○	○							
-	-			○	○			○	○							

-	-			●	●			●	●							
-	-			○	○			-	-							
								○	○							

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### CNC functionality: Couplings (continued)

Axial coupling in the machine coordinate system MCS coupling<sup>3)</sup>

NCU 561.5

NCU 571.5/572.5/573.5

**6FC5251-0AD11-0AA0**

Master-value coupling and curve table interpolation LEAD<sup>3)</sup>

NCU 561.5

NCU 571.5/572.5/573.5

**6FC5251-0AD06-0AA0**

Electronic gear unit EG<sup>3)</sup>

NCU 561.5

NCU 571.5/572.5/573.5

**6FC5251-0AE00-0AA0**

Pair of synchronized axes (gantry axes)

Max. number

NCU 561.5

NCU 571.5

NCU 572.5/573.5

**6FC5255-0AB00-0AA0**

Master-slave for drives

NCU 561.5

NCU 571.5/572.5/573.5

**6FC5251-0AC07-0AA0**

Generic couplings CP

● CP Standard

4 axis pairs in simultaneous coupled motion

● CP Basic

4 axis pairs in simultaneous coupled motion and 1x synchronous spindle/multi-edge turning or master value coupling/curve table interpolation or axial coupling in machine coordinate system

NCU 561.5

NCU 571.5/572.5/573.5

**6FC5251-0AG01-0AA0**

● CP Comfort

4 axis pairs in simultaneous coupled motion and 4x synchronous spindle/multi-edge turning and/or master value coupling/curve table interpolation and/or axial coupling in machine coordinate system, 1x electronic gear unit for 3 leading axes (without curve tables/cascading)

NCU 561.5

NCU 571.5/572.5/573.5

**6FC5251-0AG02-0AA0**

● CP Expert

8 axis pairs in simultaneous coupled motion and 8x synchronous spindle/multi-edge turning and/or master value coupling/curve table interpolation and/or axial coupling in machine coordinate system, 8x electronic gear unit for 3 leading axes (without curve tables/cascading), 5x electronic gear unit for 5 leading axes (with curve tables/cascading)

NCU 561.5/571.5

NCU 572.5/573.5

**6FC5251-0AG03-0AA0**

<sup>1)</sup> With restricted functionality, see export versions.

<sup>2)</sup> Extended from 3 to 8 in software version 7.2 and higher of the NCU system software.

<sup>3)</sup> Not simultaneously with generic couplings CP.

# Overview of functions SINUMERIK CNC controls

2

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline												
802S base line	802C base line			810DE power- line	810D power- line			840DE power- line	840D power- line	Note on operating software Blank field: Function is not dependent on operating software						
										HMI- Ad- van- ced	HMI- Em- bed- ded	Shop Mill		Shop Turn	HT 6	
-	-			-	-			-	-							
-	-			o <sup>1)</sup>	o			-	o							
-	-			-	-			-	-							
-	-			-	-			o <sup>1)</sup>	o							
-	-			-	-			-	-							
-	-			o	o			o	o							
-	-							-	-							
-	-							o	o							
-	-							o	o							
-	-			o	o			o	o							
-	-							-	-							
-	-							o	o							
-	-			•	•			•	•							
-	-			-	-			-	-							
-	-							-	-							
-	-							o <sup>1)</sup>	o							
-	-			-	-			-	-							
-	-							o <sup>1)</sup>	o							
-	-			-	-			-	-							
-	-							o <sup>1)</sup>	o							
-	-			-	-			-	-							
-	-							o <sup>1)</sup>	o							

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### CNC functionality: Transformations

Cartesian point-to-point (PTP) travel	
NCU 561.5	
NCU 571.5/572.5/573.5	
TRANSMIT/peripheral surface transformation	<b>6FC5251-0AB01-0AA0</b>
NCU 561.5	
NCU 571.5/572.5/573.5	
Inclined axis	<b>6FC5251-0AB06-0AA0</b>
NCU 561.5	
NCU 571.5/572.5/573.5	
Concatenated transformations (inclined axis TRAANG after TRAORI/cardan millhead/TRANSMIT/TRACYL)	
NCU 561.5	
NCU 571.5/572.5/573.5	
Machining package milling Contains the options: Machining package five axes, multi-axis interpolation, spline interpolation for 5-axis machining, 3D tool radius compensation	<b>6FC5251-0AG00-0AA0</b>
Machining package 5 axes contains the multi-axis interpolation option	<b>6FC5251-0AA10-0AA0</b>
Handling transformation package	<b>6FC5251-0AD07-0AA0</b>
Generic transformation	
NCU 561.5	
NCU 571.5/572.5/573.5	
Transformation for pantograph kinematics, 2 axes	<b>6FC5251-0AE45-0AA0</b>
3-axis PARACOP transformation for parallel kinematics (1st channel)	<b>6FC5251-0AE31-0AA0</b>
Transformation TRICEPT 5 axes	
• Root	<b>6FC5251-0AE50-0AA0</b>
• DMS	<b>6FC5251-0AE51-0AA0</b>
• 6th axis	<b>6FC5251-0AE53-0AA0</b>
HEXAPOD transformation 6 axes	<b>6FC5251-0AF75-0AA0</b>
Transformation Dynamic Swivel Tripod (DST)	<b>6FC5251-0AE60-0AA0</b>
• 6th axis	<b>6FC5251-0AE61-0AA0</b>

### CNC functionality: Measuring

Measuring stage 1 2 probes (switching) with/without deletion of distance-to-go	See HMI software
Measuring stage 2 (logging of measurement results, measurement functions from synchronized actions, cyclic measurement)	<b>6FC5250-0AD00-0AA0</b> See HMI software

<sup>1)</sup> With 3-axis and 4-axis transformation.

# Overview of functions SINUMERIK CNC controls

2

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline											
802S base line	802C base line			810DE power- line	810D power- line			840DE power- line	840D power- line	Note on operating software Blank field: Function is not dependent on operating software					
										HMI- Ad- van- ced	HMI- Em- bed- ded	Shop Mill		Shop Turn	HT 6

-	-			●	●			-	-							
								●	●							
-	-			○	○			-	-							
								○	○							
-	-			○	○			-	-							
								○	○							
-	-			●	●			-	-							
								●	●							
-	-			-	-			-	○							
								-	○							
-	-			-	-			-	○							
				-	○			-	○							
-	-			● 1)	● 1)			-	-							
								-	-							
								● 1)	●							
-	-			-	-			-	○							
				-	-			-	○							
-	-			-	-			-	○							
				-	-			-	○							
-	-			-	-			-	○							
				-	-			-	○							

-	-			●	●			●	●							
				○	○			○	○							

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### CNC functionality: Technologies

Punching/nibbling functions

NCU 561.5

NCU 571.5/572.5/573.5

**6FC5251-0AC00-0AA0**

Oscillation functions, block-related, modal and asynchronous

**6FC5251-0AB04-0AA0**

More than one feed in block, e.g. for calipers

Handwheel override

Contour handwheel

**6FC5251-0AG04-0AA0**

Electronic transfer

Contains the master-value coupling option LEAD

**6FC5250-0AD05-0AA0**

NCU 561.5

NCU 571.5/572.5/573.5

### CNC functionality: Motion-synchronous actions

High-speed CNC inputs/outputs

- 4 digital inputs/4 digital outputs on-board

- Expansion via NCU terminal block  
32 digital inputs/32 digital outputs,  
8 analog inputs/8 analog outputs

See Basic components

Synchronized action (max. 16) and high-speed auxiliary function output

Synchronized action stage 2, up to 255 parallel actions per channel, technology cycles

**6FC5251-0AD05-0AA0**

Positioning axes and spindles via synchronized actions (command axes)

Analog value control in interpolation cycle  
precondition: analog outputPath velocity-dependent analog output  
(laser power control)**6FC5251-0AC04-0AA0**

NCU 561.5

NCU 571.5/572.5/573.5

1) With restricted functionality, see export versions.

# Overview of functions SINUMERIK CNC controls

2

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline											
802S base line	802C base line			810DE power- line	810D power- line			840DE power- line	840D power- line	Note on operating software Blank field: Function is not dependent on operating software					
										HMI- Ad- van- ced	HMI- Em- bed- ded	Shop Mill		Shop Turn	HT 6

-	-			-	-			-	-							
								o	o							
-	-			o	o			o	o							
-	-			•	•			•	•							
-	-			•	•			•	•							
-	-			o	o			o	o							
-	-			-	-											
								-	-							
								o	1)							

-	-			-	-			•	•							
-	-			o	o			o	o							
-	-			• 1)	•			• 1)	•							
-	-			o 1)	o			o 1)	o							
-	-			•	•			•	•							
-	-			•	•			•	•							
-	-			o	o											
								-	-							
								o	o							

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### CNC functionality: Motion-synchronous actions (continued)

Laser switching signal, high-speed

NCU 561.5

NCU 571.5/572.5/573.5: 6/12/31 axes

**6FC5251-0AE74-0AA0**

Clearance control

- 1D in interpolation cycle via synchronized action
- 1D/3D in position control cycle, incl. in interpolation cycle

NCU 561.5

NCU 571.5/572.5/573.5: 6/12/31 axes

**6FC5251-0AC05-0AA0**Evaluation of internal drive variables  
precondition for Adaptive Control**6FC5251-0AB17-0AA0**Continuous dressing  
parallel dressing, online modification of tool offset

NCU 561.5

NCU 571.5/572.5/573.5

Asynchronous subroutine ASUB<sup>1)</sup>

Interrupt routines with fast retraction from the contour

**6FC5251-0AA00-0AA0**Cross mode actions (ASUBs and  
synchronized actions in all operating modes)**6FC5251-0AD04-0AA0**

### Open Architecture

HMI programming package (OEM contract required)

See HMI software

HMI configuring package WinCC flexible (OEM contract required)

See HMI software

User-interface expansion (HMI Advanced/HMI Embedded)

See HMI software

OA package NCK (OEM contract required)

See Basic components

SINUMERIK NCK Runtime OA (runtime license)

**6FC5251-0AA20-0AA0**

<sup>1)</sup> High-speed CNC inputs/outputs required.

<sup>2)</sup> With restricted functionality, see export versions.

<sup>3)</sup> 20 unreserved screens.





# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### CNC programming: Language

Programming language (DIN 66025 and high-level language extension)

Main program call from main program and subroutines

Subroutine levels/interrupt routines, max.

Number of subroutine passes ≤ 9 999

Number of levels for skip blocks (/0 to /...)

Polar coordinates

NCU 561.5

NCU 571.5/572.5/573.5

1/2/3-point contours

Dimensions metric/inch,  
changeover manually or via program

Inverse time feedrate

Auxiliary function output via

- M word, max. programmable value range: INT  $2^{31}-1$

- H word,  
max. programmable value range: REAL  $\pm 3.4028 \text{ ex } 38$   
(display:  $\pm 999\,999\,999.9999$ ) INT  $-2^{31} \dots 2^{31}-1$

High-level CNC language with

- User variables, configurable
- Predefined user variables (arithmetic parameters), configurable
- Read/write system variables
- Indirect programming
- Program jumps and branches
- Program coordination with WAIT, START, INIT
  - NCU 561.5
  - NCU 571.5/572.5/573.5
- Arithmetic and trigonometric functions
- Compare operations and logic operations
- Macro technique
- Control structures  
(IF-ELSE-ENDIF, WHILE, FOR, REPEAT, LOOP)
- Commands to HMI
- STRING functions

<sup>1)</sup> M function: 1 ... 99.

# Overview of functions SINUMERIK CNC controls

2

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline												
802S base line	802C base line			810DE power-line	810D power-line			840DE power-line	840D power-line	Note on operating software Blank field: Function is not dependent on operating software						
										HMI-Advanced	HMI-Embedded	Shop Mill		Shop Turn	HT 6	
•	•			•	•			•	•							
•	•			•	•			•	•							
4/0	4/0			11/4	11/4			11/4	11/4							
•	•			•	•			•	•							
1	1			8	8			8	8							
-	-			•	•											
								-	-							
•	•			•	•			•	•							
•	•			•	•			•	•							
-	-			•	•			•	•							
• <sup>1)</sup>	• <sup>1)</sup>			•	•			•	•							
-	-			•	•			•	•							
-	-			•	•			•	•							
•	•			•	•			•	•							
•	•			•	•			•	•							
-	-			•	•			•	•							
-	-			•	•			•	•							
•	•			•	•			•	•							
•	•			•	•			•	•							
-	-			•	•			•	•							
-	-			•	•			•	•							
•	•			•	•			•	•							
•	•			•	•			•	•							
-	-			•	•			•	•							
-	-			•	•			•	•							
-	-			◇	◇			◇	◇	•	•	-		-	-	
-	-			•	•			•	•							

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### CNC programming: Language (continued)

Online ISO dialect interpreter

**6FC5253-0AE00-0AA0**

Program management

- Management of programs and workpieces in NCK
- Management of programs and workpieces on hard disk (HD)
- Management of programs and workpieces on floppy disk drive
- Management of programs and workpieces on network drive
- Number of workpieces on CNC/CNC + HD, max.
- Templates for workpieces, programs and INI files
- Job lists

### CNC programming: Cycles

Process-oriented cycles for drilling/milling and turning

See HMI software

Pocket milling with free contour definition and islands

NCU 561.5

NCU 571.5/572.5/573.5

See HMI software

Pocket milling with free contour definition, islands and residual material removal

NCU 561.5

NCU 571.5/572.5/573.5

See HMI software

Enhanced stock removal functions with blank part description

NCU 561.5

NCU 571.5/572.5/573.5

See HMI software

Enhanced stock removal functions with blank part description and residual material removal

NCU 561.5

NCU 571.5/572.5/573.5

See HMI software

Measuring cycles for drilling/milling and turning

See HMI software

Access protection for cycles

Cycle storage separate from CNC main memory

**6FC5251-0AF00-0AA0**

1) Management of workpieces is not possible.  
2) Precondition: DNC (option).

3) Partially.

# Overview of functions SINUMERIK CNC controls

2

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline												
802S base line	802C base line			810DE power-line	810D power-line			840DE power-line	840D power-line	Note on operating software Blank field: Function is not dependent on operating software						
										HMI-Advanced	HMI-Embedded	Shop Mill		Shop Turn	HT 6	
-	-			○	○			○	○							
● <sub>1)</sub>	● <sub>1)</sub>			●	●			●	●	●	●	●		●	●	
-	-			◇	◇			◇	◇	●	-	●		●	-	
-	-			◇	◇			◇	◇	●	○	○		○	-	
-	-			◇	◇			◇	◇	○ <sub>2)</sub>	○	○		○	-	
100/-	100/-			250/-	250/-			250/-	250/-	-/1 000	-	-/1 000		-/1 000	-	
-	-			◇	◇			◇	◇	●	-	-		-	-	
-	-			◇	◇			◇	◇	●	-	-		-	-	
●	●			◇	◇			◇	◇	●	○	●		●	-	
-	-			◇	◇			-	-	○	-	●		●	-	
								◇	◇							
-	-			◇	◇					○	-	○		○	-	
								-	-							
-	-			◇	◇			◇	◇	○	-	-		●	-	
								-	-							
-	-			○	○					○	-	-		○	-	
								-	-							
-	-			○	○			○	○	○	○	● <sub>3)</sub>		● <sub>3)</sub>	-	
●	●			●	●			●	●		-					
-	-			○	○			○	○							

# Overview of functions SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

## CNC programming: Program support

Program editor

- Text editor with editing functions: Select, copy, delete, ...
- Machining step programming
- Write protection for lines
- Suppression of lines in the display

See HMI software

- Dual editor
- Multi-channel step sequence programming<sup>4)</sup>

**6FC5253-0AF03-0AA0**

Program support for geometry entries

- Geometry processor with programming graphics/  
Free contour input (contour calculator)
- Screens for 1/2/3-point contours

See HMI software

Program support for cycles

- Screens and stationary auxiliary displays
- Dynamic programming graphics during programming
- Programming support can be extended, e.g. customer cycles

## Parameters

Max. number of basic frames

Max. number of selectable offsets

Zero offsets, programmable (frames)

Scratching, determining zero offset

Zero offsets, external via PLC

Global and local user data

Global program user data

Display system variables (also via online configurable display) and log

1) Configurable by Siemens.  
2) For presentation of the machining step.

3) With user interface expansion, see Base software and HMI-Advanced Commissioning Manual.  
4) On request.

# Overview of functions SINUMERIK CNC controls

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline												
802S base line	802C base line			810DE power- line	810D power- line			840DE power- line	840D power- line	Note on operating software Blank field: Function is not dependent on operating software					Shop Turn	HT 6
										HMI- Ad- van- ced	HMI- Em- bed- ded	Shop Mill				
●	●			◇	◇			◇	◇	●	●	●			●	●
-	-			◇	◇			◇	◇	-	-	○			○	-
-	-			◇	◇			◇	◇	●	-	●			●	-
-	-			◇	◇			◇	◇	●	-	● 2)			●	-
-	-			◇	◇			◇	◇	●	●	-			-	-
-	-			◇	◇			◇	◇	○	-	-			-	-
-	-			◇	◇			◇	◇	●	●	●			●	-
●	●			◇	◇			◇	◇	●	●	●			●	●
●	●			◇	◇			◇	◇	●	●	●			●	-
-	-			◇	◇			◇	◇	-	-	●			●	-
1)	1)			◇	◇			◇	◇	● 3)	● 3)	● 3)			● 3)	●
1	1			16	16			16	16	16	16	1			1	-
4	4			100	100			100	100	100	100	100			100	100
1	1			●	●			●	●							
●	●			◇	◇			◇	◇	●	●	●			●	-
-	-			●	●			●	●	●	●	●			●	-
-	-			●	●			●	●	●	-	●			●	●
-	-			●	●			●	●	●	●	●			●	●
-	-			◇	◇			◇	◇	●	-	-			-	-

# Overview of functions SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

## Simulation

Up to n channels can be simulated sequentially

- NCU 561.5
- NCU 571.5
- NCU 572.5/573.5

Several channels and programs can machine the same blank part in succession

Simulation of program X, while program Y is being executed

Drilling/milling<sup>1)</sup>

- Multi-sided 2D view, dynamic
- 3D view, static
- Simultaneous recording (real-time simulation of current machining)

See HMI software

Turning<sup>1)</sup>

- Traverse path simulation without model (broken-line graphics)
- Contour of blank part can be specified
- Simulation in working plane G18
- Simulation in working planes G17/G19
- Full cut/partial cut with circumferential edges, front face and peripheral surfaces, milling and drilling operations
- Counterspindle
- 3D simulation of the finished part (static/dynamic)
- Simultaneous recording (real-time simulation of current machining)

See HMI software

## Operating modes

JOG

- Handwheel selection
- Inch/metric changeover
- Manual measurement of zero offset
- Manual measurement of tool offset
- Automatic tool/workpiece measurement
- Reference point approach, automatic/via CNC program

See HMI software

<sup>1)</sup> Tool carrier vertical to the workpiece.  
<sup>2)</sup> Dynamic for PCU 50.3.

<sup>3)</sup> Precondition: Measuring cycles.



# Overview of functions SINUMERIK CNC controls

2

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline												
802S base line	802C base line			810DE power-line	810D power-line			840DE power-line	840D power-line	Note on operating software Blank field: Function is not dependent on operating software					Shop Turn	HT 6
										HMI-Advanced	HMI-Embedded	Shop Mill				

-	-			2	2					10	1	1			1	-
								2	2							
								6	6							
								10	10							
-	-			◇	◇			◇	◇	●	-	-			-	-
-	-			◇	◇			◇	◇	●	-	-			-	-
-	-			◇	◇			◇	◇	●	-	●			-	-
-	-			◇	◇			◇	◇	●	-	●			-	-
-	-			◇	◇			◇	◇	-	○	○			-	-
-	-			◇	◇			◇	◇	●	●	-			-	-
-	-			◇	◇			◇	◇	●	-	-			-	-
-	-			◇	◇			◇	◇	●	●	-			●	-
-	-			◇	◇			◇	◇	●	-	-			●	-
-	-			◇	◇			◇	◇	●	-	-			●	-
-	-			◇	◇			◇	◇	●	-	-			●	-
-	-			◇	◇			◇	◇	-	-	-			○ <sup>2)</sup>	-
-	-			◇	◇			◇	◇	-	●	-			○	-

●	●			●	●			●	●	●	●	-			-	●
●	●			●	●			●	●	●	●	-			-	-
-	-			●	●			●	●	●	●	●			●	-
●	●			◇	◇			◇	◇	●	●	●			●	-
●	●			◇	◇			◇	◇	-	-	●			●	-
-	-			●	●			●	●	○ <sup>3)</sup>	-	●			●	-
●	●			●	●			●	●	●	●	●			●	●

# Overview of functions SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

## Operating modes (continued)

### MDA

- Input in text editor
- Save MDA program
- Input screen forms for technology and positioning, cycle support

### Teach In

- Teach positions in MDA buffer
- Teach (record/playback)
- Teach In with HT 6

### Teach In

**6FC5571-0AA01-0BF0**

### Automatic

- Execution from network drive or PC card for PCU 20
- Execution from RS 232 C (V.24) interface
- Execution from hard disk
- Program control

See HMI software

- Program editing

- Overstoring

- DRF offset

- Block search with/without calculation

### Repos (repositioning on the contour)

- With operator command/semi-automatically
- Program-controlled

### Preset

Set actual value

## Tools

### Tool types

- Turning
- Drilling/milling
- Grinding
- Groove sawing

1) Precondition: DNC (option).

2) Precondition: Network/floppy disk drive management on PCU 20 (option).

# Overview of functions SINUMERIK CNC controls

2

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline											
802S base line	802C base line			810DE power- line	810D power- line			840DE power- line	840D power- line	Note on operating software Blank field: Function is not dependent on operating software					
										HMI- Ad- van- ced	HMI- Em- bed- ded	Shop Mill		Shop Turn	HT 6

●	●			●	●			●	●	●	●				●
●	●			●	●			●	●	●	●	●		●	●
-	-			●	●			●	●	●	●	-		-	●
-	-			●	●			●	●	-	-	●		●	-
-	-			●	●			●	●	●	●	-		-	●
-	-			●	●			●	●	-	-	-		-	-
-	-			○	○			○	○	-	-	-		-	●
○	○			-	-			-	-						
●	●			●	●			●	●	●	●				●
-	-			●	●			●	●	○ <sub>1)</sub>	○ <sub>2)</sub>	○		○	-
●	●			●	●			●	●	●	●	●		●	-
-	-			●	●			●	●	●	-	●		●	-
●	●			●	●			●	●	●	●	●		●	●
●	●			●	●			●	●	●	●	●		●	●
-	-			●	●			●	●	●	●	-		-	●
-	-			●	●			●	●	●	●	●		●	●
●	●			●	●			●	●	●	●	●		●	●
●	●			●	●			●	●	●	●	●		●	-
-	-			●	●			●	●	●	●	●		●	-
-	-			●	●			●	●	●	●	●		●	-
-	-			●	●			●	●	●	●	●		●	-

●	●			●	●			●	●	●	●	-		●	●
●	●			●	●			●	●	●	●	●		●	●
-	-			●	●			●	●	●	●	-		-	●
-	-			●	●			●	●	●	●	-		-	●

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### Tools (continued)

Tool radius compensations in plane

- With approach and retract strategies

NCU 561.5

NCU 571.5/572.5/573.5

- With transition circle/ellipse on outer edges

NCU 561.5

NCU 571.5/572.5/573.5

Configurable intermediate blocks with tool radius compensation active

NCU 561.5

NCU 571.5/572.5/573.5

3D tool radius compensation

NCU 561.5

NCU 571.5/572.5/573.5

**6FC5251-0AB13-0AA0**

Tool change via T number

Tool carrier with orientation capability

NCU 561.5

NCU 571.5/572.5/573.5

Look-ahead detection of contour violations

NCU 561.5

NCU 571.5/572.5/573.5

Grinding-specific tool offset with grinding wheel surface speed

NCU 561.5

NCU 571.5/572.5/573.5

Tool orientation interpolation<sup>1)</sup>

Online tool length compensation

Operation without tool management

- Tool offset selection via D number without T assignment (flat D number)
- Editing of tool data
- Tool offset selection via T and D numbers
- Data backup via RS 232 C (V.24) interface
- Number of tools/cutting edges in tool list

<sup>1)</sup> Precondition: Machining package 5 axes (option).

# Overview of functions SINUMERIK CNC controls

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline												
802S base line	802C base line			810DE power-line	810D power-line			840DE power-line	840D power-line	Note on operating software Blank field: Function is not dependent on operating software					HT 6	
										HMI-Advanced	HMI-Embedded	Shop Mill		Shop Turn		
-	-			•	•			-	-							
								•	•							
•	•			•	•			-	-							
								•	•							
-	-			•	•			-	-			•	•	•		-
								•	•							
-	-			-	-			-	-			•	•	•		-
								○	○							
•	•			•	•			•	•			•	•	•		•
-	-			•	•							•	•	•		-
								-	-							
•	•			•	•			•	•							
								-	-							
-	-			•	•			•	•			•	•	-		-
								-	-							
-	-			-	-			•	•							
-	-			-	-			•	•							
•	•			•	•			•	•			•	•	-		•
-	-			•	•			•	•			•	•	-		•
•	•			•	•			•	•			•	•	-		•
•	•			•	•			•	•			•	•	•		•
•	•			-	-			-	-			-	-	-		-
15/30	15/30			600/1500	600/1500			600/1500	600/1500			-	-	-		-



# Overview of functions SINUMERIK CNC controls

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline											
802S base line	802C base line			810DE power- line	810D power- line			840DE power- line	840D power- line	Note on operating software Blank field: Function is not dependent on operating software					HT 6
										HMI- Ad- van- ced	HMI- Em- bed- ded	Shop Mill		Shop Turn	
-	-			○	○			○	○	○	○	●		●	-
-	-			○	○			○	○	○	○	●		●	-
-	-			○	○			○	○	○	-	2)		2)	-
-	-			○	○			○	○	○	○	●		●	-
-	-			○	○			○	○	○	-	-		-	-
-	-			600/ 1 500	600/ 1 500			600/ 1 500	600/ 1 500	600/ 1 500	600/ 1 500	600/ 1 200 1)		600/ 1 200 1)	-
-	-			○	○			○	○	○	-	-		-	-
-	-			●	●			●	●	●	●	●		●	-
-	-			○	○			○	○	○	○	●		●	-
-	-			○	○			○	○	○	○	●		●	-
-	-			○	○			○	○	○	○	●		●	-
-	-			○	○			○	○	○	-	-		-	-
-	-			32	32			32	32	32	32	3		3	-
-	-			○	○			○	○	○	○	●		●	-
-	-			○	○			○	○	○	○	●		●	-
-	-			○	○			○	○	○	-	-		-	-
-	-			○	○			○	○	○	○	●		●	-
-	-			○	○			○	○	○	-	-		-	-
-	-			○	○			○	○	○	-	-		-	-
-	-			○	○			○	○	○	-	-		-	-
-	-			○	○			○	○	○	-	-		-	-
-	-			○	○			○	○	○	-	-		-	-
-	-			○	○			○	○	○	-	●		●	-
-	-			○	○			○	○	○	-	●		●	-
-	-			○	○			○	○	○	○	●		●	-

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### Communication

Serial interface RS 232 C (V.24)

Disk drive operation

Multipoint Interface (MPI)

Ethernet connection

I/O interfacing via PROFIBUS DP<sup>1)</sup>  
(software option)

Data exchange between machining channels

High-speed data interchange between CNC and PLC

Data backup on hard disk

Data backup on PC card

PC card as additional program memory (PCU 20)

See HMI software

See HMI software

**6FC5252-0AD00-0AA0**

### ePS Network Services

ePS Network Services:

- Company Account and
- Value Account

are preconditions for service use

- eP Access:

Remote control and monitoring  
of machine control systems using Internet Explorer

- eP Dynamic (includes eP Access):

Acquisition, logging, analysis and processing  
of machine faults

- eP Performance (includes eP Dynamic):

Procedure for acquiring the machine status and maintenance support

See HMI software

See HMI software

See HMI software

See HMI software

### Motion Control Information System MCIS

DNC Machine/IFC: CNC program transfer via the network

TDI: Tool management function for individual machines and networked machines

TDI Ident Connection: Connection to tool identification systems

MDA Machine/IFC: Machine and production data acquisition

RPC SINUMERIK: Data interchange between CNC and host computer

TPM Machine: Support for maintenance and repair

See HMI software

See HMI software

See HMI software

See HMI software

See HMI software

See HMI software

<sup>1)</sup> For literature on the subject of PROFIBUS DP, see Services – Documentation.

<sup>2)</sup> For PCU 20/PCU 50.3.

<sup>3)</sup> With HMI-Advanced.

<sup>4)</sup> Precondition: DNC (option).



# Overview of functions SINUMERIK CNC controls

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline												
802S base line	802C base line			810DE power-line	810D power-line			840DE power-line	840D power-line	Note on operating software Blank field: Function is not dependent on operating software					Shop Turn	HT 6
										HMI-Advanced	HMI-Embedded	Shop Mill				
●	●			◇	◇			◇	◇	● <sup>3)</sup>	● <sup>2)</sup>	● <sup>2)</sup>		● <sup>2)</sup>	●	
-	-			◇	◇			◇	◇	●	○	○		○	-	
-	-			●	●			●	●	●	●	●		●	●	
-	-			◇	◇			◇	◇	○ <sup>4)</sup>	○	○		○	-	
-	-			○	○			○	○							
-	-			●	●			●	●					-		
-	-			●	●			●	●							
-	-			◇	◇			◇	◇	●	-	● <sup>3)</sup>		● <sup>3)</sup>	-	
-	-			●	●			●	●	●	●	●		●	●	
-	-			◇	◇			◇	◇	-	● <sup>5)</sup>	-		-	-	
-	-			◇	◇			◇	◇	○ <sup>6)</sup>	-	○ <sup>6)</sup>		○ <sup>6)</sup>	-	
-	-			◇	◇			◇	◇	○ <sup>6)</sup>	-	○ <sup>6)</sup>		○ <sup>6)</sup>	-	
-	-			◇	◇			◇	◇	○ <sup>6)</sup>	-	○ <sup>6)</sup>		○ <sup>6)</sup>	-	
-	-			○	○			○	○	○ <sup>6)</sup>	-	○ <sup>6)</sup>		○ <sup>6)</sup>	-	
-	-			◇	◇			◇	◇	○	-	○ <sup>3)</sup>		○ <sup>3)</sup>	-	
-	-			◇	◇			◇	◇	○	-	○ <sup>3)</sup>		-	-	
-	-			◇	◇			◇	◇	○	-	-		-	-	
-	-			◇	◇			◇	◇	○	-	○ <sup>3)</sup>		○ <sup>3)</sup>	-	
-	-			◇	◇			◇	◇	○	-	-		-	-	
-	-			◇	◇			◇	◇	○	-	-		-	-	

<sup>5)</sup> Excludes use of RCS Host remote diagnostics on PC card. RCS Host Embedded can be used. Precondition: Network/floppy disk drive management on PCU 20 (option).

<sup>6)</sup> For PCU 50.3 with HMI-Advanced.

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### Data management

ADDM agent: Backup and recovery client  
(precondition: SIMATIC STEP 7)

See HMI software

### Operation

Operator panel fronts OP 015/OP 015A/TP 015A, 15" color

See Operator components

Operator panel fronts OP 012, 12.1" color

See Operator components

Operator panel fronts OP 010/OP 010C/OP 010S, 10.4" color

See Operator components

Thin Client Unit for operator panel fronts

- TCU

See Operator components

Operator panel fronts with integrated TCU

- OP 015AT/TP 015AT, 15" color

See Operator components

- OP 08T, 7,5" color

See Operator components

PCU 20<sup>3)</sup>

See Operator components

PCU 50.3<sup>3)</sup>

See Operator components

Control unit management with TCU

See Operator components

Identical display on all OPs with TCU

- Simultaneous operation interlock
- Different resolutions (e.g. OP 010/HT 8)
- Up to 4 operator panel fronts with one TCU each on a PCU 50.3<sup>1)</sup>  
plus 1 additional operator panel front directly on the PCU 50.3<sup>1)</sup>

Physical separation of operator panel front (OP) and PCU  
as well as connection of up to 2 operator panels via video link

1 operator panel for up to 8 NCUs/  
2 operator panels for up to 4 NCUs

Control unit management for each PCU  
(up to 9 PCUs for up to 9 NCUs)

Functionality: Active, passive and suppression mechanisms

**6FC5253-0AE03-0AA0**

Integrated operator panel: SINUMERIK 802S/802C base line, 8" monochrome

See Basic components

Connection for

See Operator components

- Standard DVI monitor with PCU 50.3, VGA via ext. adapter
- SIMATIC OP 177B/OP 277 with 6" display<sup>4)</sup>
- SIMATIC TP 177B/TP 277 with 6" display<sup>4)</sup>
- SIMATIC Mobile Panel 177/Mobile Panel 277<sup>4)</sup>
- SIMATIC MP 277/MP 377 with Keys/Touch<sup>4)</sup>

Connection of SIMATIC HMI to PLC

<sup>1)</sup> Precondition: PCU with 1.2 GHz.

<sup>2)</sup> Three CCUs on one operator panel. Two operator panels on one CCU.

<sup>3)</sup> HMI software for PC/PG can be ordered separately.

<sup>4)</sup> WinCC flexible is required for OA applications.

# Overview of functions SINUMERIK CNC controls

2

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline											
802S base line	802C base line			810DE power- line	810D power- line			840DE power- line	840D power- line	Note on operating software Blank field: Function is not dependent on operating software					
										HMI- Ad- van- ced	HMI- Em- bed- ded	Shop Mill		Shop Turn	HT 6
-	-			◇	◇			◇	◇	○	-	○ <sub>3)</sub>		○ <sub>3)</sub>	-
-	-			○	○			○	○	○	○	○		○	-
-	-			○	○			○	○	○	○	○		○	-
-	-			○	○			○	○						
-	-			○	○			○	○						
-	-			○	○			○	○	-	●	○		○	-
-	-			○	○			○	○	○	○	○		○	-
-	-			●	●			●	●						
-	-			●	●			●	●						
-	-			●	●			●	●						
-	-			○	○			○	○						
-	-			● <sub>2)</sub>	● <sub>2)</sub>			●	●	●	●	-		-	-
-	-			-	-			◇	◇	○	○	-		-	○
●	●			-	-			-	-	-	-	-		-	-
-	-			●	●			●	●						
-	-			●	●			●	●						
-	-			●	●			●	●						
-	-			●	●			●	●						
-	-			●	●			●	●						
-	-			●	●			●	●						

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### Operation (continued)

SINUMERIK HT 8 handheld terminal	See Operator components
SINUMERIK HT 6 handheld terminal	See Operator components
Mini handheld unit	See Operator components
Handheld unit type B-MPI	See Operator components
Machine control panel	See Operator components
Push Button Panel	See Operator components
Electronic handwheels can be connected	See Operator components
Full CNC keyboard	See Operator components
Standard PC keyboard MF-II	See Operator components
Floppy disk (3.5"/1.44 MB)	See Operator components
Floppy disk (3.5"/1.44 MB) with USB connection	See Operator components
Plain text display of user variables	
Multi-channel display	
2D representation of 3D protection areas/work areas	
Actual-value system for workpiece (grinding)	
Menu selection via the PLC	
CNC program messages	
Online help for programming, alarms and machine data (can be extended)	
Screen blanking	
Access protection, 8 levels	
Languages of operating software	
Languages of operating software packages HMI-Advanced, HMI-Embedded, ShopMill, ShopTurn on CD-ROM	See HMI software
<ul style="list-style-type: none"> <li>• 2 languages switchable online</li> <li>• Chinese Simplified, English, French, German, Italian, Spanish</li> <li>• Additional languages: Czech, Hungarian, Polish, Russian, Turkish</li> <li>• Additional languages: e.g. Chinese Traditional, Czech, Danish, Dutch, Finnish, Hungarian, Japanese, Korean, Polish, Romanian, Russian, Swedish, Turkish</li> <li>• Maximum configuration for installed languages</li> <li>• Other languages</li> </ul>	See Basic components
Operating software can be used for:	
<ul style="list-style-type: none"> <li>• SINUMERIK 810D powerline/840D powerline</li> </ul>	See HMI software
Operator interface with Solution for Powertrain TRANSLINE HMI PRO software	See HMI software
Operator interface with Solution for Powertrain TRANSLINE HMI Lite CE software	See HMI software

<sup>1)</sup> Third handwheel can be operated as a contour handwheel (option).

<sup>2)</sup> No Simplified Chinese.

<sup>3)</sup> Included on the CD-ROM Toolbox.

<sup>4)</sup> Included on CD-ROM of HMI language extensions. Please enquire about available software versions.

# Overview of functions SINUMERIK CNC controls

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline												
802S base line	802C base line			810DE power-line	810D power-line			840DE power-line	840D power-line	Note on operating software Blank field: Function is not dependent on operating software					Shop Turn	HT 6
										HMI-Advanced	HMI-Embedded	Shop Mill				
-	-			○	○			○	○							
-	-			○	○			○	○	-	-	-		-		●
○	○			○	○			○	○							
-	-			○	○			○	○							
●	●			○	○			○	○							
-	-			○	○			○	○							
2	2			2/3 <sup>1)</sup>	2/3 <sup>1)</sup>			2/3 <sup>1)</sup>	2/3 <sup>1)</sup>							
-	-			○	○			○	○							
-	-			○	○			○	○							
-	-			◇	◇			◇	◇	○	○	○		○		-
-	-			◇	◇			◇	◇	○	-	-		-		-
-	-			●	●			●	●	●	●	●		●		●
-	-			◇	◇			◇	◇	●	-	-		-		-
-	-			●	●			●	●	●	●	-		-		-
-	-			●	●			●	●	●	●	-		-		-
-	-			-	-			◇	◇	●	●	●		●		-
-	-			●	●			●	●	●	●	-		-		●
-	-			●	●			●	●	●	-	-		-		-
-	-			●	●			●	●	●	●	●		●		●
●	●			●	●			●	●	●	●	●		●		●
-	-			○	○			○	○	○	○	○		○		○
●	●			●	●			●	●	●	●	●		●		●
●	●			◆	◆			◇	◇	●	●	●		● <sup>2)</sup>		●
● <sup>3)</sup>	● <sup>3)</sup>			-	-			-	-	-	-	-		-		-
-	-			◆	◆			◇	◇	○ <sup>4)</sup>	○ <sup>4)</sup>	○ <sup>4)</sup>		○ <sup>4)</sup>		○
2	2			◆	◆			◇	◇	5)	8	8		8		2
6)	6)			◆	◆			◇	◇	6)	6)	6)		6)		6)
-	-			○	○			○	○	○	○	○		○		○
-	-			-	-			◇	◇	○	-	-		-		-
-	-			-	-			○	○	-	-	-		-		-

5) No restriction.  
6) On request.

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### Axis monitoring functions

Working area limitation	
Limit switch monitoring Software and hardware limit switches	
2D/3D protection zones	
Contour monitoring	
Contour monitoring with tunnel function	<b>6FC5251-0AB16-0AA0</b>
Position monitoring	
Standstill (zero-speed) monitoring	
Clamping monitoring	
Path length evaluation	<b>6FC5251-0AF05-0AA0</b>

### Compensations

Backlash compensation	
Leadscrew error compensation	
Measuring system error compensation	
Electronic weight counterbalance	<b>6FC5255-0AC00-0AA0</b>
Sag compensation, multi-dimensional	<b>6FC5251-0AB15-0AA0</b>
NCU 561.5	
NCU 571.5/572.5/573.5	
Quadrant error compensation per operation	
NCU 561.5	
NCU 571.5/572.5/573.5	
Quadrant error compensation, automatic (neural network)	<b>6FC5251-0AB14-0AA0</b>
NCU 561.5	
NCU 571.5/572.5/573.5	
Graphical monitoring of quadrant error compensation using the circularity test	See HMI software
Temperature compensation	<b>6FC5251-0AA13-0AA0</b>
Automatic drift compensation for analog speed setpoints	
Feedforward control	
• Velocity-dependent	
• Acceleration-dependent	<b>6FC5250-0AA07-0AA0</b>
3D error compensation SEC 3D	<b>6FC5251-0AF33-0AA0</b>

<sup>1)</sup> With restricted functionality, see export versions.

<sup>2)</sup> Precondition: Commissioning tool for SIMODRIVE 611 digital.  
Already included in HMI-Advanced system software, also for PC/PG.

# Overview of functions SINUMERIK CNC controls

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline												
802S base line	802C base line			810DE power- line	810D power- line			840DE power- line	840D power- line	Note on operating software Blank field: Function is not dependent on operating software						
										HMI- Ad- van- ced	HMI- Em- bed- ded	Shop Mill		Shop Turn	HT 6	
-	-			●	●			●	●							
●	●			●	●			●	●							
-	-			●	●			●	●							
●	●			●	●			●	●							
-	-			○	○			○	○							
-	●			●	●			●	●							
-	●			●	●			●	●							
-	●			●	●			●	●							
-	-			○	○			○	○							
●	●			●	●			●	●							
●	●			●	●			●	●							
●	●			●	●			●	●							
-	-			○	○			○	○							
-	-			○ 1)	○											
								-	-							
								○ 1)	○							
-	-			●	●					●	-	-		-	-	
								-	-							
								●	●							
-	-			○	○											
								-	-							
								○	○							
-	-			◇	◇			◇	◇	●	○ 2)					-
-	-			○	○			○	○							
-	●			-	-			-	-							
-	-			●	●			●	●							
-	-			○	○			○	○							
-	-			-	-			○	○							

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### PLC area

SIMATIC S7-200 integrated	
SIMATIC S7-300 CPU 314C-2 DP integrated	
SIMATIC S7-300 CPU 317-2 DP integrated	
Machining time, typically in ms/KI for bit operations <sup>3)</sup>	
Machining time, typically in ms/KI for word operations <sup>3)</sup>	
PLC user memory in KB, incl. basic PLC program	
PLC user memory, maximum configuration in KB	
Expansion of the PLC user memory by 64 KB	<b>6FC5252-0AA03-0AA0</b>
Ladder steps memory configuration	
PLC programming with HiGraph (add-on package for STEP 7)	
PLC programming tool	See HMI software
PLC programming tool, PLC program examples, standard machine data and alarm text editor on Toolbox	
Toolbox with basic PLC program, standard machine data and CNC variable selector	See HMI software
Digital inputs, input image max. in bytes	
Digital outputs, output image max. in bytes	
I/O inputs, max. number in bytes	
I/O outputs, max. number in bytes	
Bit memories, max. number in bytes	
Timers, max. number	
Counters, max. number	
FB, FC, max. number per type	
DB, max. number	
Cyclic function block	
Time-controlled function blocks	
Equipment for PLC programming and program test with PG/PC	
I/O modules, max. number (central configuration)	See Basic components
Distributed DP slaves on PROFIBUS DP, max. number	
Distributed I/O via PROFIBUS DP <ul style="list-style-type: none"> <li>• Via CP 342-5 DP, data transfer rate up to 1.5 Mbit/s</li> <li>• Via integrated interface, data transfer rates up to 12 Mbit/s</li> </ul>	See Communication (page 2/38)
PROFINET IO/PROFINET CBA Via external CP 343-1 communication board (Advanced)	
User machine data for configuring the PLC user program	

<sup>1)</sup> Without CNC variable selector.

<sup>2)</sup> Included in the basic package.

<sup>3)</sup> 1 KI = 1 024 instructions; corresponds to approx. 3 KB.

<sup>4)</sup> With digital I/O module, 16I/16O.



# Overview of functions SINUMERIK CNC controls

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline											
802S base line	802C base line			810DE power-line	810D power-line			840DE power-line	840D power-line	Note on operating software Blank field: Function is not dependent on operating software					
										HMI-Advanced	HMI-Embedded	Shop Mill		Shop Turn	HT 6
●	●			-	-			-	-						
-	-			●	●			-	-						
-	-			-	-			●	●						
1.8	1.8			0.1	0.1			0.03	0.03						
5.9	5.9			0.25	0.25			0.1	0.1						
-	-			●	●			●	●						
-	-			480	480			768	768						
-	-			○	○			○	○						
4 000	4 000			-	-			-	-						
-	-			○	○			○	○						
2)	2)			-	-			-	-						
2)	2)			-	-			-	-						
1)	1)			○	○			○	○						
48/ 64 <sup>4)</sup>	48/ 64 <sup>4)</sup>			128	128			256	256						
16/ 32 <sup>4)</sup>	16/ 32 <sup>4)</sup>			128	128			256	256						
48	48			2 048 <sup>5)</sup>	2 048 <sup>5)</sup>			4 096	4 096						
16	16			2 048 <sup>5)</sup>	2 048 <sup>5)</sup>			4 096	4 096						
1 024	1 024			4 096	4 096			4 096	4 096						
16	16			256	256			512	512						
32	32			256	256			512	512						
64 <sup>6)</sup>	64 <sup>6)</sup>			256	256			2 048 <sup>7)</sup>	2 048 <sup>7)</sup>						
-	-			399	399			2 047 <sup>7)</sup>	2 047 <sup>7)</sup>						
●	●			●	●			●	●						
-	-			●	●			●	●						
○	○			○	○			○	○						
-	-			○	○			○	○						
-	-			○	○			○	○						
-	-			○	○			○	○						
-	-			○	○			○	○						
-	-			○	○			○	○						
-	-			○	○			○	○						
●	●			●	●			●	●						

5) Number = Sum of inputs and outputs.  
6) Subroutines.

7) FBs, FCs and DBs in total max. 2 048.

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### Monitoring functions

Axis limitation from the PLC	
Spindle speed limitation	
Generator operation	<b>6FC5255-0AE00-0AA0</b>
Extended stop and retract (ESR), incl. generator operation	<b>6FC5250-0AE01-0AA0</b>
Tool and process monitoring <sup>1)</sup>	See HMI software
PROFIBUS tool and process monitoring	<b>6FC5251-0AE71-0AA0</b>
Axial data output via PROFIBUS (ADAS)	<b>6FC5251-0AF44-0AA0</b>

### Safety functions

SINUMERIK Safety Integrated safety functions for personnel and machine protection <sup>2)</sup>	See Basic components
<ul style="list-style-type: none"> <li>• SI Basic (for up to 1 axis/spindle; up to 4 inputs/outputs can be used for the safe programmable logic)</li> </ul>	<b>6FC5250-0AG00-0AA0</b>
<ul style="list-style-type: none"> <li>• SI Comfort (for up to 1 axis/spindle; up to 64 inputs/outputs can be used for the safe programmable logic)</li> </ul>	<b>6FC5250-0AG10-0AA0</b>
<ul style="list-style-type: none"> <li>• SI axis/spindle (from the second axis/spindle, per axis/spindle)</li> </ul>	<b>6FC5250-0AG11-0AA0</b>
<ul style="list-style-type: none"> <li>• SI axis/spindle package (additional 15 axes/spindles)</li> </ul>	<b>6FC5250-0AG12-0AA0</b>
SinuCom NC SI (integrated automatic acceptance test)	See HMI software

### Startup

Startup software for converter system is integrated:	
<ul style="list-style-type: none"> <li>• SIMODRIVE 611 digital</li> </ul>	
Startup software on external PC/PG	See HMI software
<ul style="list-style-type: none"> <li>• SIMODRIVE 611 universal HRS</li> </ul>	
Startup trace (drive optimization without an additional oscilloscope)	
Series startup via serial interface	
Series startup via programming of PC card offline or online	

<sup>1)</sup> Product of SINUMERIK Solution Partner (currently for ARTIS).

<sup>2)</sup> Precondition: See Basic components.

<sup>3)</sup> Included in the basic package.

# Overview of functions SINUMERIK CNC controls

2

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline												
802S base line	802C base line			810DE power- line	810D power- line			840DE power- line	840D power- line	Note on operating software Blank field: Function is not dependent on operating software						
										HMI- Ad- van- ced	HMI- Em- bed- ded	Shop Mill		Shop Turn	HT 6	
-	-			●	●			●	●							
●	●			●	●			●	●							
-	-			-	-			○	○							
-	-			-	-			○	○							
-	-			-	-			○	○							
-	-			-	-			○	○							
-	-			-	-			○	○							
-	-			-	-			○	○							
-	-			-	-			○	○							
-	-			-	-			○	○							
-	-			◇	◇			◇	◇	●	-					-
● 3)	● 3)			○	○			○	○							
●	●			◇	◇			◇	◇	●	○					-
●	●			●	●			●	●	●	●					-
-	-			●	●			●	●	●	●					-

# Overview of functions

## SINUMERIK CNC controls

2

- Basic version
- Option
- ◇ Function is dependent on operating software
- ◆ Precondition: HMI-Advanced operating software
  - Not possible

Order No.

### Startup (continued)

SinuCom startup software for SINUMERIK 810D powerline/840D powerline

SinuCom NC

Dialog-based parameterization of machine data, management of series startup files, integrated online help for functions, machine data and alarms

See HMI software

SinuCom NC Trace

Dynamic recording of variables and signals – optimization without additional oscilloscope

See HMI software

SinuCom FFS

Creation of an image for the PC card

See HMI software

SinuCom ARC

Reading, deleting, inserting and changing series startup files

See HMI software

Startup software on PC/PG for SIMODRIVE 611 digital

See HMI software

### Diagnostic functions

PLC status

Process fault diagnostics for S7 HiGraph and S7 Graph for PCU 50.3 with Solution for Powertrain TRANSLINE HMI PRO

See HMI software

RCS remote diagnostics/host and viewer

See HMI software

Alarms and messages

Action log can be activated for diagnostic purposes

### Tools

Programming language SIMATIC STEP 7

See HMI software

- LAD ladder diagram
- FBD function block diagram
- STL statement list

SIMATIC STEP 7 for SINUMERIK hardware for service functions

SinuCom PCIN

See HMI software

SinuCom Update Agent for series startup and software

See HMI software

Data backup (Backup/Restore) with ghost on hard disk/network

See PCU 50.3

CAD reader for PC

See HMI software

Offline SINUMERIK 800/840D CNC program converter

On request

# Overview of functions SINUMERIK CNC controls

SINUMERIK 802				SINUMERIK 810D powerline/840D powerline												
802S base line	802C base line			810DE power- line	810D power- line			840DE power- line	840D power- line	Note on operating software Blank field: Function is not dependent on operating software						
										HMI- Ad- van- ced	HMI- Em- bed- ded	Shop Mill		Shop Turn	HT 6	
-	-			○	○			○	○							
-	-			-	-			○	○							
-	-			○	○			○	○							
-	-			○	○			○	○							
-	-			○	○			○	○							
●	●			●	●			●	●	●	●	●		●	●	
-	-			-	-			○	○							-
-	-			◇	◇			◇	◇	○	○	○		○	○	○
●	●			●	●			●	●							
-	-			●	●			●	●	●	●	●		●	-	
●	●			○	○			○	○							
-	-			○	○			○	○							
-	-			○	○			○	○							
-	-			◇	◇			◇	◇	○	-					-
-	-			○	○			○	○							
-	-			○	○			○	○							
-	-			○	○			○	○							
-	-			○	○			○	○							
-	-			○	○			○	○	-	-	-		-	-	-

# Overview of functions

## SINUMERIK CNC controls

2

### Overview of options for SINUMERIK 810D powerline/840D powerline

Option	Page	Order No.	Option	Page	Order No.
2nd machining channel and maximum memory configuration as an additional package	2/6	<b>6FC5451-0AF03-0AA0</b>	Involute interpolation	2/14	<b>6FC5251-0AF01-0AA0</b>
3-axis transformation PARACOP	2/18	<b>6FC5251-0AE31-0AA0</b>	Laser switching signal, high-speed	2/22	<b>6FC5251-0AE74-0AA0</b>
3D error compensation SEC 3D	2/44	<b>6FC5251-0AF33-0AA0</b>	Link axis	2/12	<b>6FC5251-0AD10-0AA0</b>
Additional axis/spindle + channel (for NCU 561.x)	2/4	<b>6FC5251-0AD08-0AA0</b>	Machining channel, each additional	2/4	<b>6FC5251-0AA07-0AA0</b>
Advanced Position Control	2/12	<b>6FC5251-0AF04-0AA0</b>	Machining channels (4) and axes (13) as a package	2/6	<b>6FC5251-0AD01-0AA0</b>
Axial data output via PROFIBUS (ADAS)	2/48	<b>6FC5251-0AF44-0AA0</b>	Machining package 5 axes	2/18	<b>6FC5251-0AA10-0AA0</b>
Axial coupling in the machine coordinate system	2/16	<b>6FC5251-0AD11-0AA0</b>	Machining package milling	2/18	<b>6FC5251-0AG00-0AA0</b>
Axis container	2/12	<b>6FC5251-0AE01-0AA0</b>	Master-slave for drives	2/16	<b>6FC5251-0AC07-0AA0</b>
Axis/spindle interpolation, each additional	2/6	<b>6FC5251-0AA03-0AA0</b>	Master-value coupling and curve table interpolation	2/16	<b>6FC5251-0AD06-0AA0</b>
Clearance control, 1D/3D in position control cycle	2/22	<b>6FC5251-0AC05-0AA0</b>	Measuring stage 2	2/18	<b>6FC5250-0AD00-0AA0</b>
CNC main memory expanded by 1 MB	2/4	<b>6FC5251-0AD02-0AA0</b>	Mode group (MG), each additional	2/4	<b>6FC5251-0AD00-0AA0</b>
Continue machining at the contour (retrace support)	2/14	<b>6FC5251-0AE72-0AA0</b>	Multi-axis interpolation	2/14	<b>6FC5251-0AA16-0AA0</b>
Contour handwheel	2/20	<b>6FC5251-0AG04-0AA0</b>	Multi-channel step sequence programming	2/28	<b>6FC5253-0AF03-0AA0</b>
Contour monitoring with tunnel function	2/44	<b>6FC5251-0AB16-0AA0</b>	Online ISO dialect interpreter	2/26	<b>6FC5253-0AE00-0AA0</b>
Control unit management	2/40	<b>6FC5253-0AE03-0AA0</b>	Operation with tool management	2/36	<b>6FC5251-0AB12-0AA0</b>
Cross-mode actions	2/22	<b>6FC5251-0AD04-0AA0</b>	Oscillation functions	2/20	<b>6FC5251-0AB04-0AA0</b>
Cycle storage separate from CNC main memory	2/26	<b>6FC5251-0AF00-0AA0</b>	Pair of synchronized axes (gantry axes)	2/16	<b>6FC5255-0AB00-0AA0</b>
Electronic gear unit	2/16	<b>6FC5251-0AE00-0AA0</b>	Path length evaluation	2/44	<b>6FC5251-0AF05-0AA0</b>
Electronic transfer	2/20	<b>6FC5250-0AD05-0AA0</b>	Path switch signals/cam controller	2/10	<b>6FC5251-0AB07-0AA0</b>
Electronic weight counterbalance	2/44	<b>6FC5255-0AC00-0AA0</b>	Path velocity-dependent analog output	2/20	<b>6FC5251-0AC04-0AA0</b>
Enabling of internal drive control 6th axis for interpolation tasks	2/6	<b>6FC5451-0AF02-0AA0</b>	PLC user memory expanded by 64 KB	2/46	<b>6FC5252-0AA03-0AA0</b>
Enabling of internal drive control 6th axis for positioning tasks	2/6	<b>6FC5451-0AF01-0AA0</b>	Polynomial interpolation	2/14	<b>6FC5251-0AA15-0AA0</b>
Evaluation of internal drive variables	2/22	<b>6FC5251-0AB17-0AA0</b>	Positioning axis/auxiliary spindle, each additional	2/6	<b>6FC5251-0AA04-0AA0</b>
Extended stop and retract ESR	2/48	<b>6FC5250-0AE01-0AA0</b>	PROFIBUS tool and process monitoring	2/48	<b>6FC5251-0AE71-0AA0</b>
Fast interpolation link	2/12	<b>6FC5251-0AF03-0AA0</b>	Program preprocessing	2/10	<b>6FC5251-0AC02-0AA0</b>
Feedforward control, acceleration-dependent	2/44	<b>6FC5250-0AA07-0AA0</b>	Punching/hibbling functions	2/20	<b>6FC5251-0AC00-0AA0</b>
Generator operation	2/48	<b>6FC5255-0AE00-0AA0</b>	Quadrant error compensation, automatic	2/44	<b>6FC5251-0AB14-0AA0</b>
Generic couplings	2/16	<b>6FC5251-0AG01-0AA0</b> <b>6FC5251-0AG02-0AA0</b> <b>6FC5251-0AG03-0AA0</b>	Safety Integrated	2/48	<b>6FC5250-0AG00-0AA0</b> <b>6FC5250-0AG10-0AA0</b> <b>6FC5250-0AG11-0AA0</b> <b>6FC5250-0AG12-0AA0</b>
Handling transformation package	2/18	<b>6FC5251-0AD07-0AA0</b>	• SI Basic		
Inclined axis	2/18	<b>6FC5251-0AB06-0AA0</b>	• SI Comfort		
Interrupt routines with fast retraction from the contour	2/22	<b>6FC5251-0AA00-0AA0</b>	• SI axis/spindle		
I/O interfacing via PROFIBUS DP	2/38	<b>6FC5252-0AD00-0AA0</b>	• SI axis/spindle package		
			Sag compensation, multi-dimensional	2/44	<b>6FC5251-0AB15-0AA0</b>
			SINUMERIK NCK Runtime OA	2/22	<b>6FC5251-0AA20-0AA0</b>

### Overview of options for SINUMERIK 810D powerline/840D powerline (continued)

Option	Page	Order No.	Option	Page	Order No.
Setpoint exchange	2/10	<b>6FC5251-0AE76-0AA0</b>	Transformation HEXAPOD 6 axes	2/18	<b>6FC5251-0AF75-0AA0</b>
Setpoint linkage for multiple NCUs	2/12	<b>6FC5251-0AF02-0AA0</b>	Transformation pantograph kinematics 2 axes	2/18	<b>6FC5251-0AE45-0AA0</b>
Spline interpolation for 3-axis machining	2/14	<b>6FC5251-0AF14-0AA0</b>	Transformation TRICEPT 5 axes		
Spline interpolation for 5-axis machining	2/14	<b>6FC5251-0AA14-0AA0</b>	• Root	2/18	<b>6FC5251-0AE50-0AA0</b>
Synchronized action stage 2	2/20	<b>6FC5251-0AD05-0AA0</b>	• DMS	2/18	<b>6FC5251-0AE51-0AA0</b>
Synchronous spindle/multi-edge turning	2/14	<b>6FC5255-0AB01-0AA0</b>	• 6th axis	2/18	<b>6FC5251-0AE53-0AA0</b>
Tangential control	2/10	<b>6FC5251-0AB11-0AA0</b>	TRANSMIT/ peripheral surface transformation	2/18	<b>6FC5251-0AB01-0AA0</b>
Temperature compensation	2/44	<b>6FC5251-0AA13-0AA0</b>	Travel to fixed stop	2/10	<b>6FC5255-0AB02-0AA0</b>
3D tool radius compensation	2/34	<b>6FC5251-0AB13-0AA0</b>			
Transformation Dynamic Swivel Tripod	2/18	<b>6FC5251-0AE60-0AA0</b>			
Transformation Dynamic Swivel Tripod 6th axis	2/18	<b>6FC5251-0AE61-0AA0</b>			

### Overview of options for SINUMERIK 802S/802C

Option	Page	Order No.
Teach In	2/32	<b>6FC5571-0AA01-0BF0</b>

# Overview of functions

## Positioning modules

2

- Basic version
- Option
- Not possible

FM 353

FM 354

FM 357-2L  
FM 357-2LX  
FM 357-2HSIMODRIVE 611  
universal HRS

### Structure/application

Structure

- SIMATIC S7-300
- SIMODRIVE 611

Axes per module

Channels per module

Interpolating axes, max.

Max. modules per SIMATIC  
programmable controller

Drives

- Power control for stepper motors<sup>6)</sup>
- SIMODRIVE 611 universal HRS  
(with analog setpoint interface)
- SIMODRIVE 611 universal HRS  
via PROFIBUS DP
- SIMOVERT MASTERDRIVES MC  
via PROFIBUS DP

	FM 353	FM 354	FM 357-2L FM 357-2LX FM 357-2H	SIMODRIVE 611 universal HRS
Structure				
• SIMATIC S7-300	●	●	●	–
• SIMODRIVE 611	–	–	–	●
Axes per module	1	1	4	1/2
Channels per module	1	1	4 <sup>3)</sup>	–
Interpolating axes, max.	–	–	4	2
Max. modules per SIMATIC programmable controller	1)	1)	3 <sup>3)</sup>	–
Drives				
• Power control for stepper motors <sup>6)</sup>	●	–	●	–
• SIMODRIVE 611 universal HRS (with analog setpoint interface)	● 5)	●	●	●
• SIMODRIVE 611 universal HRS via PROFIBUS DP	● 5)	–	●	●
• SIMOVERT MASTERDRIVES MC via PROFIBUS DP	–	–	●	–

### Measuring systems that can be connected

Indirect measuring systems

- Incremental rotary measuring systems via RS 422
- Incremental encoder with sin/cos 1 V<sub>pp</sub>
- Resolver
- Absolute rotary measuring systems with SSI
- Absolute rotary measuring systems with EnDat

Direct measuring systems

- Incremental rotary measuring systems via RS 422
- Incremental encoder with sin/cos 1 V<sub>pp</sub>
- Resolver
- Absolute rotary measuring systems with SSI
- Absolute linear scale with SSI
- Absolute linear scale with EnDat

	FM 353	FM 354	FM 357-2L FM 357-2LX FM 357-2H	SIMODRIVE 611 universal HRS
Indirect measuring systems				
• Incremental rotary measuring systems via RS 422	–	●	● 2)	● 4)
• Incremental encoder with sin/cos 1 V <sub>pp</sub>	–	–	–	●
• Resolver	–	–	–	●
• Absolute rotary measuring systems with SSI	–	●	● 2)	–
• Absolute rotary measuring systems with EnDat	–	–	–	●
Direct measuring systems				
• Incremental rotary measuring systems via RS 422	–	●	● 2)	–
• Incremental encoder with sin/cos 1 V <sub>pp</sub>	–	–	–	●
• Resolver	–	–	–	●
• Absolute rotary measuring systems with SSI	–	●	● 2)	–
• Absolute linear scale with SSI	–	●	● 2)	–
• Absolute linear scale with EnDat	–	–	–	●

### Functionality

Traversing range in m

Velocity in mm/min

Max. stepping rate in kHz

Acceleration in m/s<sup>2</sup>

Acceleration in kHz/s for stepper drives

Jerk time in s

	FM 353	FM 354	FM 357-2L FM 357-2LX FM 357-2H	SIMODRIVE 611 universal HRS
Traversing range in m	±1 000	±1 000	±1 000	± 200
Velocity in mm/min	–	0.01 ... 500 000	0.001 ... > 10 000 000	1 ... 2 000 000.000
Max. stepping rate in kHz	200	–	750	–
Acceleration in m/s <sup>2</sup>	–	0.001 ... 100	0.001 ... 100	0.001 ... 999
Acceleration in kHz/s for stepper drives	0.01 ... 10 000	–	0.001 ... 100	–
Jerk time in s	–	0 ... 10	0 ... 10	0 ... 0.2

1) Depending on requirements and module complement of the subrack.

2) Also in combination with stepper drive.

3) With FM 357-2H only 1.

4) With sin/cos module only.

5) Via shaft angle encoder interface only.

6) On request.



# Overview of functions

## Positioning modules

2

- Basic version
- Option
- Not possible

FM 353

FM 354

FM 357-2L  
FM 357-2LX  
FM 357-2HSIMODRIVE 611  
universal HRS

### Functionality (continued)

Basic resolution in				
• mm	10 <sup>-3</sup>	10 <sup>-3</sup>	10 <sup>-3</sup>	10 <sup>-3</sup>
• inch	10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>	10 <sup>-4</sup>
• degrees	10 <sup>-2</sup> , 10 <sup>-4</sup>	10 <sup>-2</sup> , 10 <sup>-4</sup>	10 <sup>-2</sup> , 10 <sup>-4</sup>	10 <sup>-3</sup>
Position-controlled mode	–	●	●	●
Controlled operation with stepper drives	●	–	●	–
Position control cycle in ms	–	2	2 ... 3	1 ... 4
Interpolation time in ms	2	2	6 ... 9	2 ... 20
Rotary axis	●	●	●	○
Automatic block search	●	●	●	○
Programmable acceleration	●	●	●	○
High-speed process signals				
• Inputs	4	4	12	1
• Outputs	4	4	8 1)	–
Options for assigning the high-speed inputs:				
• External start	●	●	●	●
• Enable input (Stop)	●	●	●	●
• External block change	●	●	2)	●
• Set actual value on-the-fly	●	●	2)	●
• On-the-fly measurement	●	●	●	●
• Home position switch	●	●	●	●
• Reversing cam	●	●	●	–
Options for assigning the high-speed outputs:				
• Position reached Stop	●	●	●	●
• Forward, back	●	●	●	–
• M function output M97/M98	●	●	2)	–
• Start enable	●	●	2)	–
• Direct output (for user)	●	●	●	–
• Cam output	–	–	●	–

### CNC programming

Programming language (DIN 66025)	●	●	●	–
No. of traversing programs	199 3)	199 3)	4)	1
Program length in blocks, max.	100	100	4)	256
Block capacity per module, max.	● 3)	● 3)	● 4)	256 <sup>5)</sup>
Subroutine levels, max.	1	1	11	–
No. of subroutine passes, max.	250	250	≤ 9 999	–
Max. number of different subroutines from one program	20	20	● 4)	–

1) Expandable using local bus segment.

2) Via synchronized actions.

3) Limited by program memory (16 KB).

4) Limited by program memory (770 KB).

5) With software version 10 or higher.

# Overview of functions

## Positioning modules

2

- Basic version
- Option
- Not possible

FM 353

FM 354

FM 357-2L  
FM 357-2LX  
FM 357-2HSIMODRIVE 611  
universal HRS

### CNC programming (continued)

Dimensions in mm, degrees, inch	●	●	●	●
Skip block	●	●	●	●
Subroutines	●	●	●	–
Endless loop with M18	●	●	With GOTO	With GOTO
M function, actual-value-specific	–	–	●	–
M function, time/acknowledgement-driven	●	●	●	–
Syntax check	●	●	●	●

### Communication

Backup of user data on PG from				
● Hard disk, floppy disk	FM Param	FM Param	FM Param	○
● Memory card	–	–	●	–
I/O bus, S7-CPU ↔ FM	●	●	●	–
Software technology module for communication between CPU and positioning module	●	●	●	●
Multipoint interface (MPI)				
● Via SIMATIC S7-CPU	●	●	●	–
Networking with PROFIBUS DP via SIMATIC S7 CP 342-5 DP	○	○	○	●
PROFIBUS DP with PROFIdrive profile	–	–	● 1)	○
SIMODRIVE drive interface	–	±10 V	±10 V	±10 V
Power control for stepper motors <sup>4)</sup> drive interface (stepping rate, direction signal)	●	–	●	–
Data transfer via memory card	–	–	●	–

### Operation

Standard screens for OP7	● 2)	● 2)	–	–
Standard screens for OP17	● 2)	● 2)	● 2)	–
Standard screens for OP27	–	–	● 2)	–
Standard screens for TP 170B/MP 270B	–	–	● 2)	–

### Operating modes and machine functions

Incremental dimension, relative	●	●	●	●
Jog mode	●	●	●	●
Control	●	●	●	○
MDI	●	●	● 3)	–
Automatic	●	●	●	●
Reference point approach	●	●	●	●
Follow-up mode	–	●	●	○
Parking axis	●	●	–	○
Simulation	●	●	●	–

1) Cannot be used when HT 6 is used in combination with FM 357-2H.

2) Included in the configuration package.

3) Only via startup screen.

4) On request.

# Overview of functions

## Positioning modules

2

- Basic version
- Option
- Not possible

FM 353

FM 354

FM 357-2L  
FM 357-2LX  
FM 357-2HSIMODRIVE 611  
universal HRS

### Operating modes and machine functions (continued)

	FM 353	FM 354	FM 357-2L FM 357-2LX FM 357-2H	SIMODRIVE 611 universal HRS
Length measurement	●	●	●	–
Retrigger reference point	●	●	●	–
Switch off enable input	●	●	●	–
Switch off software limit switch	●	●	●	–
On-the-fly measurement	●	●	● 1)	●
Switch off automatic drift compensation	–	●	●	–
Preset (set actual value)	●	●	●	–
Block search	●	●	–	●
Teach In	●	●	● 2)	○
Delete distance-to-go	●	●	●	–
Restart	●	●	●	–
Handling transformation	–	–	● 2)	–

### Compensations and reference points

	FM 353	FM 354	FM 357-2L FM 357-2LX FM 357-2H	SIMODRIVE 611 universal HRS
20 tool compensations	●	●	●	–
Tool compensations 1 length + 1 wear (add./abs.)	●	●	●	–
Tool compensation, 3 lengths	–	–	●	–
Zero offset	●	●	●	●
Reference point offset	●	●	●	●
Automatic drift compensation for analog speed setpoints	–	●	●	–
Backlash compensation	●	●	●	●

### Axis monitoring functions

	FM 353	FM 354	FM 357-2L FM 357-2LX FM 357-2H	SIMODRIVE 611 universal HRS
Software limit switch monitoring	●	●	●	●
Position monitoring	–	●	●	●
Standstill (zero-speed) monitoring	–	●	●	●
Rotation monitoring	●	–	●	–
Plausibility in data communication	●	●	●	–
Limit value	●	●	●	●
Following error	–	●	●	●
Cable break	–	●	●	●
Setpoint	●	●	●	–
Watchdog	●	●	●	–

1) Not with FM 357-2L.

2) With FM 357-2H.

# Overview of functions

## Positioning modules

2

- Basic version
- Option
- Not possible

FM 353

FM 354

FM 357-2L  
FM 357-2LX  
FM 357-2HSIMODRIVE 611  
universal HRS

### PLC area

FM can be used in SIMATIC S7-300

PLC programming with HiGraph  
Add-on package for STEP 7

SIMATIC S7 technology modules

Digital inputs/outputs, max.

No. of I/O modules, max.

Bit memories

Counter

Timers

Main memory in KB

Machining time

● Bit commands, typ. in  $\mu$ s● Word commands, typ. in  $\mu$ s

FB

FC

DB

Cyclic function block

Time-controlled function blocks

STEP 7 programming language

Programming: STL, SCL, LAD/FBD

Equipment for PLC programming and program testing

Memory card (flash EPROM)

	CPU 314 and higher	CPU 314 and higher	CPU 314C and higher	–
PLC programming with HiGraph Add-on package for STEP 7	–	–	○	–
SIMATIC S7 technology modules	●	●	●	–
Digital inputs/outputs, max.	1 024	1 024	992	8 <sup>1)</sup>
No. of I/O modules, max.	32	32	31	–
Bit memories	2 048	2 048	2 048	–
Counter	256	256	256	–
Timers	256	256	256	–
Main memory in KB	48	48	48	–
Machining time				
● Bit commands, typ. in $\mu$ s	0.1	0.1	0.1	–
● Word commands, typ. in $\mu$ s	1.0	1.0	1.0	–
FB	512	512	512	–
FC	512	512	512	–
DB	511	511	511	–
Cyclic function block	●	●	●	–
Time-controlled function blocks	●	●	●	–
STEP 7 programming language	●	●	●	–
Programming: STL, SCL, LAD/FBD	●	●	●	–
Equipment for PLC programming and program testing	PG 7../PC	PG 7../PC	PG 7../PC	–
Memory card (flash EPROM)	CPU 314 CPU 315	CPU 314 CPU 315	CPU 314C CPU 315 CPU 316 CPU 318-2	–

### Diagnostic functions

PLC status

Diagnostic buffer specifying error ID codes

Servo alarms

Diagnostic alarms and messages

PLC status	●	●	●	–
Diagnostic buffer specifying error ID codes	● 2)	● 2)	● 2)	●
Servo alarms	●	●	●	●
Diagnostic alarms and messages	●	●	●	●

### Startup/parameterization

PG 720/PG 740/PG 760 programming devices

PC with RS 232 C (V.24)

PC with MPI card

Windows-based startup tool

Configured using SIMATIC STEP 7

Startup functions

● Measurement functions

PG 720/PG 740/PG 760 programming devices	○	○	○	●
PC with RS 232 C (V.24)	–	–	–	●
PC with MPI card	○	○	○	–
Windows-based startup tool	●	●	●	●
Configured using SIMATIC STEP 7	●	●	●	●
Startup functions	–	–	–	●
● Measurement functions	–	–	–	●

1) Expansion is possible via options.

2) The last 5 events.

# Operator components for CNC controls



## 3/2 General

3/2 Introduction

## 3/4 Operator panels

3/4 SINUMERIK OP 08T  
 3/5 SINUMERIK OP 010  
 3/6 SINUMERIK OP 010S  
 3/7 SINUMERIK OP 010C  
 3/8 SINUMERIK OP 012  
 3/9 SINUMERIK OP 015  
 3/10 SINUMERIK OP 015A  
 3/11 SINUMERIK OP 015AT  
 3/12 SINUMERIK TP 015A  
 3/13 SINUMERIK TP 015AT  
 3/14 SINUMERIK direct key module  
 3/15 SINUMERIK PCU 20  
 3/17 SINUMERIK PCU 50.3  
 3/20 SINUMERIK TCU  
 3/22 SINUMERIK Video link

## 3/24 Handheld units

3/24 SINUMERIK HT 6  
 3/25 SINUMERIK HT 8  
 3/27 Handheld unit type B-MPI  
 3/28 Mini handheld unit  
 3/29 Electronic handwheel  
 3/30 Handwheel connection module

## 3/31 Machine control panels

3/31 SINUMERIK MCP 310  
 3/32 SINUMERIK MCP 483C  
 3/34 SINUMERIK MCP 483  
 3/36 SINUMERIK OP 032S machine control panel  
 3/37 SINUMERIK PP 012  
 3/38 SINUMERIK MPP 483  
 3/40 Expansion panel  
 3/41 SINUMERIK MPI interface  
 3/42 SIRIUS 3SB3  
 3/42 Laser inscription

## 3/43 Keyboards

3/43 KBPC CG US standard PC keyboard  
 3/43 Keyboard tray  
 3/44 SINUMERIK KB 310C  
 3/45 SINUMERIK KB 483C  
 3/46 Dyna Systems full CNC keyboard

## 3/47 Storage devices

3/47 SINUMERIK card reader USB 2.0  
 3/48 CompactFlash Card  
 3/49 Industrial USB Hub 4  
 3/50 SIMATIC PC USB FlashDrive  
 3/51 SINUMERIK 3.5" floppy disk drive, USB 1.1  
 3/52 SINUMERIK 3.5" floppy disk drive

## 3/53 Housing systems

3/53 Rittal command panel systems  
 3/54 ROSE Systemtechnik GmbH



For products approved for Canada and U.S.A., see Appendix.

# Operator components for CNC controls

## General

### Introduction

### Overview



SINUMERIK OP 08T



SINUMERIK OP 010



SINUMERIK OP 010S



SINUMERIK OP 010C



SINUMERIK OP 012



SINUMERIK OP 015

SINUMERIK OP 015A/TP 015A/  
OP 015AT/TP 015ATSINUMERIK  
HT 8SINUMERIK  
PCU 20SINUMERIK  
PCU 50.3

P\_NC01\_XX\_00742a

### SINUMERIK operator panel fronts with PCU

The SINUMERIK operator panel fronts (OP) and touch operator panels (TP) can be combined with SINUMERIK PCUs (industrial PCs) and contain numerous innovations to improve ease of operation.

The USB interface on the panel front provides hot plug and play functionality for a standard PC keyboard and/or mouse. The SINUMERIK operator panel fronts are available with displays in a variety of sizes, and with membrane or mechanical keyboards.

Thus the SINUMERIK operator panel fronts can be tailored to the individual user's requirements.

### SINUMERIK PCUs

With the SINUMERIK PCUs and the SINUMERIK operator panel fronts, you can create innovative operator panels. The SINUMERIK PCUs are fitted to the rear of the SINUMERIK operator panel fronts.

The powerful SINUMERIK PCUs contain numerous innovations. The communication interfaces via Ethernet and PROFIBUS DP are already on board.

The complementary proven operator control components, such as handheld units, machine control panels, Push Button Panels, electronic handwheels, keyboards, card readers and 3.5" floppy disk drives can be used with the SINUMERIK PCUs.

### SINUMERIK TCU

The SINUMERIK Thin Client Unit TCU allows operator panel fronts and the SINUMERIK PCUs/NCUs to be installed separately. For this reason, the user interface is copied to one or several operator panel fronts, each with a SINUMERIK TCU.

### Operator panels

An operator panel comprises a SINUMERIK PCU (large-scale integrated industrial PC) and a SINUMERIK operator panel front, which is available with various performance levels or various display sizes.

The displays comply with the quality standards relating to the pixel error class defined by ISO standard 13406-2, class 2.

### Benefits

- Intelligent, rugged operator panels that have an impressively low-profile and compact design
- Individual design of your user interface, using your expertise by means of openness in human-machine communication
- Distributed design due to physical separation of PCU and operator panel front

### Application

The operator panels are predominantly used for visualization and for the operation of machine tools. They are particularly suitable for milling, turning, grinding and special-purpose machines.

For further information on applications, refer to the section Operation in chapter Overview of functions.

## Overview (continued)

**Handheld units**

The SINUMERIK handheld units are available with a variety of performance options. Small handheld units are also available, which can be used as mobile machine control panels.

Benefits

- Ergonomic machine control thanks to carefully designed housing
- Setup and operation of simple machines with the mini handheld unit, especially as part of JobShop or similar applications
- Setup, operation, teaching and programming of user programs with the multifunctional handheld terminal

**Machine control panels**

Machine control panels, push button panels and handwheels are available for the user-friendly operation of the machine functions of SINUMERIK and PLC-controlled machines.

Benefits

- Ergonomic machine control thanks to sophisticated design
- Machine-specific adaptations by means of variable labeling and control devices that can additionally be integrated

**Keyboards**

The keyboards allow convenient and user-friendly input of programs and texts.

Benefits

- Ergonomic keyboard
- CNC-specific supplements

**Storage devices**

Storage devices are used for archiving user data.

**Housing systems**

Housing systems can be manufactured to precise dimensions and ready to install for numerous combinations of SINUMERIK operating components.

Benefits

Optimum configuration options for SINUMERIK CNC controls with:

- Operator Panel
- CNC full keyboard
- Machine control panel
- Push Button Panel

# Operator components for CNC controls

## Operator panels

### SINUMERIK OP 08T

#### Overview



The extremely compact SINUMERIK OP 08T operator panel front supports the distributed installation of the operator panel front and control. The SINUMERIK OP 08T operator panel front contains a membrane keyboard with 65 keys (layout as SINUMERIK KB 310C full CNC keyboard), as well as 2 x (8 + 2) horizontal and 2 x 8 vertical softkeys.

The operator panel front is mounted from the rear using special clamps supplied with the panel.

#### Benefits

- Design of compact operator panels through shallow installation depth/reduced size and low power dissipation
- Vibration-free mounting of the SINUMERIK PCU in the control cabinet
- Efficient operation of larger machines using up to 4 additional distributed operator panels

#### Design

The SINUMERIK OP 08T operator panel front is connected to the PCU/NCU via Ethernet as a Thin Client in its own subnet (via DHCP server to PCU/NCU).

Ports:

- 2 x USB 1.1
- Ethernet 10/100 Mbit/s

#### Function

- Signal transmission between operator panel front and PCU/NCU via Industrial Ethernet
- Simple installation
- Mixed operation with one operator panel front directly at the PCU is possible. Operation on an SINUMERIK OP 08T has the same authorization rights as operation on an operator panel front connected directly to the PCU. The operator panel in passive mode shows a darkened screen.
- The distance to the operator panel fronts is determined by the maximum distance between two network nodes/access points (100 m/328 ft).

#### Integration

The SINUMERIK OP 08T operator panel front can be used for:

- SINUMERIK 810D powerline/840D powerline:  
SINUMERIK PCU 50.3

#### Technical specifications

<b>Order No.</b>	<b>6FC5203-0AF04-1BA0</b>
<b>Product name</b>	SINUMERIK OP 08T operator panel front
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	15 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP65</li> <li>• Rear IP00</li> </ul>
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>• Storage 5 ... 95 % at 25 °C (77 °F)</li> <li>• Transport 5 ... 95 % at 25 °C (77 °F)</li> <li>• Operation 5 ... 80 % at 25 °C (77 °F)</li> </ul>
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Transport -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Operation               <ul style="list-style-type: none"> <li>- Front 0 ... 45 °C (32 ... 113 °F)</li> <li>- Rear 0 ... 55 °C (32 ... 131 °F)</li> </ul> </li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 310 mm (12.2 in)</li> <li>• Height 330 mm (13.0 in)</li> <li>• Depth 41 mm (1.61 in)</li> </ul> Panel cutout <ul style="list-style-type: none"> <li>• Width 285 mm (11.2 in)</li> <li>• Height 304 mm (12.0 in)</li> </ul>
<b>Weight, approx.</b>	2.9 kg (6.39 lb)

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK OP 08T operator panel front</b> 19.1 cm/7.5" TFT (640 x 480) with membrane keys and integrated TCU	<b>6FC5203-0AF04-1BA0</b>
<b>Accessories</b>	
<b>Slide-in labels for inscribing</b> 3 A4 sheets for OP 08T	<b>6FC5248-0AF04-1BA0</b>
<b>Caps (5 units)</b> For USB port	<b>6FC5248-0AF05-0BA0</b>
<b>Set of clamps (9 units)</b> For supplementary operating components with 2.5 mm (0.10 in) profile, length: 20 mm (0.79 in)	<b>6FC5248-0AF14-0AA0</b>



## Overview



The SINUMERIK OP 010 operator panel front with 10.4" TFT color display with a resolution of 640 x 480 pixels (VGA) features a 62-key membrane keypad with 8 + 4 horizontal and 8 vertical softkeys that has been optimized for programming subroutines.

The operator panel front is mounted from the rear using special clamps supplied with the panel.

## Benefits

- Low-cost operator control and monitoring thanks to 10" display with optimized keyboard

## Integration

The SINUMERIK operator panel front OP 010 can be used for:

- SINUMERIK 810D powerline/840D powerline:  
SINUMERIK PCU 20/PCU 50.3

## Technical specifications

<b>Order No.</b>	<b>6FC5203-0AF00-0AA1</b>
<b>Product name</b>	SINUMERIK OP 010 operator panel front
<b>Input voltage</b>	Via PCU, TCU or video link receiver (5 V DC)
<b>Power consumption, max.</b>	16 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>Front IP65</li> <li>Rear IP00</li> </ul>
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>Storage 5 ... 95 % at 25 °C (77 °F)</li> <li>Transport 5 ... 95 % at 25 °C (77 °F)</li> <li>Operation 5 ... 80 % at 25 °C (77 °F)</li> </ul>
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>Storage -20 ... +60 °C (-4 ... 140 °F)</li> <li>Transport -20 ... +60 °C (-4 ... 140 °F)</li> <li>Operation <ul style="list-style-type: none"> <li>- Front 0 ... 45 °C (32 ... 113 °F)</li> <li>- Rear 0 ... 55 °C (32 ... 131 °F)</li> </ul> </li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>Width 483 mm (19.02 in)</li> <li>Height 310 mm (12.2 in)</li> <li>Depth 30 mm (1.18 in)</li> </ul>
Depth	
<ul style="list-style-type: none"> <li>Without PCU 20 mm (0.78 in)</li> <li>With PCU 20 <ul style="list-style-type: none"> <li>- Clearance 10 mm (0.39 in)</li> </ul> </li> <li>With PCU 50.3 <ul style="list-style-type: none"> <li>- Clearance 10 mm (0.39 in)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>108.2 mm (4.25 in)</li> <li>10 mm (0.39 in)</li> </ul>
<b>Weight, approx.</b>	5 kg (11 lb)

## Selection and ordering data

Designation	Order No.
<b>SINUMERIK OP 010 operator panel front</b> 26.4 cm/10.4" TFT (640 x 480) with membrane keys	<b>6FC5203-0AF00-0AA1</b>
<b>Accessories</b>	
<b>Slide-in labels for inscribing</b> 3 A4 sheets for SINUMERIK OP 010	<b>6FC5248-0AF07-0AA0</b>
<b>Caps (10 units)</b> For USB port	<b>6FC5248-0AF05-0AA0</b>
<b>Set of clamps (6 units)</b>	<b>6FC5248-0AF06-0AA0</b>

# Operator components for CNC controls

## Operator panels

### SINUMERIK OP 010S

#### Overview



The slimline SINUMERIK OP 010S operator panel front with 10.4" TFT color display with a resolution of 640 x 480 pixels (VGA) features 8 + 4 horizontal and 8 vertical mechanical softkeys.

A full CNC keyboard can be used as the input keyboard.

The operator panel front is mounted from the rear using special clamps supplied with the panel.

#### Benefits

- Space-saving operator control and monitoring
- Ergonomic and reliable operation thanks to the SINUMERIK KB 310C full CNC keyboard

#### Integration

The SINUMERIK operator panel front OP 010S can be used for:

- SINUMERIK 810D powerline/840D powerline:  
SINUMERIK PCU 20/PCU 50.3

#### Technical specifications

<b>Order No.</b>	<b>6FC5203-0AF04-0AA0</b>
<b>Product name</b>	SINUMERIK OP 010S operator panel front
<b>Input voltage</b>	Via PCU, TCU or video link receiver (5 V DC)
<b>Power consumption, max.</b>	16 W
<b>Degree of protection according to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP54</li> <li>• Rear IP00</li> </ul>
<b>Humidity rating based on EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>• Storage 5 ... 95 % at 25 °C (77 °F)</li> <li>• Transport 5 ... 95 % at 25 °C (77 °F)</li> <li>• Operation 5 ... 80 % at 25 °C (77 °F)</li> </ul>
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage -25 ... +55 °C (-13 ... +131 °F)</li> <li>• Transport -25 ... +55 °C (-13 ... +131 °F)</li> <li>• Operation               <ul style="list-style-type: none"> <li>- Front 0 ... 45 °C (32 ... 113 °F)</li> <li>- Rear 0 ... 55 °C (32 ... 131 °F)</li> </ul> </li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 310 mm (12.2 in)</li> <li>• Height 330 mm (13.0 in)</li> <li>• Depth 45 mm (1.77 in)</li> </ul> Depth <ul style="list-style-type: none"> <li>• Without PCU 35 mm (1.38 in)</li> <li>• With PCU 20 91 mm (3.58 in)               <ul style="list-style-type: none"> <li>- Clearance 10 mm (0.39 in)</li> </ul> </li> <li>• With PCU 50.3 123.2 mm (4.85 in)               <ul style="list-style-type: none"> <li>- Clearance 10 mm (0.39 in)</li> </ul> </li> </ul>
<b>Weight, approx.</b>	5.5 kg (12.13 lb)

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK OP 010S operator panel front</b> 26.4 cm/10.4" TFT (640 x 480) with mechanical keys	<b>6FC5203-0AF04-0AA0</b>
<i>Accessories</i>	
<b>Caps</b> (10 units) For USB port	<b>6FC5248-0AF05-0AA0</b>
<b>Set of clamps</b> (6 units)	<b>6FC5248-0AF06-0AA0</b>

## Overview



The SINUMERIK OP 010C operator panel front with 10.4" TFT color display with a resolution of 640 x 480 pixels (VGA) features a 65-key mechanical keypad with 8 + 4 horizontal and 8 vertical softkeys.

The 6 hotkeys are designed with replaceable key covers for machine-specific adaptation. The key covers can be freely inscribed using laser.

The operator panel front is mounted from the rear using special clamps supplied with the panel.

## Benefits

- Easy, reliable operator control and monitoring thanks to the integral keyboard with mechanical keys
- Fast selection of the main functions using the 6 integral hotkeys

## Integration

The SINUMERIK operator panel front OP 010C can be used for:

- SINUMERIK 810D powerline/840D powerline:  
SINUMERIK PCU 20/PCU 50.3

## Technical specifications

<b>Order No.</b>	<b>6FC5203-0AF01-0AA0</b>
<b>Product name</b>	SINUMERIK OP 010C operator panel front
<b>Input voltage</b>	Via PCU, TCU, or video link receiver (5 V DC)
<b>Power consumption, max.</b>	16 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP54</li> <li>• Rear IP00</li> </ul>
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>• Storage 5 ... 95 % at 25 °C (77 °F)</li> <li>• Transport 5 ... 95 % at 25 °C (77 °F)</li> <li>• Operation 5 ... 80 % at 25 °C (77 °F)</li> </ul>
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage -25 ... +55 °C (-13 ... +131 °F)</li> <li>• Transport -25 ... +55 °C (-13 ... +131 °F)</li> <li>• Operation               <ul style="list-style-type: none"> <li>- Front 0 ... 45 °C (32 ... 113 °F)</li> <li>- Rear 0 ... 55 °C (32 ... 131 °F)</li> </ul> </li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 483 mm (19.0 in)</li> <li>• Height 310 mm (12.2 in)</li> <li>• Depth 30 mm (1.18 in)</li> </ul> Depth <ul style="list-style-type: none"> <li>• Without PCU 20 mm (0.79 in)</li> <li>• With PCU 20               <ul style="list-style-type: none"> <li>- Clearance 10 mm (0.39 in)</li> </ul> </li> <li>• With PCU 50.3               <ul style="list-style-type: none"> <li>- Clearance 108.2 mm (4.26 in)</li> <li>10 mm (0.39 in)</li> </ul> </li> </ul>
<b>Weight, approx.</b>	5 kg (11.0 lb)

## Selection and ordering data

Designation	Order No.
<b>SINUMERIK OP 010C operator panel front</b> 26.4 cm/10.4" TFT (640 x 480) with mechanical keys	<b>6FC5203-0AF01-0AA0</b>
<i>Accessories</i>	
<b>Square key cover for inscribing</b> 1 set comprising of: 90 x ergo gray, 20 x red, 20 x yellow, 20 x green, 20 x mid-gray	<b>6FC5248-0AF12-0AA0</b>
<b>Caps (10 units)</b> For USB port	<b>6FC5248-0AF05-0AA0</b>
<b>Set of clamps (6 units)</b>	<b>6FC5248-0AF06-0AA0</b>

# Operator components for CNC controls

## Operator panels

### SINUMERIK OP 012

#### Overview



The SINUMERIK OP 012 operator panel front with 12.1" TFT color display with a resolution of 800 x 600 pixels (SVGA) features a 59-key membrane keypad as well as 2 x (8 + 2) horizontal and 2 x 8 vertical softkeys. The integral mouse provides an additional method of machine control. The 2 x 8 vertical softkeys can be used as direct keys.

The operator panel front is mounted from the rear using special clamps supplied with the panel.

#### Benefits

- User-friendly operator control and monitoring thanks to 12" display
- Easy operation thanks to integral keyboard and mouse

#### Integration

The SINUMERIK operator panel front OP 012 can be used for:

- SINUMERIK 810D powerline/840D powerline:  
SINUMERIK PCU 20/PCU 50.3

The optional SINUMERIK direct key module provides an additional connection of the 2 x 8 vertical softkeys as direct keys to PROFIBUS DP, if no SINUMERIK Push Button Panel or machine control panel with connection of the direct keys is available.

#### Technical specifications

<b>Order No.</b>	<b>6FC5203-0AF02-0AA1</b>
<b>Product name</b>	SINUMERIK OP 012 operator panel front
<b>Input voltage</b>	Via PCU, TCU or video link receiver (5 V DC)
<b>Power consumption, max.</b>	21 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP65</li> <li>• Rear IP00</li> </ul>
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>• Storage 5 ... 95 % at 25 °C (77 °F)</li> <li>• Transport 5 ... 95 % at 25 °C (77 °F)</li> <li>• Operation 5 ... 80 % at 25 °C (77 °F)</li> </ul>
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Transport -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Operation               <ul style="list-style-type: none"> <li>- Front 0 ... 45 °C (32 ... 113 °F)</li> <li>- Rear 0 ... 55 °C (32 ... 131 °F)</li> </ul> </li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 483 mm (19.02 in)</li> <li>• Height 310 mm (12.2 in)</li> <li>• Depth 30 mm (1.18 in)</li> </ul> Depth <ul style="list-style-type: none"> <li>• Without PCU 20 mm (0.78 in)</li> <li>• With PCU 20               <ul style="list-style-type: none"> <li>- Clearance 76 mm (2.99 in)</li> <li>10 mm (0.39 in)</li> </ul> </li> <li>• With PCU 50.3               <ul style="list-style-type: none"> <li>- Clearance 108.2 mm (4.25 in)</li> <li>10 mm (0.39 in)</li> </ul> </li> </ul>
<b>Weight, approx.</b>	5 kg (11 lb)

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK OP 012 operator panel front</b> 30.7 cm/12.1" TFT (800 x 600) with membrane keys and mouse	<b>6FC5203-0AF02-0AA1</b>
<b>SINUMERIK direct key module PROFIBUS DP</b> With mounting kit for SINUMERIK OP 012	<b>6FC5247-0AF11-0AA0</b>
<b>Accessories</b>	
<b>Slide-in labels for inscribing</b> (3 A4 sheets) for SINUMERIK OP 012	<b>6FC5248-0AF08-0AA0</b>
<b>USB mouse</b> For operator panel front	<b>6FC5247-0AF01-0AA0</b>
<b>Caps (10 units)</b> For USB port	<b>6FC5248-0AF05-0AA0</b>
<b>Set of clamps (6 units)</b>	<b>6FC5248-0AF06-0AA0</b>

## Overview



The SINUMERIK OP 015 operator panel front with 15" TFT color display with a resolution of 1024 x 768 pixels (XGA) features 8 + 4 horizontal and 8 vertical membrane softkeys.

The SINUMERIK KB 483C full CNC keyboard can be used as input keyboard.

The operator panel front is mounted from the rear using special clamps supplied with the panel.

## Benefits

- Very user-friendly operator control and monitoring thanks to brilliant 15" display
- Ergonomic and reliable operation thanks to the optional SINUMERIK KB 483C full CNC keyboard

## Integration

The SINUMERIK operator panel front OP 015 can be used for:

- SINUMERIK 810D powerline/840D powerline:  
SINUMERIK PCU 20/PCU 50.3

## Technical specifications

<b>Order No.</b>	<b>6FC5203-0AF03-0AA0</b>
<b>Product name</b>	SINUMERIK OP 015 operator panel front
<b>Input voltage</b>	Via PCU, TCU, or video link receiver (5 V DC)
<b>Power consumption, max.</b>	24 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP65</li> <li>• Rear IP00</li> </ul>
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>• Storage 5 ... 95 % at 25 °C (77 °F)</li> <li>• Transport 5 ... 95 % at 25 °C (77 °F)</li> <li>• Operation 5 ... 80 % at 25 °C (77 °F)</li> </ul>
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Transport -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Operation               <ul style="list-style-type: none"> <li>- Front 0 ... 45 °C (32 ... 113 °F)</li> <li>- Rear 0 ... 55 °C (32 ... 131 °F)</li> </ul> </li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 483 mm (19.0 in)</li> <li>• Height 310 mm (12.2 in)</li> <li>• Depth 52 mm (2.05 in)</li> </ul> Depth <ul style="list-style-type: none"> <li>• Without PCU 42 mm (1.65 in)</li> <li>• With PCU 20               <ul style="list-style-type: none"> <li>- Clearance 98 mm (3.86 in)</li> <li>10 mm (0.39 in)</li> </ul> </li> <li>• With PCU 50.3               <ul style="list-style-type: none"> <li>- Clearance 130.2 mm (5.13 in)</li> <li>10 mm (0.39 in)</li> </ul> </li> </ul>
<b>Weight, approx.</b>	7 kg (15.4 lb)

## Selection and ordering data

Designation	Order No.
<b>SINUMERIK OP 015 operator panel front</b> 38.3 cm/15.1" TFT (1024 x 768) with membrane keys	<b>6FC5203-0AF03-0AA0</b>
<i>Accessories</i>	
<b>Caps</b> (10 units) For USB port	<b>6FC5248-0AF05-0AA0</b>
<b>Set of clamps</b> (6 units)	<b>6FC5248-0AF06-0AA0</b>

# Operator components for CNC controls

## Operator panels

### SINUMERIK OP 015A

#### Overview



The SINUMERIK OP 015A operator panel front with 15" TFT color display with a resolution of 1024 x 768 pixels (XGA) features a 62-key membrane keyboard with 2 x (8 + 2) horizontal and 2 x 8 vertical softkeys and an integral mouse. The 2 x 8 vertical softkeys can be used as direct keys in the PLC.

The operator panel front is mounted from the rear using special clamps supplied with the panel.

#### Benefits

- Very user-friendly operator control and monitoring thanks to 15" display
- Easy operation thanks to integral keyboard and mouse

#### Integration

The SINUMERIK operator panel front OP 015A can be used for:

- SINUMERIK 810D powerline/840D powerline:  
SINUMERIK PCU 20/PCU 50.3

The optional SINUMERIK direct key module provides an additional connection of the 2 x 8 vertical softkeys as direct keys to PROFIBUS DP, if no SINUMERIK Push Button Panel or machine control panel with connection of the direct keys is available.

#### Technical specifications

<b>Order No.</b>	<b>6FC5203-0AF05-0AB0</b>
<b>Product name</b>	SINUMERIK OP 015A operator panel front
<b>Input voltage</b>	Via PCU, TCU, or video link receiver (5 V DC)
<b>Power consumption, max.</b>	25 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	
• Front	IP65
• Rear	IP00
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).

#### Technical specifications (continued)

<b>Order No.</b>	<b>6FC5203-0AF05-0AB0</b>
<b>Product name</b>	SINUMERIK OP 015A operator panel front
<b>Relative humidity</b>	
• Storage	5 ... 95 % at 25 °C (77 °F)
• Transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Ambient temperature</b>	
• Storage	-20 ... +60 °C (-4 ... +140 °F)
• Transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	
- Front	0 ... 45 °C (32 ... 113 °F)
- Rear	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width	483 mm (19.0 in)
• Height	355 mm (14.0 in)
• Depth	53 mm (2.09 in)
Depth	
• Without PCU	42 mm (1.65 in)
• With PCU 20	95 mm (3.74 in)
- Clearance	10 mm (0.39 in)
• With PCU 50.3	127 mm (5.00 in)
- Clearance	10 mm (0.39 in)
<b>Weight, approx.</b>	8.4 kg (18.5 lb)

#### Selection and ordering data

<b>Designation</b>	<b>Order No.</b>
<b>SINUMERIK OP 015A operator panel front</b>	<b>6FC5203-0AF05-0AB0</b>
38.3 cm/15.1" TFT (1024 x 768) with membrane keys	
<b>SINUMERIK direct key module PROFIBUS DP</b>	<b>6FC5247-0AF11-0AA0</b>
With mounting kit for SINUMERIK OP 012	
<b>Direct key module mounting kit</b>	<b>6FC5247-0AF30-0AA0</b>
For SINUMERIK OP 015A/TP 015A	

#### Accessories

<b>Slide-in labels for inscribing</b>	<b>6FC5248-0AF24-0AA0</b>
3 A4 sheets for SINUMERIK OP 015A/OP 015AT/TP 015A/TP 015AT for vertical softkeys	
<b>USB mouse</b>	<b>6FC5247-0AF01-0AA0</b>
For operator panel front	
<b>Caps (10 units)</b>	<b>6FC5248-0AF05-0AA0</b>
For USB port	
<b>Set of clamps (9 units)</b>	<b>6FC5248-0AF14-0AA0</b>
For supplementary operating components with 2.5 mm (0.10 in) profile, length: 20 mm (0.79 in)	

## Overview



The SINUMERIK OP 015AT operator panel front with 15" TFT color display, 1024 x 768 pixels (XGA), supports the distributed installation of the operator panel front and control. The SINUMERIK OP 015AT operator panel front contains a membrane keyboard with 62 keys as well as 2 x (8 + 2) horizontal and 2 x 8 vertical softkeys and an integral mouse.

The operator panel front is mounted from the rear using special clamps supplied with the panel.

## Benefits

- Design of flat operator panels through shallow installation depth and low power dissipation
- Vibration-free mounting of the SINUMERIK PCU in the control cabinet
- Efficient operation of larger machines using up to 4 additional, distributed operator panels

## Design

The SINUMERIK OP 015AT operator panel front is connected to the PCU/NCU via Ethernet as a Thin Client in its own subnet (via DHCP server to PCU/NCU).

Ports:

- 3 x USB 1.1 (2 x rear, 1 x front)
- Ethernet 10/100 Mbit/s

## Function

- Signal transmission between operator panel front and PCU/NCU via Industrial Ethernet
- Simple installation
- Mixed operation with one operator panel front directly at the PCU is possible. Operation on a SINUMERIK OP 015AT has the same authorization rights as operation on an operator panel front connected directly to the PCU. The operator panel in passive mode shows a darkened screen.
- The distance to the operator panel fronts is determined by the maximum distance between two network nodes/access points (100 m/328 ft).

## Integration

The SINUMERIK operator panel front OP 015AT can be used for:

- SINUMERIK 810D powerline/840D powerline:  
SINUMERIK PCU 50.3

## Technical specifications

<b>Order No.</b>	<b>6FC5203-0AF05-1AB0</b>
<b>Product name</b>	SINUMERIK OP 015AT operator panel front
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	25 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP65</li> <li>• Rear IP00</li> </ul>
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>• Storage 5 ... 95 % at 25 °C (77 °F)</li> <li>• Transport 5 ... 95 % at 25 °C (77 °F)</li> <li>• Operation 5 ... 80 % at 25 °C (77 °F)</li> </ul>
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Transport -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Operation               <ul style="list-style-type: none"> <li>- Front 0 ... 45 °C (32 ... 113 °F)</li> <li>- Rear 0 ... 55 °C (32 ... 131 °F)</li> </ul> </li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 483 mm (19.0 in)</li> <li>• Height 355 mm (14.0 in)</li> <li>• Depth 53 mm (2.09 in)</li> </ul> Depth without PCU 42 mm (1.65 in) <ul style="list-style-type: none"> <li>• Clearance 10 mm (0.39 in)</li> </ul>
<b>Weight, approx.</b>	7.6 kg (16.8 lb)

## Selection and ordering data

Designation	Order No.
<b>SINUMERIK OP 015AT operator panel front</b> 38 cm/15" TFT (1024 x 768) with membrane keys and integral TCU	<b>6FC5203-0AF05-1AB0</b>
<b>Accessories</b>	
<b>Slide-in labels for inscribing</b> 3 A4 sheets for SINUMERIK OP 015A/OP 015AT/TP 015A/TP 015AT for vertical softkeys	<b>6FC5248-0AF24-0AA0</b>
<b>USB mouse</b> For operator panel front	<b>6FC5247-0AF01-0AA0</b>
<b>Caps (10 units)</b> For USB port	<b>6FC5248-0AF05-0AA0</b>
<b>Set of clamps (9 units)</b> For supplementary operating components with 2.5 mm (0.10 in) profile, length: 20 mm (0.79 in)	<b>6FC5248-0AF14-0AA0</b>

# Operator components for CNC controls

## Operator panels

### SINUMERIK TP 015A

#### Overview



The SINUMERIK TP 015A touch operator panel front with 15" TFT color display with a resolution of 1024 x 768 pixels (XGA) and touch screen features a 62-key membrane keyboard, as well as 2 x (8 + 2) horizontal and 2 x 8 vertical softkeys and an integral mouse. The 2 x 8 vertical softkeys can be used as direct keys in the PLC.

The touch operator panel front is mounted from the rear using special clamps supplied with the panel.

#### Benefits

- Very user-friendly operator control and monitoring thanks to 15" display
- Easy operation thanks to touch screen, integral keyboard and mouse

#### Integration

The SINUMERIK touch operator panel front TP 015A can be used for:

- SINUMERIK 810D powerline/840D powerline: SINUMERIK PCU 50.3

The optional SINUMERIK direct key module provides an additional connection of the 2 x 8 vertical softkeys as direct keys to the PROFIBUS DP, if no SINUMERIK Push Button Panel or machine control panel with connection of the direct keys is available or if the direct key commands cannot be transferred over the Thin Client.

#### Technical specifications

<b>Order No.</b>	<b>6FC5203-0AF08-0AB0</b>
<b>Product name</b>	SINUMERIK TP 015A operator panel front
<b>Input voltage</b>	Via PCU, TCU, or video link receiver (5 V DC)
<b>Power consumption, max.</b>	25 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP65</li> <li>• Rear IP00</li> </ul>
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>• Storage 5 ... 95 % at 25 °C (77 °F)</li> <li>• Transport 5 ... 95 % at 25 °C (77 °F)</li> <li>• Operation 5 ... 80 % at 25 °C (77 °F)</li> </ul>
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Transport -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Operation               <ul style="list-style-type: none"> <li>- Front 0 ... 45 °C (32 ... 113 °F)</li> <li>- Rear 0 ... 55 °C (32 ... 131 °F)</li> </ul> </li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 483 mm (19.0 in)</li> <li>• Height 355 mm (14.0 in)</li> <li>• Depth 53 mm (2.09 in)</li> </ul>
<b>Depth</b>	<ul style="list-style-type: none"> <li>• Without PCU 42 mm (1.65 in)</li> <li>• With PCU 50.3 - Clearance 10 mm (0.39 in)</li> </ul>
<b>Weight, approx.</b>	8.4 kg (18.5 lb)

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK TP 015A operator panel front</b> 15.0" TFT (1024 x 768) with membrane keys and touch	<b>6FC5203-0AF08-0AB0</b>
<b>SINUMERIK direct key module PROFIBUS DP</b> (With mounting kit for SINUMERIK OP 012)	<b>6FC5247-0AF11-0AA0</b>
<b>Direct key module mounting kit</b> For SINUMERIK OP 015A/TP 015A	<b>6FC5247-0AF30-0AA0</b>
<b>Accessories</b>	
<b>Slide-in labels for inscribing</b> 3 A4 sheets for SINUMERIK OP 015A/OP 015AT/TP 015A/TP 015AT for vertical softkeys	<b>6FC5248-0AF24-0AA0</b>
<b>USB mouse</b> For operator panel front	<b>6FC5247-0AF01-0AA0</b>
<b>Caps (10 units)</b> For USB port	<b>6FC5248-0AF05-0AA0</b>
<b>Set of clamps (9 units)</b> For supplementary operating components with 2.5 mm (0.10 in) profile, length: 20 mm (0.79 in)	<b>6FC5248-0AF14-0AA0</b>



## Overview



The SINUMERIK TP 015AT touch operator panel front with 15" TFT color display, 1024 x 768 pixels (XGA) and touch screen supports the distributed installation of the operator panel front and control. The SINUMERIK TP 015AT touch operator panel front contains a membrane keyboard with 62 keys as well as 2 x (8 + 2) horizontal and 2 x 8 vertical softkeys and an integral mouse.

The operator panel front is mounted from the rear using special clamps supplied with the panel.

## Benefits

- Flat operator panel through shallow installation depth
- Low power dissipation
- Simple installation
- Vibration-free mounting in the control cabinet
- Efficient operation of larger machines using up to 4 additional distributed operator panels

## Design

The SINUMERIK TP 015AT touch operator panel front is connected to the PCU/NCU via Ethernet as a Thin Client in its own subnet (via DHCP server to PCU/NCU).

Ports:

- 3 x USB 1.1 (2 x rear, 1 x front)
- Ethernet 10/100 Mbit/s

## Function

- Signal transmission between operator panel front and PCU/NCU via Industrial Ethernet
- Mixed operation with one operator panel front directly at the PCU is possible. Operation on a TP 015AT has the same authorization rights as operation on an operator panel front connected directly to the PCU. The operator panel in passive mode shows a darkened screen.
- The distance to the operator panel fronts is determined by the maximum distance between two network nodes/access points (100 m/328 ft).

## Integration

The SINUMERIK touch operator panel front TP 015AT can be used for:

- SINUMERIK 810D powerline/840D powerline:  
SINUMERIK PCU 50.3

## Technical specifications

<b>Order No.</b>	<b>6FC5203-0AF08-1AB0</b>
<b>Product name</b>	SINUMERIK TP 015AT operator panel front
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	25 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP65</li> <li>• Rear IP00</li> </ul>
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>• Storage 5 ... 95 % at 25 °C (77 °F)</li> <li>• Transport 5 ... 95 % at 25 °C (77 °F)</li> <li>• Operation 5 ... 80 % at 25 °C (77 °F)</li> </ul>
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Transport -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Operation               <ul style="list-style-type: none"> <li>- Front 0 ... 45 °C (32 ... 113 °F)</li> <li>- Rear 0 ... 55 °C (32 ... 131 °F)</li> </ul> </li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 483 mm (19.0 in)</li> <li>• Height 355 mm (14.0 in)</li> <li>• Depth 53 mm (2.09 in)</li> </ul> Depth without PCU 42 mm (1.65 in) <ul style="list-style-type: none"> <li>• Clearance 10 mm (0.39 in)</li> </ul>
<b>Weight, approx.</b>	7.6 kg (16.8 lb)

## Selection and ordering data

Designation	Order No.
<b>SINUMERIK TP 015AT touch operator panel front</b> 15.0" TFT (1024 x 768) with membrane keys, touch screen and integral TCU	<b>6FC5203-0AF08-1AB0</b>
<b>Accessories</b>	
<b>Slide-in labels for inscribing</b> 3 A4 sheets for SINUMERIK OP 015A/OP 015AT/TP 015A/TP 015AT	<b>6FC5248-0AF24-0AA0</b>
<b>USB mouse</b> For operator panel front	<b>6FC5247-0AF01-0AA0</b>
<b>Caps (10 units)</b> For USB port	<b>6FC5248-0AF05-0AA0</b>
<b>Set of clamps (9 units)</b> For supplementary operating components with 2.5 mm (0.10 in) profile, length: 20 mm (0.79 in)	<b>6FC5248-0AF14-0AA0</b>

# Operator components for CNC controls

## Operator panels

### SINUMERIK direct key module

#### Overview



The SINUMERIK direct key module enables you to operate the machine using both key rows (to the left and right of the screen) on the SINUMERIK operator panel fronts OP 012/OP 015A/TP 015A.

#### Design

The SINUMERIK direct key module is fitted alongside the SINUMERIK PCU 50.3 on the SINUMERIK operator panel fronts OP 012/OP 015A/TP 015A. Cables and installation components for assembling the SINUMERIK PCU 50.3 with OP 012 are included in the scope of delivery.

For the combination SINUMERIK PCU 50.3 with OP 015A/TP 015A there is a separate mounting kit which, if required, must be ordered separately.

#### Integration

The SINUMERIK direct key module is suitable for connection to:

- SINUMERIK PCU 50.3 with the SINUMERIK operator panel fronts OP 012/OP 015A/TP 015A

The SINUMERIK direct key module is connected to PROFIBUS DP of the SINUMERIK operator panel front using a ribbon cable and PROFIBUS connectors.

#### Technical specifications

<b>Order No.</b>	<b>6FC5247-0AF11-0AA0</b>
<b>Product name</b>	SINUMERIK direct key module for PROFIBUS DP
<b>Input voltage</b>	5 V DC
<b>Power consumption, max.</b>	0.75 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95 % at 25 °C (77 °F)
• Transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Ambient temperature</b>	
• Storage	-20 ... +60 °C (-4 ... +140 °F)
• Transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width	106 mm (4.17 in)
• Height	42 mm (1.65 in)
• Depth	80 mm (3.15 in)
<b>Weight, approx.</b>	0.6 kg (1.32 lb)

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK direct key module PROFIBUS DP</b>	<b>6FC5247-0AF11-0AA0</b>
With mounting kit for SINUMERIK OP 012	
<b>Direct key module mounting kit</b>	<b>6FC5247-0AF30-0AA0</b>
For SINUMERIK OP 015A/TP 015A	

## Overview



The high-performance SINUMERIK PCU 20 does not need a hard disk and already incorporates MPI/PROFIBUS DP communication onboard. Connection to Ethernet and a floppy disk drive are available as an option.

The SINUMERIK PCU 20 is equipped with the HMI-Embedded user interface (Chinese Simplified/ English/French/German/ Italian/Spanish) as standard. Other languages for the HMI-Embedded user interface can be ordered separately (see HMI software for CNC controls).

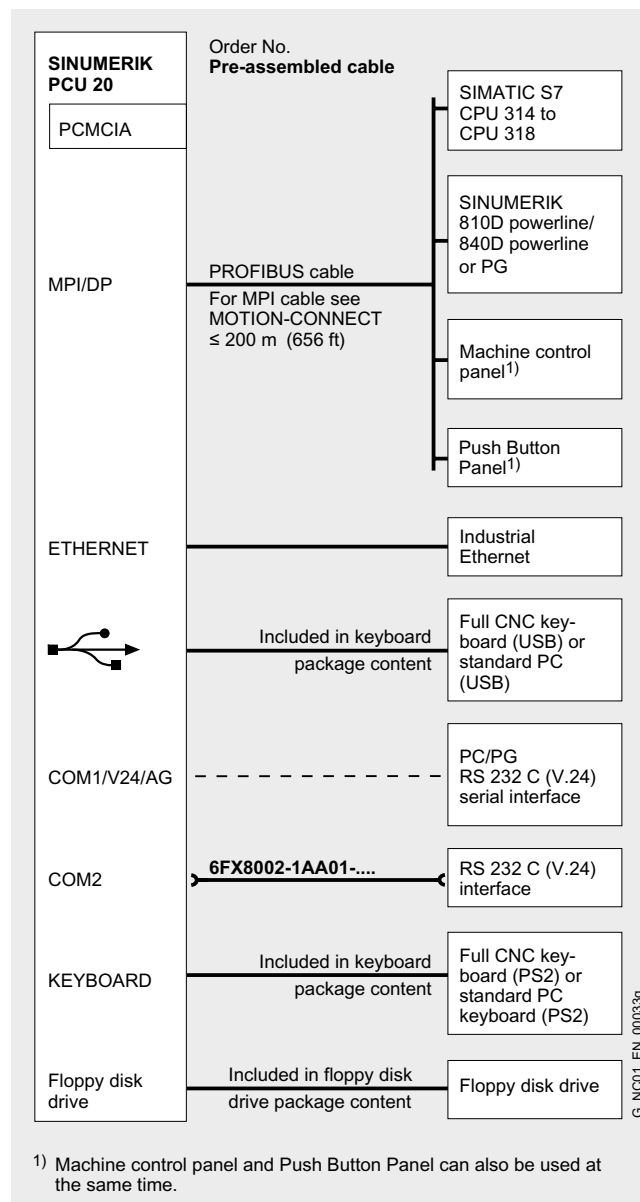
## Design

- Single-chip PC processor 266 MHz or 333 MHz/32 MB DRAM/16 MB Flash
- Embedded operating system
- Ports:
  - COM 1 (V.24/TTY), COM 2 (V.24)
  - PS/2 keyboard
  - MPI interface
  - USB, 2 channels (1 x internal/1 x external)
  - Ethernet 10/100 Mbit/s, external floppy disk drive (SW option)
  - PCMCIA memory card interface (can be alternatively used with PC card or CompactFlash Card (via adapter) as external program memory).

## Integration

The SINUMERIK PCU 20 can be used for:

- SINUMERIK 810D powerline/840D powerline with SINUMERIK operator panel fronts  
OP 010 (from 6FC5203-0AF00-0AA1)/  
OP 010C/OP 010S/OP 012/OP 015/OP 015A



Connection overview for SINUMERIK PCU 20

Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

# Operator components for CNC controls

## Operator panels

### SINUMERIK PCU 20

#### Technical specifications

Order No.	6FC5210-0DF00-1AA2	6FC5210-0DF00-0AA2
<b>Product name</b>	SINUMERIK PCU 20	
<b>Processor</b>	Single Chip PC	
• Clock frequency	333 MHz	266 MHz
<b>Input voltage</b>	24 V DC	
<b>Power consumption, max.</b>	60 W	
<b>Power loss ride-through time</b>	20 ms	
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20	
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).	
<b>Relative humidity</b>		
• Storage	5 ... 95 % at 25 °C (77 °F)	
• Transport	5 ... 95 % at 25 °C (77 °F)	
• Operation	5 ... 80 % at 25 °C (77 °F)	
<b>Ambient temperature</b>		
• Storage	-25 ... +55 °C (-13 ... +131 °F)	
• Transport	-25 ... +55 °C (-13 ... +131 °F)	
• Operation	0 ... 55 °C (32 ... 131 °F)	
<b>Dimensions</b>		
• Width	297 mm (11.7 in)	
• Height	267 mm (10.5 in)	
• Depth	56 mm (2.20 in)	
<b>Weight, approx.</b>	4 kg (8.82 lb)	

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK PCU 20</b>	
With current HMI software	
• SPC 266 MHz/32 MB	<b>6FC5210-0DF00-0AA2</b>
• SPC 333 MHz/32 MB	<b>6FC5210-0DF00-1AA2</b>
<b>Network/floppy disk drive management</b>	<b>6FC5253-0AE01-0AA0</b>
Software option	
<b>CompactFlash Card 512 MB</b>	<b>6FC5313-4AG00-0AA2</b>
Empty	

## Overview



The high-performance SINUMERIK PCU 50.3 features onboard interfaces for communication via Ethernet, MPI and PROFIBUS DP, leaving the integrated slots free for other cards. The SINUMERIK PCU 50.3 comes equipped with the Windows XP ProEmbSys operating system and, for backing up and restoring data, the Ghost data back-up software.

The HMI-Advanced software can be ordered additionally.

The SINUMERIK Service Pack Recovery Media WIN XP ProEmbSys is available for the PCU with Windows XP ProEmbSys for reinstalling Windows software components and for restoring the delivery status.

## Benefits

- High performance thanks to the latest Intel Mobile processor technology
- Reliable operation due to monitoring of temperature, hard disk and fan
- Service-friendly thanks to the support of a USB boot device (for example, for booting USB memory sticks, USB floppy and USB hard disks)

## Design

- Intel Mobile processor technology
  - PCU 50.3-C: Intel Celeron M Mobile processor 1.5 GHz/512 MB/1 MB L2 Cache/400 MHz FSB
  - PCU 50.3-P: Intel Pentium M Mobile processor 2.0 GHz/1 GB/2 MB L2 Cache/533 MHz FSB
- 40 GB replaceable hard disk with transport mechanism:
  - 12 GB for applications (HMI-Advanced, MCIS software) and data (parts programs, documentation, other data)
  - 15 GB for local backups and software to be installed
- Max. memory configuration 2 GB incl. graphics memory on 2 memory module slots
- Integrated 2D/3D graphics; dynamic graphics memory (8 to 96 MB); the graphics memory is taken from the main memory.
- Windows XP ProEmbSys operating system
- Data backup/restore using the Ghost data backup software
- Ports:
  - 2 x Ethernet 10/100 Mbit/s (RJ45)
  - 4 x USB 2.0
  - 1 x PROFIBUS/MPI interface
- Expansion slots:
  - 2 x PCI (1 x 265 mm (10.4 in), 1 x 175 mm (6.89 in))
  - 1 x CompactFlash Card

## Technical specifications

Order No.	6FC5210-0DF31-2AA0	6FC5210-0DF33-2AA0
Product name	SINUMERIK PCU 50.3-C	SINUMERIK PCU 50.3-P
Processor	Intel Celeron M	Intel Pentium M
RAM	512 MB SDRAM	1 GB SDRAM
Input voltage	24 V DC	
Power consumption, max.	190 W	
Power loss ride-through time	20 ms	
Degree of protection to EN 60529 (IEC 60529)	IP20	
Humidity rating in accordance with EN 60721-3-3	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).	
Relative humidity		
• Storage/Transport	5 ... 95 % at 25 °C (77 °F)	
• Operation	10 ... 80 % at 25 °C (77 °F)	
Ambient temperature		
• Storage/Transport	-20 ... +60 °C (-4 ... +140 °F)	
• Operation		
- Max. 15 W for expansions <sup>1)</sup>	5 ... 55 °C (41 ... 131 °F)	
- Max. 20 W for expansions <sup>1)</sup>	5 ... 50 °C (41 ... 122 °F)	
- Max. 30 W for expansions <sup>1)</sup>	5 ... 45 °C (41 ... 113 °F)	
Dimensions		
• Width x Height x Depth	297 mm x 267 mm x 81.7 mm (11.69 in x 10.51 in x 3.22 in)	
Weight, approx.	6 kg (13.23 lb)	

<sup>1)</sup> Expansion cards, for example.

# Operator components for CNC controls

## Operator panels

### SINUMERIK PCU 50.3

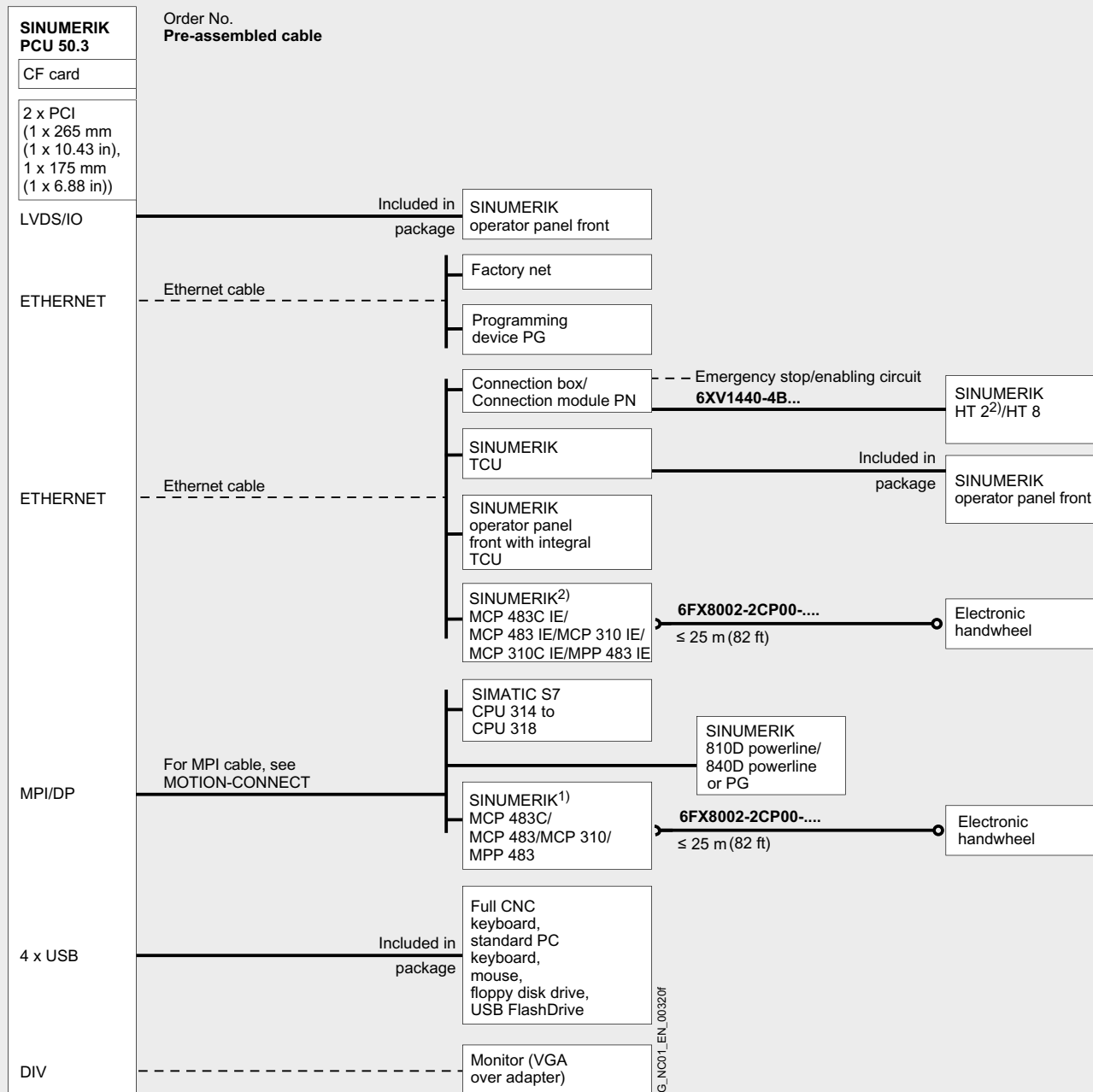
#### Integration

The SINUMERIK PCU 50.3 can be used for:

- SINUMERIK 810D powerline/840D powerline (HMI-Advanced software version 6.4 or higher)

Note:

The SINUMERIK PCU 50.3 is delivered without mounting brackets. Please include the mounting brackets in the order.



1) For SINUMERIK 810D powerline/840D powerline.  
2) For SINUMERIK 840Di sl/840D sl.

Connection overview for SINUMERIK PCU 50.3

Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

## Selection and ordering data

Designation	Order No.
<b>SINUMERIK PCU 50.3-C</b> 1.5 GHz/1 x 512 MB, Windows XP ProEmbSys	<b>6FC5210-0DF31-2AA0</b>
<b>SINUMERIK PCU 50.3-P</b> 2.0 GHz/1 x 1 GB, Windows XP ProEmbSys	<b>6FC5210-0DF33-2AA0</b>
<b>HMI-Advanced</b> On hard disk of SINUMERIK PCU <sup>1)</sup> Languages: Chinese Simplified, English, French, German, Italian, Spanish	
• Single license for current software version	<b>6FC5253-0BX10-0AF0</b>
• Single license for specific software version	<b>6FC5253-■BX10-■AF0</b>

Example of specific software version, e.g. 7.5:  
6FC5253-7....-5...

Designation	Order No.
<i>Accessories</i>	
<b>Hard disk</b> For SINUMERIK PCU 50.3 with support plate and damper	<b>6FC5247-0AF08-4AA0</b>
<b>Memory expansion</b> For SINUMERIK PCU 50.3	
• 512 MB	<b>6ES7648-2AG30-0GA0</b>
• 1 GB	<b>6ES7648-2AG40-0GA0</b>
<b>Mounting bracket</b> For SINUMERIK PCU, video link receiver or TCU behind operator panel front	<b>6FC5248-0AF20-2AA0</b>
<b>CompactFlash Card 1 GB</b> Empty	<b>6FC5313-5AG00-0AA0</b>
<b>USB FlashDrive 2 GB</b>	<b>6ES7648-0DC40-0AA0</b>
<b>SINUMERIK Service Pack Recovery Media WIN XP ProEmbSys</b> For SINUMERIK PCU with Windows XP ProEmbSys on DVD Contents: • Windows XP ProEmbSys incl. SP2 • Ghost system software; emergency BOOT • Multilingual User Interface Pack (Chinese Simplified, Chinese Traditional, Czech, Danish, Dutch, Finnish, French, German, Hungarian, Italian, Japanese, Korean, Polish, Portuguese/ Brazilian, Rumanian, Russian, Slovak, Spanish, Swedish, Turkish) Documentation (English/German)	<b>6FC5253-8CX10-0XU8</b>
<b>PCI interface card 2 x COM, 2 x LPT</b> For SINUMERIK PCU 50.3 (only for use with applications within the framework of HMI Open Architecture, occupies 1 to 2 PCI expansion slots)	<b>6ES7648-2CA01-0AA0</b>

<sup>1)</sup> Please ensure that the order number for the software to be delivered on the hard disk directly follows the order for the SINUMERIK PCU on the order form.

# Operator components for CNC controls

## Operator panels

### SINUMERIK TCU

#### Overview



The SINUMERIK Thin Client Unit TCU for distributed installation permits physical separation of operator panel fronts and SINUMERIK PCU/NCU or SIMOTION P350-3. For this purpose, the operator interface is copied to one/several operator panel fronts with one SINUMERIK TCU each.

#### Benefits

- Design of flat operator panels through the shallow installation depth and low power dissipation
- Vibration-free mounting in the control cabinet
- Efficient operation of larger machines using up to 5 uniform operator panels

#### Design

The SINUMERIK TCUs are coupled via Industrial Ethernet as Thin Clients in a dedicated subnetwork (via DHCP server on the PCU/NCU).

- Graphics: Resolution 640 x 480 to 1024 x 768, 16-bit color depth

#### Ports:

- 2 x USB 1.1 for connection of mouse and keyboard
- Industrial Ethernet 10/100 Mbit/s

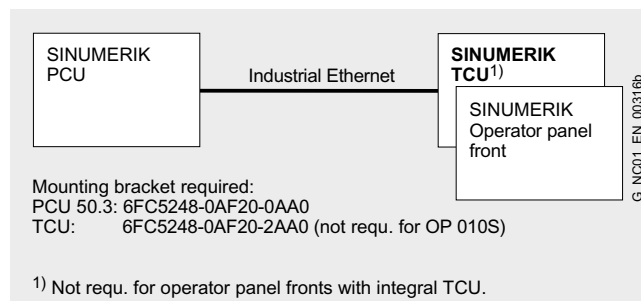
#### Function

- Signal transmission between SINUMERIK PCU/NCU/SIMOTION P350-3 and operator panel front via Industrial Ethernet
- Easy installation and service-friendly layout thanks to the component structure
- Functionality of the SINUMERIK PCU/SIMOTION P350-3 as in centralized configuration (e.g. number of PCI slots). The same operating screen is shown synchronously on all operator panel fronts and can be used from all panel fronts. Operation on a Thin Client has the same authorization rights as operation on an operator panel front connected directly to the SINUMERIK PCU/SIMOTION P350-3. The operator panel in passive mode shows a darkened screen.
- Operation is possible on the active operator panel. An enabling function permits a passive operator panel to request operation.
- The combined operation of operator panel fronts on a SINUMERIK TCU or with an integral TCU and an operator panel front directly connected to the SINUMERIK PCU/SIMOTION P350-3 is possible.
- The distance to the operator panel fronts is determined by the maximum distance between two network nodes/access points (100 m/328 ft).

#### Integration

The SINUMERIK TCU can be used for:

- SINUMERIK 810D powerline/840D powerline:  
Operator panel fronts OP 010/OP 010C/OP 010S/OP 012/TP 012/OP 015/OP 015A/TP 015A with TFT display on SINUMERIK PCU 50.3



Connection overview for SINUMERIK TCU without central OP on PCU

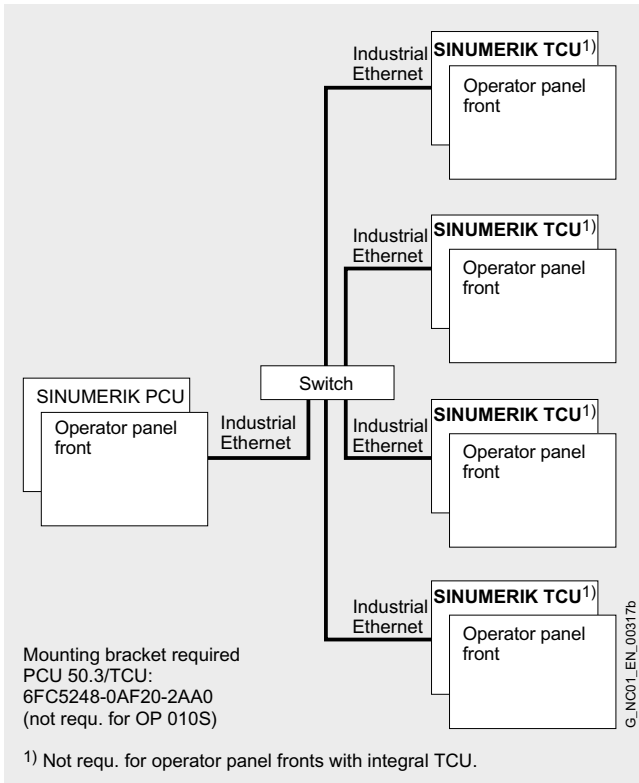


# Operator components for CNC controls

## Operator panels

SINUMERIK TCU

### Integration (continued)



Connection overview for SINUMERIK TCU with central OP on PCU

### Technical specifications

<b>Order No.</b>	<b>6FC5312-0DA00-0AA1</b>
<b>Product name</b>	SINUMERIK Thin Client Unit TCU
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	28.8 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP00
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95 % at 25 °C (77 °F)
• Transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Ambient temperature</b>	
• Storage	-25 ... +55 °C (-13 ... +131 °F)
• Transport	-25 ... +55 °C (-13 ... +131 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width	260 mm (10.2 in)
• Height	265 mm (10.4 in)
• Depth	40 mm (1.57 in)
<b>Weight, approx.</b>	1.7 kg (3.75 lb)

### Selection and ordering data

Designation	Order No.
<b>SINUMERIK Thin Client Unit TCU</b>	<b>6FC5312-0DA00-0AA1</b>
<b>Accessories</b>	
<b>Mounting bracket, flat</b>	<b>6FC5248-0AF20-0AA0</b>
For SINUMERIK PCU with/without video link transmitter in control cabinet	
<b>Upright mounting bracket</b>	<b>6FC5248-0AF20-1AA0</b>
For SINUMERIK PCU 50.3 with/without video link transmitter in control cabinet	
<b>Mounting bracket</b>	<b>6FC5248-0AF20-2AA0</b>
For SINUMERIK PCU, video link receiver or TCU behind operator panel front	
<b>Industrial Ethernet Switch</b>	<b>6GK5108-0BA00-2AA3</b>
SCALANCE X108 unmanaged With 8 RJ45 ports 10/100 Mbit/s for configuring star topologies	
<b>Industrial Ethernet Switch</b>	<b>6GK5208-0BA10-2AA3</b>
SCALANCE X208 managed With 8 RJ45 ports 10/100 Mbit/s for configuring line, star and ring topologies	
<b>Industrial Ethernet Switch</b>	<b>6GK5208-0HA00-2AA6</b>
SCALANCE X208PRO managed With 8 RJ45 ports 10/100 Mbit/s for configuring line, star and ring topologies; with IP65 degree of protection, incl. 8 RJ45 and 3 M12 dust protection caps	
<b>IE FC Standard Cable GP 2 x 2 (Type A)</b>	<b>6XV1840-2AH10</b>
4-core, shielded TP installation cable for connection to an IE FC outlet RJ45/IE FC RJ45 plug; PROFINET-compatible; with UL approval; sold by the meter; Max. length 1 000 m (3 280 ft), minimum order quantity 20 m (65 ft)	
<b>IE FC Trailing Cable GP 2 x 2 (Type C)</b>	<b>6XV1840-3AH10</b>
4-core, shielded TP installation cable for connection to an IE FC outlet RJ45/IE FC RJ45 plug 180/90 for use as trailing cable; PROFINET-compatible; without UL approval; sold by the meter; Max. length 1 000 m (3 280 ft), minimum order quantity 20 m (65 ft)	
<b>IE FC RJ45 Plug 180</b>	<b>6GK1901-1BB10-2AA0</b>
RJ cable connector for Industrial Ethernet with rugged metal housing and integrated insulation displacement contacts; with 180° cable outlet	

### More information

Information on the SIMATIC NET components such as the Industrial Ethernet Electrical Lean Switches SCALANCE X108 and the Industrial Ethernet FC TP Standard/Trailing Cable can be found in the Siemens A&D Mall or in the IK PI Catalog.

# Operator components for CNC controls

## Operator panels

### SINUMERIK Video link

#### Overview



The SINUMERIK video link components for distributed configurations enable spatial separation of the SINUMERIK OP operator panel fronts and the SINUMERIK PCU and connection of up to two identical OP operator panel fronts on one PCU.

#### Benefits

- Flat OP layout thanks to minimized mounting depth and low power loss
- Vibration-free installation of the SINUMERIK PCU in the control cabinet
- Efficient operator control of larger machines thanks to a maximum of two identical operator panels

#### Function

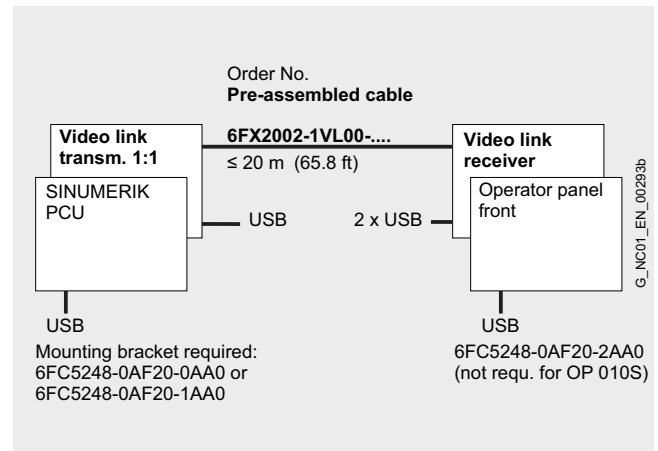
Distributed configurations also enable:

- Signal transfer between PCU and operator panel front via a single cable
- Easy installation and service-friendly layout thanks to the component structure
- PCU functionality as in a centralized configuration (e.g. number of PCI slots)
- Distances of up to 20 m (65.6 ft) between PCU and operator panel front
- All operator panels are active at the same time. As many as two operator panels display the same on-screen display and permit the same functions at the same time.

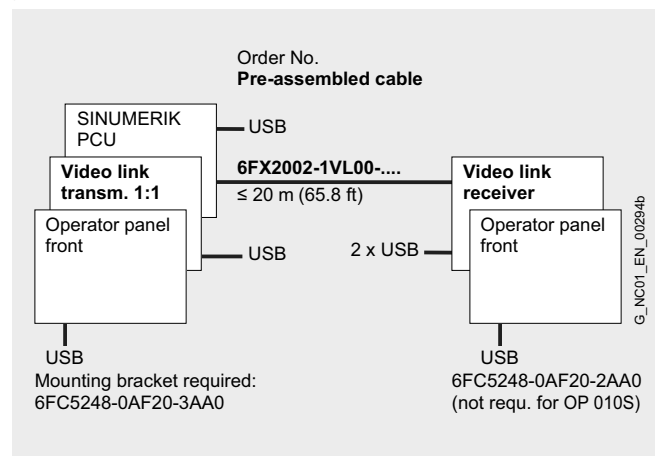
#### Preconditions:

- Operator panel fronts OP 010/OP 010C/OP 010S/OP 012/OP 015/OP 015A/TP 015A with TFT display
- SINUMERIK PCU 50.3

#### Integration



Connection overview: Installation of a SINUMERIK PCU with one operator panel front.



Connection overview: Installation of a SINUMERIK PCU with two operator panel fronts. The PCU is installed with the video link transmitter immediately behind the operator panel front (not possible when using OP 010S).

Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

## Technical specifications

<b>Order No.</b>	<b>6FC5247-0AF22-1AA0</b>
<b>Product name</b>	SINUMERIK video link transmitter 1:1
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP00
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95% at 25 °C (77 °F)
• Transport	5 ... 95% at 25 °C (77 °F)
• Operation	5 ... 80% at 25 °C (77 °F)
<b>Ambient temperature</b>	
• Storage	-25 ... +55 °C (-13 ... +131 °F)
• Transport	-25 ... +55 °C (-13 ... +131 °F)
• Operation	5 ... 55 °C (41 ... 131 °F)
<b>Distance between video link transmitter and video link receiver</b>	20 m (65.6 ft)
<b>Dimensions</b>	
• Width	265 mm (10.4 in)
• Height	277 mm (10.9 in)
• Depth	35 mm (1.38 in)
<b>Weight, approx.</b>	1.2 kg (2.65 lb)

<b>Order No.</b>	<b>6FC5247-0AF22-0AA0</b>
<b>Product name</b>	SINUMERIK video link receiver
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	40 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP00
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95% at 25 °C (77 °F)
• Transport	5 ... 95% at 25 °C (77 °F)
• Operation	5 ... 80% at 25 °C (77 °F)
<b>Ambient temperature</b>	
• Storage	-25 ... +55 °C (-13 ... +131 °F)
• Transport	-25 ... +55 °C (-13 ... +131 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Distance between video link transmitter and video link receiver</b>	20 m (65.6 ft)
<b>Dimensions</b>	
• Width	260 mm (10.2 in)
• Height	265 mm (10.43 in)
• Depth	37 mm (1.46 in)
<b>Weight, approx.</b>	1.8 kg (3.97 lb)

<b>Order No.</b>	<b>6FC5248-0AF20-0AA0</b>	<b>6FC5248-0AF20-1AA0</b>	<b>6FC5248-0AF20-2AA0</b>	<b>6FC5248-0AF20-3AA0</b>
<b>Product name</b>	Flat mounting bracket	Upright mounting bracket	Mounting bracket	Central mounting bracket
<b>Weight, approx.</b>	0.6 kg (1.32 lb)	1 kg (2.21 lb)	0.5 kg (1.10 lb)	0.6 kg (1.32 lb)

## Selection and ordering data

<b>Designation</b>	<b>Order No.</b>
<b>Video link transmitter 1:1</b>	<b>6FC5247-0AF22-1AA0</b>
<b>Mounting bracket, flat</b> For PCU with video link transmitter in control cabinet	<b>6FC5248-0AF20-0AA0</b>
<b>Upright mounting bracket</b> For PCU 50.3 with video link transmitter in control cabinet	<b>6FC5248-0AF20-1AA0</b>
<b>Mounting bracket, central</b> For PCU 50.3 with video link transmitter behind operator panel front	<b>6FC5248-0AF20-3AA0</b>
<b>Video link receiver</b>	<b>6FC5247-0AF22-0AA0</b>
<b>Mounting bracket</b> For PCU or video link receiver behind operator panel front	<b>6FC5248-0AF20-2AA0</b>
<b>Video link cable</b>	
• Length 10 m (32.81 ft)	<b>6FX2002-1VL00-1BA0</b>
• Length 15 m (49.22 ft)	<b>6FX2002-1VL00-1BF0</b>
• Length 20 m (65.62 ft)	<b>6FX2002-1VL00-1CA0</b>

# Operator components for CNC controls

## Handheld units

### SINUMERIK HT 6

#### Overview



The mobile SINUMERIK HT 6 handheld terminal combines the functions of an operator panel and a machine control panel in a single device. The SINUMERIK HT 6 permits complete machine operation, monitoring, and the creation of user programs through teaching and programming.

#### Design

The emergency stop and enabling buttons each have 2 channels (4-core), allowing them to be cross-circuit monitored. The SINUMERIK HT 6 is connected via a distributor.

#### Function

The standard SINUMERIK HT6 provides a user interface for handling applications.

The functionality of this user interface includes, for example:

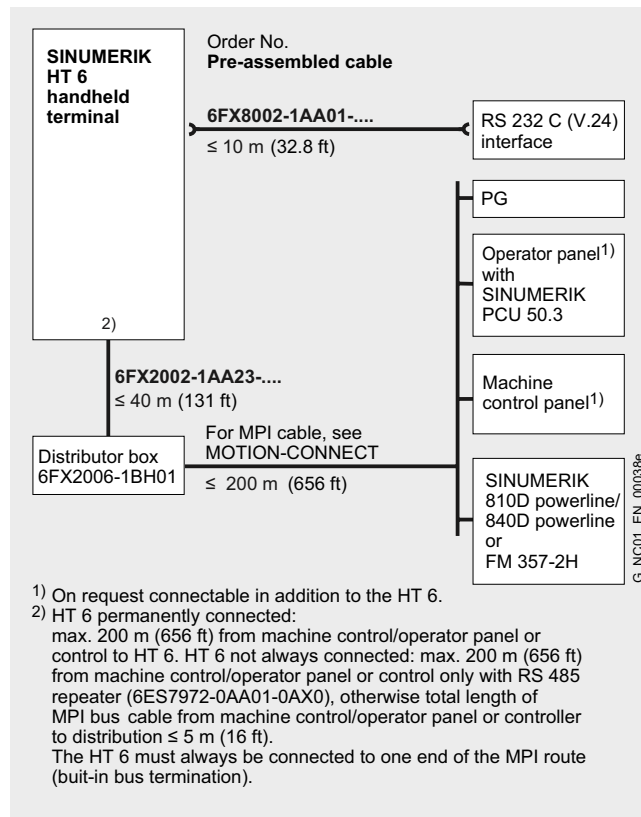
- Parameter setting changes (simple tool offset, R parameter, setting data, zero offset, user data)
- Parts programming (creation of workpieces, part programs, and subroutines)
- Manual machine operation
- Automatic machine operation
- Teaching
- Transfer of programs and data via integrated V.24 interface
- Display of messages and alarms
- Reading and editing of PLC data
- Displaying and editing of machine data

The Remote diagnostics host for SINUMERIK HT 6 function is optionally available (see HMI software for CNC controls).

#### Integration

The SINUMERIK HT 6 can be used for:

- SINUMERIK 810D powerline/840D powerline
- FM 357-2



SINUMERIK HT 6 connection overview

Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

#### Technical specifications

<b>Order No.</b>	<b>6FC5403-0AA10-0AA1</b>
<b>Product name</b>	SINUMERIK HT 6 handheld terminal
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	12 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP54
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95 % at 25 °C (77 °F)
• Transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Ambient temperature</b>	
• Storage	-20 ... +60 °C (-4 ... +140 °F)
• Transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	0 ... 45 °C (32 ... 113 °F)
<b>Dimensions</b>	
• Enclosure outside diameter	290 mm (11.42 in)
• Height (incl. override rotary button)	70 mm (2.76 in)
<b>Weight, approx.</b>	1.5 kg (3.31 lb)

# Operator components for CNC controls

## Handheld units

### SINUMERIK HT 6

### SINUMERIK HT 8

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK HT 6 handheld terminal</b> With system software display switchover: English/German	<b>6FC5403-0AA10-0AA1</b>
<b>HT 6 system software</b> On CD-ROM Languages: English, German, French, Italian, Spanish	
• Software update service	<b>6FC5453-0AX10-0AG2</b>
• Service Pack on order of specific software version <sup>1)</sup>	<b>6FC5453-■AX10-■AG3</b>
<b>Additional languages</b> On CD-ROM Languages: Korean, Dutch, Portuguese/Brazilian, Swedish, Hungarian	
• Single license without data carrier	<b>6FC5253-0BX10-0XG1</b>
• Single license for specific software version <sup>1)</sup>	<b>6FC5253-■BX10-■XG0</b>

#### Accessories

<b>Distributor</b> Including shorting plug	
• For 3-wire enabling	<b>6FX2006-1BC01</b>
• For 4-wire enabling	<b>6FX2006-1BH01</b>
<b>Signal cable (straight plug)</b>	<b>6FX2002-1AA23-....</b>
For 6FX2006-1BH01 distributor box with 4-wire enabling Length: max. 40 m (131 ft) <sup>2)</sup>	
<b>Signal cable (angled plug)</b>	<b>6FX2002-1YB02-....</b>
For 6FX2006-1BH01 distributor box with 4-wire enabling Length: max. 40 m (131 ft) <sup>2)</sup>	
<b>Signal cable</b>	<b>6FX2002-1AA83-....</b>
For 6FX2006-1BC01 distributor box with 3-wire enabling (compatible with HPU Type MPI) Length: max. 40 m (131 ft) <sup>2)</sup>	

<sup>1)</sup> Please enquire about specific software version.

<sup>2)</sup> For length code, see MOTION-CONNECT.

#### Overview



The mobile SINUMERIK HT 8 handheld terminal combines the functions of an operator panel and a machine control panel in a single device, permitting complete operator control and monitoring of machines. It can be used as a supplementary main operator panel or as a secondary control panel. The safety system is designed to allow personnel to work in the machine's hazard zone.

#### Benefits

- Mobility for operator control and monitoring
- Pixel-graphics 7.5" TFT color display
- Operation via touch screen and membrane keys
- Emergency stop button and 2 enabling buttons for left-handed and right-handed operators
- Insertion and removal during operation without triggering of emergency stop (functionality available only in conjunction with the PN Plus connection box)
- Rugged, compact and ergonomically designed

#### Design

The emergency stop button and the 2 enabling buttons (three-step) each have two channels. The SINUMERIK HT 8 is connected via the PN Basic/PN Plus connection box at any installation location in the plant, or to the Basic PN connection module for installation in the control cabinet.

#### Function

The SINUMERIK HT 8 operates according to the Thin Client principle. The operator interface software is installed on a SINUMERIK PCU 50.3. An Ethernet link is used to transfer screen contents from the PCU 50.3 to the HT 8 and key information from the HT 8 to the PCU 50.3. The HT 8 display basically shows the same operator interface that is displayed on the standard operator panels of the SINUMERIK control system.

The PN Plus connection box provides hot swapping (insert or remove during operation).

The operator interface can be customized if required (see HMI Open Architecture).

# Operator components for CNC controls

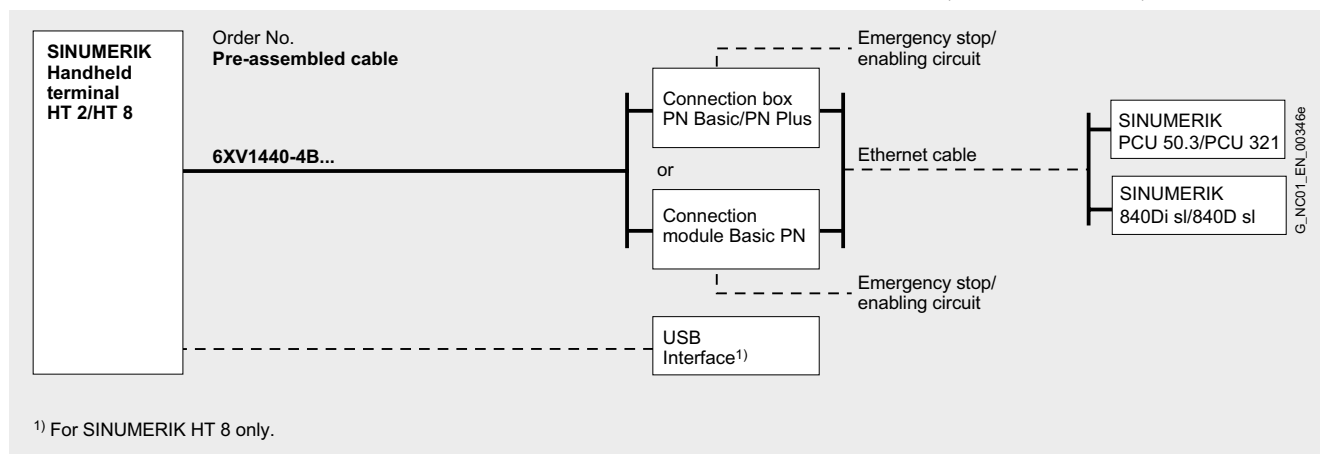
## Handheld units

### SINUMERIK HT 8

#### Integration

The SINUMERIK HT 8 can be used for:

- SINUMERIK 810D powerline/840D powerline:  
SINUMERIK PCU 50.3 (without handwheel)



SINUMERIK HT 8 connection overview

Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

#### Technical specifications

Order No.	<b>6FC5403-0AA20-0AA0</b>
Product name	SINUMERIK HT 8 handheld terminal
Input voltage	24 V DC
Power consumption, max.	15 W
Degree of protection to EN 60529 (IEC 60529)	IP65
Humidity rating in accordance with EN 60721-3-3	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
Relative humidity	
• Storage/Transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
Ambient temperature	
• Storage/Transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	0 ... 45 °C (32 ... 113 °F)
Dimensions	
• Outer diameter of housing	290 mm (11.4 in)
• Height (including override rotary button)	126 mm (4.96 in)
Weight, approx.	1.73 kg (3.81 lb)

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK HT 8 handheld terminal</b>	<b>6FC5403-0AA20-0AA0</b>
Based on the Thin Client principle operator interface software in the SINUMERIK PCU 50.3	
<b>Accessories</b>	
<b>Wall holder</b>	<b>6AV6574-1AF04-4AA0</b>
For safe storage of the SINUMERIK HT 8, also suitable for stationary operation	
<b>PN Basic connection box degree of protection: IP65</b>	<b>6AV6671-5AE01-0AX0</b>
Without automatic emergency stop override for mounting in the system	
<b>PN Plus connection box degree of protection: IP65</b>	<b>6AV6671-5AE11-0AX0</b>
With automatic emergency stop override for mounting in the system	
<b>Basic PN connection module</b>	<b>6FC5303-0AA01-1AA0</b>
Without automatic emergency stop override for mounting in the control cabinet	
<b>Signal cable</b>	
For mobile panels	
• Length: 2 m (6.56 ft)	<b>6XV1440-4BH20</b>
• Length: 5 m (16.4 ft)	<b>6XV1440-4BH50</b>
• Length: 8 m (26.3 ft)	<b>6XV1440-4BH80</b>
• Length: 10 m (32.8 ft)	<b>6XV1440-4BN10</b>
• Length: 15 m (49.2 ft)	<b>6XV1440-4BN15</b>
• Length: 20 m (65.6 ft)	<b>6XV1440-4BN20</b>
• Length: 25 m (82.0 ft)	<b>6XV1440-4BN25</b>
<b>Coiled connecting cable</b>	<b>6FC5348-0AA08-3AA0</b>
For SINUMERIK HT 8/HT 2	
Length: 1.5 m (4.92 ft), stretches to 3.5 m (11.5 ft)	

# Operator components for CNC controls

## Handheld units

### Handheld unit type B-MPI

#### Overview



The handheld unit type B-MPI is suitable for manually operating machine tools, such as axis feed movements. All keys are freely assignable, and the keyboard can be optionally labeled.

#### Design

The handheld unit features 2-channel emergency stop and enabling circuits. The enabling button is a 3-step enabling button. The handheld unit is available for 3-wire or 4-wire enabling.

The handheld unit type B-MPI is connected via a distributor box to the MPI line. The distributor box is designed for installation in a control cabinet or in a separate enclosure.

In the version with 4-wire connection of the enabling buttons, monitoring of the transverse short-circuit is possible in the enabling circuit. Due to the modified connector layout, these handheld units can be used only with the distributor box for this version. All handheld units are UL-certified for the US and Canada.

We can supply a holder for storing the handheld unit. The holder is manufactured from black polystyrene and can be fixed to a suitable base with 4 screws.

#### Integration

The handheld unit type B-MPI can be used for:

- SINUMERIK 810D powerline/840D powerline

#### Technical specifications

<b>Order No.</b>	<b>6FX2007-1AC04-1AC14</b> <b>6FX2007-1AE04-1AE14</b>
<b>Product name</b>	Handheld unit type B-MPI
<b>Operating voltage, unregulated</b>	24 V DC
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP65
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F)
<b>Ambient temperature</b>	
• Storage/Transport	-20 ... +60 °C (-4 ... 140 °F)
• Operation	0 ... 45 °C (32 ... 113 °F)
<b>Max. distance to NCU/PCU</b>	200 m (656 ft)
<b>Dimensions</b>	
• Length x Width x Height	252 mm x 114 mm x 110 mm (9.92 in x 4.49 in x 4.33 in)
<b>Weight, approx. without connecting cable</b>	1.2 kg (2.65 lb)

#### Selection and ordering data

Designation	Order No.
<b>Handheld unit type B-MPI</b>	
3-step enabling button incl. connecting cable with connector	
• 3-wire enabling	
- Coiled connecting cable Length: 1.5 m (4.92 ft); stretches to 3.5 m (11.5 ft)	<b>6FX2007-1AC04</b>
- Straight cable Length: 10 m (32.8 ft)	<b>6FX2007-1AC14</b>
• 4-wire enabling	
- Coiled connecting cable Length: 1.5 m (4.92 ft); stretches to 3.5 m (11.5 ft)	<b>6FX2007-1AE04</b>
- Straight cable Length: 10 m (32.8 ft)	<b>6FX2007-1AE14</b>

#### Accessories

<b>Distributor</b>	
For handheld unit and handheld programming unit incl. shorting plug	
• 3-wire enabling	<b>6FX2006-1BC01</b>
• 4-wire enabling	<b>6FX2006-1BH01</b>
<b>Holder</b> Made of polystyrene	<b>6FX2006-1HA00</b>
<b>Extension cable</b>	
Between handheld unit and distributor	
• 3-wire enabling	
- Length: 5 m (16.4 ft)	<b>6FX2002-1AB04-1AF0</b>
- Length: 10 m (32.8 ft)	<b>6FX2002-1AB04-1BA0</b>
- Length: 15 m (49.2 ft)	<b>6FX2002-1AB04-1BF0</b>
- Length: 0.5 m (19.7 in) with angled connector	<b>6FX2002-1AB14-1AA5</b>
• 4-wire enabling	
- Length: 5 m (16.4 ft)	<b>6FX2002-1AB84-1AF0</b>
- Length: 10 m (32.8 ft)	<b>6FX2002-1AB84-1BA0</b>
- Length: 15 m (49.2 ft)	<b>6FX2002-1AB84-1BF0</b>
- Length: 0.5 m (19.7 in) with angled connector	<b>6FX2002-1AB24-1AA5</b>

# Operator components for CNC controls

## Handheld units

### Mini handheld unit

#### Overview



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

#### Benefits

Since coarse, medium and fine infeed can easily be graduated, the operator control concept offers fast, increment-precise positioning. The signals are guided in parallel (without MPI) to the CNC.

#### Design

In addition to the 2-channel emergency stop and acknowledgement keys, a rapid traverse key and two +/- keys as well as a handwheel to traverse the axes in jog mode are available. Emergency stop has a 4-wire connection. The 3-step acknowledgement key has a 3-wire connection. Up to 5 axes can be selected via a rotary switch. Customer-specific applications can be implemented via 3 user-assignable function keys. If necessary, the customer can use slide-in labels to mark the keys specifically.

For the connection, the connection kit, which must be ordered separately, is required.

To change the cable outlet direction, we offer an angle socket for the connection kit. The angle socket allows the flange socket of the connection kit to be mounted 90° rotated. The angle socket can be used only in conjunction with the connection kit non-assembled.

The mini handheld unit can be fixed on metal surfaces by means of the integrated magnetic clamp. A holder is available as an option.

#### Integration

The mini handheld unit can be used for:

- SINUMERIK 810D powerline/840D powerline

#### Technical specifications

<b>Order No.</b>	<b>6FX2007-1AD03-1AD13</b>
<b>Product name</b>	Mini handheld unit
<b>Operating voltage</b>	24 V DC
<b>Handwheel</b>	100 S/R, $V_B = 5$ V; RS 422
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP65
<b>Humidity classification in accordance with DIN EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Ambient temperature</b>	
• Storage	-20 ... +60 °C (-4 ... +140 °F)
• Transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Distance between handwheel and NCU, max.</b>	25 m (82 ft)
when using the handwheel	
<b>Dimensions, approx.</b>	
• Length	180 mm (7.09 in)
• Width	90 mm (3.54 in)
• Height	70 mm (2.76 in)
<b>Weight, approx.</b>	0.5 kg (1.10 lb)
without connecting cable	

#### Selection and ordering data

Designation	Order No.
<b>Mini handheld unit</b>	
3-step acknowledgement key incl. magnetic clamps and connecting cable with metal connector	
• Coiled connecting cable Length: 1.5 m (4.92 ft), stretches to 3.5 m (11.5 ft)	<b>6FX2007-1AD03</b>
• Straight cable Length: 5 m (16.4 ft)	<b>6FX2007-1AD13</b>
<b>Accessories</b>	
<b>Connection kit for mini handheld unit, non-assembled</b>	
Version for metal connector, for connection to machine control panel <u>without</u> Industrial Ethernet	
• With terminating connector	<b>6FX2006-1BG03</b>
• Without terminating connector	<b>6FX2006-1BG13</b>
<b>Connection kit for mini handheld unit, pre-assembled</b>	
Version for metal connector, for connection to machine control panel <u>with</u> Industrial Ethernet	
• With terminating connector	<b>6FX2006-1BG11</b>
<b>90° angle socket</b>	<b>6FX2006-1BG56</b>
For connection kit, non-assembled 6FX2006-1BG03 Metal version	
<b>Holder</b>	<b>6FX2006-1BG70</b>
For mini handheld units 6FX2007-1AD.3	



# Operator components for CNC controls

## Handheld units

### Electronic handwheel

#### Overview



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

The front panel can be removed. A version with 24 V DC and an HTL interface is available for connection to I/O modules.

The portable handwheel is connected via the coiled connecting cable and a flange socket. The enclosure is equipped with a magnetic clamp. A holder is available for stowing the handwheel on non-metallic surfaces.

#### Selection and ordering data

Designation	Order No.
<b>Electronic handwheel</b>	
• With front panel 120 x 20 mm (4.72 x 4.72 in), with setting wheel, 5 V DC, RS 422	<b>6FC9320-5DB01</b>
• With front panel 76.2 x 76.2 mm (3.00 x 3.00 in), with setting wheel, 5 V DC, RS 422	<b>6FC9320-5DC01</b>
• Portable in housing, coiled cable 2.5 m (8.20 ft) with setting wheel, 5 V DC, RS 422	<b>6FC9320-5DE02</b>
• With front panel 76.2 x 76.2 mm (3.00 x 3.00 in), with setting wheel, 24 V DC, HTL	<b>6FC9320-5DH01</b>
• Without front panel, with small setting wheel, 5 V DC, RS 422	<b>6FC9320-5DM00</b>
• Without front panel, without setting wheel, for installation, 5 V DC, RS 422	<b>6FC9320-5DF01</b>
<b>Adapter set</b>	<b>6FC9320-5DN00</b>
For installation in front panel with 3-hole fixing	
<b>Flange socket</b>	<b>6FC9341-1AQ</b>
For portable handwheel	
<b>Holder</b>	<b>6FX2006-1BG70</b>
For portable handwheel	

#### Technical specifications

Order No.	6FC9320-5DB01	6FC9320-5DC01/-5DF01/ 6FC9320-5DM00	6FC9320-5DE02	6FC9320-5DH01
<b>Product name</b>	Electronic handwheel	Electronic handwheel	Portable electr. handwheel	Electronic handwheel
<b>Rated voltage</b>	5 V DC ± 5 %			10 ... 30 V DC
<b>Rated current, max.</b>	60 mA			15 mA
<b>Interface</b>	RS 422 (TTL)			HTL
<b>Phase angle of pulse sequence A to B</b>	90° electrical			
<b>Pulses</b>	2 x 100 pulses/rev.			
<b>Actuating force</b>	8 Ncm	4 Ncm		
<b>Output frequency, max.</b>	2 kHz			
<b>Distance from NCU</b>	25 m (82.0 ft)		20 m (65.6 ft)	25 m (82.0 ft)
<b>Degree of protection to EN 60529 (IEC 60529)</b>				
• Front	IP65			
• Rear	IP50			
<b>Relative atmospheric humidity</b>				
• Storage/Transport	10 ... 95 % at 25 °C (77 °F)			
• Operation	5 ... 80 % at 25 °C (77 °F)			
<b>Ambient temperature</b>				
• Storage/Transport	-40 ... +85 °C (-40 ... +185 °F)			
• Operation	0 ... 70 °C (32 ... 158 °F)			
<b>Weight, approx.</b>	0.6 kg (1.32 lb)	0.4 kg (0.88 lb)	1.3 kg (2.87 lb)	0.4 kg (0.88 lb)

# Operator components for CNC controls

## Handheld units

### Handwheel connection module

#### Overview



The SINUMERIK handwheel connection module for PROFIBUS can be used to connect two handwheels or the handwheel of the handheld unit type B-MPI and the mini handheld unit.

On the SINUMERIK handwheel connection module for PROFIBUS, digital inputs, outputs, connections for override rotary switches and handwheels are provided, as well as a PROFIBUS DP interface for communication.

The SINUMERIK handwheel connection module for PROFIBUS is designed for control cabinet mounting.

#### Design

Interfaces:

- PROFIBUS DP
- 6 inputs
- 6 inputs and 6 outputs (additional cable set required)
- 16 direct keys of SINUMERIK OP 012/OP 015A/TP 015A
- 2 handwheels

#### Integration

The SINUMERIK handwheel connection module for PROFIBUS can be used for:

- SINUMERIK 840D powerline over PROFIBUS DP

#### Technical specifications

<b>Order No.</b>	<b>6FC5303-0AA02-0AA0</b>
<b>Product name</b>	SINUMERIK handwheel connection module for PROFIBUS
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	15.2 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP00
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95 % at 25 °C (77 °F)
• Transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 95 % at 25 °C (77 °F)
<b>Ambient temperature</b>	
• Storage	-25 ... +55 °C (-13 ... +131 °F)
• Transport	-25 ... +55 °C (-13 ... +131 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width	234 mm (9.21 in)
• Height	137 mm (5.39 in)
• Depth	40 mm (1.57 in)
<b>Weight, approx.</b>	0.82 kg (1.81 lb)

#### Selection and ordering data

Designation	Order No.
<b>Handwheel connection module for PROFIBUS</b>	<b>6FC5303-0AA02-0AA0</b>
<b>Accessories</b>	
<b>Signal cable for handwheel</b> Pre-assembled Length: ≤ 25 m (82.0 ft) <sup>1)</sup>	<b>6FX8002-2CP00-....</b>
<b>Feed/rapid traverse override electronic rotary switch</b> 1x23G, T=32, cap, button, pointer, rapid-traverse and feed dials	<b>6FC5247-0AF13-1AA0</b>
<b>Spindle/rapid traverse override electronic rotary switch</b> 1x16G, T=24, cap, button, pointer, rapid-traverse and spindle dials	<b>6FC5247-0AF12-1AA0</b>
<b>Cable set (60 units)</b> For additional control devices of the machine control panels Length: 500 mm (19.7 in)	<b>6FC5247-0AA35-0AA0</b>

16G: Latching at position 16  
T=24: 24 positions for 360°

For length code, see Connection system MOTION-CONNECT.

# Operator components for CNC controls

## Machine control panels

SINUMERIK MCP 310

### Overview



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

49 keys have user-inscribed slide-in labels for machine-specific adaptations. A DIN A4 sheet (for laser printers) for inscribing the slide-in labels is included in the scope of supply.

A connecting cable is included in the scope of supply for connecting the direct keys of the SINUMERIK operator panel fronts OP 012/OP 015A/TP 015A.

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

### Design

#### Control elements:

- Mode and function keys
  - 49 keys with LEDs: 49 keys when connected via PROFIBUS DP or 48 keys when connected via MPI
  - Direction keys for milling machines with rapid traverse override
  - 16 user-assigned standard keys
- Feed control with override feed/rapid traverse (rotary switch with 23 positions)
- Key switch (4 positions and 3 different keys)

#### Key type:

- Membrane keys

#### Interfaces:

- PROFIBUS DP/MPI interface
- 6 inputs/6 outputs for 6 control devices (additional cable set required for control devices)
- For 16 direct keys of the OP 012/OP 015A/TP 015A when connected via PROFIBUS DP<sup>1)</sup> (connecting cable (850 mm/2.79 ft) included in scope of supply)
- For 2 handwheels when connected via PROFIBUS DP<sup>1)</sup>

#### Expansion facilities:

- 6 slots for control devices ( $d = 16 \text{ mm}/0.63 \text{ in}$ )
- 1 slot for emergency stop button or rotary override switch (up to  $d = 22 \text{ mm}/0.87 \text{ in}$ )

<sup>1)</sup> With SINUMERIK 810D powerline/840D powerline: Option for direct keys/handwheel connection is required and the handwheel connection function depends on the NCU system software.

### Integration

The SINUMERIK MCP 310 machine control panel can be used with:

- SINUMERIK 810D powerline/840D powerline over MPI interface or PROFIBUS DP

### Technical specifications

<b>Order No.</b>	<b>6FC5203-0AF23-1AA0</b>
<b>Product name</b>	SINUMERIK MCP 310 machine control panel
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	16 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP65</li> <li>• Rear IP00</li> </ul>
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>• Storage 5 ... 95 % at 25 °C (77 °F)</li> <li>• Transport 5 ... 95 % at 25 °C (77 °F)</li> <li>• Operation 5 ... 80 % at 25 °C (77 °F)</li> </ul>
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Transport -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Operation               <ul style="list-style-type: none"> <li>- Front 0 ... 45 °C (32 ... 113 °F)</li> <li>- Rear 0 ... 55 °C (32 ... 131 °F)</li> </ul> </li> </ul>
<b>Distance to NCU/PCU</b>	<ul style="list-style-type: none"> <li>• MPI interface 200 m (656 ft)</li> <li>• PROFIBUS DP 100 m (328 ft)</li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 310 mm (12.2 in)</li> <li>• Height 175 mm (6.89 in)</li> <li>• Depth 65 mm (2.56 in)</li> </ul> Panel cutout <ul style="list-style-type: none"> <li>• Width 285 mm (11.2 in)</li> <li>• Height 135 mm (5.31 in)</li> <li>• Tolerance + 1 mm (0.04 in)</li> </ul>
<b>Weight, approx.</b>	1.2 kg (2.65 lb)

# Operator components for CNC controls

## Machine control panels

### SINUMERIK MCP 310

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK MCP 310 machine control panel</b> MPI/PROFIBUS DP Width 310 mm (12.2 in), with membrane keys	<b>6FC5203-0AF23-1AA0</b>
<b>Direct key/handwheel connection<sup>1)</sup></b> Option for 6FC5203-0AF22-1AA2/ -0AF23-1AA0	<b>6FC5252-0AF00-0AA0</b>
<b>Accessories</b>	
<b>Slide-in labels for inscribing</b> 3 A4 sheets	<b>6FC5248-0AF23-1AA0</b>
<b>Actuating element, 22 mm (0.87 in)</b> Latching mushroom pushbutton, red and non-illuminated with 40 mm (1.57 in) protection against lifting and tilting, incl. holder	<b>3SB3000-1HA20</b>
<b>Contact block with 2 contacts</b> 1 NO + 1 NC, 2-pole screw terminal	<b>3SB3400-0A</b>
<b>Key switch with key</b> For SINUMERIK MCP 6FC5203-0AF22-1AA2/ -0AF23-1AA0 6FC5303-0AF22-1AA0/ -0AF23-1AA0	<b>6FC5247-0AF02-0AA0</b>
<b>Key set (10 sets)</b> For machine control panel	<b>6FC5148-0AA03-0AA0</b>
<b>Spindle/rapid traverse override rotary switch</b> 1x16G, T=24, cap, button, pointer, and rapid traverse and spindle dials	<b>6FC5247-0AF12-1AA0</b>
<b>Feed/rapid traverse override rotary switch</b> 1x23G, T=32, cap, button, pointer, and rapid traverse and feed dials	<b>6FC5247-0AF13-1AA0</b>
<b>Cable set (60 units)</b> For additional control devices of the machine control panels Length: 500 mm (19.7 in)	<b>6FC5247-0AA35-0AA0</b>
<b>Set of clamps (9 units)</b> For supplementary operator components with 2.5 mm (0.10 in) profile, length: 20 mm (0.79 in)	<b>6FC5248-0AF14-0AA0</b>

16G: Latching at position 16  
T=24: 24 positions for 360°

### SINUMERIK MCP 483C

#### Overview



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

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

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

#### Design

##### Control elements:

- Mode and function keys
  - 50 keys, of which 48 with LEDs
  - Direction keys for milling machines with rapid traverse override (key covers on the direction keys for milling machines included in the accessories pack supplied)
  - 17 user-labeled standard keys
- Spindle control with override spindle (rotary switch with 16 positions)
- Feed control with override feed/rapid traverse (rotary switch with 23 positions)
- Keyswitch (4 positions and 3 different keys)
- Emergency stop button (2 x (1 NO + 1 NC))

##### Key type:

- Mechanical keys

##### Interface:

- MPI interface

##### Expansion option:

- 2 slots for control devices ( $d = 16 \text{ mm}/0.63 \text{ in}$ )

<sup>1)</sup> With SINUMERIK 810D powerline/840D powerline:  
Option for direct keys/handwheel connection is required and the handwheel connection function depends on the NCU system software.

# Operator components for CNC controls

## Machine control panels

SINUMERIK MCP 483C

### Integration

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

- SINUMERIK 810D powerline/840D powerline

### Technical specifications

<b>Order No.</b>	<b>6FC5203-0AF22-0AA2</b>
<b>Product name</b>	SINUMERIK MCP 483C machine control panel
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	5 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	
• Front	IP54
• Rear	IP00
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95 % at 25 °C (77 °F)
• Transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Ambient temperature</b>	
• Storage	-25 ... +55 °C (-13 ... +131 °F)
• Transport	-25 ... +55 °C (-13 ... +131 °F)
• Operation	
- Front	0 ... 45 °C (32 ... 113 °F)
- Rear	0 ... 55 °C (32 ... 131 °F)
<b>Distance to NCU/PCU, max.</b>	200 m (656 ft)
<b>Dimensions</b>	
• Width	483 mm (19.0 in)
• Height	155 mm (6.10 in)
• Depth	77 mm (3.03 in)
Panel cutout	
• Width	450 mm (17.7 in)
• Height	135 mm (5.31 in)
• Tolerance	1 mm (0.04 in)
<b>Weight, approx.</b>	1.6 kg (3.53 lb)

### Selection and ordering data

Designation	Order No.
<b>SINUMERIK MCP 483C machine control panel</b> MPI, 19" wide, with mechanical keys	<b>6FC5203-0AF22-0AA2</b>
<b>Accessories</b>	
<b>Square key cover, for labeling</b> 1 set comprising: 90 x ergo gray, 20 x red, 20 x yellow, 20 x green, 20 x mid-gray	<b>6FC5248-0AF12-0AA0</b>
<b>Square key cover, for labeling</b> 90 x transparent	<b>6FC5248-0AF21-0AA0</b>
<b>Actuating element, 22 mm (0.86 in)</b> Latching mushroom pushbutton, red and non-illuminated with 40 mm (1.57 in) protection against lifting and tilting, incl. holder	<b>3SB3000-1HA20</b>
<b>Contact block with 2 contacts</b> 1 NO + 1 NC, 2-pole screw terminal	<b>3SB3400-0A</b>
<b>Key set (10 sets)</b> For machine control panel	<b>6FC5148-0AA03-0AA0</b>
<b>Rapid traverse dial</b> (1 set = 20 units) for SINUMERIK MCP 483C 16-position rotary switch	<b>6FC5248-0AF30-0AA0</b>
<b>Spindle/rapid traverse override rotary switch</b> 1x16G, T=24, cap, button, pointer and rapid traverse and spindle dials	<b>6FC5247-0AF12-1AA0</b>
<b>Feed/rapid traverse override rotary switch</b> 1x23G, T=32, cap, button, pointer, and rapid traverse and feed dials	<b>6FC5247-0AF13-1AA0</b>
<b>Set of clamps (9 units)</b> For supplementary operator components with 2.5 mm (0.10 in) profile, length: 20 mm (0.79 in)	<b>6FC5248-0AF14-0AA0</b>

16G: Latching at position 16  
T=24: 24 positions for 360°

3

# Operator components for CNC controls

## Machine control panels

### SINUMERIK MCP 483

#### Overview



The SINUMERIK MCP 483 machine control panel with membrane keys is designed to permit user-friendly, well-structured operation of machine functions. It is suitable for machine-level operation of milling and turning machines, and particularly grinding machines.

46 keys and both control device slots are equipped with user-inscribable slide-in labels for adapting to specific machines. A DIN A4 sheet (for laser printers) for inscribing the slide-in labels is included in the scope of supply.

A connecting cable is included in the scope of supply for connecting the direct keys of the SINUMERIK operator panel fronts OP 012/OP 015A/TP 015A.

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

#### Design

##### Control elements:

- Mode and function keys
  - 50 keys with LEDs: 50 keys when connected via PROFIBUS DP or 48 keys when connected via MPI
  - Direction keys for milling machines with rapid traverse override
  - 17 user-assigned standard keys
- Spindle control with override spindle (rotary switch with 16 positions)
- Feed control with override feed/rapid traverse (rotary switch with 23 positions)
- Key switch (4 positions and 3 different keys)
- Emergency stop button (2 x (1 NO + 1 NC))

##### Key type:

- Membrane keys

##### Interfaces:

- PROFIBUS DP/MPI interface
- 6 inputs/6 outputs for 6 control devices for connection via PROFIBUS DP (additional cable set required for control devices)
- For 16 direct keys of the OP 012/OP 015A/TP 015A when connected via PROFIBUS DP<sup>1)</sup> (connecting cable (850 mm/2.79 ft) included in scope of supply)
- For 2 handwheels when connected via PROFIBUS DP<sup>1)</sup>

##### Expansion facility:

- 2 slots for control devices ( $d = 16 \text{ mm}/0.63 \text{ in}$ )

#### Integration

The SINUMERIK MCP 483 machine control panel can be used with:

- SINUMERIK 810D powerline/840D powerline over MPI interface or PROFIBUS DP

#### Technical specifications

<b>Order No.</b>	<b>6FC5203-0AF22-1AA2</b>
<b>Product name</b>	SINUMERIK MCP 483 machine control panel
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	16 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	
• Front	IP65
• Rear	IP00
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95 % at 25 °C (77 °F)
• Transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Ambient temperature</b>	
• Storage	-20 ... +60 °C (-4 ... +140 °F)
• Transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	
- Front	0 ... 45 °C (32 ... 113 °F)
- Rear	0 ... 55 °C (32 ... 131 °F)
<b>Distance to NCU/PCU</b>	
• MPI interface	200 m (656 ft)
• PROFIBUS DP	100 m (328 ft)
<b>Dimensions</b>	
• Width	483 mm (19.0 in)
• Height	155 mm (6.10 in)
• Depth	70 mm (2.76 in)
Panel cutout	
• Width	450 mm (17.7 in)
• Height	135 mm (5.31 in)
• Tolerance	+ 1 mm (0.04 in)
<b>Weight, approx.</b>	1.6 kg (3.53 lb)

<sup>1)</sup> With SINUMERIK 810D powerline/840D powerline: Option for direct keys/handwheel connection is required and the handwheel connection function depends on the NCU system software.

# Operator components for CNC controls

## Machine control panels

SINUMERIK MCP 483

### Selection and ordering data

Designation	Order No.
<b>SINUMERIK MCP 483 machine control panel</b> MPI/PROFIBUS DP Width 19", with membrane keys, emergency stop 22 mm (0.87 in)	<b>6FC5203-0AF22-1AA2</b>
<b>Direct keys/handwheel connection<sup>1)</sup></b> Option for 6FC5203-0AF22-1AA2/-0AF23-1AA0	<b>6FC5252-0AF00-0AA0</b>
<b>Accessories</b>	
<b>Slide-in labels for inscribing</b> 3 A4 sheets	<b>6FC5248-0AF22-1AA1</b>
<b>Actuating element, 22 mm (0.87 in)</b> Latching mushroom pushbutton, red and non-illuminated with 40 mm (1.57 in) protection against lifting and tilting, incl. holder	<b>3SB3000-1HA20</b>
<b>Contact block with 2 contacts</b> 1 NO + 1 NC, 2-pole screw terminal	<b>3SB3400-0A</b>
<b>Key switch with key</b> For SINUMERIK MCP 6FC5203-0AF22-1AA2/-0AF23-1AA0 6FC5303-0AF22-1AA0/-0AF23-1AA0	<b>6FC5247-0AF02-0AA0</b>
<b>Key set (10 sets)</b> For machine control panel	<b>6FC5148-0AA03-0AA0</b>
<b>Feed/rapid traverse override rotary switch</b> 1x23G, T=32, cap, button, pointer, and rapid traverse and feed dials	<b>6FC5247-0AF13-1AA0</b>
<b>Spindle/rapid traverse override rotary switch</b> 1x16G, T=24, cap, button, pointer, and rapid traverse and spindle dials	<b>6FC5247-0AF12-1AA0</b>
<b>Cable set (60 units)</b> For additional control devices of the machine control panels Length: 500 mm (19.7 in)	<b>6FC5247-0AA35-0AA0</b>
<b>Set of clamps (9 units)</b> For supplementary operator components with 2.5 mm (0.10 in) profile, length: 20 mm (0.79 in)	<b>6FC5248-0AF14-0AA0</b>

16G: Latching at position 16  
 T=24: 24 positions for 360°

<sup>1)</sup> With SINUMERIK 810D powerline/840D powerline:  
 Option for direct keys/handwheel connection is required and the handwheel connection function depends on the NCU system software.

# Operator components for CNC controls

## Machine control panels

### SINUMERIK OP 032S machine control panel

#### Overview



The SINUMERIK OP 032S machine control panel enables user-friendly, straightforward operation of machine functions. It is suitable for machine-level operation of milling, turning, grinding and special machines.

All keys are designed with replaceable covers for machine-specific adaptations. The key covers can be freely inscribed using laser.

The machine control panel is fixed using screws.

#### Design

##### Control elements:

- Mode and function keys
  - 49 keys, of which 48 with LEDs
  - 16 freely assignable standard customer keys
- Feed control with override feed/rapid traverse (rotary switch with 23 positions)

##### Key type:

- Mechanical keys

##### Interfaces:

- MPI interface
- 6 inputs/6 outputs for 6 control devices (additional cable set required for control devices)
- 4 inputs for 1 key switch (additional cable set required for control devices)

##### Expansion facilities:

- 6 slots for control devices ( $d = 16 \text{ mm}/0.63 \text{ in}$ )
- 1 slot for key switch ( $d = 16 \text{ mm}/0.63 \text{ in}$ )
- 1 slot for emergency stop button without rotary override switch ( $d = 22 \text{ mm}/0.87 \text{ in}$ )

#### Technical specifications

<b>Order No.</b>	<b>6FC5203-0AD10-1AA0</b>
<b>Product name</b>	SINUMERIK OP 032S machine control panel
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	10.8 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP54</li> <li>• Rear IP20</li> </ul>
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>• Storage/Transport 5 ... 95 % at 25 °C (77 °F)</li> <li>• Operation 5 ... 80 % at 25 °C (77 °F)</li> </ul>
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage/Transport -25 ... +55 °C (-13 ... +131 °F)</li> <li>• Operation               <ul style="list-style-type: none"> <li>- Front 0 ... 45 °C (32 ... 113 °F)</li> <li>- Rear 0 ... 55 °C (32 ... 131 °F)</li> </ul> </li> </ul>
<b>Distance to NCU/PCU</b>	200 m (656 ft)
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 310 mm (12.2 in)</li> <li>• Height 175 mm (6.89 in)</li> <li>• Depth 56 mm (2.20 in)</li> </ul>
<b>Weight, approx.</b>	1.3 kg (2.87 lb)

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK OP 032S machine control panel</b> Standard/US layout	<b>6FC5203-0AD10-1AA0</b>
<b>Accessories</b>	
<b>Override rotary switch</b> With spindle and rapid-traverse dial and cable for the OP 032S machine control panel	<b>6FC5247-0AA34-0AA1</b>
<b>Cable set</b> (60 units) For additional control devices of the machine control panel Length: 500 mm (19.69 in)	<b>6FC5247-0AA35-0AA0</b>
<b>Key cover inscribable</b> 1 set comprising of: 90 x ergo gray, 20 x red, 20 x yellow, 20 x green, 20 x mid gray	<b>6FC5148-0AA13-0AA0</b>
<b>Transparent key cover</b> With adhesive label	<b>6FC5148-0AA14-0AA0</b>
<b>Actuating element 22 mm (0.87 in)</b> Latching mushroom pushbutton, red and non-illuminated with 40 mm (1.57 in) protection against lifting and tilting, incl. holder	<b>3SB3000-1HA20</b>
<b>Contact block with 2 contacts</b> 1 NO + 1 NC, 2-pole screw terminal	<b>3SB3400-0A</b>
<b>Fixing screws</b> (100 units) For OP 032S machine control panel	<b>6FC3988-7BJ10</b>



# Operator components for CNC controls

## Machine control panels

SINUMERIK PP 012

### Overview



With its modular and ergonomically arranged control elements, the SINUMERIK PP 012 Push Button Panel provides user-friendly, easy operation as supplement for SINUMERIK and PLC-controlled machines.

Compared to the SINUMERIK PP 012 Push Button Panel, the PP 012H is additionally equipped with a connector for the handheld units, SINUMERIK HT6 handheld terminal and handheld unit type B-MPI with 2-channel enabling. Clamp-mounting facilitates installation.

### Design

The features of the basic SINUMERIK PP 012 Push Button Panel include:

- Emergency stop button (4-core), latching, tamper-proof
- Four-position selector key switch
- MPI and V.24 interface
- 8 illuminated pushbuttons (and 2 free slots)
- Direct key connection for SINUMERIK OP 012 (incl. ribbon cable)
- Feed rate override
- With SINUMERIK PP 012H only: Connection for external handheld unit

The distribution box and the repeater electronics for safe connection and removal of the handheld unit during operation are already integrated.

With additional functions, which can be directly integrated by the customer, the Push Button Panel can be adapted for various applications.

### Selection and ordering data

Designation	Order No.
<b>SINUMERIK PP 012 Push Button Panel</b>	<b>6FC5203-0AF24-0AA0</b>
<b>SINUMERIK PP 012H Push Button Panel</b>	<b>6FC5203-0AF25-1AA0</b>
With port for external handheld unit, 4-wire enabling	
<i>Options</i>	
<b>Override rotary switch</b>	<b>6FC5247-0AA34-0AA1</b>
With spindle/rapid-traverse dial and cable for SINUMERIK Push Button Panel	
<b>Raised buttons</b>	<b>6FC5 247-0AA41-0AA0</b>
(2 units)	
<b>Expansion card</b>	<b>6FC5247-0AA42-0AA0</b>
For 12 digital inputs and 12 digital outputs	
<b>Contact block 2 x NC</b>	<b>3SB3400-0E</b>
For emergency stop button	

### Technical specifications

Order No.	6FC5203-0AF24-0AA0	6FC5203-0AF25-1AA0
<b>Product name</b>	SINUMERIK PP 012 Push Button Panel	SINUMERIK PP 012H Push Button Panel
<b>Input voltage</b>	24 V DC	
<b>Power consumption, max.</b>	20 W	
<b>Degree of protection to EN 60529 (IEC 60529)</b>		
• Front	IP54	
• Rear	IP10A	
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).	
<b>Relative humidity</b>		
• Storage/Transport	5 ... 95 % at 25 °C (77 °F)	
• Operation	5 ... 80 % at 25 °C (77 °F)	
<b>Ambient temperature</b>		
• Storage/Transport	-40 ... +70 °C (-40 ... +158 °F)	
• Operation		
- Front	0 ... 45 °C (32 ... 113 °F)	
- Rear	0 ... 55 °C (32 ... 131 °F)	
<b>Dimensions</b>		
• Width x Height x Depth	483 mm x 155 mm x 175 mm (19.0 in x 6.10 in x 6.89 in)	
Panel cutout		
• Width x Height	451 mm x 138 mm (17.8 in x 5.43 in)	
<b>Weight, approx.</b>	3 kg (6.62 lb)	

# Operator components for CNC controls

## Machine control panels

### SINUMERIK MPP 483

#### Overview



The SINUMERIK MPP 483 Machine Push Button Panel (Machine Push Button Panel, width 483 mm) is available as an expansion to SINUMERIK and PLC-controlled machines. Its modular design and ergonomically arranged control elements permit user-friendly and easy operator control.

The SINUMERIK MPP 483 provides large long-stroke keys for easy machine operation as well as a membrane keyboard for powerful set-up functions.

Tuned to the requirements of the powertrain sector, the SINUMERIK MPP 483 is suitable for use with many different types of machine wherever ergonomics and operating flexibility are priorities. An A4 sheet for laser printers for inscribing the slide-in labels plus a set of colored key caps are included in the scope of supply.

The SINUMERIK Machine Push Button Panel is mounted from the rear using special clamps supplied with the panel.

#### Design

The basic version of the SINUMERIK MPP 483 Machine Push Button Panel offers, for example:

- Emergency stop button (4-core), latching, tamper-proof
- 8 equipped illuminated pushbuttons for control elements ( $d = 22.5 \text{ mm}/0.89 \text{ in}$ )
- 2 blanking plugs for easy retrofitting
- 25 function keys with inscribed standard slide-in strips (membrane keys)
- Key switches with 2 positions for bridging the emergency stop circuit and for authorization of mode selection
- Direct key connection for SINUMERIK OP 012/OP 015A/TP 015A, incl. ribbon cable
- Feed rate override
- Interfaces for 2 handwheels for connection via PROFIBUS DP (function depends on NCU software)
- Communication via MPI/PROFIBUS DP

#### Expansion facilities:

- 2 spare slots ( $d = 22.5 \text{ mm}/0.89 \text{ in}$ )
- Spindle override
- Individual adaptation of long-stroke key colors and labeling

#### Other standard versions:

- SINUMERIK MPP 483A for mounting applications, without override and with user-assignable and inscribable slide-in strips. Only the 4 keys for mode selection are inscribed.
- SINUMERIK MPP 483H with port for an external handheld unit. SINUMERIK HT 6 handheld terminal or handheld unit type B-MPI with 2-channel enabling can be connected.
- SINUMERIK MPP 483HTC with port for an external Thin Client handheld unit or SINUMERIK HT 8 handheld terminal

#### Special versions:

- SINUMERIK MPP 483S: Special versions are possible comprising different configuration types with various control elements and options, for example with the EKS identification system from Euchner.
- SINUMERIK MPP 483L: This special version is characterized by a higher masking frame (244 mm/9.61 in) that offers additional mounting space like an integrated expansion frame.

#### Integration

The SINUMERIK MPP 483 Machine Push Button Panel can be used with:

- SINUMERIK 810D powerline/840D powerline over MPI interface or PROFIBUS DP

# Operator components for CNC controls

## Machine control panels

SINUMERIK MPP 483

### Technical specifications

Order No.	6FC5303-1AF00-0AA1	6FC5303-1AF00-1AA1	6FC5303-1AF01-0AA1	6FC5303-1AF00-8AA1
<b>Product name</b>	SINUMERIK MPP 483 Machine Push Button Panel	SINUMERIK MPP 483 H Machine Push Button Panel	SINUMERIK MPP 483 A Machine Push Button Panel	SINUMERIK MPP 483 HTC Machine Push Button Panel
<b>Input voltage</b>	24 V DC			
<b>Power consumption, max.</b>	21 W	35 W	21 W	35 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP54</li> <li>• Rear IP10A</li> </ul>			
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).			
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>• Storage 10 ... 95 % at 25 °C (77 °F)</li> <li>• Transport 10 ... 95 % at 25 °C (77 °F)</li> <li>• Operation 5 ... 80 % at 25 °C (77 °F)</li> </ul>			
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Transport -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Operation <ul style="list-style-type: none"> <li>- Front 0 ... 45 °C (32 ... 113 °F)</li> <li>- Rear 0 ... 55 °C (32 ... 131 °F)</li> </ul> </li> </ul>			
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 483 mm (19.0 in)</li> <li>• Height 155 mm (6.10 in)</li> <li>• Depth 140 mm (5.51 in) (105 mm (4.13 in) when a PROFIBUS adapter is used)</li> </ul> Panel cutout <ul style="list-style-type: none"> <li>• Width 451 mm (17.8 in)</li> <li>• Height 138 mm (5.43 in)</li> </ul>			
<b>Weight, approx.</b>	3 kg (6.62 lb)			

### Selection and ordering data

Designation	Order No.
<b>SINUMERIK MPP 483 Machine Push Button Panel</b>	<b>6FC5303-1AF00-0AA1</b>
<b>SINUMERIK MPP 483 H Machine Push Button Panel</b> With port for SINUMERIK HT 6 or handheld unit with 4-wire enabling	<b>6FC5303-1AF00-1AA1</b>
<b>SINUMERIK MPP 483 A Machine Push Button Panel</b> Without override	<b>6FC5303-1AF01-0AA1</b>
<b>SINUMERIK MPP 483 HTC Machine Push Button Panel</b> With port for SINUMERIK HT 8 with feed override via MPI/PROFIBUS DP	<b>6FC5303-1AF00-8AA1</b>

3

# Operator components for CNC controls

## Machine control panels

### Expansion panel

#### Overview



The expansion panel is used for the installation of up to 12 additional control elements, e.g. buttons, signaling lights, and key switches as an expansion to a Push Button Panel or a machine control panel.

The expansion panel in SINUMERIK PP 012 design provides rounded edges for a uniform design with the new SINUMERIK operator panels. Clamp-mounting facilitates installation.

#### Design

The expansion panel is 19" wide, and can accommodate up to twelve 22 mm (0.87 in) control elements of any type.

The 12 slots are pre-punched and can be easily broken out as required. Panels with customized complements can be provided on request.

Inscriptions are made on 2 slide-in labels which are inserted from the rear.

When used in connection with the SINUMERIK Push Button Panel and the optional expansion card 12 DI/12 DO, the customized control elements can be connected to the expansion card and, by means of the optocoupler, to the base electronics of the SINUMERIK Push Button Panel.

#### Technical specifications

<b>Order No.</b>	<b>6FC5247-0AA43-1AA0</b>
<b>Product name</b>	Expansion panel in SINUMERIK PP 012 design
<b>Dimensions</b>	
• Width	483 mm (19.0 in)
• Height	95 mm (3.74 in)
• Depth	30 mm (1.18 in)
Panel cutout	
• Width	451 mm (17.8 in)
• Height	77.6 mm (3.05 in)
<b>Weight, approx.</b>	0.5 kg (1.10 lb)

#### Selection and ordering data

Designation	Order No.
<b>Expansion panel in SINUMERIK PP 012 design</b>	<b>6FC5247-0AA43-1AA0</b>
For clamp fixing 19" wide with 12 slots	
<b>Expansion card 12 DI/12 DO</b>	<b>6FC5247-0AA42-0AA0</b>
For 12 digital inputs and 12 digital outputs (for SINUMERIK PP 012 only)	

# Operator components for CNC controls

## Machine control panels

### SINUMERIK MPI interface

#### Overview



Customers can connect their own operator panels using the SINUMERIK MPI interface. The unit provides digital inputs and outputs, and an MPI communications interface for this purpose.

#### Design

##### Interfaces:

- MPI interface
- 64 digital inputs and 64 digital outputs

#### Technical specifications

<b>Order No.</b>	<b>6FC5203-0AE00-0AA0</b>
<b>Product name</b>	SINUMERIK MPI interface for customer operator panel
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	5 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP00
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95 % at 25 °C (77 °F)
• Transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Ambient temperature</b>	
• Storage	-40 ... +70 °C (-40 ... +158 °F)
• Transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Distance to NCU/PCU</b>	200 m (656 ft)
<b>Dimensions</b>	
• Width	293 mm (11.5 in)
• Height	92 mm (3.62 in)
• Depth	15 mm (0.59 in)
<b>Weight, approx.</b>	0.5 kg (1.10 lb)

#### Selection and ordering data

Designation	Order No.
SINUMERIK MPI interface for customer operator panel	<b>6FC5203-0AE00-0AA0</b>

# Operator components for CNC controls

## Machine control panels

### SIRIUS 3SB3

#### Overview



#### *Innovative technology, simple installation*

SIRIUS 3SB3 is our modular, tried-and-tested complete range of pushbuttons and indicator lights. Whether round or square, plastic or metal - we can supply the ideal solution for any application. Your benefit: SIRIUS 3SB3 products are quick and easy to install - and are dependable in operation.

#### Benefits

- Emergency stop with reliable direct connection to AS-Interface
- SIRIUS 3SB3 control devices in plastic and metal for the world market
- Rugged metal control devices: IP67 degree of protection/NEMA 4
- Cost-effective and uniquely identifiable with integral super-bright LED
- Various connection possibilities: Screw-type and solder-pin connection or spring-loaded terminal connection

#### More information

For further information, please contact:

#### Technical Assistance

Phone: +49 (0) 911/895-5900  
 Fax: +49 (0) 911/895-5907  
 E-mail: [technical-assistance@siemens.com](mailto:technical-assistance@siemens.com)

Additional information is available in the Internet under:



[www.siemens.com/automation/cd](http://www.siemens.com/automation/cd)

### Laser inscription

#### Overview



Laser inscription is possible on all materials in principle and can therefore be used for permanent and reliable identification, also for special keys in the case of SINUMERIK machine control panels.

The quality of laser inscribed products is significantly higher than conventional inscription techniques.

#### Benefits

- Maximum precision
- Long service life
- Flexible application
- Protects material

#### More information

Direct ordering of laser inscribed special keys, as well as an overview of the different key symbols (heading: keys) for the SINUMERIK machine control panels, is possible over the Internet.

#### LASERline Teschauer GmbH

Contact: Dipl.-Ing. Margitta Teschauer

Max-Planck-Straße 22b  
 09114 CHEMNITZ  
 Germany

Phone: +49 (0) 371/3301057  
 Fax: +49 (0) 371/3301058  
 E-mail: [laserline@teschauer.de](mailto:laserline@teschauer.de)

Additional information is available in the Internet under:



[www.teschauer.de](http://www.teschauer.de)

## KBPC CG US standard PC keyboard

## Keyboard tray

## Overview



Programs and texts can be edited easily with the compact SINUMERIK KBPC CG US standard PC keyboard.

The standard PC keyboard is not suitable for industrial use (EMC) and should not be used as a permanent installation. It may be used only for servicing and commissioning.

## Integration

The KBPC CG US standard PC keyboard can be used for:

- SINUMERIK 810D powerline/840D powerline with PCU 50.3

The standard PC keyboard cannot be used in conjunction with the full CNC keyboard.

## Technical specifications

<b>Order No.</b>	<b>6FC5203-0AC01-3AA0</b>
<b>Product name</b>	SINUMERIK KBPC CG US standard PC keyboard
<b>Input voltage</b>	5.25 V DC
<b>Power consumption, max.</b>	0.1 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Ambient temperature</b>	
• Storage	-20 ... +60 °C (-4 ... +140 °F)
• Transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	0 ... 50 °C (32 ... 122 °F)
<b>Dimensions</b>	
• Width	405 mm (15.9 in)
• Height	44 mm (1.73 in)
• Depth	180 mm (7.09 in)
<b>Weight, approx.</b>	1.3 kg (2.87 lb)

## Selection and ordering data

Designation	Order No.
<b>SINUMERIK KBPC CG US standard PC keyboard</b>	<b>6FC5203-0AC01-3AA0</b>
MF-II compatible, 104 key layout, connection: USB, incl. connecting cable length: 1.7 m (66.9 in)	

## Overview



This extremely stable 19" keyboard tray in anthracite facilitates your work when using a standard external keyboard with an operator panel.

Special screws permit easy attachment of the keyboard tray, and equally easy removal following work.

If required, a version with an additional removable tray for a mouse is also available.

## Technical specifications

<b>Order No.</b>	<b>6FC5247-0AA40-0AA0</b>
<b>Product name</b>	Keyboard tray
<b>Dimensions</b>	
• Width	487 mm (19.2 in)
• Depth	196 mm (7.72 in)
<b>Weight, approx.</b>	1.6 kg (3.53 lb)

## Selection and ordering data

Designation	Order No.
<b>Keyboard tray</b>	<b>6FC5247-0AA40-0AA0</b>
For keyboard (incl. 2 collar screws)	

# Operator components for CNC controls

## Keyboards

### SINUMERIK KB 310C

#### Overview



The SINUMERIK KB 310C full CNC keyboard permits user-friendly input of programs and text.

The keyboard is mounted from the rear using special clamps supplied with the keyboard.

#### Design

Control elements:

- Standard/US QWERTY layout
- 75 mechanical keys
- Alpha block with special characters
- Numeric block with special characters
- Cursor block
- CNC function keys with hot keys for fast selection of the control area

Interface:

- USB 1.1

#### Integration

The SINUMERIK KB 310C full CNC keyboard is used for:

- SINUMERIK 810D powerline/840D powerline

#### Technical specifications

<b>Order No.</b>	<b>6FC5203-0AF21-0AA1</b>
<b>Product name</b>	SINUMERIK KB 310C full CNC keyboard
<b>Input voltage</b>	5.25 V DC
<b>Power consumption, max.</b>	0.4 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP54</li> <li>• Rear IP00</li> </ul>
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>• Storage 5 ... 95 % at 25 °C (77 °F)</li> <li>• Transport 5 ... 95 % at 25 °C (77 °F)</li> <li>• Operation 5 ... 80 % at 25 °C (77 °F)</li> </ul>
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage -25 ... +55 °C (-13 ... +131 °F)</li> <li>• Transport -25 ... +55 °C (-13 ... +131 °F)</li> <li>• Operation               <ul style="list-style-type: none"> <li>- Front 0 ... 45 °C (32 ... 113 °F)</li> <li>- Rear 0 ... 55 °C (32 ... 131 °F)</li> </ul> </li> </ul>
<b>Distance to PCU</b>	3 m (9.84 ft)
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 310 mm (12.2 in)</li> <li>• Height 175 mm (6.89 in)</li> <li>• Depth 31 mm (1.22 in)</li> </ul> Panel cutout <ul style="list-style-type: none"> <li>• Width 285 mm (11.2 in)</li> <li>• Height 155 mm (6.10 in)</li> <li>• Tolerance + 1 mm (0.04 in)</li> </ul>
<b>Weight, approx.</b>	0.9 kg (1.98 lb)

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK KB 310C full CNC keyboard</b> Width 310 mm (12.2 in), connection: USB 1.1, with mechanical keys, incl. connecting cable Length: 1.5 m (4.9 ft)	<b>6FC5203-0AF21-0AA1</b>
<b>Accessories</b>	
<b>Set of clamps</b> (9 units) For operator components with 2.5 mm (0.10 in) profile Length: 20 mm (0.79 in)	<b>6FC5248-0AF14-0AA0</b>



**Overview**

The SINUMERIK KB 483C full CNC keyboard permits user-friendly input of programs and text.

The keyboard is mounted from the rear using special clamps supplied with the keyboard.

**Design**Control elements:

- Standard/US QWERTY layout
- 78 mechanical keys
- Alpha block with special characters
- Numeric block with special characters
- Cursor block
- CNC function keys with hot keys for fast selection of the control area

Interface:

- USB 1.1

**Integration**

The SINUMERIK KB 483C full CNC keyboard is used for:

- SINUMERIK 810D powerline/840D powerline

**Technical specifications**

<b>Order No.</b>	<b>6FC5203-0AF20-0AA1</b>
<b>Product name</b>	SINUMERIK KB 483C full CNC keyboard
<b>Input voltage</b>	5.25 V DC
<b>Power consumption, max.</b>	0.4 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	
• Front	IP54
• Rear	IP00
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95 % at 25 °C (77 °F)
• Transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Ambient temperature</b>	
• Storage	-25 ... +55 °C (-13 ... +131 °F)
• Transport	-25 ... +55 °C (-13 ... +131 °F)
• Operation	
- Front	0 ... 45 °C (32 ... 113 °F)
- Rear	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width	483 mm (19.0 in)
• Height	133 mm (5.24 in)
• Depth	31 mm (1.22 in)
Panel cutout	
• Width	450 mm (17.7 in)
• Height	112.5 mm (4.43 in)
• Tolerance	+ 1 mm (0.04 in)
<b>Weight, approx.</b>	1.3 kg (2.87 lb)

**Selection and ordering data**

<b>Designation</b>	<b>Order No.</b>
<b>SINUMERIK KB 483C full CNC keyboard</b> Width 19", connection: USB 1.1, with mechanical keys incl. connecting cable Length: 1.5 m (4.9 ft)	<b>6FC5203-0AF20-0AA1</b>
<b>Accessories</b>	
<b>Set of clamps</b> (9 units) For operator components with 2.5 mm (0.10 in) profile Length: 20 mm (0.79 in)	<b>6FC5248-0AF14-0AA0</b>

# Operator components for CNC controls

## Keyboards

### Dyna Systems full CNC keyboard

#### Overview



The full CNC membrane keyboards from Dyna Systems in Siemens design permit user-friendly input of programs and text.

The full CNC keyboards are mounted from the rear using special clamps supplied with the keyboard.

#### Design

##### Control elements:

- Standard/US QWERTY layout
- Membrane keyboard with 78 keys (QWERTY 483)
- Membrane keyboard with 75 keys (QWERTY 310)
- Alpha block with special characters
- Numeric block with special characters
- Cursor block
- CNC function keys with hot keys for fast selection of the control area

##### Interface:

- USB 1.1

#### Integration

Membrane keyboards can be used for:

- SINUMERIK 810D powerline/840D powerline

#### Technical specifications

Product name	Dyna Systems full CNC membrane keyboard
<b>Input voltage</b>	5.25 V DC
<b>Power consumption, max.</b>	0.4 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP65</li> <li>• Rear IP00</li> </ul>
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage -25 ... +55 °C (-13 ... +131 °F)</li> <li>• Transport -25 ... +55 °C (-13 ... +131 °F)</li> <li>• Operation               <ul style="list-style-type: none"> <li>- Front 0 ... 45 °C (32 ... 113 °F)</li> <li>- Rear 0 ... 55 °C (32 ... 131 °F)</li> </ul> </li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width               <ul style="list-style-type: none"> <li>- QWERTY 483 483 mm (19.02 in)</li> <li>- QWERTY 310 310 mm (12.20 in)</li> </ul> </li> <li>• Height               <ul style="list-style-type: none"> <li>- QWERTY 483 133 mm (5.24 in)</li> <li>- QWERTY 310 175 mm (6.89 in)</li> </ul> </li> <li>• Depth 31 mm (1.22 in)</li> </ul> Panel cutout <ul style="list-style-type: none"> <li>• Width               <ul style="list-style-type: none"> <li>- QWERTY 483 451 mm (17.76 in)</li> <li>- QWERTY 310 278.4 mm (10.96 in)</li> </ul> </li> <li>• Height               <ul style="list-style-type: none"> <li>- QWERTY 483 115.1 mm (4.53 in)</li> <li>- QWERTY 310 157.6 mm (6.20 in)</li> </ul> </li> <li>• Tolerance + 1 mm (0.04 in)</li> </ul>
<b>Weight, approx.</b>	<ul style="list-style-type: none"> <li>• QWERTY 483 1.3 kg (2.87 lb)</li> <li>• QWERTY 310 1.1 kg (2.43 lb)</li> </ul>

#### More information

Dyna Systems GmbH is known for developing innovative, customized operating systems. We are experts in solving human-machine communication problems. Are you looking for solutions? We can help!

##### Dyna Systems GmbH

Grünteweg 14  
88175 SCHEIDEGG, Germany

Phone: +49 (0) 8381-919-200

Fax: +49 (0) 8381-919-290

E-mail: [info@dynasystems.de](mailto:info@dynasystems.de)

Additional information is available in the Internet under:



[www.dynasystems.de](http://www.dynasystems.de)

# Operator components for CNC controls

## Storage devices

### SINUMERIK card reader USB 2.0

#### Overview



The SINUMERIK card reader for CF/SD/MMC memory media is suitable for archiving user data and can be installed in front panels. The connection is made via a USB interface.

#### Function

The SINUMERIK card reader is suitable for CF, SD and MMC cards and is provided for archiving and exchange of user data.

Since the reader can be installed in front panels, data can be exchanged without opening the control cabinet door.

The card reader can be booted. Cards can be inserted and removed during operation.

#### Integration

The SINUMERIK card reader for CF/SD/MMC memory media can be connected to:

- SINUMERIK PCU 50.3
- SINUMERIK TCU (CF cards only)

#### Technical specifications

<b>Order No.</b>	<b>6FC5335-0AA00-0AA0</b>
<b>Product name</b>	SINUMERIK card reader USB 2.0 for memory media CF/SD/MMC
<b>Number of card slots</b>	2
<b>Card types</b>	<ul style="list-style-type: none"> <li>• 1. slot CF cards</li> <li>• 2. slot SD/MMC cards</li> </ul>
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP54</li> <li>• Rear IP00</li> </ul>
<b>Relative humidity, max.</b>	90 %
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Transport -40 ... +70 °C (-40 ... +158 °F)</li> <li>• Storage -40 ... +70 °C (-40 ... +158 °F)</li> <li>• Operation 0 ... 60 °C (32 ... 140 °F)</li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 145 mm (5.71 in)</li> <li>• Height 50 mm (1.97 in)</li> <li>• Depth 143 mm (5.63 in)</li> </ul>
<b>Weight, approx.</b>	0.4 kg (0.88 lb)

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK card reader USB 2.0</b> For memory media CF/SD/MMC Incl. connecting cable Length: 1 m (3.28 ft)	<b>6FC5335-0AA00-0AA0</b>
<i>Accessories</i>	
<b>CompactFlash Card 1 GB</b> Empty	<b>6FC5313-5AG00-0AA0</b>
<b>Cover</b> For SINUMERIK floppy disk drive and card reader with masking frame, cover, and bearing bracket	<b>6FC5247-0AA20-0AA0</b>

# Operator components for CNC controls

## Storage devices

### CompactFlash Card

#### Overview



The CompactFlash Card is used to store user data or system software.

#### Integration

The CompactFlash Card is suitable for:

- SINUMERIK 810D powerline/840D powerline: additional memory for user data in the SINUMERIK PCU 20 via the PC card adapter or SINUMERIK PCU 50.3.

#### Technical specifications

<b>Order No.</b>	<b>6FC5313-5AG00-0AA0</b>
<b>Product name</b>	SIMOTION/SINUMERIK CompactFlash Card 1 GB
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	8 ... 95 %, without condensation
• Transport	8 ... 95 %, without condensation
• Operation	8 ... 95 %, without condensation
<b>Ambient temperature</b>	
• Storage	-25 ... +85 °C (-13 ... +185 °F)
• Transport	-25 ... +85 °C (-13 ... +185 °F)
• Operation	0 ... 70 °C (32 ... 158 °F)
<b>Dimensions</b>	
• Width	43 mm (1.69 in)
• Height	3 mm (0.12 in)
• Depth	37 mm (1.46 in)
<b>Weight, approx.</b>	12 g (0.42 oz)

#### Selection and ordering data

Designation	Order No.
<b>CompactFlash Card 1 GB</b>	<b>6FC5313-5AG00-0AA0</b>
Empty	

# Operator components for CNC controls

## Storage devices

### Industrial USB Hub 4

#### Overview



The Industrial USB Hub 4 is essentially used as a USB hub for the connection of I/O devices to SINUMERIK PCU 50.3.

USB peripherals can be connected to the operator component and operated via the USB Hub 4 without opening the cabinet door.

The Industrial USB Hub 4 differs from commercially available USB hubs mainly in its suitability for use in rugged industrial environments (IP65).

#### Application

Use of the Industrial USB Hub 4 means that up to four I/O devices, e.g. USB stick, USB floppy disk drive, USB card reader, etc. can be connected simultaneously to the operator component, thereby increasing the availability of the system to be operated. The cabinet door no longer has to be opened in order to connect the I/O devices. Continuous operation of the operator component is therefore possible.

In addition, the Industrial USB Hub 4 has the following features:

- Inspection window for each interface
- Vibration-proof latching of connected USB cables and USB sticks
- One LED per interface for checking the data traffic
- Sufficient interior space for easy insertion and removal
- Facility for attachment to a DIN rail

#### Integration

The Industrial USB Hub 4 is suitable for connection to:

- SINUMERIK PCU 50.3

#### Technical specifications

<b>Order No.</b>	<b>6AV6671-3AH00-0AX0</b>
<b>Product name</b>	Industrial USB Hub 4
<b>Supply voltage</b>	24 V DC
• Permissible range	+20.4 ... +28.8 V DC
<b>Ports</b>	4 acc. to USB; 500 mA each
<b>Degree of protection to EN 60529 (IEC 60529)</b>	
• Front	IP65
• Rear	IP20
<b>Relative humidity, max.</b>	90 %
<b>Ambient temperature</b>	
• Storage	-20 °C ... +60 °C (-4 °F ... +140 °F)
• Transport	-20 °C ... +60 °C (-4 °F ... +140 °F)
• Operation (vertical installation)	0 °C ... 50 °C (32 °F ... 122 °F)
<b>Dimensions</b>	
• Width	212 mm (8.35 in)
• Height	156 mm (6.14 in)
• Depth	50 mm (1.97 in)
<b>Mounting cut-out</b>	
• Width	182 mm (7.17 in)
• Height	138 mm (5.43 in)
<b>Weight, approx.</b>	0.5 kg (1.10 lb)
<b>Certification</b>	CE

#### Selection and ordering data

Designation	Order No.
<b>Industrial USB Hub 4</b> With 4 USB interfaces, degree of protection IP65	<b>6AV6671-3AH00-0AX0</b>

# Operator components for CNC controls

## Storage devices

### SIMATIC PC USB FlashDrive

#### Overview



The SIMATIC PC USB FlashDrive is the ideal mobile storage medium. Thanks to the rugged and ultra-compact construction in a metal enclosure, fast data transfer (USB 2.0) and the high memory capacity of 2 GB, the USB FlashDrive offers optimum values for use in industrial applications. It can be used to replace floppy disks or CD-ROMs as data storage and it is supplied with boot capability.

#### Benefits

##### Ultra-compact and rugged

- 2 USB FlashDrives can be plugged into the SIMATIC PC/SINUMERIK PCU one above the other
- Suitable for use in industrial environments thanks to the metal enclosure
- Faultless operation (system test) with SIMATIC PC/PG (hardware and software)/SINUMERIK PCU
- Automation License Manager V2.0 can be installed.

#### Application

The SIMATIC PC USB FlashDrive is the fastest and simplest method for saving your data (e.g. recipes, configuration data, user data) and transporting them easily from one place to another, or it can be used as boot medium, e.g. for SIMATIC PC BIOS Manager, SIMATIC PC Image Creator or SINUMERIK PCU.

Typical users are development and servicing engineers, as well as application and technical consultants.

#### Function

- Formatted for boot capability including preinstalled operating system (FreeDOS) for use as a boot medium, e.g., for SIMATIC PC Image Creator
- High performance for faster data transfer - USB 2.0 high-speed
- High memory capacity of 2 GB
- Simple installation – plug & play, no drivers necessary (except for Windows 98SE)
- High degree of data security thanks to write protection switch
- Status LED for data transfer and operating state
- SIMATIC BIOS Manager, a software tool for SIMATIC PCs for testing and duplication of Bios setup settings (CMOS data) included in the scope of supply
- No external power supply necessary

#### Integration

The SIMATIC PC USB FlashDrive is suitable for:

- SIMATIC PC/PG
- SINUMERIK PCU 50.3

Recommended operating systems:

- Windows 2000/XP

#### Technical specifications

<b>Order No.</b>	<b>6ES7648-0DC40-0AA0</b>
<b>Product name</b>	SIMATIC PC USB FlashDrive
<b>Supported operating systems</b>	Windows 98/2000/XP
<b>Write protection</b>	Via switch
<b>Ambient temperature</b>	
• Storage	-20 ... +70 °C (-4 ... +158 °F)
• Operation	5 ... 55 °C (41 ... 131 °F)
<b>Dimensions</b>	
• Length	52.7 mm (2.07 in)
• Width	13.5 mm (0.53 in)
• Height	5.5 mm (0.22 in)
<b>Weight, approx.</b>	13.5 g (0.48 oz)
<b>Certification</b>	CE

#### Selection and ordering data

Designation	Order No.
<b>SIMATIC PC USB FlashDrive<sup>1)</sup></b> 2 GB, USB 2.0, metal enclosure, with boot capability, incl. SIMATIC PC BIOS Manager	<b>6ES7648-0DC40-0AA0</b>

<sup>1)</sup> Subject to export regulations AL: N ECCN: EAR99H

# Operator components for CNC controls

## Storage devices

### SINUMERIK 3.5" floppy disk drive, USB 1.1

#### Overview



The SINUMERIK 3.5" floppy disk drive, USB 1.1 is suitable for archiving user data and can be installed in front panels. The connection is made via the USB interface.

#### Function

The SINUMERIK 3.5" floppy disk drive, USB 1.1 is designed for the transfer of user data. Installation in front panels makes it possible to transfer data without opening the control cabinet door. High density (1.2/1.44 MB) 3.5" floppy disks can be used for storing user data.

#### Integration

The SINUMERIK floppy disk drive, USB 1.1 is suitable for connecting to:

- SINUMERIK PCU 50.3
- SINUMERIK TCU

#### Technical specifications

<b>Order No.</b>	<b>6FC5235-0AA05-1AA2</b>
<b>Product name</b>	SINUMERIK 3.5" floppy disk drive USB 1.1
<b>Input voltage</b>	5.25 V DC
<b>Power consumption, max.</b>	2.5 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	<ul style="list-style-type: none"> <li>• Front IP54</li> <li>• Rear IP00</li> </ul>
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>• Storage 5 ... 90 % at -22 ... +60 °C (-8 ... +140 °F)</li> <li>• Transport 5 ... 95 % at -40 ... +65 °C (-40 ... +149 °F)</li> <li>• Operation 20 ... 80 % at 4 ... 51.7 °C (39 ... 125 °F)</li> </ul>
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Transport -20 ... +60 °C (-4 ... +140 °F)</li> <li>• Operation 4 ... 50 °C (39.2 ... 122 °F)</li> </ul>
<b>Distance to PCU</b>	5 m (16.4 ft)
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 145 mm (5.71 in)</li> <li>• Height 50 mm (1.97 in)</li> <li>• Depth 161 mm (6.34 in)</li> </ul>
<b>Weight, approx.</b>	0.32 kg (0.71 lb)

#### Selection and ordering data

<b>Designation</b>	<b>Order No.</b>
<b>SINUMERIK 3.5" floppy disk drive, USB 1.1</b>	<b>6FC5235-0AA05-1AA2</b>
Incl. connecting cable Length: 1 m (3.28 ft)	
<b>Accessories</b>	
<b>Cover</b>	<b>6FC5247-0AA20-0AA0</b>
For SINUMERIK floppy disk drive and card reader with masking frame, cover, and bearing bracket	

# Operator components for CNC controls

## Storage devices

### SINUMERIK 3.5" floppy disk drive

#### Overview



The SINUMERIK 3.5" floppy disk drive can be used for archiving user data and can be installed in front panels.

#### Function

Normal density (720 KB) and high density (1.2/1.44 MB) 3.5" floppy disks can be used for storing user data.

#### Integration

The SINUMERIK 3.5" floppy disk drive is suitable for connecting to:

- SINUMERIK PCU 20 with floppy disk drive interface

#### Technical specifications

<b>Order No.</b>	<b>6FC5235-0AA05-0AA1</b>
<b>Product name</b>	SINUMERIK 3.5" floppy disk drive
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	5 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	
• Front	IP54
• Rear	IP00
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95 % at 25 °C (77 °F)
• Transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Ambient temperature</b>	
• Storage	-20 ... +60 °C (-4 ... +140 °F)
• Transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Distance to PCU</b>	0.5 m (19.7 in)
<b>Dimensions</b>	
• Width	145 mm (5.71 in)
• Height	50 mm (1.97 in)
• Depth	185 mm (7.28 in)
<b>Weight, approx.</b>	0.8 kg (1.76 lb)

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK 3.5" floppy disk drive</b>	<b>6FC5235-0AA05-0AA1</b>
Incl. connecting cable Length: 0.5 m (19.7 in)	
<b>Accessories</b>	
<b>Cover</b> For SINUMERIK floppy disk drive and card reader with masking frame, cover, and bearing bracket	<b>6FC5247-0AA20-0AA0</b>



# Operator components for CNC controls

## Housing systems

### Rittal command panel systems

#### Overview



Rittal command panel systems are manufactured with exact dimensions for any combination of SINUMERIK operator components and are ready for installation. Optimum installation of the operator components is assured thanks to the customized dimensions. Select from a wide range of different housing systems, e.g.:

#### *Rittal VIP 6000 – Multi-talented in shape and function*

The increased surface size resulting from cooling fins and screw channels is the most reliable and cheapest type of heat dissipation.

- Individual mounting depths of 155 ... 438 mm (6.10 in ... 17.24 in)
- 3 frame versions (wide, narrow or combined), depending on application and design requirements
- Optimum heat dissipation with 3 types of housing
- Versatile housing connectors
- Continuous edge profile, 3 versions in 5 colors
- Keyboard housing, mounting depths: 27 mm/44 mm/105 mm (1.06 in/1.73 in/4.13 in), tray for keyboards
- Continuous screw channels for flexible internal design
- Rear panel screwed or hinged

#### *Rittal Optipanel – The slimline alternative design*

- Individual mounting depths: 50 mm/100 mm/150 mm (1.97 in/3.94 in/5.91 in)
- Standard housing matched to SINUMERIK operator panel 19" x 7 HU, mounting depth 100 mm (3.94 in), available ex stock
- Continuous edge profile
- Keyboard housing, mounting depths: 50 mm/100 mm (1.97 in/3.94 in), tray for keyboards, tilting angle can be set to any value between 80° and 155°
- Continuous T slot for flexible internal design
- Rear panel screwed or hinged

#### *Rittal Comfort Panel – Functional and safe*

The "third dimension" command panel in the HMI sector. With a new design and additional functions, the Rittal Comfort Panel is ideally matched to SINUMERIK operator components.

- Individual mounting depths of 74 ... 464 mm (2.91 in ... 18.27 in)
- Standard housing matched to SINUMERIK operator panel 19" x 7 HU, mounting depths: 74 mm/113 mm/152 mm/191 mm/308 mm (2.91 in/4.45 in/5.98 in/7.52 in/12.13 in), available ex stock
- Keyboard housing, mounting depths: 35 mm/74 mm (1.38 in/2.91 in), tray for keyboards, tilting angle can be set to any value between 88° and 136°, with toothed wheel adjustable in increments of 8°; can be tilted upwards after use to save space where necessary
- Rear panel screwed or hinged
- Design profile for color coordination with the machine or equipment ID
- All-round soft profile made of plastic reduces the risk of injury
- Flat front frame for optimum access to lateral drives
- Continuous mounting channels for individual dismantling of accessories, internally and externally

#### Accessories

##### *Support arm systems*

- **CP-S** compact, for small and flat panel housings
- **CP-L** for small to medium-sized panel housings
- **CP-XL** open for simple cable inlet, closed for high loads
- **CP-Q**, the square alternative

##### *Stand systems*

- Stationary
- Mobile
- Adjustable height
- Console as stable base for supporting arm systems

#### More information

You will find comprehensive information in the Rittal Manual and News 2007. These can be ordered direct from Rittal, or you can contact your Rittal technical consultant.

#### **Rittal GmbH & Co. KG**

Postfach 16 62  
35726 HERBORN, Germany

Phone: +49 (0) 2772-505-0  
Fax: +49 (0) 2772-505-2319  
E-mail: [info@rittal.de](mailto:info@rittal.de)

Additional information is available in the Internet under:



[www.rittal.de](http://www.rittal.de)

# Operator components for CNC controls

## Housing systems

ROSE Systemtechnik GmbH

### Overview



#### Slim Line Commander

The ROSE SL 2000 and SL 3000 Slim Line Commanders are tailored housing systems for built-in control components with numerous configuration possibilities.

With various mounting depths, the basic versions of the aluminum housing systems in various sizes provide ideal surface-mounting possibilities for CNC control with:

- SINUMERIKOP 010/OP 010S/OP 010C/OP 012/OP 015/OP 015A
- SINUMERIK TP 015A

and the full CNC keyboards, the machine control panels, and the SINUMERIK Push Button Panel.

#### SL 2000

- Multifunctional add-on system with all-round fixing slots
- Individual front panel installation from front or back
- Mounting depths: 80 mm/110 mm/185 mm (3.15 in/4.33 in/7.28 in)



#### SL 3000

- Profile combinations permit variable depths
- Hollow chamber profile for hidden installation of drives and connectors
- Mounting depths: 60 mm/160 mm/200 mm (2.36 in/6.30 in/7.87 in)  
Mounting depths with combined profiles: 120 mm/220 mm/260 mm/360 mm (4.72 in/8.66 in/10.2 in/14.2 in)

#### LIMANDA



LIMANDA is the ideal polyamide panel housing for installing small operator panels and control devices for mobile and fixed applications to the IP65 degree of protection.

- Dimensions of Limanda 1: 317 mm x 287 mm x 75 mm (12.5 in x 11.3 in x 2.95 in)
- Dimensions of Limanda 2: 270 mm x 248 mm x 64 mm (10.6 in x 9.76 in x 2.52 in)

Suitable for SIMATIC Panels:

- PP7/PP17
- OP7/OP15/OP17
- TP27-6/TP 170
- C7

#### More information

Are you looking for an individual solution for your application? Ask us!

Your partner for industrial housing systems:

#### ROSE Systemtechnik GmbH

Erbeweg 13-15  
32457 PORTA WESTFALICA, Germany

Phone: +49 (0) 571-5041-0  
Fax: +49 (0) 571-5041-6  
E-mail: [rose@rose-pw.de](mailto:rose@rose-pw.de)

Additional information is available in the Internet under:



<http://www.rose-pw.de>

# HMI software for CNC controls



## 4/2 Operator control and programming

- 4/2 HMI-Embedded
- 4/3 HMI-Advanced
- 4/4 ShopMill
- 4/5 ShopTurn
- 4/7 Technology cycles
- 4/8 Measuring functions/  
measuring cycles
- 4/9 CAD Reader
- 4/10 TRANSLINE HMI

## 4/11 Open Architecture

- 4/11 HMI Open Architecture
- 4/13 EasyMask
- 4/13 EasyTrans
- 4/14 HotWin
- 4/14 EasyMon

## 4/15 Motion Control Information System MCIS

- 4/15 Introduction
- 4/15 DNC – Direct Numeric Control
- 4/16 DNC Machine
- 4/17 DNC Cell/DNC Plant
- 4/19 DNC HMI
- 4/19 DNC IFC SINUMERIK
- 4/20 DNC IFC Serial
- 4/20 DNC IFC Dialog
- 4/21 DNC IFC Filesystem
- 4/21 DNC Compare
- 4/22 TDI – Tool Data Information
- 4/23 TDI Overview
- 4/24 TDI Toolhandling
- 4/24 TDI Planning
- 4/25 TDI Statistic
- 4/25 TDI IFC
- 4/26 TDI Cell/TDI Plant
- 4/27 TDI Machine
- 4/28 TDI Toolplan Generation
- 4/29 TDI Ident Connection

## Motion Control Information System MCIS (continued)

- 4/30 MDA – Machine Data Acquisition
- 4/30 MDA Cell
- 4/32 MDA IFC
- 4/32 MDA Machine
- 4/34 RPC – Remote Procedure Call  
(computer coupling)
- 4/35 TPM – Total Productive  
Maintenance
- 4/36 RCS – Remote Control System
- 4/37 RCS Host/RCS Viewer
- 4/38 RCS Host/RCS Viewer Embedded
- 4/39 ADDM – Data Management

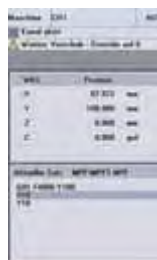
## 4/40 ePS Network Services

### 4/42 Tools

- 4/42 SIMATIC STEP 7 for  
SINUMERIK hardware
- 4/42 SinuCom
- 4/44 SinuCom Update Agent

## 4/45 SINUMERIK Solution Partners

- 4/45 Solution Partners Automation  
Machine Tools SINUMERIK



# HMI software for CNC controls

## Operator control and programming

### HMI-Embedded

#### Overview



The HMI-Embedded software is a technology-independent, multi-channel operating software for machine tools and executes on an embedded operating system. The software supports convenient and complete window-oriented operation of machines.

The generation of part programs is assisted by a text editor which provides easy-to-use, screen form-based support. The powerful contour calculator enables programming and graphic display of complex workpiece contours.

#### Function

Part programs can be rapidly checked using the 2D simulation for turning. An easy-to-use milling simulation is optionally available.

The graphical user interface can be expanded in the basic version by up to 20 screen forms via predefined softkeys without additional software.

Using these softkeys, it is possible to import machine-specific screen forms, displays or function trees. Programming support, such as cycle support, can be intensified with the Expand User Interface function. Configuring takes place using simple text files.

The user interface can be optionally expanded by more than 20 screen forms using the integral editor at specific predefined softkeys with a SINUMERIK HMI copy license OA.

#### Selection and ordering data

Designation	Order No.
<b>HMI-Embedded</b>	
For PCU 20 and PC/PG on CD-ROM	
Languages: Chinese Simplified <sup>1)</sup> , English, French, German, Italian, Spanish	
• Single license for current software version	<b>6FC5253-0BX00-0AG0</b>
• Single license for specific software version	<b>6FC5253-■BX00-■AG0</b>
• Single license without data carrier	<b>6FC5253-0BX00-0AG1</b>
• Software update service	<b>6FC5253-0BX00-0AG2</b>
• Update on order of specific software version	<b>6FC5253-■BX00-■AG3</b>
<b>Additional languages<sup>2)3)</sup></b>	
On CD-ROM	
Languages: Chinese simplified, Chinese Traditional, Czech, Danish, Dutch, Finnish, Hungarian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Swedish, Turkish	
• Single license for specific software version	<b>6FC5253-■BX10-■XG0</b>
• Single license without data carrier	<b>6FC5253-0BX10-0XG1</b>
<b>Milling Simulation</b>	<b>6FC5253-0AE02-0AA0</b>
For HMI-Embedded Software option	
<b>SINUMERIK HMI copy license OA</b>	<b>6FC5253-0AF00-0AA0</b>
Software option	

Example of specific software version, e.g. 6.5:  
6FC5253-6....-5...

<sup>1)</sup> HMI-Embedded software version 6.5 and higher.

<sup>2)</sup> CD-ROM also contains the languages: English, French, German, Italian, Spanish.

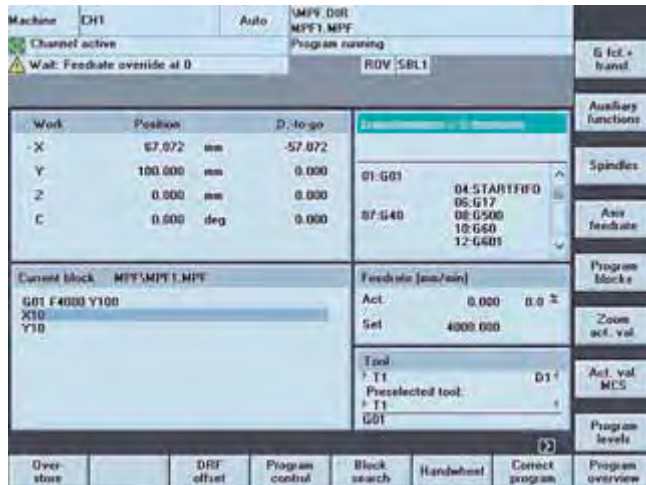
<sup>3)</sup> Please inquire about available software versions.

# HMI software for CNC controls

## Operator control and programming

HMI-Advanced

### Overview



The HMI-Advanced software is a universal, multi-channel user interface software for machine tools. The software supports convenient and complete window-oriented operation of machines. The text editor provides easy-to-use, screen form-based support.

The powerful contour calculator enables programming and graphic display of complex workpiece contours. Part programs can be rapidly checked using the integral 2D/3D simulation for turning and milling.

### Function

You can modify or redesign the graphical user interface easily with HMI-Advanced:

Using the integral editor, the graphical user interface can be extended in the basic version by up to 20 screen forms via predefined softkeys.

Using these softkeys, it is possible to import machine-specific screen forms, displays or function trees. Programming support, such as cycle support, can be intensified with the Expand User Interface function. Configuring takes place using simple text files.

Using the SINUMERIK HMI configuration package WinCC flexible 2008, you can configure screen forms graphically, quickly and easily.

The SINUMERIK HMI programming package (with extensive online documentation) permits you to develop your own operating ideas and concepts using the Microsoft Visual Studio 6 development tool and the HMI basic software.

In order to use one or more of these possibilities, it is necessary to have the SINUMERIK HMI copy license OA option for each PCU. When using the integral editor, this is only necessary from the 21st screen form onwards.

### Integration

The SINUMERIK software HMI-Advanced can be used with:

- SINUMERIK 810D powerline/840D powerline: SINUMERIK PCU 50.3

Preconditions for HMI-Advanced on PC/PG:

- IBM-compatible PC, Pentium 1.2 GHz or better
- RAM: at least 512 MB
- Windows XP operating system
- Vacant PCI slot/PCMCIA CP 5512/CP 5611

### Selection and ordering data

Designation	Order No.
<b>HMI-Advanced</b>	
Incl. technology cycles for drilling, milling and turning and the startup tool for SIMODRIVE 611 digital on DVD-ROM	
Languages: Chinese Simplified, English, French, German, Italian, Spanish	
<b>For SINUMERIK PCU 50.3</b>	
• Single license for specific software version	<b>6FC5253-■BX10-■AG0</b>
• Single license without data carrier	<b>6FC5253-0BX10-0AG1</b>
• Software update service	<b>6FC5253-0BX10-0AG2</b>
• Update on order of specific software version	<b>6FC5253-■BX10-■AG3</b>
<b>For PC/PG</b>	
• Single license for specific software version	<b>6FC5253-■BX40-■AG0</b>
• Single license without data carrier	<b>6FC5253-0BX40-0AG1</b>
• Software update service	<b>6FC5253-0BX40-0AG2</b>
• Update on order of specific software version	<b>6FC5253-■BX40-■AG3</b>
<b>Additional languages<sup>1)</sup></b>	
On DVD-ROM	
Languages: Chinese Simplified, Chinese Traditional, Czech, Danish, Dutch, Finnish, Hungarian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Swedish, Turkish	
• Without license	<b>6FC5253-■BX10-■XG8</b>
• Single license for specific software version	<b>6FC5253-■BX10-■XG0</b>
• Single license without data carrier	<b>6FC5253-0BX10-0XG1</b>
<b>Network/floppy disk drive management</b>	<b>6FC5253-0AE01-0AA0</b>
Software option	
<b>SINUMERIK HMI copy license OA</b>	<b>6FC5253-0AF00-0AA0</b>
Software option	

Example of specific software version, e.g., 7.5:  
6FC5253-7....-5...

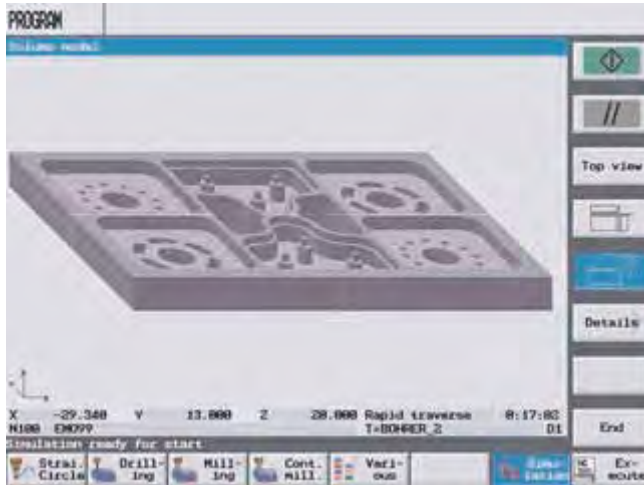
<sup>1)</sup> Please inquire about available software versions.

# HMI software for CNC controls

## Operator control and programming

### ShopMill

#### Overview



ShopMill is operating and programming software for milling machines that makes it easy for you to operate the machine and to program workpieces.

With ShopMill, you get a complete CNC control solution for milling in the workshop area. You can use ShopMill on single-channel versions of vertical or universal milling machines with up to 12 axes (including rotary axes and spindles). Of the 12 axes, 3 linear and 2 rotary axes plus 1 spindle can be displayed simultaneously. In addition to an extensive cycle package, it offers a host of practice-oriented setup functions (e.g. workpiece or tool measurement) and functions for data handling.

ShopMill's tool management function is transparent and user-friendly. To use this function, it must be integrated into the PLC program of the machine.

ShopMill supports three different programming methods:

- G code programs that are generated externally, e.g. mold making programs imported from CAD/CAM systems.
- G code programs that are created directly on the machine. All technology cycles are available with G-code programming.
- Machining step programs that are created directly on the machine (available as an option)  
Workpiece programming is easy because programming is graphically supported and no knowledge of G codes is required. ShopMill displays the program as a clear, understandable work plan and presents the individual cycles and contour elements in a dynamic graphical display.

With the SINUMERIK PCU 20/PCU 50.3, ShopMill can access the CompactFlash card or hard disk and the Ethernet (option). Consequently, even large mold making programs can be executed with ShopMill. With the SINUMERIK PCU 50.3, the HMI-Advanced areas Utilities, Parameters, Diagnostics and Start-up are permanently integrated into ShopMill. The solutions for Open Architecture or Solution Partner applications from ShopMill can therefore be used.

A PC version is available for ShopMill (see SinuTrain/Jobshop).

#### Benefits

- Clear program presentation in the machining step program (option)
- Dynamic input graphics for contour elements and cycles
- Adaptation of the traversing paths of the tool while taking account of the workpiece contour and obstacles
- High-performance contour calculator for the input of a free contour
- Networking and floppy disk drive connection (option)
- Support of swivel heads and swiveling tables
- Individual cycles and user screen forms can be integrated.

#### Function

- Machining step programming (option)
- ShopMill tool management
- Simultaneous recording (option)
- Residual material identification and machining in the contour pocket cycle (option)
- 3D graphics of the finished part
- Multiple clamping of identical workpieces with optimization of the tool sequence
- Multiple clamping of different workpieces with optimization of the tool sequence (option)
- Remote diagnostics (option)
- A swivel cycle supports multiface machining and machining of inclined surfaces independently of the machine kinematics (swivel table/swivel head)
- Access to external programs through network interfacing or floppy disk drive (option)

#### Integration

The SINUMERIK software ShopMill can be used with:

- SINUMERIK 810D powerline/840D powerline

# HMI software for CNC controls

## Operator control and programming

ShopMill

ShopTurn

### Selection and ordering data

Designation	Order No.
<b>ShopMill HMI</b> Without machining step programming, incl. tool boxes, tool management on CD-ROM Languages: Chinese Simplified, English, German, French, Italian, Spanish	
• Single license for current software version	<b>6FC5463-0FA20-0AG0</b>
• Single license for specific software version	<b>6FC5463-■FA20-■AG0</b>
• Single license without data carrier	<b>6FC5463-0FA20-0AB1</b>
• Software update service	<b>6FC5463-0FA20-0AB2</b>
• Update on order of specific software versions	<b>6FC5463-■FA20-■AG3</b>
<b>Additional languages<sup>1)</sup></b> On DVD-ROM Languages: Chinese Traditional, Czech, Danish, Dutch, Finnish, Hungarian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Swedish, Turkish	
• Single license for specific software version	<b>6FC5253-■BX10-■XG0</b>
• Single license without data carrier	<b>6FC5253-0BX10-0XG1</b>
<b>ShopMill machining step programming</b> Software option	<b>6FC5463-0FA21-0AA0</b>
<b>Automatic residual material detection and machining</b> In contour pocket cycle <sup>2)</sup> Software option	<b>6FC5463-0FA01-0AA0</b>
<b>Simultaneous recording</b> Real-time simulation of current machining operation Software option	<b>6FC5463-0FA02-0AA0</b>
<b>Network/floppy disk drive management<sup>3)</sup></b> Software option	<b>6FC5463-0FA03-0AA0</b>
<b>Multiple clamping of different workpieces<sup>2)</sup></b> Software option	<b>6FC5463-0FA04-0AA0</b>

For the SINUMERIK 840D powerline the appropriate single license without a data carrier must be purchased for each NCU before using the system software.

Example of specific software version, e.g. 6.4:  
6FC5463-6....-4...

### More information

Additional information is available in the Internet under:



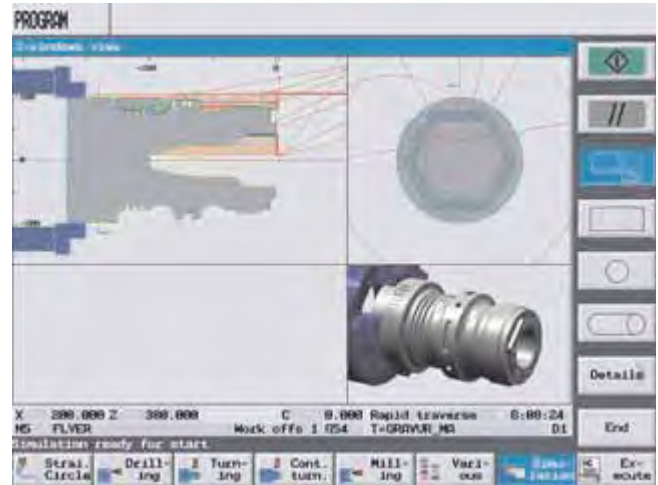
[www.siemens.com/jobshop](http://www.siemens.com/jobshop)

<sup>1)</sup> On request.

<sup>2)</sup> Precondition: Software option ShopMill machining step programming.

<sup>3)</sup> Contains the software option Network/floppy disk drive management for PCU 20.

### Overview



ShopTurn is an operating and programming software program for single-slide turning machines that makes it easy for you to operate the machine and to program workpieces.

With ShopTurn, you get a complete CNC control solution for turning in the workshop area. In addition to an extensive cycle package, it offers a host of practice-oriented setup functions (e.g. workpiece or tool measurement) and functions for data handling.

You can use ShopTurn on single-channel versions of single-slide turning machines with up to 12 axes (including rotary axes and spindles). Of the 12 axes, 5 axes plus 1 spindle can be displayed simultaneously. ShopTurn also supports machine extensions with C axes, Y axes and counterspindle.

ShopTurn's tool management function is transparent and user-friendly. To use this function, it must be integrated into the PLC program of the machine.

ShopTurn supports three different programming methods:

- G code programs that are generated externally, e.g. imported from CAD/CAM systems
- G code programs that are created directly on the machine. All technology cycles are available with G-code programming.
- Machining step programs that are created directly on the machine (available as an option)  
Workpiece programming is easy because programming is graphically supported and no knowledge of G codes is required. ShopTurn displays the program as a clear, understandable work plan and presents the individual cycles and contour elements in a dynamic graphic.

With the SINUMERIK PCU 20/PCU 50.3, ShopTurn can access the CompactFlash card or hard disk and the Ethernet (option). Consequently, even large programs can be executed with ShopTurn.

With the SINUMERIK PCU 20/PCU 50.3, the HMI-Advanced areas Utilities, Parameters, Diagnostics and Start-up are permanently integrated into ShopTurn. The solutions for Open Architecture or Solution Partner applications from ShopTurn can therefore be used.

A PC version is available for ShopTurn (see SinuTrain/Jobshop).

# HMI software for CNC controls

## Operator control and programming

### ShopTurn

#### Benefits

- Clear program presentation in the machining step program (option)
- Easy operation for manual turning functions
- Dynamic input graphics for contour elements and cycles
- High-performance contour calculator for the input of a free contour
- Automatic generation of the approach and departure movements depending on the tool position and the type of machining
- Individual cycles and user pictures can be integrated

#### Function

- Machining step programming (option)
- Manual Machine (option)
- ShopTurn tool management
- Simultaneous recording (option)
- Residual material identification and machining when cutting (option)
- 3D simulation of the finished part (option)
- Travel to fixed stop (option) when using the counterspindle
- Synchronous spindle (option) when using the counterspindle
- Transmit/Tracyl (option) when using rotating tools
- Access to external programs through network interfacing or floppy disk drive (option)
- Remote diagnostics (option)

#### Integration

The SINUMERIK software ShopTurn can be used with:

- SINUMERIK 810D powerline/840D powerline

#### Selection and ordering data

Designation	Order No.
<b>ShopTurn HMI</b>	
Without machining step programming, incl. tool boxes, tool management on CD-ROM	
Languages: Chinese Simplified, English, German, French, Italian, Spanish	
• Single license for current software version	<b>6FC5463-0GA20-0AG0</b>
• Single license for specific software version	<b>6FC5463-■ GA20-■ AG0</b>
• Single license without data carrier	<b>6FC5463-0GA20-0AB1</b>
• Software update service	<b>6FC5463-0GA20-0AB2</b>
• Update on order of specific software versions	<b>6FC5463-■ GA20-■ AG3</b>

#### Selection and ordering data (continued)

Designation	Order No.
<b>Additional languages<sup>1)</sup></b>	
On DVD-ROM	
Languages: Chinese Traditional, Czech, Danish, Dutch, Finnish, Hungarian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Swedish, Turkish	
• Single license for specific software version	<b>6FC5253-■ BX10-■ XG0</b>
• Single license without data carrier	<b>6FC5253-0BX10-0XG1</b>
<b>ShopTurn machining step programming</b>	<b>6FC5463-0GA21-0AA0</b>
Software option	
<b>Residual material detection and machining</b>	<b>6FC5463-0GA10-0AA0</b>
During cutting <sup>2)</sup>	
Software option	
<b>3D simulation of the finished part</b>	<b>6FC5463-0GA11-0AA0</b>
Software option	
<b>Simultaneous recording</b>	<b>6FC5463-0GA12-0AA0</b>
Real-time simulation of current machining operation	
Software option	
<b>Travel to fixed stop</b>	<b>6FC5255-0AB02-0AA0</b>
When using counterspindle	
Software option	
<b>Synchronous spindle</b>	<b>6FC5255-0AB01-0AA0</b>
When using counterspindle	
Software option	
<b>Transmit/peripheral surface transformation</b>	<b>6FC5251-0AB01-0AA0</b>
When using driven tools	
Software option	
<b>Network/floppy disk drive management<sup>3)</sup></b>	<b>6FC5463-0FA03-0AA0</b>
Software option	

For the SINUMERIK 840D powerline the appropriate single license without a data carrier must be purchased for each NCU before using the system software.

Example of specific software version, e.g. 6.4:  
6FC5463-6....-4...

#### More information

Additional information is available in the Internet under:



[www.siemens.com/jobshop](http://www.siemens.com/jobshop)

<sup>1)</sup> On request.

<sup>2)</sup> Precondition: Software option ShopTurn machining step programming.

<sup>3)</sup> Contains the software option Network/floppy disk drive management for PCU 20.



## Overview



Technology cycles  
Example: Swiveling to any surface

Technology cycles (standard cycles) for drilling/milling and turning are available for frequently repeated machining tasks.

Standard cycles are generally applicable technology subroutines, with which you can implement specific machining processes such as tapping a thread or milling a pocket. The cycles are adapted to a concrete machining task by means of defining parameters.

## Function

The following standard cycles are available:

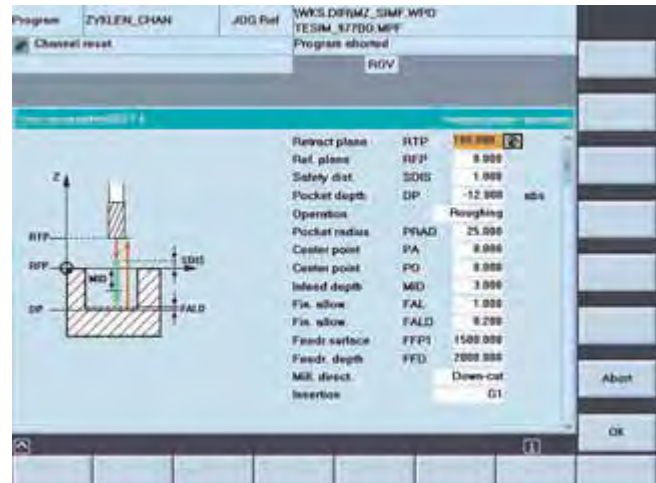
- **Drilling:**  
Drilling/centering, drilling/counterboring, deep-hole drilling, tapping with and without compensating chuck, boring 1 to 5, row of holes/circle of holes, grid of holes, machining on inclined surfaces
- **Milling:**  
Thread milling, elongated holes in a circle, groove in a circle, circumferential groove, rectangular/circular pocket, face milling, path milling, rectangular/circular spigot, pocket milling with islands (option), machining on inclined surfaces, high-speed settings for optimized HSC machining, engraving
- **Turning:**  
Groove, undercut, cutting with relief cut, extended cutting with residual material recognition (option), thread undercut, thread cutting, chaining of threads, thread recutting

The parameters are set via graphically supported input screen forms in plain text.

## Integration

Technology cycles are already included in the HMI-Advanced software.

The cycles pocket milling with islands and enhanced stock removal with residual material detection are not included in the HMI-Advanced software (option).



Technology cycles  
Example: Circular pocket milling

## Selection and ordering data

Designation	Order No.
<b>Technology cycles</b>	
For drilling/milling and turning on 3.5" floppy disks For languages/additional languages, see HMI-Advanced and HMI-Embedded	
• Single license for current software version	6FC5250-0AX00-0AB0
• Single license for specific software version	6FC5250-■AX00-■AB0
• Single license without data carrier	6FC5250-0AX00-0AB1
• Software update service	6FC5250-0AX00-0AB2
• Update on order of specific software versions	6FC5250-■AX00-■AB3
<b>Pocket milling with islands</b>	
On 3.5" floppy disks	
• Single license for current software version	6FC5250-0FX01-0AB0
• Single license for specific software version 6.3	6FC5250-6FX01-3AB0
• Single license without data carrier	6FC5250-0FX01-0AB1
<b>Enhanced stock removal with residual material detection</b>	
On 3.5" floppy disks	
• Single license for current software version	6FC5250-0GX01-0AB0
• Single license for specific software version 6.3	6FC5250-6GX01-3AB0
• Single license without data carrier	6FC5250-0GX01-0AB1

Example of specific software version, e.g. 6.5:  
6FC5250-6....-5...

# HMI software for CNC controls

## Operator control and programming

### Measuring functions/measuring cycles

#### Overview



Measuring cycles  
Example: Measuring a shaft

Measuring functions can execute either channel-specifically including all axes programmed in the measuring set as well as axially from the parts program or from synchronous actions beyond CNC block limits.

Measuring cycles are subroutines for solving specific measuring tasks. They are easy to use by entering values for predefined parameters. A general distinction is made between tool measurement and workpiece measurement. For this purpose, we provide you with a complete range of measuring cycles.

#### Benefits

- 2 probes can be connected simultaneously
- Measurement in space with frame
- Adaptable measuring modes with/without deletion of residual distance
- Display and logging of measuring parameters and results (with measuring cycles)
- Results can be read in the machine or workpiece coordinate system
- Cyclic measurement with synchronous actions parallel to workpiece machining
- Measurement in JOG mode for milling machines

The SINUMERIK measuring functions and measuring cycles make a significant contribution to further automation of the manufacturing process.

- Machining accuracy is ensured.
- Idle times are shortened.
- Error sources are eliminated.

#### Function



Measuring cycles  
Example: 2-angle measurement for determining the position of a plane in space

In the case of **tool measuring**, the loaded tool (typically in the revolver on turning machines) is moved toward the probe which is either in a fixed position or swiveled into the working range by a mechanical device. The automatically derived tool geometry is entered in the relevant tool offset data record.

In the case of **workpiece measuring**, a probe is moved towards the clamped workpiece like a tool. The flexible selection of measuring cycles means that you can handle practically every measuring task associated with turning or milling.

The principle of "on-the-fly measurement" is implemented in SINUMERIK controls. The advantage of this principle is that processing of the probe signal is carried out directly in the CNC.

The measuring parameters and the results of the measurements are output extremely clearly in separate screen forms which are either automatically deselected at the end of the cycle, or can be acknowledged when starting the CNC.

The result of the workpiece measurement can either include automatic offset of the zero point or a correction of the tool wear by the difference between the actual value and the setpoint.

The measured results can be logged in a file. The Siemens measuring cycles offer a standard log which you can also adapt.

In order to measure tool and workpiece dimensions, a touch-trigger probe is required that supplies a constant signal (rather than a pulse) when deflected. The probe should switch bounce-free, and mechanical adjustment may be necessary.

Multidirectional probes can be used for all tool and workpiece measurements on turning and milling machines. Bidirectional probes are treated like a mono probe for workpiece measurements on milling and machining centers, but are not suitable for tool measurements.

Monodirectional probes can be used on milling machines and machining centers with slight restrictions in workpiece measurements, but are not suitable for tool measurements or for workpiece measurements on turning machines.

### Measuring functions/measuring cycles

#### Function (continued)

We offer:

- Measuring cycles for turning machines
  - Tool measurements (calibration/measurement) for turning tools
  - Tool measurements for milling tools and drills on turning machines
  - Calibrating workpiece probes
  - 1-point workpiece measurement
  - 2-point workpiece measurement
- Measuring cycles for milling machines and machining centers
  - Tool measurements (calibration/measurement) for milling tools
  - Calibrating workpiece probes
  - Paraxial workpiece measurement on hole/shaft/slot/web/rectangle
  - 1-point workpiece measurement on area
  - Workpiece measurement at any angle on hole/shaft/slot/web
  - Workpiece measurement at angular position (1-/2-angle measurement)
  - Automatic set-up corner internal and external
  - Measurement of workpiece sphere and automatic correction of work offset

#### Integration

General (channel-specific) measuring functions are included as standard in the basic version of the SINUMERIK 810D powerline/840D powerline CNCs.

Axial measuring, measuring from synchronous actions and continuous measuring can be implemented with Measuring Stage 2 (option).

The optional measuring cycles are already included in version 6.4 and higher of the HMI-Advanced software. A license (CoL) must be acquired to provide proof of authorization to use the software.

#### Selection and ordering data

Designation	Order No.
<b>Measuring cycles</b>	
For drilling/milling and turning on 3.5" floppy disks	
For languages/additional languages, see HMI-Advanced and HMI-Embedded	
• Single license for current software version	<b>6FC5250-0BX00-0AB0</b>
• Single license for specific software version	<b>6FC5250-■BX00-■AB0</b>
• Single license without data carrier	<b>6FC5250-0BX00-0AB1</b>
• Software update service	<b>6FC5250-0BX00-0AB2</b>
• Update on order of specific software versions	<b>6FC5250-■BX00-■AB3</b>

Example of specific software version, e.g. 6.3:  
6FC5...-6....-3...

### CAD Reader

#### Overview



The CAD Reader program converts DXF files into contours or hole drilling templates.

#### Function

- Importing of DXF files
- Suppressing of graphic layers
- Automatic contour tracing
- Any workpiece zero per extracted contour/drilling pattern
- Several contours/drilling patterns can be extracted simultaneously
- Conversion into contours or drilling patterns for ShopMill, ShopTurn, HMI-Advanced or HMI-Embedded
- Display of extracted contours/drilling patterns in the geometric processor/cycle support

#### Integration

The CAD Reader program can be used with:

- SINUMERIK 810D powerline/840D powerline

Preconditions:

- Windows 95/98/Me/NT 4.0/2000/XP operating system
- Mouse

#### Selection and ordering data

Designation	Order No.
<b>CAD Reader for PC</b>	
Incl. documentation	
Languages: English, German	
• Single license without data carrier	<b>6FC5260-0AY00-0AG1</b>
• Single license with CD-ROM current software version	<b>6FC5260-0AY00-0AG0</b>
• Single license with CD-ROM specific software version	<b>6FC5260-■AY00-■AG0</b>
• Software update service	<b>6FC5260-0AY00-0AG2</b>
• ServicePack on order of specific software version	<b>6FC5260-■AY00-■AG8</b>

Example of specific software version, e.g., 6.2:  
6FC5260-6....-2...

# HMI software for CNC controls

## Operator control and programming

### TRANSLINE HMI

#### Overview



TRANSLINE HMI is the machine user interface for operator control and monitoring tasks in large-scale production, for example in transfer lines, machining centers and assembly lines.

TRANSLINE HMI ensures uniformity in the operation of machines with diverse tasks and technologies by means of standardized operator screen forms and a parameterizable navigation menu.

The technology-specific operator screen forms are combined into function groups, such as machine functions (workpiece counting, cycle times, workpiece overview), help texts, overviews, tool change functions and manual operating functions. Prepared diagnostic screen forms support rapid fault localization in the event of a machine fault.

#### Function

Diverse target hardware HMIs are supported to ensure the best possible price/performance ratio for different applications. HMI PRO RT runtime software can run on the standard hardware SINUMERIK PCU 50.3 and is equivalent to the PC platform solution. HMI Lite CE is available for the Windows CE-based MP/OP/TP 277 and OP/TP 177B SIMATIC Panels.

The standard application is easy to adapt or expand and is therefore ideally suited for implementing customized versions for project-specific use.

#### HMI PRO

Configuration software which runs on PGs/PCs can be used to parameterize and configure screen forms for HMI PRO RT and load them into the target hardware. Two diagnostic screen forms are available for the process error diagnostics integrated into HMI PRO RT. Process error diagnostics are used in combination with S7-PDIAG, S7-GRAPH and S7-HiGraph. Users can freely configure their own operator screen forms using the simple, integrated graphic editor.

The basic scope of supply can be expanded by screen forms that are configured by the user with WinCC flexible and/or applications written in high-level languages, e.g. Visual Basic.

HMI PRO RT can be expanded with WinCC flexible screen forms provided that the SINUMERIK HMI configuration package WinCC flexible is installed on the configuration device.

HMI PRO can be expanded with WinCC flexible and/or high-level language applications provided that the SINUMERIK HMI Copy License OA is available on the target hardware.

#### Function (continued)

#### HMI Lite CE

HMI Lite CE contains a sample project that can be expanded with machine-specific or project-specific screen forms by using WinCC flexible. A diagnostic screen form is available for the optional ProAgent process error diagnostics. It can be used in combination with S7-PDIAG, S7-GRAPH and S7-HiGraph.

HMI Lite CE can be expanded with interactive screen forms that access SINUMERIK data provided that the SINUMERIK Copy License CE is available for each operator panel.

#### Selection and ordering data

Designation	Order No.
<b>HMI PRO RT</b>	
Runtime software incl. configuration software	
• Single license for current software version	<b>6FC5263-0PY50-0AG0</b>
• Single license for specific software version	<b>6FC5263-■PY50-■AG0</b>
• Single license without data carrier	<b>6FC5263-0PY50-0AG1</b>
<b>HMI Lite CE</b>	
Runtime software	
• Single license for current software version	<b>6FC5263-0PY11-0AG0</b>
• Single license for specific software version	<b>6FC5263-■PY11-■AG0</b>
• Single license without data carrier	<b>6FC5263-0PY11-0AG1</b>

Example of a specific software version, e.g.: HMI PRO RT 7.2: 6FC5263-7PY50-2AG0

#### More information

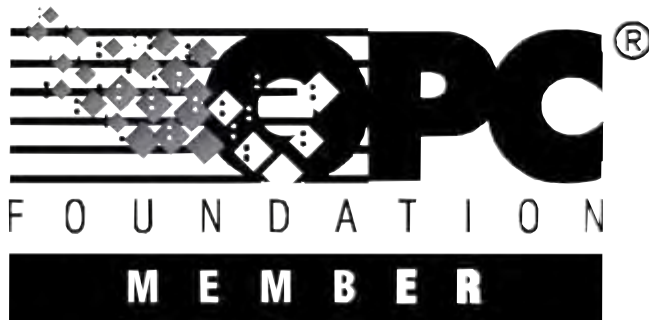
For further details, see SIMATIC WinCC flexible or SIMATIC ProAgent.

# HMI software for CNC controls

## Open Architecture

### HMI Open Architecture

#### Overview



HMI openness provides OEMs with the option of achieving their own look and for implementing their own operating and display functions.

This openness is available in combination with the SINUMERIK HMI programming package and the SINUMERIK HMI configuring package.

#### Application

	SINUMERIK HMI user interface	Preconditions
<b>SINUMERIK HMI programming package V7.x</b>	HMI-Advanced	SINUMERIK HMI copy license OA
<b>SINUMERIK HMI configuring package WinCC flexible 2008</b>	HMI-Advanced	SINUMERIK HMI copy license OA
<b>SINUMERIK HMI Expand User Interface</b>	HMI-Advanced HMI-Embedded	SINUMERIK HMI copy license OA

One SINUMERIK HMI copy license CE is required per control in order to use OEM applications on the SIMATIC CE Panels.

[Always subject to conclusion of an OEM contract.](#)

#### Function

##### *SINUMERIK HMI programming package*

The SINUMERIK HMI programming package permits the development of high-level language applications based on the programming languages Visual Basic and Visual C++ in HMI-Advanced with SINUMERIK PCU 50.3.

##### Benefits

- Integration of user interfaces in HMI-Advanced with SINUMERIK PCU 50.3
- User interfaces for stand-alone execution (without HMI-Advanced)
- Supports Microsoft COM and OPC interfaces

##### Note

To develop your own applications, you need to run the software version of the SINUMERIK HMI programming package that matches the HMI-Advanced or HMI sl on the target hardware.

Example: HMI-Advanced software version 7.5.x requires SINUMERIK HMI programming package software version 7.1.

#### Function (continued)

##### *SINUMERIK HMI configuring package*

With the SINUMERIK HMI configuring package, any skilled worker with basic technical experience can create technology-related modules for programming, operation and visualization, without the need for high-level language expertise.

It is then possible to generate user interfaces, which can be integrated into HMI-Advanced, or which can be used autonomously, i.e., executed without HMI-Advanced, and which use the communications interfaces of the SINUMERIK.

The graphics-supported engineering tool SIMATIC WinCC flexible 2008 Advanced is used as the basis for configuration. You are therefore able to create stand-alone user interfaces for operating and visualizing plant and machine tools. The SINUMERIK HMI configuring package WinCC flexible 2008 is required additionally to integrate user interfaces in HMI-Advanced with SINUMERIK PCU 50.3.

##### Benefits

- Integration of user interfaces in HMI-Advanced with SINUMERIK PCU 50.3
- User interfaces for stand-alone execution (without HMI-Advanced)
- Integration of user interfaces in SIMATIC HMI panels of the 170 or 270 series and the MP370 on a SINUMERIK control

##### Note

SIMATIC WinCC flexible 2008 Advanced is not included in the SINUMERIK HMI WinCC flexible 2008 configuring package and must be ordered separately if required.

##### *SINUMERIK HMI copy license OA*

The SINUMERIK HMI copy license OA permits the execution of the user's own HMI Open Architecture applications on the SINUMERIK PCU 20/PCU 50.3 or on a PC/PG on the SINUMERIK control that were created using the

- SINUMERIK HMI programming package or
- SINUMERIK HMI WinCC flexible 2008 configuring package or
- Expand User Interface > 20 configured screen forms (integrated into HMI-Advanced and HMI-Embedded) or
- OPC (OLE for Process Control) openness to higher-level systems thanks to standardized OPC interface

An expansion of the TRANSLINE HMI PRO user interface with individual applications that have been created with WinCC flexible also requires the SINUMERIK HMI copy license OA on the SINUMERIK control.

<sup>1)</sup> Also possible with HMI-Embedded

# HMI software for CNC controls

## Open Architecture

### HMI Open Architecture

#### Function (continued)

##### SINUMERIK HMI copy license CE

The SINUMERIK HMI copy license CE allows users to run their own HMI Open Architecture applications on SIMATIC CE Panels on the SINUMERIK control. The engineering software SIMATIC WinCC flexible and the SINUMERIK HMI configuring package WinCC flexible 2008 are needed to create these applications.

When the SINUMERIK HMI copy license CE is added, the functions can be used in conjunction with:

- CNC variable dialog (symbolic presentation)
- CNC file management, e.g., selection of part programs
- CNC functions e.g., apply tool, NC Start/Stop and other PI utilities
- Alarms and messages in plain text

The SIMATIC Panels below can be connected via PROFIBUS or Ethernet depending on which interface is provided on the panel:

- OP 170B/OP 177B/OP 277
- TP 170B/TP 177B/TP 277
- Mobile Panel 170, Mobile Panel 177, Mobile Panel 277
- MP 277/MP 370/MP 377

#### Integration

##### Preconditions:

- SINUMERIK 810D powerline/840D powerline
- SINUMERIK PCU 50.3 in conjunction with HMI-Advanced or TCU in conjunction with HMI-Embedded
- SINUMERIK operator panels:  
OP 010/OP 010S/OP 010C/OP 012/OP 015/OP 015A/  
OP 015AT/TP 015A/TP 015AT
- SIMATIC CE Panels:  
OP 170B/OP 177B/TP 170B/TP 177B/Mobile Panel 170/  
Mobile Panel 177/Mobile Panel 277/MP 277/MP 370/MP 377
- Programming of SINUMERIK user interfaces  
- SINUMERIK HMI programming package  
(for HMI-Advanced)
- Configuring of SINUMERIK user interfaces  
- SINUMERIK HMI configuring package WinCC flexible 2008  
- SIMATIC WinCC flexible 2008 Advanced
- One SINUMERIK HMI copy license OA is required per control in order to use supplementary software on the SINUMERIK PCU.
- Always subject to conclusion of an OEM contract.

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK HMI copy license OA</b> For SINUMERIK 810D/840D	<b>6FC5253-0AF00-0AA0</b>
<b>SINUMERIK HMI copy license CE</b> For SINUMERIK 810D/840D	<b>6FC5253-0AG03-0AA0</b>
<b>Visualization systems</b>	
<b>SIMATIC WinCC flexible 2008 Compact</b>	<b>6AV6611-0AA51-3CA5</b>
<b>SIMATIC WinCC flexible 2008 Standard</b>	<b>6AV6612-0AA51-3CA5</b>
<b>SIMATIC WinCC flexible 2008 Advanced</b>	<b>6AV6613-0AA51-3CA5</b>

#### Selection and ordering data (continued)

Designation	Order No.
<b>SINUMERIK HMI Programming package</b> Incl. HMI-Advanced for PC/PG for SINUMERIK 810D/840D/840Di sl/840D sl Runtime system languages: Chinese Simplified, English, French, German, Italian, Spanish Engineering system languages: English, German • Single license on DVD-ROM for current software version incl. Automation Value Card with 400 credits • Single license on DVD-ROM for specific software version incl. Automation Value Card with 400 credits • Single license without data carrier • Software update service • Upgrade for specific software version	<b>6FC5253-0BX20-0AG0</b>  <b>6FC5253-■BX20-■AG0</b>  <b>6FC5253-0BX20-0AG1</b>  <b>6FC5253-0BX20-0AG2</b>  <b>6FC5253-■BX20-■AG3</b>
<b>SINUMERIK HMI configuring package WinCC flexible 2008</b> Incl. HMI-Advanced for PC/PG for SINUMERIK 810D/840D/840Di sl/840D sl Runtime system languages: supports all HMI runtime system languages Engineering system languages: English, French, German, Italian, Spanish • Single license on CD-ROM for current software version incl. Automation Value Card with 400 credits • Single license on CD-ROM for specific software version incl. Automation Value Card with 400 credits • Single license without data carrier • Software update service • Upgrade for specific software version	<b>6FC5253-0CX25-0AG0</b>  <b>6FC5253-■CX25-■AG0</b>  <b>6FC5253-0CX25-0AG1</b>  <b>6FC5253-0CX25-0AG2</b>  <b>6FC5253-■CX25-■AG3</b>

Example of specific software version, e.g. 1.3:  
6FC5253-1.....3...

#### More information

You will find further information in the Updates at [www.siemens.com/automation](http://www.siemens.com/automation)

You can obtain technical support and advice from:

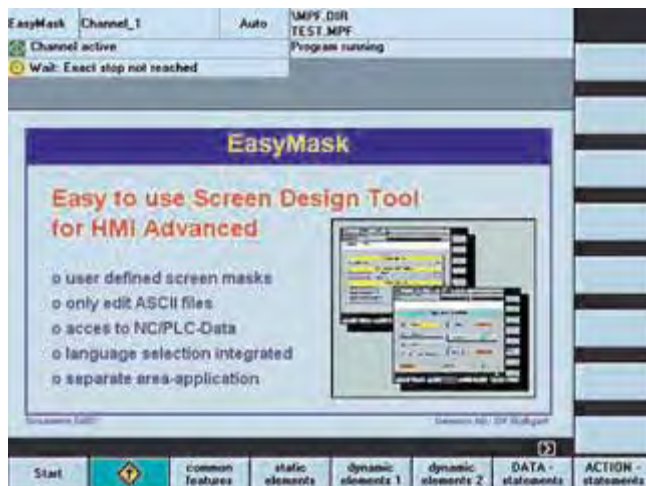
**Siemens AG**  
Industry Sector  
NL Stuttgart  
Dept. RD I IA&DT SDW CC ENG 1 11 STG  
Competence Center Stuttgart

Fax: +49 (0) 711-137-2838  
E-mail: [info.mc-hmi-oa.rd@siemens.com](mailto:info.mc-hmi-oa.rd@siemens.com)

## EasyMask

## EasyTrans

## Overview



EasyMask is a simple configuring tool for generating operating screens. EasyMask is configured using inputs in INI and text files entered with an ASCII editor. This permits you to easily generate your own operating screens.

## Selection and ordering data

Designation	Order No.
<b>EasyMask</b> For HMI-Advanced 7.x	
• Single license without data carrier	<b>6FC5263-0AY00-0AB1</b>
• Floppy disk	<b>6FC5263-7AY00-0AB0</b>

## Overview



EasyTrans is a simple tool for administration of data blocks. Various parameter areas (R parameters, PLC data blocks and PLC bit memories) can be saved in a backup file on the HMI, and downloaded back into the control. EasyTrans can create, read and delete several backup files in a directory. It is configured using entries in an INI file.

## Selection and ordering data

Designation	Order No.
<b>EasyTrans</b> For HMI-Advanced 7.x	
• Single license without data carrier	<b>6FC5263-0AY10-0AB1</b>
• Floppy disk	<b>6FC5263-7AY10-0AB0</b>

## More information

You can obtain further information on EasyMask and EasyTrans from:

**Siemens AG**  
Industry Sector

NL Stuttgart  
Dept. RD I IA&DT SDW CC ENG 1 11 STG  
Competence Center for Machine Tools and Special Machines

Fax: +49 (0) 711-137-2838  
E-mail: info.mc-hmi-oa.rd@siemens.com

# HMI software for CNC controls

## Open Architecture

### HotWin

#### Overview



HotWin is an application which enables the user to configure up to 32 input/output windows on the user interface. These windows can be activated via the PLC or using NCK signals (signal 0: window cannot be seen, signal 1: window can be seen).

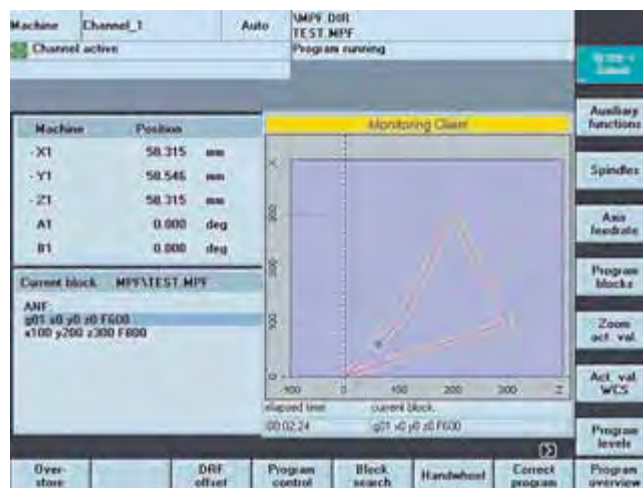
The contents of the windows can be configured in EasyMask syntax.

#### Selection and ordering data

Designation	Order No.
<b>HotWin</b>	
For HMI-Advanced 7.x	
• Single license without data carrier	<b>6FC5263-0AY20-0AB1</b>
• Floppy disk	<b>6FC5263-7AY20-0AB0</b>

### EasyMon

#### Overview



EasyMon is an application which facilitates online monitoring of traverse paths (tool center point) at a selected level on the user interface.

The display is also active during program testing (PRT). The monitoring window is configured using parameterization displays.

#### Selection and ordering data

Designation	Order No.
<b>EasyMon</b>	
For HMI-Advanced 7.x	
• Single license without data carrier	<b>6FC5263-0AY30-0AG1</b>
• CD-ROM	<b>6FC5263-7AY30-0AG0</b>

#### More information

You can obtain further information on HotWin and EasyMon from:

**Siemens AG**  
Industry Sector

NL Stuttgart  
Dept. RD I IA&DT SDW CC ENG 1 11 STG  
Competence Center for Machine Tools and Special Machines

Fax: +49 (0) 711-137-2838  
E-mail: info.mc-hmi-oa.rd@siemens.com



# HMI software for CNC controls

## Motion Control Information System MCIS

### Introduction

### DNC – Direct Numeric Control

#### Overview

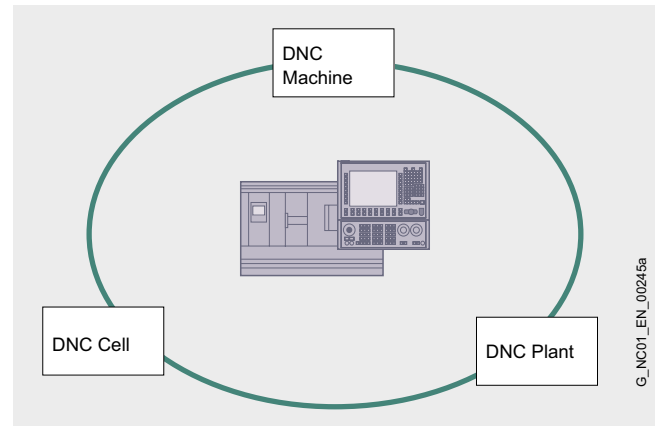


With the Motion Control Information System you will increase the productivity and reliability of your machine tools by integrating the machines perfectly into the process chain.

For the production area, this means:

- Smooth coordination of planning, disposal and execution
- Shorter setup times and enhanced efficiency
- Reduced machine downtimes
- Simplified fault analyses

#### Overview



#### *CNC program management DNC*

The CNC program management DNC supports handling of the CNC programs and reduces the costs for CNC data organization.

As a result of the convenient electronic CNC program management and archiving, the CNC programs are always available in their latest version for the machines of the complete production area. This is particularly relevant in production areas with a high degree of flexibility and variation and where CNC data frequently change, for example in machining centers, special machines and flexible production lines.

The CNC program management DNC consists of software modules which can be applied depending on the functional requirements.

#### *DNC Machine*

DNC Machine is the software module for CNC program transfer between the SINUMERIK control and an CNC programming workstation over the network filesystem.

#### *DNC Cell*

DNC Cell is the software module as a single-user solution for DNC networking of a small production area.

#### *DNC Plant*

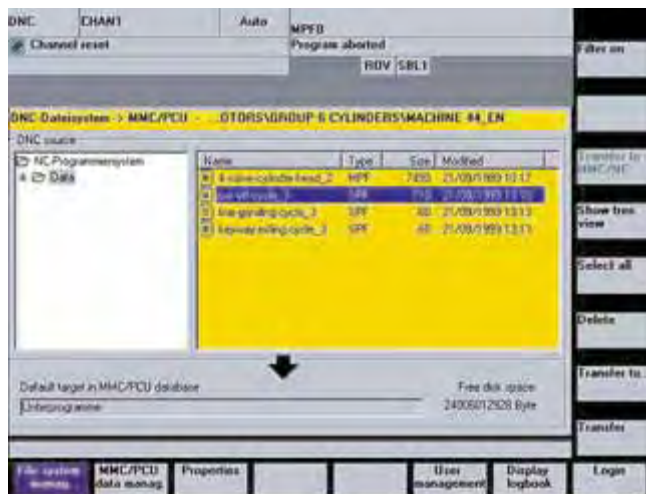
DNC Plant is the software module as a multi-user solution for DNC networking throughout a factory.

# HMI software for CNC controls

## Motion Control Information System MCIS

### DNC – Direct Numeric Control DNC Machine

#### Overview



DNC Machine is used to connect the SINUMERIK controls over the standard Ethernet network to a file system, for example, to transfer CNC programs between the CNC programming system and the CNC machine.

#### Benefits

- Cost reduction in CNC data management
- Increase in machine operating times thanks to shorter set-up times
- Fast, reliable provision of program
- The latest CNC programs are always available for the SINUMERIK control
- Simple integration of the SINUMERIK control into a standard Ethernet network
- CNC program input by the programmer and automatic transfer to the SINUMERIK control mean that handling of the program on the machine by the operator is unnecessary.

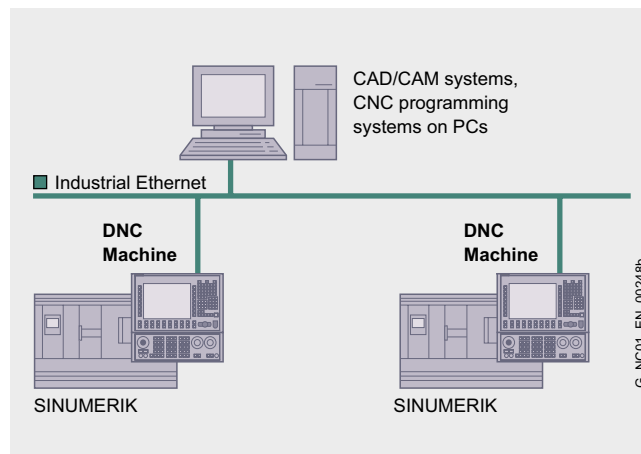
#### Function

- Operator interface for CNC program transfer/uploading on the SINUMERIK operator panel
- Fixed definition, or free navigation in Windows or UNIX network directories in which the CNC programs have been saved by the programmer
- View of CNC programs available for the machine in the network directory. Filters are possible.
- Selection and transmission of single or several CNC data/ files and workpiece directories
- Automatic CNC program importing from a network directory
- Direct loading of CNC programs into the CNC
- Utilization of Windows administration information (file name, file length, generation/modification date)
- Logbook of CNC program transfers
- Deletion of CNC data in the network directory and in the SINUMERIK control
- Key switch-dependent function privileges on the SINUMERIK control

#### Integration

##### Preconditions:

- SINUMERIK 810D powerline/840D powerline with SINUMERIK PCU 50.3
- For connecting to a UNIX file system, network software is also required on the SINUMERIK.



#### Selection and ordering data

Designation	Order No.
<b>DNC Machine</b>	
Software option for CNC program transfer to CD-ROM	
Languages: English, French, German, Italian, Spanish	
• Single license for current software version	<b>6FC6000-0AC00-0AA0</b>
• Single license for specific software version	<b>6FC6000-0AC00-0AA0</b>
• Single license without data carrier	<b>6FC6000-0AF00-0AB0</b>
• Upgrade on order of specific software version	<b>6FC6000-0AC00-0AA0</b>

Example of specific software version, e.g. 2.0:  
6FC6000-0AC02-0A..

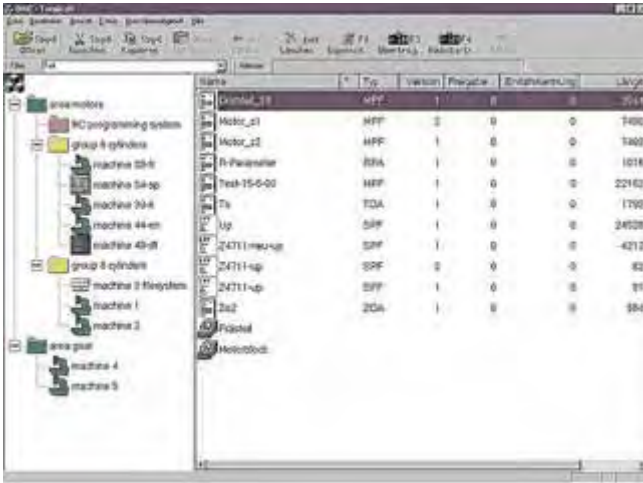
G\_NC01\_EN\_00248b

# HMI software for CNC controls

## Motion Control Information System MCIS

DNC – Direct Numeric Control  
DNC Cell/DNC Plant

### Overview



DNC Cell/DNC Plant supports handling of the CNC programs. DNC Cell/DNC Plant is software for user-friendly management, archiving and transfer of CNC programs, and can be used to network small and complex CNC production areas with DNC Cell or DNC Plant.

As a result of the convenient electronic CNC program management and archiving, the CNC programs are always available in their latest version for the CNC machines of the complete production area. This is particularly relevant in production areas with a high degree of flexibility and variation and where CNC data frequently change, for example in machining centers, special machines and flexible production lines.

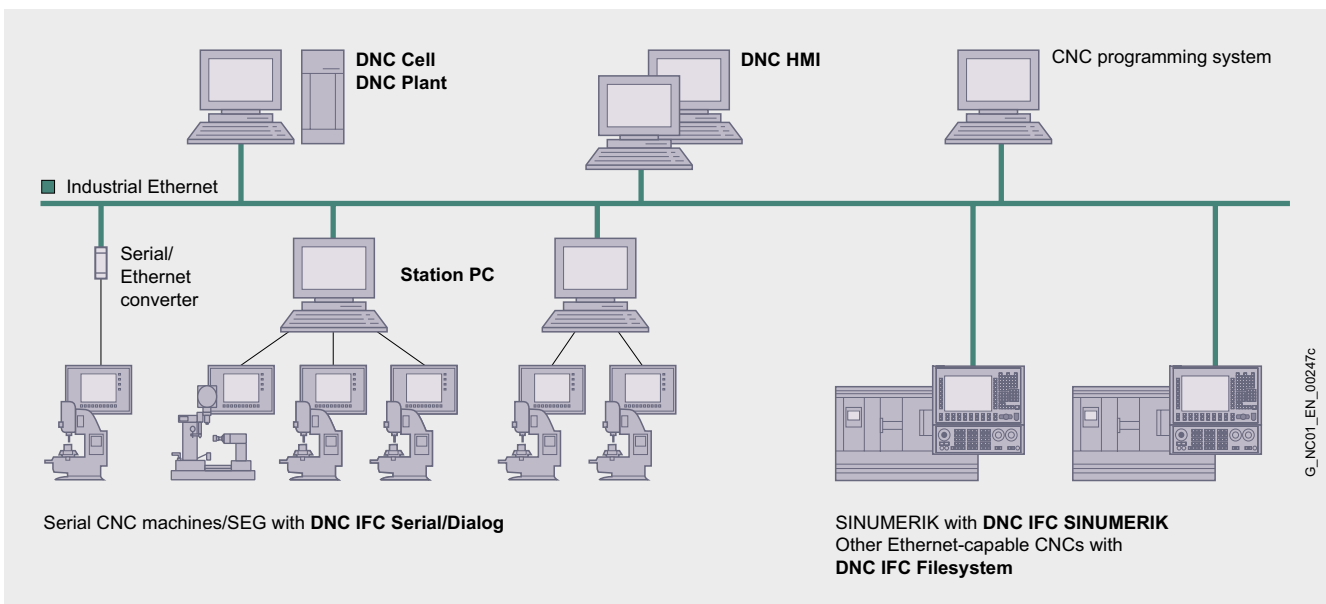
### Benefits

- Cost reduction in CNC data management
  - Convenient, central CNC program management with provision of the CNC programs
  - Low management overhead and simple handling mean that a floppy disk drive for archiving of CNC data is unnecessary
- Increase in machine operating times and reduction in setup times through reliable and fast provision of CNC program
- No DNC terminals are required on the machine because the CNC program is requested directly on the CNC operator panel
- Cost-effective and reliable electronic data archiving
- Automatic CNC data archiving of the SINUMERIK control
- Simple integration of many different types and generations of CNC controls
- Direct connection of SINUMERIK PCU 50.3 with Windows via standard Industrial Ethernet network

### Integration

Preconditions for DNC Cell/DNC Plant:

- Standard/server PC as required
  - Pentium III or higher, at least 512 MB RAM
  - Hard disks depending on data volumes of CNC programs (min. 1 GB available space), e.g., 3 x 36 GB RAID 5 for DNC Plant
- Operating system
  - Windows 2003 Server (additional client access licenses<sup>1)</sup>)
  - Windows XP Professional/Windows Vista
- The database is dependent on the size of the plant: MSDE (included in scope of delivery of DNC Cell, no license required) or ORACLE, SQL Server for DNC Plant
- Internet Explorer, version 5.0 and higher



<sup>1)</sup> Client access licenses required for each DNC IFC SINUMERIK/ DNC IFC Filesystem and each additional connected computer.

# HMI software for CNC controls

## Motion Control Information System MCIS

### DNC – Direct Numeric Control DNC Cell/DNC Plant

#### Design

##### *DNC Cell – the solution for one work station*

One PC (a work station) can be connected to DNC Cell. The management functions can only be operated from this PC.

Using the DNC IFC Serial interface client (per CNC), up to 16 CNC machines with a serial interface can be connected to DNC Cell. DNC Cell already contains a DNC IFC Serial interface module.

Up to 16 further Ethernet-capable CNC machines with DNC IFC SINUMERIK or DNC IFC Filesystem modules can also be integrated.

##### *DNC Plant – the solution for networking large production plants*

Several hundred CNC machines can be connected to DNC Plant. The CNC data are managed on a powerful central server.

The DNC HMI (Human Machine Interface) software module can be used to install further terminals (multi-user system) on Windows PCs for management and handling of the CNC programs. For example, several CNC programmers or machine setters can work with the CNC program management using PCs in the office or production area.

The interface client DNC IFC SINUMERIK (per SINUMERIK) is used to integrate the SINUMERIK controls into DNC Plant via the Ethernet network. In addition, any Ethernet-capable CNC machines can be supplied with CNC programs using DNC IFC Filesystem modules.

CNC machines with serial interfaces (without special protocol) are integrated using station PCs. Up to 16 serial CNC machines and the DNC IFC Serial interface clients (per CNC) can be connected to DNC Plant on one station PC each.

#### Function

- Software for central management and transfer of CNC programs on a standard PC (work station)
- Connection of CNCs or tool setting stations via serial interfaces using DNC IFC Serial
- Integration of additional CNC machines over an Ethernet network
  - SINUMERIK control via standard Ethernet network with DNC IFC SINUMERIK
  - Ethernet-capable CNC machines that can be supplied with CNC programs through a network filesystem (see DNC IFC Filesystem)
- Connection of CNC programming systems via standard network, e.g., via Ethernet, Novell or token ring
- Automatic data import from CNC programming system
- Shopfloor-oriented CNC program archiving structures with DNC Explorer
- Program override through operator inputs on the station PC/DNC HMI (DNC Plant)
- User management with user-dependent functions such as display, edit, copy, delete, enable CNC programs
- Program transfer through operator inputs on the DNC Cell/DNC Plant PC
- Program transfer directly on the CNC operator panel with DNC IFC Dialog

#### Function (continued)

- Automatic data archiving of the SINUMERIK control
- CNC program comparison/machine adaptation between the SINUMERIK control and DNC Cell using DNC Compare
- GUI for parameterization of interface parameters
- Scalable system configuration from small, local DNC systems (DNC Cell) up to the factory-wide multi-user system (DNC Plant)
- Networking of heterogeneous CNC machinery of very different generations and controls as an integrated system from the production planning department to the production shop

#### Selection and ordering data

Designation	Order No.
<b>DNC Cell</b>	
CNC program management Software package	
Languages: English, French, German, Italian, Spanish	
• Single license without data carrier	<b>6FC6000-0BF00-0AB0</b>
• Single license with CD-ROM of current software version	<b>6FC6000-0BC00-0AA0</b>
• Single license with CD-ROM of specific software version	<b>6FC6000-0BC0■-■AA0</b>
• Upgrade with CD-ROM of specific software version	<b>6FC6000-0BC0■-■AE0</b>
<b>DNC Plant</b>	
CNC program management Software package	
Languages: English, French, German, Italian, Spanish	
• Single license without data carrier	<b>6FC6000-0CF00-0AB0</b>
• Single license with CD-ROM of current software version	<b>6FC6000-0CC00-0AA0</b>
• Single license with CD-ROM of specific software version	<b>6FC6000-0CC0■-■AA0</b>

Example of a specific software version, e.g.: 2.1:  
6FC6000-0CC02-1AA0

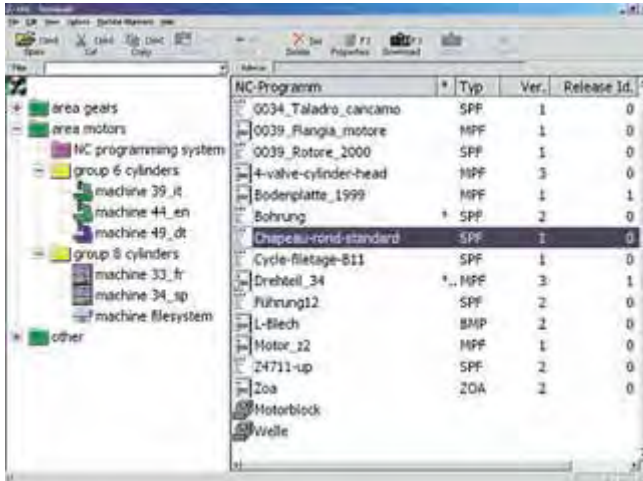
# HMI software for CNC controls

## Motion Control Information System MCIS

DNC – Direct Numeric Control  
DNC Cell/DNC Plant – DNC HMI

DNC – Direct Numeric Control  
DNC Cell/DNC Plant – DNC IFC SINUMERIK

### Overview



DNC HMI can be used to add operator stations to DNC Plant on which, e.g., the CNC programmers can carry out the administration of their CNC programs.

### Function

- DNC HMI extends DNC Plant by terminals, e.g. as workstation for CNC programmers, administrators, machine setters in the production area
- All management and administration functions can be executed on DNC HMI depending on the access privileges
- DNC Plant already contains a user interface DNC HMI.

A DNC HMI license is required for each further user interface.

### Integration

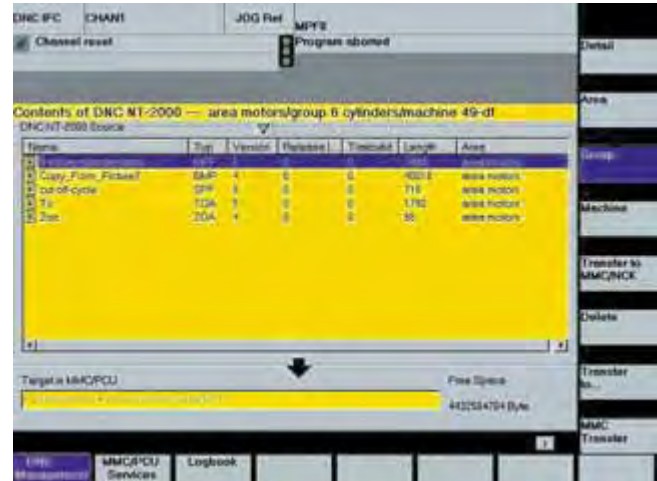
#### Preconditions:

- Standard PC
  - Pentium III or higher, at least 512 MB RAM
- Operating system
  - Windows 2003 Server
  - Windows XP Professional
  - Windows Vista
- Internet Explorer, version 5.0 and higher

### Selection and ordering data

Designation	Order No.
<b>DNC HMI</b> Additional PC user interface	<b>6FC6000-0DF00-0AB0</b>
• Single license without data carrier	

### Overview



The interface client DNC IFC SINUMERIK is used to connect the SINUMERIK control to DNC Cell or DNC Plant, and provides the machine operator with an operator interface for transfer of CNC programs.

### Function

- Summary of the CNC data/programs available for the SINUMERIK control in the database of DNC Cell/DNC Plant
- Display of management information for the CNC program
- Display of graphics on the SINUMERIK
- Selection and transfer of one or more (multiple selection) CNC data/files to the SINUMERIK control by means of operations on the SINUMERIK
- Selection and uploading of one or more (multiple selection) CNC data/files to the DNC archive DNC Cell/DNC Plant by means of operations on the SINUMERIK
- Key switch-dependent functions

One DNC IFC SINUMERIK license is required for each SINUMERIK control to be connected.

### Integration

#### Preconditions:

- SINUMERIK 810D powerline/840D powerline with SINUMERIK PCU 50.3

### Selection and ordering data

Designation	Order No.
<b>DNC IFC SINUMERIK</b> CNC program transfer via network on the control for each SINUMERIK 810D/840D Software option	<b>6FC6000-0EF00-0AB0</b>
• Single license without data carrier	

# HMI software for CNC controls

## Motion Control Information System MCIS

DNC – Direct Numeric Control  
DNC Cell/DNC Plant – DNC IFC Serial

### Overview

The interface client DNC IFC Serial is used to connect CNC machines with a serial interface to DNC Cell or DNC Plant.

### Function

- Software module for connection of serial CNC machines (punched-tape format) to DNC Cell/DNC Plant (per serial CNC)
- Machine connections
  - DNC Cell: max. 16 to DNC Cell PC
  - DNC Plant: max. 16 per station PC/DNC Plant PC (direct serial)
 More than 16 machine connections to the station PC or plant PC are possible through interface converters (ComServer).
- Program transfer through operation on DNC Cell/DNC Plant PC or on the station PC of DNC Plant (see DNC Plant)
- Program transfer directly on the CNC operator panel with DNC IFC Dialog (see DNC IFC Dialog)
- Reloading mode possible

### Integration

#### Preconditions:

- Control with serial interface without special protocol (punched-tape format)

### Selection and ordering data

Designation	Order No.
<b>DNC IFC Serial</b> Connection for serial CNC, per serial CNC Software option <ul style="list-style-type: none"> <li>• Single license without data carrier</li> </ul>	<b>6FC6000-0FF00-0AB0</b>

DNC – Direct Numeric Control  
DNC Cell/DNC Plant – DNC IFC Dialog

### Overview

DNC IFC Dialog is a functional expansion of DNC IFC Serial.

DNC IFC Dialog means that DNC input terminals are superfluous for transfer of CNC programs since the transfer is carried out directly on the operator panel of the serial CNC machine.

### Function

- DNC IFC Dialog (optional per serial CNC) can be used to transfer programs directly on the CNC operator panel of serial CNC machines
- Connection of many different types of serial CNC machines without special transmission protocol

### Integration

#### Preconditions:

- Control with serial interface without special protocol (punched-tape format)
- It must be possible to save at least two CNC programs on the control unit
- An CNC program editor must be available with which a pseudo program can be generated
- The alphanumeric characters of the required CNC program name must be available on the machine's operator panel

### Selection and ordering data

Designation	Order No.
<b>DNC IFC Dialog</b> Optional, for each serial CNC Software option <ul style="list-style-type: none"> <li>• Single license without data carrier</li> </ul>	<b>6FC6000-0GF00-0AB0</b>

# HMI software for CNC controls

## Motion Control Information System MCIS

### DNC – Direct Numeric Control DNC Cell/DNC Plant – DNC IFC Filesystem

#### Overview

The interface client DNC IFC Filesystem is used to connect Ethernet-capable CNC machines (e.g., SINUMERIK with PCU 20 and non-Siemens controls) to DNC Cell or DNC Plant.

#### Function

- Software module for connection of Ethernet-capable CNC machines to DNC Cell/DNC Plant (per Ethernet-capable CNC)
- Machine connections
  - DNC Cell: max. 16 to DNC Cell PC (incl. DNC IFC SINUMERIK)
  - DNC Plant: no limitation
- Program transfer via operation on DNC Cell/DNC Plant PC or on the DNC Plant station PC

#### Integration

##### Preconditions:

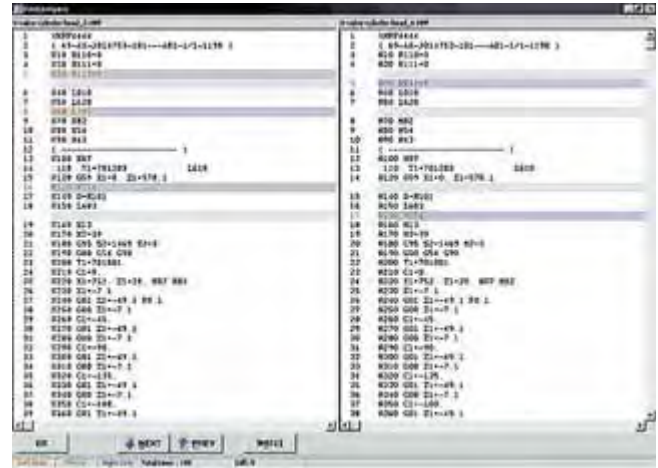
- Control with the capability of transferring CNC programs in a file system

#### Selection and ordering data

Designation	Order No.
<b>DNC IFC Filesystem</b> Connection for network-capable CNC machines For each Ethernet-capable CNC Software option • Single license without data carrier	<b>6FC6000-0KF00-0AB0</b>

### DNC – Direct Numeric Control DNC Cell/DNC Plant – DNC Compare

#### Overview



DNC Compare is a supplementary function for DNC Cell/DNC Plant which enables

- Comparison of different CNC programs
- Comparison/adaption of CNC programs between the DNC Cell/Plant archive and the SINUMERIK.

#### Benefits

- Instrument for quality assurance
- Fast, simple analysis of optimized CNC programs, e.g., by comparing with the original program
- Avoidance of faulty machining operations through fast checking of non-released CNC programs on the SINUMERIK

#### Function

- Individual comparison of CNC program  
This function is used, e.g., to compare two different program versions. The differences are displayed color-coded.
- CNC program comparison list  
This function can be used to check whether the CNC programs present in the CNC machine (SINUMERIK) are also present on the DNC computer. This is displayed in the form of a comparison/difference list.

#### Integration

##### Preconditions:

- The CNC program comparison list is only possible for:
  - SINUMERIK 810D powerline/840D powerline
- The DNC IFC SINUMERIK software module is required on the SINUMERIK.

#### Selection and ordering data

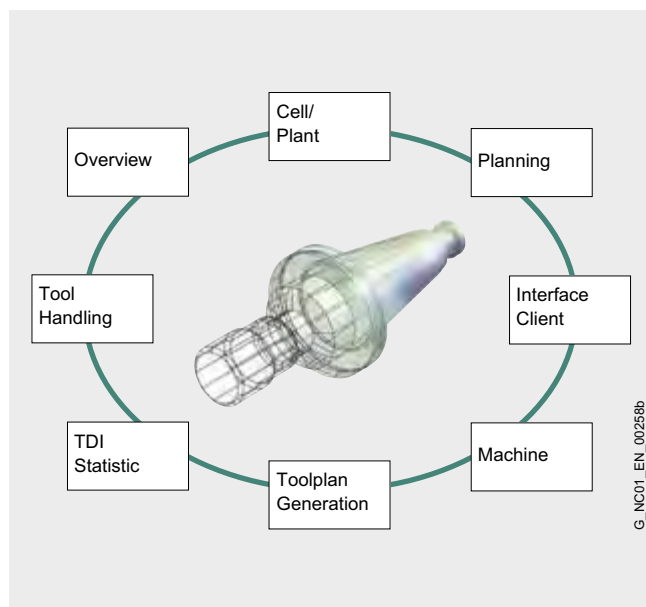
Designation	Order No.
<b>DNC Compare</b> CNC program comparison Software option • Single license without data carrier	<b>6FC6000-0HF00-0AB0</b>

# HMI software for CNC controls

## Motion Control Information System MCIS

### TDI – Tool Data Information

#### Overview



Tool Data Information is one of the central tasks in CNC production. Requirements are:

- Smooth Toolhandling processes
- Cost control
- Cost savings

This is where Tool Data Information MCIS TDI plays an important role. It makes this potential for rationalization transparent and provides functions that help attain the potential savings revealed.

MCIS TDI has the correct connection concepts and functions for a complete overview of the tools used and to permit a closed tool data cycle in the production area for:

- Single machines, flexible transfer lines, or complete machinery
- SINUMERIK 810D powerline/840D powerline highly-automated CNCs
- SIMATIC S7-based controls
- Integration of tool setting stations or cross-factory tool management systems

#### Benefits

- With TDI Tool Data Information you always have the right tool data at the right place at the right time
- Transparency of the tool cycle permits savings in tool costs
- Modularity of the TDI modules permits optimized customer-oriented and demand-oriented application
- Scalable use from a single machine up to a complete machine park

#### Function

TDI is a modular system from which you can combine the right modules for each degree of automation.

All TDI modules are designed such that they can operate on a single machine or within networked, interconnected systems, e.g., they can display an overview of all actual tool data on a single machine or a central control system.

As the system has been designed consistently as a client-server solution and uses the latest communication mechanisms based on HTTP/XML, it is possible to vary the distribution of the modules in the network and to access them from any position. This means up-to-date information can always be accessed wherever it is needed.

The UIs of the MCIS TDI modules are designed such that they execute and can be operated on a SINUMERIK platform (function keys) as well as on a PC platform (pull-down menus) and in the TRANSLINE HMI PRO environment.

The MCIS TDI modules can be optionally combined in various stages. This provides operators with optimum solutions for their requirements.

The functionality can be extended by TDI Interface Client (IFC) for interfacing with other systems, e.g., PDA.

The following functions are available:

##### *TDI Overview*

Availability of actual tool data throughout the network

##### *TDI Toolhandling*

Operator-prompted loading and unloading with TO data import from the tool setting station

##### *TDI Planning*

Planning of tool demand based on current magazine loading

##### *TDI Statistic*

Statistical evaluations of tool use

##### *TDI IFC*

Interface client for connecting external tool management systems

##### *TDI Cell*

All available functions combined on a single server and network-wide operation of client-based interfaces for small production areas

##### *TDI Plant*

All available functions combined on a single server and network-wide operation of client-based interfaces for large production areas

##### *TDI Machine*

Stand-alone non-network-compatible function package for tool planning and connection to tool setting stations

##### *TDI Toolplan Generation*

Auxiliary module for creating tool plans based on CNC program simulation

##### *TDI Ident Connection*

Stand-alone module for connecting tool identification systems

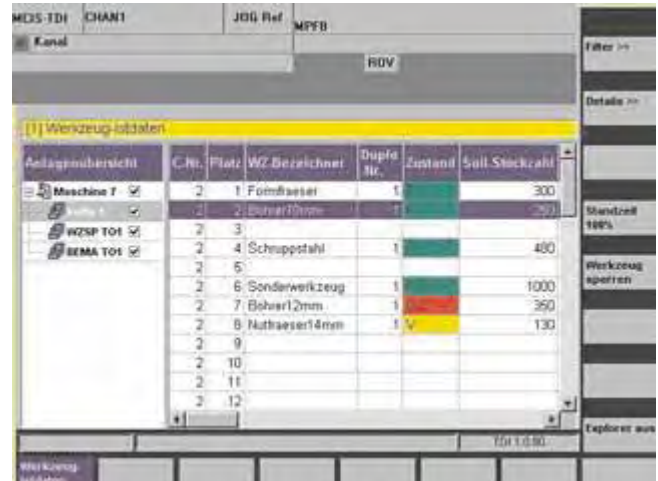


### Integration

Preconditions for TDI modules:

- With SINUMERIK controls, it is assumed that the standard tool management option is installed. SINUMERIK controls without standard or vendor-specific tool management can be configured as SIMATIC S7-based machines or must be connected specific to the project.
- In the case of controls from other vendors, the manageable tool data are reduced to a simplified tool data structure. A basic precondition is that the component must be Windows-based, the control must be accessible via Ethernet and the interface must be OPC-compatible.
- If tools stored in tool cabinets are to be recorded and managed by TDI, a TDI Toolhandling user interface for loading and unloading the tools must be assigned to the respective storage location, e.g., a Windows PC integrated in the network.
- PC hardware Pentium III or higher, at least 512 MB RAM
- Windows XP operating system
- Server hardware Pentium III or later, at least 512 MB RAM, hard disks depending on additional MCIS packages and customer requirements, e.g., 3 x 36 GB (Raid 5), Windows XP Professional, client access licenses, DAT tape drive for data backup, server database Oracle or SQL server
- SINUMERIK controls:
  - SINUMERIK 810D powerline/840D powerline with SINUMERIK PCU 50.3

### Overview



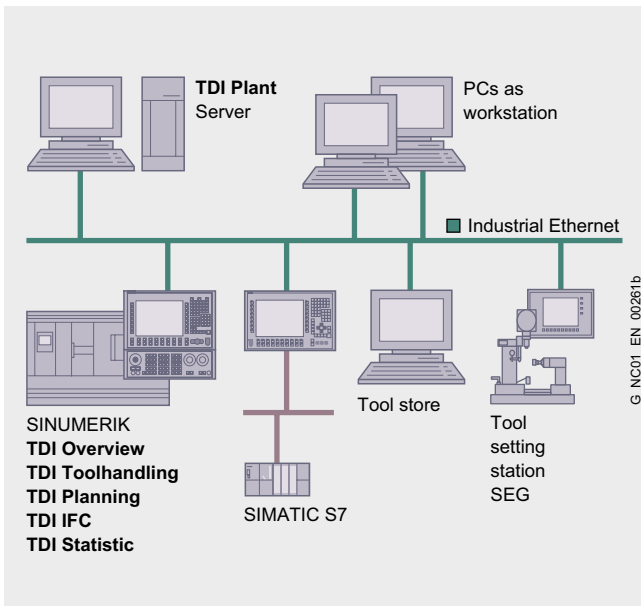
TDI Overview provides a clear overview of the actual tool data of the connected units and tool magazines.

### Benefits

- Specific reduction of tool inventory using current information on the tool situation
- Increase in machine operating times through early recognition of tool bottlenecks
- Reduction in processing times through network-wide availability of tool data, e.g.: CNC program generation
- Specific tool searching using many different filters
- Easy modification of tool data, e.g., increase service life, tool disabling, adaptation of cutting edge data

### Function

- Selection of plant components using an Explorer structure
- Management and display of tools from tool storage locations present in a plant such as tool cabinets, tool transportation units, tool stores
- Convenient filter settings such as disabled/worn tools, tools in the prewarning limit, tool service life from ... to ..., only occupied or empty locations
- Set the service life of selected tools to 100 % again using function key
- Disable a selected tool using function key
- Columns can be combined as required, thus the table layout can be adapted and stored online
- Display of all detailed data of a selected tool with the option to modify cutting edge data



### Selection and ordering data

Designation	Order No.
<b>TDI Overview</b> Overview of actual tool data, local version Software option Languages: Chinese Simplified, English, French, German, Italian, Spanish	
<ul style="list-style-type: none"> <li>• Single license without data carrier</li> </ul>	<b>6FC6000-2EF00-0AB0</b>
<ul style="list-style-type: none"> <li>• Single license with CD-ROM of current software version</li> </ul>	<b>6FC6000-2EC00-0AA0</b>
<ul style="list-style-type: none"> <li>• Single license with CD-ROM of specific software version</li> </ul>	<b>6FC6000-2EC00-0AA0</b>

Example of a specific software version, e.g. 2.1:  
6FC6000-2EC02-1A..

# HMI software for CNC controls

## Motion Control Information System MCIS

### TDI – Tool Data Information TDI Toolhandling

#### Overview



Using the convenient dialog prompting of TDI Toolhandling, you can import, buffer or forward tool data when loading and unloading – over the network. Any containers within a plant can be involved in the processes. The objective is to obtain a closed tool data circuit.

#### Benefits

- Minimization of faults when entering tool data through data acquisition from the system
- No loss of tool data if the tools are no longer or not yet in the machine
- Use of low-cost tool identification systems (barcode, read only), since tool data are obtained via the network
- Fast tool loading on the machine through provision of consignment lists
- Clear representation of tool movements through function-based screen with origin and destination

#### Function

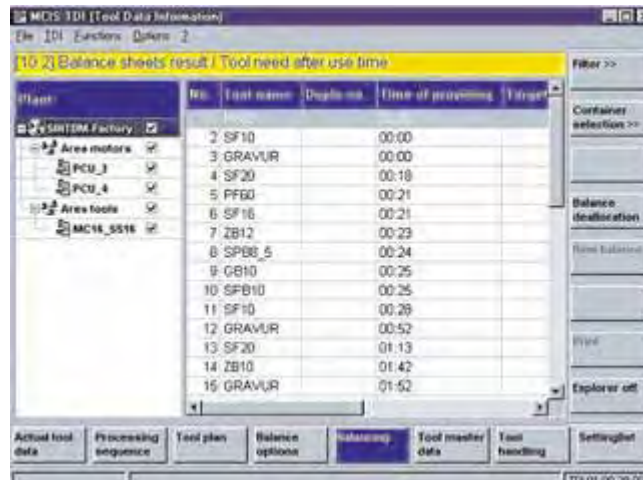
- Data simulation of all tool movements in a plant or on a single machine
- Initialization of loading and unloading processes with direct assignment of location or automatic searching for empty location
- Generation of consignment lists with loading and unloading processes and their automatic execution
- Display of tool movements with origin and destination
- Management of external tool stores with or without location management
- Connection of tool setting stations via a defined standard interface with importing of TC data directly into the tool management option of the control

#### Selection and ordering data

Designation	Order No.
<b>TDI Toolhandling</b>	
Tool handling, local version Basic product	
Languages: Chinese Simplified, English, French, German, Italian, Spanish	
• Single license	<b>6FC6000-2FF00-0AB0</b>
• Single license with CD-ROM of current software version	<b>6FC6000-2FC00-0AA0</b>
• Single license with CD-ROM of specific software version	<b>6FC6000-2FC00-■AA0</b>

### TDI – Tool Data Information TDI Planning

#### Overview



The provision of tools for the next production period is of major importance to ensure optimum utilization of machine capacity. TDI Planning can be used to ensure that the required tools are provided at the right time. TDI Planning generates the tool requirements for the next production period based on the current tool inventory on the machine.

#### Benefits

- Minimization of machine downtimes through foresighted provision of tools
- Fast response to a new production situation as result of planning possibilities on the machine and control system
- Minimum magazine loading as result of information on which tools are no longer required

#### Function

- Gross tool requirement  
Display of total tool requirement including replacement tools for the selected machining sequence
- Net tool requirement  
Display of total tool requirement for the selected machining sequence, where the tools in the magazines are taken into account. The net requirement results from comparison of the gross tool requirements with the current magazine loading.
- Unloading list  
The unloading list contains magazine tools which are not required in the net requirement, as well as disabled tools.

#### Selection and ordering data

Designation	Order No.
<b>TDI Planning</b>	
Tool planning, local version	
Languages: Chinese Simplified, English, French, German, Italian, Spanish	
• Single license	<b>6FC6000-2GF00-0AB0</b>
• Single license with CD-ROM of current software version	<b>6FC6000-2GC00-0AA0</b>
• Single license with CD-ROM of specific software version	<b>6FC6000-2GC00-■AA0</b>

Example of a specific software version, e.g. 2.1:  
6FC6000-2FC02-1A..6FC6000-2GC02-1A..

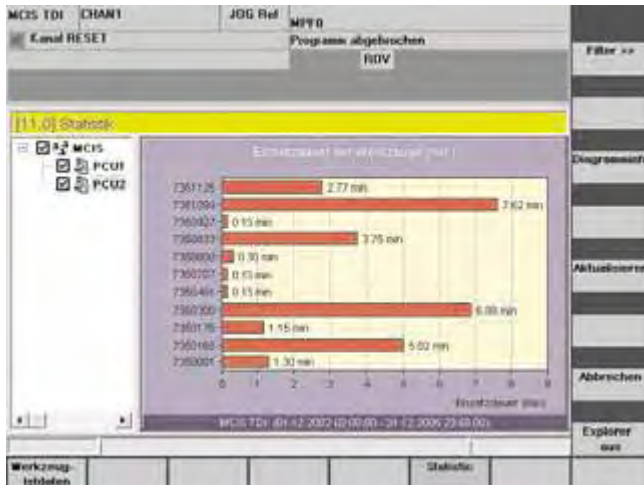
# HMI software for CNC controls

## Motion Control Information System MCIS

### TDI – Tool Data Information TDI Statistic

### TDI – Tool Data Information TDI IFC

#### Overview



TDI Statistic provides informative diagrams of recorded tool events. These tool events are presented on the basis of the following evaluations:

- Frequency of application of tools
- Duration of service of tools
- Tool failure in the spindle
- Program standstill due to missing tools
- Event list for all tools

#### Benefits

- Very user-friendly thanks to visualization of tool requirements
- The tool process on the machine is transparent
- Database for analysis and optimization

#### Function

By means of the TDI Statistic module, recorded machine events can be displayed in diagrams or tables. The machines to be monitored can be selected from a plant hierarchy display in a tree structure. A filter mask allows diagrams of a specific type to be displayed for selection, special event filters to be used and the time period for monitoring to be defined.

#### Selection and ordering data

Designation	Order No.
<b>TDI Statistic</b>	
Tool statistics, local version Software option	
Languages: Chinese Simplified English, French, German, Italian, Spanish	
• Single license	<b>6FC6000-2KF00-0AB0</b>
• Single license with CD-ROM of current software version	<b>6FC6000-2KC00-0AA0</b>
• Single license with CD-ROM of specific software version	<b>6FC6000-2KC00-■AA0</b>

Example of a specific software version, e.g. 2.1:  
6FC6000-2KC02-1A..

#### Overview

TDI IFC is used for importing and exporting tool data with external systems for further processing purposes. Depending on requirements, this interface can be parameterized specific to the project.

#### Benefits

Closed tool data cycle in production prevents faulty inputs by operator.

#### Function

TDI IFC can have different designs. A TDI IFC TDM is available, which is an interface between TDI and TDM from TDM Systems. The following data can be transferred via this interface:

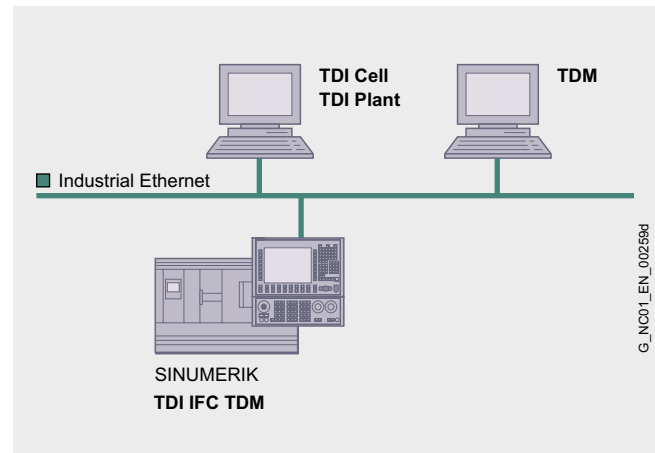
- Tool master data
- Tool plans
- Planning results
- TO data

Further TDI IFC designs must be clarified specific to the project.

#### Integration

Each interface must be clarified specific to the project.

For preconditions for TDI modules, please see TDI – Tool Data Information.



#### More information

For further details, please contact our representative in your local Siemens Regional Office.

# HMI software for CNC controls

## Motion Control Information System MCIS

### TDI – Tool Data Information TDI Cell/TDI Plant

#### Overview

Anlagenübersicht	C.Nr.	Platz	WZ-Bezeichnung	Duplo. Nr.	Zustand	Soll-Steckzahl
Maschine 7	2	1	Foerbaesser	1		300
	2	2	Bohrer10mm			250
	2	3				
	2	4	Schruppstahl	1		400
	2	5				
	2	6	Sondenwerkzeug	1		1000
	2	7	Bohrer12mm	1		350
	2	8	Nutbaesser14mm	1		130
	2	9				
	2	10				
	2	11				
	2	12				
	2	13				
	2	14				
	2	14				

You can use TDI Cell/TDI Plant to make TDI functions installed on individual machines available on a network-wide basis.

Up to 16 CNC machines can be interconnected to form an information network using TDI Cell. TDI Cell can be installed on a host computer or a master control under Windows XP.

TDI Plant permits factory-wide networking of the CNCs and further tool-specific system components. More than 16 CNC machines can be interconnected to form an information network using TDI Plant. Purchase of TDI Plant is project-specific and is offered in line with customer requests.

#### Benefits

- Network-wide availability of all tool information
- Tool data at the right location and at the right time
- Plant-wide transparency of tool usage
- Closed tool data cycle in a complete production sequence
- Reduction of tool organization costs thanks to central data management

#### Function

If a TDI Cell/TDI Plant configuration has been generated, it is possible to centrally display and manage tool data for all connected controls on the host computer/master control:

- Central management of tool master data, tool plans and tool requests for all connected CNCs
- Calling of all actual tool data of the connected units
- Planning sessions can be held for all connected units
- Data can be transferred from and to higher-level tool management systems or production planning systems (MCIS PDA)
- Design of a plant configuration with up to 4 levels (groups, units, machine magazines)

#### TDI Cell

- Connection of up to 16 CNC machines

#### TDI Plant

- Additional operation/management workstations with TDI HMI
- Connection of up to 200 CNC machines or amalgamation of several TDI Cells

#### Integration

The following plant components can be connected in TDI Cell/TDI Plant:

- SINUMERIK control (the integration is carried out project-specifically if standard tool management is not present or if customized tool management exists)
- SIMATIC S7 with DB 59 via OPC server
- Non-Siemens controls via OPC server (project-specific adaptation necessary)
- PC-based control systems, e.g., MCIS PDA or TDM from TDM Systems
- External tool store, e.g., preset tools or used tools without machine assignment

Precondition with TDI Plant:

Server is offered as a project-specific product

For preconditions for TDI modules, please see TDI – Tool Data Information.

#### Selection and ordering data

Designation	Order No.
<b>TDI Cell</b>	
Software option	
Languages: Chinese Simplified, English, French, German, Italian, Spanish	
• Single license without data carrier	<b>6FC6000-2BF00-0AB0</b>
• Single license with CD-ROM of current software version	<b>6FC6000-2BC00-0AA0</b>
• Single license with CD-ROM of specific software version	<b>6FC6000-2BC00-1AA0</b>

Example of a specific software version, e.g., 2.1:  
6FC6000-2BC02-1A..

# HMI software for CNC controls

## Motion Control Information System MCIS

TDI – Tool Data Information  
TDI Machine

### Overview



With TDI Machine, tool management is possible implemented in single CNC machines.

TDI Machine is a function package with the tool management functions which are mostly used for single machines. TDI Machine offers operators direct support for provision of tools at the right time and when loading/unloading tools.

### Benefits

- Very user-friendly thanks to visualization of tool requirements
- Numerous filter functions for application-specific generation of result lists
- Operator-prompted loading and unloading of individual tools in parallel with machining time together with the SINUMERIK standard tool management option
- Simple interfacing of a tool setting station via Ethernet for importing of tool correction data

### Function

The following functions help the operator to keep control of the tool situation on the machine:

- Determination of actual tool requirements for next production period by comparison with the actual state of the tool in the magazine
- Communication with further systems relevant to the tool cycle, such as host tool management systems, production planning and tool setting

Machine downtimes are then minimized, and short setup times are achieved.

### Function (continued)

The following functions are offered:

- Gross tool requirement  
Display of total tool requirement including replacement tools for the selected machining sequence
- Net tool requirement  
Display of total tool requirement including replacement tools for the selected machining sequence, where the tools in the magazines and their remaining service life are taken into account. The net requirement therefore results from comparison of the gross tool requirements with the current magazine loading.
- Unloading list  
The unloading list contains magazine tools which are not required in the net requirement, as well as disabled tools.
- Loading list  
The list of tools to be loaded can be transferred from the TDI Machine into the tool list of the NCK. The loading procedure itself is carried out by the loading functions of the tool management option.
- Communication with tool setting stations  
TDI Machine is able to exchange all relevant data with tool setting stations via TCP/IP
  - Transfer of tool requirement to tool setting stations
  - Importing of TC data of tool setting stations and transfer of data to tool list of standard tool management option.
- Coupling to tool management systems  
If tool management systems (e.g. from TDM Systems) are present, a project-specific coupling can be installed.
  - Importing of current tool master data and tool plans for determination of tool requirement
  - Transfer of determined tool requirement
  - Importing of TC data, and transfer of data to the tool list of the standard tool management option.

### Selection and ordering data

Designation	Order No.
<b>TDI Machine</b>	
Tool management, local version Software option	
Languages: Chinese Simplified, English, French, German, Italian, Spanish	
• Single license	<b>6FC6000-2AF00-0AB0</b>
• Single license with CD-ROM of current software version	<b>6FC6000-2AC00-0AA0</b>
• Single license with CD-ROM of specific software version	<b>6FC6000-2AC0-■-AA0</b>

Example of a specific software version, e.g. 2.1:  
6FC6000-2AC02-1A..

# HMI software for CNC controls

## Motion Control Information System MCIS

### TDI – Tool Data Information

### TDI Toolplan Generation

#### Overview

No.	Tool name	Edge	Active time	Block number
1	ThreadCutter	1	1.00	N1500
2	CentreDrill	1	5.00	N1500
3	EndMill	1	10.00	N2010
4	TwistDrill	1	8.00	N2500
5	AngleHeadCutter	1	15.00	N3000
6	FacingTool	1	4.00	N3550
7	SubMillingTool	1	7.50	N3800

Machining: 50.50 min Current tool: D  
Idle time: 0.00 min Current: N

TDI Toolplan Generation permits you to generate the associated tool plans on the SINUMERIK using simulation of NC programs.

#### Benefits

- Autonomous generation of tool plans
- Tool plans are always up-to-date since they are generated on the basis of the CNC programs actually used on the machine

#### Function

Tool plans are required for tool planning TDI Planning/ TDI Machine. If these tool plans are not provided by a CNC programming system, the machine operator can use TDI Toolplan Generation to independently generate the tool plans based on the existing CNC programs.

These tool plans can be saved in the CNC data management option. TDI Planning and TDI Machine have access to this during the planning session.

CNC programs from which tool plans are created must execute with the standard CNC program simulation of the SINUMERIK control.

#### Selection and ordering data

Designation	Order No.
<b>TDI Toolplan Generation</b>	
Tool plan generation, local version Software option	
Languages: Chinese Simplified, English, French, German, Italian, Spanish	
• Single license	<b>6FC6000-2JF00-0AB0</b>
• Single license with CD-ROM of current software version	<b>6FC6000-2JC00-0AA0</b>
• Single license with CD-ROM of specific software version	<b>6FC6000-2JC0-■-AA0</b>

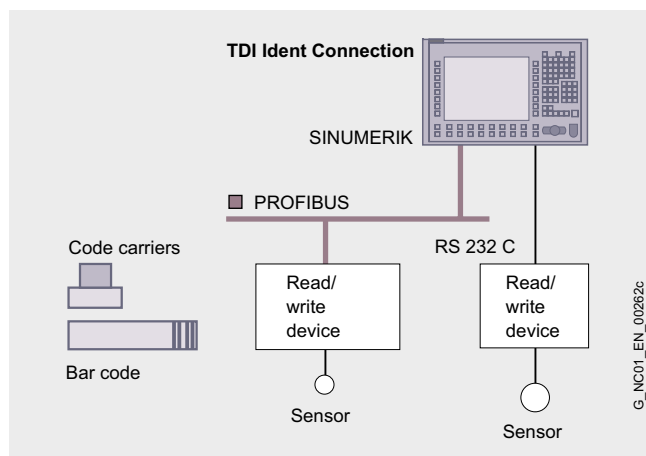
Example of a specific software version, e.g. 2.1:  
6FC6000-2JC02-1A.

# HMI software for CNC controls

## Motion Control Information System MCIS

TDI – Tool Data Information  
TDI Ident Connection

### Overview



TDI Ident Connection is a software module for the SINUMERIK with which tools with identification systems can be conveniently loaded or unloaded using the PLC or the operator interface of the standard tool management option. The tool data can be uploaded or downloaded for the control using the tool cabinet, code carrier or host computer.

### Benefits

- Connection of many different data carriers
- Various connection possibilities
- Use of low-cost read-only data media through addition of tool data via network
- Reduction of fault-prone manual inputs
- Transparent tool data through carrying of data on tool

### Function

- The following data carriers are supported depending on the type of connection:
  - Connection via PROFIBUS/PLC: Balluff, Bilz, MOBY, bar code
  - Connection via V.24 interface of SINUMERIK PCU: Balluff (BIS C-480 or BIS C-600), bar code
- Loading/unloading of tool data with/without searching for empty location
- Reading/writing tool and cutting edge data
- Creating/deleting tool in tool list
- Loading/unloading tool in tool cabinet
- Supplementing tool data on code carrier with saved tool data from the tool cabinet or list, e.g., when using read-only chips and bar code
- Interface for loading/uploading tool data for a production host computer following successful identification of the tool by means of the code carrier (MCIS RPC coupling software to host computer)
- PLC interface for starting the write/read procedure, e.g., via OP 177B, key or limit switch, e.g., automatic execution of loading/unloading points with reading/writing on code carrier
- Tool management (option)

### Integration

#### Preconditions:

- SINUMERIK 810D powerline/840D powerline
- Tool management option

For preconditions for TDI modules, please see TDI – Tool Data Information.

### Selection and ordering data

Designation	Order No.
<b>TDI Ident Connection</b>	
Connection of tool identification systems	
Software option	
Languages: Chinese Simplified, English, French, German, Italian, Spanish	
• Single license without data carrier	<b>6FC6000-2HF00-0AB0</b>
• Single license with CD-ROM of current software version	<b>6FC6000-2HC00-0AA0</b>
• Single license with CD-ROM of specific software version	<b>6FC6000-2HC01-1AA0</b>

Example of a specific software version, e.g., 1.1:  
6FC6000-2HC01-1A..

### More information

For further information about the hardware for the MOBY tool information system, please refer to RFID Systems at:



[www.siemens.com/simatic-sensors](http://www.siemens.com/simatic-sensors)

# HMI software for CNC controls

## Motion Control Information System MCIS

### MDA – Machine Data Acquisition

#### Overview

##### Machine data management

The Motion Control Information System MCIS MDA function package acquires machine data and machine states as well as type-specific piece counts automatically or manually. Furthermore, its diverse functions allow precise evaluations and analyses to be performed. As a result, machine performance can be verified through objectively established key figures. System parameters such as cycle times and utilization ratio can be monitored. Improved transparency leads to early recognition of opportunities for improvement.

The positive detection and representation of faults simplifies service, maintenance and repairs. You benefit from a significant increase in capacity utilization and machine availability.

##### MDA Cell

MDA Cell is the software module that provides a single-workstation solution for machine data acquisition and analysis of a small manufacturing area. MDA Cell can be expanded on a project-specific basis to the plant-wide MDA Plant solution.

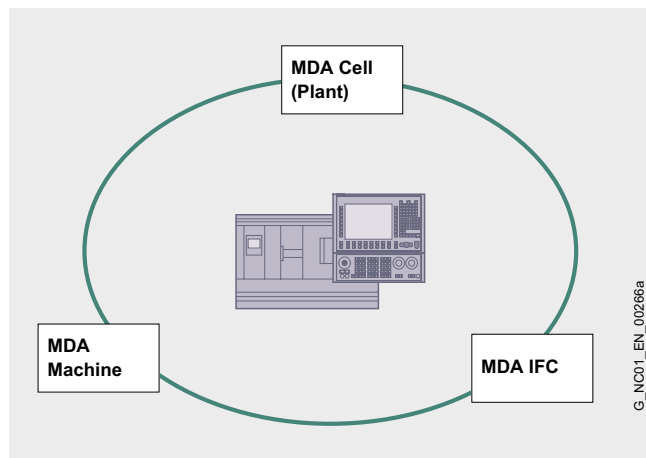
##### MDA IFC

MDA IFC is the software module for SINUMERIK for local acquisition of information on the machine (such as status, piece counts, alarms and messages). Analysis and visualization are performed on the server side in the MDA Cell or MDA Plant modules.

##### MDA Machine

MDA Machine is the software module for SINUMERIK for local acquisition and analysis of information on the machine (such as status, piece counts, alarms and messages).

#### Integration



#### More information

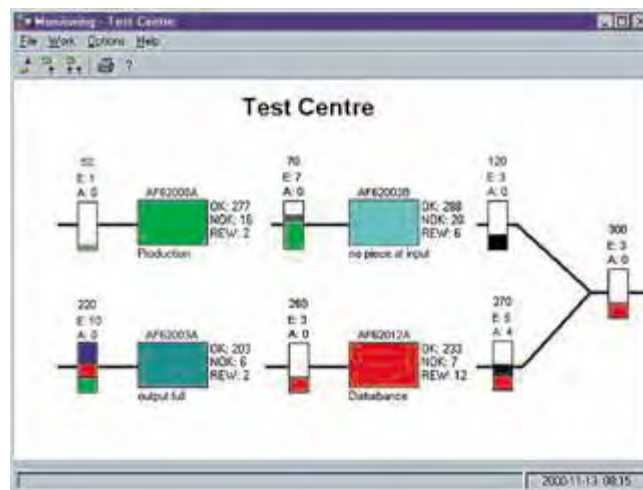
Additional information is available in the Internet under:



[www.siemens.com/automation/support](http://www.siemens.com/automation/support)

### MDA – Machine Data Acquisition MDA Cell

#### Overview



MDA Cell is used to collect, analyze and store machine data from small manufacturing areas with up to 16 machines on a central server. MDA IFC is used on each machine to acquire data at the machine level.

The analyses are performed at a workstation, whereby comparative analyses of "analysis groups" are possible.

As a result, system operators benefit from substantially improved transparency in their production. Improved transparency leads to earlier recognition of opportunities for improvement.

#### Benefits

Objectively established key figures are useful for verifying machine performance and for monitoring and archiving system parameters such as cycle times and utilization ratios.

Such key figures (Key Performance Indicators) include:

- The OEE key figure (Overall Equipment Effectiveness)
- Utilization
- Availability
- Level of performance
- Quality level

These figures are useful in formulating corrective measures sooner and in eliminating faults in accordance with their importance. The positive detection and analysis of faults simplify service and repairs or maintenance. You benefit from a significant increase in productivity.

The value of the inherent functionality of this approach increases with the number of the machines that are monitored in this manner. A further gain in convenience and transparency is achieved through comparative assessments of freely definable machines on an analysis workstation.

#### Function

- Software for the analysis and storage of machine data on a standard PC (a workstation)
- Connection of up to 16 machines/equipment units with MDA IFC (per machine/equipment unit)
- Single-step process display
- Subsequent status correction after acquisition and transfer of data from MDA IFC



# HMI software for CNC controls

## Motion Control Information System MCIS

MDA – Machine Data Acquisition  
MDA Cell

### Function (continued)

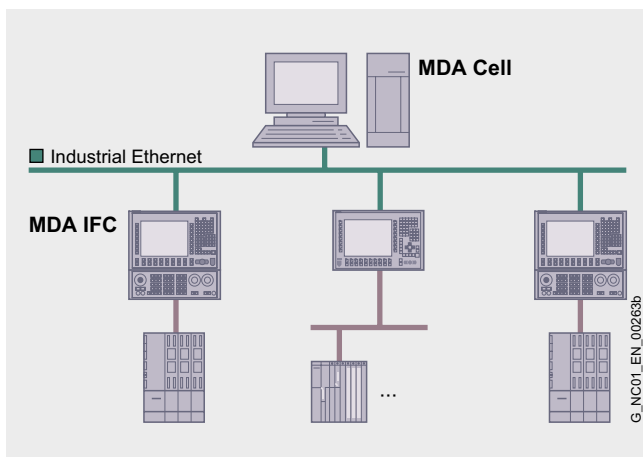
- Comparative analyses can also be obtained via the lower-level machines/equipment units ("self-definable analysis groups"):
  - Workpiece counter (machine-specific and part-specific)
  - Current states
  - Fault analysis
  - Status analysis
  - Shift/daily/weekly/monthly total
  - Logbook, (Prio) protocol
  - Availability/capacity utilization
  - History of availability/capacity utilization
  - OEE indicators
  - Only SINUMERIK: Alarm statistics, alarm protocol, current alarms
- Export function to Excel, print-out of tables, hardcopy

MDA Cell is a solution with a single PC (a workstation). All functions can be operated only from this PC.

### Integration

#### Preconditions:

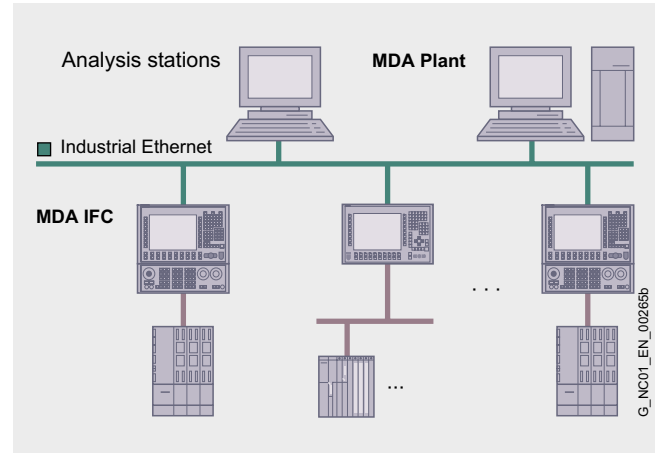
- Standard PC as required
  - Pentium III or higher, at least 512 MB RAM
  - Hard drives as required by data volume, at least 1 GB free
- Operating system
  - Windows 2000 Professional/Server  
(in the case of Server, additional client access licenses<sup>1)</sup>)
  - Windows XP Professional
  - Windows Vista
  - Windows 2003 Server  
(additional client access licenses<sup>1)</sup>)



For each operator panel, up to 8 equipment units (MDA IFC licenses) can be acquired. For each MDA Cell, a total of 16 machines/equipment units can be evaluated.

### Integration (continued)

For solutions with several analysis workstations or if you are connecting more than 16 machines/equipment units, we offer MDA Plant, the expanded, project-specific solution. This solution also supports additional analyses, e.g., cycle times. With MDA Plant, it is also possible to integrate MES/ERP systems. For each MDA Plant, 50 to 70 machines/equipment units can be evaluated. For each operator panel:  $n \times \text{MDA IFC}$  ( $n \leq 8$ ).



### Selection and ordering data

Designation	Order No.
<b>MDA Cell</b>	
Support for machine and production data management Software package	
Languages: Chinese Simplified, English, French, German, Italian, Spanish	
• Single license without data carrier	<b>6FC6000-3BF00-0AB0</b>
• Single license with CD-ROM of current software version	<b>6FC6000-3BC00-0AA0</b>
• Single license with CD-ROM of specific software version	<b>6FC6000-3BC0-■-AA0</b>
• Upgrade with CD-ROM of specific software version	<b>6FC6000-3BC0-■-AE0</b>

Example of specific software version, e.g., 2.2:  
6FC6000-3BC02-2A..

<sup>1)</sup> Client access licenses required for each operator panel networked via Ethernet.

# HMI software for CNC controls

## Motion Control Information System MCIS

### MDA – Machine Data Acquisition MDA IFC

#### Overview



The MDA IFC Interface Client is used to interconnect the SINUMERIK control or an OPC-compatible control (e.g., SIMATIC S7) with MDA Cell or with MDA Plant, the expanded project solution.

This interface ensures reliable transmission and buffer storage in the event of network disruptions.

#### Function

- Automatic acquisition of machine data from the open interface via the DB13/DB14 standard data blocks of the PLC. Alternatively, 5 fixed states can be acquired via the plug-and-play interface.
  - Machine states, processing results via DB
  - Total piece counts DB
  - Types of pieces, piece type-specific piece counts via DB
  - Cycle times via DB
  - Alarms and messages (only with SINUMERIK)
- Manual status entry, fault explanation by the operator
- Automatic buffer storage of the acquired data on the hard drive of SINUMERIK. In the event of a network failure, these data are then automatically tracked by MDA Cell/MDA Plant.

One MDA IFC license is required for each connected SINUMERIK or OPC control.

#### Integration

Preconditions:

See MDA Machine and MDA Cell.

#### Selection and ordering data

Designation	Order No.
<b>MDA IFC</b>	<b>6FC6000-3EF00-0AB0</b>
Production data acquisition for network-capable controls Basic product, license only	
Languages: Chinese Simplified, English, French, German, Italian, Spanish	

### MDA – Machine Data Acquisition MDA Machine

#### Overview



MDA Machine software permits acquisition and evaluation of data on the machine, e.g., states, quantities, alarms, and messages.

#### Benefits

- Up-to-date machine data allow swift responses
- Greater transparency at the machine and in the production process leads to earlier recognition of possible improvements
- Targeted actions increase machine utilization times
- Verification of machine performance through objectively established indicators and performance data (OEE number, availability, capacity utilization, performance, quality)

#### Function

- Automatic acquisition of machine data from the open interface in the DB13/DB14 standard data blocks of the PLC. Alternatively, fixed states can be acquired via the plug-and-play interface.
  - Machine states, processing results via DB
  - Total piece counts DB
  - Types of pieces, piece type-specific piece counts via DB
  - Cycle times via DB
  - Alarms and messages (only with SINUMERIK)
- Manual status entry, fault explanation by the operator
- Automatic buffer storage of the acquired data on the hard drive of SINUMERIK. In the event of a network failure, these data are then automatically tracked by MDA Cell/MDA Plant.
- Export function to Excel, print-out of tables, hardcopy
- Analyses:
  - Workpiece counter (machine-specific and part-specific)
  - Current states
  - Fault analysis
  - Status analysis
  - Shift/daily/weekly/monthly total
  - Logbook, (Prio) protocol
  - Availability/capacity utilization
  - History of availability/capacity utilization
  - Key performance indicators (capacity utilization, availability)
  - Alarm statistics, alarm log, current alarms (with SINUMERIK only)

One MDA Machine license is required for each connected SINUMERIK or OPC control.

# HMI software for CNC controls

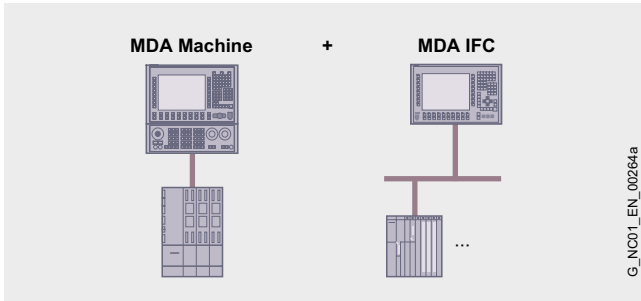
## Motion Control Information System MCIS

MDA – Machine Data Acquisition  
MDA Machine

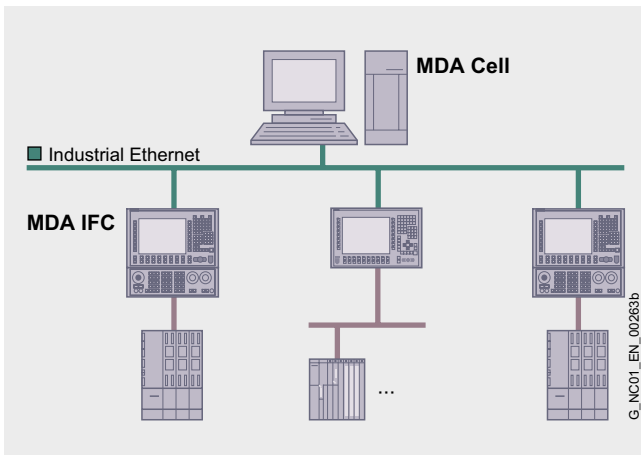
### Integration

Preconditions:

- SINUMERIK 810D powerline/840D powerline with SINUMERIK PCU 50.3



If several equipment units are to be operated and analyzed on one machine, additional MDA IFC licenses must be obtained. For each operator panel, up to 8 equipment units can be evaluated: 1 MDA Machine license and up to 7 additional MDA IFC licenses.



The system can be expanded with MDA Cell. For each MDA Cell, a total of 16 machines/equipment units can be evaluated.

### Selection and ordering data

Designation	Order No.
<b>MDA Machine</b>	
Software for machine data acquisition and evaluation on CD-ROM	
Languages: Chinese Simplified, English, French, German, Italian, Spanish	
• Single license for current software version	<b>6FC6000-3AC00-0AA0</b>
• Single license for specific software version	<b>6FC6000-3AC0-■-AA0</b>
• Single license without data carrier	<b>6FC6000-3AF00-0AB0</b>
• Upgrade on order of specific software version	<b>6FC6000-3AC0-■-AE0</b>
• Trial license Single license for current software version	<b>6FC6000-3AC00-0AT7</b>
• Trial license Single license for specific software version	<b>6FC6000-3AC0-■-AT7</b>

Example of specific software version, e.g. 2.2:  
6FC6000-3AC02-2A..

# HMI software for CNC controls

## Motion Control Information System MCIS

### RPC – Remote Procedure Call (computer coupling)

#### Overview

RPC SINUMERIK software is used to integrate SINUMERIK controls into a customer's production network. All essential machine data (such as states, piece counts, alarms, messages, CNC programs, machine tool downtimes) can be exchanged via RPC SINUMERIK between a numerical control system and a PLC.

#### Benefits

- Simple integration of the control with customer/project applications through a defined Ethernet/TCP-IP-based interface
- Simple configuring on the PLC of the data to be transmitted
- Use of MCIS RPC as a tool for implementing productivity-boosting measures:
  - Increased level of machine utilization through production planning and control
  - Reduction in machine downtime through transfer of maintenance data etc.
- Simple application through the use of standard hardware/software components from the PC world
  - Networking hardware/software (Ethernet cards, TCP-IP)
  - Familiarization
  - Start-up, maintenance

#### Function

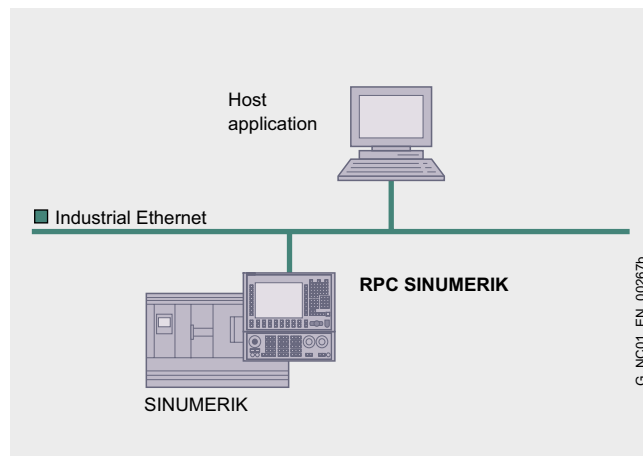
- Defined, open communication interface for exchanging essential SINUMERIK control data
- Data transmission can be initiated by the host computer and/or by the SINUMERIK control
- The host application is created by the user in the RPC environment (interfaces, examples). This can be performed by the end user or a software firm, or ordered from Siemens.
- The original equipment manufacturer (OEM) prepares the control:
  - Installs RPC on the control
  - Supplies the data interface in the PLC (DB12)
- The following data can be exchanged:
  - CNC programs, tool data
  - Machine status data
  - Messages
  - Data for the production dialog
  - Mode switching, synchronization
  - Transport requests
  - Configurable data from PLC or CNC

Even without its own user interface, RPC SINUMERIK can also run with additional languages (e.g., Chinese Simplified, Korean, Russian). The tools supplied with RPC continue to be available in English/German.

#### Integration

##### Preconditions:

- SINUMERIK 810D powerline/840D powerline with SINUMERIK PCU 50.3
- Computer-controlled loading and unloading of tools requires MCIS TDI Toolhandling.



RPC SINUMERIK cannot run by itself in a given systems environment. An application to be created for a customer specifically (not included in RPC SINUMERIK) must always be provided on the host computer side.

#### Selection and ordering data

Designation	Order No.
<b>RPC SINUMERIK</b>	
Communications software for linking to host computer on CD-ROM	
Languages: English, German	
• Single license for current software version	<b>6FC6000-7AC00-0AA0</b>
• Single license for specific software version	<b>6FC6000-7AC0■-■AA0</b>
• Single license without data carrier	<b>6FC6000-7AF00-0AB0</b>
• Upgrade on order of specific software version	<b>6FC6000-7AC0■-■AE0</b>

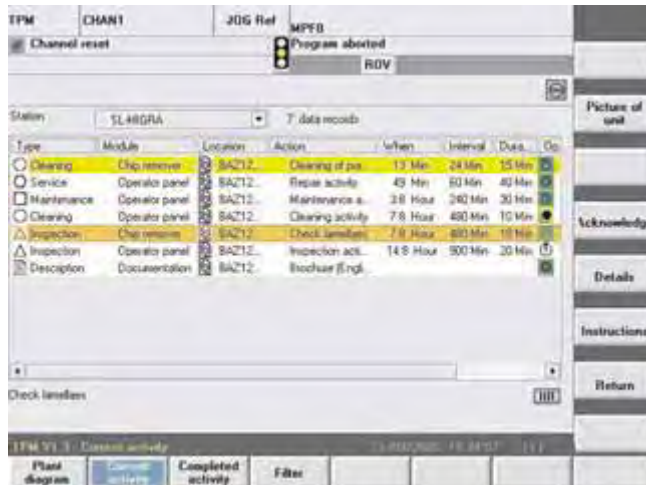
Example of specific software version, e.g. 2.0:  
6FC6000-7AC02-0A..

# HMI software for CNC controls

## Motion Control Information System MCIS

### TPM – Total Productive Maintenance

#### Overview



MCIS TPM provides support for cleaning, inspection, maintenance, and/or repair operations which have to be carried out on machines and plants. MCIS TPM can be used on all standard PCs, single or series-connected machines, e.g., machining centers, as well as in transfer lines and flexible production lines. The maintenance measures to be taken can be defined and administered by either the user or machine manufacturer.



#### Benefits

- MCIS TPM is a maintenance standard integrated into the CNC.
- Increased incorporation of machine operators into maintenance operations for machines and plants, thus reduced workload for maintenance departments with simple routine operations
- The machine operator becomes aware of the maintenance requirements of the machine
- Overview of all networked machines on a central PC in the supervisors office
- Reduction in paper documentation (paperless production) by including electronic documents and pictures on the machine
- Maintenance instructions integrated onto the control
- Optimization of total plant efficiency by striving for zero defect and zero breakdown production
- Single mode or networking with central database
- Maintenance measures can be coupled with PLC states or time intervals (e.g., filter change every 12 months or regularly after every 5 000 hours of operation)

#### Function

The traffic light symbol of the software module TPM (Total Productive Maintenance) reminds the operator of the machine or the maintenance engineer in the workshop in advance to perform or plan the necessary maintenance work.

After being prompted by the traffic light symbol, the machine operator can call up the appropriate brief instructions on the control and is thus integrated into the maintenance process.

The various modules are as follows:

##### TPM Machine

Single-user system for SINUMERIK with user interface and local data storage which can also be networked later with TPM Cell or in projects with TPM Plant. Licensing is for each machine.

##### TPM Cell

Acknowledgement, evaluation and data storage on a central PC. The number of machines that can be connected is restricted to a maximum of 16 machines with TPM IFC.

##### TPM IFC

The TPM user interface without a local database for SINUMERIK can only be used in combination with TPM Cell or in projects with TPM Plant. Licensing is for each machine.

##### TPM HMI

An additional TPM user interface on PCs in the production area for connection to TPM Cell or TPM Plant. Licensing is for each installation.

#### Integration

##### Preconditions:

- TPM Machine/TPM IFC: SINUMERIK 840D powerline with SINUMERIK PCU 50.3
- TPM HMI: Standard PC, Pentium III or later, at least 512 MB RAM with Windows XP Professional with appropriate capacities
- TPM Cell: Server operating system with the appropriate licenses (Windows 2003 Server) and a database, e.g., Microsoft SQL Server 2003, are also required.
- Mouse (useful for operation)

# HMI software for CNC controls

## Motion Control Information System MCIS

### TPM – Total Productive Maintenance

### RCS – Remote Control System

#### Selection and ordering data

Designation	Order No.
<b>TPM</b> Software package for maintenance Languages: Chinese Traditional, English, French, German, Hungarian, Italian, Russian, Spanish	
<b>TPM Machine for SINUMERIK PCU 50.3</b> <ul style="list-style-type: none"> <li>• Single license</li> <li>• Single license with CD-ROM of current software version</li> <li>• Single license with CD-ROM of specific software version</li> <li>• Upgrade TPM Machine Single license</li> </ul>	<b>6FC6000-1AF00-0AB0</b> <b>6FC6000-1AC00-0AAA</b> <b>6FC6000-1AC0■-■AA0</b> <b>6FC6000-1AC02-1AF0</b>
<b>TPM Cell for Windows-based PC</b> <ul style="list-style-type: none"> <li>• Single license</li> <li>• Single license with CD-ROM of current software version</li> <li>• Single license with CD-ROM of specific software version</li> </ul>	<b>6FC6000-1BF00-0AB0</b> <b>6FC6000-1BC00-0AAA</b> <b>6FC6000-1BC0■-■AA0</b>
<b>TPM IFC for SINUMERIK PCU 50.3</b> <ul style="list-style-type: none"> <li>• Single license</li> <li>• Single license with CD-ROM of current software version</li> <li>• Single license with CD-ROM of specific software version</li> </ul>	<b>6FC6000-1EF00-0AB0</b> <b>6FC6000-1EC00-0AAA</b> <b>6FC6000-1EC0■-■AA0</b>
<b>TPM HMI for Windows-based PC</b> <ul style="list-style-type: none"> <li>• Single license</li> </ul>	<b>6FC6000-1DF00-0AB0</b>
<b>TPM demo version</b> <ul style="list-style-type: none"> <li>• Trial license TPM Machine or TPM Cell with CD-ROM, current software version</li> </ul>	<b>6FC6000-1AC00-0AT7</b>

Example of specific software version, e.g., 2.1:  
6FC6000-1AC02-1A..

#### Overview



Using the RCS Host and RCS Viewer or RCS Remote Diagnostics software, you are able to service your machinery remotely from a central service point. This means:

- Less frequent service calls for the machines
- More efficient deployment of on-site service personnel
- Better preparation of service calls

Machine availability is enhanced thanks to:

- Rapid online presence on site
- Conference calls involving several specialists
- Rapid data transfer to and from the machine

# HMI software for CNC controls

## Motion Control Information System MCIS

RCS – Remote Control System  
RCS Host/RCS Viewer

### Overview



#### Remote diagnostics for SINUMERIK with Windows-based HMI

RCS Host and RCS Viewer software facilitates remote maintenance of machines with HMI-Advanced. Remote maintenance functions include the complete remote control of all user interfaces, exchange of files between systems as well as remote administration for network administrators.

The Host software is already included on the Windows-based PCUs on delivery. The function can be ordered separately for each SINUMERIK operator panel.

The RCS Viewer software is installed on the PC in the service center.

### Benefits

Cost savings in service thanks to:

- Less frequent service calls for the machines
- More efficient deployment of on-site service personnel
- Better preparation of service calls

Machine availability is enhanced thanks to:

- Rapid online presence on site
- Conference calls involving several specialists
- Rapid data transfer to and from the machine

### Function

- Request for remote diagnostics support by e-mail
- Automatic establishment of Internet connection
- Status display on the operator panel and in the PLC
- Connection control via the PLC

As well as Symantec pcAnywhere basic functions, e.g.:

- Remote control, monitoring and administration
- Transfer of files including file synchronization
- Session recording
- Exchange of text information (chat)
- Event logging
- Remote working, local printing
- Simultaneous connections on Viewer possible
- Multiplex configuration with several Viewers and one host
- Effective security concept to prevent unauthorized access (login and password, operator approval, or callback to a previously defined connection)

### Integration

The components can be connected via:

- Ethernet in local networks (LAN)
- Wide Area Networks (WAN)
- Internet (VPN)
- Point-to-point connection (analog, ISDN modem)

Preconditions:

- RCS Viewer
  - PCs with Windows XP Professional operating system and network or modem connection
- RCS Host
  - SINUMERIK control
  - HMI-Advanced software version 6.3.15 and higher

### Selection and ordering data

Designation	Order No.
<b>RCS Host for SINUMERIK 810D powerline/ 840D powerline</b> Software option Single license	<b>6FC6000-6AF00-0BB0</b>
<b>RCS Viewer for PC/PG</b>	
• Single license	<b>6FC6000-6DF00-0BB0</b>
• Single license with CD-ROM of current software version	<b>6FC6000-6DC00-0BA0</b>
• Single license with CD-ROM of specific software version	<b>6FC6000-6DC01-1BA0</b>

Example of a specific software version, e.g. 1.1:  
6FC6000-6DC01-1BA0

# HMI software for CNC controls

## Motion Control Information System MCIS

RCS – Remote Control System  
RCS Host/RCS Viewer Embedded

### Overview



#### Remote diagnostics integrated into NCU software

RCS Host and RCS Viewer Embedded software facilitates remote maintenance of machines with HMI-Embedded. Remote maintenance functions include complete remote control, exchange of files between the machine and communications partner as well as remote administration for network administrators.

The RCS Host option can be activated using machine data in combination with a license.

The RCS Viewer Embedded software is installed from CD-ROM onto a Windows-based PC in the service center.

### Benefits

Cost savings in service thanks to:

- Less frequent service calls for the machines
- More efficient deployment of on-site service personnel
- Better preparation of service jobs

Machine availability is enhanced thanks to:

- Rapid online presence on site
- Conference calls involving several specialists
- Rapid data transfer to and from the machine

### Function

- Remote control
- Remote monitoring
- Remote administration
- File transfer

### Integration

The components can be connected via:

- Ethernet in local networks (LAN)
- Wide Area Networks (WAN)
- Internet (VPN)

Preconditions:

- RCS Viewer Embedded
  - PC with Windows XP Professional operating system and Ethernet network interface connection
  - Optional: VPN router for reliable, secure access to the Internet or company networks (Cisco 801/803 was tested)
- RCS Host
  - SINUMERIK PCU 20 with HMI-Embedded from software version 6.4
  - Option for managing up to 4 additional network drives
  - Optional: VPN router for reliable, secure access to the Internet or company networks (Cisco 801/803 was tested)

### Selection and ordering data

Designation	Order No.
<b>RCS Host Embedded for SINUMERIK PCU 20</b> Software option Single license	<b>6FC6000-6AF88-8BB0</b>
<b>Network/floppy disk drive management for PCU 20</b> Software option for file transfer Single license with Network Manager CD	<b>6FC5253-0AE01-0AA0</b>
<b>RCS Viewer Embedded for PC/PG</b>	
• Single license	<b>6FC6000-6DF88-8BB0</b>
• Single license with CD-ROM of current software version	<b>6FC6000-6DC80-0BA0</b>
• Single license with CD-ROM of specific software version	<b>6FC6000-6DC81-1BA0</b>

Example of a specific software version, e.g. 1.1:  
6FC6000-6DC81-1BA0..



# HMI software for CNC controls

## Motion Control Information System MCIS

### ADDM – Data Management

#### Overview



With ADDM, you are completely in control of the SIMATIC and SINUMERIK controls – around the clock and with any program version. This tool is indispensable in a modern production area and ensures user-friendly backup, comparison and management of control data.

#### Benefits

- **Absolute clarity in data management**  
With ADDM, everything executes on a uniform user interface – all types and formats of CNC, PLC and configuration data right through to system software. The tool offers unambiguous access authorizations and intuitive handling. The directory structure is always in line with the physical production layout, even complex systems can be understood at a glance.
- **Secure and flexible management of distributed control concepts**  
ADDM can be flexibly used for every client/server and online storage system as well as for stand-alone machines. This means: Central data storage with maximum fault tolerance and availability as well as efficient archiving of all machine data. Thus: Fast feedback of the required version, if required. Checked, controlled, and documented archiving when several persons are working in parallel.
- **Minimize downtimes**  
You can rely on ADDM every time. Even when control components have to be replaced, for example. ADDM makes all the data available again immediately. With one click, without time-consuming reparameterization and configuration, whether for individual programs or complete hard disk partitions, you will have the right data in the right place.

#### Function

##### *Controls fully mastered – across all program versions*

Backup can be time-driven, fully-automatic or manual. The data are available at all times and can be used for fast, simple disaster recovery in the event of a fault.

##### *System-active checking*

If, for example, data changes become obvious in an online-offline comparison, automatic backup can take place and/or the change can be notified by e-mail.

##### *Hot version backups*

The required version can be called up immediately from up to 99 backups (regardless of archive versions).

##### *Total transparency and overview*

The practice-oriented structure is ideal not only for highly-complex control systems but also for non-networked single machines – with a uniform user interface for all data types and formats. Checked, controlled and documented archiving when several persons are working in parallel.

#### Function (continued)

##### *Totally Integrated Automation (TIA)*

ADDM has a unique way of managing your data uniformly in production.

##### *Optimum availability*

Reliable backup of all system and configuring data, including documentation and circuit diagrams, can be carried out manually or automatically with time control – for made-to-measure distributed control concepts.

##### *Easy to handle*

No programming knowledge required – so no need for special training courses. With the use of communication modules, data can also be exchanged conveniently with controls via the MPI/PROFIBUS interface on TCP/IP.

##### *Contiguous archiving*

The machine data are fully versioned and archived and can be copied back at any time. This also includes the documentation.

##### *Operator-free data backup using the ADDM Agent*

Data backup of SINUMERIK controls can be time-driven or manual, without installing a user interface, using the ADDM Agent. The backup, load and compare functions can be performed remotely using the ADDM Client.

#### Selection and ordering data

Designation	Order No.
<b>ADDM</b> Software package Languages: English, German	
<b>ADDM Single User</b>	
• Single license with CD-ROM of current software version	<b>6BQ3030-1AA30-3AC0</b>
• Trial license with CD-ROM of current software version	<b>6BQ3030-1AA70-3AC0</b>
• Single user upgrade	<b>6BQ3030-1AB13-3AC0</b>
<b>ADDM Client</b>	
• Single license without data carrier	<b>6BQ3030-1AA20-1AC0</b>
• Single license with CD-ROM of current software version	<b>6BQ3030-1AA10-0AC0</b>
• Client upgrade from V5.x to V6.1 with CD-ROM	<b>6BQ3030-1AB11-3AC0</b>
<b>ADDM Server</b>	
• Single license with CD-ROM of current software version	<b>6BQ3030-1AA00-3AC0</b>
• Server upgrade from V5.x to V6.1 with CD-ROM	<b>6BQ3030-1AB10-3AC0</b>
<b>ADDM Agent</b>	
• Single license without data carrier	<b>6BQ3030-1AA00-1AB0</b>
• Single license with CD-ROM of current software version	<b>6BQ3030-4AA00-0AC0</b>
• Agent upgrade from V1.x to V1.2 with CD-ROM	<b>6BQ3030-1AB12-3AC0</b>

#### More information

Additional information is available in the Internet under:



[www.siemens.com/addm](http://www.siemens.com/addm)

# HMI software for CNC controls

## ePS Network Services

### Overview



ePS Network Services – the Internet-based services offered by Siemens – not only provide support for maintenance procedures, but also create a platform for inter-company servicing and support processes. All services are geared to improving the productivity and availability of machines and can be accessed immediately and globally via secure Internet connections. All services are easy to configure on the ePS servers via PC from anywhere in the world. Typical examples of these services are remote access to control systems, optimized fault diagnostics with trace functions, monitors and data services (comparison and archiving of data) and trend analyses on machine components for status-specific maintenance.

Machine manufacturers and other service providers are able to develop and market (retrospectively if necessary) product-related services through ePS Network Services. This allows innovative potentials to be used to achieve better integration into the service and support processes of the machine operator. Remote configuration, operation and monitoring make it possible to localize and analyze faults without implementing logic in the control system. Data can be archived and compared. Test and measuring procedures are available to the manufacturers of machine tools and their maintenance departments as well as trend analyses for continuous evaluation of the status of the machines. Siemens Customer Support can also provide you with support using ePS Network Services.

Assisted by ePS Network Services, you can remain focused on your core competence. Siemens is offering you innovative services, today and for the future, which will give you invaluable support with fault diagnostics, prognostic maintenance and process optimization. These services will enable you to increase the efficiency of your servicing and maintenance procedures, minimize machine downtimes by scheduled maintenance, improve reliability and boost the performance of your machinery.

#### *The business model – Application Service Provider*

- No investment costs for IT infrastructure and software
- No administration overhead required for hardware and software
- Functionality and infrastructure can be leased instead of purchased

#### *The platform*

- Standardized communication platform, standardized protocol used worldwide
- Reduced load on control system
- Central data management and secure access thanks to defined user rights, access protection and data encryption
- Highest security measures

### Benefits

- Remote access and detailed information are available worldwide to support fast fault localization and targeted fault analysis.
- Faults are rectified faster, resource deployment is optimized and costs (TCO) are therefore reduced.
- Prognostic maintenance minimizes unplanned downtimes as well as maintenance costs thanks to the optimized disposition of spare parts.
- Secure communication in harmony with IT guidelines is facilitated.

### Function

ePS Network Services provide functions for remote control, notification of events (e.g., faults), and condition-oriented maintenance over the Internet.

#### *Remote access*

- Desktop control
- File transfer
- Chat
- Video

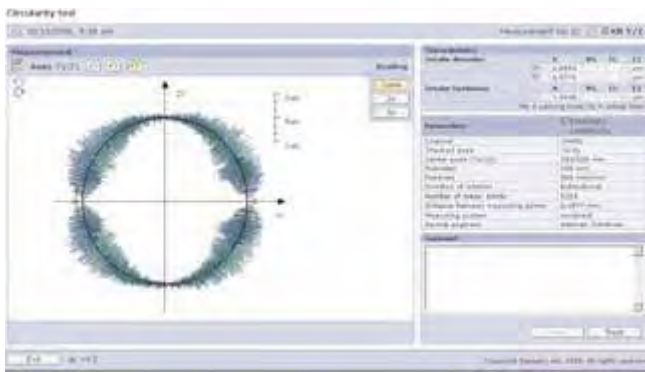
#### *Control Monitor Services*

Recording of an event history with documentation of individual states prevailing when the event occurred. This allows the status of the device to be analyzed and compared with earlier states should a fault occur. The current status of the machine is documented using the following events and data:

- Alarms, PLC variables, CNC variables, time intervals, combinations of these events
- Limit value violation from CNC and PLC variable recordings, measurement/test series and performance monitors
- Manual help request by the machine operator in the event of faults
- HMI action log, machine data, CNC status data
- PLC trace, PLC data blocks
- Any files (e.g., log files) of the control
- Interval evaluations of CNC and PLC variables for individual responses

### Function (continued)

#### Condition Monitoring Services



Circularity test

Measurement and documentation of the current machine status on the basis of predefined, standardized tests and continuous recording of status parameters (traverse path, traverse time, and traverse operations for one axis). The test parameters can be defined centrally and configured with appropriate warning limits. Using series of measurements, it is also possible to identify trends and apply them as a basis for optimizing maintenance and service activities. The machine operator can then carry out these predefined tests quickly and easily and without additional test equipment.

The following tests and monitors are available:

- Circularity test
- Synchronized axes test and universal axis test
- CNC monitor and PLC monitor

These functions can be set up when the machine is assembled or at a later time.

#### Data Services

Save the current control archives (NCK and PLC archives) on the ePS Server. They can later be reimported into the control in a controlled manner and used as reference for comparisons.

#### Workflow Services

Triggering of service and maintenance processes by notification via media that are internal and external to the system (text message, e-mail, service cases). Planning, monitoring, and documentation of maintenance activities on the machine. Maintenance plans permit:

- Load- and consumption-based predictive maintenance
- Automatic triggering of work processes when faults are detected
- Planning of the schedule and contents of condition monitors and monitoring of their execution

The Workflow Services can respond to all event sources of the Control Monitor Services and Condition Monitoring Services.

#### Administration Services

Functions for the administration of the system:

- Creation and administration of machines
- Creation and administration of users
- Assignment of access rights for external organizations
- Access to useful data/invoices
- Creation of copies of fully configured machines

### Integration

Preconditions:

- SINUMERIK 810D powerline/840D powerline with SINUMERIK PCU 50.3
- Internet access

### Selection and ordering data

Designation	Order No.
<b>ePS Network Services</b> Initial order for utilizing the services for each service organization	<b>6FC6001-0EE00-0AM8</b>
<b>ePS Value Account 1000Cr</b> Utilization credit for ePS Network Services 1000 credits	<b>6FC6001-0EE00-0AF8</b>

### More information

When you order ePS Network Services, you will be able to access its functions for your service organization. The prices of individual services per machine plus pay-as-you-use elements will be charged against your credit balance each month. You can top up your credit balance at any time by ordering ePS Value Account. The general conditions for Application Service Providing (ASP) of Siemens AG, Automation and Drives, apply.

Additional information is available in the Internet under:



[www.siemens.com/sinumerik/eps](http://www.siemens.com/sinumerik/eps)

# HMI software for CNC controls

## Tools

### SIMATIC STEP 7 for SINUMERIK hardware

#### Overview

The SIMATIC STEP 7 software for service functions can be used to read status and service displays of the CPU via the PLC program without the need for an additional programming device and to integrate new modules.

The software is designed for service functions. The conditions of the SINUMERIK supply contract apply.

Existing service packs for SIMATIC STEP 7 are released separately for STEP 7 on PCU.

#### Integration

SIMATIC STEP 7 can be used on:

- SINUMERIK PCU 50.3

Preconditions:

- Mouse and PC keyboard
- Operating system Windows XP SP1 for SIMATIC STEP7 V5.3
- Operating system Windows XP SP1 or SP1a for SIMATIC STEP7 V5.3 SP1
- Operating system Windows XP SP1 or SP2 for SIMATIC STEP7 V5.3 SP2

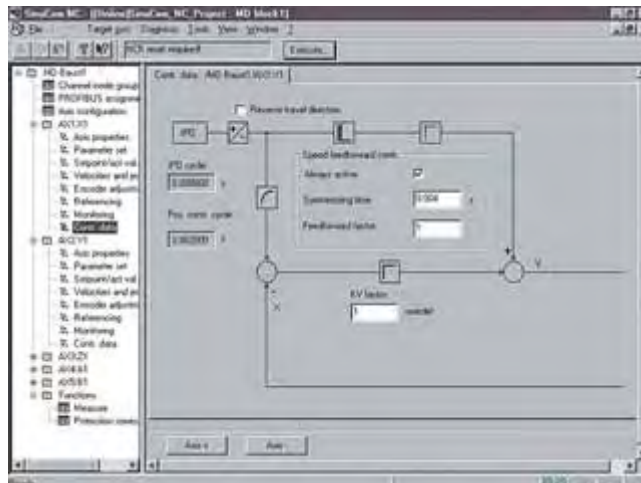
#### Selection and ordering data

Designation	Order No.
<b>SIMATIC STEP 7 for SINUMERIK hardware</b>	
• Single license without data carrier	<b>6FC5252-0AY00-0AG1</b>
• Single license with CD-ROM of current software version	<b>6FC5252-0AY00-0AG0</b>
• Single license with CD-ROM of specific software version	<b>6FC5252-<span style="background-color: #000080; color: white;">AY01</span>-<span style="background-color: #000080; color: white;">AG0</span></b>

Example of specific software version, e.g., 5.3:  
6FC5252-5.....3...

### SinuCom

#### Overview



The SinuCom program package consists of:

- SinuCom NC
  - SinuCom NC Trace
  - SinuCom NC SI
- SinuCom FFS
- SinuCom ARC
- SinuCom PCIN
- Startup software for SINAMICS S120/SIMODRIVE 611 digital

This program package supports simple and effective startup of SINUMERIK 810D powerline/840D powerline controls on CNC machines.

The included programs provide comprehensive support during the startup of machines, including the use of the Trace functionality, during the Safety Integrated acceptance test, in generating CF-card images, in the management of serial startup data, and for the transmission of CNC user data.

The programs are designed mainly for use by the startup and service personnel of original equipment manufacturers (OEMs).

#### Function

##### *SinuCom NC*

The SinuCom NC program enables SINUMERIK 810D powerline/840D powerline controls to be started up easily using:

- Dialog-based parameterization of machine data
- Management of series machine startup files
- Integrated online help for functions, machine data and alarms
- Functional description in German and English as PDF (part of the online help)

Preconditions:

- Windows XP operating system
- SINUMERIK 810D powerline software version 3.3 and higher, SINUMERIK 840D powerline software version 5.3 and higher
- Mouse

**Function** (continued)**SinuCom NC Trace**

The SinuCom NC Trace function is used for the dynamic recording of CNC, PLC and HMI variables, and of drive signals that are available via the CNC. These variables can be displayed, printed out or stored in a file, similar to using an oscillograph or logic analyzer. The SinuCom NC Trace function provides support in:

- Fault detection and fault correction
- Machine performance analysis, benchmarking and tuning
- Process performance analysis, benchmarking and tuning

Preconditions:

- Windows XP operating system
- SINUMERIK 810D powerline/840D powerline 6.4.15 and higher and HMI-Advanced 6.3.15 and higher (variables of the CNC, PLC, HMI and drive)
- Mouse

**SinuCom NC SI**

The SinuCom NC SI function is used to automate the Safety Integrated acceptance test, it supports the original equipment manufacturer (OEM), and optimizes the process:

- Verification of machines in accordance with EU Machinery Directive EN 954-1 (control category 3)
- Testing of safety functions (partly automated) during the machine acceptance
- Logging of measured data and test results incl. Trace function records
- Testing of single/special-purpose machines, machine components (as a partial test) and series machines as series startup
- Shorter startup times since, in the new acceptance mode, power-on alarms during the acceptance test are acknowledged by RESET
- User-friendly operation due to controlled execution and the automatic configuration of the Trace functions
- Unambiguous quality verification for original equipment manufacturers as well as customers and for dealings with government agencies

Preconditions:

- Windows XP operating system
- SINUMERIK 840D powerline 6.4.15 or higher and HMI-Advanced 6.3.15 or higher
- Mouse

**SinuCom FFS**

The SinuCom FFS program is used to generate an image for the PC card of the CCU/NCU of SINUMERIK 810D powerline/840D powerline. It contains:

- Processing of the flash file system
- Preparing the image for programming the PC card
- Integrated help

The PC card is programmed using standard tools. These tools are not included in SinuCom FFS.

Preconditions:

- Windows ME/NT 4.0/XP operating system
- SINUMERIK 810D powerline/840D powerline

When copying the software, be sure to follow the I DT software marketing guidelines!

**Function** (continued)**SinuCom ARC**

The SinuCom ARC program simplifies the processing of series startup files:

- Reading, deleting, inserting and changing series startup files
- Integrated help

Preconditions:

- Windows ME/NT 4.0/2000/XP operating system

**SinuCom PCIN**

The SinuCom PCIN program is used to send and receive CNC user data, such as machine data and part programs, via the serial interface between a PC/PG and a Siemens control. It contains:

- Setting up and interrogating V.24 interface
- Editing archive files
- Storing files from directories individually
- Secure data transmission
- Integrated help

Preconditions:

- Windows 95/98/ME/NT 4.0/2000/XP operating system
- SINUMERIK 810D powerline/840D powerline

Secure data transmission is supported by HMI-Advanced version 6.1.05 or higher.

**Startup software for SINAMICS S120/SIMODRIVE 611 digital**

The startup software for PCs/programming devices can be used to optimize first-time starting of drives with SINAMICS S120/SIMODRIVE 611 digital if HMI-Advanced user interface software is not available.

Preconditions:

- Windows XP operating system

**Selection and ordering data**

Designation	Order No.
<b>SinuCom Startup/service tools</b>	
SinuCom NC (incl. SinuCom NC Trace, SinuCom NC SI), SinuCom FFS, SinuCom CFS, SinuCom ARC, SinuCom PCIN startup software for SINAMICS S120/SIMODRIVE 611 digital	
Languages: English, French, German, Italian, Spanish Documentation: English/German	
• Single license without data carrier	<b>6FC5250-0AY00-0AG1</b>
• Single license on DVD-ROM of current software version	<b>6FC5250-0AY00-0AG0</b>
• Single license on DVD-ROM of specific software version	<b>6FC5250-7AY00-■AG0</b>
• Software update service	<b>6FC5250-0AY00-0AG2</b>
• Update on DVD-ROM on order of specific software version	<b>6FC5250-7AY00-■AG3</b>

Example of specific software version, e.g., 7.5:  
6FC5250-7....-5...



# HMI software for CNC controls

## SINUMERIK Solution Partners

Solution Partners Automation  
Machine Tools SINUMERIK

### Overview

What is meant by Solution Partner in the context of Motion Control Machine Tools?

- The basis of business relations between an external solution provider/service provider and Siemens is a mutual agreement. Once this contract has been concluded and signed, the external solution provider/service provider has the right to call himself a Solution Partner.
- An MT SINUMERIK Solution Partner develops solutions (hardware and/or software) for use in Motion Control.
- An MT SINUMERIK Solution Partner product does not compete with Siemens Motion Control products, but rather supplements them.
- The Solution Partner is himself responsible for the development, sales, delivery, warranty, and service of his MT SINUMERIK Solution Partner products.

MT SINUMERIK Solution Partners use their special expertise to supplement the open SINUMERIK control with specific special functionalities. MT SINUMERIK Solution Partners have backgrounds in many different sectors and technologies – say hello to the partners of the future.

### More information

Additional information is available in the Internet under:



[www.siemens.com/sinumerik/solutionpartner](http://www.siemens.com/sinumerik/solutionpartner)

Or contact:

#### Siemens AG

Industry Sector

I DT MC MT P 3

Mr. Yalcin Delioglan

Phone: +49 (0) 9131-98-3173

Fax: +49 (0) 9131-98-63173

E-mail: [yalcin.delioglan@siemens.com](mailto:yalcin.delioglan@siemens.com)

<i>Solutions of the certified MT SINUMERIK Solution Partners</i>	Page
<b>ARTIS GmbH</b> Tool and process monitoring	4/46
<b>Comara KG</b> Intelligent feedrate control	4/46
<b>Gibbs and Associates</b> Graphic programming package 2½D for the workshop	4/47
<b>Hofmann GmbH &amp; Co. KG</b> EMB 7000 ring balancer	4/47
<b>IBE Software GmbH</b> Shopfloor-oriented cutting applications	4/48
<b>m&amp;h Inprocess Messtechnik GmbH</b> 3D workpiece measurement	4/48
<b>MARPOSS S.p.A.</b> Laser tool inspection	4/49
<b>Mitutoyo Messgeräte GmbH</b> Evaluation software for the feedback of measuring data	4/49
<b>Montronix GmbH</b> Tool and process monitoring	4/50
<b>Müller IT &amp; VIDEO GmbH</b> Teleservice with video	4/50
<b>OMATIVE Systems</b> Real-time feedrate optimization	4/51
<b>Renishaw Plc.</b> Non-contact tool inspection	4/51
<b>PROMETEC GmbH</b> PROMOS 2	4/52
<b>PROMETEC GmbH</b> PROSIN	4/52
<b>PROMETEC GmbH</b> ACfeed	4/53
<b>PROMETEC GmbH</b> MCI – Machine Condition Indicator	4/53
<b>Sequoia IT s.r.l.</b> Collision and vibration monitoring	4/54
<b>Visual Components Oy</b> ILP – safe CNC programming	4/54
<b>Walter DITTEL GmbH</b> Balancing and process monitoring systems	4/55

# HMI software for CNC controls

## SINUMERIK Solution Partners

**ARTIS GmbH**  
Tool and process monitoring

**Comara KG**  
Intelligent feedrate control

### Overview



#### Tool and process monitoring system

The autonomous CTM system (Computer integrated Tool and Machine monitoring) from ARTIS can be integrated into the CNC and is used to monitor tools, machines, and processes.

#### Benefits:

- Fast integration resulting from minimized hardware and field-bus technology
- Simple, fast installation of software
- No additional wiring with the sensor-free solution
- 4 independent monitoring channels on one CTM card
- Autonomous mode of operation, thus minimum load on the control
- System and sensors from a single source

Operator control of CTM as well as visualization can be integrated into the user interface of the CNC. Operation is clear, informative and easy to master following a short period of training.

Tool monitoring prevents the production of faulty parts or the occurrence of other damage resulting from worn, broken, or missing tools. Bearing damage on motor spindles, tool unbalance and collisions are detected by the machine monitoring functions. The functions for process monitoring are responsible for observation of quality criteria, for example, the tolerances of tap-drill sizes and thread depths.

### More information

Please contact:

#### ARTIS Gesellschaft für angewandte Messtechnik mbH

Contact Sales and Marketing: Mr. Volker Meyer  
Contact Engineering: Dr. Dirk Lange

Sellhorner Weg 28-30  
29646 BISPINGEN-BEHRINGEN  
Germany

Phone: +49 (0) 5194-950-0  
Fax: +49 (0) 5194-7825  
E-mail: meyer@artis.de  
E-mail: lange@artis.de  
[www.artis.de](http://www.artis.de)

### Overview



#### Intelligent feedrate control

The intelligent software solution iCut tracks the stock removal process and intervenes automatically when required.

iCut measures the spindle output up to 500 times per second and adjusts the feedrate automatically to the current cutting conditions. Variations in allowance or cutter contact angle, different depths of cut, increased hardness or tool wear - the feedrate is as fast as possible, but as slow as necessary. The ideal feedrate in any situation. With a unique response time.

iCut always calculates on the basis of the programmed feedrate, which corresponds to 100 %. From the load values measured on the tool, iCut computes the ideal feedrate for the prevailing cutting conditions and increases or reduces the feedrate fully automatically (e.g., 70 % or 120 %).

#### Benefits:

- Production time savings combined with high process stability.

### More information

Please contact:

#### Comara KG

Contact: Mr. Markus Gruber

Industriestraße 21  
78112 ST. GEORGEN/SCHWARZWALD  
Germany

Phone: +49 (0) 7724-9158-0  
Fax: +49 (0) 7724-9158-10  
E-mail: [info@comara.de](mailto:info@comara.de)  
[www.comara.de](http://www.comara.de)



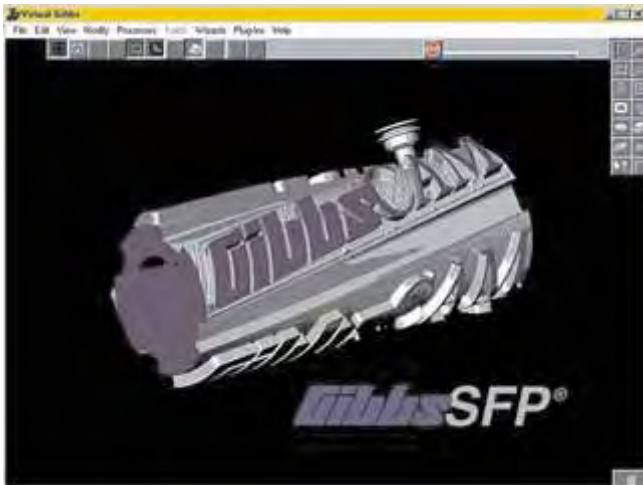
# HMI software for CNC controls

## SINUMERIK Solution Partners

Gibbs and Associates  
Graphic programming package

Hofmann GmbH & Co. KG  
EMB 7000 ring balancer

### Overview



#### Graphic programming package 2½D for the workshop

Gibbs and Associates offers a 2½D milling programming package for the workshop. The graphical, interactive user interface permits easy operation on the machine.

The programmed contours can be displayed in a powerful volume simulation prior to machining. Similar workpieces from parts families can be rapidly produced using parametrics and associativity. The programs are 100 % exchangeable with all CNCs with GibbsSFP.

### More information

Please contact:

#### Gibbs and Associates

Contact: Mr. John Sare

323 Science Drive, Moorepark  
USA-93021 California

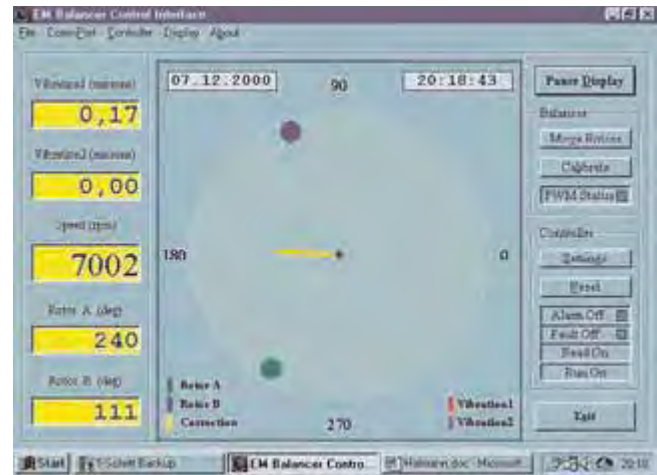
Phone (USA): +1 80 55 23 00 04  
Fax (USA): +1 80 55 23 00 06  
E-mail: [jsare@gibbscam.com](mailto:jsare@gibbscam.com)

Representation in Germany:

Wingenbach & Pickhardt GmbH

Phone: +49 (0) 2122-541610  
Fax: +49 (0) 2122-541611  
[www.gibbscam.com](http://www.gibbscam.com)

### Overview



#### EMB 7000 ring balancer

The EMB 7000 ring balancer is simply a revolutionary solution. The vibrations caused by unbalance on rotating systems will be actively eliminated during rotation within a fraction of a second. Two unbalanced disks are permanently fixed onto the tooling spindle via thin ring bearings. A fast intelligent controller determines the unbalance in the spindle using sensors, computers and controls the two disks into the optimum position to compensate for the unbalance. Both disks are quickly shifted electromagnetically by the stators into the estimated positions.

#### Benefits:

- Operates at spindle speeds up to 51 000 rpm
- Positioning of the compensation rings within fractions of a second also during the non-stationary acceleration phase
- Spindle monitoring systems
- 2-plane-balancing

### More information

Please contact:

#### Hofmann Mess- und Auswuchttechnik GmbH & Co. KG

Contact Sales and Marketing: Dr. Axel Rückert

Werner-von-Siemens-Straße 21  
64319 PFUNGSTADT  
Germany

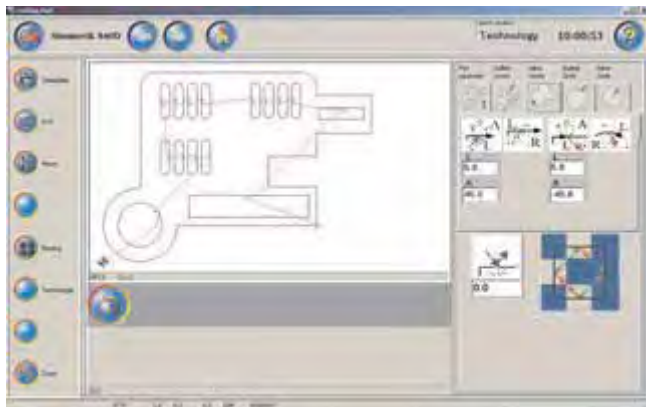
Phone: +49 (0) 6157-949-0  
Fax: +49 (0) 6157-949-120  
E-mail: [vertrieb@hofmann-balancing.com](mailto:vertrieb@hofmann-balancing.com)  
[www.hofmann-balancing.com](http://www.hofmann-balancing.com)

# HMI software for CNC controls

## SINUMERIK Solution Partners

**IBE Software GmbH**  
Shopfloor-oriented cutting applications

### Overview



#### Shopfloor-oriented cutting applications

With cncCUT, CNC programs can be created directly on the CNC control quickly and easily without the need for specialist knowledge.

The geometry is based on various graphical formats, including DXF. Different geometrical shapes can also be created directly at the machine using ready-made macros based on dimension parameters. The system automatically creates the cutting paths, complete with first cuts, but they can be modified manually.

By entering the number of parts, nesting is performed based on the shortest traversing paths with subsequent creation of the CNC program. The saved nesting diagrams can be called again at any time and executed. Technologies, such as different velocities, can be stored in a reference and can be assigned automatically according to material and thickness.

#### More information

Please contact:

##### IBE Software GmbH

Contact: Mr. Gustav Evers

Friedrich-Paffrath-Straße 41  
26389 WILHELMSHAVEN  
Germany

Phone: +49 (0) 4421-994357

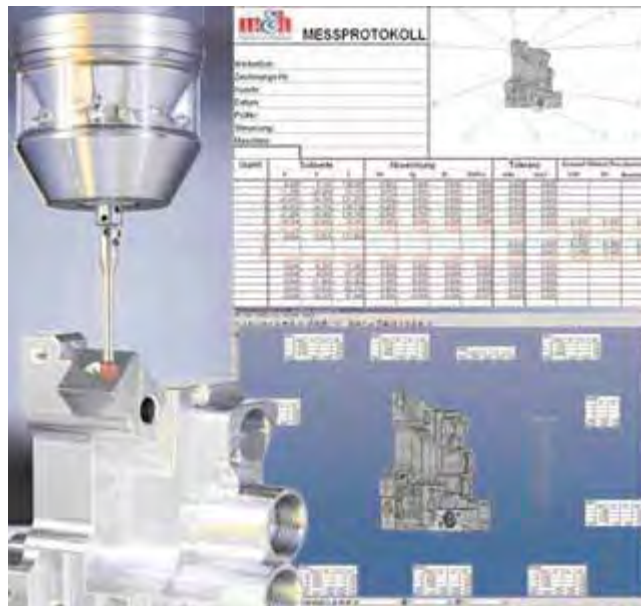
Fax: +49 (0) 4421-994371

E-mail: [info@ibe-software.de](mailto:info@ibe-software.de)

[www.cnccut.org](http://www.cnccut.org)

**m&h Inprocess Messtechnik GmbH**  
3D workpiece measurement

### Overview



#### 3D Form Inspect Software – Workpiece measurement

*The high-speed 3D control solution for tool and mold makers supporting workpiece measuring directly on the machine tool.*

##### Benefits:

- 3D form control on the machine tool
- Cost savings – no need for a measuring machine
- Reworking possible because measuring takes place on the machine tool while the part is still clamped in position
- Time saving, there is no need to move the part to measuring machine

3D Form Inspect Software overview:

- Free-form surfaces can be measured at any angle on the machine tool
- Touch trigger points can be selected easily just by clicking with the mouse on the PC
- Easy to use, no need for special measuring knowledge
- Graphic evaluation on the screen or via report generator on printer
- Available for SINUMERIK controls

High precision in combination with high precision m&h probes and a laser-calibrated machine tool with linear scales is accessible. Many companies have been using our proven, trend-setting probes for more than a decade. High-precision probes from m&h ensure secure radio/infrared transmission with optimum receiving technology, reliable activation, operation tailored for a workshop, durability, and the highest degree of precision.

#### More information

Please contact:

##### m&h Inprocess Messtechnik GmbH

Contact: W. Madlener

Am Langholz 11  
88289 WALDBURG  
Germany

Phone: +49 (0) 7529-9733-0

Fax: +49 (0) 7529-9733-7

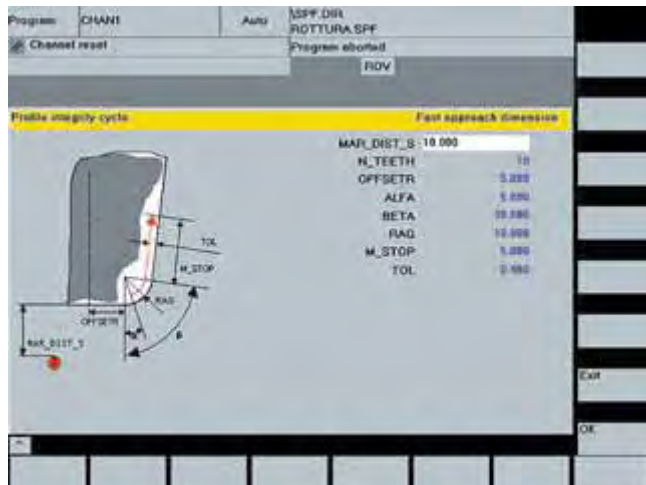
E-mail: [vertrieb@mh-inprocess.com](mailto:vertrieb@mh-inprocess.com)

[www.mh-inprocess.com](http://www.mh-inprocess.com)

### MARPOSS S.p.A. Laser tool inspection

### Mitutoyo Messgeräte GmbH Evaluation software

#### Overview



#### Software for Marposs spindle measurements, monitoring of contact tools and laser tool monitoring on machine tools

Measuring cycles for part and tool measuring cycles with Marposs Mida measuring heads and Mida lasers. Easy programming thanks to the special user interface. All the necessary measurements can be performed on the part and on the tool for rapid setup of the machine, high-speed monitoring of the part before and after the machining cycle as well as continuous monitoring of the safe range of stress.

#### Tool measurements with Mida laser:

- Tool status and breakage
- Measuring the length and diameter of the tool
- Checking and updating the length and diameter of the tool
- Checking the condition of the cutting profile of the tool
- Measuring and updating the cutting radius and determining the deflection range
- Compensating the thermal deviation of the machine axes

#### Part measurements with Mida spindle measuring heads:

- Protected positioning of the measuring head
- Measuring of drilled holes, pins, pockets and shoulders
- Single surface measurement
- Measuring the internal and external cross-arm

#### More information

Please contact:

#### MARPOSS S.p.A.

Contact:  
Sales and Marketing: Dipl. Ing. Horst Peipers  
Engineering: Dipl. Ing. (FH) Georg Schulte-Hubbert

Mercedesstraße 10  
71384 WEINSTADT  
Germany

Phone: +49 (0) 7151-2054151  
Fax: +49 (0) 7151-2054552  
E-mail: horst.peipers@de.marposs.com  
E-mail: georg.schulte-hubbert@de.marposs.com

International contact: Andrea Turrini

MARPOSS S.p.A. – via Saliceto 13  
40100 Bentivoglio BO – Italy  
Phone: +39 05 18 99 25 3  
Fax.: +39 05 18 99 95 0  
E-mail: andrea.turrini@marposs.com  
[www.marposs.com](http://www.marposs.com)

#### Overview



#### Evaluation software for the feedback of measuring data

The Correct Plus evaluation software ensures the fast feedback of measuring data to machining centers when integrated in the user interface of the CNC control. It makes the immediate online correction of machining data, which are received continuously or as samples by a coordinate measuring device, possible. Online correction can include each individual feature, e.g., the position and diameter of drilled holes.

#### Benefits:

- Integration of the calculated correction values into the correction database of the machine tool
- Production of the subsequent workpiece with corrected data due to the immediate transfer of the modified work program to the machine control unit
- Cost-saving shortening of the run-in times of new process sequences
- A.S.A.P. change-over of 100 % measurements to inspections on the basis of samples due to an extremely quick stabilization of run-in times
- Automatic analysis of measurement results, calculation of new set values, and direct creation of correction databases without time losses
- Clear improvement of process security thanks to error reduction, since the corrections are always performed in the direction of the nominal value
- Considerable reduction in scrap, since possible fabrication defects do not cumulate all the time, but can be corrected directly on the next workpiece to be processed
- Full automation of process sequences via optional software
- Executes under Windows 98/NT 4.0/2000/XP

#### More information

Please contact:

#### Mitutoyo Messgeräte GmbH

Contact: Mr. Ralf Kuzella

Borsigstraße 8-10  
41469 NEUSS  
Germany

Phone: +49 (0) 2137-1020  
Fax: +49 (0) 2137-8685  
E-mail: r.kuzella@mitutoyo.de  
[www.mitutoyo.de](http://www.mitutoyo.de)

# HMI software for CNC controls

## SINUMERIK Solution Partners

**Montronix GmbH**  
Tool and process monitoring

**Müller IT & VIDEO GmbH**  
Teleservice with video

### Overview



#### Tool and process monitoring system

Montronix monitoring systems and the support of the Montronix employees will ensure that you have your machining process under control. Montronix is your competent partner worldwide for all machining tasks.

Montronix systems provide you with the following advantages:

- Tool monitoring and protection
- Shorter machine downtimes
- Avoidance of faults and reduction in rejects
- Improvement in quality
- Optimization of machining process

The visualization software (M-View) enables the machine operator to evaluate the machining process rapidly and precisely. The graphic display shows process deviations, broken tools, increasing wear and collisions, which can be statistically recorded and evaluated.

The IPM (Integrated Process Monitor) operator control and visualization software combines operation and simultaneous visualization. Communication is via an RS 232 C or RS 485 interface.

It is possible to switch from the machining process to process visualization at any time. A fast, reliable working method is ensured by the clear and simple operation.

#### More information

Please contact:

##### **Montronix GmbH**

Contact: Mr. J. Kraft

Am Teerhaus 5  
71720 OBERSTENFELD  
Germany

Phone: +49 (0) 7062-679300  
Fax: +49 (0) 7062-679310  
E-mail: [info@montronix.de](mailto:info@montronix.de)  
[www.montronix.de](http://www.montronix.de)

### Overview



#### Teleservice with video

VIDEO VISION is a video conferencing system that can be used worldwide and has been developed specifically for machine servicing. It enables the service engineers to operate the control as though they were on site. Through the simultaneous audio and video connection, the engineer is able to examine the machine and to provide the user with expert support in order to carry out repairs by means of remote instructions.

VIDEO VISION NM permits flexible use. This video conferencing system contains all the VIDEO VISION functions, but can also be installed on a notebook, inter alia, and permits connection via ISDN, an analog line, GSM, or the Internet.

In the case of larger machines and production systems, the audio-video-radio link is recommended, which can transmit sound and video images wirelessly over distances of up to 70 m (230 ft). The supplied ear-phones and an integrated directional microphone even permit use in a very loud production environment.

VIDEO VISION EVI is appropriate for pure video monitoring of the machine. You can monitor your complete machine environment from the control using up to 7 pan-and-tilt zoom cameras.

#### Requirements for VIDEO VISION:

- Telecommunications link (ISDN connection recommended)

#### More information

Please contact:

##### **Müller IT & VIDEO GmbH**

Contact: Mr. Kai Müller

Unter Lau 21  
72587 RÖMERSTEIN  
Germany

Phone: +49 (0) 7382-9396-0  
Fax: +49 (0) 7382-9396-26  
E-mail: [info@vivi.de](mailto:info@vivi.de)  
[www.vivi.de](http://www.vivi.de)

### OMATIVE Systems

#### Real-time feedrate optimization

### Renishaw Plc.

#### Non-contact tool inspection

#### Overview



#### ADAPTIVE CONTROL & MONITORING (ACM) for real-time feedrate optimization

The OMATIVE ACM system is fully integrated into SINUMERIK NCK version 6.5 or higher and into the SINUMERIK HMI environment's user interface purely as a software solution. ACM can be used for every cutting operation in feedrate-control, monitoring and event-recording modes.

In **feedrate-control** mode, ACM measures the current spindle load and continuously calculates the optimum feedrate for each individual tool and material. The feedrate is set to the highest possible value automatically and in real time. This reduces cycle times and also prevents tool breakage and damage to the tool and spindle, particularly during critical roughing operations and in rough-finishing applications. If the tool becomes overloaded, ACM stabilizes the feedrate to an acceptable value automatically. This value is defined via an algorithm in the internal expert system and, if necessary, the feed is suspended. In this way, tool breakage can also be detected.

In **monitoring** mode, the spindle load is monitored without adaptation of the feedrate. If the spindle becomes underloaded or overloaded, an alarm is triggered and, if necessary, the machine is stopped. Missing tools or tool breakages are also detected.

In **event-recording** mode, the machine's event data are saved or transferred via the PC network using the OMATIVE Pro software and can be analyzed as machine and production reports. Event recording is performed automatically in feedrate-control and monitoring modes.

#### More information

Please contact:

**OMATIVE Systems**  
OMATIVE Systems Head Office  
P.O. Box 34272  
Jerusalem 91341  
Israel  
Tel.: +972-2-6510310  
Fax: +972-2-6511786  
E-Mail: [omative@omative.com](mailto:omative@omative.com)  
[www.omative.com](http://www.omative.com)

Location Europe  
**OMATIVE Systems Europe GmbH**  
Contact: Ms. Oxana Lerich  
Rudolf-Diesel-Straße 12  
78048 VILLINGEN SCHWENNINGEN,  
Germany  
Tel.: +49 (0) 7721-88789-3  
Fax: +49 (0) 7721-88789-50  
E-Mail: [info@omative-europe.de](mailto:info@omative-europe.de)  
[www.omative-europe.de](http://www.omative-europe.de)

#### Overview



Renishaw has developed software that can be used in conjunction with the systems for non-contact tool control NC1, NC3 and NC4.

The program routines contain the following functions:

- Static length measurement (e.g., drill, tap)
- Length determination with rotating spindle (e.g., end mill, milling heads)
- High-speed tool-breakage monitoring
- Automatic tool measuring
- Monitoring of the cutting edge geometry and profile monitoring for breakage of a single edge
- Temperature compensation

Renishaw systems for tool monitoring are available as carrier systems or module systems which cover a wide range of different applications. All systems use the MicroHole technology that provides protection to IP68 even during the measuring procedure. The NC4 system also offers an integrated PassiveSeal, which maintains full protection even if the compressed air supply is interrupted. Active drip suppression prevents false response caused by drops of coolant.

#### More information

Please contact:

**Renishaw Plc.**  
Contact: Dr.-Ing. Jan Linnenbürger  
New Mills  
Wotton-under-Edge  
Gloucestershire  
GL12 8JR  
UK  
Phone: +49 (0) 7127-9810  
Fax: +49 (0) 7127-88237  
E-mail: [jan.linnenbuerger@renishaw.com](mailto:jan.linnenbuerger@renishaw.com)  
[www.renishaw.com](http://www.renishaw.com)

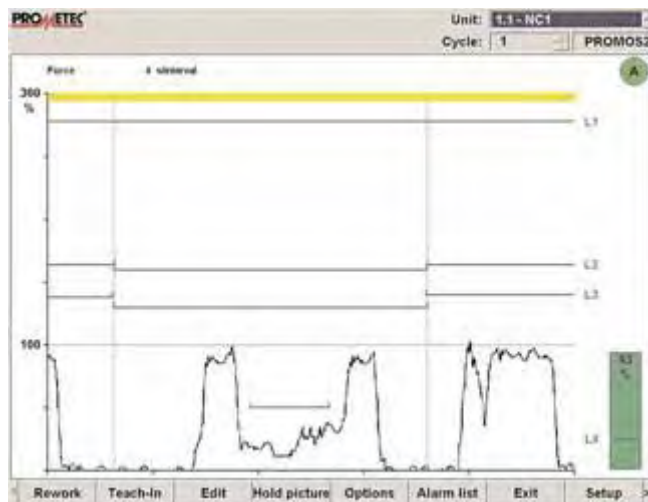
# HMI software for CNC controls

## SINUMERIK Solution Partners

PROMETEC GmbH  
PROMOS 2

PROMETEC GmbH  
PROSIN

### Overview



#### *PROMOS 2 modular tool and process monitoring system with PROVIS software*

The modular process monitoring system provides fast collision detection and reliable tool monitoring for all machining processes:

- Detection of tool breakage
- Detection of idle passes
- Detection of tool contact
- Detection of tool wear

This functionality can be achieved in particular for machining centers, rotary indexing machines and transfer lines without the need for special sensors if the control system is equipped with digital drives, e.g., SIMODRIVE 611 digital.

Furthermore, additional functions are available for the visualization and, therefore, diagnostics and optimization of the machining operations. For the user, this means:

- Avoidance of most tool breakage incidents by prompt, automatic tool replacement
- Tool or workpiece damage is minimized, consequential damage prevented
- Increase in productivity without increased use of personnel
- Increase in quality through process optimization

In addition to machine and tool protection, PROMOS 2 also helps to reduce machining times and improve part quality.

Operator inputs are made centrally using the operator panel of the control.

The modular PROMOS 2 system is available with different performance data (e.g., available monitoring functions, number of monitorable tools, crash data recorder) to permit optimum matching to the machining task with regard to cost and function. PROMOS 2 can be operated with all PROMETEC sensors (force, expansion, distance, active power, torque, vibration, structure-borne noise, sound emission, fluid noise).

### Overview



#### *PROSIN drill break detection as an integrated software solution for the SINUMERIK 840D control*

The low-cost PROSIN software permits direct access to the current values of the digital drives of the machine tool. If a tool breaks, the current of the relevant drive changes; this value is increased in the case of a blunt tool. Additional sensors or complete monitoring electronics therefore become superfluous.

#### Features:

- Breakage detection for drills of 2 mm (0.08 in) or more
- Operation using SINUMERIK operator panels
- No additional hardware required
- Only one operating side
- Extremely easy to retrofit
- Up to 120 different cuts can be monitored by means of prewarning and alarm thresholds
- New: Performance value monitoring

A special screen form, which is integrated in the standard user interface of the SINUMERIK, is available for parameterizing the operations of a CNC program which require monitoring. This screen form permits input and optimization of the settings for the cuts of one or more tools to be monitored as well as display of the values that are actually measured.

The limits of the software-based monitoring solution presented here depend on the application: If collisions are to be detected, or turning/milling tools reliably monitored for breakage, the specially adapted sensor technology of other PROMETEC solutions is still required.

This tool monitoring system is of particular interest for the mass production of metal parts, e.g., in the automotive supply industry, in order to increase quality while reducing costs.

### More information

Please contact:

#### **PROMETEC GmbH**

Contact: Dr. Werner Klufft

Jülicher Straße 338  
52070 AACHEN  
Germany

Phone: +49 (0) 241-16609-10

Fax: +49 (0) 241-16609-50

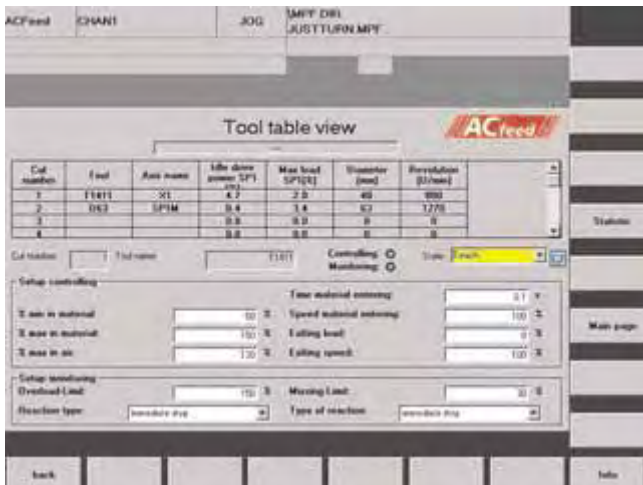
E-mail: [klufft@prometec.com](mailto:klufft@prometec.com)

[www.prometec.com](http://www.prometec.com)

PROMETEC GmbH  
ACfeed

PROMETEC GmbH  
MCI – Machine Condition Indicator

### Overview



#### *Adaptive control for intelligent automatic feed optimization as integrated software solution for the SINUMERIK 840D control*

From the load values measured on the tool, ACfeed computes the ideal feedrate for the prevailing cutting conditions and increases or reduces the feedrate fully automatically (e.g., 70 % or 140 %). The spindle load is always set to an optimum 100 %. This not only saves time and significantly increases the number of pieces machined between tool resharpening, but also protects tools against overloading.

ACfeed is used primarily for milling operations, but has proven increasingly successful as a tool for other types of machining, e.g., as a cutting force control for turning operations.

An integrated monitoring system completes the ACfeed function package.

Optimized for automotive production: Enormous time savings and increased process stability thanks to feed optimization. The total cycle time is reduced on average by 5 %.

Optimized for aircraft production: Increased reliability of machining because tools are not overloaded and due to individually adjustable limiting of machining forces (even without feedrate increase) with same degree of precision.

Intelligent feedrate control for compensating tool loading with:

- Variations in allowance on cast or forged parts
- Variations in material hardness and structure
- Contours with varying cutting depths or uneven surfaces
- Materials, e.g. stainless steel, tool steel, that are difficult to cut
- Wide variations in surface property (hard skin, burnished edges)
- Varying cutting widths

### More information

Please contact:

#### **PROMETEC GmbH**

Contact: Dr. Werner Klufft  
Jülicher Straße 338  
52070 AACHEN  
Germany

Phone: +49 (0) 241-16609-10  
Fax: +49 (0) 241-16609-50  
E-mail: [klufft@prometec.com](mailto:klufft@prometec.com)  
[www.prometec.com](http://www.prometec.com)

### Overview



#### *MCI – Machine Condition Indicator MCIview software – machine condition monitoring based on evaluation of a single vibration sensor*

Using a sensor mounted on the spindle housing, MCI acquires the vibration signals from a machine tool fully automatically and continuously in all the different machine states of the production process, e.g., cutting, tool changes, spindle run-up, acceleration and braking of axes.

MCI also tests the spindle and slide during no-load operation at predefined intervals.

The MCI hardware acquires and stores the sensor data and processes them using an integrated digital signal processor. The signals are conditioned by a variety of analytical processes, e.g. Fast Fourier Transformation, RMS,  $I^2$ , and can also be monitored on the basis of predefined threshold values.

The objective is to generate, store and monitor trends. Characteristics measured for each cycle, cut or tool are stored; these include, for example, maximum values, performance values, average values, standard deviations. If these characteristic values exceed a defined threshold, a warning or alarm is displayed. This system allows early detection of typical symptoms of wear on the machine and critical changes in the cutting process.

Furthermore, MCI triggers a crash limit at extreme vibration acceleration levels to shut down the machine immediately.

Separating the measurements into "machining" and "non-machining" means that causes of problems can be identified quickly: For example, if extremely high values are measured during the machining process, but the values measured are perfectly normal during tool changes, axis traversal and when the same spindle is running under no load, it is clear that the tool cutting conditions need to be optimized as the spindle and axes are obviously not the cause of the problem.

The MCI data which can be viewed online on the control can be displayed and stored at any time via an interface installed on the housing of the machine or control cabinet. The trends can then be analyzed for non-conformances in offline mode and compared with the data of other machines of the same type. Data can be archived centrally and accessed via the company's intranet.

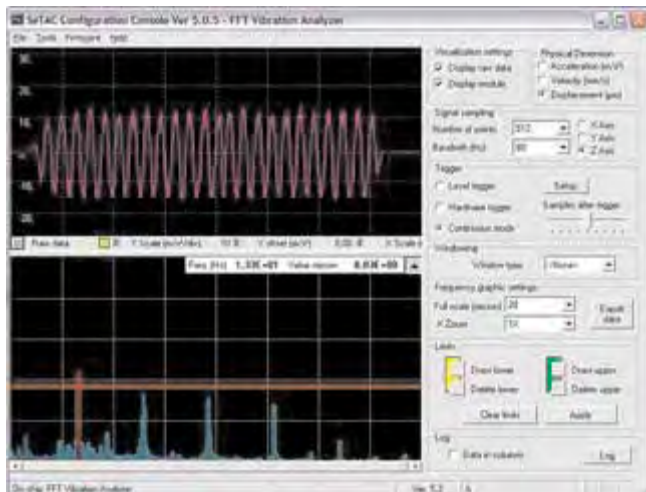
Condition monitoring requires only one vibration sensor in the machine if this is optimally positioned – further sensors can be fitted for supplementary functions such as tool imbalance or tool seat detection (TSD).

# HMI software for CNC controls

## SINUMERIK Solution Partners

Sequoia IT s.r.l.  
Collision and vibration monitoring

### Overview



#### SeTAC, the triaxial system for vibration monitoring and collision detection

Identification of abnormal collisions and vibrations through digital real-time alarms (response time less than 1 ms), directly integrated into the machine.

Thanks to its innovative technological settings, SeTAC has overcome the previous weaknesses in the onboard machine vibration analysis. Thanks to the miniaturized state-of-the-art electronic components, our device combines the innovative technology for signal analysis in a single hardware. SeTAC is therefore a small and compact solution that transmits any type of abnormal collision and vibration on the machine through its extremely fast digital alarms.

#### Main characteristics

- Built-in self-diagnostics able to guarantee full measurement reliability.
- Triaxial analysis with a measurement range of  $\pm 18$  g per axis.
- High precision of both high and low frequency analysis.
- Ability to permanently store up to 12 000 vibration events, indicating the time and amplitude of phenomena.
- Configurable for all types of industrial application.

#### Main applications

- Reduces and avoids damage to the machine tool by triggering an alarm in the case of a machine standstill as soon as an abnormal collision or vibration occurs (digital alarm triggered in less than 1 ms from the start of the event).
- Black box function. The course of the collisions and vibrations on the monitored machine is reconstructed.
- Detection of the degree of unbalance through digital alarms with several thresholds.
- Monitoring of specific mechanical components or specific behaviors, e.g. chattering.
- The instrument can be integrated with the machine control chain through change in behavior depending on the vibration data.

### More information

Please contact:

#### Sequoia IT s.r.l.

Contact: Mr. Massimiliano Titolo  
Via Einaudi 25  
10024 Moncalieri (TO)  
Italy

Phone: +39 011-6402992  
Fax: +39 011-6402985  
E-mail: [info@sequoia.it](mailto:info@sequoia.it)  
[www.sequoia.it](http://www.sequoia.it)

Visual Components Oy  
ILP – safe CNC programming

### Overview



#### ILP – safe CNC programming

ILP is a 3D graphical interface for safe CNC programming on the SINUMERIK 840D CNC control. Operators run new or modified production programs with the real control on the shop-floor but with a virtual machining center to verify the setup and check for errors before real machining begins.

#### Benefits:

- Improved program verification process
- Avoid costly crashes and set-up errors
- Minimal if any training required for operators

For the first time companies can execute NC programs on the actual control and see the results on the operator screen in vivid 3D detail, using the actual axis data as would be delivered to the drives – in real time. Visual validation is a natural way for operators to check that there are no tool - part - program mismatches.

After executing a collision free program in the ILP window and the operator is satisfied, control switches to on-line mode and actual machining commences.

The ILP user interface has just a few button commands so it is easy to learn and use with minimal or no training. New operators can use the actual CNC equipment and make mistakes on the real control to see the effect of their actions without any production interruptions or destruction of property.

### More information

Please contact:

#### Visual Components Oy

Contact: Mr. Patrik Buch Lund

Korpäänmäentie 17 CL6  
00300 HELSINKI  
Finland

Phone: +358 9 323 2250  
Fax: +358 9 323 2251  
E-mail: [patrik.buchlund@visualcomponents.com](mailto:patrik.buchlund@visualcomponents.com)  
[www.visualcomponents.com](http://www.visualcomponents.com)



**Overview****6000 fully-automatic balancing and process monitoring system**

The 6000 fully automatic balancing and process monitoring system can be completely remote-controlled by the control and displays process signals on the machine screen. All data of the balancing procedure and the structure-borne noise signals (AE) are therefore available online for the machine operator.

Benefits:

- Convenient balancing system with non-contact transmission of signals and power makes it wear-free and maintenance-free
- 2 out-of-balance, 2 speed and 4 AE signal limits can be programmed
- Balancing heads are available with built-in AE sensor and neutral position of the balancing weights (spindle, attachment and ring balancing systems), large balancing capacity within very small space, speeds up to 15 000 rpm
- Tools for machine diagnostics (compliance, resonance)
- Connection facility for 4 structure-borne noise sensors, stationary or rotary
- AE sensor technology positioned directly at place of occurrence, resulting in high signal quality
- State-of-the-art evaluation of structure-borne noise for bypassing air grinding, monitoring of grinding process and dressing, 31 different settings can be permanently saved
- Storage of measured AE signals on control PC or external PC; connection via RS 232 C interface

**More information**

Please contact:

**Walter DITTEL GmbH**

Contact: Mr. Adi Sporer

Erpftinger Straße 36  
86899 LANDSBERG AM LECH  
Germany

Phone: +49 (0) 8191-3351-17

Fax: +49 (0) 8191-3351-49

E-mail: [sporer@dittel.com](mailto:sporer@dittel.com)

[www.dittel.com](http://www.dittel.com)

# HMI software for CNC controls

Notes

4



# Basic components



<b>5/2</b>	<b>CNC controls</b>
5/2	Introduction
5/4	SINUMERIK 802S base line
5/6	SINUMERIK 802C base line
5/8	SINUMERIK 810D powerline
5/13	Axis expansion plug-in unit
5/14	SINUMERIK 840D powerline
5/17	NCU 561.5
5/17	NCU 571.5
5/17	NCU 572.5
5/17	NCU 573.5
5/19	Compile cycles
5/19	NCK OA package for NCUs
5/20	SINUMERIK Safety Integrated
<b>5/22</b>	<b>SINUMERIK I/O modules</b>
5/22	EFP single I/O module
5/23	NCU terminal block with DMP compact modules
<b>5/25</b>	<b>SIMATIC I/O modules</b>
<b>5/28</b>	<b>Positioning modules</b>
5/28	Introduction
5/29	Positioning module FM 353
5/30	Positioning module FM 354
5/31	Positioning module FM 357-2
<b>5/33</b>	<b>Supplementary components</b>
5/33	Power supplies SITOP power
5/33	Controlled power supplies
5/34	Modular power supplies with add-on modules
5/35	DC UPS modules and battery modules
<b>5/36</b>	<b>Ordering examples</b>
5/36	Ordering example 1: SINUMERIK 810DE powerline
5/37	Ordering example 2: SINUMERIK 840DE powerline



For products approved for Canada and U.S.A., see Appendix.

# Basic components

## CNC controls

### Introduction

### Overview

5

#### CNC control

##### SINUMERIK 802S base line

1 MG/1 channel  
4 axes  
(3 axes analog/  
1 spindle analog)



##### SINUMERIK 802C base line

1 MG/1 channel  
4 axes  
(3 axes analog/  
1 spindle analog)



##### SINUMERIK 810D powerline

2 MGs/2 channels  
6 axes digital  
(4 axes/2 spindles)  
(5 axes/1 spindle)



CCU box      CCU module

##### SINUMERIK 840D powerline

**NCU 561.5**  
2 MGs/2 channels  
2 axes/spindles digital

**NCU 571.5**  
2 MGs/2 channels  
6 axes/spindles digital

**NCU 572.5**  
10 MGs/10 channels  
31 axes/spindles digital

**NCU 573.5**  
10 MGs/10 channels  
31 axes/spindles digital



NCU box      NCU 573.5

#### Converter system

##### Power control for stepper motors<sup>1)</sup>

##### SIMODRIVE 611 universal HRS

##### SIMODRIVE 611 digital



Axis expansion  
plug-in unit

##### SIMODRIVE 611 digital



PC card

P\_NC01\_XX\_00864

<sup>1)</sup> On request

## Overview (continued)

### *SINUMERIK I/O modules*

**EFP single I/O module**

**NCU terminal block with  
DMP compact modules**



EFP single  
I/O module



NCU terminal block with  
DMP compact modules

P\_INCO1\_XX\_00866

# Basic components

## CNC controls

### SINUMERIK 802S base line

#### Overview



The SINUMERIK 802S base line is a CNC control that was developed for operation with up to 3 stepper drives and one analog spindle.

The target market is that of turning and milling machines in the low-end performance range that place correspondingly low demands on the drive technology. This allows stepper motor technology to be used with all the advantages of its simple design and good accuracy and ruggedness.

The "manual machine" user interface allows you to operate a turning machine as either a CNC machine or a conventional (cycle) machine.

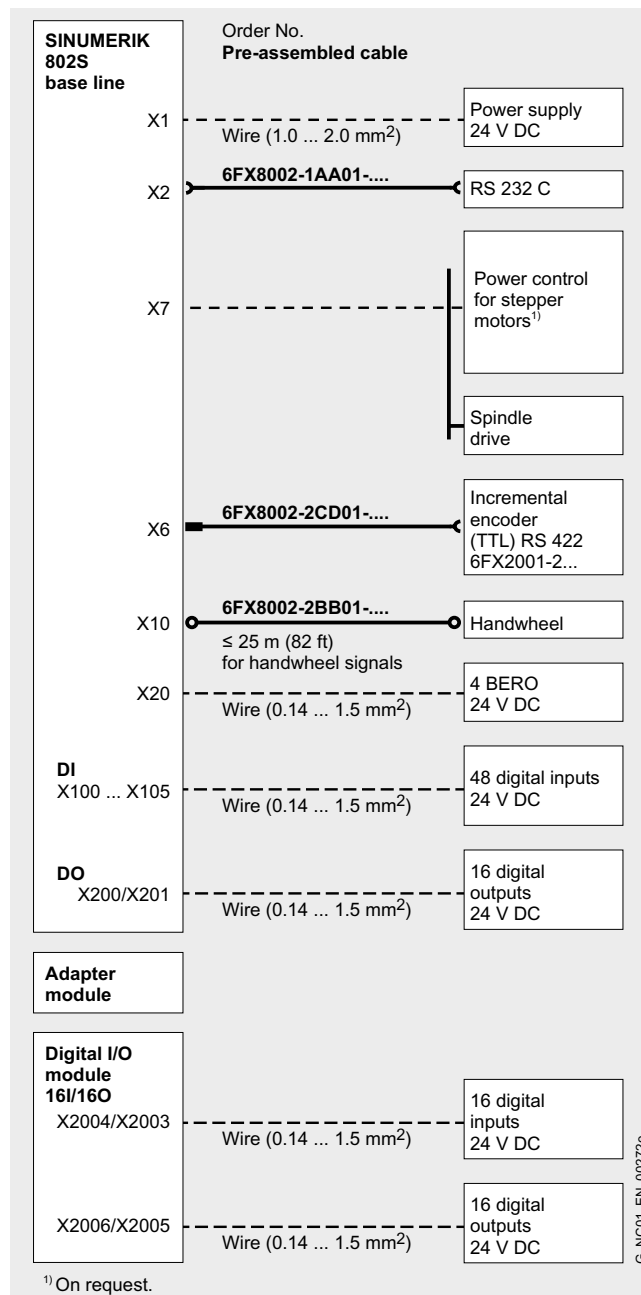
#### Benefits

- Very compact mounting dimensions
- Easy operation thanks to DIN programming
- High reliability thanks to operator panel mounting,
- Compact control comprising of CNC, PLC, MCP and I/O section
- Complete delivery with CNC, Toolbox and logbook
- All tools are included in the scope of supply
- Very cost-effective drive technology using stepper motors
- Maintenance-free: Without battery and fan

#### Function

- Up to 3 axes for stepper drive and one analog spindle (without C-axis)
- Analog spindle through  $\pm 10$  V interface
- Turning or milling are freely selectable
- Pre-assigned machine data
- RS 232 C interface
- 48 digital inputs and 16 digital outputs 0.5 A
  - Can be expanded by one module with 16 digital inputs and 16 digital outputs
- Sample program and PLC templates
- "Manual machine" user interface (can be loaded as second user interface for Turning function)

#### Integration



Connection overview for SINUMERIK 802S base line

Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

### Technical specifications

<b>Order No.</b>	<b>6FC5500-0AA00-1AA0</b>
<b>Product name</b>	SINUMERIK 802S base line
<b>Input voltage</b>	24 V DC
<b>Basic unit</b>	2.6 A
<b>24 V current requirement</b>	
<b>Power consumption, max.</b>	24 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	
• Front	IP65
• Rear	IP20
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95 %
• Transport	5 ... 95 %
• Operation	5 ... 95 %
<b>Ambient temperature</b>	
• Storage	-40 ... +70 °C (-40 ... +158 °F)
• Transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width	420 mm (16.5 in)
• Height	300 mm (11.8 in)
• Depth	83 mm (3.27 in)
<b>Weight, approx.</b>	4.5 kg (9.92 lb)

<b>Order No.</b>	<b>6FC5511-0CA00-0AA0</b>
<b>Product name</b>	SINUMERIK 802S/802C digital I/O module, 16I/16O
<b>Input voltage</b>	24 V DC
<b>Number of digital inputs</b>	16
<b>Number of digital outputs</b>	16
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95 %
• Transport	5 ... 95 %
• Operation	5 ... 95 %
<b>Ambient temperature</b>	
• Storage	-40 ... +70 °C (-40 ... +158 °F)
• Transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width	80 mm (3.15 in)
• Height	125 mm (4.92 in)
• Depth	120 mm (4.72 in)
<b>Weight, approx.</b>	0.35 kg (0.77 lb)

### Selection and ordering data

Designation	Order No.
<b>SINUMERIK 802S base line</b>	<b>6FC5500-0AA00-1AA0</b>
Complete package comprising of:	
• Operator panel control incl. machine control panel and I/O (48 digital inputs and 16 digital outputs)	
• Toolbox	
• Logbook	
<b>Emergency stop button</b>	
On the operator panel	
• Actuating element	<b>3SB3000-1HA20</b>
• Contact block	<b>3SB3400-0A</b>
<b>Adapter block with installation kit</b>	<b>6FC5511-0CB00-0AA0</b>
For one-time expansion of inputs and outputs with digital I/O module 16I/16O	
<b>Digital I/O module 16I/16O</b>	<b>6FC5511-0CA00-0AA0</b>
16 digital inputs/ 16 digital outputs	

# Basic components

## CNC controls

### SINUMERIK 802C base line

#### Overview



The SINUMERIK 802C base line is a CNC control that was developed for operation with up to 3 analog drives and one analog spindle. The target market is that of turning and milling machines in the low-end performance range and the retrofit market.

It is possible in this case to implement simple drives with TTL encoders or resolvers. A typical example is the SIMODRIVE base line drive.

The "manual machine" user interface allows you to operate a turning machine as either a CNC machine or a conventional (cycle) machine.

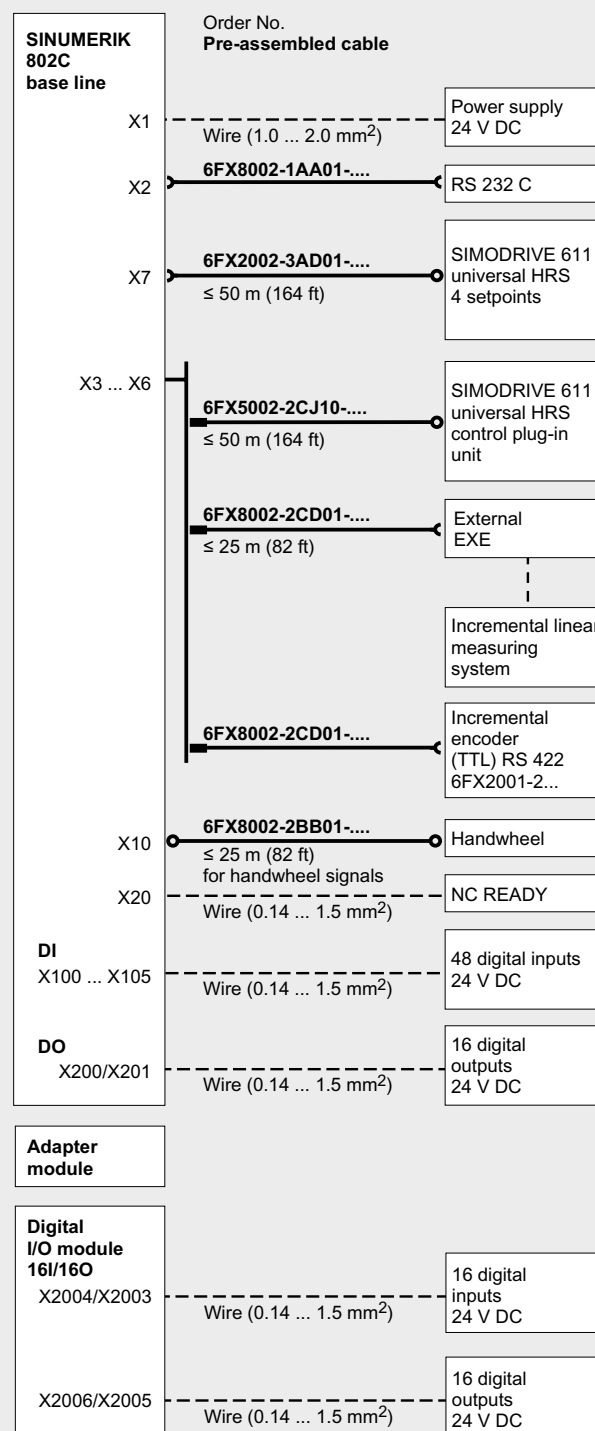
#### Benefits

- Very compact mounting dimensions
- Easy operation thanks to DIN programming
- High reliability thanks to operator panel mounting
- Compact control comprising of CNC, PLC, MCP and I/O section
- Complete delivery with CNC, Toolbox and logbook
- All tools are included in the scope of supply
- Maintenance-free: Without battery and fan

#### Function

- Up to 3 analog axes and one analog spindle (without C-axis)
- Analog spindle via  $\pm 10$  V interface
- Turning or milling are freely selectable
- Pre-assigned machine data
- RS 232 C interface
- 48 digital inputs and 16 digital outputs 0.5 A
  - Can be expanded by one module with 16 digital inputs and 16 digital outputs
- Sample program and PLC templates
- "Manual machine" user interface (can be loaded as second user interface for Turning function)

#### Integration



Connection overview for SINUMERIK 802D base line

Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

G\_NC01\_EN\_00274e



### Technical specifications

<b>Order No.</b>	<b>6FC5500-0AA11-1AA0</b>
<b>Product name</b>	SINUMERIK 802C base line
<b>Input voltage</b>	24 V DC
<b>Basic unit 24 V current requirement</b>	2.6 A
<b>Power consumption, max.</b>	24 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	
• Front	IP65
• Rear	IP20
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air tem- perature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95 %
• Transport	5 ... 95 %
• Operation	5 ... 95 %
<b>Ambient temperature</b>	
• Storage	-40 ... +70 °C (-40 ... +158 °F)
• Transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width	420 mm (16.5 in)
• Height	300 mm (11.8 in)
• Depth	83 mm (3.27 in)
<b>Weight, approx.</b>	4.5 kg (9.92 lb)

<b>Order No.</b>	<b>6FC5511-0CA00-0AA0</b>
<b>Product name</b>	SINUMERIK 802S/802C digital I/O module, 16I/16O
<b>Input voltage</b>	24 V DC
<b>Number of digital inputs</b>	16
<b>Number of digital outputs</b>	16
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air tem- perature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	5 ... 95 %
• Transport	5 ... 95 %
• Operation	5 ... 95 %
<b>Ambient temperature</b>	
• Storage	-40 ... +70 °C (-40 ... +158 °F)
• Transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width	80 mm (3.15 in)
• Height	125 mm (4.92 in)
• Depth	120 mm (4.72 in)
<b>Weight, approx.</b>	0.35 kg (0.77 lb)

### Selection and ordering data

Designation	Order No.
<b>SINUMERIK 802C base line</b>	<b>6FC5500-0AA11-1AA0</b>
Complete package comprising of:	
• Operator panel control incl. machine control panel and I/O (48 digital inputs and 16 digital outputs)	
• Toolbox	
• Logbook	
<b>Emergency stop button</b>	
On the operator panel	
• Actuating element	<b>3SB3000-1HA20</b>
• Contact block	<b>3SB3400-0A</b>
<b>Adapter block with installation kit</b>	<b>6FC5511-0CB00-0AA0</b>
For one-time expansion of inputs and outputs with digital I/O module 16I/16O	
<b>Digital I/O module 16I/16O</b>	<b>6FC5511-0CA00-0AA0</b>
16 digital inputs/ 16 digital outputs	

# Basic components

## CNC controls

### SINUMERIK 810D powerline

#### Overview



SINUMERIK 810D powerline covers the medium performance range of SINUMERIK Motion Control Systems. All the CNC, PLC, closed-loop control and communication tasks are combined on one CCU module (Compact Control Unit) and they can be supplemented with power sections as well as control modules of the converter system SIMODRIVE 611 digital. SINUMERIK 810D powerline can be implemented for a wide range of different technologies.

#### Benefits

The SINUMERIK 810D powerline is a compact digital CNC system.

It is the ideal hardware platform for conventionally controlled turning machines, universal turning machines, vertical and universal milling machines.

Even complex tasks for handling, machine tools and special tools can be solved. Compatible system software and hardware components permit integration with SINUMERIK 840D powerline. Thanks to openness in the HMI and PLC, users can integrate their specific know-how. They can also implement the well-proven Motion Control System MCIS products for the production area.

The SINUMERIK 810D powerline comprises a high-performance CCU 3.4 module (compact control unit) in combination with the current SINUMERIK operator panel fronts.

#### Application

SINUMERIK 810D powerline is used worldwide in turning, drilling, milling, grinding, nibbling, stamping, in mechanical engineering and mold-making as well as in wood processing, handling and large-scale production and JobShop manufacturing.

#### Design

The high-performance CCU is installed in a basic enclosure (CCU box) with integrated power modules. The CCU box is available in two different versions:

- For internal cooling in the control cabinet, the CCU box with 3 power sections:
  - 2 x 6 A/12 A for feed drives
  - 1 x 18 A/36 A for feed drives or 1 x 24 A/32 A for main spindle drives
- For either internal cooling in the control cabinet or external cooling through the back of the control cabinet, with 2 power sections:
  - 2 x 9 A/18 A for feed drives

The structure of the SINUMERIK 810D powerline is compatible with the SIMODRIVE 611 digital converter system. It can be expanded with the SIMODRIVE 611 power sections. The SINUMERIK 810D powerline is operated by UI or I/R modules from the SIMODRIVE 611 series.

The SINUMERIK 810D powerline has 6 onboard measuring system inputs, which can also be used for direct measuring systems. Expansion is possible using SIMODRIVE 611 control modules.

The SINUMERIK 810DE powerline is available for export to countries requiring export approval.

The SINUMERIK 810DE powerline system software (export version) is supplied on an integrated flash EPROM and is included in the scope of supply. If the standard software is required, a PC card with this software must be inserted.

If the standard software is in use, the PC card remains plugged in. The standard software must be separately ordered. The spare memory space on the PC card can be used for series machine start-up/service data.

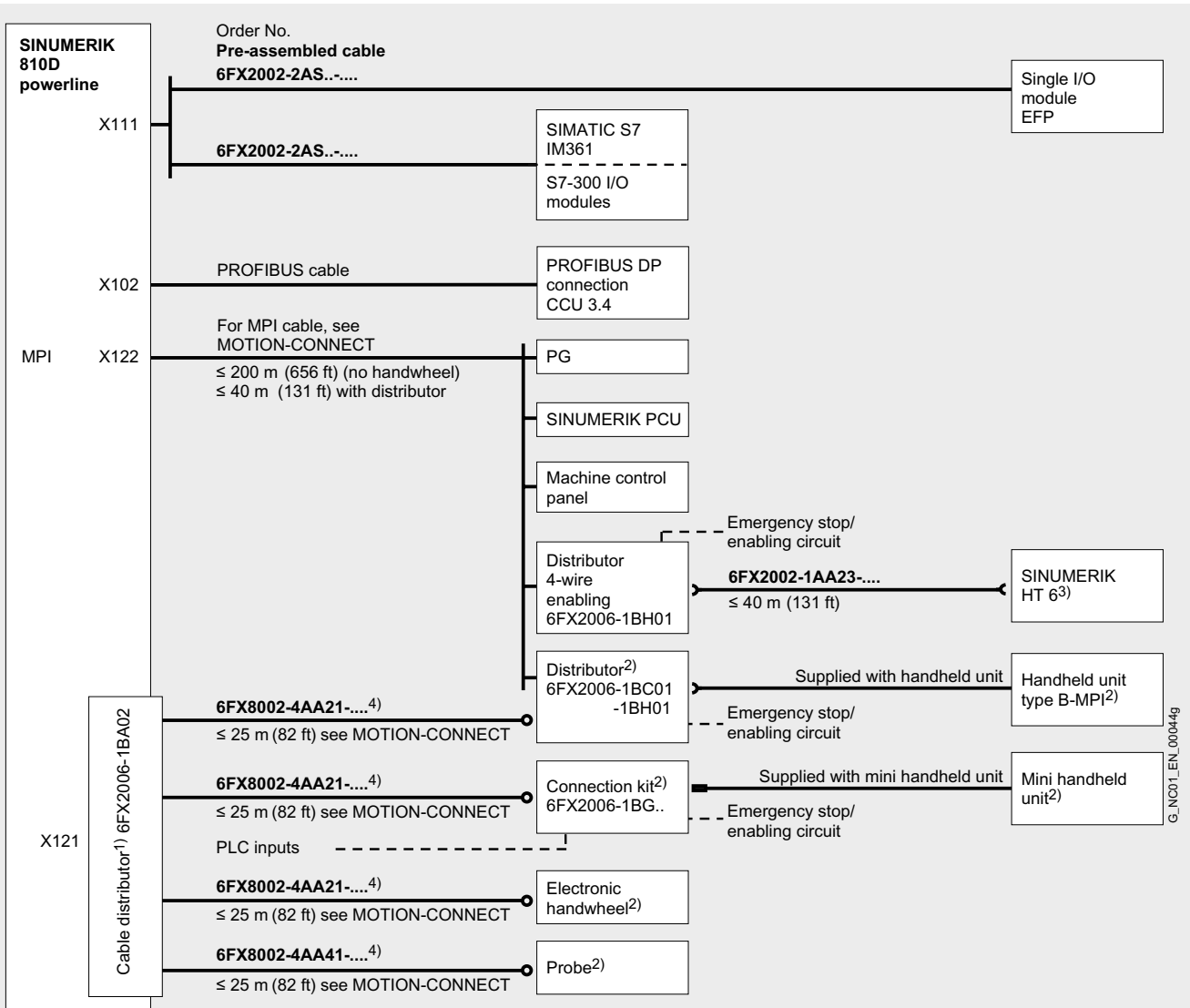
Positioning tasks can be implemented in the SIMATIC S7-300 by means of the FM 353 and FM 354 modules or using SIMODRIVE 611 universal HRS.

#### Integration

The following components can be connected to the SINUMERIK 810D powerline:

- Operator panel front with PCU and machine control panel
- SIMATIC CE panel
- SIMATIC OP7/OP17
- Push Button Panel
- Handheld unit type B-MPI
- Mini handheld unit
- SINUMERIK HT 6
- SIMATIC S7-300 I/O
- EFP single I/O module
- 3 handwheels and 2 probes via cable distributor
- NCU terminal block with DMP compact modules
- Distributed PLC I/O via PROFIBUS DP connection
- Programming device
- SIMODRIVE 611 digital converter system
- 1FK7/1FT6/1FT7/1PH/1FN/1FE1/1FW6/2SP1/1LA motors
- PROFINET IO and PROFINET CBA via external CP 343-1 Advanced communication board

## Integration (continued)



1) A maximum of 2 handwheels and 2 probes can be connected.

2) Max. distance between handwheel/probe and X121 terminal: ≤ 25 m (82 ft).

3) HT 6 always connected: max. 200 m (656 ft) from X122 plug to HT 6. HT 6 not always connected: max. 200 m (656 ft) from X122 plug to HT 6 only with RS 485 repeater (6ES7972-0AA01-0XA0). Otherwise total length MPI from X122 plug to distributor ≤ 5 m (16 ft).

The HT 6 must always be connected to one end of the MPI length (integrated bus termination).

4) CNC side with DU box connector.

Connection overview for SINUMERIK 810D powerline, part 1 of 2

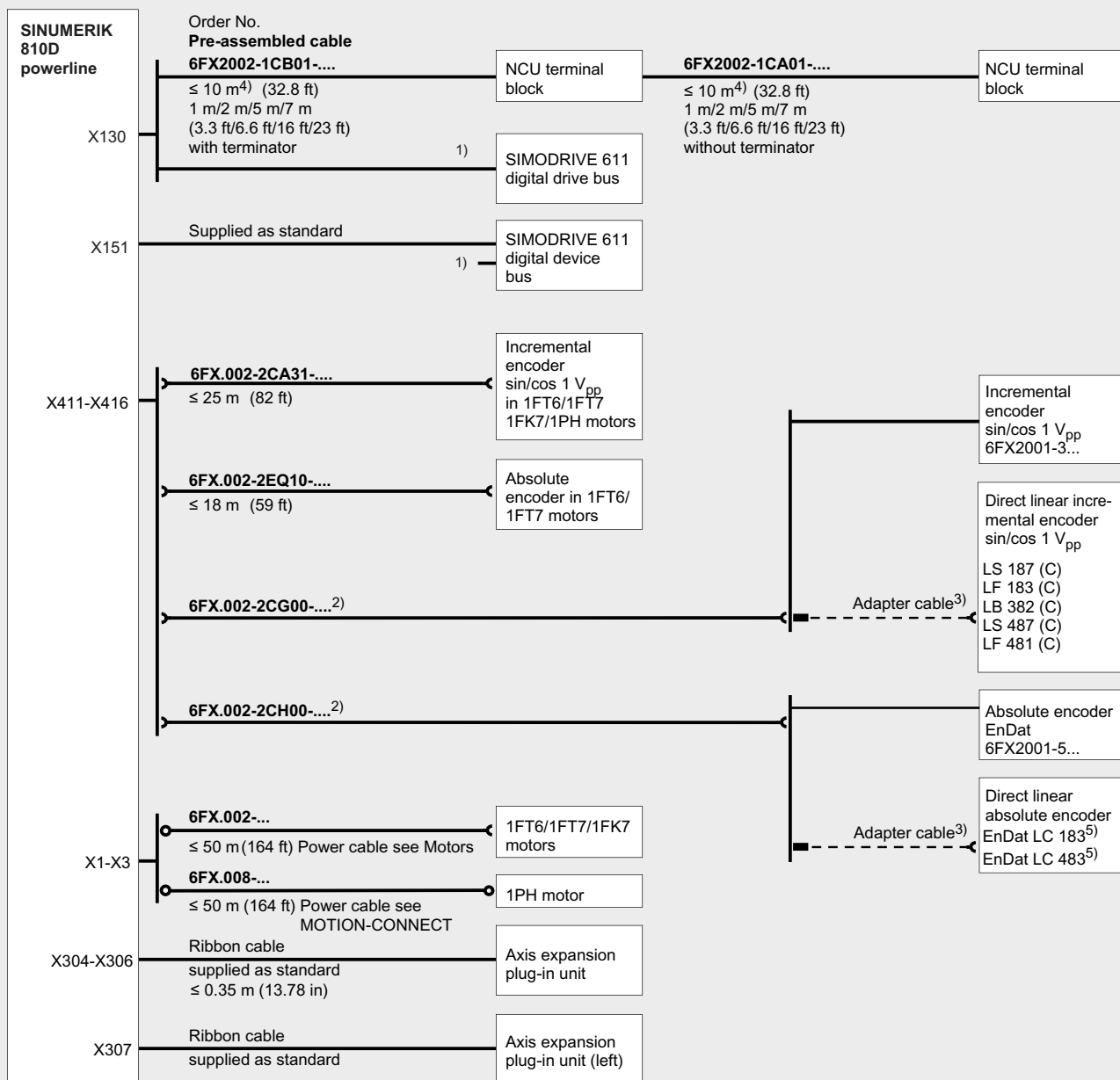
Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

# Basic components

## CNC controls

### SINUMERIK 810D powerline

#### Integration (continued)



- 1) Cable set for external SIMODRIVE 611 closed-loop control must be ordered separately.
- 2) Maximum cable length for power consumption of 300 mA is 15 m (49 ft) (longer cables can be used for lower consumption rates but should never exceed 50 m (164 ft)).
- 3) Cables can be ordered from the linear-scale manufacturer.
- 4) The max. connecting length at the drive bus is 10 m (32.8 ft).
- 5) For SINUMERIK 810D powerline with NC software version 06.05.36 or higher  
For SINUMERIK 840D powerline with NC software version 07.04.08 or higher

Connection overview for SINUMERIK 810D powerline, part 2 of 2

Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

G\_INCO1\_EN\_00045g

## Technical specifications

Order No.	6FC5447-0AA01-0AA0	6FC5447-0AA00-0AA1
<b>Product name</b>	SINUMERIK 810D powerline CCU box with 2 int. PS	SINUMERIK 810D powerline CCU box with 3 int. PS
<b>Input voltage</b>	600 V/625 V/680 V DC	
<b>Power loss</b>		
• Total	180 W	350 W
• Internal	69 W	350 W
• External	111 W	–
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20 with internal cooling IP20 with external cooling for the electronics area IP54 with external cooling for the heatsink in the cooling area	IP20
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).	
<b>Relative humidity</b>		
• Storage	10 ... 95 %	
• Transport	10 ... 95 %	
• Operation	< 95 % for 1h, annual average < 65 %	
<b>Ambient temperature</b>		
• Storage	-20 ... +60 °C (-4 ... +140 °F)	
• Transport	-20 ... +60 °C (-4 ... +140 °F)	
• Operation	0 ... 40 °C (32 ... 104 °F)	
- Max. with derating	55 °C (131 °F)	
<b>Dimensions</b>		
• Width	150 mm (5.91 in)	
• Height	480 mm (18.9 in)	
• Depth	268 mm (10.6 in)	
<b>Mounting position in operation</b>	Vertical	
<b>Weight, approx.</b>	9.7 kg (21.4 lb)	9.8 kg (21.6 lb)

Order No.	6FC5410-0AY03-1AA0
<b>Product name</b>	SINUMERIK 810D powerline CCU 3.4
<b>Input voltage</b>	Via SIMODRIVE device bus
<b>Power consumption, max.</b>	40 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20 with CCU box
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	10 ... 95 %
• Transport	10 ... 95 %
• Operation	< 95 % for 1h, annual average < 65 %
<b>Ambient temperature</b>	
• Storage	-20 ... +60 °C (-4 ... +140 °F)
• Transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width	150 mm (5.91 in)
• Height	307 mm (12.1 in)
• Depth	220 mm (8.66 in)
<b>Mounting position in operation</b>	Vertical
<b>Weight, approx.</b>	1.6 kg (3.53 lb)

# Basic components

## CNC controls

### SINUMERIK 810D powerline

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK 810D powerline</b>	
• <b>CCU box</b> with 3 internal power sections internal cooling, incl. 3-axis shield-connection plate	<b>6FC5447-0AA00-0AA1</b>
• <b>CCU box</b> with 2 internal power sections internal/external cooling, incl. 2-axis shield-connection plate	<b>6FC5447-0AA01-0AA0</b>
• <b>CCU 3.4 module</b> with system software 6 (export)	<b>6FC5410-0AY03-1AA0</b>
<b>CCU system software</b> On PC card	
<b>Standard 810D powerline</b>	
• Single license for current software version	<b>6FC5450-0AX03-0AH0</b>
• Single license for specific software version	<b>6FC5450-■ AX03-■ AH0</b>
• Software update service	<b>6FC5450-0AX03-0AH2</b>
• Update/upgrade on order of specific software version	<b>6FC5450-■ AX03-■ AH3</b>
<b>Export 810DE powerline</b>	
• Single license for current software version	<b>6FC5450-0AY03-0AH0</b>
• Single license for specific software version	<b>6FC5450-■ AY03-■ AH0</b>
• Software update service	<b>6FC5450-0AY03-0AH2</b>
• Service Pack/upgrade on order of specific software version	<b>6FC5450-■ AY03-■ AH3</b>
<b>Toolbox</b> For SINUMERIK 810D/840D <sup>1)</sup> on CD-ROM with:	
• PLC basic program	
• Standard machine data	
• NC variable selector	
- Single license for current software version	<b>6FC5252-0AX21-0AB0</b>
- Single license for specific software version	<b>6FC5252-■ AX21-■ AG0</b>
- Single license without data carrier	<b>6FC5252-0AX21-0AB1</b>
- Software update service	<b>6FC5252-0AX21-0AB2</b>
- Service Pack on order of specific software version	<b>6FC5252-■ AX21-■ AG3</b>
<b>Cable distributor</b>	<b>6FX2006-1BA02</b>
Without DU box connector for connection of 2 handwheels (encoders with differential or TTL signals, as required), 2 probes	
<b>DU box connector</b> (10 units)	<b>6FX2003-0FA00</b>
For connecting devices to cable distributor	
<b>MPI bus cable, pre-assembled</b>	See MOTION CONNECT

Example of a specific software version, e.g., 6.5:  
6FC5450-6....-5...

Designation	Order No.
<i>Spare and wear parts</i>	
<b>Backup battery</b> For CCU 3.4 module	<b>6FC5247-0AA18-0AA0</b>
<b>PC card</b> According to PCMCIA standard, type STRATA, empty	
• 8 MB	<b>6FC5247-0AA11-0AA3</b>
• 16 MB	<b>6FC5247-0AA11-1AA3</b>

#### Important ordering information:

SINUMERIK 810D powerline and the **standard software** are ordered using two order numbers. Hardware and software on the PC card must be ordered together. The standard software can only be supplied in a bundle. The software order item must directly follow the hardware order item. The export software must not be explicitly ordered.

Ordering example:

Order item	Designation	Quantity	Order No.
1	SINUMERIK 810D powerline	1	6FC5410-0AY03-1AA0
2	Standard software for SINUMERIK 810D powerline	1	6FC5450-0AX03-0AH0

<sup>1)</sup> One license is required for each SINUMERIK CCU. The CD-ROM contains several software versions.

#### Overview



To expand the SINUMERIK 810D powerline to up to 6 axes, axis expansion plug-in units are required. These are inserted in the power modules of the SIMODRIVE 611 digital, where they take the place of the closed-loop control plug-in units.

The axis expansion plug-in units are designed for 1-axis and 2-axis power modules. The ribbon cable forms an integral part of the axis expansion plug-in unit and can be used to cover a gap of 150 mm (5.91 inches) between the SINUMERIK 810D powerline and the final expansion plug-in unit.

The CCU 3.4 module can control up to 6 axes onboard. A single-axis expansion plug-in unit (left) is available in addition to the axis expansion unit (right). It is connected to the CCU 3.4 module using the 4th pulse interface. This module is then inserted into a SIMODRIVE 611 power module positioned between the supply unit and the SINUMERIK 810D powerline.

A ribbon cable for connection of SIMODRIVE 611 power modules up to 150 mm (5.91 in) wide is enclosed with the single-axis expansion plug-in unit (left).

#### Expansions using SIMODRIVE 611 digital control modules

The use of SIMODRIVE 611 digital control modules is only necessary if the number of measuring system inputs on the SINUMERIK 810D powerline is not enough.

A terminator for the drive bus must be ordered separately if the external SIMODRIVE 611 control is used.

#### Selection and ordering data

Designation	Order No.
<b>Axis expansion plug-in unit</b> For SINUMERIK 810D incl. ribbon cable	<b>6FC5412-0FA10-0AA0</b>
<b>Axis expansion plug-in unit left, single-axis</b> For SINUMERIK 810D incl. ribbon cable	<b>6FC5412-0FA12-0AA0</b>
<b>Cable set for external SIMODRIVE 611 control</b> Comprising of device bus and drive bus	<b>6FC5412-0FA80-0AA0</b>
<b>Device bus cable</b> Length: 400 mm (15.75 in)	<b>6SN1161-1AA00-0BA0</b>
<b>Terminator</b> For drive bus	<b>6FX2003-0DA00</b>

# Basic components

## CNC controls

### SINUMERIK 840D powerline

#### Overview



The SINUMERIK 840D powerline provides you with modularity, openness, a uniform structure for operating, programming and visualizing and provides a system platform with innovative functions for almost all technologies. Together with the SIMODRIVE 611 digital converter system, and supplemented by the SIMATIC S7-300 automation system, the SINUMERIK 840D powerline offers a complete digital system which is especially suitable for complex processing tasks and is characterized by maximum dynamics and precision. With the SINUMERIK 840D powerline, certified SINUMERIK Safety Integrated functions can be obtained with which highly effective protection of persons and machines is possible in a simple, economical and practical manner.

#### Benefits

- The digital CNC system for complex tasks
- Maximum performance and flexibility especially for complex multiple-axis systems
- Uniform openness from operation up to the NC core.
- Integral, certified safety functions for man and machine: SINUMERIK Safety Integrated
- Well-proven operating and programming software such as ShopMill or ShopTurn and Motion Control Information System products (MCIS products)

#### Application

The SINUMERIK 840D powerline is used worldwide for turning, drilling, milling, grinding, laser machining, nibbling, punching, in tool and mold making, as press control, for high-speed cutting applications, for wood and glass processing, for handling operations, in transfer lines and rotary indexing machines, for mass production and JobShop production.

The SINUMERIK 840D powerline is available as an export version for use in countries where approval is required.

#### Design

The SINUMERIK 840D powerline combines CNC, PLC and communications tasks on one NCU module. The powerful NCU multi-processor module is directly integrated into the SIMODRIVE 611 digital converter system following installation in the NCU box by positioning it on the right next to the I/R module. The scope of delivery of all NCUs includes the device bus cable and the drive bus terminator.

All NCUs have onboard connections for 4 high-speed digital CNC inputs and 4 high-speed digital CNC outputs. Further fast inputs/outputs can be connected via NCU terminal blocks on the drive bus.

#### Function

##### *Performance and flexibility*

The scalability of the hardware and software – both in the CNC and control area – provides exceptional prerequisites for use of the SINUMERIK 840D powerline in many sectors. The possibilities range from simple positioning tasks up to complex multi-axis systems.

We offer different types of NCU for your machining tasks.

If there is a high requirement for axes and channels, e.g. with rotary indexing or multi-spindle machines, computing performance, configuration facilities and memory areas of the NCUs can be combined using link modules, thus becoming significantly extended (fast IPO link).

5-axis machining tasks, e.g. milling of free-form surfaces, can be solved simply and conveniently using this machining package. The following functions are included in the 5-axis machining package: 5-axis transformation with tool orientation, 5-axis tool length compensation, oriented tool retraction, tool-oriented RTCP and cardan millhead/nutating head.

Use of an NCU 573.5 is recommended for maximum dynamics and accuracy in mold making or in the HSC sector.

##### *System-wide openness*

Thanks to openness across the HMI, CNC and PLC, users can apply their specific expertise such that they achieve exactly the individual control solution desired. The SINUMERIK 840D powerline offers openness up to the NC core. This open architecture and the high computing performance of the SINUMERIK 840D powerline mean that adaptation of the CNC functions to many different innovative machine kinematics can be achieved flexibly, rapidly and cost-effectively. Additional technology-specific functions can be subsequently loaded as compile cycles.

##### *Integrated certified safety functions*

SINUMERIK 840D powerline includes certified SINUMERIK Safety Integrated functions with which highly effective protection of persons and machines is possible in a simple, economical and practical manner.

##### *Well-proven operator software and programming software*

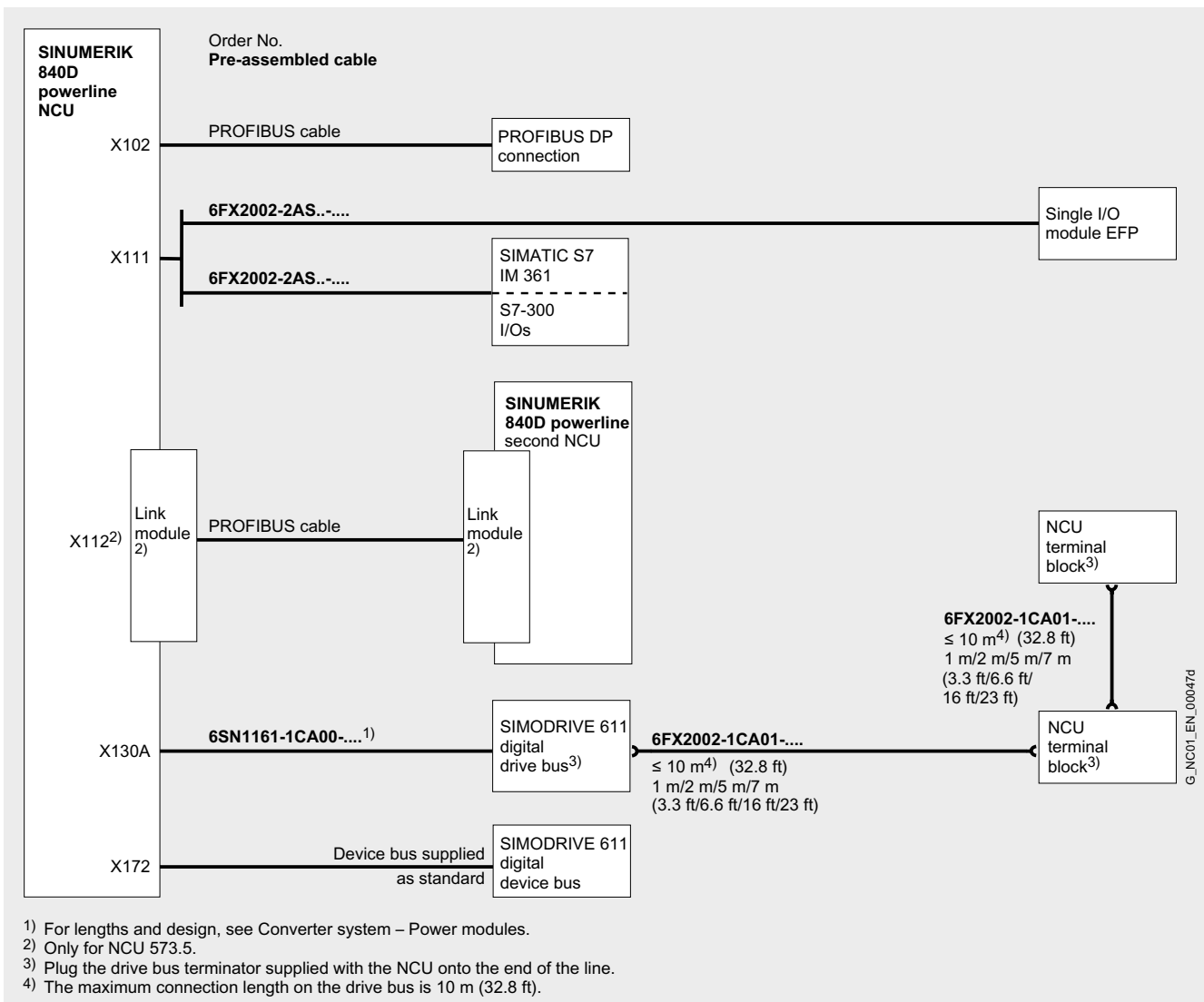
ShopMill or ShopTurn for genuine workshop CNC and Motion Control Information System products (MCIS products) for the production area, such as CNC program management.



### Integration

The following components can be connected to the SINUMERIK 840D powerline:

- SINUMERIK operator panel front with PCU and machine control panel
- SIMATIC CE panel
- SIMATIC OP7/OP17
- SINUMERIK Push Button Panel
- SINUMERIK handheld unit type B-MPI
- SINUMERIK mini-handheld unit
- SINUMERIK HT 6
- SIMATIC S7-300 I/O
- SINUMERIK single I/O module EFP
- SINUMERIK NCU terminal block with DMP compact modules
- 2 handwheels, 2 probes, 4 high-speed digital CNC inputs and 4 high-speed digital CNC outputs via cable distributors
- Distributed PLC I/O via PROFIBUS DP connection
- SIMODRIVE 611 digital converter system
- Programming device
- 1FK7/1FT6/1FT7/1FN/1FW6/1PH/1FE1/2SP1/1LA motors
- PROFINET IO and PROFINET CBA via external CP 343-1 Advanced communication board



Connection overview for SINUMERIK 840D powerline, part 1 of 2

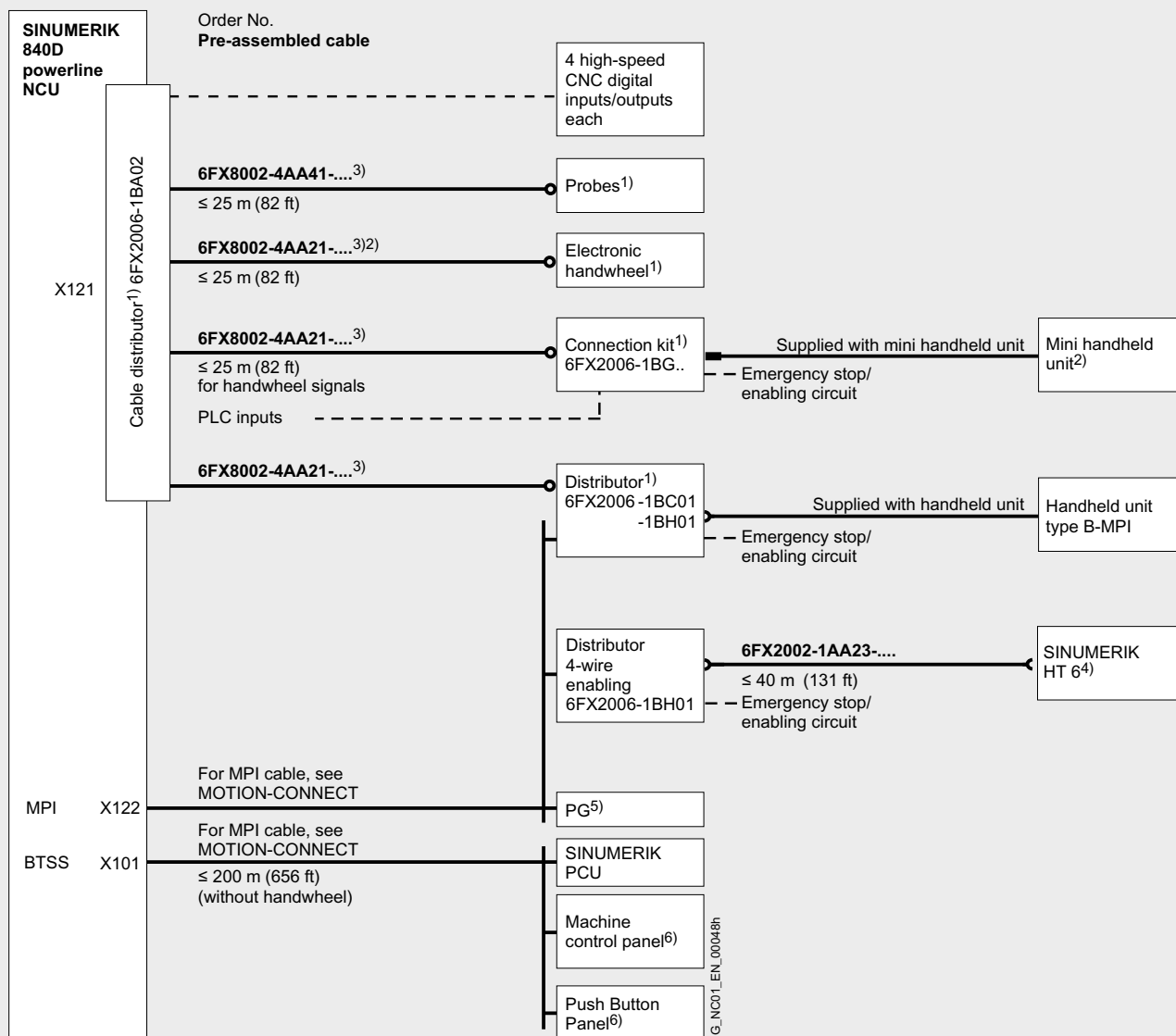
Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

# Basic components

## CNC controls

### SINUMERIK 840D powerline

#### Integration (continued)



1) A maximum of 2 handwheels and 2 probes can be connected.

2) Max. distance between handwheel and X121 terminal: ≤ 25 m (82 ft).

3) CNC side with DU box connector.

4) HT 6 always connected: max. 200 m (656 ft) from plug X122 to HT 6. HT 6 not always connected: max. 200 m (656 ft) from plug X122 to HT 6 only with RS 485 repeater (6ES7972-0AA01-0XA0). Otherwise, total MPI length from plug X122 to distributor ≤ 5 m (16 ft). The HT 6 must always be connected to one end of the MPI length (integrated bus termination).

5) If handheld unit and PG are to be used at the same time: MPI bus cable (6FX2002-4EB... ) with 3 plugs required.

6) Machine control panel and Push Button Panel can be operated at the same time.

Connection overview for SINUMERIK 840D powerline, part 2 of 2

Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

#### Overview



#### NCU 561.5

The NCU 561.5 of the SINUMERIK 840D powerline is suitable for simple positioning or machining tasks. Two axes can handle simple positioning or machining tasks in a maximum of two machining channels and two mode groups. Interpolation is limited to one linear axis with one spindle (e.g. for tapping).

The basic version of the CNC user memory is 3 MB, and can be optionally expanded up to 6 MB.

#### NCU 571.5

The NCU 571.5 is a configuration of the SINUMERIK 840D powerline which provides up to 6 axes in a maximum of 2 machining channels and 2 mode groups. Interpolation is possible for a maximum of 5 axes with the standard version of the NCU system software (multi-axis interpolation option).

The basic version of the CNC user memory is 3 MB, and can be optionally expanded up to 6 MB.

#### NCU 572.5

The NCU 572.5 represents the mid-performance stage within the SINUMERIK 840D powerline range.

The NCU system software provides 31 axes with up to 6 machining channels and up to 6 mode groups. Interpolation is possible for a maximum of 12 axes with the standard version of the NCU system software (multi-axis interpolation option).

The basic version of the CNC user memory is 3 MB, and can be optionally expanded up to 6 MB.

#### NCU 573.5

The NCU 573.5 is the flagship of the SINUMERIK 840D powerline, representing the highest configuration within the SINUMERIK 840D range. The integrated PLC features significantly enhanced performance.

Up to 31 axes are available in up to 10 machining channels which can be executed in up to 10 mode groups. Up to 12 axes/spindles are supported per channel. Interpolation is possible for a maximum of 12 axes with the standard version of the NCU system software (multi-axis interpolation option).

The basic version of the CNC user memory is 3 MB, and can be optionally expanded up to 6 MB.

#### Technical specifications

Order No.	6FC5356-0BB15-0AA0	6FC5357-0BB15-0AA0	6FC5357-0BB25-0AA0	6FC5357-0BB35-0AA0
<b>Product name</b>	SINUMERIK 840D powerline NCU 561.5	SINUMERIK 840D powerline NCU 571.5	SINUMERIK 840D powerline NCU 572.5	SINUMERIK 840D powerline NCU 573.5
<b>Processor</b>	Celeron		Celeron	Pentium III
• Clock frequency	400 MHz		650 MHz	933 MHz
<b>SIMATIC S7 - integrated</b>	PLC 317-2 DP			
<b>Input voltage</b>	Via SIMODRIVE device bus			
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20 with NCU box			
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).			
<b>Relative humidity</b>				
• Storage	10 ... 95 %			
• Transport	10 ... 95 %			
• Operation	< 95 % for 1h, annual average < 65 %			
<b>Ambient temperature</b>				
• Storage	-20 ... +60 °C (-4 ... +140 °F)			
• Transport	-20 ... +60 °C (-4 ... +140 °F)			
• Operation	0 ... 55 °C (32 ... 131 °F)			
<b>Dimensions</b>				
• Width	50 mm (1.97 in)			
• Height	316 mm (12.4 in)			
• Depth	207 mm (8.15 in)			
<b>Weight, approx.</b>	0.72 kg (1.59 lb)			1.05 kg (2.32 lb)

# Basic components

## CNC controls

### SINUMERIK 840D powerline NCUs

#### Selection and ordering data

Designation	Order No.
<b>NCU system software 2 axes</b> On PC card	
• Export 840DE powerline	<b>6FC5250-■DY30-■AH■</b>
<b>NCU system software 4 axes grinding</b> On PC card	
• Export 840DE powerline	<b>6FC5250-■HY30-■AH■</b>
<b>NCU system software 6 axes</b> On PC card	
• Standard 840D powerline	<b>6FC5250-■CX30-■AH■</b>
• Export 840DE powerline	<b>6FC5250-■CY30-■AH■</b>
<b>NCU system software 12 axes</b> On PC card	
• Standard 840D powerline	<b>6FC5250-■BX30-■AH■</b>
• Export 840DE powerline	<b>6FC5250-■BY30-■AH■</b>
<b>NCU system software 31 axes</b> On PC card	
• Standard 840D powerline	<b>6FC5250-■AX30-■AH■</b>
• Export 840DE powerline	<b>6FC5250-■AY30-■AH■</b>
- Single license for current software version	<b>0 0 0</b>
- Single license for specific software version	<b>■ ■ 0</b>
- Single license without data carrier	<b>0 0 1</b>
- Software Update Service	<b>0 0 2</b>
- Upgrade for specific software version	<b>■ ■ 3</b>
<b>Toolbox<sup>1)</sup></b> For SINUMERIK 810D/840D on CD-ROM with:	
• PLC basic program	
• Standard machine data	
• NC variable selector	
- Single license for current software version	<b>6FC5252-0AX21-0AB0</b>
- Single license for specific software version	<b>6FC5252-■AX21-■AG0</b>
- Single license without data carrier	<b>6FC5252-0AX21-0AB1</b>
- Software Update Service	<b>6FC5252-0AX21-0AB2</b>
- Upgrade for specific software version	<b>6FC5252-■AX21-■AG3</b>

Example of a specific software version, e.g., 7.4:  
6FC5250-7...-4...

From software release 6.4 or higher (6.5 for NCU 5xx.5), the NCU system software can be used for 2, 6, 12 or 31 axes. These numbers of axes result in the following maximum number of physical axes (also in the PLC program):

- NCU 561.5: 2 physical axes
- NCU 571.5: 6 physical axes
- NCU 572.5/NCU 573.5: 31 physical axes

Designation	Order No.
<b>NCU box</b> For accommodating the NCU 561.5/571.5/572.5/573.5	<b>6FC5247-0AA00-0AA3</b>
<b>NCU 561.5</b>	<b>6FC5356-0BB15-0AA0</b>
<b>NCU 571.5</b>	<b>6FC5357-0BB15-0AA0</b>
<b>NCU 572.5</b>	<b>6FC5357-0BB25-0AA0</b>
<b>NCU 573.5</b>	<b>6FC5357-0BB35-0AA0</b>
<b>CNC user memory</b> Expanded by 1 MB	<b>6FC5251-0AD02-0AA0</b>
<b>PLC user memory</b> Expanded by 64 KB	<b>6FC5252-0AA03-0AA0</b>
<b>I/O interfacing via PROFIBUS DP</b> Software option	<b>6FC5252-0AD00-0AA0</b>
<b>Link module (PROFIBUS DP)</b> For NCU 573.5	<b>6FC5212-0AA01-1AA0</b>
<b>Cable distributor</b> For connecting 2 handwheels, 2 probes and 4 digital inputs/ outputs	<b>6FX2006-1BA02</b>
<b>DU box connector 4-pole</b> (10 units) For connecting devices to cable distributor	<b>6FX2003-0FA00</b>
<i>Spare and wear parts</i>	
<b>Battery</b>	<b>6FC5247-0AA18-0AA0</b>
<b>Battery compartment</b> With battery and fan	<b>6FC5247-0AA06-0AA0</b>
<b>PC card</b> Acc. to PCMCIA standard Type STRATA (empty)	
• 8 MB (up to and including NCU software version 7.2)	<b>6FC5247-0AA11-0AA3</b>
• 16 MB (NCU software version 7.4 and higher)	<b>6FC5247-0AA11-1AA3</b>
<b>Device bus cable</b> 50 mm (1.97 in)	<b>6FC5247-0AA23-0AA0</b>
<b>Drive bus cable</b> For 50 mm (1.97 in) module width	<b>6SN1161-1CA00-0AA0</b>
<b>Terminator</b> For drive bus	<b>6FX2003-0DA00</b>

The device bus cable and the terminator for the drive bus are included in the NCU scope of supply.

<sup>1)</sup> One license is required for each NCU. The CD-ROM contains several software versions.

### SINUMERIK 840D powerline Compile cycles

### SINUMERIK 840D powerline NCK OA package for NCUs

#### Overview



The openness of the SINUMERIK 840D powerline NCK allows users to develop solutions for (almost) every technological problem and application!

This is possible with the integration of technological add-on functions in the NCU system software in the form of compile cycles. The compile cycles can either be programmed based on the NCK OA package and the appropriate development environment, or through development and testing in industrial conditions contracted to Siemens.

Below is a selection of the technological add-on functions that have already been developed in the form of loadable compile cycles and are available as options with SINUMERIK 840D powerline:

- 1D/3D clearance control in position control cycle
- Axial coupling in the machine coordinate system
- Handling transformation package
- Pantograph kinematics transformation, two axes
- PARACOP 3-axis transformation for parallel kinematics (first channel)
- Tripod-hybrid-kinematics Exechon transformation
- Laser switching signal, high-speed
- Continue machining at the contour
- PROFIBUS tool and process monitoring
- Space error compensation for kinematic transformations
- Axis collision protection
- Crank interpolation

Additional compile cycles are implemented or being developed or can be developed at the customer's request.

A typical example for the use of compile cycles are special transformations for specific machine kinematics. With these transformations, workpieces can be programmed in Cartesian coordinates while the transformation calculates the required machine axis movements.

#### Overview

The NCK OA package (Open Architecture package NCK) is a component of the SINUMERIK Open Architecture that allows manufacturer-specific NCK functions (compile cycles) to be implemented in the system. They are implemented in the NCU's system software in C or C++.

The NCK OA package requires an export approval.

[An OEM contract is required to use the NCK OA package.](#)

The development system must be a SUN workstation with Solaris operating system.

#### More information

For further information about compile cycles and the NCK OA package, contact:

##### Siemens AG

Industry Sector

I DT MC MT S 3

Contact: Mr. Hanneforth

Phone: +49 (0) 9131-98-3498

Fax: +49 (0) 9131-98-63498

E-mail: [horst.hanneforth@siemens.com](mailto:horst.hanneforth@siemens.com)

# Basic components

## CNC controls

SINUMERIK 840D powerline  
SINUMERIK Safety Integrated

### Overview



SINUMERIK Safety Integrated provides integrated safety functions that support the implementation of highly effective personnel and machine protection. The safety functions comply with the requirements of Category 3 according to EU standard EN 954-1 and safety integrity level SIL 2 of EN 61508. Consequently, important functional safety requirements can be converted easily and efficiently. Available functions include, among others:

- Functions for safety monitoring of velocity and standstill
- Functions for establishing safe boundaries in work spaces and protected spaces, and for range recognition
- Direct connection of all safety-related signals and their internal logical linkage

### Benefits

- High level of safety: complete implementation of the safety functions in Category 3/SIL 2
- High level of flexibility: supports the implementation of practically sound safety and operating concepts
- Very economical: reduced hardware and installation costs
- Enhanced availability: absence of interference-susceptible electromechanical switching elements

### Function

The safety functions are available in all modes and can communicate with the process using safety-oriented input/output signals.

They can be implemented for each individual axis and spindle:

- Safe shutdown  
Provides transition of the drive from motion to rest when a monitoring device or a sensor (e.g. a light barrier) is triggered.
- Safe braking ramp (SBR)  
Monitoring of the speed curve. The speed must be reduced after a stop request has been issued.
- Safe operating stop (SBH)  
Monitors drives for standstill. The drives remain fully functional for position control.
- Safe standstill (SS)  
Pulse suppression of drives, providing safe electronic interruption of the power supply.
- Safely limited speed (SG)  
Monitoring of configurable velocity limit values, e.g. during setup without enabling button.
- Safety-related output  $n < n_x$   
Speed recognition of a drive
- Safe software limit switch (SE)  
Variable travel limitations
- Safe software cams (SN)  
Range recognition
- Safety-related input/output signals (SGE/SGA)  
Interface with process
- Safe programmable logic (SPL)  
Direct connection of all safety-related signals and their internal logical linkage.
- Safe brake management (SBM)  
- 2-channel braking signal  
- Cyclic brake test
- Safety-oriented communication via standard bus  
Connection of distributed I/O for process and safety signals using the PROFIsafe protocol via PROFIBUS.
- Integrated acceptance test  
Partially automated acceptance test for all safety-related functions. Simple operation of the test process, automatic configuration of Trace functions and automatic generation of an acceptance report.

5

# Basic components

## CNC controls

SINUMERIK 840D powerline  
SINUMERIK Safety Integrated

### Integration

Requirements for SINUMERIK 840D powerline:

- General
  - SINUMERIK 840D powerline
  - SIMODRIVE 611 digital with High Performance control module or High Standard control module with additional DMS input
  - The measuring circuit cables must comply with the SIMODRIVE 611 digital specifications
- For the integrated acceptance test
  - SinuCom NC software tool (can run on PC/PG)
  - SINUMERIK software version from 6.4.15
- Sensor/actuator integration with PROFIsafe I/Os
  - SINUMERIK 840D powerline with NCU 57x.5
  - SINUMERIK software version from 6.3
  - Software option I/O interface via PROFIBUS DP
  - SIMATIC ET 200S or
  - SIMATIC ET 200eco or
  - SIMATIC ET 200pro or
  - DP/AS-i F-Link
  - S7 F Configuration Pack software module
- Software options in accordance with selection and ordering data
  - With software version 7 and above, the SI Basic option can be ordered for machines for which 4 inputs/outputs are sufficient for safe programmable logic.
  - When more than 4 inputs/outputs are required for safe programmable logic, the SI Comfort option must be used.
  - When the function safe programmable logic is not used with Safety Integrated, the SI Basic option is adequate.

### Selection and ordering data

Designation	Order No.
<b>SINUMERIK Safety Integrated for SINUMERIK 840D</b> (from software Version 7)	
• SI Basic For 1 axis/spindle; up to 4 inputs/outputs can be used for the safe programmable logic	<b>6FC5250-0AG00-0AA0</b>
• SI Comfort For 1 axis/spindle; up to 64 inputs/outputs can be used for the safe programmable logic	<b>6FC5250-0AG10-0AA0</b>
• SI axis/spindle From the second axis/spindle, per axis/spindle	<b>6FC5250-0AG11-0AA0</b>
• SI axis/spindle package Additional 15 axes/spindles	<b>6FC5250-0AG12-0AA0</b>

### More information

The following Type Examination Certificates and certificates are available for the SINUMERIK 840D powerline:

- Type Examination Certificate by BIA (EN 954-1/DIN V VDE 0801)
- Type Examination Certificate by BGIA (EN 954-1/EN 61508)
- Certificate by TÜV Rheinland (EN 954-1/IEC 61508)
- Certificate by TÜV Rheinland of North America (NFPA79/IEC 61508)

A list of certified software and hardware versions is included with the Certificate of License (CoL) for the SINUMERIK Safety Integrated option.

Please contact your local Siemens branch if you have questions concerning current certifications.

Download under:

[support.automation.siemens.com/WWW/view/en/28368460/134200](http://support.automation.siemens.com/WWW/view/en/28368460/134200)

# Basic components

## SINUMERIK I/O modules

### EFP single I/O module

#### Overview



The single I/O module EFP has 64 inputs and 32 short-circuit-proof outputs. The total current for the outputs is 12 A, i.e. 32 outputs with 0.5 A each and a simultaneity factor of 0.75.

Up to 3 single I/O modules can be connected to the SINUMERIK 810D powerline or SINUMERIK 840D powerline, combinations with SIMATIC S7-300 strings are permissible.

#### Terminal strip converter

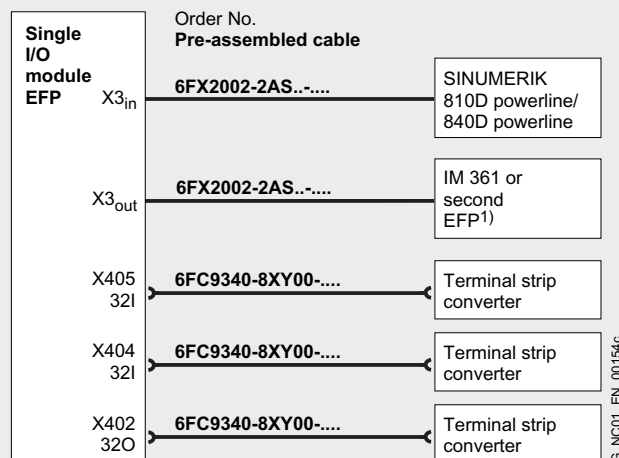
A terminal strip converter is used for safe and easy signal connection between the input/output groups of the control and the machine. If you are using terminal strip converters with LED display, the LED is lit when the signal mode is active/high. This simplifies simulation, setup and service at the interface between the control and the machine.

The terminal strip converter is mounted easily by snapping it onto DIN rails.

#### Selection and ordering data

Designation	Order No.
<b>Single I/O module EFP</b> 64 inputs/32 outputs, isolated	<b>6FC5411-0AA00-0AA0</b>
<b>Connecting cable</b> Shielded, for single-tier configuration for multiple EFP modules Length: 150 mm (5.91 in)	<b>6FC5411-0AA80-0AA0</b>
<b>Terminal strip converter</b> 34-pole, 0.5 A output	
• Without LED status display	<b>6FC9302-2AA</b>
• Red LED status display	<b>6FC9302-2AB</b>
• Green LED status display	<b>6FC9302-2BB01</b>

#### Integration



<sup>1)</sup> The cable 6FC5411-0AA80-0AA0 (0.15 m/5.9 in) is available for a single-tier design with EFP.

Connection overview for single I/O module

Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

#### Technical specifications

<b>Order No.</b>	<b>6FC5411-0AA00-0AA0</b>
<b>Product name</b>	SINUMERIK single I/O module EFP
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	292.8 W
<b>Input/output interfaces</b>	64 inputs digital/ 32 outputs digital
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	10 ... 95 %
• Transport	10 ... 95 %
• Operation	< 95 % for 1h, annual average < 65 %
<b>Ambient temperature</b>	
• Storage	-40 ... +70 °C (-40 ... +158 °F)
• Transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width	50 mm (1.97 in)
• Height	374 mm (14.7 in)
• Depth	153 mm (6.02 in)
<b>Weight, approx.</b>	1.7 kg (3.75 lb)



### NCU terminal block with DMP compact modules

#### Overview



For rapid movement synchronization and/or for safety-oriented input/output signals on the NCK channel of the SINUMERIK Safety Integrated<sup>1)</sup> safety function, digital and analog CNC inputs/outputs can be connected to the drive bus via the NCU terminal block (max. 2) when using the SINUMERIK 810D powerline and SINUMERIK 840D powerline.

#### Technical specifications

<b>Order No.</b>	<b>6FC5211-0AA00-0AA0</b>
<b>Product name</b>	SINUMERIK NCU terminal block
<b>Input voltage</b>	24 V DC
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Relative humidity</b>	
• Storage	10 ... 95 %
• Transport	10 ... 95 %
• Operation	< 95 % for 1h, annual average < 65 %
<b>Ambient temperature</b>	
• Storage	-40 ... +70 °C (-40 ... +158 °F)
• Transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width	257 mm (10.1 in)
• Height	100 mm (3.94 in)
• Depth	40 mm (1.57 in)
<b>Weight, approx.</b>	0.5 kg (1.10 lb)

#### Integration

Up to eight DMP compact modules can be plugged into an NCU terminal block. In the maximum configuration, the following can be connected for general functions:

- 32 digital inputs
- 32 digital outputs
- 8 analog inputs, max. 4 analog inputs/outputs per NCU terminal block
- 8 analog outputs, max. 4 analog inputs/outputs per NCU terminal block

The number of digital inputs and outputs that can be connected is increased for applications of the SINUMERIK Safety Integrated safety function

- To up to 64 digital inputs/outputs for the safe programmable logic (SPL) functionality
- By additional digital input and output signals for each safety axis.

<sup>1)</sup> Not for SINUMERIK 810D powerline.

# Basic components

## SINUMERIK I/O modules

### NCU terminal block with DMP compact modules

#### Technical specifications (continued)

Order No.	6FC5211-0AA10-0AA0	6FC5111-0CA04-0AA0	6FC5111-0CA05-0AA0	6FC5111-0CA03-0AA2	6FC5111-0CA01-0AA0	6FC5111-0CA02-0AA2
<b>Product name</b>	SINUMERIK DMP compact 11 analog, conversion time 75 µs	SINUMERIK DMP compact 11 analog	SINUMERIK DMP compact 10 analog	SINUMERIK DMP compact 80 digital	SINUMERIK DMP compact 16l digital	SINUMERIK DMP compact 16O digital
<b>Input voltage</b>	24 V DC					
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20					
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).					
<b>Relative humidity</b>	<ul style="list-style-type: none"> <li>• Storage: 10 ... 95 %</li> <li>• Transport: 10 ... 95 %</li> <li>• Operation: &lt; 95 % for 1h, annual average &lt; 65 %</li> </ul>					
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>• Storage: -40 ... +70 °C (-40 ... +158 °F)</li> <li>• Transport: -40 ... +70 °C (-40 ... +158 °F)</li> <li>• Operation: 0 ... 55 °C (32 ... 131 °F)</li> </ul>					
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width: 25 mm (0.98 in)</li> <li>• Height: 90 mm (3.54 in)</li> <li>• Depth: 108 mm (4.25 in)</li> </ul>					
<b>Weight, approx.</b>	0.16 kg (0.35 lb)	0.15 kg (0.33 lb)	0.14 kg (0.31 lb)	0.145 kg (0.32 lb)	0.125 kg (0.28 lb)	0.16 kg (0.35 lb)

#### Selection and ordering data

Designation	Order No.
<b>NCU terminal block</b> For 8 DMP compact module	<b>6FC5211-0AA00-0AA0</b>
<b>DMP compact 16l digital</b> With 16 digital inputs 24 V DC isolated	<b>6FC5111-0CA01-0AA0</b>
<b>DMP compact 16O digital</b> With 16 outputs (2 x 8) 24 V DC/0.5 A isolated and short-circuit resistant, with free-wheeling diode	<b>6FC5111-0CA02-0AA2</b>
<b>DMP compact 80 digital</b> With 8 outputs 24 V DC/2 A isolated and short-circuit resistant, with free-wheeling diode	<b>6FC5111-0CA03-0AA2</b>

Designation	Order No.
<b>DMP compact 11 analog</b> With 1 analog input Input voltage: Nominal range: ± 10 V or ± 500 mV (conversion time: < 60 ms) Overrange: ± 20 V or ± 1 V (conversion time: < 80 ms) Resolution: 12 bit + sign	<b>6FC5111-0CA04-0AA0</b>
<b>DMP compact 11 analog high-speed</b> With 1 analog input Input voltage: Nominal range ± 10 V, conversion time: 75 µs, resolution: 11 bit + sign (4.88 mV per bit)	<b>6FC5211-0AA10-0AA0</b>
<b>DMP compact 10 analog</b> With 1 analog output ± 10 V; ± 3 mA Resolution 13 bit + sign, isolated	<b>6FC5111-0CA05-0AA0</b>
<b>Terminator for drive bus</b> (with SINUMERIK 840D already incl. in NCU scope of supply)	<b>6FX2003-0DA00</b>

For SINUMERIK 810D powerline, a separate terminator needs to be ordered for the drive bus.

### Overview



Modules from the SIMATIC product range are available as machine I/Os for SINUMERIK 810D powerline/840D powerline.

- SINUMERIK 810D powerline: Modules of the SIMATIC S7-300 series
- SINUMERIK 840D powerline: Modules of the SIMATIC S7-300 series and distributed I/O via PROFIBUS DP

For details of the SIMATIC product range, refer to the interactive CA 01 catalog under SIMATIC Industrial Automation Systems.

#### SINUMERIK 810D powerline/840D powerline

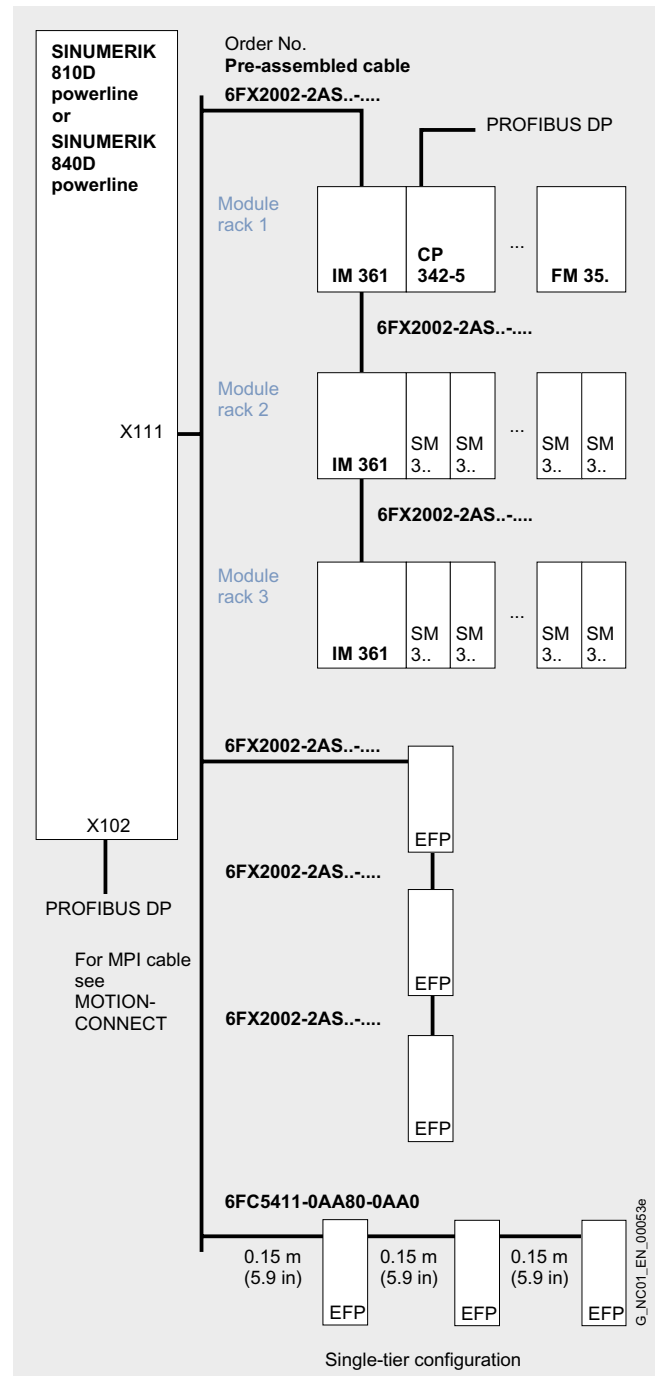
The SINUMERIK 810D powerline/840D powerline also incorporate the PLC-CPU. This PLC-CPU is compatible with SIMATIC S7, and its functionality is based on a:

- CPU 315-2 DP for SINUMERIK 810DE powerline/810D powerline with CCU 3.4 module
- CPU 317-2 DP for SINUMERIK 840DE powerline/840D powerline with NCU 561.5/NCU 571.5/NCU 572.5/NCU 573.5

Maximum configuration with SIMATIC S7-300: 3 lines with

- IM 361 interface and up to 8 SM 3.. I/O modules or
- Single I/O module EFP; combinations of IM 361 and EFP single I/O modules are possible.

### Integration



Connection overview for SINUMERIK 810D powerline/840D powerline and I/Os

Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

# Basic components

## SIMATIC I/O modules

### Selection and ordering data

Designation	Order No.
<b>Backup battery</b> For SIMATIC S7-300 CPUs and S5-90U 3.6 V; 950 mAh	<b>6ES7971-1AA00-0AA0</b>
<b>PS 307 load power supply</b> Incl. power connector; 120/230 V AC; 24 V DC	
• 2 A	<b>6ES7307-1BA00-0AA0</b>
• 5 A, outdoor	<b>6ES7307-1EA00-0AA0</b>
• 5 A	<b>6ES7307-1EA80-0AA0</b>
• 10 A	<b>6ES7307-1KA01-0AA0</b>
<b>Mounting adapter</b> For snapping the PS 307 onto 35 mm standard rails (EN 50022)	<b>6ES7390-6BA00-0AA0</b>
<b>MicroMemory Card</b> For SIMATIC S7-300/C7/ET 200S/IM151/CPU 3.3 V; nFlash	
• 64 KB	<b>6ES7953-8LF20-0AA0</b>
• 128 KB	<b>6ES7953-8LG11-0AA0</b>
• 512 KB	<b>6ES7953-8LJ20-0AA0</b>
• 2 MB	<b>6ES7953-8LL20-0AA0</b>
• 4 MB	<b>6ES7953-8LM20-0AA0</b>
• 8 MB	<b>6ES7953-8LP20-0AA0</b>
<b>Front connector</b> (1 unit)	
• 20-pin, with screw contacts	<b>6ES7392-1AJ00-0AA0</b>
• 20-pin, with spring-loaded contacts	<b>6ES7392-1BJ00-0AA0</b>
• 40-pin, with screw contacts	<b>6ES7392-1AM00-0AA0</b>
• 40-pin, with spring-loaded contacts	<b>6ES7392-1BM01-0AA0</b>
<b>Shield connection element</b> 80 mm (3.15 in) wide, with two rows for 4 terminals each	<b>6ES7390-5AA00-0AA0</b>
<b>Shield connection terminals</b> (2 units)	
• For 2 cables of diameter 2 ... 6 mm (0.08 ... 0.24 in)	<b>6ES7390-5AB00-0AA0</b>
• For 1 cable of diameter 3 ... 8 mm (0.12 ... 0.31 in)	<b>6ES7390-5BA00-0AA0</b>
• For 1 cable of diameter 4 ... 13 mm (0.16 ... 0.51 in)	<b>6ES7390-5CA00-0AA0</b>
<b>Mounting rail</b>	
• 160 mm (6.30 in)	<b>6ES7390-1AB60-0AA0</b>
• 480 mm (18.90 in)	<b>6ES7390-1AE80-0AA0</b>
• 530 mm (20.87 in)	<b>6ES7390-1AF30-0AA0</b>
• 830 mm (32.68 in)	<b>6ES7390-1AJ30-0AA0</b>
• 2 000 mm (78.74 in)	<b>6ES7390-1BC00-0AA0</b>
<b>Mounting location number labels</b> 1 set	<b>6ES7912-0AA00-0AA0</b>
<b>IM 360 interface</b> For expanding the S7-300 with up to 3 expansion racks that can be plugged into the central controller	<b>6ES7360-3AA01-0AA0</b>

Designation	Order No.
<b>IM 361 interface</b> For expanding the S7-300 with up to 3 expansion racks that can be plugged into the expansion unit	<b>6ES7361-3CA01-0AA0</b>
<b>IM 365 interface module</b> For expanding the S7-300 with up to 1 expansion rack, comprising of 2 modules with a permanently attached connecting cable 1 m (3.28 ft)	<b>6ES7365-0BA01-0AA0</b>
<b>Connecting cable</b> Between IM 360 and IM 361 or IM 361 and IM 361	
• 1 m (3.28 ft)	<b>6ES7368-3BB01-0AA0</b>
• 2.5 m (8.20 ft)	<b>6ES7368-3BC51-0AA0</b>
• 5 m (16.4 ft)	<b>6ES7368-3BF01-0AA0</b>
• 10 m (32.8 ft)	<b>6ES7368-3CB01-0AA0</b>
<b>IM 153-1 interface module</b> Slave interface for connecting an ET 200M to PROFIBUS DP	<b>6ES7153-1AA03-0XB0</b>
<b>SM 321 digital input modules</b> Incl. labeling strips, bus coupler, for connecting switches and 2-wire proximity switches (BERO)	
• 16 inputs, 24 V DC	<b>6ES7321-1BH02-0AA0</b>
• 16 inputs, 24 V DC, source input	<b>6ES7321-1BH50-0AA0</b>
• 32 inputs, 24 V DC	<b>6ES7321-1BL00-0AA0</b>
• 16 inputs, 24 V DC, diagnostics-capability	<b>6ES7321-7BH01-0AB0</b>
• 16 inputs, 120 V AC	<b>6ES7321-1FH00-0AA0</b>
• 32 inputs, 120 V AC	<b>6ES7321-1EL00-0AA0</b>
• 8 inputs, 120/230 V AC	<b>6ES7321-1FF01-0AA0</b>
<b>SM 321 digital output modules</b> Incl. labeling strips, bus coupler, for connecting solenoid valves, contactors, small motors, lamps and motor starters	
• 16 outputs, 24 V DC, 0.5 A	<b>6ES7322-1BH01-0AA0</b>
• 32 outputs, 24 V DC, 0.5 A	<b>6ES7322-1BL00-0AA0</b>
• 8 outputs, 24 V DC, 0.5 A, diagnostics-capability	<b>6ES7322-8BF00-0AB0</b>
• 16 outputs, 120 V AC, 0.5 A	<b>6ES7322-1FH00-0AA0</b>
• 8 outputs, 24 V DC, 2 A	<b>6ES7322-1BF01-0AA0</b>
• 8 outputs, 120/230 V AC, 1 A	<b>6ES7322-1FF01-0AA0</b>
• 8 outputs, relay contact, 2 A	<b>6ES7322-1HF01-0AA0</b>
• 8 outputs, relay contact, 5 A	<b>6ES7322-1HF10-0AA0</b>
• 16 outputs, relay contact, 8 A	<b>6ES7322-1HH01-0AA0</b>

### Selection and ordering data (continued)

Designation	Order No.
<b>SM 323 digital input/output modules</b> Incl. labeling strips, bus coupler, for connecting switches, 2-wire proximity switches (BERO), solenoid valves, contactors, small motors, lamps and motor starters <ul style="list-style-type: none"> <li>• 8 inputs/8 outputs</li> <li>• 16 inputs/16 outputs</li> </ul>	<b>6ES7323-1BH01-0AA0</b> <b>6ES7323-1BL00-0AA0</b>
<b>SM 331 analog input modules</b> Incl. labeling strips, bus coupler, measuring range modules; for connecting voltage and current encoders, thermocouples, resistors and resistor thermometers <ul style="list-style-type: none"> <li>• 8 inputs, 13 bit resolution</li> <li>• 8 inputs</li> <li>• 2 inputs</li> <li>• 8 inputs, enhanced resolution</li> <li>• 8 inputs for thermoresistors</li> <li>• 8 inputs for thermocouples</li> </ul>	<b>6ES7331-1KF01-0AB0</b> <b>6ES7331-7KF02-0AB0</b> <b>6ES7331-7KB02-0AB0</b> <b>6ES7331-7NF00-0AB0</b> <b>6ES7331-7PF01-0AB0</b> <b>6ES7331-7PF11-0AB0</b>
<b>SM 332 analog output modules</b> Incl. labeling strips, bus coupler; for connecting analog actuators <ul style="list-style-type: none"> <li>• 4 outputs</li> <li>• 4 outputs, 16 bit</li> <li>• 2 outputs</li> <li>• 8 outputs</li> </ul>	<b>6ES7332-5HD01-0AB0</b> <b>6ES7332-7ND02-0AB0</b> <b>6ES7332-5HB01-0AB0</b> <b>6ES7332-5HF00-0AB0</b>
<b>SM 334 analog input/output modules</b> Incl. labeling strips, bus coupler; for connecting analog sensors and actuators <ul style="list-style-type: none"> <li>• 4 inputs, 2 outputs</li> <li>• 4 inputs, 2 outputs; resistance measurement, Pt 100</li> </ul>	<b>6ES7334-0CE01-0AA0</b> <b>6ES7334-0KE00-0AB0</b>

Designation	Order No.
<b>SM 335 analog input/output modules</b> Incl. labeling strips, bus coupler; with special functions: <ul style="list-style-type: none"> <li>• Comparator for extremely fast comparison of an analog value</li> <li>• Extremely fast measurement of analog values (&lt; 0.5 ms)</li> </ul> With 4 high-speed inputs (max. 14 bit resolution, max. 0.2 ms conversion time per channel), 4 high-speed outputs (max. 12 bit resolution, max. 0.8 ms conversion time per channel), 1 pulse input (counter input/24 V, 500 Hz) and encoder supply (10 V, 25 mA)	<b>6ES7335-7HG01-0AB0</b>
<b>Interference suppression filter</b> For up to four SM 335	<b>6ES7335-7HG00-6AA0</b>
<b>Manual for SM 335</b> <ul style="list-style-type: none"> <li>• German</li> <li>• English</li> </ul>	<b>6ES7335-7HG00-8AA1</b> <b>6ES7335-7HG00-8BA1</b>
<b>S7-300 manual</b> Design, CPU data, module data, operations list <ul style="list-style-type: none"> <li>• German</li> <li>• English</li> <li>• French</li> <li>• Spanish</li> <li>• Italian</li> </ul>	<b>6ES7398-8FA10-8AA0</b> <b>6ES7398-8FA10-8BA0</b> <b>6ES7398-8FA10-8CA0</b> <b>6ES7398-8FA10-8DA0</b> <b>6ES7398-8FA10-8EA0</b>
<b>Communications module CP 343-2</b> For connecting SIMATIC S7-300 and ET 200M to AS-Interface according to AS-Interface specifications V3.0	<b>6GK7343-2AH01-0XA0</b>
<b>Communications module CP 342-5</b> For connecting SIMATIC S7-300 to PROFIBUS DP	<b>6GK7342-5DA02-0XE0</b>

For technical specifications, see the SIMATIC Catalog ST 70 or the A&D Mall.

# Basic components

## Positioning modules

### Introduction

### Overview

#### Positioning module

**FM 353**  
Control for 1 stepper motor



**FM 354**  
Analog control for 1 servo motor



**FM 357-2**  
Analog and stepper motor control for 4 axes



#### Converter system

Power control for stepper motors<sup>1)</sup>

**SIMODRIVE 611 universal HRS**

**SIMODRIVE 611 universal HRS**

P\_NC01\_XX\_00865

**SIMODRIVE 611 universal HRS**  
(see Converter system)



**SIMODRIVE 611**

P\_NC01\_XX\_00630

5

<sup>1)</sup> On request.

# Basic components

## Positioning modules

### Positioning module FM 353

#### Overview

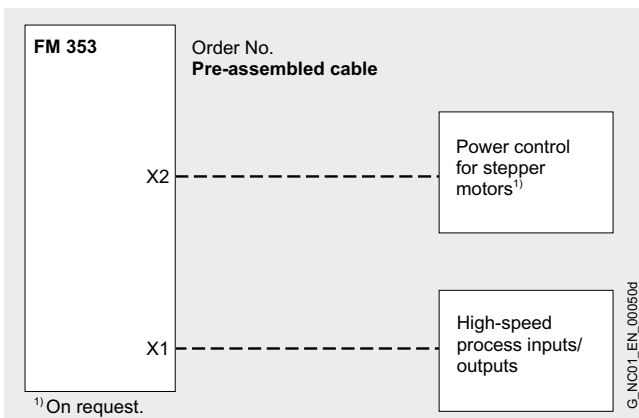


The FM 353 single-axis positioning module for stepper motors has the same basic design as the SIMATIC S7-300 series.

#### Application

- PLC positioning axis for the SINUMERIK 810D powerline and SINUMERIK 840D powerline for stepper motors, e.g. as infeed, retooling, setup or loader axis
- Positioning of stepper motors
- Independent operation in the SIMATIC S7-300

#### Integration



Connection overview for FM 353

Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

#### Technical specifications

<b>Order No.</b>	<b>6ES7353-1AH01-0AE0</b>
<b>Product name</b>	Positioning module FM 353
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	7 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Ambient temperature</b>	
• Storage	-40...+70 °C (-40 ... +158 °F)
• Transport	-40...+70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width	80 mm (3.15 in)
• Height	125 mm (4.92 in)
• Depth	118 mm (4.65 in)
<b>Weight, approx.</b>	0.5 kg (1.10 lb)

#### Selection and ordering data

Designation	Order No.
<b>Positioning module FM 353</b>	<b>6ES7353-1AH01-0AE0</b>
Incl. configuring package on CD-ROM Languages: English, German, French, Italian comprising of:	
• Manual (electronic) for FM 353	
• Standard function blocks (STEP 7 interface software)	
• Screen form-based configuration software for FM 353	
• Standard interactive screen forms for OP7/OP17	
<b>Manuals</b> Paper version	
<u>Languages:</u>	
• German	<b>6ES7353-1AH01-8AG0</b>
• English	<b>6ES7353-1AH01-8BG0</b>
• French	<b>6ES7353-1AH01-8CG0</b>
• Italian	<b>6ES7353-1AH01-8EG0</b>
<b>Front connector</b>	<b>6ES7392-1AJ00-0AA0</b>
20-pin, with screw contacts	
<b>EditFM</b>	<b>6FC5263-0AA03-0AB0</b>
Traversing program editor for FM 353/354/357-2, executes on PG/PC without STEP 7 installation	

# Basic components

## Positioning modules

### Positioning module FM 354

#### Overview



The FM 354 single-axis positioning module for servo motors has the same basic design as the SIMATIC S7-300 series.

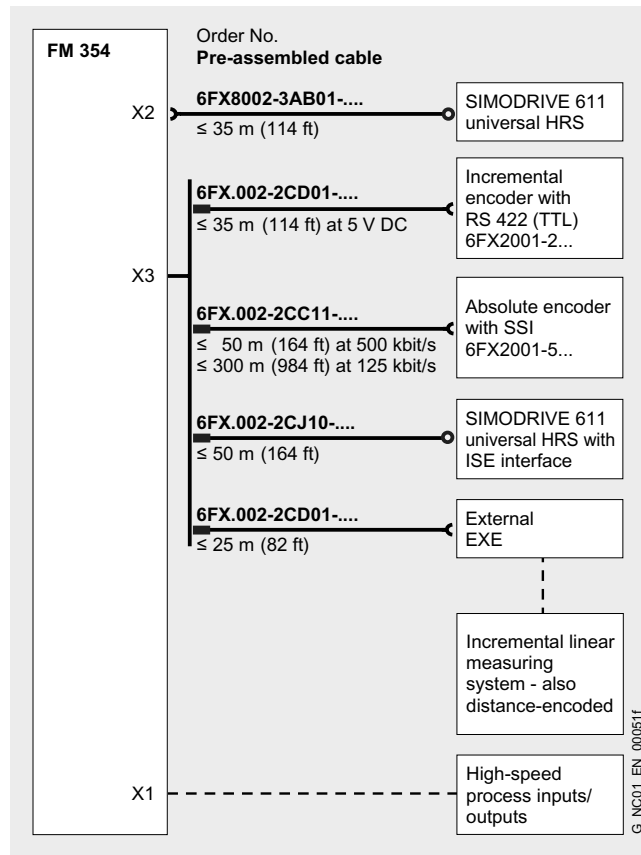
#### Application

- Position-controlled analog auxiliary axes on SINUMERIK 810D powerline and SINUMERIK 840D powerline, e.g. as infeed, retooling, setup or loader axis
- Positioning of position-controlled servo axes
- Independent operation in the SIMATIC S7-300

#### Technical specifications

<b>Order No.</b>	<b>6ES7354-1AH01-0AE0</b>
<b>Product name</b>	Positioning module FM 354
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	8 W
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Ambient temperature</b>	
• Storage	-40 ... +70 °C (-40 ... +158 °F)
• Transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width	80 mm (3.15 in)
• Height	125 mm (4.92 in)
• Depth	118 mm (4.65 in)
<b>Weight, approx.</b>	0.55 kg (1.21 lb)

#### Integration



Connection overview for FM 354

Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

#### Selection and ordering data

Designation	Order No.
<b>Positioning module FM 354</b>	<b>6ES7354-1AH01-0AE0</b>
Incl. configuring package on CD-ROM Languages: English, German, French, Italian comprising of:	
• Manual (electronic) for FM 354	
• Standard function blocks (STEP 7 interface software)	
• Screen form-based configuration software for FM 354	
• Standard interactive screen forms for OP7/OP17	
<b>Manuals</b> Paper version	
<b>Languages:</b>	
• German	<b>6ES7354-1AH01-8AG0</b>
• English	<b>6ES7354-1AH01-8BG0</b>
• French	<b>6ES7354-1AH01-8CG0</b>
• Italian	<b>6ES7354-1AH01-8EG0</b>
<b>Front connector</b>	<b>6ES7392-1AJ00-0AA0</b>
20-pin, with screw contacts	
<b>EditFM</b>	<b>6FC5263-0AA03-0AB0</b>
Traversing program editor for FM 353/354/357-2, executes on PG/PC without STEP 7 installation	

G\_NC01\_EN\_00051F



### Overview



The FM 357-2 is a positioning and path control which enables intelligent control of the movement of up to 4 axes. The FM 357-2 controls stepper drives and position-controlled servo drive axes.

The component takes the form of a module for SIMATIC S7-300 and can be operated in conjunction with a SIMATIC CPU 314 C or higher, whereby up to 3 modules<sup>1)</sup> can be combined with a CPU. SIMATIC HMI OPs, e.g. OP17, OP27 or Windows CE devices such as TP 170B or higher (with ProTool V6) can be used for control and monitoring.

### Application

- Processing of metal, wood, plastic and stone
- Textiles and packaging industries
- Wrapping machines
- Handling systems

The FM 357-2 has an extensive range of different applications from independent, individual positioning axes to interpolating multi-axis path control.

### Design

The FM 357-2 consists of the basic module and the system firmware, which has to be ordered separately. This is available in 3 versions, FM 357-2L, FM 357-2LX and FM 357-2H.

The configuration package contains a user-friendly setup tool which enables the user to set the system up from within STEP 7.

### Function

#### *FM 357-2 with FM 357-2L system firmware*

- 4 measuring circuits for the connection of position-controlled servo axes or stepper drives or external master axes
- Interface for SIMODRIVE 611 universal HRS or SIMOVERT MASTERDRIVES MC via PROFIBUS DP with Motion Control (*not for FM 357-2H in conjunction with SINUMERIK HT 6*)
- Axis relationship: linear/rotary interpolation, independent individual axes
- Axis synchronization by means of travel association or curve tables (electronic cam disks) or with external master
- Travel with programmable acceleration and slowdown
- Transformable coordinate systems
- Operating modes: jog, incremental, reference point, MDI (manual data input), automatic, automatic single block
- Displacement signals (cam controller)
- Special emergency stop routines with rapid restart
- Program-controlled movement function on the basis of the movement program, M function
- Programs can be parameterized by means of user variables
- Programming in accordance with DIN 66025 with higher level language elements (loops, conditions)
- Data backup to memory card (optional)
- Multi-channel functionality (any combination with up to 4 channels can be defined, 1 channel for FM 357-2H)

#### *FM 357-2 with FM 357-2LX system firmware*

As FM 357-2L, plus the following:

- Spline interpolation (A, B, C splines) for definition of movement by means of interpolation points
- High-performance "Gantry" portal function
- Flexible synchronized actions (extended interrupt routines)
- Probe evaluation without time delay
- Programmable overlap of oscillating movements
- Track speed-dependent variable control
- Programmable travel against a fixed limit
- 3D protection zones

#### *FM 357-2 with FM 357-2H system firmware*

As FM 357-2LX, plus the following:

- Coordinate transformation for buckling arm, scara and portal systems, comparable handling transformation package with up to 4 axes in one channel
- Teach-in functions with SINUMERIK HT 6

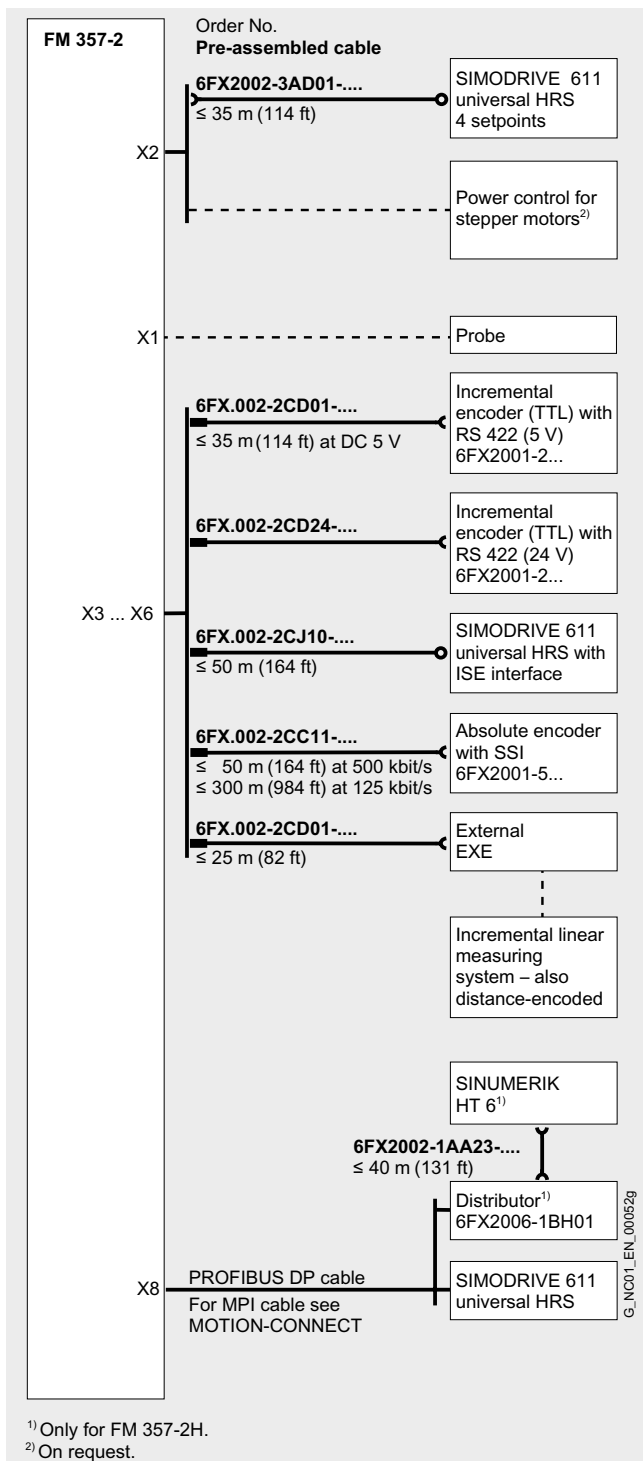
<sup>1)</sup> One module with FM 357-2H.

# Basic components

## Positioning modules

### Positioning module FM 357-2

#### Integration



Connection overview for FM 357-2

Information about application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

#### Technical specifications

<b>Order No.</b>	<b>6ES7357-4AH01-0AE0</b>
<b>Product name</b>	Positioning module FM 357-2
<b>Input voltage</b>	24 V DC
<b>Power consumption, typ.</b>	24 W
<b>Programmable traversing velocity, max.</b>	1 000 m/min (3 281 ft/min)
<b>Power consumption from 5 V DC bus backplane, max.</b>	100 mA
<b>NC program memory</b>	750 KB
<b>Cycle signal (T, *T)</b>	Acc. to RS 422
<b>Direction signal (D, *D)</b>	Acc. to RS 422
<b>Release signal (F, *F)</b>	Acc. to RS 422
<b>Encoder frequency for T, *T max.</b>	750 kHz
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20
<b>Humidity rating in accordance with EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Ambient temperature</b>	
• Storage/Transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	
• Width x Height x Depth	200 mm (7.87 in) x 125 mm (4.92 in) x 118 mm (4.65 in)
<b>Weight, approx.</b>	1.2 kg (2.65 lb)

#### Selection and ordering data

Designation	Order No.
<b>Positioning and path control module FM 357-2</b>	<b>6ES7357-4AH01-0AE0</b>
Basic unit	
<b>System firmware FM 357-2L</b>	<b>6ES7357-4AH03-3AE0</b>
Single license	
<b>System firmware FM 357-2LX</b>	<b>6ES7357-4BH03-3AE0</b>
With additional functions	
Single license	
<b>System firmware FM 357-2H</b>	<b>6ES7357-4CH03-3AE0</b>
With additional functions	
Single license	
incl. configuring package on CD-ROM	
Languages: English, German, French, Italian comprising of:	
Equipment manual (electronic), configuration software (parameterization screen forms, standard function blocks HMI screen forms for OP17/OP27/TP 170B/MP 270B)	
<b>Manuals</b> Paper version	
<u>Languages:</u>	
• German	<b>6ES7357-4AH00-8AG0</b>
• English	<b>6ES7357-4AH00-8BG0</b>
• French	<b>6ES7357-4AH00-8CG0</b>
• Italian	<b>6ES7357-4AH00-8EG0</b>
<b>Front screw connector</b>	<b>6ES7392-1AM00-0AA0</b>
For connection, probe and NC-Ready signal	
<b>EditFM</b>	<b>6FC5263-0AA03-0AB0</b>
Traversing program editor for FM 353/354/357-2, executes on PG/PC without STEP 7 installation	

### Overview

#### Controlled power supplies

The 24 V power supply units from the SITOP range are optimized for industrial use and operate on the switched-mode principle. Due to the precisely regulated output voltage, the devices are even suitable for the connection of sensitive sensors. Different versions are available depending on the output current and field of application. In some cases, functional expansion is possible with add-on modules. For example, for back-up in the event of long supply system outages, DC UPS modules 6 A, 15 A and 40 A are available with external back-up by rechargeable batteries. 48 V power supplies have been added to the SITOP product range.

### More information

Additional information is available in the Internet under:












[www.siemens.com/sitop](http://www.siemens.com/sitop)

### Benefits

- Precise output voltage
- Low residual ripple
- Wide input voltage range
- High efficiency
- Simple installation
- Integrated electronic short-circuit protection
- Safe electric isolation (SELV acc. to EN 60950 or EN 50178)
- Compliance with national and international standards, e.g. EMC compliant with EN 61000-6-2 and EN 55022 Class B, UL and cUL (CSA) approval
- No release of silicon

### Selection and ordering data

#### 24 V and 48 V power supplies

Design	Input		Output		Order No.
	Voltage $V_{in}$ rated		Voltage $V_{out}$ rated	Current $I_{out}$ rated	
<b>24 V DC/2.5 A; 5 A; 10 A single-phase</b>  					
 <b>2.5 A</b>	120 V/230 V AC (85 ... 132 V/ 170 ... 264 V AC)		24 V DC $\pm 3\%$	2.5 A	<b>6EP1332-2BA10</b>
 <b>5 A</b>	120 V/230 V AC (85 ... 132 V/ 170 ... 264 V AC)		24 V DC $\pm 3\%$	5 A	<b>6EP1333-2BA01</b>
 <b>10 A</b>	120 V/230 V AC (85 ... 132 V/ 170 ... 264 V AC)		24 V DC $\pm 3\%$	10 A	<b>6EP1334-2BA01</b>
<b>24 V DC/5 A; 10 A single-phase, flat design</b>  					
 <b>5 A</b>	120 V/230 V AC (85 ... 132 V/ 170 ... 264 V AC)		24 V DC $\pm 1\%$	5 A	<b>6EP1333-1AL12</b>
 <b>10 A</b>	120 V/230 V AC (85 ... 132 V/ 170 ... 264 V AC)		24 V DC $\pm 1\%$	10 A	<b>6EP1334-1AL12</b>
<b>24 V DC/20 A and 48 V DC; 10 A three-phase</b>					
<b>10 A</b>	400 ... 500 V 3AC (320 ... 575 V 3AC)		48 V DC $\pm 3\%$	10 A	<b>6EP1456-2BA00</b>

# Basic components

## Supplementary components

### Power supplies SITOP power Modular power supplies with add-on modules

#### Overview

##### Modular power supplies with add-on modules

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

- Metal housing for standard rail mounting
- 5 A and 10 A units with single-phase and two-phase connection (L1 and N, L1 and L2)
- 20 A and 40 A units with single-phase or three-phase connection
- Adjustable output voltage up to 28.8 V
- 3 x LED status display
- Selectable short-circuit response, constant current or retentive shutdown
- Switchover for parallel operation
- Radio interference level Class B
- Input current harmonics limitation acc. to EN 61000-3-2 (except 6EP1337-3BA00)

Three add-on modules offer supplementary functions.

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

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

The **redundancy module** decouples the basic units from each other via diodes so that a redundant 24 V power supply can be established.

Power supply units and add-on modules

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

#### Selection and ordering data

	Design	Input		Output		Order No.
		Voltage $V_{in}$ rated		Voltage $V_{out}$ rated	Current $I_{out}$ rated	
<b>Basic power supply units</b> $\text{UL}$ $\text{c}$ $\text{UL}$						
	<b>5 A</b>	120 V/230 ... 500 V AC (85 ... 132 V/ 176 ... 550 V)		24 V DC $\pm 3\%$	5 A	<b>6EP1333-3BA00</b>
	<b>10 A</b>	120 V/230 ... 500 V AC (85 ... 132 V/ 176 ... 550 V)		24 V DC $\pm 3\%$	10 A	<b>6EP1334-3BA00</b>
	<b>20 A</b>	120 V/230 V AC (85 ... 132 V/ 176 ... 264 V)		24 V DC $\pm 3\%$	20 A	<b>6EP1336-3BA00</b>
		400 ... 500 V 3AC (340 ... 550 V)		24 V DC $\pm 3\%$	20 A	<b>6EP1436-3BA00</b>
		400 ... 500 V 3AC (340 ... 550 V)		48 V DC $\pm 3\%$	20 A	<b>6EP1457-3BA00</b>
	<b>20 A</b>	400 ... 500 V 3AC (360 ... 550 V)		24 V DC $\pm 3\%$	20 A	<b>6EP1436-3BA01</b>
	<b>40 A</b>	120 V/230 V AC (85 ... 132 V/176 ... 264 V)		24 V DC $\pm 3\%$	40 A	<b>6EP1337-3BA00</b>
		400 ... 500 V 3AC (340 ... 550 V)		24 V DC $\pm 3\%$	40 A	<b>6EP1437-3BA00</b>
<b>Add-on modules</b> $\text{UL}$ $\text{c}$ $\text{UL}$						
	<b>Signaling module</b>	24 V DC				<b>6EP1961-3BA10</b>
	<b>Buffer module</b>	24 V DC (24 ... 28.8 V)		$V_{in}$ - approx. 1 V	40 A	<b>6EP1961-3BA00</b>
	<b>Redundancy module</b>	24 V DC (24 ... 28.8 V)		$V_{in}$ - approx. 0.5 V	20 A	<b>6EP1961-3BA20</b>

#### Overview

##### DC UPS modules

By combining a DC UPS module with at least one battery module and a SITOP 24 V power supply, long power failures can be bridged absolutely free of interruptions.

##### DC UPS modules

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

##### Battery modules

- 2.5 Ah: Ambient temperature -40 ... +60 °C (-40 ... +140 °F)
- 1.2 ... 12 Ah: Ambient temperature 5 ... 40 °C (41 ... 104 °F)

#### Selection and ordering data

##### DC UPS modules and battery modules

Design	Input	Output		Order No.			
		Voltage $V_{in \text{ rated}}$	Voltage $V_{out \text{ rated}}$		Current $I_{out \text{ rated}}$		
<b>DC UPS modules 24 V DC</b>  							
	<b>6 A</b>	24 V DC (22 ... 29 V DC)	24 V DC (mains operation: 22 ... 28.5 V, battery operation: 27.0 ... 19 V)	6 A	<b>6EP1931-2DC21</b>		
			With serial interface	<b>6EP1931-2DC31</b>			
			With USB interface	<b>6EP1931-2DC42</b>			
	<b>15 A</b>	24 V DC (22 ... 29 V DC)	24 V DC (mains operation: 22 ... 28 V, battery operation: 27.0 ... 19 V)	15 A	<b>6EP1931-2EC21</b>		
			With serial interface	<b>6EP1931-2EC31</b>			
			With USB interface	<b>6EP1931-2EC42</b>			
	<b>40 A</b>	24 V DC (22 ... 29 V DC)	24 V DC (mains operation: 22 ... 28.5 V, battery operation: 27.0... 19 V)	40 A	<b>6EP1931-2FC21</b>		
			With USB interface	<b>6EP1931-2FC42</b>			
Design	Charging voltage	Output		Order No.			
	at 25 °C (77 °F) $V_{charge}$	Voltage $V_{out \text{ rated}}$					
<b>6 A and 15 A battery modules for DC UPS modules</b>  							
	<b>2.5 Ah/ High-temperature rechargeable bat- tery</b>	27.7 V DC	24 V DC (end of charge voltage: 27.7 V, exhaustive discharge protection: 19 V)		<b>6EP1935-6MD31</b>		
				27.0 V DC	24 V DC (end of charge voltage: 27.0V, exhaustive discharge protection: 19 V)		<b>6EP1935-6MC01</b>
						27.0 V DC	24 V DC (end of charge voltage: 27.0V, exhaustive discharge protection: 19 V)
<b>15 A and 40 A battery modules for DC UPS modules</b>  							
	<b>7 Ah</b>	27.0 V DC	24 V DC (end of charge voltage: 27.0 V, exhaustive discharge protection: 19 V)		<b>6EP1935-6ME21</b>		
				27.0 V DC	24 V DC (end of charge voltage: 27.0 V, exhaustive discharge protection: 19 V)		<b>6EP1935-6MF01</b>

# Basic components

## Ordering examples

### Ordering example 1: SINUMERIK 810DE powerline

#### Overview

Equipment for a milling machine is required (X, Y and Z axes), tool magazine axis and main spindle with:

- SINUMERIK 810DE powerline with CCU 3.4 module
- Operator panel
- SIMODRIVE 611 digital
- Motors
- Pre-assembled cables MOTION-CONNECT

Designation	Quantity	Order No.
<i>SINUMERIK 810DE powerline</i>		
<b>SINUMERIK OP 010S operator control panel</b> with 10.4"-TFT, mechanical keys	1	6FC5203-0AF04-0AA0
<b>SINUMERIK KB 310C full CNC keyboard</b>	1	6FC5203-0AF21-0AA1
<b>SINUMERIK MCP 310 machine control panel</b>	1	6FC5203-0AF23-1AA0
<b>SINUMERIK PCU 20</b> with single chip PC processor 266 MHz/32 MB and current HMI software	1	6FC5210-0DF00-0AA2
<b>MPI bus cable</b> with three connectors, Length: 5 m (16.4 ft), not suitable for trailing	1	6FX2002-4EA04-1AF0
<b>CCU 3.4 module</b> with system software (export)	1	6FC5410-0AY03-1AA0
<b>CCU box</b> with 2 internal power sections	1	6FC5447-0AA01-0AA0
<b>Cable distributor</b>	1	6FX2006-1BA02
<b>Electronic handwheel</b> with front panel 120 mm x 120 mm (4.72 in x 4.72 in)	1	6FC9320-5DB01
<b>Pre-assembled cable</b> for connecting the handwheel, length: 5 m (16.4 ft)	1	6FX8002-4AA21-1AF0
<b>Toolbox</b> for SINUMERIK 810D powerline/840D powerline, single license, specific software version	1	6FC5252-0AX21-0AB0
<b>Axis expansion plug-in unit</b> for SINUMERIK 810D powerline	1	6FC5412-0FA10-0AA0
<b>Axis expansion plug-in unit, left</b> for SINUMERIK 810D powerline	1	6FC5412-0FA12-0AA0
<b>Single I/O module EFP</b>	1	6FC5411-0AA00-0AA0
<i>SIMATIC S7-300</i> (see Catalog ST 70)		
<b>Pre-assembled connecting cable</b> between SINUMERIK 810D powerline and EFP, length: 2.5 m (8.20 ft)	1	6ES7368-3BC51-0AA0
<i>SIMODRIVE 611</i>		
<b>16 kW infeed/regenerative feedback module</b> , internal cooling	1	6SN1145-1BA01-0BA2
<b>HFD package</b> for infeed/regenerative feedback module 16 kW	1	6SN1111-0AA00-0BV0
<b>Power module</b> 2-axis version 2 x 9 A/18 A with internal cooling for 1FK7 motor	1	6SN1123-1AB00-0BA1
<b>Power module</b> single-axis design, internal cooling 24 A for 1PH7 motor	1	6SN1123-1AA00-0CA2
<b>Shield connection plate</b>		
• 100 mm (3.94 in) (for 16 kW infeed/regenerative feedback module)	1	6SN1162-0EA00-0BA0
• 50 mm (1.97 in) (for power modules)	2	6SN1162-0EA00-0AA0
<i>Motors</i>		
<b>1FK7 motor</b> , incremental encoder sin/cos 1 V <sub>pp</sub> installed, without holding brake	1	1FK7042-5AF71-1AG0
<b>1FK7 motor</b> , incremental encoder sin/cos 1 V <sub>pp</sub> installed, without holding brake	2	1FK7063-5AF71-1AG0
<b>Pre-assembled power cable</b> for 1FK7 motor without brake cable/with complete shield Length: 7 m (23 ft)	3	6FX8002-5CA01-1AH0
<b>1FK7 motor</b> , incremental encoder sin/cos 1 V <sub>pp</sub> installed, with holding brake	1	1FK7063-5AF71-1AH0
<b>Pre-assembled power cable</b> for 1FK7 motor with brake cable/with complete shield Length: 7 m (23 ft)	1	6FX8002-5DA01-1AH0
<b>Pre-assembled signal cable</b> for 1FK7 motor, suitable for trailing Length: 7 m (22.9 ft)	4	6FX8002-2CA31-1AH0
<b>1PH7 motor</b> Type of construction IM B5	1	1PH7103-2NG02-0CJ0
<b>Power cable</b> for 1PH7 motor, sold by the meter without brake cable/with complete shield Length: 50 m (164 ft) (shortest length supplied)	1	6FX8008-1BB41-1FA0
<b>Pre-assembled signal cable</b> for motor encoder in 1PH7 motor, suitable for trailing Length: 9 m (29.5 ft)	1	6FX8002-2CA31-1AK0

# Basic components

## Ordering examples

### Ordering example 2: SINUMERIK 840DE powerline

#### Overview

The equipment for a compact machine tool for milling is required with:

- SINUMERIK 840DE powerline
- User-friendly operation
- SIMODRIVE 611 digital
- Motors
- Pre-assembled cables MOTION-CONNECT

Designation	Quantity	Order No.
<b>SINUMERIK 840DE powerline</b>		
<b>SINUMERIK OP 012 operator panel front</b> with 12.1" TFT, with membrane keys and mouse	1	6FC5203-0AF02-0AA1
<b>SINUMERIK PCU 50.3-C</b> with 1.5 GHz/512 MB with Windows XP ProEmbSys	1	6FC5210-0DF31-2AA0
<b>HMI-Advanced</b> on CD-ROM for PCU 50.3 Single license, specific software version 6.4	1	6FC5253-6BX10-4AG0
<b>Floppy disk drive 3.5" USB 1.1</b> , including 1.0 m (3.28 ft) connecting cable	1	6FC5235-0AA05-1AA2
<b>SINUMERIK MCP 483 machine control panel</b>	1	6FC5203-0AF22-1AA2
<b>MPI bus cable</b> with 3 connectors, length: 1/10 m (32.8 ft) can be trailed, termination resistors can be disconnected	1	6FX2002-4EB10-1BA0
<b>NCU 573.5</b>	1	6FC5357-0BB35-0AA0
<b>NCU box</b> to accommodate the NCU 573.5	1	6FC5247-0AA00-0AA3
<b>NCU system software</b> 12 axes on PC card, export 840DE Single license, specific software version 6.5	1	6FC5250-6BY30-5AH0
<b>Toolbox</b> for SINUMERIK 810D powerline/840D powerline Single license, specific software version 6.5	1	6FC5252-6AX21-5AG0
<b>Cable distributor</b>	1	6FX2006-1BA02
<b>Electronic handwheel</b> with front panel 120 mm x 120 mm (4.72 in x 4.72 in)	1	6FC9320-5DB01
<b>Pre-assembled cable</b> for connecting the handwheel, Length: 5 m (16.4 ft)	1	6FX8002-4AA21-1AF0
<b>CNC functionality for SINUMERIK 840DE powerline</b>		
• Additional second machining channel	1	6FC5251-0AA07-0AA0
• Spline interpolation	1	6FC5251-0AA14-0AA0
• Expansion of the PLC user memory by 6 x 64 KB (to 352 KB)	4	6FC5252-0AA03-0AA0
<b>SIMATIC S7-300</b> (see Catalog ST 70)		
<b>IM 361 interface module</b>	2	6ES7361-3CA01-0AA0
<b>Pre-assembled cable</b> between IM modules, length: 1 m (3.28 ft)	2	6ES7368-3BB01-0AA0
<b>SM 321 digital input module</b> 16 inputs 24 V DC	8	6ES7321-1BH02-0AA0
<b>SM 322 digital output module</b> 16 outputs 24 V DC/0.5 A	5	6ES7322-1BH01-0AA0
<b>SM 322 digital output module</b> 8 outputs 24 V DC/2 A	2	6ES7322-1BF01-0AA0
<b>Mounting rail</b> Length: 530 mm (20.87 in)	2	6ES7390-1AF30-0AA0
<b>Front connector</b> (1 unit) 20-pin, with screw contacts	15	6ES7392-1AJ00-0AA0

# Basic components

## Ordering examples

### Ordering example 2: SINUMERIK 840DE powerline

#### Overview (continued)

Designation	Quantity	Order No.
<b>SIMODRIVE 611</b>		
<b>Infeed/regenerative feedback module 16 kW</b> , internal cooling	1	6SN1145-1BA01-0BA2
<b>HFD package</b> for infeed/regenerative feedback module 16 kW	1	6SN1111-0AA00-0BV0
<b>Power module</b> 2-axis version 2 x 5 A/10 A with internal cooling	2	6SN1123-1AB00-0AA1
<b>Power module</b> single-axis version for 1FT6 (18 A/36 A) and 1PH (24 A/32 A) with internal cooling	2	6SN1123-1AA00-0CA2
<b>High Performance closed-loop control in 2-axis design</b> <b>Control module with digital setpoint interface for 1FT6 motors</b> for incremental encoder sin/cos 1 V <sub>pp</sub> or absolute encoder with EnDat Direct measuring system incremental encoder sin/cos 1 V <sub>pp</sub> or absolute encoder with EnDat	2	6SN1118-0DK23-0AA1
<b>High Performance closed-loop control in single-axis design</b> <b>Control module with digital setpoint interface for 1PH motors</b> for incremental encoder sin/cos 1 V <sub>pp</sub> or absolute encoder with EnDat Direct measuring system incremental encoder sin/cos 1 V <sub>pp</sub> or absolute encoder with EnDat	1	6SN1118-0DJ23-0AA1
<b>Shield connection plate</b>		
• 100 mm (3.94 in) (for 16 kW infeed/regenerative feedback module)	1	6SN1162-0EA00-0BA0
• 50 mm (1.97 in) (for power modules)	4	6SN1162-0EA00-0AA0
<b>Drive bus cable</b> for 4 x 50 mm (4 x 1.97 in) modules	4	6SN1161-1CA00-0AA0
<b>Motors</b>		
<b>1FT6 motor</b> , incremental encoder sin/cos 1 V <sub>pp</sub> installed, without holding brake	4	1FT6064-1AF71-3AG1
<b>Pre-assembled power cable</b> for 1FT6 motor without brake cable/with complete shield Length: 10 m (32.8 ft)	4	6FX8002-5CA01-1BA0
<b>1FT6 motor</b> , incremental encoder sin/cos 1 V <sub>pp</sub> installed, without holding brake	1	1FT6102-1AC71-1AG1
<b>Pre-assembled power cable</b> for 1FT6 motor without brake cable/with complete shield Length: 10 m (32.8 ft)	1	6FX8002-5CA21-1BA0
<b>Pre-assembled signal cable</b> for encoder in 1FT6 motor Length: 10 m (32.8 ft)	5	6FX8002-2CA31-1BA0
<b>1PH7 motor</b> Type of construction IM B5	1	1PH7103-2NG02-0CJ0
<b>Power cable</b> without brake cable/with complete shield Length: 50 m (164 ft) (shortest length supplied) Sold by the meter	1	6FX8008-1BB41-1FA0
<b>Pre-assembled signal cable</b> for encoder on 1PH7 motor Length: 10 m (32.8 ft)	1	6FX8002-2CA31-1BA0



## Synchronous motors



<b>6/2</b>	<b>Introduction</b>	<b>6/103</b>	<b>Selection guides</b>
<b>6/4</b>	<b>1FT6 motors</b>	6/103	Type of construction/mounting position
6/6	Core type, natural cooling	6/103	Degree of protection
6/8	Standard type, natural cooling	<b>6/104</b>	<b>Dimension drawings</b>
6/18	Standard type, forced ventilation	6/104	1FT6 motors
6/22	Standard type, water cooling	6/116	1FT7 Compact motors
<b>6/24</b>	<b>1FT7 Compact motors</b>	6/118	1FK7 Compact/ 1FK7 High Dynamic motors
6/26	Core type, natural cooling	6/121	1FT6 motors with series SP+ planetary gearbox
6/28	Standard type, natural cooling	6/126	1FT7 Compact motors with series SP+ planetary gearbox
<b>6/38</b>	<b>1FK7 Compact/ 1FK7 High Dynamic motors</b>	6/129	1FK7 motors with series SP+ planetary gearbox
6/40	1FK7 Compact, natural cooling	6/134	1FK7 motors with series LP+ planetary gearbox
6/42	1FK7 High Dynamic, natural cooling	6/137	1FK7-DYA compact geared motors
<b>6/44</b>	<b>Gearboxes</b>	6/138	1FN3 linear motors
6/44	Series SP+ planetary gearbox for 1FT6 motors	6/140	1FW6 built-in torque motors
6/49	Series SP+ planetary gearbox for 1FT7 motors	6/96	1FE1 built-in motors
6/54	Series SP+ planetary gearbox for 1FK7 motors	6/141	2SP1 motor spindles
6/60	Series LP+ planetary gearbox for 1FK7 motors	<b>6/142</b>	<b>CAD CREATOR</b>
<b>6/62</b>	<b>Geared motors</b>	Dimension drawing and 2D/3D CAD generator <a href="http://www.siemens.com/cad-creator">www.siemens.com/cad-creator</a>	
6/62	1FK7-DYA compact geared motors		
<b>6/66</b>	<b>1FN3 linear motors</b>		
6/76	Standard type, water cooling		
6/76	Hall-effect sensor box		
6/76	Connector box		
6/77	Measuring systems		
6/77	Liquid cooling		
6/84	Encoder connection boxes SME91/SME92/SME93/SME94		
<b>6/78</b>	<b>1FW6 built-in torque motors</b>		
6/84	Standard type, water cooling		
6/84	Encoder connection boxes SME91/SME92/SME93/SME94		
<b>6/86</b>	<b>1FE1 built-in motors</b>		
6/97	Standard type, water cooling		
6/97	VPM Voltage Protection Module		
<b>6/98</b>	<b>2SP1 motor spindles</b>		
6/98	Standard type, water cooling		



For products approved for Canada  
and U.S.A., see Appendix.

# Synchronous motors for SIMODRIVE 611

## Introduction

### Overview

	1FT6	1FT7 Compact	1FK7 Compact 1FK7 High Dynamic
<b>Cooling</b>	Natural cooling Forced ventilation Water cooling	Natural cooling	Natural cooling
<b>Rated speed</b>	1 500 ... 6 000 rpm	1 500 ... 6 000 rpm	2 000 ... 6 000 rpm
<b>Static torque <math>M_0</math></b>	0.4 ... 300 Nm (3.54 ... 2 655 lb <sub>f</sub> -in)	2 ... 70 Nm (17.7 ... 620 lb <sub>f</sub> -in)	0.85 ... 48 Nm (7.52 ... 425 lb <sub>f</sub> -in) (1FK7 Compact) 1.3 ... 28 Nm (11.5 ... 248 lb <sub>f</sub> -in) (1FK7 High Dynamic)
<b>Overload capability up to max.</b>	$3 \times M_0$	$4 \times M_0$	$3 \times M_0$
<b>Encoder system, built-in</b>	<ul style="list-style-type: none"> <li>• Incremental encoder</li> <li>• Absolute encoder</li> <li>• Resolver</li> </ul> See the technical specifications and the selection and ordering data for the required motor for information about a compatible encoder system.		
<b>Sound pressure level <math>L_{pA}</math> (1 m) in accordance with EN ISO 1680</b>	55 ... 74 dB	65 ... 74 dB	55 ... 74 dB
<b>Degree of protection EN 60034-5 (IEC 60034-5)</b>	IP64 ... IP68	IP64 ... IP67	IP64 IP65, additional IP67 drive end flange
<b>Insulation of the stator winding EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a winding temperature rise of $\Delta T = 100$ K at an ambient temperature of 40 °C (104 °F)		
	With water cooling, inlet temperature max. 30 °C (86 °F)	–	–
<b>Type of motor</b>	Permanent-magnet synchronous motor, 3-phase		
<b>Paint finish</b>	Anthracite RAL 7016	Pearl dark grey RAL 9023	Unpainted, Anthracite RAL 7016 (option)
<b>Holding brake</b>	Built-in (option)		
<b>Mounted gearing</b>	<ul style="list-style-type: none"> <li>• Planetary gearbox series SP+ <math>i = 4</math> to 10 (single-stage) <math>i = 16</math> to 50 (2-stage)</li> </ul>	–	<ul style="list-style-type: none"> <li>• Planetary gearbox series LP+ <math>i = 5</math>, <math>i = 10</math> (single-stage)</li> <li>• Planetary gearbox series SP+ <math>i = 4</math> to 10 (single-stage) <math>i = 16</math> to 50 (2-stage)</li> </ul>

### Application

There are many fields of application for the 1FT6/1FT7/1FK7/1FN3/1FW6 synchronous motors.

On machine tools, they are designated and used as feed motors.

On production machines, such as printing, packaging and textile machines, they are designated as synchronous servo motors.

The motors are referred to generally in this documentation as synchronous motors, due to their principle of operation.

The 1FE1 built-in motors are used as motor spindles in machine tools for turning, milling, or grinding. The 2SP1 motor spindles are a motorized spindle series used in machine tools for milling.

**Core types** can be supplied for certain motor types. These core types can be express delivered as replacement motors in the event of plant outages and offer the advantage of a quicker spare parts supply. For this reason, core types should be used for configuration wherever possible.

## Overview (continued)

	<b>Linear motors 1FN3 Peak load</b>	<b>1FN3 Continuous load</b>
<b>Cooling</b>	Water cooling	Water cooling
<b>Velocity at <math>F_{rated}</math></b>	105 ... 836 m/min (344 ... 2 743 ft/min) <sup>1)</sup>	129 ... 435 m/min (423 ... 1 427 ft/min) <sup>1)</sup>
<b>Feedrate force <math>F_{rated}</math></b>	200 ... 8 100 N (45.0 ... 1 821 lb <sub>f</sub> )	150 ... 10 375 N (33.7 ... 2 332 lb <sub>f</sub> )
<b>Overload capability up to max.</b>	$2.75 \times F_{rated}$	$1.7 \times F_{rated}$
<b>Encoder system</b> (not included in scope of supply)	Linear scale (enclosed or open) <ul style="list-style-type: none"> <li>• Incremental encoder sin/cos 1 V<sub>pp</sub></li> <li>• Absolute encoder with EnDat interface</li> </ul>	
<b>Degree of protection EN 60034-5 (IEC 60034-5)</b>	IP65	
<b>Insulation of the stator winding EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a winding temperature of 120 °C (248 °F) Inlet temperature of coolant max. 35 °C (95 °F)	
<b>Type of motor</b>	Permanent-magnet synchronous linear motor, 3-phase	
<b>Paint finish</b>	Unpainted	

	<b>1FW6 built-in torque motors</b>	<b>1FE1 built-in motors</b>	<b>2SP1 motor spindles</b>
<b>Cooling</b>	Water cooling		
<b>Speed at <math>M_{rated}</math></b>	34 ... 430 rpm	Up to 40 000 rpm	Up to 18 000 rpm
<b>Static torque <math>M_0</math></b>	119 ... 4 760 Nm (87.8 ... 3 511 lb <sub>f</sub> -ft)	–	–
<b>Rated torque <math>M_{rated}</math></b>	109 ... 4 590 Nm (80.4 ... 3 386 lb <sub>f</sub> -ft)	5 ... 820 Nm (3.69 ... 605 lb <sub>f</sub> -ft)	42 ... 170 Nm (31.0 ... 125 lb <sub>f</sub> -ft)
<b>Overload capability up to max.</b>	$2 \times M_0$	–	–
<b>Encoder system</b>	Rotary encoder <ul style="list-style-type: none"> <li>• Incremental encoder sin/cos 1 V<sub>pp</sub></li> <li>• Absolute encoder with EnDat interface</li> </ul>	Hollow-shaft measuring system L&B GEL 244	Hollow-shaft measuring system Incremental encoder sin/cos 1 V <sub>pp</sub> 256 S/R (built-in)
<b>Sound pressure level <math>L_{pA}</math> (1 m) in accordance with EN ISO 1680</b>	–	Depending on spindle design	70 dB <sup>2)</sup>
<b>Degree of protection EN 60034-5 (IEC 60034-5)</b>	IP23	IP00 or as specified by spindle manufacturer	IP64 (in working area) IP53 (behind the spindle flange)
<b>Insulation of the stator winding EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a wind- ing temperature rise of $\Delta T = 100$ K for an ambient temperature of 40 °C (104 °F)  Inlet temperature of coolant max. 35 °C (95 °F)	Temperature class 155 (F)  With an inlet temperature of coolant of 25 °C (77 °F)	
<b>Type of motor</b>	Permanent-magnet synchronous torque motor, 3-phase	AC main spindle motor in synchronous system with permanent magnets	AC main spindle motor in asynchronous/synchronous system
<b>Paint finish</b>	Unpainted		
<b>Holding brake</b>	–	Using spindle design	–

<sup>1)</sup> Observe maximum speed of measuring system.

<sup>2)</sup> Sound pressure level of stock removal and tool changing are not taken into account.

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT6 motors

#### Overview



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

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

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

1FT6 motors are available with natural cooling, forced ventilation, or water cooling. With the natural cooling method, heat is dissipated through the surface of the motor, whereas with the forced ventilation method, heat is forced out by means of built-on fans. Maximum power ratings, as well as a high degree of protection, can be achieved using water cooling.

#### Benefits

- Optimum surface quality of the workpiece thanks to high rotational accuracy (sinusoidal current injection)
- Minimized downtime due to high dynamic performance
- Power and signal connections for use in highly contaminative areas
- Easy installation thanks to reduced cabling overhead
- High resistance to cantilever force
- High thermal reserves for continuous and overload conditions
- High overload capability (250 ms)
- Extremely high efficiency
- Extremely good drive dynamic response due to low rotor moments of inertia
- Low torque ripple (average value 1 %)
- High degree of protection

#### Application

- High-performance machine tools
- Machines with stringent requirements in terms of dynamic response, precision and flexibility, e.g. packaging machines, high-bay racking vehicles, conveyor systems, handling equipment, and printing machines

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT6 motors

### Technical specifications

<b>Product name</b>	1FT6 motor
<b>Type of motor</b>	Permanent-magnet synchronous motor
<b>Magnet material</b>	Rare-earth magnet material
<b>Cooling</b>	Natural cooling, forced ventilation, water cooling For water cooling max. inlet temperature 30 °C (86 °F) Avoid condensation
<b>Temperature monitoring</b>	KTY 84 temperature sensor in the stator winding
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a winding temperature rise of $\Delta T = 100$ K at an ambient temperature of 40 °C (104 °F)
<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)</b>	IM B5 (IM V1, IM V3) IM B14 (IM V18, IM V19) IM B35 for 1FT613
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	IP64 standard type IP65 core type
<b>Shaft extension on the drive end (DE) in accordance with DIN 748-3 (IEC 60072-1)</b>	Plain shaft
<b>Shaft and flange accuracy<sup>1)</sup> in accordance with DIN 42955 (IEC 60072-1)</b>	Tolerance N
<b>Vibration magnitude in accordance with EN 60034-14 (IEC 60034-14)</b>	Grade A is maintained up to rated speed
<b>Sound pressure level <math>L_{pA}</math> (1 m) in accordance with EN ISO 1680, max.</b>	
<ul style="list-style-type: none"> <li>• Motors with natural/water cooling           <ul style="list-style-type: none"> <li>- 1FT602 ... 1FT604 55 dB</li> <li>- 1FT606 ... 1FT613 70 dB</li> </ul> </li> <li>• Motors with forced ventilation           <ul style="list-style-type: none"> <li>- 1FT608/1FT610 70 dB</li> <li>- 1FT613 74 dB</li> </ul> </li> </ul>	

<b>Product name</b>	1FT6 motor
<b>Encoder systems, built-in</b>	<ul style="list-style-type: none"> <li>• Incremental encoder sin/cos 1 V<sub>pp</sub> 2 048 S/R with C and D tracks encoder IC2048S/R</li> <li>• Absolute encoder, multi-turn (Traversing range 4 096 revolutions) with EnDat interface Single-turn range: 1FT602: 512 S/R encoder AM512S/R 1FT603 ... 1FT613: 2 048 S/R encoder AM2048S/R</li> <li>• 2-pole resolver</li> <li>• Multi-pole resolver (number of pole pairs corresponds to number of pole pairs of the motor)</li> </ul>
<b>Connection</b>	Connectors for signals and power Terminal box possible on 1FT61
<b>Paint finish</b>	Anthracite RAL 7016
<b>2nd rating plate</b>	Enclosed separately
<b>Options</b>	<ul style="list-style-type: none"> <li>• Shaft extension on the drive end (DE) with fitted key and keyway (half-key balancing)</li> <li>• Vibration magnitude Grade R</li> <li>• Built-in holding brake</li> <li>• Degree of protection IP67, IP68 M5 sealing air connection present (except with forced ventilation)</li> <li>• Terminal box for power terminal</li> <li>• Planetary gearbox, built-on (requirement: Plain shaft extension, shaft and flange accuracy tolerance N, vibration magnitude grade A, and IP65 degree of protection)</li> </ul>

S/R = signals/revolution

6

<sup>1)</sup> Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT6 core type motors

#### Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque <sup>1)</sup>	Rated current	<b>1FT6 synchronous motors</b> <b>Core type</b> <b>Natural cooling</b>	No. of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	A			$10^{-4}\text{ kgm}^2$ (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)
<b>2 000</b>	100	4.8 (6.4)	27 (239)	23 (204)	11	<b>1FT6102 - 1AC71 - ■■■■ 1</b>	4	99 (0.0876)	27.5 (60.6)
		8.0 (10.7)	50 (443)	38 (336)	17.6	<b>1FT6105 - 1AC71 - ■■■■ 1</b>	4	168 (0.1487)	39.5 (87.1)
<b>3 000</b>	48	1.4 (1.9)	5 (44)	4.3 (38.1)	2.9	<b>1FT6044 - 1AF71 - ■■■■ 1</b>	2	5.1 (0.0045)	8.3 (18.3)
	63	1.5 (2.0)	6 (53)	4.7 (41.6)	3.4	<b>1FT6062 - 1AF71 - ■■■■ 1</b>	3	8.5 (0.0752)	9.5 (20.9)
		2.2 (3.0)	9.5 (84.1)	7 (62)	4.9	<b>1FT6064 - 1AF71 - ■■■■ 1</b>	3	13 (0.0115)	12.5 (27.6)
	80	3.2 (4.3)	13 (115)	10.3 (91.2)	8.7	<b>1FT6082 - 1AF71 - ■■■■ 1</b>	4	30 (0.0266)	15 (33.1)
<b>4 500</b>	63	1.7 (2.3)	6 (53)	3.6 (31.9)	3.9	<b>1FT6062 - 1AH71 - ■■■■ 1</b>	3	8.5 (0.0752)	9.5 (20.9)
		2.3 (3.1)	9.5 (84.1)	4.8 (42.5)	5.5	<b>1FT6064 - 1AH71 - ■■■■ 1</b>	3	13 (0.0115)	12.5 (27.6)
	80	4.9 (6.7)	20 (177)	10.5 (92.9)	12.5	<b>1FT6084 - 1AH71 - ■■■■ 1</b>	4	48 (0.0425)	20.5 (45.2)
		5.7 (7.6)	27 (239)	12 (106.2)	12.6	<b>1FT6086 - 1AH71 - ■■■■ 1</b>	4	66.5 (0.0589)	25.5 (56.2)
<b>6 000</b>	36	0.88 (1.2)	2 (18)	1.4 (12.4)	2.1	<b>1FT6034 - 1AK71 - ■■■■ 1</b>	2	1.1 (0.001)	4.4 (9.7)
	80	4.1 (5.5)	20 (177)	6.5 (57.5)	9.2	<b>1FT6084 - 1AK71 - ■■■■ 1</b>	4	48 (0.0425)	20.5 (45.2)

<b>Type of construction:</b>	IM B5	1
<b>Connector outlet direction:</b>	Transverse right (not for 1FT603/1FT604/1FT606) Transverse left (not for 1FT603/1FT604/1FT606) Axial NDE Axial DE	1 2 3 4
<b>Encoder systems:</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 2 048 S/R Absolute encoder EnDat 2 048 S/R <sup>1)</sup>	A E
<b>Shaft extension:</b>	<b>Shaft and flange accuracy:</b> Plain shaft Plain shaft	Tolerance N Tolerance N
		<b>Holding brake:</b> Without With
<b>Vibration magnitude:</b>	<b>Degree of protection:</b>	G H
Grade A	IP65	1

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT6 core type motors  
Natural cooling

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T=100\text{ K}$  A	Calculated power <sup>4)</sup>  $P_{\text{calc}}$ for $M_0$ $\Delta T=100\text{ K}$  kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector		
			Rated output current <sup>3)</sup>  $I_{\text{rated}}$  A	Order No.	Power connector  Size	Cable cross- section <sup>2)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.
1FT6102-1AC7...	12.1	5.7 (7.6)	18	For ordering data, see Converter system	1.5	4 x 1.5	6FX 002-5A21 - ....
1FT6105-1AC7...	21.4	10.5 (14.1)	28		1.5	4 x 4	6FX 002-5A41 - ....
1FT6044-1AF7...	3	1.6 (2.1)	3		1	4 x 1.5	6FX 002-5A01 - ....
1FT6062-1AF7...	4.1	1.9 (2.6)	5		1	4 x 1.5	6FX 002-5A01 - ....
1FT6064-1AF7...	6.1	3.0 (4.0)	9		1	4 x 1.5	6FX 002-5A01 - ....
1FT6082-1AF7...	9.6	4.1 (5.5)	18		1.5	4 x 1.5	6FX 002-5A21 - ....
1FT6084-1AF7...	13.2	6.3 (8.5)	18		1.5	4 x 1.5	6FX 002-5A21 - ....
1FT6086-1AF7...	16.4	8.5 (11.4)	18		1.5	4 x 2.5	6FX 002-5A31 - ....
1FT6062-1AH7...	5.7	2.8 (3.8)	9		1	4 x 1.5	6FX 002-5A01 - ....
1FT6064-1AH7...	9.0	4.5 (6.0)	9		1	4 x 1.5	6FX 002-5A01 - ....
1FT6084-1AH7...	19.8	9.4 (12.6)	18		1.5	4 x 4	6FX 002-5A41 - ....
1FT6086-1AH7...	23.3	12.7 (17.0)	28		1.5	4 x 4	6FX 002-5A41 - ....
1FT6034-1AK7...	2.6	1.3 (1.7)	3		1	4 x 1.5	6FX 002-5A01 - ....
1FT6084-1AK7...	24.1	12.6 (16.9)	28		1.5	4 x 4	6FX 002-5A41 - ....

#### Type of power cable:

MOTION-CONNECT 800

MOTION-CONNECT 700 (only with brake cores)

MOTION-CONNECT 500

MOTION-CONNECT 500 PLUS (only up to a cross-section of 6 mm<sup>2</sup>)

8 0  
7 0  
5 0  
5 1

Without brake cores

With brake cores

C  
D

For length code as well as power and signal cables, see Connection system MOTION-CONNECT. ....

6

<sup>1)</sup> If the absolute encoder is used,  $M_{\text{rated}}$  is reduced by 10 %.

<sup>2)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

<sup>3)</sup> For the default setting of pulse frequency.

<sup>4)</sup>  $P_{\text{calc}} [\text{kW}] = \frac{M_0 [\text{Nm}] \times n_{\text{rated}}}{9550}$   $P_{\text{calc}} [\text{HP}] = \frac{M_0 [\text{lb}_f\text{-in}] \times n_{\text{rated}}}{63000}$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT6 standard type motors

#### Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque <sup>1)</sup>	Rated current	1FT6 synchronous motors Standard type Natural cooling	No. of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	A			$10^{-4}\text{ kgm}^2$ (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)
1 500	100	3.8 (5.1)	27 (239)	24.5 (216.8)	8.4	<b>1FT6102 - 8AB7</b> ■ ■ ■ ■ ■ ■ ■ ■	4	99 (0.0876)	27.5 (60.6)
		6.4 (8.9)	50 (443)	41 (363)	14.5	<b>1FT6105 - 8AB7</b> ■ ■ ■ ■ ■ ■ ■ ■	4	168 (0.1487)	39.5 (87.1)
		9.6 (12.9)	70 (620)	61 (540)	20.5	<b>1FT6108 - 8AB7</b> ■ ■ ■ ■ ■ ■ ■ ■	4	260 (0.2301)	55.5 (122.4)
	132	9.7 (13)	75 (664)	62 (549)	19	<b>1FT6132 - 6AB7</b> 1 - ■ ■ ■ ■ ■ ■ ■ ■	3	430 (0.3806)	85 (187.4)
		11.8 (15.8)	95 (841)	75 (664)	24	<b>1FT6134 - 6AB7</b> 1 - ■ ■ ■ ■ ■ ■ ■ ■	3	547 (0.4841)	100 (220.5)
		13.8 (18.5)	115 (1018)	88 (779)	27	<b>1FT6136 - 6AB7</b> 1 - ■ ■ ■ ■ ■ ■ ■ ■	3	664 (0.5876)	117 (258)

<b>Type of construction:</b>	IM B5 IM B14 <sup>2)</sup> (not for 1FT613)	1 2				
<b>Connector outlet direction:</b>	Transverse right Transverse left Axial NDE (not for 1FT613) Axial DE	1 2 3 4				
<b>Terminal box/ Cable entry:</b>	Transverse/from right Transverse/from left Axial/from NDE Axial/from DE	5 6 7 8				
<b>Encoder systems:</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 2 048 S/R Absolute encoder EnDat 2 048 S/R <sup>1)</sup> Multipole resolver 2-pole resolver	A E S T				
<b>Shaft extension:</b>	<b>Shaft and flange accuracy:</b>	<b>Holding brake:</b>				A B D E G H K L
Fitted key and keyway	Tolerance N	Without				
Fitted key and keyway	Tolerance N	With				
Fitted key and keyway	Tolerance R	Without				
Fitted key and keyway	Tolerance R	With				
Plain shaft	Tolerance N	Without				
Plain shaft	Tolerance N	With				
Plain shaft	Tolerance R	Without				
Plain shaft	Tolerance R	With				
<b>Vibration magnitude:</b>	<b>Degree of protection:</b>					0 1 2 6 3 4 5 7
Grade A	IP64					
Grade A	IP65					
Grade A	IP67					
Grade A	IP68					
Grade R	IP64					
Grade R	IP65					
Grade R	IP67					
Grade R	IP68					

To select the type of construction and degree of protection, see Selection guides.



# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT6 standard type motors  
Natural cooling

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T=100$ K  A	Calculated power <sup>5)</sup>  $P_{calc}$ for $M_0$ $\Delta T=100$ K  kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector		
			Rated output current <sup>3)</sup>  $I_{rated}$  A	Order No.	Power connector  Size	Cable cross- section <sup>4)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.
1FT6102-8AB7...	8.7	4.2 (5.63)	9	For ordering data, see Converter system	1.5	4 x 1.5	<b>6FX 002 - 5 A21 - ....</b>
1FT6105-8AB7...	16.0	7.9 (10.59)	18		1.5	4 x 2.5	<b>6FX 002 - 5 A31 - ....</b>
1FT6108-8AB7...	22.3	11.0 (14.75)	28		1.5	4 x 4	<b>6FX 002 - 5 A41 - ....</b>
1FT6132-6AB7...	21.6	11.8 (15.82)	28		1.5	4 x 4	<b>6FX 002 - 5 A41 - ....</b>
1FT6134-6AB7...	27.0	14.9 (19.97)	28		1.5	4 x 4	<b>6FX 002 - 5 A41 - ....</b>
1FT6136-6AB7...	34	18.1 (24.26)	56		1.5	4 x 10	<b>6FX 002 - 5 A61 - ....</b>

#### Type of power cable:

MOTION-CONNECT 800

MOTION-CONNECT 700 (only with brake cores)

MOTION-CONNECT 500

MOTION-CONNECT 500 PLUS (only up to a cross-section of 6 mm<sup>2</sup>)

8 0  
7 0  
5 0  
5 1

Without brake cores

With brake cores

C  
D

For length code as well as power and signal cables, see Connection system MOTION-CONNECT.

....

<sup>1)</sup> If the absolute encoder is used,  $M_{rated}$  is reduced by 10 %.

<sup>2)</sup> Same flange as for IM B5 type of construction, but with metric threaded insert in the four fixing holes.

<sup>3)</sup> For the default setting of pulse frequency.

<sup>4)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

<sup>5)</sup>  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$   $P_{calc} [HP] = \frac{M_0 [lb_f-in] \times n_{rated}}{63000}$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT6 standard type motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque <sup>1)</sup>	Rated current	1FT6 synchronous motors Standard type Natural cooling	No. of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100$ K	$M_0$ at $\Delta T=100$ K	$M_{rated}$ at $\Delta T=100$ K	$I_{rated}$ at $\Delta T=100$ K	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	A			10 <sup>-4</sup> kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)
2 000	63	0.8 (1.1)	4 (35)	3.7 (32.7)	1.9	1FT6061 - 6AC7	3	6 (0.0053)	8 (17.6)
		1.1 (1.5)	6 (53)	5.2 (46)	2.6	1FT6062 - 6AC7	3	8.5 (0.0075)	9.5 (20.9)
		1.7 (2.3)	9.5 (84.1)	8 (71)	3.8	1FT6064 - 6AC7	3	13 (0.0115)	12.5 (27.6)
	80	1.6 (5.1)	8 (71)	7.5 (66.4)	4.1	1FT6081 - 8AC7	4	21 (0.0186)	12.5 (27.6)
		2.4 (3.2)	13 (115)	11.4 (101)	6.6	1FT6082 - 8AC7	4	30 (0.0266)	15 (33.1)
		3.5 (4.7)	20 (177)	16.9 (149.6)	8.3	1FT6084 - 8AC7	4	48 (0.0425)	20.5 (45.2)
		4.7 (6.3)	27 (239)	22.5 (199)	10.9	1FT6086 - 8AC7	4	66.5 (0.0589)	25.5 (56.2)
	100	4.8 (6.4)	27 (239)	23 (204)	11	1FT6102 - 8AC7	4	99 (0.0876)	27.5 (60.6)
		8.0 (10.7)	50 (443)	38 (336)	17.6	1FT6105 - 8AC7	4	168 (0.1478)	39.5 (87.1)
		11.5 (15.4)	70 (620)	55 (487)	24.5	1FT6108 - 8AC7	4	260 (0.2301)	55.5 (122.4)
	132	11.5 (15.4)	75 (664)	55 (487)	23	1FT6132 - 6AC7 1	3	430 (0.3806)	85 (188)
		13.6 (18.2)	95 (841)	65 (575)	27	1FT6134 - 6AC7 1	3	547 (0.4841)	100 (221)
15.5 (20.8)		115 (1018)	74 (665)	30	1FT6136 - 6AC7 1	3	664 (0.5876)	117 (258)	

<b>Type of construction:</b>	IM B5 IM B14 <sup>2)</sup> (not for 1FT613)	1 2
<b>Connector outlet direction:</b>	Transverse right (not for 1FT606) Transverse left (not for 1FT606) Axial NDE (not for 1FT613) Axial DE	1 2 3 4
<b>Terminal box/ Cable entry:</b> (only for 1FT61)	Transverse/from right Transverse/from left Axial/from NDE Axial/from DE	5 6 7 8
<b>Encoder systems:</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 2 048 S/R Absolute encoder EnDat 2 048 S/R <sup>1)</sup> Multipole resolver 2-pole resolver	A E S T
<b>Shaft extension:</b>	<b>Shaft and flange accuracy:</b>	<b>Holding brake:</b>
Fitted key and keyway	Tolerance N	Without
Fitted key and keyway	Tolerance N	With
Fitted key and keyway	Tolerance R	Without
Fitted key and keyway	Tolerance R	With
Plain shaft	Tolerance N	Without
Plain shaft	Tolerance N	With
Plain shaft	Tolerance R	Without
Plain shaft	Tolerance R	With
<b>Vibration magnitude:</b>	<b>Degree of protection:</b>	
Grade A	IP64	0
Grade A	IP65	1
Grade A	IP67	2
Grade A	IP68	6
Grade R	IP64	3
Grade R	IP65	4
Grade R	IP67	5
Grade R	IP68	7

To select the type of construction and degree of protection, see Selection guides.

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT6 standard type motors  
Natural cooling

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T=100$ K  A	Calculated power <sup>6)</sup>  $P_{calc}$ for $M_0$ $\Delta T=100$ K  kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector		
			Rated output current <sup>3)</sup>  $I_{rated}$  A	Order No.	Power connector  Size	Cable cross- section <sup>5)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.
1FT6061-6AC7...	1.9	0.84 (1.13)	3	For ordering data, see Converter system	1	4 x 1.5	6FX 002 - 5A01 - ....
1FT6062-6AC7...	2.7	1.3 (1.74)	3		1	4 x 1.5	6FX 002 - 5A01 - ....
1FT6064-6AC7...	4.2	2.0 (2.68)	5		1	4 x 1.5	6FX 002 - 5A01 - ....
1FT6081-8AC7...	3.9	1.7 (2.28)	5		1.5	4 x 1.5	6FX 002 - 5A21 - ....
1FT6082-8AC7...	6.6	2.7 (3.62)	9		1.5	4 x 1.5	6FX 002 - 5A21 - ....
1FT6084-8AC7...	8.8	4.2 (5.63)	9		1.5	4 x 1.5	6FX 002 - 5A21 - ....
1FT6086-8AC7...	11.3	5.7 (7.64)	18		1.5	4 x 1.5	6FX 002 - 5A21 - ....
1FT6102-8AC7...	12.1	5.7 (7.64)	18		1.5	4 x 1.5	6FX 002 - 5A21 - ....
1FT6105-8AC7...	21.4	10.5 (14.07)	28		1.5	4 x 4	6FX 002 - 5A41 - ....
1FT6108-8AC7...	29	14.7 (19.71)	28 <sup>4)</sup>		1.5	4 x 6	6FX 002 - 5A51 - ....
1FT6132-6AC7...	29	15.7 (21.05)	28 <sup>4)</sup>		1.5	4 x 6	6FX 002 - 5A51 - ....
1FT6134-6AC7...	36	19.9 (26.68)	56		1.5	4 x 10	6FX 002 - 5A61 - ....
1FT6136-6AC7...	42	24.1 (32.31)	56		3	4 x 10	6FX 5 002 - 5A13 - ....

#### Type of power cable:

MOTION-CONNECT 800

MOTION-CONNECT 700 (only with brake cores)

MOTION-CONNECT 500

MOTION-CONNECT 500 PLUS (only up to a cross-section of 6 mm<sup>2</sup>)

8 0  
7 0  
5 0  
5 1

C  
D

Without brake cores  
With brake cores

For length code as well as power and signal cables, see Connection system MOTION-CONNECT. ....

6

<sup>1)</sup> If the absolute encoder is used,  $M_{rated}$  is reduced by 10 %.

<sup>2)</sup> Same flange as for IM B5 type of construction, but with metric threaded insert in the four fixing holes.

<sup>3)</sup> For the default setting of pulse frequency.

<sup>4)</sup> With the specified power module, the motor cannot be fully utilized at  $M_0$  at  $\Delta T=100$  K winding temperature rise. If a power module with a higher rating is used, you must check whether the specified power cable can be connected to it.

<sup>5)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

<sup>6)</sup>  $P_{calc}$  [kW] =  $\frac{M_0$  [Nm] x  $n_{rated}$ }{9550}  $P_{calc}$  [HP] =  $\frac{M_0$  [lb<sub>f</sub>-in] x  $n_{rated}$ }{63000}

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT6 standard type motors

#### Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque <sup>1)</sup>	Rated current	1FT6 synchronous motors Standard type Natural cooling	No. of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	A			$10^{-4}\text{ kgm}^2$ (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)
3 000	48	0.7 (0.99)	2.6 (23)	2.15 (19)	1.7	1FT6041 - 4AF71 - ■■■■	2	2.9 (0.0025)	6.6 (14.6)
		1.4 (1.9)	5 (44)	4.3 (38.1)	2.9	1FT6044 - 4AF71 - ■■■■	2	5.1 (0.0045)	8.3 (18.3)
	63	1.1 (1.5)	4 (35)	3.5 (31)	2.6	1FT6061 - 6AF7■ - ■■■■	3	6 (0.0053)	8 (17.6)
		1.5 (2.0)	6 (53)	4.7 (41.6)	3.4	1FT6062 - 6AF7■ - ■■■■	3	8.5 (0.0075)	9.5 (20.9)
		2.2 (2.95)	9.5 (84.1)	7 (62)	4.9	1FT6064 - 6AF7■ - ■■■■	3	13 (0.0115)	12.5 (27.6)
	80	2.2 (2.95)	8 (71)	6.9 (61.1)	5.6	1FT6081 - 8AF7■ - ■■■■	4	21 (0.0186)	12.5 (27.6)
		3.2 (4.3)	13 (115)	10.3 (91.2)	8.7	1FT6082 - 8AF7■ - ■■■■	4	30 (0.0266)	15 (33.1)
		4.6 (6.2)	20 (177)	14.7 (130.1)	11	1FT6084 - 8AF7■ - ■■■■	4	48 (0.0425)	20.5 (45.2)
		5.8 (7.8)	27 (239)	18.5 (163.7)	13	1FT6086 - 8AF7■ - ■■■■	4	66.5 (0.0589)	25.5 (56.2)
	100	6.1 (8.2)	27 (239)	19.5 (172.6)	13.2	1FT6102 - 8AF7■ - ■■■■	4	99 (0.0876)	27.5 (60.6)
		9.7 (13)	50 (443)	31 (274)	22.5	1FT6105 - 8AF7■ - ■■■■	4	168 (0.1487)	39.5 (87.1)
		11.6 (15.2)	70 (620)	37 (328)	25	1FT6108 - 8AF7■ - ■■■■	4	260 (0.2301)	55.5 (122.4)
132	11.3 (15.2)	75 (664)	36 (319)	23	1FT6132 - 6AF71 - ■■■■	3	430 (0.3806)	85 (187.4)	

<b>Type of construction:</b>	IM B5	1
	IM B14 <sup>2)</sup> (not for 1FT604/1FT613)	2
<b>Connector outlet direction:</b>	Transverse right (not for 1FT604/1FT606)	1
	Transverse left (not for 1FT604/1FT606)	2
	Axial NDE (not with power connector size 3 and not with 1FT613)	3
	Axial DE	4
<b>Terminal box/ Cable entry:</b> (only for 1FT61)	Transverse/from right	5
	Transverse/from left	6
	Axial/from NDE	7
	Axial/from DE	8
<b>Encoder systems:</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 2 048 S/R	A
	Absolute encoder EnDat 2 048 S/R <sup>1)</sup>	E
	Multipole resolver	S
	2-pole resolver	T
<b>Shaft extension:</b>	<b>Shaft and flange accuracy:</b>	<b>Holding brake:</b>
Fitted key and keyway	Tolerance N	Without
Fitted key and keyway	Tolerance N	With
Fitted key and keyway	Tolerance R	Without
Fitted key and keyway	Tolerance R	With
Plain shaft	Tolerance N	Without
Plain shaft	Tolerance N	With
Plain shaft	Tolerance R	Without
Plain shaft	Tolerance R	With
		A
		B
		D
		E
		G
		H
		K
		L
<b>Vibration magnitude:</b>	<b>Degree of protection:</b>	0
Grade A	IP64	1
Grade A	IP65	2
Grade A	IP67	6
Grade A	IP68	6
Grade R	IP64	3
Grade R	IP65	4
Grade R	IP67	5
Grade R	IP68	7

To select the type of construction and degree of protection, see Selection guides.

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT6 standard type motors  
Natural cooling

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T=100$ K  A	Calculated power <sup>6)</sup>  $P_{calc}$ for $M_0$ $\Delta T=100$ K  kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector		
			Rated output current <sup>3)</sup>  $I_{rated}$  A	Order No.	Power connector  Size	Cable cross- section <sup>4)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.
1FT6041-4AF7 ...	1.9	0.8 (1.07)	3	For ordering data, see Converter system	1	4 x 1.5	6FX 002-5A01 - ....
1FT6044-4AF7 ...	3	1.6 (2.14)	3		1	4 x 1.5	6FX 002-5A01 - ....
1FT6061-6AF7 ...	2.7	1.3 (1.74)	3		1	4 x 1.5	6FX 002-5A01 - ....
1FT6062-6AF7 ...	4.1	1.9 (2.55)	5		1	4 x 1.5	6FX 002-5A01 - ....
1FT6064-6AF7 ...	6.1	3.0 (4.02)	9		1	4 x 1.5	6FX 002-5A01 - ....
1FT6081-8AF7 ...	5.8	2.5 (3.35)	9		1.5	4 x 1.5	6FX 002-5A21 - ....
1FT6082-8AF7 ...	9.6	4.1 (5.5)	18		1.5	4 x 1.5	6FX 002-5A21 - ....
1FT6084-8AF7 ...	13.2	6.3 (8.45)	18		1.5	4 x 1.5	6FX 002-5A21 - ....
1FT6086-8AF7 ...	16.4	8.5 (11.39)	18		1.5	4 x 2.5	6FX 002-5A31 - ....
1FT6102-8AF7 ...	16.9	8.5 (11.39)	18		1.5	4 x 2.5	6FX 002-5A31 - ....
1FT6105-8AF7 ...	32	15.7 (21.05)	28 <sup>5)</sup>		1.5	4 x 6	6FX 002-5A51 - ....
1FT6108-8AF7 ...	41	22.0 (29.49)	56		3	4 x 10	6FX 5 002-5A13 - ....
1FT6132-6AF7 ...	43	23.6 (31.64)	56		3	4 x 10	6FX 5 002-5A13 - ....

#### Type of power cable:

MOTION-CONNECT 800

MOTION-CONNECT 700 (only with brake cores)

MOTION-CONNECT 500

MOTION-CONNECT 500 PLUS (only up to a cross-section of 6 mm<sup>2</sup>)

8 0  
7 0  
5 0  
5 1

C  
D

Without brake cores

With brake cores

For length code as well as power and signal cables, see Connection system MOTION-CONNECT. ....

6

<sup>1)</sup> If the absolute encoder is used,  $M_{rated}$  is reduced by 10 %.

<sup>2)</sup> Same flange as for IM B5 type of construction, but with metric threaded insert in the four fixing holes.

<sup>3)</sup> For the default setting of pulse frequency.

<sup>4)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

<sup>5)</sup> With the specified power module, the motor cannot be fully utilized at  $M_0$  at  $\Delta T=100$  K winding temperature rise. If a power module with a higher rating is used, you must check whether the specified power cable can be connected to it.

<sup>6)</sup>  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$   $P_{calc} [HP] = \frac{M_0 [lb_f-in] \times n_{rated}}{63000}$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT6 standard type motors

#### Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque <sup>1)</sup>	Rated current	1FT6 synchronous motors Standard type Natural cooling	No. of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	A			$10^{-4}\text{ kgm}^2$ (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)
4 500	63	1.4 (1.9)	4 (35)	2.9 (25.7)	3.4	1FT6061 - 6AH7 ■■■■	3	6 (0.0053)	8 (17.6)
		1.7 (2.3)	6 (53)	3.6 (31.9)	3.9	1FT6062 - 6AH7 ■■■■	3	8.5 (0.0075)	9.5 (20.9)
		2.3 (3.1)	9.5 (84.1)	4.8 (42.5)	5.5	1FT6064 - 6AH7 ■■■■	3	13 (0.0115)	12.5 (27.6)
	80	2.7 (3.6)	8 (71)	5.8 (51.3)	7.3	1FT6081 - 8AH7 ■■■■	4	21 (0.0186)	12.5 (27.6)
		4 (5.4)	13 (115)	8.5 (75.2)	11	1FT6082 - 8AH7 ■■■■	4	30 (0.0266)	15 (33.1)
		4.9 (6.6)	20 (177)	10.5 (92.9)	12.5	1FT6084 - 8AH7 ■■■■	4	48 (0.0425)	20.5 (45.2)
		5.7 (7.6)	27 (239)	12 (106.2)	12.6	1FT6086 - 8AH7 ■■■■	4	66.5 (0.0589)	25.5 (56.2)
	100	5.7 (7.6)	27 (239)	12 (106.2)	12	1FT6102 - 8AH7 ■■■■	4	99 (0.0876)	27.5 (60.6)

<b>Type of construction:</b>	IM B5 IM B14 <sup>2)</sup>	1 2
<b>Connector outlet direction:</b>	Transverse right (not for 1FT606) Transverse left (not for 1FT606) Axial NDE Axial DE	1 2 3 4
<b>Terminal box/ Cable entry:</b> (only for 1FT61)	Transverse/from right Transverse/from left Axial/from NDE Axial/from DE	5 6 7 8
<b>Encoder systems:</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 2 048 S/R Absolute encoder EnDat 2 048 S/R <sup>1)</sup> Multipole resolver 2-pole resolver	A E S T
<b>Shaft extension:</b>	<b>Shaft and flange accuracy:</b>	<b>Holding brake:</b>
Fitted key and keyway	Tolerance N	Without
Fitted key and keyway	Tolerance N	With
Fitted key and keyway	Tolerance R	Without
Fitted key and keyway	Tolerance R	With
Plain shaft	Tolerance N	Without
Plain shaft	Tolerance N	With
Plain shaft	Tolerance R	Without
Plain shaft	Tolerance R	With
<b>Vibration magnitude:</b>	<b>Degree of protection:</b>	0 1 2 6 3 4 5 7
Grade A	IP64	
Grade A	IP65	
Grade A	IP67	
Grade A	IP68	
Grade R	IP64	
Grade R	IP65	
Grade R	IP67	
Grade R	IP68	

To select the type of construction and degree of protection, see Selection guides.

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT6 standard type motors  
Natural cooling

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T=100$ K  A	Calculated power <sup>6)</sup>  $P_{calc}$ for $M_0$ $\Delta T=100$ K  kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector			
			Rated output current <sup>3)</sup>  $I_{rated}$  A	Order No.	Power connector  Size	Cable cross- section <sup>5)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.	
1FT6061-6AH7...	4	1.9 (2.6)	5	For ordering data, see Converter system	1	4 x 1.5	<b>6FX</b> ■ ■ 02 - <b>5</b> ■ ■ A01 - ....	
1FT6062-6AH7...	5.7	2.8 (3.8)	9		1	4 x 1.5	<b>6FX</b> ■ ■ 02 - <b>5</b> ■ ■ A01 - ....	
1FT6064-6AH7...	9.0	4.5 (6.0)	9		1	4 x 1.5	<b>6FX</b> ■ ■ 02 - <b>5</b> ■ ■ A01 - ....	
1FT6081-8AH7...	8.6	3.8 (5.1)	9		1.5	4 x 1.5	<b>6FX</b> ■ ■ 02 - <b>5</b> ■ ■ A21 - ....	
1FT6082-8AH7...	14.8	6.1 (8.2)	18		1.5	4 x 1.5	<b>6FX</b> ■ ■ 02 - <b>5</b> ■ ■ A21 - ....	
1FT6084-8AH7...	19.8	9.4 (12.6)	18 <sup>4)</sup>		1.5	4 x 4	<b>6FX</b> ■ ■ 02 - <b>5</b> ■ ■ A41 - ....	
1FT6086-8AH7...	23.3	12.7 (17.0)	28		1.5	4 x 4	<b>6FX</b> ■ ■ 02 - <b>5</b> ■ ■ A41 - ....	
1FT6102-8AH7...	24.1	12.7 (17.0)	28		1.5	4 x 4	<b>6FX</b> ■ ■ 02 - <b>5</b> ■ ■ A41 - ....	
<b>Type of power cable:</b>								
MOTION-CONNECT 800							8 0	
MOTION-CONNECT 700 (only <u>with</u> brake cores)							7 0	
MOTION-CONNECT 500							5 0	
MOTION-CONNECT 500 PLUS (only up to a cross-section of 6 mm <sup>2</sup> )							5 1	
Without brake cores							C	
With brake cores							D	
For length code as well as power and signal cables, see Connection system MOTION-CONNECT.							....	

<sup>1)</sup> If the absolute encoder is used,  $M_{rated}$  is reduced by 10 %.

<sup>2)</sup> Same flange as for IM B5 type of construction, but with metric threaded insert in the four fixing holes.

<sup>3)</sup> For the default setting of pulse frequency.

<sup>4)</sup> With the specified power module, the motor cannot be fully utilized at  $M_0$  at  $\Delta T=100$  K winding temperature rise. If a power module with a higher rating is used, you must check whether the specified power cable can be connected to it.

<sup>5)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

<sup>6)</sup>  $P_{calc}$  [kW] =  $\frac{M_0 \text{ [Nm]} \times n_{rated}}{9550}$   $P_{calc}$  [HP] =  $\frac{M_0 \text{ [lb}_f\text{-in]} \times n_{rated}}{63000}$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT6 standard type motors

#### Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque <sup>1)</sup>	Rated current	1FT6 synchronous motors Standard type Natural cooling	No. of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	A			$10^{-4}\text{ kgm}^2$ (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)
6 000	28	0.19 (0.25)	0.4 (3.5)	0.3 (2.7)	1.1	1FT6021 - 6AK71 - ■ ■ ■ ■ ■	3	0.21 (0.0002)	1.2 (2.6)
		0.31 (0.42)	0.8 (7.1)	0.5 (4.4)	0.9	1FT6024 - 6AK71 - ■ ■ ■ ■ ■	3	0.34 (0.0003)	2.1 (4.6)
	36	0.47 (0.63)	1 (9)	0.75 (6.6)	1.2	1FT6031 - 4AK71 - ■ ■ ■ ■ ■	2	0.65 (0.0006)	3.1 (6.8)
		0.88 (1.18)	2 (18)	1.4 (12.4)	2.1	1FT6034 - 4AK71 - ■ ■ ■ ■ ■	2	1.1 (0.0010)	4.4 (9.7)
	48	1.1 (1.5)	2.6 (23)	1.7 (15)	2.4	1FT6041 - 4AK71 - ■ ■ ■ ■ ■	2	2.9 (0.0025)	6.6 (14.6)
		1.9 (2.6)	5 (44)	3 (26.6)	4.1	1FT6044 - 4AK71 - ■ ■ ■ ■ ■	2	5.1 (0.0045)	8.3 (18.3)
	63	1.3 (1.7)	4 (35)	2.1 (18.6)	3.1	1FT6061 - 6AK7■ - ■ ■ ■ ■ ■	3	6 (0.0053)	8 (17.6)
		1.3 (1.7)	6 (53)	2.1 (18.6)	3.2	1FT6062 - 6AK7■ - ■ ■ ■ ■ ■	3	8.5 (0.0075)	9.5 (20.9)
		1.3 (1.7)	9.5 (84.1)	2.1 (18.6)	3.5	1FT6064 - 6AK7■ - ■ ■ ■ ■ ■	3	13 (0.0115)	12.5 (27.6)
	80	2.9 (13.9)	8 (70.8)	4.6 (40.7)	7.7	1FT6081 - 8AK7■ - ■ ■ ■ ■ ■	4	21 (0.0186)	12.5 (27.6)
		3.5 (4.7)	13 (115)	5.5 (48.7)	9.1	1FT6082 - 8AK7■ - ■ ■ ■ ■ ■	4	30 (0.0266)	15 (33.1)
		4.1 (5.6)	20 (177)	6.5 (57.5)	9.2	1FT6084 - 8AK7■ - ■ ■ ■ ■ ■	4	48 (0.0425)	20.5 (45.2)

<b>Type of construction:</b>	IM B5 IM B14 <sup>2)</sup> (not for 1FT602/1FT603/1FT604)	1 2
<b>Connector outlet direction:</b>	Transverse right (not for 1FT603/1FT604/1FT606) Transverse left (not for 1FT603/1FT604/1FT606) Axial NDE Axial DE	1 2 3 4
<b>Encoder systems:</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 2 048 S/R Absolute encoder EnDat 2 048 S/R <sup>1)</sup> (not for 1FT602) Absolute encoder EnDat 512 S/R <sup>1)</sup> (not for 1FT602) Multipole resolver 2-pole resolver	A E H S T
<b>Shaft extension:</b>	<b>Shaft and flange accuracy:</b>	<b>Holding brake:</b>
Fitted key and keyway	Tolerance N	Without
Fitted key and keyway	Tolerance N	With
Fitted key and keyway	Tolerance R	Without
Fitted key and keyway	Tolerance R	With
Plain shaft	Tolerance N	Without
Plain shaft	Tolerance N	With
Plain shaft	Tolerance R	Without
Plain shaft	Tolerance R	With
		A B D E G H K L
<b>Vibration magnitude:</b>	<b>Degree of protection:</b>	0 1 2 6 3 4 5 7
Grade A	IP64	
Grade A	IP65 (not for 1FT602)	
Grade A	IP67	
Grade A	IP68 (not for 1FT602)	
Grade R	IP64	
Grade R	IP65 (not for 1FT602)	
Grade R	IP67	
Grade R	IP68 (not for 1FT602)	

To select the type of construction and degree of protection, see Selection guides.



# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT6 standard type motors  
Natural cooling

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T=100\text{ K}$  A	Calculated power <sup>5)</sup>  $P_{\text{calc}}$ for $M_0$ $\Delta T=100\text{ K}$  kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector		
			Rated output current <sup>3)</sup>  $I_{\text{rated}}$  A	Order No.	Power connector  Size	Cable cross- section <sup>5)</sup>  $\text{mm}^2$	Pre-assembled cable  Order No.
1FT6021-6AK7 ...	1.25	0.3 (0.4)	3	For ordering data, see Converter system	1	4 x 1.5	6FX ■ ■ 02- 5 ■ A01 - ....
1FT6024-6AK7 ...	1.25	0.5 (0.7)	3		1	4 x 1.5	6FX ■ ■ 02- 5 ■ A01 - ....
1FT6031-4AK7 ...	1.4	0.6 (0.8)	3		1	4 x 1.5	6FX ■ ■ 02- 5 ■ A01 - ....
1FT6034-4AK7 ...	2.6	1.3 (1.7)	3		1	4 x 1.5	6FX ■ ■ 02- 5 ■ A01 - ....
1FT6041-4AK7 ...	3	1.6 (2.1)	3		1	4 x 1.5	6FX ■ ■ 02- 5 ■ A01 - ....
1FT6044-4AK7 ...	5.9	3.1 (4.2)	9		1	4 x 1.5	6FX ■ ■ 02- 5 ■ A01 - ....
1FT6061-6AK7...	5	2.5 (3.4)	5		1	4 x 1.5	6FX ■ ■ 02- 5 ■ A01 - ....
1FT6062-6AK7...	7.6	3.8 (5.1)	9		1	4 x 1.5	6FX ■ ■ 02- 5 ■ A01 - ....
1FT6064-6AK7...	12	4.0 (5.4)	18		1	4 x 1.5	6FX ■ ■ 02- 5 ■ A01 - ....
1FT6081-8AK7...	11.1	5.0 (6.7)	18		1.5	4 x 1.5	6FX ■ ■ 02- 5 ■ A21 - ....
1FT6082-8AK7...	17.3	8.2 (10.99)	18		1.5	4 x 2.5	6FX ■ ■ 02- 5 ■ A31 - ....
1FT6084-8AK7...	24.1	12.6 (16.9)	28		1.5	4 x 4	6FX ■ ■ 02- 5 ■ A41 - ....

#### Type of power cable:

MOTION-CONNECT 800

MOTION-CONNECT 700 (only with brake cores)

MOTION-CONNECT 500

MOTION-CONNECT 500 PLUS (only up to a cross-section of 6 mm<sup>2</sup>)

8 0  
7 0  
5 0  
5 1

Without brake cores

With brake cores

C  
D

For length code as well as power and signal cables, see Connection system MOTION-CONNECT.

....

<sup>1)</sup> If the absolute encoder is used,  $M_{\text{rated}}$  is reduced by 10 %.

<sup>2)</sup> Same flange as for IM B5 type of construction, but with metric threaded insert in the four fixing holes.

<sup>3)</sup> For the default setting of pulse frequency.

<sup>4)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

<sup>5)</sup>  $P_{\text{calc}} [\text{kW}] = \frac{M_0 [\text{Nm}] \times n_{\text{rated}}}{9550}$   $P_{\text{calc}} [\text{HP}] = \frac{M_0 [\text{lb-ft-in}] \times n_{\text{rated}}}{63000}$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT6 standard type motors Forced ventilation

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque <sup>1)</sup>	Rated current	<b>1FT6 synchronous motors Standard type Forced ventilation<sup>2)</sup></b>	No. of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)	
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.		$J$	$m$	
rpm		kW (HP)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	A			$10^{-4}\text{ kgm}^2$ (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)	
<b>1 500</b>	100	9.3 (12.5)	65 (575)	59 (522)	21.7	<b>1FT6105 - 8SB7</b> - ■■■■■	4	168 (0.1487)	45.5 (100.3)	
		13 (17)	90 (797)	83 (735)	31	<b>1FT6108 - 8SB7</b> - ■■■■■	4	260 (0.2301)	61.5 (135.6)	
	132	16 (21)	110 (974)	102 (903)	36	<b>1FT6132 - 6SB71</b> - ■■■■■	3	430 (0.3806)	91 (201)	
		20.4 (27.4)	140 (1239)	130 (1151)	45	<b>1FT6134 - 6SB71</b> - ■■■■■	3	547 (0.4810)	106 (234)	
		25.1 (33.7)	175 (1549)	160 (1417)	55	<b>1FT6136 - 6SB71</b> - ■■■■■	3	664 (0.5876)	123 (271)	
<b>2 000</b>	100	11.7 (15.7)	65 (575)	56 (496)	28	<b>1FT6105 - 8SC7</b> - ■■■■■	4	168 (0.1487)	45.5 (100.3)	
		16.8 (22.5)	90 (797)	80 (708)	40	<b>1FT6108 - 8SC7</b> - ■■■■■	4	260 (0.2301)	61.5 (135.6)	
	132	20.5 (27.5)	110 (974)	98 (867)	46	<b>1FT6132 - 6SC71</b> - ■■■■■	3	430 (0.3806)	91 (201)	
		26.2 (35.1)	140 (1239)	125 (1106)	57	<b>1FT6134 - 6SC71</b> - ■■■■■	3	547 (0.4810)	106 (234)	
			32.5 (43.6)	175 (1549)	155 (1372)	72	<b>1FT6136 - 6SC71</b> - ■■■■■	3	664 (0.5876)	123 (271)

<b>Type of construction:</b>	IM B5 IM B14 <sup>3)</sup> (not for 1FT613)	1 2
<b>Connector outlet direction:</b>	Transverse right Transverse left Axial NDE (not with power connector size 3 and not with 1FT613) Axial DE	1 2 3 4
<b>Terminal box/ Cable entry:</b>	Transverse/from right Transverse/from left Axial/from NDE Axial/from DE	5 6 7 8
<b>Encoder systems:</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 2 048 S/R Absolute encoder EnDat 2 048 S/R <sup>1)</sup> Multipole resolver 2-pole resolver	A E S T
<b>Shaft extension:</b>	<b>Shaft and flange accuracy:</b>	<b>Holding brake:</b>
Fitted key and keyway	Tolerance N	Without
Fitted key and keyway	Tolerance N	With
Fitted key and keyway	Tolerance R	Without
Fitted key and keyway	Tolerance R	With
Plain shaft	Tolerance N	Without
Plain shaft	Tolerance N	With
Plain shaft	Tolerance R	Without
Plain shaft	Tolerance R	With
		A B D E G H K L
<b>Vibration magnitude:</b>	<b>Degree of protection:<sup>4)</sup></b>	0 1 3 4
Grade A	IP64	
Grade A	IP65	
Grade R	IP64	
Grade R	IP65	

To select the type of construction and degree of protection, see Selection guides.

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT6 standard type motors  
Forced ventilation

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T=100$ K  A	Calculated power <sup>8)</sup>  $P_{calc}$ for $M_0$ $\Delta T=100$ K  kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector		
			Rated output current <sup>5)</sup>  $I_{rated}$  A	Order No.	Power connector  Size	Cable cross- section <sup>7)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.
1FT6105-8SB7...	21.9	10.2 (13.7)	28	For ordering data, see Converter system	1.5	4 x 4	6FX 002-5A41 - ....
1FT6108-8SB7...	30	14.1 (18.9)	28 <sup>6)</sup>		1.5	4 x 6	6FX 002-5A51 - ....
1FT6132-6SB7...	36	17.3 (23.2)	56		3	4 x 10	6FX 5 002-5A13 - ....
1FT6134-6SB7...	44	22.0 (29.5)	56		3	4 x 10	6FX 5 002-5A13 - ....
1FT6136-6SB7...	55	27.5 (36.9)	56		3	4 x 16	6FX 002-5A23 - ....
1FT6105-8SC7...	30	13.6 (18.2)	28 <sup>6)</sup>		1.5	4 x 6	6FX 002-5A51 - ....
1FT6108-8SC7...	41	18.8 (25.2)	56		3	4 x 10	6FX 5 002-5A13 - ....
1FT6132-6SC7...	47	23.0 (30.6)	56		3	4 x 10	6FX 5 002-5A13 - ....
1FT6134-6SC7...	58	29.3 (39.3)	56 <sup>6)</sup>		3	4 x 16	6FX 002-5A23 - ....
1FT6136-6SC7...	77	36.6 (49.1)	140		3	4 x 25	6FX 002-5DA33 - ....

#### Type of power cable:

MOTION-CONNECT 800

MOTION-CONNECT 700 (only with brake cores)

MOTION-CONNECT 500

MOTION-CONNECT 500 PLUS (only up to a cross-section of 6 mm<sup>2</sup>)

8 0  
7 0  
5 0  
5 1

C  
D

Without brake cores  
With brake cores

For length code as well as power and signal cables, see Connection system MOTION-CONNECT.

#### Notes on forced ventilation:

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

<sup>1)</sup> If the absolute encoder is used,  $M_{rated}$  is reduced by 10 %.

<sup>2)</sup> Not for use in atmospheres containing conductive dust. Forced ventilation cannot be used if flammable, chemically aggressive, electrically-conductive or explosive dust is present.

<sup>3)</sup> Same flange as for IM B5 type of construction, but with metric threaded insert in the four fixing holes.

<sup>4)</sup> The degree of protection refers to the motor; the built-on fan meets the requirements of degree of protection IP54.

<sup>5)</sup> For the default setting of pulse frequency.

<sup>6)</sup> With the specified power module, the motor cannot be fully utilized at  $M_0$  at  $\Delta T=100$  K winding temperature rise. If a power module with a higher rating is used, you must check whether the specified power cable can be connected to it.

<sup>7)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

<sup>8)</sup>  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$   $P_{calc} [HP] = \frac{M_0 [lb_f-in] \times n_{rated}}{63000}$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT6 standard type motors Forced ventilation

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque <sup>1)</sup>	Rated current	<b>1FT6 synchronous motors Standard type Forced ventilation<sup>2)</sup></b>	No. of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	A			$10^{-4}\text{ kgm}^2$ (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)
<b>3 000</b>	80	6.9 (9.3)	26 (230)	22 (195)	17	<b>1FT6084 - 8SF7</b> - ■ ■ ■ ■ ■	4	48 (0.0425)	25 (55.1)
		9.7 (13)	35 (310)	31 (274)	24.5	<b>1FT6086 - 8SF7</b> - ■ ■ ■ ■ ■	4	66.5 (0.0589)	30 (66.2)
	100	15.7 (21.1)	65 (575)	50 (443)	35	<b>1FT6105 - 8SF7</b> - ■ ■ ■ ■ ■	4	168 (0.1487)	45.5 (100.3)
		22 (30)	90 (797)	70 (620)	53	<b>1FT6108 - 8SF7</b> - ■ ■ ■ ■ ■	4	260 (0.2301)	61.5 (135.6)
		28.3 (37.9)	110 (974)	90 (797)	62	<b>1FT6132 - 6SF7 1</b> - ■ ■ ■ ■ ■	3	430 (0.3806)	91 (201)
	132	34.6 (46.4)	140 (1 239)	110 (974)	72	<b>1FT6134 - 6SF7 1</b> - ■ ■ ■ ■ ■	3	547 (0.4810)	106 (234)
45.5 (61.0)		175 (1 549)	145 (1 283)	104	<b>1FT6136 - 6SF7 1</b> - ■ ■ ■ ■ ■	3	664 (0.5877)	123 (271)	
<b>4 500</b>	80	9.4 (12.6)	26 (230)	20 (177)	24.5	<b>1FT6084 - 8SH7</b> - ■ ■ ■ ■ ■	4	48 (0.0425)	25 (55.1)
		12.7 (17)	35 (310)	27 (239)	31.5	<b>1FT6086 - 8SH7</b> - ■ ■ ■ ■ ■	4	66.5 (0.0589)	30 (66.2)
	100	18.8 (25.2)	65 (575)	40 (354)	41	<b>1FT6105 - 8SH7</b> - ■ ■ ■ ■ ■	4	168 (0.1487)	45.5 (100.3)
<b>6 000</b>	80	10.7 (14.3)	26 (230)	17 (151)	25.5	<b>1FT6084 - 8SK7</b> - ■ ■ ■ ■ ■	4	48 (0.0425)	25 (55.1)
		13.8 (18.5)	35 (310)	22 (195)	29	<b>1FT6086 - 8SK7</b> - ■ ■ ■ ■ ■	4	66.5 (0.0589)	30 (66.2)

<b>Type of construction:</b>	IM B5 IM B14 <sup>3)</sup> (not for 1FT613)	1 2
<b>Connector outlet direction:</b> (not for 1FT6136-6SF71)	Transverse right Transverse left Axial NDE (not with power connector size 3 and not with 1FT613) Axial DE	1 2 3 4
<b>Terminal box/ Cable entry:</b> (only for 1FT61)	Transverse/from right Transverse/from left Axial/from NDE Axial/from DE	5 6 7 8
<b>Encoder systems:</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 2 048 S/R Absolute encoder EnDat 2 048 S/R <sup>1)</sup> Multipole resolver 2-pole resolver	A E S T
<b>Shaft extension:</b>	<b>Shaft and flange accuracy:</b>	<b>Holding brake:</b>
Fitted key and keyway	Tolerance N	Without
Fitted key and keyway	Tolerance N	With
Fitted key and keyway	Tolerance R	Without
Fitted key and keyway	Tolerance R	With
Plain shaft	Tolerance N	Without
Plain shaft	Tolerance N	With
Plain shaft	Tolerance R	Without
Plain shaft	Tolerance R	With
<b>Vibration magnitude:</b>	<b>Degree of protection:<sup>4)</sup></b>	A B D E G H K L
Grade A	IP64	0
Grade A	IP65	1
Grade R	IP64	3
Grade R	IP65	4

To select the type of construction and degree of protection, see Selection guides.

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT6 standard type motors  
Forced ventilation

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T=100$ K A	Calculated power <sup>8)</sup>  $P_{calc}$ for $M_0$ $\Delta T=100$ K kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector		
			Rated output current <sup>5)</sup>  $I_{rated}$ A	Order No.	Power connector  Size	Cable cross- section <sup>7)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.
1FT6084-8SF7...	18.2	8.2 (10.99)	18 <sup>6)</sup>	For ordering data, see Converter system	1.5	4 x 2.5	6FX 002-5A31 - ....
1FT6086-8SF7...	25	11.0 (14.75)	28		1.5	4 x 4	6FX 002-5A41 - ....
1FT6105-8SF7...	42	20.4 (27.35)	56		3	4 x 10	6FX 5 002-5A13 - ....
1FT6108-8SF7...	62	28.3 (37.94)	70		3	4 x 16	6FX 002-5A23 - ....
1FT6132-6SF7...	69	34.6 (46.38)	140		3	4 x 25	6FX 002-5DA33 - ....
1FT6134-6SF7...	83	44.0 (58.98)	140		3	4 x 25	6FX 002-5DA33 - ....
1FT6136-6SF7...	110	55.0 (73.8)	140		Terminal box (max. 4 x 35)		
1FT6084-8SH7...	26	12.3 (16.49)	28		1.5	4 x 4	6FX 002-5A41 - ....
1FT6086-8SH7...	38	16.5 (22.12)	56		3	4 x 10	6FX 5 002-5A13 - ....
1FT6105-8SH7...	59	30.6 (41.02)	56 <sup>6)</sup>		3	4 x 16	6FX 002-5A23 - ....
1FT6084-8SK7...	35	16.3 (21.85)	56		1.5	4 x 10	6FX 002-5A61 - ....
1FT6086-8SK7...	44	22.0 (29.49)	56		3	4 x 10	6FX 5 002-5A13 - ....

#### Type of power cable:

MOTION-CONNECT 800

MOTION-CONNECT 700 (only with brake cores)

MOTION-CONNECT 500

MOTION-CONNECT 500 PLUS (only up to a cross-section of 6 mm<sup>2</sup>)

8 0  
7 0  
5 0  
5 1

C  
D

Without brake cores

With brake cores

For length code as well as power and signal cables, see Connection system MOTION-CONNECT.

#### Notes on forced ventilation:

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

<sup>1)</sup> If the absolute encoder is used,  $M_{rated}$  is reduced by 10 %.

<sup>2)</sup> Not for use in atmospheres containing conductive dust. Forced ventilation cannot be used if flammable, chemically aggressive, electrically-conductive or explosive dust is present.

<sup>3)</sup> Same flange as for IM B5 type of construction, but with metric threaded insert in the four fixing holes.

<sup>4)</sup> The degree of protection refers to the motor; the built-on fan meets the requirements of degree of protection IP54.

<sup>5)</sup> For the default setting of pulse frequency.

<sup>6)</sup> With the specified power module, the motor cannot be fully utilized at  $M_0$  at  $\Delta T=100$  K winding temperature rise. If a power module with a higher rating is used, you must check whether the specified power cable can be connected to it.

<sup>7)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

<sup>8)</sup>  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$   $P_{calc} [HP] = \frac{M_0 [lb\text{-}ft] \times n_{rated}}{63000}$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT6 standard type motors

#### Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FT6 synchronous motors Standard type Water cooling <sup>1)2)</sup>	No. of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100$ K	$M_0$ at $\Delta T=100$ K	$M_{rated}$ at $\Delta T=100$ K	$I_{rated}$ at $\Delta T=100$ K	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	A			$10^{-4}$ kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)
1 500	100	18.2 (24.4)	119 (1053)	116 (1027)	43	1FT6108 - 8WB7	4	260 (0.2301)	61.5 (135.6)
		24.1 (32.3)	119 (1053)	115 (1018)	57	1FT6105 - 8WC7	4	168 (0.1487)	45.5 (100.3)
3 000	63	3.2 (4.3)	10.2 (90.3)	10 (89)	6.9	1FT6062 - 6WF7	3	8.5 (0.0075)	9.5 (20.9)
		5.1 (6.8)	16.2 (143.4)	16 (142)	10.3	1FT6064 - 6WF7	3	13 (0.0115)	12.5 (27.6)
	80	11.0 (14.8)	35 (310)	35 (310)	27	1FT6084 - 8WF7	4	48 (0.0425)	21 (46.3)
		14.5 (19.4)	47 (416)	46 (407)	37	1FT6086 - 8WF7	4	66.5 (0.0589)	26 (57.3)
	100	24.5 (32.8)	85 (752)	78 (690)	82	1FT6105 - 8WF7	4	168 (0.1487)	45.5 (100.3)
		34.2 (45.8)	119 (1053)	109 (965)	81	1FT6108 - 8WF7	4	260 (0.2301)	61.5 (135.6)
4 500	63	4.7 (6.3)	10.2 (90.3)	10 (89)	9.6	1FT6062 - 6WH7	3	8.5 (0.0075)	9.5 (20.9)
		7.5 (10.1)	16.2 (143.4)	16 (142)	15.2	1FT6064 - 6WH7	3	13 (0.0115)	12.5 (27.6)
	80	16.5 (22.1)	35 (310)	35 (310)	39	1FT6084 - 8WH7	4	48 (0.0425)	21 (46.3)
		21.2 (28.4)	47 (416)	45 (398)	53	1FT6086 - 8WH7	4	66.5 (0.0589)	26 (57.3)
6 000	63	6.2 (8.3)	10.2 (90.3)	9.8 (87)	12.7	1FT6062 - 6WK7	3	8.5 (0.0075)	9.5 (20.9)
		9.9 (13.3)	16.2 (143.4)	15.8 (139.8)	20	1FT6064 - 6WK7	3	13 (0.0115)	12.5 (27.6)
	80	21.4 (28.7)	35 (310)	34 (301)	51	1FT6084 - 8WK7	4	48 (0.0425)	21 (46.3)
		27.7 (37.1)	47 (416)	44 (389)	58	1FT6086 - 8WK7	4	66.5 (0.0589)	26 (57.3)

<b>Type of construction:</b>	IM B5 IM B14 <sup>3)</sup>	1 2
<b>Connector outlet direction:</b>	Transverse right (not for 1FT606) Transverse left (not for 1FT606) Axial NDE Axial DE (1FT6062 only with water connection on side or below) <sup>2)</sup>	1 2 3 4
<b>Terminal box/ Cable entry:</b> (only for 1FT61)	Transverse/from right Transverse/from left Axial/from NDE Axial/from DE	5 6 7 8
<b>Encoder systems:</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 2 048 S/R Absolute encoder EnDat 2 048 S/R Multipole resolver 2-pole resolver	A E S T
<b>Shaft extension:</b>	<b>Shaft and flange accuracy:</b>	<b>Holding brake:</b>
Fitted key and keyway	Tolerance N	Without
Fitted key and keyway	Tolerance N	With
Fitted key and keyway	Tolerance R	Without
Fitted key and keyway	Tolerance R	With
Plain shaft	Tolerance N	Without
Plain shaft	Tolerance N	With
Plain shaft	Tolerance R	Without
Plain shaft	Tolerance R	With
<b>Vibration magnitude:</b>		<b>Degree of protection:</b>
Grade A		IP64
Grade A		IP65
Grade A		IP67 <sup>4)</sup>
Grade A		IP68 <sup>4)</sup>
Grade R		IP64
Grade R		IP65
Grade R		IP67 <sup>4)</sup>
Grade R		IP68 <sup>4)</sup>
		0 1 2 6 3 4 5 7

To select the type of construction and degree of protection, see Selection guides.

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT6 standard type motors  
Water cooling

### Selection and ordering data

Motor type (continued)	Static current	Calculated power <sup>9)</sup>	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector		
			Rated output current <sup>5)</sup>	Order No.	Power connector	Cable cross- section <sup>7)</sup>	Pre-assembled cable
	$I_0$ at $M_0$ $\Delta T=100$ K	$P_{calc}$ for $M_0$ $\Delta T=100$ K	$I_{rated}$		Size	mm <sup>2</sup>	Order No.
1FT6108-8WB7...	43	18.7 (25.07)	56	For ordering data, see Converter system	3	4 x 10	6FX 5 002- 5 A13 - ....
1FT6105-8WC7...	58	17.8 (23.86)	56 <sup>6)</sup>		3	4 x 16	6FX 002- 5 A23 - ....
1FT6108-8WC7...	57	24.9 (33.38)	56 <sup>6)</sup>		3	4 x 16	6FX 002- 5 A23 - ....
1FT6062-6WF7...	6.9	3.2 (4.29)	9		1	4 x 1.5	6FX 002- 5 A01 - ....
1FT6064-6WF7...	10.3	5.1 (6.84)	18		1	4 x 1.5	6FX 002- 5 A01 - ....
1FT6084-8WF7...	24.5	11.0 (14.75)	28		1.5	4 x 4	6FX 002- 5 A41 - ....
1FT6086-8WF7...	34	14.8 (19.84)	56		1.5	4 x 10	6FX 002- 5 A61 - ....
1FT6105-8WF7...	83	26.7 (35.79)	140		3	4 x 25	6FX 002- 5 DA33 - ....
1FT6108-8WF7...	86	37.4 (50.13)	140		3	4 x 35	6FX 002- 5 DA43 - .... <sup>8)</sup>
1FT6062-6WH7...	9.7	4.8 (6.43)	18		1	4 x 1.5	6FX 002- 5 A01 - ....
1FT6064-6WH7...	15.4	7.6 (10.19)	18	1	4 x 2.5	6FX 002- 5 A11 - ....	
1FT6084-8WH7...	37	16.5 (22.12)	56	1.5	4 x 10	6FX 002- 5 A61 - ....	
1FT6086-8WH7...	52	22.1 (29.62)	56	3	4 x 16	6FX 002- 5 A23 - ....	
1FT6062-6WK7...	12.9	6.4 (8.58)	18	1	4 x 1.5	6FX 002- 5 A01 - ....	
1FT6064-6WK7...	20.5	10.2 (13.67)	28	1	4 x 2.5	6FX 002- 5 A11 - ....	
1FT6084-8WK7...	47	22.0 (29.49)	56	3	4 x 10	6FX 5 002- 5 A13 - ....	
1FT6086-8WK7...	59	29.5 (39.54)	70	3	4 x 16	6FX 002- 5 A23 - ....	

#### Type of power cable:

MOTION-CONNECT 800  
MOTION-CONNECT 700 (only with brake cores)  
MOTION-CONNECT 500  
MOTION-CONNECT 500 PLUS (only up to a cross-section of 6 mm<sup>2</sup>)

8 0  
7 0  
5 0  
5 1

Without brake cores  
With brake cores

C  
D

For length code as well as power and signal cables, see Connection system MOTION-CONNECT.

....

#### Notes on water cooling:

- Inlet temperature of cooling water: max. 30 °C (86 °F)
- Cooling water throughput: at least 5 l/min  
(5 l = 1.1 British gallons/1.32 US gallons)
- Pressure ahead of motor:  $p_{max} = 3$  bar
- Cooling water connection: G 3/8"
- Coolant: water with up to 25 % corrosion protection  
(recommendation: Tyfocor)
- Loss of pressure between inlet and outlet < 0.1 bar

<sup>1)</sup> Delivered as standard with water connection on top.

<sup>2)</sup> Water connection on right side: Add -Z + order code Q20 to order number  
Water connection on left side: Add -Z + order code Q21 to order number  
Water connection below: Add -Z + order code Q22 to order number

<sup>3)</sup> Same flange as for IM B5 type of construction, but with metric threaded insert in the four fixing holes.

<sup>4)</sup> Cannot be ordered for 1FT6105-8WF7.../1FT6108-8WF7... in combination with terminal box.

<sup>5)</sup> For the default setting of pulse frequency.

<sup>6)</sup> With the specified power module, the motor cannot be fully utilized at  $M_0$  at  $\Delta T = 100$  K winding temperature rise. If a power module with a higher rating is used, you must check whether the specified power cable can be connected to it.

<sup>7)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

<sup>8)</sup> MOTION-CONNECT 800 or 500 type of power cable only.

<sup>9)</sup>  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$   $P_{calc} [HP] = \frac{M_0 [lb_f-in] \times n_{rated}}{63000}$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT7 Compact motors

#### Overview



The new 1FT7 Compact motors are permanent-magnet synchronous motors with very compact dimensions and an optically attractive design. Due to the well proven cross-profile, quick and easy mounting of the motors is possible.

The 1FT7 Compact motors fulfill the highest demands on dynamic performance, speed setting range, shaft and flange accuracy. They are equipped with state-of-the-art encoder technology and optimized for operation on our fully digital drive and control systems.

#### Benefits

- High shaft and flange accuracy
- Low torque ripple (average value <math>< 1\%</math>)
- High dynamic performance
- High overload capability (up to  $4 \times M_0$ )
- Compact design
- High degree of protection
- Rugged, vibration-isolated encoder mounting
- Easy encoder replacement on site without alignment
- Quick and easy mounting due to cross-profile
- Rotatable connectors
- New flange type with recessed flange surface, especially suitable for toothed-belt output and vertical assembly (IM V1). The previous flange design, compatible with the 1FT6 motors, can be ordered optionally.

#### Application

- High-performance machine tools
- Machines with stringent requirements in terms of dynamic response and precision, such as packaging machines, foil extractor machines, printing machines and handling equipment



# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT7 Compact motors

### Technical specifications

<b>Product name</b>	1FT7 Compact motor
<b>Type of motor</b>	Permanent-magnet synchronous motor
<b>Magnet material</b>	Rare-earth magnet material
<b>Cooling</b>	Natural cooling
<b>Temperature monitoring</b>	KTY 84 temperature sensor in the stator winding
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a winding temperature rise of $\Delta T = 100 \text{ K}$ at an ambient temperature of $40 \text{ °C}$ ( $104 \text{ °F}$ )
<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)</b>	IM B5 (IM V1, IM V3) with flange 0
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	IP65
<b>Shaft extension on the drive end (DE) in accordance with DIN 748-3 (IEC 60072-1)</b>	Plain shaft
<b>Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)<sup>1)</sup></b>	Tolerance N
<b>Vibration magnitude in accordance with EN 60034-14 (IEC 60034-14)</b>	Grade A is maintained up to rated speed
<b>Sound pressure level <math>L_{pA}</math> (1 m) in accordance with EN ISO 1680, max.</b>	
• 1FT703 ... 1FT706:	65 dB
• 1FT708 ... 1FT710:	70 dB
<b>Encoder systems, built-in</b>	<ul style="list-style-type: none"> <li>• Incremental encoder sin/cos 1 <math>V_{pp}</math> 2 048 S/R with C and D tracks encoder IC2048S/R</li> <li>• Absolute encoder 2 048 S/R single-turn, 4 096 revolutions multi-turn (traversing range) with EnDat interface encoder AM2048S/R</li> </ul>
<b>Connection</b>	Connectors for signals and power can be rotated
<b>Paint finish</b>	Pearl dark grey (RAL 9023)
<b>2nd rating plate</b>	Enclosed separately
<b>Options</b>	<ul style="list-style-type: none"> <li>• Type of construction IM B5 (IM V1, IM V3) with flange 1 (compatible with 1FT6)</li> <li>• Shaft extension on the drive end (DE) with fitted key and keyway (half-key balancing)</li> <li>• Vibration magnitude Grade R</li> <li>• Built-in holding brake</li> <li>• Degree of protection IP64, IP67</li> <li>• Shaft and flange accuracy Tolerance R</li> </ul>

S/R = signals/revolution

<sup>1)</sup> Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT7 Compact core type motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FT7 Compact synchronous motors Core type Natural cooling	Number of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)	A			$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_f\text{-in-s}^2$ )	kg (lb)
2 000	100	5.03 (6.75)	30 (22.1)	24 (17.7)	10	1FT7102 - 1AC7 - 1 1 1	5	91.4 (80.9)	26.1 (57.5)
		7.96 (10.7)	50 (36.9)	38 (28)	15	1FT7105 - 1AC7 - 1 1 1	5	178 (157)	44.2 (97.5)
3 000	48	1.35 (1.81)	5 (3.7)	4.3 (3.2)	2.6	1FT7044 - 1AF7 - 1 1 1	3	5.43 (4.81)	7.2 (15.9)
	63	1.7 (2.28)	6 (4.4)	5.4 (4.0)	3.9	1FT7062 - 1AF7 - 1 1 1	5	7.36 (6.51)	7.1 (15.7)
		2.39 (3.20)	9 (6.6)	7.6 (5.6)	5.2	1FT7064 - 1AF7 - 1 1 1	5	11.9 (10.5)	9.7 (21.4)
	80	3.24 (4.34)	13 (9.6)	10.5 (7.7)	6.6	1FT7082 - 1AF7 - 1 1 1	5	26.5 (23.4)	14 (30.9)
4 500	80	4.55 (6.10)	20 (14.8)	14.5 (10.7)	8.5	1FT7084 - 1AF7 - 1 1 1	5	45.1 (39.9)	20.8 (45.9)
		5.65 (7.58)	28 (20.7)	18 (13.3)	11	1FT7086 - 1AF7 - 1 1 1	5	63.6 (56.2)	27.5 (60.6)
		4.82 (6.46) <sup>3)</sup>	20 (14.8)	11.5 (8.5) <sup>3)</sup>	10.1 <sup>3)</sup>	1FT7084 - 1AH7 - 1 1 1	5	45.1 (39.9)	20.8 (45.9)
		4.71 (6.32)	28 (20.7)	10 (7.4)	10	1FT7086 - 1AH7 - 1 1 1	5	63.6 (56.2)	27.5 (60.6)
6 000	36	0.88 (1.18)	2 (1.5)	1.4 (1.0)	2.1	1FT7034 - 1AK7 - 1 1 1	3	0.85 (0.75)	3.8 (8.38)
	63	2.13 (2.86) <sup>1)</sup>	6 (4.4)	3.7 (2.7) <sup>1)</sup>	5.9 <sup>1)</sup>	1FT7062 - 1AK7 - 1 1 1	5	7.36 (6.51)	7.1 (15.7)
		2.59 (3.47) <sup>2)</sup>	9 (6.6)	5.5 (4.1) <sup>2)</sup>	6.1 <sup>2)</sup>	1FT7064 - 1AK7 - 1 1 1	5	11.9 (10.5)	9.7 (21.4)

<b>Type of construction IM B5:</b>	Flange 0	0	
	Flange 1 (compatible with 1FT6)	1	
<b>Encoder systems:</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 2 048 S/R with C and D tracks	N	
	Absolute encoder EnDat 2 048 S/R	M	
<b>Shaft extension:</b>	Plain shaft	G	
	Plain shaft		
<b>Shaft and flange accuracy:</b>	Tolerance N	H	
	Tolerance N		
<b>Holding brake:</b>	Without		
	With		
<b>Vibration magnitude:</b>	Grade A	1	
<b>Degree of protection:</b>	IP65		

To select the type of construction and degree of protection, see Selection guides.

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT7 Compact core type motors  
Natural cooling

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T = 100$ K  A	Calculated power <sup>6)</sup>  $P_{calc}$ for $M_0$ $\Delta T = 100$ K  kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector			
			Rated output current <sup>5)</sup>  $I_{rated}$  A	Order No.	Power connector  Size	Cable cross- section <sup>4)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.	
1FT7102-1AC7...	12.5	6.28 (8.42)	18	For ordering data, see Converter system	1.5	4 x 1.5	6FX 002 - 5A21 - ....	
1FT7105-1AC7...	18	10.47 (14.0)	18		1.5	4 x 2.5	6FX 002 - 5A31 - ....	
1FT7044-1AF7...	2.8	1.57 (2.11)	3		1	4 x 1.5	6FX 002 - 5A01 - ....	
1FT7062-1AF7...	3.9	1.88 (2.52)	5		1	4 x 1.5	6FX 002 - 5A01 - ....	
1FT7064-1AF7...	5.7	2.83 (3.80)	9		1	4 x 1.5	6FX 002 - 5A01 - ....	
1FT7082-1AF7...	7.6	4.08 (5.47)	9		1	4 x 1.5	6FX 002 - 5A01 - ....	
1FT7084-1AF7...	11	6.28 (8.42)	18		1	4 x 1.5	6FX 002 - 5A01 - ....	
1FT7086-1AF7...	15.5	8.80 (11.8)	18		1.5	4 x 2.5	6FX 002 - 5A31 - ....	
1FT7084-1AH7...	15.6	9.42 (12.6)	18		1.5	4 x 2.5	6FX 002 - 5A31 - ....	
1FT7086-1AH7...	22.4	13.19 (17.7)	28		1.5	4 x 4	6FX 002 - 5A41 - ....	
1FT7034-1AK7...	2.7	1.26 (1.69)	3		1	4 x 1.5	6FX 002 - 5A01 - ....	
1FT7062-1AK7...	8.4	3.77 (5.06)	9		1	4 x 1.5	6FX 002 - 5A01 - ....	
1FT7064-1AK7...	9	5.65 (7.58)	9		1	4 x 1.5	6FX 002 - 5A01 - ....	
<b>Type of power cable:</b>							8	
MOTION-CONNECT 800							5	
MOTION-CONNECT 500								
Without brake cores								C
With brake cores								D
For length code as well as power and signal cables, see Connection system MOTION-CONNECT.								....

6

1) These values refer to  $n = 5\,500$  rpm.

2) These values refer to  $n = 4\,500$  rpm.

3) These values refer to  $n = 4\,000$  rpm.

4) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

5) With default setting of the pulse frequency.

6)  $P_{calc} [\text{kW}] = \frac{M_0 [\text{Nm}] \times \eta_{rated}}{9550}$   $P_{calc} [\text{HP}] = \frac{M_0 [\text{lb}_f\text{-in}] \times \eta_{rated}}{63000}$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT7 Compact standard type motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FT7 Compact synchronous motors Standard type Natural cooling	Number of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)	A			$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_f\text{-in-s}^2$ )	kg (lb)
1 500	100	4.08 (5.47)	30 (22.1)	26 (19.2)	8	1FT7102 - 5AB7■ - 1 ■ ■ ■ ■	5	91.4 (80.9)	26.1 (57.5)
		6.60 (8.85)	50 (36.9)	42 (31.0)	13	1FT7105 - 5AB7■ - 1 ■ ■ ■ ■	5	178 (157)	44.2 (97.5)
		9.58 (12.8)	70 (51.6)	61 (45.0)	16	1FT7108 - 5AB7■ - 1 ■ ■ ■ ■	5	248 (219)	59.0 (130)
<b>Type of construction IM B5:</b>			Flange 0 Flange 1 (compatible with 1FT6)		0 1				
<b>Encoder systems:</b>			Incremental encoder sin/cos 1 V <sub>pp</sub> 2 048 S/R with C and D tracks Absolute encoder EnDat 2 048 S/R			N M			
<b>Shaft extension:</b>			<b>Shaft and flange accuracy:</b>		<b>Holding brake:</b>				
Fitted key and keyway			Tolerance N		Without				A
Fitted key and keyway			Tolerance N		With				B
Fitted key and keyway			Tolerance R		Without				D
Fitted key and keyway			Tolerance R		With				E
Plain shaft			Tolerance N		Without				G
Plain shaft			Tolerance N		With				H
Plain shaft			Tolerance R		Without				K
Plain shaft			Tolerance R		With				L
<b>Vibration magnitude:</b>			<b>Degree of protection:</b>						0
Grade A			IP64						1
Grade A			IP65						2
Grade A			IP67						3
Grade R			IP64						4
Grade R			IP65						5
Grade R			IP67						

To select the type of construction and degree of protection, see Selection guides.

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT7 Compact standard type motors  
Natural cooling

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T=100$ K A	Calculated power <sup>3)</sup>  $P_{calc}$ for $M_0$ $\Delta T=100$ K kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector			
			Rated output current <sup>2)</sup>  $I_{rated}$ A	Order No.	Power connector  Size	Cable cross- section <sup>1)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.	
1FT7102-5AB7...	9	4.71 (6.32)	9	For ordering data, see Converter system	1.5	4 x 1.5	<b>6FX 002 - 5 A21 - ....</b>	
1FT7105-5AB7...	15	7.85 (10.5)	18		1.5	4 x 1.5	<b>6FX 002 - 5 A21 - ....</b>	
1FT7108-5AB7...	18	10.99 (14.7)	18		1.5	4 x 2.5	<b>6FX 002 - 5 A31 - ....</b>	
<b>Type of power cable:</b>								
MOTION-CONNECT 800							8	
MOTION-CONNECT 500							5	
Without brake cores								C
With brake cores								D
For length code as well as power and signal cables, see Connection system MOTION-CONNECT.								....

<sup>1)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F)

<sup>2)</sup> With default setting of the pulse frequency.

<sup>3)</sup>  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$   $P_{calc} [HP] = \frac{M_0 [lb_f-in] \times n_{rated}}{63000}$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT7 Compact standard type motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	<b>1FT7 Compact synchronous motors Standard type Natural cooling</b>	Number of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	A			$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_r\text{-in-s}^2$ )	kg (lb)
<b>2 000</b>	80	2.39 (3.20)	13 (9.6)	11.4 (8.4)	4.9	<b>1FT7082 - 5AC7 - 1</b>	5	26.5 (23.5)	14 (30.9)
		3.54 (4.75)	20 (14.8)	16.9 (12.5)	8.4	<b>1FT7084 - 5AC7 - 1</b>	5	45.1 (39.9)	20.8 (45.9)
		4.71 (6.32)	28 (20.7)	22.5 (16.6)	9.2	<b>1FT7086 - 5AC7 - 1</b>	5	63.6 (56.3)	27.5 (60.6)
	100	5.03 (6.75)	30 (22.1)	24.0 (17.7)	10	<b>1FT7102 - 5AC7 - 1</b>	5	91.4 (80.9)	26.1 (57.5)
		7.96 (10.7)	50 (36.9)	38.0 (28.0)	15	<b>1FT7105 - 5AC7 - 1</b>	5	178 (157)	44.2 (97.5)
		10.5 (14.1)	70 (51.6)	50.0 (36.9)	18	<b>1FT7108 - 5AC7 - 1</b>	5	248 (219)	59 (130)

#### Type of construction IM B5:

Flange 0  
Flange 1 (compatible with 1FT6)

0  
1

#### Encoder systems:

Incremental encoder sin/cos 1 V<sub>pp</sub> 2 048 S/R with C and D tracks  
Absolute encoder EnDat 2 048 S/R

N  
M

#### Shaft extension:

Fitted key and keyway  
Fitted key and keyway  
Fitted key and keyway  
Fitted key and keyway  
Plain shaft  
Plain shaft  
Plain shaft  
Plain shaft

#### Shaft and flange accuracy:

Tolerance N  
Tolerance N  
Tolerance R  
Tolerance R  
Tolerance N  
Tolerance N  
Tolerance R  
Tolerance R

#### Holding brake:

Without  
With  
Without  
With  
Without  
With  
Without  
With

A  
B  
D  
E  
G  
H  
K  
L

#### Vibration magnitude:

Grade A  
Grade A  
Grade A  
Grade R  
Grade R  
Grade R

#### Degree of protection:

IP64  
IP65  
IP67  
IP64  
IP65  
IP67

0  
1  
2  
3  
4  
5

To select the type of construction and degree of protection, see Selection guides.

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT7 Compact standard type motors  
Natural cooling

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T=100$ K  A	Calculated power <sup>3)</sup>  $P_{\text{calc}}$ for $M_0$ $\Delta T=100$ K  kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector			
			Rated output current <sup>2)</sup>  $I_{\text{rated}}$  A	Order No.	Power connector  Size	Cable cross- section <sup>1)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.	
1FT7082-5AC7...	5	2.72 (3.65)	5	For ordering data, see Converter system	1	4 x 1.5	<b>6FX 002 - 5 A01 - ....</b>	
1FT7084-5AC7...	9	4.19 (5.62)	9		1	4 x 1.5	<b>6FX 002 - 5 A01 - ....</b>	
1FT7086-5AC7...	10.6	5.86 (7.86)	18		1	4 x 1.5	<b>6FX 002 - 5 A01 - ....</b>	
1FT7102-5AC7...	12.5	6.28 (8.42)	18		1.5	4 x 1.5	<b>6FX 002 - 5 A21 - ....</b>	
1FT7105-5AC7...	18	10.47 (14.0)	18		1.5	4 x 2.5	<b>6FX 002 - 5 A31 - ....</b>	
1FT7108-5AC7...	25	14.66 (19.7)	28		1.5	4 x 4	<b>6FX 002 - 5 A41 - ....</b>	
<b>Type of power cable:</b>								
MOTION-CONNECT 800							8	
MOTION-CONNECT 500							5	
Without brake cores								C
With brake cores								D
For length code as well as power and signal cables, see Connection system MOTION-CONNECT.								....

<sup>1)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

<sup>2)</sup> With default setting of the pulse frequency.

<sup>3)</sup>  $P_{\text{calc}} [\text{kW}] = \frac{M_0 [\text{Nm}] \times n_{\text{rated}}}{9550}$   $P_{\text{calc}} [\text{HP}] = \frac{M_0 [\text{lb}_f\text{-in}] \times n_{\text{rated}}}{63000}$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT7 Compact standard type motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FT7 Compact synchronous motors Standard type Natural cooling	Number of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{rated}$ at $\Delta T=100\text{ K}$	$I_{rated}$ at $\Delta T=100\text{ K}$	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	A			$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_f\text{-in-s}^2$ )	kg (lb)
3 000	48	0.85 (1.14)	3 (2.2)	2.7 (2.0)	2.1	1FT7042 - 5AF7 ■ - 1 ■ ■ ■ ■	3	2.81 (2.49)	4.6 (10.1)
		1.35 (1.81)	5 (3.7)	4.3 (3.2)	2.6	1FT7044 - 5AF7 ■ - 1 ■ ■ ■ ■	3	5.43 (4.81)	7.2 (15.9)
		1.76 (2.36)	7 (5.2)	5.6 (4.1)	3.5	1FT7046 - 5AF7 ■ - 1 ■ ■ ■ ■	3	7.52 (6.66)	9.3 (20.5)
	63	1.70 (2.28)	6 (4.4)	5.4 (4.0)	3.9	1FT7062 - 5AF7 ■ - 1 ■ ■ ■ ■	5	7.36 (6.51)	7.1 (15.7)
		2.39 (3.20)	9 (6.6)	7.6 (5.6)	5.2	1FT7064 - 5AF7 ■ - 1 ■ ■ ■ ■	5	11.9 (10.5)	9.7 (21.4)
		2.92 (3.92)	12 (8.9)	9.3 (6.9)	7.2	1FT7066 - 5AF7 ■ - 1 ■ ■ ■ ■	5	16.4 (14.5)	12.3 (27.1)
		3.42 (4.59)	15 (11.1)	10.9 (8.0)	6.7	1FT7068 - 5AF7 ■ - 1 ■ ■ ■ ■	5	23.2 (20.5)	16.3 (35.9)
	80	3.24 (4.34)	13 (9.6)	10.3 (7.6)	6.6	1FT7082 - 5AF7 ■ - 1 ■ ■ ■ ■	5	26.5 (23.5)	14.0 (30.9)
		4.55 (6.10)	20 (14.8)	14.5 (10.7)	8.5	1FT7084 - 5AF7 ■ - 1 ■ ■ ■ ■	5	45.1 (39.9)	20.8 (45.9)
		5.62 (7.54)	28 (20.7)	18 (13.3)	11	1FT7086 - 5AF7 ■ - 1 ■ ■ ■ ■	5	63.6 (56.3)	27.5 (60.6)
	100	6.28 (8.42)	30 (22.1)	20 (14.8)	12	1FT7102 - 5AF7 ■ - 1 ■ ■ ■ ■	5	91.4 (80.9)	26.1 (57.5)
		8.80 (11.8)	50 (36.9)	28 (20.7)	15	1FT7105 - 5AF7 ■ - 1 ■ ■ ■ ■	5	178 (157)	44.2 (97.5)
8.17 (11.0)		70 (51.6)	20 (14.8)	12	1FT7108 - 5AF7 ■ - 1 ■ ■ ■ ■	5	248 (220)	59.0 (130)	

#### Type of construction IM B5:

Flange 0  
Flange 1 (compatible with 1FT6)

0  
1

#### Encoder systems:

Incremental encoder sin/cos 1 V<sub>pp</sub> 2 048 S/R with C and D tracks  
Absolute encoder EnDat 2 048 S/R

N  
M

#### Shaft extension:

Fitted key and keyway  
Fitted key and keyway  
Fitted key and keyway  
Fitted key and keyway  
Plain shaft  
Plain shaft  
Plain shaft  
Plain shaft

#### Shaft and flange accuracy:

Tolerance N  
Tolerance N  
Tolerance R  
Tolerance R  
Tolerance N  
Tolerance N  
Tolerance R  
Tolerance R

#### Holding brake:

Without  
With  
Without  
With  
Without  
With  
Without  
With

A  
B  
D  
E  
G  
H  
K  
L

#### Vibration magnitude:

Grade A  
Grade A  
Grade A  
Grade R  
Grade R  
Grade R

#### Degree of protection:

IP64  
IP65  
IP67  
IP64  
IP65  
IP67

0  
1  
2  
3  
4  
5

To select the type of construction and degree of protection, see Selection guides.



# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT7 Compact standard type motors  
Natural cooling

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T=100$ K  A	Calculated power <sup>3)</sup>  $P_{\text{calc}}$ for $M_0$ $\Delta T=100$ K  kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector		
			Rated output current <sup>2)</sup>  $I_{\text{rated}}$  A	Order No.	Power connector  Size	Cable cross- section <sup>1)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.
1FT7042-5AF7...	2.1	0.94 (1.26)	3	For ordering data, see Converter system	1	4 x 1.5	6FX 002 - 5A01 - ....
1FT7044-5AF7...	2.8	1.57 (2.11)	3		1	4 x 1.5	6FX 002 - 5A01 - ....
1FT7046-5AF7...	4	2.20 (2.95)	5		1	4 x 1.5	6FX 002 - 5A01 - ....
1FT7062-5AF7...	3.9	1.88 (2.52)	5		1	4 x 1.5	6FX 002 - 5A01 - ....
1FT7064-5AF7...	5.7	2.83 (3.80)	9		1	4 x 1.5	6FX 002 - 5A01 - ....
1FT7066-5AF7...	8.4	3.77 (5.06)	9		1	4 x 1.5	6FX 002 - 5A01 - ....
1FT7068-5AF7...	8.3	4.71 (6.32)	9		1	4 x 1.5	6FX 002 - 5A01 - ....
1FT7082-5AF7...	7.6	4.08 (5.47)	9		1	4 x 1.5	6FX 002 - 5A01 - ....
1FT7084-5AF7...	11	6.28 (8.42)	18		1	4 x 1.5	6FX 002 - 5A01 - ....
1FT7086-5AF7...	15.5	8.80 (11.8)	18		1.5	4 x 2.5	6FX 002 - 5A31 - ....
1FT7102-5AF7...	18	9.42 (12.6)	18		1.5	4 x 2.5	6FX 002 - 5A31 - ....
1FT7105-5AF7...	26	15.71 (21.0)	28		1.5	4 x 4	6FX 002 - 5A41 - ....
1FT7108-5AF7...	36	21.99 (29.5)	42		1.5	4 x 6	6FX 002 - 5A51 - ....

**Type of power cable:**  
MOTION-CONNECT 800  
MOTION-CONNECT 500

8  
5

Without brake cores  
With brake cores

C  
D

For length code as well as power and signal cables, see Connection system MOTION-CONNECT.

....

6

1) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

2) With default setting of the pulse frequency.

3)  $P_{\text{calc}} [\text{kW}] = \frac{M_0 [\text{Nm}] \times n_{\text{rated}}}{9550}$   $P_{\text{calc}} [\text{HP}] = \frac{M_0 [\text{lb}_f\text{-in}] \times n_{\text{rated}}}{63000}$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT7 Compact standard type motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FT7 Compact synchronous motors Standard type Natural cooling	Number of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	A			$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_r\text{-in-s}^2$ )	kg (lb)
4 500	48	1.32 (1.77) <sup>1)</sup>	7.0 (5.2)	3.6 (2.7) <sup>1)</sup>	4.7 <sup>1)</sup>	1FT7046 - 5AH7 - 1 ■ ■ ■ ■	3	7.52 (6.66)	9.3 (20.5)
	63	2.55 (3.42) <sup>2)</sup>	12 (8.9)	6.1 (4.5) <sup>2)</sup>	7.5 <sup>2)</sup>	1FT7066 - 5AH7 - 1 ■ ■ ■ ■	5	16.4 (14.5)	12.3 (27.1)
	80	3.77 (5.06)	13 (9.6)	8.0 (5.9)	8.4	1FT7082 - 5AH7 - 1 ■ ■ ■ ■	5	26.5 (23.5)	14.0 (30.9)
		4.82 (6.46) <sup>2)</sup>	20 (14.8)	11.5 (8.5) <sup>2)</sup>	10.1 <sup>2)</sup>	1FT7084 - 5AH7 - 1 ■ ■ ■ ■	5	45.1 (39.9)	20.8 (45.9)
		4.71 (6.32)	28 (20.7)	10 (7.4)	10	1FT7086 - 5AH7 - 1 ■ ■ ■ ■	5	63.6 (56.3)	27.5 (60.6)

<b>Type of construction IM B5:</b>	Flange 0 Flange 1 (compatible with 1FT6)	0 1		
<b>Encoder systems:</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 2 048 S/R with C and D tracks Absolute encoder EnDat 2 048 S/R	N M		
<b>Shaft extension:</b>	<b>Shaft and flange accuracy:</b>	<b>Holding brake:</b>		
Fitted key and keyway	Tolerance N	Without		A
Fitted key and keyway	Tolerance N	With		B
Fitted key and keyway	Tolerance R	Without		D
Fitted key and keyway	Tolerance R	With		E
Plain shaft	Tolerance N	Without		G
Plain shaft	Tolerance N	With		H
Plain shaft	Tolerance R	Without		K
Plain shaft	Tolerance R	With		L
<b>Vibration magnitude:</b>	<b>Degree of protection:</b>			
Grade A	IP64			0
Grade A	IP65			1
Grade A	IP67			2
Grade R	IP64			3
Grade R	IP65			4
Grade R	IP67			5

To select the type of construction and degree of protection, see Selection guides.

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT7 Compact standard type motors  
Natural cooling

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T = 100$ K  A	Calculated power <sup>5)</sup>  $P_{\text{calc}}$ for $M_0$ $\Delta T = 100$ K  kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector		
			Rated output current <sup>4)</sup>  $I_{\text{rated}}$  A	Order No.	Power connector  Size	Cable cross- section <sup>3)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.
1FT7046-5AH7...	8.1	3.30 (4.43)	9	For ordering data, see Converter system	1	4 x 1.5	<b>6FX 002 - 5A01 - ....</b>
1FT7066-5AH7...	13.6	5.65 (7.58)	18		1	4 x 1.5	<b>6FX 002 - 5A01 - ....</b>
1FT7082-5AH7...	12.3	6.13 (8.22)	18		1	4 x 1.5	<b>6FX 002 - 5A01 - ....</b>
1FT7084-5AH7...	15.6	9.42 (12.6)	18		1.5	4 x 2.5	<b>6FX 002 - 5A31 - ....</b>
1FT7086-5AH7...	22.4	13.19 (17.7)	28		1.5	4 x 4	<b>6FX 002 - 5A41 - ....</b>

#### Type of power cable:

MOTION-CONNECT 800  
MOTION-CONNECT 500

8  
5

Without brake cores  
With brake cores

C  
D

For length code as well as power and signal cables, see Connection system MOTION-CONNECT.

....

1) These values refer to  $n = 3\,500$  rpm.

2) These values refer to  $n = 4\,000$  rpm.

3) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

4) With default setting of the pulse frequency.

5)  $P_{\text{calc}} [\text{kW}] = \frac{M_0 [\text{Nm}] \times n_{\text{rated}}}{9550}$   $P_{\text{calc}} [\text{HP}] = \frac{M_0 [\text{lb}_f\text{-in}] \times n_{\text{rated}}}{63000}$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FT7 Compact standard type motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FT7 Compact synchronous motors Standard type Natural cooling	Number of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	A			$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_r\text{-in-s}^2$ )	kg (lb)
<b>6 000</b>	36	0.88 (1.18)	2 (1.5)	1.4 (1.0)	2.1	<b>1FT7034 - 5AK7 - 1</b> ■ ■ ■ ■	3	0.85 (0.75)	3.8 (8.38)
		1.07 (1.43)	3 (2.2)	1.7 (1.3)	2.4	<b>1FT7036 - 5AK7 - 1</b> ■ ■ ■ ■	3	1.33 (1.18)	5.0 (11.0)
	48	1.26 (1.69)	3 (2.2)	2.0 (1.5)	3	<b>1FT7042 - 5AK7 - 1</b> ■ ■ ■ ■	3	2.81 (2.49)	4.6 (10.1)
		1.41 (1.89) <sup>1)</sup>	5 (3.7)	3.0 (2.2) <sup>1)</sup>	3.6 <sup>1)</sup>	<b>1FT7044 - 5AK7 - 1</b> ■ ■ ■ ■	3	5.43 (4.81)	7.2 (15.9)
	63	2.13 (2.86) <sup>2)</sup>	6 (4.4)	3.7 (2.7) <sup>2)</sup>	5.9 <sup>2)</sup>	<b>1FT7062 - 5AK7 - 1</b> ■ ■ ■ ■	5	7.36 (6.51)	7.1 (15.7)
		2.59 (3.47) <sup>1)</sup>	9 (6.6)	5.5 (4.1) <sup>1)</sup>	6.1 <sup>1)</sup>	<b>1FT7064 - 5AK7 - 1</b> ■ ■ ■ ■	5	11.9 (10.5)	9.7 (21.4)

#### Type of construction IM B5:

Flange 0  
Flange 1 (compatible with 1FT6)

0  
1

#### Encoder systems:

Incremental encoder sin/cos 1 V<sub>pp</sub> 2 048 S/R with C and D tracks  
Absolute encoder EnDat 2 048 S/R

N  
M

#### Shaft extension:

Fitted key and keyway  
Fitted key and keyway

#### Shaft and flange accuracy:

Tolerance N  
Tolerance N

#### Holding brake:

Without  
With

A  
B  
D  
E  
G  
H  
K  
L

Fitted key and keyway  
Fitted key and keyway

Tolerance R  
Tolerance R

Without  
With

Plain shaft  
Plain shaft

Tolerance N  
Tolerance N

Without  
With

Plain shaft  
Plain shaft

Tolerance R  
Tolerance R

Without  
With

#### Vibration magnitude:

Grade A  
Grade A  
Grade A  
Grade R  
Grade R  
Grade R

#### Degree of protection:

IP64  
IP65  
IP67  
IP64  
IP65  
IP67

0  
1  
2  
3  
4  
5

To select the type of construction and degree of protection, see Selection guides.

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FT7 Compact standard type motors  
Natural cooling

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T=100$ K A	Calculated power <sup>5)</sup>  $P_{\text{calc}}$ for $M_0$ $\Delta T=100$ K kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector			
			Rated output current <sup>4)</sup>  $I_{\text{rated}}$ A	Order No.	Power connector  Size	Cable cross- section <sup>3)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.	
1FT7034-5AK7...	2.7	1.26 (1.69)	3	For ordering data, see Converter system	1	4 x 1.5	<b>6FX 002 - 5 A01 - ....</b>	
1FT7036-5AK7...	4.0	1.88 (2.52)	5		1	4 x 1.5	<b>6FX 002 - 5 A01 - ....</b>	
1FT7042-5AK7...	3.9	1.89 (2.53)	5		1	4 x 1.5	<b>6FX 002 - 5 A01 - ....</b>	
1FT7044-5AK7...	5.7	3.15 (4.22)	9		1	4 x 1.5	<b>6FX 002 - 5 A01 - ....</b>	
1FT7062-5AK7...	8.4	3.78 (5.07)	9		1	4 x 1.5	<b>6FX 002 - 5 A01 - ....</b>	
1FT7064-5AK7...	9	5.67 (7.60)	9		1	4 x 1.5	<b>6FX 002 - 5 A01 - ....</b>	
<b>Type of power cable:</b>								
MOTION-CONNECT 800							8	
MOTION-CONNECT 500							5	
Without brake cores								C
With brake cores								D
For length code as well as power and signal cables, see Connection system MOTION-CONNECT.								....

1) These values refer to  $n = 4\,500$  rpm.

2) These values refer to  $n = 5\,500$  rpm.

3) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

4) With default setting of the pulse frequency.

5) 
$$P_{\text{calc}} [\text{kW}] = \frac{M_0 [\text{Nm}] \times n_{\text{rated}}}{9550} \quad P_{\text{calc}} [\text{HP}] = \frac{M_0 [\text{lb}_f\text{-in}] \times n_{\text{rated}}}{63000}$$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FK7 motors

#### Overview



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

1FK7 motors can be combined with the SIMODRIVE 611 converter system to create a powerful system with high functionality. The integrated encoder systems for speed and position control can be selected depending on the application.

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

#### Benefits

##### **1FK7 Compact motors offer:**

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

##### **1FK7 High Dynamic motors offer:**

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

#### Application

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

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FK7 motors

### Technical specifications

<b>Product name</b>	1FK7 Compact motor 1FK7 High Dynamic motor
<b>Type of motor</b>	Permanent-magnet synchronous motor
<b>Magnet material</b>	Rare-earth magnet material
<b>Cooling</b>	Natural cooling
<b>Temperature monitoring</b>	KTY 84 temperature sensor in stator winding
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a winding temperature rise of $\Delta T = 100$ K at an ambient temperature of 40 °C (104 °F)
<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)</b>	IM B5 (IM V1, IM V3)
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	IP64
<b>Shaft extension on the drive end (DE) in accordance with DIN 748-3 (IEC 60072-1)</b>	Plain shaft
<b>Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)<sup>1)</sup></b>	Tolerance N
<b>Vibration magnitude in accordance with EN 60034-14 (IEC 60034-14)</b>	Grade A is maintained up to rated speed
<b>Sound pressure level <math>L_{pA}</math> (1 m) in accordance with EN ISO 1680, max.</b>	<ul style="list-style-type: none"> <li>• 1FK701 ... 1FK704: 55 dB</li> <li>• 1FK706: 65 dB</li> <li>• 1FK708 ... 1FK710: 70 dB</li> </ul>
<b>Encoder systems, built-in</b>	<ul style="list-style-type: none"> <li>• Incremental encoder sin/cos 1 <math>V_{pp}</math> 2 048 S/R with C and D tracks encoder IC2048S/R</li> <li>• Absolute encoder, multi-turn (Traversing range 4 096 revolutions) with EnDat interface Single-turn range: 1FK701: 16 S/R encoder AM16S/R 1FK702 ... 1FK703: 512 S/R encoder AM512S/R 16 S/R encoder AM16S/R 1FK704 ... 1FK710: 2 048 S/R encoder AM2048S/R 32 S/R encoder AM32S/R</li> <li>• 2-pole resolver</li> <li>• Multi-pole resolver (number of pole pairs corresponds to number of pole pairs of the motor)</li> </ul>

S/R = signals/revolution

<b>Product name</b>	1FK7 Compact motor 1FK7 High Dynamic motor
<b>Connection</b>	Connectors for signals and power can be rotated by 270°
<b>Paint finish</b>	Unpainted
<b>2nd rating plate</b>	Attached in the NDE cover
<b>3rd rating plate</b>	Enclosed separately
<b>Options<sup>2)</sup></b>	<ul style="list-style-type: none"> <li>• Shaft extension on the drive end (DE) with fitted key and keyway (half-key balancing)</li> <li>• Built-in holding brake</li> <li>• Degree of protection IP65, plus DE flange IP67</li> <li>• Planetary gearbox, built-on (requires: plain shaft extension, degree of protection IP64 for LP+ and IP65 for SP+)</li> <li>• Anthracite paint finish</li> </ul>

6

<sup>1)</sup> Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

<sup>2)</sup> 1FK701 only available in degree of protection IP54 and anthracite paint finish, separately packed rating plate, planetary gearbox not available.

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FK7 Compact motors

#### Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque <sup>1)</sup>	Rated current	1FK7 Compact synchronous motor Natural cooling	No. of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)	
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100$ K	$M_0$ at $\Delta T=100$ K	$M_{rated}$ at $\Delta T=100$ K	$I_{rated}$ at $\Delta T=100$ K	Order No.		$J$	$m$	
rpm		kW (HP)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	A			$10^{-4}$ kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)	
<b>2 000</b>	100	4.29 (5.75)	27 (238)	20.5 (181.4)	9.6	<b>1FK7101 - 5AC71- 1</b> ■ ■ ■	4	79.9 (0.0707)	21 (46.3)	
		5.23 (7.01)	36 (319)	25 (221.3)	11.5	<b>1FK7103 - 5AC71- 1</b> ■ ■ ■	4	105 (0.0929)	29 (63.9)	
		7.75 (10.39)	48 (425)	37 (328)	16	<b>1FK7105 - 5AC71- 1</b> ■ ■ ■	4	156 (0.1381)	39 (86.2)	
<b>3 000</b>	48	0.82 (1.1)	3 (27)	2.6 (23)	1.95	<b>1FK7042 - 5AF71- 1</b> ■ ■ ■	4	3.01 (0.0027)	4.9 (10.8)	
	63	1.48 (1.98)	6 (53)	4.7 (41.6)	3.7	<b>1FK7060 - 5AF71- 1</b> ■ ■ ■	4	7.95 (0.0070)	7 (15.4)	
		2.29 (3.07)	11 (97)	7.3 (64.6)	5.6	<b>1FK7063 - 5AF71- 1</b> ■ ■ ■	4	15.1 (0.0134)	11.5 (25.4)	
	80	2.14 (2.87)	8 (71)	6.8 (60.2)	4.4	<b>1FK7080 - 5AF71- 1</b> ■ ■ ■	4	15 (0.0133)	10 (22.1)	
		3.3 (4.42)	16 (142)	10.5 (92.9)	7.4	<b>1FK7083 - 5AF71- 1</b> ■ ■ ■	4	27.3 (0.0242)	14 (30.9)	
	100	3.77 (5.05)	18 (159)	12 (106.1)	8	<b>1FK7100 - 5AF71- 1</b> ■ ■ ■	4	55.3 (0.0489)	19 (41.9)	
		4.87 (6.53)	27 (238)	15.5 (137.2)	11.8	<b>1FK7101 - 5AF71- 1</b> ■ ■ ■	4	79.9 (0.0707)	21 (46.3)	
		5.37 (7.2) <sup>2)</sup>	36 (319)	20.5 (181.4) <sup>2)</sup>	16.5 <sup>2)</sup>	<b>1FK7103 - 5AF71- 1</b> ■ ■ ■	4	105 (0.0929)	29 (63.9)	
		8.17 (10.95)	48 (425)	26 (230)	18	<b>1FK7105 - 5AF71- 1</b> ■ ■ ■	4	156 (0.1381)	39 (86.2)	
	<b>4 500</b>	63	1.74 (2.33)	6 (53)	3.7 (32.7)	4.1	<b>1FK7060 - 5AH71- 1</b> ■ ■ ■	4	7.95 (0.0070)	7 (15.4)
			2.09 (2.8) <sup>3)</sup>	11 (97)	5 (44.3) <sup>3)</sup>	6.1 <sup>3)</sup>	<b>1FK7063 - 5AH71- 1</b> ■ ■ ■	4	15.1 (0.0134)	11.5 (25.4)
80		2.39 (3.2) <sup>3)</sup>	8 (71)	5.7 (50.5) <sup>3)</sup>	5.6 <sup>3)</sup>	<b>1FK7080 - 5AH71- 1</b> ■ ■ ■	4	15 (0.0133)	10 (22.1)	
		3.04 (4.8) <sup>4)</sup>	16 (142)	8.3 (73.5) <sup>4)</sup>	9 <sup>4)</sup>	<b>1FK7083 - 5AH71- 1</b> ■ ■ ■	4	27.3 (0.0242)	14 (30.9)	
<b>6 000</b>	20	0.05 (0.07)	0.18 (1.6)	0.08 (0.7)	0.85	<b>1FK7011 - 5AK71- 1</b> ■ ■ ■ 3	4	0.064 (0.00006)	0.9 (2)	
		0.10 (0.13)	0.35 (3.1)	0.16 (1.4)	0.85	<b>1FK7015 - 5AK71- 1</b> ■ ■ ■ 3	4	0.083 (0.00007)	1.1 (2.4)	
	28	0.43 (0.58)	0.85 (7.5)	0.6 (5.3)	1.4	<b>1FK7022 - 5AK71- 1</b> ■ ■ ■	3	0.28 (0.0002)	1.8 (4)	
	36	0.50 (0.67)	1.1 (9.7)	0.8 (7.1)	1.3	<b>1FK7032 - 5AK71- 1</b> ■ ■ ■	3	0.61 (0.0005)	2.7 (6)	
		0.63 (0.84)	1.6 (14.2)	1 (8.9)	1.3	<b>1FK7034 - 5AK71- 1</b> ■ ■ ■	3	0.9 (0.0008)	3.7 (8.2)	
	48	0.69 (0.92)	1.6 (14.2)	1.1 (9.7)	1.7	<b>1FK7040 - 5AK71- 1</b> ■ ■ ■	4	1.69 (0.0015)	3.5 (7.7)	
		1.02 (1.41) <sup>5)</sup>	3 (27)	1.95 (17.3) <sup>5)</sup>	3.1 <sup>5)</sup>	<b>1FK7042 - 5AK71- 1</b> ■ ■ ■	4	3.01 (0.0027)	4.9 (10.8)	

#### Encoder systems:

Incremental encoder sin/cos 1 V<sub>pp</sub> 2 048 S/R  
 Absolute encoder EnDat 2 048 S/R<sup>1)</sup>  
 (only for 1FK704 ... 1FK710)  
 Absolute encoder EnDat 512 S/R<sup>1)</sup>  
 (only for 1FK702 ... 1FK703)  
 Absolute encoder EnDat 32 S/R<sup>1)</sup>  
 (only for 1FK704 ... 1FK710)  
 Absolute encoder EnDat 16 S/R<sup>1)</sup>  
 (only for 1FK701 ... 1FK703)  
 Multipole resolver  
 2-pole resolver

A  
E  
H  
G  
J  
S  
T

#### Shaft extension:

Fitted key and keyway  
 Fitted key and keyway  
 Plain shaft  
 Plain shaft

#### Shaft and flange accuracy:

Tolerance N  
 Tolerance N  
 Tolerance N  
 Tolerance N

#### Holding brake:

Without  
 With  
 Without  
 With

A  
B  
G  
H

#### Degree of protection:

IP64 (not for 1FK701)  
 IP65 and IP67 drive end flange (not for 1FK701)  
 IP64 (IP54 for 1FK701) and anthracite paint finish  
 IP65 and IP67 drive end flange, anthracite paint finish  
 (not for 1FK701)  
 IP65 and IP67 drive end flange, anthracite paint finish  
 and metal rating plate on motor (not for 1FK701)

0  
2  
3  
5  
8

To select the degree of protection, see Selection guides.



# Synchronous motors

## Feed motors for SIMODRIVE 611

**1FK7 Compact motors**  
**Natural cooling**
**Selection and ordering data**

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T=100$ K  A	Calculated power <sup>9)</sup>  $P_{calc}$ for $M_0$ $\Delta T=100$ K  kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector		
			Rated output current <sup>8)</sup>  $I_{rated}$  A	Order No.	Power connector  Size	Cable cross- section <sup>7)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.
1FK7101-5AC71...	12.3	5.7 (7.64)	18	For ordering data, see Converter system	1.5	4 x 1,5	<b>6FX 002-5A21 - ...</b>
1FK7103-5AC71...	14.7	7.5 (10.06)	18		1.5	4 x 1,5	<b>6FX 002-5A21 - ...</b>
1FK7105-5AC71...	20	10 (13.4)	28		1.5	4 x 2.5	<b>6FX 002-5A31 - ...</b>
1FK7042-5AF71...	2.2	0.9 (1.21)	3		1	4 x 1.5	<b>6FX 002-5A01 - ...</b>
1FK7060-5AF71...	4.5	1.9 (2.55)	5		1	4 x 1.5	<b>6FX 002-5A01 - ...</b>
1FK7063-5AF71...	8	3.5 (4.69)	9		1	4 x 1.5	<b>6FX 002-5A01 - ...</b>
1FK7080-5AF71...	4.8	2.5 (3.35)	5		1	4 x 1.5	<b>6FX 002-5A01 - ...</b>
1FK7083-5AF71...	10.4	5.0 (6.7)	9 <sup>6)</sup>		1	4 x 1.5	<b>6FX 002-5A01 - ...</b>
1FK7100-5AF71...	11.2	5.7 (7.64)	18		1	4 x 1.5	<b>6FX 002-5A01 - ...</b>
1FK7101-5AF71...	19	8.5 (11.39)	18 <sup>6)</sup>		1.5	4 x 2.5	<b>6FX 002-5A31 - ...</b>
1FK7103-5AF71...	27.5	11.3 (15.15)	28		1.5	4 x 4	<b>6FX 002-5A41 - ...</b>
1FK7105-5AF71...	31	15 (20.11)	28 <sup>6)</sup>		1.5	4 x 10	<b>6FX 002-5A61 - ...</b>
1FK7060-5AH71...	6.2	2.8 (3.75)	9		1	4 x 1.5	<b>6FX 002-5A01 - ...</b>
1FK7063-5AH71...	12	5.2 (6.97)	18		1	4 x 1.5	<b>6FX 002-5A01 - ...</b>
1FK7080-5AH71...	7.4	3.8 (5.09)	9		1	4 x 1.5	<b>6FX 002-5A01 - ...</b>
1FK7083-5AH71...	15	7.5 (10.06)	18		1	4 x 1.5	<b>6FX 002-5A01 - ...</b>
1FK7011-5AK71...	1.5	0.11	3		0.5	4 x 1.5	<b>6FX 5002-5DA30 - ...</b>
1FK7015-5AK71...	1.5	0.22	3		0.5	4 x 1.5	<b>6FX 5002-5DA30 - ...</b>
1FK7022-5AK71...	1.8	0.5	3		1	4 x 1.5	<b>6FX 002-5A01 - ...</b>
1FK7032-5AK71...	1.7	0.7 (0.94)	3		1	4 x 1.5	<b>6FX 002-5A01 - ...</b>
1FK7034-5AK71...	1.9	1 (1.34)	3	1	4 x 1.5	<b>6FX 002-5A01 - ...</b>	
1FK7040-5AK71...	2.25	1 (1.34)	3	1	4 x 1.5	<b>6FX 002-5A01 - ...</b>	
1FK7042-5AK71...	4.4	1.9 (2.55)	5	1	4 x 1.5	<b>6FX 002-5A01 - ...</b>	

**Type of power cable:**

MOTION-CONNECT 800  
MOTION-CONNECT 700 (only with brake cores)  
MOTION-CONNECT 500  
MOTION-CONNECT 500 PLUS (only up to a cross-section of 6 mm<sup>2</sup>)

8 0  
7 0  
5 0  
5 1

C  
D

Without brake cores  
With brake cores

For length code as well as power and signal cables, see connection system MOTION-CONNECT.

....

<sup>1)</sup> If the absolute encoder is used,  $M_{rated}$  is reduced by 10 %.

<sup>2)</sup> These values refer to  $n = 2\,500$  rpm.

<sup>3)</sup> These values refer to  $n = 4\,000$  rpm.

<sup>4)</sup> These values refer to  $n = 3\,500$  rpm.

<sup>5)</sup> These values refer to  $n = 5\,000$  rpm.

<sup>6)</sup> With the specified power module, the motor cannot be fully utilized at  $M_0$  at  $\Delta T = 100$  K winding temperature rise. If a power module with a higher rating is used, you must check whether the specified power cable can be connected to it.

<sup>7)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

<sup>8)</sup> For the default setting of pulse frequency.

<sup>9)</sup>  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$   $P_{calc} [HP] = \frac{M_0 [lb_f-in] \times n_{rated}}{63000}$

# Synchronous motors

## Feed motors for SIMODRIVE 611

### 1FK7 High Dynamic motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque <sup>1)</sup>	Rated current	<b>1FK7 High Dynamic synchronous motor Natural cooling</b>	No. of pole pairs	Rotor moment of inertia (without brake)	Weight (without brake)
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100$ K	$M_0$ at $\Delta T=100$ K	$M_{rated}$ at $\Delta T=100$ K	$I_{rated}$ at $\Delta T=100$ K	Order No.		$J$	$m$
rpm		kW (HP)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	A				
<b>3 000</b>	48	1.1 (1.5)	4 (35)	3.5 (31)	4	<b>1FK7044 - 7AF71- 1</b> ■ ■ ■ ■	3	1.28 (0.0011)	7.7 (17)
	63	1.7 (2.3)	6.4 (56.6)	5.4 (47.8)	5.3	<b>1FK7061 - 7AF71- 1</b> ■ ■ ■ ■	3	3.4 (0.0030)	10 (22.1)
		2.51 (3.36)	12 (106)	8 (71)	7.5	<b>1FK7064 - 7AF71- 1</b> ■ ■ ■ ■	3	6.5 (0.0058)	15.5 (34.2)
	80	3.14 (4.21) <sup>2)</sup>	22 (195)	12 (106) <sup>2)</sup>	12.5 <sup>2)</sup>	<b>1FK7085 - 7AF71- 1</b> ■ ■ ■ ■	4	23 (0.0204)	23.5 (51.8)
3.77 (5.05) <sup>3)</sup>		28 (248)	18 (159) <sup>3)</sup>	14.5 <sup>3)</sup>	<b>1FK7086 - 7AF71- 1</b> ■ ■ ■ ■	4	23 (0.0204)	23.5 (51.8)	
<b>4 500</b>	48	1.23 (1.65)	3.1 (27.4)	2.6 (23)	4	<b>1FK7043 - 7AH71- 1</b> ■ ■ ■ ■	3	1 (0.0009)	6.3 (13.9)
		1.41 (1.53)	4 (35)	3 (27)	4.9	<b>1FK7044 - 7AH71- 1</b> ■ ■ ■ ■	3	1.28 (0.0011)	7.7 (17)
	63	2.03 (2.72)	6.4 (56.6)	4.3 (38.1)	5.9	<b>1FK7061 - 7AH71- 1</b> ■ ■ ■ ■	3	3.4 (0.0030)	10 (22.1)
		2.36 (3.16)	12 (106)	5 (44)	7	<b>1FK7064 - 7AH71- 1</b> ■ ■ ■ ■	3	6.5 (0.0058)	15.5 (34.2)
<b>6 000</b>	36	0.57 (0.76)	1.3 (11.5)	0.9 (8)	1.5	<b>1FK7033 - 7AK71- 1</b> ■ ■ ■ ■	3	0.27 (0.0002)	3.1 (6.8)
	48	1.26 (1.69)	3.1 (27.4)	2 (17.7)	4.4	<b>1FK7043 - 7AK71- 1</b> ■ ■ ■ ■	3	1 (0.0009)	6.3 (13.9)

#### Encoder systems:

Incremental encoder sin/cos 1 V<sub>pp</sub> 2 048 S/R  
 Absolute encoder EnDat 2 048 S/R<sup>1)</sup> (not for 1FK703)  
 Absolute encoder EnDat 512 S/R<sup>1)</sup> (only for 1FK703)  
 Absolute encoder EnDat 32 S/R<sup>1)</sup> (not for 1FK703)  
 Absolute encoder EnDat 16 S/R<sup>1)</sup> (only for 1FK703)  
 Multipole resolver  
 2-pole resolver

A  
E  
H  
G  
J  
S  
T

#### Shaft extension:

Fitted key and keyway  
 Fitted key and keyway  
 Plain shaft  
 Plain shaft

#### Shaft and flange accuracy:

Tolerance N  
 Tolerance N  
 Tolerance N  
 Tolerance N

#### Holding brake:

Without  
 With  
 Without  
 With

A  
B  
G  
H

#### Degree of protection:

IP64  
 IP65 and IP67 drive end flange  
 IP64 and anthracite paint finish  
 IP65 and IP67 drive end flange, anthracite paint finish  
 IP65 and IP67 drive end flange, anthracite paint finish and  
 metal rating plate on motor

0  
2  
3  
5  
8

To select the degree of protection, see Selection guides.

# Synchronous motors

## Feed motors for SIMODRIVE 611

1FK7 High Dynamic motors  
Natural cooling

### Selection and ordering data

Motor type (continued)	Static current  $I_0$ at $M_0$ $\Delta T=100$ K  A	Calculated power <sup>6)</sup>  $P_{calc}$ for $M_0$ $\Delta T=100$ K  kW (HP)	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector		
			Rated output current <sup>5)</sup>  $I_{rated}$  A	Order No.	Power connector  Size	Cable cross- section <sup>4)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.
1FK7044-7AF71...	4.5	1.3 (1.7)	5	For ordering data, see Converter system	1	4 x 1.5	6FX ■ 02- 5 ■ A01 - ....
1FK7061-7AF71...	6.1	2.0 (2.7)	9		1	4 x 1.5	6FX ■ 02- 5 ■ A01 - ....
1FK7064-7AF71...	11	3.8 (5.1)	18		1	4 x 1.5	6FX ■ 02- 5 ■ A01 - ....
1FK7085-7AF71...	22.5	6.9 (9.3)	28		1.5	4 x 4	6FX ■ 02- 5 ■ A41 - ....
1FK7086-7AF71...	21	8.8 (11.8)	28		1.5	4 x 4	6FX ■ 02- 5 ■ A41 - ....
1FK7043-7AH71...	4.5	1.5 (2.0)	5		1	4 x 1.5	6FX ■ 02- 5 ■ A01 - ....
1FK7044-7AH71...	6.3	1.9 (2.6)	9		1	4 x 1.5	6FX ■ 02- 5 ■ A01 - ....
1FK7061-7AH71...	8	3.0 (4.0)	9		1	4 x 1.5	6FX ■ 02- 5 ■ A01 - ....
1FK7064-7AH71...	15	5.7 (7.6)	18		1	4 x 1.5	6FX ■ 02- 5 ■ A01 - ....
1FK7033-7AK71...	2.2	0.8 (1.1)	3		1	4 x 1.5	6FX ■ 02- 5 ■ A01 - ....
1FK7043-7AK71...	6.4	1.9 (2.6)	9		1	4 x 1.5	6FX ■ 02- 5 ■ A01 - ....

#### Type of power cable:

MOTION-CONNECT 800  
MOTION-CONNECT 700 (only with brake cores)  
MOTION-CONNECT 500  
MOTION-CONNECT 500 PLUS (only up to a cross-section of 6 mm<sup>2</sup>)

8 0  
7 0  
5 0  
5 1

Without brake cores  
With brake cores

C  
D

For length code as well as power and signal cables, see connection system MOTION-CONNECT. ....

6

<sup>1)</sup> If the absolute encoder is used,  $M_{rated}$  is reduced by 10 %.

<sup>2)</sup> These values refer to  $n = 2\,500$  rpm.

<sup>3)</sup> These values refer to  $n = 2\,000$  rpm.

<sup>4)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

<sup>5)</sup> For the default setting of pulse frequency.

<sup>6)</sup>  $P_{calc} [\text{kW}] = \frac{M_0 [\text{Nm}] \times n_{rated}}{9550}$   $P_{calc} [\text{HP}] = \frac{M_0 [\text{lb}_f\text{-in}] \times n_{rated}}{63000}$

# Synchronous motors

## Gearboxes

### Series SP+ planetary gearbox for 1FT6 motors

#### Overview

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

When selecting the gearbox, ensure that its maximum permissible input speed is not exceeded by the maximum speed of the motor. In the case of high operating frequencies, allowance must be made for the factor  $f_2$  (see Configuration Manual Synchronous motors). The frictional losses of the gearbox must always be taken into account.

The gearboxes are only available in non-balanced design.

#### Benefits

- High efficiency  
Single-stage: > 97 %  
2-stage: > 94 %
- Minimum torsional backlash  
Single-stage: ≤ 4 arcmin  
2-stage: ≤ 6 arcmin
- Power transmission from the central sun wheel via planet wheels
- No shaft deflections in the planet wheel set due to symmetrical force distribution
- Very low moment of inertia and thus short acceleration times of the motors
- Output shaft bearings dimensioned for high cantilever and axial loads with preloaded tapered-roller bearings
- The gearboxes are connected to the motor shaft via an integrated clamping hub. A plain motor shaft extension is necessary for this purpose. Shaft and flange accuracy tolerance N in accordance with DIN 42955 and vibration magnitude grade A in accordance with EN 60034-14 are sufficient. The motor flange is adapted by means of adapter plates.
- Output shaft of gearbox exactly coaxial with the motor
- The gearboxes are enclosed (seal between gearbox and motor) and filled with oil at the factory. They are lubricated and sealed for their service life.  
The gearboxes are suitable for all mounting positions.
- Degree of protection of gearbox: IP65
- Small dimensions
- Low weight



1FT6 synchronous motor with mounted planetary gearbox series SP+

#### Integration

1FT602 to 1FT613 motors can be supplied ex factory (Siemens AG) complete with flange-mounted planetary gearbox.

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

The motor/gearbox combinations listed in the selection tables are mainly intended for cycle operation S3-60 % (ON time ≤ 60 % and ≤ 20 min). Reduced maximum motor speeds and output torques apply for use in S1 continuous duty (ON time > 60 % or > 20 min). The gearbox temperature must not exceed 90 °C (194 °F).

Follow the instructions contained in the Configuration Manual for synchronous motors when assigning gearboxes to the motor.

1FT6 motors must be designed with plain motor shaft extension, shaft and flange accuracy tolerance N and vibration magnitude grade A/degree of protection IP65 (for 1FT602: IP64) for mounting onto the gearbox.

# Synchronous motors

## Gearboxes

### Series SP+ planetary gearbox, single-stage for 1FT6 motors

#### Selection and ordering data

Motor	Planetary gearbox single-stage			Available gear ratio $i =$				Motor speed, max. S3-60 % $n_{G1}$  ( $n_1$ ) rpm	Output torque, max. S3-60 % $M_{G2}$  ( $T_{2B}$ ) Nm (lb <sub>f</sub> -ft)	Radial output shaft loading, max. <sup>1)</sup> $F_r$  ( $F_{2Rmax}$ ) N (lb <sub>f</sub> )	Axial output shaft loading, max. <sup>1)</sup> $F_a$  ( $F_{2Amax}$ ) N (lb <sub>f</sub> )
	Type	Torsional backlash arcmin	Gearbox weight, approx. kg (lb)	4	5	7	10				
1FT6021 1FT6024	SP 060S-MF1	≤ 4	1.9 (4.2)	–	–	–	✓	6 000	40 (29.5) (32 for $i = 10$ )	2 700 (606)	2 400 (540)
1FT6031 1FT6034				✓	✓	✓	✓				
1FT6034	SP 075S-MF1	≤ 4	3.9 (8.6)	–	–	–	✓				
1FT6041 1FT6044				✓	✓	✓	✓				
1FT6061 1FT6062 1FT6064	SP 100S-MF1	≤ 3	7.7 (17.0)	✓	✓	✓	✓	4 500	300 (221) (225 for $i = 10$ )	6 300 (1416)	5 650 (1 270)
1FT6081 1FT6082 1FT6084 1FT6086	SP 140S-MF1	≤ 3	17.2 (37.9)	✓	✓	✓	✓				
1FT6086	SP 180S-MF1	≤ 3	34 (75.0)	–	–	–	✓				
1FT6102 1FT6105 1FT6108				✓	✓	✓	✓				
1FT6105 1FT6108	SP 210S-MF1	≤ 3	56 (123)	–	–	–	✓	2 500	2 500 (1 844) (2 400 for $i = 7$ 1 900 for $i = 10$ )	21 000 (4 721)	30 000 (6 744)
1FT6132 1FT6134 1FT6136				✓	✓	✓	✓				
1FT6134 1FT6136	SP 240S-MF1	≤ 3	83 (183)	–	–	–	✓				
1FT6134 1FT6136				–	–	–	✓				
<b>Order codes</b>				<b>J02</b>	<b>J03</b>	<b>J05</b>	<b>J09</b>				
• Gear shaft with fitted key				<b>J22</b>	<b>J23</b>	<b>J25</b>	<b>J29</b>				
• Gear shaft without fitted key											

Ordering data

1FT6...-...71--■1-Z

J■ ■

**G** without holding brake  
**H** with holding brake

Order No. of the motor with identifier **-Z** and order code for mounting the planetary gearbox assigned to the motor  
Preconditions for mounting planetary gearbox SP+:  
Plain motor shaft extension/shaft and flange accuracy tolerance N and vibration magnitude grade A/IP65 degree of protection<sup>2)</sup>

✓ Possible

– Not possible

1) In reference to the output shaft center.

2) IP64 degree of protection with 1FT602.: 1FT602.-6AK71--■0-Z J..

**G**  
**H**

# Synchronous motors

## Gearboxes

### Series SP+ planetary gearbox, single-stage for 1FT6 motors

#### Technical specifications

Planetary gearbox with 1FT6 motor										
Single-stage Type	Gear ratio	Motor speed Continuous duty S1 <sup>1)</sup> $n_{N1}$ rpm	Output torque $M_{N2} (T_{2N})$ Nm (lb <sub>F</sub> -ft)	Moments of inertia of gearbox (referred to the drive)						
				1FT602.	1FT603.	1FT604.	1FT606.	1FT608.	1FT610.	1FT613.
				$J_1$ kgcm <sup>2</sup> (lb <sub>F</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>F</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>F</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>F</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>F</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>F</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>F</sub> -in <sup>2</sup> )
SP 060S-MF1	4	3 300	26 (19.2)	0.15 (0.05)	0.22 (0.08)	–	–	–	–	–
	5	3 300	26 (19.2)	0.12 (0.04)	0.20 (0.07)	–	–	–	–	–
	7	4 000	26 (19.2)	0.10 (0.03)	0.18 (0.06)	–	–	–	–	–
	10	4 000	17 (12.5)	0.09 (0.03)	0.17 (0.06)	–	–	–	–	–
SP 075S-MF1	4	2 900	75 (55.3)	–	–	0.78 (0.27)	–	–	–	–
	5	2 900	75 (55.3)	–	–	0.68 (0.23)	–	–	–	–
	7	3 100	75 (55.3)	–	–	0.59 (0.20)	–	–	–	–
	10	3 100	52 (38.3)	–	0.38 (0.13)	0.54 (0.19)	–	–	–	–
SP 100S-MF1	4	2 500	180 (132)	–	–	–	3.04 (1.04)	–	–	–
	5	2 500	175 (129)	–	–	–	2.61 (0.89)	–	–	–
	7	2 800	170 (125)	–	–	–	2.29 (0.78)	–	–	–
	10	2 800	120 (88.5)	–	–	–	2.07 (0.71)	–	–	–
SP 140S-MF1	4	2 100	360 (266)	–	–	–	–	11.0 (3.76)	–	–
	5	2 100	360 (266)	–	–	–	–	9.95 (3.40)	–	–
	7	2 600	360 (266)	–	–	–	–	9.01 (3.08)	–	–
	10	2 600	220 (162)	–	–	–	–	8.44 (2.88)	–	–
SP 180S-MF1	4	1 500	750 (553)	–	–	–	–	–	33.9 (11.6)	–
	5	1 500	750 (553)	–	–	–	–	–	27.9 (9.53)	–
	7	2 300	750 (553)	–	–	–	–	–	22.2 (7.59)	–
	10	2 300	750 (553)	–	–	–	–	19.2 (6.56)	19.2 (6.56)	–
SP 210S-MF1	4	1 200	1 500 (1 106)	–	–	–	–	–	–	94.3 (32.2)
	5	1 500	1 500 (1 106)	–	–	–	–	–	–	76.9 (26.3)
	7	1 700	1 400 (1 033)	–	–	–	–	–	–	61.5 (21.0)
	10	2 000	1 000 (738)	–	–	–	–	–	53.1 (18.1)	53.1 (18.1)
SP 240S-MF1	10	1 700	1 300 (959)	–	–	–	–	–	–	70.8 (24.2)

<sup>1)</sup> The limit values in the table apply for S1 continuous duty (ON time > 60 % or > 20 min) for a maximum gearbox temperature of 90 °C (194 °F).

# Synchronous motors

## Gearboxes

### Series SP+ planetary gearbox, two-stage for 1FT6 motors

#### Selection and ordering data

Motor Type	Planetary gearbox two-stage			Available gear ratio $i =$					Motor speed, max. S3-60 % $n_{G1}$ ( $n_1$ ) rpm	Output torque, max. S3-60 % $M_{G2}$ ( $T_{2B}$ ) Nm (lb <sub>f</sub> -ft)	Radial output shaft loading, max. <sup>1)</sup> $F_r$ ( $F_{2Rmax}$ ) N (lb <sub>f</sub> )	Axial output shaft loading, max. <sup>1)</sup> $F_a$ ( $F_{2Amax}$ ) N (lb <sub>f</sub> )
	Type	Torsional backlash arcmin	Gearbox weight, approx. kg (lb)	16	20	28	40	50				
1FT6021 1FT6024 1FT6031	SP 060S-MF2	≤ 6	2.0 (4.4)	✓	✓	✓	✓	✓	6 000	40 (29.5)	2 700 (607)	2 400 (540)
1FT6024 1FT6031 1FT6034 1FT6041	SP 075S-MF2	≤ 6	3.6 (7.9)	-	-	-	-	✓	6 000	110 (81.1)	4 000 (899)	3 350 (753)
1FT6034 1FT6041 1FT6044 1FT6061 1FT6062 1FT6064	SP 100S-MF2	≤ 5	7.9 (17.4)	-	-	-	✓	✓	4 500	300 (221)	6 300 (1 416)	5 650 (1 270)
1FT6044 1FT6061 1FT6062 1FT6064 1FT6081 1FT6082 1FT6084	SP 140S-MF2	≤ 5	17 (37.5)	-	-	-	✓	✓	4 000	600 (442)	9 450 (2 124)	9 870 (2 219)
1FT6064 1FT6081 1FT6082 1FT6084 1FT6086 1FT6102	SP 180S-MF2	≤ 5	36.4 (80.3)	-	-	-	✓	✓	4 000	1 100 (811)	14 700 (3 305)	14 150 (3 181)
1FT6082 1FT6105	SP 210S-MF2	≤ 5	55.0 (121)	-	-	-	-	✓	3 500	2 400 (1 770) (2 500 for $i = 20$ )	21 000 (4 721)	30 000 (6 744)
1FT6084 1FT6086 1FT6102 1FT6105 1FT6108 1FT6132 1FT6134 1FT6136	SP 240S-MF2	≤ 5	80.6 (178)	-	-	-	✓	✓	3 500	4 500 (3 319) (4 000 for $i = 40$ 4 300 for $i = 50$ )	30 000 (6 744)	30 000 (6 744)
<b>Order codes</b>				<b>J12</b>	<b>J13</b>	<b>J15</b>	<b>J16</b>	<b>J17</b>				
• Gear shaft with fitted key				<b>J32</b>	<b>J33</b>	<b>J35</b>	<b>J36</b>	<b>J37</b>				
• Gear shaft without fitted key												

Ordering data

1FT6...-...71-...-Z

J ■ ■

G without holding brake  
H with holding brake

Order No. of the motor with identifier **-Z** and order code for mounting the planetary gearbox assigned to the motor  
Preconditions for mounting planetary gearbox SP+:  
Plain motor shaft extension/shaft and flange accuracy tolerance N and vibration magnitude grade A/IP65 degree of protection<sup>2)</sup>

<sup>1)</sup> In reference to the output shaft center.

<sup>2)</sup> IP64 degree of protection with 1FT602.: 1FT602.-6AK71-...-Z J..

G  
H

# Synchronous motors

## Gearboxes

### Series SP+ planetary gearbox, two-stage for 1FT6 motors

#### Technical specifications

Planetary gearbox with 1FT6 motor										
Two-stage Type	Gear ratio	Motor speed	Output torque	Moments of inertia of gearbox (referred to the drive)						
				Continuous duty S1 <sup>1)</sup>			1FT602.	1FT603.	1FT604.	1FT606.
		$n_{N1}$	$M_{N2} (T_{2N})$	$J_1$	$J_1$	$J_1$	$J_1$	$J_1$	$J_1$	$J_1$
		rpm	Nm (lb <sub>f</sub> -ft)	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )
SP 060S-MF2	16	4 400	26 (19.2)	0.08 (0.03)	0.17 (0.06)	–	–	–	–	–
	20	4 400	26 (19.2)	0.07 (0.02)	0.16 (0.06)	–	–	–	–	–
	28	4 400	26 (19.2)	0.06 (0.02)	0.16 (0.06)	–	–	–	–	–
	40	4 400	26 (19.2)	0.06 (0.02)	–	–	–	–	–	–
	50	4 800	26 (19.2)	0.06 (0.02)	–	–	–	–	–	–
SP 075S-MF2	16	3 500	75 (55.3)	–	0.23 (0.08)	0.55 (0.19)	–	–	–	–
	20	3 500	75 (55.3)	–	0.20 (0.07)	0.53 (0.18)	–	–	–	–
	28	3 500	75 (55.3)	–	0.18 (0.06)	0.50 (0.17)	–	–	–	–
	40	3 500	75 (55.3)	–	0.17 (0.06)	–	–	–	–	–
	50	3 800	75 (55.3)	0.10 (0.03)	0.16 (0.06)	–	–	–	–	–
SP 100S-MF2	16	3 100	180 (133)	–	–	0.81 (0.28)	2.18 (0.75)	–	–	–
	20	3 100	180 (133)	–	–	0.70 (0.24)	2.07 (0.71)	–	–	–
	28	3 100	180 (133)	–	–	0.60 (0.21)	1.97 (0.67)	–	–	–
	40	3 100	180 (133)	–	0.38 (0.13)	0.55 (0.19)	1.92 (0.66)	–	–	–
	50	3 500	175 (129)	–	0.38 (0.13)	0.54 (0.19)	–	–	–	–
SP 140S-MF2	16	2 900	360 (265)	–	–	–	–	10.3 (3.52)	–	–
	20	2 900	360 (265)	–	–	–	2.71 (0.93)	9.77 (3.34)	–	–
	28	2 900	360 (265)	–	–	–	2.34 (0.80)	9.41 (3.22)	–	–
	40	2 900	360 (265)	–	–	1.40 (0.48)	2.10 (0.72)	9.16 (3.13)	–	–
	50	3 200	360 (265)	–	–	1.39 (0.48)	2.08 (0.71)	–	–	–
SP 180S-MF2	16	2 700	750 (553)	–	–	–	–	12.4 (4.24)	13.5 (4.61)	–
	20	2 700	750 (553)	–	–	–	–	10.9 (3.73)	12.0 (4.10)	–
	28	2 700	750 (553)	–	–	–	–	9.48 (3.24)	–	–
	40	2 700	750 (553)	–	–	–	5.51 (1.88)	8.67 (2.96)	–	–
	50	2 900	750 (553)	–	–	–	5.45 (1.86)	8.61 (2.94)	–	–
SP 210S-MF2	16	2 500	1 500 (1 106)	–	–	–	–	–	34.5 (11.8)	–
	50	2 500	1 500 (1 106)	–	–	–	–	28.3 (9.67)	–	–
SP 240S-MF2	16	2 300	2 500 (1 844)	–	–	–	–	–	39.2 (13.4)	39.2 (13.4)
	20	2 500	2 500 (1 844)	–	–	–	–	–	34.6 (11.8)	34.6 (11.8)
	28	2 500	2 500 (1 844)	–	–	–	–	30.5 (10.4)	30.5 (10.4)	–
	40	2 500	2 500 (1 844)	–	–	–	–	28.2 (9.64)	28.2 (9.64)	–
	50	2 500	2 500 (1 844)	–	–	–	–	27.9 (9.53)	27.9 (9.53)	–

<sup>1)</sup> The limit values in the table apply for S1 continuous duty (ON time > 60 % or > 20 min) for a maximum gearbox temperature of 90 °C (194 °F).



# Synchronous motors

## Gearboxes

### Series SP+ planetary gearbox for 1FT7 motors

#### Overview

1FT7 motors can be combined with planetary gearboxes to form compact coaxial drive units. The gearboxes are flanged directly to the drive end of the motors.

When selecting the gearbox, ensure that its maximum permissible input speed is not exceeded by the maximum speed of the motor. In the case of high operating frequencies, allowance must be made for the factor  $f_2$  (see Configuration Manual Synchronous motors). The frictional losses of the gearbox must always be taken into account.

The gearboxes are only available in non-balanced design.

#### Benefits

- High efficiency  
Single-stage: > 97 %  
2-stage: > 94 %
- Minimum torsional backlash  
Single-stage: ≤ 4 arcmin  
two-stage: ≤ 6 arcmin
- Power transmission from the central sun wheel via planet wheels
- No shaft deflections in the planet wheel set due to symmetrical force distribution
- Very low moment of inertia and thus short acceleration times of the motors
- Output shaft bearings dimensioned for high cantilever and axial loads with preloaded tapered-roller bearings
- The gearboxes are connected to the motor shaft via an integrated clamping hub. A plain motor shaft extension is necessary for this purpose. Shaft and flange accuracy tolerance N in accordance with DIN 42955 and vibration magnitude grade A in accordance with EN 60034-14 are sufficient. The motor flange is adapted by means of adapter plates.
- Output shaft of gearbox exactly coaxial with the motor
- The gearboxes are enclosed (seal between gearbox and motor) and filled with oil at the factory. They are lubricated and sealed for their service life.  
The gearboxes are suitable for all mounting positions.
- Degree of protection of gearbox: IP65
- Small dimensions
- Low weight



1FT7 synchronous motor with mounted planetary gearbox series SP+

#### Integration

1FT703 to 1FT710 naturally-cooled motors can be supplied ex factory (Siemens AG) complete with flange-mounted planetary gear unit.

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

The motor/gearbox combinations listed in the selection tables are mainly intended for cycle operation S3-60 % (ON time ≤ 60 % and ≤ 20 min). Reduced maximum motor speeds and output torques apply for use in S1 continuous duty (ON time > 60 % or > 20 min). It is not permissible to exceed a gearbox temperature of 90 °C (194 °F).

Follow the instructions contained in the section for synchronous motors in the Configuration Manual when assigning gearboxes to the motor.

1FT7 motors must be designed with flange type 1, with plain motor shaft extension, shaft and flange accuracy tolerance N and vibration magnitude grade A/degree of protection IP65, for mounting onto the gearbox.

# Synchronous motors

## Gearboxes

### Series SP+ planetary gearbox, single-stage for 1FT7 motors

#### Selection and ordering data

Motor Natural cooling	Planetary gearbox single-stage			Available gear ratio $i =$				Motor speed, max. S3-60 % $n_{G1}$  ( $n_1$ ) rpm	Output torque, max. S3-60 % $M_{G2}$  ( $T_{2B}$ ) Nm (lb <sub>f</sub> -ft)	Radial output shaft loading, max. <sup>1)</sup> $F_r$  ( $F_{2Rmax}$ ) N (lb <sub>f</sub> )	Axial output shaft loading, max. <sup>1)</sup> $F_a$  ( $F_{2Amax}$ ) N (lb <sub>f</sub> )
				Type	Tor- sional back- lash arcmin	Gearbox weight, approx. kg (lb)	4				
1FT7034	SP 060S-MF1	≤ 4	1.9 (4.2)	✓	✓	✓	–	6 000	40 (295)	2 700 (607)	2 400 (540)
1FT7034	SP 075S-MF1	≤ 4	3.9 (8.6)	–	–	–	✓	6 000	110 (81.1)	4 000 (899)	3 350 (753)
1FT7036				✓	✓	✓	✓				
1FT7042				✓	✓	✓	✓				
1FT7044				✓	✓	✓	✓				
1FT7046				✓	✓	✓	–				
1FT7046	SP 100S-MF1	≤ 3	7.7 (17.0)	–	–	–	✓	4 500	300 (221)	6 300 (1 416)	5 650 (1 270)
1FT7062				✓	✓	✓	✓				
1FT7064				✓	✓	✓	✓				
1FT7066				✓	✓	✓	✓				
1FT7068				✓	✓	✓	–				
1FT7068	SP 140S-MF1	≤ 3	17.2 (37.9)	–	–	–	✓	4 000	600 (442)	9 450 (2 124)	9 870 (2 219)
1FT7082				✓	✓	✓	✓				
1FT7084				✓	✓	✓	✓				
1FT7086				✓	✓	✓	–				
1FT7086	SP 180S-MF1	≤ 3	34 (75.0)	–	–	–	✓	3 500	1 100 (810)	14 700 (3 305)	14 150 (3 181)
1FT7102				✓	✓	✓	✓				
1FT7105				✓	✓	✓	–				
1FT7108				✓	✓	✓	–				
1FT7105	SP 210S-MF1	≤ 3	56 (123)	–	–	–	✓	2 500	2 500 (1 844)	21 000 (4 721)	30 000 (6 744)
1FT7108				–	–	–	✓				
<b>Order codes</b>				<b>J02</b>	<b>J03</b>	<b>J05</b>	<b>J09</b>				
• Gear shaft <u>with</u> fitted key				<b>J22</b>	<b>J23</b>	<b>J25</b>	<b>J29</b>				
• Gear shaft <u>without</u> fitted key											

Ordering data

1FT7...-...71-...-1-Z

J ■ ■

G without holding brake  
H with holding brake

Order No. of the motor with identifier **-Z** and order code for mounting the planetary gearbox assigned to the motor  
 Preconditions for mounting planetary gearbox SP+:  
 Plain motor shaft extension/shaft and flange accuracy tolerance N and vibration magnitude grade A/IP65 degree of protection

✓ Possible

– Not possible

<sup>1)</sup> In reference to the output shaft center.

## Technical specifications

Planetary gearbox with 1FT7 motor								
Single-stage Type	Gear ratio	Motor speed	Output torque	Moments of inertia of gearbox (referred to the drive)				
				Continuous duty S1 <sup>1)</sup>				
		$n_{N1}$ rpm	$M_{N2}$ ( $T_{2N}$ ) Nm (lb <sub>f</sub> -ft)	1FT703. $J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	1FT704. $J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	1FT706. $J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	1FT708. $J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	1FT710. $J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )
SP 060S-MF1	4	3 300	26 (19.2)	0.22 (0.08)	–	–	–	–
	5	3 300	26 (19.2)	0.20 (0.07)	–	–	–	–
	7	4 000	26 (19.2)	0.18 (0.06)	–	–	–	–
SP 075S-MF1	4	2 900	75 (55.3)	0.61 (0.21)	0.78 (0.27)	–	–	–
	5	2 900	75 (55.3)	0.51 (0.17)	0.68 (0.23)	–	–	–
	7	3 100	75 (55.3)	0.42 (0.14)	0.59 (0.20)	–	–	–
	10	3 100	52 (38.4)	0.38 (0.13)	0.54 (0.19)	–	–	–
SP 100S-MF1	4	2 500	180 (133)	–	–	3.04 (1.04)	–	–
	5	2 500	175 (129)	–	–	2.61 (0.89)	–	–
	7	2 800	170 (125)	–	–	2.29 (0.78)	–	–
	10	2 800	120 (88.5)	–	1.38 (0.47)	2.07 (0.71)	–	–
SP 140S-MF1	4	2 100	360 (266)	–	–	–	11.0 (3.76)	–
	5	2 100	360 (266)	–	–	–	9.95 (3.40)	–
	7	2 600	360 (266)	–	–	–	9.01 (3.08)	–
	10	2 600	220 (162)	–	–	5.28 (1.80)	8.44 (2.88)	–
SP 180S-MF1	4	1 500	750 (553)	–	–	–	–	33.9 (11.6)
	5	1 500	750 (553)	–	–	–	–	27.9 (9.53)
	7	2 300	750 (553)	–	–	–	–	22.2 (7.59)
	10	2 300	750 (553)	–	–	–	19.2 (6.56)	19.2 (6.56)
SP 210S-MF1	10	2 000	1 000 (738)	–	–	–	–	53.1 (18.1)

<sup>1)</sup> The limit values in the table apply for S1 continuous duty (ON time > 60 % or > 20 min) for a maximum gearbox temperature of 90 °C (194 °F).

# Synchronous motors

## Gearboxes

### Series SP+ planetary gearbox, 2-stage for 1FT7 motors

#### Selection and ordering data

Motor Natural cooling	Planetary gearbox two-stage			Available gear ratio $i =$					Motor speed, max. S3-60 % $n_{G1}$	Output torque, max. S3-60 % $M_{G2}$	Radial output shaft loading, max. <sup>1)</sup> $F_r$	Axial output shaft loading, max. <sup>1)</sup> $F_a$
	Type	Torsional backlash arcmin	Gearbox weight, approx. kg (lb)	16	20	28	40	50				
1FT7034	SP 075S-MF2	≤ 6	3.6 (7.9)	✓	✓	✓	–	–	6 000	110 (81.1)	4 000 (899)	3 350 (753)
1FT7036				✓	–	–	–	–				
1FT7042				✓	–	–	–	–				
1FT7034	SP 100S-MF2	≤ 5	7.9 (17.4)	–	✓	–	✓	✓	4 500	300 (221)	6 300 (1 416)	5 650 (1 270)
1FT7036				–	✓	–	✓	✓				
1FT7042				–	✓	–	✓	✓				
1FT7044				–	✓	–	✓	✓				
1FT7046				–	✓	–	–	–				
1FT7062				–	✓	–	–	–				
1FT7064				–	–	–	–	–				
1FT7044	SP 140S-MF2	≤ 5	17 (37.5)	–	–	–	✓	✓	4 000	600 (442)	9 450 (2 124)	9 870 (2 219)
1FT7046				–	–	–	✓	✓				
1FT7062				–	–	–	✓	✓				
1FT7064				–	–	–	✓	✓				
1FT7066				–	–	–	–	–				
1FT7068				–	–	–	–	–				
1FT7082				–	–	–	–	–				
1FT7084				–	–	–	–	–				
1FT7064	SP 180S-MF2	≤ 5	36.4 (80.3)	–	–	–	✓	✓	4 000	1 100 (811)	14 700 (3 305)	14 150 (3 181)
1FT7066				–	–	–	✓	✓				
1FT7068				–	–	–	✓	✓				
1FT7082				–	–	–	✓	✓				
1FT7084				–	–	–	✓	✓				
1FT7086				–	–	–	–	–				
1FT7102				–	–	–	–	–				
1FT7084	SP 210S-MF2	≤ 5	55 (121)	–	–	–	✓	✓	3 500	2 400 (1 770)	21 000 (4 721)	30 000 (6 744)
1FT7086				–	–	–	✓	✓		(2 500 for $i = 40$ )		
1FT7102				–	–	–	–	–				
1FT7105				–	–	–	–	–				
1FT7108				–	–	–	–	–				
1FT7086	SP 240S-MF2	≤ 5	80.6 (178)	–	–	–	–	✓	3 500	4 500 (3 319)	30 000 (6 744)	33 000 (7 419)
1FT7102				–	–	–	–	✓		(4 000 for $i = 40$ )		
1FT7105				–	–	–	–	✓		(4 300 for $i = 50$ )		
1FT7108				–	–	–	–	–				
<b>Order codes</b>				<b>J12</b>	<b>J13</b>	<b>J15</b>	<b>J16</b>	<b>J17</b>				
• Gear shaft with fitted key				<b>J32</b>	<b>J33</b>	<b>J35</b>	<b>J36</b>	<b>J37</b>				
• Gear shaft without fitted key												

Ordering data

1FT7...-...71-...-1-Z

J ■ ■

G without holding brake  
H with holding brake

Order No. of the motor with identifier **-Z** and order code for mounting the planetary gearbox assigned to the motor  
Preconditions for mounting planetary gearbox SP+:  
Plain motor shaft extension/shaft and flange accuracy tolerance N and vibration magnitude grade A/IP65 degree of protection

<sup>1)</sup> In reference to the output shaft center.

## Technical specifications

Planetary gearbox with 1FT7 motor								
Two-stage Type	Gear ratio	Motor speed	Output torque	Moments of inertia of gearbox (referred to the drive)				
				1FT703 .	1FT704.	1FT706.	1FT708.	1FT710.
Continuous duty S1 <sup>1)</sup>				$J_1$	$J_1$	$J_1$	$J_1$	$J_1$
			$n_{N1}$	$M_{N2} (T_{2N})$	$J_1$	$J_1$	$J_1$	$J_1$
			rpm	Nm (lb <sub>f</sub> -ft)	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )
SP 075S-MF2	16	3 500	75 (55.3)	0.23 (0.08)	0.55 (0.19)	–	–	–
	20	3 500	75 (55.3)	0.20 (0.07)	–	–	–	–
	28	3 500	75 (55.3)	0.18 (0.06)	–	–	–	–
SP 100S-MF2	16	3 100	180 (133)	–	0.81 (0.28)	2.18 (0.75)	–	–
	20	3 100	180 (133)	0.54 (0.19)	0.70 (0.24)	2.07 (0.71)	–	–
	28	3 100	180 (133)	0.43 (0.15)	0.60 (0.21)	–	–	–
	40	3 100	180 (133)	0.38 (0.13)	0.55 (0.19)	–	–	–
	50	3 500	175 (129)	0.38 (0.13)	0.54 (0.19)	–	–	–
SP 140S-MF2	16	2 900	360 (265)	–	–	3.19 (1.09)	10.3 (3.52)	–
	20	2 900	360 (265)	–	–	2.71 (0.93)	9.77 (3.34)	–
	28	2 900	360 (265)	–	1.65 (0.56)	2.34 (0.80)	–	–
	40	2 900	360 (265)	–	1.40 (0.48)	2.10 (0.72)	–	–
	50	3 200	360 (265)	–	1.39 (0.48)	2.08 (0.71)	–	–
SP 180S-MF2	16	2 700	750 (553)	–	–	–	12.4 (4.24)	13.5 (4.61)
	20	2 700	750 (553)	–	–	–	10.9 (3.73)	12.0 (4.10)
	28	2 700	750 (553)	–	–	6.32 (2.16)	9.48 (3.24)	–
	40	2 700	750 (553)	–	–	5.51 (1.88)	8.67 (2.96)	–
	50	2 900	750 (553)	–	–	5.45 (1.86)	8.61 (2.94)	–
SP 210S-MF2	16	2 500	1 500 (1 106)	–	–	–	–	34.5 (11.8)
	20	2 500	1 500 (1 106)	–	–	–	–	31.5 (10.8)
	28	2 500	1 500 (1 106)	–	–	–	30.0 (10.3)	30.0 (10.3)
	40	2 500	1 500 (1 106)	–	–	–	28.5 (9.74)	–
	50	2 500	1 500 (1 106)	–	–	–	28.3 (9.67)	–
SP 240S-MF2	20	2 500	2 500 (1 844)	–	–	–	–	34.6 (11.8)
	28	2 500	2 500 (1 844)	–	–	–	–	30.5 (10.4)
	40	2 500	2 500 (1 844)	–	–	–	–	28.2 (9.64)
	50	2 500	2 500 (1 844)	–	–	–	27.9 (9.53)	27.9 (9.53)

<sup>1)</sup> The limit values in the table apply for S1 continuous duty (ON time > 60 % or > 20 min) for a maximum gearbox temperature of 90 °C (194 °F).

# Synchronous motors

## Gearboxes

### Series SP+ planetary gearbox for 1FK7 motors

#### Overview

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

When selecting the gearbox, ensure that its maximum permissible input speed is not exceeded by the maximum speed of the motor. In the case of high operating frequencies, allowance must be made for the factor  $f_2$  (see Configuration Manual Synchronous motors). The frictional losses of the gearbox must always be taken into account.

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

#### Benefits

- High efficiency  
Single-stage: > 97 %  
2-stage: > 94 %
- Minimum torsional backlash  
Single-stage: ≤ 4 arcmin  
2-stage: ≤ 6 arcmin
- Power transmission from the central sun wheel via planet wheels
- No shaft deflections in the planet wheel set due to symmetrical force distribution
- Very low moment of inertia and thus short acceleration times of the motors
- Output shaft bearings dimensioned for high cantilever and axial loads with preloaded tapered-roller bearings
- The gearboxes are connected to the motor shaft via an integrated clamping hub. A plain motor shaft extension is necessary for this purpose. Shaft and flange accuracy tolerance N in accordance with DIN 42955 and vibration magnitude grade A in accordance with EN 60034-14 are sufficient. The motor flange is adapted by means of adapter plates.
- Output shaft of gearbox exactly coaxial with the motor
- The gearboxes are enclosed (seal between gearbox and motor) and filled with oil at the factory. They are lubricated and sealed for their service life.  
The gearboxes are suitable for all mounting positions.
- Degree of protection of gearbox: IP65
- Small dimensions
- Low weight



1FK7 synchronous motor with built-in planetary gearbox series SP+

#### Integration

1FK702 to 1FK710 motors can be supplied ex factory (Siemens AG) complete with flange-mounted planetary gearbox.

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

The motor/gearbox combinations listed in the selection table are mainly intended for cycle operation S3-60 % (ON time ≤ 60 % and ≤ 20 min). Reduced maximum motor speeds and output torques apply for use in S1 continuous duty (ON time > 60 % or > 20 min). The gearbox temperature may not exceed 90 °C (194 °F).

Follow the instructions contained in the Configuration Manual for synchronous motors when assigning gearboxes to the motor.

1FK7 motors must be designed with plain motor shaft extension/shaft and flange accuracy tolerance N, degree of protection IP65 and anthracite paint finish for mounting onto the gearbox.

# Synchronous motors

## Gearboxes

### Series SP+ planetary gearbox, single-stage for 1FK7 motors

#### Selection and ordering data

Motor Natural cooling	Planetary gearbox single-stage			Available gear ratio $i =$				Motor speed, max. S3-60 % $n_{G1}$	Output torque, max. S3-60 % $M_{G2}$	Radial output shaft loading, max. <sup>1)</sup> $F_r$	Axial output shaft loading, max. <sup>1)</sup> $F_a$
				4	5	7	10				
Type	Type	Tor-sional back-lash arcmin	Gearbox weight, approx. kg (lb)					$(n_1)$ rpm	$(T_{2B})$ Nm (lb <sub>f</sub> -ft)	$(F_{2Rmax})$ N (lb <sub>f</sub> )	$(F_{2Amax})$ N (lb <sub>f</sub> )
1FK7022	SP 060S-MF1	≤ 4	1.9 (4.2)	✓	✓	✓	✓	6 000	40 (29.5)	2 700 (607)	2 400 (540)
1FK7032				✓	✓	✓	✓		(32 for $i = 10$ )		
1FK7033				✓	✓	✓	✓				
1FK7034				✓	✓	✓	✓				
1FK7040	SP 075S-MF1	≤ 4	3.9 (7.9)	✓	✓	✓	✓	6 000	110 (81.1)	4 000 (899)	3 350 (753)
1FK7042				✓	✓	✓	✓		(90 for $i = 10$ )		
1FK7043				✓	✓	✓	✓				
1FK7044				✓	✓	✓	✓				
1FK7060	SP 100S-MF1	≤ 3	7.7 (17.0)	✓	✓	✓	✓	4 500	300 (221)	6 300 (1 416)	5 650 (1 270)
1FK7061				✓	✓	✓	✓		(225 for $i = 10$ )		
1FK7063				✓	✓	✓	✓				
1FK7064				✓	✓	✓	✓				
1FK7080	SP 140S-MF1	≤ 3	17.2 (37.9)	✓	✓	✓	✓	4 000	600 (442)	9 450 (2 124)	9 870 (2 219)
1FK7083				✓	✓	✓	✓		(480 for $i = 10$ )		
1FK7085				✓	✓	✓	✓				
1FK7086				✓	✓	✓	✓				
1FK7100	SP 180S-MF1	≤ 3	34 (75.0)	✓	✓	✓	✓	3 500	1 100 (811)	14 700 (3 305)	14 150 (3 181)
1FK7101				✓	✓	✓	✓				
1FK7103				✓	✓	✓	✓				
1FK7105				✓	✓	✓	✓				
1FK7105	SP 210S-MF1	≤ 3	56 (123)	–	–	–	✓	2 500	2 500 (1 844) (2 400 for $i = 7$ 1 900 for $i = 10$ )	21 000 (4 721)	30 000 (6 744)
<b>Order codes</b>				<b>J02</b>	<b>J03</b>	<b>J05</b>	<b>J09</b>				
• Gear shaft <u>with</u> fitted key				<b>J22</b>	<b>J23</b>	<b>J25</b>	<b>J29</b>				
• Gear shaft <u>without</u> fitted key											

#### Ordering data

1FK7...-A..1-...5-Z

J ■ ■

**G** without holding brake  
**H** with holding brake

Order No. of the motor with identifier **-Z** and order code for mounting the planetary gearbox assigned to the motor  
Preconditions for mounting planetary gearbox SP+:  
Plain motor shaft extension and IP65 degree of protection, anthracite paint finish

✓ Possible

– Not possible

<sup>1)</sup> In reference to the output shaft center.

# Synchronous motors

## Gearboxes

### Series SP+ planetary gearbox, single-stage for 1FK7 motors

#### Technical specifications

Planetary gearbox with 1FK7 motor									
Single-stage Type	Gear ratio	Motor speed Continuous duty S1 <sup>1)</sup> $n_{N1}$ rpm	Output torque $M_{N2} (T_{2N})$ Nm (lb <sub>f</sub> -ft)	Moments of inertia of gearbox (referred to the drive)					
				1FK702 $J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	1FK703. $J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	1FK704. $J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	1FK706. $J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	1FK708. $J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	1FK710. $J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )
SP 060S-MF1	4	3 300	26 (19.2)	0.15 (0.05)	0.22 (0.08)	–	–	–	–
	5	3 300	26 (19.2)	0.12 (0.04)	0.20 (0.07)	–	–	–	–
	7	4 000	26 (19.2)	0.10 (0.03)	0.18 (0.06)	–	–	–	–
	10	4 000	17 (12.5)	0.09 (0.03)	0.17 (0.06)	–	–	–	–
SP 075S-MF1	4	2 900	75 (55.3)	–	–	0.78 (0.27)	–	–	–
	5	2 900	75 (55.3)	–	–	0.68 (0.23)	–	–	–
	7	3 100	75 (55.3)	–	–	0.59 (0.20)	–	–	–
	10	3 100	52 (38.4)	–	–	0.54 (0.19)	–	–	–
SP 100S-MF1	4	2 500	180 (133)	–	–	–	3.04 (1.04)	–	–
	5	2 500	175 (129)	–	–	–	2.61 (0.89)	–	–
	7	2 800	170 (125)	–	–	–	2.29 (0.78)	–	–
	10	2 800	120 (88.5)	–	–	–	2.07 (0.71)	–	–
SP 140S-MF1	4	2 100	360 (265)	–	–	–	–	11.0 (3.76)	–
	5	2 100	360 (265)	–	–	–	–	9.95 (3.40)	–
	7	2 600	360 (265)	–	–	–	–	9.01 (3.08)	–
	10	2 600	220 (162)	–	–	–	–	8.44 (2.88)	–
SP 180S-MF1	4	1 500	750 (553)	–	–	–	–	–	33.9 (11.6)
	5	1 500	750 (553)	–	–	–	–	–	27.9 (9.53)
	7	2 300	750 (553)	–	–	–	–	–	22.2 (7.59)
	10	2 300	750 (553)	–	–	–	–	–	19.2 (6.56)
SP 210S-MF1	10	2 000	1 000 (738)	–	–	–	–	–	53.1 (18.1)

<sup>1)</sup> The limit values in the table apply for S1 continuous duty (ON time > 60 % or > 20 min) for a maximum gearbox temperature of 90 °C (194 °F).



# Synchronous motors

## Gearboxes

### Series SP+ planetary gearbox, two-stage for 1FK7 motors

#### Selection and ordering data

Motor Natural cooling	Planetary gearbox two-stage			Available gear ratio $i =$					Motor speed, max. S3-60 %	Output torque, max. S3-60 %	Radial output shaft loading, max. <sup>1)</sup>	Axial output shaft loading, max. <sup>1)</sup>
				16	20	28	40	50				
Type	Type	Tor- sional back- lash arcmin	Gearbox weight, approx. kg (lb)						$n_{G1}$	$M_{G2}$	$F_r$	$F_a$
									( $n_1$ ) rpm	( $T_{2B}$ ) Nm (lb <sub>f</sub> -ft)	( $F_{2Rmax}$ ) N (lb <sub>f</sub> )	( $F_{2Amax}$ ) N (lb <sub>f</sub> )
1FK7022	SP 060S-MF2	≤ 6	2.0 (4.4)	✓	✓	✓	–	–	6 000	40 (295)	2 700 (607)	2 400 (540)
1FK7032				✓	✓	–	–	–				
1FK7033				✓	✓	–	–	–				
1FK7022	SP 075S-MF2	≤ 6	3.6 (7.9)	–	–	–	✓	✓	6 000	110 (81.1)	4 000 (899)	3 350 (753)
1FK7032				–	–	✓	✓	✓				
1FK7033				–	–	✓	✓	✓				
1FK7034				✓	✓	✓	–	–				
1FK7040				✓	✓	✓	–	–				
1FK7042				✓	✓	–	–	–				
1FK7043				✓	–	–	–	–				
1FK7034	SP 100S-MF2	≤ 5	7.9 (17.4)	–	–	–	✓	✓	4 500	300 (221)	6 300 (1 416)	2 400 (1 270)
1FK7040				–	–	–	✓	✓				
1FK7042				–	–	✓	✓	✓				
1FK7043				–	✓	✓	✓	✓				
1FK7044				✓	✓	✓	✓	–				
1FK7060				✓	✓	✓	–	–				
1FK7061				✓	✓	–	–	–				
1FK7044	SP 140S-MF2	≤ 5	17 (37.5)	–	–	–	–	✓	4 000	600 (442)	9 450 (2 124)	9 870 (2 219)
1FK7060				–	–	–	✓	✓				
1FK7061				–	–	✓	✓	✓				
1FK7063				✓	✓	✓	–	–				
1FK7064				✓	✓	✓	–	–				
1FK7080				✓	✓	✓	✓	–				
1FK7083				✓	✓	–	–	–				

#### Order codes

- Gear shaft with fitted key
- Gear shaft without fitted key

J12

J13

J15

J16

J17

J32

J33

J35

J36

J37

Ordering data

1FK7...-A..1...5-Z

J ■ ■

G  
Hwithout holding brake  
with holding brake

Order No. of the motor with identifier **-Z** and order code for mounting the planetary gearbox assigned to the motor  
Preconditions for mounting planetary gearbox SP+: Plain motor shaft extension and IP65 degree of protection, anthracite paint finish

✓ Possible

– Not possible

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

# Synchronous motors

## Gearboxes

### Series SP+ planetary gearbox, two-stage for 1FK7 motors

#### Selection and ordering data

Motor Natural cooling	Planetary gearbox two-stage			Available gear ratio $i =$					Motor speed, max. S3-60 % $n_{G1}$ ( $n_1$ ) rpm	Output torque, max. S3-60 % $M_{G2}$ ( $T_{2B}$ ) Nm (lb <sub>f</sub> -ft)	Radial output shaft loading, max. <sup>1)</sup> $F_r$ ( $F_{2Rmax}$ ) N (lb <sub>f</sub> )	Axial output shaft loading, max. <sup>1)</sup> $F_a$ ( $F_{2Amax}$ ) N (lb <sub>f</sub> )
	Type	Torsional backlash arcmin	Gearbox weight, approx. kg (lb)	16	20	28	40	50				
1FK7063	SP 180S-MF2	≤ 5	36.4 (80.3)	-	-	-	✓	✓	4 000	1 100 (811)	14 700 (3 305)	14 150 (3 181)
1FK7064				-	-	-	✓	✓				
1FK7080				-	-	-	-	✓				
1FK7083				-	-	✓	-	-				
1FK7085				✓	✓	-	-	-				
1FK7086				✓	✓	-	-	-				
1FK7100				✓	✓	✓	-	-				
1FK7101				✓	✓	-	-	-				
1FK7103				✓	-	-	-	-				
1FK7083	SP 210S-MF2	≤ 6	55 (121)	-	-	-	✓	✓	3 500	2 400 (1 770) (2 500 for $i = 20$ )	21 000 (4 721)	30 000 (6 744)
1FK7085				-	-	✓	✓	-				
1FK7086				-	-	✓	-	-				
1FK7100				-	-	-	✓	✓				
1FK7101				-	-	-	✓	-				
1FK7103				-	✓	-	-	-				
1FK7105				✓	✓	-	-	-				
1FK7101	SP 240S-MF2	≤ 6	80.6 (178)	-	-	-	✓	✓	3 500	4 500 (3 319) (4 000 for $i = 40$ 4 300 for $i = 50$ )	30 000 (6 744)	33 000 (7 419)
1FK7103				-	-	✓	✓	-				
1FK7105				-	-	✓	-	-				
<b>Order codes</b>				<b>J12</b>	<b>J13</b>	<b>J15</b>	<b>J16</b>	<b>J17</b>				
• Gear shaft <u>with</u> fitted key				<b>J32</b>	<b>J33</b>	<b>J35</b>	<b>J36</b>	<b>J37</b>				
• Gear shaft <u>without</u> fitted key												

Ordering data

1FK7...-A..1-..5-Z

J ■ ■

**G** without holding brake  
**H** with holding brake

Order No. of the motor with identifier **-Z** and order code for mounting the planetary gearbox assigned to the motor  
Preconditions for mounting planetary gearbox SP+: Plain motor shaft extension and IP65 degree of protection, anthracite paint finish

<sup>1)</sup> In reference to the output shaft center.

## Technical specifications

Planetary gearbox with 1FK7 motor									
Two-stage Type	Gear ratio	Motor speed	Output torque	Moments of inertia of gearbox (referred to the drive)					
				Continuous duty S1 <sup>1)</sup>		1FK702.	1FK703.	1FK704.	1FK706.
		$n_{N1}$	$M_{N2} (T_{2N})$	$J_1$	$J_1$	$J_1$	$J_1$	$J_1$	$J_1$
		rpm	Nm (lb <sub>f</sub> -ft)	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )
SP 060S-MF2	16	4 400	26 (19.2)	0.08 (0.03)	0.17 (0.06)	–	–	–	–
	20	4 400	26 (19.2)	0.07 (0.02)	0.16 (0.06)	–	–	–	–
	28	4 400	26 (19.2)	0.06 (0.02)	–	–	–	–	–
SP 075S-MF2	16	3 500	75 (55.3)	–	0.23 (0.08)	0.55 (0.19)	–	–	–
	20	3 500	75 (55.3)	–	0.20 (0.07)	0.53 (0.19)	–	–	–
	28	3 500	75 (55.3)	–	0.18 (0.06)	0.50 (0.17)	–	–	–
	40	3 500	75 (55.3)	0.10 (0.03)	0.17 (0.06)	–	–	–	–
	50	3 800	75 (55.3)	0.10 (0.03)	0.16 (0.06)	–	–	–	–
SP 100S-MF2	16	3 100	180 (132)	–	–	0.81 (0.28)	2.18 (0.75)	–	–
	20	3 100	180 (132)	–	–	0.70 (0.24)	2.07 (0.71)	–	–
	28	3 100	180 (132)	–	–	0.60 (0.20)	1.97 (0.67)	–	–
	40	3 100	180 (132)	–	0.38 (0.13)	0.55 (0.19)	–	–	–
	50	3 500	175 (129)	–	0.38 (0.13)	0.54 (0.19)	–	–	–
SP 140S-MF2	16	2 900	360 (266)	–	–	–	3.19 (1.09)	10.3 (3.52)	–
	20	2 900	360 (266)	–	–	–	2.71 (0.93)	9.77 (3.34)	–
	28	2 900	360 (266)	–	–	–	2.34 (0.80)	9.41 (3.22)	–
	40	2 900	360 (266)	–	–	–	2.10 (0.72)	9.16 (3.13)	–
	50	3 200	360 (266)	–	–	1.39 (0.48)	2.08 (0.71)	–	–
SP 180S-MF2	16	2 700	750 (553)	–	–	–	–	12.4 (4.24)	13.5 (4.61)
	20	2 700	750 (553)	–	–	–	–	10.9 (3.73)	12.0 (4.10)
	28	2 700	750 (553)	–	–	–	–	9.48 (3.24)	10.6 (3.62)
	40	2 700	750 (553)	–	–	–	5.51 (1.88)	8.67 (2.96)	–
	50	2 900	750 (553)	–	–	–	5.45 (1.86)	8.61 (2.94)	–
SP 210S-MF2	16	2 500	1 500 (1 106)	–	–	–	–	–	34.5 (11.8)
	20	2 500	1 500 (1 106)	–	–	–	–	–	31.5 (10.8)
	28	2 500	1 500 (1 106)	–	–	–	–	30.0 (10.3)	30.0 (10.3)
	40	2 500	1 500 (1 106)	–	–	–	–	28.5 (9.74)	28.5 (9.74)
	50	2 500	1 500 (1 106)	–	–	–	–	28.3 (9.67)	28.3 (9.67)
SP 240S-MF2	28	2 500	2 500 (1 844)	–	–	–	–	–	30.5 (10.4)
	40	2 500	2 500 (1 844)	–	–	–	–	–	28.2 (9.64)
	50	2 500	2 500 (1 844)	–	–	–	–	–	27.9 (9.53)

<sup>1)</sup> The limit values in the table apply for S1 continuous duty (ON time > 60 % or > 20 min) for a maximum gearbox temperature of 90 °C (194 °F).

# Synchronous motors

## Gearboxes

### Series LP+ planetary gearbox for 1FK7 motors

#### Overview

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

When selecting the gearbox, ensure that its maximum permissible input speed is not exceeded by the maximum speed of the motor. In the case of high operating frequencies, allowance must be made for the factor  $f_2$  (see Configuration Manual Synchronous motors). The frictional losses of the gearbox must always be taken into account.

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

#### Benefits

- High efficiency, single-stage: > 97 %
- Minimum torsional backlash  
Single-stage:  $\leq 4$  arcmin
- Power transmission from the central sun wheel via planet wheels
- No shaft deflections in the planet wheel set due to symmetrical force distribution
- The gearboxes are connected to the motor shaft via an integrated clamping hub. A plain motor shaft extension is necessary for this purpose. Shaft and flange accuracy tolerance N in accordance with DIN 42955 and vibration magnitude grade A in accordance with EN 60034-14 are sufficient. The motor flange is adapted by means of adapter plates.
- Output shaft of gearbox exactly coaxial with the motor
- The gearboxes are suitable for all mounting positions.
- The gearboxes are sealed (seal between gearbox and motor) and filled with grease in the factory. They are lubricated and sealed for their service life.
- Degree of protection of gearbox: IP64
- Small dimensions
- Low weight



1FK7 synchronous motor with mounted planetary gearbox series LP+

#### Integration

1FK702 to 1FK710 motors can be supplied ex factory (Siemens AG) complete with flange-mounted planetary gearbox.

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

The motor/gearbox combinations listed in the selection table are mainly intended for cycle operation S3-60 % (ON time  $\leq 60$  % and  $\leq 20$  min). Reduced maximum motor speeds and output torques apply for use in S1 continuous duty (ON time > 60 % or > 20 min). The gearbox temperature may not exceed 90 °C (194 °F).

Follow the instructions contained in the Configuration Manual for synchronous motors when assigning gearboxes to the motor.

1FK7 motors must be designed with plain motor shaft extension/shaft and flange accuracy tolerance N, degree of protection IP64 and anthracite paint finish for mounting onto the gearbox.

# Synchronous motors

## Gearboxes

### Series LP+ planetary gearbox, single-stage for 1FK7 motors

#### Selection and ordering data

Motor Natural cooling	Planetary gearbox single-stage Torsion. backlash ≤ 12 arcmin		Available gear ratio $i =$		Input speed, max. S3-60 % $n_{G1}$ rpm	Output torque, max. S3-60 % $M_{G2}$ at $i = 5$ Nm (lb <sub>f</sub> -ft)	$M_{G2}$ at $i = 10$ Nm (lb <sub>f</sub> -ft)	Output shaft radial force, max. <sup>1)</sup> $F_r$ N (lb <sub>f</sub> )	Gearbox moment of inertia $J_G$ at $i = 5/10$ $10^{-4} \text{kgm}^2$ ( $10^{-3} \text{lb}_f\text{-in-s}^2$ )
	Type	Gearbox weight, approx. kg (lb)	5	10					
1FK7022	LP 050-M01	0.75 (1.65)	✓	–	8 000	12 (8.9)	11 (8.1)	650 (146)	0.055 (0.05)
1FK7022	LP 070-M01	2.0 (4.41)	–	✓	6 000	35 (25.8)	32 (23.6)	1 450 (326)	0.28 (0.25)
1FK7032			✓	✓					
1FK7033			✓	✓					
1FK7034			✓	✓					
1FK7040	LP 090-M01	4.0 (8.82)	✓	✓	6 000	90 (66.4)	80 (59.0)	1 900 (427)	1.77 (1.57)
1FK7042			✓	✓					
1FK7043			✓	✓					
1FK7044			✓	✓					
1FK7060	LP 120-M01	8.6 (19.0)	✓	✓	4 800	220 (162)	200 (148)	4 000 (899)	5.42 (4.80)
1FK7061			✓	✓					
1FK7063			✓	✓					
1FK7064			✓	–					
1FK7080	LP 155-M01	17 (37.5)	✓	✓	3 600	450 (332)	350 (258)	6 000 (1 349)	25.7 (22.8)
1FK7082			✓	✓					
1FK7083			✓	✓					
1FK7085			✓	✓					
1FK7086			✓	✓					
1FK7100			✓	✓					
1FK7101			✓	–					
1FK7103			✓	–					
1FK7105	✓	–							

#### Order codes

• Gear shaft with fitted key

V40

V42

Ordering data

1FK7...-A..1-...3-Z

V ■ ■

G

without holding brake

H

with holding brake

Order No. of the motor with identifier **-Z** and

order code for mounting the planetary gearbox assigned to the motor

Preconditions for mounting LP+ planetary gearboxes:

Plain motor shaft extension and IP64 degree of protection, anthracite paint finish

#### Continuous duty

Continuous duty is permissible at the rated speed and rated torque. The gearbox temperature may not exceed 90 °C (194 °F).

Planetary gearbox single-stage Torsional backlash ≤ 12 arcmin	Rated input speed	Rated output torque	
Type	$n_{G1}$	$M_{G2}$ at $i = 5$	$M_{G2}$ at $i = 10$
	rpm	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)
LP 050-M01	4 000	5.7 (4.2)	–
LP 070-M01	3 700	18 (13.3)	16.5 (12.2)
LP 090-M01	3 400	45 (33.2)	40 (29.5)
LP 120-M01	2 600	110 (81.1)	100 (73.8)
LP 155-M01	2 000	320 (236)	190 (140)

✓ Possible

– Not possible

<sup>1)</sup> Referred to the center of the output shaft at 100 rpm.

# Synchronous motors

## Geared motors

### 1FK7-DYA compact geared motors

#### Overview



The 1FK7-DYA compact geared motor combines electrical and mechanical components in the smallest space possible. This mechatronic unit consists of a permanent-magnet 1FK7 synchronous motor and a directly mounted single-stage planetary gearbox.

The 1FK7-DYA compact geared motors with degree of protection IP64 are designed for operation without external cooling as the heat is dissipated over the motor surface. The integrated planetary gearboxes have high maximum torques and permit high radial and axial forces at the shaft extension.

#### Benefits

- Space-saving installation due to the high power density of the motor and integration of the planetary gearbox directly into the motor end shield. Mounting to the machine is greatly simplified by this and the logistics are reduced to a minimum.
- Mounting in types of construction IM B5 and IM B14 is possible.
- Highly dynamic due to lower motor moment of inertia; this means shorter cycle times.
- Maintenance-free
- Suitable for S1 continuous duty
- High positioning accuracy thanks to low mechanical torsional backlash of < 8 arcmin
- Mechanical compatibility with regard to IM B14 flange and shaft extension for the LP+ planetary gearbox
- Power connection via plug, signal connection via plug

#### Applications

In general mechanical engineering, any place where coaxial drive units are used, e.g. in

- Packaging machines
- Wood, glass and ceramic processing machines
- Plastic, injection molding and foil stretching machines
- Handling systems
- Machine tools
- All kinds of auxiliary axes

#### Integration

1FK7-DYA compact geared motors can be combined with the SIMODRIVE 611 converter system to create a powerful system with high functionality.

The integrated encoder system for speed and position control can be selected depending on the application.

## Technical specifications

<b>Product name</b>	1FK7-DYA compact geared motor
<b>Type of motor</b>	Permanent-magnet synchronous motor
<b>Magnet material</b>	Rare-earth magnet material
<b>Cooling</b>	Natural cooling
<b>Temperature monitoring</b>	KTY 84 temperature sensor in stator winding
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a winding temperature rise of $\Delta T = 100$ K at an ambient temperature of 40 °C (104 °F)
<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)</b>	IM B5 (IM V1, IM V3) IM B14
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	IP64
<b>Shaft extension on the drive end (DE) in accordance with DIN 748-3 (IEC 60072-1)</b>	With fitted key
<b>Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)<sup>1)</sup></b>	Tolerance N
<b>Vibration magnitude in accordance with EN 60034-14 (IEC 60034-14)</b>	Grade A is maintained up to rated speed
<b>Sound pressure level <math>L_{pA}</math> (1 m) in accordance with EN ISO 1680, max.</b>	
<ul style="list-style-type: none"> <li>• 1FK703</li> <li>• 1FK704</li> <li>• 1FK706</li> <li>• 1FK708</li> </ul>	72 dB 75 dB 80 dB 82 dB
<b>Encoder systems, built-in</b>	<ul style="list-style-type: none"> <li>• Incremental encoder sin/cos 1 V<sub>pp</sub> 2 048 S/R with C and D tracks encoder IC2048S/R</li> <li>• Absolute encoder, multi-turn (Traversing range 4 096 revolutions) with EnDat interface Single-turn range: 1FK703: 512 S/R encoder AM512S/R 16 S/R encoder AM16S/R 1FK704 ... 1FK708: 2 048 S/R encoder AM2048S/R 32 S/R encoder AM32S/R</li> <li>• 2-pole resolver</li> <li>• Multi-pole resolver (number of pole pairs corresponds to number of pole pairs of the motor)</li> </ul>
<b>Connection</b>	Connectors for signals and power can be rotated by 270°
<b>Paint finish</b>	Anthracite RAL 7016
<b>2nd rating plate</b>	Attached in the NDE cover
<b>3rd rating plate</b>	Enclosed separately
<b>Options</b>	Built-in holding brake

<sup>1)</sup> Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

# Synchronous motors

## Geared motors

### 1FK7-DYA compact geared motors

#### Selection and ordering data

Rated speed	Rated power	Maximum speed	Maximum torque	Static torque	Rated torque <sup>1)</sup>	Available gear ratios	<b>1FK7-DYA compact geared motors Natural Cooling</b>	No. of pole pairs	Rotor moment of inertia <sup>2)</sup>	
$n_{2 \text{ rated}}$	$P_2$	$n_{2 \text{ max}}$	$M_{2 \text{ max}}$	$M_{20}$	$M_{2 \text{ rated}}$	$i$			(without brake)	(with brake)
rpm	kW (HP)	rpm	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)		Order No.	Order code	10 <sup>-4</sup> kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	10 <sup>-4</sup> kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )
<b>370</b>	0.37 (0.50)	600	32 (283)	11 (97)	9.5 (84.1)	10	<b>1FK7032-5AK71-1 ■ ■ 3-Z A03</b>	3	0.75 (0.0007)	0.83 (0.0007)
<b>740</b>	0.5 (0.67)	1 200	32 (283)	7.5 (66)	6.5 (57.5)	5	<b>1FK7034-5AK71-1 ■ ■ 3-Z A00</b>	3	1.04 (0.0009)	1.12 (0.0007)
<b>340</b>	0.45 (0.60)	600	49 (434)	15 (133)	12.5 (110.6)	10	<b>1FK7040-5AK71-1 ■ ■ 3-Z A13</b>	4	2.3 (0.0020)	3 (0.0027)
<b>680</b>	0.71 (0.95)	1 200	51 (451)	13 (115)	10 (88.5)	5	<b>1FK7042-5AK71-1 ■ ■ 3-Z A10</b>	4	3.6 (0.0027)	4.3 (0.0032)
<b>260</b>	1.25 (1.68)	480	175 (1 549)	57 (505)	46 (407)	10	<b>1FK7060-5AH71-1 ■ ■ 3-Z A73</b>	4	10.3 (0.0091)	12.5 (0.0111)
<b>520</b>	1.74 (2.33)	960	170 (1 505)	51 (451)	32 (283)	5	<b>1FK7063-5AH71-1 ■ ■ 3-Z A70</b>	4	17.4 (0.0154)	19.6 (0.0173)
<b>200</b>	1.47 (1.97)	360	242 (2 142)	76 (673)	70 (620)	10	<b>1FK7080-5AH71-1 ■ ■ 3-Z A83</b>	4	28.7 (0.0254)	31.8 (0.0281)
<b>400</b>	1.88 (2.52)	720	233 (2 062)	68 (602)	45 (398)	5	<b>1FK7083-5AH71-1 ■ ■ 3-Z A80</b>	4	41 (0.0363)	49.6 (0.0439)

#### Encoder systems:

Incremental encoder sin/cos 1 V<sub>pp</sub> 2 048 S/R  
 Absolute encoder EnDat 2 048 S/R<sup>1)</sup> (not for 1FK703)  
 Absolute encoder EnDat 512 S/R<sup>1)</sup> (only for 1FK703)  
 Absolute encoder EnDat 32 S/R<sup>1)</sup> (not for 1FK703)  
 Absolute encoder EnDat 16 S/R<sup>1)</sup> (only for 1FK703)  
 Multipole resolver  
 2-pole resolver

**A  
E  
H  
G  
J  
S  
T**

#### Shaft extension:

Fitted key and keyway  
 Fitted key and keyway

#### Shaft and flange accuracy:

Tolerance N  
 Tolerance N

#### Holding brake:

Without  
 With

**U  
V**

#### Degree of protection:

IP64, paint finish anthracite, color RAL 7016

**3**

To select the degree of protection, see Selection guides.



## Selection and ordering data

Motor type (continued)	Weight		Static current	Maximum current	SIMODRIVE 611 power module		Power cable with complete shield Motor connection and brake connection via power connector		
	(without brake)	(with brake)			Rated output current	Order No.	Power connector	Cable cross- section <sup>3)</sup>	Pre-assembled cable
	<i>m</i>	<i>m</i>	$I_0$ at $M_0$ $\Delta T=100\text{ K}$	$I_{max}$	$I_{rated}$		Size	mm <sup>2</sup>	Order No.
	kg (lb)	kg (lb)	A	A	A				
1FK7032-5AK71-...	4.11 (9.1)	4.47 (9.9)	1.7	5	3	For ordering data, see Converter system	1	4 x 1.5	<b>6FX</b> ■ ■ <b>02-5</b> ■ <b>A01</b> -....
1FK7034-5AK71-...	5.01 (11.05)	5.37 (11.84)	1.9	7.9	3		1	4 x 1.5	<b>6FX</b> ■ ■ <b>02-5</b> ■ <b>A01</b> -....
1FK7040-5AK71-...	6.6 (14.6)	7.61 (16.8)	2.3	7.4	3		1	4 x 1.5	<b>6FX</b> ■ ■ <b>02-5</b> ■ <b>A01</b> -....
1FK7042-5AK71-...	7.91 (17.4)	8.62 (19.0)	4.4	14.9	5		1	4 x 1.5	<b>6FX</b> ■ ■ <b>02-5</b> ■ <b>A01</b> -....
1FK7060-5AH71-...	13.9 (30.7)	15 (33.1)	6.2	19	9		1	4 x 1.5	<b>6FX</b> ■ ■ <b>02-5</b> ■ <b>A01</b> -....
1FK7063-5AH71-...	17.6 (38.8)	19 (41.9)	12	41	18		1	4 x 1.5	<b>6FX</b> ■ ■ <b>02-5</b> ■ <b>A01</b> -....
1FK7080-5AH71-...	23.4 (51.6)	24.6 (54.2)	7.4	24	9		1	4 x 1.5	<b>6FX</b> ■ ■ <b>02-5</b> ■ <b>A01</b> -....
1FK7083-5AH71-...	28.6 (63.1)	31.2 (68.8)	15	48	18		1	4 x 1.5	<b>6FX</b> ■ ■ <b>02-5</b> ■ <b>A01</b> -....

## Type of power cable:

MOTION-CONNECT 800  
MOTION-CONNECT 700 (only with brake cores)  
MOTION-CONNECT 500  
MOTION-CONNECT 500 PLUS (only up to a cross-section of 6 mm<sup>2</sup>)

8 0  
7 0  
5 0  
5 1

Without brake cores  
With brake cores

C  
D

For length code as well as power and signal cables, see Connection system MOTION-CONNECT.

....

<sup>1)</sup> If the absolute encoder is used,  $M_{2rated}$  is reduced by 10 %.

<sup>2)</sup> In reference to the internal motor shaft.

<sup>3)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

# Synchronous motors

## Linear motors for SIMODRIVE 611

### 1FN3 linear motors Water cooling

#### Overview



In combination with the SIMODRIVE 611 digital/universal HRS converter system, 1FN3 linear motors provide an optimally tuned linear direct drive system for the requirements of modern mechanical engineering.

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

#### Benefits

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

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

#### Design

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

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

The stainless metal encapsulation of the primary section ensures the high mechanical ruggedness and resistance to soiling required for use in machine tools, as well as high resistance to corrosive liquids. In addition, the motor places minimal demands on the preparation of mounting surfaces thanks to the large air gap. The mounting tolerances for the air gap are  $\pm 0.3$  mm (0.012 in).

#### Design variants

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

- Single-sided motors
  - The single-sided version consists of a primary section that is mounted parallel to the associated secondary section.
- Double-sided motors
  - The special secondary section of the double-sided version lies between two primary sections (one primary section with standard winding and one with complementary winding). The design as a double-sided motor is particularly suitable for applications with movable secondary section and small traversing paths with fast acceleration, e.g. non-circular machining.

#### Application

##### Version for peak load

Used in machine axes that are temporarily accelerated, e.g. S3 duty or when large forces are required for a short time.

Typical applications:

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

##### Version for continuous load

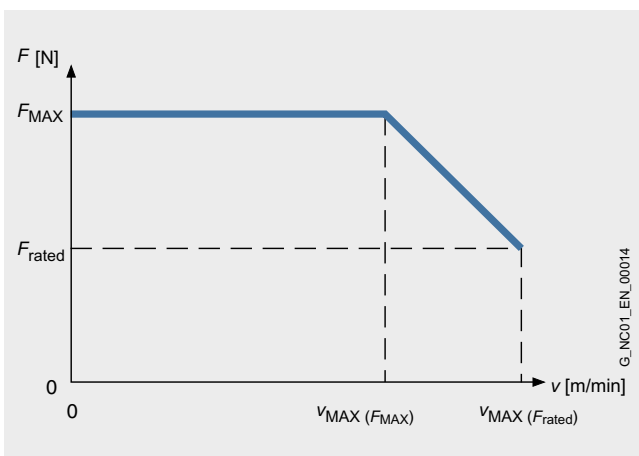
Used in machine axes with constant acceleration changes, e.g. S1 duty, with high process/weight forces or for operation without water cooling.

Typical applications:

- Grinding
- Non-circular machining (e.g. oscillating applications)
- Z-axes without weight compensation, quills
- Handling, Cartesian robots

### Technical specifications

<b>Product name</b>	1FN3 linear motors
	Peak load <span style="float: right;">Continuous load</span>
<b>Type of motor</b>	Permanent-magnet synchronous linear motor
<b>Magnet material</b>	Rare-earth magnet material
<b>Overload ratio (<math>F_{MAX}:F_{rated}</math>) up to max.</b>	2.75 <span style="float: right;">1.7</span>
<b>Cooling</b>	Water cooling
<b>Water cooler connections</b>	G 1/8 internal thread on all primary and secondary section coolers
<b>Temperature influence on surrounding construction with precision cooling, max.</b>	+4 K
<b>Coolant inlet temperature, permissible</b>	35 °C (95 °F) (avoid condensation) > 35 °C (95 °F) on reduction of rated motor power
<b>Temperature monitoring integrated in the primary section winding</b>	2 monitoring circuits (Temp-S with PTC thermistor) and Temp-F with KTY 84 temperature sensor (for 1FN3050, Temp-S only) Evaluation via encoder connection boxes SME9..
<b>Insulation of stator winding in accordance with EN (IEC) 60034-1</b>	Temperature class 155 (F) for a winding temperature of 120 °C (248 °F)
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	IP65
<b>Available configurations</b>	Different gradations due to modular construction
<b>Secondary section cover</b>	Exchangeable through all segments or segment by segment
<b>2nd rating plate</b>	Enclosed separately
<b>Recommended measuring systems</b>	See Overview of measuring systems
<b>Type of connection</b>	Prepared for separate connection of the power and signal cable



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

# Synchronous motors

## Linear motors for SIMODRIVE 611

### 1FN3 standard type linear motors Version for peak load – water cooling

#### Selection and ordering data

Feedrate force		Maximum velocity <sup>3)</sup>		1FN3 linear motors – Version for peak load Water cooling		Weight, approx.	
$F_{rated}^{1)2)}$	$F_{MAX}$	$v_{MAX}$ at $F_{MAX}$	$v_{MAX}$ at $F_{rated}$	Primary section	Secondary section	Primary section without/with precision cooling	Secondary section without/with heatsink profiles
N (lb <sub>f</sub> )	N (lb <sub>f</sub> )	m/min (ft/min)	m/min (ft/min)	Order No.	Order No.	kg (lb)	kg (lb)
200 (45)	550 (124)	146 (479)	373 (1 224)	<b>1FN3050-2WC00-0EA1</b>	<b>1FN3050-4SA00-0AA0</b>	2.4/2.9 (5.3/6.4)	0.4/0.5 (0.9/1.1)
200 (45)	550 (124)	146 (479)	373 (1 224)	<b>1FN3050-2WC00-0FA1</b>		2.4/2.9 (5.3/6.4)	0.4/0.5 (0.9/1.1)
200 (45)	490 (110)	138 (453)	322 (1 056)	<b>1FN3100-1WC00-0BA1</b>	<b>1FN3100-4SA00-0AA0</b>	2.2/- (4.9/-) <sup>4)</sup>	0.7/0.8 (1.5/1.8)
450 (101)	1 100 (247)	131 (430)	297 (974)	<b>1FN3100-2WC00-0BA1</b>		3.8/4.4 (8.4/9.7)	
450 (101)	1 100 (247)	237 (778)	497 (1 631)	<b>1FN3100-2WE00-0BA1</b>		3.8/4.4 (8.4/9.7)	
675 (152)	1 650 (371)	120 (394)	277 (909)	<b>1FN3100-3WC00-0BA1</b>		5.4/6.2 (11.9/13.7)	
675 (152)	1 650 (371)	237 (778)	497 (1 631)	<b>1FN3100-3WE00-0BA1</b>		5.4/6.2 (11.9/13.7)	
900 (202)	2 200 (495)	131 (430)	297 (974)	<b>1FN3100-4WC00-0BA1</b>		7.4/8.5 (16.3/18.7)	
900 (202)	2 200 (495)	237 (778)	497 (1 631)	<b>1FN3100-4WE00-0BA1</b>		7.4/8.5 (16.3/18.7)	
1 125 (253)	2 750 (618)	109 (358)	255 (837)	<b>1FN3100-5WC00-0BA1</b>		9.1/10.4 (20.1/22.9)	
340 (76)	820 (184)	126 (413)	282 (925)	<b>1FN3150-1WC00-0BA1</b>	<b>1FN3150-4SA00-0AA0</b>	3.0/- (6.6/-) <sup>4)</sup>	1.2/1.3 (2.7/2.9)
675 (152)	1 650 (371)	126 (413)	282 (925)	<b>1FN3150-2WC00-0BA1</b>		5.3/6 (11.7/13.2)	
1 015 (228)	2 470 (555)	126 (413)	282 (925)	<b>1FN3150-3WC00-0BA1</b>		7.8/8.7 (17.2/19.2)	
1 350 (304)	3 300 (742)	126 (413)	282 (925)	<b>1FN3150-4WC00-0BA1</b>		10.2/11.4 (22.5/25.1)	
1 690 (380)	4 120 (926)	126 (413)	282 (925)	<b>1FN3150-5WC00-0BA1</b>		12.8/14.2 (28.2/31.3)	
615 (138)	1 720 (387)	128 (420)	309 (1 014)	<b>1FN3300-1WC00-0BA1</b>	<b>1FN3300-4SA00-0AA0</b>	6.2/- (13.7/-) <sup>4)</sup>	2.4/2.6 (5.3/5.7)
1 225 (275)	3 450 (776)	63 (207)	176 (577)	<b>1FN3300-2WB00-0BA1</b>		11.4/12.4 (25.1/27.3)	
1 225 (275)	3 450 (776)	125 (410)	297 (974)	<b>1FN3300-2WC00-0BA1</b>		11.4/12.4 (25.1/27.3)	
1 225 (275)	3 450 (776)	369 (1 211)	805 (2 641)	<b>1FN3300-2WG00-0BA1</b>		11.4/12.4 (25.1/27.3)	
1 840 (414)	5 170 (1 162)	125 (410)	297 (974)	<b>1FN3300-3WC00-0BA1</b>		17.0/18.4 (37.5/40.6)	
1 840 (414)	5 170 (1 162)	383 (1 257)	836 (2 743)	<b>1FN3300-3WG00-0BA1</b>		17.0/18.4 (37.5/40.6)	
2 450 (551)	6 900 (1 551)	63 (207)	176 (577)	<b>1FN3300-4WB00-0BA1</b>		22.2/24 (48.9/52.9)	
2 450 (551)	6 900 (1 551)	125 (410)	297 (974)	<b>1FN3300-4WC00-0BA1</b>		22.2/24 (48.9/52.9)	

#### Type of connection:

Frame sizes 1FN3100 to 1FN3900

Connection cover prepared for separate power and signal cables

Frame size 1FN3050

Permanently connected power and signal cables with open core ends  
Length: 2 m (6.56 ft)

Frame size 1FN3050

Permanently connected power and signal cables pre-assembled,  
with connectors  
Length: 0.5 m (1.64 ft)

**B**

**E**

**F**

# Synchronous motors

## Linear motors for SIMODRIVE 611

1FN3 standard type linear motors  
Version for peak load – water cooling

### Selection and ordering data

Motor type Primary section (continued)	Rated current $I_{rated}^{1)}$	Maxi- mum cur- rent $I_{MAX}$	Calculated power $P_{calc}$	SIMODRIVE 611 power module		Power cable with complete shield Motor connection via adapter cable with power connector for increased velocity/acceleration			
				Required rated current $I_{rated}/I_{MAX}$	Order No.	Pre-assembled adapter cable for motor Order No.	Power con- nector Size	Cable cross- section <sup>5)</sup> mm <sup>2</sup>	Pre-assembled basic cable to converter Order No.
	A	A	kW (HP)	A					
1FN3050-2WC00-...	2.7	8.2	4.1 (5.5)	5/10	For ordering data, see Converter system	– <sup>6)</sup>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3050-2WC00-...	2.7	8.2	4.1 (5.5)	5/10		– <sup>7)</sup>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3100-1WC00-...	2.4	6.5	3.1 (4.2)	5/10		<b>6FX7002-5LM42- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3100-2WC00-...	5.1	13.5	6.3 (8.5)	9/18		<b>6FX7002-5LM42- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3100-2WE00-...	8.1	21.5	8.3 (11.1)	18/36		<b>6FX7002-5LM42- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3100-3WC00-...	7.2	19.1	9.2 (12.3)	18/36		<b>6FX7002-5LM42- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3100-3WE00-...	12.1	32.2	12.4 (16.6)	18/36		<b>6FX7002-5LM42- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3100-4WC00-...	10.1	27.0	12.6 (16.9)	18/36		<b>6FX7002-5LM42- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3100-4WE00-...	16.1	43.0	16.5 (22.1)	28/56		<b>6FX7002-5LM42- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3100-5WC00-...	11.0	29.5	14.4 (19.3)	18/36		<b>6FX7002-5LM42- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3150-1WC00-...	3.6	9.5	4.3 (5.8)	5/10		<b>6FX7002-5LM42- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3150-2WC00-...	7.2	19.1	8.7 (11.7)	18/36		<b>6FX7002-5LM42- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3150-3WC00-...	10.7	28.6	13.0 (17.4)	18/36		<b>6FX7002-5LM42- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3150-4WC00-...	14.3	38.2	17.4 (23.3)	28/56		<b>6FX7002-5LM42- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3150-5WC00-...	17.9	47.7	21.7 (29.1)	28/56		<b>6FX7002-5LM42- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3300-1WC00-...	6.5	20.0	8.7 (11.7)	18/36		<b>6FX7002-5LM62- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3300-2WB00-...	8.0	24.7	13.2 (17.7)	18/36		<b>6FX7002-5LM62- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3300-2WC00-...	12.6	39.2	16.8 (22.5)	28/56		<b>6FX7002-5LM62- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3300-2WG00-...	32.2	99.7	30.1 (40.4)	56/112		<b>6FX7002-5LM82- ....</b>	1.5	4 x 6	<b>6FX8002-5CA51- ....</b>
1FN3300-3WC00-...	19.0	58.7	25.1 (33.7)	28/56 <sup>8)</sup>		<b>6FX7002-5LM62- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>
1FN3300-3WG00-...	50.0	154.9	46.2 (61.9)	70/140 <sup>8)</sup>	<b>6FX7002-5LM02- ....</b>	1.5	4 x 16	<b>6FX8002-5CA71- ....</b>	
1FN3300-4WB00-...	16.0	49.4	26.3 (35.3)	28/56	<b>6FX7002-5LM62- ....</b>	1	4 x 2.5	<b>6FX8002-5CA11- ....</b>	
1FN3300-4WC00-...	25.3	78.3	33.5 (44.9)	56/112	<b>6FX7002-5LM72- ....</b>	1.5	4 x 4	<b>6FX8002-5CA41- ....</b>	
For length code as well as power and signal cables, see Connection system MOTION-CONNECT.						....			....

Designation	Order No.
<b>Signal cable, pre-assembled with M17 connector</b>	
• For 1FN3100/1FN3150 motors	<b>6FX7002-2SL01-....</b>
• For 1FN3300 to 1FN3900 motors	<b>6FX7002-2SL02-....</b>

<sup>1)</sup> For water cooling with inlet temperature 35 °C (95 °F).

<sup>2)</sup> A reduction of up to 30 % must be expected in case of motor standstill, at very low speeds, or with very short traverse paths.

<sup>3)</sup> Velocity values refer to a converter DC link voltage of 600 V DC.

<sup>4)</sup> No precision cooler available.

<sup>5)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

<sup>6)</sup> Permanently connected power and signal cables, length 2 m (6.56 ft), with open core ends:

<sup>7)</sup> Permanently connected power and signal cables, length 0.5 m (1.64 ft), with power connector size 1 and M17 signal connector.

<sup>8)</sup> Power modules are designed for feedrate force  $F_{rated}$ . If feedrate force  $F_{MAX}$  is utilized, the next largest power module must be used. If a power module with a higher rating is used, you must check whether the specified power cable can be connected to it.

# Synchronous motors

## Linear motors for SIMODRIVE 611

### 1FN3 standard type linear motors Version for peak load – water cooling

#### Selection and ordering data

Feedrate force		Maximum velocity <sup>3)</sup>		1FN3 linear motors – Version for peak load Water cooling		Weight, approx.	
$F_{rated}^{1)2)}$	$F_{MAX}$	$v_{MAX} at F_{MAX}$	$v_{MAX} at F_{rated}$	Primary section	Secondary section	Primary section without/with precision cooling	Secondary section without/with heatsink profiles
N (lb <sub>f</sub> )	N (lb <sub>f</sub> )	m/min (ft/min)	m/min (ft/min)	Order No.	Order No.	kg (lb)	kg (lb)
1 930 (434)	5 180 (1 165)	30 (98)	112 (368)	<b>1FN3450-2WA50-0BA1</b>	<b>1FN3450-4SA00-0AA0</b>	15.9/17.1 (35.1/37.7)	3.8/4 (8.4/8.8)
1 930 (434)	5 180 (1 165)	120 (394)	275 (902)	<b>1FN3450-2WC00-0BA1</b>		15.9/17.1 (35.1/37.7)	
1 930 (434)	5 180 (1 165)	240 (787)	519 (1 703)	<b>1FN3450-2WE00-0BA1</b>		15.9/17.1 (35.1/37.7)	
2 895 (651)	7 760 (1 745)	62 (203)	164 (538)	<b>1FN3450-3WB00-0BA1</b>		22.6/24.3 (49.8/53.6)	
2 895 (651)	7 760 (1 745)	90 (295)	217 (712)	<b>1FN3450-3WB50-0BA1</b>		22.6/24.3 (49.8/53.6)	
2 895 (651)	7 760 (1 745)	120 (394)	275 (902)	<b>1FN3450-3WC00-0BA1</b>		22.6/24.3 (49.8/53.6)	
2 895 (651)	7 760 (1 745)	240 (787)	519 (1 703)	<b>1FN3450-3WE00-0BA1</b>		22.6/24.3 (49.8/53.6)	
3 860 (868)	10 350 (2 327)	62 (203)	164 (538)	<b>1FN3450-4WB00-0BA1</b>		30.9/33.1 (68.1/73)	
3 860 (868)	10 350 (2 327)	90 (295)	217 (712)	<b>1FN3450-4WB50-0BA1</b>		30.9/33.1 (68.1/73)	
3 860 (868)	10 350 (2 327)	120 (394)	275 (902)	<b>1FN3450-4WC00-0BA1</b>		30.9/33.1 (68.1/73)	
3 860 (868)	10 350 (2 327)	240 (787)	519 (1 703)	<b>1FN3450-4WE00-0BA1</b>	30.9/33.1 (68.1/73)		
2 610 (587)	6 900 (1 551)	36 (118)	120 (394)	<b>1FN3600-2WA50-0BA1</b>	<b>1FN3600-4SA00-0AA0</b>	22.2/24.7 (49/54.5)	4.6/5 (10.1/11)
3 915 (880)	10 350 (2 327)	58 (190)	155 (509)	<b>1FN3600-3WB00-0BA1</b>		31.5/33.4 (69.5/73.7)	
3 915 (880)	10 350 (2 327)	112 (368)	254 (833)	<b>1FN3600-3WC00-0BA1</b>		31.5/33.4 (69.5/73.7)	
5 220 (1 174)	13 800 (3 102)	26 (85)	105 (345)	<b>1FN3600-4WA30-0BA1</b>		40.8/43.3 (90/95.5)	
5 220 (1 174)	13 800 (3 102)	58 (190)	155 (509)	<b>1FN3600-4WB00-0BA1</b>		40.8/43.3 (90/95.5)	
5 220 (1 174)	13 800 (3 102)	91 (299)	215 (705)	<b>1FN3600-4WB50-0BA1</b>		40.8/43.3 (90/95.5)	
5 220 (1 174)	13 800 (3 102)	112 (368)	254 (833)	<b>1FN3600-4WC00-0BA1</b>		40.8/43.3 (90/95.5)	
4 050 (910)	10 350 (2 327)	65 (213)	160 (525)	<b>1FN3900-2WB00-0BA1</b>	<b>1FN3900-4SA00-0AA0</b>	28.2/29.7 (62.2/65.4)	7.5/7.9 (16.5/17.4)
4 050 (910)	10 350 (2 327)	115 (377)	253 (830)	<b>1FN3900-2WC00-0BA1</b>		28.2/29.7 (62.2/65.4)	
6 075 (1 366)	15 530 (3 491)	75 (246)	181 (594)	<b>1FN3900-3WB00-0BA1</b>		42.2/44.3 (93.1/97.6)	
8 100 (1 821)	20 700 (4 653)	65 (213)	160 (525)	<b>1FN3900-4WB00-0BA1</b>		56.2/58.9 (124/130)	
8 100 (1 821)	20 700 (4 653)	88 (290)	203 (666)	<b>1FN3900-4WB50-0BA1</b>		56.2/58.9 (124/130)	
8 100 (1 821)	20 700 (4 653)	115 (377)	253 (830)	<b>1FN3900-4WC00-0BA1</b>		56.2/58.9 (124/130)	

#### Type of connection:

Frame sizes 1FN3100 to 1FN3900

**B**

Connection cover prepared for separate power and signal cables

# Synchronous motors

## Linear motors for SIMODRIVE 611

1FN3 standard type linear motors  
Version for peak load – water cooling

### Selection and ordering data

Motor type Primary section (continued)	Rated current $I_{rated}^1)$	Maxi- mum current $I_{MAX}$	Calculated power $P_{calc}$	SIMODRIVE 611 power module		Power cable with complete shield Motor connection via adapter cable with power connector for increased velocity/acceleration			
				Required rated current $I_{rated}/I_{MAX}$	Order No.	Pre-assembled adapter cable for motor Order No.	Power con- nector Size	Cable cross- section <sup>4)</sup> mm <sup>2</sup>	Pre-assembled basic cable to converter Order No.
1FN3450-2WA50-...	8.6	25.3	15.9 (21.3)	18/36	For ordering data, see Converter system	6FX7002-5LM62- ....	1	4 x 2.5	6FX8002-5CA11- ....
1FN3450-2WC00-...	18.8	55.3	23.1 (31)	28/56		6FX7002-5LM62- ....	1	4 x 2.5	6FX8002-5CA11- ....
1FN3450-2WE00-...	33.8	99.7	32.6 (43.7)	56/112		6FX7002-5LM82- ....	1.5	4 x 6	6FX8002-5CA51- ....
1FN3450-3WB00-...	17.9	52.7	27.5 (36.9)	28/56		6FX7002-5LM62- ....	1	4 x 2.5	6FX8002-5CA11- ....
1FN3450-3WB50-...	22.8	67.3	31.1 (41.7)	56/112		6FX7002-5LM72- ....	1.5	4 x 4	6FX8002-5CA41- ....
1FN3450-3WC00-...	28.1	83.0	34.6 (46.4)	56/112		6FX7002-5LM72- ....	1.5	4 x 4	6FX8002-5CA41- ....
1FN3450-3WE00-...	50.7	149.6	48.9 (65.6)	70/140 <sup>7)</sup>		6FX7002-5LM02- ....	1.5	4 x 16	6FX8002-5CA71- ....
1FN3450-4WB00-...	23.8	70.3	36.7 (49.2)	56/112		6FX7002-5LM72- ....	1.5	4 x 4	6FX8002-5CA41- ....
1FN3450-4WB50-...	30.4	89.8	41.4 (55.5)	56/112		6FX7002-5LM82- ....	1.5	4 x 6	6FX8002-5CA51- ....
1FN3450-4WC00-...	37.5	110.6	46.2 (61.9)	56/112		6FX7002-5LM32- ....	1.5	4 x 10	6FX8002-5CA61- ....
1FN3450-4WE00-...	67.6	199.5	65.3 (87.5)	140/210		6FX7008-1BB61- .... <sup>5)</sup>	–	4 x 25	6FX7008-1BB25- .... <sup>6)</sup>
1FN3600-2WA50-...	12.4	36.0	21.9 (29.4)	18/36		6FX7002-5LM62- ....	1	4 x 2.5	6FX8002-5CA11- ....
1FN3600-3WB00-...	23.2	67.3	35.4 (47.5)	56/112		6FX7002-5LM72- ....	1.5	4 x 4	6FX8002-5CA41- ....
1FN3600-3WC00-...	35.2	102.4	41.6 (55.8)	56/112		6FX7002-5LM82- ....	1.5	4 x 6	6FX8002-5CA51- ....
1FN3600-4WA30-...	22.3	64.9	41.8 (56.1)	42/64 <sup>7)</sup>		6FX7002-5LM72- ....	1.5	4 x 4	6FX8002-5CA41- ....
1FN3600-4WB00-...	30.9	89.8	47.2 (63.3)	56/112		6FX7002-5LM82- ....	1.5	4 x 6	6FX8002-5CA51- ....
1FN3600-4WB50-...	40.8	118.5	52.2 (70)	70/140	6FX7002-5LM32- ....	1.5	4 x 10	6FX8002-5CA61- ....	
1FN3600-4WC00-...	46.9	136.5	55.5 (74.4)	70/140	6FX7002-5LM32- ....	1.5	4 x 10	6FX8002-5CA61- ....	
1FN3900-2WB00-...	24.7	69.5	34.5 (46.3)	56/112	6FX7002-5LM72- ....	1.5	4 x 4	6FX8002-5CA41- ....	
1FN3900-2WC00-...	36.7	103.3	41.0 (55)	56/112	6FX7002-5LM32- ....	1.5	4 x 10	6FX8002-5CA61- ....	
1FN3900-3WB00-...	40.6	114.0	54.5 (73.1)	70/140	6FX7002-5LM32- ....	1.5	4 x 10	6FX8002-5CA61- ....	
1FN3900-4WB00-...	49.4	138.9	68.9 (92.4)	70/140	6FX7002-5LM32- ....	1.5	4 x 10	6FX8002-5CA61- ....	
1FN3900-4WB50-...	60.6	170.3	76.3 (102.3)	140/210	6FX7002-5LM02- ....	1.5	4 x 16	6FX8002-5CA71- ....	
1FN3900-4WC00-...	73.5	206.5	81.9 (109.8)	140/210	6FX7008-1BB61- .... <sup>5)</sup>	–	4 x 25	6FX7008-1BB25- .... <sup>6)</sup>	

For length code as well as power and signal cables, see Connection system MOTION-CONNECT.

Designation	Order No.
<b>Signal cable, pre-assembled with M17 connector</b>	
• For 1FN3100/1FN3150 motors	6FX7002-2SL01-....
• For 1FN3300 to 1FN3900 motors	6FX7002-2SL02-....

<sup>1)</sup> For water cooling with inlet temperature 35 °C (95 °F).

<sup>2)</sup> A reduction of up to 30 % must be expected in case of motor standstill, at very low speeds, or with very short traverse paths.

<sup>3)</sup> Velocity values refer to a converter DC link voltage of 600 V DC.

<sup>4)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

<sup>5)</sup> Sold by the meter only (4 x 16 mm<sup>2</sup>). Connected to primary section with 16 mm<sup>2</sup> (< 1.5 m (4.92 ft)) then routed onwards through terminal box with 25 mm<sup>2</sup>.

<sup>6)</sup> Sold by the meter only (4 x 25 mm<sup>2</sup>).

<sup>7)</sup> Power modules are designed for feedrate force  $F_{rated}$ . If feedrate force  $F_{MAX}$  is utilized, the next largest power module must be used. If a power module with a higher rating is used, you must check whether the specified power cable can be connected to it.

# Synchronous motors

## Linear motors for SIMODRIVE 611

### 1FN3 standard type linear motors

#### Version for continuous load – water cooling

#### Selection and ordering data

Feedrate force		Maximum velocity <sup>3)</sup>		1FN3 linear motors – Version for continuous load Water cooling		Weight, approx.	
$F_{rated}^{1)2)}$	$F_{MAX}$	$v_{MAX}$ at $F_{MAX}$	$v_{MAX}$ at $F_{rated}$	Primary section	Secondary section	Primary section without/with precision cooling	Secondary section without/with heatsink profiles
N (lb <sub>f</sub> )	N (lb <sub>f</sub> )	m/min (ft/min)	m/min (ft/min)	Order No.	Order No.	kg (lb)	kg (lb)
150 (34)	260 (58)	242 (794)	435 (1 427)	<b>1FN3050-1ND00-0EA1</b>	<b>1FN3050-4SA00-0AA0</b>	1.9/2.3 (4.2/5.1)	0.4/0.5 (0.9/1.1)
150 (34)	260 (58)	242 (794)	435 (1 427)	<b>1FN3050-1ND00-0FA1</b>		1.9/2.3 (4.2/5.1)	
300 (67)	510 (115)	108 (354)	202 (663)	<b>1FN3050-2NB80-0EA1</b>		3.2/3.9 (7.1/8.6)	
300 (67)	510 (115)	108 (354)	202 (663)	<b>1FN3050-2NB80-0FA1</b>		3.2/3.9 (7.1/8.6)	
300 (67)	510 (115)	117 (384)	214 (702)	<b>1FN3100-1NC00-0BA1</b>	<b>1FN3100-4SA00-0AA0</b>	3/3.5 (6.6/7.7)	0.7/0.8 (1.5/1.8)
605 (136)	1 020 (229)	170 (558)	307 (1 007)	<b>1FN3100-2NC80-0BA1</b>		5.1/5.9 (11.3/13.1)	
905 (203)	1 530 (344)	115 (337)	211 (692)	<b>1FN3100-3NC00-0BA1</b>		7.3/8.3 (16.1/18.03)	
1 205 (271)	2 040 (459)	169 (555)	305 (1 001)	<b>1FN3100-4NC80-0BA1</b>		10/11.9 (22.1/26.2)	
455 (102)	770 (173)	129 (423)	234 (768)	<b>1FN3150-1NC20-0BA1</b>	<b>1FN3150-4SA00-0AA0</b>	4.1/4.6 (9.0/10.1)	1.2/1.3 (2.7/2.9)
905 (203)	1 530 (344)	110 (361)	201 (660)	<b>1FN3150-2NB80-0BA1</b>		7.2/8.1 (15.9/17.9)	
1 360 (306)	2 300 (517)	163 (535)	292 (958)	<b>1FN3150-3NC70-0BA1</b>		10.5/11.6 (23.2/25.6)	
1 810 (407)	3 060 (688)	109 (358)	200 (656)	<b>1FN3150-4NB80-0BA1</b>		13.8/15.2 (30.4/33.5)	
865 (195)	1 470 (331)	129 (423)	230 (755)	<b>1FN3300-1NC10-0BA1</b>	<b>1FN3300-4SA00-0AA0</b>	8.8/9.5 (19.4/20.9)	2.4/2.6 (5.3/5.7)
1 730 (389)	2 940 (661)	127 (417)	228 (748)	<b>1FN3300-2NC10-0BA1</b>		16.1/17.2 (35.5/37.9)	
2 595 (583)	4 400 (989)	144 (473)	257 (843)	<b>1FN3300-3NC40-0BA1</b>		22.8/24.3 (50.3/53.6)	
3 460 (778)	5 870 (1 320)	109 (358)	196 (643)	<b>1FN3300-4NB80-0BA1</b>		30.4/32.3 (67.0/71.2)	
2 595 (583)	4 400 (989)	153 (502)	271 (889)	<b>1FN3450-2NC50-0BA1</b>	<b>1FN3450-4SA00-0AA0</b>	22/23.2 (48.5/51.2)	3.8/4 (8.4/8.8)
3 890 (875)	6 600 (1 484)	152 (499)	270 (886)	<b>1FN3450-3NC50-0BA1</b>		32/32.7 (70.6/72.1)	
5 185 (1 166)	8 810 (1 981)	106 (348)	190 (623)	<b>1FN3450-4NB80-0BA1</b>		42.3/44.4 (93.3/97.9)	
3 460 (778)	5 870 (1 320)	112 (368)	200 (656)	<b>1FN3600-2NB80-0BA1</b>	<b>1FN3600-4SA00-0AA0</b>	28.9/30.4 (63.7/67.0)	4.6/5 (10.1/11)
5 185 (1 166)	8 810 (1 981)	111 (364)	199 (653)	<b>1FN3600-3NB80-0BA1</b>		42.9/45.0 (94.6/99.2)	
6 915 (1 555)	11 740 (2 639)	111 (364)	199 (653)	<b>1FN3600-4NB80-0BA1</b>		56.6/59.2 (124.8/130.54)	
5 185 (1 166)	8 810 (1 981)	71 (233)	130 (427)	<b>1FN3900-2NB20-0BA1</b>	<b>1FN3900-4SA00-0AA0</b>	42.4/44.2 (93.5/97.5)	7.5/7.9 (16.5/17.4)
7 780 (1 749)	13 210 (2 970)	71 (233)	129 (423)	<b>1FN3900-3NB20-0BA1</b>		62/64.5 (136.7/142.2)	
10 375 (2 332)	17 610 (3 959)	70 (230)	129 (423)	<b>1FN3900-4NB20-0BA1</b>		82.2/85.4 (181.3/188.3)	

#### Type of connection:

Frame sizes 1FN3100 to 1FN3900

Connection cover prepared for separate power and signal cables

Frame size 1FN3050

Permanently connected power and signal cables with open core ends

Length: 2 m (6.56 ft)

Frame size 1FN3050

Permanently connected power and signal cables pre-assembled, with connectors

Length: 0.5 m (1.64 ft)

**B**

**E**

**F**



# Synchronous motors

## Linear motors for SIMODRIVE 611

1FN3 standard type linear motors  
Version for continuous load – water cooling

### Selection and ordering data

Motor type Primary section (continued)	Rated current $I_{rated}^{1)}$	Maxi- mum current $I_{MAX}$	Calculated power $P_{calc}$	SIMODRIVE 611 power module		Power cable with complete shield Motor connection via adapter cable with power connector for increased velocity/acceleration				
				Required rated current $I_{rated}/I_{MAX}$	Order No.	Pre-assembled adapter cable for motor Order No.	Power con- nector Size	Cable cross- section <sup>5)</sup> mm <sup>2</sup>	Pre-assembled basic cable to converter Order No.	
1FN3050-1ND...	2.8	5.9	1.8 (2.4)	3/6	For ordering data, see Converter system	6)	1	4 x 2.5	6FX8002-5CA11- ...	
1FN3050-1ND...	2.8	5.9	1.8 (2.4)	3/6		6)	1	4 x 2.5	6FX8002-5CA11- ...	
1FN3050-2NB...	2.8	5.9	2.4 (3.2)	3/6		6)	1	4 x 2.5	6FX8002-5CA11- ...	
1FN3050-2NB...	2.8	5.9	2.4 (3.2)	3/6		6)	1	4 x 2.5	6FX8002-5CA11- ...	
1FN3100-1NC...	2.8	5.9	2.1 (2.8)	3/6		6FX7002-5LM42- ...	1	4 x 2.5	6FX8002-5CA11- ...	
1FN3100-2NC...	8	16.5	5.2 (7)	9/18		6FX7002-5LM42- ...	1	4 x 2.5	6FX8002-5CA11- ...	
1FN3100-3NC...	8.5	17.6	6.3 (8.5)	9/18		6FX7002-5LM42- ...	1	4 x 2.5	6FX8002-5CA11- ...	
1FN3100-4NC...	15.9	33.1	10.3 (13.8)	18/36		6FX7002-5LM42- ...	1	4 x 2.5	6FX8002-5CA11- ...	
1FN3150-1NC...	4.5	9.4	3.2 (4.3)	5/10		6FX7002-5LM42- ...	1	4 x 2.5	6FX8002-5CA11- ...	
1FN3150-2NB...	8	16.5	5.9 (7.9)	9/18		6FX7002-5LM42- ...	1	4 x 2.5	6FX8002-5CA11- ...	
1FN3150-3NC...	16.9	35.2	10.8 (14.5)	18/36		6FX7002-5LM42- ...	1	4 x 2.5	6FX8002-5CA11- ...	
1FN3150-4NB...	15.9	33.1	11.7 (15.7)	18/36		6FX7002-5LM42- ...	1	4 x 2.5	6FX8002-5CA11- ...	
1FN3300-1NC...	8.1	17.1	5.4 (7.2)	9/18		6FX7002-5LM62- ...	1	4 x 2.5	6FX8002-5CA11- ...	
1FN3300-2NC...	16.2	34.1	10.8 (14.5)	18/36		6FX7002-5LM62- ...	1	4 x 2.5	6FX8002-5CA11- ...	
1FN3300-3NC...	27.3	57.4	17.4 (23.3)	28/56 <sup>4)</sup>		6FX7002-5LM72- ...	1.5	4 x 4	6FX8002-5CA41- ...	
1FN3300-4NB...	28.4	59.6	19.8 (26.6)	28/56 <sup>4)</sup>		6FX7002-5LM72- ...	1.5	4 x 4	6FX8002-5CA41- ...	
1FN3450-2NC...	28.4	59.6	17.5 (23.5)	28/56 <sup>4)</sup>		6FX7002-5LM72- ...	1.5	4 x 4	6FX8002-5CA41- ...	
1FN3450-3NC...	42.5	89.5	26.2 (35.1)	42/64 <sup>4)</sup>		6FX7002-5LM32- ...	1.5	4 x 10	6FX8002-5CA61- ...	
1FN3450-4NB...	40.8	85.8	28.1 (37.7)	42/64 <sup>4)</sup>		6FX7002-5LM32- ...	1.5	4 x 10	6FX8002-5CA61- ...	
1FN3600-2NB...	28.4	59.6	19.1 (25.6)	28/56 <sup>4)</sup>		6FX7002-5LM72- ...	1.5	4 x 4	6FX8002-5CA41- ...	
1FN3600-3NB...	42.5	89.5	28.5 (38.2)	42/64 <sup>4)</sup>		6FX7002-5LM32- ...	1.5	4 x 10	6FX8002-5CA61- ...	
1FN3600-4NB...	56.7	119.3	38 (51)	56/112 <sup>4)</sup>		6FX7002-5LM02- ...	1.5	4 x 16	6FX8002-5YP02- ...	
1FN3900-2NB...	28.4	59.6	22 (29.5)	28/56 <sup>4)</sup>		6FX7002-5LM72- ...	1.5	4 x 4	6FX8002-5CA41- ...	
1FN3900-3NB...	42.5	89.5	32.9 (44.1)	42/64 <sup>4)</sup>		6FX7002-5LM32- ...	1.5	4 x 10	6FX8002-5CA61- ...	
1FN3900-4NB...	56.7	119.3	43.8 (58.7)	56/112 <sup>4)</sup>		6FX7002-5LM02- ...	1.5	4 x 16	6FX8002-5YP02- ...	
For length code as well as power and signal cables, see Connection system MOTION-CONNECT.						....			....	

Designation	Order No.
<b>Signal cable, pre-assembled with M17 connector</b>	
• For 1FN3100/1FN3150 motors	6FX7002-2SL01-....
• For 1FN3300 to 1FN3900 motors	6FX7002-2SL02-....

<sup>1)</sup> For water cooling with inlet temperature 35 °C (95 °F).

<sup>2)</sup> A reduction of up to 30 % must be expected in case of motor standstill, at very low speeds, or with very short traverse paths.

<sup>3)</sup> Velocity values refer to a converter DC link voltage of 600 V DC.

<sup>4)</sup> Power modules are designed for feedrate force  $F_{rated}$ . If feedrate force  $F_{MAX}$  is utilized, the next largest power module must be used. If a power module with a higher rating is used, you must check whether the specified power cable can be connected to it.

<sup>5)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

<sup>6)</sup> Permanently connected power and signal cables.

# Synchronous motors

## Linear motors for SIMODRIVE 611

### 1FN3 standard type linear motors

#### Water cooling

#### Selection and ordering data

1FN3 linear motors Type	Optional components Secondary section cover		Cover end pieces for secondary section cover <sup>2)</sup> Retaining of the integrated cover without heat sink profiles Order No.
	Integrated <sup>1)</sup> Order No.	Segmented Order No.	
1FN3050-...	<b>1FN3050-0TB00-1</b> ■ ■ 0	<b>1FN3050-4TP00-1A</b> ■ ■	<b>1FN3050-0TC00-0AA0</b>
1FN3100-...	<b>1FN3100-0TB00-1</b> ■ ■ 0	<b>1FN3100-4TP00-1A</b> ■ ■	<b>1FN3100-0TC00-0AA0</b>
1FN3150-...	<b>1FN3150-0TB00-1</b> ■ ■ 0	<b>1FN3150-4TP00-1A</b> ■ ■	<b>1FN3150-0TC00-0AA0</b>
1FN3300-...	<b>1FN3300-0TB00-1</b> ■ ■ 0	<b>1FN3300-4TP00-1A</b> ■ ■	<b>1FN3300-0TC00-0AA0</b>
1FN3450-...	<b>1FN3450-0TB00-1</b> ■ ■ 0	<b>1FN3450-4TP00-1A</b> ■ ■	<b>1FN3450-0TC00-0AA0</b>
1FN3600-...	<b>1FN3600-0TB00-1</b> ■ ■ 0	<b>1FN3600-4TP00-1A</b> ■ ■	–
1FN3900-...	<b>1FN3900-0TB00-1</b> ■ ■ 0	<b>1FN3900-4TP00-1A</b> ■ ■	–

<b>Number of secondary sections</b>	0	<b>A</b>	<b>Number of secondary sections for all frame sizes</b>	2.5	<b>C</b>	<b>5</b>
	10	<b>B</b>		3	<b>D</b>	<b>0</b>
	20	<b>C</b>		3.5	<b>D</b>	<b>5</b>
	30	<b>D</b>		4	<b>E</b>	<b>0</b>
	40	<b>E</b>		5	<b>F</b>	<b>0</b>
	50	<b>F</b>				
	0	<b>A</b>	<b>Number of secondary sections for frame sizes 1FN3600/1FN3900</b>	5.5	<b>F</b>	<b>5</b>
	1	<b>B</b>		6.5	<b>G</b>	<b>5</b>
	2	<b>C</b>				
	3	<b>D</b>				
	4	<b>E</b>				
	5	<b>F</b>				
	6	<b>G</b>				
7	<b>H</b>					
8	<b>J</b>					
9	<b>K</b>					

1FN3 linear motors Version for peak load	Optional components Precision cooler
Type	Order No.
1FN3050-2W...	<b>1FN3050-2PK00-0AA0</b>
1FN3100-2W...	<b>1FN3100-2PK00-0AA0</b>
1FN3100-3W...	<b>1FN3100-3PK00-0AA0</b>
1FN3100-4W...	<b>1FN3100-4PK00-0AA0</b>
1FN3100-5W...	<b>1FN3100-5PK00-0AA0</b>
1FN3150-2W...	<b>1FN3150-2PK00-0AA0</b>
1FN3150-3W...	<b>1FN3150-3PK00-0AA0</b>
1FN3150-4W...	<b>1FN3150-4PK00-0AA0</b>
1FN3150-5W...	<b>1FN3150-5PK00-0AA0</b>
1FN3300-2W...	<b>1FN3300-2PK00-0AA0</b>
1FN3300-3W...	<b>1FN3300-3PK00-0AA0</b>
1FN3300-4W...	<b>1FN3300-4PK00-0AA0</b>
1FN3450-2W...	<b>1FN3450-2PK00-0AA0</b>
1FN3450-3W...	<b>1FN3450-3PK00-0AA0</b>
1FN3450-4W...	<b>1FN3450-4PK00-0AA0</b>
1FN3600-2W...	<b>1FN3600-2PK00-0AA0</b>
1FN3600-3W...	<b>1FN3600-3PK00-0AA0</b>
1FN3600-4W...	<b>1FN3600-4PK00-0AA0</b>
1FN3900-2W...	<b>1FN3900-2PK00-0AA0</b>
1FN3900-3W...	<b>1FN3900-3PK00-0AA0</b>
1FN3900-4W...	<b>1FN3900-4PK00-0AA0</b>

1FN3 linear motors Version for continuous load	Optional components Precision cooler
Type	Order No.
1FN3050-1N...	<b>1FN3050-1PK10-0AA0</b>
1FN3050-2N...	<b>1FN3050-2PK10-0AA0</b>
1FN3100-1N...	<b>1FN3100-1PK10-0AA0</b>
1FN3100-2N...	<b>1FN3100-2PK10-0AA0</b>
1FN3100-3N...	<b>1FN3100-3PK10-0AA0</b>
1FN3100-4N...	<b>1FN3100-4PK10-0AA0</b>
1FN3150-1N...	<b>1FN3150-1PK10-0AA0</b>
1FN3150-2N...	<b>1FN3150-2PK10-0AA0</b>
1FN3150-3N...	<b>1FN3150-3PK10-0AA0</b>
1FN3150-4N...	<b>1FN3150-4PK10-0AA0</b>
1FN3300-1N...	<b>1FN3300-1PK10-0AA0</b>
1FN3300-2N...	<b>1FN3300-2PK10-0AA0</b>
1FN3300-3N...	<b>1FN3300-3PK10-0AA0</b>
1FN3300-4N...	<b>1FN3300-4PK10-0AA0</b>
1FN3450-2N...	<b>1FN3450-2PK10-0AA0</b>
1FN3450-3N...	<b>1FN3450-3PK10-0AA0</b>
1FN3450-4N...	<b>1FN3450-4PK10-0AA0</b>
1FN3600-2N...	<b>1FN3600-2PK10-0AA0</b>
1FN3600-3N...	<b>1FN3600-3PK10-0AA0</b>
1FN3600-4N...	<b>1FN3600-4PK10-0AA0</b>
1FN3900-2N...	<b>1FN3900-2PK10-0AA0</b>
1FN3900-3N...	<b>1FN3900-3PK10-0AA0</b>
1FN3900-4N...	<b>1FN3900-4PK10-0AA0</b>

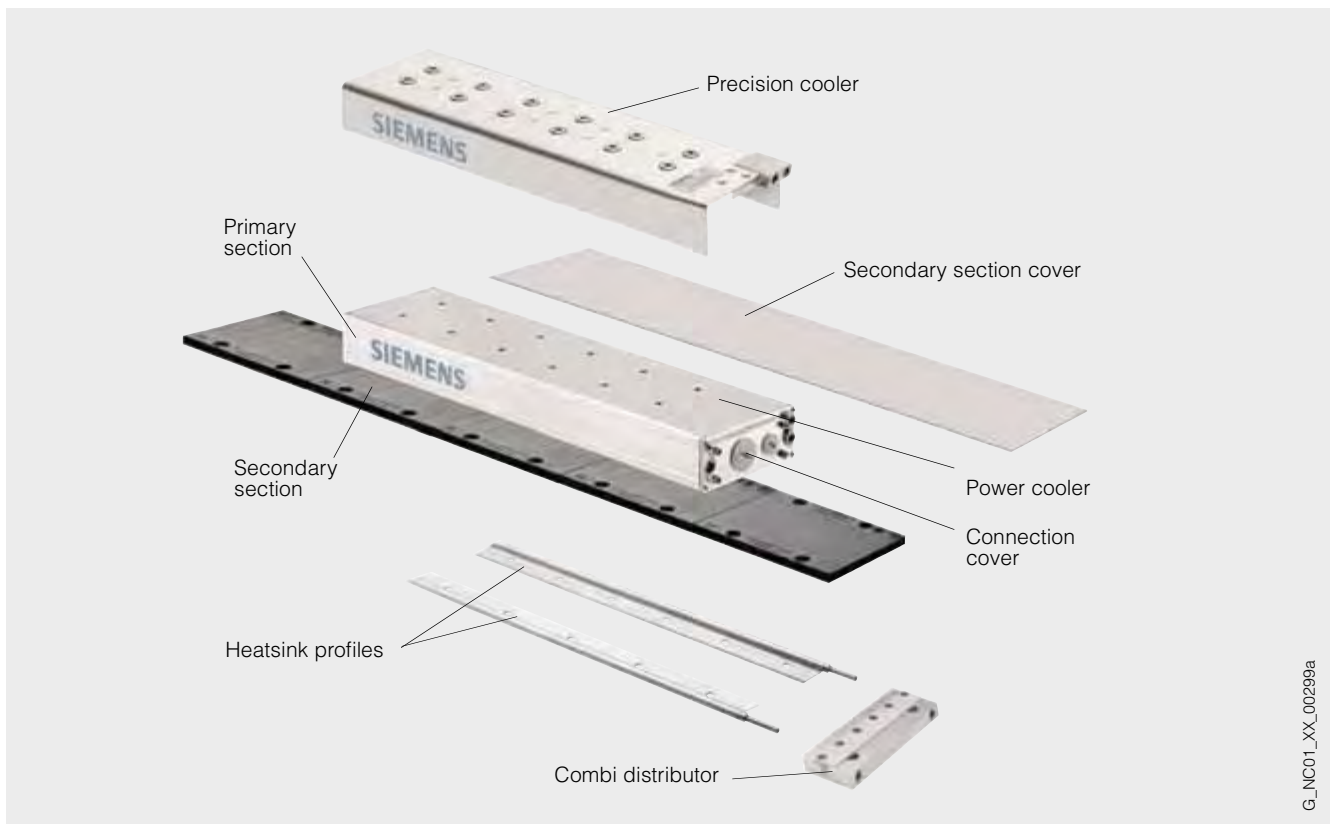
<sup>1)</sup> Integrated cover for several secondary sections. The maximum length of the secondary section cover is 6 m (19.7 ft). For the following frame sizes, this corresponds to: 1FN3050 to 1FN3150, a maximum number of 50 secondary sections (AB to FA). 1FN3300 to 1FN3900, a maximum number of 32 secondary sections (AB to DC).

<sup>2)</sup> The secondary section end pieces are designed to allow clamping of the integrated secondary section cover.

# Synchronous motors

## Linear motors for SIMODRIVE 611

1FN3 standard type linear motors  
Water cooling



G\_NC01\_XX\_00299a

6

### Selection and ordering data

Linear motors Type	Optional components			
	Heatsink profile <sup>3)</sup>	Secondary section end pieces <sup>2)</sup>		
		Combi distributor	Combi adapter	Combi end piece
		Parallel water connection for all heatsink profiles	Combi adapter and end piece can only be implemented together. Single-sided water connection	Water diversion
	Order No.	Order No.	Order No.	Order No.
1FN3050-...	1FN3002-0TK0 ■ -1 ■ ■ 0	1FN3050-0TJ01-0AA0	1FN3050-0TG01-0AA0	1FN3050-0TF01-0AA0
1FN3100-...	1FN3002-0TK0 ■ -1 ■ ■ 0	1FN3100-0TJ01-0AA0	1FN3100-0TG01-0AA0	1FN3100-0TF01-0AA0
1FN3150-...	1FN3002-0TK0 ■ -1 ■ ■ 0	1FN3150-0TJ01-0AA0	1FN3150-0TG01-0AA0	1FN3150-0TF01-0AA0
1FN3300-...	1FN3003-0TK0 ■ -1 ■ ■ 0	1FN3300-0TJ01-0AA0	1FN3300-0TG01-0AA0	1FN3300-0TF01-0AA0
1FN3450-...	1FN3003-0TK0 ■ -1 ■ ■ 0	1FN3450-0TJ01-0AA0	1FN3450-0TG01-0AA0	1FN3450-0TF01-0AA0
1FN3600-...	1FN3004-0TK0 ■ -1 ■ ■ 0	1FN3600-0TJ01-0AA0	–	–
1FN3900-...	1FN3005-0TK0 ■ -1 ■ ■ 0	1FN3900-0TJ01-0AA0	–	–

**With plug-in coupling prepared** for connection to combi distributor with plug-in coupling, combi adapter with plug-in coupling, combi end piece with plug-in coupling or as intermediate unit for heatsink profile with cable grommet nipple  
Frame sizes 1FN3050 to 1FN3450<sup>4)</sup>:  
**Grommet nipple only on right end** of secondary section track  
Frame sizes 1FN3600/1FN3900:  
**Grommet nipple on both ends** of secondary section track  
Frame sizes 1FN3050 to 1FN3450<sup>4)</sup>:  
**Grommet nipple only on left end** of secondary section track

	Number of secondary sections
A	0
B	10
C	20
A	0
B	1
C	2
D	3
E	4
F	5
G	6
H	7
J	8
K	9

<sup>3)</sup> Frame sizes 1FN3050 to 1FN3450:  
2 units per secondary section track.  
1FN3600 to 1FN3900:  
3 units per secondary section track.  
The maximal available length of a single-part heatsink profile is 3 m (9.84 ft).  
For the following frame sizes, this corresponds to:  
1FN3050 to 1FN3150, a maximum of 24 secondary sections (AB to CE)  
1FN3300 to 1FN3900, a maximum of 16 secondary sections (AB to BG).

<sup>4)</sup> Available only in length AC (equals 2 secondary sections). The difference in the secondary section track length must be compensated through assembly with the heatsink profile 1FN300.-0TK04-1..0.

# Synchronous motors

## Linear motors for SIMODRIVE 611

### 1FN3 linear motors Hall-effect sensor box

#### Overview



The motor position can be identified with an incremental linear measuring system using an additional hall-effect sensor box, or also motion-based if certain supplementary conditions are taken into account.

### 1FN3 linear motors Connector box

#### Overview



A connector box is required to connect a hall-effect sensor box (option).

#### Selection and ordering data

Linear motor	Hall-effect sensor box	
1FN3	Straight cable outlet	Cable outlet at side
Type	Order No.	Order No.

#### Mounted opposite primary section terminal end

1FN3050-2... 1FN3100-2... 1FN3100-4... 1FN3150-2... 1FN3150-4...	<b>1FN3002-0PH00-0AA0</b>	<b>1FN3002-0PH01-0AA0</b>
--	---------------------------	---------------------------

1FN3100-1... 1FN3100-3... 1FN3100-5... 1FN3150-1... 1FN3150-3... 1FN3150-5...	<b>1FN3005-0PH00-0AA0</b>	<b>1FN3005-0PH01-0AA0</b>
--	---------------------------	---------------------------

1FN3300-2... 1FN3300-4... 1FN3450-2... 1FN3450-4... 1FN3600-2... 1FN3600-4... 1FN3900-2... 1FN3900-4...	<b>1FN3003-0PH00-0AA0</b>	<b>1FN3003-0PH01-0AA0</b>
--	---------------------------	---------------------------

1FN3300-1... 1FN3300-3... 1FN3450-3... 1FN3600-3... 1FN3900-3...	<b>1FN3006-0PH00-0AA0</b>	<b>1FN3006-0PH01-0AA0</b>
--	---------------------------	---------------------------

#### Mounted on primary section terminal end

1FN3050-... 1FN3100-... 1FN3150-...	<b>1FN3002-0PH00-0AA0</b>	<b>1FN3002-0PH01-0AA0</b>
---	---------------------------	---------------------------

1FN3300-... 1FN3450-... 1FN3600-... 1FN3900-...	<b>1FN3003-0PH00-0AA0</b>	<b>1FN3003-0PH01-0AA0</b>
--	---------------------------	---------------------------

#### Technical specifications

<b>Product name</b>	Connector box
<b>Degree of protection in accordance with EN 60529-5 (IEC 60529)</b>	IP65
<b>Air humidity in accordance with DIN 40040</b>	95 % (without condensation)
<b>Dimensions</b> (without sockets or cable glands)	
• Width	69.6 mm (2.74 in)
• Height	54 mm (2.13 in)
• Depth	25 mm (0.98 in)
<b>Weight, approx.</b>	0.26 kg (0.57 lb)

#### Selection and ordering data

Designation	Order No.
<b>Connector box</b>	<b>1FN1910-0AA00-0AA0</b>
For connecting an incremental encoder	

# Synchronous motors

## Linear motors for SIMODRIVE 611

### 1FN3 motors Measuring systems

### 1FN3 linear motors Liquid cooling

#### Overview

#### Recommended linear measuring systems for 1FN3 linear motors

Type	Absolute encoder EnDat enclosed	
	LC 183	LC 483
Signal cycle	20 µm	20 µm
Acceleration in measuring direction, max.	100 m/s <sup>2</sup> (328 ft/s <sup>2</sup> )	100 m/s <sup>2</sup> (328 ft/s <sup>2</sup> )
Traversing velocity, max.	180 m/min (591 ft/min)	180 m/min (591 ft/min)
Measuring length, max.	3 040 mm (120 in)	2 040 mm (80.3 in)
Output signal	1 V <sub>pp</sub>	1 V <sub>pp</sub>

Type	Incremental encoder sin/cos 1 V <sub>pp</sub> enclosed	
	LS 187 (C)	LS 487 (C)
Signal cycle	20 µm	20 µm
Acceleration in measuring direction, max.	100 m/s <sup>2</sup> (328 ft/s <sup>2</sup> )	100 m/s <sup>2</sup> (328 ft/s <sup>2</sup> )
Traversing velocity, max.	120 m/min (394 ft/min)	120 m/min (394 ft/min)
Measuring length, max.	3 040 mm (120 in)	2 040 mm (80.3 in)
Output signal	1 V <sub>pp</sub>	1 V <sub>pp</sub>

Type	Incremental encoder sin/cos 1 V <sub>pp</sub> open		
	LIDA 185	LIDA 485	Renishaw RG2
Signal cycle	40 µm	20 µm	20 µm
Acceleration in measuring direction, max.	200 m/s <sup>2</sup> (656 ft/s <sup>2</sup> ) <sup>1)</sup>	200 m/s <sup>2</sup> (656 ft/s <sup>2</sup> ) <sup>1)</sup>	300 m/s <sup>2</sup> (984 ft/s <sup>2</sup> ) <sup>1)</sup>
Traversing velocity, max.	480 m/min (1 575 ft/min)	480 m/min (1 575 ft/min)	300 m/min (984 ft/min)
Measuring length, max.	30 040 mm (1 183 in)	30 040 mm (1 183 in)	50 000 mm (1 968 in)
Output signal	1 V <sub>pp</sub>	1 V <sub>pp</sub>	1 V <sub>pp</sub>

<sup>1)</sup> Refers to the measuring head.

#### Overview

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

Please get in touch with the contact persons of the cooling unit manufacturers listed below for technical information.

#### BKW Kälte-Wärme-Versorgungstechnik GmbH

Benzstraße 2  
72649 WOLFSLUGEN, Germany  
Phone: +49 (0) 7022-5003-0  
Fax: +49 (0) 7022-5003-30  
E-mail: [info@bkw-kuema.de](mailto:info@bkw-kuema.de)  
[www.bkw-kuema.de](http://www.bkw-kuema.de)

#### Helmut Schimpke und Team Industriekühlanlagen GmbH + Co. KG

Contact person: Ginsterweg 25-27  
Mr. Gerken 42781 HAAN, Germany  
Phone: +49 (0) 2129-9438-0  
Fax: +49 (0) 2129-9438-99  
E-mail: [info@schimpke.de](mailto:info@schimpke.de)  
[www.schimpke.de](http://www.schimpke.de)

#### Hydac System GmbH

Contact person: Postfach 12 51  
Mr. Klein 66273 SULZBACH/SAAR, Germany  
Phone: +49 (0) 6897-509-708  
Fax: +49 (0) 6897-509-454  
E-mail: [winfried.klein@hydac.com](mailto:winfried.klein@hydac.com)  
[www.hydac.com](http://www.hydac.com)

#### Pfannenberg GmbH

Contact person: Werner-Witt-Straße 1  
Mr. Hille 21035 HAMBURG, Germany  
Phone: +49 (0) 40-73412-127  
Fax: +49 (0) 40-73412-101  
E-mail: [werner.hille@pfannenberg.com](mailto:werner.hille@pfannenberg.com)  
[www.pfannenberg.com](http://www.pfannenberg.com)

#### Rittal GmbH & Co. KG

Contact person: Postfach 16 62  
Mr. Cieslar 35726 HERBORN, Germany  
Phone: +49 (0) 2772-505-2063  
Fax: +49 (0) 2772-505-2966  
E-mail: [cieslar.g@rittal.de](mailto:cieslar.g@rittal.de)  
[www.rittal.de](http://www.rittal.de)

For design of the coolers, see Configuration Manual (see documentation for Order No.).

# Synchronous motors

## Torque motors for SIMODRIVE 611

### 1FW6 standard type built-in torque motors Water cooling

#### Overview



1FW6 built-in torque motors are liquid-cooled, multi-pole permanent-magnet AC synchronous motors with hollow-shaft rotor. The 1FW6 motors are supplied as built-in components that are held together in the delivered state by transport locks. For a complete drive unit, an additional bearing and shaft encoder are required.

Each frame size is available in different axis lengths. The stator and rotor are equipped with flanges at each end with centering surfaces and threaded holes for installation in the machine.

**Please note that when 1FW6 direct motors (torque motors) are used in fork heads for machine tools or robots, a license for US patent US5584621 and the associated international patent protection may be required.**

#### Benefits

- No elasticity in the drive train
- High availability, since there are no gear components subject to wear in the drive train
- High torque, compact design and low construction volume
- Low moment of inertia
- Direct coupling to the machine using flanges

#### Application

In conjunction with the SIMODRIVE 611 digital/universal HRS converter system, the built-in torque motors can be used as direct drive for the following machine applications:

- Rotary indexing machines, rotary tables, swivel axes
- Rotary axes (A, B, C axis in 5-axis machine tools)
- Turret indexing and cylinder indexing for single-spindle and multi-spindle machines
- Dynamic tool magazines
- Rotating spindles in milling machines
- Roller and cylinder drives
- Infeed and handling axes

#### Design

The 1FW6 built-in torque motor comprises the following components:

##### Stator

Iron core with a 3-phase AC winding. To improve dissipation of the heat loss, the motor can be force-cooled by means of a liquid cooler (main cooler).

##### Rotor

Cylindrical hollow shaft made of steel with permanent magnets fixed to the circumference.

If the main cooler and precision cooler are used together in a heat exchanger, a cooling connection adapter (accessory) can be ordered separately for simpler connection.

##### Cooler types

The design of the cooler system is dependent on the size (external diameter) of the motor.

1FW6 motor Type	Type of cooling
1FW6090 to 1FW6130	Jacket cooling
1FW6160 to 1FW6290	Integrated cooling

# Synchronous motors

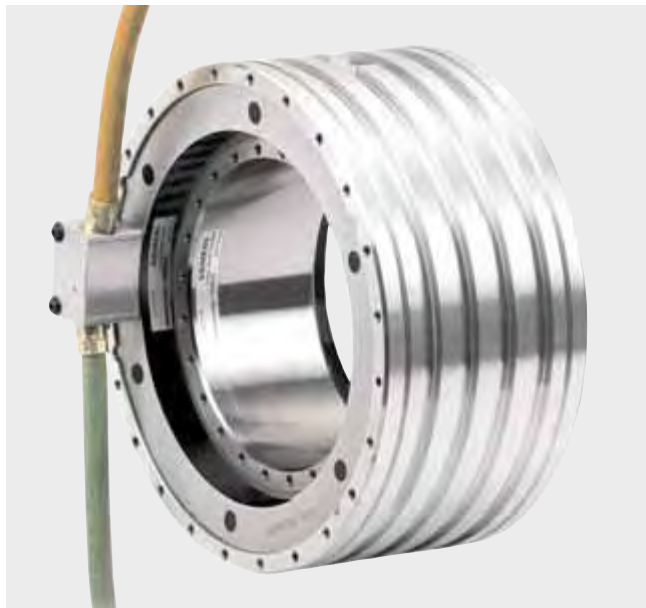
## Torque motors for SIMODRIVE 611

1FW6 standard type built-in torque motors  
Water cooling

### Design (continued)

#### Motors with jacket cooling

The coolant inlet and outlet must be provided by the machine manufacturer in the surrounding construction.



Motor components of sizes 1FW6090 to 1FW6150 with jacket cooling (rotor, stator)

#### Motors with integrated cooling

These motors feature a ready-to-connect, integrated dual-circuit cooling system and are therefore thermally insulated against the mechanical axis construction to a considerable extent.



Motor components of sizes 1FW6160 to 1FW6290 with integrated cooling (rotor, stator)

### Integration

The 1FW6 motors which must be fed from the SIMODRIVE 611 digital/universal HRS converter system are designed for operation on a 600 V DC-link voltage level and require a sinusoidal current.

The cable connection is brought out of the front face of the stator and the free cable end must be connected to a terminal box provided by the machine manufacturer. The length of the power and signal cables from the motor to the converter system must not exceed 50 m (164 ft).

### Technical specifications

<b>Product name</b>	1FW6 built-in torque motors
<b>Type of motor</b>	Synchronous motor with permanent magnet rotor, multi-pole (number of rotor poles 44 ... 98)
<b>Torque ripple</b>	$\leq 1.5\% M_0$
<b>Coolant inlet temperature, max.</b>	35 °C (95 °F)
<b>Pressure in cooling circuit, max.</b>	10 bar (static)
<b>Temperature monitoring</b>	2 x PTC thermistor drilled hole with response threshold 130/150 °C (266/302 °F) (in accordance with DIN 44081/DIN 44082) and 1 x KTY84 thermistor (in accordance with IEC 60034-11) in the stator. Evaluation via encoder connection boxes SME9..
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F)
<b>Type of construction</b>	Individual components: Stator, rotor
<b>Degree of protection in accordance with IEC 60034-5</b>	IP23 The final degree of protection (minimum degree of protection is IP54) for the installed motor is determined by the machine manufacturer. Protection against touch, foreign bodies and water for electrical equipment is specified in accordance with IEC 60034-5.
<b>Encoder system (not included in scope of supply)</b>	The encoder must be selected according to the mechanical and converter-specific boundary conditions.
<b>Connection, electrical</b>	Permanently connected power and signal cables
<b>Paint finish</b>	Unpainted

# Synchronous motors

## Torque motors for SIMODRIVE 611

### 1FW6 standard type built-in torque motors Water cooling

#### Selection and ordering data

Maximum torque	Static torque <sup>1)3)</sup>	Rated torque <sup>2)3)</sup>	Max. speed at maximum torque <sup>2)</sup>	Max. speed at rated torque <sup>2)</sup>	1FW6 built-in torque motors Water cooled Standard type	Moment of inertia of rotor	Weight, approx. stator + rotor
$M_{\max}$	$M_0$	$M_{\text{rated}}$	$n_{\max}$ at $M_{\max}$	$n_{\max}$ at $M_{\text{rated}}$	Order No.	$J$	$m$
Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	rpm	rpm		10 <sup>-2</sup> kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)
179 (1 584)	119 (1 053)	113 (1 000)	46	140	<b>1FW6090-0 B05-0F 2</b>	1.52 (0.1345)	9.2 (20.3)
		109 (965)	140	250	<b>1FW6090-0 B05-0K 2</b>	1.52 (0.1345)	9.2 (20.3)
251 (2 221)	166 (1 469)	154 (1 363)	120	220	<b>1FW6090-0 B07-0K 2</b>	2.2 (0.1947)	12.2 (27)
		142 (1 257)	270	430	<b>1FW6090-0 B07-1J 2</b>	2.2 (0.1947)	12.2 (27)
358 (3 168)	238 (2 106)	231 (2 044)	8.7	82	<b>1FW6090-0 B10-0K 2</b>	3.09 (0.2735)	17.2 (37.9)
		216 (1 912)	170	270	<b>1FW6090-0 B10-1J 2</b>	3.09 (0.2735)	17.2 (37.9)
537 (4 752)	357 (3 159)	338 (2 991)	78	150	<b>1FW6090-0 B15-1J 2</b>	4.65 (0.4116)	27.2 (60)
		319 (2 823)	200	310	<b>1FW6090-0 B15-2J 2</b>	4.65 (0.4116)	27.2 (60)
439 (3 885)	258 (2 283)	241 (2 133)	47	130	<b>1FW6130-0 B05-0K 2</b>	6.37 (0.5638)	13.2 (29.1)
		217 (1 920)	180	310	<b>1FW6130-0 B05-1J 2</b>	6.37 (0.5638)	13.2 (29.1)
614 (5 434)	361 (3 195)	344 (3 044)	21	96	<b>1FW6130-0 B07-0K 2</b>	8.92 (0.7895)	18.2 (40.1)
		324 (2 867)	110	200	<b>1FW6130-0 B07-1J 2</b>	8.92 (0.7895)	18.2 (40.1)
878 (7 770)	516 (4 567)	484 (4 283)	50	120	<b>1FW6130-0 B10-1J 2</b>	12.7 (1.1240)	25.2 (55.6)
		450 (3 983)	150	250	<b>1FW6130-0 B10-2J 2</b>	12.7 (1.1240)	25.2 (55.6)
1 320 (11 682)	775 (6 859)	744 (6 584)	14	78	<b>1FW6130-0 B15-1J 2</b>	19.1 (1.6905)	38.2 (84.2)
		714 (6 319)	77	150	<b>1FW6130-0 B15-2J 2</b>	19.1 (1.6905)	38.2 (84.2)
710 (6 284)	360 (3 186)	338 (2 992)	230	110	<b>1FW6150-0 B05-1J 2</b>	10.1 (0.8939)	21.7 (47.8)
		298 (2 638)	650	340	<b>1FW6150-0 B05-4F 2</b>	10.1 (0.8939)	21.7 (47.8)
994 (8 798)	504 (4 461)	470 (4 160)	260	130	<b>1FW6150-0 B07-2J 2</b>	14.2 (1.2568)	33.5 (73.9)
		444 (3 930)	450	230	<b>1FW6150-0 B07-4F 2</b>	14.2 (1.2568)	33.5 (73.9)
1 420 (12 568)	720 (6 373)	668 (5 912)	170	78	<b>1FW6150-0 B10-2J 2</b>	20.9 (1.8498)	46.5 (103)
		663 (5 868)	300	150	<b>1FW6150-0 B10-4F 2</b>	20.9 (1.8498)	46.5 (103)
2 130 (18 853)	1 080 (9 559)	1 050 (9 294)	100	34	<b>1FW6150-0 B15-2J 2</b>	31.3 (2.7703)	70.8 (156)
		1 030 (9 117)	190	91	<b>1FW6150-0 B15-4F 2</b>	31.3 (2.7703)	70.8 (156)

**Cable outlet** for 1FW6090 to 1FW6150 only:

Axial  
Radially outwards  
Tangential

P  
Q  
N

#### Type of connection:

Permanently connected power and signal cables with open core ends  
Length: 2 m (6.56 ft)  
Permanently connected power and signal cables pre-assembled with connectors  
Length: 0.5 m (1.64 ft)

C

D



# Synchronous motors

## Torque motors for SIMODRIVE 611

1FW6 standard type built-in torque motors  
Water cooling

### Selection and ordering data

Motor type (continued)	Static current 1)3)	Rated current 2)3)	Maxi- mum current <sup>2)</sup>	Calculated power	SIMODRIVE 611 power module		Power cable with complete shield Motor connection via power connector <sup>5)</sup>		
					Required rated current	Order No.	Power connec- tor	Cable cross- section <sup>6)</sup>	Pre-assembled basic cable to converter
					$I_{rated}/I_{max}$				
	A	A	A	kW (HP)	A				
1FW6090-0.B05-0F..	5.9	5.6	9.5	6.55 (8.78)	5/10 <sup>4)</sup>	For ordering data, see Converter system	1	4 x 2.5	<b>6FX8002-5CA11-....</b>
1FW6090-0.B05-0K..	8.2	7.4	13	8.12 (10.88)	9/18		1	4 x 2.5	<b>6FX8002-5CA11-....</b>
1FW6090-0.B07-0K..	10	9.5	16	10.3 (13.8)	9/18 <sup>4)</sup>		1	4 x 2.5	<b>6FX8002-5CA11-....</b>
1FW6090-0.B07-1J..	16	13	26	14.1 (18.9)	18/36		1	4 x 2.5	<b>6FX8002-5CA11-....</b>
1FW6090-0.B10-0K..	8.2	7.9	13	9.43 (12.6)	9/18		1	4 x 2.5	<b>6FX8002-5CA11-....</b>
1FW6090-0.B10-1J..	16	14	26	15.3 (20.5)	18/36		1	4 x 2.5	<b>6FX8002-5CA11-....</b>
1FW6090-0.B15-1J..	16	15	26	17.1 (22.9)	18/36		1	4 x 2.5	<b>6FX8002-5CA11-....</b>
1FW6090-0.B15-2J..	26	23	43	24.1 (32.3)	28/56		1.5	4 x 4	<b>6FX8002-5CA41-....</b>
1FW6130-0.B05-0K..	9.7	9	18	12.2 (16.4)	9/18 <sup>4)</sup>		1	4 x 2.5	<b>6FX8002-5CA11-....</b>
1FW6130-0.B05-1J..	17	14	32	18.3 (24.5)	18/36		1	4 x 2.5	<b>6FX8002-5CA11-....</b>
1FW6130-0.B07-0K..	10	10	20	14.2 (19)	9/18 <sup>4)</sup>		1	4 x 2.5	<b>6FX8002-5CA11-....</b>
1FW6130-0.B07-1J..	17	15	32	19.7 (26.4)	18/36		1	4 x 2.5	<b>6FX8002-5CA11-....</b>
1FW6130-0.B10-1J..	17	16	32	21.4 (28.7)	18/36		1	4 x 2.5	<b>6FX8002-5CA11-....</b>
1FW6130-0.B10-2J..	28	24	53	30.6 (41)	28/56		1.5	4 x 4	<b>6FX8002-5CA41-....</b>
1FW6130-0.B15-1J..	19	18	36	25.4 (34.1)	18/36 <sup>4)</sup>		1	4 x 2.5	<b>6FX8002-5CA11-....</b>
1FW6130-0.B15-2J..	28	26	54	34.1 (45.7)	28/56		1.5	4 x 4	<b>6FX8002-5CA41-....</b>
1FW6150-0.B05-1J..	18	17	44	22.8 (30.6)	18/36		1	4 x 2.5	<b>6FX8002-5CA11-....</b>
1FW6150-0.B05-4F..	44	36	100	39.4 (52.8)	56/112		1.5	4 x 10	<b>6FX8002-5CA61-....</b>
1FW6150-0.B07-2J..	27	25	66	32.0 (42.9)	28/56		1.5	4 x 4	<b>6FX8002-5CA41-....</b>
1FW6150-0.B07-4F..	44	38	100	42.7 (57.3)	56/112		1.5	4 x 10	<b>6FX8002-5CA61-....</b>
1FW6150-0.B10-2J..	27	26	66	36.2 (48.5)	28/56	1.5	4 x 4	<b>6FX8002-5CA41-....</b>	
1FW6150-0.B10-4F..	44	40	100	47.3 (63.4)	56/112	1.5	4 x 10	<b>6FX8002-5CA61-....</b>	
1FW6150-0.B15-2J..	27	26	66	42.8 (57.4)	28/56	1.5	4 x 4	<b>6FX8002-5CA41-....</b>	
1FW6150-0.B15-4F..	44	41	100	54.5 (73.1)	56/112	1.5	4 x 10	<b>6FX8002-5CA61-....</b>	

For length code as well as power and signal cables, see Connection system MOTION-CONNECT. ....

1) Torque and current at low speeds.

2) The values refer to a supply voltage of 400 V 3 AC ± 10 % (converter DC link voltage 600 V DC).

3) In case of water cooling with inlet temperature of 35 °C (95 °F) and maximum rotor flange temperature of 60 °C (140 °F).

4) Selection optimized to size of power module. The next higher power module offers 100 % torque utilization.

5) Fixed cable outlet, not pre-assembled, 2 m (6.56 ft) in length. Power and signal connectors are not included in the scope of supply of the motor and have to be ordered separately.

6) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

# Synchronous motors

## Torque motors for SIMODRIVE 611

### 1FW6 standard type built-in torque motors Water cooling

#### Selection and ordering data

Maximum torque	Static torque <sup>1)3)</sup>	Rated torque <sup>2)3)</sup>	Max. speed at maximum torque <sup>2)</sup>	Max. speed at rated torque <sup>2)</sup>	1FW6 built-in torque motors Water cooled Standard type	Moment of inertia of rotor	Weight, approx. stator + rotor
$M_{\max}$	$M_0$	$M_{\text{rated}}$	$n_{\max}$ at $M_{\max}$	$n_{\max}$ at $M_{\text{rated}}$		$J$	$m$
Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	rpm	rpm	Order No.	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)
716 (6 337)	467 (4 133)	431 (3 814)	84	140	<b>1FW6160-0 ■ B05-1J ■ 2</b>	0.19 (1.682)	36.3 (80.0)
		404 (3 575)	150	250	<b>1FW6160-0 ■ B05-2J ■ 2</b>	0.19 (1.682)	36.3 (80.0)
1 000 (8 850)	653 (5 779)	620 (5 487)	53	96	<b>1FW6160-0 ■ B07-1J ■ 2</b>	0.258 (2.283)	48.3 (106.5)
		594 (5 257)	100	170	<b>1FW6160-0 ■ B07-2J ■ 2</b>	0.258 (2.283)	48.3 (106.5)
1 430 (12 656)	933 (8 257)	903 (7 992)	29	60	<b>1FW6160-0 ■ B10-1J ■ 2</b>	0.36 (3.186)	66.3 (146.2)
		878 (7 770)	65	110	<b>1FW6160-0 ■ B10-2J ■ 2</b>	0.36 (3.186)	66.3 (146.2)
2 150 (19 028)	1 400 (12 390)	1 350 (11 948)	34	66	<b>1FW6160-0 ■ B15-2J ■ 2</b>	0.531 (4.699)	95.3 (210.1)
		1 280 (11 328)	97	160	<b>1FW6160-0 ■ B15-5G ■ 2</b>	0.531 (4.699)	95.3 (210.1)
990 (8 762)	672 (5 947)	633 (5 602)	54	97	<b>1FW6190-0 ■ B05-1J ■ 2</b>	0.358 (3.168)	42.8 (94.4)
		605 (5 354)	96	160	<b>1FW6190-0 ■ B05-2J ■ 2</b>	0.358 (3.168)	42.8 (94.4)
1 390 (12 302)	941 (8 328)	905 (8 009)	33	63	<b>1FW6190-0 ■ B07-1J ■ 2</b>	0.486 (4.142)	55.8 (123)
		879 (7 779)	64	110	<b>1FW6190-0 ■ B07-2J ■ 2</b>	0.486 (4.142)	55.8 (123)
1 980 (17 523)	1 340 (11 859)	1 310 (11 594)	14	38	<b>1FW6190-0 ■ B10-1J ■ 2</b>	0.678 (6.0002)	75.8 (167)
		1 290 (11 417)	39	70	<b>1FW6190-0 ■ B10-2J ■ 2</b>	0.678 (6.0002)	75.8 (167)
2 970 (26 285)	2 020 (17 877)	1 970 (17 435)	17	40	<b>1FW6190-0 ■ B15-2J ■ 2</b>	0.998 (8.832)	107.8 (238)
		1 890 (16 727)	62	100	<b>1FW6190-0 ■ B15-5G ■ 2</b>	0.998 (8.832)	107.8 (238)
1 320 (11 682)	841 (7 443)	799 (7 071)	34	69	<b>1FW6230-0 ■ B05-1J ■ 2</b>	0.622 (5.505)	44.8 (98.8)
		774 (6 850)	59	110	<b>1FW6230-0 ■ B05-2J ■ 2</b>	0.622 (5.505)	44.8 (98.8)
1 840 (16 284)	1 180 (10 443)	1 140 (10 089)	19	45	<b>1FW6230-0 ■ B07-1J ■ 2</b>	0.843 (7.460)	58.8 (130)
		1 120 (9 912)	38	73	<b>1FW6230-0 ■ B07-2J ■ 2</b>	0.843 (7.460)	58.8 (130)
2 630 (23 276)	1 680 (14 868)	1 630 (14 426)	21	46	<b>1FW6230-0 ■ B10-2J ■ 2</b>	1.18 (10.443)	81.8 (180)
		1 520 (13 452)	74	130	<b>1FW6230-0 ■ B10-5G ■ 2</b>	1.18 (10.443)	81.8 (180)
3 950 (34 958)	2 520 (22 302)	2 440 (21 594)	19	43	<b>1FW6230-0 ■ B15-4C ■ 2</b>	1.73 (15.310)	117.8 (260)
		2 380 (21 063)	44	80	<b>1FW6230-0 ■ B15-5G ■ 2</b>	1.73 (15.310)	117.8 (260)
8 570 (75 854)	4 760 (42 126)	4 590 (40 622)	28	53	<b>1FW6290-0 ■ B15-7A ■ 2</b>	4.40 (38.939)	214.6 (473)

**Cable outlet** for 1FW6160 to 1FW6290 only:

Axial  
Radially outwards  
Tangential

W  
V  
T

**Type of connection:**

Permanently connected power and signal cables with open core ends  
Length: 2 m (6.56 ft)  
Permanently connected power and signal cables pre-assembled with connectors  
Length: 0.5 m (1.64 ft)

C  
D

# Synchronous motors

## Torque motors for SIMODRIVE 611

1FW6 standard type built-in torque motors  
Water cooling

### Selection and ordering data

Motor type <sup>4)</sup> (continued)	Static current 1)3)		Rated current 2)3)		Maximum current <sup>2)</sup>		Calculated power		SIMODRIVE 611 power module		Power cable with complete shield Motor connection via power connector <sup>4)</sup>		
	$I_0$	$I_{rated}$	$I_{max}$	$P_{el, max}$	$I_{rated}/I_{max}$	Required rated current	Order No.	Power connector	Cable cross-section <sup>5)</sup>	Pre-assembled basic cable to converter	Size	mm <sup>2</sup>	Order No.
	A	A	A	kW (HP)	A	A							
1FW6160-0.B05-1J..	17	16	31	15.1 (20.2)	18/36	For ordering data, see Converter system	1	4 x 2.5	6FX8002-5CA11-....				
1FW6160-0.B05-2J..	28	24	49	20 (26.8)	28/56		1.5	4 x 4	6FX8002-5CA41-....				
1FW6160-0.B07-1J..	17	16	31	16.7 (22.4)	18/36	For ordering data, see Converter system	1	4 x 2.5	6FX8002-5CA11-....				
1FW6160-0.B07-2J..	28	25	49	21.8 (29.2)	28/56		1.5	4 x 4	6FX8002-5CA41-....				
1FW6160-0.B10-1J..	17	17	31	19 (25.5)	18/36	For ordering data, see Converter system	1	4 x 2.5	6FX8002-5CA11-....				
1FW6160-0.B10-2J..	28	26	49	24.4 (32.7)	28/56		1.5	4 x 4	6FX8002-5CA41-....				
1FW6160-0.B15-2J..	28	26	49	28.2 (37.8)	28/56	For ordering data, see Converter system	1.5	4 x 4	6FX8002-5CA41-....				
1FW6160-0.B15-5G..	56	50	98	42.6 (57.1)	56/112		1.5	4 x 16	6FX8002-5YP02-....				
1FW6190-0.B05-1J..	18	17	31	16.3 (21.9)	18/36	For ordering data, see Converter system	1	4 x 2.5	6FX8002-5CA11-....				
1FW6190-0.B05-2J..	27	24	47	20.6 (27.6)	28/56		1.5	4 x 4	6FX8002-5CA41-....				
1FW6190-0.B07-1J..	18	17	31	18.2 (24.4)	18/36	For ordering data, see Converter system	1	4 x 2.5	6FX8002-5CA11-....				
1FW6190-0.B07-2J..	27	25	47	22.7 (30.4)	28/56		1.5	4 x 4	6FX8002-5CA41-....				
1FW6190-0.B10-1J..	18	17	31	20.7 (27.8)	18/36	For ordering data, see Converter system	1	4 x 2.5	6FX8002-5CA11-....				
1FW6190-0.B10-2J..	27	26	47	25.7 (34.5)	28/56		1.5	4 x 4	6FX8002-5CA41-....				
1FW6190-0.B15-2J..	27	26	47	30.1 (40.4)	28/56	For ordering data, see Converter system	1.5	4 x 4	6FX8002-5CA41-....				
1FW6190-0.B15-5G..	54	50	95	44.1 (59.1)	56/112		1.5	4 x 16	6FX8002-5YP02-....				
1FW6230-0.B05-1J..	16	15	31	17.3 (23.2)	18/36	For ordering data, see Converter system	1	4 x 2.5	6FX8002-5CA11-....				
1FW6230-0.B05-2J..	24	22	45	21 (28.2)	28/56		1.5	4 x 4	6FX8002-5CA41-....				
1FW6230-0.B07-1J..	16	16	31	19.4 (26.0)	18/36	For ordering data, see Converter system	1	4 x 2.5	6FX8002-5CA11-....				
1FW6230-0.B07-2J..	24	22	45	23.6 (31.6)	28/56		1.5	4 x 4	6FX8002-5CA41-....				
1FW6230-0.B10-2J..	24	23	45	27.1 (36.3)	28/56	For ordering data, see Converter system	1.5	4 x 4	6FX8002-5CA41-....				
1FW6230-0.B10-5G..	54	48	100	42 (56.3)	56/112		1.5	4 x 16	6FX8002-5YP02-....				
1FW6230-0.B15-4C..	33	32	63	38 (50.9)	42/64	For ordering data, see Converter system	1.5	4 x 6	6FX8002-5CA51-....				
1FW6230-0.B15-5G..	53	49	100	47.4 (63.5)	56/112		1.5	4 x 16	6FX8002-5YP02-....				
1FW6290-0.B15-7A..	64	61	130	65.2 (87.4)	70/140	For ordering data, see Converter system	1.5	4 x 16	6FX8002-5YP02-....				

For length code as well as power and signal cables, see Connection system MOTION-CONNECT. ....

### Accessories

Designation	Order No.	Designation	Order No.
<b>Cooling connection adapter</b>		<b>Power connector<sup>4)</sup></b>	
• For torque motors 1FW6160 to 1FW6230	<b>1FW6160-1BA00-0AA0</b>	• Size 1 for 4 x 2.5 mm <sup>2</sup>	<b>6FX2003-0LA00</b>
• For torque motors 1FW6290	<b>1FW6290-1BA00-0AA0</b>	• Size 1.5 for 4 x 4/4 x 10/4 x 16 mm <sup>2</sup>	<b>6FX2003-0LA10</b>
		<b>Signal connector<sup>4)</sup></b>	
		• M17 (socket) for 6 x 0.5 + 1 x 1.0 mm <sup>2</sup>	<b>6FX2003-0SU07</b>
		<b>Signal cable, pre-assembled with M17 connector</b>	
		• For 1FW6 torque motors	<b>6FX7002-2SL10-....</b>

<sup>1)</sup> Torque and current at low speeds.

<sup>2)</sup> The values refer to a supply voltage of 400 V 3 AC ± 10 % (converter DC link voltage 600 V DC).

<sup>3)</sup> In case of water cooling with inlet temperature of 35 °C (95 °F) and maximum rotor flange temperature of 60 °C (140 °F).

<sup>4)</sup> Fixed cable outlet, not pre-assembled, 2 m (6.56 ft) in length. Power and signal connectors are not included in the scope of supply of the motor and must be ordered separately.

<sup>5)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C under continuous operating conditions at an ambient air temperature of 40 °C (104 °F).

# Synchronous motors

## Linear/torque motors for SIMODRIVE 611

### Encoder connection boxes SME91/SME92/SME93/SME94

#### Overview



The SME91/SME92/SME93/SME94 encoder connection boxes enable motor and position encoder sensors to be connected in the vicinity of the motor in the case of drives with built-in motors. The encoder connection box is responsible for protecting the motor and outputting the current operating temperature/over-temperature to the converter system without time delay.

#### Benefits

- Motor protection
- Fault-free transmission to the converter system
- Low cabling overhead
- PU-molded PCB in the housing, making the module extremely rugged and suitable for direct use in the machine

#### Application

The SME91/SME92/SME93/SME94 encoder connection boxes are suitable for connecting external position measuring systems and commutation devices to

- 1FN3 linear motors
- 1FW6 torque motors

#### Integration

The SME91/SME92/SME93/SME94 encoder connection boxes can be used for 1FN3 linear motors and torque motors 1FW6 on the SIMODRIVE 611 digital/universal HRS converter system.

#### Technical specifications

<b>Order No.</b>	<b>1FN1910-0AA20-1AA0/-2AA0/-3AA0/-4AA0</b>
<b>Product name</b>	Encoder connection boxes SME91/SME92/SME93/SME94
<b>Degree of protection in accordance with EN 60529 (IEC 60529)</b>	IP67
<b>Air humidity in accordance with DIN 40040</b>	5 ... 85 % (without condensation)
<b>Dimensions</b> (without sockets)	
• Width	150 mm (5.91 in)
• Height	64 mm (2.52 in)
• Depth	34 mm (1.34 in)
<b>Weight, approx.</b>	0.75 kg (1.65 lb)

#### Selection and ordering data

Designation	Order No.
<b>Encoder connection box SME91</b> For connecting absolute encoders • 1 x connection for temperature sensors, 7-pole	<b>1FN1910-0AA20-1AA0</b>
<b>Encoder connection box SME92</b> For connecting absolute encoders • 2 x connection for temperature sensors, 7-pole for two motors connected in parallel	<b>1FN1910-0AA20-2AA0</b>
<b>Encoder connection box SME93</b> For connecting incremental encoders (connection of an optional hall-effect sensor box is possible) • 1 x connection for temperature sensors, 7-pole	<b>1FN1910-0AA20-3AA0</b>
<b>Encoder connection box SME94</b> For connecting incremental encoders (connection of an optional hall-effect sensor box is possible) • 2 x connection for temperature sensors, 7-pole for two motors connected in parallel	<b>1FN1910-0AA20-4AA0</b>

## Overview

	<b>1FW6 built-in torque motors</b>	<b>1FE1 built-in motors</b>	<b>2SP1 motor spindles</b>
<b>Cooling</b>	Water cooling		
<b>Speed at <math>M_{rated}</math></b>	34 ... 430 rpm	Up to 40 000 rpm	Up to 18 000 rpm
<b>Static torque <math>M_0</math></b>	119 ... 4 760 Nm (87.8 ... 3 511 lb <sub>f</sub> -ft)	–	–
<b>Rated torque <math>M_{rated}</math></b>	109 ... 4 590 Nm (80.4 ... 3 386 lb <sub>f</sub> -ft)	5 ... 820 Nm (3.69 ... 605 lb <sub>f</sub> -ft)	42 ... 170 Nm (31.0 ... 125 lb <sub>f</sub> -ft)
<b>Overload capability up to max.</b>	2 x $M_0$	–	–
<b>Encoder system</b>	Rotary encoder <ul style="list-style-type: none"> <li>• Incremental encoder sin/cos 1 V<sub>pp</sub></li> <li>• Absolute encoder with EnDat interface</li> </ul>	Hollow-shaft measuring system L&B GEL 244	Hollow-shaft measuring system Incremental encoder sin/cos 1 V <sub>pp</sub> 256 S/R (built-in)
<b>Sound pressure level <math>L_{pA}</math> (1 m) in accordance with EN ISO 1680</b>	–	Depending on spindle design	70 dB <sup>1)</sup>
<b>Degree of protection EN 60034-5 (IEC 60034-5)</b>	IP23	IP00 or as specified by spindle manufacturer	IP64 (in working area) IP53 (behind the spindle flange)
<b>Insulation of the stator winding EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a winding temperature rise of $\Delta T = 100$ K for an ambient temperature of 40 °C (104 °F)	Temperature class 155 (F)	
	Inlet temperature of coolant max. 35 °C (95 °F)	With an inlet temperature of coolant of 25 °C (77 °F)	
<b>Type of motor</b>	Permanent-magnet synchronous torque motor, 3-phase	AC main spindle motor in synchronous system with permanent magnets	AC main spindle motor in asynchronous/synchronous system
<b>Paint finish</b>	Unpainted		
<b>Holding brake</b>	–	Using spindle design	–

<sup>1)</sup> Sound pressure level of stock removal and tool changing are not taken into account.

# Synchronous motors

## Main spindle motors for SIMODRIVE 611

### 1FE1 standard type built-in motors

#### Water cooling

#### Overview



The 1FE1 built-in motors are water-cooled, synchronous motors that are supplied as stator and rotor components. When the rotor has been mounted to the spindle in the spindle box, a complete spindle unit is created.

#### Benefits

- Compact design (e. g. for turning machines and vertical milling machines) by dispensing with mechanical components, such as motor switch armature, belt drive, gearbox and spindle encoder
- High power density thanks to water cooling
- Maximum speed up to 40 000 rpm, torque up to 820 Nm for S1 duty
- Higher torque – up to 60 % – with the same active component volume, consequently more compact machine design compared to 1PH2
- Extremely short ramp-up and braking times (50 %) thanks to higher torque compared to 1PH2
- Cold rotor due to excitation using permanent magnets, this means significantly less power loss in the rotor in the lower speed range and therefore less bearing heating and spindle expansion
- The stator and rotor are **ready to install**, no finishing is necessary
- The absence of drive transverse forces permits extremely high accuracy on the workpiece thanks to smooth, accurate spindle motion even at very low speeds
- Larger rotor inner bore than squirrel-cage rotor of asynchronous motors, but with the same outer diameter, which is an advantage with regard to the bar capacity of automatic turning machines and results in higher spindle stiffness due to larger shaft diameters for milling spindles
- Increased rigidity of the spindle drive achieved by mounting the motor components between the spindle main bearings
- Less cooling capacity required for the same power compared to 1PH2, i. e. greater efficiency
- Only one encoder (hollow-shaft measuring system) for sensing motor speed and spindle position
- Simple servicing by replacing complete motor spindles

#### Benefits (continued)

- Compatible system of SINUMERIK, SIMODRIVE 611 and motor, therefore fast commissioning is ensured
- Higher machine productivity:  
The permanent-magnet motor spindles (PE spindles) increase the power density and economic efficiency of CNC machines. The optimized combination of 1FE1 built-in motor, drive control and CNC offers further opportunities for rationalization, such as lower workpiece machining times and fewer clamping faces.

#### Application

The 1FE1 built-in water-cooled synchronous motors are used in combination with the SIMODRIVE 611 converter system where there is a requirement for excellent machining quality, accuracy and running smoothness, and very short ramp-up times.

The 1FE1 built-in motors are offered in two main versions:

- High-Torque series  
6-pole/8-pole synchronous motors are available that have been developed for turning and grinding machines with moderate maximum speeds. These motors are characterized by an extremely high torque utilization. In this case, the speed range is approximately 1:2.
- High-Speed series  
In this series, 4-pole synchronous motors are available for milling. These motors are optimized for high maximum speeds and a speed range of over 1:4. A voltage limitation module is required for these motors when they are operated up to the maximum speed.

#### Design

The 1FE1 built-in motor comprises:

- A laminated, permanent-magnet rotor, which, as an option, can be designed with a sleeve for simple mounting and removal
- A wound stator core with cooling jacket and encapsulated winding overhang
  - Free cable ends of 0.5 m/1.5 m (1.64 ft/4.92 ft)
  - Two integral PTC thermistors (incl. 1 spare), optionally with full or universal protection
  - A cooling jacket into which the stator has been inserted.

#### Rotor with sleeve

Torque is transmitted to the spindle mechanically without play by means of a cylindrical stepped press fit. The rotor is mounted on the spindle by thermal shrinking.

The rotor with sleeve is pre-balanced and can be removed and subsequently remounted. The bond can be released by pressure-oil injection without affecting the joint surfaces.

#### Rotor without sleeve

Torque is transmitted to the spindle mechanically without play by means of a cylindrical stepped press fit. The rotor is mounted on the spindle by thermal shrinking.

Removal of the rotor is not possible with this type of mounting. Rotors without sleeves are not pre-balanced.

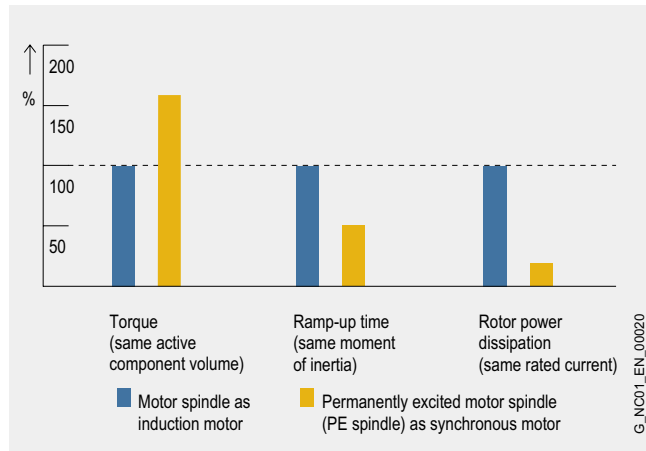
# Synchronous motors

## Main spindle motors for SIMODRIVE 611

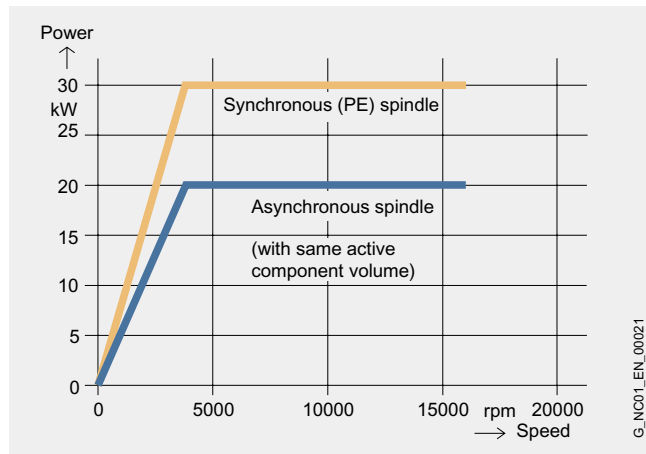
**1FE1 standard type built-in motors**  
**Water cooling**

### Characteristic curves

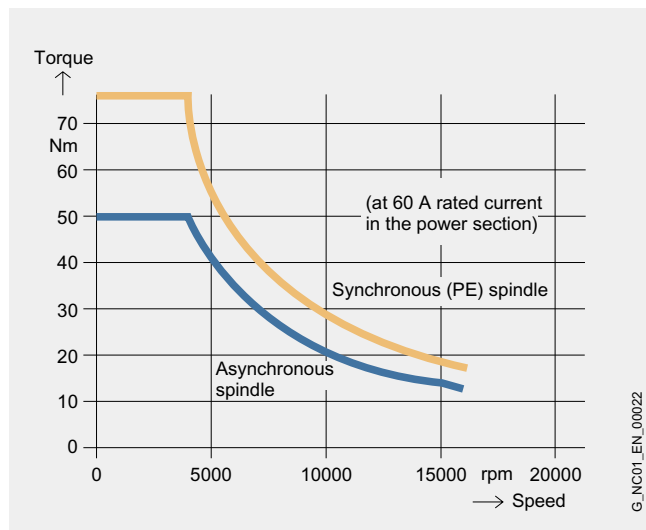
#### Comparison of synchronous/asynchronous spindle



Advantages of 1FE1 synchronous spindle over asynchronous spindle



Comparison of power/speed characteristics



Comparison of torque/speed characteristics

Power/speed and torque/speed characteristics of PE spindles compared to the asynchronous version under the following supplementary conditions: identical active part volume and identical rated current (60 A) of the power section.

### Technical specifications

<b>Product name</b>	1FE1 built-in motors
<b>Type of motor</b>	Synchronous spindle with permanent-magnet rotor
<b>Constant power range</b>	1:2 (6-/8-pole)/1:4 (4-pole)
<b>Recommended coolant inlet temperature, approx.</b>	25 °C (77 °F)
<b>Standard protection – temperature monitoring</b>	2 KTY thermistors in the stator winding, 1 as spare
<b>Full protection optional</b>	In addition to standard protection
Application example: processing at motor standstill	3 x PTC thermistor drilling Evaluation possibility e. g. using thermal motor protection: Order No.: 3RN1013-1GW10
<b>Universal protection optional</b>	Full protection + NTC PT3-51F + NTC K227
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a coolant inlet temperature of 25 °C (77 °F)
<b>Type of construction (cf. ISO)</b>	Individual components: Stator, rotor, motor encoder
<b>Degree of protection in accordance with IEC 60034-5</b>	IP00
<b>Balance quality of rotor in accordance with ISO 1940-1</b>	<ul style="list-style-type: none"> <li>• Rotor with sleeve Depending on the design - Pre-balanced, balance quality G 2.5 Reference speed 3 600 rpm</li> <li>- Unbalanced for complete balancing after mounting</li> <li>• Rotor without sleeve Not pre-balanced</li> </ul>
<b>Recommended motor encoder (not included in scope of supply)</b>	Hollow-shaft measuring system L&B GEL 244 for speeds greater than 33 000 rpm
<b>Motor connection</b>	Free cable ends with l = 0.5/1.5 m (1.64 ft/4.92 ft) length

### More information

For a list of heat exchanger manufacturers, please refer to Asynchronous motors – Liquid cooling.

# Synchronous motors

## Main spindle motors for SIMODRIVE 611

### 1FE1 standard type built-in motors

#### Water cooling

#### Selection and ordering data

Rated power for duty type in accordance with IEC 60034-1 <sup>1)</sup>		Rated torque <sup>1)</sup>		Rated speed	Speed, max.	1FE1 built-in motors Water cooling Standard type	Moment of inertia Rotor without sleeve <sup>8)</sup>	Weight, approx. (rotor and stator)
$P_{rated}$		$M_{rated}$		$n_{rated}$	$n_{max}$			
S1	S6-40 %	S1	S6-40 %			Order No.	$kgm^2$ ( $lb_f-in-s^2$ )	kg (lb)
kW (HP)	kW (HP)	Nm ( $lb_f-in$ )	Nm ( $lb_f-in$ )	rpm	rpm			

#### High-Torque series, 6-pole

7.4 (9.9)	10 (13.4)	4.5 (39.8)	6 (53.1)	15 800	20 000	<b>1FE1041-6WM</b> ■ 0- 1 B A ■	0.00019 (0.0017)	2.8 (6.2)
14.4 (19.3)	18 (24.1)	11 (97)	14 (124)	12 500	18 000	<b>1FE1042-6WN</b> ■ 0- 1 B A ■	0.00033 (0.0029)	6.5 (14.3)
11.5 (15.4)	14.6 (19.6)	11 (97)	14 (124)	10 000	15 000	<b>1FE1042-6WR</b> ■ 0- 1 B A ■	0.00033 (0.0029)	6.5 (14.3)
6.3 (8.5)	7.9 (10.6)	10 (89)	12.6 (112)	6 000	12 000	<b>1FE1051-6WN</b> ■ 0- 1 B ■ ■	0.00106 (0.0094)	5.5 (12.1)
8.3 (11.1)	10.4 (13.9)	10 (89)	12.6 (112)	8 000	15 000	<b>1FE1051-6WK</b> ■ 0- 1 B ■ ■	0.00106 (0.0094)	5.5 (12.1)
11.5 (15.4)	14.5 (19.4)	20 (177)	25.2 (223)	5 500	12 000	<b>1FE1052-6WN</b> ■ 0- 1 B ■ ■	0.00195 (0.0173)	8.2 (18.1)
14 (18.8)	18 (24.1)	18 (159)	23 (204)	7 500	15 000	<b>1FE1052-6WK</b> ■ 0- 1 B ■ ■	0.00195 (0.0173)	8.2 (18.1)
23 (30.8)	29 (38.9)	37 (328)	46 (407)	6 000	12 000	<b>1FE1054-6WN</b> ■ 0- 1 B A ■	0.0038 (0.0336)	14.3 (31.5)
11.6 (15.6)	15 (20.1)	13 (115)	17 (151)	8 500	12 000	<b>1FE1061-6WH</b> ■ 0- 1 B ■ ■	0.00141 (0.0125)	5.5 (12.1)
4 (5.4)	5.3 (7.1)	13 (115)	17 (151)	3 000	5 000	<b>1FE1061-6WY</b> ■ 0- 1 B ■ ■	0.00141 (0.0125)	5.5 (12.1)
25 (33.5)	36.5 (48.9)	56 (496)	81 (717)	4 300	12 000	<b>1FE1064-6WN</b> ■ 1- 1 B A ■	0.00553 (0.0489)	14.5 (32)
20 (26.8)	29 (38.9)	56 (496)	81 (717)	3 400	10 000	<b>1FE1064-6WQ</b> ■ 1- 1 B A ■	0.00553 (0.0489)	14.5 (32)
34 (45.6)	42 (56.3)	65 (575)	81 (717)	5 000	8 500	<b>1FE1082-6WP</b> ■ 0- 1 B ■ ■	0.01048 (0.0927)	14 (30.9)
24.5 (32.8)	30.5 (40.9)	65 (575)	81 (717)	3 600	6 000	<b>1FE1082-6WS</b> ■ 0- 1 B ■ ■	0.01048 (0.0927)	14 (30.9)
29.3 (39.3)	36.5 (48.9)	65 (575)	81 (717)	4 300	9 000	<b>1FE1082-6WQ</b> ■ 1- 1 B ■ ■	0.01048 (0.0927)	14 (30.9)
15 (20.1)	18.7 (25.1)	65 (575)	81 (717)	2 200	9 000	<b>1FE1082-6WW</b> ■ 1- 1 B ■ ■	0.01048 (0.0927)	14 (30.9)
23.1 (31)	31.1 (41.7)	130 (1 151)	175 (1 549)	1 700	7 000	<b>1FE1084-6WU</b> ■ 1- 1 B ■ ■	0.02067 (0.1829)	30 (66.2)
31 (41.6)	42 (56.3)	130 (1 151)	175 (1 549)	2 300	9 000	<b>1FE1084-6WR</b> ■ 1- 1 B ■ ■	0.02067 (0.1829)	30 (66.2)
15 (20.1)	19 (25.5)	130 (1 151)	175 (1 549)	1 100	4 500	<b>1FE1084-6WX</b> ■ 1- 1 B ■ ■	0.02067 (0.1829)	30 (66.2)
10 (13.4)	13.2 (17.7)	28 (248)	36 (319)	3 500	7 000	<b>1FE1091-6WN</b> ■ 0- 1 B ■ ■	0.00814 (0.0720)	20 (44.1)
6.3 (8.5)	7.5 (10.1)	30 (266)	36 (319)	2 000	4 000	<b>1FE1091-6WS</b> ■ 0- 1 B ■ ■	0.00814 (0.0720)	20 (44.1)
24.2 (32.4)	31 (41.6)	66 (584)	85 (752)	3 500	7 000	<b>1FE1092-6WN</b> ■ 0- 1 B ■ ■	0.01566 (0.1386)	30.5 (67.3)
22 (29.5)	28 (37.5)	66 (584)	85 (752)	3 200	7 000	<b>1FE1092-6WR</b> ■ 1- 1 B ■ ■	0.01566 (0.1386)	30.5 (67.3)
36.6 (49.1)	47 (63)	100 (885)	128 (1 133)	3 500	7 000	<b>1FE1093-6WN</b> ■ 0- 1 B ■ ■	0.02317 (0.2051)	41 (90.4)
21 (28.2)	27 (36.2)	100 (885)	128 (1 133)	2 000	4 000	<b>1FE1093-6WS</b> ■ 0- 1 B ■ ■	0.02317 (0.2051)	41 (90.4)
16.8 (22.5)	21.5 (28.8)	100 (885)	128 (1 133)	1 600	7 000	<b>1FE1093-6WV</b> ■ 1- 1 B ■ ■	0.02317 (0.2051)	41 (90.4)

• Standard protection: 2 x KTY<sup>2)</sup>

• Full protection: 2 x KTY + 3 x PTC thermistor drilling<sup>6)</sup>

• Universal protection<sup>7)</sup>

1  
3  
5

• Delivery of stator + rotor<sup>2)4)5)</sup>

1

• Stator with cooling jacket<sup>2)3)</sup>

B

• Without rotor jacket

• With rotor jacket, for  $d^*$  see dimensions table

• With rotor jacket, for  $d^{**}$  see dimensions table

• With rotor jacket "-..D." only for 1FE1082..., see dimensions table

A  
B  
C  
D

• Free cable ends with rigid connection, 1.5 m (4.92 ft) in length  
Cable outlet at larger outer diameter of cooling jacket  
Cable outlet at smaller outer diameter of cooling jacket (on request)

0  
1

• Free cable ends, flexible, 0.5 m (1.64 ft) in length (preferred variant)  
Cable outlet at larger outer diameter of cooling jacket  
Cable outlet at smaller outer diameter of cooling jacket (on request)

2  
3

S1 = continuous duty

S6 = intermittent duty:

Sizes 40, 50, 60: duty cycle time 1 min

Sizes 80 to 140: duty cycle time 2 min



# Synchronous motors

## Main spindle motors for SIMODRIVE 611

1FE1 standard type built-in motors  
Water cooling

### Selection and ordering data

Motor type (continued)	Rated current for duty type in accordance with IEC 60034-1 <sup>1)</sup>		Voltage Protection Module	SIMODRIVE 611 power module	
	$I_{rated}$	S6-40 %		Required rated current	Order No.
	S1	S6-40 %		$I_{rated}$ S1 to $n_{max}$	
	A	A		A	

#### High-Torque series, 6-pole

1FE1041-6WM...	13	17.5	–	24	For ordering data, see Converter system
1FE1042-6WN...	24	32	–	45	
1FE1042-6WR...	19	26	–	30	
1FE1051-6WN...	15	22	–	24	
1FE1051-6WK...	20	29	–	30	
1FE1052-6WN...	30	44	–	45	
1FE1052-6WK...	37	54	–	45	
1FE1054-6WN...	60	88	–	85	
1FE1061-6WH...	21	30	–	24	
1FE1061-6WY...	8	11.5	–	8	
1FE1064-6WN...	56	80	VPM 120	60	
1FE1064-6WQ...	43	61	VPM 120	45	
1FE1082-6WP...	65	91	–	85	
1FE1082-6WS...	45	62	–	45	
1FE1082-6WQ...	60	84	VPM 120	60	
1FE1082-6WW...	30	42	VPM 120	30	
1FE1084-6WU...	45	64	VPM 120	45	
1FE1084-6WR...	60	84	VPM 120	60	
1FE1084-6WX...	30	42	VPM 120	30	
1FE1091-6WN...	24	35	–	30	
1FE1091-6WS...	15	19	–	24	
1FE1092-6WN...	58	84	–	60	
1FE1092-6WR...	41	58	VPM 120	45	
1FE1093-6WN...	83	120	–	85	
1FE1093-6WS...	53	76	–	60	
1FE1093-6WV...	43	60	VPM 120	45	

<sup>1)</sup> Data for  $\Delta T = 105$  K, special windings on request.

<sup>2)</sup> Standard scope of supply: Encapsulated winding with 2 x KTY (1 spare).

<sup>3)</sup> Stator without cooling jacket, with soaked winding on request.

<sup>4)</sup> Ordering spare parts: stator: 1FE1...-.....-2.W.

<sup>5)</sup> Ordering spare parts: rotor: 1FE1...-.....-3.W..

<sup>6)</sup> Full protection option, application example: loading at motor standstill, external tripping unit required: Order No. 3RN1013-1GW10.

<sup>7)</sup> Universal protection option: full protection + NTC PT3-51F + NTC K227.

<sup>8)</sup> For moment of inertia with sleeve, see Configuration Manual.

# Synchronous motors

## Main spindle motors for SIMODRIVE 611

### 1FE1 standard type built-in motors

#### Water cooling

#### Selection and ordering data

Rated power for duty type in accordance with IEC 60034-1 <sup>1)</sup>		Rated torque <sup>1)</sup>		Rated speed	Speed, max.	1FE1 built-in motors Water cooling Standard type	Moment of inertia Rotor without/with sleeve <sup>9)</sup>	Weight, approx. (rotor and stator)
$P_{\text{rated}}$		$M_{\text{rated}}$		$n_{\text{rated}}$	$n_{\text{max}}$			
S1	S6-40 %	S1	S6-40 %			Order No.	$\text{kgm}^2$ ( $\text{lb}_f\text{-in-s}^2$ )	kg (lb)
kW (HP)	kW (HP)	Nm ( $\text{lb}_f\text{-in}$ )	Nm ( $\text{lb}_f\text{-in}$ )	rpm	rpm			

#### High-Torque series, 6-pole

33 (44.2)	35 (46.9)	150 (1 328)	190 (1 682)	2 100	6 500	<b>1FE1113-6WU</b> ■ 1- 1 B ■ ■ ■	0.0650 (0.5752)	57 (126)
22 (29.5)	24 (32.2)	150 (1 328)	190 (1 682)	1 400	5 700	<b>1FE1113-6WX</b> ■ 1- 1 B ■ ■ ■	0.0650 (0.5752)	57 (126)
41.9 (56.2)	53.6 (71.9)	200 (1 770)	256 (2 266)	2 000	6 500	<b>1FE1114-6WR</b> ■ 1- 1 B ■ ■ ■	0.06239 (0.5521)	80 (176)
29.3 (39.3)	37.5 (50.3)	200 (1 770)	256 (2 266)	1 400	6 500	<b>1FE1114-6WT</b> ■ 1- 1 B ■ ■ ■	0.06239 (0.5521)	80 (176)
20.9 (28.0)	26.8 (35.9)	200 (1 770)	256 (2 266)	1 000	6 000	<b>1FE1114-6WW</b> ■ 1- 1 B ■ ■ ■	0.06239 (0.5521)	80 (176)
41.6 (55.8)	45.0 (60.4)	265 (2 345)	340 (3 009)	1 500	6 500	<b>1FE1115-6WT</b> ■ 1- 1 B C ■ ■	0.0780 (0.690)	90 (198)
37.7 (50.5)	48.3 (64.8)	300 (2 655)	384 (3 399)	1 200	6 500	<b>1FE1116-6WR</b> ■ 1- 1 B ■ ■ ■	0.09285 (0.8217)	103 (227)
28.3 (37.9)	36.2 (48.5)	300 (2 655)	384 (3 399)	900	5 500	<b>1FE1116-6WT</b> ■ 1- 1 B ■ ■ ■	0.09285 (0.8217)	103 (227)
22 (29.5)	28 (37.5)	300 (2 655)	384 (3 399)	700	4 000	<b>1FE1116-6WW</b> ■ 1- 1 B ■ ■ ■	0.09285 (0.8217)	103 (227)

#### High-Torque series, 8-pole

63 (84.5)	80 (107)	430 (3 806)	620 (5 487)	1 400	6 500	<b>1FE1144-8WL</b> ■ 1- 1 B ■ ■ ■	0.11440 (1.013)	84.5 (186)
104 (139.4)	124 (166) <sup>2)</sup>	585 (5 178)	795 (7 036) <sup>2)</sup>	1 700	8 000	<b>1FE1145-8WN</b> ■ 1- 1 B ■ ■ ■	0.21636 (1.9148)	117 (258)
79.6 (106.7)	96 (129)	585 (5 178)	795 (7 036)	1 300	6 000	<b>1FE1145-8WQ</b> ■ 1- 1 B ■ ■ ■	0.21636 (1.9148)	117 (258)
67.4 (90.4)	80 (107)	585 (5 178)	795 (7 036)	1 100	5 000	<b>1FE1145-8WS</b> ■ 1- 1 B ■ ■ ■	0.21636 (1.9148)	117 (258)
103 (138.1)	124 (166) <sup>2)</sup>	820 (7 258)	1 110 (9 824) <sup>2)</sup>	1 200	5 500	<b>1FE1147-8WN</b> ■ 1- 1 B ■ ■ ■	0.28823 (2.5508)	155 (342)
81.6 (109.4)	96 (129)	820 (7 258)	1 110 (9 824)	950	4 200	<b>1FE1147-8WQ</b> ■ 1- 1 B ■ ■ ■	0.28823 (2.5508)	155 (342)
64.4 (86.3)	80 (107)	820 (7 258)	1 110 (9 824)	750	3 500	<b>1FE1147-8WS</b> ■ 1- 1 B ■ ■ ■	0.28823 (2.5508)	155 (342)

- Standard protection: 2 x KTY<sup>3)</sup>
- Full protection: 2 x KTY + 3 x PTC thermistor drilling<sup>7)</sup>
- Universal protection<sup>3)</sup>

1  
3  
5

- Delivery of stator + rotor<sup>3)5)6)</sup>

1

- Stator with cooling jacket<sup>3)4)</sup>

B

- Without rotor jacket
- With rotor jacket, for  $d^*$  see dimensions table
- With rotor jacket, for  $d^{**}$  see dimensions table
- With rotor jacket "-...D." only for 1FE1113-.../1FE1145-.../1FE1147-..., see dimensions table
- With rotor jacket "-...E." only for 1FE1113-..., see dimensions table

A  
B  
C  
D  
E

- Free cable ends with rigid connection, 1.5 m (4.92 ft) in length  
Cable outlet at larger outer diameter of cooling jacket  
Cable outlet at smaller outer diameter of cooling jacket (on request)
- Free cable ends, flexible, 0.5 m (1.64 ft) in length (preferred variant)  
Cable outlet at larger outer diameter of cooling jacket  
Cable outlet at smaller outer diameter of cooling jacket (on request)

0  
1  
2  
3

S1 = continuous duty

S6 = intermittent duty:

Sizes 40, 50, 60: duty cycle time 1 min

Sizes 80 to 140: duty cycle time 2 min

# Synchronous motors

## Main spindle motors for SIMODRIVE 611

1FE1 standard type built-in motors  
Water cooling

### Selection and ordering data

Motor type (continued)	Rated current for duty type in accordance with IEC 60034-1 <sup>1)</sup>		Voltage Protection Module	SIMODRIVE 611 power module	
	$I_{\text{rated}}$ S1 A	S6-40 % A		Required rated current $I_{\text{rated}}$ S1 A	Order No.

#### High-Torque series, 6-pole

1FE1113-6WU...	60	91	VPM 120	60	For ordering data, see Converter system
1FE1113-6WX...	43	62	VPM 120	45	
1FE1114-6WR...	108	160	VPM 120	120	
1FE1114-6WT...	84	123	VPM 120	85	
1FE1114-6WW...	58	85	VPM 120	60	
1FE1115-6WT...	85	123	VPM 120	85	
1FE1116-6WR...	109	160	VPM 120	120	
1FE1116-6WT...	84	123	VPM 120	85	
1FE1116-6WW...	60	87	VPM 120	60	

#### High-Torque series, 8-pole

1FE1144-8WL...	133	193	VPM 200	200	For ordering data, see Converter system
1FE1145-8WN...	200	290 <sup>2)</sup>	VPM 200	200	
1FE1145-8WQ...	158	230	VPM 200	200	
1FE1145-8WS...	130	188	VPM 200	200	
1FE1147-8WN...	200	290 <sup>2)</sup>	VPM 200	200	
1FE1147-8WS...	158	230	VPM 200	200	
1FE1147-8WS...	130	190	VPM 200	200	

<sup>1)</sup> Data for  $\Delta T = 105$  K, special windings on request.

<sup>2)</sup> Observe limit for power section.

<sup>3)</sup> Standard scope of supply: Encapsulated winding with 2 x KTY (1 spare).

<sup>4)</sup> Stator without cooling jacket, with soaked winding on request.

<sup>5)</sup> Ordering spare parts: stator: 1FE1...-.....-2.W.

<sup>6)</sup> Ordering spare parts: rotor: 1FE1...-.....-3W..

<sup>7)</sup> Full protection option, application example: loading at motor standstill, external tripping unit required: Order No. 3RN1013-1GW10.

<sup>8)</sup> Universal protection option: full protection + NTC PT3-51F + NTC K227.

<sup>9)</sup> For moment of inertia with sleeve, see Configuration Manual.

# Synchronous motors

## Main spindle motors for SIMODRIVE 611

### 1FE1 standard type built-in motors

#### Water cooling

#### Selection and ordering data

Rated power for duty type in accordance with IEC 60034-1 <sup>1)</sup>		Rated torque <sup>1)</sup>		Rated speed	Speed, max.	1FE1 built-in motors Water cooling Standard type	Moment of inertia Rotor without sleeve	Weight, approx. (rotor and stator)
$P_{rated}$	S6-40 %	$M_{rated}$	S6-40 %	$n_{rated}$	$n_{max}$		$J$	$m$
kW (HP)	kW (HP)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	rpm	rpm	Order No.	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)

#### High-Speed series, 4-pole

12.6 (16.9)	17.6 (23.6)	5 (44.3)	7 (62)	24 000	40 000	<b>1FE1051-4HC</b> ■ 0- 1 B A ■	0.00045 (0.004)	4.1 (9.0)
6.5 (8.7)	8.0 (10.7)	6.5 (57.5)	9.0 (79.7)	9 500	30 000	<b>1FE1051-4WN</b> ■ 1- 1 B A ■	0.00057 (0.005)	4.2 (9.3)
31.4 (42.1)	35 (47)	12 (106)	15.5 (137.2)	25 000	40 000 <sup>8)</sup>	<b>1FE1052-4HD</b> ■ 0- 1 B A ■	0.00087 (0.007)	7.15 (15.77)
23.9 (32.0)	30 (40)	12 (106)	15.5 (137.2)	19 000	40 000 <sup>8)</sup>	<b>1FE1052-4HG</b> ■ 1- 1 B A ■	0.00087 (0.007)	7.15 (15.77)
11 (15)	12 (16)	13 (115)	18 (159)	8 000	30 000	<b>1FE1052-4WN</b> ■ 1- 1 B A ■	0.00110 (0.0097)	7.35 (16.21)
17.5 (23.1)	19 (26)	13 (115)	17 (151)	12 500	30 000	<b>1FE1052-4WK</b> ■ 1- 1 B A ■	0.00110 (0.0097)	7.35 (16.21)
25.5 (34.2)	32.5 (43.6)	18 (159)	23 (204)	13 500	40 000 <sup>8)</sup>	<b>1FE1053-4HH</b> ■ 1- 1 B A ■	0.00128 (0.0113)	10.2 (22.5)
16.5 (22.1)	18 (24)	20 (177)	27 (239)	7 900	30 000	<b>1FE1053-4WN</b> ■ 1- 1 B A ■	0.00163 (0.0144)	10.5 (23.2)
23 (31)	25 (34)	20 (177)	27 (239)	11 000	30 000	<b>1FE1053-4WJ</b> ■ 1- 1 B A ■	0.00163 (0.0144)	10.5 (23.2)
16 (21)	16 (21)	28 (248)	40 (354)	5 500	24 000	<b>1FE1072-4WN</b> ■ 1- 1 B A ■	0.00287 (0.0254)	11.2 (24.7)
20 (27)	20 (27)	28 (248)	40 (354)	6 800	24 000	<b>1FE1072-4WL</b> ■ 1- 1 B A ■	0.00287 (0.0254)	11.2 (24.7)
28.5 (38.2)	28.5 (38.2)	28 (248)	40 (354)	9 700	24 000	<b>1FE1072-4WH</b> ■ 1- 1 B A ■	0.00287 (0.0254)	11.2 (24.7)
30 (40)	30 (40)	42 (372)	59 (522)	6 800	24 000	<b>1FE1073-4WN</b> ■ 1- 1 B A ■	0.00430 (0.0381)	16 (35)
15 (20)	15 (20)	45 (398)	64 (566)	3 200	14 000	<b>1FE1073-4WT</b> ■ 1- 1 B A ■	0.00430 (0.0381)	16 (35)
41 (55)	41 (55)	56 (496)	79 (699)	7 000	20 000	<b>1FE1074-4WN</b> ■ 1- 1 B A ■	0.00573 (0.0507)	21 (46)
48 (64)	51 (68)	60 (531)	86 (761)	7 700	20 000	<b>1FE1074-4WM</b> ■ 1- 1 B A ■	0.00573 (0.0507)	21 (46)
25.8 (34.6)	28 (38)	60 (531)	85 (752)	4 100	18 000	<b>1FE1074-4WT</b> ■ 1- 1 B A ■	0.00573 (0.0507)	21 (46)
15.5 (20.8)	15.5 (20.8)	42 (372)	55 (487)	3 500	20 000	<b>1FE1082-4WN</b> ■ 1- 1 B A ■	0.00559 (0.0495)	15.1 (33.3)
8.8 (11.8)	8.8 (11.8)	42 (372)	55 (487)	2 000	11 000	<b>1FE1082-4WR</b> ■ 1- 1 B A ■	0.00559 (0.0495)	15.1 (33.3)
28 (38)	28 (38)	63 (558)	83 (735)	4 200	20 000	<b>1FE1083-4WN</b> ■ 1- 1 B A ■	0.00847 (0.0750)	22 (49)
38 (58)	38 (51)	84 (744)	110 (974)	4 300	20 000	<b>1FE1084-4WN</b> ■ 1- 1 B A ■	0.01118 (0.0989)	28.5 (62.9)
35 (47)	35 (47)	78 (690)	110 (974)	4 300	20 000	<b>1FE1084-4WP</b> ■ 1- 1 B A ■	0.01118 (0.0989)	28.5 (62.9)
30 (40)	30 (40)	84 (743)	110 (974)	3 400	18 000	<b>1FE1084-4WQ</b> ■ 1- 1 B A ■	0.01118 (0.0989)	28.5 (62.9)
26.4 (35.4)	26.4 (35.4)	84 (743)	110 (974)	3 000	15 000	<b>1FE1084-4WT</b> ■ 1- 1 B A ■	0.01118 (0.0989)	28.5 (62.9)
38 (51)	38 (51)	105 (929)	138 (1 221)	3 500	18 000	<b>1FE1085-4WN</b> ■ 1- 1 B A ■	0.01388 (0.1228)	35 (77)
24 (32)	24 (32)	105 (929)	140 (1 239)	2 200	12 000	<b>1FE1085-4WT</b> ■ 1- 1 B A ■	0.01388 (0.1228)	35 (77)
33 (44)	33 (44)	105 (929)	140 (1 239)	3 000	16 000	<b>1FE1085-4WQ</b> ■ 1- 1 B A ■	0.01388 (0.1228)	35 (77)

- Standard protection: 2 x KTY<sup>2)</sup>
- Full protection: 2 x KTY + 3 x PTC thermistor drilling<sup>6)</sup>
- Universal protection<sup>7)</sup>

1  
3  
5

- Delivery of stator + rotor<sup>2)4)5)</sup>

1

- Stator with cooling jacket<sup>2)3)</sup>

B

- Without rotor jacket

A

- Free cable ends with rigid connection, 1.5 m (4.92 ft) in length  
Cable outlet at larger outer diameter of cooling jacket  
Cable outlet at smaller outer diameter of cooling jacket (on request)
- Free cable ends, flexible, 0.5 m (1.64 ft) in length (preferred variant)  
Cable outlet at larger outer diameter of cooling jacket  
Cable outlet at smaller outer diameter of cooling jacket (on request)

0  
1  
2  
3

S1 = continuous duty  
S6 = intermittent duty:  
Sizes 40, 50, 60: duty cycle time 1 min  
Sizes 80 to 140: duty cycle time 2 min

# Synchronous motors

## Main spindle motors for SIMODRIVE 611

1FE1 standard type built-in motors  
Water cooling

### Selection and ordering data

Motor type (continued)	Rated current for duty type in accordance with IEC 60034-1 <sup>1)</sup>		Voltage Protection Module	SIMODRIVE 611 power module	
	$I_{rated}$	S6-40 %		Required rated current $I_{rated}$ S1 to $n_{max}$	Order No.
	S1	S6-40 %		A	
	A	A			

### High-Speed series, 4-pole

1FE1051-4HC...	25	34.5	–	45	For ordering data, see Converter system
1FE1051-4WN...	12	17	VPM 120	24	
1FE1052-4HD...	57	75	–	120	
1FE1052-4HG...	44	59	VPM 120	85	
1FE1052-4WN...	20	26	VPM 120	30	
1FE1052-4WK...	30	39	VPM 120	45	
1FE1053-4HH...	46	63	VPM 120	85	
1FE1053-4WN...	29	38	VPM 120	45	
1FE1053-4WJ...	36	49	VPM 120	60	
1FE1072-4WN...	36	54	VPM 120	45	
1FE1072-4WL...	45	68	VPM 120	60	
1FE1072-4WH...	64	96	VPM 120	85	
1FE1073-4WN...	65	97	VPM 120	85	
1FE1073-4WT...	30	44	VPM 120	30	
1FE1074-4WN...	91	136	VPM 120	120	
1FE1074-4WM...	97	144	VPM 120	120	
1FE1074-4WT...	53	77	VPM 120	60	
1FE1082-4WN...	42	60	VPM 120	45	
1FE1082-4WR...	24	34	VPM 120	24	
1FE1083-4WN...	77	110	VPM 120	85	
1FE1084-4WN...	105	150	VPM 120	120	
1FE1084-4WP...	79	120	VPM 120	85	
1FE1084-4WQ...	83	119	VPM 120	85	
1FE1084-4WT...	60	85	VPM 120	60	
1FE1085-4WN...	105	150	VPM 120	120	
1FE1085-4WT...	60	85	VPM 120	60	
1FE1085-4WQ...	85	120	VPM 120	85	

<sup>1)</sup> Data for  $\Delta T = 105$  K, special windings on request.

<sup>2)</sup> Standard scope of supply: Encapsulated winding with 2 x KTY (1 spare).

<sup>3)</sup> Stator without cooling jacket, with soaked winding on request.

<sup>4)</sup> Ordering spare parts: stator: 1FE1...-.....-2.W.

<sup>5)</sup> Ordering spare parts: rotor: 1FE1...-.....-3W..

<sup>6)</sup> Full protection option, application example: loading at motor standstill, external tripping unit required: Order No. 3RN1013-1GW10.

<sup>7)</sup> Universal protection option: full protection + NTC PT3-51F + NTC K227.

<sup>8)</sup> Series reactor required, see Configuration Manual.

# Synchronous motors

## Main spindle motors for SIMODRIVE 611

### 1FE1 standard type built-in motors

#### Water cooling

#### Selection and ordering data

Rated power for duty type in accordance with IEC 60034-1 <sup>1)</sup>		Rated torque <sup>1)</sup>		Rated speed	Speed, max.	1FE1 built-in motors Water cooling Standard type	Moment of inertia Rotor without sleeve	Weight, approx. (rotor and stator)
$P_{\text{rated}}$		$M_{\text{rated}}$		$n_{\text{rated}}$	$n_{\text{max}}$		$J$	
S1	S6-40 %	S1	S6-40 %			Order No.	$\text{kgm}^2$ ( $\text{lb}_f\text{-in-s}^2$ )	kg (lb)
kW (HP)	kW (HP)	Nm ( $\text{lb}_f\text{-in}$ )	Nm ( $\text{lb}_f\text{-in}$ )	rpm	rpm			

#### High-Speed series, 4-pole

16 (21)	16 (21)	45 (398)	60 (531)	3 400	18 000	<b>1FE1092-4WP</b> ■ 1- 1 B ■ ■ ■ 0.00916 (0.0811)	30 (66)
10.5 (14.1)	10.5 (14.1)	50 (443)	64 (310)	2 000	10 000	<b>1FE1092-4WV</b> ■ 1- 1 B ■ ■ ■ 0.00916 (0.0811)	30 (66)
27.5 (36.9)	27.5 (36.9)	75 (664)	103 (912)	3 500	18 000	<b>1FE1093-4WM</b> ■ 1- 1 B ■ ■ ■ 0.01694 (0.1499) <sup>9)</sup>	43.5 (95.9)
26 (35)	26 (35)	75 (664)	103 (912)	3 300	16 000	<b>1FE1093-4WN</b> ■ 1- 1 B ■ ■ ■ 0.01694 (0.1499) <sup>9)</sup>	43.5 (95.9)
35 (47)	35 (47)	75 (664)	103 (912)	4 500	18 000	<b>1FE1093-4WH</b> ■ 1- 1 B ■ ■ ■ 0.01694 (0.1499) <sup>9)</sup>	43.5 (95.9)
40 (54)	40 (54)	100 (885)	137 (1 213)	3 800	18 000	<b>1FE1094-4WL</b> ■ 1- 1 B ■ ■ ■ 0.02168 (0.1919) <sup>9)</sup>	50.5 (111.4)
46 (62)	46 (62)	100 (885)	137 (1 213)	4 400	18 000	<b>1FE1094-4WK</b> ■ 1- 1 B ■ ■ ■ 0.02168 (0.1919) <sup>9)</sup>	50.5 (111.4)
26 (35)	26 (35)	100 (885)	125 (1 106)	2 500	13 000	<b>1FE1094-4WS</b> ■ 1- 1 B ■ ■ ■ 0.02168 (0.1919) <sup>9)</sup>	50.5 (111.4)
18 (24)	18 (24)	95 (841)	118 (1 044)	1 800	10 000	<b>1FE1094-4WU</b> ■ 1- 1 B ■ ■ ■ 0.02168 (0.1919) <sup>9)</sup>	50.5 (111.4)
46 (62)	46 (62)	125 (1 106)	170 (1 505)	3 500	18 000	<b>1FE1095-4WN</b> ■ 1- 1 B ■ ■ ■ 0.02642 (0.2338) <sup>9)</sup>	59 (130)
52 (70)	52 (70)	150 (1 328)	206 (1 823)	3 300	16 000	<b>1FE1096-4WN</b> ■ 1- 1 B ■ ■ ■ 0.03140 (0.2779) <sup>9)</sup>	67 (148)
38.5 (51.6)	45 (60)	102 (903)	142 (1 257)	3 600	16 000	<b>1FE1103-4WN</b> ■ 1- 1 B A ■ ■ 0.01589 (0.1406)	34 (75)
54 (72)	64 (86)	136 (1 204)	190 (1 682)	3 800	16 000	<b>1FE1104-4WN</b> ■ 1- 1 B A ■ ■ 0.02098 (0.1857)	42.5 (93.7)
53.4 (71.6)	64 (86)	170 (1 505)	236 (2 089)	3 000	16 000	<b>1FE1105-4WN</b> ■ 1- 1 B A ■ ■ 0.02609 (0.2309)	52 (115)
72.6 (97.3)	85 (114)	204 (1 806)	283 (2 505)	3 400	16 000	<b>1FE1106-4WN</b> ■ 1- 1 B A ■ ■ 0.03147 (0.2785)	61.5 (135.6)
62 (83)	66 (89)	204 (1 806)	270 (2 390)	2 900	14 000	<b>1FE1106-4WR</b> ■ 1- 1 B A ■ ■ 0.03147 (0.2785)	61.5 (135.6)
56.5 (75.7)	60 (80)	200 (1 770)	270 (2 390)	2 700	12 500	<b>1FE1106-4WS</b> ■ 1- 1 B A ■ ■ 0.03147 (0.2785)	61.5 (135.6)
25 (34)	30 (40)	200 (1 770)	270 (2 390)	1 200	6 000	<b>1FE1106-4WY</b> ■ 1- 1 B A ■ ■ 0.03147 (0.2785)	61.5 (135.6)
63 (85)	75 (101)	200 (1 770)	275 (2 434)	3 000	14 000	<b>1FE1124-4WN</b> ■ 1- 1 B A ■ ■ 0.05112 (0.4524)	62.6 (138.0)
78.5 (105.2)	90 (121)	250 (2 213)	345 (3 054)	3 000	14 000	<b>1FE1125-4WN</b> ■ 1- 1 B A ■ ■ 0.06337 (0.5608)	76 (168)
65.5 (87.8)	82 (110)	250 (2 213)	345 (3 054)	2 500	12 500	<b>1FE1125-4WP</b> ■ 1- 1 B A ■ ■ 0.06337 (0.5608)	76 (168)
94 (126)	112 (150) <sup>2)</sup>	300 (2 655)	410 (3 629) <sup>2)</sup>	3 000	14 000	<b>1FE1126-4WN</b> ■ 1- 1 B A ■ ■ 0.07604 (0.6729)	90 (198)
78.5 (105.2)	100 (134) <sup>2)</sup>	300 (2 655)	410 (3 629) <sup>2)</sup>	2 500	12 500	<b>1FE1126-4WP</b> ■ 1- 1 B A ■ ■ 0.07604 (0.6729)	90 (198)
63 (85)	82 (110)	300 (2 655)	410 (3 629)	2 000	10 000	<b>1FE1126-4WQ</b> ■ 1- 1 B A ■ ■ 0.07604 (0.6729)	90 (198)

- Standard protection: 2 x KTY<sup>3)</sup>
- Full protection: 2 x KTY + 3 x PTC thermistor drilling<sup>7)</sup>
- Universal protection<sup>3)</sup>

1  
3  
5

- Delivery of stator + rotor<sup>3)5)6)</sup>

1

- Stator with cooling jacket<sup>3)4)</sup>

B

- Without rotor jacket
- Without rotor jacket,  $d_f = 80 \text{ mm}$  (3.15 in) for 1FE109.-4W... only

A

R

- Free cable ends with rigid connection, 1.5 m (4.92 ft) in length  
Cable outlet at larger outer diameter of cooling jacket  
Cable outlet at smaller outer diameter of cooling jacket (on request)
- Free cable ends, flexible, 0.5 m (1.64 ft) in length (preferred variant)  
Cable outlet at larger outer diameter of cooling jacket  
Cable outlet at smaller outer diameter of cooling jacket (on request)

0

1

2

3

S1 = continuous duty  
S6 = intermittent duty:  
Sizes 50 and 70: Duty cycle time 1 min  
Sizes 80 to 120: duty cycle time 2 min

# Synchronous motors

## Main spindle motors for SIMODRIVE 611

1FE1 standard type built-in motors  
Water cooling

### Selection and ordering data

Motor type (continued)	Rated current for duty type in accordance with IEC 60034-1 <sup>1)</sup>		Voltage Protection Module	SIMODRIVE 611 power module	
	$I_{\text{rated}}$ S1 A	S6-40 % A		Required rated current $I_{\text{rated}}$ S1 A	Order No.
<b>High-Speed series, 4-pole</b>					
1FE1092-4WP...	41	58	VPM 120	45	For ordering data, see Converter system
1FE1092-4WV...	24	35	VPM 120	30	
1FE1093-4WM...	64	92	VPM 120	85	
1FE1093-4WN...	60	86.4	VPM 120	60	
1FE1093-4WH...	83	120	VPM 120	120	
1FE1094-4WL...	90	130	VPM 120	120	
1FE1094-4WK...	108	156	VPM 120	120	
1FE1094-4WS...	60	85	VPM 120	60	
1FE1094-4WU...	45	64	VPM 120	45	
1FE1095-4WN...	108	156	VPM 120	120	
1FE1096-4WN...	120	173	VPM 120	120	
1FE1103-4WN...	84	127	VPM 120	85	
1FE1104-4WN...	120	181	VPM 200	120	
1FE1105-4WN...	120	180	VPM 200	120	
1FE1106-4WN...	159	240	VPM 200	200	
1FE1106-4WR...	128	184	VPM 200	200	
1FE1106-4WS...	120	170	VPM 200	120	
1FE1106-4WY...	60	85	VPM 120	60	
1FE1124-4WN...	135	198	VPM 200	200	
1FE1125-4WN...	162	240	VPM 200	200	
1FE1125-4WP...	147	215	VPM 200	200	
1FE1126-4WN...	200	295 <sup>2)</sup>	VPM 200	200	
1FE1126-4WP...	180	265 <sup>2)</sup>	VPM 200	200	
1FE1126-4WQ...	147	215	VPM 200	200	

<sup>1)</sup> Data for  $\Delta T = 105$  K, special windings on request.

<sup>2)</sup> Observe limit for power section.

<sup>3)</sup> Standard scope of supply: Encapsulated winding with 2 x KTY (1 spare).

<sup>4)</sup> Stator without cooling jacket, with soaked winding on request.

<sup>5)</sup> Ordering spare parts: stator: 1FE1...-.....-2.W.

<sup>6)</sup> Ordering spare parts: rotor: 1FE1...-.....-3W..

<sup>7)</sup> Full protection option, application example: loading at motor standstill, external tripping unit required: Order No. 3RN1013-1GW10.

<sup>8)</sup> Universal protection option: full protection + NTC PT3-51F + NTC K227.

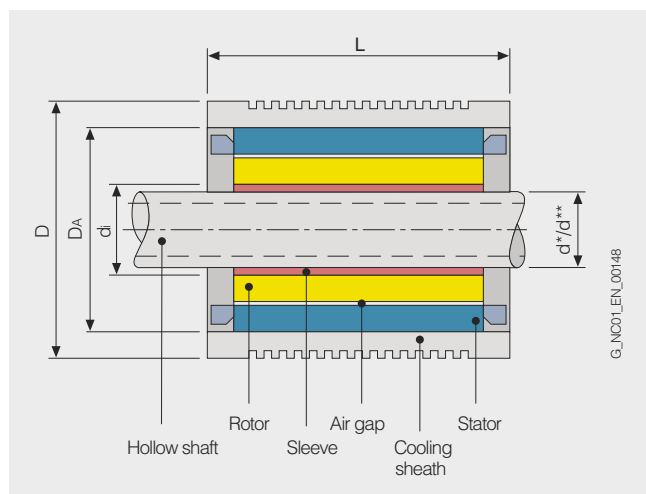
<sup>9)</sup> For moment of inertia for version "R" without rotor jacket  $d_f = 80$  mm (3.15 in), see Planning Guide.

# Synchronous motors

## Main spindle motors for SIMODRIVE 611

### 1FE1 built-in motors

#### Dimension drawing



1FE1 motor Type	L mm (in)	D mm (in)	DA mm (in)	di mm (in)
<b>High-Speed series</b>				
1FE1051-4....-1BA.	130 (5.12)	120 (4.72)	106 (4.17)	46 (1.81)
1FE1052-4....-1BA.	180 (7.09)	120 (4.72)	106 (4.17)	46 (1.81)
1FE1053-4....-1BA.	230 (9.06)	120 (4.72)	106 (4.17)	46 (1.81)
1FE1072-4W...-1BA.	185 (7.28)	155 (6.10)	135 (5.31)	58 (2.28)
1FE1073-4W...-1BA.	235 (9.25)	155 (6.10)	135 (5.31)	58 (2.28)
1FE1074-4W...-1BA.	285 (11.22)	155 (6.10)	135 (5.31)	58 (2.28)
1FE1082-4W...-1BA.	190 (7.48)	180 (7.09)	160 (6.30)	68 (2.68)
1FE1083-4W...-1BA.	240 (9.45)	180 (7.09)	160 (6.30)	68 (2.68)
1FE1084-4W...-1BA.	290 (11.42)	180 (7.09)	160 (6.30)	68 (2.68)
1FE1085-4W...-1BA.	340 (13.39)	180 (7.09)	160 (6.30)	68 (2.68)
1FE1092-4W...-1BR.	200 (7.87)	205 (8.07)	180 (7.09)	80 (3.15)
1FE1093-4W...-1BA.	250 (9.84)	205 (8.07)	180 (7.09)	72 (2.83)
1FE1093-4W...-1BR.	250 (9.84)	205 (8.07)	180 (7.09)	80 (3.15)
1FE1094-4W...-1BA.	300 (11.81)	205 (8.07)	180 (7.09)	72 (2.83)
1FE1094-4W...-1BR.	300 (11.81)	205 (8.07)	180 (7.09)	80 (3.15)
1FE1095-4W...-1BA.	350 (13.78)	205 (8.07)	180 (7.09)	72 (2.83)
1FE1095-4W...-1BR.	350 (13.78)	205 (8.07)	180 (7.09)	80 (3.15)
1FE1096-4W...-1BA.	400 (15.75)	205 (8.07)	180 (7.09)	72 (2.83)
1FE1096-4W...-1BR.	400 (15.75)	205 (8.07)	180 (7.09)	80 (3.15)
1FE1103-4W...-1BA.	265 (10.43)	230 (9.06)	200 (7.87)	96 (3.78)
1FE1104-4W...-1BA.	315 (12.40)	230 (9.06)	200 (7.87)	96 (3.78)
1FE1105-4W...-1BA.	365 (14.37)	230 (9.06)	200 (7.87)	96 (3.78)
1FE1106-4W...-1BA.	415 (16.34)	230 (9.06)	200 (7.87)	96 (3.78)
1FE1124-4W...-1BA.	315 (12.40)	270 (10.63)	240 (9.45)	110 (4.33)
1FE1125-4W...-1BA.	365 (14.37)	270 (10.63)	240 (9.45)	110 (4.33)
1FE1126-4W...-1BA.	415 (16.34)	270 (10.63)	240 (9.45)	110 (4.33)

Rotors of the High-Speed series are supplied without rotor sleeve and unbalanced.

1FE1 motor Type	L mm (in)	D mm (in)	DA mm (in)	di mm (in)	Internal rotor diameter with sleeve				
					d* mm (in)	d**-.C. mm (in)	d**-.D. mm (in)	d**-.E. mm (in)	
<b>High-Torque series</b>									
1FE1041-6W...-1BA.	107 (4.21)	95 (3.74)	85 (3.35)	44 (1.73)	-	-	-	-	-
1FE1042-6W...-1BA.	157 (6.20)	95 (3.74)	85 (3.35)	44 (1.73)	-	-	-	-	-
1FE1051-6W...-1B..	170 (6.69)	115 (4.53)	103.5 (4.07)	42 (1.65)	-	33 (1.30)	-	-	-
1FE1052-6W...-1B..	220 (8.66)	115 (4.53)	103.5 (4.07)	42 (1.65)	-	33 (1.30)	-	-	-
1FE1054-6W...-1BA.	320 (12.60)	115 (4.53)	103.5 (4.07)	42 (1.65)	-	-	-	-	-
1FE1061-6W...-1B..	130 (5.12)	130 (5.12)	118 (4.65)	58 (2.28)	48 (1.89)	-	-	-	-
1FE1064-6W...-1BA.	280 (11.02)	130 (5.12)	118 (4.65)	58 (2.28)	-	-	-	-	-
1FE1082-6W...-1B..	195 (7.68)	190 (7.48)	170 (6.69)	93 (3.66)	67 (2.64)	74 (2.91)	80 (3.15)	-	-
1FE1084-6W...-1B..	295 (11.61)	190 (7.48)	170 (6.69)	93 (3.66)	-	74 (2.91)	-	-	-
1FE1091-6W...-1B..	150 (5.91)	205 (8.07)	180 (7.09)	92 (3.62)	67 (2.64)	80 (3.15)	-	-	-
1FE1092-6W...-1B..	200 (7.87)	205 (8.07)	180 (7.09)	92 (3.62)	67 (2.64)	80 (3.15)	-	-	-
1FE1093-6W...-1B..	250 (9.84)	205 (8.07)	180 (7.09)	92 (3.62)	67 (2.64)	80 (3.15)	-	-	-
1FE1113-6W...-1B..	260 (10.24)	250 (9.84)	220 (8.66)	120 (4.72)	-	-	80 (3.15)	105.2 (4.14)	-
1FE1114-6W...-1B..	310 (12.20)	250 (9.84)	220 (8.66)	120 (4.72)	82 (3.23)	102 (4.02)	-	-	-
1FE1115-6W...-1BC.	360 (14.20)	250 (9.84)	220 (8.66)	-	-	102 (4.02)	-	-	-
1FE1116-6W...-1B..	410 (16.14)	250 (9.84)	220 (8.66)	120 (4.72)	82 (3.23)	102 (4.02)	-	-	-
1FE1144-8W...-1B..	340 (13.39)	310 (12.20)	280 (11.02)	166.7 (6.56)	-	150.3 (5.92)	-	-	-
1FE1145-8W...-1B..	390 (15.35)	310 (12.20)	280 (11.02)	-	-	150.3 (5.92)	140.3 (5.52)	125 (4.92)	-
1FE1147-8W...-1B..	490 (19.29)	310 (12.20)	280 (11.02)	-	-	150.3 (5.92)	140.3 (5.52)	-	-

#### Note:

Rotors without rotor sleeve "-.A." are supplied without pre-balancing.

Rotors with rotor sleeve "-.B./-.C./-.D./-.E." are supplied pre-balanced.



# Synchronous motors

## Main spindle motors for SIMODRIVE 611

### VPM Voltage Protection Module

#### Overview

The VPM Voltage Protection Module is used with motors 1FE1...-...1-... and 2SP1 with EMF of  $V > 800$  V to 2 000 V ( $V_{\text{eff}}$  570 V to 1 400 V) to limit the DC link voltage at the converter in the event of a fault. If the line voltage fails at maximum motor speed or if the drive converter pulses are canceled as a result of the power failure, the synchronous motor regenerates at high voltage back into the DC link.

The VPM detects a DC link voltage that is too high ( $> 800$  V DC) and short-circuits the three motor supply cables. The power remaining in the motor is converted to heat via the short circuit in the VPM and motor.

#### Integration

The VPM is only operational in conjunction with SIMODRIVE 611 and 1FE1/2SP1 motors.

The VPM must be installed between motor and converter system (at a maximum distance from the converter system of 1.5 m (4.92 ft)). 6FX8 shielded motor supply cables must be used in combination with the VPM.

System requirements for operating the VPM with 1FE1/2SP1 motors:

- SIMODRIVE 611 digital with High Performance control
- SIMODRIVE 611 universal HRS software version 3.3
- SINUMERIK 840D powerline software version 4.4 and higher

#### Technical specifications

Product name	Voltage Protection Module		
	VPM 120	VPM 200	VPM 200 DYNAMIK
Degree of protection in accordance with EN 60529 (IEC 60529)	IP20		
Humidity rating based on EN 60721-3-3	Class 3K5, condensation and icing excluded. Low air temperature 0 °C (32 °F)		
Ambient temperature			
• Storage	-25 ... +55 °C (-13 ... +131 °F)		
• Transport	-25 ... +55 °C (-13 ... +131 °F)		
• Operation	0 ... 55 °C (32 ... 131 °F)		
Dimensions			
• Height	300 mm (11.8 in)	300 mm (11.8 in)	300 mm (11.8 in)
• Width	150 mm (5.91 in)	250 mm (9.84 in)	250 mm (9.84 in)
• Depth	180 mm (7.09 in)	190 mm (7.48 in)	260 mm (10.2 in)
Weight, approx.	6 kg (13.2 lb)	11 kg (24.3 lb)	12 kg (26.5 lb)

#### Selection and ordering data

Designation	Order No.
<b>Voltage Protection Module</b>	
• VPM 120 (120 A)	<b>6SN1113-1AA00-1JA1</b>
• VPM 200 (200 A)	<b>6SN1113-1AA00-1KA1</b>
• VPM 200 DYNAMIK (200 A) For large conductor cross-sections (up to 50 mm <sup>2</sup> ) and for non-Siemens synchronous motors	<b>6SN1113-1AA00-1KC1</b>

# Synchronous motors

## Motor spindles for SIMODRIVE 611

### 2SP1 standard type motor spindles Water cooling

#### Overview



The 2SP1 motor spindle product range comprises compact standard motor spindles for milling machines that can be used as an alternative to belt-driven spindles and can be used both for rough cutting and for precise fine machining.

The 2SP1 motor spindle contains all the classical elements of a motor spindle, such as a tool interface, tool clamping and release mechanism, spindle bearings suitable for absorbing the machining forces, water-cooled drive motor, spindle casing for fixing and sensors for indexing and monitoring tool changeover.

The motorized spindles are available in 2 diameters of 200 mm (7.87 in) (2SP120) and 250 mm (9.84 in) (2SP125) and are offered with different torque and speed graduations to match the respective milling machine family. The motor spindles are ideally matched to the performance levels of SIMODRIVE 611.

The complete product range of 2SP1 motor spindles was developed in cooperation with and is manufactured at Weiss Spindeltechnologie GmbH.

#### Benefits

The 2SP1 motor spindles offer the user the following important advantages over conventional belt-driven solutions:

- Compact spindle solution and "everything included" in the spindle box
- Fewer components and easy installation
- Economical standard solution as compared with today's belt-driven solutions
- Drive train with high degree of rigidity
- High torque and speed and therefore high productivity thanks to high cutting efficiency and reduction of non-productive time
- Higher speed and shorter start-up times as compared with conventional belt-driven or gear solutions
- Economical pneumatic tool release mechanism or optional fast hydraulic tool release mechanism
- Worldwide system delivery including spindle mechanics from a single source – from Siemens
- Extremely short tool change times with 2SP210 thanks to 2-channel technology and clamping set with optional latching capability

#### Application

The main application area for 2SP1 motor spindles are main spindles for simple milling machines and machining centers in the job shop area of the machine tools sector.

The 2SP120 motor spindles are particularly suitable for the area of light metal machining at low torque and high speeds.

The 2SP125 motor spindles are characterized by a high torque. The main area of application is in the machining of steel and castings.

#### Design

The 2SP1 motor spindles are characterized by a rugged design.

Depending on the version, the following options are available for 2SP1 motor spindles:

- Various tool interfaces
- Internal tool cooling
- External tool cooling

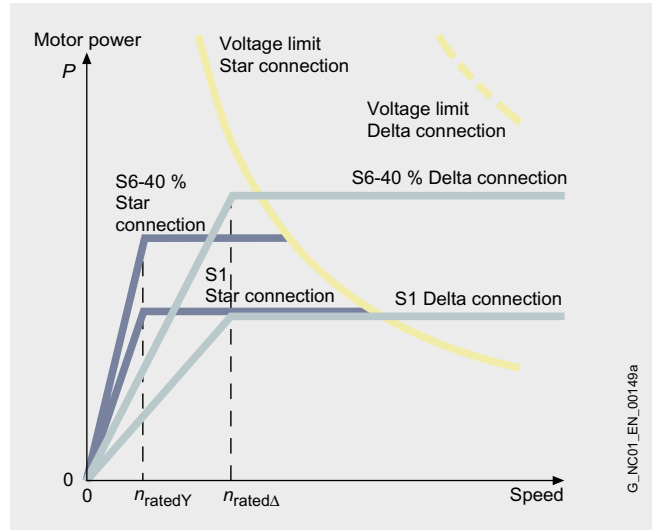
# Synchronous motors Motor spindles for SIMODRIVE 611

## 2SP1 standard type motor spindles Water cooling

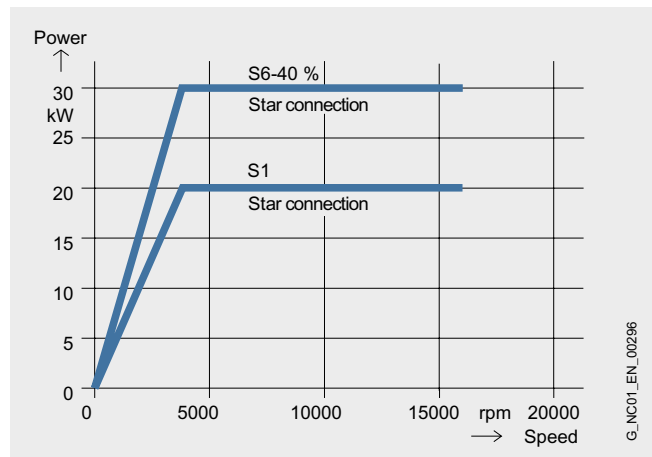
### Integration

- The 2SP1 motor spindle can generally be used with:
- SIMODRIVE 611 digital in combination with High Standard or High Performance closed-loop control
  - SIMODRIVE 611 universal HRS
  - SINUMERIK 810D powerline
  - SINUMERIK 840D powerline
- A VPM 120 Voltage Protection Module must be used with motor spindles in synchronous design, see 1FE1 built-in motors.

### Characteristic curves



2SP1 motor spindles in asynchronous design with star-delta changeover



2SP1 motor spindles in synchronous design



# Synchronous motors

## Motor spindles for SIMODRIVE 611

### 2SP1 standard type motor spindles

#### Water cooling

#### Selection and ordering data

Spindle diameter	Rated power Star/delta		Rated torque Star/delta		Rated speed Star/delta	Maximum speed	2SP1 motor spindles Water cooling Standard type
	$P_{rated}$ S1	S6-40 %	$M_{rated}$ S1	S6-40 %	$n_{rated}$	$n_{max}$	
mm (in)	kW (HP)	kW (HP)	Nm (lb <sub>f</sub> -in)	Nm (lb <sub>f</sub> -in)	rpm	rpm	Order No.
<b>Synchronous</b>							
<b>200</b>	12.0/- (16.1/-)	12.0/- (16.1/-)	42/- (372/-)	55/- (487/-)	2 700/-	15 000	<b>2SP1202-1HA</b> ■ ■ -1 D ■ ■
	15.5/- (20.8/-)	15.5/- (20.8/-)	42/- (372/-)	55/- (487/-)	3 500/-	18 000	<b>2SP1202-1HB</b> ■ ■ -2 D ■ ■
	26.4/- (35.4/-)	26.4/- (35.4/-)	84/- (744/-)	110/- (974/-)	3 000/-	15 000	<b>2SP1204-1HA</b> ■ ■ -1 D ■ ■
	35.0/- (46.9/-)	35.0/- (46.9/-)	78/- (690/-)	110/- (974/-)	4 300/-	18 000	<b>2SP1204-1HB</b> ■ ■ -2 D ■ ■
<b>Asynchronous</b>							
<b>250</b>	13.2/13.2 (17.7/17.7)	18.9/18.9 (25.3/25.3)	70/32 (620/283)	100/45 (885/398)	1 800/4 000	10 000	<b>2SP1253-8HA</b> 0 ■ -0 ■ ■ 2
	13.2/13.2 (17.7/17.7)	18.9/18.9 (25.3/25.3)	70/32 (620/283)	100/45 (885/398)	1 800/4 000	15 000	<b>2SP1253-8HA</b> 0 ■ -1 D ■ 2
	11.7/11.7 (15.7/15.7)	16.7/16.7 (22.4/22.4)	140/62 (1 239/549)	200/89 (1 170/788)	800/1 800	10 000	<b>2SP1255-8HA</b> 0 ■ -0 ■ ■ 2
	11.7/11.7 (15.7/15.7)	16.7/16.7 (22.4/22.4)	140/62 (1 239/549)	200/89 (1 170/788)	800/1 800	15 000	<b>2SP1255-8HA</b> 0 ■ -1 D ■ 2
<b>Synchronous</b>							
<b>250</b>	26.0/- (34.9/-)	29.0/- (38.9/-)	100/- (885/-)	130/- (1 151/-)	2 500/-	10 000	<b>2SP1253-1HA</b> 0 ■ -0 ■ ■ 2
	35.0/- (46.9/-)	38.0/- (50.9/-)	100/- (885/-)	130/- (1 151/-)	3 300/-	15 000	<b>2SP1253-1HB</b> 0 ■ -1 D ■ 2
	46.3/- (62.1/-)	55.0/- (73.7/-)	170/- (1 505/-)	236/- (2 089/-)	2 600/-	10 000	<b>2SP1255-1HA</b> 0 ■ -0 ■ ■ 2
	53.4/- (71.6/-)	64.0/- (85.8/-)	170/- (1 505/-)	236/- (2 089/-)	3 000/-	15 000	<b>2SP1255-1HB</b> 0 ■ -1 D ■ 2
<b>Tool clamping and release mechanism:</b>							
Pneumatic ( <u>only</u> for 2SP125)							0
Pneumatic ( <u>only</u> for 2SP120)							2
Hydraulic ( <u>only</u> for 2SP120)							3
<b>Cooling:</b>							
Closed cooling jacket							1
Closed cooling jacket and internal tool cooling							3
Closed cooling jacket and ring for external tool cooling ( <u>only</u> for 2SP120)							4
Closed cooling jacket, internal tool cooling and ring for external tool cooling ( <u>only</u> for 2SP120)							5
<b>Tool interfaces:</b>							
Tool interface SK 40							A B C D E R
Tool interface BT 40 45°							
Tool interface CAT 40							
Tool interface HSK A63							
Tool interface BT 40 30°							
Tool interface HSK A63, latching ( <u>only</u> for 2SP120)							
<b>Sensors:</b>							
"Tool clamped" sensor, "draw-bar in the release position" sensor and "clamped without tool" sensor							D F
D + "position of release piston" sensor ( <u>only</u> for 2SP120)							
<b>Type of connection:</b>							
Permanently connected cable, sensor cable with signal connector, length: 1.5 m (4.92 ft)							2 6
Power cable with open core ends							
Power cable with connector (2SP1202: Connector size 1.5/2SP1204: Connector size 3)							

# Synchronous motors

## Motor spindles for SIMODRIVE 611

2SP1 standard type motor spindles  
Water cooling

### Selection and ordering data

Motor type (continued)	Moment of inertia  $J$  kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	Weight, <sup>1)</sup> approx.  $m$  kg (lb)	Rated current Star/delta		Voltage Protection Module	SIMODRIVE 611 power module	
			$I_{rated}$ S1 A	S6-40 % A		Required rated current  $I_{rated}$ S1 A	Order No.
<b>Synchronous</b>							
2SP1202-1HA...	0.015 (0.1327)	83 (183)	30/-	43/-	VPM 120	30	For ordering data, see Converter system
2SP1202-1HB...	0.015 (0.1327)	83 (183)	42/-	60/-	VPM 120	45	
2SP1204-1HA...	0.023 (0.2035)	101 (223)	60/-	85/-	VPM 120	60	
2SP1204-1HB...	0.023 (0.2035)	101 (223)	79/-	120/-	VPM 120	85	
<b>Asynchronous</b>							
2SP1253-8HA0.-0...	0.037 (0.3274)	130 (287)	28/29	39/39	-	30	For ordering data, see Converter system
2SP1253-8HA0.-1...	0.037 (0.3274)	130 (287)	28/29	39/39	-	30	
2SP1255-8HA0.-0...	0.055 (0.4867)	165 (364)	30/29	40/37	-	30	
2SP1255-8HA0.-1...	0.055 (0.4867)	165 (364)	30/29	40/37	-	30	
<b>Synchronous</b>							
2SP1253-1HA...	0.037 (0.3274)	130 (287)	53/-	75/-	VPM 120	60	For ordering data, see Converter system
2SP1253-1HB...	0.037 (0.3274)	130 (287)	68/-	98/-	VPM 120	85	
2SP1255-1HA...	0.055 (0.4867)	165 (364)	95/-	135/-	VPM 120	120	
2SP1255-1HB...	0.055 (0.4867)	165 (364)	120/-	180/-	VPM 120	120	

### More information

Please refer to Asynchronous motors – Liquid cooling for a list of heat exchanger manufacturers.

In addition to the standard motor spindles in the 2SP1 product range, it is also possible to use individually customized motor spindle designs.

For information about other motor spindles for turning, grinding, milling and drilling, please contact:

#### Weiss Spindeltechnologie GmbH

– a Siemens Company –

Rudolf-Diesel-Straße 35  
97424 SCHWEINFURT, Germany

Phone: +49 (0) 9721-7701-10  
Fax: +49 (0) 9721-7701-133

More information is available on the Internet at



[www.weissgmbh.de](http://www.weissgmbh.de)

<sup>1)</sup> No options included.  
Internal tool cooling: + 1 kg (2.21 lb)  
External tool cooling: + 8 kg (17.6 lb).

# Synchronous motors

## Motor spindles for SIMODRIVE 611

### 2SP1 standard type motor spindles

#### Water cooling

#### Technical specifications










Product name	2SP120 motor spindles	2SP125 motor spindles
<b>Standard functions</b>		
<b>Speed, max.</b>	15 000 rpm	10 000 rpm
<b>Enclosure</b>	Cartridge with flange mounting	Cartridge with flange mounting
<b>Working position</b>	Horizontal/vertical	Horizontal/vertical
<b>Tool holder</b>	HSK A63	SK 40 for tools with asymmetrical T sliding blocks
<b>Tool clamping device</b>	<ul style="list-style-type: none"> <li>• Release using pneumatic cylinder, 6 bar</li> <li>• Clamping using cup-spring assembly</li> </ul>	<ul style="list-style-type: none"> <li>• Release using pneumatic cylinder, 6 bar</li> <li>• Clamping using cup-spring assembly</li> </ul>
<b>Tool taper cleaning</b>	Compressed air through draw-bar 5 to 6 bar	Compressed air through draw-bar 5 to 6 bar
<b>Cooling with water</b>	<ul style="list-style-type: none"> <li>• Max. 5 bar, 10 l/min</li> <li>• Max. 25 % corrosion protection agent Clariant Antifrogen N or Tyfocor</li> <li>• Filter grade 100 µm</li> </ul>	<ul style="list-style-type: none"> <li>• Max. 5 bar, 10 l/min</li> <li>• Max. 25 % corrosion protection agent Clariant Antifrogen N or Tyfocor</li> <li>• Filter grade 100 µm</li> </ul>
<b>Recommended coolant inlet temperature, approx.</b>	25 °C (77 °F) (depending on the ambient temperature)	25 °C (77 °F) (depending on the ambient temperature)
<b>Standard protection Temperature monitoring</b>	<ul style="list-style-type: none"> <li>• Motor thermal sensor KTY84-130</li> <li>• PTC for full thermal protection</li> <li>• NTC PT3-51F</li> <li>• NTC K227</li> </ul>	<ul style="list-style-type: none"> <li>• Motor thermal sensor KTY84-130</li> <li>• PTC for full thermal protection</li> <li>• NTC PT3-51F</li> <li>• NTC K227</li> </ul>
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a coolant inlet temperature of 25 °C (77 °F)	Temperature class 155 (F) for a coolant inlet temperature of 25 °C (77 °F)
<b>Degree of protection in accordance with IEC 60034-5</b>	IP64 (in working area) IP53 (behind the spindle flange)	IP64 (in working area) IP53 (behind the spindle flange)
<b>Bearing lubrication</b>	Grease, permanent lubrication	Grease, permanent lubrication
<b>Seal, bearing front</b>	Sealing air 1 to 1.5 m <sup>3</sup> /h, filter grade 8 µm	Sealing air 1 to 1.5 m <sup>3</sup> /h, filter grade 8 µm
<b>Measuring system</b>	Hollow-shaft measuring system, incremental, sin/cos 1 V <sub>pp</sub> 256 S/R with zero mark	Hollow-shaft measuring system, incremental, sin/cos 1 V <sub>pp</sub> 256 S/R with zero mark
<b>Clamping status monitoring</b>		
• Sensors analog	<ul style="list-style-type: none"> <li>• Tool clamped</li> <li>• Draw-bar in the release position</li> <li>• Clamped without tool</li> </ul>	–
• Sensors digital	<ul style="list-style-type: none"> <li>• Position of release piston</li> </ul>	<ul style="list-style-type: none"> <li>• Tool clamped<sup>1)</sup></li> <li>• Draw-bar in the release position</li> <li>• Clamped without tool</li> </ul>
<b>Connections for the media</b>		
• Cooling	2 x hose plug-in connector, Ø 12/10 mm (0.47/0.39 in)	2 x G 1/2 (Ø 9 mm (0.35 in))
• Sealing air	1 x G 1/8 radial/Ø 5 mm (0.20 in) axial	1 x G 1/8 (Ø 8 mm (0.31 in))
• Air purge	1 x G 1/4	1 x G 1/4
• Release tool	1 x G 1/4	1 x M16x1.5
• Clamp tool	1 x G 1/8	1 x G 1/8
<b>Electrical connections</b>	<ul style="list-style-type: none"> <li>• Power through cable 1.5 m (4.92 ft)</li> <li>• Sensors through signal plug</li> </ul>	<ul style="list-style-type: none"> <li>• Power through cable 1.5 m (4.92 ft)</li> <li>• Sensors through signal plug</li> </ul>
<b>Options</b>		
<b>Increased max. speed</b>	18 000 rpm	15 000 rpm (with HSK A63)
<b>Internal tool cooling</b>	<ul style="list-style-type: none"> <li>• 50 bar, up to 54 l/min</li> <li>• Filter grade 50 µm according to -/16/13 ISO 4406</li> <li>• 1 x G1/4 coolant</li> <li>• 1 x G1/8 leakage</li> </ul>	<ul style="list-style-type: none"> <li>• 50 bar, up to 54 l/min</li> <li>• Filter grade 50 µm according to -/16/13 ISO 4406</li> <li>• 1 x G1/4 coolant</li> <li>• 1 x G1/8 leakage</li> </ul>
<b>External tool cooling</b>	<ul style="list-style-type: none"> <li>• Ring with 6 adjustable nozzles</li> <li>• 5 bar</li> <li>• Filter grade 50 µm according to -/16/13 ISO 4406</li> </ul>	–
<b>Tool clamping device</b>	<ul style="list-style-type: none"> <li>• Release using hydraulic cylinder, 80 bar</li> <li>• Clamping using cup-spring assembly</li> <li>• 1 x G 1/4, release tool</li> <li>• 1 x G 1/4, clamp tool</li> </ul>	–
<b>Tool interface</b>	–	BT 40, CAT 40, HSK A63

<sup>1)</sup> For manual tool changing; additional sensors are required for automatic tool changing (see Options).

# Synchronous motors

## Selection guides

### Type of construction/mounting position

Type of construction/ mounting position	Designation	Type of construction/ mounting position	Designation	Type of construction/ mounting position	Designation
	IM B3		IM B5 IM B14		IM B35
	IM V5		IM V1 IM V18		IM V15
	IM V6		IM V3 IM V19		IM V35

### Degree of protection

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

Since coolants used for machine tools and transfer machines usually contain oil, are able to creep, and may also be corrosive, protection against water alone is insufficient. The indicated degree of protection should only be considered here as a guideline. The motors must be protected by suitable covers. Attention must be paid to providing suitable sealing of the motor shaft for the selected degree of protection for the motor.

The table can serve as a decision aid for selecting the proper degree of protection for motors. For a mounting position with vertical shaft end IM V3/IM V19, static fluid on the flange is only permitted with degree of protection IP67/IP68 and recessed DE flange in some cases.

	Liquids	General workshop environment	Water; gen. coolant (95 % water, 5 % oil); oil	Creep oil; petroleum; aggressive coolants
Effect				
Dry		IP64	–	–
Water-enriched environment		–	IP64	IP67 <sup>1)</sup>
Mist		–	IP65	IP67
Spray		–	IP65	IP68
Jet		–	IP67	IP68
Surge, brief immersion; constant inundation		–	IP67	IP68

<sup>1)</sup> IP64 with dry run at shaft exit.

# Synchronous motors

## Dimension drawings

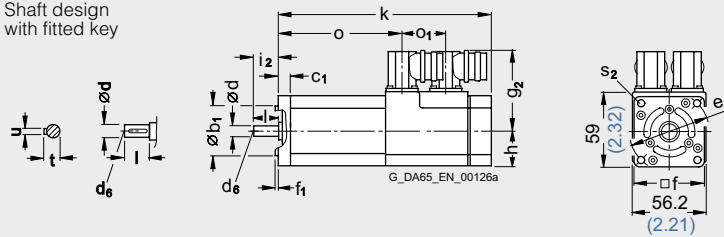
### 1FT6 motors without/with DRIVE-CLiQ Natural cooling

For motor		Dimensions in mm (in)													Encoder system: Resolver			
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	Without DRIVE-CLiQ	With DRIVE-CLiQ	h H	i <sub>2</sub> -	s <sub>2</sub> S	o <sub>1</sub>	without brake		with brake	
									g <sub>2</sub> -	g <sub>2</sub> -					k LB	o -	k LB	o -
<b>1FT6, type of construction IM B5, natural cooling, with connector, without/with brake</b>																		
28	<b>1FT6021</b>		-	40 (1.57)	9.8 (0.39)	63 (2.48)	55 (2.17)	2.5 (0.10)	64 (2.52)	73.5 (2.89)	28 (1.10)	20 (0.79)	5.8 (0.23)	34.5 (1.36)	193 (7.60)	122 (4.80)	218 (8.58)	147 (5.79)
	<b>1FT6024</b>														233 (9.17)	162 (6.38)	258 (10.16)	187 (7.36)
36	<b>1FT6031</b>		92 (3.62)	60 (2.36)	8 (0.31)	75 (2.95)	72 (2.83)	3 (0.12)	76 (2.99)	86 (3.39)	36 (1.42)	30 (1.18)	5.5 (0.22)	-	180 (7.09)	151 (5.94)	200 (7.87)	171 (6.73)
	<b>1FT6034</b>														220 (8.66)	191 (7.52)	240 (9.45)	211 (8.31)

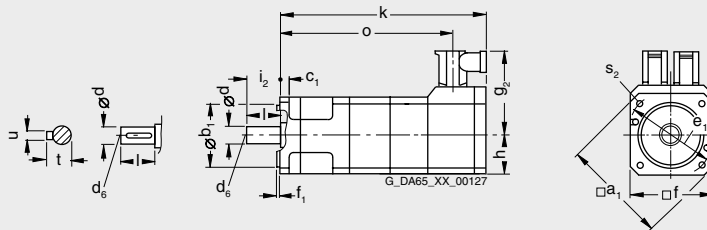
Shaft height	Type	DIN IEC	Encoder system: Incremental encoder Absolute encoder				DE shaft extension							
			k LB	o -	k LB	o -	d D	d <sub>6</sub> -	l E	t GA	u F			
28	<b>1FT6021</b>		193 (7.60)	122 (4.80)	218 (8.58)	147 (5.79)	<b>9</b> (0.35)	M3	20 (0.79)	10.2 (0.40)	3 (0.12)			
	<b>1FT6024</b>		233 (9.17)	162 (6.38)	258 (10.16)	187 (7.36)								
36	<b>1FT6031</b>		220 (8.66)	151 (5.94)	240 (9.45)	171 (6.73)	<b>14</b> (0.55)	M5	30 (1.18)	16 (0.63)	5 (0.20)			
	<b>1FT6034</b>		260 (10.24)	191 (7.52)	280 (11.02)	211 (8.31)								

**1FT602**

Shaft design with fitted key



**1FT603**





# Synchronous motors Dimension drawings

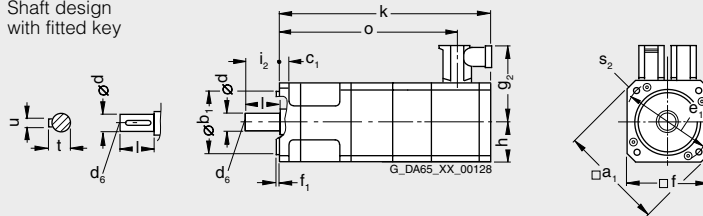
## 1FT6 motors without/with DRIVE-CLiQ Natural cooling

For motor		Dimensions in mm (in)													Encoder system: Resolver				
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	Without DRIVE-CLiQ		With DRIVE-CLiQ		i <sub>2</sub> -	s <sub>2</sub> <sup>1)</sup> S	s <sub>2</sub> <sup>2)</sup> S	without brake		with brake	
									g <sub>2</sub> -	g <sub>2</sub> -	h H	k LB				o -	k LB	o -	
<b>1FT6, type of construction IM B5, natural cooling, with connector, without/with brake</b>																			
48	<b>1FT6041</b>		120 (4.72)	80 (3.15)	10 (0.39)	100 (3.94)	96 (3.78)	3 (0.12)	80 (3.15)	90 (3.54)	48 (1.89)	40 (1.57)	7 (0.28)	M6	185 (7.28)	159 (6.26)	220 (8.66)	194 (7.64)	
	<b>1FT6044</b>														235 (9.25)	209 (8.23)	270 (10.63)	244 (9.61)	
63	<b>1FT6061</b>		146 (5.75)	110 (4.33)	10 (0.39)	130 (5.12)	116 (4.57)	3.5 (0.14)	90 (3.54)	100 (3.94)	58 (2.28)	50 (1.97)	9 (0.35)	M8	194 (7.64)	172 (6.77)	224 (8.82)	202 (7.95)	
	<b>1FT6062</b>														219 (8.62)	197 (7.76)	249 (9.80)	227 (8.94)	
	<b>1FT6064</b>														269 (10.59)	247 (9.72)	299 (11.77)	277 (10.91)	

Shaft height	Type	DIN IEC	Encoder system: Incremental encoder Absolute encoder				DE shaft extension				
			without brake		with brake		d D	d <sub>6</sub> -	l E	t GA	u F
48	<b>1FT6041</b>		k LB	o -	k LB	o -	<b>19</b> (0.75)	M6	40 (1.57)	21.5 (0.85)	6 (0.24)
	<b>1FT6044</b>		228 (8.98)	157 (6.18)	263 (10.35)	192 (7.56)					
63	<b>1FT6061</b>		228 (8.98)	172 (6.77)	258 (10.16)	202 (7.95)	<b>24</b> (0.94)	M8	50 (1.97)	27 (1.06)	8 (0.31)
	<b>1FT6062</b>		253 (9.96)	197 (7.76)	283 (11.14)	227 (8.94)					
	<b>1FT6064</b>		303 (11.93)	247 (9.72)	333 (13.11)	277 (10.91)					

**1FT604  
1FT606**

Shaft design  
with fitted key



1) IM B5  
2) IM B14

# Synchronous motors

## Dimension drawings

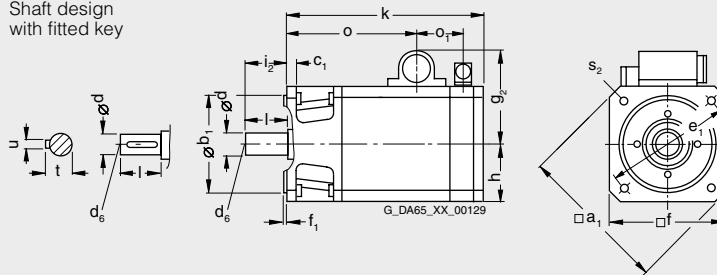
**1FT6 motors without/with DRIVE-CLiQ**  
**Natural cooling**

For motor		Dimensions in mm (in)													Encoder system: Resolver			
Shaft height	Type	DIN IEC	a <sub>1</sub>	b <sub>1</sub>	c <sub>1</sub>	e <sub>1</sub>	f	f <sub>1</sub>	g <sub>2</sub>	h	i <sub>2</sub>	s <sub>2</sub> <sup>1)</sup>	s <sub>2</sub> <sup>2)</sup>	o <sub>1</sub>	without brake		with brake	
			P	N	LA	M	AB	T	-	H	-	S	S	-	k	o	k	o
<b>1FT6, type of construction IM B5, natural cooling, with connector, without/with brake</b>																		
80	<b>1FT6081</b>		194 (7.64)	130 (5.12)	12 (0.47)	165 (6.50)	155 (6.10)	3.5 (0.14)	127.5 (5.02)	77.5 (3.05)	58 (2.28)	11 (0.43)	M10	76 (2.99)	221 (8.70)	113 (4.45)	248 (9.76)	140 (5.51)
	<b>1FT6082</b>														246 (9.69)	138 (5.43)	273 (10.75)	165 (6.50)
	<b>1FT6084</b>														296 (11.65)	188 (7.40)	342 (13.46)	234 (9.21)
	<b>1FT6086</b>														346 (13.62)	238 (9.37)	392 (15.43)	284 (11.18)

Shaft height	Type	DIN IEC	Encoder system: Incremental encoder Absolute encoder				DE shaft extension				
			without brake		with brake		d	d <sub>6</sub>	l	t	u
			k	o	k	o	D	-	E	GA	F
80	<b>1FT6081</b>		221 (8.70)	113 (4.45)	248 (9.76)	140 (5.51)	<b>32</b> <b>(1.26)</b>	M12	58 (2.28)	35 (1.38)	10 (0.39)
	<b>1FT6082</b>		246 (9.69)	138 (5.43)	273 (10.75)	165 (6.50)					
	<b>1FT6084</b>		296 (11.65)	188 (7.40)	342 (13.46)	234 (9.21)					
	<b>1FT6086</b>		346 (13.62)	238 (9.37)	392 (15.43)	284 (11.18)					

**1FT608**

Shaft design with fitted key



1) IM B5  
 2) IM B14

# Synchronous motors Dimension drawings

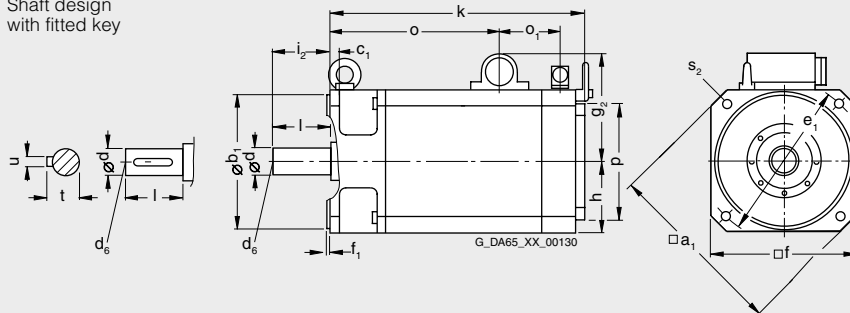
## 1FT6 motors without/with DRIVE-CLiQ Natural cooling

For motor		Dimensions in mm (in)														
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	Connector Size		h H	i <sub>2</sub> -	p HD	s <sub>2</sub> <sup>1)</sup> S	s <sub>2</sub> <sup>2)</sup> S	o <sub>1</sub> -
									1.5	3						
<b>1FT6, type of construction IM B5, natural cooling, with connector, without/with brake</b>																
100	<b>1FT6102</b> <b>1FT6105</b> <b>1FT6108</b>		240 (9.45)	180 (7.09)	13 (0.51)	215 (8.46)	192 (7.56)	4 (0.16)	146 (5.75)	172 (6.77)	96 (3.78)	80 (3.15)	155 (6.10)	14 (0.55)	M12	76 (2.99)
132	<b>1FT6132</b> <b>1FT6134</b> <b>1FT6136</b>		-	250 (9.84)	18 (0.71)	300 (11.81)	260 (10.24)	5 (0.20)	172.5 (6.79)	198.5 (7.81)	132 (5.20)	82 (3.23)	245 (9.65)	18 (0.71)	-	66 (2.60)

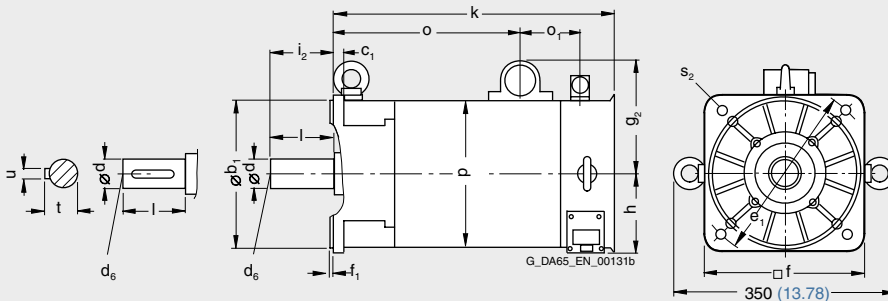
Shaft height	Type	DIN IEC	Encoder system: Resolver				Incremental encoder Absolute encoder				DE shaft extension				
			without brake		with brake		without brake		with brake		d	d <sub>6</sub>	l	t	u
			k LB	o -	k LB	o -	k LB	o -	k LB	o -	D	-	E	GA	F
100	<b>1FT6102</b> <b>1FT6105</b> <b>1FT6108</b>		295 (11.61)	186 (7.32)	341 (13.43)	232 (9.13)	295 (11.61)	186 (7.32)	341 (13.43)	232 (9.13)	<b>38</b> (1.50)	M12	80 (3.15)	41 (1.61)	10 (0.39)
132	<b>1FT6132</b> <b>1FT6134</b> <b>1FT6136</b>		423 (16.65)	288 (11.34)	473 (18.62)	338 (13.31)	423 (16.65)	288 (11.34)	473 (18.62)	338 (13.31)	<b>48</b> (1.89)	M16	82 (3.23)	52.5 (2.07)	14 (0.55)

**1FT610**

Shaft design with fitted key



**1FT613**



1) IM B5  
2) IM B14

# Synchronous motors

## Dimension drawings

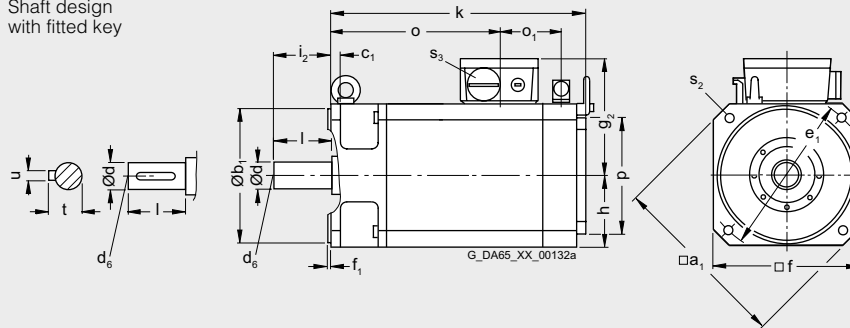
### 1FT6 motors without/with DRIVE-CLiQ Natural cooling

For motor		Dimensions in mm (in)															
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	Terminal box		h H	i <sub>2</sub> -	p HD	s <sub>2</sub> <sup>1)</sup> S	s <sub>2</sub> <sup>2)</sup> S	s <sub>3</sub> -	o <sub>1</sub> -
									g <sub>2</sub> -	g <sub>2</sub> -							
<b>1FT6, type of construction IM B5, natural cooling, with terminal box, without/with brake</b>																	
100	<b>1FT6102</b> <b>1FT6105</b> <b>1FT6108</b>		240 (9.45)	180 (7.09)	13 (0.51)	215 (8.46)	192 (7.56)	4 (0.16)	155 (6.10)	160 (6.30)	96 (3.78)	80 (3.15)	155 (6.10)	14 (0.55)	M12	PG29	76 (2.99)
132	<b>1FT6132</b> <b>1FT6134</b> <b>1FT6136</b>		-	250 (9.84)	18 (0.71)	300 (11.81)	260 (10.24)	5 (0.20)	-	194 (7.64)	132 (5.20)	82 (3.23)	245 (9.65)	18 (0.71)	-	PG29/ PG36	-

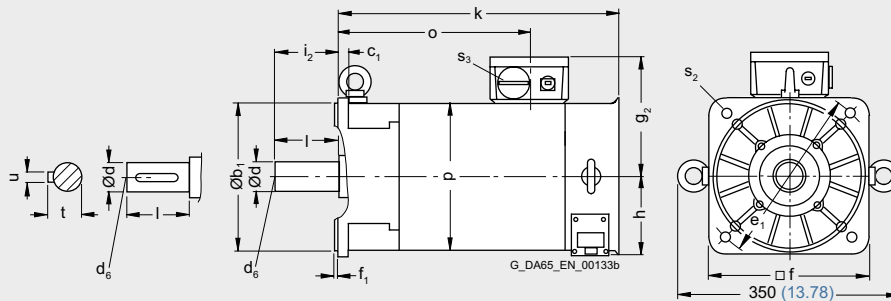
Shaft height	Type	DIN IEC	Encoder system:				Incremental encoder				DE shaft extension				
			Resolver		Incremental encoder		Absolute encoder		d D	d <sub>6</sub> -	l E	t GA	u F		
			without brake	with brake	without brake	with brake	without brake	with brake							
100	<b>1FT6102</b> <b>1FT6105</b> <b>1FT6108</b>		k LB	o -	k LB	o -	k LB	o -	k LB	o -	<b>38</b> (1.50)	M12	80 (3.15)	41 (1.61)	10 (0.39)
132	<b>1FT6132</b> <b>1FT6134</b> <b>1FT6136</b>		k LB	o -	k LB	o -	k LB	o -	k LB	o -	<b>48</b> (1.89)	M16	82 (3.23)	51.5 (2.03)	14 (0.55)

**1FT610**

Shaft design with fitted key



**1FT613**



1) IM B5  
2) IM B14

# Synchronous motors Dimension drawings

## 1FT6 motors without/with DRIVE-CLiQ Forced ventilation

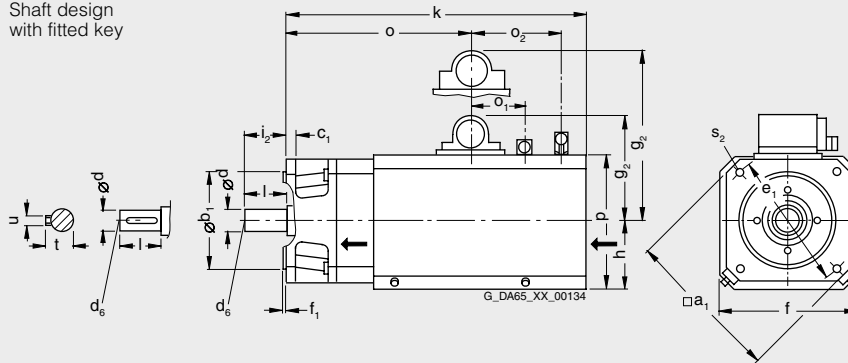
For motor Dimensions in mm (in)

Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	Connector		g <sub>2</sub> -	g <sub>2</sub> -	h H	i <sub>2</sub> -	p HD	s <sub>2</sub> <sup>1)</sup> S	s <sub>2</sub> <sup>2)</sup> S	o <sub>1</sub> -	o <sub>2</sub> -
									Size 1.5	Size 3									
<b>1FT6, type of construction IM B5, forced ventilation, with connector, without/with brake</b>																			
80	<b>1FT6084</b> <b>1FT6086</b>		194 (7.64)	130 (5.12)	12 (0.47)	165 (6.50)	185 (7.28)	3.5 (0.14)	140 (5.51)	154 (6.06)	93 (3.66)	58 (2.28)	175 (6.89)	11 (0.43)	M10	76 (2.99)	169 (6.65)		
100	<b>1FT6105</b> <b>1FT6108</b>		240 (9.45)	180 (7.09)	13 (0.51)	215 (8.46)	221 (8.70)	4 (0.16)	158 (6.22)	172 (6.77)	111 (4.37)	80 (3.15)	212 (8.35)	14 (0.55)	M12	76 (2.99)	170 (6.69)		

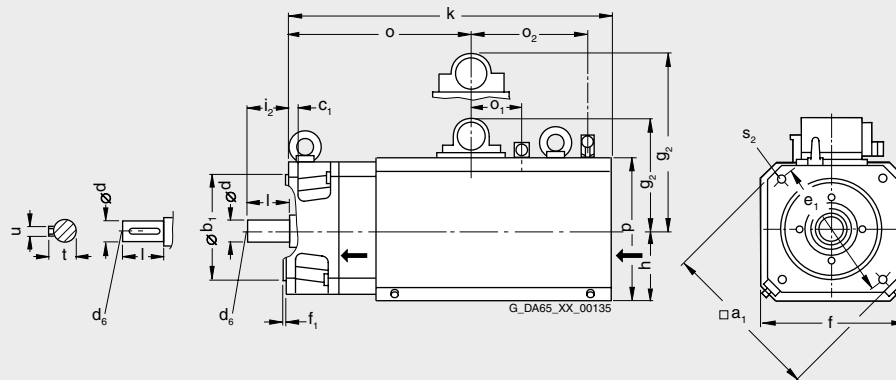
Shaft height	Type	DIN IEC	Encoder system:				DE shaft extension							
			Resolver		Incremental encoder		without brake		with brake					
			k	o	k	o	d	d <sub>6</sub>	l	t	u			
			LB	-	LB	-	D	-	E	GA	F			
80	<b>1FT6084</b> <b>1FT6086</b>		399 (15.71) 449 (17.68)	188 (7.40) 238 (9.37)	445 (17.52) 495 (19.49)	234 (9.21) 284 (11.18)	<b>32</b> <b>(1.26)</b>	M12	58 (2.28)	35 (1.38)	10 (0.39)			
100	<b>1FT6105</b> <b>1FT6108</b>		473 (18.62) 573 (22.56)	261 (10.28) 361 (14.21)	519 (20.43) 619 (24.37)	307 (12.09) 407 (16.02)	<b>38</b> <b>(1.50)</b>	M12	80 (3.15)	41 (1.61)	10 (0.39)			

**1FT608**

Shaft design with fitted key



**1FT610**



1) IM B5  
2) IM B14

# Synchronous motors

## Dimension drawings

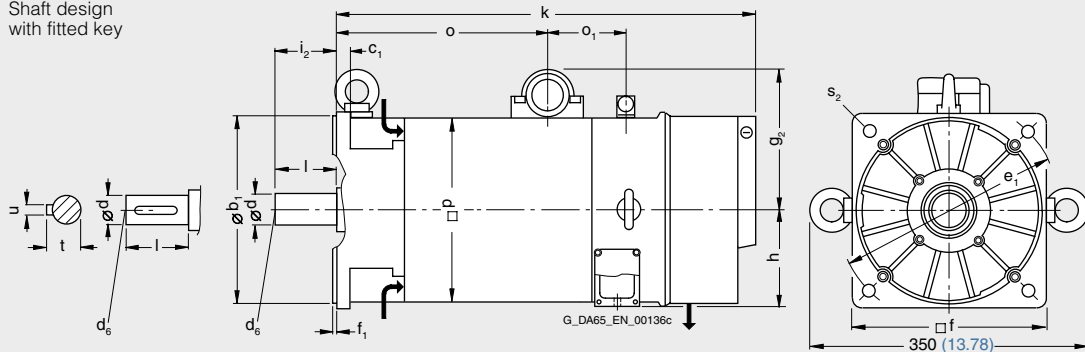
### 1FT6 motors without/with DRIVE-CLiQ Forced ventilation

For motor		Dimensions in mm (in)															
Shaft height	Type	DIN IEC	a <sub>1</sub>	b <sub>1</sub>	c <sub>1</sub>	e <sub>1</sub>	f	f <sub>1</sub>	Connector		i <sub>2</sub>	p	s <sub>2</sub> <sup>1)</sup>	s <sub>2</sub> <sup>2)</sup>	o <sub>1</sub>	o <sub>2</sub>	
			P	N	LA	M	AB	T	g <sub>2</sub>	h	–	HD	S	S	–	–	
<b>1FT6, type of construction IM B5, forced ventilation, with connector, without/with brake</b>																	
132	<b>1FT6132</b> <b>1FT6134</b> <b>1FT6136</b>		–	250 (9.84)	18 (0.71)	300 (11.81)	260 (10.24)	5 (0.20)	198.5 (7.81)	132 (5.20)	82 (3.23)	245 (9.65)	18 (0.71)	–	66 (2.60)	–	

Shaft height	Type	DIN IEC	Encoder system:				DE shaft extension									
			k	o	k	o	d	d <sub>6</sub>	l	t	u					
			Resolver	Incremental encoder	Absolute encoder	without brake	with brake									
			LB	–	LB	–	D	–	E	GA	F					
132	<b>1FT6132</b> <b>1FT6134</b> <b>1FT6136</b>		541 (21.30)	288 (11.34)	591 (23.27)	338 (13.31)	<b>48</b> <b>(1.89)</b>	M16	82 (3.23)	51.5 (2.03)	14 (0.55)					
			591 (23.27)	338 (13.31)	641 (25.24)	388 (15.28)										
			641 (25.24)	388 (15.28)	691 (27.20)	438 (17.24)										

#### 1FT613

Shaft design with fitted key



1) IM B5  
2) IM B14

# Synchronous motors Dimension drawings

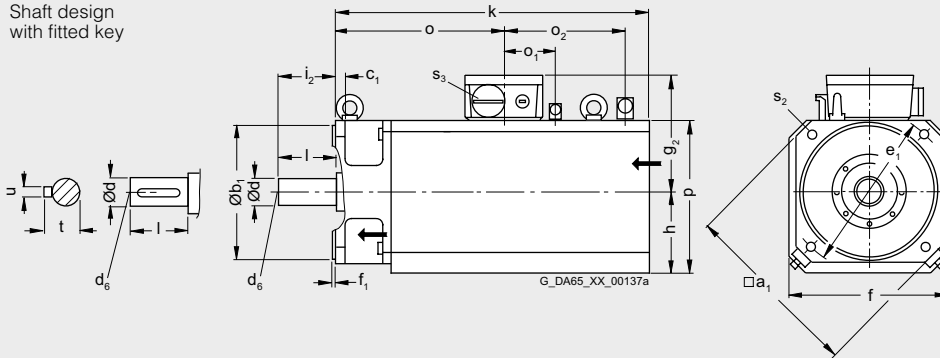
## 1FT6 motors without/with DRIVE-CLiQ Forced ventilation

For motor		Dimensions in mm (in)										Terminal box					
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	gk 130	gk 230	gk 420	h H	i <sub>2</sub> -	p HD	s <sub>2</sub> <sup>1)</sup> S	s <sub>2</sub> <sup>2)</sup> S	s <sub>3</sub> -
									g <sub>2</sub> -	g <sub>2</sub> -	g <sub>2</sub> -				111 (4.37)	80 (3.15)	212 (8.35)
<b>1FT6, type of construction IM B5, forced ventilation, with terminal box, without/with brake</b>																	
100	<b>1FT6105</b> <b>1FT6108</b>		240 (9.45)	180 (7.09)	13 (0.51)	215 (8.46)	221 (8.70)	4 (0.16)	167 (6.57)	172 (6.77)	-	111 (4.37)	80 (3.15)	212 (8.35)	14 (0.55)	M12	PG29
132	<b>1FT6132</b> <b>1FT6134</b> <b>1FT6136</b>		-	250 (9.84)	18 (0.71)	300 (11.81)	260 (10.24)	5 (0.20)	-	186.5 (7.34)	202 (7.95)	132 (5.20)	82 (3.23)	245 (9.65)	18 (0.71)	-	PG29/ PG36

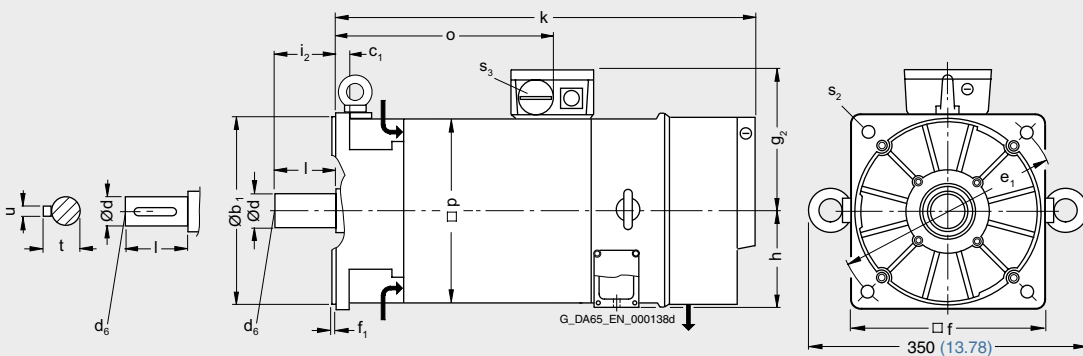
Shaft height	Type	DIN IEC	o <sub>1</sub> -	o <sub>2</sub> -	Encoder system:				DE shaft extension								
					k LB	o -	k LB	o -	d D	d <sub>6</sub> -	l E	t GA	u F				
					Resolver												
					Incremental encoder												
					Absolute encoder												
					without brake				with brake								
100	<b>1FT6105</b> <b>1FT6108</b>		76 (2.99)	170 (6.69)	473 (18.62)	261 (10.28)	519 (20.43)	307 (12.09)	<b>38</b> (1.50)	M12	80 (3.15)	41 (1.61)	10 (0.39)				
132	<b>1FT6132</b> <b>1FT6134</b> <b>1FT6136</b>		-	-	541 (21.30)	288 (11.34)	591 (23.27)	338 (13.31)	<b>48</b> (1.89)	M16	82 (3.23)	51.5 (2.03)	14 (0.55)				

**1FT610**

Shaft design with fitted key



**1FT613**



1) IM B5  
2) IM B14

# Synchronous motors

## Dimension drawings

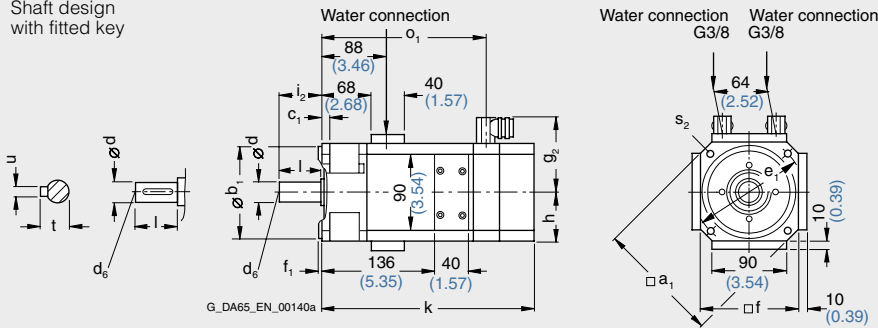
### 1FT6 motors without/with DRIVE-CLiQ Water cooling

For motor		Dimensions in mm (in)															
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	Connector size				h H	i <sub>2</sub> -	p HD	s <sub>2</sub> <sup>1)</sup> S	s <sub>2</sub> <sup>2)</sup> S
									1	1	1.5	3					
									g <sub>2</sub> -	g <sub>2</sub> -	g <sub>2</sub> -	g <sub>2</sub> -					
<b>1FT6, type of construction IM B5, water cooling, with connector, without/with brake</b>																	
63	<b>1FT6062</b> <b>1FT6064</b>		146 (5.75)	110 (4.33)	10 (0.39)	130 (5.12)	116 (4.57)	3.5 (0.14)	100 (3.94)	99 (3.90)	-	-	58 (2.28)	50 (1.97)	-	9 (0.35)	M8
80	<b>1FT6084</b> <b>1FT6086</b>		194 (7.64)	130 (5.12)	12 (0.47)	165 (6.50)	155 (6.10)	3.5 (0.14)	-	-	139.5 (5.49)	153.5 (6.04)	77.5 (3.05)	58 (2.28)	-	11 (0.43)	M10

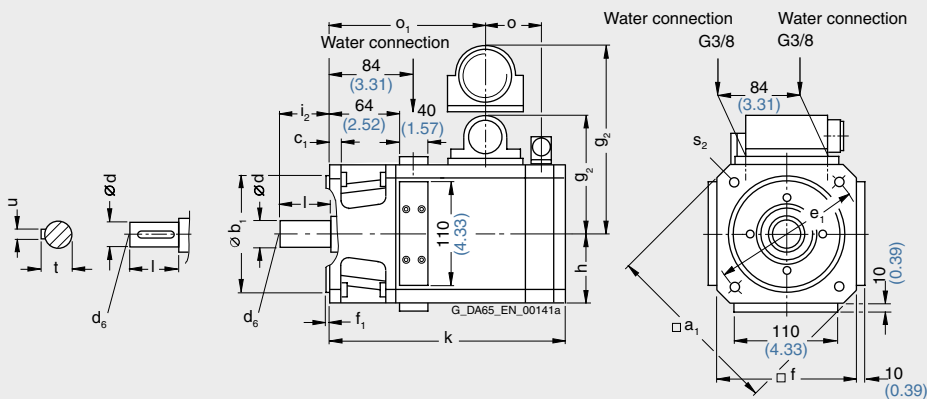
Shaft height	Type	DIN IEC	Encoder system:								DE shaft extension					
			Resolver				Incremental encoder				d D	d <sub>6</sub> -	l E	t GA	u F	
			without brake		with brake		without/with brake		without/with brake							
o -	k LB	o <sub>1</sub> -	k LB	o <sub>1</sub> -	k LB	o <sub>1</sub> -	k LB	o <sub>1</sub> -	k LB	o <sub>1</sub> -						
63	<b>1FT6062</b> <b>1FT6064</b>		-	-	-	-	-	253 (9.96)	227 (8.94)	283 (11.14)	227 (8.94)	<b>24</b> <b>(0.94)</b>	M8	50 (1.97)	27 (1.06)	8 (0.31)
80	<b>1FT6084</b> <b>1FT6086</b>		76 (2.99)	296 (11.65)	188 (7.40)	342 (13.46)	234 (9.21)	-	-	-	-	<b>32</b> <b>(1.26)</b>	M12	58 (2.28)	35 (1.38)	10 (0.39)
								346 (13.62)	238 (9.37)	392 (15.43)	284 (11.18)					

**1FT606**

Shaft design with fitted key



**1FT608**



1) IM B5  
2) IM B14



# Synchronous motors Dimension drawings

## 1FT6 motors without/with DRIVE-CLiQ Water cooling

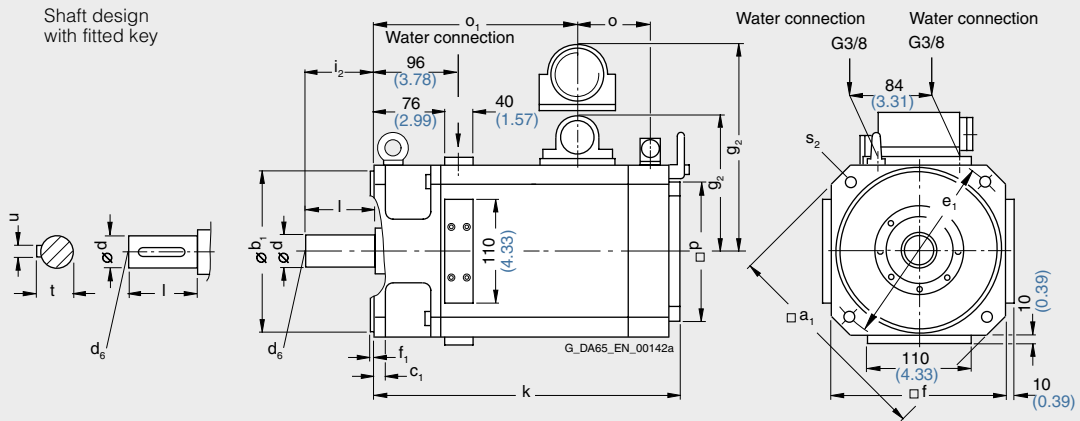
For motor Dimensions in mm (in)

Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	Connector		h H	i <sub>2</sub> -	p HD	s <sub>2</sub> <sup>1)</sup> S	s <sub>2</sub> <sup>2)</sup> S	o -
									1.5	3						
<b>1FT6, type of construction IM B5, water cooling, with connector, without/with brake</b>																
100	<b>1FT6105</b> <b>1FT6108</b>		240 (9.45)	180 (7.09)	13 (0.51)	215 (8.46)	192 (7.56)	4 (0.16)	158 (6.22)	172 (6.77)	96 (3.78)	80 (3.15)	155 (6.10)	14 (0.55)	M12	76 (2.99)

Shaft height	Type	DIN IEC	Encoder system:				DE shaft extension				
			Resolver		Incremental encoder		Absolute encoder		without brake		with brake
			k	o <sub>1</sub>	k	o <sub>1</sub>	d	d <sub>6</sub>	l	t	u
			LB	-	LB	-	D	-	E	GA	F
100	<b>1FT6105</b> <b>1FT6108</b>		370 (14.57)	261 (10.28)	416 (16.38)	307 (12.09)	<b>38</b> <b>(1.50)</b>	M12	80 (3.15)	41 (1.61)	10 (0.39)
			470 (18.50)	361 (14.21)	516 (20.31)	407 (16.02)					

**1FT610**

Shaft design with fitted key



1) IM B5  
2) IM B14



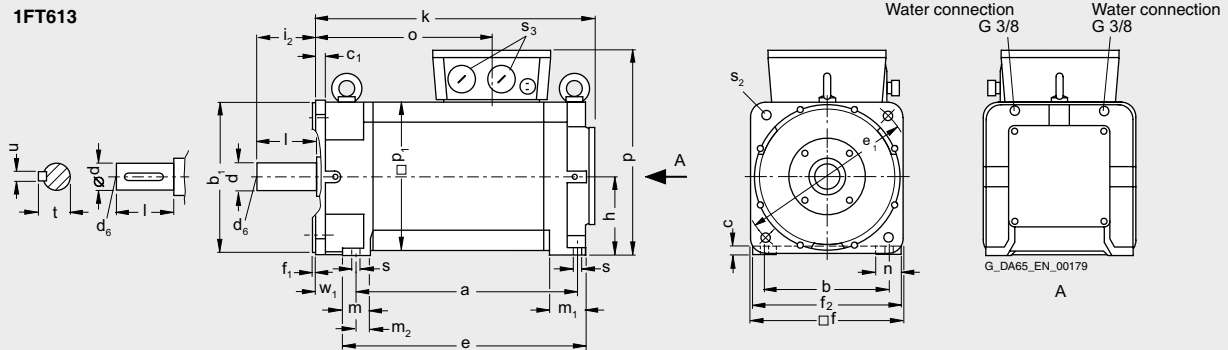
# Synchronous motors Dimension drawings

## 1FT6 motors without/with DRIVE-CLiQ Water cooling

For motor		Dimensions in mm (in)																	
Shaft height	Type	DIN	a	b	b <sub>1</sub>	c	c <sub>1</sub>	e	e <sub>1</sub>	f	f <sub>1</sub>	f <sub>2</sub>	h	i <sub>2</sub>	k	m	m <sub>1</sub>	m <sub>2</sub>	
		IEC	B	A	N	LA	-	BB	M	AB	T	-	H	-	LB	BA	-	-	
<b>1FT6, type of construction IM B35, water cooling, with terminal box</b>																			
132	<b>1FT6132</b>		342 (13.46)	216 (8.50)	250 (9.84)	14 (0.55)	16 (0.63)	366 (14.41)	300 (11.81)	260 (10.24)	5 (0.20)	245 (9.65)	132 (5.20)	82 (3.23)	423 (16.65)	36 (1.42)	53 (2.09)	23 (0.91)	
	<b>1FT6134</b>		392 (15.43)					416 (16.38)							473 (18.62)				
	<b>1FT6136</b>		442 (17.40)					466 (18.35)							523 (20.59)				
	<b>1FT6138</b>		517 (20.35)					541 (21.30)							598 (23.54)				

Shaft height	Type	DIN IEC	n AA	o -	p HD	p <sub>1</sub> AC	s K	s <sub>2</sub> K	s <sub>3</sub> -	n <sub>rated</sub> = 1 500 rpm	n <sub>rated</sub> = 2 500 rpm	DE shaft extension					
										s <sub>3</sub> -	w <sub>1</sub> C	d D	d <sub>6</sub> -	l E	t GA	u F	
132	<b>1FT6132</b>		14 (0.55)	255.5 (10.06)	350.5 (13.80)	245 (9.65)	12 (0.47)	18 (0.71)	M32 x 1.5	M40 x 1.5	53 (2.09)	<b>48</b> <b>(1.89)</b>	M16	82 (3.23)	51.5 (2.03)	14 (0.55)	
	<b>1FT6134</b>			305.5 (12.03)					M40 x 1.5	M50 x 1.5							
	<b>1FT6136</b>			355.5 (14.00)					M50 x 1.5	M50 x 1.5							
	<b>1FT6138</b>			430.5 (16.95)					M50 x 1.5	M50 x 1.5							

1FT613



# Synchronous motors

## Dimension drawings

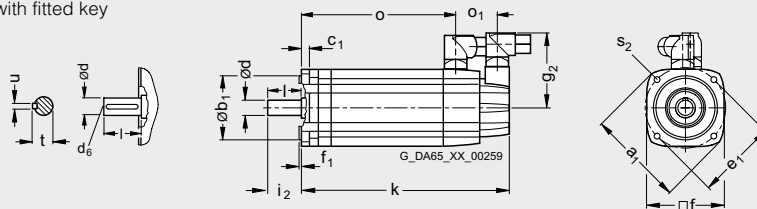
### 1FT7 Compact motors without/with DRIVE-CLiQ Natural cooling

For motor		Dimensions in mm (in)											Flange 1 (1FT6-compatible)			
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	g <sub>2</sub> -	o <sub>1</sub> -	s <sub>2</sub> S	i <sub>2</sub> -	without brake		with brake	
													k LB	o -	k LB	o -
<b>1FT7 Compact, type of construction IM B5, natural cooling, with connector, without/with brake</b>																
36	<b>1FT7034</b>		90 (3.54)	60 (2.36)	8 (0.31)	75 (2.95)	72 (2.83)	3 (0.12)	80 (3.15)	48 (1.89)	6.5 (0.26)	30 (1.18)	195 (7.68)	133 (5.24)	222 (8.74)	160 (6.30)
	<b>1FT7036</b>												243 (9.57)	181 (7.13)	270 (10.63)	208 (8.19)
48	<b>1FT7042</b>		120 (4.72)	80 (3.15)	10 (0.39)	100 (3.94)	96 (3.78)	3 (0.12)	93 (3.66)	53 (2.09)	6.5 (0.26)	40 (1.57)	169 (6.65)	102 (4.02)	201 (7.91)	134 (5.28)
	<b>1FT7044</b>												219 (8.62)	152 (5.98)	251 (9.88)	184 (7.24)
	<b>1FT7046</b>												259 (10.20)	192 (7.56)	291 (11.46)	224 (8.82)
63	<b>1FT7062</b>		155 (6.10)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	104 (4.09)	53 (2.09)	9 (0.35)	50 (1.97)	173 (6.81)	106 (4.17)	208 (8.19)	141 (5.55)
	<b>1FT7064</b>												205 (8.07)	137 (5.39)	240 (9.45)	173 (6.81)
	<b>1FT7066</b>												236 (9.29)	169 (6.65)	272 (10.71)	204 (8.03)
	<b>1FT7068</b>												284 (11.18)	216 (8.50)	319 (12.56)	252 (9.92)

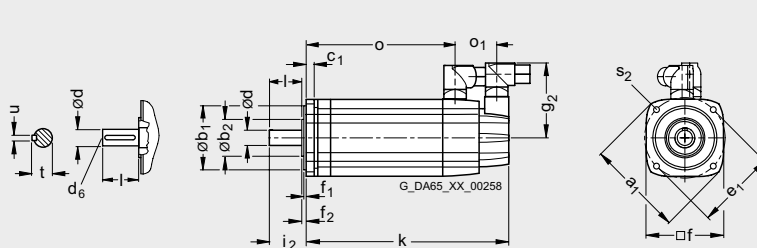
Shaft height	Type	DIN IEC	Flange 0			without brake		with brake		DE shaft extension				
			b <sub>2</sub> -	i <sub>2</sub> -	f <sub>2</sub> -	k LB	o -	k LB	o -	d D	d <sub>6</sub> -	l E	t GA	u F
36	<b>1FT7034</b>		36 (1.42)	36.5 (1.44)	5.5 (0.22)	189 (7.44)	127 (5.00)	216 (8.50)	154 (6.06)	<b>14</b> (0.55)	M5	30 (1.18)	16 (0.63)	5 (0.20)
	<b>1FT7036</b>					237 (9.33)	175 (6.89)	264 (10.39)	202 (7.95)					
48	<b>1FT7042</b>		46 (1.81)	46 (1.81)	5.5 (0.22)	163 (6.42)	96 (3.78)	195 (7.68)	128 (5.04)	<b>19</b> (0.75)	M6	40 (1.57)	21.5 (0.85)	6 (0.24)
	<b>1FT7044</b>					213 (8.39)	146 (5.75)	245 (9.65)	178 (7.01)					
	<b>1FT7046</b>					253 (9.96)	186 (7.32)	285 (11.22)	218 (8.58)					
63	<b>1FT7062</b>		51 (2.01)	56.5 (2.22)	6 (0.24)	167 (6.57)	99 (3.90)	202 (7.95)	135 (5.31)	<b>24</b> (0.94)	M8	50 (1.97)	27 (1.06)	8 (0.31)
	<b>1FT7064</b>					198 (7.80)	131 (5.16)	233 (9.17)	166 (6.54)					
	<b>1FT7066</b>					230 (9.06)	162 (6.38)	265 (10.43)	198 (7.80)					
	<b>1FT7068</b>					277 (10.91)	210 (8.27)	312 (12.28)	245 (9.65)					

Flange 1  
(1FT6-compatible)  
**1FT703**  
**1FT704**  
**1FT706**

Shaft design  
with fitted key



Flange 0  
**1FT703**  
**1FT704**  
**1FT706**



# Synchronous motors Dimension drawings

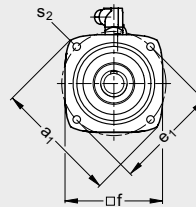
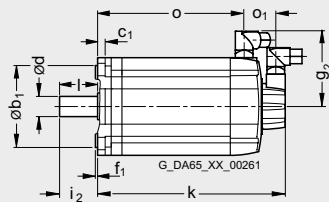
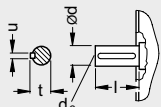
## 1FT7 Compact motors without/with DRIVE-CLiQ Natural cooling

For motor		Dimensions in mm (in)											Flange 1 (1FT6-compatible)			
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	g <sub>2</sub> -	o <sub>1</sub> -	s <sub>2</sub> S	i <sub>2</sub> -	without brake		with brake	
													k LB	o -	k LB	o -
<b>1FT7 Compact, type of construction IM B5, natural cooling, with connector, without/with brake</b>																
80	<b>1FT7082</b>		195 (7.68)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	141 (5.55)	51 (2.01)	11 (0.43)	58 (2.28)	196 (7.72)	130 (5.12)	248 (9.76)	183 (7.20)
	<b>1FT7084</b>												247 (9.72)	182 (7.17)	299 (11.77)	234 (9.21)
	<b>1FT7086</b>												299 (11.77)	234 (9.21)	351 (13.82)	286 (11.26)
100	<b>1FT7102</b>		245 (9.65)	180 (7.09)	13 (0.51)	215 (8.46)	196 (7.72)	4 (0.16)	161 (6.34)	56 (2.20)	14 (0.55)	80 (3.15)	221 (8.70)	151 (5.94)	273 (10.75)	203 (7.99)
	<b>1FT7105</b>												307 (12.09)	238 (9.37)	360 (14.17)	290 (11.42)
	<b>1FT7108</b>												377 (14.84)	307 (12.09)	429 (16.89)	359 (14.13)

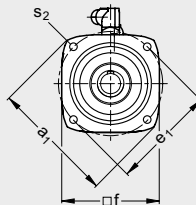
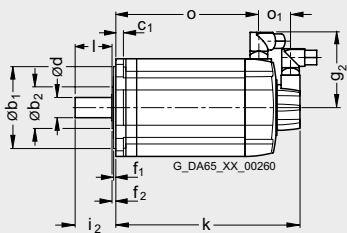
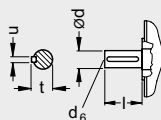
Shaft height	Type	DIN IEC	Flange 0			without brake		with brake		DE shaft extension				
			b <sub>2</sub> -	i <sub>2</sub> -	f <sub>2</sub> -	k LB	o -	k LB	o -	d D	d <sub>6</sub> -	l E	t GA	u F
80	<b>1FT7082</b>		66 (2.60)	64.5 (2.54)	6 (0.24)	189 (7.44)	124 (4.88)	241 (9.49)	176 (6.93)	<b>32</b> <b>(1.26)</b>	M12	58 (2.28)	35 (1.38)	10 (0.39)
	<b>1FT7084</b>					241 (9.49)	175 (6.89)	293 (11.54)	228 (8.98)					
	<b>1FT7086</b>					292 (11.50)	227 (8.94)	345 (13.58)	279 (10.98)					
100	<b>1FT7102</b>		81 (3.19)	87 (3.43)	6.5 (0.26)	214 (8.43)	144 (5.67)	266 (10.47)	196 (7.72)	<b>38</b> <b>(1.50)</b>	M12	80 (3.15)	41 (1.61)	10 (0.39)
	<b>1FT7105</b>					301 (11.85)	231 (9.09)	353 (13.90)	283 (11.14)					
	<b>1FT7108</b>					370 (14.57)	300 (11.81)	422 (16.61)	352 (13.86)					

Flange 1 (1FT6-compatible)  
**1FT708**  
**1FT710**

Shaft design with fitted key



Flange 0  
**1FT708**  
**1FT710**



# Synchronous motors

## Dimension drawings

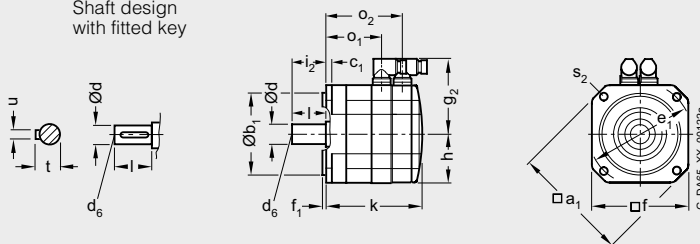
### 1FK7 Compact motors without/with DRIVE-CLiQ Natural cooling

For motor		Dimensions in mm (in)											Encoder system: Resolver Absolute encoder EnDat 16 S/R / 15 bit (16 S/R) without brake                      with brake					
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	g <sub>2</sub> -	h H	i <sub>2</sub> -	s <sub>2</sub> S	k LB	o <sub>1</sub> -	o <sub>2</sub> -	k LB	o <sub>1</sub> -	o <sub>2</sub> -
<b>1FK7 Compact, type of construction IM B5, natural cooling, with connector, without/with brake</b>																		
20	<b>1FK7011-5</b>	-	30	7	46	40	2.5	65.5	20	18	4.5	140	89	118	140	89	118	
	<b>1FK7015-5</b>		(1.18)	(0.28)	(1.81)	(1.57)	(0.10)	(2.58)	(0.79)	(0.71)	(0.18)	(5.51)	(3.50)	(4.65)	(5.51)	(3.50)	(4.65)	
28	<b>1FK7022-5</b>	-	40	10	63	55	2.5	75	27.5	20	5.4	153	95	128	175	95	150	
			(1.57)	(0.39)	(2.48)	(2.17)	(0.10)	(2.95)	(1.08)	(0.79)	(0.21)	(6.02)	(3.74)	(5.04)	(6.89)	(3.74)	(5.91)	
36	<b>1FK7032-5</b>	92	60	8	75	72	3	81	36	30	6.5	150	90	125	175	90	149	
	<b>1FK7034-5</b>		(3.62)	(2.36)	(0.31)	(2.95)	(2.83)	(0.12)	(3.19)	(1.42)	(0.26)	(5.91)	(3.54)	(4.92)	(6.89)	(3.54)	(5.87)	
48	<b>1FK7040-5</b>	120	80	10	100	96	3	90	48	40	7	134	73	106	163	73	135	
	<b>1FK7042-5</b>		(4.72)	(3.15)	(0.39)	(3.94)	(3.78)	(0.12)	(3.54)	(1.89)	(0.28)	(5.28)	(2.87)	(4.17)	(6.42)	(2.87)	(5.31)	
63	<b>1FK7060-5</b>	155	110	10	130	126	3.5	105	63	50	9	157	94	126	200	94	169	
	<b>1FK7063-5</b>		(6.10)	(4.33)	(0.39)	(5.12)	(4.96)	(0.14)	(4.13)	(2.48)	(1.97)	(6.18)	(3.70)	(4.96)	(7.87)	(3.70)	(6.65)	
												(202)	(139)	(171)	(245)	(139)	(214)	
												(7.95)	(5.47)	(6.73)	(9.65)	(5.47)	(8.43)	

Shaft height	Type	Encoder system: Incremental encoder sin/cos 1 V <sub>pp</sub> / 22 bit (2 048 S/R) Absolute encoder EnDat 2 048 S/R / 22 bit (2 048 S/R) EnDat 512 S/R / 20 bit (512 S/R) EnDat 32 S/R / 16 bit (32 S/R)						DE shaft extension				
		without brake			with brake			d	d <sub>6</sub>	l	t	u
		k LB	o <sub>1</sub> -	o <sub>2</sub> -	k LB	o <sub>1</sub> -	o <sub>2</sub> -	D	-	E	GA	F
20	<b>1FK7011-5</b>	155	89	118	155	89	118	<b>8</b>	-	18	8.8	2
	<b>1FK7015-5</b>	180	114	143	180	114	143	(0.31)		(0.71)	(0.35)	(0.08)
		(7.09)	(4.49)	(5.63)	(7.09)	(4.49)	(5.63)					
28	<b>1FK7022-5</b>	178	95	128	200	95	150	<b>9</b>	M3	20	10.2	3
		(7.01)	(3.74)	(5.04)	(7.87)	(3.74)	(5.91)	(0.35)		(0.79)	(0.40)	(0.12)
36	<b>1FK7032-5</b>	175	90	125	200	90	149	<b>14</b>	M5	30	16	5
	<b>1FK7034-5</b>	200	115	150	225	115	174	(0.55)		(1.18)	(0.63)	(0.20)
		(7.87)	(4.53)	(5.91)	(8.86)	(4.53)	(6.85)					
48	<b>1FK7040-5</b>	155	73	106	184	73	135	<b>19</b>	M6	40	21.5	6
	<b>1FK7042-5</b>	182	101	134	211	101	163	(0.75)		(1.57)	(0.85)	(0.24)
		(7.17)	(3.98)	(5.28)	(8.31)	(3.98)	(6.42)					
63	<b>1FK7060-5</b>	180	94	126	223	94	169	<b>24</b>	M8	50	27	8
	<b>1FK7063-5</b>	225	139	171	268	139	214	(0.94)		(1.97)	(1.06)	(0.31)
		(8.86)	(5.47)	(6.73)	(10.55)	(5.47)	(8.43)					

1FK701.-5  
1FK702.-5  
1FK703.-5  
1FK704.-5  
1FK706.-5

Shaft design  
with fitted key



# Synchronous motors Dimension drawings

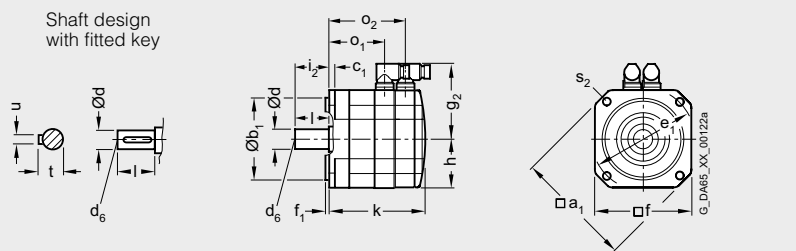
## 1FK7 Compact motors without/with DRIVE-CLiQ Natural cooling

For motor		Dimensions in mm (in)											Encoder system:					
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	g <sub>2</sub> -	h H	i <sub>2</sub> -	s <sub>2</sub> S	Resolver			with brake		
													without brake			with brake		
<b>1FK7 Compact, type of construction IM B5, natural cooling, with connector, without/with brake</b>																		
80	<b>1FK7080-5</b>		186 (7.32)	130 (5.12)	13 (0.51)	165 (6.50)	155 (6.10)	3.5 (0.14)	119.5 (4.70)	77.5 (3.05)	58 (2.28)	11 (0.43)	156 (6.14)	91 (3.58)	124 (4.88)	184 (7.24)	91 (3.58)	151 (5.94)
	<b>1FK7083-5</b>												194 (7.64)	129 (5.08)	162 (6.38)	245 (9.65)	129 (5.08)	207 (8.15)
100	<b>1FK7100-5</b>		240 (9.45)	180 (7.09)	13 (0.51)	215 (8.46)	192 (7.56)	4 (0.16)	138 (5.43)	96 (3.78)	80 (3.15)	14 (0.55)	185 (7.28)	113 (4.45)	153 (6.02)	204 (8.03)	113 (4.45)	172 (6.77)
	<b>1FK7101-5</b>												211 (8.31)	139 (5.47)	179 (7.05)	240 (9.45)	139 (5.47)	208 (8.19)
	<b>1FK7103-5</b>												237 (9.33)	165 (6.50)	205 (8.07)	266 (10.47)	165 (6.50)	234 (9.21)
	<b>1FK7105-5</b>												289 (11.38)	217 (8.54)	257 (10.12)	318 (12.52)	217 (8.54)	286 (11.26)

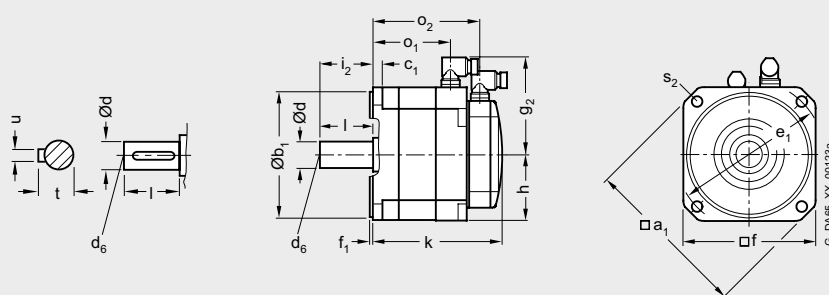
Shaft height	Type	Encoder system:						DE shaft extension				
		Incremental encoder sin/cos 1 V <sub>pp</sub> / 22 bit (2 048 S/R) Absolute encoder EnDat 2 048 S/R / 22 bit (2 048 S/R) EnDat 32 S/R / 16 bit (32 S/R)										
		without brake			with brake			d	d <sub>6</sub>	l	t	u
		k LB	o <sub>1</sub> -	o <sub>2</sub> -	k LB	o <sub>1</sub> -	o <sub>2</sub> -	D	-	E	GA	F
80	<b>1FK7080-5</b>	179 (7.05)	91 (3.58)	124 (4.88)	206 (8.11)	91 (3.58)	151 (5.94)	<b>32</b> <b>(1.26)</b>	M12	58 (2.28)	35 (1.38)	10 (0.39)
	<b>1FK7083-5</b>	217 (8.54)	129 (5.08)	162 (6.38)	268 (10.55)	153 (6.02)	213 (8.39)					
100	<b>1FK7100-5</b>	208 (8.19)	113 (4.45)	153 (6.02)	227 (8.94)	113 (4.45)	172 (6.77)	<b>38</b> <b>(1.50)</b>	M12	80 (3.15)	41 (1.61)	10 (0.39)
	<b>1FK7101-5</b>	234 (9.21)	139 (5.47)	179 (7.05)	263 (10.35)	139 (5.47)	208 (8.19)					
	<b>1FK7103-5</b>	260 (10.24)	165 (6.50)	205 (8.07)	289 (11.38)	165 (6.50)	234 (9.21)					
	<b>1FK7105-5</b>	312 (12.28)	217 (8.54)	257 (10.12)	341 (13.43)	217 (8.54)	286 (11.26)					

**1FK708 -5**

Shaft design with fitted key



**1FK7100-5  
1FK7101-5  
1FK7103-5  
1FK7105-5**



# Synchronous motors

## Dimension drawings

### 1FK7 High Dynamic motors without/with DRIVE-CLiQ Natural cooling

For motor Dimensions in mm (in)

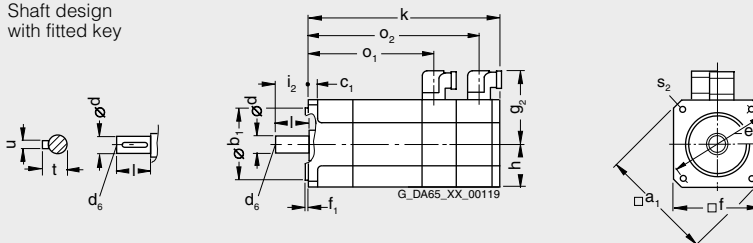
Shaft height	Type	DIN IEC	a <sub>P</sub>	b <sub>N</sub>	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	g <sub>2</sub> -	h H	i <sub>2</sub> -	s <sub>2</sub> S	Encoder system:		
													k LB	o <sub>1</sub> -	o <sub>2</sub> -
1FK7 High Dynamic, type of construction IM B5, natural cooling, with connector, without/with brake															
36	1FK7033-7		92 (3.62)	60 (2.36)	8 (0.31)	75 (2.95)	72 (2.83)	3 (0.12)	78 (3.07)	36 (1.42)	30 (1.18)	6.5 (0.26)	170/195 (6.69/7.68)	108/108 (4.25/4.25)	145/170 (5.71/6.69)
48	1FK7043-7		120 (4.72)	80 (3.15)	10 (0.39)	100 (3.94)	96 (3.78)	3 (0.12)	90 (3.54)	48 (1.89)	40 (1.57)	7 (0.28)	191/220 (7.52/8.66)	130/130 (5.12/5.12)	163/192 (6.42/7.56)
	1FK7044-7												216/245 (8.51/9.65)	155/155 (6.10/6.10)	188/217 (7.40/8.54)
63	1FK7061-7		155 (6.10)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	105 (4.13)	63 (2.48)	50 (1.97)	9 (0.35)	185/228 (7.28/8.98)	121/121 (4.76/4.76)	153/196 (6.02/7.72)
	1FK7064-7												249/292 (9.80/11.50)	185/185 (7.28/7.28)	217/260 (8.54/10.24)
80	1FK7085-7		186 (7.32)	130 (5.12)	13 (0.51)	165 (6.50)	155 (6.10)	3.5 (0.14)	141.5 (5.57)	77.5 (3.05)	58 (2.28)	11 (0.43)	261/303 (10.28/11.93)	192/192 (7.56/7.56)	229/272 (9.02/10.71)
	1FK7086-7								140.5 (5.53)						

6

Shaft height	Type	DIN IEC	Encoder system:			DE shaft extension				
			k LB	o <sub>1</sub> -	o <sub>2</sub> -	d D	d <sub>6</sub> -	l E	t GA	u F
Incremental encoder sin/cos 1 V <sub>pp</sub> / 22 bit (2 048 S/R) Absolute encoder EnDat 2 048 S/R / 22 bit (2 048 S/R) EnDat 512 S/R / 20 bit (512 S/R) EnDat 32 S/R / 16 bit (32 S/R)										
without/with brake										
36	1FK7033-7		194/219 (7.64/8.62)	109/109 (4.29/4.29)	144/168 (5.67/6.61)	14 (0.55)	M5	30 (1.18)	16 (0.63)	5 (0.20)
48	1FK7043-7		212/241 (8.35/9.49)	130/130 (5.12/5.12)	163/192 (6.42/7.56)	19 (0.75)	M6	40 (1.57)	21.5 (0.85)	6 (0.24)
	1FK7044-7		237/266 (9.33/10.47)	155/155 (6.10/6.10)	188/217 (7.40/8.54)					
63	1FK7061-7		208/251 (8.19/9.88)	121/121 (4.76/4.76)	154/197 (6.06/7.76)	24 (0.94)	M8	50 (1.97)	27 (1.06)	8 (0.31)
	1FK7064-7		272/315 (10.71/12.40)	185/185 (7.28/7.28)	218/261 (8.58/10.28)					
80	1FK7085-7		283/326 (11.14/12.83)	192/192 (7.56/7.56)	229/272 (9.02/10.71)	32 (1.26)	M12	58 (2.28)	35 (1.38)	10 (0.39)
	1FK7086-7									

1FK703-7  
1FK704-7  
1FK706-7  
1FK708-7

Shaft design with fitted key



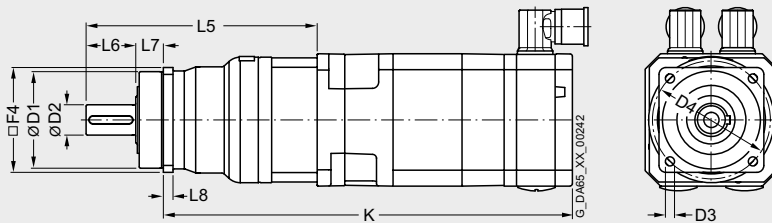


# Synchronous motors Dimension drawings

## 1FT6 motors without/with DRIVE-CLiQ with series SP+ planetary gearbox, single-stage

For motors		Dimensions in mm (in)										Encoder system:				
Shaft height	Type	F4	Planetary gearbox Type	D1	D2	D3	D4	L5	L6	L7	L8	Resolver		Increm. encoder Absolute encoder		
												without brake	with brake	without brake	with brake	
												K	K	K	K	
<b>1FT6 with SP+ planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, without/with brake</b>																
28	<b>1FT6021</b>	62 (2.44)	<b>SP060S-MF1</b>	60 (2.36)	16 (0.63)	5.5 (0.22)	68 (2.68)	138 (5.43)	28 (1.10)	20 (0.79)	6 (0.24)	283 (11.14)	308 (12.13)	283 (11.14)	308 (12.13)	
	<b>1FT6024</b>											323 (12.72)	348 (13.70)	323 (12.72)	348 (13.70)	
36	<b>1FT6031</b>	62 (2.44)	<b>SP060S-MF1</b>	60 (2.36)	16 (0.63)	5.5 (0.22)	68 (2.68)	142 (5.59)	28 (1.10)	20 (0.79)	6 (0.24)	274 (10.79)	294 (11.57)	314 (12.36)	334 (13.15)	
	<b>1FT6034</b>											314 (12.36)	334 (13.15)	354 (13.94)	374 (14.72)	
48	<b>1FT6041</b>	76 (2.99)	<b>SP075S-MF1</b>	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	164 (6.46)	36 (1.42)	20 (0.79)	7 (0.28)	328 (12.91)	348 (13.70)	368 (14.49)	388 (15.28)	
	<b>1FT6044</b>											347 (13.66)	382 (15.04)	390 (15.35)	425 (16.73)	
63	<b>1FT6061</b>	101 (3.98)	<b>SP100S-MF1</b>	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	217 (8.54)	58 (2.28)	30 (1.18)	10 (0.39)	327 (12.87)	357 (14.06)	357 (14.06)	387 (15.24)	
	<b>1FT6062</b>											352 (13.86)	382 (15.04)	382 (15.04)	412 (16.22)	
80	<b>1FT6081</b>	141 (5.55)	<b>SP140S-MF1</b>	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	283 (11.14)	82 (3.23)	30 (1.18)	12 (0.47)	392 (15.43)	419 (16.50)	392 (15.43)	419 (16.50)	
	<b>1FT6082</b>											417 (16.42)	444 (17.48)	417 (16.42)	444 (17.48)	
80	<b>1FT6084</b>											467 (18.39)	513 (20.20)	467 (18.39)	513 (20.20)	
	<b>1FT6086</b>											517 (20.35)	563 (22.17)	517 (20.35)	563 (22.17)	
	<b>1FT6086</b>	182 (7.17)	<b>SP180S-MF1</b>	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	310 (12.20)	82 (3.23)	30 (1.18)	15 (0.59)	544 (21.42)	590 (23.23)	544 (21.42)	590 (23.23)	

1FT602  
1FT603  
1FT604  
1FT606  
1FT608



6

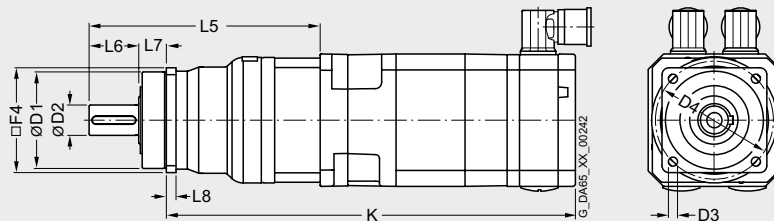
# Synchronous motors

## Dimension drawings

### 1FT6 motors without/with DRIVE-CLiQ with series SP+ planetary gearbox, single-stage

For motor		Dimensions in mm (in)										Encoder system:				
Shaft height	Type	F4	Planetary gearbox Type	D1	D2	D3	D4	L5	L6	L7	L8	Resolver		Increm. encoder Absolute encoder		
												without brake K	with brake K	without brake K	with brake K	
<b>1FT6 with SP+ planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, without/with brake</b>																
100	<b>1FT6102</b>	182 (7.17)	<b>SP180S-MF1</b>	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	310 (12.20)	82 (3.23)	30 (1.18)	15 (0.59)	493 (19.41)	539 (21.22)	493 (19.41)	539 (21.22)	
	<b>1FT6105</b>											568 (22.36)	614 (24.17)	568 (22.36)	614 (24.17)	
	<b>1FT6105</b>	215 (8.46)	<b>SP210S-MF1</b>	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	385 (15.16)	105 (4.13)	38 (1.50)	17 (0.67)	612 (24.09)	658 (25.91)	612 (24.09)	658 (25.91)	
	<b>1FT6108</b>	182 (7.17)	<b>SP180S-MF1</b>	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	310 (12.20)	82 (3.23)	30 (1.18)	15 (0.59)	668 (26.30)	714 (28.11)	668 (26.30)	714 (28.11)	
132		215 (8.46)	<b>SP210S-MF1</b>	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	385 (15.16)	105 (4.13)	38 (1.50)	17 (0.67)	712 (28.03)	758 (29.84)	712 (28.03)	758 (29.84)	
	<b>1FT6132</b>	215 (8.46)	<b>SP210S-MF1</b>	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	385 (15.16)	105 (4.13)	38 (1.50)	17 (0.67)	665 (26.18)	715 (28.15)	665 (26.18)	715 (28.15)	
	<b>1FT6134</b>											715 (28.15)	765 (30.12)	715 (28.15)	765 (30.12)	
	<b>1FT6134</b>	242 (9.53)	<b>SP240S-MF1</b>	200 (7.87)	85 (3.35)	17 (0.67)	290 (11.42)	443 (17.44)	130 (5.12)	40 (1.57)	20 (0.79)	746 (29.37)	796 (31.34)	746 (29.37)	796 (31.34)	
	<b>1FT6136</b>	215 (8.46)	<b>SP210S-MF1</b>	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	385 (15.16)	105 (4.13)	38 (1.50)	17 (0.67)	765 (30.12)	815 (32.09)	765 (30.12)	815 (32.09)	
			242 (9.53)	<b>SP240S-MF1</b>	200 (7.87)	85 (3.35)	17 (0.67)	290 (11.42)	443 (17.44)	130 (5.12)	40 (1.57)	20 (0.79)	796 (31.34)	846 (33.31)	796 (31.34)	846 (33.31)

1FT610  
1FT613

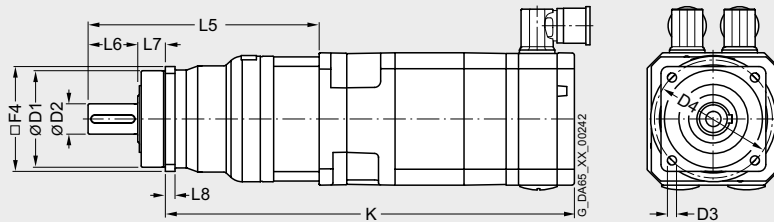


# Synchronous motors Dimension drawings

## 1FT6 motors without/with DRIVE-CLiQ with series SP+ planetary gearbox, two-stage

For motor		Dimensions in mm (in)										Encoder system:				
Shaft height	Type	F4	Planetary gearbox Type	D1	D2	D3	D4	L5	L6	L7	L8	Resolver		Increm. encoder Absolute encoder		
												without brake K	with brake K	without brake K	with brake K	
<b>1FT6 with SP+ planetary gearbox, two-stage, type of construction IM B5, natural cooling, with connector, without/with brake</b>																
28	<b>1FT6021</b>	62	<b>SP060S-MF2</b>	60	16	5.5	68	156	28	20	6	301	326	301	326	
		(2.44)	(2.36)	(0.63)	(0.22)	(2.68)	(6.14)	(1.10)	(0.79)	(0.24)	(11.85)	(12.83)	(11.85)	(12.83)		
			76	<b>SP075S-MF2</b>	70	22	6.6	85	175	36	20	7	312	337	312	337
			(2.99)	(2.76)	(0.87)	(0.26)	(3.35)	(6.89)	(1.42)	(0.79)	(0.28)	(12.28)	(13.27)	(12.28)	(13.27)	
		<b>1FT6024</b>	62	<b>SP060S-MF2</b>	60	16	5.5	68	156	28	20	6	341	366	341	366
	(2.44)		(2.36)	(0.63)	(0.22)	(2.68)	(6.14)	(1.10)	(0.79)	(0.24)	(13.43)	(14.41)	(13.43)	(14.41)		
		76	<b>SP075S-MF2</b>	70	22	6.6	85	175	36	20	7	352	377	352	377	
		(2.99)	(2.76)	(0.87)	(0.26)	(3.35)	(6.89)	(1.42)	(0.79)	(0.28)	(13.86)	(14.84)	(13.86)	(14.84)		
		101	<b>SP100S-MF2</b>	90	32	9	120	230	58	30	10	375	400	375	400	
		(3.98)	(3.54)	(1.26)	(0.35)	(4.72)	(9.06)	(2.28)	(1.18)	(0.39)	(14.76)	(15.75)	(14.76)	(15.75)		
36	<b>1FT6031</b>	62	<b>SP060S-MF2</b>	60	16	5.5	68	164	28	20	6	296	316	336	356	
		(2.44)	(2.36)	(0.63)	(0.22)	(2.68)	(6.46)	(1.10)	(0.79)	(0.24)	(11.65)	(12.44)	(13.23)	(14.02)		
				76	<b>SP075S-MF2</b>	70	22	6.6	85	179	36	20	7	303	323	343
			(2.99)	(2.76)	(0.87)	(0.26)	(3.35)	(7.05)	(1.42)	(0.79)	(0.28)	(11.93)	(12.72)	(13.50)	(14.29)	
			101	<b>SP100S-MF2</b>	90	32	9	120	230	58	30	10	322	342	362	382
			(3.98)	(3.54)	(1.26)	(0.35)	(4.72)	(9.06)	(2.28)	(1.18)	(0.39)	(12.68)	(13.46)	(14.25)	(15.04)	
	<b>1FT6034</b>	76	<b>SP075S-MF2</b>	70	22	6.6	85	179	36	20	7	343	363	383	403	
(2.99)		(2.76)	(0.87)	(0.26)	(3.35)	(7.05)	(1.42)	(0.79)	(0.28)	(13.50)	(14.29)	(15.08)	(15.87)			
			101	<b>SP100S-MF2</b>	90	32	9	120	230	58	30	10	362	382	402	422
		(3.98)	(3.54)	(1.26)	(0.35)	(4.72)	(9.06)	(2.28)	(1.18)	(0.39)	(14.25)	(15.04)	(15.83)	(16.61)		
		141	<b>SP140S-MF2</b>	130	40	11	165	298	82	30	12	406	426	446	466	
		(5.56)	(5.12)	(1.57)	(0.43)	(6.50)	(11.73)	(3.23)	(1.18)	(0.47)	(15.98)	(16.77)	(17.56)	(18.35)		
48	<b>1FT6041</b>	76	<b>SP075S-MF2</b>	70	22	6.6	85	192	36	20	7	321	356	364	399	
		(2.99)	(2.76)	(0.87)	(0.26)	(3.35)	(7.56)	(1.42)	(0.79)	(0.28)	(12.64)	(14.02)	(14.33)	(15.71)		
				101	<b>SP100S-MF2</b>	90	32	9	120	234	58	30	10	331	366	374
			(3.98)	(3.54)	(1.26)	(0.35)	(4.72)	(9.21)	(2.28)	(1.18)	(0.39)	(13.03)	(14.41)	(14.72)	(16.10)	
			141	<b>SP140S-MF2</b>	130	40	11	165	298	82	30	12	371	406	414	449
			(5.55)	(5.12)	(1.57)	(0.43)	(6.50)	(11.73)	(3.23)	(1.18)	(0.47)	(14.61)	(15.98)	(16.30)	(17.68)	
	<b>1FT6044</b>	101	<b>SP100S-MF2</b>	90	32	9	120	234	58	30	10	381	416	424	459	
(3.98)		(3.54)	(1.26)	(0.35)	(4.72)	(9.21)	(2.28)	(1.18)	(0.39)	(15.00)	(16.38)	(16.69)	(18.07)			
			141	<b>SP140S-MF2</b>	130	40	11	165	298	82	30	12	421	456	464	499
		(5.55)	(5.12)	(1.57)	(0.43)	(6.50)	(11.73)	(3.23)	(1.18)	(0.47)	(16.57)	(17.95)	(18.27)	(19.65)		
		182	<b>SP180S-MF2</b>	160	55	13.5	215	346	82	30	15	469	504	512	547	
		(7.17)	(6.30)	(2.17)	(0.53)	(8.46)	(13.62)	(3.23)	(1.18)	(0.59)	(18.46)	(19.84)	(20.16)	(21.54)		

1FT602  
1FT603  
1FT604



6

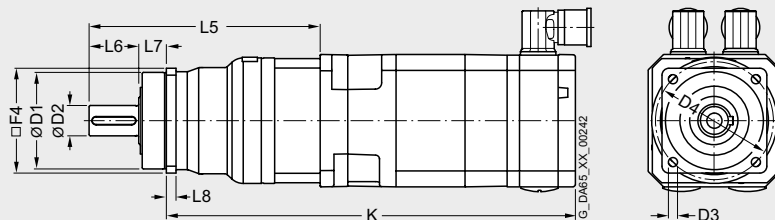
# Synchronous motors

## Dimension drawings

### 1FT6 motors without/with DRIVE-CLiQ with series SP+ planetary gearbox, two-stage

For motor		Dimensions in mm (in)										Encoder system:				
Shaft height	Type	F4	Planetary gearbox Type	D1	D2	D3	D4	L5	L6	L7	L8	Resolver		Increm. encoder Absolute encoder		
												without brake K	with brake K	without brake K	with brake K	
<b>1FT6 with SP+ planetary gearbox, two-stage, type of construction IM B5, natural cooling, with connector, without/with brake</b>																
63	<b>1FT6061</b>	101	<b>SP100S-MF2</b>	90	32	9	120	252	58	30	10	362	392	392	422	
		(3.98)		(3.54)	(1.26)	(0.35)	(4.72)	(9.92)	(2.28)	(1.18)	(0.39)	(14.25)	(15.43)	(15.43)	(16.61)	
		141	<b>SP140S-MF2</b>	130	40	11	165	305	82	30	12	391	421	421	451	
	(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(12.01)	(3.23)	(1.18)	(0.47)	(15.39)	(16.57)	(16.57)	(17.76)		
	182	<b>SP180S-MF2</b>	160	55	13.5	215	346	82	30	15	432	462	462	492		
	(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(13.62)	(3.23)	(1.18)	(0.59)	(17.01)	(18.19)	(18.19)	(19.37)		
	<b>1FT6062</b>	101	<b>SP100S-MF2</b>	90	32	9	120	252	58	30	10	387	417	417	447	
		(3.98)		(3.54)	(1.26)	(0.35)	(4.72)	(9.92)	(2.28)	(1.18)	(0.39)	(15.24)	(16.42)	(16.42)	(17.60)	
		141	<b>SP140S-MF2</b>	130	40	11	165	305	82	30	12	416	446	446	476	
(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(12.01)	(3.23)	(1.18)	(0.47)	(16.38)	(17.56)	(17.56)	(18.74)			
<b>1FT6064</b>	101	<b>SP100S-MF2</b>	90	32	9	120	252	58	30	10	437	467	467	497		
	(3.98)		(3.54)	(1.26)	(0.35)	(4.72)	(9.92)	(2.28)	(1.18)	(0.39)	(17.20)	(18.39)	(18.39)	(19.57)		
	141	<b>SP140S-MF2</b>	130	40	11	165	305	82	30	12	466	496	496	526		
(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(12.01)	(3.23)	(1.18)	(0.47)	(18.35)	(19.53)	(19.53)	(20.71)			
182	<b>SP180S-MF2</b>	160	55	13.5	215	346	82	30	15	507	537	537	567			
(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(13.62)	(3.23)	(1.18)	(0.59)	(19.96)	(21.14)	(21.14)	(22.32)			
80	<b>1FT6081</b>	141	<b>SP140S-MF2</b>	130	40	11	165	332	82	30	12	441	468	441	468	
		(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(13.07)	(3.23)	(1.18)	(0.47)	(17.36)	(18.43)	(17.36)	(18.43)	
		182	<b>SP180S-MF2</b>	160	55	13.5	215	355	82	30	15	464	491	464	491	
	(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(13.98)	(3.23)	(1.18)	(0.59)	(18.27)	(19.33)	(18.27)	(19.33)		
	215	<b>SP210S-MF2</b>	180	75	17	250	415	105	38	17	493	520	493	520		
	(8.46)		(7.09)	(2.95)	(0.67)	(9.84)	(16.34)	(4.13)	(1.50)	(0.67)	(19.41)	(20.47)	(19.41)	(20.47)		
	<b>1FT6082</b>	141	<b>SP140S-MF2</b>	130	40	11	165	332	82	30	12	466	493	466	493	
		(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(13.07)	(3.23)	(1.18)	(0.47)	(18.35)	(19.41)	(18.35)	(19.41)	
		182	<b>SP180S-MF2</b>	160	55	13.5	215	355	82	30	15	489	516	489	516	
	(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(13.98)	(3.23)	(1.18)	(0.59)	(19.25)	(20.31)	(19.25)	(20.31)		
	215	<b>SP210S-MF2</b>	180	75	17	250	415	105	38	17	518	545	518	545		
	(8.46)		(7.09)	(2.95)	(0.67)	(9.84)	(16.34)	(4.13)	(1.50)	(0.67)	(20.39)	(21.46)	(20.39)	(21.46)		
	<b>1FT6084</b>	141	<b>SP140S-MF2</b>	130	40	11	165	332	82	30	12	516	562	516	562	
		(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(13.07)	(3.23)	(1.18)	(0.47)	(20.31)	(22.13)	(20.31)	(22.13)	
		182	<b>SP180S-MF2</b>	160	55	13.5	215	355	82	30	15	539	585	539	585	
(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(13.98)	(3.23)	(1.18)	(0.59)	(21.22)	(23.03)	(21.22)	(23.03)			
245	<b>SP240S-MF2</b>	200	85	17	290	467.5	130	40	20	594	640	594	640			
(9.65)		(7.87)	(3.35)	(0.67)	(11.42)	(18.41)	(5.12)	(1.57)	(0.79)	(23.39)	(25.20)	(23.39)	(25.20)			
<b>1FT6086</b>	182	<b>SP180S-MF2</b>	160	55	13.5	215	355	82	30	15	589	635	589	635		
	(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(13.98)	(3.23)	(1.18)	(0.59)	(23.19)	(25.00)	(23.19)	(25.00)		
245	<b>SP240S-MF2</b>	200	85	17	290	467.5	130	40	20	644	690	644	690			
(9.65)		(7.87)	(3.55)	(0.67)	(11.42)	(18.41)	(5.12)	(1.57)	(0.79)	(25.35)	(27.17)	(25.35)	(27.17)			

1FT606  
1FT608

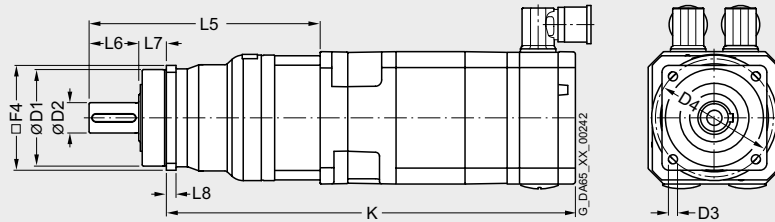


# Synchronous motors Dimension drawings

## 1FT6 motors without/with DRIVE-CLiQ with series SP+ planetary gearbox, two-stage

For motor		Dimensions in mm (in)										Encoder system:				
Shaft height	Type	F4	Planetary gearbox Type	D1	D2	D3	D4	L5	L6	L7	L8	Resolver		Increm. encoder Absolute encoder		
												without brake	with brake	without brake	with brake	
												K	K	K	K	
<b>1FT6 with SP+ planetary gearbox, two-stage, type of construction IM B5, natural cooling, with connector, without/with brake</b>																
100	<b>1FT6102</b>	182	<b>SP180S-MF2</b>	160	55	13.5	215	355	82	30	15	538	584	538	584	
		(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(13.98)	(3.23)	(1.18)	(0.59)	(21.18)	(22.99)	(21.18)	(22.99)	
			245	<b>SP240S-MF2</b>	200	85	17	290	467.5	130	40	20	593	639	593	639
			(9.65)		(7.87)	(3.35)	(0.67)	(11.42)	(18.41)	(5.17)	(1.57)	(0.79)	(23.35)	(25.16)	(23.35)	(25.16)
		<b>1FT6105</b>	215	<b>SP210S-MF2</b>	180	75	17	250	415	105	38	17	642	688	642	688
			(8.46)		(7.09)	(2.95)	(0.67)	(9.84)	(16.34)	(4.13)	(1.50)	(0.67)	(25.28)	(27.09)	(25.28)	(27.09)
		245	<b>SP240S-MF2</b>	200	85	17	290	467.5	130	40	20	668	714	668	714	
		(9.65)		(7.87)	(3.35)	(0.67)	(11.42)	(18.41)	(5.12)	(1.57)	(0.79)	(26.30)	(28.11)	(26.30)	(28.11)	
	<b>1FT6108</b>	245	<b>SP240S-MF2</b>	200	85	17	290	467.5	130	40	20	768	814	768	814	
		(9.65)		(7.87)	(3.35)	(0.67)	(11.42)	(18.41)	(5.12)	(1.57)	(0.79)	(30.24)	(32.05)	(30.24)	(32.05)	
132	<b>1FT6132</b>	245	<b>SP240S-MF2</b>	200	85	17	290	467.5	130	40	20	721	771	721	771	
		(9.65)		(7.87)	(3.35)	(0.67)	(11.42)	(18.41)	(5.12)	(1.57)	(0.79)	(28.39)	(30.35)	(28.39)	(30.35)	
	<b>1FT6134</b>											771	821	771	821	
												(30.35)	(32.32)	(30.35)	(32.32)	
	<b>1FT6136</b>											821	871	821	871	
												(32.32)	(34.29)	(32.32)	(34.29)	

**1FT610  
1FT613**



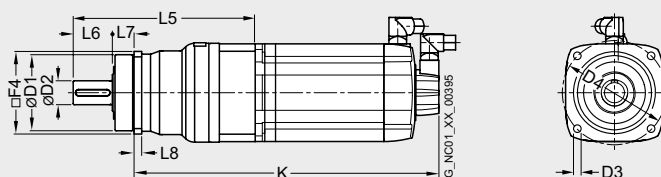
# Synchronous motors

## Dimension drawings

### 1FT7 Compact motors without/with DRIVE-CLiQ with series SP+ planetary gearbox, single-stage

For motors		Dimensions in mm (inches)										Encoder system:			
Shaft height	Type	F4	Planetary gearbox Type	D1	D2	D3	D4	L5	L6	L7	L8	Incremental encoder		Absolute encoder	
												without brake		with brake	
1FT7 with SP+ planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, without/with brake													K	K	
36	1FT7034	62 (2.44)	SP060S-MF1	60 (2.36)	16 (0.63)	5.5 (0.22)	68 (2.68)	142 (5.59)	28 (1.10)	20 (0.79)	6 (0.24)	347 (13.66)	374 (14.72)		
	1FT7034	76 (2.99)	SP075S-MF1	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	163.8 (6.45)	36 (1.42)	20 (0.79)	7 (0.28)	361 (14.21)	388 (15.28)		
	1FT7036											297 (11.69)	324 (12.76)		
48	1FT7042							167.5 (6.59)				275 (10.83)	307 (12.09)		
	1FT7044											325 (12.80)	357 (14.06)		
	1FT7046											365 (14.37)	397 (15.63)		
	1FT7046	101 (3.98)	SP100S-MF1	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	210 (8.27)	58 (2.28)	30 (1.18)	10 (0.39)	375 (14.76)	407 (16.02)		
63	1FT7062							217 (8.54)				296 (11.65)	331 (13.03)		
	1FT7064											327 (12.87)	362 (14.25)		
	1FT7066											359 (14.13)	394 (15.51)		
	1FT7068											406 (15.98)	441 (17.36)		
	1FT7068	141 (5.55)	SP140S-MF1	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	274.3 (10.80)	82 (3.23)	30 (1.18)	12 (0.47)	439 (17.28)	474 (18.66)		
80	1FT7082							283.3 (11.15)				361 (14.21)	413 (16.26)		
	1FT7084											412 (16.22)	464 (18.27)		
	1FT7086											464 (18.27)	516 (20.31)		
	1FT7086	182 (7.17)	SP180S-MF1	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	310 (12.20)	82 (3.23)	30 (1.18)	15 (0.59)	491 (19.33)	543 (21.38)		
100	1FT7102											412 (16.22)	464 (18.27)		
	1FT7105											498 (19.61)	550 (21.65)		
	1FT7108											568 (22.36)	620 (24.41)		
	1FT7105	215 (8.46)	SP210S-MF1	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	385 (15.16)	105 (4.13)	38 (1.50)	17 (0.67)	542 (21.34)	594 (23.39)		
	1FT7108											612 (24.09)	664 (26.14)		

1FT703  
1FT704  
1FT706  
1FT708  
1FT710

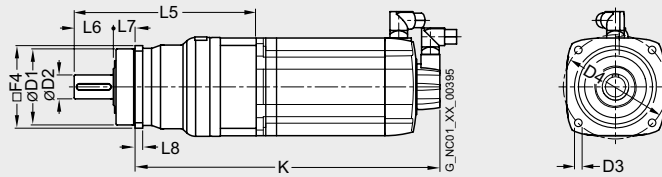


# Synchronous motors Dimension drawings

## 1FT7 Compact motors without/with DRIVE-CLiQ with series SP+ planetary gearbox, two-stage

For motors		Dimensions in mm (inches)										Encoder system: Incremental encoder Absolute encoder	
Shaft height	Type	F4	Planetary gearbox Type	D1	D2	D3	D4	L5	L6	L7	L8	without brake K	with brake K
<b>1FT7 with SP+ planetary gearbox, two-stage, type of construction IM B5, natural cooling, with connector, without/with brake</b>													
36	<b>1FT7034</b>	76 (2.99)	<b>SP075S-MF2</b>	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	179.4 (7.06)	36 (1.42)	20 (0.79)	7 (0.28)	376 (14.80)	403 (15.87)
	<b>1FT7036</b>											312 (12.28)	339 (13.35)
48	<b>1FT7042</b>							192 (7.56)				331 (13.03)	331 (13.03)
36	<b>1FT7034</b>	101 (3.98)	<b>SP100S-MF2</b>	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	230.3 (9.07)	58 (2.28)	30 (1.18)	10 (0.39)	395 (15.55)	422 (16.61)
	<b>1FT7036</b>											331 (13.03)	358 (14.09)
48	<b>1FT7042</b>							234 (9.21)				341 (13.43)	341 (13.43)
	<b>1FT7044</b>											359 (14.13)	391 (15.39)
	<b>1FT7046</b>											431 (16.97)	431 (16.97)
	<b>1FT7044</b>	141 (5.55)	<b>SP140S-MF2</b>	130 (5.12)	40 (1.58)	11 (0.43)	165 (6.50)	298.3 (11.74)	82 (3.23)	30 (1.18)	12 (0.47)	399 (15.71)	431 (16.97)
	<b>1FT7046</b>											471 (18.54)	471 (18.54)

1FT703  
1FT704



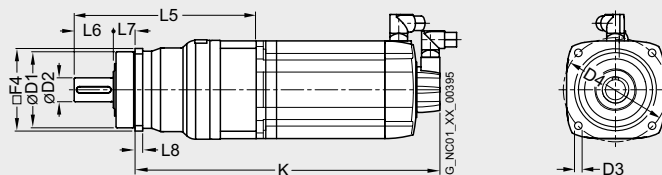
# Synchronous motors

## Dimension drawings

### 1FT7 Compact motors without/with DRIVE-CLiQ with series SP+ planetary gearbox, two-stage

For motors		Dimension in mm (inches)										Encoder system: Incremental encoder Absolute encoder	
Shaft height	Type	F4	Planetary gearbox Type	D1	D2	D3	D4	L5	L6	L7	L8	without	with
												brake K	brake K
<b>1FT7 with SP+ planetary gearbox, two-stage, type of construction IM B5, natural cooling, with connector, without/with brake</b>													
63	<b>1FT7062</b>	101 (3.98)	<b>SP100S-MF2</b>	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	252 (9.92)	58 (2.28)	30 (1.18)	10 (0.39)	331 (13.03)	366 (14.41)
	<b>1FT7064</b>											362 (14.25)	397 (15.63)
63	<b>1FT7062</b>	141 (5.55)	<b>SP140S-MF2</b>	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	305 (12.01)	82 (3.23)	30 (1.18)	12 (0.47)	360 (14.17)	395 (15.55)
	<b>1FT7064</b>											391 (15.39)	426 (16.77)
	<b>1FT7066</b>											458 (18.03)	458 (18.03)
	<b>1FT7068</b>											505 (19.88)	505 (19.88)
80	<b>1FT7082</b>							332 (13.07)				410 (16.14)	462 (18.19)
	<b>1FT7084</b>											461 (18.15)	513 (20.20)
63	<b>1FT7064</b>	182 (7.17)	<b>SP180S-MF2</b>	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	346 (13.62)	82 (3.23)	30 (1.18)	15 (0.59)	432 (17.01)	467 (18.39)
	<b>1FT7066</b>											499 (19.65)	499 (19.65)
	<b>1FT7068</b>											546 (21.50)	546 (21.50)
80	<b>1FT7082</b>							355 (13.98)				433 (17.05)	485 (19.09)
	<b>1FT7084</b>											536 (21.10)	536 (21.10)
	<b>1FT7086</b>											536 (21.10)	588 (23.15)
100	<b>1FT7102</b>											457 (17.99)	509 (20.04)
80	<b>1FT7084</b>	215 (8.46)	<b>SP210S-MF2</b>	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	415 (16.34)	105 (4.13)	38 (1.50)	17 (0.67)	565 (22.24)	565 (22.24)
	<b>1FT7086</b>											617 (24.29)	617 (24.29)
100	<b>1FT7102</b>											538 (21.18)	538 (21.18)
	<b>1FT7105</b>											572 (22.52)	624 (24.57)
	<b>1FT7108</b>											694 (27.32)	694 (27.32)
80	<b>1FT7086</b>	245 (9.65)	<b>SP240S-MF2</b>	200 (7.87)	85 (3.35)	17 (0.67)	290 (11.42)	467.5 (18.41)	130 (5.12)	40 (1.57)	20 (0.79)	643 (25.31)	643 (25.31)
100	<b>1FT7102</b>											512 (20.16)	564 (22.20)
	<b>1FT7105</b>											598 (23.54)	650 (25.59)
	<b>1FT7108</b>											668 (26.30)	720 (28.35)

1FT706  
1FT708  
1FT710



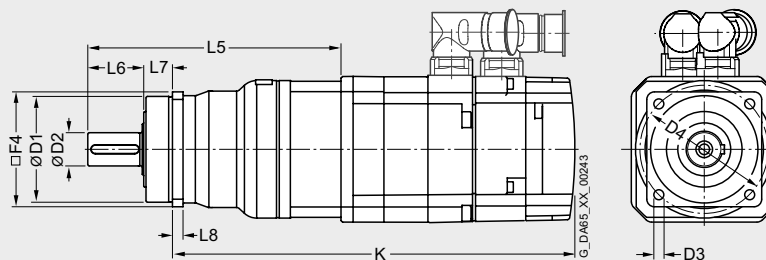


# Synchronous motors Dimension drawings

## 1FK7 Compact motors without/with DRIVE-CLiQ with series SP+ planetary gearbox, single-stage

For motor		Dimensions in mm (in)											Encoder system:			
Shaft height	Type	F4	Planetary gearbox Type	D1	D2	D3	D4	L5	L6	L7	L8	without brake	with brake	without brake	with brake	
												K	K	K	K	
<b>1FK7 Compact with SP+ planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, without/with brake</b>																
28	<b>1FK7022-5</b>	62 (2.44)	<b>SP060S-MF1</b>	60 (2.36)	16 (0.63)	5.5 (0.22)	68 (2.68)	137 (5.39)	28 (1.10)	20 (0.79)	6 (0.24)	242 (9.53)	264 (10.39)	267 (10.51)	289 (11.38)	
36	<b>1FK7032-5</b>	62 (2.44)	<b>SP060S-MF1</b>	60 (2.36)	16 (0.63)	5.5 (0.22)	68 (2.68)	142 (5.59)	28 (1.10)	20 (0.79)	6 (0.24)	244 (9.61)	269 (10.59)	269 (10.59)	294 (11.57)	
	<b>1FK7034-5</b>											269 (10.59)	294 (11.57)	294 (11.57)	319 (12.56)	
48	<b>1FK7040-5</b>	76 (2.99)	<b>SP075S-MF1</b>	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	168 (6.61)	36 (1.42)	20 (0.79)	7 (0.28)	246 (9.69)	275 (10.83)	267 (10.51)	296 (11.65)	
	<b>1FK7042-5</b>											274 (10.79)	303 (11.93)	294 (11.57)	323 (12.72)	
63	<b>1FK7060-5</b>	101 (3.98)	<b>SP100S-MF1</b>	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	217 (8.54)	58 (2.28)	30 (1.18)	10 (0.39)	286 (11.26)	329 (12.95)	309 (12.17)	352 (13.86)	
	<b>1FK7063-5</b>											331 (13.03)	374 (14.72)	354 (13.94)	397 (15.63)	
80	<b>1FK7080-5</b>	141 (5.55)	<b>SP140S-MF1</b>	130 (5.12)	40 (1.58)	11 (0.43)	165 (6.50)	283 (11.14)	82 (3.23)	30 (1.18)	12 (0.47)	327 (12.87)	355 (13.98)	350 (13.78)	377 (14.84)	
	<b>1FK7083-5</b>											365 (14.37)	416 (16.38)	388 (15.28)	439 (17.28)	
100	<b>1FK7100-5</b>	182 (7.17)	<b>SP180S-MF1</b>	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.47)	310 (12.20)	82 (3.23)	30 (1.18)	15 (0.59)	383 (15.08)	402 (15.83)	406 (15.98)	425 (16.73)	
	<b>1FK7101-5</b>											409 (16.10)	438 (17.24)	432 (17.01)	461 (18.15)	
	<b>1FK7103-5</b>											435 (17.13)	464 (18.27)	458 (18.03)	487 (19.17)	
	<b>1FK7105-5</b>	182 (7.17)	<b>SP180S-MF1</b>	160 (6.30)	55 (2.17)	13.5 (0.55)	215 (8.47)	310 (12.20)	82 (3.23)	30 (1.18)	15 (0.59)	487 (19.17)	516 (20.31)	510 (20.08)	539 (21.22)	
	<b>1FK7105-5</b>	215 (8.46)	<b>SP210S-MF1</b>	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	385 (15.16)	105 (4.13)	38 (1.50)	17 (0.67)	531 (20.91)	560 (22.05)	554 (21.81)	583 (22.95)	

1FK702.-5  
1FK703.-5  
1FK704.-5  
1FK706.-5  
1FK708.-5  
1FK710.-5



6

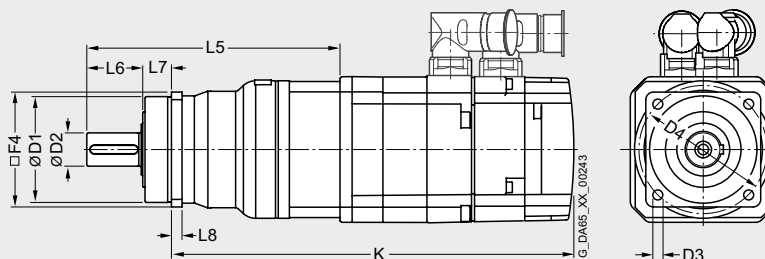
# Synchronous motors

## Dimension drawings

### 1FK7 High Dynamic motors without/with DRIVE-CLiQ with series SP+ planetary gearbox, single-stage

For motor		Dimensions in mm (in)											Encoder system:			
Shaft height	Type	F4	Planetary gearbox Type	D1	D2	D3	D4	L5	L6	L7	L8	without brake	with brake	without brake	with brake	
												K	K	K	K	
<b>1FK7 High Dynamic with SP+ planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, without/with brake</b>																
36	<b>1FK7033-7</b>	62 (2.44)	<b>SP060S-MF1</b>	60 (2.36)	16 (0.63)	5.5 (0.22)	68 (2.68)	142 (5.59)	28 (1.10)	20 (0.79)	6 (0.24)	263 (10.35)	288 (11.34)	288 (11.34)	313 (12.32)	
48	<b>1FK7043-7</b>	76 (2.99)	<b>SP075S-MF1</b>	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	168 (6.61)	36 (1.42)	20 (0.79)	7 (0.28)	303 (11.93)	332 (13.07)	324 (12.76)	353 (13.90)	
	<b>1FK7044-7</b>											328 (12.91)	357 (14.06)	349 (13.74)	378 (14.88)	
63	<b>1FK7061-7</b>	101 (3.98)	<b>SP100S-MF1</b>	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	217 (8.54)	58 (2.28)	30 (1.18)	10 (0.39)	314 (12.36)	357 (14.06)	337 (13.27)	380 (14.96)	
	<b>1FK7064-7</b>											378 (14.88)	421 (16.57)	401 (15.79)	444 (17.48)	
80	<b>1FK7085-7</b>	141	<b>SP140S-MF1</b>	130	40	11	165	283	82	30	12	432	474	454	497	
	<b>1FK7086-7</b>	(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(11.14)	(3.23)	(1.18)	(0.47)	(17.01)	(18.66)	(17.87)	(19.57)	

1FK703.-7  
1FK704.-7  
1FK706.-7  
1FK708.-7

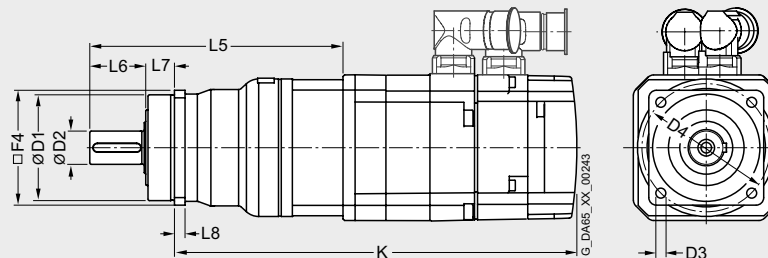


# Synchronous motors Dimension drawings

## 1FK7 Compact motors without/with DRIVE-CLiQ with series SP+ planetary gearbox, two-stage

For motor		Dimensions in mm (in)											Encoder system:			
Shaft height	Type	F4	Planetary gearbox Type	D1	D2	D3	D4	L5	L6	L7	L8	without brake	with brake	without brake	with brake	
												K	K	K	K	
<b>1FK7 Compact with SP+ planetary gearbox, two-stage, type of construction IM B5, natural cooling, with connector, without/with brake</b>																
28	1FK7022-5	62	SP060S-MF2	60	16	5.5	68	156	28	20	6	261	283	286	308	
		(2.44)		(2.36)	(0.63)	(0.22)	(2.68)	(6.14)	(1.10)	(0.79)	(0.24)	(10.28)	(11.14)	(11.26)	(12.13)	
		76	SP075S-MF2	70	22	6.6	85	175	36	20	7	272	294	297	319	
(2.99)		(2.76)	(0.87)	(0.26)	(3.35)	(6.89)	(1.42)	(0.79)	(0.28)	(10.71)	(11.57)	(11.69)	(12.56)			
101	SP100S-MF2	90	32	9	120	230	58	30	10	295	317	320	342			
(3.98)		(3.54)	(1.26)	(0.35)	(4.72)	(9.06)	(2.28)	(1.18)	(0.39)	(11.61)	(12.48)	(12.60)	(13.46)			
36	1FK7032-5	62	SP060S-MF2	60	16	5.5	68	164	28	20	6	266	291	291	316	
		(2.44)		(2.36)	(0.63)	(0.22)	(2.68)	(6.46)	(1.10)	(0.79)	(0.24)	(10.47)	(11.46)	(11.46)	(12.44)	
		76	SP075S-MF2	70	22	6.6	85	179	36	20	7	273	298	298	323	
	(2.99)		(2.76)	(0.87)	(0.26)	(3.35)	(7.05)	(1.42)	(0.79)	(0.28)	(10.75)	(11.73)	(11.73)	(12.72)		
	101	SP100S-MF2	90	32	9	120	230	58	30	10	292	317	317	342		
	(3.98)		(3.54)	(1.26)	(0.35)	(4.72)	(9.06)	(2.28)	(1.18)	(0.39)	(11.50)	(12.48)	(12.48)	(13.46)		
1FK7034-5	76	SP075S-MF2	70	22	6.6	85	179	36	20	7	298	323	323	348		
	(2.99)		(2.76)	(0.87)	(0.26)	(3.35)	(7.05)	(1.42)	(0.79)	(0.28)	(11.73)	(12.72)	(12.72)	(13.70)		
	101	SP100S-MF2	90	32	9	120	230	58	30	10	317	342	342	367		
(3.98)		(3.54)	(1.26)	(0.35)	(4.72)	(9.06)	(2.28)	(1.18)	(0.39)	(12.48)	(13.46)	(13.46)	(14.45)			
48	1FK7040-5	76	SP075S-MF2	70	22	6.6	85	192	36	20	7	270	299	291	320	
		(2.99)		(2.76)	(0.87)	(0.26)	(3.35)	(7.56)	(1.42)	(0.79)	(0.28)	(10.63)	(11.77)	(11.46)	(12.60)	
		101	SP100S-MF2	90	32	9	120	234	58	30	10	280	309	301	330	
	(3.98)		(3.54)	(1.26)	(0.35)	(4.72)	(9.21)	(2.28)	(1.18)	(0.39)	(11.02)	(12.17)	(11.85)	(12.99)		
	141	SP140S-MF2	130	40	11	165	298	82	30	12	320	349	341	370		
	(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(11.73)	(3.23)	(1.18)	(0.47)	(12.60)	(13.74)	(13.43)	(14.57)		
1FK7042-5	76	SP075S-MF2	70	22	6.6	85	192	36	20	7	298	327	298	347		
	(2.99)		(2.76)	(0.87)	(0.26)	(3.35)	(7.56)	(1.42)	(0.79)	(0.28)	(11.73)	(12.87)	(11.73)	(13.66)		
	101	SP100S-MF2	90	32	9	120	234	58	30	10	308	337	308	357		
(3.98)		(3.54)	(1.26)	(0.35)	(4.72)	(9.21)	(2.28)	(1.18)	(0.39)	(12.13)	(13.27)	(12.13)	(14.06)			
141	SP140S-MF2	130	40	11	165	298	82	30	12	348	377	368	397			
(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(11.73)	(3.23)	(1.18)	(0.47)	(13.71)	(14.84)	(14.49)	(15.63)			
63	1FK7060-5	101	SP100S-MF2	90	32	9	120	252	58	30	10	321	364	344	387	
		(3.98)		(3.54)	(1.26)	(0.35)	(4.72)	(9.92)	(2.28)	(1.18)	(0.39)	(12.64)	(14.33)	(13.54)	(15.24)	
	141	SP140S-MF2	130	40	11	165	305	82	30	12	350	393	373	416		
(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(12.01)	(3.23)	(1.18)	(0.47)	(13.78)	(15.47)	(14.69)	(16.38)			
1FK7063-5	141	SP140S-MF2	130	40	11	165	305	82	30	12	395	438	418	461		
	(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(12.01)	(3.23)	(1.18)	(0.47)	(15.55)	(17.24)	(16.46)	(18.15)		
182	SP180S-MF2	160	55	13.5	215	346	82	30	15	436	479	459	502			
(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(13.62)	(3.23)	(1.18)	(0.59)	(17.17)	(18.86)	(18.07)	(19.76)			

1FK702.-5  
1FK703.-5  
1FK704.-5  
1FK706.-5



6

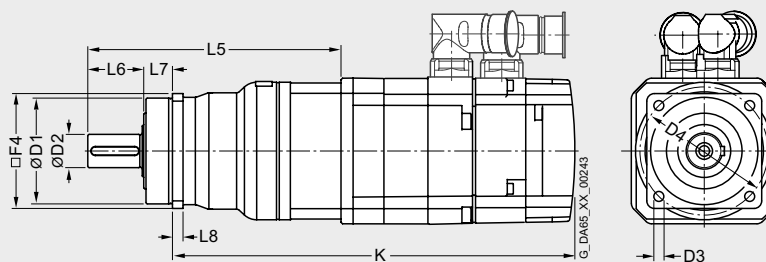
# Synchronous motors

## Dimension drawings

### 1FK7 Compact motors without/with DRIVE-CLiQ with series SP+ planetary gearbox, two-stage

For motor		Dimensions in mm (in)											Encoder system:			
Shaft height	Type	F4	Planetary gearbox Type	D1	D2	D3	D4	L5	L6	L7	L8	Resolver		Incremental encoder sin/cos 1 V <sub>pp</sub> / 22 bit (2 048 S/R)		
												without brake	with brake	without brake	with brake	
<b>1FK7 Compact with SP+ planetary gearbox, two-stage, type of construction IM B5, natural cooling, with connector, without/with brake</b>																
80	1FK7080-5	141	SP140S-MF2	130	40	11	165	332	82	30	12	376	404	399	426	
		(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(13.07)	(3.23)	(1.18)	(0.47)	(14.80)	(15.91)	(15.71)	(16.77)	
		182	SP180S-MF2	160	55	13.5	215	355	82	30	15	399	427	422	449	
	(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(13.98)	(3.23)	(1.18)	(0.59)	(15.71)	(16.81)	(16.61)	(17.68)		
	215	SP210S-MF2	180	75	17	250	415	105	38	17	428	456	451	478		
	(8.46)		(7.09)	(2.95)	(0.67)	(9.84)	(16.34)	(4.13)	(1.50)	(0.67)	(16.85)	(17.95)	(17.76)	(18.82)		
80	1FK7083-5	141	SP140S-MF2	130	40	11	165	332	82	30	12	414	465	437	488	
		(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(13.07)	(3.23)	(1.18)	(0.47)	(16.30)	(18.31)	(17.20)	(19.21)	
		182	SP180S-MF2	160	55	13.5	215	355	82	30	15	437	488	460	511	
	(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(13.98)	(3.23)	(1.18)	(0.59)	(17.20)	(19.21)	(18.11)	(20.12)		
	215	SP210S-MF2	180	75	17	250	415	105	38	17	466	517	489	540		
	(8.46)		(7.09)	(2.95)	(0.67)	(9.84)	(16.34)	(4.13)	(1.50)	(0.67)	(18.35)	(20.35)	(19.25)	(21.26)		
100	1FK7100-5	182	SP180S-MF2	160	55	13.5	215	310	82	30	15	383	402	406	425	
		(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(12.20)	(3.23)	(1.18)	(0.59)	(15.08)	(15.83)	(15.98)	(16.73)	
	215	SP210S-MF2	180	75	17	250	415	105	38	17	457	476	480	499		
	(8.46)		(7.09)	(2.95)	(0.67)	(9.84)	(16.34)	(4.13)	(1.50)	(0.67)	(17.99)	(18.74)	(18.90)	(19.65)		
	1FK7101-5	182	SP180S-MF2	160	55	13.5	215	310	82	30	15	409	438	432	461	
		(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(12.20)	(3.23)	(1.18)	(0.59)	(16.10)	(17.24)	(17.01)	(18.15)	
		215	SP210S-MF2	180	75	17	250	415	105	38	17	483	512	506	535	
	(8.46)		(7.09)	(2.95)	(0.67)	(9.84)	(16.34)	(4.13)	(1.50)	(0.67)	(19.02)	(20.16)	(19.92)	(21.06)		
	245	SP240S-MF2	200	85	17	290	467.5	130	40	20	509	538	531	561		
	(9.65)		(7.87)	(3.35)	(0.67)	(11.42)	(18.41)	(5.12)	(1.57)	(0.79)	(20.04)	(21.18)	(20.91)	(22.09)		
	1FK7103-5	182	SP180S-MF2	160	55	13.5	215	310	82	30	15	435	464	458	487	
		(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(12.20)	(3.23)	(1.18)	(0.59)	(17.13)	(18.27)	(18.03)	(19.19)	
215		SP210S-MF2	180	75	17	250	415	105	38	17	509	538	532	561		
(8.46)		(7.09)	(2.95)	(0.67)	(9.84)	(16.34)	(4.13)	(1.50)	(0.67)	(20.04)	(21.18)	(20.94)	(22.09)			
245	SP240S-MF2	200	85	17	290	467.5	130	40	20	535	564	557	587			
(9.56)		(7.87)	(3.35)	(0.67)	(11.42)	(18.41)	(5.12)	(1.57)	(0.79)	(21.06)	(22.20)	(21.93)	(23.11)			
1FK7105-5	215	SP210S-MF2	180	75	17	250	415	105	38	17	561	590	584	613		
	(8.46)		(7.09)	(2.95)	(0.67)	(9.84)	(16.34)	(4.13)	(1.50)	(0.67)	(22.09)	(23.23)	(22.99)	(24.13)		
245	SP240S-MF2	200	85	17	290	467.5	130	40	20	587	616	610	639			
(9.65)		(7.87)	(3.35)	(0.67)	(11.42)	(18.41)	(5.12)	(1.57)	(0.79)	(23.11)	(24.25)	(24.02)	(25.16)			

1FK708.-5  
1FK710.-5

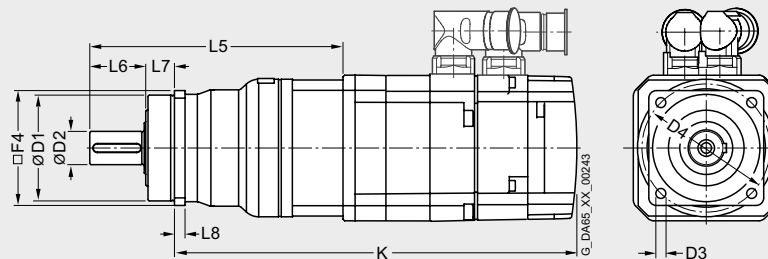


# Synchronous motors Dimension drawings

## 1FK7 High Dynamic motors without/with DRIVE-CLiQ with series SP+ planetary gearbox, two-stage

For motor		Dimensions in mm (in)											Encoder system:			
Shaft height	Type	F4	Planetary gearbox Type	D1	D2	D3	D4	L5	L6	L7	L8	without brake	with brake	without brake	with brake	
												K	K	K	K	
<b>1FK7 High Dynamic with SP+ planetary gearbox, two-stage, type of construction IM B5, natural cooling, with connector, without/with brake</b>																
36	1FK7033-7	62	SP060S-MF2	60	16	5.5	68	164	28	20	6	285	310	310	335	
		(2.44)		(2.36)	(0.63)	(0.22)	(2.68)	(6.46)	(1.10)	(0.79)	(0.24)	(11.22)	(12.20)	(12.20)	(13.19)	
		76	SP075S-MF2	70	22	6.6	85	179	36	20	7	292	317	317	342	
(2.99)		(2.76)	(0.87)	(0.26)	(3.35)	(7.05)	(1.42)	(0.79)	(0.28)	(11.50)	(12.48)	(12.48)	(13.46)			
101	SP100S-MF2	90	32	9	120	230	58	30	10	311	336	336	361			
(3.98)		(3.54)	(1.26)	(0.35)	(4.72)	(9.06)	(2.28)	(1.18)	(0.39)	(12.24)	(13.23)	(13.23)	(14.21)			
48	1FK7043-7	76	SP075S-MF2	70	22	6.6	85	192	36	20	7	327	356	348	377	
		(2.99)		(2.76)	(0.87)	(0.26)	(3.35)	(7.56)	(1.42)	(0.79)	(0.28)	(12.87)	(14.02)	(13.70)	(14.84)	
		101	SP100S-MF2	90	32	9	120	234	58	30	10	337	366	358	387	
	(3.98)		(3.54)	(1.26)	(0.35)	(4.72)	(9.21)	(2.28)	(1.18)	(0.39)	(13.27)	(14.41)	(14.09)	(15.24)		
	141	SP140S-MF2	130	40	11	165	298	82	30	12	377	406	398	427		
	(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(11.74)	(3.23)	(1.18)	(0.47)	(14.84)	(15.98)	(15.67)	(16.81)		
1FK7044-7	101	SP100S-MF2	90	32	9	120	234	58	30	10	362	391	383	412		
	(3.98)		(3.54)	(1.26)	(0.35)	(4.72)	(9.21)	(2.28)	(1.18)	(0.39)	(14.25)	(15.39)	(15.08)	(16.22)		
	141	SP140S-MF2	130	40	11	165	298	82	30	12	402	431	432	452		
(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(11.73)	(3.23)	(1.18)	(0.47)	(15.83)	(16.97)	(17.01)	(17.80)			
63	1FK7061-7	101	SP100S-MF2	90	32	9	120	252	58	30	10	349	392	372	415	
	(3.98)		(3.54)	(1.26)	(0.35)	(4.72)	(9.92)	(2.28)	(1.18)	(0.39)	(13.74)	(15.43)	(14.65)	(16.34)		
	1FK7061-7	141	SP140S-MF2	130	40	11	165	305	82	30	12	378	421	401	444	
	(5.55)		(5.12)	(1.57)	(0.43)	(6.50)	(12.01)	(3.23)	(1.18)	(0.47)	(14.88)	(16.57)	(15.79)	(17.48)		
	1FK7064-7										442	485	465	508		
(17.17)										(17.40)	(19.09)	(18.31)	(20.00)			
1FK7064-7	182	SP180S-MF2	160	55	14	215	346	82	30	15	483	526	506	549		
(7.17)		(6.30)	(2.17)	(0.55)	(8.46)	(13.62)	(3.23)	(1.18)	(0.59)	(19.02)	(20.71)	(19.92)	(21.61)			
80	1FK7085-7	182	SP180S-MF2	160	55	13.5	215	355	82	30	15	504	546	526	569	
	(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(13.98)	(3.23)	(1.18)	(0.59)	(19.84)	(21.50)	(20.71)	(22.40)		
	215	SP210S-MF2	180	75	17	250	415	105	38	17	533	575	555	598		
	(8.46)		(7.09)	(2.95)	(0.67)	(9.84)	(16.34)	(4.13)	(1.50)	(0.67)	(20.98)	(22.64)	(21.85)	(23.54)		
1FK7086-7	182	SP180S-MF2	160	55	13.5	215	355	82	30	15	504	546	526	569		
(7.17)		(6.30)	(2.17)	(0.53)	(8.46)	(13.98)	(3.23)	(1.18)	(0.59)	(19.84)	(21.50)	(20.71)	(22.40)			
215	SP210S-MF2	180	75	17	250	415	105	38	17	533	575	555	598			
(8.46)		(7.09)	(2.95)	(0.67)	(9.84)	(16.34)	(4.13)	(1.50)	(0.67)	(20.98)	(22.64)	(21.85)	(23.54)			

1FK703.-7  
1FK704.-7  
1FK706.-7  
1FK708.-7



6

# Synchronous motors

## Dimension drawings

### 1FK7 Compact motors without/with DRIVE-CLiQ with series LP+ planetary gearbox, single-stage

For motor		Dimensions in mm (in)														
Shaft height	Type	Planetary gearbox Type	Dimensions													
			D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>	L <sub>8</sub>	L <sub>9</sub>	L <sub>10</sub>	L <sub>16</sub>	
28	<b>1FK7022-5</b>	<b>LP050-M01</b>	50 (1.97)	35 (1.38)	12 (0.47)	44 (1.73)	M4	18 (0.71)	4 (0.16)	7 (0.28)	8 (0.31)	14 (0.55)	4 (0.16)	50 (1.97)	88 (3.46)	
	<b>1FK7022-5</b>	<b>LP070-M01</b>	70 (2.76)	52 (2.05)	16 (0.63)	62 (2.44)	M5	28 (1.10)	5 (0.20)	8 (0.31)	10 (0.39)	18 (0.71)	5 (0.20)	70 (2.76)	119 (4.69)	
36	<b>1FK7032-5</b>	<b>LP070-M01</b>	70 (2.76)	52 (2.05)	16 (0.63)	62 (2.44)	M5	28 (1.10)	5 (0.20)	8 (0.31)	10 (0.39)	18 (0.71)	5 (0.20)	70 (2.76)	126 (4.96)	
	<b>1FK7034-5</b>															
48	<b>1FK7040-5</b>	<b>LP090-M01</b>	90 (3.54)	68 (2.68)	22 (0.87)	80 (3.15)	M6	36 (1.42)	5 (0.20)	10 (0.39)	12 (0.47)	25 (0.98)	6 (0.24)	90 (3.54)	158 (6.22)	
	<b>1FK7042-5</b>															
63	<b>1FK7060-5</b>	<b>LP120-M01</b>	120 (4.72)	90 (3.54)	32 (1.26)	108 (4.25)	M8	58 (2.28)	6 (0.24)	12 (0.47)	16 (0.63)	35 (1.38)	10 (0.39)	120 (4.72)	210 (8.27)	
	<b>1FK7063-5</b>															
80	<b>1FK7080-5</b>	<b>LP155-M01</b>	155 (6.10)	120 (4.72)	40 (1.57)	140 (5.51)	M10	82 (3.23)	8 (0.31)	15 (0.59)	20 (0.79)	43 (1.69)	12 (0.47)	150 (5.91)	266 (10.47)	
	<b>1FK7083-5</b>															

6

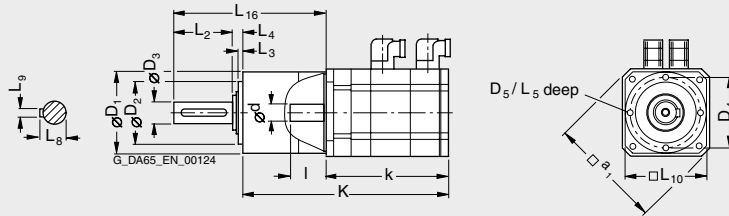
Encoder system:  
 Resolver  
 Absolute encoder EnDat 16 S/R / 15 bit (16 S/R)  
 Incremental encoder sin/cos 1 V<sub>pp</sub> / 22 bit (2 048 S/R)  
 Absolute encoder EnDat 2 048 S/R / 22 bit (2 048 S/R)  
 EnDat 512 S/R / 20 bit (512 S/R)  
 EnDat 32 S/R / 16 bit (32 S/R)

Shaft height	Type	DIN IEC	without brake		with brake		without brake		with brake		l	d	a <sub>1</sub>
			k	K	k	K	k	K	k	K			
			LB	-	LB	-	LB	-	LB	-	E	D	P

### 1FK7 Compact with LP+ planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, without/with brake

28	<b>1FK7022-5</b>	153 (6.02)	216 (8.50)	175 (6.89)	238 (9.37)	178 (7.01)	241 (9.49)	200 (7.87)	263 (10.35)	20	9	-
	<b>1FK7022-5</b>		236 (9.29)		258 (10.16)		261 (10.28)		283 (11.14)			
36	<b>1FK7032-5</b>	150 (5.91)	240 (9.45)	175 (6.89)	265 (10.43)	175 (6.89)	265 (10.43)	200 (7.87)	290 (11.42)	30	14	92
	<b>1FK7034-5</b>	175 (6.89)	265 (10.43)	200 (7.87)	290 (11.42)	200 (7.87)	290 (11.42)	225 (8.86)	315 (12.40)			
48	<b>1FK7040-5</b>	135 (5.31)	247 (9.72)	164 (6.46)	276 (10.87)	155 (6.10)	267 (10.51)	184 (7.24)	296 (11.65)	40	19	120
	<b>1FK7042-5</b>	162 (6.38)	274 (10.79)	191 (7.52)	303 (11.93)	183 (7.20)	295 (11.61)	212 (8.35)	324 (12.76)			
63	<b>1FK7060-5</b>	157 (6.18)	297 (11.69)	200 (7.87)	340 (13.39)	180 (7.09)	320 (12.60)	223 (8.78)	363 (14.29)	50	24	155
	<b>1FK7063-5</b>	202 (7.95)	342 (13.46)	245 (9.65)	385 (15.16)	225 (8.86)	365 (14.37)	268 (10.55)	408 (16.06)			
80	<b>1FK7080-5</b>	156 (6.14)	325 (12.80)	184 (7.24)	353 (13.90)	179 (7.05)	347 (13.66)	206 (8.11)	375 (14.76)	58	32	186
	<b>1FK7083-5</b>	194 (7.64)	363 (14.29)	245 (9.65)	414 (16.30)	217 (8.54)	385 (15.16)	268 (10.55)	436 (17.17)			

1FK702.-5  
 1FK703.-5  
 1FK704.-5  
 1FK706.-5  
 1FK708.-5



# Synchronous motors Dimension drawings

## 1FK7 Compact motors without/with DRIVE-CLiQ with series LP+ planetary gearbox, single-stage

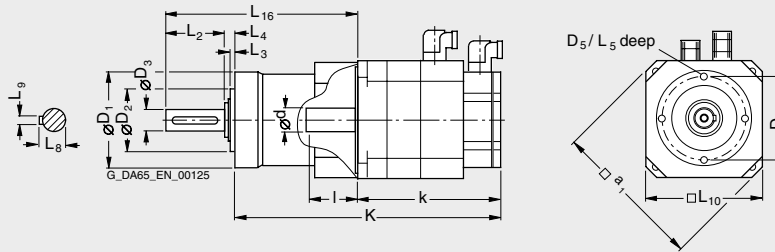
For motor		Dimensions in mm (in)													
Shaft height	Type	Planetary gearbox													
		Type	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>	L <sub>8</sub>	L <sub>9</sub>	L <sub>10</sub>	L <sub>16</sub>
100	<b>1FK710-5</b>	<b>LP155-M01</b>	155 (6.10)	120 (4.72)	40 (1.57)	140 (5.51)	M10	82 (3.23)	8 (0.31)	15 (0.59)	20 (0.79)	43 (1.69)	12 (0.47)	150 (5.91)	286 (11.26)

Shaft height	Type	DIN IEC	Encoder system:				l	d	a <sub>1</sub>				
			Resolver		Incremental encoder sin/cos 1 V <sub>pp</sub> / 22 bit (2 048 S/R) Absolute encoder EnDat 2 048 S/R / 22 bit (2 048 S/R) EnDat 32 S/R / 16 bit (32 S/R)								
			without brake		with brake								
			k	K	k	K	k	K					
			LB	-	LB	-	LB	-	LB	-	E	D	P

### 1FK7 Compact with LP+ planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, without/with brake

100	<b>1FK7100-5</b>	185 (7.28)	374 (14.72)	204 (8.03)	393 (15.47)	208 (8.19)	396 (15.59)	227 (8.94)	415 (16.34)	80 (3.15)	38 (1.50)	240 (9.45)
	<b>1FK7101-5</b>	211 (8.31)	400 (15.75)	240 (9.45)	429 (16.89)	234 (9.21)	422 (16.61)	263 (10.35)	452 (17.80)			
	<b>1FK7103-5</b>	237 (9.33)	426 (16.77)	266 (10.47)	455 (17.91)	260 (10.24)	448 (17.64)	289 (11.38)	478 (18.82)			
	<b>1FK7105-5</b>	289 (11.38)	478 (18.82)	318 (12.52)	507 (19.96)	312 (12.28)	500 (19.69)	341 (13.43)	530 (20.87)			

#### 1FK710-5



# Synchronous motors

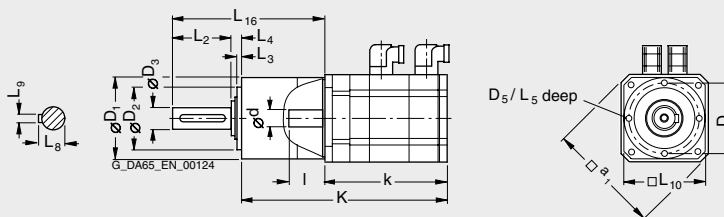
## Dimension drawings

### 1FK7 High Dynamic motors without/with DRIVE-CLiQ with series LP+ planetary gearbox, single-stage

For motor		Dimensions in mm (in)														
Shaft height	Type	Planetary gearbox Type	Dimensions in mm (in)													
			D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>	L <sub>8</sub>	L <sub>9</sub>	L <sub>10</sub>	L <sub>16</sub>	
36	<b>1FK7033-7</b>	<b>LP070-M01</b>	70 (2.76)	52 (2.05)	16 (0.63)	62 (2.44)	M5	28 (1.10)	5 (0.20)	8 (0.31)	10 (0.39)	18 (0.71)	5 (0.20)	70 (2.76)	126 (4.96)	
48	<b>1FK7043-7</b> <b>1FK7044-7</b>	<b>LP090-M01</b>	90 (3.54)	68 (2.68)	22 (0.87)	80 (3.15)	M6	36 (1.42)	5 (0.20)	10 (0.39)	12 (0.47)	25 (0.98)	6 (0.24)	90 (3.54)	158 (6.22)	
63	<b>1FK7061-7</b> <b>1FK7064-7</b>	<b>LP120-M01</b>	120 (4.72)	90 (3.54)	32 (1.26)	108 (4.25)	M8	58 (2.28)	6 (0.24)	12 (0.47)	16 (0.63)	35 (1.38)	10 (0.39)	120 (4.72)	210 (8.27)	
80	<b>1FK7085-7</b> <b>1FK7086-7</b>	<b>LP155-M01</b>	155 (6.10)	120 (4.72)	40 (1.57)	140 (5.51)	M10	82 (3.23)	8 (0.31)	15 (0.59)	20 (0.79)	43 (1.69)	12 (0.47)	150 (5.91)	266 (10.47)	

Shaft height	Type	DIN IEC	Encoder system:										l	d	a <sub>1</sub>	
			Resolver		Incremental encoder sin/cos 1 V <sub>pp</sub> / 22 bit (2 048 S/R)		Absolute encoder EnDat 16 S/R / 15 bit (16 S/R)		Absolute encoder EnDat 2 048 S/R / 22 bit (2 048 S/R)		EnDat 512 S/R / 20 bit (512 S/R)					EnDat 32 S/R / 16 bit (32 S/R)
		without brake		with brake		without brake		with brake								
		k	K	k	K	k	K	k	K	k	K	E	D	P		
		LB	-	LB	-	LB	-	LB	-	LB	-					
<b>1FK7 High Dynamic with LP+ planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, without/with brake</b>																
36	<b>1FK7033-7</b>	170 (6.69)	260 (10.24)	195 (7.68)	285 (11.22)	195 (7.68)	285 (11.22)	220 (8.66)	310 (12.20)	30 (1.18)	14 (0.55)	92 (3.62)				
48	<b>1FK7043-7</b>	191 (7.52)	303 (11.93)	220 (8.66)	332 (13.07)	212 (8.35)	324 (12.76)	240 (9.45)	352 (13.86)	40 (1.57)	19 (0.75)	120 (4.72)				
	<b>1FK7044-7</b>	216 (8.50)	328 (12.91)	245 (9.65)	357 (14.06)	237 (9.33)	349 (13.74)	265 (10.43)	377 (14.84)							
63	<b>1FK7061-7</b>	185 (7.28)	325 (12.80)	228 (8.98)	368 (14.49)	208 (8.19)	348 (13.70)	251 (9.88)	391 (15.39)	50 (1.97)	24 (0.94)	155 (6.10)				
	<b>1FK7064-7</b>	249 (9.80)	389 (15.31)	292 (11.50)	432 (17.01)	272 (10.71)	412 (16.22)	315 (12.40)	455 (17.91)							
80	<b>1FK7085-7</b>	261 (10.28)	430 (16.93)	304 (11.97)	473 (18.62)	284 (11.18)	453 (17.83)	326 (12.83)	495 (19.49)	58 (2.28)	32 (1.26)	186 (7.32)				
	<b>1FK7086-7</b>															

**1FK7033-7**  
**1FK704.-7**  
**1FK706.-7**  
**1FK708.-7**





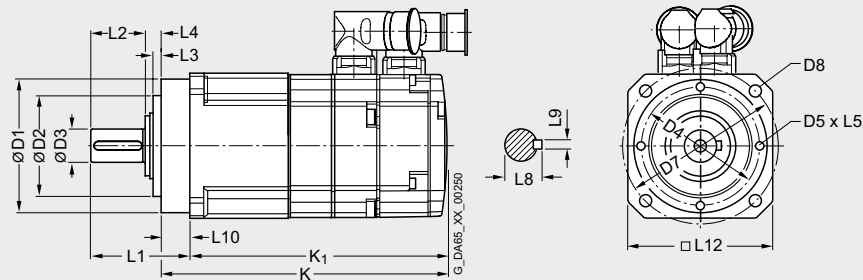
# Synchronous motors Dimension drawings

## 1FK7-DYA motors without/with DRIVE-CLiQ with planetary gearbox, single-stage

For motor		Dimensions in mm (in)																
		Planetary gearbox																
Shaft height	Type	Type	D1	D2	D3	D4	D5	D7	D8	L1	L2	L3	L4	L5	L8	L9	L10	L12
36	<b>1FK7032-5</b>	<b>DYA70-10</b>	70 (2.76)	52 (2.05)	16 (0.63)	62 (2.44)	M5	82 (3.23)	5.5 (0.22)	56 (2.20)	28 (1.10)	5 (0.20)	8 (0.31)	10 (0.39)	18 (0.71)	5 (0.20)	20 (0.79)	76 (2.99)
	<b>1FK7034-5</b>	<b>DYA70-5</b>																
48	<b>1FK7040-5</b>	<b>DYA90-10</b>	90 (3.54)	68 (2.68)	22 (0.87)	80 (3.15)	M6	105 (4.13)	7 (0.28)	66 (2.60)	36 (1.42)	5 (0.20)	10 (0.39)	12 (0.47)	24.5 (0.96)	6 (0.24)	20 (0.79)	101 (3.98)
	<b>1FK7042-5</b>	<b>DYA90-5</b>																
63	<b>1FK7060-5</b>	<b>DYA120-10</b>	120 (4.72)	90 (3.54)	32 (1.26)	108 (4.25)	M8	140 (5.51)	9 (0.35)	95 (3.74)	58 (2.28)	6 (0.24)	12 (0.47)	16 (0.63)	35 (1.38)	10 (0.39)	25 (0.98)	128 (5.04)
	<b>1FK7063-5</b>	<b>DYA120-5</b>																
80	<b>1FK7080-5</b>	<b>DYA155-10</b>	155 (6.10)	120 (4.72)	40 (1.57)	140 (5.51)	M10	170 (6.69)	11 (0.43)	127 (5.00)	82 (3.23)	8 (0.31)	15 (0.59)	20 (0.79)	43 (1.69)	12 (0.47)	30 (1.18)	161 (6.34)
	<b>1FK7083-5</b>	<b>DYA155-5</b>																

Shaft height	Type	Encoder system:																
		Resolver				Absolute encoder EnDat 16 S/R / 15 bit (16 S/R)				Incremental encoder sin/cos 1 V <sub>pp</sub> / 22 bit (2 048 S/R)				Absolute encoder EnDat 32 S/R / 16 bit (32 S/R)				
		without brake		with brake		without brake		with brake		without brake		with brake		without brake		with brake		
		K	K1	K	K1	K	K1	K	K1	K	K1	K	K1	K	K1	K	K1	
<b>1FK7-DYA with planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, without/with brake</b>																		
36	<b>1FK7032-5</b>	197 (7.76)	177 (6.97)	222 (8.74)	202 (7.95)	222 (8.74)	202 (7.95)	247 (9.72)	227 (8.94)	222 (8.74)	247 (9.72)	227 (8.94)	222 (8.74)	247 (9.72)	227 (8.94)	222 (8.74)	247 (9.72)	227 (8.94)
	<b>1FK7034-5</b>	222 (8.74)	202 (7.95)	247 (9.72)	227 (8.94)	247 (9.72)	227 (8.94)	272 (10.71)	252 (9.92)	247 (9.72)	227 (8.94)	252 (9.92)	247 (9.72)	227 (8.94)	272 (10.71)	252 (9.92)	247 (9.72)	227 (8.94)
48	<b>1FK7040-5</b>	194 (7.64)	174 (6.85)	223 (8.78)	203 (7.99)	214 (8.43)	194 (7.64)	243 (9.57)	223 (8.78)	223 (8.78)	243 (9.57)	223 (8.78)	223 (8.78)	243 (9.57)	223 (8.78)	243 (9.57)	223 (8.78)	243 (9.57)
	<b>1FK7042-5</b>	221 (8.70)	201 (7.91)	250 (9.84)	230 (9.06)	242 (9.53)	222 (8.74)	271 (10.67)	251 (9.88)	250 (9.84)	230 (9.06)	271 (10.67)	251 (9.88)	250 (9.84)	230 (9.06)	271 (10.67)	251 (9.88)	250 (9.84)
63	<b>1FK7060-5</b>	233 (9.17)	208 (8.19)	261 (10.28)	236 (9.29)	256 (10.08)	231 (9.09)	284 (11.18)	259 (10.20)	264 (10.39)	239 (9.41)	264 (10.39)	239 (9.41)	264 (10.39)	239 (9.41)	264 (10.39)	239 (9.41)	264 (10.39)
	<b>1FK7063-5</b>	278 (10.94)	253 (9.96)	306 (12.05)	281 (11.06)	301 (11.85)	276 (10.87)	329 (12.95)	304 (11.97)	309 (12.17)	284 (11.18)	309 (12.17)	284 (11.18)	309 (12.17)	284 (11.18)	309 (12.17)	284 (11.18)	309 (12.17)
80	<b>1FK7080-5</b>	250 (9.84)	220 (8.66)	278 (10.94)	248 (9.76)	273 (10.75)	243 (9.57)	300 (11.81)	270 (10.63)	281 (11.06)	251 (9.88)	281 (11.06)	251 (9.88)	281 (11.06)	251 (9.88)	281 (11.06)	251 (9.88)	281 (11.06)
	<b>1FK7083-5</b>	288 (11.34)	258 (10.16)	339 (13.35)	309 (12.17)	311 (12.24)	281 (11.06)	362 (14.25)	332 (13.07)	319 (12.56)	289 (11.38)	319 (12.56)	289 (11.38)	319 (12.56)	289 (11.38)	319 (12.56)	289 (11.38)	319 (12.56)

1FK703.-5  
1FK704.-5  
1FK706.-5  
1FK708.-5



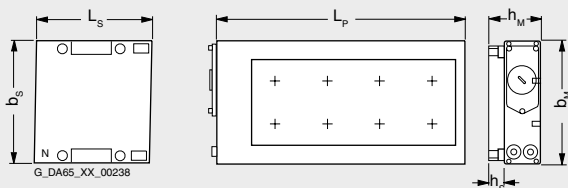
6

# Synchronous motors

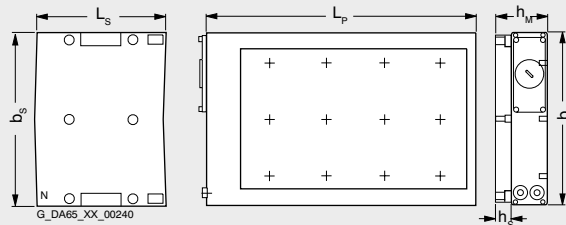
## Dimension drawings

### 1FN3 linear motors Version for peak load – water cooling

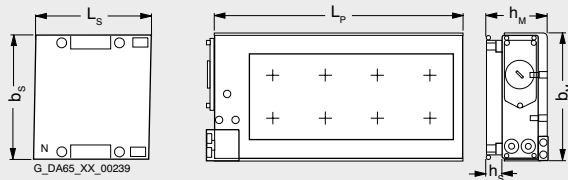
Primary section	Dimensions in mm (in)				Primary section length	Secondary section	Dimensions in mm (in)				Secondary section length
	Without precision cooling		With precision cooling				Without precision cooling		With precision cooling and cover		
Type	$b_M$	$h_M$	$b_M$	$h_M$	$L_P$	Type	$b_S$	$h_S$	$b_S$	$h_S$	$L_S$
<b>1FN3, version for peak load – water cooling</b>											
<b>1FN3050-2W</b>	67 (2.64)	48.5 (1.91)	76 (2.99)	63.4 (2.50)	255 (10.04)	<b>1FN3050-4SA00-0AA0</b>	58 (2.28)	11.8 (0.46)	75 (2.95)	14.8 (0.58)	120 (4.72)
<b>1FN3100-1W</b>	96 (3.78)	48.5 (1.91)	–	–	150 (5.91)	<b>1FN3100-4SA00-0AA0</b>	88 (3.46)	11.8 (0.46)	105 (4.13)	14.8 (0.58)	120 (4.72)
<b>1FN3100-2W</b>			105 (4.13)	63.4 (2.50)	255 (10.04)						
<b>1FN3100-3W</b>			360 (14.17)								
<b>1FN3100-4W</b>			465 (18.31)								
<b>1FN3100-5W</b>			570 (22.44)								
<b>1FN3150-1W</b>	126 (4.96)	50.5 (1.99)	–	–	150 (5.91)	<b>1FN3150-4SA00-0AA0</b>	118 (4.65)	13.8 (0.54)	135 (5.31)	16.8 (0.66)	120 (4.72)
<b>1FN3150-2W</b>			135 (5.31)	65.4 (2.57)	255 (10.04)						
<b>1FN3150-3W</b>			360 (14.17)								
<b>1FN3150-4W</b>			465 (18.31)								
<b>1FN3150-5W</b>			570 (22.44)								
<b>1FN3300-1W</b>	141 (5.55)	64.1 (2.52)	–	–	221 (8.70)	<b>1FN3300-4SA00-0AA0</b>	134 (5.28)	16.5 (0.65)	151 (5.94)	19.5 (0.77)	184 (7.24)
<b>1FN3300-2W</b>			151 (5.94)	79 (3.11)	382 (15.04)						
<b>1FN3300-3W</b>			543 (21.38)								
<b>1FN3300-4W</b>			704 (27.72)								
<b>1FN3450-2W</b>	188 (7.40)	66.1 (2.60)	197 (7.76)	81 (3.19)	382 (15.04)	<b>1FN3450-4SA00-0AA0</b>	180 (7.09)	18.5 (0.73)	197 (7.76)	21.5 (0.85)	184 (7.24)
<b>1FN3450-3W</b>			543 (21.38)								
<b>1FN3450-4W</b>			704 (27.72)								
<b>1FN3600-2W</b>	248 (9.76)	64.1 (2.52)	257 (10.12)	86 (3.39)	382 (15.04)	<b>1FN3600-4SA00-0AA0</b>	240 (9.45)	16.5 (0.65)	247 (9.72)	26.5 (1.04)	184 (7.24)
<b>1FN3600-3W</b>			543 (21.38)								
<b>1FN3600-4W</b>			704 (27.72)								
<b>1FN3900-2W</b>	342 (13.46)	66.1 (2.60)	351 (13.82)	88 (3.46)	382 (15.04)	<b>1FN3900-4SA00-0AA0</b>	334 (13.15)	18.5 (0.73)	341 (13.43)	28.5 (1.12)	184 (7.24)
<b>1FN3900-3W</b>			543 (21.38)								
<b>1FN3900-4W</b>			704 (27.72)								



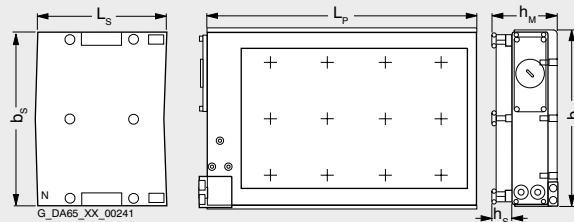
1FN3050 to 1FN3450 without precision cooling



1FN3600 to 1FN3900 without precision cooling  
Note: 4-row drill pattern with 1FN3900 for fixing the primary section



1FN3050 to 1FN3450 with precision cooling

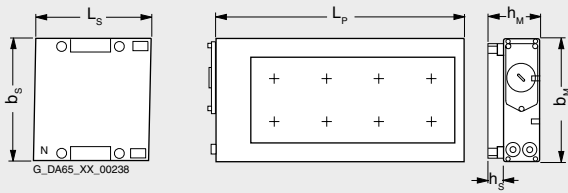


1FN3600 to 1FN3900 with precision cooling  
Note: 4-row drill pattern with 1FN3900 for fixing the primary section

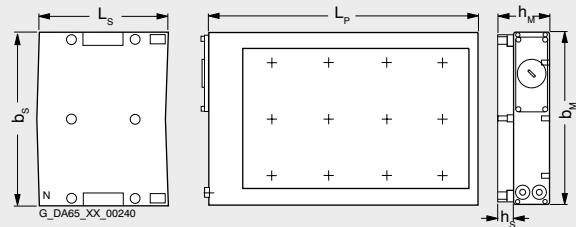
# Synchronous motors Dimension drawings

## 1FN3 linear motors Version for continuous load – water cooling

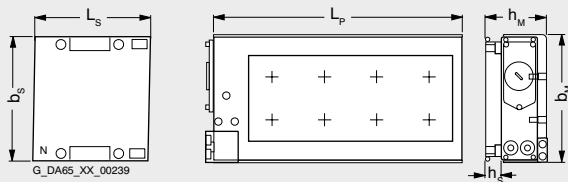
Primary section	Dimensions in mm (in)				Primary section length	Secondary section	Dimensions in mm (in)				Secondary section length
	Without precision cooling		With precision cooling				Without precision cooling	With precision cooling			
Type	$b_M$	$h_M$	$b_M$	$h_M$	$L_P$	Type	$b_S$	$h_S$	$b_M$	$h_M$	$L_S$
<b>1FN3, version for continuous load – water cooling</b>											
<b>1FN3050-1ND</b>	67 (2.64)	59.4 (2.34)	76 (2.99)	74.3 (2.93)	162 (6.38)	<b>1FN3050-4SA00-0AA0</b>	58 (2.28)	11.8 (0.46)	75 (2.95)	14.8 (0.58)	120 (4.72)
<b>1FN3050-2NB</b>					267 (10.51)						
<b>1FN3100-1NC</b>	96 (3.78)	59.4 (2.34)	105 (4.13)	74.3 (2.93)	162 (6.38)	<b>1FN3100-4SA00-0AA0</b>	88 (3.46)	11.8 (0.46)	105 (4.13)	14.8 (0.58)	120 (4.72)
<b>1FN3100-2NC</b>					267 (10.51)						
<b>1FN3100-3NC</b>					372 (14.65)						
<b>1FN3100-4NC</b>					477 (18.78)						
<b>1FN3150-1NC</b>	126 (4.96)	61.4 (2.42)	135 (5.31)	76.3 (3.00)	162 (6.38)	<b>1FN3150-4SA00-0AA0</b>	118 (4.65)	13.8 (0.54)	135 (5.31)	16.8 (0.66)	120 (4.72)
<b>1FN3150-2NB</b>					267 (10.51)						
<b>1FN3150-3NC</b>					372 (14.65)						
<b>1FN3150-4NB</b>					477 (18.78)						
<b>1FN3300-1NC</b>	141 (5.55)	78 (3.07)	150 (5.91)	92.9 (3.66)	238 (9.37)	<b>1FN3300-4SA00-0AA0</b>	134 (5.28)	16.5 (0.65)	151 (5.94)	19.5 (0.77)	184 (7.24)
<b>1FN3300-2NC</b>					399 (15.71)						
<b>1FN3300-3NC</b>					560 (22.05)						
<b>1FN3300-4NB</b>					721 (28.39)						
<b>1FN3450-2NC</b>	188 (7.40)	80 (3.15)	197 (7.76)	94.9 (3.74)	399 (15.71)	<b>1FN3450-4SA00-0AA0</b>	180 (7.09)	18.5 (0.73)	197 (7.76)	21.5 (0.85)	184 (7.24)
<b>1FN3450-3NC</b>					560 (22.05)						
<b>1FN3450-4NB</b>					721 (28.39)						
<b>1FN3600-2NB</b>	248 (9.76)	78 (3.07)	257 (10.12)	99.9 (3.93)	399 (15.71)	<b>1FN3600-4SA00-0AA0</b>	240 (9.45)	16.5 (0.65)	247 (9.72)	26.5 (1.04)	184 (7.24)
<b>1FN3600-3NB</b>					560 (22.05)						
<b>1FN3600-4NB</b>					721 (28.39)						
<b>1FN3900-2NB</b>	342 (13.46)	80 (3.15)	351 (13.82)	101.9 (4.01)	399 (15.71)	<b>1FN3900-4SA00-0AA0</b>	334 (13.15)	18.5 (0.73)	341 (13.43)	28.5 (1.12)	184 (7.24)
<b>1FN3900-3NB</b>					560 (22.05)						
<b>1FN3900-4NB</b>					721 (28.39)						



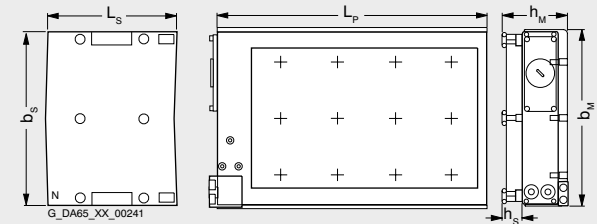
1FN3050 to 1FN3450 without precision cooling



1FN3600 to 1FN3900 without precision cooling  
Note: 4-row drill pattern with 1FN3900 for fixing the primary section



1FN3050 to 1FN3450 with precision cooling



1FN3600 to 1FN3900 with precision cooling  
Note: 4-row drill pattern with 1FN3900 for fixing the primary section

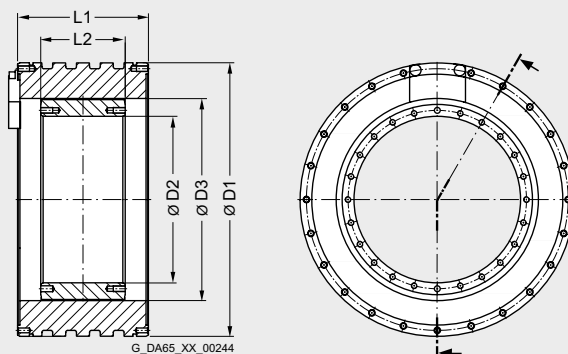
# Synchronous motors

## Dimension drawings

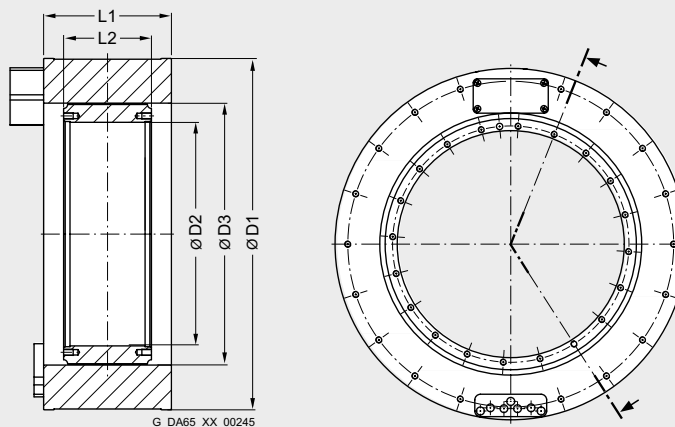
### 1FW6 built-in torque motors Water cooling

For motor	Dimensions in mm (in)				
Type	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	L <sub>1</sub>	L <sub>2</sub>
<b>1FW6, type of construction IM B5, water cooling</b>					
1FW6090-0.B05	230 (9.06)	140 (5.51)	170 (6.69)	90 (3.54)	51 (2.01)
1FW6090-0.B07				110 (4.33)	71 (2.80)
1FW6090-0.B10				140 (5.51)	101 (3.98)
1FW6090-0.B15				190 (7.48)	151 (5.94)
1FW6130-0.B05	310 (12.20)	220 (8.66)	254 (10.00)	90 (3.54)	51 (2.01)
1FW6130-0.B07				110 (4.33)	71 (2.80)
1FW6130-0.B10				140 (5.51)	101 (3.98)
1FW6130-0.B15				190 (7.48)	151 (5.94)
1FW6150-0.B05	385 (15.16)	265 (10.43)	300 (11.81)	110 (4.33)	51 (2.01)
1FW6150-0.B07				130 (5.12)	71 (2.80)
1FW6150-0.B10				180 (7.09)	101 (3.98)
1FW6150-0.B15				210 (8.27)	151 (5.94)
1FW6160-0.B05	440 (17.32)	280 (11.02)	328 (12.91)	110 (4.33)	60 (2.36)
1FW6160-0.B07				130 (5.12)	80 (3.15)
1FW6160-0.B10				160 (6.30)	110 (4.33)
1FW6160-0.B15				210 (8.27)	160 (6.30)
1FW6190-0.B05	502 (19.76)	342 (13.46)	389 (15.31)	110 (4.33)	60 (2.36)
1FW6190-0.B07				130 (5.12)	80 (3.15)
1FW6190-0.B10				160 (6.30)	110 (4.33)
1FW6190-0.B15				210 (8.27)	160 (6.30)
1FW6230-0.B05	576 (22.68)	416 (16.38)	463 (18.23)	110 (4.33)	60 (2.36)
1FW6230-0.B07				130 (5.12)	80 (3.15)
1FW6230-0.B10				160 (6.30)	110 (4.33)
1FW6230-0.B15				210 (8.27)	160 (6.30)
1FW6290-0.B15	730 (28.74)	522 (20.55)	580 (22.83)	220 (8.66)	170 (6.69)

1FW6090  
1FW6130  
1FW6150



1FW6160  
1FW6190  
1FW6230  
1FW6290

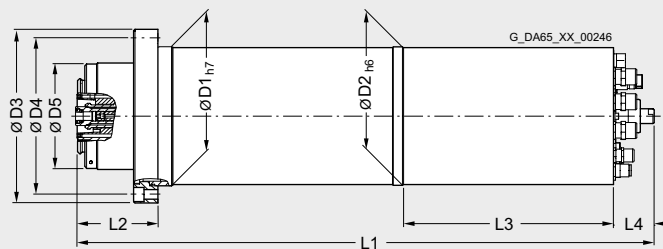
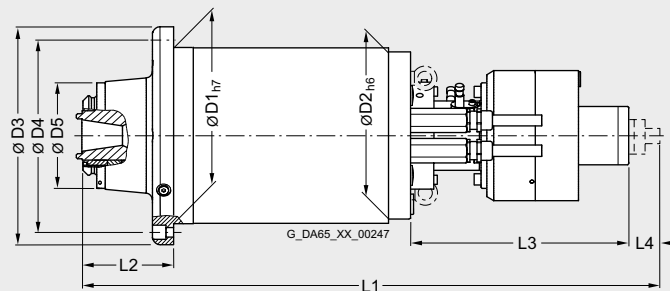


# Synchronous motors

## Dimension drawings

### 2SP1 motor spindles Water cooling

For motor	Dimensions in mm (in)								
Type	D1	D2	D3	D4	D5	L1 <sup>1)</sup>	L2	L3	L4
<b>2SP1, type of construction IM B5, water cooling</b>									
<b>2SP1202</b>	200 (7.88)	199 (7.84)	250 (9.85)	225 (8.87)	150 (5.91)	735 <sup>4)</sup> (28.94)	115.5 (4.55)	309 <sup>4)</sup> (12.17)	58 <sup>4)</sup> (2.28)
<b>2SP1204</b>						835 <sup>4)</sup> (32.87)			
<b>2SP1253<sup>2)</sup></b>	250 (9.85)	237 (9.34)	310 (12.21)	275 (10.84)	150 (5.91)	813 (32.03)	124.4 (4.90)	310 (12.21)	43 (1.69)
<b>2SP1255<sup>2)</sup></b>						913 (35.97)			
<b>2SP1253<sup>3)</sup></b>						819 (32.27)	130.0 (5.12)		
<b>2SP1255<sup>3)</sup></b>						919 (36.21)			

**2SP120****2SP125**

<sup>1)</sup> The spindle is approx. 43 mm (1.69 in) shorter without turning bushing.

<sup>2)</sup> HSK A63 tool interface.

<sup>3)</sup> SK40, CAT40, BT40 tool interfaces.

<sup>4)</sup> Spindle length L1 is approx. 118 mm (4.65 in) shorter, L3 approx. 147 mm (5.79 in) shorter and L4 approx. 30 mm (1.18 in) longer with a hydraulic tool clamping device.

# Synchronous motors

## CAD CREATOR

### Dimension sheet and 2D/3D CAD generator

#### Overview



The CAD CREATOR provides a user-friendly interface which helps you to create product-specific data quickly and supports you in generating plant documentation considering project-specific information.

#### Benefits

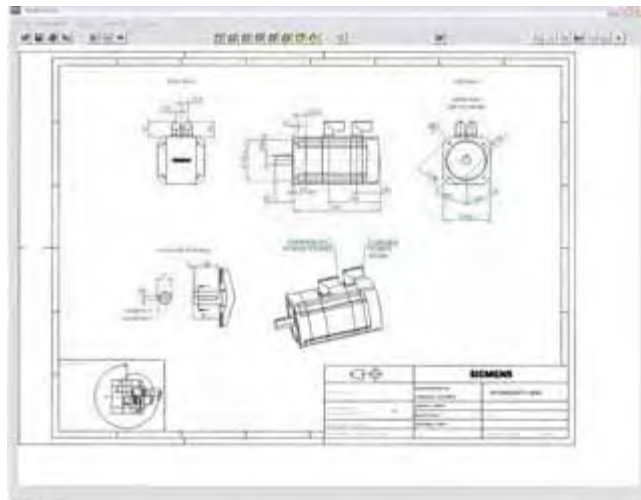
- Multilingual operator interface in English, French, German, Italian and Spanish
- Dimension sheets with measurements in mm or inches
- Dimension sheets and 2D/3D CAD data for
  - Motors
    - 1FK7/1FT6/1FT7/1FE1 synchronous motors
    - 1FK7-DYA geared motors
    - 1PH7/1PH4 asynchronous motors
    - 1PM4/1PM6 asynchronous motors
    - 2SP1 motor spindles
  - MOTION-CONNECT connection system
  - SINUMERIK
    - Operator components for CNC controls

The CAD CREATOR provides you with various options to begin the product configuration:

- Order number
- Order number search
- Geometric data

#### Benefits (continued)

Once a product is successfully configured, the product-specific information, such as dimension drawing and 2D/3D CAD data are displayed and offered for storing in various formats, e.g.: \*.pdf, \*.dxf, \*.stp or \*.igs.



The CAD CREATOR is available on DVD-ROM and as an Internet application.

#### More information

Additional information is available in the Internet at:



[www.siemens.com/cad-creator](http://www.siemens.com/cad-creator)



#### Selection and ordering data

Designation	Order No.
<b>CAD CREATOR</b>	<b>6SL3075-0AA00-0AG0</b>
Dimension sheet and 2D/3D CAD generator	
On DVD-ROM	
Languages: English, German, French, Italian, Spanish	

# Asynchronous motors



<b>7/2</b>	<b>Introduction</b>
<b>7/4</b>	<b>1PH7 motors</b> with solid shaft/forced ventilation
<b>7/18</b>	<b>1PH4 motors</b> with solid shaft/water cooling
<b>7/22</b>	<b>1PM4 motors</b> with hollow shaft/oil/water cooling
<b>7/23</b>	<b>1PM6 motors</b> with hollow shaft/forced ventilation
<b>7/27</b>	<b>1PH2 built-in motors</b> for direct drive/water cooling
<b>7/30</b>	<b>Liquid cooling</b> Cooling principle Cooling unit manufacturers
<b>7/31</b> 7/31	<b>Gearboxes</b> Two-speed gearboxes for 1PH7/1PH4 motors
<b>7/33</b>	<b>Selection guides</b> Type of construction/mounting position Degree of protection
<b>7/34</b> 7/34 7/41 7/43 7/44 7/45 7/46 7/29	<b>Dimension drawings</b> 1PH7 motors 1PH4 motors 1PM4 motors 1PM6 motors 1PH7 motors with gearbox 1PH4 motors with gearbox 1PH2 built-in motors
<b>Part 6</b>	<b>CAD CREATOR</b> Dimension drawing and 2D/3D CAD generator <a href="http://www.siemens.com/cad-creator">www.siemens.com/cad-creator</a>

For products approved for Canada and U.S.A., see Appendix.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### Introduction

#### Overview

	Asynchronous motors with solid shaft	
	1PH7	1PH4
<b>Cooling</b>	Forced ventilation	Water cooling
<b>Rated power <math>P_{\text{rated}}</math> (S1)</b>	3.7 ... 100 kW (4.96 ... 134 HP)	7.5 ... 52 kW (10.1 ... 69.7 HP)
<b>Maximum speed</b>	12 000 rpm	
<b>Rated torque <math>M_{\text{rated}}</math></b>	23.6 ... 750 Nm (17.4 ... 553 lb <sub>f</sub> -ft)	48 ... 331 Nm (35.4 ... 244 lb <sub>f</sub> -ft)
<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)</b>	IM B3 (IM V5, IM V6) IM B5 (IM V1, IM V3, only possible with 1PH710/1PH713 ) IM B35 (IM V15, IM V35)	IM B35 (IM V15, IM V35)
<b>Encoder system, built-in</b>	Incremental encoder	
<b>Sound pressure level <math>L_{\text{pA}}</math> (1 m) in accordance with EN ISO 1680</b>	70 ... 76 dB If the external fan unit is operated on a 50 Hz supply system Tolerance + 3 dB	69 ... 71 dB Tolerance + 3 dB
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	IP55 Fan IP54	IP65 IP55 at shaft exit
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a coolant temperature (air) of up to 40 °C (104 °F)	Temperature class 155 (F) for a coolant inlet temperature of up to 30 °C (86 °F)
<b>Type of motor</b>	Squirrel-cage induction motor	
<b>Type of connection</b>	Star connection	
<b>Paint finish</b>	Unpainted/primed Anthracite (option)	Anthracite
<b>Holding brake</b>	–	Fitted to drive end (option)
<b>Mounted gearing</b>	Prepared (option)	

#### Application

The areas of application for the 1PH/1PM asynchronous motors are extremely varied.

In machine tools, they are usually used as main spindle motors.

In production machines, such as printing, packaging and re-forming machines, they are used as high-output asynchronous servo motors.

The motors are referred to generally in this documentation as asynchronous motors, due to their principle of operation.

**Core types** can be supplied for certain motor types. These core types can be express delivered as replacement motors in the event of plant outages and offer the advantage of a quicker spare parts supply. For this reason, core types should be used for configuration wherever possible.



# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### Introduction

#### Overview

	Asynchronous motors with hollow shaft		Asynchronous built-in motors
	1PM4	1PM6	1PH2
<b>Cooling</b>	Oil/water cooling	Forced ventilation	Water cooling
<b>Rated power <math>P_{\text{rated}}</math> (S1)</b>	3.7 ... 27 kW (4.96 ... 36.2 HP)	3.7 ... 22 kW (4.96 ... 29.5 HP)	7.5 ... 30.9 kW (10.1 ... 41.4 HP)
<b>Maximum speed</b>	12 000 rpm (optional: 18 000 rpm)		Up to 10 000 rpm
<b>Rated torque <math>M_{\text{rated}}</math></b>	24 ... 170 Nm (32.2 ... 228 lb <sub>f</sub> -ft)	24 ... 140 Nm (32.2 ... 188 lb <sub>f</sub> -ft)	48 ... 197 Nm (64.4 ... 264 lb <sub>f</sub> -ft)
<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)</b>	IM B35 (IM V15, IM V35)	IM B5 (IM V1, IM V3)	Supplied in component form, assembled on user's premises
<b>Encoder system</b>	Hollow-shaft measuring system: Incremental encoder (built-in)		Hollow-shaft measuring system
<b>Sound pressure level <math>L_{\text{pA}}</math> (1 m) in accordance with EN ISO 1680</b>	69 dB Tolerance + 3 dB	70 dB If the external fan unit is operated on a 50 Hz supply system Tolerance + 3 dB	Depending on spindle design
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	IP65 IP55 at shaft exit	IP55 Fan IP54	IP00 or as specified by spindle manufacturer
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a coolant inlet temperature of up to 30 °C (86 °F)	Temperature class 155 (F) for a coolant temperature (air) of up to 40 °C (104 °F)	Temperature class 155 (F) for a coolant inlet temperature of up to 25 °C (77 °F)
<b>Type of motor</b>	Squirrel-cage induction motor		
<b>Type of connection</b>	Selectable star/delta connection <sup>1)</sup>		
<b>Paint finish</b>	Anthracite		Unpainted
<b>Holding brake</b>	-		Using spindle design
<b>Mounted gearing</b>	-		

S/R = signals/revolution

<sup>1)</sup> Star connection only for water cooling.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### 1PH7 motors

#### Overview



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

Air-cooled 1PH7 motors are rugged and low-maintenance 4-pole asynchronous motors with squirrel-cage rotors.

A fan for providing forced ventilation is mounted axially on the rear of the motor. The normal direction of air flow is from the drive end (DE) to the non-drive end (NDE) in order to keep the exhaust heat of the motor away from the machine. The reverse direction of air flow can be ordered as an option.

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

#### Benefits

- Short overall length of motor
- Minimal overall dimension thanks to the integrated terminal box (SH 100 to SH 160)
- Maximum speeds of up to 9 000 rpm (optional: 12 000 rpm)
- Full rated torque is continuously available, even at standstill
- Optimum matching to the SIMODRIVE 611 power levels

#### Application

- Small, compact machine tools
- Complex machining centers and turning machines
- Special machines
- Printing industry:
  - Single drives for printing units
- Rubber, plastic, wire, and glass manufacturing:
  - Drives for extruders, calendars, rubber injection machines, film machines, fleece machines
  - Wire-drawing machines, wire-stranding machines, etc.
- General applications such as coiler and winder drives

#### Technical specifications (general)

<b>Product name</b>	1PH7 motor
<b>Coolant temperature, permissible</b>	- 15 ... + 40 °C (+ 5 ... + 104 °F)
<b>Temperature monitoring</b>	KTY 84 temperature sensor in stator winding
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a coolant temperature of up to 40 °C (104 °F)
<b>Motor fan ratings</b>	400 V 3 AC ± 10 %, 50 Hz/60 Hz 480 V 3 AC + 5 %, -10 %, 60 Hz
<b>Encoder system, built-in</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 2 048 S/R without C and D tracks encoder IN2048S/R
<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)</b>	IM B3 IM B35 IM B5 (only SH 100 and SH 132)
<b>Sound pressure level L<sub>pA</sub> (1 m) in accordance with EN ISO 1680</b> Tolerance + 3 dB	From DE to NDE (with the fan operating on a 50 Hz supply system)
• 1PH710/1PH713	70 dB
• 1PH716	75 dB <sup>1)</sup>
• 1PH718	73 dB <sup>2)</sup>
• 1PH722	76 dB <sup>2)</sup>
<b>Terminal box connection type</b>	
• Motor/fan	Terminals in terminal box
• Motor encoder and PTC thermistor	17-pin circular socket, without mating connector
<b>Rating plate</b>	1 supplied separately with terminal box

#### Technical specifications (core type)

<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)<sup>3)</sup></b>	
• 1PH710/1PH713	IM B5 (IM V1, IM V3)
• 1PH716	IM B35 (IM V15, IM V35)
<b>Terminal box location</b> View DE <sup>4)</sup>	Top, cable entry from right
<b>Bearing version on DE<sup>5)</sup></b>	Bearing for belt or coupling output
<b>Vibration magnitude in accordance with EN 60034-14 (IEC 60034-14)</b>	Grade S
<b>Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)<sup>6)</sup></b>	Tolerance R (reduced)
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	Motor IP55, fan IP54
<b>Paint finish</b>	Unpainted Optional: anthracite

S/R = signals/revolution

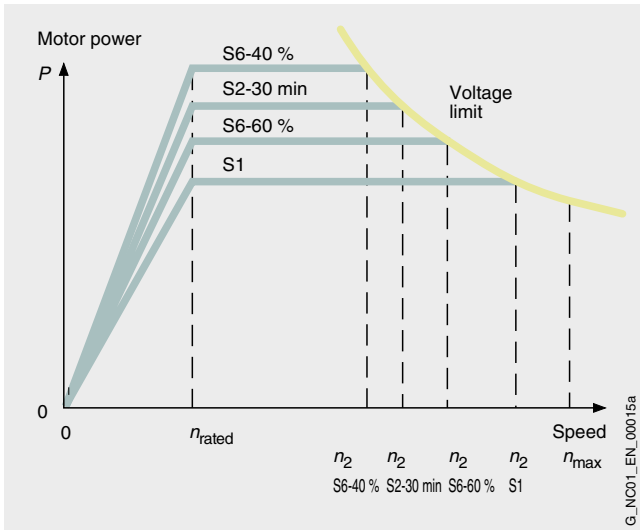
- 1) The sound pressure level can be reduced if the fan is operated on a 60 Hz supply system with option K44.
- 2) The sound pressure level can be reduced if the air flow is from the drive end to the non-drive end with option G15.
- 3) For type of construction, see Selection guides.
- 4) DE is the drive end with shaft. NDE is the non-drive end.
- 5) For maximum permissible load, see the 1PH Motors Configuration Manual.
- 6) Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

1PH7 motors

### Characteristic curves



Typical speed/power graph for AC motors<sup>1)</sup>

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

- S1: Continuous duty
- S6: Continuous duty with intermittent loading and a relative duty factor of 60 % (S6-60 %) or 40 % (S6-40 %) with a maximum duty cycle time of 10 minutes.
- S2: Short-time duty with duty period of 30 min (S2-30 min) and subsequent standstill.

1PH7 motor Type	Rated speed $n_{rated}$ rpm	Attainable speed for rated power in duty type in accordance with IEC 60034-1 $n_2^{2)}$			
		S1 rpm	S6-60 % rpm	S6-40 % rpm	S2-30 min rpm
1PH7101-.NF	1 500	8 200	7 000	6 000	6 500
1PH7103-.ND	1 000	3 750	3 750	3 100	3 350
1PH7103-.NF	1 500	5 000	4 600	3 900	4 500
1PH7103-.NG	2 000	9 000	7 500	6 400	6 900
1PH7105-.NF	1 500	7 900	6 750	5 750	6 150
1PH7107-.ND	1 000	5 800	4 800	4 100	4 650
1PH7107-.NF	1 500	6 500	6 200	5 250	5 650
1PH7107-.NG	2 000	7 000	7 000	6 900	7 000
1PH7131-.NF	1 500	6 700	5 500	4 500	5 000
1PH7133-.ND	1 000	4 700	3 700	2 800	3 450
1PH7133-.NF	1 500	6 800	5 600	4 500	5 100
1PH7133-.NG	2 000	6 500	6 500	5 900	6 450
1PH7135-.NF	1 500	7 500	6 200	5 200	5 650
1PH7137-.ND	1 000	5 400	4 500	3 600	4 100
1PH7137-.NF	1 500	7 000	7 000	6 200	6 800
1PH7137-.NG	2 000	6 000	6 000	5 800	6 000
1PH7163-.NB	500	2 500	1 900	1 500	1 730
1PH7163-.ND	1 000	5 800	4 800	4 000	4 400
1PH7163-.NF	1 500	5 500	5 500	5 500	5 500
1PH7163-.NG	2 000	3 500	3 500	3 500	3 500
1PH7167-.NB	500	2 100	1 600	1 250	1 400
1PH7167-.ND	1 000	6 250	5 200	4 300	4 700
1PH7167-.NF	1 500	4 500	4 500	4 500	4 500
1PH7167-.NG	2 000	3 250	3 250	3 250	3 250
1PH7184-.NT	500	4 500	3 800	3 350	3 350
1PH7184-.ND	1 000	5 000	4 400	3 600	3 600
1PH7184-.NE	1 250	5 000	4 680	4 190	3 600
1PH7184-.NF	1 500	5 000	5 000	5 000	5 000
1PH7184-.NL	2 500	5 000	5 000	5 000	5 000
1PH7186-.NT	500	4 800	4 100	3 580	4 000
1PH7186-.ND	1 000	5 000	4 650	3 850	3 850
1PH7186-.NE	1 250	5 000	4 260	3 780	3 580
1PH7224-.NC	700	3 020	2 570	2 290	2 170
1PH7224-.ND	1 000	4 500	4 500	4 100	3 730
1PH7224-.NF	1 500	4 500	4 330	4 000	3 890

<sup>1)</sup> For further configuration information, see the 1PH Motors Configuration Manual.

<sup>2)</sup> Values taken from the speed/power graph with regulated infeed. When using unregulated infeed modules, and with option for increased maximum speed, proceed in accordance with the 1PH Motors Configuration Manual.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### 1PH7 core type motors SH 100 to SH 160

#### Selection and ordering data

Shaft height	Rated speed	Continuous speed, max.		Speed, max. <sup>1)</sup>		Rated power for duty type in accordance with IEC 60034-1				1PH7 asynchronous motor with solid shaft Forced ventilation Core type		
		$n_{S1 \text{ cont.}}^{2)}$	$n_{S1 \text{ cont.}}^{3)}$	$n_{\text{max}}$	$n_{\text{max}}^{4)}$	$P_{\text{rated}}$	S1	S6-60 %	S6-40 %		S2-30 min	
SH	$n_{\text{rated}}$	rpm	rpm	rpm	rpm	rpm	kW (HP)	kW (HP)	kW (HP)	kW (HP)	Order No.	
100	2 000	5 500	–	9 000	–	7 (9)	8.5 (11.4)	10 (13)	9.25 (12.4)	1PH7103 - ■ NG02 - 0C ■ ■		
	1 500	5 500	–	9 000	–	9 (12)	11 (14.8)	13 (17)	12 (16)	1PH7107 - ■ NF02 - 0C ■ ■		
132	1 000	4 500	–	8 000	–	12 (16)	15 (20)	18.5 (24.8)	16 (21)	1PH7133 - ■ ND02 - 0C ■ ■		
	2 000					20 (27)	25 (34)	30 (40)	27.5 (36.9)	1PH7133 - ■ NG02 - 0C ■ ■		
	1 000	4 500	–	8 000	–	17 (23)	20.5 (27.5)	25 (34)	22.5 (30.2)	1PH7137 - ■ ND02 - 0C ■ ■		
	2 000					28 (38)	35 (47)	43 (58)	39 (52)	1PH7137 - ■ NG02 - 0C ■ ■		
160	1 000	3 700	–	6 500	–	22 (30)	27 (36)	33 (44)	30 (40)	1PH7163 - ■ ND03 - 0C ■ ■		
	1 500					30 (40)	37 (50)	45 (60)	41 (55)	1PH7163 - ■ NF03 - 0C ■ ■		
	1 500	3 700	–	6 500	–	37 (50)	46 (62)	56 (75)	51 (68)	1PH7167 - ■ NF03 - 0C ■ ■		
<b>Fans:</b>		External fan unit, heavy-gauge threaded cable entry in terminal box								2		
		External fan unit, metric cable entry in terminal box								7		
<b>Encoder system:</b>		Incremental encoder sin/cos 1 V <sub>pp</sub> without C and D tracks								N		
<b>Type of construction:<sup>5)</sup></b>		IM B5 (IM V1, IM V3)								2		
		IM B35 (IM V15, IM V35) <sup>6)</sup>								3		
<b>Shaft extension DE:<sup>5)</sup></b>		<b>Balancing:</b>		<b>Direction of air flow (fan):</b>		<b>Blow-out direction:</b>						
Fitted key		Half-key		DE → NDE		Axial		A				
Plain shaft		–		DE → NDE		Axial		J				
<b>Degree of protection:</b>		<b>Paint finish:</b>									0	
IP55, fan IP54		Unpainted									3	
IP55, fan IP54		Anthracite										

To select the type of construction, see Selection guides.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

1PH7 core type motors  
SH 100 to SH 160

### Selection and ordering data

Motor type (continued)	Rated torque	Moment of inertia	Weight, approx.	Rated current for duty type in accordance with IEC 60034-1				SIMODRIVE 611 power module		
				$M_{rated}$				Rated output current <sup>7)</sup>	Order No.	
				$J$						
				$m$	$I_{rated}$					
	Nm (lb <sub>f</sub> -ft)	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)		S1 A	S6-60 % A	S6-40 % A	S2-30 min A	S1 A	
1PH7103-.NG02-....	33.4 (24.6)	0.017 (0.148)	40 (88)		17.5	20.5	23.5	21.5	24	For ordering data, see Converter system
1PH7107-.NF02-....	57.3 (42.2)	0.029 (0.252)	63 (139)		23.5	27.5	31	29	24	
1PH7133-.ND02-....	114.6 (84.5)	0.076 (0.66)	90 (198)		30	36	43	37.5	30	
1PH7133-.NG02-....	95.5 (70.4)	0.076 (0.66)	90 (198)		45	54	63	59	45	
1PH7137-.ND02-....	162.3 (119.6)	0.109 (0.946)	130 (287)		43	50	60	54	45	
1PH7137-.NG02-....	133.7 (98.5)	0.109 (0.946)	130 (287)		60	73	87	80	60	
1PH7163-.ND03-....	210.1 (154.8)	0.19 (1.649)	180 (397)		55	65	77	71	60	
1PH7163-.NF03-....	191.0 (140.8)	0.19 (1.649)	180 (397)		72	86	102	94	85	
1PH7167-.NF03-....	235.5 (173.6)	0.23 (1.996)	228 (503)		82	97	115	104	85	



1PH7 motor (SH 100 to SH 160)

- 1) For continuous duty (with 30 %  $n_{max}$ , 60 %  $\frac{2}{3} n_{max}$ , 10 % standstill) for a duty cycle time of 10 min. For maintenance intervals for motors and components, see 1PH Motors Configuration Manual.
- 2) Bearing version for coupling/belt output.
- 3) Bearing version for increased maximum speed.
- 4) Version for increased maximum speed only possible with vibration magnitude grade SR. The following option is not possible: Shaft seal.
- 5) The following motor versions are required for ZF gearbox mounting prepared (see Gearboxes for gear selection):  
Shaft with fitted key and full-key balancing.
- 6) Motors of shaft height 160 and higher require foot support.
- 7) With default setting of the pulse frequency.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### 1PH7 standard type motors SH 100

#### Selection and ordering data

Shaft height	Rated speed	Continuous speed, max.		Speed, max. <sup>1)</sup>		Rated power for duty type in accordance with IEC 60034-1				1PH7 asynchronous motor with solid shaft Forced ventilation Standard type	
		$n_{S1 \text{ cont.}}^{2)}$	$n_{S1 \text{ cont.}}^{3)}$	$n_{\text{max}}$	$n_{\text{max}}^{4)}$	$P_{\text{rated}}$	S1	S6-60 %	S6-40 %		S2-30 min
SH	$n_{\text{rated}}$	rpm	rpm	rpm	rpm	kW (HP)	kW (HP)	kW (HP)	kW (HP)	Order No.	
100	1 500	5 500	10 000	9 000	12 000	3.7 (5)	4.5 (6)	5.25 (7.04)	4.9 (6.6)	1PH7101 - NF - 0	
	1 000	5 500	10 000	9 000	12 000	3.7 (5)	4.5 (6)	5.25 (7.04)	4.7 (6.3)	1PH7103 - ND - 0	
	1 500					5.5 (7.4)	6.7 (9)	7.7 (10.3)	7 (9.4)	1PH7103 - NF - 0	
	2 000					7 (9)	8.5 (11.4)	10 (13)	9.25 (12.4)	1PH7103 - NG - 0	
	1 500	5 500	10 000	9 000	12 000	7 (9)	8.5 (11.4)	10 (13)	9.25 (12.4)	1PH7105 - NF - 0	
	1 000	5 500	10 000	9 000	12 000	6.25 (8.38)	7.5 (10)	8.8 (11.8)	7.75 (10.39)	1PH7107 - ND - 0	
	1 500					9 (12)	11 (15)	13 (17)	12 (16)	1PH7107 - NF - 0	
2 000					10.5 (14)	12.5 (17)	14.5 (19.4)	13.5 (18.1)	1PH7107 - NG - 0		
<b>Fans:</b>		External fan unit, heavy-gauge threaded cable entry in terminal box								2	
		External fan unit, metric cable entry in terminal box								7	
<b>Encoder system:</b>		Incremental encoder sin/cos 1 V <sub>pp</sub> without C and D tracks								N	
<b>Terminal box/ Cable entry:</b>		Top/right								0	
		Top/NDE								2	
		Top/left								3	
<b>Type of construction:<sup>5)</sup></b>		IM B3 (IM V5, IM V6)								0	
		IM B5 (IM V1, IM V3)								2	
		IM B35 (IM V15, IM V35)								3	
<b>Bearing version for:</b>		<b>Vibration magnitude:</b>		<b>Shaft and flange accuracy:</b>						B	
Coupling/belt output		Grade R		Tolerance R						C	
Coupling/belt output		Grade S		Tolerance R						D	
Coupling/belt output		Grade SR		Tolerance R						L	
Increased speed (coupling/belt output)		Grade SR		Tolerance R							
<b>Shaft extension DE:<sup>5)</sup></b>		<b>Balancing:</b>		<b>Direction of air flow (fan):</b>		<b>Blow-out direction:</b>				A	
Fitted key		Half-key		DE → NDE		Axial				B	
Fitted key		Half-key		NDE → DE		Axial				C	
Fitted key		Full-key		DE → NDE		Axial				D	
Fitted key		Full-key		NDE → DE		Axial				J	
Plain shaft		–		DE → NDE		Axial				K	
Plain shaft		–		NDE → DE		Axial					
<b>Degree of protection:</b>		<b>Seal:</b>		<b>Paint finish:</b>						0	
IP55, fan IP54		–		Unpainted						2	
IP55, fan IP54		DE flange with shaft sealing ring <sup>6)</sup>		Unpainted						3	
IP55, fan IP54		–		Anthracite						5	
IP55, fan IP54		DE flange with shaft sealing ring <sup>6)</sup>		Anthracite						6	
IP55, fan IP54		–		Anthracite, two coats						8	
IP55, fan IP54		DE flange with shaft sealing ring <sup>6)</sup>		Anthracite, two coats							

To select the type of construction and the degree of protection, see Selection guides.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

1PH7 standard type motors  
SH 100

### Selection and ordering data

Motor type (continued)	Rated torque  $M_{\text{rated}}$  Nm (lb <sub>f</sub> -ft)	Moment of inertia  $J$  kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	Weight, approx.  $m$  kg (lb)	Rated current for duty type in accordance with IEC 60034-1				SIMODRIVE 611 power module	
				$I_{\text{rated}}$				Rated output current <sup>7)</sup> $I_{\text{rated}}$	Order No.
				S1 A	S6-60 % A	S6-40 % A	S2-30 min A		
1PH7101-.NF...	23.6 (17.4)	0.017 (0.150)	40 (88)	10	11.5	12.5	12	24	For ordering data, see Converter system
1PH7103-.ND...	35.3 (26)	0.017 (0.150)	40 (88)	10	11.5	13	12	24	
1PH7103-.NF...	35.0 (25.8)	0.017 (0.150)	40 (88)	13	16	18	16.5	24	
1PH7103-.NG...	33.4 (24.6)	0.017 (0.150)	40 (88)	17.5	20.5	23.5	21.5	24	
1PH7105-.NF...	44.6 (32.9)	0.029 (0.257)	63 (139)	17.5	21	23.5	22	24	
1PH7107-.ND...	59.7 (44)	0.029 (0.257)	63 (139)	17.5	20.5	23	21	24	
1PH7107-.NF...	57.3 (42.2)	0.029 (0.257)	63 (139)	23.5	27.5	31	29	24	
1PH7107-.NG...	50.1 (36.9)	0.029 (0.257)	63 (139)	26	28.5	33	31	30	



1PH7 motor (SH 100 to SH 160)

- 1) For continuous duty (with 30 %  $n_{\text{max}}$ , 60 %  $\frac{2}{3} n_{\text{max}}$ , 10 % standstill) for a duty cycle time of 10 min. For maintenance intervals for motors and components, see the 1PH Motors Configuration Manual.
- 2) Bearing version for coupling/belt output.
- 3) Bearing version for increased maximum speed.
- 4) Version for increased maximum speed only possible with vibration magnitude grade SR. The following option is not possible: Shaft sealing ring.
- 5) The following motor versions are required for ZF gearbox mounting prepared (see Gearboxes for gear selection):
  - Types of construction IM B5 or IM B35
  - Shaft with fitted key and full-key balancing.
- 6) Only appropriate if the sealing ring is occasionally lubricated with oil spray/mist. A sealing ring is not possible with increased maximum speed.
- 7) With default setting of the pulse frequency.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### 1PH7 standard type motors SH 132

#### Selection and ordering data

Shaft height	Rated speed	Continuous speed, max.		Speed, max. <sup>1)</sup>		Rated power for duty type in accordance with IEC 60034-1				1PH7 asynchronous motor with solid shaft Forced ventilation Standard type	
		$n_{S1 \text{ cont.}}^{2)}$	$n_{S1 \text{ cont.}}^{3)}$	$n_{\text{max}}$	$n_{\text{max}}^{4)}$	$P_{\text{rated}}$	S1	S6-60 %	S6-40 %		S2-30 min
SH	$n_{\text{rated}}$	rpm	rpm	rpm	rpm	kW (HP)	kW (HP)	kW (HP)	kW (HP)	Order No.	
132	1 500	4 500	8 500	8 000	10 000	11 (15)	13.5 (18.1)	16.5 (22.1)	15 (20)	1PH7131 - ■ NF ■ ■ - 0 ■ ■ ■	
	1 000	4 500	8 500	8 000	10 000	12 (16)	15 (20)	18.5 (24.8)	16 (22)	1PH7133 - ■ ND ■ ■ - 0 ■ ■ ■	
	1 500					15 (20)	18.5 (24.8)	23 (31)	20.5 (27.5)	1PH7133 - ■ NF ■ ■ - 0 ■ ■ ■	
	2 000					20 (27)	25 (34)	30 (40)	27.5 (36.9)	1PH7133 - ■ NG ■ ■ - 0 ■ ■ ■	
	1 500	4 500	8 500	8 000	10 000	18.5 (24.8)	23 (31)	28 (38)	25.5 (34.2)	1PH7135 - ■ NF ■ ■ - 0 ■ ■ ■	
	1 000	4 500	8 500	8 000	10 000	17 (23)	20.5 (27.5)	25 (34)	22.5 (30.2)	1PH7137 - ■ ND ■ ■ - 0 ■ ■ ■	
	1 500					22 (30)	27.5 (36.9)	33 (44)	30 (40)	1PH7137 - ■ NF ■ ■ - 0 ■ ■ ■	
2 000					28 (38)	35 (47)	43 (58)	39 (52)	1PH7137 - ■ NG ■ ■ - 0 ■ ■ ■		
<b>Fans:</b>		External fan unit, heavy-gauge threaded cable entry in terminal box								2	
		External fan unit, metric cable entry in terminal box								7	
<b>Encoder system:</b>		Incremental encoder sin/cos 1 V <sub>pp</sub> without C and D tracks								N	
<b>Terminal box/ Cable entry:</b>		Top/right								0	
		Top/NDE								2	
		Top/left								3	
<b>Type of construction:<sup>5)</sup></b>		IM B3 (IM V5, IM V6)								0	
		IM B5 (IM V1, IM V3)								2	
		IM B35 (IM V15, IM V35)								3	
<b>Bearing version for:</b>		<b>Vibration magnitude:</b>		<b>Shaft and flange accuracy:</b>						B C D L	
Coupling/belt output		Grade R		Tolerance R							
Coupling/belt output		Grade S		Tolerance R							
Coupling/belt output		Grade SR		Tolerance R							
Increased speed (coupling/belt output)		Grade SR		Tolerance R							
<b>Shaft extension DE:<sup>5)</sup></b>		<b>Balancing:</b>		<b>Direction of air flow (fan):</b>				<b>Blow-out direction:</b>		A B C D J K	
Fitted key		Half-key		DE → NDE				Axial			
Fitted key		Half-key		NDE → DE				Axial			
Fitted key		Full-key		DE → NDE				Axial			
Fitted key		Full-key		NDE → DE				Axial			
Plain shaft		–		DE → NDE				Axial			
Plain shaft		–		NDE → DE				Axial			
<b>Degree of protection:</b>		<b>Seal:</b>		<b>Paint finish:</b>						0 2 3 5 6 8	
IP55, fan IP54		–		Unpainted							
IP55, fan IP54		DE flange with shaft sealing ring <sup>6)</sup>		Unpainted							
IP55, fan IP54		–		Anthracite							
IP55, fan IP54		DE flange with shaft sealing ring <sup>6)</sup>		Anthracite							
IP55, fan IP54		–		Anthracite, two coats							
IP55, fan IP54		DE flange with shaft sealing ring <sup>6)</sup>		Anthracite, two coats							

To select the type of construction and the degree of protection, see Selection guides.



# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

1PH7 standard type motors  
SH 132

### Selection and ordering data

Motor type (continued)	Rated torque  $M_{\text{rated}}$  Nm (lb <sub>f</sub> -ft)	Moment of inertia  $J$  kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	Weight, approx.  $m$  kg (lb)	Rated current for duty type in accordance with IEC 60034-1				SIMODRIVE 611 power module	
				$I_{\text{rated}}$				Rated output current <sup>7)</sup> $I_{\text{rated}}$	Order No.
				S1 A	S6-60 % A	S6-40 % A	S2-30 min A		
1PH7131-.NF...	70.0 (51.6)	0.076 (0.673)	90 (199)	24	29	34	31.5	24	For ordering data, see Converter system
1PH7133-.ND...	114.6 (84.5)	0.076 (0.673)	90 (199)	30	36	43	37.5	30	
1PH7133-.NF...	95.5 (70.4)	0.076 (0.673)	90 (199)	34	41	49	43.5	45	
1PH7133-.NG...	95.5 (70.4)	0.076 (0.673)	90 (199)	45	54	63	59	45	
1PH7135-.NF...	117.8 (86.8)	0.109 (0.965)	130 (287)	42	50	58	54	45	
1PH7137-.ND...	162.3 (119.6)	0.109 (0.965)	130 (287)	43	50	60	54	45	
1PH7137-.NF...	140.1 (103.3)	0.109 (0.965)	130 (287)	57	68	79	73	60	
1PH7137-.NG...	133.7 (98.5)	0.109 (0.965)	130 (287)	60	73	87	80	60	



1PH7 motor (SH 100 to SH 160)

- 1) For continuous duty (with 30 %  $n_{\text{max}}$ , 60 %  $\frac{2}{3} n_{\text{max}}$ , 10 % standstill) for a duty cycle time of 10 min. For maintenance intervals for motors and components, see the 1PH Motors Configuration Manual.
- 2) Bearing version for coupling/belt output.
- 3) Bearing version for increased maximum speed.
- 4) Version for increased maximum speed only possible with vibration magnitude grade SR. The following option is not possible: Shaft sealing ring.
- 5) The following motor versions are required for ZF gearbox mounting prepared (see Gearboxes for gear selection):
  - Types of construction IM B5 or IM B35
  - Shaft with fitted key and full-key balancing.
- 6) Only appropriate if the sealing ring is occasionally lubricated with oil spray/mist. A sealing ring is not possible with increased maximum speed.
- 7) With default setting of the pulse frequency.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### 1PH7 standard type motors SH 160

#### Selection and ordering data

Shaft height	Rated speed	Continuous speed, max.		Speed, max. <sup>1)</sup>		Rated power for duty type in accordance with IEC 60034-1				1PH7 asynchronous motor with solid shaft Forced ventilation Standard type
		$n_{S1 \text{ cont.}}^{2)}$	$n_{S1 \text{ cont.}}^{3)}$	$n_{\text{max}}$	$n_{\text{max}}^{4)}$	$P_{\text{rated}}$	S1	S6-60 %	S6-40 %	
SH	$n_{\text{rated}}$	rpm	rpm	rpm	rpm	kW (HP)	kW (HP)	kW (HP)	kW (HP)	Order No.
160	500	3 700	7 000	6 500	8 000	12 (16)	15 (20)	18 (24)	16.5 (22.1)	1PH7163 - ■ NB ■ - 0 ■ ■ ■
	1 000					22 (30)	27 (36)	33 (44)	30 (40)	1PH7163 - ■ ND ■ - 0 ■ ■ ■
	1 500					30 (40)	37 (50)	45 (60)	41 (55)	1PH7163 - ■ NF ■ - 0 ■ ■ ■
	2 000					36 (48)	44 (59)	52 (70)	48 (64)	1PH7163 - ■ NG ■ - 0 ■ ■ ■
	500	3 700	7 000	6 500	8 000	16 (21)	19.5 (26.2)	24 (32)	21.5 (28.8)	1PH7167 - ■ NB ■ - 0 ■ ■ ■
	1 000					28 (38)	34.5 (46.3)	42 (56)	38 (51)	1PH7167 - ■ ND ■ - 0 ■ ■ ■
	1 500					37 (50)	46 (62)	56 (75)	51 (68)	1PH7167 - ■ NF ■ - 0 ■ ■ ■
	2 000					41 (55)	51 (69)	61 (81)	56 (75)	1PH7167 - ■ NG ■ - 0 ■ ■ ■
<b>Fans:</b>		External fan unit, heavy-gauge threaded cable entry in terminal box								2
		External fan unit, metric cable entry in terminal box								7
<b>Encoder system:</b>		Incremental encoder sin/cos 1 V <sub>pp</sub> without C and D tracks								N
<b>Terminal box/ Cable entry:</b>		Top/right								0
		Top/NDE								2
		Top/left								3
<b>Type of construction:<sup>5)</sup></b>		IM B3 (IM V5, IM V6)								0
		IM B35 (IM V15, IM V35) <sup>7)</sup>								3
<b>Bearing version for:</b>		<b>Vibration magnitude:</b>		<b>Shaft and flange accuracy:</b>						B C D L
Coupling/belt output		Grade R		Tolerance R						
Coupling/belt output		Grade S		Tolerance R						
Coupling/belt output		Grade SR		Tolerance R						
Increased speed (coupling/belt output)		Grade SR		Tolerance R						
<b>Shaft extension DE:<sup>5)</sup></b>		<b>Balancing:</b>		<b>Direction of air flow (fan):</b>		<b>Blow-out direction:</b>				A B C D J K
Fitted key		Half-key		DE → NDE		Axial				
Fitted key		Half-key		NDE → DE		Axial				
Fitted key		Full-key		DE → NDE		Axial				
Fitted key		Full-key		NDE → DE		Axial				
Plain shaft		-		DE → NDE		Axial				
Plain shaft		-		NDE → DE		Axial				
<b>Degree of protection:</b>		<b>Seal:</b>		<b>Paint finish:</b>						0 2 3 5 6 8
IP55, fan IP54		-		Unpainted						
IP55, fan IP54		DE flange with shaft sealing ring <sup>6)</sup>		Unpainted						
IP55, fan IP54		-		Anthracite						
IP55, fan IP54		DE flange with shaft sealing ring <sup>6)</sup>		Anthracite						
IP55, fan IP54		-		Anthracite, two coats						
IP55, fan IP54		DE flange with shaft sealing ring <sup>6)</sup>		Anthracite, two coats						

To select the type of construction and the degree of protection, see Selection guides.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

1PH7 standard type motors  
SH 160

### Selection and ordering data

Motor type (continued)	Rated torque	Moment of inertia	Weight, approx.	Rated current for duty type in accordance with IEC 60034-1				SIMODRIVE 611 power module	
				$M_{\text{rated}}$				Rated output current <sup>8)</sup>	Order No.
				$J$					
	Nm (lb <sub>f</sub> -ft)	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)	$I_{\text{rated}}$	S1	S6-60 %	S6-40 %	S2-30 min	S1
1PH7163-.NB...	229.2 (168.9)	0.19 (1.682)	180 (397)	30	36	42	39	30	For ordering data, see Converter system
1PH7163-.ND...	210.1 (154.8)	0.19 (1.682)	180 (397)	55	65	77	71	60	
1PH7163-.NF...	191.0 (140.8)	0.19 (1.682)	180 (397)	72	86	102	94	85	
1PH7163-.NG...	171.9 (126.7)	0.19 (1.682)	180 (397)	85	100	114	107	85	
1PH7167-.NB...	305.5 (225.2)	0.23 (2.036)	228 (503)	37	44	53	48	45	
1PH7167-.ND...	267.4 (197.1)	0.23 (2.036)	228 (503)	71	85	100	92	85	
1PH7167-.NF...	235.5 (173.6)	0.23 (2.036)	228 (503)	82	97	115	104	85	
1PH7167-.NG...	195.8 (144.3)	0.23 (2.036)	228 (503)	89	106	124	115	120	



1PH7 motor (SH 100 to SH 160)

- 1) For continuous duty (with 30 %  $n_{\text{max}}$ , 60 %  $\frac{2}{3} n_{\text{max}}$ , 10 % standstill) for a duty cycle time of 10 min. For maintenance intervals for motors and components, see the 1PH Motors Configuration Manual.
- 2) Bearing version for coupling/belt output.
- 3) Bearing version for increased maximum speed.
- 4) Version for increased maximum speed only possible with vibration magnitude grade SR. The following option is not possible: Shaft sealing ring.
- 5) The following motor versions are required for ZF gearbox mounting prepared (see Gearboxes for gear selection):
  - Types of construction IM B5 or IM B35
  - Shaft with fitted key and full-key balancing.
- 6) Only appropriate if the sealing ring is occasionally lubricated with oil spray/mist. A sealing ring is not possible with increased maximum speed.
- 7) Motors of shaft height 160 and higher require foot support.
- 8) With default setting of the pulse frequency.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### 1PH7 standard type motors SH 180

#### Selection and ordering data

Shaft height	Rated speed	Continuous speed, max.			Speed, max. <sup>1)</sup>		Rated power for duty type in accordance with IEC 60034-1				1PH7 asynchronous motor with solid shaft Forced ventilation Standard type	
		$n_{S1 \text{ cont.}}^{2)}$	$n_{S1 \text{ cont.}}^{3)}$	$n_{S1 \text{ cont.}}^{4)}$	$n_{\text{max}}$	$n_{\text{max}}^{5)}$	$P_{\text{rated}}$	S1	S6-60 %	S6-40 %		S2-30 min
SH	$n_{\text{rated}}$	rpm	rpm	rpm	rpm	rpm	rpm	kW (HP)	kW (HP)	kW (HP)	kW (HP)	Order No.
180	500	3 500	3 000	4 500	5 000	7 000	21.5 (28.8)	26.5 (35.5)	30.5 (40.9)	30 (40)	1PH7184 - NT - 0	
	1 000						39 (52)	48 (64)	58 (78)	58 (78)	1PH7184 - ND - 0	
	1 250						40 (54)	50 (57)	56 (75)	66 (89)	1PH7184 - NE - 0	
	1 500						51 (68)	68 (91)	81 (109)	81 (68)	1PH7184 - NF - 0	
	2 500						78 (105)	97 (130)	115 (154)	115 (154)	1PH7184 - NL - 0	
	500	3 500	3 000	4 500	5 000	7 000	29.6 (39.7)	36.5 (49)	43 (58)	38 (51)	1PH7186 - NT - 0	
	1 000						51 (68)	65 (87)	77 (103)	77 (103)	1PH7186 - ND - 0	
	1 250						60 (80)	71 (95)	80 (107)	84 (113)	1PH7186 - NE - 0	
	<b>Fans:</b> External fan unit, heavy-gauge threaded cable entry in terminal box											2
	External fan unit, metric cable entry in terminal box											7
<b>Encoder system:</b> Incremental encoder sin/cos 1 V <sub>pp</sub> , 2 048 S/R without C or D tracks											N	
<b>Terminal box/ Cable entry:</b> Top/right											0	
Top/DE											1	
Top/NDE											2	
Top/left											3	
<b>Type of construction:</b> IM B3											0	
IM B3 (IM V5, IM V6) (hoisting system for vertical types of construction)											1	
IM B35 <sup>9)</sup>											3	
IM B35 (flange D= 450 mm (17.72), only for 1PH7184 <sup>9)</sup> )											4	
IM B35 (IM V15, IM V35) (hoisting system for vertical types of construction) <sup>9)</sup>											5	
IM B35 (IM V15, IM V35) (flange D = 450 mm (17.72), only for 1PH7184 <sup>9)</sup> )											6	
<b>Bearing version for:</b> Coupling output											A B C D E F G H J	
Coupling output												
Coupling output												
Coupling output												
Belt output												
Belt output												
Increased cantilever force (belt output)												
Increased cantilever force (belt output)												
Increased speed (coupling output)												
Increased speed (coupling output)												
<b>Shaft extension DE:<sup>7)</sup></b> Fitted key											A B C D J K	
Fitted key												
Fitted key												
Fitted key												
Plain shaft												
Plain shaft												
<b>Balancing:</b> Half-key												
Half-key												
Full-key												
Full-key												
Plain shaft												
Plain shaft												
<b>Direction of air flow (fan):</b> DE → NDE											A B C D J K	
NDE → DE												
DE → NDE												
NDE → DE												
DE → NDE												
NDE → DE												
<b>Blow-out direction:</b> Right												
Axial												
Right												
Axial												
Right												
Axial												
<b>Degree of protection:</b> IP55, fan IP54											0 2 3 5 6 8	
IP55, fan IP54												
IP55, fan IP54												
IP55, fan IP54												
IP55, fan IP54												
IP55, fan IP54												
<b>Seal:</b> –												
DE flange with shaft sealing ring <sup>6)</sup>												
–												
DE flange with shaft sealing ring <sup>6)</sup>												
–												
DE flange with shaft sealing ring <sup>6)</sup>												
<b>Paint finish:</b> Primed												
Primed												
Anthracite												
Anthracite												
Anthracite, two coats												
Anthracite, two coats												

To select the type of construction and the degree of protection, see Selection guides.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

1PH7 standard type motors  
SH 180

### Selection and ordering data

Motor type (continued)	Rated torque	Moment of inertia	Weight, approx. <sup>8)</sup>	Rated current for duty type in accordance with IEC 60034-1				SIMODRIVE 611 power module	
				$I_{rated}$				Rated output current <sup>10)</sup>	Order No.
				S1	S6-60 %	S6-40 %	S2 30 min		
Nm (lb <sub>f</sub> -ft)	$J$ kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	$m$ kg (lb)	A	A	A	A	A		
1PH7184-.NT...	410 (302)	0.5 (4.425)	390 (860)	76	90	103	102	85	For ordering data, see Converter system
1PH7184-.ND...	372 (274)	0.5 (4.425)		90	106	126	126	120	
1PH7184-.NE...	305 (225)	0.5 (4.425)		85	100	110	128	85	
1PH7184-.NF...	325 (240)	0.5 (4.425)		120	149	174	174	120	
1PH7184-.NL...	298 (220)	0.5 (4.425)		172	204	237	237	200	
1PH7186-.NT...	565 (416)	0.67 (5.930)	460 (1 014)	105	126	147	130	120	
1PH7186-.ND...	487 (359)	0.67 (5.930)		118	141	164	164	120	
1PH7186-.NE...	458 (338)	0.67 (5.930)		120	135	150	156	120	



1PH7 motor (SH 180 and SH 225)

- 1) For continuous duty (with 30 %  $n_{max}$ , 60 %  $\frac{2}{3} n_{max}$ , 10 % standstill) for a duty cycle time of 10 min. For maintenance intervals for motors and components, see the 1PH Motors Configuration Manual.
- 2) Bearing version for coupling/belt output.
- 3) Bearing version for increased cantilever force.
- 4) Bearing version for increased maximum speed.
- 5) Version for increased maximum speed, only possible in combination with vibration magnitude grade S. The following option is not possible: Shaft sealing ring.
- 6) Only appropriate if the sealing ring is occasionally lubricated with oil spray/mist. A sealing ring is not possible for type of construction IM B3 (IM V5, IM V6), version with increased cantilever force or increased maximum speed.
- 7) The following motor versions are required for ZF gearbox mounting prepared (see Gearboxes for gear selection):
  - Type of construction IM B35, IM V15 (not IM V35)
  - Shaft with fitted key and full-key balancing
  - Bearing version for coupling output
  - Shaft and flange accuracy R
  - DE flange with shaft sealing ring
- 8) Applies to type of construction IM B35, as type of construction IM B3, the motor is 20 kg (44 lb) lighter.
- 9) Motors of shaft height 160 and higher require foot support.
- 10) With default setting of the pulse frequency.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### 1PH7 standard type motors SH 225

#### Selection and ordering data

Shaft height	Rated speed	Continuous speed, max.			Speed, max. <sup>1)</sup>		Rated power for duty type in accordance with IEC 60034-1				1PH7 asynchronous motor with solid shaft Forced ventilation Standard type	
		$n_{S1 \text{ cont.}}^{2)}$	$n_{S1 \text{ cont.}}^{3)}$	$n_{S1 \text{ cont.}}^{4)}$	$n_{\text{max}}^{5)}$	$n_{\text{max}}^{5)}$	$P_{\text{rated}}$	S1	S6-60 %	S6-40 %		S2-30 min
SH	$n_{\text{rated}}$	rpm	rpm	rpm	rpm	rpm	rpm	kW (HP)	kW (HP)	kW (HP)	kW (HP)	Order No.
225	700	3 100	2 700	3 600	4 500	5 500	55 (74)	66 (89)	75 (101)	78 (105)	1PH7224 - NC - 0	
	1 000						71 (95)	88 (118)	105 (141)	114 (153)	1PH7224 - ND - 0	
	1 500						100 (134)	126 (169)	136 (182)	140 (188)	1PH7224 - NF - 0	
<b>Fans:</b>		External fan unit, heavy-gauge threaded cable entry in terminal box										2
		External fan unit, metric cable entry in terminal box										7
<b>Encoder system:</b>		Incremental encoder sin/cos 1 V <sub>pp</sub> without C and D tracks										N
<b>Terminal box/ Cable entry:</b>		Top/right Top/DE Top/NDE Top/left										0 1 2 3
<b>Type of construction:</b>		IM B3 IM B3 (IM V5, IM V6) (hoisting system for vertical types of construction) IM B35 <sup>9)</sup> IM B35 (IM V15, IM V35) (hoisting system for vertical types of construction) <sup>9)</sup>										0 1 3 5
<b>Bearing version for:</b>		<b>Vibration magnitude:</b>		<b>Shaft and flange accuracy:</b>								A B C D E F G H J
Coupling output		Grade R		Tolerance N								
Coupling output		Grade R		Tolerance R								
Coupling output		Grade S		Tolerance R								
Coupling output		Grade SR		Tolerance R								
Belt output		Grade R		Tolerance N								
Belt output		Grade R		Tolerance R								
Increased cantilever force (belt output)		Grade R		Tolerance N								
Increased cantilever force (belt output)		Grade R		Tolerance R								
Increased speed (coupling output)		Grade S		Tolerance R								
<b>Shaft extension DE:<sup>7)</sup></b>		<b>Balancing:</b>		<b>Direction of air flow (fan):</b>		<b>Blow-out direction:</b>						A B C D J K
Fitted key		Half-key		DE → NDE		Right						
Fitted key		Half-key		NDE → DE		Axial						
Fitted key		Full-key		DE → NDE		Right						
Fitted key		Full-key		NDE → DE		Axial						
Plain shaft		-		DE → NDE		Right						
Plain shaft		-		NDE → DE		Axial						
<b>Degree of protection:</b>		<b>Seal:</b>		<b>Paint finish:</b>								0 2 3 5 6 8
IP55, fan IP54		-		Primed								
IP55, fan IP54		DE flange with shaft sealing ring <sup>6)</sup>		Primed								
IP55, fan IP54		-		Anthracite								
IP55, fan IP54		DE flange with shaft sealing ring <sup>6)</sup>		Anthracite								
IP55, fan IP54		-		Anthracite, two coats								
IP55, fan IP54		DE flange with shaft sealing ring <sup>6)</sup>		Anthracite, two coats								

To select the type of construction and the degree of protection, see Selection guides.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

1PH7 standard type motors  
SH 225

### Selection and ordering data

Motor type (continued)	Rated torque	Moment of inertia	Weight, approx. <sup>8)</sup>	Rated current for duty type in accordance with IEC 60034-1				SIMODRIVE 611 power module	
				$I_{rated}$				Rated output current <sup>10)</sup>	Order No.
				S1	S6-60 %	S6-40 %	S2-30 min		
	$M_{rated}$	$J$	$m$	A	A	A	A	A	
	Nm (lb <sub>f</sub> -ft)	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)						
1PH7224-.NC...	750 (553)	1.48 (13.099)	650 (1 433)	117	135	149	155	120	For ordering data, see Converter system
1PH7224-.ND...	678 (450)	1.48 (13.099)	650 (1 433)	164	190	222	240	200	
1PH7224-.NF...	636 (469)	1.48 (13.099)	650 (1 433)	188	230	248	256	200	



1PH7 motor (SH 180 and SH 225)

- 1) For continuous duty (with 30 %  $n_{max}$ , 60 %  $\frac{2}{3} n_{max}$ , 10 % standstill) for a duty cycle time of 10 min. For maintenance intervals for motors and components, see the 1PH Motors Configuration Manual.
- 2) Bearing version for coupling/belt output.
- 3) Bearing version for increased cantilever force.
- 4) Bearing version for increased maximum speed.
- 5) Version for increased maximum speed, only possible in combination with vibration magnitude grade S. The following option is not possible: Shaft sealing ring.
- 6) Only appropriate if the sealing ring is occasionally lubricated with oil spray/mist. A sealing ring is not possible for type of construction IM B3 (IM V5, IM V6), version with increased cantilever force or increased maximum speed.
- 7) The following motor versions are required for ZF gearbox mounting prepared (see Gearboxes for gear selection):
  - Type of construction IM B35, IM V15 (not IM V35)
  - Shaft with fitted key and full-key balancing
  - Bearing version for coupling output
  - Shaft and flange accuracy R
  - DE flange with shaft sealing ring.
- 8) Applies to type of construction IM B35, as type of construction IM B3, the motor is 20 kg (44 lb) lighter.
- 9) Motors of shaft height 160 and higher require foot support.
- 10) With default setting of the pulse frequency.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### 1PH4 motors

#### Overview



Given the compact design of modern machines, the heat loss from electrical drives can have an adverse effect on the accuracy of machining. The resulting demands for cold motors with a high power density led to the development of the water-cooled 1PH4 motors.

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

1PH4 motors are rugged, 4-pole asynchronous motors with squirrel-cage rotors. Power loss and noise emission are reduced to a minimum. Thanks to the compact design of the motors, high maximum speeds can be achieved.

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

#### Benefits

- High power density thanks to the small construction volume
- Maximum speeds of up to 9 000 rpm (optional: 12 000 rpm)
- Full rated torque is continuously available, even at standstill
- Cooled flange to prevent thermal stressing of the connected mechanical power train
- Low noise level
- High degree of protection IP65 (shaft exit IP55)
- High rotational accuracy
- High cantilever force loading
- Ruggedness

#### Application

- Wherever extreme ambient conditions, such as high temperatures, dust, dirt, or a corrosive atmosphere, do not permit air cooling
- In processes in which the environment must not be heated
- On special machines, when cooling water is available due to the process
- Milling machines with full enclosure
- High-load milling spindles
- Counterspindles or rotating tools for turning machines



# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

1PH4 motors

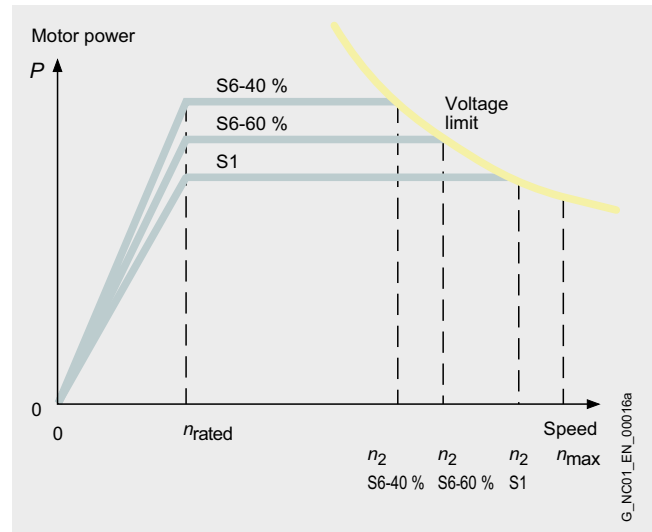
### Technical specifications

<b>Product name</b>	1PH4 motor
<b>Cooling</b>	Water cooling
<b>Coolant inlet temperature</b>	Because of the formation of condensation, we recommend a coolant inlet temperature of approx. 30 °C (86 °F), depending on the ambient conditions.
<b>Cooling water pressure at inlet, max.</b>	7 bar
<b>Temperature monitoring</b>	2 KTY 84 temperature sensors in the stator winding, 1 as reserve
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a coolant inlet temperature of up to 30 °C (86 °F)
<b>Encoder system, built-in</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 2 048 S/R without C and D tracks encoder IN2048S/R
<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)</b>	IM B35 (IM V15, IM V35)
<b>Terminal box location (view DE)<sup>1)</sup></b>	Top, rotatable 4 x 90°
<b>Terminal box connection type</b>	
• Motor	Terminals in terminal box
• Motor encoder and PTC thermistor	12-pin/17-pin circular socket (without mating connector)
<b>Bearing version on DE<sup>2)</sup></b>	Duplex bearing for belt or coupling output (minimum cantilever force required)
<b>Vibration magnitude in accordance with EN 60034-14 (IEC 60034-14)</b>	Grade R (reduced)
<b>Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)<sup>3)</sup></b>	Tolerance N (normal)
<b>Shaft extension DE in accordance with DIN 748-3 (IEC 60072-1)</b>	Full-key balancing with keyway
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	IP65, IP55 on shaft exit
<b>Sound pressure level L<sub>pA</sub> (1 m) in accordance with EN ISO 1680</b> Tolerance + 3 dB	
• 1PH410/1PH413	69 dB
• 1PH416	71 dB
<b>Paint finish</b>	Anthracite

S/R = signals/revolution

Refer to Liquid cooling for a list of heat exchanger manufacturers.

### Characteristic curves

Typical speed/power graph for AC motors<sup>4)</sup>

The graph shows the typical relationship between motor speed and drive power in 1PH4 motors for duty types in accordance with IEC 60034-1:

S1: Continuous duty

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

1PH4 motor	Rated speed	Attainable speed for rated power in duty type in accordance with IEC 60034-1		
Type	$n_{rated}$	$n_2^{5)}$		
	rpm	rpm	S6-60 %	S6-40 %
			rpm	rpm
1PH4103	1 500	8 600	7 500	6 500
1PH4105	1 500	8 800	7 600	6 500
1PH4107	1 500	8 600	7 400	6 400
1PH4133	1 500	8 000	7 400	6 000
1PH4135	1 500	7 400	6 200	5 500
1PH4137	1 500	6 800	5 800	5 000
1PH4138	1 500	7 800	6 600	5 800
1PH4163	1 500	6 300	5 200	4 500
1PH4167	1 500	5 200	4 400	3 800
1PH4168	1 500	6 300	5 300	4 600

- DE is the drive end with shaft. NDE is the non-drive end.
- For maximum permissible load, see the 1PH Motors Configuration Manual.
- Shaft extension run-out, concentricity of centering and shaft, and perpendicularity of flange to shaft.
- For further configuration information, see the 1PH Motors Configuration Manual.
- Values taken from the speed/power graph with regulated infeed. When using unregulated infeed modules, and with option for increased maximum speed, proceed in accordance with the 1PH Motors Configuration Manual.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### 1PH4 standard type motors SH 100 to SH 160

#### Selection and ordering data

Shaft height	Rated speed	Continuous speed, max.			Speed, max. <sup>1)</sup>			Rated power for duty type (in accordance with IEC 60034-1)			1PH4 asynchronous motor with solid shaft Water cooling Standard type
		$n_{S1 \text{ cont.}}^{2)}$	$n_{S1 \text{ cont.}}^{3)}$	$n_{S1 \text{ cont.}}^{4)}$	$n_{\text{max}}^{2)}$	$n_{\text{max}}^{3)}$	$n_{\text{max}}^{4)}$	$P_{\text{rated}}$	S6-60 %	S6-40 %	
SH	$n_{\text{rated}}$	$n_{S1 \text{ cont.}}^{2)}$	$n_{S1 \text{ cont.}}^{3)}$	$n_{S1 \text{ cont.}}^{4)}$	$n_{\text{max}}^{2)}$	$n_{\text{max}}^{3)}$	$n_{\text{max}}^{4)}$	S1	S6-60 %	S6-40 %	Order No.
	rpm	rpm	rpm	rpm	rpm	rpm	rpm	kW (HP)	kW (HP)	kW (HP)	
100	1 500	5 600	6 500	10 000	7 500	9 000	12 000	7.5 (10.1)	8.75 (11.73)	10 (13)	1PH4103 - 4NF26
								11 (15)	12.75 (17.1)	14.75 (19.78)	1PH4105 - 4NF26
								14 (19)	16.25 (21.79)	18.75 (25.14)	1PH4107 - 4NF26
132	1 500	5 200	6 000	9 250	6 700	8 000	10 000	15 (20)	18 (24)	21 (28)	1PH4133 - 4NF26
								22 (30)	26.5 (36)	31 (42)	1PH4135 - 4NF26
								27 (36)	32.5 (44)	38 (51)	1PH4137 - 4NF26
								30 (40)	36 (48)	42 (56)	1PH4138 - 4NF26
160	1 500	4 000	4 500	7 000	5 300	6 500	8 000	37 (50)	45 (60)	52.5 (70.4)	1PH4163 - 4NF26
								46 (62)	55 (74)	65 (87)	1PH4167 - 4NF26
								52 (70)	62.5 (84)	73 (98)	1PH4168 - 4NF26

Encoder system: Incremental encoder sin/cos 1 V<sub>pp</sub> 2 048 S/R without C or D tracks

N

#### Options

Designation	Order code
<b>Bearing version</b> (view DE) (standard = duplex bearing) • Single bearing for coupling, for low to medium cantilever forces or planetary gear units (e.g. mounting of a ZF gearbox 2LG43... <sup>5)</sup> <sup>6)</sup>	<b>K00</b>
<b>Vibration magnitude</b> in accordance with EN 60034-14 (IEC 60034-14) (standard = vibration magnitude grade R, duplex bearing) • Grade S with duplex bearing <sup>7)</sup> • Grade S with single bearing <sup>7)</sup> • Grade SR with single bearing <sup>7)</sup>	<b>K05<sup>8)</sup></b> <b>K02<sup>8)</sup></b> <b>K03<sup>8)</sup></b>
<b>Shaft and flange accuracy</b> in accordance with DIN 42955 (IEC 60072-1) (standard = tolerance N) • Tolerance R <sup>9)</sup>	<b>K04</b>
<b>Shaft extension DE</b> (standard = full-key balancing with keyway) • Plain shaft • Half-key balancing	<b>K42</b> <b>L69</b>

Designation	Order code
<b>Shaft seal DE<sup>10)</sup></b> • Radial shaft sealing ring, oil-tight, IP65	<b>K18</b>
<b>Brake<sup>6)</sup></b> • With holding brake mounted on DE	<b>G46</b>
<b>Terminal box location</b> (view DE) (standard = top) • On right side, cable entry from below <sup>6)</sup> • On left side, cable entry from below <sup>6)</sup> Rotation of terminal box on its own axis • By 90°, cable entry from drive end <sup>12)</sup> • By 90°, cable entry from non-drive end <sup>12)</sup> • By 180°, cable entry from above <sup>12)</sup>	<b>K09<sup>11)</sup></b> <b>K10<sup>11)</sup></b> <b>K83</b> <b>K84</b> <b>K85<sup>11)</sup></b>
<b>Speed<sup>13)</sup></b> • With increased maximum speed and half-key balancing	<b>L37</b>
<b>Other</b> • Second rating plate, separately packed	<b>K31</b>

When ordering a motor with options, **-Z** should be added to the order number and the order code should also be specified for each additional required version.

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

Order No. **1PH4135-4NF26-Z**

Order code(s) **K05 + K09 + K31**

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

1PH4 standard type motors  
SH 100 to SH 160

### Selection and ordering data

Motor type (continued)	Rated torque  $M_{\text{rated}}$  Nm (lb <sub>r</sub> -ft)	Moment of inertia  $J$  kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx.  $m$  kg (lb)	Motor rated current for duty type in accordance with IEC 60034-1			SIMODRIVE 611 power module	
							Required rated output current <sup>14)</sup>  $I_{\text{rated}}$  S1	Order No.
				S1	S6-60 % A	S6-40 % A		
1PH4103 - ...	48 (35)	0.017 (0.150)	52 (115)	26	29	32	30	For ordering data, see Converter system
1PH4105 - ...	70 (52)	0.024 (0.212)	67 (148)	38	42	47	45	
1PH4107 - ...	90 (66)	0.031 (0.274)	80 (176)	46	52	58	60	
1PH4133 - ...	95 (70)	0.046 (0.407)	90 (198)	55	65	74	60	
1PH4135 - ...	140 (103)	0.071 (0.628)	112 (247)	73	86	99	85	
1PH4137 - ...	170 (125)	0.085 (0.752)	130 (287)	85	100	114	85	
1PH4138 - ...	190 (140)	0.097 (0.859)	150 (331)	102	119	136	120	
1PH4163 - ...	235 (173)	0.17 (1.505)	175	107	125	142	120	
1PH4167 - ...	293 (216)	0.206 (1.823)	210	120	138	158	120	
1PH4168 - ...	331 (244)	0.22 (1.947)	240	148	173	197	200	

### Notes on water cooling

Motor type	Coolant flow rate (water)	Connecting thread on non-drive end (NDE)
1PH410	6 l/min	G 1/4
1PH413	8 l/min	G 3/8
1PH416	10 l/min	G 1/2

<sup>1)</sup> For continuous duty (with 30 %  $n_{\text{max}}$ , 60 %  $\frac{2}{3} n_{\text{max}}$ , 10 % standstill) for a duty cycle time of 10 min. For maintenance intervals for motors and components, see 1PH Motors Configuration Manual.

<sup>2)</sup> Bearing version for duplex bearing.

<sup>3)</sup> Bearing version for single bearing.

<sup>4)</sup> Bearing version for maximum speed using option L37.

<sup>5)</sup> Vibration magnitude grades S, SR and mounting position IM V35 not possible for integrated gearbox. Use order code K00 + G97 for old ZF gearbox 2LG42... (for selecting gearing, see Gearboxes).

<sup>6)</sup> Options gearbox assembly, brake assembly and terminal box location mutually exclude each other.

<sup>7)</sup> Options K05, K02 and K03 mutually exclude each other.

<sup>8)</sup> Automatically includes option K04.

<sup>9)</sup> Increased shaft accuracy.

<sup>10)</sup> Only appropriate if the sealing ring is occasionally lubricated with oil spray/mist.

<sup>11)</sup> Options K09 or K10 cannot be combined with K85.

<sup>12)</sup> Options K83, K84 and K85 mutually exclude each other.

<sup>13)</sup> Version for increased maximum speed includes vibration magnitude grade SR and half-key balancing. The following option is not possible: Shaft seal.

<sup>14)</sup> With default setting of the pulse frequency.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### 1PM4 motors with hollow shaft

#### Overview



1PM4 motor (SH 100 and SH 132, liquid-cooled)

The liquid-cooled 1PM4 motors have been specially designed for direct mounting on mechanical spindles. The hollow shaft permits the passage of coolant for tools with internal cooling. The shaft is prepared on the non-drive end (NDE) of the motor for connection of a turning bushing for input of the coolant.

Given the compact design of modern machines, the heat loss from electrical drives can have an adverse effect on the accuracy of machining. The resulting demand for cold motors with a high power density led to the development of the 1PM4 liquid-cooled motors.

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

The motors have a built-in hollow-shaft measuring system for recording the motor speed and indirect position.

#### Benefits

- Hollow shaft for passage of coolant with direct spindle mounting
- Maximum speeds of up to 12 000 rpm (optional: 18 000 rpm)<sup>4)</sup>
- Full rated torque is continuously available, even at standstill
- Cooled flange to prevent thermal stressing of the connected mechanical power train
- Low noise level
- High rotational accuracy
- Short ramp-up and braking times

#### Application

- Compact machining centers
- Special machines
- Directly driven tools with internal cooling

#### Technical specifications

<b>Product name</b>	1PM4 motor
<b>Coolant inlet temperature</b>	Because of the formation of condensation, we recommend a coolant inlet temperature of approximately 30 °C (86 °F), depending on the ambient conditions.
<b>Cooling water pressure at inlet, max.</b>	3 bar
<b>Temperature monitoring</b>	2 KTY 84 temperature sensors in the stator winding, 1 as reserve
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a coolant inlet temperature of up to 30 °C (86 °F)
<b>Encoder system, built-in</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 256 S/R without C and D tracks encoder IN256S/R
<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)<sup>1)</sup></b>	IM B35 (IM V15, IM V35)
<b>Terminal box location</b> View DE <sup>2)</sup>	Top, rotatable 4 x 90°
<b>Terminal box connection type</b>	<ul style="list-style-type: none"> <li>• Motor: Terminals in terminal box</li> <li>• Motor encoder and PTC thermistor: 17-pin circular socket, without mating connector</li> </ul>
<b>Vibration magnitude in accordance with EN 60034-14 (IEC 60034-14)</b>	Grade SR
<b>Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)<sup>3)</sup></b>	Tolerance R (reduced)
<b>DE shaft extension</b>	With plain shaft Without keyway
<b>Hollow ID for shaft</b>	∅ 11.5 mm (0.45 in)
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	IP65, IP55 on shaft exit
<b>Sound pressure level L<sub>pA</sub> (1 m) in accordance with EN ISO 1680</b> Tolerance + 3 dB	69 dB <sup>4)</sup>
<b>Paint finish</b>	Anthracite

S/R = signals/revolution

#### Notes on liquid cooling

Motor type	Coolant flow rate (water, oil)	Connecting thread on non-drive end (NDE)
1PM410	6 l/min	G 1/4
1PM413	8 l/min	G 3/8

Refer to Liquid cooling for a list of heat exchanger manufacturers.

<sup>1)</sup> For types of construction, see Selection guides.

<sup>2)</sup> DE is the drive end with shaft. NDE is the non-drive end.

<sup>3)</sup> Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

<sup>4)</sup> With option L37: 72 dB.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### 1PM6 motors with hollow shaft

#### Overview



1PM6 motors (SH 100 and SH 132 with radial and axial fans)

The air-cooled 1PM6 motors have been specially designed for direct mounting on mechanical spindles. The hollow shaft permits the passage of coolant for tools with internal cooling. The shaft is prepared on the non-drive end (NDE) of the motor for connection of a turning bushing for input of the coolant.

The 1PM6 motors are rugged and maintenance-free 4-pole asynchronous motors with squirrel-cage rotors. They have been designed specifically for use in conjunction with the SIMODRIVE 611 converter system.

A fan for providing forced ventilation is mounted either radially or axially (depending on the version) on the rear of the motor. The direction of air flow is from the drive end (DE) to the non-drive end (NDE), in order to keep the exhaust heat of the motor away from the machine tool.

The motors have a built-in hollow-shaft measuring system for recording the motor speed and indirect position.

#### Benefits

- Hollow shaft for passage of coolant with direct spindle mounting
- Maximum speeds of up to 12 000 rpm (optional: 18 000 rpm)<sup>2)</sup>
- Full rated torque is always available, even at standstill
- Axial or radial fans
- High rotational accuracy
- Short ramp-up and braking times

#### Application

- Compact machining centers
- Special machines
- Directly driven tools with internal cooling

#### Technical specifications

<b>Product name</b>	1PM6 motor
<b>Coolant temperature, permissible</b>	-15 ... +40 °C (+5 ... +104 °F)
<b>Temperature monitoring</b>	2 KTY 84 temperature sensors in the stator winding, 1 as reserve
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a coolant temperature of up to 40 °C (104 °F)
<b>Motor fan ratings</b>	400 V 3 AC, 50 Hz/60 Hz
<b>Encoder system, built in</b>	Incremental encoder sin/cos 1 V <sub>pp</sub> 256 S/R without C and D tracks encoder IN256S/R
<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)<sup>1)</sup></b>	IM B5 (IM V1, IM V3)
<b>Terminal box location</b> View DE <sup>2)</sup>	<ul style="list-style-type: none"> <li>• Axial fan Top, rotatable 4 x 90°</li> <li>• Radial fan On right side, rotatable 4 x 90°</li> </ul>
<b>Terminal box connection type</b>	<ul style="list-style-type: none"> <li>• Motor/fan Terminals in terminal box</li> <li>• Motor encoder and PTC thermistor 17-pin circular socket, without mating connector</li> </ul>
<b>Vibration magnitude in accordance with EN 60034-14 (IEC 60034-14)</b>	Grade SR
<b>Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)<sup>3)</sup></b>	Tolerance R (reduced)
<b>DE shaft extension</b>	With plain shaft Without keyway
<b>Hollow ID for shaft</b>	Ø 11.5 mm (0.45 in)
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	IP55, fan IP54
<b>Sound pressure level L<sub>pA</sub> (1 m) in accordance with EN ISO 1680</b> Tolerance + 3 dB	70 dB <sup>4)</sup> From DE to NDE (with the fan operating on a 50 Hz supply system)
<b>Paint finish</b>	Anthracite

S/R = signals/revolution

<sup>1)</sup> For types of construction, see Selection guides.

<sup>2)</sup> DE is the drive end with shaft. NDE is the non-drive end.

<sup>3)</sup> Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

<sup>4)</sup> With option L37: 72 dB.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### 1PM4/1PM6 standard type motors SH 100/SH 132

#### Selection and ordering data

Shaft height	Rated speed		Con- tinu- ous speed, max.	Speed, max. <sup>1)</sup>		Rated power for <b>star</b> $n_{ratedY} = 1\,500\text{ rpm}$		Rated power for <b>delta</b> $n_{rated\Delta} = 4\,000\text{ rpm}$		1PM4 asynchronous motor with hollow shaft Standard type	1PM6 asynchronous motor with hollow shaft Standard type
	star	delta		$n_{S1cont.}$	$n_{max}$	$P_{rated}$	$P_{rated}$	S1	S6-40 %		
SH	rpm	rpm	rpm	rpm	kW (HP)	kW (HP)	kW (HP)	kW (HP)	Order No.	Order No.	

SH	Rated speed		Con- tinu- ous speed, max.	Speed, max. <sup>1)</sup>		Rated power for <b>star</b> $n_{ratedY} = 1\,500\text{ rpm}$		Rated power for <b>delta</b> $n_{rated\Delta} = 4\,000\text{ rpm}$		Oil cooling <sup>2)</sup>	Forced ventilation
	star	delta		$n_{S1cont.}$	$n_{max}$	$P_{rated}$	$P_{rated}$	S1	S6-40 %	S1	S6-40 %
SH	rpm	rpm	rpm	rpm	kW (HP)	kW (HP)	kW (HP)	kW (HP)	Order No.	Order No.	
100	1 500	4 000	12 000	12 000	3.7 (5)	5.25 (7.04)	3.7 (5)	6 (8)	1PM4101-2LF86-1 ■ S1	1PM6101-2LF8 ■-1 ■ ■ 1	
	1 500	4 000	18 000	18 000	3.7 (5)	5.25 (7.04)	3.7 (5)	6 (8)	1PM4101-2LF86-1 ■ S1-Z <sup>3)</sup>	1PM6101-2LF8 ■-1 ■ ■ 1-Z <sup>3)</sup>	
	1 500	4 000	12 000	12 000	7.5 (10.1)	11 (15)	7.5 (10.1)	13 (17)	1PM4105-2LF86-1 ■ S1	1PM6105-2LF8 ■-1 ■ ■ 1	
	1 500	4 000	18 000	18 000	7.5 (10.1)	11 (15)	7.5 (10.1)	13 (17)	1PM4105-2LF86-1 ■ S1-Z <sup>3)</sup>	1PM6105-2LF8 ■-1 ■ ■ 1-Z <sup>3)</sup>	
132	1 500	4 000	10 000	10 500	11 (15)	16.5 (22.1)	11 (15)	19.5 (26.2)	1PM4133-2LF86-1 ■ S1	1PM6133-2LF8 ■-1 ■ ■ 1	
	1 500	4 000	15 000	15 000	11 (15)	16.5 (22.1)	11 (15)	19.5 (26.2)	1PM4133-2LF86-1 ■ S1-Z <sup>3)</sup>	1PM6133-2LF8 ■-1 ■ ■ 1-Z <sup>3)</sup>	
	1 500	4 000	10 000	10 500	18.5 (24.8)	28 (38)	18.5 (24.8)	32 (43)	1PM4137-2LF86-1 ■ S1	1PM6137-2LF8 ■-1 ■ ■ 1	
	1 500	4 000	12 000	12 000	18.5 (24.8)	28 (38)	18.5 (24.8)	32 (43)	1PM4137-2LF86-1 ■ S1-Z <sup>3)</sup>	1PM6137-2LF8 ■-1 ■ ■ 1-Z <sup>3)</sup>	
	1 500	4 000	10 000	10 500	22 (30)	33 (44)	22 (30)	39 (52)	–	1PM6138-2LF8 ■-1 ■ ■ 1	
	1 500	4 000	11 000	11 000	22 (30)	33 (44)	22 (30)	39 (52)	–	1PM6138-2LF8 ■-1 ■ ■ 1-Z <sup>3)</sup>	

SH	Rated speed		Con- tinu- ous speed, max.	Speed, max. <sup>1)</sup>		Rated power for <b>star</b> $n_{ratedY} = 1\,500\text{ rpm}$		Rated power for <b>delta</b> $n_{rated\Delta} = 4\,000\text{ rpm}$		Water cooling <sup>4)</sup>
	star	delta		$n_{S1cont.}$	$n_{max}$	$P_{rated}$	$P_{rated}$	S1	S6-40 %	S1
SH	rpm	rpm	rpm	rpm	kW (HP)	kW (HP)	kW (HP)	kW (HP)	Order No.	
100	1 500	–	12 000	12 000	5 (7)	6.5 (8.7)	–	–	1PM4101-2LW26-1 ■ S1	
	1 500	–	18 000	18 000	5 (7)	6.5 (8.7)	–	–	1PM4101-2LW26-1 ■ S1-Z <sup>3)</sup>	
	1 500	–	12 000	12 000	11 (15)	14.75 (19.78)	–	–	1PM4105-2LW26-1 ■ S1	
	1 500	–	18 000	18 000	11 (15)	14.75 (19.78)	–	–	1PM4105-2LW26-1 ■ S1-Z <sup>3)</sup>	
132	1 500	–	10 000	10 500	15 (20)	21 (28)	–	–	1PM4133-2LW26-1 ■ S1	
	1 500	–	15 000	15 000	15 (20)	21 (28)	–	–	1PM4133-2LW26-1 ■ S1-Z <sup>3)</sup>	
	1 500	–	10 000	10 500	27 (36)	38 (51)	–	–	1PM4137-2LW26-1 ■ S1	
	1 500	–	12 000	12 000	27 (36)	38 (51)	–	–	1PM4137-2LW26-1 ■ S1-Z <sup>3)</sup>	

Type of construction:	IM B35, IM V15, IM V35	IM B5	1
		IM V1	4
		IM V3	5
<b>Fans:</b>			
Without fan combined with terminal box/metric cable entry	Top/right Top/DE Top/NDE Top/left	A B C D	
Axial fan/Blow-out direction below/Direction of air flow DE → NDE combined with terminal box/metric cable entry		Top/from right Top/from DE Top/from NDE Top/from left	A R B R C R D R
Radial fan/Blow-out direction NDE/Direction of air flow DE → NDE combined with terminal box/metric cable entry		Right side/below Right side/DE Right side/NDE <sup>7)</sup>	E D F D G D

To select the type of construction, see Selection guides.

<sup>1)</sup> For continuous duty (with 30 %  $n_{max}$ , 60 %  $\frac{2}{3} n_{max}$ , 10 % standstill) for a duty cycle time of 10 min. For maintenance intervals for motors and components, see 1PM Motors Configuration Manual.

<sup>2)</sup> Star/delta changeover.

<sup>3)</sup> With option L37: Version for increased maximum speed.

<sup>4)</sup> Only star connection possible.

<sup>5)</sup> Version for increased maximum speeds includes vibration magnitude grade SR. The following option is not possible: Shaft seal.

<sup>6)</sup> With default setting of the pulse frequency.

<sup>7)</sup> 1PM6101 and 1PM6105 only.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

1PM4/1PM6 standard type motors  
SH 100/SH 132

### Selection and ordering data

Motor type (continued)	Rated torque for star		Rated torque for delta		Moment of inertia	Weight, approx.		Rated current for star		SIMODRIVE 611 power module	
	$M_{rated}$		$M_{rated}$			$J$	$m$	$m$	$I_{rated}$		Required rated output current <sup>6)</sup>
	S1	S6-40 %	S1	S6-40 %		kg	kg	S1	S6-40 %	S1	
	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)	kg (lb)	A	A	A	

1PM .101- ...	24 (18)	33 (24)	9 (7)	14 (10)	0.011 (0.097)	42 (93)	45 (99)	13	17.5	24	For ordering data, see Converter system.
1PM .101- ... <sup>3)</sup>	24 (18)	33 (24)	9 (7)	14 (10)	0.011 (0.097)	42 (93)	45 (99)	13	17.5	24	
1PM .105- ...	48 (35)	70 (52)	18 (13)	31 (23)	0.024 (0.212)	67 (148)	70 (154)	23	31	24	
1PM .105- ... <sup>3)</sup>	48 (35)	70 (52)	18 (13)	31 (23)	0.024 (0.212)	67 (148)	70 (154)	23	31	24	
1PM .133- ...	70 (52)	105 (77)	26 (19)	47 (35)	0.046 (0.407)	90 (198)	94 (207)	41	58	45	For ordering data, see Converter system.
1PM .133- ... <sup>3)</sup>	70 (52)	105 (77)	26 (19)	47 (35)	0.046 (0.407)	90 (198)	94 (207)	41	58	45	
1PM .137- ...	118 (87)	178 (131)	44 (32)	76 (56)	0.085 (0.752)	130 (287)	135 (298)	56	79	60	
1PM .137- ... <sup>3)</sup>	118 (87)	178 (131)	44 (32)	76 (56)	0.085 (0.752)	130 (287)	135 (298)	56	79	60	
1PM6138- ...	140 (103)	210 (155)	53 (39)	93 (69)	0.104 (0.920)	–	156 (344)	58	80	60	
1PM6138- ... <sup>3)</sup>	140 (103)	210 (155)	53 (39)	93 (69)	0.104 (0.920)	–	156 (344)	58	80	60	

1PM4101- ...	32 (24)	41 (30)	–	–	0.011 (0.097)	42 (93)	–	18	22.5	24	For ordering data, see Converter system.
1PM4101- ... <sup>3)</sup>	32 (24)	41 (30)	–	–	0.011 (0.097)	42 (93)	–	18	22.5	24	
1PM4105- ...	70 (52)	94 (69)	–	–	0.024 (0.212)	67 (148)	–	38	47	45	
1PM4105- ... <sup>3)</sup>	70 (52)	94 (69)	–	–	0.024 (0.212)	67 (148)	–	38	47	45	
1PM4133- ...	95 (70)	134 (99)	–	–	0.046 (0.407)	90 (198)	–	55	74	60	For ordering data, see Converter system.
1PM4133- ... <sup>3)</sup>	95 (70)	134 (99)	–	–	0.046 (0.407)	90 (198)	–	55	74	60	
1PM4137- ...	172 (127)	242 (178)	–	–	0.085 (0.752)	130 (287)	–	85	114	85	
1PM4137- ... <sup>3)</sup>	172 (127)	242 (178)	–	–	0.085 (0.752)	130 (287)	–	85	114	85	

### Options

Designation	Order code
Speed <sup>5)</sup>	
• With increased maximum speed	<b>L37</b>

When ordering a motor with options, **-Z** should be added to the order number and the order code should also be specified for each additional required version.

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

Order No. **1PM4101-2LF86-1AS1-Z**

Order code **L37**



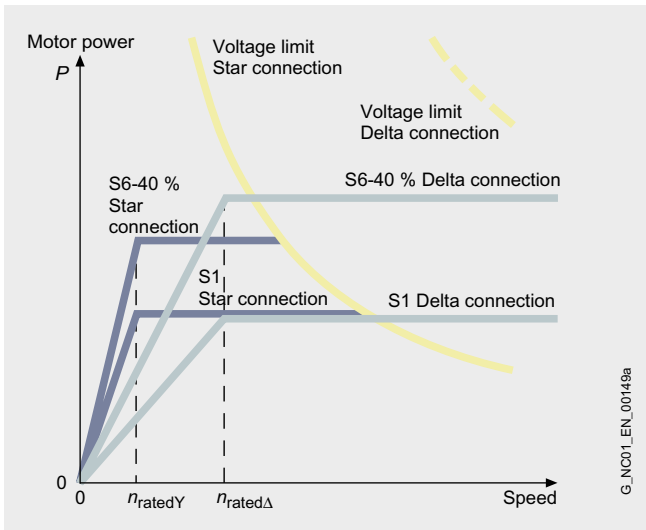
1PM6 motor (radial fan),  
1PM6 motor (axial fan) and 1PM4 motor (liquid-cooled)

# Asynchronous motors

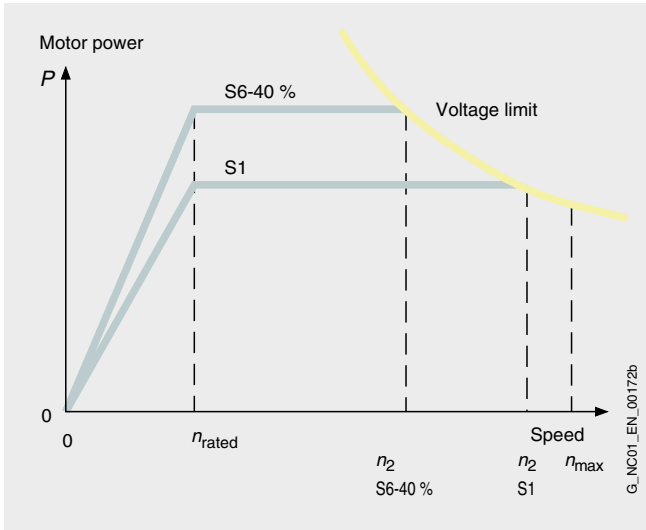
## Main spindle motors for SIMODRIVE 611

### 1PM4/1PM6 motors SH 100/SH 132

#### Characteristic curves



Typical speed/power graph for 1PM4 motors with selectable star/delta connection<sup>1)</sup> (oil-cooled) and 1PM6 motors<sup>1)</sup>



Typical speed/power graph for 1PM4 motors<sup>1)</sup> (water-cooled)

The graphs show the typical relationship between motor speed and drive power for 1PM4/1PM6 motors for the following duty types in accordance with IEC 60034-1:

- S1: Continuous duty
- S6-40 %: Continuous duty with intermittent loading and a relative duty factor of 40 % (S6-40 %) with a maximum duty cycle time of 10 minutes.

1PM motor	Rated speed	Attainable speeds for rated power in duty type in accordance with IEC 60034-1			Rated speed	Attainable speeds for rated power in duty type in accordance with IEC 60034-1		
		Star connection				Delta connection		
Type	$n_{ratedY}$	$n_2^{2)}$	S6-40 %	$n_{rated\Delta}$	$n_2^{2)}$	S6-40 %	S1	
	rpm	rpm	rpm	rpm	rpm	rpm	rpm	

#### Forced ventilation

1PM6101	1 500	9 710	7 170	4 000	12 000	12 000
1PM6105	1 500	9 000	6 360	4 000	12 000	12 000
1PM6133	1 500	8 000	8 140	4 000	10 500	10 500
1PM6137	1 500	7 000	5 920	4 000	10 500	10 500
1PM6138	1 500	4 000	4 000	4 000	6 000	6 500

#### Oil cooling

1PM4101	1 500	9 710	7 170	4 000	12 000	12 000
1PM4105	1 500	9 000	6 360	4 000	12 000	12 000
1PM4133	1 500	8 000	8 140	4 000	10 500	10 500
1PM4137	1 500	7 000	5 920	4 000	10 500	10 500

#### Water cooling

1PM4101	1 500	9 670	7 590	—	—	—
1PM4105	1 500	9 460	7 130	—	—	—
1PM4133	1 500	8 290	6 130	—	—	—
1PM4137	1 500	6 860	4 920	—	—	—

7

<sup>1)</sup> For further configuration information, see the 1PM Motors Configuration Manual.

<sup>2)</sup> Values taken from the speed/power graph with regulated infeed. When using unregulated infeed modules, and with option for increased maximum speed, proceed in accordance with the 1PM Motors Configuration Manual.



# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### 1PH2 built-in motors for direct drive

#### Overview



Active parts (rotor and stator) of 1PH2 asynchronous integral motors

1PH2 built-in motors for turning machines are liquid-cooled squirrel-cage AC asynchronous motors. These built-in motors have been specially developed for variable-speed operation of main spindles on turning machines.

#### Benefits

- Compact design obtained by dispensing with mechanical components such as coupling, belt drive, gearbox and spindle encoder
- High power density as a result of liquid cooling
- The absence of drive transverse forces permits extremely high accuracy on workpiece due to smooth, accurate spindle motion even at very low speeds
- Extremely short ramp-up and braking times
- Full rated torque is continuously available, even at standstill
- Simple servicing by replacing complete motor spindles
- Increased rigidity of the spindle drive, achieved by mounting the motor components between the main spindle bearings
- C-axis compatibility with hollow-shaft measuring system mounted on the spindle
- Low noise level due to absence of machine elements
- Torque is transmitted to the spindle mechanically without play by means of a cylindrical stepped press fit. The rotor is mounted on the spindle by thermal shrinking. The bond can be released by pressure-oil injection without affecting the joint surfaces.
- The rotor with sleeve is pre-balanced and can be removed and subsequently remounted
- The rotor with sleeve is finished-machined - that is, the rotor outer diameter need not be finished after mounting.

#### Application

1PH2 built-in motors are used for machines requiring excellent machining quality, accuracy and running smoothness.

- Turning machines
- Grinders

#### Technical specifications

<b>Product name</b>	1PH2 built-in motor
<b>Coolant inlet temperature</b>	Because of the formation of condensation, we recommend a coolant inlet temperature of approx. 25 °C (77 °F), depending on the ambient conditions.
<b>Cooling water pressure at inlet, max.</b>	7 bar
<b>Temperature monitoring</b>	2 KTY 84 temperature sensors in the stator winding, 1 as reserve
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a coolant inlet temperature of up to 25 °C (77 °F)
<b>Motor encoder, recommended (not included in scope of supply)</b>	Hollow-shaft measuring system
<b>Type of construction (cf. ISO)</b>	Individual components: Stator, rotor
<b>Motor connection type</b>	Free cable ends with 0.5 m (19.7 in) or 1.5 m (59.1 in) length
<b>Balance quality of rotor in accordance with ISO 1940-1</b>	Sizes 093 to 118: G 2.5 Reference speed 3 600 rpm
<b>Degree of protection in accordance with IEC 60034-5</b>	IP00

#### Notes on water cooling

Motor type	Coolant flow rate (water)	Connecting thread
1PH209	8 l/min	Dependent on cooler used
1PH211	8 l/min	

Refer to Liquid cooling for a list of heat exchanger manufacturers.

# Asynchronous motors

## Main spindle motors for SIMODRIVE 611

### 1PH2 built-in motors for direct drive

#### Selection and ordering data

Rated speed	Speed, max.	Rated power for duty type in accordance with IEC 60034-1 <sup>1)</sup>				1PH2 asynchronous built-in motor for direct drive Water cooling Standard type	Rated torque <sup>1)</sup>	
		$P_{rated}$	$P_{rated}$	$P_{rated}$	$P_{rated}$		$M_{rated}$	$M_{rated}$
$n_{rated}$	$n_{max}$	S1	S1 $\Delta T=105\text{ K}$	S6-60 %	S6-40 %	Order No.	$\Delta T=105\text{ K}$	
rpm	rpm	kW (HP)	kW (HP)	kW (HP)	kW (HP)		Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)
1 500	10 000	7.5 (10.1)	9.4 (12.6)	8.2 (11.0)	9 (12.1)	1PH2093 - 6WF4 ■	48 (35.4)	60 (44.3)
		10.1 (13.5)	13 (17.4)	11 (14.8)	12 (16.1)	1PH2095 - 6WF4 ■	64 (47.2)	83 (61.2)
1 500	10 000	15.1 (20.2)	18.5 (24.8)	17 (22.8)	19 (25.5)	1PH2113 - 6WF4 ■	95 (70.1)	118 (87.0)
		16.5 (22.1)	21.5 (28.8)	18.5 (24.8)	21 (28.2)	1PH2115 - 6WF4 ■	105 (77.4)	137 (101)
		18.1 (24.3)	23.7 (31.8)	20.5 (27.5)	23 (30.8)	1PH2117 - 6WF4 ■	115 (84.8)	151 (111)
		23.6 (31.6)	30.9 (41.4)	26 (34.9)	29.5 (39.6)	1PH2118 - 6WF4 ■	146 (108)	197 (145)

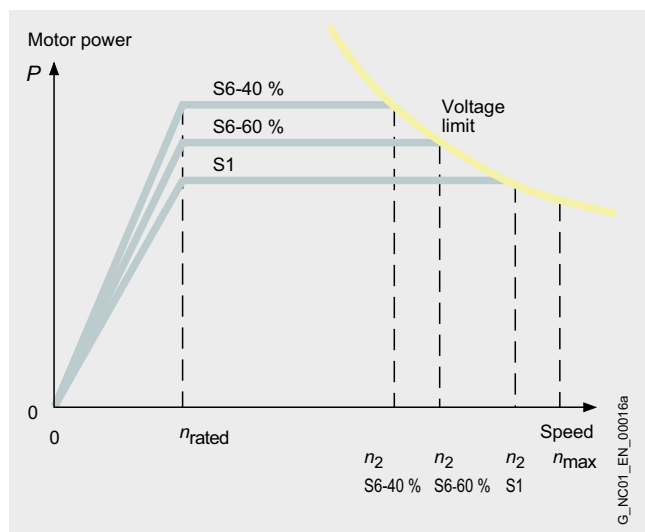
#### Free cable ends:

Length: 1.5 m (59.1 in)

Length: 0.5 m (19.7 in) (preferred type)

1  
2

#### Characteristic curves

Typical speed/power graph for AC motors<sup>2)</sup>

The graph shows the typical relationship between motor speed and drive power for 1PH2 motors for the following duty types in accordance with IEC60034-1:

S1: Continuous duty

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

1PH2 motor	Rated speed	Attainable speed for rated power in duty type in accordance with IEC 60034-1		
		$n_2$ <sup>3)</sup>	$n_2$ <sup>3)</sup>	$n_2$ <sup>3)</sup>
Type	$n_{rated}$	S1 rpm	S6-60 % rpm	S6-40 % rpm
1PH2093	1 500	4 700	4 200	3 900
1PH2095	1 500	4 000	3 600	3 300
1PH2113	1 500	5 400	4 800	4 400
1PH2115	1 500	4 500	4 100	3 700
1PH2117	1 500	4 700	4 200	3 800
1PH2118	1 500	5 300	4 700	4 300

<sup>1)</sup> Data for  $\Delta T = 70\text{ K}$ , unless specified otherwise.

<sup>2)</sup> For further configuration information, see the 1PH Motors Configuration Manual.

<sup>3)</sup> Values taken from the speed/power graph with regulated infeed. When using unregulated infeed modules, proceed in accordance with the 1PH Motors Configuration Manual.

<sup>4)</sup> With default setting of the pulse frequency.

# Asynchronous motors

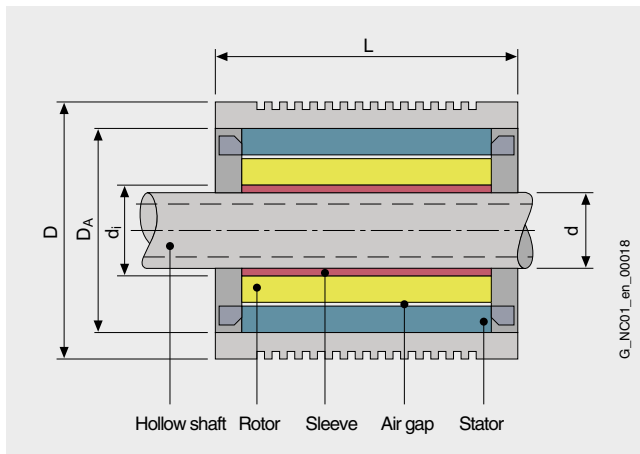
## Main spindle motors for SIMODRIVE 611

### 1PH2 built-in motors for direct drive

#### Selection and ordering data

Motor type (continued)	Moment of inertia of rotor  $J$  $\text{kgm}^2$ ( $\text{lb}_f\text{-in-s}^2$ )	Weight (rotor and stator), approx.  $\text{kg}$ ( $\text{lb}$ )	Rated current for duty type in accordance with IEC 60034-1 <sup>1)</sup>			SIMODRIVE 611 power module	
			$I_{\text{rated}}$			Required rated output current  $I_{\text{rated}}$	Order No.
			S1	S6-60 %	S6-40 %		
A	A	A	A	A			
1PH2093-6W...	0.028 (0.25)	33 (72.8)	24	26	28	30	For ordering data, see Converter system.
1PH2095-6W...	0.036 (0.32)	42 (92.6)	30	32	34	30	
1PH2113-6W...	0.066 (0.58)	51 (112)	56	61	67	60	
1PH2115-6W...	0.073 (0.65)	56 (123)	55	60	66	60	
1PH2117-6W...	0.079 (0.70)	62 (137)	60	67	74	60	
1PH2118-6W...	0.100 (0.89)	78 (172)	82	90	100	85	

#### Dimensional drawings



1PH2 motor	Standard spindle diameter	Rotor internal diameter	Stator outer diameter	Total outer diameter	Total length
Type	$d$	$d_i$	$D_A$	$D$	$L$
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)
1PH2093	67 (2.64)	85 (3.35)	180 (7.09)	205 (8.07)	250 (9.84)
1PH2095					300 (11.81)
1PH2113	82 (3.23)	100 (3.94)	220 (8.66)	250 (9.84)	290 (11.42)
1PH2115					310 (12.20)
1PH2117					330 (12.99)
1PH2118					390 (15.35)

# Asynchronous motors

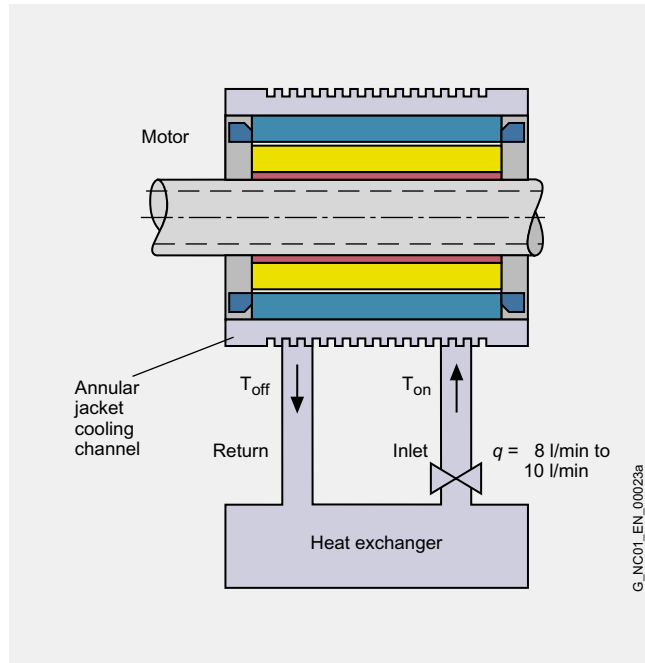
## Liquid cooling

For 1PH4/1PM4/1PH2/1FE1 motors

### Overview

#### Cooling principle

For design of the cooling units, see Configuration Manual.



#### Cooling unit manufacturers

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

Please contact the companies below for technical information.

#### BKW Kälte-Wärme-Versorgungstechnik GmbH

Contact: Benzstraße 2  
Mr. Walker 72649 WOLFSCHLUGEN, Germany  
Phone: +49 (0) 7022-5003-0  
Fax: +49 (0) 7022-5003-30  
E-Mail: [info@bkw-kuema.de](mailto:info@bkw-kuema.de)  
[www.bkw-kuema.de](http://www.bkw-kuema.de)

#### DELTATHERM Hirmer GmbH

Contact: Gewerbegebiet Bövingen 122  
Mr. Hirmer 53804 MUCH, Germany  
Phone: +49 (0) 2245-6107-0  
Fax: +49 (0) 2245-6107-10  
E-Mail: [info@deltatherm.com](mailto:info@deltatherm.com)  
[www.deltatherm.de](http://www.deltatherm.de)

#### Glen Dimplex Deutschland GmbH

RIEDEL Kältetechnik Division

Contact: Am Goldenen Feld 18  
Mr. Schneider 95326 KULMBACH, Germany  
Phone: +49 (0) 9221-709-555  
Fax: +49 (0) 9221-709-549  
E-Mail: [info@riedel-cooling.com](mailto:info@riedel-cooling.com)  
[www.riedel-cooling.com](http://www.riedel-cooling.com)

#### Helmut Schimpke Industriekühlanlagen GmbH + Co. KG

Contact: Ginsterweg 25-27  
Mr. Geerkens 42781 HAAAN, Germany  
Phone: +49 (0) 2129-9438-0  
Fax: +49 (0) 2129-9438-99  
E-Mail: [info@schimpke.de](mailto:info@schimpke.de)  
[www.schimpke.de](http://www.schimpke.de)

#### Hydac System GmbH

Contact: Postfach 12 51  
Mr. Klein 66273 SULZBACH/SAAR, Germany  
Phone: +49 (0) 6897-509-708  
Fax: +49 (0) 6897-509-454  
E-Mail: [winfried.klein@hydac.com](mailto:winfried.klein@hydac.com)  
[www.hydac.com](http://www.hydac.com)

#### Hyfra Industriekühlanlagen GmbH

Contact: Industriepark 54  
Mr. Forberger 56593 KRUNKEL, Germany  
Phone: +49 (0) 2687-898-0  
Fax: +49 (0) 2687-898-25  
E-Mail: [infohyfra@hyfra.com](mailto:infohyfra@hyfra.com)  
[www.hyfra.de](http://www.hyfra.de)

#### KKT Kraus Kälte- und Klimatechnik GmbH

Contact: Mühlach 13a  
Mr. Titschack 90552 RÖTHENBACH A. D. PEGNITZ, Germany  
Phone: +49 (0) 911-95333-40  
Fax: +49 (0) 911-95333-33  
E-Mail: [gtitschack@kkt-kraus.com](mailto:gtitschack@kkt-kraus.com)  
[www.kkt-kraus.de](http://www.kkt-kraus.de)

#### Pfannenberg GmbH

Contact: Werner-Witt-Straße 1  
Mr. Hille 21035 HAMBURG, Germany  
Phone: +49 (0) 40-73412-127  
Fax: +49 (0) 40-73412-101  
E-Mail: [werner.hille@pfannenberg.com](mailto:werner.hille@pfannenberg.com)  
[www.pfannenberg.de](http://www.pfannenberg.de)

**Application**

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

**Benefits**

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

- Drive power up to 100 kW (134 HP)
- Constant power range at drive shaft up to 1:24
- Suitable for both directions of rotation
- Motor shaft heights SH 100 to SH 225
- Types of construction IM B35 and IM V15 (IM V35 available on request)

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

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

**Design**

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

Position 1: Gear ratio  $i_1 = 4$

Position 2: Gear ratio  $i_2 = 1$

The motor is flange-mounted onto the change-speed gearbox using an adapter plate. The AC motor must be suitably prepared for mounting.

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

Any transverse force imported into the gearbox has to be borne by the gearbox and transmitted to the machine base.

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

Vertical mounting positions for the IM V15 and IM V35 require circulating-oil lubrication of the gearboxes.

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

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

**Design (continued)**

Profile of a planetary gearbox

The power unit (motor and gearbox) is supplied with vibration magnitude grade R in accordance with EN 60034-14 (IEC 60034-14). This is also the case when the motor is ordered with vibration magnitude grade S.

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

**Motors with built-on planetary gearbox**

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

**Siemens AG**

Industrial Solutions and Services  
Contact: Mr. Britz

Im Schiffelland 10  
66386 ST. INGBERT, Germany

Fax: +49 (0) 68 94 - 8 91 - 112

E-mail: hans-peter.britz@siemens.com

The following details must be specified with the order:

Ordering example for 1PH4 motor:

**Motor complete with gearbox**  
**1PH4133-4NF26-Z**  
**K00**  
**2LG4315-3FD11**

Ordering example for 1PH7 motor:

**Motor complete with gearbox**  
**1PH7186-2NE03-0BC2**  
**2LG4260-1JC21**  
**1PH7163-2NF03-0CC0**  
**2LG4320-3JD1**

<sup>1)</sup> Not included in scope of supply.

# Asynchronous motors

## Gearboxes

### Two-speed gearboxes for 1PH7/1PH4 motors

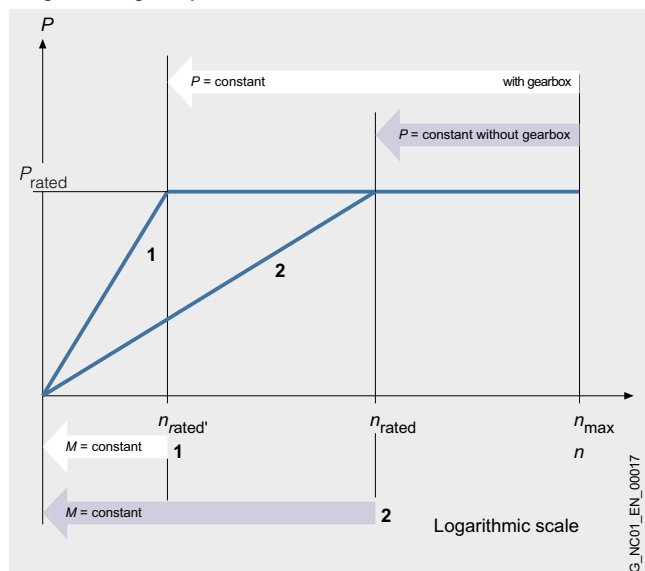
#### Technical specifications

Motor 1PH	Gearbox		Speed, max. <sup>1)</sup>	Rated torque, permissible (S1 duty)			Maximum torque, permissible (S6-60 % duty)			Moment of inertia of gearbox		Weight of gearbox, approx.
	ZF identifier	Type		Drive	Output $i = 1$	Output $i = 4$	Drive	Output $i = 1$	Output $i = 4$	Output $i = 1$	Output $i = 4$	
Shaft height			$n_{\max}$	$M$	$M$	$M$	$M$	$M$	$M$	$J$	$J$	$m$
SH			rpm	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)
100	2K 120	2LG4312-...	8 000	120 (88.5)	120 (88.5)	480 (354)	140 (103)	140 (103)	560 (413)	0.0110 (0.10)	0.0114 (0.10)	30 (66.2)
132	2K 250	2LG4315-...	6 300	250 (184)	250 (184)	1 000 (738)	400 (295)	400 (295)	1 600 (1 180)	0.0270 (0.24)	0.0570 (0.50)	62 (137)
160	2K 300	2LG4320-...	6 300	300 (221)	300 (221)	1 200 (885)	400 (295)	400 (295)	1 600 (1 180)	0.0270 (0.24)	0.0570 (0.50)	70 (154)
180	2K 800	2LG4250-...	5 000	800 (590)	800 (590)	3 200 (2 360)	900 (664)	900 (664)	3 600 (2 655)	0.1956 (1.73)	0.1766 (1.56)	110 (243)
	2K 801	2LG4260-...										
225	2K 802	2LG4270-...	On request									

For further binding technical specifications and configuring aid (e.g. lubrication, temperature rise and typical applications), please refer to the latest catalog supplied by ZF (Zahnradfabrik Friedrichshafen). The permissible characteristics of the motor and gearbox are a governing factor in the design of the complete drive unit (motor and gearbox).

With 1PH4168 or 1PH7167-2NB motors, for example, the rated torque must be reduced to 300 Nm (221 lb<sub>f</sub>-ft). With motors of SH 132, please note that the maximum permissible speed of the 2K 250 gearbox for splash lubrication is 6 300 rpm.

The use of a change-speed gearbox permits the constant power range to be greatly increased.



Power-speed graph

#### Legend:

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

Type of construction for complete unit	Output flange dimension $D_2$	<b>Two-speed gearbox (standard version)<sup>2)</sup></b> Gear stage $i_1 = 4$	
	mm (in)	Order No.	ZF identifier

#### For 1PH710/1PH410 motors

IM B5, IM B35, IM V1, IM V15	100 (3.94)	<b>2LG4312-3CC31</b>	2K 120
------------------------------	------------	----------------------	--------

#### For 1PH713/1PH413 motors

IM B5, IM B35	118 (4.65)	<b>2LG4315-3FD11</b>	2K 250
IM V1, IM V15	118 (4.65)	<b>2LG4315-3FC11</b>	2K 250

#### For 1PH716/1PH416 motors

IM B35	130 (5.12)	<b>2LG4320-3JD11</b>	2K 300
IM V15	130 (5.12)	<b>2LG4320-3JC11</b>	2K 300

#### For 1PH7184 motors

IM B35, IM V15	180 (7.09)	<b>2LG4250-1JC11</b>	2K 800
----------------	------------	----------------------	--------

#### For 1PH7186 motors


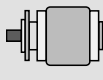
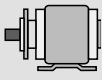






IM B35, IM V15	180 (7.09)	<b>2LG4260-1JC21</b>	2K 801
----------------	------------	----------------------	--------

- 1) Higher drive speeds are allowed with oil-cooled gearboxes and for gear ratios  $i = 1$  in some instances (refer to the ZF Catalog).
- 2) Special versions, such as gearboxes with different torsional backlash, or other gear ratios ( $i = 3.17$  or  $i = 5.5$ ), are available on request.

# Asynchronous motors

## Selection guides

### Type of construction/mounting position

Type of construction/ mounting position	Designation	Type of construction/ mounting position	Designation	Type of construction/ mounting position	Designation
	IM B3		IM B5 IM B14		IM B35
	IM V5		IM V1 IM V18		IM V15
	IM V6		IM V3 IM V19		IM V35

### Degree of protection

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

Since coolants used for machine tools and transfer machines usually contain oil, are able to creep, and may also be corrosive, protection against water alone is insufficient. The indicated degree of protection should only be considered here as a guideline. The motors must be protected by suitable covers. Attention must be paid to providing suitable sealing of the motor shaft for the selected degree of protection for the motor.

The table can serve as a decision aid for selecting the proper degree of protection for motors. For a mounting position with vertical shaft end IM V3/IM V19, static fluid on the flange is only permitted with degree of protection IP67/IP68 and recessed DE flange in some cases.

	Liquids	General workshop environment	Water; gen. coolant (95 % water, 5 % oil); oil	Creep oil; petroleum; aggressive coolants
Effect				
Dry		IP64	–	–
Water-enriched environment		–	IP64	IP67 <sup>1)</sup>
Mist		–	IP65	IP67
Spray		–	IP65	IP68
Jet		–	IP67	IP68
Surge, brief immersion; constant inundation		–	IP67	IP68

<sup>1)</sup> IP64 with dry run at shaft exit.



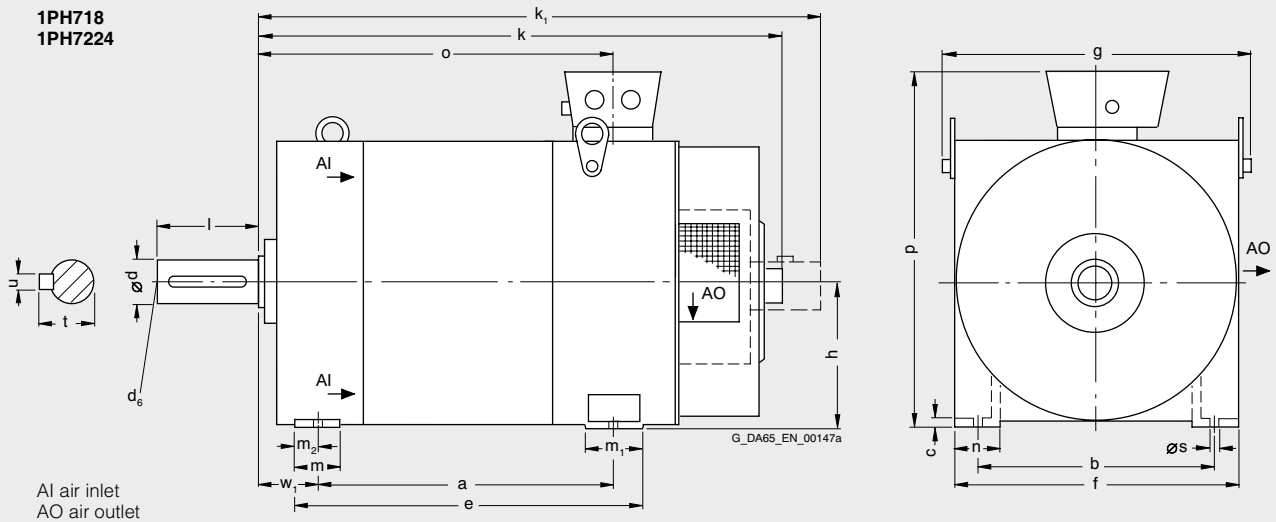


# Asynchronous motors Dimension drawings

## 1PH7 motors Forced ventilation

For motor		Dimensions in mm (in)															Terminal box type 1XB7322	
Shaft height	Type	DIN IEC	a B	b A	c LA	e M	f AB	g AC	h H	k LB	k <sub>1</sub> -	m BA	m <sub>1</sub> -	m <sub>2</sub> -	n AA	o -	p HD	
<b>1PH7, type of construction IM B3, forced ventilation, direction of air flow DE → NDE</b>																		
180	<b>1PH7184</b>		430 (16.93)	279 (10.98)	14 (0.55)	510 (20.08)	360 (14.17)	408 (16.09)	180 (7.09)	835 (32.87)	-	60 (2.36)	120 (4.72)	35 (1.38)	65 (2.56)	541 (21.3)	495 (19.49)	
	<b>1PH7186</b>		520 (20.47)			600 (23.62)				925 (36.42)						631 (24.84)		
225	<b>1PH7224</b>		445 (17.52)	356 (14.02)	18 (0.71)	530 (20.87)	450 (17.72)	498 (19.61)	225 (8.86)	-	1100 (43.31)	60 (2.36)	120 (4.72)	40 (1.57)	85 (3.35)	629 (24.76)	595 (23.43)	

DE shaft extension									
Shaft height	Type	DIN IEC	s K	w <sub>1</sub> C	d D	d <sub>6</sub> -	l E	t GA	u F
180	<b>1PH7184</b>		14.5 (0.57)	121 (4.76)	<b>60</b> (2.36)	M20	140 (5.51)	64 (2.52)	18 (0.72)
	<b>1PH7186</b>				<b>65</b> (2.56)			69 (2.72)	
225	<b>1PH7224</b>		18.5 (0.73)	149 (5.87)	<b>75</b> (2.95)	M20	140 (5.51)	79.5 (3.13)	20 (0.79)



# Asynchronous motors

## Dimension drawings

### 1PH7 motors Forced ventilation

For motor Dimensions in mm (in) Terminal box type 1XB7322

Shaft height Type DIN IEC a B b A c LA e M f AB g AC h H k LB m BA m<sub>1</sub> - m<sub>2</sub> - n AA o - p HD

**1PH7, type of construction IM B3, forced ventilation, direction of air flow NDE → DE**

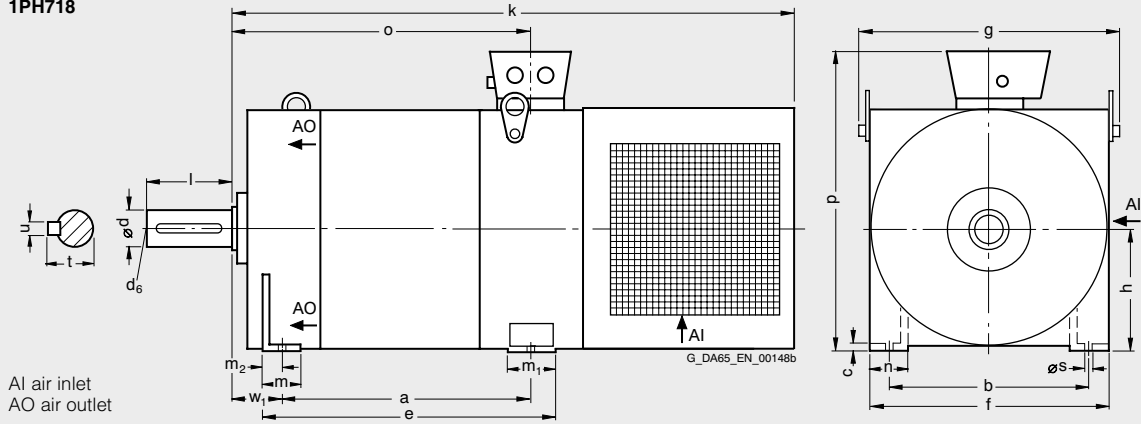
180	<b>1PH7184</b>		430 (16.93)	279 (10.98)	14 (0.55)	510 (20.08)	360 (14.17)	405 (15.94)	180 (7.09)	1010 (39.76)	60 (2.36)	120 (4.72)	35 (1.38)	65 (2.56)	541 (21.3)	495 (19.49)
	<b>1PH7186</b>		520 (20.47)			600 (23.62)				1100 (43.31)					631 (24.84)	
225	<b>1PH7224</b>		445 (17.52)	356 (14.02)	18 (0.71)	530 (20.87)	450 (17.72)	498 (19.61)	225 (8.86)	1090 (42.91)	60 (2.36)	120 (4.72)	40 (1.57)	85 (3.35)	629 (24.76)	595 (23.43)

For motor DE shaft extension

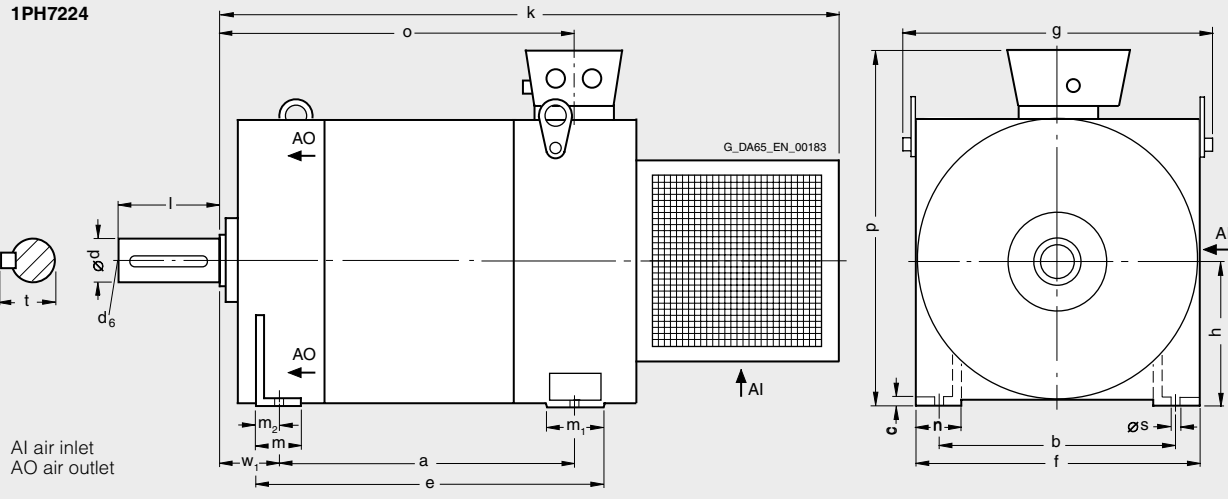
Shaft height Type DIN IEC s K w<sub>1</sub> C d D d<sub>6</sub> - l E t GA u F

180	<b>1PH7184</b>		14.5 (0.57)	121 (4.76)	<b>60</b> (2.36)	M20	140 (5.51)	64 (2.52)	18 (0.71)
	<b>1PH7186</b>				<b>65</b> (2.56)		69 (2.72)		
225	<b>1PH7224</b>		18.5 (0.73)	149 (5.87)	<b>75</b> (2.95)	M20	140 (5.51)	79.5 (3.13)	20 (0.79)

1PH718



1PH7224



7

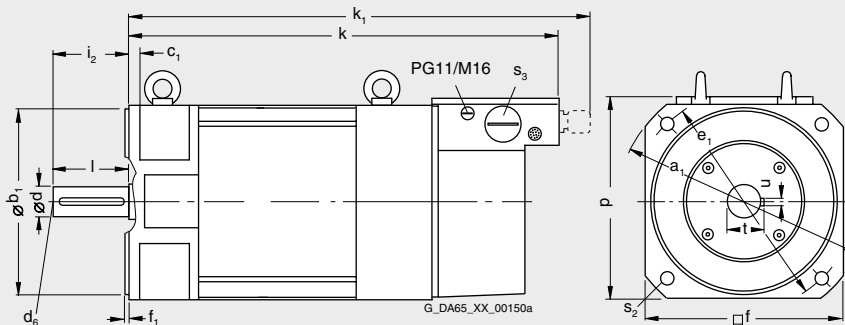
# Asynchronous motors

## Dimension drawings

**1PH7 motors**  
**Forced ventilation**

For motor		Dimensions in mm (in)													
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	i <sub>2</sub> -	k LB	k <sub>1</sub> -	p HD	s <sub>2</sub> S	s <sub>3</sub> -	
<b>1PH7, type of construction IM B5, forced ventilation</b>															
100	<b>1PH7101</b> <b>1PH7103</b> <b>1PH7105</b> <b>1PH7107</b>		250 (9.84)	180 (7.09)	10 (0.39)	215 (8.46)	196 (7.72)	4 (0.16)	80 (3.15)	411 (16.18)	434 (17.09)	218 (8.58)	14 (0.55)	PG29/M32	
										506 (19.92)	529 (20.83)				
132	<b>1PH7131</b> <b>1PH7133</b> <b>1PH7135</b> <b>1PH7137</b>		350 (13.78)	250 (9.84)	16 (0.63)	300 (11.81)	260 (10.24)	5 (0.2)	110 (4.33)	538 (21.18)	561 (22.09)	273 (10.75)	18 (0.71)	PG36/M40	
										623 (24.53)	646 (25.43)				

For motor		DE shaft extension					
Shaft height	Type	DIN IEC	d D	d <sub>6</sub> -	l E	t GA	u F
<b>1PH7, type of construction IM B5, forced ventilation</b>							
100	<b>1PH7101</b> <b>1PH7103</b> <b>1PH7105</b> <b>1PH7107</b>		38 (1.5)	M12	80 (3.15)	41 (1.61)	10 (0.39)
132	<b>1PH7131</b> <b>1PH7133</b> <b>1PH7135</b> <b>1PH7137</b>		42 (1.65)	M16	110 (4.33)	45 (1.77)	12 (0.47)

**1PH710**  
**1PH713**


# Asynchronous motors

## Dimension drawings

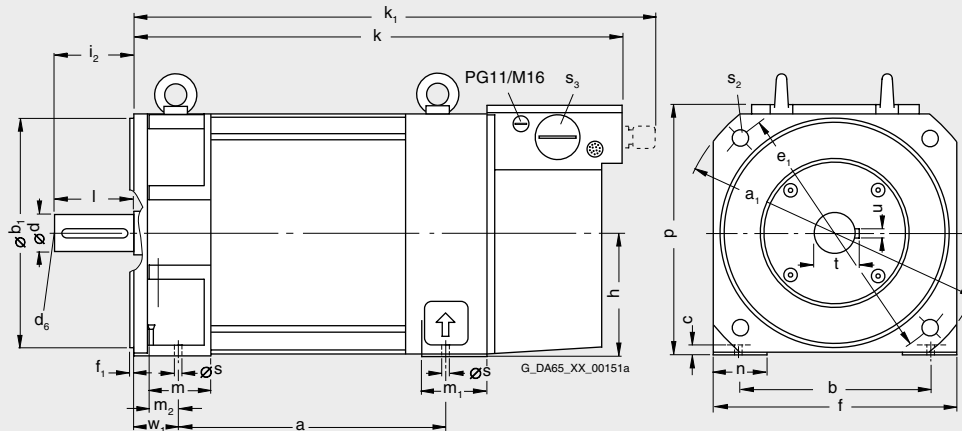
### 1PH7 motors Forced ventilation

For motor		Dimensions in mm (in)																	
Shaft height	Type	DIN IEC	a B	a <sub>1</sub> P	b A	b <sub>1</sub> N	c LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	h H	i <sub>2</sub> -	k LB	k <sub>1</sub> -	m BA	m <sub>1</sub> -	m <sub>2</sub> -	n AA	p HD
<b>1PH7, type of construction IM B35, forced ventilation</b>																			
100	<b>1PH7101</b> <b>1PH7103</b> <b>1PH7105</b> <b>1PH7107</b>		202.5 (7.97)	250 (9.84)	160 (6.3)	180 (7.09)	11 (0.43)	215 (8.46)	196 (7.72)	4 (0.16)	100 (3.94)	80 (3.15)	411 (16.18)	435 (17.13)	52 (2.05)	64 (2.52)	27 (1.06)	39 (1.54)	220 (8.66)
			297.5 (11.71)										506 (19.92)	529 (20.83)					
132	<b>1PH7131</b> <b>1PH7133</b> <b>1PH7135</b> <b>1PH7137</b>		265.5 (10.45)	350 (13.78)	216 (8.5)	250 (9.84)	14 (0.55)	300 (11.81)	260 (10.24)	5 (0.2)	132 (5.2)	110 (4.33)	538 (21.18)	561 (22.09)	63 (2.48)	75 (2.95)	33 (1.3)	52 (2.05)	275 (10.83)
			350.5 (13.8)										623 (24.53)	646 (25.43)					
160	<b>1PH7163</b>  <b>1PH7167</b>		346.5 (13.64)	400 (15.75)	254 (10)	300 (11.81)	17 (0.67)	350 (13.78)	314 (12.36)	5 (0.2)	160 (6.3)	110 (4.33)	640 (25.2)	663 (26.1)	78 (3.07)	81 (3.19)	42 (1.65)	62 (2.44)	330 (12.99)
			406.5 (16)										700 (27.56)	723 (28.46)					

## DE shaft extension

Shaft height	Type	DIN IEC	s K	s <sub>2</sub> S	s <sub>3</sub> -	w <sub>1</sub> C	d D	d <sub>6</sub> -	l E	t GA	u F
100	<b>1PH7101</b> <b>1PH7103</b> <b>1PH7105</b> <b>1PH7107</b>		12 (0.47)	14 (0.55)	PG29/M32	40 (1.57)	<b>38</b> <b>(1.5)</b>	M12	80 (3.15)	41 (1.61)	10 (0.39)
132	<b>1PH7131</b> <b>1PH7133</b> <b>1PH7135</b> <b>1PH7137</b>		12 (0.47)	18 (0.71)	PG36/M40	50 (1.97)	<b>42</b> <b>(1.65)</b>	M16	110 (4.33)	45 (1.77)	12 (0.47)
160	<b>1PH7163</b> <b>1PH7167</b>		14 (0.47)	18 (0.71)	PG42/M50	64 (2.52)	<b>55</b> <b>(2.17)</b>	M20	110 (4.33)	59 (2.32)	16 (0.63)

1PH710  
1PH713  
1PH716



# Asynchronous motors

## Dimension drawings

**1PH7 motors**  
**Forced ventilation**

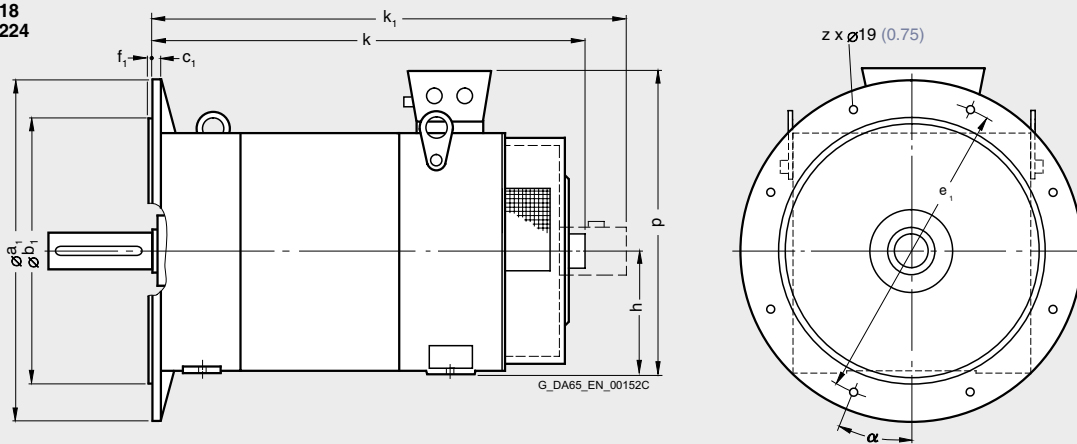
For motor Dimensions in mm (in)

For dimensions for foot mounting, shaft and terminal box, see dimension drawing of 1PH718 and 1PH7224 motors, type of construction IM B3.

Terminal box type 1XB7322

Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f <sub>1</sub> T	h H	k LB	k <sub>1</sub> -	p	z	α
<b>1PH7, type of construction IM B35, forced ventilation, direction of air flow DE → NDE</b>													
180	<b>1PH7184<sup>1)</sup></b>		400 (15.75)	300 (11.81)	15 (0.59)	350 (13.78)	5 (0.2)	180 (7.09)	835 (32.87)	-	495 (19.49)	4	45°
	<b>1PH7184<sup>1)</sup></b>		450 (17.72)	350 (13.78)	16 (0.63)	400 (15.75)			835 (32.87)			8	22.5°
	<b>1PH7186</b>								925 (36.42)				
225	<b>1PH7224</b>		550 (21.65)	450 (17.72)	18 (0.71)	500 (19.69)	5 (0.2)	225 (8.86)	-	1100 (43.31)	595 (23.43)	8	22.5°

**1PH718**  
**1PH7224**



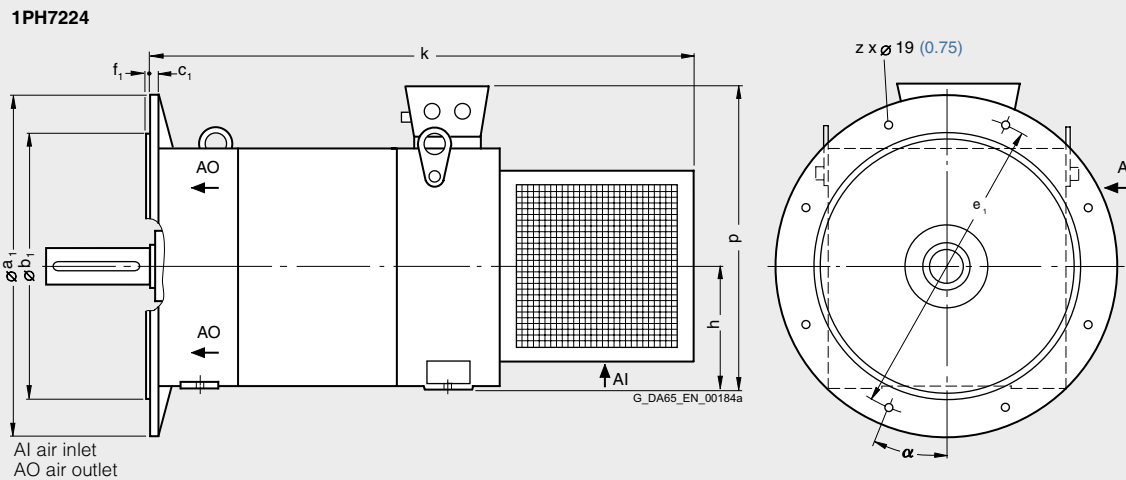
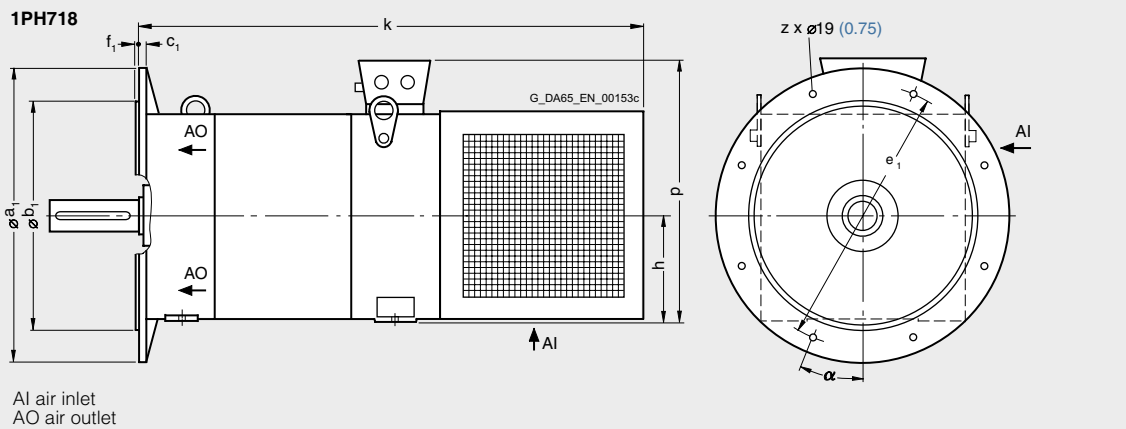
<sup>1)</sup> For flange selection, see order number complements for SH 180 and SH 225.

# Asynchronous motors

## Dimension drawings

### 1PH7 motors Forced ventilation

For motor		Dimensions in mm (in)										For dimensions of the shaft and terminal box foot installation, see dimension drawing of 1PH718 and 1PH7224 motors, type of construction IM B3. Terminal box type 1XB7322	
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f <sub>1</sub> T	h H	k LB	p	z	α	
<b>1PH7, type of construction IM B35, forced ventilation, direction of air flow NDE → DE</b>													
180	1PH7184 <sup>1)</sup>		400 (15.75)	300 (11.81)	15 (0.59)	350 (13.78)	5 (0.2)	180 (7.09)	1010 (39.76)	495 (19.49)	4	45°	
	1PH7184 <sup>1)</sup>		450 (17.72)	350 (13.78)	16 (0.63)	400 (15.75)			1010 (39.76)		8	22.5°	
	1PH7186								1100 (43.31)				
225	1PH7224		550 (21.65)	450 (17.72)	18 (0.71)	500 (19.69)	5 (0.2)	225 (8.86)	1090 (42.91)	595 (23.43)	8	22.5°	



<sup>1)</sup> For flange selection, see order number complements for SH 180 and SH 225.

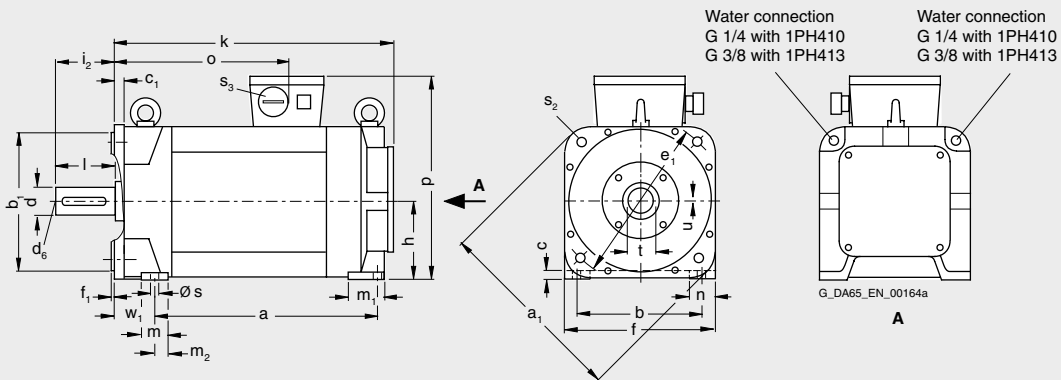
# Asynchronous motors Dimension drawings

## 1PH4 motors Water cooling

For motor		Dimensions in mm (in)																	
Shaft height	Type	DIN IEC	a B	a <sub>1</sub> P	b A	b <sub>1</sub> N	c LA	c <sub>1</sub> -	e <sub>1</sub> -	f AB	f <sub>1</sub> T	h H	i <sub>2</sub> -	k LB	m BA	m <sub>1</sub> -	m <sub>2</sub> -	n AA	
<b>1PH4, type of construction IM B35, water cooling</b>																			
100	<b>1PH4103</b>		349 (13.74)	250 (9.84)	160 (6.30)	180 (7.09)	11 (0.43)	12 (0.47)	215 (8.46)	190 (7.48)	4 (0.16)	100 (3.94)	80 (3.15)	416 (16.38)	35 (1.38)	60 (2.36)	24 (0.94)	40 (1.57)	
	<b>1PH4105</b>		409 (16.10)											476 (18.74)					
	<b>1PH4107</b>		474 (18.66)											541 (21.30)					
132	<b>1PH4133</b>		377 (14.84)	350 (13.78)	216 (8.50)	250 (9.84)	14 (0.55)	16 (0.63)	300 (11.81)	245 (9.65)	5 (0.20)	132 (5.20)	110 (4.33)	458 (18.03)	36 (1.42)	85 (3.35)	24 (0.94)	43 (1.69)	
	<b>1PH4135</b>		447 (17.60)											528 (20.79)					
	<b>1PH4137</b>		497 (19.57)											578 (22.76)					
	<b>1PH4138</b>		532 (20.9)											613 (24.13)					

		DE shaft extension													
Shaft height	Type	DIN IEC	o -	p HD	s K	s <sub>2</sub> K	s <sub>3</sub> -	w <sub>1</sub> C	d D	d <sub>6</sub> -	l E	t GA	u F		
100	<b>1PH4103</b>		244 (9.61)	259 (10.20)	12 (0.47)	14 (0.55)	PG29	44 (1.73)	<b>38</b> (1.50)	M12	80 (3.15)	41 (1.61)	10 (0.39)		
	<b>1PH4105</b>		304 (11.97)												
	<b>1PH4107</b>		369 (14.53)												
132	<b>1PH4133</b>		264 (10.39)	334.5 (13.17)	12 (0.47)	18 (0.71)	PG36	53 (2.09)	<b>42</b> (1.77)	M16	110 (4.33)	45 (1.77)	12 (0.47)		
	<b>1PH4135</b>		334 (13.15)												
	<b>1PH4137</b>		384 (15.12)												
	<b>1PH4138</b>		419 (16.50)												

**1PH410  
1PH413**



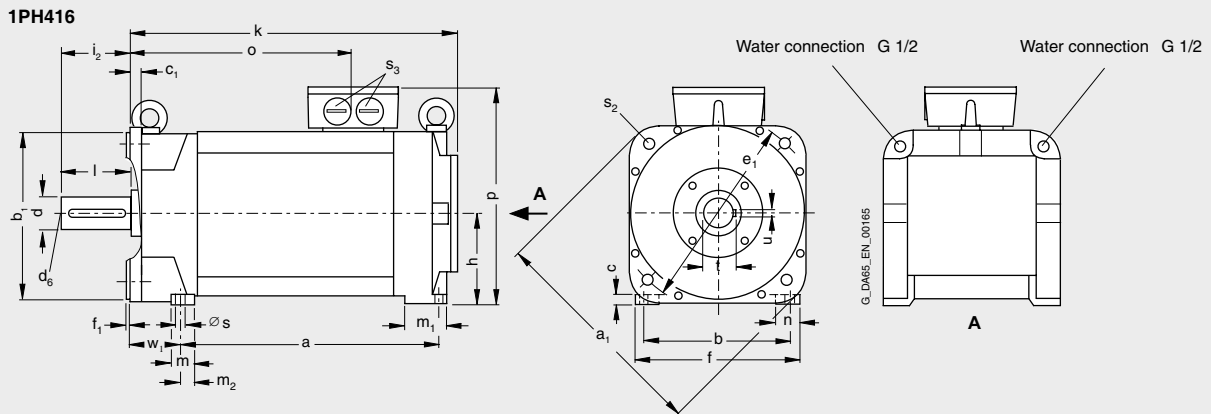
# Asynchronous motors

## Dimension drawings

### 1PH4 motors Water cooling

For motor		Dimensions in mm (in)																	
Shaft height	Type	DIN IEC	a B	a <sub>1</sub> P	b A	b <sub>1</sub> N	c LA	c <sub>1</sub> -	e <sub>1</sub> -	f AB	f <sub>1</sub> T	h H	i <sub>2</sub> -	k LB	m BA	m <sub>1</sub> -	m <sub>2</sub> -	n AA	
<b>1PH4, type of construction IM B35, water cooling</b>																			
160	<b>1PH4163</b>		508 (20.00)	400 (15.75)	254 (10.00)	300 (11.81)	15 (0.59)	18 (0.71)	350 (13.78)	294 (11.57)	5 (0.20)	160 (6.30)	110 (4.33)	591 (23.27)	44 (1.73)	77 (3.03)	29 (1.14)	49 (1.93)	
	<b>1PH4167</b>		563 (22.17)											646 (25.43)					
	<b>1PH4163</b>		608 (23.94)											691 (27.20)					

		DE shaft extension												
Shaft height	Type	DIN IEC	o -	p HD	s K	s <sub>2</sub> K	s <sub>3</sub> -	w <sub>1</sub> C	d D	d <sub>6</sub> -	l E	t GA	u F	
160	<b>1PH4163</b>		407 (16.02)	388 (15.28)	14 (0.55)	18 (0.71)	PG36	56 (2.20)	<b>55</b> (2.17)	M20	110 (4.33)	59 (2.32)	16 (0.63)	
	<b>1PH4167</b>		462 (18.19)											
	<b>1PH4168</b>		507 (19.96)											



7



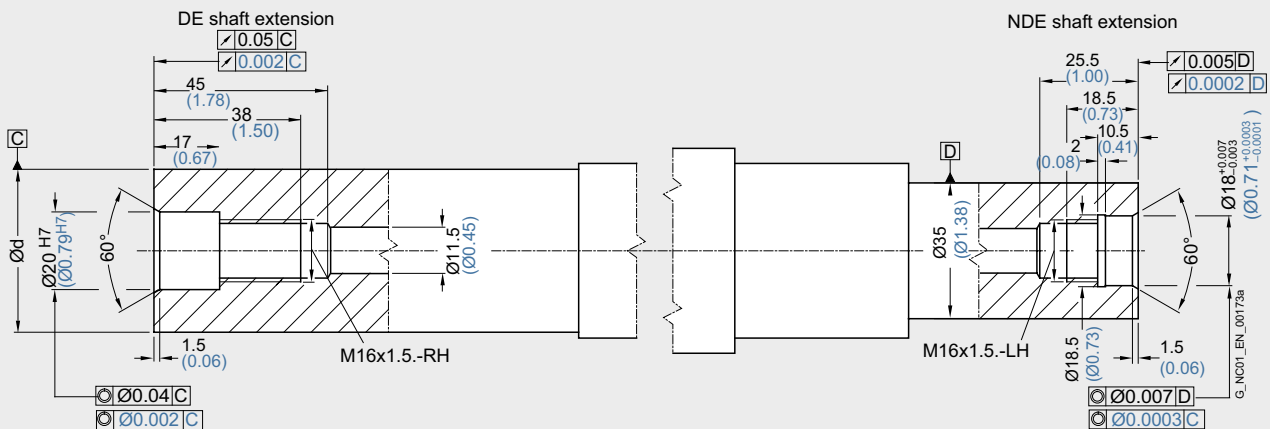
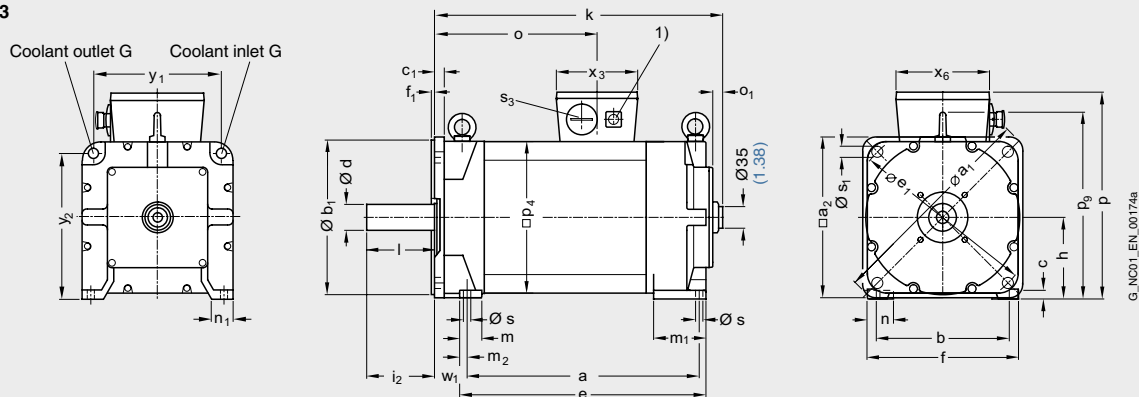
# Asynchronous motors Dimension drawings

## 1PM4 motors Water cooling

For motor		Dimensions in mm (in)																			
Shaft height	Type	DIN IEC	a B	a <sub>1</sub> P	a <sub>2</sub> -	b A	b <sub>1</sub> N	c HA	c <sub>1</sub> LA	e BB	e <sub>1</sub> M	f AB	f <sub>1</sub> T	G -	h H	i <sub>2</sub> -	k LB	m BA	m <sub>1</sub> -	m <sub>2</sub> -	
<b>1PM4, type of construction IM B35, water cooling</b>																					
100	<b>1PM4101</b>	304	250	196	160	180	11	12	326	215	190	4	G1/4	100	80	389	35	60	11		
	<b>1PM4105</b>	409							431								494				
132	<b>1PM4133</b>	377	350	260	216	250	14	16	400	300	246	5	G3/8	132	110	468	36	85	12		
	<b>1PM4137</b>	497							520								588				

Motor		Dimensions in mm (in)																		DE shaft extension	
Shaft height	Type	DIN IEC	n AA	n <sub>1</sub> -	o -	o <sub>1</sub> -	p HD	p <sub>4</sub> AC	p <sub>9</sub> -	s K	s <sub>1</sub> S	s <sub>3</sub> -	w <sub>1</sub> C	x <sub>3</sub>	x <sub>6</sub>	y <sub>1</sub> -	y <sub>2</sub> -	d D	l E		
100	<b>1PM4101</b>	37	35	199	18	259	190	233	12	14	M32x1.5	44	117	122	154	177	38	80			
	<b>1PM4105</b>	304		12																	
132	<b>1PM4133</b>	43	35	264	16	335	245	302	12	18	M40x1.5	53	132	152	206	235	42	110			
	<b>1PM4137</b>	384		15.12																	

**1PM410  
1PM413**



1) Signal connection.

# Asynchronous motors

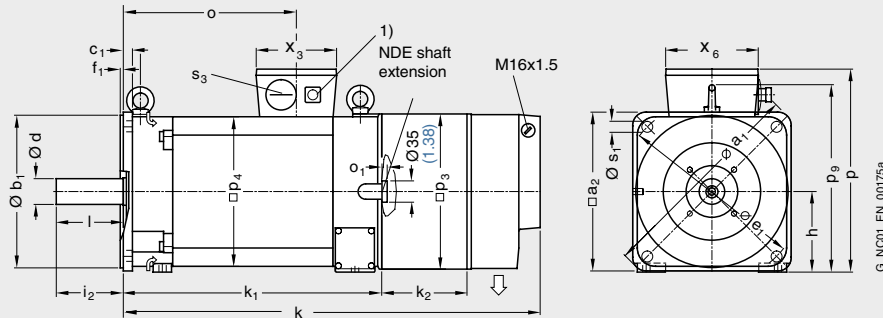
## Dimension drawings

### 1PM6 motors Forced ventilation

For motor		Dimensions in mm (in)														DE shaft extension	
Shaft height	Type	DIN IEC	a <sub>1</sub> P	a <sub>2</sub> -	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f <sub>1</sub> T	h H	i <sub>2</sub> -	p <sub>4</sub> AC	s <sub>1</sub> S	s <sub>3</sub> -	x <sub>3</sub> -	x <sub>6</sub> -	d D	l E
<b>1PM6, type of construction IM B35, forced ventilation</b>																	
100	<b>1PM6101</b> <b>1PM6105</b>		250 (9.84)	196 (7.72)	180 (7.09)	14 (0.55)	215 (8.46)	4 (0.16)	100 (3.94)	80 (3.15)	190 (7.48)	14 (0.55)	M32x1.5	117 (4.61)	122 (4.80)	<b>38</b> <b>(1.50)</b>	80 (3.15)
132	<b>1PM6133</b> <b>1PM6137</b> <b>1PM6138</b>		350 (13.78)	260 (10.24)	250 (9.84)	15 (0.59)	300 (11.81)	5 (0.20)	132 (5.20)	110 (4.33)	245 (9.65)	18 (0.71)	M40x1.5	132 (5.20)	152 (5.98)	<b>42</b> <b>(1.65)</b>	110 (4.33)

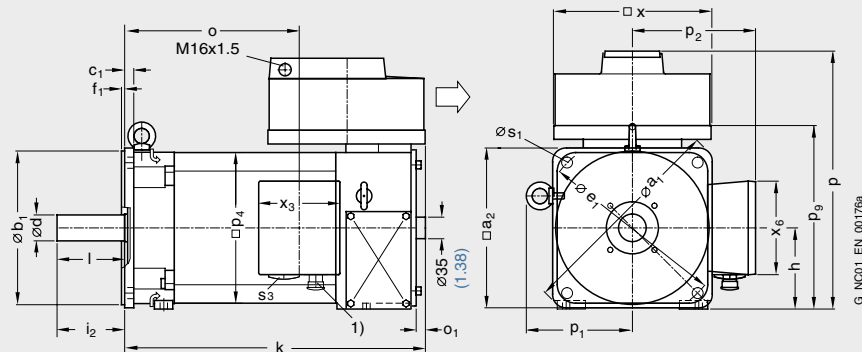
Motor		Dimensions in mm (in)									
Shaft height	Type	DIN IEC	k LB	k <sub>1</sub> -	k <sub>2</sub> -	o -	o <sub>1</sub> -	p HD	p <sub>3</sub> -	p <sub>9</sub> -	
<b>With axial fan</b>											
100	<b>1PM6101</b> <b>1PM6105</b>		614 (24.17) 719 (28.31)	337 (13.27) 442 (17.40)	160 (6.30)	198 (7.80) 304 (11.97)	10 (0.39)	259 (10.20)	195 (7.68)	236 (9.29)	
132	<b>1PM6133</b> <b>1PM6137</b> <b>1PM6138</b>		684 (26.93) 804 (31.65) 874 (34.41)	424 (16.69) 544 (21.42) 614 (24.17)	140 (5.51)	284 (11.18) 404 (15.91) 474 (18.66)	-2 (-0.08)	333 (13.11)	254 (10.00)	307 (12.09)	

1PM6 motor with axial fan



Motor		Dimensions in mm (in)								
Shaft height	Type	DIN IEC	k LB	o -	o <sub>1</sub> -	p HD	p <sub>1</sub> -	p <sub>2</sub> -	p <sub>9</sub> -	x -
<b>With radial fan</b>										
100	<b>1PM6101</b> <b>1PM6105</b>		389 (15.31) 494 (19.45)	199 (7.83) 304 (11.97)	20 (0.79)	331 (13.03)	133 (5.24)	159 (6.26)	231 (9.09)	190 (7.48)
132	<b>1PM6133</b> <b>1PM6137</b> <b>1PM6138</b>		490 (19.29) 610 (24.02) 680 (26.77)	285 (11.22) 405 (15.94) 475 (18.70)	15 (0.59)	420 (16.54)	172 (6.77)	201 (7.91)	302 (11.89)	256 (10.08)

1PM6 motor with radial fan



1) Signal connection

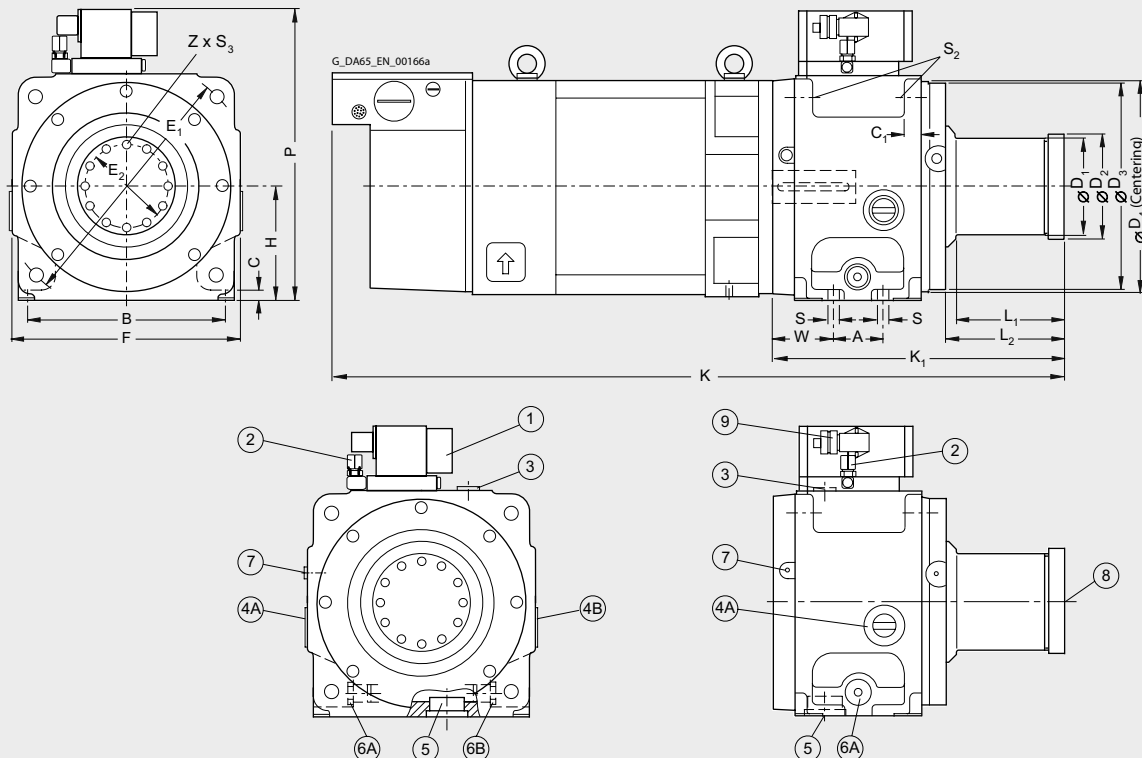
# Asynchronous motors

## Dimension drawings

### 1PH7 motors with two-speed gearbox Forced ventilation

For motor		Gearbox Dimensions in mm (in)												
Shaft height	Type	A	B	C	C <sub>1</sub>	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	E <sub>1</sub>	E <sub>2</sub>	F	H	
		<b>1PH7 with two-speed gearbox, type of construction IM B35, forced ventilation</b>												
100	1PH7101	55	184	12	18	100	100	188	190	215	80	208	<b>108</b>	
	1PH7103	(2.17)	(7.24)	(0.47)	(0.71)	(3.94)	(3.94)	(7.40)	(7.48)	(8.46)	(3.15)	(8.19)	<b>(4.25)</b>	
	1PH7105													
	1PH7107													
132	1PH7131	58	234	12	20	116	118	249	250	300	100	270	<b>136</b>	
	1PH7133	(2.28)	(9.21)	(0.47)	(0.79)	(4.57)	(4.65)	(9.80)	(9.84)	(11.81)	(3.94)	(10.63)	<b>(5.35)</b>	
	1PH7135													
	1PH7137													
160	1PH7163	58	290	17	20	140	130	249	250	350	100	326	<b>164</b>	
	1PH7167	(2.28)	(11.42)	(0.67)	(0.79)	(5.51)	(5.12)	(9.80)	(9.84)	(13.78)	(3.94)	(12.83)	<b>(6.46)</b>	
		Total length motor-gearbox												
Shaft height	Type	K <sub>1</sub>	L <sub>1</sub>	L <sub>2</sub>	P	S	S <sub>2</sub>	S <sub>3</sub>	Z	W	K			
100	1PH7101	298	–	116	301	14	14	M8	8	63	709			
	1PH7103	(11.73)		(4.57)	(11.85)	(0.55)	(0.55)			(2.48)	(27.91)			
	1PH7105										804			
	1PH7107										(31.65)			
132	1PH7131	346.5	129.5	142.5	346	14	18	M12	12	71	885			
	1PH7133	(13.64)	(5.10)	(5.61)	(13.62)	(0.55)	(0.71)			(2.80)	(34.84)			
	1PH7135										970			
	1PH7137										(38.19)			
160	1PH7163	346.5	–	142.5	402	14	18	M12	12	71	987			
	1PH7167	(13.64)		(5.61)	(15.83)	(0.55)	(0.71)			(2.80)	(38.86)			
												1024		
												(40.31)		

Dimensions for 1PH7184, 1PH7186 and 1PH7224 on request.



① Switching unit (lifting solenoid 24 V DC, 5 A).

② Ventilation valve.

③ Oil filling bolt.

④A Oil level inspection window or oil return for counterclockwise rotation and circulating-oil lubrication.

④B Oil level inspection window or oil return for clockwise rotation and circulating-oil lubrication.

⑤ Oil drain bolt for type of construction IM B35.

⑥A Oil inlet for clockwise rotation and circulating-oil lubrication.

⑥B Oil inlet for counterclockwise rotation and circulating-oil lubrication.

⑦ Oil inlet for type of construction IM V15 (must be connected).

⑧ Oil inlet for type of construction IM V36.

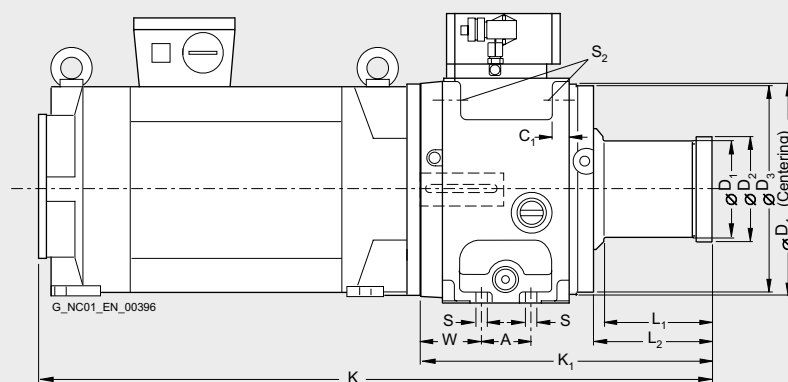
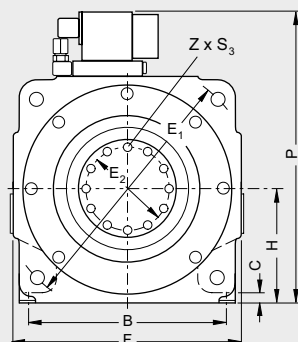
⑨ Connector, manufacture: Harting, type HAN 8 U.

# Asynchronous motors

## Dimension drawings

### 1PH4 motors with two-speed gearbox Forced ventilation

For motor		Gearbox Dimensions in mm (in)											
Shaft height	Type	A	B	C	C <sub>1</sub>	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	E <sub>1</sub>	E <sub>2</sub>	F	H
<b>1PH4 with two-speed gearbox, type of construction IM B35, forced ventilation</b>													
100	<b>1PH4103</b> <b>1PH4105</b> <b>1PH4107</b>	55 (2.17)	184 (7.24)	12 (0.47)	18 (0.71)	100 (3.94)	100 (3.94)	188 (7.40)	190 (7.48)	215 (8.46)	80 (3.15)	208 (8.19)	<b>108</b> <b>(4.25)</b>
132	<b>1PH4133</b> <b>1PH4135</b> <b>1PH4137</b> <b>1PH4138</b>	58 (2.28)	234 (9.21)	12 (0.47)	20 (0.79)	116 (4.57)	118 (4.65)	249 (9.80)	250 (9.84)	300 (11.81)	100 (3.94)	270 (10.63)	<b>136</b> <b>(5.35)</b>
160	<b>1PH4163</b> <b>1PH4167</b> <b>1PH4168</b>	58 (2.28)	290 (11.42)	17 (0.67)	20 (0.79)	140 (5.51)	130 (5.12)	249 (9.80)	250 (9.84)	350 (13.78)	100 (3.94)	326 (12.83)	<b>164</b> <b>(6.46)</b>
Motor		Gearbox Dimensions in mm (in)										Total length motor-gearbox	
Shaft height	Type	K <sub>1</sub>	L <sub>1</sub>	L <sub>2</sub>	P	S	S <sub>2</sub>	S <sub>3</sub>	Z	W	K		
100	<b>1PH4103</b> <b>1PH4105</b> <b>1PH4107</b>	298 (11.73)	–	116 (4.57)	301 (11.85)	14 (0.55)	14 (0.55)	M8	8	63 (2.48)	714 (28.11) 774 (30.47) 839 (33.03)		
132	<b>1PH4133</b> <b>1PH4135</b> <b>1PH4137</b> <b>1PH4138</b>	346.5 (13.64)	129.5 (5.10)	142.5 (5.61)	346 (13.62)	14 (0.55)	18 (0.71)	M12	12	71 (2.80)	805 (31.69) 875 (34.45) 925 (36.42) 960 (37.80)		
160	<b>1PH4163</b> <b>1PH4167</b> <b>1PH4168</b>	346.5 (13.64)	–	142.5 (5.61)	402 (15.83)	14 (0.55)	18 (0.71)	M12	12	71 (2.80)	938 (36.93) 993 (39.09) 1038 (40.87)		



## Measuring systems SIMODRIVE sensor



<b>8/2</b>	<b>Built-on optoelectronic rotary encoders</b>
8/2	Introduction
8/2	Incremental encoders
8/3	TTL (RS 422) incremental encoder
8/3	sin/cos 1 V <sub>pp</sub> incremental encoder
8/3	HTL incremental encoder
8/3	TTL (RS 422) double-track incremental encoder
8/6	Absolute encoders
8/7	SSI absolute encoder
8/7	EnDat absolute encoder
8/7	PROFIBUS DP absolute encoder
8/10	Mounting accessories

For products approved for Canada and U.S.A., see Appendix.

# Measuring systems SIMODRIVE sensor

## Built-on optoelectronic rotary encoders

### Introduction

### Incremental encoders

#### Overview



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

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

#### Application

A distinction is made between incremental and absolute measuring procedures:

- In the case of incremental encoders, the machine must travel to a reference point after each power-off state, as the position is not usually stored in the controller, and movements of the machine while the power is off are not recorded.
- Absolute encoders, on the other hand, also record these movements while the power is off and return the actual position with power On. Travel to a reference point is not necessary.

#### Design

All encoders are available in Synchro flange and supported flange joint versions. Encoders with a Synchro flange can be attached to the machine with 3 clamp straps or mounted with axial screws. The encoder is driven by means of a plug-in coupling or a spring disk coupling. Alternatively, pulleys can also be used.

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

For rotary encoders with cables, the cable length including the connector is 1 m (3.28 ft).

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

- One-time bending:  $\geq 20$  mm (0.79 in)
- Continuous bending:  $\geq 75$  mm (2.95 in)

#### Function



Incremental encoders deliver a defined number of electrical pulses per rotation, which represent the measurement of the traveled distance or angle.

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

The following output levels are available:

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

# Measuring systems SIMODRIVE sensor

## Built-on optoelectronic rotary encoders

### Incremental encoders

#### Technical specifications

Product name	TTL (RS 422) incremental encoder	sin/cos 1 V <sub>pp</sub> incremental encoder	HTL incremental encoder	TTL (RS 422) double-track incremental encoder
<b>Operating voltage V<sub>p</sub> on encoder</b>	5 V DC ± 10 % or 10 ... 30 V DC	5 V DC ± 10 %	10 ... 30 V DC	5 V DC ± 5 %
<b>Limit frequency, typical</b>	–	≥ 180 kHz (- 3 dB) ≥ 450 kHz (- 6 dB)	–	–
<b>Scanning frequency, max.</b>	300 kHz	–	300 kHz	Track 1: 160 kHz Track 2: 1 MHz
<b>No-load current consumption, max.</b>	150 mA	150 mA	150 mA	150 mA per track
<b>Signal level</b>	TTL (RS 422)	sinusoidal 1 V <sub>pp</sub>	V <sub>H</sub> ≥ 21 V at I <sub>H</sub> = 20 mA at 24 V V <sub>L</sub> ≤ 2.8 V at I <sub>L</sub> = 20 mA at 24 V	TTL (RS 422)
<b>Outputs protected against short-circuit to 0 V</b>	Yes	Yes	Yes	Yes
<b>Switching time (10 ... 90 %) (1 m (3.28 ft) cable and recommended input circuit)</b>	Rise/fall time t <sub>r</sub> /t <sub>f</sub> ≤ 50 ns	–	Rise/fall time t <sub>r</sub> /t <sub>f</sub> ≤ 200 ns	Rise/fall time t <sub>r</sub> /t <sub>f</sub> ≤ 100 ns
<b>Phase angle, signal A to B</b>	90°	90° ± 10°el.	90°	90°
Edge spacing, min. at				
• 1 MHz	–	–	–	Track 2: ≥ 0.125 μs
• 300 kHz	≥ 0.45 μs	–	≥ 0.45 μs	–
• 160 kHz	–	–	–	Track 1: ≥ 0.8 μs
<b>Cable length to downstream electronics<sup>1)</sup>, max.</b>	100 m (328 ft)	150 m (492 ft)	300 m (984 ft)	Up to 500 kHz: 100 m (328 ft) Up to 1 MHz: 50 m (164 ft)
<b>LED failure monitoring</b>	High-resistance driver	–	High-resistance driver	–
<b>Resolution, max.</b>	5 000 S/R	2 500 S/R	2 500 S/R	Track 1: 1 024 S/R Track 2: 9 000 S/R
<b>Accuracy (in angular seconds)</b>	± 18 mech. x 3 600/ number of signals/revolution z	± 18 mech. x 3 600/ number of signals/revolution z	± 18 mech. x 3 600/ number of signals/revolution z	Track 1: ± 63 Track 2: ± 12
<b>Speed, max.</b>				
• Electrical	(18 × 10 <sup>6</sup> rpm)/ number of signals/revolution	(27 × 10 <sup>6</sup> rpm)/ number of signals/revolution (at - 6 dB)	(18 × 10 <sup>6</sup> rpm)/ number of signals/revolution	Track 1: 9 000 rpm Track 2: 6 500 rpm
• Mechanical	12 000 rpm	12 000 rpm	12 000 rpm	12 000 rpm
<b>Friction torque (at 20 °C) (68 °F)</b>	≤ 0.01 Nm (0.08 lb <sub>f</sub> -in)	≤ 0.01 Nm (0.08 lb <sub>f</sub> -in)	≤ 0.01 Nm (0.08 lb <sub>f</sub> -in)	≤ 0.01 Nm (0.08 lb <sub>f</sub> -in)
<b>Starting torque (at 20 °C) (68 °F)</b>	≤ 0.01 Nm (0.08 lb <sub>f</sub> -in)	≤ 0.01 Nm (0.08 lb <sub>f</sub> -in)	≤ 0.01 Nm (0.08 lb <sub>f</sub> -in)	≤ 0.01 Nm (0.08 lb <sub>f</sub> -in)
<b>Shaft loading capacity</b>				
• n > 6 000 rpm				
- Axial	10 N (2.25 lb <sub>f</sub> )	10 N (2.25 lb <sub>f</sub> )	10 N (2.25 lb <sub>f</sub> )	–
- Radial at shaft extension	20 N (4.50 lb <sub>f</sub> )	20 N (4.50 lb <sub>f</sub> )	20 N (4.50 lb <sub>f</sub> )	–
• n ≤ 6 000 rpm				
- Axial	40 N (8.99 lb <sub>f</sub> )	40 N (8.99 lb <sub>f</sub> )	40 N (8.99 lb <sub>f</sub> )	10 N (2.25 lb <sub>f</sub> )
- Radial at shaft extension	60 N (13.5 lb <sub>f</sub> )	60 N (13.5 lb <sub>f</sub> )	60 N (13.5 lb <sub>f</sub> )	20 N (4.50 lb <sub>f</sub> )
<b>Angular acceleration, max.</b>	10 <sup>5</sup> rad/s <sup>2</sup>	10 <sup>5</sup> rad/s <sup>2</sup>	10 <sup>5</sup> rad/s <sup>2</sup>	10 <sup>5</sup> rad/s <sup>2</sup>
<b>Moment of inertia of rotor</b>	1.45 × 10 <sup>-6</sup> kgm <sup>2</sup> (12.8 × 10 <sup>-6</sup> lb <sub>f</sub> -in-s <sup>2</sup> )	1.45 × 10 <sup>-6</sup> kgm <sup>2</sup> (12.8 × 10 <sup>-6</sup> lb <sub>f</sub> -in-s <sup>2</sup> )	1.45 × 10 <sup>-6</sup> kgm <sup>2</sup> (12.8 × 10 <sup>-6</sup> lb <sub>f</sub> -in-s <sup>2</sup> )	20 × 10 <sup>-6</sup> kgm <sup>2</sup> (177 × 10 <sup>-6</sup> lb <sub>f</sub> -in-s <sup>2</sup> )
<b>Vibration (55 ... 2 000 Hz) to EN 60068-2-6</b>	≤ 300 m/s <sup>2</sup> (984 ft/s <sup>2</sup> )	≤ 300 m/s <sup>2</sup> (984 ft/s <sup>2</sup> )	≤ 300 m/s <sup>2</sup> (984 ft/s <sup>2</sup> )	≤ 100 m/s <sup>2</sup> (328 ft/s <sup>2</sup> )
<b>Shock to EN 60068-2-27</b>				
• 2 ms	≤ 2 000 m/s <sup>2</sup> (6 562 ft/s <sup>2</sup> )	≤ 2 000 m/s <sup>2</sup> (6 562 ft/s <sup>2</sup> )	≤ 2 000 m/s <sup>2</sup> (6 562 ft/s <sup>2</sup> )	–
• 6 ms	≤ 1 000 m/s <sup>2</sup> (3 281 ft/s <sup>2</sup> )	≤ 1 000 m/s <sup>2</sup> (3 281 ft/s <sup>2</sup> )	≤ 1 000 m/s <sup>2</sup> (3 281 ft/s <sup>2</sup> )	≤ 1 000 m/s <sup>2</sup> (3 281 ft/s <sup>2</sup> )

S/R = signals/revolution

<sup>1)</sup> With recommended cable and input circuitry of the downstream electronics, observe max. permissible cable length of module to be evaluated

# Measuring systems SIMODRIVE sensor

## Built-on optoelectronic rotary encoders

### Incremental encoders

#### Technical specifications (continued)

Product name	TTL (RS 422) incremental encoder	sin/cos 1 V <sub>pp</sub> incremental encoder	HTL incremental encoder	TTL (RS 422) double-track incremental encoder
<b>Ambient temperature</b>				
<u>Operation</u>				
• Flange outlet or fixed cable				
- At V <sub>p</sub> = 5 V ± 10 %	-40 ... +100 °C (-40 ... +212 °F)	-40 ... +100 °C (-40 ... +212 °F)	-40 ... +100 °C (-40 ... +212 °F)	-10 ... +70 °C (+14 ... +158 °F)
- At V <sub>p</sub> = 10 ... 30 V	-40 ... +70 °C (-40 ... +158 °F)	–	–	–
• Flexible cable				
- At V <sub>p</sub> = 5 V ± 10 %	-10 ... +100 °C (+14 ... +212 °F)	-10 ... +100 °C (+14 ... +212 °F)	-10 ... +100 °C (+14 ... +212 °F)	-10 ... +70 °C (+14 ... +158 °F)
- At V <sub>p</sub> = 10 ... 30 V	-10 ... +70 °C (+14 ... +158 °F)	–	–	–
<b>Degree of protection to EN 60529 (IEC 60529)</b>				
• Without shaft input	IP67	IP67	IP67	IP67
• With shaft input	IP64	IP64	IP64	IP64
<b>EMC</b>	Tested in accordance with the guidelines for electromagnetic compatibility 89/336/EEC and the regulations of the EMC guidelines (applicable basic standards)			
<b>Weight, approx.</b>	0.25 kg (0.55 lb)	0.25 kg (0.55 lb)	0.25 kg (0.55 lb)	0.7 kg (1.54 lb)
<b>CE mark</b>	Yes	Yes	Yes	Yes



# Measuring systems SIMODRIVE sensor

## Built-on optoelectronic rotary encoders

### Incremental encoders

#### Selection and ordering data

Designation	Order No.	Designation	Order No.
<b>TTL (RS 422) incremental encoder</b>		<b>sin/cos 1 V<sub>pp</sub> incremental encoder</b>	
Synchro flange and <u>5 V DC supply voltage</u>		Synchro flange and <u>5 V DC supply voltage</u>	
Connection:		Connection:	
• Axial flange outlet	<b>6FX2001-2G ■■■</b>	• Axial flange outlet	<b>6FX2001-3G ■■■</b>
• Radial flange outlet	<b>6FX2001-2E ■■■</b>	• Radial flange outlet	<b>6FX2001-3E ■■■</b>
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-2C ■■■</b>	• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-3C ■■■</b>
Synchro flange and <u>10 ... 30 V DC supply voltage</u>		Resolution	
Connection:		1 000 S/R	<b>B 0 0</b>
• Axial flange outlet	<b>6FX2001-2H ■■■</b>	1 024 S/R	<b>B 0 2</b>
• Radial flange outlet	<b>6FX2001-2F ■■■</b>	2 500 S/R	<b>C 5 0</b>
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-2D ■■■</b>		
<u>Supported flange joint and 5 V DC supply voltage</u>		<b>HTL incremental encoder</b>	
Connection:		Synchro flange and <u>10 ... 30 V DC supply voltage</u>	
• Axial flange outlet	<b>6FX2001-2R ■■■</b>	Connection:	
• Radial flange outlet	<b>6FX2001-2P ■■■</b>	• Axial flange outlet	<b>6FX2001-4H ■■ 0</b>
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-2M ■■■</b>	• Radial flange outlet	<b>6FX2001-4F ■■ 0</b>
<u>Supported flange joint and 10 ... 30 V DC supply voltage</u>		• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-4D ■■ 0</b>
Connection:		<u>Supported flange joint and 10 ... 30 V DC supply voltage</u>	
• Axial flange outlet	<b>6FX2001-2S ■■■</b>	Connection:	
• Radial flange outlet	<b>6FX2001-2Q ■■■</b>	• Axial flange outlet	<b>6FX2001-4S ■■ 0</b>
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-2N ■■■</b>	• Radial flange outlet	<b>6FX2001-4Q ■■ 0</b>
Resolution		• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-4N ■■ 0</b>
500 S/R	<b>A 5 0</b>	Resolution	
1 000 S/R	<b>B 0 0</b>	100 S/R	<b>A 1</b>
1 024 S/R	<b>B 0 2</b>	500 S/R	<b>A 5</b>
1 250 S/R	<b>B 2 5</b>	1 000 S/R	<b>B 0</b>
1 500 S/R	<b>B 5 0</b>	2 500 S/R	<b>C 5</b>
2 000 S/R	<b>C 0 0</b>		
2 048 S/R	<b>C 0 4</b>	<b>TTL (RS 422) double-track incremental encoder</b>	
2 500 S/R	<b>C 5 0</b>	Synchro flange and <u>5 V DC supply voltage</u>	
3 600 S/R	<b>D 6 0</b>	Connection:	
5 000 S/R	<b>F 0 0</b>	• Cable 1 m (3.28 ft) with axial connector 2 types of resolution: 9 000/1 024 S/R	<b>6FX2001-2UK00</b>

S/R = signals/revolution

<sup>1)</sup> Universal integrated cable outlet for axial and radial outlet direction.

# Measuring systems SIMODRIVE sensor

## Built-on optoelectronic rotary encoders

### Absolute encoders

#### Function

Absolute encoders (absolute shaft encoders) are designed on the same scanning principle as incremental encoders, but have a greater number of tracks. For example, if there are 13 tracks, then  $2^{13} = 8\,192$  steps are coded in the case of single-turn encoders. The code used is a one-step code (gray code), which prevents any scanning errors from occurring.

After switching on the machine, the position value is transmitted immediately to the controller. There is no need to travel to a reference point.

SSI and EnDat absolute encoders are of advantage in time-critical applications.

In plants with a large number of encoders, PROFIBUS DP is more of an advantage due to the reduced wiring overhead. PROFIBUS DP encoders are programmable and support isochronous mode with internode communication.

Single-turn encoders divide one rotation ( $360^\circ$  mechanical) into a specific number of steps, e.g. 8 192. A unique code word is assigned to each position. After  $360^\circ$  the position values are repeated.

Multi-turn encoders also record the number of revolutions, in addition to the absolute position within one revolution. To do this, further code discs which are coupled via gear steps with the encoder shaft are scanned. When evaluating 12 additional tracks, this means that  $2^{12} = 4\,096$  revolutions can be coded.



# Measuring systems SIMODRIVE sensor

## Built-on optoelectronic rotary encoders

### Absolute encoders

#### Technical specifications

Product name	SSI absolute encoder	EnDat absolute encoder	PROFIBUS DP absolute encoder (EN 50170)
<b>Operating voltage <math>V_p</math> on encoder</b>	10 ... 30 V DC	5 V DC $\pm$ 5%	10 ... 30 V DC
<b>Power consumption, approx.</b>			
• Single-turn	160 mA	160 mA	300 ... 100 mA (2.5 W)
• Multi-turn	200 mA	200 mA	300 ... 100 mA (2.5 W)
<b>Interface</b>	SSI	EnDat	PROFIBUS
<b>Clock input</b>	Differential cable receiver according to EIA standard RS 485	Differential cable receiver according to EIA standard RS 485	Differential cable receiver according to EIA standard RS 485
<b>Data output</b>	Differential cable driver according to EIA standard RS 485	Differential cable driver according to EIA standard RS 485	Differential cable driver according to EIA standard RS 485
<b>Short-circuit strength</b>	Yes	Yes	Yes
<b>Data transfer rate</b>	100 kHz ... 1 MHz	100 kHz ... 2 MHz	12 Mbit/s
<b>LED for diagnostics</b>	–	–	Yes (green/red)
<b>Speed, max.</b>			
• Electrical	–	–	–
- At $\pm$ 1 bit accuracy	5 000 rpm	5 000 rpm	5 800 rpm
- At $\pm$ 100 bit accuracy	10 000 rpm	10 000 rpm	–
• Mechanical			
- Single-turn	12 000 rpm	12 000 rpm	12 000 rpm
- Multi-turn	10 000 rpm	10 000 rpm	6 000 rpm
<b>Cable length to downstream electronics<sup>1)</sup>, max.</b>	Up to 1-MHz-cycle: 50 m (164 ft) Up to 300-kHz-cycle: 100 m (328 ft) Up to 100-kHz-cycle: 400 m (1 312 ft)	Up to 1-MHz-cycle: 50 m (164 ft) Up to 300-kHz-cycle: 150 m (492 ft)	Up to 12 Mbit/s: 100 m (328 ft) Up to 1.5 Mbit/s: 200 m (656 ft) Up to 93.75 kbit/s: 1 200 m (3 937 ft)
<b>Number of nodes</b>	–	–	99
<b>Connection</b>	Flange outlet, axial/radial	Flange outlet, axial/radial	Terminal block with address selector switch and bus terminating resistor in removable cover with 3 radial cable glands
<b>Cable diameter</b>	–	–	6.5 ... 9 mm (0.26 ... 0.35 in) Removal of cover possible without interrupting bus
<b>Resolution</b>			
• Single-turn	13 bit (8 192 steps)	13 bit (8 192 steps)	13 bit (8 192 steps)
• Multi-turn	25 bit (8 192 $\times$ 4 096 steps)	25 bit (8 192 $\times$ 4 096 steps)	27 bit (8 192 $\times$ 16 384 steps)
<b>Message frame length</b>			
• Single-turn	13 bit, without parity	According to EnDat specification	–
• Multi-turn	25 bit, without parity	According to EnDat specification	–
<b>Incremental track</b>	–	512 S/R, 1 $V_{pp}$	–
<b>Code type</b>			
• Sampling	Gray	Gray	Gray
• Transfer	Gray, fir tree format	Binary	Binary

<sup>1)</sup> Observe the maximum permissible cable length of the connected module.

# Measuring systems SIMODRIVE sensor

## Built-on optoelectronic rotary encoders

### Absolute encoders

#### Technical specifications (continued)

Product name	SSI absolute encoder	EnDat absolute encoder	PROFIBUS DP absolute encoder (EN 50170)
<b>Parameterization capability</b>			
• Resolution per revolution	–	–	Arbitrary 1 ... 8 192
• Total resolution	–	–	Arbitrary 1 ... 16 384
• Preset	Set to zero	–	Arbitrary
• Counting direction	Yes	–	Yes
• Speed signal	–	–	Yes
• Limit switches	–	–	Yes, 2
• Isochronous mode and internode communication acc. to DP V2	–	–	Yes
<b>Online parameterization</b>	–	–	Yes
<b>Network load, approx.</b>	–	–	20 µs per encoder at 12 Mbit/s
<b>Cycle time</b>	–	–	667 µs
<b>Accuracy</b>	± 60 angular seconds	± 60 angular seconds (incr. track)	± ½ LSB
<b>EMC</b>	Tested in accordance with EN 50081 and EN 50082	Tested in accordance with EN 50081 and EN 50082	Tested in accordance with EN 50081 and EN 50082
<b>Friction torque (at 20 °C) (68 °F)</b>	≤ 0.01 Nm (0.08 lb <sub>f</sub> -in)	≤ 0.01 Nm (0.08 lb <sub>f</sub> -in)	≤ 0.01 Nm (0.08 lb <sub>f</sub> -in)
<b>Starting torque (at 20 °C) (68 °F)</b>	≤ 0.01 Nm (0.08 lb <sub>f</sub> -in)	≤ 0.01 Nm (0.08 lb <sub>f</sub> -in)	≤ 0.01 Nm (0.08 lb <sub>f</sub> -in)
<b>Shaft loading capacity</b>			
• $n > 6\,000$ rpm			
- Axial	10 N (2.25 lb <sub>f</sub> )	10 N (2.25 lb <sub>f</sub> )	10 N (2.25 lb <sub>f</sub> )
- Radial at shaft extension	20 N (4.50 lb <sub>f</sub> )	20 N (4.50 lb <sub>f</sub> )	20 N (4.50 lb <sub>f</sub> )
• $n \leq 6\,000$ rpm			
- Axial	40 N (8.99 lb <sub>f</sub> )	40 N (8.99 lb <sub>f</sub> )	40 N (8.99 lb <sub>f</sub> )
- Radial at shaft extension	60 N (13.5 lb <sub>f</sub> )	60 N (13.5 lb <sub>f</sub> )	110 N (24.7 lb <sub>f</sub> )
<b>Angular acceleration, max.</b>	$10^5$ rad/s <sup>2</sup>	$10^5$ rad/s <sup>2</sup>	$10^5$ rad/s <sup>2</sup>
<b>Moment of inertia of rotor</b>			
• Solid shaft	$1.45 \times 10^{-6}$ kgm <sup>2</sup> ( $12.8 \times 10^{-6}$ lb <sub>f</sub> -in-s <sup>2</sup> )	$1.45 \times 10^{-6}$ kgm <sup>2</sup> ( $12.8 \times 10^{-6}$ lb <sub>f</sub> -in-s <sup>2</sup> )	$1.90 \times 10^{-6}$ kgm <sup>2</sup> ( $16.8 \times 10^{-6}$ lb <sub>f</sub> -in-s <sup>2</sup> )
• Hollow shaft	–	–	$2.80 \times 10^{-6}$ kgm <sup>2</sup> ( $24.8 \times 10^{-6}$ lb <sub>f</sub> -in-s <sup>2</sup> )
<b>Vibration (55 ... 2 000 Hz) to EN 60068-2-6</b>	≤ 300 m/s <sup>2</sup> (984 ft/s <sup>2</sup> )	≤ 300 m/s <sup>2</sup> (984 ft/s <sup>2</sup> )	≤ 100 m/s <sup>2</sup> (328 ft/s <sup>2</sup> )
<b>Shock to EN 60068-2-27</b>			
• 2 ms	≤ 2 000 m/s <sup>2</sup> (6 562 ft/s <sup>2</sup> )	≤ 2 000 m/s <sup>2</sup> (6 562 ft/s <sup>2</sup> )	≤ 2 000 m/s <sup>2</sup> (6 562 ft/s <sup>2</sup> )
• 6 ms	≤ 1 000 m/s <sup>2</sup> (3 281 ft/s <sup>2</sup> )	≤ 1 000 m/s <sup>2</sup> (3 281 ft/s <sup>2</sup> )	≤ 1 000 m/s <sup>2</sup> (3 281 ft/s <sup>2</sup> )
<b>Ambient temperature</b>			
• Operation	-40 ... +85 °C (-40 ... +185 °F)	-40 ... +100 °C (-40 ... +212 °F)	-40 ... +85 °C (-40 ... +185 °F)
<b>Degree of protection to EN 60529 (IEC 60529)</b>			
• Without shaft input	IP67	IP67	IP67
• With shaft input	IP64	IP64	IP64
<b>Weight, approx.</b>			
• Single-turn	0.35 kg (0.77 lb)	0.35 kg (0.77 lb)	0.5 kg (1.10 lb)
• Multi-turn	0.35 kg (0.77 lb)	0.35 kg (0.77 lb)	0.7 kg (1.54 lb)
<b>CE mark</b>	Yes	Yes	Yes
<b>PROFIBUS certificate</b>	–	–	Yes
<b>Supported profiles</b>	–	–	Class 1, Class 2

# Measuring systems SIMODRIVE sensor

## Built-on optoelectronic rotary encoders

**Absolute encoders**
**Selection and ordering data**

Designation	Order No.
<b>SSI absolute encoder</b>	
<u>Synchro flange and 10 ... 30 V DC supply voltage</u>	
Connection:	
• Axial flange outlet	<b>6FX2001-5HS ■■</b>
• Radial flange outlet	<b>6FX2001-5FS ■■</b>
<u>Supported flange joint and 10 ... 30 V DC supply voltage</u>	
Connection:	
• Axial flange outlet	<b>6FX2001-5SS ■■</b>
• Radial flange outlet	<b>6FX2001-5QS ■■</b>
<u>Resolution</u>	
• Single-turn 8 192 steps/revolution (13 bit)	<b>1 2</b>
• Multi-turn 8 192 steps/revolution, 4 096 revolutions (25 bit)	<b>2 4</b>
<b>EnDat absolute encoder</b>	
<u>Synchro flange and 5 V DC supply voltage</u>	
Connection:	
• Axial flange outlet	<b>6FX2001-5HE ■■</b>
• Radial flange outlet	<b>6FX2001-5FE ■■</b>
<u>Supported flange joint and 5 V DC supply voltage</u>	
Connection:	
• Axial flange outlet	<b>6FX2001-5SE ■■</b>
• Radial flange outlet	<b>6FX2001-5QE ■■</b>
<u>Resolution</u>	
• Single-turn 8 192 steps/revolution (13 bit)	<b>1 3</b>
• Multi-turn 8 192 steps/revolution, 4 096 revolutions (25 bit)	<b>2 5</b>

Designation	Order No.
<b>PROFIBUS DP absolute encoder (EN 50170)</b>	
<u>10 ... 30 V DC supply voltage</u>	
<u>Radial connection</u>	
• Synchro flange Solid shaft	<b>6FX2001-5FP ■■</b>
• Supported flange joint Solid shaft	<b>6FX2001-5QP ■■</b>
• Torque bracket Hollow shaft 8 mm/10 mm/12 mm/15 mm (0.31 in/0.39 in/0.47 in/0.59 in)	<b>6FX2001-5WP ■■</b>
<u>Resolution</u>	
• Single-turn 8 192 steps/revolution (13 bit)	<b>1 2</b>
• Multi-turn 8 192 steps/revolution, 16 384 revolutions (27 bit)	<b>2 4</b>
<b>User Manual</b>	<b>6SN1197-0AB10-0YP4</b>
For start-up and parameterization of PROFIBUS encoders Language: English/German	

**More information**

Designation	Order No.
<b>Decentralizing with PROFIBUS DP</b>	<b>ISBN3-89578-074-X</b>

# Measuring systems SIMODRIVE sensor

## Built-on optoelectronic rotary encoders

### Mounting accessories

#### Overview



#### Clamp straps/couplings

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

#### Mating connector

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

#### Replacement connector

A replacement connector is available for encoders with cable.

#### Selection and ordering data

Designation	Order No.
<b>Clamp strap</b> For double-track encoders and encoders with Synchro flange (3 units are required)	<b>6FX2001-7KP01</b>
<b>Spring disk coupling</b> Shaft diameter: <ul style="list-style-type: none"> <li>• 6 mm/6 mm (0.24 in/0.24 in)</li> <li>• 6 mm/5 mm (0.24 in/0.20 in)</li> </ul>	<b>6FX2001-7KF10</b> <b>6FX2001-7KF06</b>
<b>Plug-in coupling</b> Shaft diameter: <ul style="list-style-type: none"> <li>• 6 mm/6 mm (0.24 in/0.24 in)</li> <li>• 10 mm/10 mm (0.39 in/0.39 in)</li> </ul>	<b>6FX2001-7KS06</b> <b>6FX2001-7KS10</b>
<b>Mating connector for flange outlet or encoder connector with cap nut</b> (1 unit) Crimp version, socket contacts for cable diameters 5.5 ... 12 mm (0.22 ... 0.47 in) <ul style="list-style-type: none"> <li>• 12-pin, insulator with 12 socket contacts (1 unit) for TTL, sin/cos 1 V<sub>pp</sub>, HTL incremental encoders or and SSI absolute encoders</li> <li>• 17-pin, insulator with 17 socket contacts (1 unit) for EnDat absolute encoders</li> </ul>	<b>6FX2003-0SU12</b> <b>6FX2003-0SU17</b>
<b>Replacement connectors with external thread for encoders</b> (1 unit) <ul style="list-style-type: none"> <li>• 12-pin, insulator with 12 contact pins (1 unit) for RS 422, sin/cos 1 V<sub>pp</sub>, HTL incremental encoders and SSI absolute encoders</li> </ul>	<b>6FX2003-0SA12</b>

#### Technical specifications

Product name	Spring disk coupling	Plug-in coupling
<b>Transmission torque, max.</b>	0.8 Nm (2.88 oz <sub>f</sub> )	0.7 Nm (2.52 oz <sub>f</sub> )
<b>Shaft diameter</b>	6 mm (0.24 in) both ends or d <sub>1</sub> = 6 mm (0.24 in), d <sub>2</sub> = 5 mm (0.20 in)	6 mm (0.24 in) both ends or 10 mm (0.39 in) both ends
<b>Center offset of shafts, max.</b>	0.4 mm (0.02 in)	0.5 mm (0.02 in)
<b>Axial offset</b>	± 0.4 mm (0.02 in)	± 0.5 mm (0.02 in)
<b>Angular displacement of shafts, max.</b>	3°	1°
<b>Torsional rigidity</b>	150 Nm/rad (539.51 oz <sub>f</sub> /rad)	31 Nm/rad (111.5 oz <sub>f</sub> /rad)
<b>Lateral spring stiffness</b>	6 N/mm (1.35 lb <sub>f</sub> )	10 N/mm (2.25 lb <sub>f</sub> )
<b>Moment of inertia</b>	19 gcm <sup>2</sup> (168 x 10 <sup>-7</sup> lb <sub>f</sub> -in-s <sup>2</sup> )	20 gcm <sup>2</sup> (177 x 10 <sup>-7</sup> lb <sub>f</sub> -in-s <sup>2</sup> )
<b>Speed, max.</b>	12 000 rpm	12 000 rpm
<b>Ambient temperature</b>		
• Operation	-40 ... +150 °C (-40 ... +302 °F)	-40 ... +80 °C (-40 ... +176 °F)
<b>Weight, approx.</b>	16 g (0.56 oz)	20 g (0.71 oz)

# Converter system



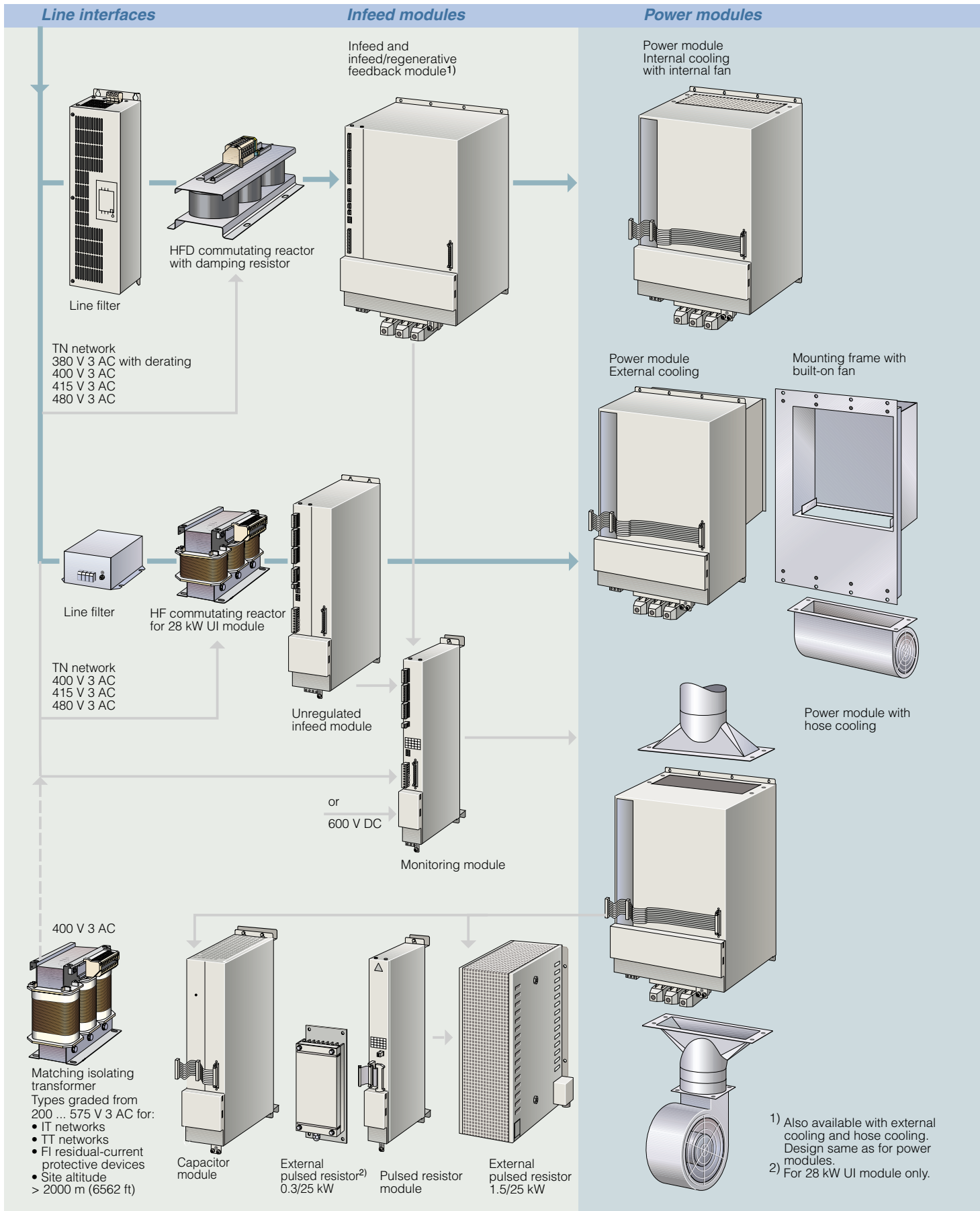
<b>9/2</b>	<b>SIMODRIVE 611</b>
9/2	Overview of the drive system
9/4	Introduction
9/7	SIMODRIVE 611 universal HRS closed-loop control
9/10	Startup box
9/10	Solution Partner: ROBOX – CANbus
9/11	High Standard/High Performance digital closed-loop control Safety Integrated
9/16	Closed-loop control with digital setpoint interface for HLA/ANA
9/18	Power modules
9/20	Infeed modules UI and I/R
9/23	Line filters
9/23	General
9/23	Line filters for UI modules
9/24	Wideband Line Filter with HFD components
9/27	Basic Line Filter
9/28	Monitoring module
9/28	Overvoltage limiter module
9/29	Pulsed resistor module
9/30	External pulsed resistors
9/31	Capacitor modules
9/32	Supplementary system components
9/37	Line interfaces for voltage matching
<b>9/40</b>	<b>Engineering software</b>
	Drive ES engineering software



For products approved for Canada and U.S.A., see Appendix.

# Converter system SIMODRIVE 611

## Overview of the drive system

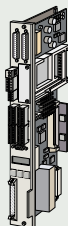


9



### Control units

#### Control units with analog setpoint interface/PROFIBUS



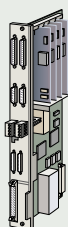
For 1FT6/1FT7/1FK7/1FN3/1FW6/1PH/2SP1/1FE1 motors and 1LA asynchronous motors

- Single-axis version with resolver only
- Two-axis version
  - For motor encoder
  - Resolver

Standard: analog setpoint interface

Option: PROFIBUS

#### Control units with digital setpoint interface



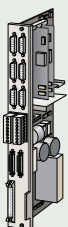
For 1FT6/1FT7/1FK7/1PH/1PM/2SP1/1FE1 motors

- Two-axis version with High Standard control
  - For motor encoder
  - Additional measuring system for voltage signals

For 1FT6/1FT7/1FK7/1FN3/1FW6/1PH/1PM/2SP1/1FE1 motors

- Single-axis version with High Performance control
  - For motor encoder
  - Additional measuring system for voltage signals

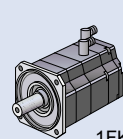
- Two-axis version with High Performance control
  - For motor encoder
  - Additional measuring system for voltage signals  
EnDat + SSI



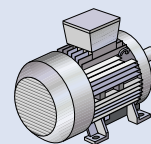
For hydraulic linear axes HLA/ANA

- Two-axis version

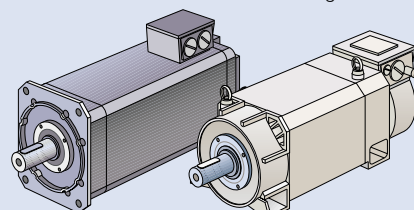
### Motors



1FK7

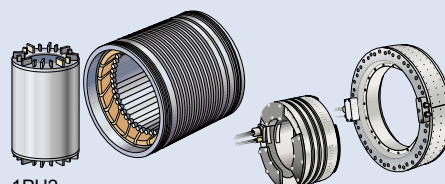


Asynchronous motor,  
e.g. 1LA

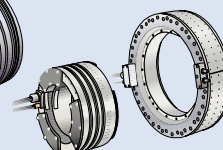


1PH4

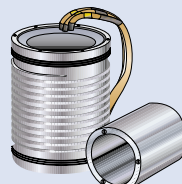
1PH7



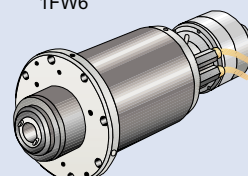
1PH2



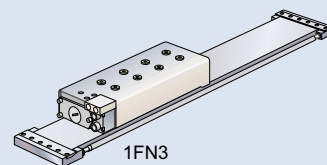
1FW6



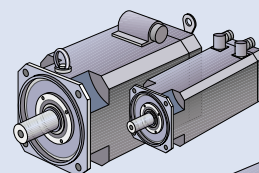
1FE1



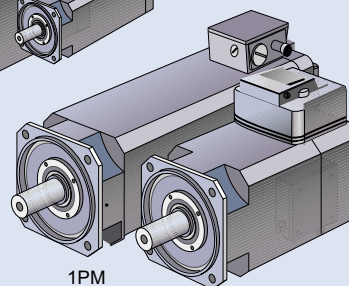
2SP1



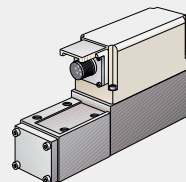
1FN3



1FT6



1PM



Servo solenoid valve for  
hydraulic linear axis  
(not part of standards package)

G\_NC01\_EN\_003086

# Converter system

## SIMODRIVE 611

### Introduction

#### Overview

##### Central drive systems with SIMODRIVE 611

Central drive systems offer a wide performance range based on a modular design. Various closed-loop control units make it possible to combine groups of drives to form a higher-level control system. The 2-axis modules enable space-saving module configurations.



SIMODRIVE 611 is a flexible, energy-saving configurable converter system that is designed to meet the economic and technical demands made on modern machines.

With SIMODRIVE 611, Siemens provides a converter system with digital closed-loop controls which meets the highest demands in terms of dynamic response, speed setting range, and smooth running characteristics.

The converter system's modular design makes it possible to configure drive systems with a virtually unlimited number of axes or main spindles.

The control units are inserted into the power modules.

The power modules are dependent on the power required by the motors. The infeed module is determined by the required DC link power.

The infeed module is used to connect a SIMODRIVE 611 system group to a low-voltage system with grounded neutral point (TN line supply).

All modules in the SIMODRIVE 611 converter system are of uniform modular design. The interfaces for power supply and communication, as well as the interfaces between control units and power modules, are standardized.

The SIMODRIVE 611 converter system is designed for operation in industrial environments in grounded TN-S and TN-C systems (VDE 0100, Part 300). For other network configurations, an upstream transformer with isolated windings must be used on the secondary side in a star connection with grounded neutral point (YN connection group). For voltage matching to other line supply voltages, matching transformers in economy circuit can be used for TN-S and TN-C systems. You can find transformer types matched to the SIMODRIVE 611 infeed modules under Line interfaces for voltage matching.

The line infeed modules contain a 6-pulse three-phase bridge connection (B6). Ensure that compatibility is maintained for operation on residual-current protective devices (EN 50178/VDE 0160 Section 5.2.11.2; Type B).

The line filters assigned to the 16 kW and 36 kW I/R modules will restrict the leakage currents to below 150 mA.

As an alternative, an isolating transformer with secondary-side YN connection must be used in conjunction with another protective measure (N connected to housing) against hazardous leakage currents to disconnect residual-current systems which do not achieve the compatibility required.

#### Note:

For satisfactory and reliable operation of the drive system, original components of the SIMODRIVE system and the original Siemens accessories as described in this catalog and in configuration manuals, functional descriptions or user manuals should be used.

The user must observe the configuring instructions.

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

If no original components are used, for example for repairs, approvals such as UL, EN, Safety Integrated, etc. can become invalid and thus the operation authorization for the machine with the non-Siemens components installed becomes invalid.

All of the 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 catalogs and configuration manuals.

The certificates are only valid if the products are used with the described system components, are installed according to the installation guidelines and are used for their intended purpose.

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

## Design

The SIMODRIVE 611 converter system consists of the following function modules:

- Control units adapted to the respective application technologies and motor types
- Power modules
- UI or I/R infeed modules
- Line filters: Line filters, Wideband Line Filters or Basic Line Filters
- HFD reactors with damping resistor
- Special modules and supplementary system components

The converter system is designed for installation in control cabinets which conform with the relevant standards for machine tool applications, in particular EN 60204.

Various cooling methods are available for the power-dependent line supply infeed and drive modules:

- Internal cooling
- External cooling
- Hose cooling for 300 mm wide modules

## Modules

Easy handling, simple assembly and wiring are among the main requirements to be fulfilled by the design of the converter modules. As a result of the consistent 50 mm mounting grid and the connection of power, signal and bus cables, it is possible to implement customer-focused solutions.

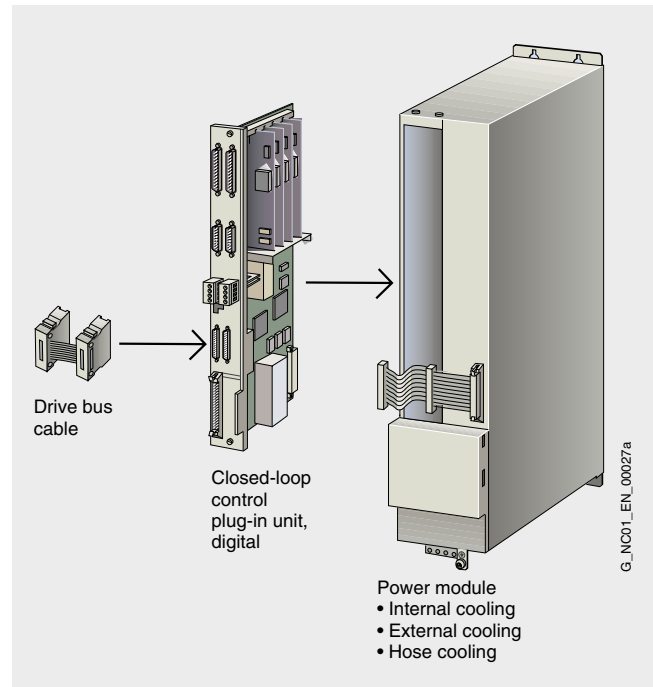
- **Width** of all modules in **50 mm (1.97 in) grid**
- **Height** of all modules is **480 mm (18.90 in)<sup>1)</sup>**
- **Depth** of the modules without connectors and optional mounted accessories referred to the mounting surface:
  - **288 mm (11.34 in)** with internal cooling or hose cooling
  - **231 mm (9.09 in)** with external cooling<sup>2)</sup>

The housings of the SIMODRIVE 611 converter system modules are enclosed and EMC-compatible as specified in EN 60529 (IEC 60529).

The electrical system is designed to conform to EN 50178 (VDE 0160) and EN 60204. CE Declarations of Conformity exist.

The requirements of the configuration manual must always be observed. Particular attention should be paid to the system characteristics and short-circuit rating.

The drive modules of the SIMODRIVE 611 drive converter system comprise the following components depending on the application: Power module, control unit, device bus cable and where relevant, a drive bus cable and option module. The drive modules are connected to the line infeed modules of the SIMODRIVE 611 converter system.



Design of the drive modules  
(here, a power module with internal cooling)

<sup>1)</sup> Including fixing lugs. The dimensions for ventilating air deflectors, shield connection plates, mounted fans and hose cooling are not included.

<sup>2)</sup> Without insertion depth of heat sink in the ventilation shaft.

# Converter system

## SIMODRIVE 611

### Introduction

#### Technical specifications

System performance data	SIMODRIVE 611
<b>Line connection</b>	380 V <sup>1)</sup> / 400 V/415 V 3 AC ± 10 % 480 V 3 AC - 10 % /+ 6 %
<b>Unregulated infeed</b>	5/10/28 kW (6.7/13.4/37.5 HP)
<b>Regulated infeed with feedback</b>	16/36/55/80/120 kW (21.5/48.3/73.8/107/161 HP)
<b>DC link voltage <math>V_{DC \text{ link}}</math></b>	
<ul style="list-style-type: none"> <li>• Unregulated           <ul style="list-style-type: none"> <li>- At 380 V<sup>1)</sup>/400 V/415 V 3 AC ± 10 %</li> <li>- At 480 V 3 AC - 10 % / + 6 %</li> </ul> </li> <li>• Regulated           <ul style="list-style-type: none"> <li>- At 380 V<sup>1)</sup>/400 V 3 AC</li> <li>- At 415 V 3 AC</li> </ul> </li> </ul>	435 V <sup>1)</sup> /490 ... 595 V/505 ... 616 V DC 580 ... 710 V DC
<b>Power modules</b>	Output voltage, max. 3 AC $V_{DC \text{ link}}/1.4$ up to 200 A
<b>Motors types that can be used<sup>2)</sup></b>	
<ul style="list-style-type: none"> <li>• Synchronous motor as feed drive</li> <li>• Asynchronous/synchronous motor as main spindle drive</li> <li>• Non-Siemens motors</li> </ul>	1FT6/1FT7/1FK7/1FN3/1FW6 1PH2/1PH4/1PH7/1PM4/1PM6/1FE1/2SP1 If these are suitable

#### More information

Designation	Order No.
<b>Configuration Manual SIMODRIVE 611 digital, Drive Converters</b>	
<ul style="list-style-type: none"> <li>• German</li> </ul>	<b>6SN1197-0AA00-1AP1</b>
<ul style="list-style-type: none"> <li>• English</li> </ul>	<b>6SN1197-0AA00-1BP1</b>
<ul style="list-style-type: none"> <li>• Italian</li> </ul>	<b>6SN1197-0AA00-1CP0</b>
<ul style="list-style-type: none"> <li>• French</li> </ul>	<b>6SN1197-0AA00-1DP0</b>
<ul style="list-style-type: none"> <li>• Spanish</li> </ul>	<b>6SN1197-0AA00-1EP0</b>

For further information, please refer to:

<http://support.automation.siemens.com/WW/view/en/10804940/133300>

<sup>1)</sup> With derating.

<sup>2)</sup> Incremental encoder sin/cos 1  $V_{pp}$  or absolute encoder, EnDat or resolver for SIMODRIVE 611 universal HRS.

#### Overview



#### Digital closed-loop control unit with analog setpoint interface or PROFIBUS DP SIMODRIVE 611 universal HRS

SIMODRIVE 611 universal HRS<sup>1)</sup> is a closed-loop control unit with analog speed setpoint interface and optional PROFIBUS DP interface. A version with integrated positioning functionality for motor frequencies up to 1 400 Hz is also available. They are suitable for:

- Synchronous motors: 1FT6/1FT7/1FK7/1FN3/1FW6/1FE1/2SP1
- Asynchronous motors: 1PH/1LA/2SP1 with/without encoder
- Non-Siemens motors suitable for converter operation

The control units SIMODRIVE 611 universal HRS can also be operated autonomously or with an external controller.

Both 1-axis and 2-axis control units can be extended with option modules, the 2-axis versions can also be used in the 1-axis power modules.

The following encoder evaluations are available for various control units:

- Resolver:
  - Resolution switchable 14/12 bit
  - 1 to 6 pairs of poles, operating frequency  $f_G$  max. up to 108 Hz/432 Hz,
  - internal pulse resolution 16 348/4 096 x number of pole pairs
- Incremental encoder with sin/cos  $1 V_{pp}$  signals up to 65 535 pulses/revolution,  $f_G$  max. up to 350 kHz, internal pulse multiplication 2 048 x pulses
- Linear scales with grid spacing in 1 nm steps up to 8 388 607 nm
- Absolute encoder with EnDat interface, same as encoder sin/cos  $1 V_{pp}$ , plus absolute position via EnDat protocol.
- TTL encoder for induction motors up to 420 kHz (no incremental shaft-angle encoder output)

#### Overview (continued)

##### Versions:

The drive can be commissioned using either a 7-segment display and keyboard on the module or using the SimoCom U commissioning tool for PCs under Windows Server 2003 SP1/XP. SimoCom U is also integrated in ADDM from Version 5.0 onwards (see ADDM Data Management) and in Drive ES Basic from Version 5.1 onwards.

Drive ES can be used to call the commissioning tool via PROFIBUS from the SIMATIC Manager, permitting data backup in the SIMATIC Manager (see Drive ES).

#### Function

##### Functions (per axis, selection):

- 2 analog inputs (14 bit)/outputs (8 bit)  $\pm 10 V$
- 4 digital inputs/outputs, programmable
- Incremental shaft-angle encoder interface (ISE), switch-selectable:
  - Output: incremental square wave or step signals, simulation of the motor encoder through differential quadrature signals A, B, R in accordance with RS 485, RS 422 (TTL). With sin/cos  $1 V_{pp}$  encoder and absolute encoder with EnDat: pulses = sin/cos for each revolution  
Pulse number can be multiplied 2:1, 1:1, 1:2, 1:4, 1:8  
With resolver: 1 024 pulses/pole pair  
Number of pulses for 12-bit setting can be multiplied 1:1, 1:2, 1:4, 1:8, 1:16, 1:32  
Number of pulses for 14-bit setting can be multiplied 4:1, 2:1, 1:1, 1:2, 1:4, 1:8
  - Input: incremental step setpoint  $X_{setp}$   
Quadrature signals, tracks A, B up to 2.5 MHz  
Pulse/directional signal up to 5 MHz  
Forward-reverse signal up to 5 MHz
- Direct, second measuring system on 2-axis module for axis A can be interfaced via axis B (the module can then be operated as single-axis module only).
  - Resolver, any number of poles
  - Incremental encoder sin/cos  $1 V_{pp}$ , 0 to 8 388 607 pulses/revolution
  - Linear scales with grid spacing in 1 nm steps up to 4 294 967 295 nm
  - Absolute encoder with EnDat interface
- RS 232/RS 485 interface for connecting PC/PG for commissioning with the SimoCom U startup tool
- Up to 4 motor data records per axis can be saved, star-delta changeover is possible
- Positioning for linear, modulo or rotary axis, jerk limitation; commands: POSITION, ENDLESS POS/NEG, WAIT, SET/RESET, GOTO, LIMIT STOP, LINK, block advance with: END, CONTINUE FLYING, CONTINUE WITH HOLD, CONTINUE EXTERNAL  
256 data records per axis can be stored as parameters. All records can be called up and edited via the PROFIBUS DP option. Direct transfer of positioning data is possible into an executing record (HMI).
- Using the terminal expansion option module, the records can also be called up BCD-coded.

<sup>1)</sup> HRS: High Resolution Speed

# Converter system

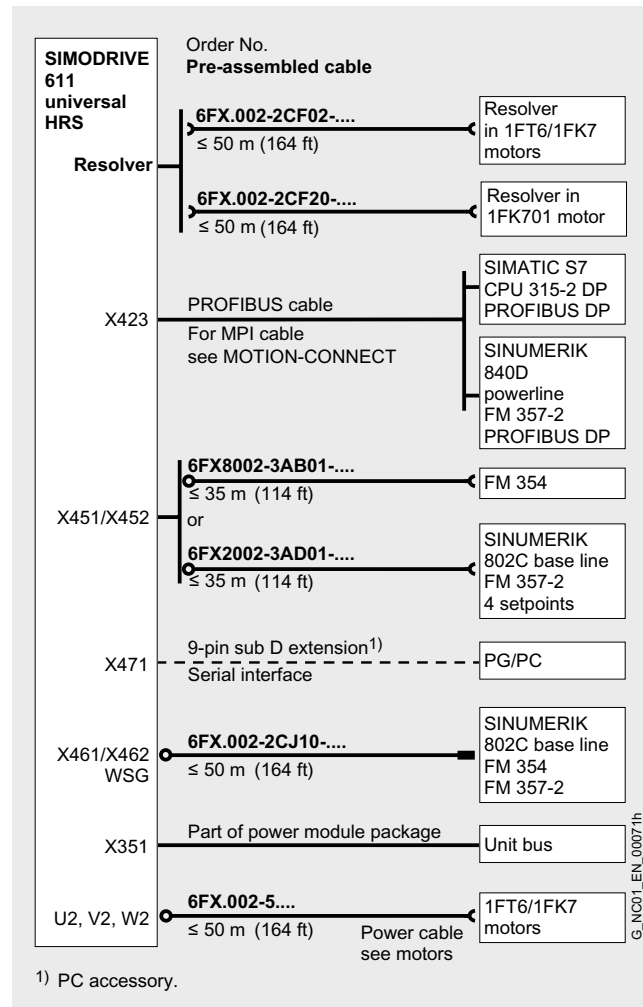
## SIMODRIVE 611

**SIMODRIVE 611 universal HRS**  
closed-loop control

### Selection and ordering data

Designation	Order No.
<b>SIMODRIVE 611 universal HRS</b>	
<ul style="list-style-type: none"> <li>Single-axis version Resolver, speed/torque setpoint</li> </ul>	<b>6SN1118-0NJ01-0AA1</b>
<ul style="list-style-type: none"> <li>Single-axis version Resolver, speed/torque setpoint, positioning</li> </ul>	<b>6SN1118-1NJ01-0AA1</b>
<ul style="list-style-type: none"> <li>2-axis version Resolver, speed/torque setpoint</li> </ul>	<b>6SN1118-0NK01-0AA1</b>
<ul style="list-style-type: none"> <li>2-axis version Resolver, speed/torque setpoint, positioning</li> </ul>	<b>6SN1118-1NK01-0AA1</b>
<ul style="list-style-type: none"> <li>2-axis version Incremental encoder sin/cos 1 <math>V_{pp}</math>/ absolute encoder velocity/speed/torque setpoint</li> </ul>	<b>6SN1118-0NH01-0AA1</b>
<ul style="list-style-type: none"> <li>2-axis version Incremental encoder sin/cos 1 <math>V_{pp}</math>/absolute encoder, velocity/speed/torque setpoint, positioning</li> </ul>	<b>6SN1118-1NH01-0AA1</b>
<b>Option module</b>	<b>6SN1114-0NA00-0AA0</b>
<b>Terminal expansion<sup>1)</sup></b>	
8 digital inputs/8 digital outputs 24 V, in total max. 480 mA parameterizable	
<b>Option module</b>	<b>6SN1114-0NB00-0AA2</b>
<b>PROFIBUS DP<sup>1)</sup></b>	
Standard slave for up to 2 axes (V1) for cyclic and acyclic data exchange up to 12 Mbit/s	
<b>Option module</b>	<b>6SN1114-0NB01-0AA1</b>
<b>Motion Control with</b>	
<b>PROFIBUS DP<sup>1)</sup></b>	
Isochronous standard slave (V1 and V2) for max. 2 axes, cyclic and acyclic data exchange up to 12 Mbit/s	
<b>SimoCom U/611 universal</b>	<b>6SN1153-2NX21-2AG0</b>
<b>toolbox</b>	
Parameterizing, commissioning and testing tool on CD-ROM Languages: English, French, German, Italian, Spanish Previous and current software version	
<b>Startup box</b>	<b>9AK1014-1AA00</b>
Service tool for commissioning with switches, analog setpoint source with potentiometers and digital setpoint display	

### Integration



Connection overview for SIMODRIVE 611 universal HRS, resolver

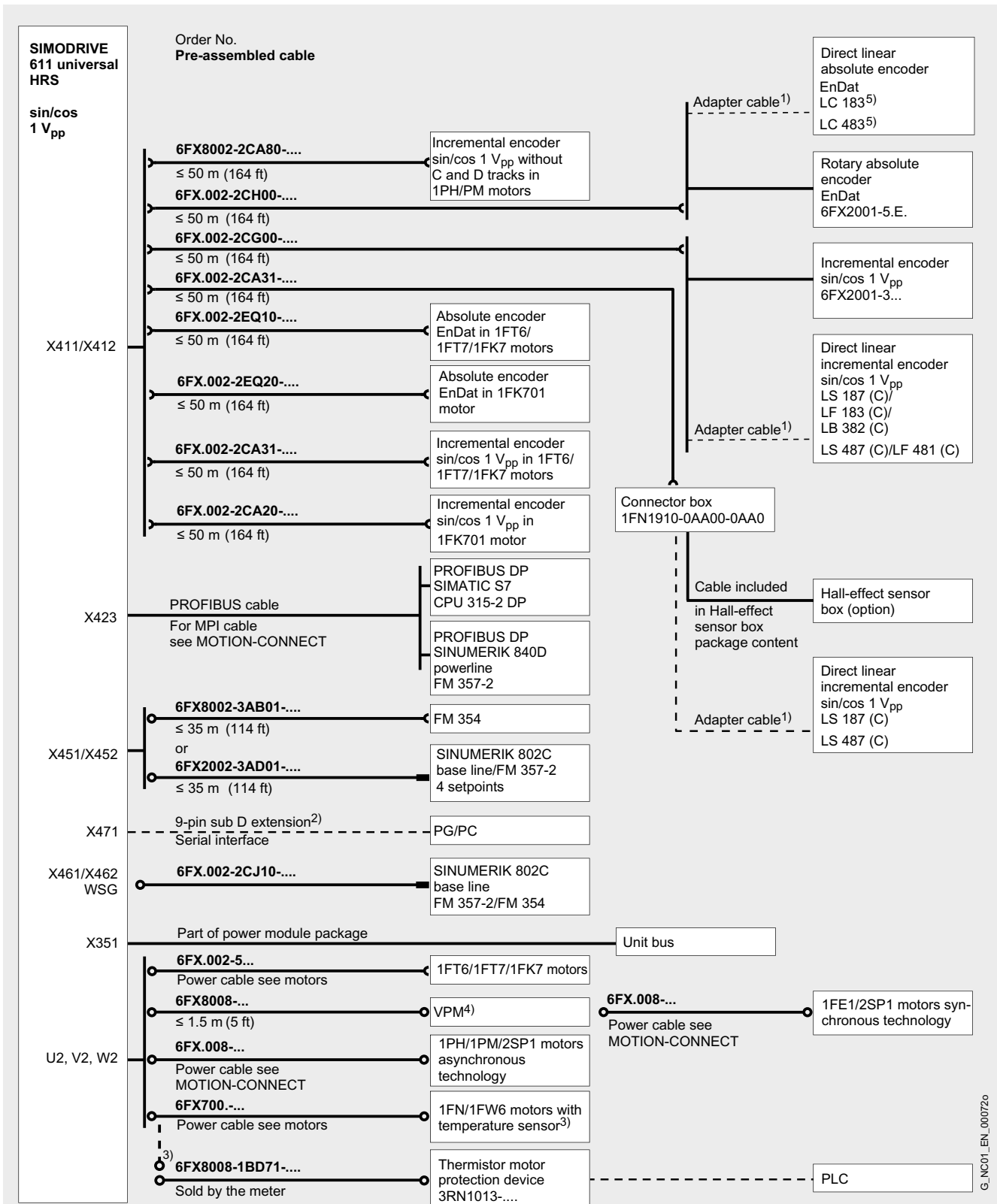
Shield connection plates or the shield connection are required to attach the power cable shields, as well as the electronics cables, e.g. incremental shaft-angle encoder.

Information about the application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

<sup>1)</sup> Only one option module can be plugged in.

# Converter system SIMODRIVE 611

SIMODRIVE 611 universal HRS  
closed-loop control



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

2) PC accessory.

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

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

5) For SINUMERIK 810D powerline with NC software version 06.05.36 or higher  
For SINUMERIK 840D powerline with NC software version 07.04.08 or higher

G\_NC01\_EN\_000720

# Converter system

## SIMODRIVE 611

**SIMODRIVE 611 universal HRS  
closed-loop control – Startup box**

### Overview



The startup box is a support device for starting up SIMODRIVE 611 universal HRS controllers.

The startup box can be connected to the control unit. An internal circuit is used to convert the 24 V DC auxiliary power supply value of the converter into an analog setpoint. The analog setpoint can be adjusted and is displayed via a five-digit LCD.

### Benefits

- Analog setting of setpoints:
  - Coarse and fine setting via two potentiometers in the ratio 1:10
  - Polarity selector switch for normal and inverse setpoint polarity
  - Potentiometer for analog offset value with autonomous On/Off switch
  - On/Off switch for setting analog setpoints
- The analog setpoint is completely decoupled and well-protected from polarity reversal within the operating voltage range.
- The analog output signal of the control terminal strip is wired to the 2 mm test sockets in the startup box.
- 6 Off switches for digital enable signals, with green LEDs
- 4 red LEDs for displaying digital output signals

### Technical specifications

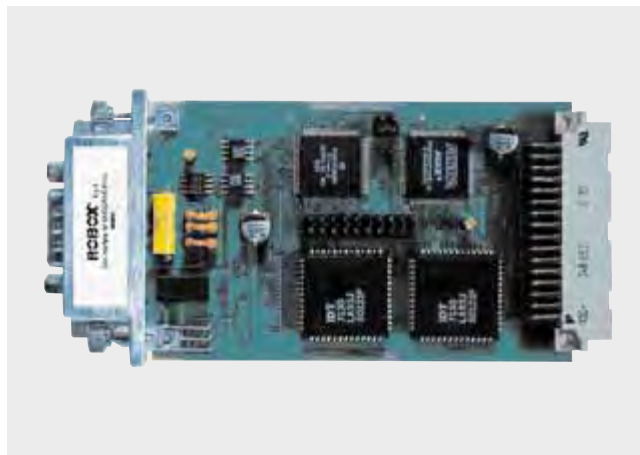
<b>Order No.</b>	<b>9AK1014-1AA00</b>
<b>Product name</b>	Startup box for SIMODRIVE 611 universal HRS
<b>Power supply</b>	24 V DC via terminal X101
<b>Voltage range, analog setpoint</b>	0 ... 12.5 V/10 mA
<b>Dimensions</b>	
• Length	175 mm (6.89 in)
• Width	90 mm (3.54 in)
• Height	45 mm (1.77 in)
<b>Length of signal cable</b>	1.3 m (4.27 ft)

### Selection and ordering data

Designation	Order No.
<b>Startup box</b>	<b>9AK1014-1AA00</b>
For SIMODRIVE 611 universal HRS	

**SIMODRIVE 611 universal HRS closed-loop  
control – Solution Partner ROBOX – CANbus**

### Overview



### ROBOX – CANopen interface for SIMODRIVE 611 universal HRS

ROBOX has developed an interface module, which allows the connection of the SIMODRIVE 611 universal HRS (single or double axis version) to a CANbus fieldbus with CANopen protocol.

#### Properties:

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

CANopen profiles handling is as follows:

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

### More information

Please contact:

#### ROBOX S.p.A.

Contact Engineering: Mr. Enea Brunella  
Via Sempione, 82  
28053 Castelletto Ticino (NO)  
Italy

Phone: +39 0331 914043  
E-mail: support@robox.it

#### Siemens S.p.A.

Contact Marketing/Sales: Mr. Luigi Crippa

Phone: +39 (02) 243-62927  
Fax: +39 (02) 243-62971



### Overview



The High Standard/High Performance control units can be universally implemented as feed or main spindle drives. They are available for the following motors:

- Synchronous motors: 1FT6/1FT7/1FK7/1FN3/1FW6/1FE1/2SP1
- Asynchronous motors: 1PH/1PM/2SP1

### Function

The High Standard/High Performance control units evaluate encoders with:

- sin/cos  $1 V_{pp}$  and absolute values with EnDat interface (pulse multiplication 128/2 048). Encoder pulse numbers up to 65 535 pulses/revolution can be parameterized.
- Linear scales with grid spacing in 1 nm steps up to 8 388 607 nm

One version can be additionally equipped with a direct measuring system (DMS) with the direct position sensing function. The DMS is required for the SINUMERIK Safety Integrated function. Some SSI encoders can be evaluated. An interference suppressor filter is required for the encoder power supply (see Supplementary system components). Restrictions apply with regard to EMC.

The drive software with the control algorithms is stored in the SINUMERIK 810D powerline/840D powerline. Each time the control and drives are energized, the software is loaded into the digital control units.

Two-axis modules can be used in a single-axis power unit.

### Function (continued)

#### Functions (selection):

- Encoder evaluation for incremental encoder sin/cos  $1 V_{pp}$  and absolute encoder with EnDat for motor encoder and direct measuring system
- Dynamic measuring circuit switchover between motor encoder measuring system and direct measuring system
- Synchronous axes (gantry)
- Travel to fixed stop for axis and spindle
- Variable incremental weighting for 8 gear speeds
- C-axis operation with one encoder
- Torque pre-control
- Weight counterbalance
- Measurement on-the-fly
- Main spindle oscillation via PLC
- Operation of asynchronous motors without encoders in field-oriented control
- Four selectable data sets for asynchronous and synchronous motors
- Brake management depending on controller enable or pulse disable
- Positive feedback sensing, plausibility check for the encoder signals
- Electrically controlled stopping in the event of an encoder fault
- Advanced Position Control APC, highly dynamic positioning
- Safety Integrated with internal pulse suppression via drive bus
- Mixed operation of various motors on one 2-axis control unit.

The available functions depend on the drive software version in the SINUMERIK 810D powerline/840D powerline.

Operation of the High Standard/High Performance controls requires CNC software higher than 06.04 09, as well as HMI software higher than 06.02.

This software supports:

- Mixed operation with older modules in the same drive group
- Startup of the modules using HMI or the startup tool SinuCom NC.

# Converter system

## SIMODRIVE 611

High Standard/High Performance digital closed-loop control – Safety Integrated

### Function (continued)

Control unit with	High Standard control	High Performance control
<b>Output frequency, max.</b>	600 Hz	1 400 Hz
<b>Encoder limit frequencies incremental encoder sin/cos 1 V<sub>pp</sub></b>	200 kHz	350 kHz <sup>1)</sup>
<b>Pulse multiplication</b>	128	2 048
<b>Cable length, max.</b>	50 m (164 ft)	50 m (164 ft) <sup>1)</sup>
<b>1FT6/1FT7/1FK7 feed motors</b>	✓	✓
<b>1FN3 linear motors</b>	–	✓
<b>1FW6 torque motors</b>	–	✓
<b>1PM/1PH7/1FE1 main spindle motors</b>	✓	✓
<b>2SP1 built-in spindle motors</b>	✓	✓
<b>Smooth running</b>		
• 1-axis version	0.2 µm	0.1 µm
• 2-axis version	1.5 µm	0.1 µm
<b>Applications</b>	Standard production machines	Microfinishing and dynamic high-performance machines

### Selection and ordering data

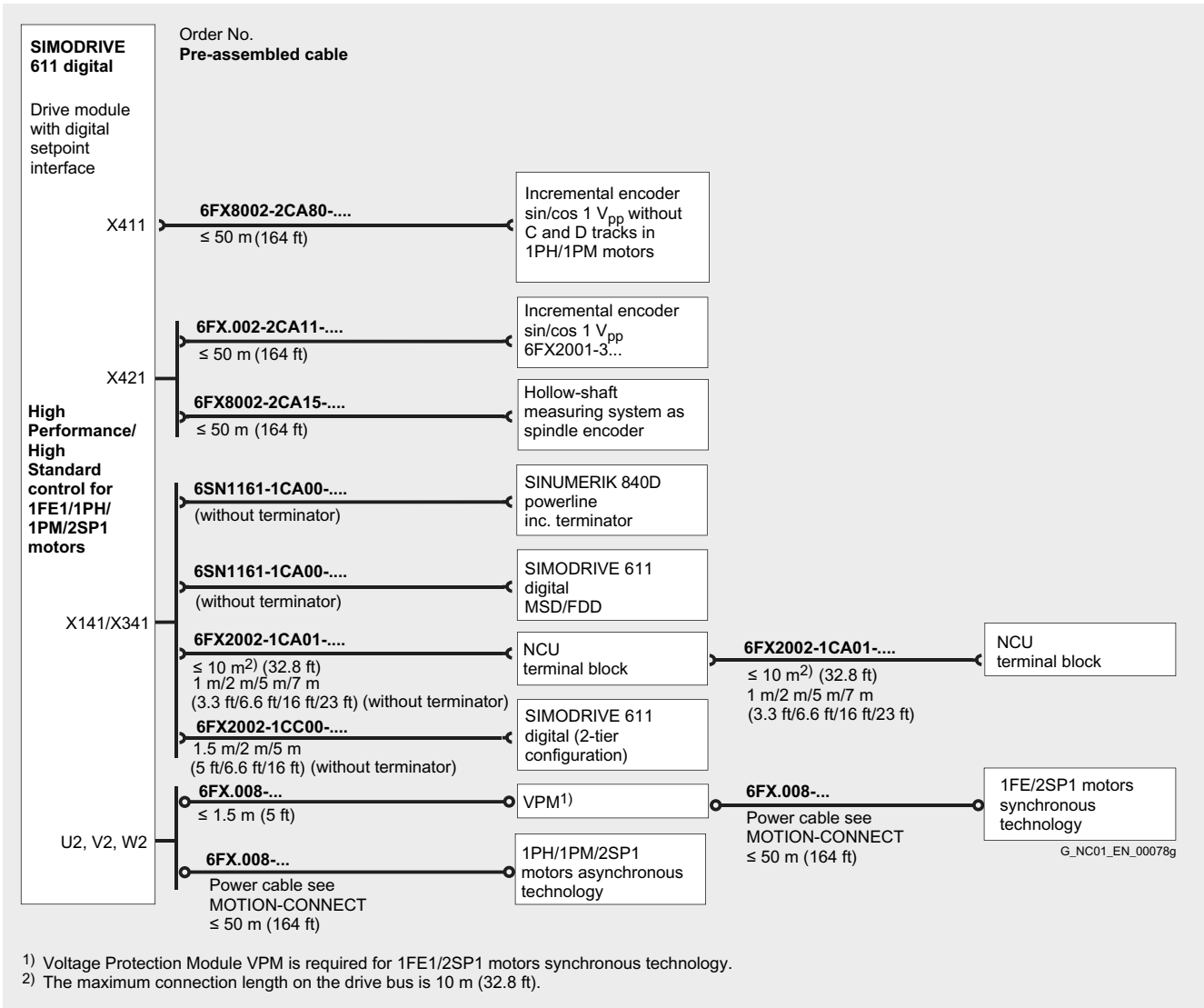
Designation	Order No.
<b>High Standard control, 2-axis version</b> Control unit with digital setpoint interface for 1FT6/1FT7/1FK7/1FE1/2SP1/1PH/1PM motors	6SN1118-0DM3-0AA2
<b>High Performance control, 1-axis version</b> Control unit with digital setpoint interface for 1FT6/1FT7/1FK7/1FN3/1FE1/2SP1/1PH/1PM/1FW6 motors	6SN1118-0DJ2-0AA2
<b>High Performance control, 2-axis version</b> Control unit with digital setpoint interface for 1FT6/1FT7/1FK7/1FN3/1FE1/2SP1/1PH/1PM/1FW6 motors	6SN1118-0DK2-0AA2
<ul style="list-style-type: none"> <li>• For motor encoder without direct measuring system Incremental encoder sin/cos 1 V<sub>pp</sub> or absolute encoder with EnDat</li> </ul>	1
<ul style="list-style-type: none"> <li>• For motor encoder with direct measuring system<sup>2)</sup> Incremental encoder sin/cos 1 V<sub>pp</sub> or absolute encoder with EnDat</li> </ul>	3

9

<sup>1)</sup> 420 kHz with boundary conditions, see Configuration Manual SIMODRIVE 611 digital, Drive Converters.

<sup>2)</sup> Suitable for SINUMERIK Safety Integrated.

## Integration



Connection overview for High Performance/High Standard control for 1FE1/1PH/1PM/2SP1 motors

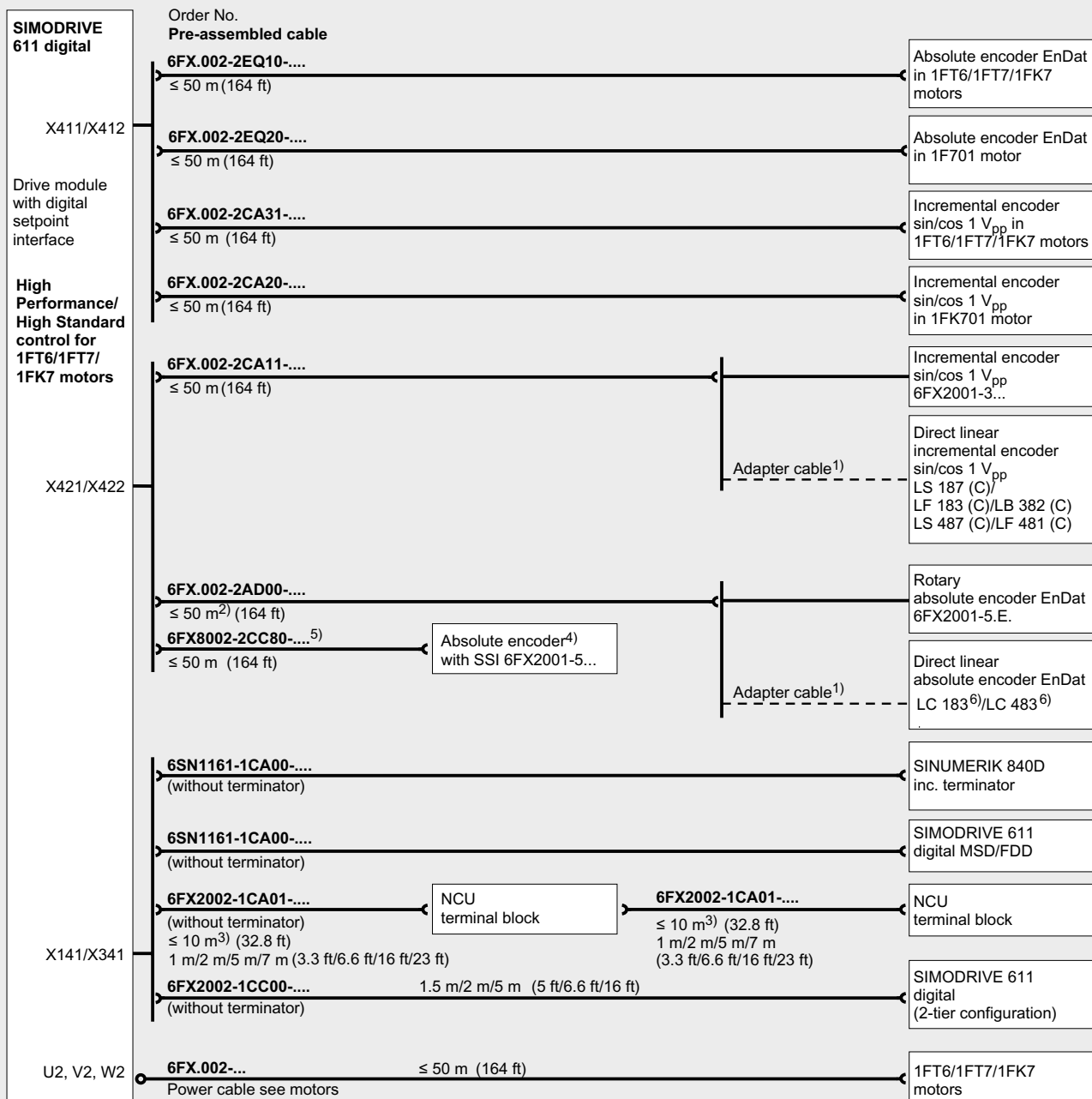
Information about the application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

# Converter system

## SIMODRIVE 611

High Standard/High Performance digital closed-loop control – Safety Integrated

### Integration (continued)



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

2) Less the length of the adapter cable.

3) The maximum connection length on the drive bus is 10 m (32.8 ft).

4) The power supply of the SSI encoders must be connected to the 24 V supply via the filter (Order No. 6SN1161-1DA00-0AA0). The filter must be mounted on the power module of the associated closed-loop control module. Other filters are not permissible.

5) Restrictions do apply with regard to the EMC.

6) For SINUMERIK 810D powerline with NC software version 06.05.36 or higher.

For SINUMERIK 840D powerline with NC software version 07.04.08 or higher.

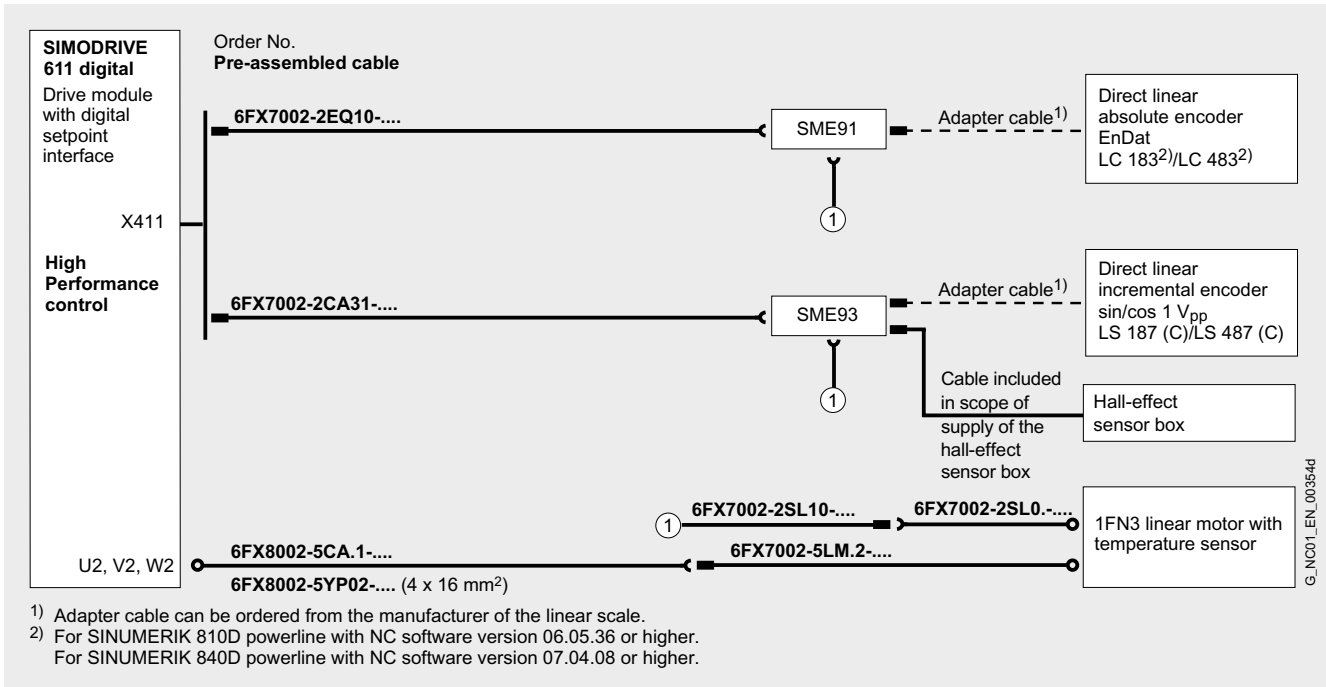
Connection overview for High Performance/High Standard control for 1FT6/1FT7/1FK7 motors

Information about the application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

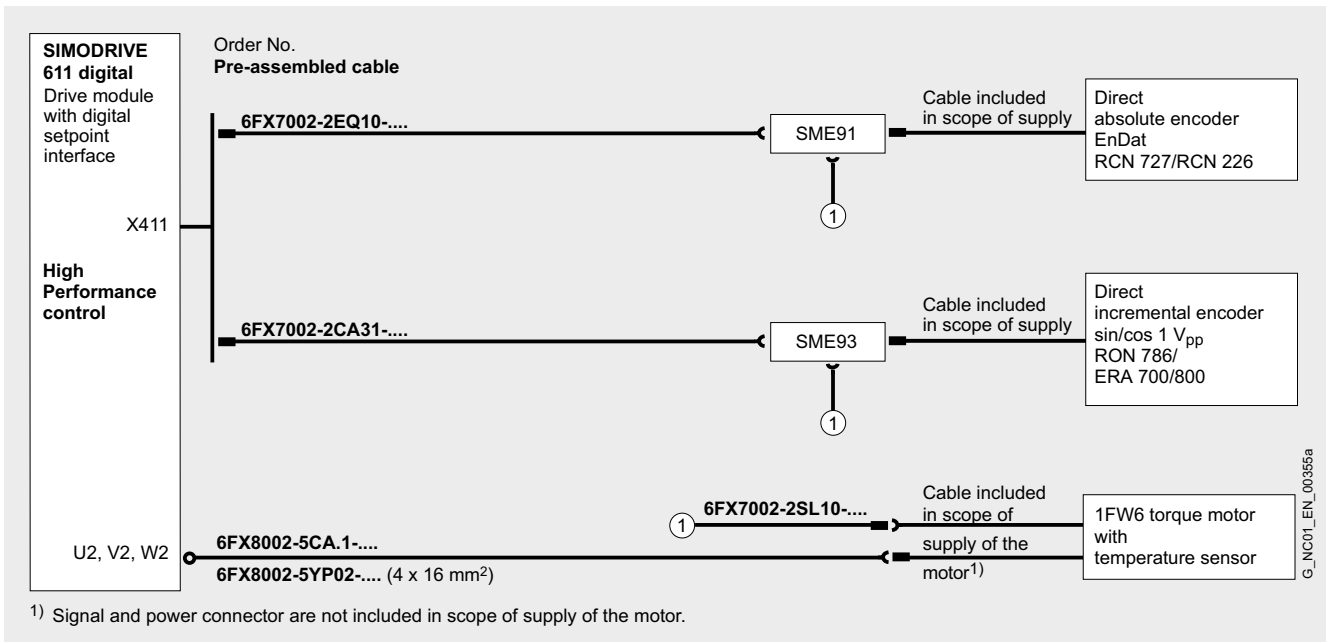
# Converter system SIMODRIVE 611

High Standard/High Performance digital closed-loop control – Safety Integrated

## Integration (continued)



Connection overview for High Performance control for 1FN3 linear motors, peak load/continuous load version  
Power and signals are connected using separate cables.



Connection overview for High Performance control for 1FW6 torque motors

Information about the application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

# Converter system

## SIMODRIVE 611

Closed-loop control with digital setpoint interface for HLA/ANA

### Overview



#### Closed-loop control unit with digital setpoint interface for hydraulic linear drives HLA/analog drives ANA

The two-axis control unit includes the selectable HLA and ANA functions. An HLA and an ANA axis can be operated together on a control unit.

The HLA/ANA control unit is installed in the universal empty housing (see supplementary system components) and can therefore be integrated in the SIMODRIVE 611 drive group.

#### Hydraulic linear drive HLA

The digital control unit SIMODRIVE 611 HLA is designed to energize and control (closed-loop) electro-hydraulic control valves in hydraulic linear axes in conjunction with SINUMERIK 840D powerline. Up to 2 hydraulic axes can be controlled. The HLA module can be used several times in the SIMODRIVE 611 digital drive group.

The HLA control unit contains the closed-loop control structures for an electro-hydraulic control circuit with high dynamic performance characteristics. The HLA control unit generates the power supply for the servo solenoid valves and the shutoff valves from an external DC voltage supply (e.g. SITOP power, see Configuration Manual) with a rated voltage of 26.5 V.

The pure hydraulic components, designed for CNC operation, are to be provided by the user.

#### Analog axis ANA

Analog axes with a speed setpoint interface  $\pm 10$  V can be implemented using the HLA control unit. In this case, the corresponding axis must be selected via the drive bus configuration with ANA. In the coarse structure, the closed-loop control then operates as digital/analog converter for the setpoint and communicates the position information from the encoder to the position controller in the SINUMERIK 840D powerline via the drive bus.

An analog axis can be essentially used the same as a digital axis. It can be programmed just like a digital, interpolating path axis or spindle.

### Function

#### Functions of the hydraulic linear axes (selection):

- Matching of differing dynamic characteristics of the axes in interpolating drive groups
- Four manipulated variable filters can be parameterized as low-pass or band-pass filters
- Compensation of non-linear effects of the servo solenoid valves and cylinders (static friction effects, surface adjustment of cylinder)
- Linearization of the flow characteristic for feed and rapid traverse (valve characteristic)
- Force limitations for
  - Processing of force profiles in material reforming
  - "Travel to fixed stop" function
- Specification of the flowrate setpoint for the valve amplifier on the basis of an analog  $\pm 10$  V interface
- The digital drive bus is the control and communications interface to the SINUMERIK 840D powerline
- Same method of operation as for the digital electromotive axes using menu-assisted drive parameterization, selection of standard data records for servo solenoid valves and input of linear cylinder data in structured data screen forms
- Evaluation of following encoders:
  - Incremental encoder  $\sin/\cos 1 V_{pp}$
  - Absolute encoder EnDat
  - Absolute encoder SSI
 An interference suppression filter (see Supplementary system components) is required for the encoder power supply (for the boundary conditions for SSI, see the configuring instructions).
- Interfaces for one shutoff valve and two pressure sensors per axis
- One BERO input per axis
- Monitoring functions for the external valve power supply, hydraulic system pressure, valve spool encoder, etc.

#### Functions of the analog axes (selection):

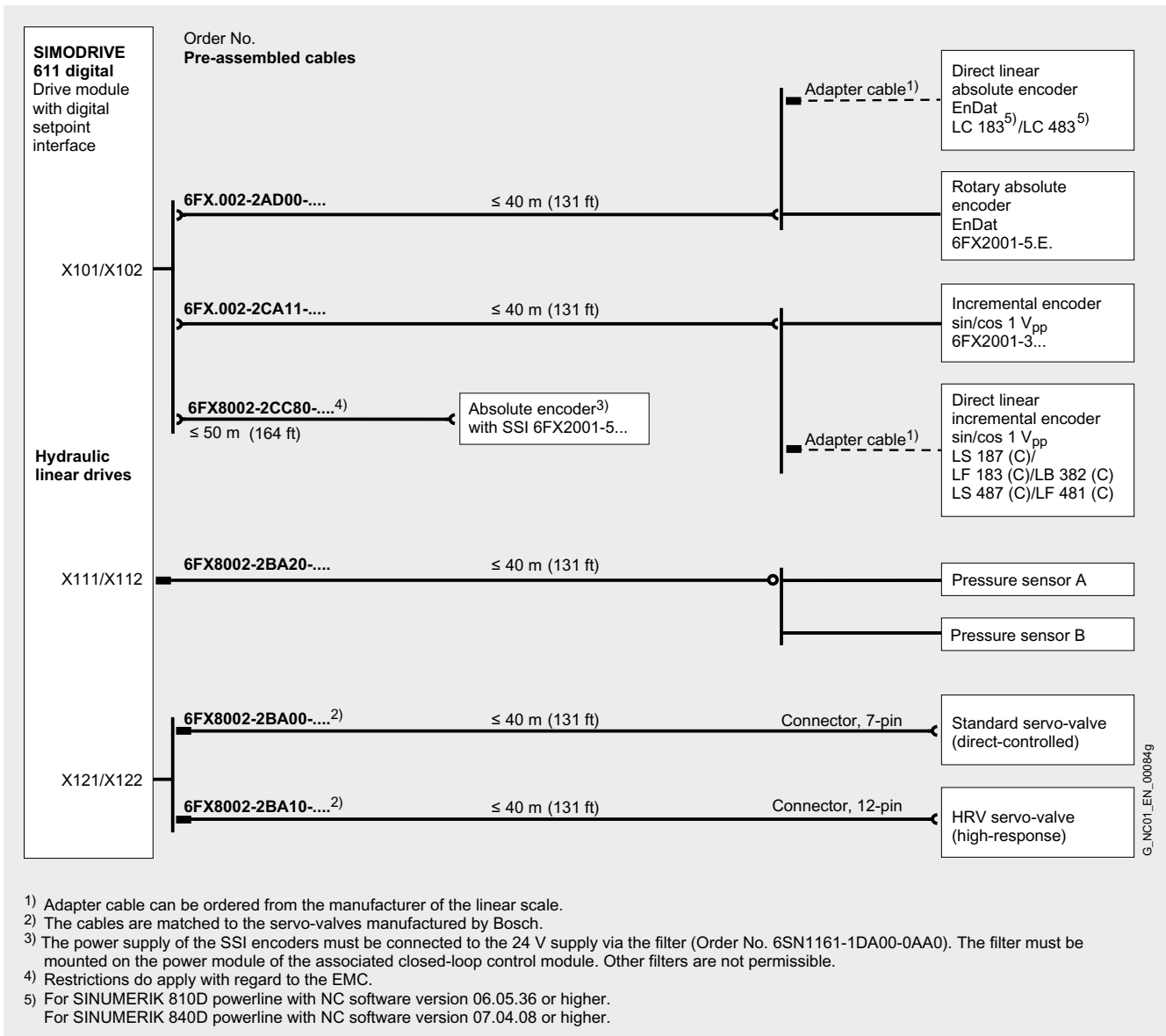
- Using the ANA configuration, up to 2 analog axes per ANA module can be operated on the digital drive bus with SINUMERIK 840D powerline:
  - Speed setpoint output  $\pm 10$  V (15 bit + sign)
- Evaluation of following encoders:
  - Incremental encoder  $\sin/\cos 1 V_{pp}$
  - Absolute encoder EnDat

### Selection and ordering data

Designation	Order No.
<b>Control unit with digital setpoint interface for hydraulic linear drives</b> Two-axis version <sup>1)</sup> with one measuring system for direct position sensing per axis; input for sinusoidal and cosine voltage signals	<b>6SN1115-0BA11-0AA1</b>

<sup>1)</sup> Also suitable for single-axis operation.

### Integration



Connection overview for HLA control with hydraulic servo solenoid valves, direct measuring systems and pressure sensors

Information about the application, configuration and cable extensions can be found under Connection system MOTION-CONNECT.

# Converter system

## SIMODRIVE 611

### Power modules

#### Overview



Power module, internal cooling, module width 100 mm (3.94 in)

Controlled by the control units, the power modules generate a sinusoidal 3-phase output voltage with a variable frequency and voltage, and are therefore ideally suited to operating 3-phase motors.

A wide range of 1-axis or 2-axis power modules is available. These modules are graded according to the current ratings and can be supplied with three different cooling techniques.

The current data refer to the series-preset values. At higher clock frequencies, derating applies (see the Configuration Manual SIMODRIVE 611 digital, Drive Converters).

For EMC-compatible wiring, shielded MOTION CONNECT power cables, shield connection plates and a shield connection are available for installing the module in the system.

The device bus cables (electronics bus) are included in the scope of delivery. The drive bus cables for the drive system with SINUMERIK 840D powerline must be ordered separately.



Power module, external cooling, with mounting frame, module width 50 mm (1.97 in)



## Technical specifications

Order No.						
Internal cooling	<b>6SN1123-1AA0.- -0HA.</b>	<b>-0AA.</b>	<b>-0BA.</b>	<b>-0CA.</b>	<b>-0DA.</b>	
External cooling	<b>6SN1124-1AA0.- -0HA.</b>	<b>-0AA.</b>	<b>-0BA.</b>	<b>-0CA.</b>	<b>-0DA.</b>	
<b>Product name</b>	Power module in 1-axis design					
<b>Cooling type</b>	Natural cooling	Natural cooling	Fan	Fan	Fan	
<b>Weight, approx.</b>	kg (lb)	6 (13.2)	6 (13.2)	6 (13.2)	6 (13.2)	9 (19.8)

Order No.						
Internal cooling	<b>6SN1123-1AA0.- -0EA.</b>	<b>-0LA.</b>	<b>-0FA.</b>	<b>-0JA.</b>	<b>-0KA.</b>	
External cooling	<b>6SN1124-1AA0.- -0EA.</b>	<b>-0LA.</b>	<b>-0FA.</b>	<b>-0JA.</b>	<b>-0KA.</b>	
Hose cooling	<b>6SN1123-1AA0.- -</b>	<b>-</b>	<b>-0FA.</b>	<b>-0JA.</b>	<b>-0KA.</b>	
<b>Product name</b>	Power module in 1-axis design (continued)					
<b>Cooling type</b>	Fan	Fan	Fan	Fan	Fan	
<b>Weight, approx.</b>	kg (lb)	10.5 (23.2)	10.5 (23.2)	17.5 <sup>1)</sup> /20.5 <sup>2)</sup> (38.6 <sup>1)</sup> /45.2 <sup>2)</sup>	21 (46.3) <sup>1)</sup>	23 (50.7) <sup>1)</sup>

Order No.						
Internal cooling	<b>6SN1123-1AB00- -0HA.</b>	<b>-0AA.</b>	<b>-0BA.</b>	<b>-0CA.</b>		
External cooling	<b>6SN1124-1AB00- -0HA.</b>	<b>-0AA.</b>	<b>-0BA.</b>	<b>-0CA.</b>		
<b>Product name</b>	Power module in 2-axis design					
<b>Cooling type</b>	Natural cooling	Fan	Fan	Fan		
<b>Weight, approx.</b>	kg (lb)	6 (13.2)	6 (13.2)	6.5 (14.3)	9.5 (20.9)	

## Selection and ordering data

Module width	Feed drives with motors	Main spindle drives with motors	Power module for internal cooling	Power module for external cooling	Mounting frame for control cabinet installation <sup>3)</sup>
	1FT6/1FT7/1FK7/ 1FN3/1FW6 Rated/peak current $I_{S1}/\hat{I}$	1PH/1FE1/2SP1/1PM asynchronous motors Rated current/ current at S6-40 %/ peak current $I_{S1}/I_{S6-40\%}/\hat{I}$	Order No.	Order No.	Order No.
mm (inch)	A	A			
<b>Single-axis power modules</b>					
50 (1.97)	3/6	3/3/3	<b>6SN1123-1AA00-0HA1</b>	<b>6SN1124-1AA00-0HA1</b>	<b>6SN1162-0BA04-0AA1</b>
50 (1.97)	5/10	5/5/8	<b>6SN1123-1AA00-0AA1</b>	<b>6SN1124-1AA00-0AA1</b>	<b>6SN1162-0BA04-0AA1</b>
50 (1.97)	9/18	8/10/16	<b>6SN1123-1AA00-0BA1</b>	<b>6SN1124-1AA00-0BA1</b>	<b>6SN1162-0BA04-0AA1</b>
50 (1.97)	18/36	24/32/32	<b>6SN1123-1AA00-0CA2</b>	<b>6SN1124-1AA00-0CA2</b>	<b>6SN1162-0BA04-0FA1</b>
100 (3.94)	28/56	30/40/51	<b>6SN1123-1AA00-0DA2</b>	<b>6SN1124-1AA00-0DA2</b>	<b>6SN1162-0BA04-0BA1</b>
150 (5.91)	42/64	45/60/76	<b>6SN1123-1AA00-0LA3</b>	<b>6SN1124-1AA00-0LA3</b>	<b>6SN1162-0BA04-0CA1</b>
150 (5.91)	56/112	60/80/102	<b>6SN1123-1AA00-0EA2</b>	<b>6SN1124-1AA00-0EA2</b>	<b>6SN1162-0BA04-0CA1</b>
300 (11.81)	70/140	85/110/127	<b>6SN1123-1AA01-0FA1</b>	<b>6SN1124-1AA01-0FA1<sup>3)</sup></b>	<b>6SN1162-0BA04-0EA0</b>
300 (11.81)	70/140	85/110/127	<b>6SN1123-1AA02-0FA1<sup>5)</sup></b>	–	–
300 (11.81)	100/100	120/150/193 <sup>6)</sup>	<b>6SN1123-1AA00-0JA1<sup>4)5)</sup></b>	<b>6SN1124-1AA00-0JA1<sup>3)</sup></b>	<b>6SN1162-0BA04-0EA0</b>
300 (11.81)	140/210	200/250/257 <sup>6)</sup>	<b>6SN1123-1AA00-0KA1<sup>4)5)</sup></b>	<b>6SN1124-1AA00-0KA1<sup>3)</sup></b>	<b>6SN1162-0BA04-0EA0</b>
<b>Two-axis power modules</b>					
50 (1.97)	3/6	3/3/3	<b>6SN1123-1AB00-0HA1</b>	<b>6SN1124-1AB00-0HA1</b>	<b>6SN1162-0BA04-0AA1</b>
50 (1.97)	5/10	5/5/8	<b>6SN1123-1AB00-0AA1</b>	<b>6SN1124-1AB00-0AA1</b>	<b>6SN1162-0BA04-0AA1</b>
50 (1.97)	9/18	8/10/16	<b>6SN1123-1AB00-0BA1</b>	<b>6SN1124-1AB00-0BA1</b>	<b>6SN1162-0BA04-0AA1</b>
100 (3.94)	18/36	24/32/32	<b>6SN1123-1AB00-0CA3</b>	<b>6SN1124-1AB00-0CA2</b>	<b>6SN1162-0BA04-0GA1</b>

The data refer to the standard rated clock cycle frequencies of the inverters.

<sup>1)</sup> Without built-on or hose cooling components.

<sup>2)</sup> With hose cooling.

<sup>3)</sup> The mounting frames are not required if the cut-outs for the module heatsinks have been provided in the rear panel of the cabinet according to the Configuration Manual. For the 300 mm (11.81 in) modules, the 6SN1162-0BA04-0EA0 mounting frame is required, which must be ordered separately.

<sup>4)</sup> Built-on fan is required. See supplementary system components.

<sup>5)</sup> Hose cooling possible. See supplementary system components.

<sup>6)</sup> Derating is required for 1FE1 motors at  $f_J < 0.5$  Hz: see Configuration Manual 1FE1 Synchronous Built-in Motors.

# Converter system SIMODRIVE 611

## Infeed modules UI and I/R

### Overview



The infeed modules (UI - unregulated, I/R - infeed/regenerative feedback module, regulated) are connected to TN line supplies 380 V<sup>1)</sup>/400 V/415 V 3 AC ± 10 %; 480 V + 6 %/- 10 %; 50/60 Hz. The infeed modules generate the DC link voltage for the drive group and the voltages for the electronics. The voltages for the electronics centrally supply the drive modules and the modules of the SINUMERIK 810D powerline/840D powerline – possibly included in the group – via the device bus.

The infeed modules have been developed for operation on TN line supplies. Line supplies other than TN or line supplies with residual-current protective devices<sup>2)</sup> require an isolating transformer with a star connection on the secondary side and with the mid-point brought out, e.g. in vector group YN. An autotransformer can be used to adapt the voltage for TN line supplies with line voltages of 200/220/240/440/500/575 V 3 AC ± 10 % 50/60 Hz.

The HFD reactor with the damping resistor is required for the regulated I/R module and to step up and control the voltage.

### Application

#### Unregulated infeed modules, UI modules

- Drive groups with low dynamic requirements
- Machines with a few braking cycles and low braking energy
- Operation on weak line supplies from  $SK_{\text{line}}/P_{\text{rated}} \geq 30$

$SK_{\text{line}}$ : Short-circuit rating of the line supply

$P_{\text{rated}}$ : Rated module power

The unregulated infeed modules (UI modules) 5 kW and 10 kW include the commutating reactor and a pulsed resistor that dissipates the excess braking energy of the drives.

Commutating reactor and pulsed resistors must be separately ordered for the 28 kW UI module.

### Application (continued)

#### Regulated infeed/regenerative feedback modules I/R modules and HFD components

- Drive groups with high dynamic requirements
- Machines with frequent braking cycles and high levels of braking energy
- Operation on line supplies from  $SK_{\text{line supply}}/P_{\text{rated}} \geq 60 \dots 100$  (depending on the power rating and the operating mode)

Using the associated HFD commutating reactor, the regulated infeed/regenerative feedback modules (I/R modules) regulate the DC link voltage to the constant value assigned to the line voltage (600/625/680 V). The damping resistor connected to the HFD commutating reactor dampens possible system oscillations.

Energy is efficiently exchanged in the DC link, e.g. when drives regeneratively brake. The I/R module feeds back excessive energy into the line supply.

In order to fulfill the EMC EU Directive, line filters that are specifically harmonized with the step-up controller function must be used.

The HFD components required for the function of the I/R modules must be separately ordered as a HFD package comprising of HFD line filter and damping resistor.

HFD packages are also offered in combination with Wideband Line Filters in a package, please refer to Wideband Line Filters with HFD components,

### Function

#### Infeed module functions

- Rectification of the line voltage to generate the DC link voltage
- Integrated line contactor can be controlled via the input terminal
- Automatic DC link precharging on connection to the line supply
- Buffering the electronics power supply from the DC link energy is possible to bring the coupled drive axes to a controlled stop should the power fail if kinetic energy can be used.
- Central monitoring of the line voltage, DC link voltage and electronics voltages

For the I/R modules coding switches can be used to select the various operating modes, e.g.:

- Sinusoidal current is drawn from the line supply with  $\lambda \geq 0.97$  (state when supplied)/squarewave current load
- Regulated/unregulated operation
- Direct operation on 380 V<sup>1)</sup>/400 V/415 V 3 AC ± 10 %, 50/60 Hz TN line supplies, with regulated DC link voltage of 600 V DC or 625 V DC
- Direct operation on 480 V 3 AC + 6 %/- 10 %; 50/60 Hz TN line supplies, unregulated DC link voltage of 600 V to 680 V DC with regenerative feedback

#### HFD commutating reactors with damping resistor

- Stored energy feature to increase the voltage for I/R modules
- Attenuation of system harmonics

<sup>1)</sup> With derating

<sup>2)</sup> Exceptions with selective, universal current-sensitive residual-current protective devices. See Configuration Manual SIMODRIVE 611 digital, Drive Converters.

## Technical specifications

Order No.										
Internal cooling	<b>6SN1145-</b> –	<b>1AA0.-0AA.</b>	<b>1AA0.-0CA.</b>	<b>1BA0.-0BA.</b>	<b>1BA0.-0CA.</b>	<b>1BA0.-0DA.</b>	<b>1BB0.-0EA.</b>	<b>1BB0.-0FA.</b>		
	<b>6SN1146-1AB0.-0BA.</b>	–	–	–	–	–	–	–		
External cooling	<b>6SN1145-</b> –	<b>1AA0.-0AA.</b>	–	–	–	–	–	–		
	<b>6SN1146-1AB0.-0BA.</b>	–	<b>1AB0.-0CA.</b>	<b>1BB0.-0BA.</b>	<b>1BB0.-0CA.</b>	<b>1BB0.-0DA.</b>	<b>1BB0.-0EA.</b>	<b>1BB0.-0FA.</b>		
Hose cooling	<b>6SN1145-</b> –	–	–	–	–	<b>1BB0.-0DA.</b>	<b>1BB0.-0EA.</b>	<b>1BB0.-0FA.</b>		
<b>Product name</b>	UI infeed module			I/R infeed/regenerative feedback module						
<b>Infeed type</b>	Unregulated <sup>1)</sup>		Unregulated <sup>1)</sup>	Unregulated	Regulated	Regulated	Regulated	Regulated <sup>2)</sup>	Regulated <sup>2)</sup>	
<b>Rated power (S1) at 400 V AC</b>	kW	5	10	28	16	36	55	80	120	
<b>Continuous/peak power of integrated pulsed resistor</b>	kW	0.2/10	0.3/25	– <sup>5)</sup>	–	–	–	–	–	
<b>Line supply voltage (power)</b>	V	400 3 AC ± 10 %/415 3 AC ± 10 %/480 3 AC + 6 % – 10 % <sup>2)</sup> (with derating to 70 % 380 V – 10 %)								
<b>Line supply voltage (electronics)</b>	V	380 3 AC – 10 % ... 480 3 AC + 6 %								
<b>DC link voltage</b>	V	490 ... 680, line-dependent			600/625 regulated/490 ... 680, line-dependent					
<b>Module width</b>	mm (in)	50 (1.97)	100 (3.94)	200 (7.87)	100 (3.94)	200 (7.87)	300 (11.81)	300 (11.81)	300 (11.81)	
<b>Cooling type</b>										
• Internal cooling	Natural cooling	Integrated fan	Integrated fan	Integrated fan	Integrated fan	Integrated fan	Built-on fan <sup>3)</sup>	Built-on fan <sup>3)</sup>		
• External cooling	Natural cooling <sup>1)</sup>	Integrated fan	Integrated fan	Integrated fan	Integrated fan	Integrated fan	Built-on fan and additional mounting frame with fan box required <sup>3)</sup>	Built-on fan and additional mounting frame with fan box required <sup>3)</sup>		
• Hose cooling	–	–	–	–	–	–	Kit for hose cooling with fan			
<b>Degree of efficiency <math>\eta</math></b>		0.98	0.98	0.98	0.97	0.97	0.97	0.97	0.97	
<b>Weight, approx.</b>	kg (lb)	6 (13.2)	10.5 (23.2)	14.5 (32.0)	11 (24.3)	14.5 (32.0)	21.5 (47.4)	24 (52.9)	27 (59.5)	

## Selection and ordering data

UI module	I/R module	Module width	Infeed module for internal cooling	Infeed module for external cooling <sup>6)</sup>	Mounting frame for control cabinet installation <sup>7)</sup>	Infeed module for hose cooling
Unregulated with pulsed resistor	Regulated with regenerative feedback					
Rated power (S1)	Rated power (S1)				For external cooling	(hose connection kit required)
kW	kW	mm (inch)	Order No.	Order No.	Order No.	Order No.
5	–	50 (1.97)	<b>6SN1146-1AB00-0BA1</b>	<b>6SN1146-1AB00-0BA1</b>	<b>6SN1162-0BA04-0JAO</b>	–
10 <sup>9)</sup>	–	100 (3.94)	<b>6SN1145-1AA01-0AA2</b>	<b>6SN1145-1AA01-0AA2</b>	<b>6SN1162-0BA04-0HA1</b>	–
28 <sup>9)</sup>	–	200 (7.87)	<b>6SN1145-1AA00-0CA0</b>	<b>6SN1146-1AB00-0CA0</b>	<b>6SN1162-0BA04-0DA1</b>	–
–	16	100 (3.94)	<b>6SN1145-1BA01-0BA2</b>	<b>6SN1146-1BB01-0BA2</b>	<b>6SN1162-0BA04-0BA1</b>	–
–	36	200 (7.87)	<b>6SN1145-1BA02-0CA2</b>	<b>6SN1146-1BB02-0CA2</b>	<b>6SN1162-0BA04-0DA1</b>	–
–	55	300 (11.81)	<b>6SN1145-1BA01-0DA1</b>	<b>6SN1146-1BB00-0DA1</b>	<b>6SN1162-0BA04-0EA0</b>	<b>6SN1145-1BB00-0DA1</b>
–	80	300 (11.81) <sup>8)</sup>	<b>6SN1145-1BB00-0EA1</b>	<b>6SN1146-1BB00-0EA1</b>	<b>6SN1162-0BA04-0EA0</b>	<b>6SN1145-1BB00-0EA1</b>
–	120	300 (11.81) <sup>8)</sup>	<b>6SN1145-1BB00-0FA1</b>	<b>6SN1146-1BB00-0FA1</b>	<b>6SN1162-0BA04-0EA0</b>	<b>6SN1145-1BB00-0FA1</b>

<sup>1)</sup> Housing suitable for drive groups with internal and external cooling.

<sup>2)</sup> 80/120 kW I/R modules require an external control voltage of 360 ... 457 V 2 AC at 50 Hz and 400 ... 510 V 2 AC at 60 Hz for the internal line contactor. A matching transformer 4AM4096-OEM50-0AA0 is available for 50 Hz systems to allow adaptation to line voltages of 230 V/380 V ± 10 %. Another matching transformer 4AM4096-OEM70-0FA0 is available for 60 Hz systems to allow adaptation to 415 V (max. 2 contactors).

<sup>3)</sup> Must be ordered separately: Built-on fan 6SN1162-0BA02-0AA2 and for external cooling mounting frame with fan box 6SN1162-0BA04-0EA0.

<sup>4)</sup> Without hose cooling kit.

<sup>5)</sup> External pulsed resistors can be connected.

<sup>6)</sup> For external cooling, the fan box is part of the mounting frame package for 300 mm (11.81 in) modules. The associated 6SN1162-0BA02-0AA2 built-on fan must be ordered separately.

<sup>7)</sup> The mounting frames are not required if the cut-outs for the module heatsinks have been provided in the rear panel of the cabinet according to the Configuration Manual. For the 300 mm (11.81 in) modules, the 6SN1162-0BA04-0EA0 mounting frame is required, which must be ordered separately.

<sup>8)</sup> For internal cooling, the built-on fan 6SN1162-0BA02-0AA2 for this 300 mm module is required, which must be ordered separately.

<sup>9)</sup> If components or cables that are mounted above the devices are closer than 300 mm (11.81 in) then a thermally conductive plate is required. Refer to pulsed resistors.

# Converter system

## SIMODRIVE 611

### Infeed modules UI and I/R

#### Selection and ordering data (continued)

The HFD components can be ordered only as a package (combination of the components). HFD components are also offered in combination with Wideband Line Filters in a package (combination of components).

For HFD packages with Wideband Line Filters, please refer to Wideband Line Filters.



Designation	Order No.	Package contents
<b>Commutating reactor<sup>1)</sup></b> For 28 kW UI module	<b>6SN1111-1AA00-0CA0</b>	–
<b>HFD package</b> Includes an HFD reactor and damping resistor with 300 W <sup>2)</sup>		
• For 16 kW I/R modules	<b>6SN1111-0AA00-0BV0</b>	6SL3000-0DE21-6AA0 + 6SN1113-1AA00-0DA0
• For 36 kW I/R modules	<b>6SN1111-0AA00-0CV0</b>	6SL3000-0DE23-6AA0 + 6SN1113-1AA00-0DA0
<b>HFD package</b> Includes an HFD reactor and damping resistor with 800 W		
• For 16 kW I/R modules	<b>6SN1111-0AA00-0BV1</b>	6SL3000-0DE21-6AA0 + 6SL3100-1BE21-3AA0
• For 36 kW I/R modules	<b>6SN1111-0AA00-0CV1</b>	6SL3000-0DE23-6AA0 + 6SL3100-1BE21-3AA0
• For 55 kW I/R modules	<b>6SN1111-0AA00-0DV0</b>	6SL3000-0DE25-5AA1 + 6SL3100-1BE21-3AA0
• For 80 kW I/R modules	<b>6SN1111-0AA00-0EV0</b>	6SL3000-0DE28-0AA1 + 6SL3100-1BE21-3AA0
• For 120 kW I/R modules	<b>6SN1111-0AA00-0FV0</b>	6SL3000-0DE31-2AA1 + 6SL3100-1BE21-3AA0

<sup>1)</sup> Already integrated into the 5 kW and 10 kW UI modules.

<sup>2)</sup> Notice: Temperature measurement is necessary at installation site.

### Line filters General

### Line filters Line filters for UI modules

#### Overview

In plants which have been specifically designed to ensure EMC, line filters work together with line reactors to restrict the conducted interference emanating from the power modules to the limit values of Class A1 and effectively protect the converter system against line-side disturbances as defined in EN 55011 and Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN systems as defined in EN 61000-2-4/IEC 61000-2-4. Optional line filter ranges that are coordinated with the power range are available for the SIMODRIVE 611 drive system:

- **Line filters** for the UI modules dampen frequencies in the range from 150 kHz to 30 MHz.
- **Wideband Line Filters** function in the frequency range from 2 kHz to 30 MHz. They therefore reduce low-frequency phase effects on the system and reduce negative effects or damage to other loads (e.g. electronic equipment) connected to the same line supply.
- **Basic Line Filters** for I/R modules are designed for use in machines in which the conducted interference in the radio frequency range from 150 kHz to 30 MHz is to be reduced in accordance with EMC regulations.

The line filters for the I/R modules may be used both in sinusoidal current mode and block current mode.

#### Note:

Radio interference suppression is required corresponding to the EMC standards (product standard IEC 61800-3, EN 61800-3, VDE 0160 T 100). Within the EU, before a machine/plant can be sold or marketed, the machine vendor (OEM) must issue a CE EMC Declaration of Conformity.

The line filters and commutating reactors are required to achieve this conformity. Together with the commutating reactor, the line filters form a unit that is specifically harmonized to the step-up controller technique of the I/R modules.

The use of other filters that are not part of the system can lead to limit values being exceeded, resonance effects, overvoltages and motor or device faults. Manufacturer certifications, such as CE, UL etc., are not valid if components are used that are not part of the system.

#### Overview

The line filters for the UI modules dampen the frequencies in the range from 150 kHz to 30 MHz.

If the system is engineered in strict adherence to the Configuration Manual and the EMC Guidelines for SIMODRIVE, SINUMERIK, SIMOTION and SINAMICS S120, the limit values at the installation location can be achieved in compliance with the EU EMC Directive. The prerequisite is that the customer takes into account any existing specific EMC Directives at the installation location and then makes a final check.

#### Selection and ordering data

Designation	Order No.
<b>Line filters</b>	
• For 5 kW UI module	<b>6SN1111-0AA01-1BA1</b>
• For 10 kW UI module	<b>6SN1111-0AA01-1AA1</b>
• For 28 kW UI module	<b>6SN1111-0AA01-1CA1</b>

#### Technical specifications

Product name	Line filters for UI modules		
Assignment to UI module	5 kW	10 kW	28 kW
<b>Rated current</b>	16 A	25 A	65 A
<b>Power loss</b>	20 W	20 W	25 W
<b>Line supply voltage</b>	380 V 3 AC ± 10 % ... 480 V 3 AC ± 10 % TN line supply		
<b>Frequency</b>	50 Hz/60 Hz ± 10 %		
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20		
<b>Ambient temperature, perm.</b>			
• Transport	-25 ... +70 °C (-13 ... +158 °F)		
• Storage	-25 ... +70 °C (-13 ... +158 °F)		
• Operation	0 ... 40 °C (32 ... 104 °F), up to 55 °C (131 °F) with derating		
<b>Interference suppression to EN 61800-3 (IEC 61800-3)/VDE 0100 part 100-3</b>	Limit value class C2		
<b>Dimensions, approx.</b>			
• Width	156 mm (6.14 in)	156 mm (6.14 in)	171 mm (6.73 in)
• Height	193 mm (7.60 in)	281 mm (11.06 in)	261 mm (10.28 in)
• Depth	81 mm (3.19 in)	91 mm (3.58 in)	141 mm (5.55 in)
<b>Weight, approx.</b>	3.8 kg (8.38 lb)	5.7 kg (12.6 lb)	12.5 kg (27.6 lb)

# Converter system

## SIMODRIVE 611

### Line filters

#### Wideband Line Filter with HFD components

#### Overview



The damping characteristics of Wideband Line Filters for SIMODRIVE 611 line feeds not only conform with the requirements of the EMC standards for the frequency range from 150 kHz to 30 MHz, but also include the range of low frequencies from 2 kHz and above. This means that Wideband Line Filters have a significantly extended function range when compared to standard filters, e.g. Basic Line Filters. This therefore achieves a certain level of independence regarding where the machines are actually located, with mostly unknown line characteristics, e.g. line impedance.

If the system is engineered in strict adherence to the Configuration Manual and the EMC Guidelines for SIMODRIVE, SINUMERIK, SIROTEC, SIMOTION and SINAMICS S120, the limit values at the installation location can be achieved in compliance with the EU EMC Directive. The prerequisite is that the customer takes into account any existing specific EMC Directives at the installation location and then makes a final check.

#### Benefits

- Simpler to comply with EMC limit values according to the standards
- Provided the network short-circuit rating is adequate, low-frequency harmonics fed back into the line supply lie within the limits stipulated by the VDEW requirements.
- Improved damping of resonant circuits, e.g. resonant circuits of unknown impedances in the drive or line supply system
- 16 kW and 36 kW I/R modules can be used in conjunction with selective, universal-current sensitive residual-current protective devices, type B with 300 mA rated fault current

#### Application

Wideband Line Filters for the I/R modules may be used both in sinusoidal current mode with cable lengths until a total of 350 m (1 148 ft) and in block current mode with cable lengths until a total of 500 m (1 640 ft).

The special HFD reactors with damping resistor are required for the function of the regulated I/R modules and to dampen possible parasitic disturbing system oscillations.

Wideband Line Filters with HFD components can be ordered only as a package.

#### Technical specifications

Product name	Commutating reactor	HFD reactor				
Assignment to infeed module	UI	I/R	I/R	I/R	I/R	I/R
<b>Rated current</b>	<b>28 kW</b>	<b>16 kW</b>	<b>36 kW</b>	<b>55 kW</b>	<b>80 kW</b>	<b>120 kW</b>
<b>Rated current</b>	65 A	30 A	67 A	103 A	150 A	225 A
<b>Power loss</b>	70 W	170 W	250 W	350 W	450 W	590 W
<b>Line supply voltage</b>	380/400 V 3 AC - 10 % ... 480 V + 6 %					
<b>Frequency</b>	50 Hz/60 Hz ± 10 %					
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP00					
<b>Ambient temperature, perm.</b>						
• Transport	-25 ... +80 °C (-13 ... +176 °F)					
• Storage	-25 ... +80 °C (-13 ... +176 °F)					
• Operation	0 ... 40 °C (32 ... 104 °F), up to 55 °C (131 °F) with derating					
<b>Dimensions, approx.</b>						
• Width	100 mm (3.94 in)	150 mm (5.91 in)	150 mm (5.91 in)	150 mm (5.91 in)	170 mm (6.69 in)	230 mm (9.06 in)
• Height	200 mm (7.87 in)	125 mm (4.92 in)	235 mm (9.25 in)	290 mm (11.42 in)	325 mm (12.80 in)	360 mm (14.17 in)
• Length	190 mm (7.48 in)	330 mm (12.99 in)	330 mm (12.99 in)	330 mm (12.99 in)	379 mm (14.92 in)	476 mm (18.74 in)
<b>Weight, approx.</b>	6 kg (13.2 lb)	8.5 kg (18.7 lb)	13 kg (28.7 lb)	18 kg (39.7 lb)	40 kg (88.2 lb)	50 kg (110 lb)

### Technical specifications (continued)

<b>Product name</b>	Wideband Line Filter				
<b>Assignment to I/R module</b>	<b>16 kW</b>	<b>36 kW</b>	<b>55 kW</b>	<b>80 kW</b>	<b>120 kW</b>
<b>Rated current</b>	30 A	67 A	103 A	150 A	225 A
<b>Power loss</b>	70 W	90 W	110 W	150 W	200 W
<b>Line supply voltage</b>	380 V 3 AC ± 10 % ... 480 V 3 AC ± 10 % TN line supply				
<b>Frequency</b>	50 Hz/60 Hz ± 10 %				
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP20				
<b>Ambient temperature, perm.</b>					
• Transport	-25 ... +70 °C (-13 ... +158 °F)				
• Storage	-25 ... +70 °C (-13 ... +158 °F)				
• Operation	0 ... 40 °C (32 ... 104 °F), up to 55 °C (131 °F) with derating				
<b>Interference suppression to EN 61800-3 (IEC 61800-3)/ VDE 0100 part 100-3</b>	Limit value class C2				
<b>Dimensions, approx.</b>					
• Width	130 mm (5.12 in)	130 mm (5.12 in)	130 mm (5.12 in)	200 mm (7.87 in)	300 mm (11.81 in)
• Height	480 mm (18.90 in)	480 mm (18.90 in)	480 mm (18.90 in)	480 mm (18.90 in)	480 mm (18.90 in)
• Depth	150 mm (5.91 in)	245 mm (9.65 in)	260 mm (10.24 in)	260 mm (10.24 in)	260 mm (10.24 in)
<b>Weight, approx.</b>	9 kg (19.8 lb)	16 kg (35.3 lb)	19 kg (41.9 lb)	22 kg (48.5 lb)	32 kg (70.6 lb)

### Selection and ordering data

Designation	Order No.	Package contents		
<b>Wideband Line Filter incl. HFD package</b>				
Includes a Wideband Line Filter, HFD reactor and damping resistor with 300 W <sup>1)</sup>				
• For 16 kW I/R modules	<b>6SN1111-0AA00-1BV0</b>	6SL3000-0BE21-6AA0 +	6SL3000-0DE21-6AA0 +	6SN1113-1AA00-0DA0
• For 36 kW I/R modules	<b>6SN1111-0AA00-1CV0</b>	6SL3000-0BE23-6AA0 +	6SL3000-0DE23-6AA0 +	6SN1113-1AA00-0DA0
<b>Wideband Line Filter incl. HFD package</b>				
Includes a Wideband Line Filter, HFD reactor and damping resistor with 800 W				
• For 16 kW I/R modules	<b>6SN1111-0AA00-1BV1</b>	6SL3000-0BE21-6AA0 +	6SL3000-0DE21-6AA0 +	6SL3100-1BE21-3AA0
• For 36 kW I/R modules	<b>6SN1111-0AA00-1CV1</b>	6SL3000-0BE23-6AA0 +	6SL3000-0DE23-6AA0 +	6SL3100-1BE21-3AA0
• For 55 kW I/R modules	<b>6SN1111-0AA00-1DV0</b>	6SL3000-0BE25-5AA0 +	6SL3000-0DE25-5AA1 +	6SL3100-1BE21-3AA0
• For 80 kW I/R modules	<b>6SN1111-0AA00-1EV0</b>	6SL3000-0BE28-0AA0 +	6SL3000-0DE28-0AA1 +	6SL3100-1BE21-3AA0
• For 120 kW I/R modules	<b>6SN1111-0AA00-1FV0</b>	6SL3000-0BE31-2AA1 +	6SL3000-0DE31-2AA1 +	6SL3100-1BE21-3AA0

<sup>1)</sup> Notice: Temperature measurement at installation site required.

# Converter system

## SIMODRIVE 611

### Line filters

#### Wideband Line Filter with HFD components

#### Accessories

##### Adapter set



Adapter set with Wideband Line Filter and HFD reactor

Adapter sets are available for the 16 kW and 36 kW I/R modules to achieve an extremely compact unit. This means that Wideband Line Filters and HFD reactors can be mounted on top of one another in the control cabinet to minimize the amount of space required.

Designation	Order No.
<b>Adapter set for Wideband Line Filters and HFD reactors</b>	
• For 16 kW I/R modules	<b>6SL3060-1FE21-6AA0</b>
• For 36 kW I/R modules	<b>6SN1162-0GA00-0CA0</b>



### Overview



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

The use of Basic Line Filters is subject to the following general conditions:

- The machine/system must only be used in industrial power systems
- No. of axes < 12
- Total cable length < 150 m (492 ft)
- The machine manufacturer (OEM ) must have the CE conformity of the machine/system confirmed by an accredited EMC test laboratory e.g. by EPCOS; e-mail: emv.labor@epcos.com.

### Technical specifications

Order No.	6SL3000-0BE21-6DA0	6SL3000-0BE23-6DA0	6SL3000-0BE25-5DA0
<b>Product name</b>	Basic Line Filter		
<b>Assignment to I/R module</b>	<b>16 kW</b>	<b>36 kW</b>	<b>55 kW</b>
<b>Rated current</b>	36 A	65 A	105 A
<b>Power loss</b>	16 W	28 W	41 W
<b>Degree of protection to EN 60592 (IEC 60592)</b>	IP20	IP20	IP20
<b>Interference suppression to EN 61800-3 (IEC 61800-3)/VDE 0100 part 100-3</b>	Limit value class C2		
<b>Dimensions</b>			
• Width	50 mm (1.97 in)	75 mm (2.95 in)	100 mm (3.94 in)
• Height	429 mm (16.89 in)	433 mm (17.05 in)	466 mm (18.35 in)
• Depth	226 mm (10.24 in)	226 mm (10.24 in)	226 mm (10.24 in)
<b>Weight, approx.</b>	5 kg (11 lb)	6.5 kg (14.3 lb)	11.5 kg (25.4 lb)

### Selection and ordering data

Designation	Order No.
<b>Basic Line Filter</b>	
• For 16 kW I/R module	<b>6SL3000-0BE21-6DA0</b>
• For 36 kW I/R module	<b>6SL3000-0BE23-6DA0</b>
• For 55 kW I/R module	<b>6SL3000-0BE25-5DA0</b>

# Converter system

## SIMODRIVE 611

### Monitoring module

#### Overview



The monitoring module is used to expand the electronics power supply if in a group a higher number of drive modules require a higher electronics power supply rating. The monitoring module includes central monitoring functions for a separate drive group. The monitoring module power supply can be taken from a 380 V to 480 V 3 AC line supply as well as from the DC link voltage – or from both e.g. for the ESR function (emergency retraction).

Separate drive groups in several cabinet panels or tiers can be formed together with several monitoring modules.

The blanking cover is required for external cooling if there is a continuous cut-out for the modules in order to close this and mount the module onto it.

#### Technical specifications

<b>Order No.</b>	<b>6SN1112-1AC01-0AA1</b>
<b>Product name</b>	Monitoring module
<b>Rated supply voltage</b>	360 V 3 AC - 10 % ... 480 V 3 AC + 6 %
<b>Power loss</b>	70 W
<b>Cooling type</b>	Natural cooling
<b>Module width</b>	50 mm (1.97 in)
<b>Weight, approx.</b>	5 kg (11 lb)

#### Selection and ordering data

Designation	Order No.
<b>Monitoring module for SIMODRIVE 611</b> Complete with all connection and coupling elements for internal and external cooling	<b>6SN1112-1AC01-0AA1</b>
<b>Blanking cover</b> For external cooling if there is a cut-out Width: 50 mm (1.97 in)	<b>6SN1162-0BA04-0JA0</b>

### Overvoltage limiter module

#### Overview



The overvoltage limiter module limits transient overvoltages that occur as the result of, for example, switching operations on inductive loads in the line supply to acceptable values. For 10 kW infeed modules and higher, this overvoltage limiter module is plugged into the X181 interface.

The overvoltage limiter module should be used for upstream transformers and for weak line supplies or those that are not in conformance with IEC (i.e. are relatively unstable).

The overvoltage limiter module must be used in order to ensure that the SIMODRIVE 611 system is in conformance with UL.

An appropriate protective circuit is integrated as standard in the 5 kW UI module.

#### Technical specifications

<b>Order No.</b>	<b>6SN1111-0AB00-0AA0</b>
<b>Product name</b>	Overvoltage limiter module
<b>Dimensions</b>	
• Width	70 mm (2.76 in)
• Height	76 mm (2.79 in)
• Depth	32.5 mm (1.28 in)
<b>Weight, approx.</b>	0.3 kg (0.7 lb)

#### Selection and ordering data

Designation	Order No.
<b>Overvoltage limiter module</b> For infeed modules 10 kW and higher for SIMODRIVE 611	<b>6SN1111-0AB00-0AA0</b>

### Overview



The pulsed resistor module is used to dissipate excess energy in the DC link, e.g. for UI or I/R modules as is the case with braking and regenerative operation. Also when the power fails, using the pulsed resistor module, the drive group can be braked.

### Benefits

Protects devices from overvoltages in the DC link.

### Function

The braking power of the complete system can be increased by using the external pulsed resistor Plus and using several pulsed resistor modules connected in parallel.

When using the internal resistor, a thermally conductive plate is required if a clearance of minimum 300 mm (11.81 in) cannot be maintained above the module.

The blanking cover is required for external cooling if there is a continuous cut-out for the modules in order to close this and mount the module onto it.

### Technical specifications

<b>Order No.</b>	<b>6SN1113-1AB01-0BA1</b>
<b>Product name</b>	Pulsed resistor module
<b>Rated supply voltage</b>	435/490/600/625/680 V DC
<b>Continuous power/peak power, max.</b>	
• With internal pulsed resistor	0.3/25 kW
• With external pulsed resistor	1.5/25 kW
<b>Module width</b>	50 mm (1.97 in)
<b>Weight, approx.</b>	5 kg (11 lb)

### Selection and ordering data

Designation	Order No.
<b>Pulsed resistor module for SIMODRIVE 611</b> Complete with all connection and coupling elements	<b>6SN1113-1AB01-0BA1</b>
<b>Blanking cover</b> For external cooling if there is a cut-out Width: 50 mm (1.97 in)	<b>6SN1162-0BA04-0JA0</b>
<b>Thermally conductive plate</b> Width: 100 mm (3.94 in)	<b>6SN1162-0BA01-0AA0</b>

# Converter system

## SIMODRIVE 611

### External pulsed resistors

#### Overview



The external pulsed resistors must be selected so that they match the required regenerative feedback power.

Braking is possible – even when the power fails – using the pulsed resistors and the corresponding modules.

By mounting the resistors outside the electrical cabinet, the power loss that occurs can be shifted out of the control cabinet.

The pulsed resistors can be used for the pulsed resistor module, the unregulated 28 kW infeed module and as damping resistor.

#### Application

##### Unregulated 28 kW infeed module

External pulsed resistors are always required for the 28 kW UI module if it can be assumed that regenerative feedback occurs.

Depending on the power requirement, a maximum of two identical pulsed resistors can be connected. The protective function is parameterized via the terminals.

##### Pulsed resistors as damping resistors with HFD commutating reactor

Together with the HFD commutating reactor, the external pulsed resistors can be alternatively used for damping. See Configuration Manual SIMODRIVE 611 digital, Drive Converters.

#### Selection and ordering data

Designation	Order No.
<b>External pulsed resistor</b> For 28 kW UI module or <b>Damping resistor</b> 0.3/25 kW incl. 3 m (9.84 ft) connecting cable	<b>6SN1113-1AA00-0DA0</b>
<b>External pulsed resistor plus</b> or <b>Damping resistor</b> 1.5/25 kW incl. 5 m (16.4 ft) connecting cable	<b>6SL3100-1BE22-5AA0</b>

#### Technical specifications

Order No.	6SN1113-1AA00-0DA0	6SL3100-1BE22-5AA0
<b>Product name</b>	External pulsed resistor 0.3/25 kW (15 Ω)	External pulsed resistor Plus 1.5/25 kW <sup>1)</sup> (15 Ω)
<b>Cooling type</b>	Natural cooling	Natural cooling
<b>Degree of protection to EN 60529 (IEC 60529)</b>	IP54	IP20
<b>Damping</b>	0 ... 230 kHz ≤ 3 dB	
<b>Dimensions</b>		
• Width	80 mm (3.15 in)	193 mm (7.60 in)
• Height	210 mm (8.27 in)	410 mm (16.14 in)
• Depth	53 mm (2.09 in)	240 mm (9.45 in)
<b>Weight, approx.</b>	3.4 kg (7.50 lb)	5.6 kg (12.3 lb)

<sup>1)</sup> In the SIMODRIVE 611 converter system.

### Overview



Centralized/distributed capacitor module 4.1 mF

The capacitor modules are used to increase the DC link capacitance. Dynamically occurring energy can be stored or a temporary power failure bridged.

### Design

- Central modules are suitable for internal and external cooling. An indicator signals that the module is ready to operate above a charging voltage of approx. 300 V.
- Distributed modules can be installed anywhere.

### Application

#### Modules with 2.8 mF and 4.1 mF for dynamic energy storage

These modules are directly connected to the DC link for dynamic processes without precharging circuits. The charging limits of the line modules must be observed here; they determine the maximum number of modules that can be connected.

#### Modules with 20 mF for bridging power failures

To relieve the centralized precharging function, these modules are charged over an internal precharging resistor and therefore do not have to be included in the calculation of the charging limits. When the DC link voltage drops due to a power failure, a diode couples this capacitor battery to the system DC link so that it can be buffered by the capacitors. Dynamic energy loading is not possible in this case, due to the precharging resistor.

#### 20 mF capacitor modules, max. permissible number

5 kW UI module	1
10 kW UI module and 16 kW I/R module	3
28 kW UI module and 36 kW to 120 kW I/R module	5

### Technical specifications

Order No.	6SN1112-1AB00-1AA0	6SN1112-1AB00-1BA0	6SN1112-1AB00-0BA0	6SN1112-1AB00-0CA0
<b>Product name</b>	Capacitor modules Distributed		Centralized	
<b>Capacitance of capacitor bank</b>	2.8 mF	4.1 mF	4.1 mF	20 mF
<b>Rated voltage <math>V_{DC}</math></b>	350 ... 750 V			
<b>Temperature range</b>	0 ... 55 °C (32 ... 131 °F)			
<b>Dimensions</b>				
• Width	100 mm (3.94 in)		100 mm (3.94 in)	300 mm (11.81 in)
• Height	334 mm (13.15 in)		480 mm (18.90 in)	480 mm (18.90 in)
• Depth	231 mm (9.09 in)		211 mm (8.31 in)	211 mm (8.31 in)
<b>Weight, approx.</b>	5.3 kg (11.7 lb)	5.8 kg (12.8 lb)	7.5 kg (16.5 lb)	21.5 kg (47.4 lb)

### Selection and ordering data

Designation	Order No.
<b>Distributed capacitor modules</b>	
Complete with all connection and coupling elements	
• 2.8 mF	<b>6SN1112-1AB00-1AA0</b>
• 4.1 mF	<b>6SN1112-1AB00-1BA0</b>
<b>Central capacitor modules</b>	
Complete with all connection and coupling elements	
• 4.1 mF	<b>6SN1112-1AB00-0BA0</b>
• 20 mF	<b>6SN1112-1AB00-0CA0</b>

# Converter system SIMODRIVE 611

## Supplementary system components

### Overview

#### Signal amplifier electronics



The signal amplifier electronics is used for encoders with current signals to convert these current signals into voltage signals for  $1 V_{pp}$ .

#### Filter module



The filter module is required for suppressing interference on the external 24 V power supply for SSI absolute encoders. The filter module must be fixed to the power module of the associated control module. No other type of filter may be used.

#### Technical specifications

<b>Order No.</b>	<b>6SN1115-0AA12-0AA0</b>
<b>Product name</b>	Signal amplifier electronics
<b>Signal shape</b>	Sine/cosine
<b>Input signal</b>	7 ... 16 $\mu A_{pp}$
<b>Output signal</b>	1 $V_{pp}$
<b>Signal frequency, max.</b>	300 kHz
<b>Operating voltage on remote sense, max.</b>	8 V DC
<b>Operating current, max.</b>	200 mA
<b>Encoder voltage supply</b>	5 V DC $\pm 5\%$
<b>Encoder current supply, max.</b>	120 mA
<b>Dimensions</b>	
• Width	121 mm (4.76 in)
• Height	54 mm (2.13 in)
• Depth	57 mm (2.24 in)

#### Coding elements for plug-in terminals (5 mm/0.20 in grid)

The plug-in terminals on the front panel of the modules can be protected against wrong connections through individual coding using freely pluggable male coding elements on the pin side, and corresponding female coding elements on the plug side (socket).

#### Reinforced DC link busbars

Power modules that are 50 mm (1.97 in), 100 mm (3.94 in) and 150 mm (5.91 in) wide are equipped as standard with DC link busbars for a transmission power of < 55 kW. For a more generous module arrangement for which > 55 kW is to be transmitted over these power modules, reinforced DC link busbars with a higher current-carrying capacity are available. The DC link busbars under the DC link cover in the module should be replaced, the connecting lugs between the power modules remain. See Configuration Manual SIMODRIVE 611 digital, Drive Converters.

#### Universal empty housing

An empty power unit housing, 50 mm (1.97 in) wide, is available for accommodating control units without a power function, e.g. the HLA/ANA control unit.

#### Adhesive warning label

Warning labels to cover the standard German/English labels, e.g. on the infeed module. The following languages are available: French/English, Spanish/English, Italian/English, Swedish/English, Finnish/English, Danish/English, Dutch/English, Portuguese/English, Greek/English, Chinese/English, Korean/English, Japanese/English, Czech/English, Russian/English, Polish/English, Turkish/English

### Overview (continued)

#### Connecting cable for a 2-tier configuration

The modules of the SIMODRIVE 611 converter system can be arranged in two tiers, one above the other, or in adjacent cabinet panels when space is limited.

For restrictions and boundary conditions, see Configuration Manual SIMODRIVE 611 digital, Drive Converters.

For 2-tier configurations, one connecting cable each for the device bus and, where applicable, for the drive bus is required.

#### Built-on fan

The built-on fan is required for the following modules:

6SN1123-1AA0.-0JA ./-0KA .

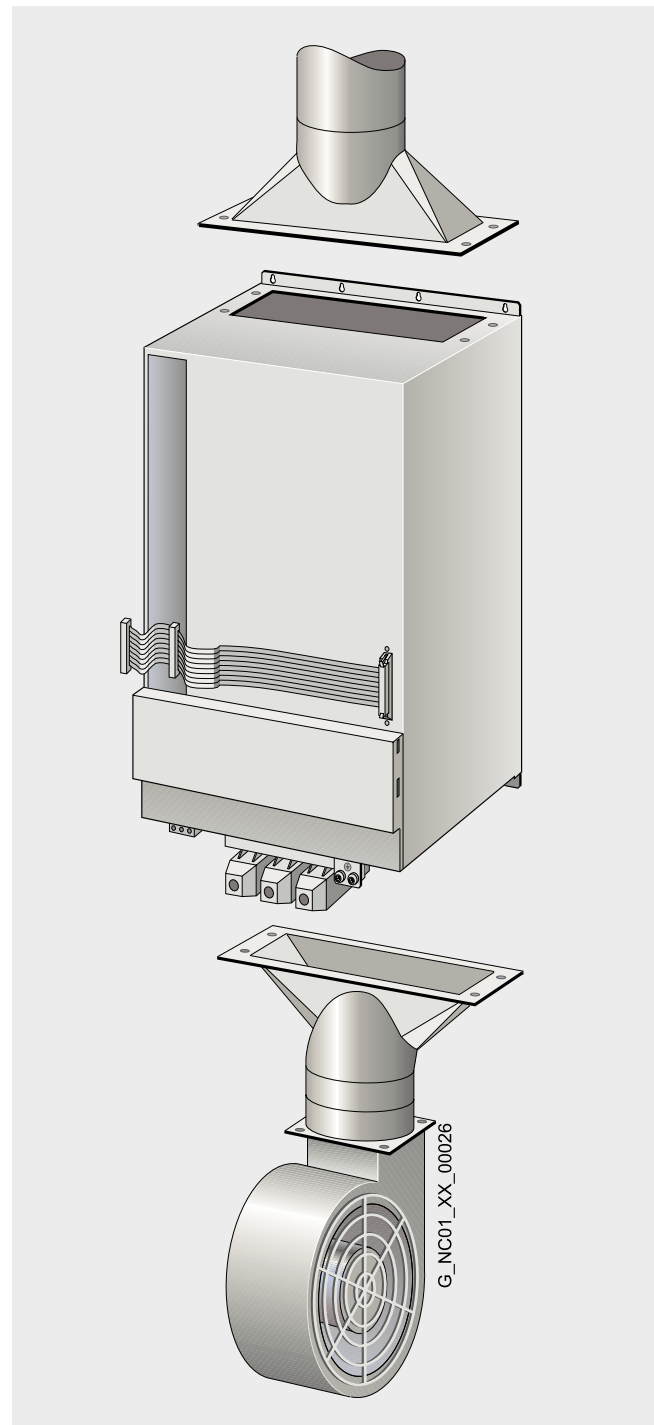
6SN1124-1AA0.-0FA ./-0JA ./-0KA .

6SN1145-1BB0-0EA ./-0FA .



Built-on fan with IP44 degree of protection for power modules for internal and external cooling.

#### Hose cooling packages



For power modules with hose cooling, two packages (1 and 2) are available with fan, hose, flanges and filter mat.

Package 2 may only be used for the 2-tier configuration comprising a combination of I/R module 6SN1145-1BB0-0DA. with the power unit 6SN1123-1FA01-0FA..

# Converter system

## SIMODRIVE 611

### Supplementary system components

#### Selection and ordering data

Designation	Order No.
<b>Drive bus cable for SIMODRIVE 611 digital</b> (50 mm (1.97 in) must be added to the length of the selected drive bus cable in order to bypass monitoring or pulsed resistor modules)	
<ul style="list-style-type: none"> <li>Flat ribbon cable for module width:               <ul style="list-style-type: none"> <li>50 mm (1.97 in) <b>6SN1161-1CA00-0AA0</b></li> <li>100 mm (3.94 in) <b>6SN1161-1CA00-0BA0</b></li> <li>150 mm (5.91 in) <b>6SN1161-1CA00-0CA0</b></li> <li>200 mm (7.87 in) <b>6SN1161-1CA00-0FA0</b></li> <li>300 mm (11.81 in) <b>6SN1161-1CA00-0DA0</b></li> </ul> </li> <li>Round cable for module width: (this is required for 6 axes or more)               <ul style="list-style-type: none"> <li>50 mm (1.97 in) <b>6SN1161-1CA00-0AA1</b></li> <li>100 mm (3.94 in) <b>6SN1161-1CA00-0BA1</b></li> <li>150 mm (5.91 in) <b>6SN1161-1CA00-0CA1</b></li> <li>350 mm (13.78 in) <b>6SN1161-1CA00-0EA1</b></li> </ul> </li> </ul>	
<b>Drive bus cable for SIMODRIVE 611 digital</b> For 2-tier configuration Shield contact clips on both sides, without terminating plug	
<ul style="list-style-type: none"> <li>Length: 2 m (6.56 ft) <b>6FX2002-1CC00-1AC0</b></li> <li>Length: 5 m (16.41 ft) <b>6FX2002-1CC00-1AF0</b></li> </ul>	
<b>Terminator</b> For drive bus <b>6FX2003-0DA00</b>	
<b>Device bus cable</b> For 2-tier configuration Length: 1.5 m (4.92 ft) <b>6SN1161-1AA00-0AA1</b>	
<b>Device bus cable</b> Length: 400 mm (15.75 in) <b>6SN1161-1AA00-0BA0</b>	
<b>Adapter terminals to connect the DC link</b> Package with 2 double terminals	
<ul style="list-style-type: none"> <li>50 mm<sup>2</sup> for module widths 50 ... 200 mm (1.97 to 7.87 in) <b>6SN1161-1AA01-0BA0</b></li> <li>95 mm<sup>2</sup> for module width 300 mm (11.81 in) <b>6SN1161-1AA01-0AA0</b></li> </ul>	

Designation	Order No.
<b>Signal amplifier electronics</b> In IP65 housing <b>6SN1115-0AA12-0AA0</b>	
<b>Coding spring</b> For plug side (socket) Quantity: 100 units <b>6FC9348-7BA</b>	
<b>Coding slider</b> For pin side Quantity: 100 units <b>6FC9348-7BB</b>	
<b>Filter module</b> For SSI absolute encoder with 24 V DC power supply <b>6SN1161-1DA00-0AA0</b>	
<b>Reinforced DC link busbars</b> 10 busbars for 50/100/150 mm (1.97/3.94/5.91 in) module <b>6SN1161-1AA02-6AA0</b>	
<b>Universal empty housing</b> Width: 50 mm (1.97 in) <b>6SN1162-1AA00-0AA0</b>	
<b>Adhesive warning label for SIMODRIVE 611</b> Quantity: 50 units <b>6SN1162-8YY00-0AA0</b>	
<b>Built-on fan</b> Radial fan with IP44 degree of protection for internal and external cooling Supply voltage: 360 ... 510 V 3 AC/45 ... 65 Hz Supply current: 0.2 ... 0.3 A <b>6SN1162-0BA02-0AA2</b>	
<b>Hose cooling packages<sup>1)</sup></b>	
<ul style="list-style-type: none"> <li><b>Package 1</b> for single module comprising:               <ul style="list-style-type: none"> <li>2 x module connection flange</li> <li>Hose 2 000 mm (6.56 ft)</li> <li>1 x cabinet connection flange</li> <li>1 x radial fan with cabinet connection flange</li> <li>Supply voltage: 360 ... 457 V 3 AC/47.5 ... 62.5 Hz</li> <li>Supply current: 1 ... 1.2 A</li> </ul> </li> </ul>	<b>6SN1162-0BA03-0AA1</b>
<ul style="list-style-type: none"> <li><b>Package 2</b> for 2-tier configuration of 55 kW I/R and 85 A power unit comprising:               <ul style="list-style-type: none"> <li>4 x module connection flange</li> <li>2 000 mm (6.56 ft) hose</li> <li>1 x cabinet connection flange</li> <li>1 x radial fan as for Package 1</li> </ul> </li> </ul>	<b>6SN1162-0BA03-0CA1</b>

<sup>1)</sup> Spare filter mats for filter type AFF0, see: [www.pfannenbergl.com](http://www.pfannenbergl.com)



### Overview

#### Adapter terminals



Adapter terminals for P600/M600 are available for connecting the DC link in two-tier configuration. Wiring has to be resistant to short circuits and ground faults and with equipotential bonding, cf. Configuration Manual.

#### Shield connection plates



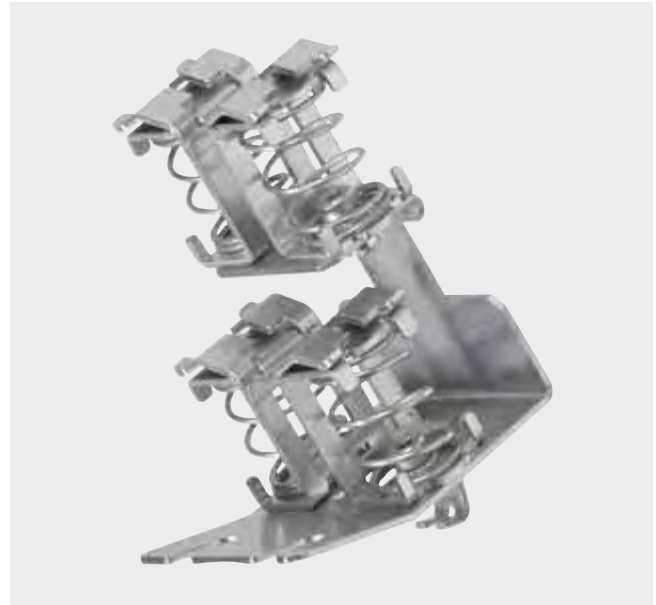
In order to meet the requirements of the IEC and EU Directives on EMC, line filters are to be used, and the motor cables and cables between the line filters, commutating reactors, and infeed module should be screened.

Shield connection plates matched to the modules are available for contacting the shields of screened motor supply cables. The shield connection plates are provided with prepared mounting points for brake connection terminals.

#### Shield connection



The shield connection is used for contacting the signal cables of the closed-loop control to the module housing's frame potential in accordance with the EMC Directive. The shield connection is available for 2 or 4 cables.



# Converter system

## SIMODRIVE 611

### Supplementary system components

#### Selection and ordering data

Designation	Order No.
<b>Shield connection plate</b> For 5 kW UI module, monitoring module and pulsed resistor module	<b>6SN1162-0EB00-0AA0</b>
<b>Shield connection plate</b> For 10 kW UI module	<b>6SN1162-0EB00-0BA0</b>
<b>Shield connection plate</b> For 28 kW UI module, I/R modules and power modules with: <ul style="list-style-type: none"> <li>• Internal cooling               <ul style="list-style-type: none"> <li>- Module width 50 mm (1.97 in) <b>6SN1162-0EA00-0AA0</b></li> <li>- Module width 100 mm (3.94 in) <b>6SN1162-0EA00-0BA0</b></li> <li>- Module width 150 mm (5.91 in) <b>6SN1162-0EA00-0CA0</b></li> <li>- Module width 200 mm (7.87 in) <b>6SN1162-0EA00-0JA0</b></li> <li>- Module width 300 mm (11.81 in) <b>6SN1162-0EA00-0DA0</b></li> </ul> </li> <li>• External cooling               <ul style="list-style-type: none"> <li>- Module width 50 mm (1.97 in) <b>6SN1162-0EB00-0AA0</b></li> <li>- Module width 100 mm (3.94 in) <b>6SN1162-0EB00-0BA0</b></li> <li>- Module width 150 mm (5.91 in) <b>6SN1162-0EB00-0CA0</b></li> <li>- Module width 200 mm (7.87 in) <b>6SN1162-0EB00-0JA0</b></li> <li>- Module width 300 mm (11.81 in) <b>6SN1162-0EB00-0DA0</b></li> </ul> </li> </ul>	
<b>Shield connection plate</b> For modules with hose cooling or internal cooling with built-on fan Module width 300 mm (11.81 in)	<b>6SN1162-0EA00-0KA0</b>
<b>Shield connection 2x</b> For signal cables of controls 10 units with screws	<b>6SN1162-0FA00-0AA1</b>
<b>Shield connection 4x</b> For signal cables of controls 5 units with screws	<b>6SN1162-0FA00-0AA2</b>

#### More information

For further information, please refer to the Configuration Manual SIMODRIVE 611 digital, Drive Converters and the EMC Guidelines for SINUMERIK, SIROTEC, SIMODRIVE, SIMOTION, SINAMICS S120.

For suitable cables, see Connection system MOTION-CONNECT.

### Overview

The SIMODRIVE 611 drive converter system is dimensioned to be directly operated on TN line supplies with rated voltages of 380 V 3 AC (with derating), 400 V 3 AC, 415 V 3 AC and 480 V 3 AC. Matching transformers that are tailored to the system are available to adapt the system to other line supply types, e.g. when connecting to IT or TT line supplies. The wide range covers the line voltages that are predominantly used in industrial regions worldwide.

TN line supplies are characterized by the fact that they have a low-resistance electrical connection between the reference ground potential of the current source and the protective conductor potential of the electrical equipment. If not directly available, these connection conditions must be fulfilled using a transformer with separate windings, whose neutral point on the secondary side is grounded at the protective conductor potential and is connected to the protective conductor of the drive converter (separate TN network).

This means that within the pulsed transistor converter, the voltage stressing on the insulating clearances between the power circuits at the line supply potential and the open and closed-loop control circuits referred to the protective conductor potential, according to a rated voltage of 300 V, complies with EN 50178.

Upstream devices providing protection against hazardous leakage currents or for fire protection (e.g. residual-current protective devices) must be universal current-sensitive in accordance with the requirements of EN 50178. When using other residual-current protective devices, a transformer with separate windings must be connected upstream of the converter for purposes of decoupling.

If only a voltage level adaptation is required on TN line supplies, then a transformer in economy circuit can be used.

### Technical specifications

Product name	Matching transformers with separate windings for 50/60 Hz networks							
Rated power	kVA	8.2	15.7	47	21	70	104	155
Assignment to infeed module	kW	5 (UI)	10 (UI)	28 (UI)/ 36 (I/R)	16 (I/R)	55 (I/R)	80 (I/R)	120 (I/R)
Output voltage	V	400 3 AC						
Frequency	Hz	50 ... 60						
Degree of protection to EN 60529 (IEC 60529)		IP00/IP20/IP23						
Ambient temperature, perm.								
• Operation	°C (°F)	-25 ... +40 (-13 ... +104), up to +55 (+131) with derating						
• Storage/transport	°C (°F)	-25 ... +80 (-13 ... +176)						
Power loss, max.	W	540	710	1 200	670	2 020	2 650	3 060
Dimensions, approx. (L x W x H)								
• Degree of protection IP00	mm (in)	360 x 268 x 320 (14.17 x 10.55 x 12.60)	420 x 262 x 370 (16.54 x 10.31 x 14.57)	480 x 267 x 420 (18.90 x 10.51 x 16.54)	480 x 209 x 420 (18.90 x 8.23 x 16.54)	630 x 330 x 585 (24.80 x 12.99 x 23.03)	780 x 350 x 665 (30.71 x 13.78 x 26.18)	780 x 391 x 665 (30.71 x 15.39 x 26.18)
• Degree of protection IP20/IP23 <sup>2)</sup>		For dimensions of the housing, please refer to Configuration Manual SIMODRIVE 611 digital, Drive Converters.						
Weight, approx.								
• Degree of protection IP00	kg (lb)	55 (121)	82 (181)	200 (441)	120 (265)	300 (662)	425 (937)	600 (1 323)
• Degree of protection IP20/IP23	kg (lb)	65 (143)	95 (209)	220 (485)	131 (289)	364 (803)	536 (1 182)	688 (1 517)
Conductor cross-section on secondary side, max.	mm <sup>2</sup>	6	16	35	16	70	FL <sup>1)</sup>	FL <sup>3)</sup>
Input voltage 575/500/480 V 3 AC ± 10 %; 50 ... 60 Hz								
Rated input current, max.	A	10.4	20	58	26	87	127	189
Conductor cross-section on primary side, max.	mm <sup>2</sup>	6	16	35	16	50	70	FL <sup>1)</sup>
Input voltage 440/415/400 V 3 AC ± 10 %; 50 ... 60 Hz								
Rated input current, max.	A	12.6	23.5	69.5	31	104	154	228
Conductor cross-section on primary side, max.	mm <sup>2</sup>	6	16	35	16	70	70	FL <sup>3)</sup>
Input voltage 240/220/200 V 3 AC ± 10 %; 50 ... 60 Hz								
Rated input current, max.	A	25.5	47	138.5	62	210	309	450
Conductor cross-section on primary side, max.	mm <sup>2</sup>	6	16	70	35	FL <sup>1)</sup>	FL <sup>3)</sup>	FL <sup>4)</sup>

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

<sup>2)</sup> Degree of protection IP20 for 21 kVA and above; with degree of protection IP23, 10 % derating must be taken into account.

<sup>3)</sup> FL = flat-type terminal for ring terminal end, CU 25 x 5; drilled hole Ø 11 mm (0.43 in).

<sup>4)</sup> FL = flat-type terminal for ring terminal end, CU 30 x 6; drilled hole Ø 11 mm (0.43 in).

# Converter system

## SIMODRIVE 611

### Line interfaces for voltage matching

#### Technical specifications (continued)

<b>Product name</b>	Matching transformers in economy circuit for 50/60 Hz (for TN networks only)					
<b>Rated power</b>						
• Autotransformer IP00/IP20	<b>kVA</b>	<b>21</b>	<b>46.5</b>	<b>70.3</b>	<b>104</b>	<b>155</b>
• Autotransformer IP23	<b>kVA</b>	<b>18.9</b>	<b>42</b>	<b>63.3</b>	<b>93.6</b>	<b>140</b>
<b>Assignment to infeed module</b>	<b>kW</b>	16 (I/R)	36 (I/R)	55 (I/R)	80 (I/R)	120 (I/R)
<b>Output voltage</b>	V	400 3 AC				
<b>Frequency</b>	Hz	50 ... 60				
<b>Vector group</b>		YNa0				
<b>Degree of protection to EN 60529 (IEC 60529)</b>		IP00/IP20/IP23				
<b>Ambient temperature, perm.</b>						
• Operation	°C (°F)	-25 ... +40 (-13 ... +104), up to +55 (+131) with derating				
• Storage/transport	°C (°F)	-25 ... +80 (-13 ... +176)				
Input voltage 480/440 V 3 AC ± 10 %						
<b>Power loss</b>						
• Autotransformer IP00/IP20	W	160 <sup>2)</sup>	430 <sup>2)</sup>	550 <sup>2)</sup>	700 <sup>2)</sup>	700
• Autotransformer IP23	W	135	370	460	590	600
<b>Conductor cross-section on primary/secondary side, max.</b>	mm <sup>2</sup>	16	35	70	FL <sup>1)</sup>	FL <sup>1)</sup>
<b>Dimensions (L x W x H)</b>						
• Autotransformer IP00/IP20	mm (in)	270 x 204 x 250 (10.63 x 8.03 x 9.84)	370 x 260 x 330 (14.57 x 10.24 x 12.99)	370 x 260 x 340 (14.57 x 10.24 x 13.39)	420 x 260 x 370 (16.54 x 10.24 x 14.57)	480 x 220 x 420 (18.90 x 8.66 x 16.54)
• Autotransformer IP23	mm (in)	351 x 330 x 395 (13.82 x 12.99 15.55)	460 x 465 x 555 (18.11 x 18.31 x 21.85)	460 x 465 x 555 (18.11 x 18.31 x 21.85)	460 x 465 x 555 (18.11 x 18.31 x 21.85)	565 x 460 x 520 (22.24 x 18.11 x 20.47)
<b>Weight, approx.</b>						
• Autotransformer IP00/IP20	kg (lb)	29 (63.9)	52 (115)	66 (146)	95 (209)	135 (298)
• Autotransformer IP23	kg (lb)	40 (88.2)	70 (154)	85 (187)	115 (254)	155 (342)
Input voltage 220 V 3 AC ± 10 %						
<b>Power loss</b>						
• Autotransformer IP00/IP20	W	550 <sup>2)</sup>	900	980	1 350	1 650
• Autotransformer IP23	W	460	760	830	1 150	1 400
<b>Conductor cross-section on primary/secondary side, max.</b>	mm <sup>2</sup>	16/16	70/50	95/70	FL <sup>1)</sup>	FL <sup>1)</sup>
<b>Dimensions (L x W x H)</b>						
• Autotransformer IP00/IP20	mm (in)	360 x 268 x 320 (14.17 x 10.55 x 12.60)	480 x 230 x 430 (18.90 x 9.06 x 16.93)	480 x 300 x 430 (18.90 x 11.81 x 16.93)	530 x 290 x 520 (20.87 x 11.42 x 20.47)	590 x 320 x 585 (23.23 x 12.60 x 23.03)
• Autotransformer IP23	mm (in)	460 x 465 x 555 (18.11 x 18.31 x 21.85)	565 x 290 x 520 (22.24 x 11.42 x 20.47)	565 x 460 x 520 (22.24 x 18.11 x 20.47)	900 x 600 x 720 (35.43 x 23.62 x 28.35)	900 x 600 x 720 (35.43 x 23.62 x 28.35)
<b>Weight, approx.</b>						
• Autotransformer IP00/IP20	kg (lb)	57 (126)	110 (243)	160 (353)	215 (474)	310 (684)
• Autotransformer IP23	kg (lb)	75 (165)	130 (287)	175 (386)	275 (606)	370 (816)

<sup>1)</sup> FL = flat-type terminal, drilled hole Ø 9 mm (0.35 in).

<sup>2)</sup> Not IP20.

## Selection and ordering data

Designation	Order No.
<b>Matching transformers with separate windings for 50/60 Hz networks</b>	
<ul style="list-style-type: none"> <li>• Input voltage 575/500/480 V 3 AC ± 10 %               <ul style="list-style-type: none"> <li>- 8.2 kVA<sup>1)</sup></li> <li>- 15.7 kVA<sup>1)</sup></li> <li>- 21 kVA</li> <li>- 47 kVA</li> <li>- 70 kVA</li> <li>- 104 kVA</li> <li>- 155 kVA</li> </ul> </li> <li>• Input voltage 440/415/400 V 3 AC ± 10 %               <ul style="list-style-type: none"> <li>- 8.2 kVA<sup>1)</sup></li> <li>- 15.7 kVA<sup>1)</sup></li> <li>- 21 kVA</li> <li>- 47 kVA</li> <li>- 70 kVA</li> <li>- 104 kVA</li> <li>- 155 kVA</li> </ul> </li> <li>• Input voltage 240/220/200 V 3 AC ± 10 %               <ul style="list-style-type: none"> <li>- 8.2 kVA<sup>1)</sup></li> <li>- 15.7 kVA<sup>1)</sup></li> <li>- 21 kVA</li> <li>- 47 kVA</li> <li>- 70 kVA</li> <li>- 104 kVA</li> <li>- 155 kVA</li> </ul> </li> <li>• Degree of protection:               <ul style="list-style-type: none"> <li>- IP00</li> <li>- IP20</li> <li>- IP23<sup>2)</sup></li> </ul> </li> </ul>	<p>4AU3695-0SB0-0CN2</p> <p>4AU3995-0SA3-0CN2</p> <p>4BU4395-0SA7-0C</p> <p>4BU4795-0SC3-0C</p> <p>4BU5595-0SA4-0C</p> <p>4BU5895-0SA6-0C</p> <p>4BU6095-0SA6-0C</p> <p>4AU3695-0SB1-0CN2</p> <p>4AU3995-0SA4-0CN2</p> <p>4BU4395-0SA8-0C</p> <p>4BU4795-0SC4-0C</p> <p>4BU5595-0SA5-0C</p> <p>4BU5895-0SA7-0C</p> <p>4BU6095-0SA7-0C</p> <p>4AU3695-0SB2-0CN2</p> <p>4AU3995-0SA5-0CN2</p> <p>4BU4395-0SB0-0C</p> <p>4BU4795-0SC5-0C</p> <p>4BU5595-0SA6-0C</p> <p>4BU5895-0SA8-0C</p> <p>4BU6095-0SA8-0C</p> <p>0</p> <p>8</p> <p>2</p>
<b>Matching transformers with economy circuit for 50/60 Hz networks</b>	
<ul style="list-style-type: none"> <li>• Input voltage 480/440 V 3 AC ± 10 %</li> </ul>	
<u>Degree of protection IP00</u>	
<ul style="list-style-type: none"> <li>- 21 kVA</li> <li>- 46.5 kVA</li> <li>- 70.3 kVA</li> <li>- 104 kVA</li> <li>- 155 kVA</li> </ul>	<p>4AP2796-0EL40-2XA0</p> <p>4AU3696-0ER20-2XA0</p> <p>4AU3696-2NA00-2XA0</p> <p>4AU3996-0EQ80-2XA0</p> <p>4BU4395-0CB50-8B</p>
<u>Degree of protection IP20</u>	
<ul style="list-style-type: none"> <li>- 155 kVA</li> </ul>	4BU4395-0CB58-8B
<u>Degree of protection IP23</u>	
<ul style="list-style-type: none"> <li>- 18.9 kVA</li> <li>- 42 kVA</li> <li>- 63.6 kVA</li> <li>- 93.6 kVA</li> <li>- 140 kVA</li> </ul>	<p>4AP2796-0EL40-2XC0</p> <p>4AU3696-0ER20-2XC0</p> <p>4AU3696-2NA00-2XC0</p> <p>4AU3996-0EQ80-2XC0</p> <p>4BU4395-0CB52-8B</p>

Designation	Order No.
<ul style="list-style-type: none"> <li>• Input voltage 220 V 3 AC ± 10 %</li> </ul>	
<u>Degree of protection IP00</u>	
<ul style="list-style-type: none"> <li>- 21 kVA</li> <li>- 46.5 kVA</li> <li>- 70.3 kVA</li> <li>- 104 kVA</li> <li>- 155 kVA</li> </ul>	<p>4AU3696-0ER30-2XA0</p> <p>4BU4395-0CB60-8B</p> <p>4BU4595-0BD00-8B</p> <p>4BU5295-0AE40-8B</p> <p>4BU5495-1AA10-8B</p>
<u>Degree of protection IP20</u>	
<ul style="list-style-type: none"> <li>- 46.5 kVA</li> <li>- 70.3 kVA</li> <li>- 104 kVA</li> <li>- 155 kVA</li> </ul>	<p>4BU4395-0CB68-8B</p> <p>4BU4595-0BD08-8B</p> <p>4BU5295-0AE48-8B</p> <p>4BU5495-1AA18-8B</p>
<u>Degree of protection IP23</u>	
<ul style="list-style-type: none"> <li>- 18.9 kVA</li> <li>- 42 kVA</li> <li>- 63.3 kVA</li> <li>- 93.6 kVA</li> <li>- 140 kVA</li> </ul>	<p>4AU3696-0ER30-2XC0</p> <p>4BU4395-0CB62-8B</p> <p>4BU4595-0BD02-8B</p> <p>4BU5295-0AE42-8B</p> <p>4BU5495-1AA12-8B</p>

<sup>1)</sup> Not IP20 degree of protection.

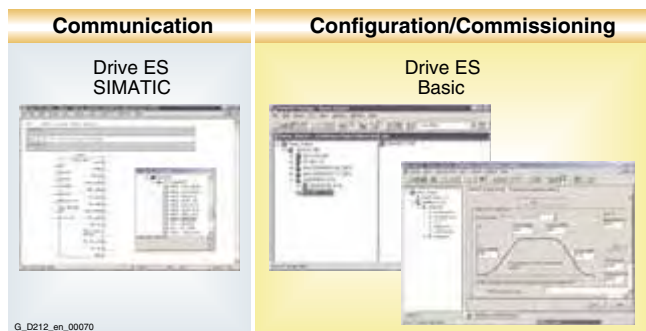
<sup>2)</sup> 10 % power derating required.

# Converter system

## SIMODRIVE 611

Engineering software  
Drive ES engineering software

### Overview



Drive ES is the engineering system used to integrate Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively in terms of communication, configuration and data management. The STEP 7 Manager user interface provides the ideal basis for this.

Various software packages are available for SINAMICS:

#### Drive ES Basic

For first-time users of the world of Totally Integrated Automation and the option for routing beyond network limits and the use of the SIMATIC TeleService.

Drive ES Basic is the basic software program for setting the parameters of all drives online and offline.

Drive ES Basic enables both the automation system and drives to be handled via the SIMATIC Manager user interface.

Drive ES Basic is the starting point for common data archiving for complete projects and for extending the use of the SIMATIC TeleService to drives. Drive ES Basic provides the configuration tools for the new Motion Control functions – slave-to-slave communication, equidistance and isochronous operation with PROFIBUS DP.

#### Drive ES SIMATIC

Easy parameter assignment of the STEP 7 communications program instead of programming.

Drive ES SIMATIC requires that STEP 7 is installed. It features a SIMATIC function block library, thereby making the programming of the PROFIBUS interface in the SIMATIC CPU for the drives easy and secure.

There is no need for separate, time-consuming programming of the data exchange between the SIMATIC CPU and the drive. All Drive ES users need to remember is: Copy – Modify – Load – Ready.

Customized, fully-developed function blocks are copied from the library into user-specific projects.

Frequently-used functions are set to run in program format:

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

#### Drive ES PCS 7

Drive ES PCS 7 integrates drives with the PROFIBUS interface into the SIMATIC PCS 7 process control system.

Drive ES PCS 7 can only be used with SIMATIC PCS 7 Version 5.2 and higher. Drive ES PCS 7 provides a function block library with function blocks for the drives and the corresponding faceplates for the operator station. This means that the drives can be operated from the PCS 7 process control system.

### Selection and ordering data

Designation	Order No.
<b>Drive ES Basic V5.4</b> Configuring software for the integration of drives into Totally Integrated Automation on CD-ROM Precondition: STEP 7 V5.3 and higher, SP 3 Languages: English, French, German, Italian, Spanish with electronic documentation	
• Single license	<b>6SW1700-5JA00-4AA0</b>
• Single license without data carrier 60 units	<b>6SW1700-5JA00-4AA1</b>
• Update service for single license	<b>6SW1700-0JA00-0AB2</b>
• Update service for single license without data carrier	<b>6SW1700-0JA00-1AB2</b>
• Upgrade from V5.x to V5.4	<b>6SW1700-5JA00-4AA4</b>
<b>Drive ES SIMATIC V5.4</b> Function block library for SIMATIC for the parameterization of communication with the drives on CD-ROM Precondition: STEP 7 V5.3 and higher, SP 3 Languages: English, French, German, Italian, Spanish with electronic documentation	
• Single license incl. 1 x Runtime license	<b>6SW1700-5JC00-4AA0</b>
• Runtime license	<b>6SW1700-5JC00-1AC0</b>
• Update service for single license	<b>6SW1700-0JC00-0AB2</b>
• Upgrade from V5.x to V5.4	<b>6SW1700-5JC00-4AA4</b>
<b>Drive ES PCS 7 V6.1</b> Function block library for PCS 7 for the integration of drives on CD-ROM Precondition: PCS 7, V6.1 and higher Languages: English, French, German, Italian, Spanish with electronic documentation	
• Single license incl. 1 x Runtime license	<b>6SW1700-6JD00-1AA0</b>
• Runtime license	<b>6SW1700-5JD00-1AC0</b>
• Update service for single license	<b>6SW1700-0JD00-0AB2</b>
• Upgrade from V5.x to V6.1	<b>6SW1700-6JD00-1AA4</b>

### More Information

Additional information is available in the Internet under:



[www.siemens.com/drivesolutions](http://www.siemens.com/drivesolutions)

# Connection system MOTION-CONNECT

# 10



<b>10/2</b>	<b>General</b>
<b>10/6</b>	<b>Power cables MOTION-CONNECT</b>
10/6	Without brake cores
10/7	With brake cores
<b>10/8</b>	<b>Power cables MOTION-CONNECT for</b>
10/8	1PH7 motors
10/8	1FN3 linear motors
10/8	1FW6 torque motors
<b>10/9</b>	<b>Power cables Extensions</b>
10/9	1FT/1FK motors
<b>10/10</b>	<b>Signal cables</b>
<b>10/10</b>	<b>Signal cables Extensions</b>
<b>10/11</b>	<b>Accessories for power/ signal cables</b>
10/11	Mounting flange
10/11	HF (high-frequency) clamp
<b>10/12</b>	<b>MPI bus cables – pre-assembled</b>
<b>10/14</b>	<b>Length codes</b>

For products approved for Canada  
and U.S.A., see Appendix

# Connection system

## MOTION-CONNECT

### General

#### Overview

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

The power cables and signal cables can be ordered by the meter or pre-assembled.

The following MOTION-CONNECT cable designs are available:

- **MOTION-CONNECT 500** is the option for mainly fixed installation.
- **MOTION-CONNECT 500 PLUS** is designed to meet average mechanical requirements and is therefore particularly suitable for woodworking machines, printing machines and simple machine tools.
- **MOTION-CONNECT 700** is the ideal complement to linear motors and machines with high dynamic requirements. The cables are resistant to cutting oils.
- **MOTION-CONNECT 800** meets all high mechanical requirements for use in cable carriers for machine tools and production machines. The cables are resistant to cutting oils.

#### Benefits

The use of pre-assembled MOTION-CONNECT cables will ensure high quality and system-tested, problem-free operation. The cables can be supplied in exact meter lengths. Intermediate lengths are also available in 0.1 m (3.94 in) increments.

Power and signal cables can be extended or configured as required.

#### Application

Degree of protection of pre-assembled power and signal cables and their extensions when closed and inserted: IP67

When cable lengths (basic cables and extensions) are determined for the systems and applications described in this catalog, the technically permissible maximum cable lengths (e.g.  $\leq 25$  m (82 ft)) specified in the catalog must be observed. Malfunctions can occur if longer cables are used.

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

When the power and/or signal cables include more than one additional intermediate connection, the maximum permissible cable length is reduced by 2 m (6.56 ft) for each interruption point.

The cables are not suitable for outdoor use.

Operation on networks with 660 V to 690 V and earthed phase conductor is permissible only after taking a special precaution to reduce the overvoltage category by one grade, e.g. upstream connection of an isolating transformer.

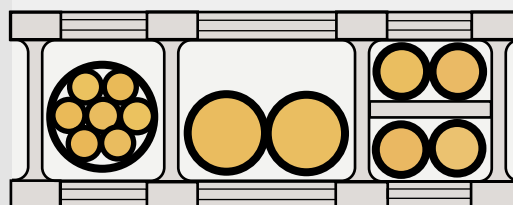


#### Function



G\_NC01\_XX\_00289

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

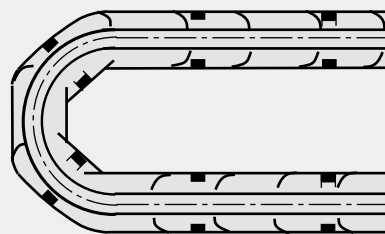


G\_NC01\_XX\_00291

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

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

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



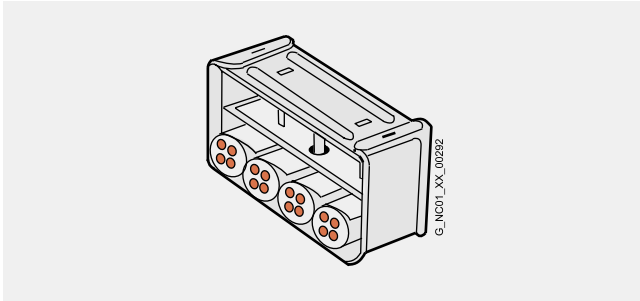
G\_NC01\_XX\_00290

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

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



### Function (continued)



MOTION-CONNECT cables are tested in a cable carrier. A cable strain relief is attached to the moving ends of the cable carrier. Strain relief is applied over a wide area of the cable jacket surface without squeezing the cable.

When installing the cables, always observe the installation instructions of the cable carrier manufacturer depending on the design of the plant.





#### Note:

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

MOTION-CONNECT cables are approved for a maximum horizontal travel distance of 5 m (16.41 ft).

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

#### Representation in connection overviews

Symbol	Explanation
	Connector with pin contacts
	Connector with socket contacts
	Exposed core ends
	Cable not included in scope of supply

### More information

#### Current carrying capacity for power and signal cables

The current carrying capacity of PVC/PUR-insulated copper cables is specified for installation types B1, B2 and C under continuous operating conditions in the table with reference to an ambient air temperature of 40 °C (104 °F). For other ambient temperatures, the values must be corrected using the derating factors in the corresponding table.

Cross-section mm <sup>2</sup>	Current carrying capacity rms; AC 50/60 Hz or DC for installation type			Standard
	B1	B2	C	
	A	A	A	
<b>Electronic</b>				EN 60204-1
0.20	–	4.3	4.4	
0.50	–	7.5	7.5	
0.75	–	9	9.5	
<b>Power</b>				EN 60204-1
0.75	8.6	8.5	9.8	
1.00	10.3	10.1	11.7	
1.50	13.5	13.1	15.2	
2.50	18.3	17.4	21	
4	24	23	28	
6	31	30	36	
10	44	40	50	
16	59	54	66	
25	77	70	84	
35	96	86	104	
50	117	103	125	
70	149	130	160	
95	180	165	194	
120	208	179	225	
150	–	–	259 <sup>1)</sup>	
185	–	–	296 <sup>1)</sup>	
> 185	Values must be taken from the standard IEC 60364-5-52			

#### 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

<sup>1)</sup> Extrapolated value.

# Connection system

## MOTION-CONNECT

### General Power cables

#### Technical specifications

Power cables	MOTION-CONNECT 500	MOTION-CONNECT 500 PLUS	MOTION-CONNECT 700	MOTION-CONNECT 800
Type	6FX500-.....-....	6FX51...-.....-....	6FX700-.....-....	6FX800-.....-....
<b>Approvals</b>				
• VDE <sup>1)</sup>	Yes	Yes	Yes	Yes
• cUL or UL/CSA	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90
• UL-CSA File No. <sup>2)</sup>	Yes	Yes	Yes	Yes
<b>Rated voltage <math>V_0/V</math> in accordance with EN 50395</b>				
• Power conductors	600 V/1 000 V	600 V/1 000 V	600 V/1 000 V	600 V/1 000 V
• Signal conductors	24 V (EN) 1 000 V (UL/CSA)	24 V (EN) 1 000 V (UL/CSA)	24 V (EN) 1 000 V (UL/CSA)	24 V (EN) 1 000 V (UL/CSA)
<b>Test voltage, rms</b>				
• Power conductors	4 kV	4 kV	4 kV	4 kV
• Signal conductors	2 kV	2 kV	2 kV	2 kV
<b>Operating temperature on the surface</b>				
• Fixed installation	-20 ... +80 °C (-4 ... +176 °F)	-20 ... +80 °C (-4 ... +176 °F)	-50 ... +80 °C (-58 ... +176 °F)	-50 ... +80 °C (-58 ... +176 °F)
• Flexible installation	0 ... 60 °C (32 ... 140 °F)	0 ... 60 °C (32 ... 140 °F)	-20 ... +60 °C (-4 ... +140 °F)	-20 ... +60 °C (-4 ... +140 °F)
<b>Tensile load, max.</b>				
• Fixed installation	50 N/mm <sup>2</sup> (7 252 lb <sub>f</sub> /in <sup>2</sup> )	50 N/mm <sup>2</sup> (7 252 lb <sub>f</sub> /in <sup>2</sup> )	50 N/mm <sup>2</sup> (7 252 lb <sub>f</sub> /in <sup>2</sup> )	50 N/mm <sup>2</sup> (7 252 lb <sub>f</sub> /in <sup>2</sup> )
• Flexible installation	20 N/mm <sup>2</sup> (2 901 lb <sub>f</sub> /in <sup>2</sup> )	20 N/mm <sup>2</sup> (2 901 lb <sub>f</sub> /in <sup>2</sup> )	20 N/mm <sup>2</sup> (2 901 lb <sub>f</sub> /in <sup>2</sup> )	20 N/mm <sup>2</sup> (2 901 lb <sub>f</sub> /in <sup>2</sup> )
<b>Smallest bending radius</b>				
• Fixed installation	5 × $D_{max}$	5 × $D_{max}$	4 × $D_{max}$	6 × $D_{max}$
• Flexible installation	See power cables	See power cables	See power cables	See power cables
<b>Torsional stress</b>	Absolute 30°/m	Absolute 30°/m	Absolute 30°/m	Absolute 30°/m
<b>Bending</b>	100 000	2 million	10 million from 16 mm <sup>2</sup> : 3 million	10 million from 10 mm <sup>2</sup> : 3 million
<b>Traversing velocity</b>	30 m/min (98.43 ft/min)	180 m/min (591 ft/min)	200 m/min (656 ft/min) from 16 mm <sup>2</sup> : 150 m/min (492 ft/min)	180 m/min (591 ft/min) from 10 mm <sup>2</sup> : 100 m/min (328 ft/min)
<b>Acceleration</b>	2 m/s <sup>2</sup> (6.56 ft/s <sup>2</sup> )	5 m/s <sup>2</sup> (16.41 ft/s <sup>2</sup> )	30 m/s <sup>2</sup> (98.43 ft/s <sup>2</sup> )	5 m/s <sup>2</sup> (16.41 ft/s <sup>2</sup> ) (5 m (16.41 ft)); 10 m/s <sup>2</sup> (32.81 ft/s <sup>2</sup> ) (2.5 m (8.20 ft))
<b>Insulation material</b>	CFC/silicone-free	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/ DIN VDE 0472-815	CFC/halogen/silicone-free IEC 60754-1/ DIN VDE 0472-815
<b>Oil resistance</b>	EN 60811-2-1 (mineral oil only)	EN 60811-2-1 (mineral oil only)	EN 60811-2-1	EN 60811-2-1
<b>Outer jacket</b>	PVC  DESINA color orange RAL 2003	PVC  DESINA color orange RAL 2003	PUR, HD22.10 S2 (VDE 0282, Part 10)  DESINA color orange RAL 2003	PUR, HD22.10 S2 (VDE 0282, Part 10)  DESINA color orange RAL 2003
<b>Flame-retardant</b>	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

<sup>1)</sup> The respective registration number is printed on the cable jacket, only valid for power cables.

<sup>2)</sup> The File Number is printed on the cable jacket.

**Technical specifications** (continued)

Signal cables	MOTION-CONNECT 500	MOTION-CONNECT 700	MOTION-CONNECT 800
Type	6FX500-.....-....	6FX700-.....-....	6FX800-.....-....
<b>Approvals</b>			
• VDE	Yes	Yes	Yes
• cUL or UL/CSA	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90
• UL-CSA File No. <sup>1)</sup>	Yes	Yes	Yes
<b>Rated voltage according to EN 50395</b>	30 V	30 V	30 V
<b>Test voltage, rms</b>	500 V	500 V	500 V
<b>Operating temperature on the surface</b>			
• Fixed installation	-20 ... +80 °C (-4 ... +176 °F)	-50 ... +80 °C (-58 ... +176 °F)	-50 ... +80 °C (-58 ... +176 °F)
• Flexible installation	0 ... 60 °C (32 ... 140 °F)	-20 ... +60 °C (-4 ... +140 °F)	-20 ... +60 °C (-4 ... +140 °F)
<b>Tensile load, max.</b>			
• Fixed installation	50 N/mm <sup>2</sup> (7 252 lb <sub>f</sub> /in <sup>2</sup> )	50 N/mm <sup>2</sup> (7 252 lb <sub>f</sub> /in <sup>2</sup> )	50 N/mm <sup>2</sup> (7 252 lb <sub>f</sub> /in <sup>2</sup> )
• Flexible installation	20 N/mm <sup>2</sup> (2 901 lb <sub>f</sub> /in <sup>2</sup> )	20 N/mm <sup>2</sup> (2 901 lb <sub>f</sub> /in <sup>2</sup> )	20 N/mm <sup>2</sup> (2 901 lb <sub>f</sub> /in <sup>2</sup> )
<b>Smallest bending radius</b>			
• Fixed installation	60 mm (2.36 in)	60 mm (2.36 in)	60 mm (2.36 in)
• Flexible installation	100 mm (3.94 in)	95 mm (3.74 in)	100 mm (3.94 in)
<b>Torsional stress</b>	Absolute 30°/m	Absolute 30°/m	Absolute 30°/m
<b>Bending</b>	2 million	10 million	10 million
<b>Traversing velocity</b>	180 m/min (591 ft/min)	200 m/min (656.2 ft/min)	180 m/min (591 ft/min)
<b>Acceleration</b>	5 m/s <sup>2</sup> (16.41 ft/s <sup>2</sup> )	30 m/s <sup>2</sup> (98.43 ft/s <sup>2</sup> )	5 m/s <sup>2</sup> (16.41 ft/s <sup>2</sup> ), (5 m (16.41 ft)); 10 m/s <sup>2</sup> (32.81 ft/s <sup>2</sup> ) (2.5 m (8.20 ft))
<b>Insulation material</b>	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
<b>Oil resistance</b>	EN 60811-2-1 (mineral oil only)	EN 60811-2-1	EN 60811-2-1
<b>Outer jacket</b>	PVC  DESINA color green RAL 6018	PUR, HD22.10 S2 (VDE 0282, Part 10)  DESINA color green RAL 6018	PUR, HD22.10 S2 (VDE 0282, Part 10)  DESINA color green RAL 6018
<b>Flame-retardant</b>	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

<sup>1)</sup> The File Number is printed on the cable jacket.

# Connection system

## MOTION-CONNECT

### Power cables

#### Overview



Synchronous and asynchronous motors are connected by means of MOTION-CONNECT power cables.

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

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

#### Note:

All power cables **6FX.002-5....-....** are also available as customized cables with crimped contacts and with the connector housing **for the motor side** supplied separately. In this case, the 6th position of the Order No. must be changed from 0 to 4: **6FX.042-5....-....**

#### Selection and ordering data

##### MOTION-CONNECT power cables *without brake cores*

No. of cores x cross-section mm <sup>2</sup>	Connector size, motor side	Pre-assembled cable for 1FT/1FK motors Order No.	$D_{max}$ 6FX50 mm (in)	$D_{max}$ 6FX51 mm (in)	$D_{max}$ 6FX8 mm (in)	Cable sold by the meter <sup>2)</sup> for motors with terminal box Order No.	Weight (without connector)			Smallest perm. bending radius <sup>1)</sup>		
							6FX50 kg/m (lb/ft)	6FX51 kg/m (lb/ft)	6FX8 kg/m (lb/ft)	6FX50 mm (in)	6FX51 mm (in)	6FX8 mm (in)
4 x 1.5	1	<b>6FX ■■■ 02-5CA01- ....</b>	8.4 (0.33)	10.1 (0.40)	10.4 (0.41)	<b>6FX ■■■ 08-1BB11- ...0</b>	0.12 (0.081)	0.16 (0.108)	0.16 (0.108)	155 (6.10)	105 (4.13)	100 (3.94)
	1.5	<b>6FX ■■■ 02-5CA21- ....</b>										
4 x 2.5	1	<b>6FX ■■■ 02-5CA11- ....</b>	10 (0.39)	11.5 (0.45)	12.1 (0.48)	<b>6FX ■■■ 08-1BB21- ...0</b>	0.21 (0.141)	0.22 (0.148)	0.23 (0.155)	180 (7.09)	115 (4.53)	120 (4.72)
	1.5	<b>6FX ■■■ 02-5CA31- ....</b>										
4 x 4	1.5	<b>6FX ■■■ 02-5CA41- ....</b>	11.4 (0.45)	13.3 (0.52)	13.2 (0.52)	<b>6FX ■■■ 08-1BB31- ...0</b>	0.27 (0.181)	0.32 (0.215)	0.31 (0.208)	210 (8.28)	135 (5.31)	130 (5.12)
4 x 6	1.5	<b>6FX ■■■ 02-5CA51- ....</b>	13.6 (0.54)	15.5 (0.61)	16 (0.63)	<b>6FX ■■■ 08-1BB41- ...0</b>	0.37 (0.242)	0.43 (0.289)	0.42 (0.282)	245 (9.65)	160 (6.30)	170 (6.69)
4 x 10	1.5	<b>6FX ■ 0 02-5CA61- ....</b>	20 (0.79)	–	19.4 (0.76)	<b>6FX ■ 0 08-1BB51- ...0</b>	0.73 (0.491)	–	0.63 (0.423)	360 (14.17)	–	210 (8.28)
	3	<b>6FX ■ 0 02-5CA13- ....</b>										
4 x 16	3	<b>6FX ■ 0 02-5CA23- ....</b>	24.2 (0.95)	–	23.6 (0.93)	<b>6FX ■ 0 08-1BB61- ...0</b>	1.10 (0.793)	–	0.95 (0.638)	440 (17.32)	–	260 (10.24)
4 x 25	–		28 (1.10)			<b>6FX 5 0 08-1BB25- ...0</b>	1.62 (1.089)			505 (19.88)		
4 x 35	–		31.5 (1.24)			<b>6FX 5 0 08-1BB35- ...0</b>	1.93 (1.297)			570 (22.44)		
4 x 50	–		38 (1.50)			<b>6FX 5 0 08-1BB50- ...0</b>	3.04 (2.043)			685 (26.44)		
4 x 70	–		42.6 (1.68)			<b>6FX 5 0 08-1BB70- ...0</b>	3.96 (2.661)			770 (30.31)		
4 x 95	–		51.7 (2.04)			<b>6FX 5 0 08-1BB05- ...0</b>	5.55 (3.729)			935 (36.81)		
4 x 120	–		56 (2.20)			<b>6FX 5 0 08-1BB12- ...0</b>	6.69 (4.495)			1 010 (39.76)		
4 x 150	–		63 (2.48)			<b>6FX 5 0 08-1BB15- ...0</b>	8.21 (5.517)			1 135 (44.69)		
4 x 185	–		66.2 (2.61)			<b>6FX 5 0 08-1BB18- ...0</b>	9.82 (6.599)			1 195 (47.05)		

**5 0 MOTION-CONNECT 500**

**5 1 MOTION-CONNECT 500 PLUS**

**8 0 MOTION-CONNECT 800**

**5 0**

**5 1**

**8 0**

Length codes

...

...0

<sup>1)</sup> Valid for installation in cable carrier.

<sup>2)</sup> Power cables of 4 mm<sup>2</sup> or greater can be ordered in exact meter lengths up to a length of 100 m (328 ft).

Power cables of 1.5 mm<sup>2</sup> and 2.5 mm<sup>2</sup> are supplied in coils or on disposable drums in lengths of 50 m (154 ft), 100 m (328 ft), 200 m (656 ft) and 500 m (1 640 ft).

## Selection and ordering data (continued)

**MOTION-CONNECT power cables with brake cores**

No. of cores x cross-section mm <sup>2</sup>	Con- nec- tor size, motor side	Pre-assembled cable for 1FT/1FK motors Order No.	$D_{max}$	$D_{max}$	$D_{max}$	$D_{max}$	Cable sold by the meter <sup>2)</sup> for motors with terminal box Order No.	Weight (without connector)				Smallest perm. bending radius <sup>1)</sup>				
			6FX50	6FX51	6FX7	6FX8		6FX50	6FX51	6FX7	6FX8	6FX50	6FX51	6FX7	6FX8	
			mm (in)	mm (in)	mm (in)	mm (in)		kg/m (lb/ft)	kg/m (lb/ft)	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)	mm (in)	mm (in)	
4 × 1.5 + 2 × 1.5	0.5	<b>6FX 5 0 02-5DA30- ....</b>	10.8 (0.43)	-	-	-	<b>6FX 5 0 08-1BA11- ...0</b>	0.22 (0.148)	-	-	-	195 (7.68)	-	-	-	
4 × 1.5 + 2 × 1.5	1	<b>6FX ■ ■ 02-5DA01- ....</b>	10.8 (0.43)	13.1 (0.52)	14.0 (0.55)	12.9 (0.51)	<b>6FX ■ ■ 08-1BA11- ...0</b>	0.22 (0.148)	0.24 (0.161)	0.26 (0.175)	0.25 (0.168)	195 (7.68)	135 (5.31)	100 (3.94)	125 (4.92)	
	1.5	<b>6FX ■ ■ 02-5DA21- ....</b>														
4 × 2.5 + 2 × 1.5	1	<b>6FX ■ ■ 02-5DA11- ....</b>	12.4 (0.49)	14.2 (0.56)	15.2 (0.60)	14.2 (0.56)	<b>6FX ■ ■ 08-1BA21- ...0</b>	0.25 (0.168)	0.31 (0.208)	0.33 (0.222)	0.31 (0.208)	225 (10.04)	145 (5.71)	110 (4.33)	140 (5.51)	
	1.5	<b>6FX ■ ■ 02-5DA31- ....</b>														
4 × 4 + 2 × 1.5	1.5	<b>6FX ■ ■ 02-5DA41- ....</b>	14.0 (0.55)	15.9 (0.63)	16.6 (0.65)	15.3 (0.60)	<b>6FX ■ ■ 08-1BA31- ...0</b>	0.35 (0.235)	0.41 (0.276)	0.43 (0.289)	0.40 (0.269)	255 (10.04)	160 (6.30)	120 (4.72)	150 (5.91)	
4 × 6 + 2 × 1.5	1.5	<b>6FX ■ ■ 02-5DA51- ....</b>	16.1 (0.63)	16.9 (0.67)	18.3 (0.72)	17.8 (0.70)	<b>6FX ■ ■ 08-1BA41- ...0</b>	0.49 (0.329)	0.51 (0.343)	0.52 (0.349)	0.53 (0.356)	290 (11.42)	170 (6.69)	130 (5.12)	195 (7.68)	
4 × 10 + 2 × 1.5	1.5	<b>6FX ■ 0 02-5DA61- ....</b>	21.7 (0.85)	-	23.5 (0.93)	20.8 (0.82)	<b>6FX ■ 0 08-1BA51- ...0</b>	0.81 (0.544)	-	0.79 (0.531)	0.78 (0.524)	395 (15.55)	-	165 (6.50)	230 (9.06)	
	3	<b>6FX 5 0 02-5DA13- ....</b>														
4 × 16 + 2 × 1.5	3	<b>6FX ■ 0 02-5DA23- ....</b>	25.0 (0.98)	-	26.1 (1.03)	24.7 (0.97)	<b>6FX ■ 0 08-1BA61- ...0</b>	1.12 (0.753)	-	1.06 (0.712)	1.05 (0.706)	450 (17.72)	-	185 (7.28)	275 (10.83)	
4 × 25 + 2 × 1.5	3	<b>6FX ■ 0 02-5DA33- ....</b>	29.4 (1.16)	-	30.5 (1.20)	27.9 (1.10)	<b>6FX ■ 0 08-1BA25- ...0</b>	1.62 (1.089)	-	1.52 (1.021)	1.51 (1.015)	530 (20.87)	-	215 (8.46)	325 (12.80)	
4 × 35 + 2 × 1.5	3	<b>6FX 5 0 02-5DA43- ....</b>	32.6 (1.28)	-	-	32.0 (1.26)	<b>6FX 5 0 08-1BA35- ...0</b>	2.06 (1.384)	-	-	2.00 (1.344)	590 (23.23)	-	-	380 (14.96)	
		<b>6FX 8 0 02-5DA43- ....</b>					<b>6FX 8 0 08-1BA35- ...0</b>									
4 × 50 + 2 × 1.5	3	<b>6FX 5 0 02-5DA53- ....</b>	38.0 (1.50)	-	-	35.8 (1.41)	<b>6FX 5 0 08-1BA50- ...0</b>	3.04 (2.043)	-	-	2.66 (1.787)	685 (26.97)	-	-	420 (16.54)	
		<b>6FX 8 0 02-5DA53- ....</b>					<b>6FX 8 0 08-1BA50- ...0</b>									
		<b>5 0 MOTION-CONNECT 500</b>					<b>5 0</b>									
		<b>5 1 MOTION-CONNECT 500 PLUS</b>					<b>5 1</b>									
		<b>7 0 MOTION-CONNECT 700</b>					<b>7 0</b>									
		<b>8 0 MOTION-CONNECT 800</b>					<b>8 0</b>									
<b>Length codes</b>		<b>....</b>					<b>...0</b>									

<sup>1)</sup> Valid for installation in cable carrier.

<sup>2)</sup> Power cables of 4 mm<sup>2</sup> or greater can be ordered in exact meter lengths up to a length of 100 m (328 ft).

Power cables of 1.5 mm<sup>2</sup> and 2.5 mm<sup>2</sup> are supplied in coils or on disposable drums in lengths of 50 m (154 ft), 100 m (328 ft), 200 m (656 ft) and 500 m (1 640 ft).

# Connection system

## MOTION-CONNECT

### Power cables

#### Selection and ordering data (continued)

##### Pre-assembled MOTION-CONNECT power cables for 1PH7 motors

Motor Type	Conduit thread	No. of cores x cross-section mm <sup>2</sup>	Pre-assembled cable for 1PH7 motors Order No.	Weight (without connector)		Smallest perm. bending radius <sup>1)</sup>	
				6FX5 kg/m (lb/ft)	6FX8 kg/m (lb/ft)	6FX5 mm (in)	6FX8 mm (in)
1PH710	PG29	4 x 10	<b>6FX</b> ■ <b>002-5CB10-</b> ....	0.73 (0.491)	0.63 (0.423)	360 (14.17)	210 (8.27)
		4 x 16	<b>6FX</b> ■ <b>002-5CB16-</b> ....	1.10 (0.739)	0.95 (0.638)	440 (17.32)	260 (10.24)
1PH713	PG36	4 x 16	<b>6FX</b> ■ <b>002-5CC16-</b> ....	1.10 (0.739)	0.95 (0.638)	440 (17.32)	260 (10.24)
		4 x 25	<b>6FX</b> <b>5 002-5CC25-</b> ....	1.62 (1.089)	-	530 (20.87)	-
		4 x 25	<b>6FX</b> <b>8 002-5DC25-</b> ....	-	1.51 (1.015)	-	325 (12.80)
		4 x 35	<b>6FX</b> <b>5 002-5CC35-</b> ....	1.93 (1.297)	-	590 (23.23)	-
		4 x 35	<b>6FX</b> <b>8 002-5DC35-</b> ....	-	2.00 (1.344)	-	380 (14.96)
1PH716	PG42	4 x 25	<b>6FX</b> <b>5 002-5CD25-</b> ....	1.62 (1.089)	-	530 (20.87)	-
		4 x 25	<b>6FX</b> <b>8 002-5DD25-</b> ....	-	1.51 (1.015)	-	325 (12.80)
		4 x 35	<b>6FX</b> <b>5 002-5CD35-</b> ....	1.93 (1.297)	-	590 (23.23)	-
		4 x 35	<b>6FX</b> <b>8 002-5DD35-</b> ....	-	2.00 (1.344)	-	380 (14.96)
<b>MOTION-CONNECT 500</b>			<b>5</b>				
<b>MOTION-CONNECT 800</b>			<b>8</b>				
<b>Length codes</b>			....				

#### Note:

Pre-assembled power cables are not provided for 1PH7 motors with a holding brake. If a holding brake is used, it must be supplied through a separate cable via the terminal box. The adapter must be removed on 1PH7 motors with metric cable entry in the terminal box.

##### MOTION-CONNECT power cables for 1FN3 linear motors, peak load/continuous load Connection via adapter cable

No. of cores x cross-section mm <sup>2</sup>	Thread Size	Pre-assembled adapter cable for 1FN3 motors Order No.	Connector size Interface	Pre-assembled basic cable to the SIMODRIVE 611 converter system Order No.	D <sub>max</sub> mm (in)	Cables sold by the meter <sup>2)</sup> for pre-assembled adapter cable 6FX7002-5LM...-.... Order No.	Weight (without connector) kg/m (lb/ft)	Smallest perm. bending radius <sup>1)</sup> mm (in)
4 x 2.5	M20	<b>6FX7002-5LM42-</b> ....	1	<b>6FX8002-5CA11-</b> ....	12.1 (0.48)	<b>6FX7008-1BB21-</b> ....	0.23 (0.15)	90 (3.54)
4 x 2.5	M20	<b>6FX7002-5LM62-</b> .... <sup>3)</sup>	1	<b>6FX8002-5CA11-</b> ....	12.1 (0.48)	<b>6FX7008-1BB21-</b> ....	0.23 (0.15)	90 (3.54)
4 x 4	M32	<b>6FX7002-5LM72-</b> ....	1.5	<b>6FX8002-5CA41-</b> ....	13.2 (0.52)	<b>6FX7008-1BB31-</b> ....	0.29 (0.19)	100 (3.94)
4 x 6	M32	<b>6FX7002-5LM82-</b> ....	1.5	<b>6FX8002-5CA51-</b> ....	15.9 (0.63)	<b>6FX7008-1BB41-</b> ....	0.37 (0.24)	120 (4.72)
4 x 10	M32	<b>6FX7002-5LM32-</b> ....	1.5	<b>6FX8002-5CA61-</b> ....	19.2 (0.76)	<b>6FX7008-1BB51-</b> ....	0.57 (0.38)	140 (5.51)
4 x 16	M32	<b>6FX7002-5LM02-</b> ....	1.5	<b>6FX8002-5YP02-</b> ....	22.5 (0.89)	<b>6FX7008-1BB61-</b> ....	0.93 (0.63)	165 (6.50)
<b>Length codes</b>		....	....	....	....	....	....	....

##### MOTION-CONNECT power cables for 1FW6 torque motors

No. of cores x cross-section mm <sup>2</sup>	Connector size	Pre-assembled cable to the converter Order No.	D <sub>max</sub> mm (in)	Cables sold by the meter <sup>2)</sup> Order No.	Weight (without connector) kg/m (lb/ft)	Smallest perm. bending radius <sup>1)</sup> mm (in)
4 x 2.5	1	<b>6FX8002-5CA11-</b> ....	12.1 (0.48)	<b>6FX8008-1BB21-</b> ....	0.23 (0.16)	120 (4.72)
4 x 4	1.5	<b>6FX8002-5CA41-</b> ....	13.2 (0.52)	<b>6FX8008-1BB31-</b> ....	0.31 (0.21)	130 (5.12)
4 x 6	1.5	<b>6FX8002-5CA51-</b> ....	16.0 (0.63)	<b>6FX8008-1BB41-</b> ....	0.46 (0.31)	170 (6.69)
4 x 10	1.5	<b>6FX8002-5CA61-</b> ....	19.4 (0.76)	<b>6FX8008-1BB51-</b> ....	0.63 (0.42)	210 (8.27)
4 x 16	1.5	<b>6FX8002-5YP02-</b> ....	23.6 (0.93)	<b>6FX8008-1BB61-</b> ....	0.95 (0.65)	260 (10.24)
<b>Length codes</b>		....	....	....	....	....

<sup>1)</sup> Valid for installation in cable carrier.

<sup>2)</sup> Power cables of 4 mm<sup>2</sup> or greater can be ordered in exact meter lengths up to a length of 100 m (328 ft).

Power cables of 1.5 mm<sup>2</sup> and 2.5 mm<sup>2</sup> are supplied in coils or on disposable drums in lengths of 50 m (154 ft), 100 m (328 ft), 200 m (656 ft) and 500 m (1 640 ft).

<sup>3)</sup> Only for motors with Order No. 1FN3300 or higher.

**Selection and ordering data**
**Power cables – extensions for 1FT/1FK motors**

No. of cores x cross-section mm <sup>2</sup>	Basic cable		Connector size	Extension	Connector size
	Order No.			Order No.	
4 × 1.5	6FX 002-5 A01-....		1	6FX 002-5 A05- ....	1
4 × 2.5	6FX 002-5 A11-....		1	6FX 002-5 A15- ....	1
4 × 1.5	6FX 002-5 A21-....		1.5	6FX 002-5 A28- ....	1.5
4 × 2.5	6FX 002-5 A31-....		1.5	6FX 002-5 A38- ....	1.5
4 × 4	6FX 002-5 A41-....		1.5	6FX 002-5 A48- ....	1.5
4 × 6	6FX 002-5 A51-....		1.5	6FX 002-5 A58- ....	1.5
4 × 10	6FX 002-5 A61-....		1.5	6FX 002-5 A68- ....	1.5
4 × 10	6FX 002-5 A13-....		3	6FX 002-5 X18- ....	3
4 × 16	6FX 002-5 A23-....		3	6FX 002-5 X28- ....	3
4 × 25	6FX 002-5 D A33-....		3	6FX 002-5 D X38- ....	3
4 × 35	6FX 5 002-5 D A43-....		3	6FX 5 002-5 D X48- ....	3
	6FX 8 002-5 D A43-....		3	6FX 8 002-5 D X48- ....	3
4 × 50	6FX 5 002-5 D A53-....		3	6FX 5 002-5 D X58- ....	3
	6FX 8 002-5 D A53-....		3	6FX 8 002-5 D X58- ....	3
<b>MOTION-CONNECT 500</b>	5			5	
<b>MOTION-CONNECT 700<sup>1)</sup></b>	7			7	
<b>MOTION-CONNECT 800</b>	8			8	
<b>Without brake cores</b>		C			C
<b>With brake cores</b>		D			D
<b>Length codes</b>					....

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

<sup>1)</sup> MOTION-CONNECT 700 only with brake cores.

# Connection system

## MOTION-CONNECT

### Signal cables

#### Signal cable extensions

#### Overview



The MOTION-CONNECT signal cables can be used to connect synchronous and asynchronous motor encoders to the converter system.

The pre-assembled MOTION-CONNECT signal cables are high-quality cables which ensure reliable, error-free operation. Depending on the design, MOTION-CONNECT signal cables are pre-assembled at either one or both ends.

#### Note:

All **6FX.002-2C...-....** signal cables are also available customized with crimped contacts and with the connector housing supplied separately.

- Signal cables with enclosed connector housing **for the motor side**: In this case, the 6th position of the Order No. must be changed from 0 to 4: 6FX.042-2C...-....
- Signal cables with enclosed connector housing **for the module side**: In this case, the 6th position of the Order No. must be changed from 0 to 1: 6FX.012-2C...-....

#### Selection and ordering data

Sub-D			
Basic cable	Order No.	Extension	Order No.
6FX	002-2AD00-....	6FX	002-2AD04-....
6FX 5	002-2AH00-....	6FX	002-2AH04-....
6FX 8	002-2AH00-....	6FX	002-2AH04-....
6FX	002-2CA11-....	6FX	002-2CB54-....
6FX 5	002-2CA20-....	6FX 5	002-2CA24-....
6FX 8	002-2CA20-....	6FX 5	002-2CA24-....
6FX	002-2CA31-....	6FX	002-2CA34-....
6FX 8	002-2CA80-....	6FX	002-2CA34-....
6FX 5	002-2CC11-....	6FX	002-2CB54-....
6FX 8	002-2CC11-....	6FX	002-2CB54-....
6FX 5	002-2CD01-....	6FX	002-2CB54-....
6FX 8	002-2CD01-....	6FX	002-2CB54-....
6FX 5	002-2CD24-....	6FX	002-2CB54-....
6FX 8	002-2CD24-....	6FX	002-2CB54-....
6FX	002-2CF02-....	6FX	002-2CF04-....
6FX 5	002-2CF20-....	6FX 5	002-2CF24-....
6FX 8	002-2CF20-....	6FX 5	002-2CF24-....
6FX	002-2CG00-....	6FX	002-2CB54-....
6FX	002-2CH00-....	6FX	002-2AD04-....
6FX	002-2EQ10-....	6FX	002-2EQ14-....
6FX 5	002-2EQ20-....	6FX 5	002-2EQ24-....
6FX 8	002-2EQ20-....	6FX 5	002-2EQ24-....
5	MOTION-CONNECT 500	5	
7	MOTION-CONNECT 700	7	
8	MOTION-CONNECT 800	8	
Length codes		....	

Sub-D			
Basic cable	Order No.	Extension	Order No.
6FX8002-2CA21-....		6FX8002-2CA41-....	

The combinations shown are only an example of how to extend signal cables.

#### 6FX.002-.....-1... Signal cables with fixed length

Order No.	Length in m (ft)							
	1 (3.28)	1.5 (4.92)	2 (6.56)	2.5 (8.20)	3 (9.84)	5 (16.41)	7 (22.97)	10 (32.81)
6FX2002-1CA01-1A■0	B		C			F	H	
6FX2002-1CB01-1A■0	B		C			F	H	
6FX2002-1CC00-1■■■		AB5	AC0			AF0		BA0
6FX2002-2AS01-1■■■				AC5		AF0		BA0
6FX2002-2AS11-1A■0	B							
6FX2002-4EA04-1■■■0						AF		BA
6FX5002-1AA00-1■■■0					AD	AF		BA
6FX8002-2CA41-1■■■0						AF		BA



# Connection system MOTION-CONNECT

## Accessories for power/signal cables Mounting flange

## Accessories for power/signal cables HF (high-frequency) clamp

### Overview



Mounting flanges are used to route or fix connectors, for example, in control cabinets. With the exception of angled connectors, a mounting flange can be mounted post-assembly on connectors with union nuts or connectors with external threads.

### Overview



To permit correct "grounding" on the cable duct or cabinet wall, a ground clamp can be ordered as an accessory together with the flanges for large-area discharging of high-frequency interferences.

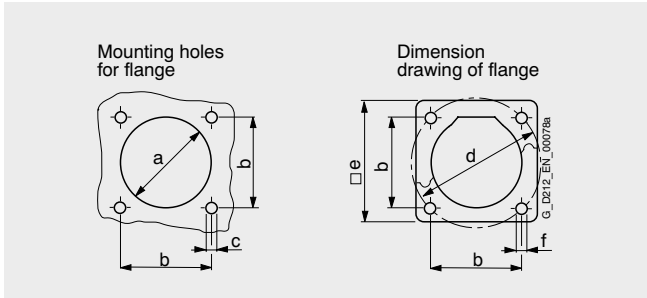
### Selection and ordering data

Designation	Order No.
<b>Mounting flange for power connectors</b>	
• Connector size 0.5	<b>6FX2003-7HX00</b>
• Connector size 1	<b>6FX2003-7BX00</b>
• Connector size 1.5	<b>6FX2003-7CX00</b>
• Connector size 3	<b>6FX2003-7AX00</b>
<b>Mounting flange for</b>	
• M23 signal connector	<b>6FX2003-7DX00</b>
• M17 signal connector	<b>6FX2003-7HX00</b>

### Selection and ordering data

Designation	Order No.
<b>HF (high-frequency) clamp for</b>	
• Power connector size 0.5 and M17 signal connector	<b>6FX2003-7FA00</b>
• Power connector size 1 and M23 signal connector	<b>6FX2003-7FX00</b>
• Power connector size 1.5	<b>6FX2003-7GX00</b>
• Power connector size 3	Not required

### Dimension drawings



Di- men- sions	Power connector				Signal connector	
	Connector size 0.5	Connector size 1	Connector size 1.5	Connector size 3	M23	M17
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)
a	Ø 22.8 (0.90)	Ø 27.8 (1.09)	Ø 46 (1.81)	Ø 65 (2.56)	Ø 27 (1.06)	Ø 22.8 (0.90)
b	22.6 (0.89)	28.3 (1.11)	42.4 (1.67)	75 (2.95)	28.3 (1.11)	22.6 (0.89)
c	M2.5 (4x)	M3 (4x)	M4 (4x)	M4 (4x)	M3 (4x)	M2.5 (4x)
d	Ø 32 (1.26)	Ø 40 (1.57)	Ø 60 (2.36)	Ø 63 (2.48)	Ø 40 (1.57)	Ø 32 (1.26)
e	30 (1.18)	35 (1.38)	55 (2.17)	85 (3.35)	35 (1.38)	30 (1.18)
f	Ø 3.2 (0.13)	Ø 3.2 (0.13)	Ø 4.4 (0.17)	Ø 4.5 (0.18)	Ø 3.2 (0.13)	Ø 3.2 (0.13)

# Connection system MOTION-CONNECT

## MPI bus cables – pre-assembled

### Selection and ordering data

Designation	Order No.	
<b>Pre-assembled MPI bus cable with variable length I<sub>2</sub></b> With 3 connectors • Trailing possible • Fixed installation Length I <sub>1</sub> : 1 m (3.28 ft) Length I <sub>2</sub> : variable	6FX8002-4EB00-.... 6FX2002-4EB00-....	<p style="text-align: right;">G_NC01_EN_00335</p>
<b>Pre-assembled MPI bus cable with variable length I<sub>2</sub></b> With 3 connectors • Trailing possible • Fixed installation Length I <sub>1</sub> : 1 m (3.28 ft) Length I <sub>2</sub> : variable	6FX8002-4EB10-.... 6FX2002-4EB10-....	<p style="text-align: right;">G_NC01_EN_00279</p>
<b>Pre-assembled MPI bus cable with variable length I<sub>2</sub></b> With 3 connectors • Trailing possible Length I <sub>1</sub> : 1 m (3.28 ft) Length I <sub>2</sub> : variable	6FX8002-4EB20-....	<p style="text-align: right;">G_NC01_EN_00280</p>
<b>Pre-assembled MPI bus cable with variable length I<sub>2</sub></b> With 3 connectors • Trailing possible Length I <sub>1</sub> : 1 m (3.28 ft) Length I <sub>2</sub> : variable	6FX8002-4EB30-....	<p style="text-align: right;">G_NC01_EN_00336</p>
<b>Pre-assembled MPI bus cable with variable length I</b> With 2 connectors • Trailing possible • Fixed installation	6FX8002-4EB40-.... 6FX2002-4EB40-....	<p style="text-align: right;">G_NC01_EN_00281</p>
<b>Pre-assembled MPI bus cable with variable length I</b> With 2 connectors • Trailing possible • Fixed installation	6FX8002-4EB50-.... 6FX2002-4EB50-....	<p style="text-align: right;">G_NC01_EN_00282</p>

MCP Machine Control Panel  
 PP Push Button Panel

Terminating resistors can be switched off

<sup>1)</sup> Connection socket for programming device or other devices.

#### Selection and ordering data (continued)

Designation	Order No.	
<b>Pre-assembled MPI bus cable with variable length I</b> With 2 connectors • Fixed installation	<b>6FX2002-4EB60-....</b>	
<b>Pre-assembled MPI bus cable with variable length I</b> With 2 connectors • Fixed installation	<b>6FX2002-4EB70-....</b>	

#### More information

For further information about PROFIBUS cables, see Catalog IK PI SIMATIC NET Industrial Communication, in the PROFIBUS section under Electrical Networks, or refer to the A&D Mall.



[www.siemens.com/automation/mall](http://www.siemens.com/automation/mall)

MCP Machine Control Panel  
 PP Push Button Panel

OFF  ON Terminating resistors can be  
 switched off

<sup>1)</sup> Connection socket for programming device or other devices.

# Connection system

## MOTION-CONNECT

### Length codes

#### Overview

Designation	Type
<b>Pre-assembled cables</b>	
6FX.....-.....	■ ■ ■ ■
6SX.....-.....	■ ■ ■ 0
0 m (0 ft)	1
100 m (328 ft)	2
200 m (656 ft)	3
300 m (984 ft)	4
0 m (0 ft)	A
10 m (32.81 ft)	B
20 m (65.62 ft)	C
30 m (98.43 ft)	D
40 m (131.24 ft)	E
50 m (164.05 ft)	F
60 m (196.86 ft)	G
70 m (229.67 ft)	H
80 m (262.48 ft)	J
90 m (295.29 ft)	K
0 m (0 ft)	A
1 m (3.28 ft)	B
2 m (6.56 ft)	C
3 m (9.84 ft)	D
4 m (13.12 ft)	E
5 m (16.41 ft)	F
6 m (19.69 ft)	G
7 m (22.97 ft)	H
8 m (26.25 ft)	J
9 m (29.53 ft)	K
0 m (0 in)	0
0.1 m (3.94 in)	1
0.2 m (7.87 in)	2
0.3 m (11.81 in)	3
0.4 m (15.75 in)	4
0.5 m (19.69 in)	5
0.6 m (23.62 in)	6
0.7 m (27.56 in)	7
0.8 m (31.5 in)	8

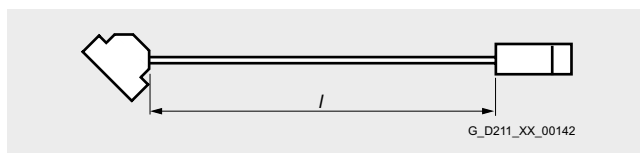
Examples:

1.0 m (3.28 ft):	1 A B 0
2.2 m (7.22 ft):	1 A C 2
8.0 m (26.25 ft):	1 A J 0
299.0 m (981 ft):	3 K K 0

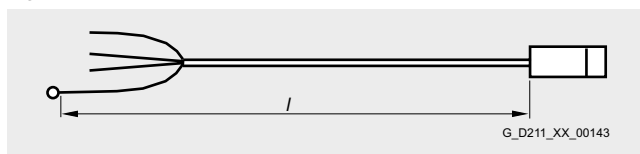
Designation	Type
<b>Length code for power and signal cables, sold by the meter<sup>1)</sup></b>	
• 50 m (164 ft)	6FX.008-.....-1FA0
• 100 m (328 ft)	6FX.008-.....-2AA0
• 200 m (656 ft)	6FX.008-.....-3AA0
• 500 m (1 640 ft)	6FX.008-.....-6AA0

#### More information

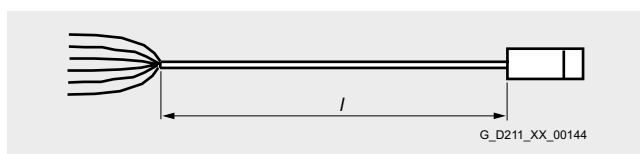
##### Length definition for pre-assembled cables



##### Signal cables



##### Power cables



Power cables for linear/torque motors 6FX.002-5LM.-.....

##### Tolerance:

- Cable lengths up to 10 m (32.8 ft):  $\pm 2\%$
- Cable lengths of 10 m (32.8 ft) and longer:  $\pm 1\%$

<sup>1)</sup> Power cables of 4 mm<sup>2</sup> or greater can be ordered in exact meter lengths up to a length of 100 m (328 ft). Power cables of 1.5 mm<sup>2</sup> and 2.5 mm<sup>2</sup> are supplied as 50 m (164 ft), 100 m (328 ft), 200 m (656 ft) and 500 m (1 640 ft) rings or on disposable drums.

# Services



<b>11/2</b>	<b>Mechatronics Support</b>
<b>11/4</b>	<b>Virtual Production</b>
<b>11/5</b>	<b>Machine Simulator</b>
<b>11/7</b>	<b>Service &amp; Support</b>
11/7	Our Services for Every Phase of Your Project
11/8	Repair service contract RSV
<b>11/10</b>	<b>Retrofit</b>
11/11	Solution Partner mz robotlab GmbH
<b>11/12</b>	<b>Fire-extinguishing systems for machine tools</b>
<b>11/13</b>	<b>Control cabinets</b>
<b>11/14</b>	<b>Logistics services for our customers</b>
<b>11/15</b>	<b>Components for CNC basic and further training</b>
11/15	SinuTrain control-identical programming and simulation software
11/19	eLearning/training booklets
<b>11/21</b>	<b>Training equipment</b>
11/21	SIMODRIVE 611 universal training case for Motion Control
11/21	SINUMERIK 802 training case
11/22	SINUMERIK 840D powerline training rack
<b>11/23</b>	<b>Training</b>
<b>11/24</b>	<b>Documentation</b>
11/24	General Documentation
11/25	SINUMERIK 802C/802S
11/25	SINUMERIK 810D powerline/840D powerline
11/27	Motors
11/28	Measuring systems
11/28	SIMODRIVE 611



# Services

## Mechatronics Support

### Overview



### Virtual Prototyping

#### **We combine mechanics, electronics and information technology in one simulation environment.**

This philosophy is implied by the name: Mechatronics is more than just mechanics and more than just electronics. Mechatronics is the integration of mechanical and electrical engineering with electronics, sensors, diagnostic equipment and information technology.

#### **And this means:**

With Mechatronics Support, the developers first create and analyze a mechatronic simulation model of the new machine. This allows all the key performance characteristics of a new machine to be determined and verified before the first (and then only) real prototype is built. This simulation process is an important source for quality improvements and development cost cutting and a valuable tool which you should utilize.

#### **We offer this service.**

We at Siemens do not consider ourselves as merely manufacturers of products, systems and plants, but as solution providers as well. With our Mechatronics Support service, we start helping you with the design of your new machine – with selective analysis and optimization using pure simulation models so that we don't even need a prototype.

#### Traditional Approach in the New Equipment Manufacturing



#### Mechatronic Approach



Mechatronics Support was previously only applied when the prototypes of new machines were unable to achieve the prescribed performance characteristics. However, it is far more effective to integrate a holistic simulated mechatronic assessment at a very early stage of product development.

Using our Mechatronics Support, it is then possible to create a mechatronic simulation model of the machine and obtain a virtual prototype instead of producing a real prototype, or series of prototype models.

Computer-aided simulation tools are applied in a standardized procedure to test and analyze the virtual prototype under production conditions in simulation mode.

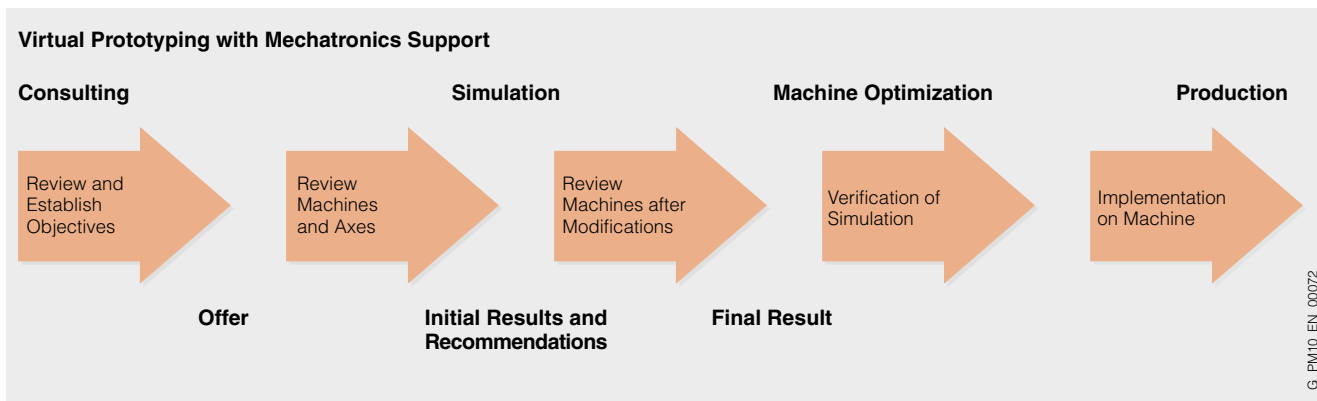
Early on in the development phase, it is possible to identify any weak points and rectify them cheaply and quickly.

#### **Complete implementation**

With our Mechatronics Support service, we offer the means of creating a simulation model which combines the mechanical machine components with the motors, converter systems, drive control and CNC in such a way as to produce an intelligently controlled virtual machine.

### Overview (continued)

*Virtual Prototyping is the TOP feature of our Mechatronics Support service*



### Procedure

The scope of tasks to be performed is defined during the **consultation process** during the machine design phase and provides the basis for a simulation quotation. **Simulation** of the machine with the FE model (finite element model) determines the forms of natural vibration, includes simulation of the closed-loop control drive systems and control technology and offers the means of calculating variations. **Machine optimization** verifies the results obtained from the simulation on the prototype or the final machine design.

### Mechatronics Support modules

The scope of services can be tailored to meet the customer's individual requirements and special needs. Service modules are provided for this purpose. These can be ordered individually or as packages – as in the case of Virtual Prototyping.

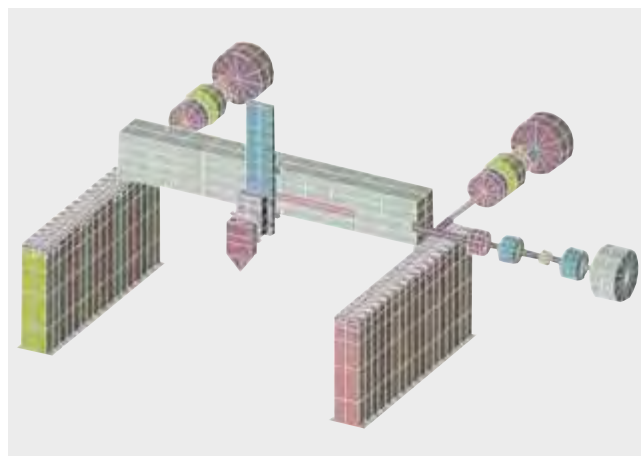
Whether you want to improve or upgrade an existing machine and wish to discuss possible options with experts in an initial technical consultation, or whether you would like a feasibility assessment of new ideas at the development stage, our Mechatronics Support service can provide you with the individual help you need.

### Benefits

- Quicker development reduces the time to market
- Increased development reliability
- Creative concepts – higher quality – increased productivity

### More information

For further information and individualized quotations, please contact your Motion Control Partner at your local Siemens sales office or regional company.



Example: FE model

### Selection and ordering data

Designation	Order No.
<b>Consultation</b> Technical consultation with customer	6FC5088-1....
<b>Machine optimization</b> Optimum setting of control and drives on the customer's machine	6FC5088-2....
<b>Machine analysis and optimization</b> Analysis of the machine and its limits. Recommendations for the manufacturer	6FC5088-3....
<b>Machine simulation</b> Simulation of individual axes and the dynamic response on the machine	6FC5088-4....
<b>Machine simulation with interpolating axes</b> Simulation of interpolating axes	6FC5088-5....
<b>Machine simulation with FE model</b> Modeling of machine using the Finite Element method	6FC5088-6....

# Services

## Virtual Production

### Overview

The Virtual Production service is aimed at end customers and operators of CNC machines and is designed to optimize productivity ratios. Virtual Production improves machining times and/or the quality of workpieces by testing and optimizing CNC program runs on simulation models.

Virtual Production is individually tailored to each end customer and their machining process.

Virtual Production makes use of Mechatronics Support if the machine manufacturer has already developed their machine in conjunction with us.

With Virtual Production, CNC program execution is broken down into several individual stages. The processing of an CNC part program in conjunction with the correct CNC image, the controlled drives and optionally, the characteristic machine dynamics are perfectly simulated. The data output by the Virtual Production system include position, velocity and acceleration of the TCP, plus the orientation between the tool and workpiece at different points in the production process. Clear and objective statements can thus be derived. No need for assumptions.

### Benefits

- Reduction of machining times
- Improvement of quality
- Increased machine productivity
- An optimized workpiece, faster
- Virtual machining instead of repeated testing on the machine

Optimization is achieved through selective identification of hidden potential with respect to programming, scope of CNC functionality and CNC parameters as it applies to the typical parts spectrum of the machine tool under investigation. With the Virtual Production system, not every part program for a machine tool needs to be optimized, but the process needs to be performed only once in relation to the customer's parts spectrum.

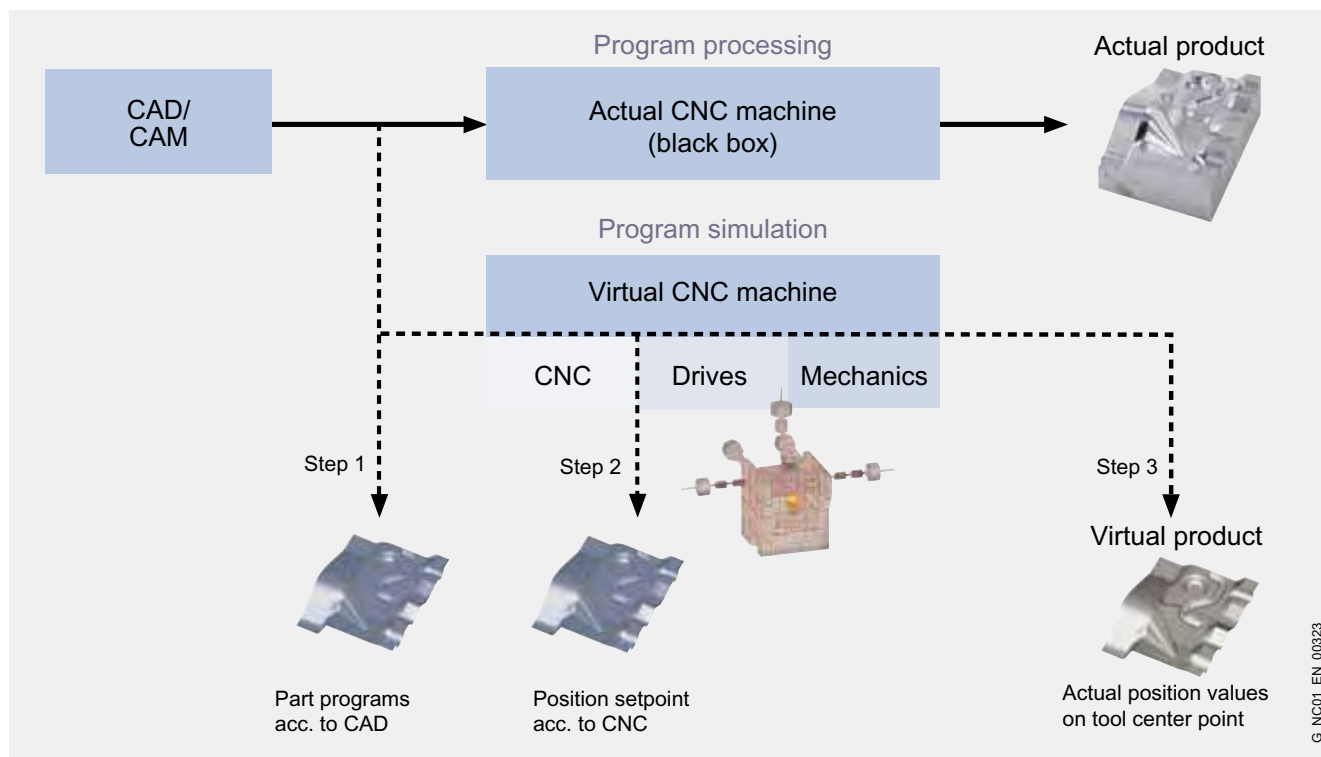
### Application

- Mass production in the automotive industry
- Production of expensive workpieces in the aerospace industry
- Single-part production in tool and mold making

### Selection and ordering data

Designation	Order No.
<b>Consultation</b> Technical consultation with customer	6FC5088-1.....2...
<b>Optimization of machining time</b> Optimization of workpiece machining time	6FC5088-2.....2...
<b>Optimization of machining quality</b> Optimization of workpiece quality	6FC5088-3.....2...

### Virtual product





### Overview

#### Automation solution – completely integrated

The Machine Simulator supports a wide range of hardware and software interfaces to the automation system. If you want to connect the entire control unit, e.g. including the CNC, PLC and the Human Machine Interface to a machine model in the Machine Simulator, you can simply use the hardware interfaces for PROFIBUS or MPI. The Machine Simulator provides consistent support for the exchange of data with the engineering environment of your automation system.

#### Machine Simulator – for simulating new machines during development

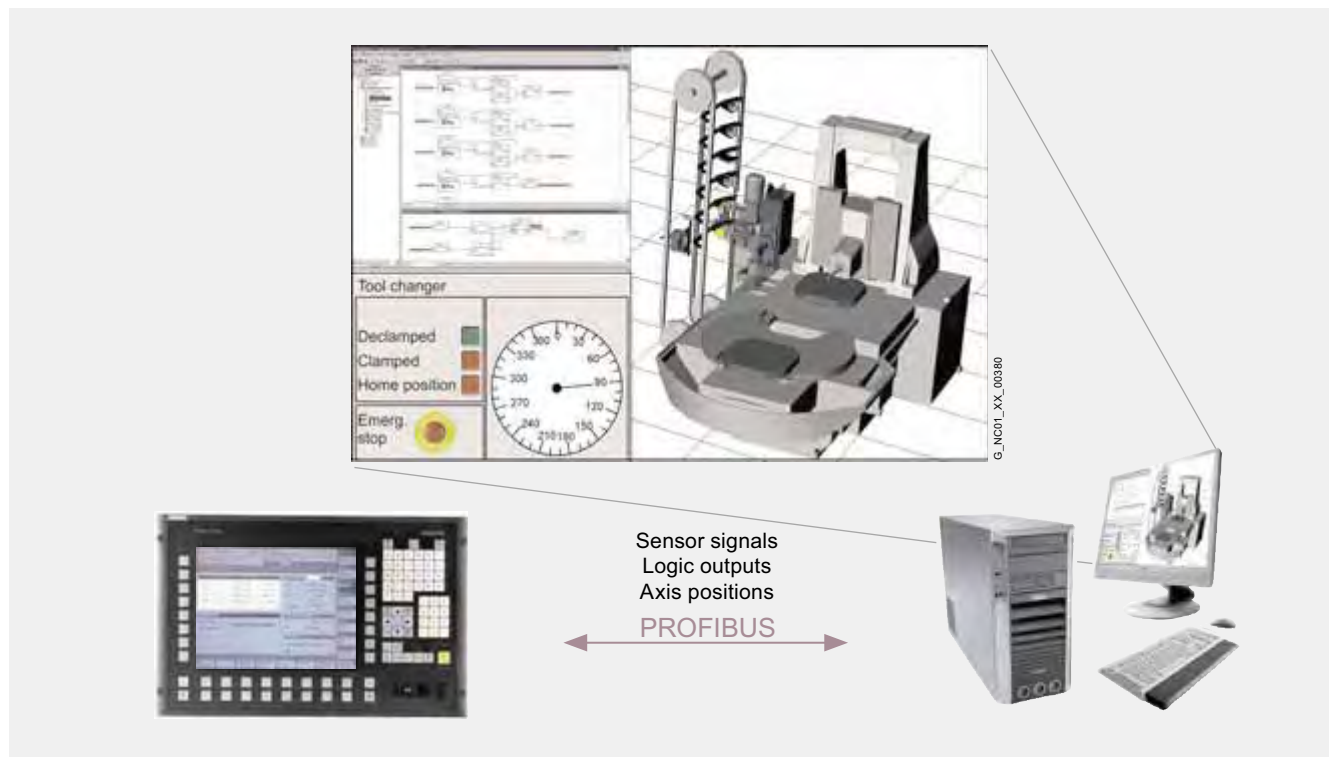
The Machine Simulator allows you to simulate the interaction between your machine tool or production machine and your automation system at all stages of product development, from commissioning through to sales and after-sales.

Long before you finish developing a machine and building a prototype, you can simulate its performance under realistic conditions using the Machine Simulator. The automation system and a virtual model of the machine are coupled simply for this purpose. This coupling has been optimized for high-performance machine tools and production machines with integrated state-of-the-art Siemens control technology such as SIMOTION and SINUMERIK.

#### Machine Simulator – modeling the machine

The Machine Simulator consists of the simulation kernel and a graphical operator interface with which the machine model is created and operated. The system includes libraries for IEC 1131-compliant function blocks and for interfacing a very wide variety of I/Os in your automation system. The Machine Simulator makes simulation as simple as it can be. Even though computer simulation is often regarded as a highly complex process, you do not need to be a simulation specialist to work effectively with the Machine Simulator. This simplicity is provided by the graphical user interface, while the simulation kernel itself runs in the background. As usual with Windows, all the main functions can be accessed with a single mouse click. You can simply drag a new model element out of the library and drop it into the machine model.

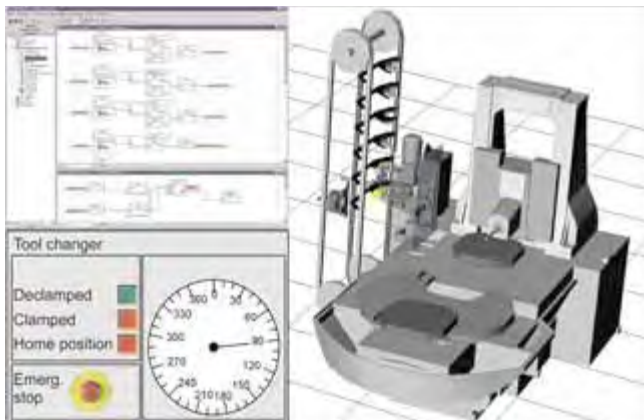
The Machine Simulator Open enables you to create completely new components in a high-level language. You can freely define the connections, states and responses of these components and therefore work highly efficiently, even when your machine models are complex.



# Services

## Machine Simulator

### Benefits



The Machine Simulator combines savings in time and cost with enhanced product quality for our customers in machine tool and production machine building. The Machine Simulator supports you in the decisive phases of product development of a machine tool or production machine - with development, commissioning, test and service.

The automation system used, including all the software modules developed by the machine manufacturer, can be tested with the Machine Simulator beforehand and in a reproducible manner – and all without having the real machines at hand.

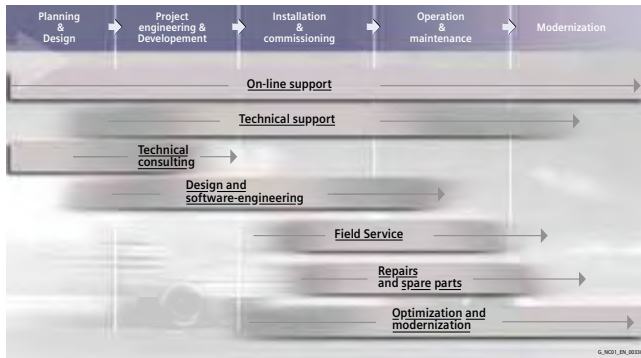
A new machine can be tested without taking any risks since proper functioning is checked in virtual reality. After the development work on the new machine has been completed, the virtual machine that has been generated can be used again for training, pre-sales and after-sales purposes.

### Selection and ordering data

Designation	Order No.
<b>Machine Simulator Basic</b> Bundle Comprises the basic software on CD-ROM and a DP-PCI card for connection to PROFIBUS	<b>6FC5880-0YC05-0AA0</b>
<b>Machine Simulator Open</b> Bundle Comprises the open software on CD-ROM and a DP-PCI card for connection to PROFIBUS	<b>6FC5880-1YC05-0AA0</b>
<b>Machine Simulator Basic</b> Software Comprises the basic software on CD-ROM	<b>6FC5880-2YC05-0AA0</b>
<b>Machine Simulator Open</b> Software Comprises the open software on CD-ROM	<b>6FC5880-3YC05-0AA0</b>
<b>Machine Simulator</b> Upgrade Comprises the license for upgrading from Machine Simulator Basic to Machine Simulator Open	<b>6FC5880-4YC05-0AA0</b>

### Our Services for Every Phase of Your Project

#### Overview



In the face of harsh competition you need optimum conditions to keep ahead all the time:

A strong starting position. A sophisticated strategy and team for the necessary support - in every phase.

Service & Support from Siemens provides this support with a complete range of different services for automation and drives.

In every phase: from planning and startup to maintenance and upgrading.

Our specialists know when and where to act to keep the productivity and cost-effectiveness of your system running in top form.

#### Online Support



The comprehensive information system available round the clock via Internet ranging from Product Support and Service & Support services to Support Tools in the Shop.

[www.siemens.com/automation/service&support](http://www.siemens.com/automation/service&support)

#### Technical Support



Competent consulting in technical questions covering a wide range of customer-oriented services for all our products and systems.

**Phone: +49 (0) 180 50 50 222**  
**Fax: +49 (0) 180 50 50 223**  
 (0.14 €/min. from a German landline network, mobile telephone prices may vary)  
 E-Mail: [adsupport@siemens.com](mailto:adsupport@siemens.com)

[www.siemens.com/automation/support-request](http://www.siemens.com/automation/support-request)

In the Unites States, call toll-free:  
**Phone: +1 800 333 7421**  
**Fax: +1 423 262 2200**  
 E-Mail: [solutions.support@sea.siemens.com](mailto:solutions.support@sea.siemens.com)

In Canada, call:  
**Phone: +1 888 303 3353**  
 E-Mail: [cic@siemens.ca](mailto:cic@siemens.ca)

In Asia, call:  
**Phone: +86 10 6475 7575**  
**Fax: +86 10 6474 7474**  
 E-Mail: [adsupport.asia@siemens.com](mailto:adsupport.asia@siemens.com)

#### Technical Consulting



Support in the planning and designing of your project from detailed actual-state analysis, target definition and consulting on product and system questions right to the creation of the automation solution.<sup>1)</sup>

#### Configuration and Software Engineering



Support in configuring and developing with customer-oriented services from actual configuration to implementation of the automation project.<sup>1)</sup>

#### Service On Site



With Service On Site we offer services for startup and maintenance, essential for ensuring system availability.

In Germany, call:  
**Phone: +49 (0) 180 50 50 444<sup>1)</sup>**  
 (0.14 €/min. from a German landline network, mobile telephone prices may vary)

In the Unites States, call toll-free:  
**Phone: +1 800 333 7421**

In Canada, call:  
**Phone: +1 888 303 3353**

#### Repairs and Spare Parts



In the operating phase of a machine or automation system we provide a comprehensive repair and spare parts service ensuring the highest degree of operating safety and reliability.

In Germany, call:  
**Phone: +49 (0) 180 50 50 448<sup>1)</sup>**  
 (0.14 €/min. from a German landline network, mobile telephone prices may vary)

In the Unites States, call toll-free:  
**Phone: +1 800 241 4453**

In Canada, call:  
**Phone: +1 888 303 3353**

#### Optimization and Upgrading



To enhance productivity and save costs in your project we offer high-quality services in optimization and upgrading.<sup>1)</sup>

<sup>1)</sup> For country-specific telephone numbers go to our Internet site at: [www.siemens.com/automation/service&support](http://www.siemens.com/automation/service&support)

# Services

## Service & Support

### Repair service contract RSV

#### Overview

##### *RSV description of performance*

In the context of the repair service contract (RSV), Siemens eliminates faults on the Siemens Industry Sector, Drive Technologies components specified in the contract (with the exception of complete motor spindles) at the machine location on behalf of the machine tool manufacturer and dealer.

##### *RSV services*

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

**Fault diagnostics** refers to the components specified in the parts list of the final destination memo. Diagnostics is carried out on the basis of a technical fault message clarified in advance by the manufacturer or dealer with specification of the contract number.

**Fault correction** is carried out by repairing and/or replacing faulty components. In the event of a machine standstill, fault correction is carried out with the response time specified for the country group. Within the agreed contract period, faulty components which were not older than 12 months at the beginning of the repair service contract will be replaced free-of-charge.

Siemens provides qualified personnel for fault diagnostics and fault correction on our products. If mechanical work is also necessary, this must be provided or arranged by the manufacturer/dealer. Example: dismounting/mounting of motors or other mechanical components.

The services are provided during the usual working hours in the country of installation.

**Spare parts** are provided either from our central spare parts warehouse or from regional spare parts warehouses using our worldwide spare parts logistic infrastructure. Our central spare parts warehouses contain all important spare parts. Regional spare parts warehouses are adapted to include the components specified in the final destination memo<sup>1)</sup>.

The following components are not defined as spare parts:

- Motors<sup>2)</sup>
- Cables<sup>3)</sup>
- Special or customer-specific modules and components not available from Siemens as spare parts.

Faulty components<sup>4)</sup> are replaced free-of-charge within the agreed contract period.

##### *Contract prerequisites*

- Final destination memo
- Data backup at the user

The manufacturer/dealer provides the final destination memo in good time prior to commencement of the contract, and ensures that all machine data is backed up and available at the user's site. Particular data for the final destination memo are: machine number, machine type, processing technology, control system, drive system, number of measuring circuits, type of data storage, data storage medium, data for OEM application, date of commissioning at end user's site, country of end user, parts list of components used.

##### *RSV certificate*

As the RSV contract partner, the manufacturer or dealer is provided with a certificate once the final destination memo has been handed over (prerequisite for provision of services at the end customer site). This certificate contains the contract number and essential contract data such as machine number, machine type, contract start date, contract end date, and address for the provision of services.

##### *Period of validity*

The RSV commences on the date registered with us for completion of the second commissioning procedure at the end customer site, and ends on expiry of the RSV period.

##### *Contract periods*

The RSV is offered for the limitation period (warranty period) that our customers (manufacturers/dealers) provide to their end customers. Various RSV periods permit you to satisfy different market requirements. In the case of RSV periods exceeding the limitation period originally granted for Siemens I DT components, the limitation period is extended with respect to claims for subsequent performance, with the exception of further rights and claims, in line with the extended RSV period. An existing RSV can be extended once by six months or one year. The extension must be ordered during the period of the basic RSV.

##### *Contract versions*

Two versions of the RSV are available:

- The **master contract** is for machine manufacturers who agree to order one RSV for all machines with Siemens equipment.
- The **individual contract** is for machine manufacturers who order an RSV only for certain machines equipped by Siemens.

##### *Service exclusions*

The contract shall not be deemed to have been performed in all cases of subclause VIII./7 quality defects of the "General conditions of supply and delivery for the electrical industry"<sup>4)</sup>. In the case of parts subject to wear (e.g., motor bearings and fans or cables), replacements will be provided free-of-charge within 12 months of commencement of the RSV in the case of proper use, irrespective of the actual duration of the RSV.

##### *Export license*

Fulfillment of the service call may be subject to authorization due to the application or the type of replacement parts, equipment and documentation required. The service call is, therefore, subject to the granting of the necessary export licenses and the absence of any other obstacles relating to German or other applicable export regulations.

<sup>1)</sup> Since the export of standard versions (components/system) is subject to a time-consuming official approval procedure, which applies in equal measure to the supply of such components for the purpose of servicing and spare parts supply, we recommend **supply of the export version** wherever possible. This applies in particular in cases where the control can be exported without official approval after the machine manufacturer has installed it in a machine tool. Please also observe the paragraph **Export control information** in Section Overview of functions.

<sup>2)</sup> For selected motors, we centrally stock components for fast delivery within Germany and the U.S.A. These motors can be manufactured and delivered within a few working days. You can obtain the current list from your Siemens partner.

<sup>3)</sup> The delivery times known to you usually apply.

<sup>4)</sup> Examples of service exclusions:

- Non-compliance with the Siemens project engineering and user regulations
- Contamination critical to function (e.g. oil, conducting materials, rust)
- Mechanical damage
- External electrical effects
- Intentional damage

#### Overview (continued)

##### Response time

As a rule, the following response times apply when the RSV is implemented in the case of a machine standstill:

##### Country groups

CG 1	Next working day
CG 2	Within two working days
CG 3	Depending on country-specific conditions
CG 4	Depending on country-specific conditions, only for customers with master contract for the price of the individual contract

We define the response time as the time from when your clarified order is placed until our service engineer begins the journey to the site stated in the order, or until troubleshooting commences using teleservice. The listed response times apply to "technically clarified fault messages" within the usual working hours of the region (e.g. Monday to Friday 8 a.m. to 5 p.m.), excluding public holidays.

##### Country list

The repair service is offered for the following countries:

Continent	Country/region
<b>Country group 1</b>	
America	Brazil, Canada, Mexico, USA
Asia	China, India, Indonesia, Japan, Malaysia, Singapore, South Korea, Taiwan, Thailand
Australia	Australia
Europe	Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, Italy, Liechtenstein, Luxembourg, Monaco, the Netherlands, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Turkey
<b>Country group 2</b>	
Africa	South Africa
America	Argentina
Australia	New Zealand
Europe	Andorra, Bulgaria, Estonia, Ireland, Latvia, Lithuania, Norway, Romania, Slovenia
<b>Country group 3</b>	
Africa	Egypt, Morocco
America	Bolivia, Chile, Columbia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela
Asia	Bahrain, Iran, Israel, Kuwait, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, Vietnam
Europe	Bosnia-Herzegovina, Belarus, Croatia, Greece, Malta, Macedonia, Russia, Serbia and Montenegro, Ukraine
<b>Country group 4</b>	
	Remaining countries

##### OEM service levels

To ensure repair service for OEM applications, an assessment is necessary based on the OEM service guideline. The assessment grades the OEM application from 0 to 4. A surcharge will be levied for OEM service grades 1 to 4.

<sup>1)</sup> Max. 24 months from the transfer of risk (delivery of components).

<sup>2)</sup> Max. 36 months from the transfer of risk (delivery of components).

<sup>3)</sup> Example for 17 measurement circuits: (basic RSV for = 9 measurement circuits) plus 8 x (measurement circuit supplement for RSV > 9 measurement circuits).

<sup>4)</sup> Physical axes and spindles count as measurement circuits.

#### Selection and ordering data

Designation	Order No.
<b>Repair service contract RSV</b>	
For Siemens I DT components on machine tools for countries in country groups 1 to 3	
<ul style="list-style-type: none"> <li>• 1 year contract period<sup>1)</sup></li> <li>• 2 year contract period<sup>2)</sup></li> <li>• Master contract</li> <li>• Individual contract</li> <li>• 0 to 4 measurement circuits<sup>4)</sup></li> <li>• 5 to 6 measurement circuits<sup>4)</sup></li> <li>• 7 to 8 measurement circuits<sup>4)</sup></li> <li>• = 9 measurement circuits<sup>4)</sup> (basic RSV for = 9 measurement circuits)</li> <li>• &gt; 9 measurement circuits<sup>4)</sup> (measurement circuit supplement for RSV &gt; 9 measurement circuits<sup>3)</sup>)</li> </ul>	<b>6FC8506-1 X0 -0AA0</b> <b>6FC8506-2 X0 -0AA0</b> R E 1 2 3 8 0
<b>Repair service contract Contract extension of 6 or 12 months</b>	
For Siemens I DT components on machine tools for countries in country groups 1 to 3	
<ul style="list-style-type: none"> <li>• Basic RSV for 1 year</li> <li>• Basic RSV for 2 years</li> <li>• Master contract</li> <li>• Individual contract</li> <li>• 0 to 4 measurement circuits<sup>4)</sup></li> <li>• 5 to 6 measurement circuits<sup>4)</sup></li> <li>• 7 to 8 measurement circuits<sup>4)</sup></li> <li>• = 9 measurement circuits<sup>4)</sup> (basic RSV for = 9 measurement circuits)</li> <li>• &gt; 9 measurement circuits<sup>4)</sup> (measurement circuit supplement for RSV &gt; 9 measurement circuits<sup>3)</sup>)</li> </ul>	<b>6FC8506-0 X0 -AA1</b> <b>6FC8506-0 X0 -AA2</b> R E 1 2 3 8 0 6 1
Contract extension (possible once per RSV)	
<ul style="list-style-type: none"> <li>• By 6 months</li> <li>• By 1 year</li> </ul>	
<b>OEM service levels</b>	
Surcharge for repair service contract for Siemens components on machine tools with OEM applications. Measurement circuits 1 to n for countries in country groups 1 to 4	
<ul style="list-style-type: none"> <li>• Surcharge for OEM service level 1</li> <li>• Surcharge for OEM service level 2</li> <li>• Surcharge for OEM service level 3</li> <li>• Surcharge for OEM service level 4</li> </ul>	<b>6FC8506-3SX01-0AA0</b> <b>6FC8506-3SX02-0AA0</b> <b>6FC8506-3SX03-0AA0</b> <b>6FC8506-3SX04-0AA0</b>

# Services

## Retrofit

### Overview



What do we mean by retrofit?

Retrofit is another word for machine modernization, for many users it is also the solution when it comes to breathing new life into machinery and equipment.

The state of the mechanical components of older machines is usually good to very good, but the controls and electrical components are worn and obsolete, so failures and spare part problems can occur more frequently.

### Benefits

With modernization, the user can reap the following essential benefits, depending on the equipment and the level of retrofitting:

- Low-cost alternative to a completely new investment
- Productivity boost through increased plant availability
- Enhanced ease of use in operation and programming
- Quality improvement in machining
- Assured supply of spare parts over a long period
- Secure and reliable data management
- State-of-the-art technology enables networking and integration into production processes

Depending on the performance range, a level of machine functionality is achieved that corresponds to state-of-the-art technology, even with regard to safety and monitoring in accordance with existing guidelines and standards.

### Application

In accordance with the task, older controls and/or drives are replaced by controls and/or drives of the latest generation, starting with machine tools and production machines, and right up to presses and punching machinery. If mechanical overhauling is required, we can offer that, too, as part of the overall package.

### More information

The SINUMERIK Manufacturing Excellence brochure describes the complete service spectrum and gives you a survey of the service portfolio for your machines and processes.

#### Designation

#### SINUMERIK Manufacturing Excellence

Brochure

- German
- English

#### Order No.

**E20001-A770-P610**

**E20001-A770-P610-X-7600**

Additional information is available in the Internet under:



[www.siemens.com/automation/partner](http://www.siemens.com/automation/partner)

[www.siemens.com/automation/service&support](http://www.siemens.com/automation/service&support)

Our service can be reached in Germany at all times under **0180 5050 444** (0.14 €/min. from the German landline network, mobile telephone prices may vary).

**Overview**
**mz robotlab GmbH – Professional automation solutions with the rcs1 robot control**

- Retrofitting of proven, reliable hardware (robots and machines) with the latest control technology
- New robots with the user-friendly, extremely flexible rcs1 control
- Sensory automation solutions for complex, innovative applications

**Hardware philosophy**

As an open, universal PC-based robot control, the rcs1 control is based on the latest, proven Siemens standards.

**Sensor-motor technology**

The rcs1 is designed to allow the versatile integration of sensor technology. In particular, stable processes for a hard contact force control robotlab sensing system (rss1) are available as an extension, which simplify numerous robotic applications, or even make them possible for the first time.

**Controllable axes**

In its standard configuration, the rcs1 is designed as a 6-axis control, but it can be expanded considerably, e.g., up to a 16-axis control with coordinated control of additional axes and belt synchronization.

**Kinematics**

The rcs1 control is not limited to classic manipulator kinematics: Kinematics can be custom defined, e.g., for Cartesian robots, gantry robots, swivel/rotating tables

**Programming**

Various user interfaces are available as options for programming the robot system:

- Handheld unit (HPU)
- Programming interface in C/C++
- Terminal programming, e.g., also via touch screen
- Text-based user interface
- Convenient window-based, menu-assisted user interfaces
- Manual programming with a 6D force sensor
- Programming with a custom configurable macro designer

**Programming languages**

- SRCL program interpreter
- C/C++ program library
- Customer-specific languages defined via a macro designer

**More information**

Please contact:

**mz robotlab GmbH**

Marie-Curie-Straße 1  
53359 RHEINBACH  
Germany

Phone: +49 (0) 2226-83600-00  
Fax: +49 (0) 2226-83600-11  
E-mail: [contact@mzrobotlab.com](mailto:contact@mzrobotlab.com)

Additional information is available in the Internet under:



[www.mzrobotlab.com](http://www.mzrobotlab.com)

# Services

## Fire-extinguishing systems for machine tools

### Overview



Sinorix al-deco are automatic fire-extinguishing systems for machine tools. Sinorix al-deco fights the fire where it breaks out – in the machine tool – without posing a risk to people, the environment, or technical components.

Sinorix al-deco fire extinguishers do not require an energy supply to detect and extinguish fires, as the actual extinguishing process functions pneumatically.

Sinorix al-deco fire extinguishers are CE-compliant, meet all the relevant EU standards and are approved by the German Technical Inspectorate (TÜV).

### Benefits

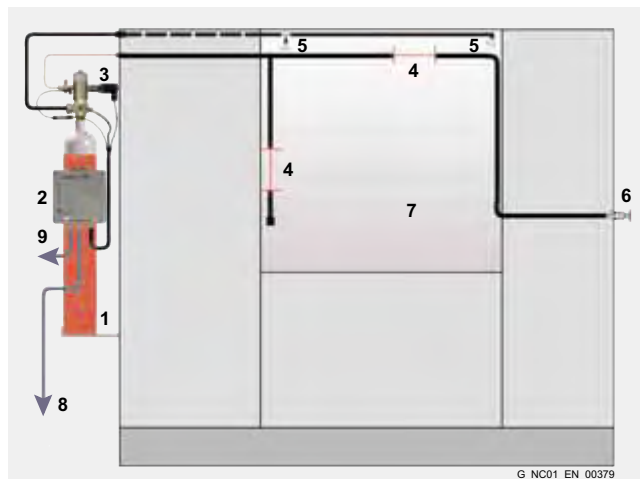
- Optimum protection against outbreak of fire in a machine tool
- Capable of detection and extinction of fires without power supply
- Online remote monitoring of fire extinguisher and extinguishing agent fill level
- Easy maintenance supported by optical/acoustic indicators
- Event log recordings

### Design

The communication interface monitors the pneumatic fire extinguishing system, signals an alarm in the event of a fire or operating state fault and supports recording of operating data.

The LIFDES sensor is pressurized and breaks open at temperatures above 110 °C (230 °F).

The DIMES measuring probe measures the extinguishing agent fill level online and outputs an alarm when it drops below the minimum required quantity. When the LIFDES sensor de-pressurizes, the valve releases the fire extinguishing agent.



- 1 Extinguishing agent container
- 2 Communication interface
- 3 DIMES measuring probe and valve
- 4 Flexible detection hose (LIFDES sensor)
- 5 Fire-extinguishing nozzles
- 6 Push button with manometer
- 7 Hazardous working area
- 8 al-deco interface  
alarm signaling with 230 V AC/3 A potential-free changeover  
contact for controlling EMERGENCY OFF
- 9 230 V AC

### Function

The Sinorix al-deco system uses fire detection and fire extinction methods which operate pneumatically. As a result, the system does not require a power supply to be able to detect and extinguish fires.

This fire extinguisher does not have any special requirements of the machine tools such as sealing air, control signals or signaling criteria.

### More information

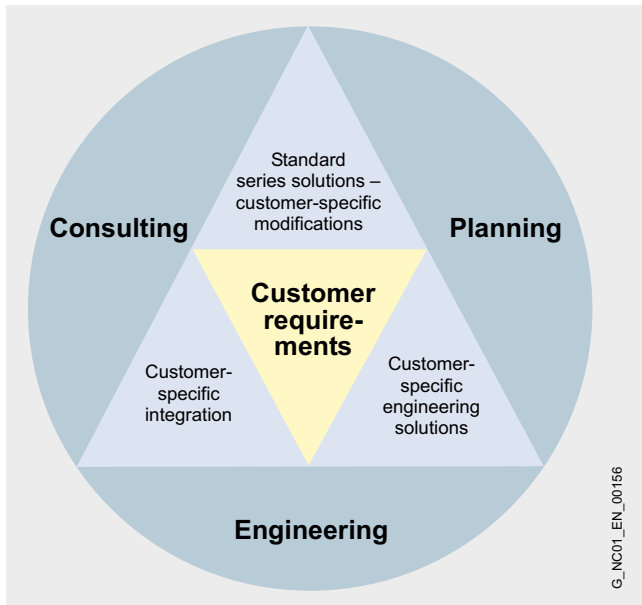
Additional information is available in the Internet under:



[www.siemens.com/buildingtechnologies](http://www.siemens.com/buildingtechnologies)



### Overview



### Innovative equipment for machine tools and production systems

Our supplied range of products and services may include complete equipment for machine tools and production systems with all services in the process chain from consulting through to after-sales service.

### Engineering

As you know, the name Siemens is a guarantee for research and innovation. With our products, you can always be sure that you are using state-of-the-art technology.

Experience gained from control cabinet manufacture is incorporated in our products, including:

- Consideration of relevant standards and (equipment) regulations
- Certification in accordance with UL
- Application of innovative technologies in control cabinet manufacture
- Electronic data exchange

### Superior logistics

Everything from a single source means:

- Cost savings in
  - Procurement
  - Storage
  - Financing
- Reduction in throughput times
- Just-in-time

### Production

Complete equipment is manufactured at a high industrial level.

- Examining consistency of the job documentation
- Checking for adherence to current regulations
- Inspection and shipment free of faults
- Documentation
- Declaration of conformity regarding the Low-Voltage Directive and manufacturer's declaration on machinery directive

### Liability of product nonconformance

Of course we accept the same liability of defects for our complete equipment as for our SINUMERIK and SIMODRIVE products.

Furthermore, you can use our worldwide repair service anywhere and at any time.

### Your benefits

One partner, one quotation, one order, one delivery, one invoice, and one contact partner for liability of defects.



# Services

## Logistics services for our customers

### Overview



#### **Flexible, uniform, successful**

With this motto we offer powerful logistics for our products individually tailored to your requirements, and uniformly from order up to delivery.

We optimize the complete logistics process between Siemens I DT Motion Control Systems and you.

This helps you to design your own processes faster, simpler and more cost-effectively.

Many of our customers have already chosen these solutions in various combinations.

#### **Customer-oriented logistics solutions**

- Modular range of services
- Tailored to your own logistics
- Flexible and reliable fulfillment of demands

#### **Customer-specific configuration**

- Provision of complete packages
- Customizing

#### **Production-based delivery**

- Machine-based generation of package
- Oriented according to your assembly sequence
- Low packaging overhead due to reusable containers for scheduled deliveries

#### **Global network for uniform logistics**

- Utilization of Siemens transport network
- Tracking and tracing throughout the complete transport route
- Competence in export and customs processes

#### **Optimized customer connections**

- Delivery on exact date according to schedule
- Directly to assembly location using ship-to-line

Modules	Service	Specification
Complete delivery	<ul style="list-style-type: none"> <li>• Packages, bundling</li> <li>• Total equipment</li> <li>• Procurement</li> </ul>	Combination into complete equipment packages; procurement of material from other production locations.
Customer-specific configuration/ Sorting	<ul style="list-style-type: none"> <li>• Machine package</li> <li>• Stowage plan</li> <li>• Installation</li> <li>• Tests</li> </ul>	Machine packages, also assembled according to stowage plan; pre-assembly of components into units, and their testing.
Labeling Delivery notes	<ul style="list-style-type: none"> <li>• Customer material number</li> <li>• ID number</li> <li>• Customer designation</li> <li>• Barcode</li> <li>• Language</li> </ul>	Customer specification in form of number and text on the delivery note, plus barcode (DIN 39) on product packaging. Language can be selected according to Siemens guideline.
Packaging versions	<ul style="list-style-type: none"> <li>• Standard carton</li> <li>• Pallet</li> <li>• Reusable container</li> <li>• Air freight container</li> <li>• Sea freight container</li> <li>• Wooden box compliant with IPPC regulation</li> </ul>	Application-oriented packaging from standard cartons to freight containers. Special packaging for pre-assembled units. We always select our packaging materials considering their environmental compatibility.
Export handling	<ul style="list-style-type: none"> <li>• Export declaration</li> <li>• Customs formalities</li> <li>• Worldwide</li> <li>• Multi-partner/multi-region handling</li> </ul>	Export handling up to the customer and also to his partner in a third country, based on the export and customs specifications of the respective countries.
Direct shipment (volume-dependent)	<ul style="list-style-type: none"> <li>• Fixed date</li> <li>• Tour</li> <li>• Ship-to-line</li> </ul>	Direct shipment on fixed, agreed days, directly to the assembly site if required. Exchange of reusable packaging.

## Components for CNC basic and further training

## SinuTrain control-identical programming and simulation software

## Overview

**SinuTrain control-identical programming and simulation software**

SinuTrain is a control-identical CNC training/programming software on a PC. It can be used for:

- Training
- Self-study
- Program development and simulation

The following variants are available (can run under Windows XP):

**SinuTrain complete package 802D/810D/840Di/840D**

- SINUMERIK HMI-Advanced – Universal operating and programming software for machine tools
- ShopMill – User and programming interface for milling machines
- ShopTurn – User and programming interface for turning machines
- ManualTurn – User and programming interface for semi-conventional turning machines
- DIN 66025 programming
- User-friendly contour calculator
- Detailed turning and milling cycles
- Tool management
- Network linking via DNC Direct Numeric Control
- CAD-Reader for reading the processing contour of your workpiece
- Printing/hard copy
- Programming examples
- Configuration tool for adapting to different machines
- 6 languages can be selected online (English, French, German, Italian, Spanish, Chinese Simplified)
- Further languages can be downloaded from the Internet.

## Overview (continued)

**SinuTrain HMI-Advanced 810D/840Di/840D DIN Programming**

- User and programming interface for DIN 66025 programming and SINUMERIK language extension
- CAD-Reader
- Printing/hard copy
- Programming examples
- Configuration tool for adapting to different machines
- 6 languages can be selected online (English, French, German, Italian, Spanish, Chinese Simplified)

**SinuTrain ShopMill**

- User and programming interface for milling machines
- CAD-Reader
- Printing/hard copy
- Programming examples
- Configuration tool for adapting to different machines
- 6 languages can be selected online (English, French, German, Italian, Spanish, Chinese Simplified)

**SinuTrain ShopTurn**

- User and programming interface for turning machines
- For other functions, see ShopMill

**SinuTrain ManualTurn**

- User and programming interface for semi-conventional turning machines
- For other functions, see ShopMill

All versions of SinuTrain are available with a single-user station license or a classroom license. The classroom license enables you to install the software on up to 16 individual PCs.

Updates for the SinuTrain complete package, for example, can be obtained on request. You will receive these updates on production of an existing SinuTrain license. Updates of the latest version or a different higher version can be obtained.

**Benefits**

- Control-identical programming training on PC – Practice-related training
- SinuTrain available in 6 languages – Additional languages on request
- Integration in CAD system – Fast program development
- Commissioning/installation/instruction through Siemens – Everything from a single source
- Teacher/instructor training and teachware – Easy start for trainers
- Integration of customer applications – OEM version can be implemented (machine tool manufacturers)

**Application**

The SinuTrain training software is used to create and simulate CNC programs on a PC, using the DIN 66025 programming language plus SINUMERIK NC language commands and the ShopMill and ShopTurn products.

# Services

## Components for CNC basic and further training

### SinuTrain control-identical programming and simulation software

#### Design

Programs created with the SinuTrain software can be used on real machines. The configurations and settings of the real machine need to be mapped in the software for this purpose. A total of 99 machines can be configured additionally and stored in the configuration memory. The machine to be used can be selected in the Start menu each time.

#### Note:

Programs can be adapted by authorized personnel within the specified limits, although additional costs may be incurred as a result.

#### Function

With DNC, programs and tool data can be transferred from PC to PC or from PC to machine. The CAD-Reader program converts DXF files into contours or hole drilling templates for SINUMERIK, ShopMill or ShopTurn. The contours can be modified later in DIN-ISO format or contour calculator format. You can print out part programs, subprograms and ShopMill/ShopTurn programs using the "Print" function.

#### The single-user station

The scope of functions of the SinuTrain software takes into account production and training requirements. The operator interface identical to production together with the identical scope of programming functions make it easy for the trainer to pass on skills and knowledge for production use. A difference in the media or methods does not exist because identical control software is used.

The environment encountered by the programmer on the PC is identical to the programming environment on the machine. Convenience is, of course, much greater on the PC.

#### The classroom

The classroom license has been specially devised to meet the requirements of a training environment and offers 16 single-user licenses.

The trainee and trainer workstations are linked over a network. The CNC programs created during training can be transferred to a training machine directly via the network using DNC, if SinuTrain has been configured for this machine.

#### Note:

We recommend the use of a network specifically designed for training environments, which will allow the tutor to intervene in the training process from the tutor workstation at any time. The network is not supplied with the SinuTrain software.

#### The training center

The last step in the integrated training concept is complete when the training programs developed by the students are transferred to the CNC machines. DNC Machine also transfers programs from PC to machine via the existing network, thus allowing execution of the programs, manual modification and program development right on the machine itself.

We also provide an appropriate infrastructure:

- Media as well as installation
- Commissioning and services
- Consulting for hardware and software.

We support machine tool manufacturers in their efforts to implement their own or external CNC training centers.

#### Selection and ordering data

Designation	Order No.
<b>SinuTrain complete package 802D/810D/840Di/840D</b> On CD-ROM for Windows XP <ul style="list-style-type: none"> <li>• Rental license, 60 h for software version 6.3</li> <li>• Single-user license Floating license for current software version</li> <li>• Single-user license Service Pack (SP)<sup>1)</sup> for specific software version</li> <li>• Classroom license Floating license (16) for current software version</li> <li>• Classroom license Service Pack (SP)<sup>1)</sup> for specific software version</li> </ul>	<b>6FC5270-6AX70-3AG7</b>  <b>6FC5270-0AX70-0AG0</b>  <b>6FC5270-■AX70-■AG3</b>  <b>6FC5270-0AX72-0AG0</b>  <b>6FC5270-■AX72-■AG3</b>
<b>SinuTrain HMI-Advanced 810D/840Di/840D DIN Programming</b> On CD-ROM for Windows XP <ul style="list-style-type: none"> <li>• Single-user license Floating license for current software version</li> <li>• Classroom license Floating license (16) for current software version</li> </ul>	<b>6FC5270-0AX74-0AG0</b>  <b>6FC5270-0AX76-0AG0</b>
<b>SinuTrain 802D</b> On CD-ROM for Windows XP <ul style="list-style-type: none"> <li>• Single-user license Floating license for current software version</li> <li>• Classroom license Floating license (16) for current software version</li> </ul>	<b>6FC5270-0AX80-0AG0</b>  <b>6FC5270-0AX82-0AG0</b>
<b>SinuTrain ShopMill</b> On CD-ROM for Windows XP <ul style="list-style-type: none"> <li>• Single-user license Floating license for current software version</li> <li>• Classroom license Floating license (16) for current software version</li> </ul>	<b>6FC5463-0FA41-0AG0</b>  <b>6FC5463-0FA43-0AG0</b>

Example of a specific software version, e.g. 6.3:  
6FC5270-6AX70-3AG3.

<sup>1)</sup> Only on verification of the license number.

## Components for CNC basic and further training

SinuTrain control-identical  
programming and simulation software

## Selection and ordering data (continued)

Designation	Order No.
<b>SinuTrain ShopTurn</b> On CD-ROM for Windows XP	
• Single-user license Floating license for current software version	<b>6FC5463-0GA51-0AG0</b>
• Classroom license Floating license (16) for current software version	<b>6FC5463-0GA53-0AG0</b>
<b>SinuTrain ManualTurn</b> On CD-ROM for Windows XP	
• Single-user license Floating license for current software version	<b>6FC5463-0GA41-0AG0</b>
• Classroom license Floating license (16) for current software version	<b>6FC5463-0GA43-0AG0</b>
<b>Option</b>	
<b>Virtual machine for training</b> On CD-Rom for SinuTrain 6.3 edition 3 and 4 for ShopMill/ ShopTurn	
• Single-user license Floating license Software version 1.0	<b>6FC5270-1AX10-0AG0</b>
• Classroom license Floating license (16) Software version 1.0	<b>6FC5270-1AX12-0AG0</b>

## Accessories

SinuTrain training keyboard<sup>1)</sup> **6FC5203-0AC55-0AA0**

## More information

For additional information, please contact your local Siemens office.

Additional information is available in the Internet under:

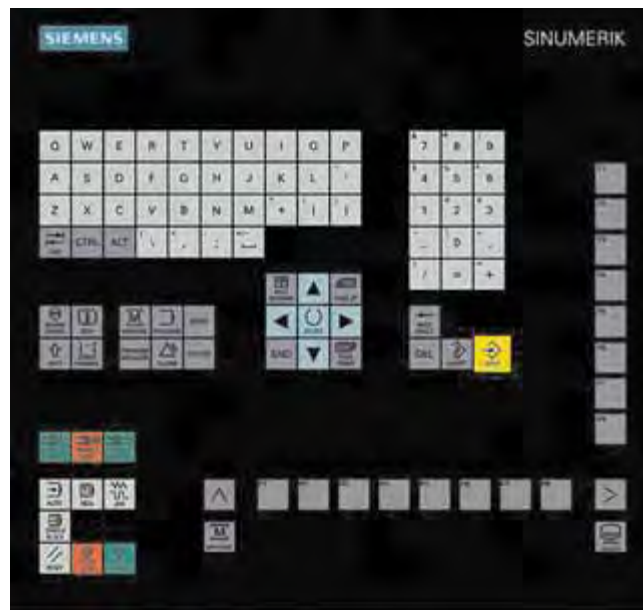


[www.sitrain.com](http://www.sitrain.com)

[www.siemens.com/sinutrain](http://www.siemens.com/sinutrain)

[www.siemens.com/jobshop](http://www.siemens.com/jobshop)

## Accessories

SinuTrain training keyboard<sup>1)</sup>

The training keyboard for machine simulation makes PC-based training in machine operation and programming even more realistic.

On the SinuTrain training keyboard, you will find all the keys familiar to you from the control itself, or from exercises in the training manual, in their original layout. This greatly simplifies the use of SinuTrain and ShopMill/ShopTurn on the one hand, and saves you from having to rethink the entire layout when you progress from training to the machine itself or use the PC as an external programming console and have to switch back and forth between machine and PC on the other hand.

The SinuTrain training keyboard is easily connected via the PC's USB interface, that is to say, neither additional hardware (plug-in card) nor an external power supply is required for the keyboard.

## Preconditions:

- An operating system-supported USB interface on the PC
- SinuTrain software

<sup>1)</sup> Not approved for use on machines.

# Services

## Components for CNC basic and further training

### SinuTrain control-identical programming and simulation software

#### Options

##### Virtual machine for training

The option Virtual machine for training is an addition to the real machine tool and supports virtual manufacturing of workpieces on the PC through 3D visualization of the machining process.

The stock removal process in particular requires extensive technical know-how to avoid collisions and to achieve high-precision workpieces. The option of Virtual machine for training offers functions for teaching this know-how and is therefore an inexpensive method for demonstrating the manufacture of a workpiece to trainees.

#### Overview of functions

##### Machine room presentation



- Simulation with machine room presentation expands the possibilities for passing on technological know-how virtually. Simulation of the complete machine results in an understanding of the complete process of stock removal.

##### Tools

- The tool management in SinuTrain is expanded with a display of the associated holders and supports.

##### Collision visualization

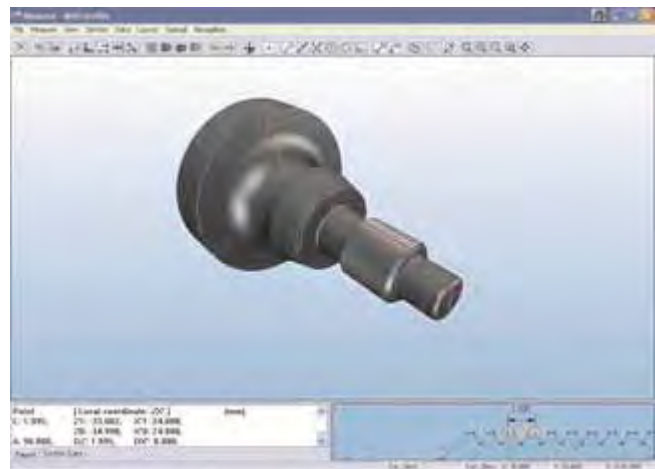


- The virtual machine for training contains functions that support the detection and visualization of a collision with a machine component, such as a rotating chuck, toolholder, etc.

##### Extended simulation

- 3D simulation with extended setting possibilities
- Collision monitoring in the machine room
- Workpiece updating with material removal
- Workpiece sections with supporting screens

##### Workpiece measuring



- Whether an approach is correct or not will only become evident once the results have been analyzed.
- Online measurement of the workpiece rounds off the technological requirements of the stock removal training.

##### Machine types

- Vertical milling machine with 3 axes
- Turning machine with powered tools
- Turning machine with counterspindle and powered tools



# Services

## Components for CNC basic and further training

### eLearning/training booklets

#### Selection and ordering data (continued)

Designation	Order No.
<b>ShopMill self-study course</b> CBT on CD-ROM	<b>6FC5095-0AA71-0 G0</b>
<b>ShopTurn self-study course</b> CBT on CD-ROM Languages: <sup>1)</sup>	<b>6FC5095-0AB00-0 G0</b>
• English/German	<b>B</b>
• English/French	<b>D</b>
• English/Italian	<b>C</b>
• English/Spanish	<b>E</b>

#### The new SITRAIN tutorials on CD-ROM

<b>SINUMERIK 802C/802S Operation and Programming</b> Languages: <sup>2)</sup> English, German, Chinese Simplified	<b>6ZB3300-0BD01-6AA0</b>
<b>SINUMERIK 840D Operation and Programming</b> Languages: <sup>2)</sup> English, German, Dutch	<b>6ZB3300-0BK00-6AA0</b>
<b>Fundamental Principles of NC Programming – Milling</b> Languages: English, French, German, Italian, Spanish, Chinese Simplified	<b>6ZB3300-0BF00-6AA0</b>
<b>Fundamental Principles of NC Programming – Turning</b> Languages: English, French, German, Italian, Spanish, Chinese Simplified	<b>6ZB3300-0BG00-6AA0</b>

#### More information

Additional information is available in the Internet



- On the topic Training at [www.siemens.com/sinumerik/training](http://www.siemens.com/sinumerik/training)
- On the topic ShopMill/ShopTurn at [www.siemens.com/automation/jobshop](http://www.siemens.com/automation/jobshop)

<sup>1)</sup> English/Chinese Simplified available soon.

<sup>2)</sup> Additional languages available soon.



### SIMODRIVE 611 universal training case for Motion Control

#### Application



The training case can be used for customer presentations and for teaching technical aspects of configuration, start-up and service. With the Motion Control variant, functions such as synchronous operation or positioning can be simulated using the toothed discs with scale divisions and stroboscopic equipment.

#### Design

- RIMOWA hard-top case with rollers
- SIMODRIVE unregulated infeed module with 2-axis power module for 0.5 kW motors
- 2-axis control unit with optional module Motion Control with PROFIBUS DP
- Start-up box

#### Technical specifications

<b>Order No.</b>	<b>6ZB2420-0AB00/-0AD00</b>
<b>Product name</b>	SIMODRIVE 611 universal training case for Motion Control
<b>Degree of protection in accordance with DIN VDE 0470 Part 1/EN 60529/IEC 60529</b>	IP00
<b>Ambient temperature</b>	
• Storage and transport	-5 ... 60 °C (23 ... 140 °F)
• Operation	5 ... 40 °C (41 ... 104 °F)
<b>Dimensions</b>	
• Width	700 mm (27.56 in)
• Height	520 mm (20.47 in)
• Depth	260 mm (10.24 in)
<b>Weight, approx.</b>	36 kg (79.4 lb)

#### Selection and ordering data

Designation	Order No.
<b>SIMODRIVE 611 universal training case for Motion Control</b> Version with 1FK6 motors with encoders and optional module Motion Control with PROFIBUS DP	
• 230 V AC power connection	<b>6ZB2420-0AB00</b>
• 110 V AC power connection	<b>6ZB2420-0AD00</b>
<b>SIMODRIVE 611 universal training case</b> Version with 1FT6 motors with absolute encoders and optional module Motion Control with PROFIBUS DP	<b>6ZB2420-0AA02</b>

### SINUMERIK 802 training case

#### Application



The SINUMERIK 802 training cases are used for practicing operation of the SINUMERIK 802S base line/802C base line controls and for demonstration purposes. The training cases can also be used as models for trade fairs or as test controllers.

#### Design

- Hard-top case
- SINUMERIK 802S base line or SINUMERIK 802C base line
- 24 V DC (110 V/230 V AC) power supply

The SINUMERIK 802 training cases are complete, with the PLC program preinstalled. The SINUMERIK control is fitted in a case suitable for transport as air freight.

#### Technical specifications

<b>Order No.</b>	On request
<b>Product name</b>	SINUMERIK 802 training case
<b>Degree of protection in accordance with DIN VDE 0470 Part 1/EN 60529/IEC 60529</b>	IP00
<b>Ambient temperature</b>	
• Storage and transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	0 ... 50 °C (32 ... 122 °F)
<b>Dimensions</b>	
• Width	700 mm (27.56 in)
• Height	500 mm (19.69 in)
• Depth	280 mm (11.02 in)
<b>Weight, approx.</b>	14 kg (30.9 lb)

#### Selection and ordering data

Designation	Order No.
<b>SINUMERIK 802S base line/802C base line training case</b>	<b>On request</b>

# Services

## Training equipment

### SINUMERIK 840D powerline training rack

#### Application



SINUMERIK 840D powerline training rack

The SINUMERIK 840D powerline training rack is used for the realistic practice of operating, programming, start-up and service tasks.

#### Design

- Simulation panel including SIMATIC S7 input, output and IM modules
- 230 V AC/24 V DC power supply, 10 A
- Connection module with 5-way socket
- SINUMERIK OP 012 with PCU 50, Pentium II, 333 MHz, 64 MB RAM
- Machine control panel
- Floppy disk drive, 3.5"
- SINUMERIK 840D powerline with an NCU
- SIMODRIVE 611 digital
  - Unregulated infeed module 10/25 kW,
  - Main spindle power module 24 A,
  - 2-axis feed module 2 x 9/18 A,
  - 2 x synchronous motor 1FT6062-3AC
  - 1 x asynchronous motor 1PH7, 3.7 kW
- Wiring prepared for Safety Integrated capability.

The SINUMERIK 840D powerline training rack is fully equipped and carries the CE mark; the adaptation programs are pre-installed.

Customer-specific adaptations can be made.

#### Technical specifications

<b>Order No.</b>	<b>6ZB2410-0AP00</b>
<b>Product name</b>	SINUMERIK 840D powerline training rack
<b>Degree of protection in accordance with DIN VDE 0470 Part 1/EN 60529/IEC 60529</b>	IP00
<b>Ambient temperature</b>	
• Storage and transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	5 ... 40 °C (41 ... 104 °F)
<b>Dimensions</b>	
• Height	1 696 mm (66.77 in)
• Width	600 mm (23.62 in)
• Depth	660 mm (25.98 in)
<b>Weight, approx.</b>	170 kg (375 lb)

#### Selection and ordering data

Designation	Order No.
SINUMERIK 840D powerline training rack	<b>6ZB2410-0AP00</b>

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

**SITRAIN** – the Siemens Training for Automation and Industrial Solutions – provides you with comprehensive support in solving your tasks.

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



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

#### Achieve more with SITRAIN

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

#### Contact

Visit our site on the Internet at:



[www.siemens.com/sitrain](http://www.siemens.com/sitrain)

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

#### SITRAIN Customer Support Germany:

Phone: +49 (0) 1805 23 56 11

Fax: +49 (0) 1805 23 56 12

(0.14 €/min. from a German landline network, mobile telephone prices may vary)

E-Mail: [info@sitrain.com](mailto:info@sitrain.com)

### SITRAIN highlights

#### Top trainers

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

#### Practical experience

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

#### Wide variety

With a total of about 300 local attendance courses, we train the complete range of Siemens products as well as interaction of the products in systems. Telecourses, teach-yourself software and seminars with a presenter on the Web supplement our classic range of courses.

#### Tailor-made training

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

#### The right mixture: Blended learning

"Blended learning" means a combination of various training media and sequences. For example, a local attendance course in a Training Center can be optimally supplemented by a teach-yourself program as preparation or follow-up. Additional effect: Reduced traveling costs and periods of absence.



# Services Documentation

## General Documentation

### Overview

A high-quality programmable control or drive system can only be used to maximum effect if the user is aware of the performance of the CNC machine tool control and the machine tool drives as a result of intensive training and good technical documentation.

This is becoming more important due to the shorter innovation cycles of modern automation products and the convergence of electronics and mechanical engineering.

Comprehensive documentation is available for the SINUMERIK CNC controls and the SIMODRIVE 611 converter 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
- PDF file available on the Internet as DOConWEB application with 'search all documents' function

[www.siemens.com/automation/doconweb](http://www.siemens.com/automation/doconweb)

Additional information is available in the Internet under:



[www.siemens.com/motioncontrol/docu](http://www.siemens.com/motioncontrol/docu)

### More information

Please send your questions and suggestions to:  
docu.motioncontrol@siemens.com

### Selection and ordering data

Designation	Order No.
<b>Catalog NC 60 · 2009</b>	
• German	Only PDF: (E86060-K4460-A101-B3)
• English	<b>E86060-K4460-A101-B3-7600</b>
<b>Catalog NC 61 · 2007/2008</b>	
• German	<b>E86060-K4461-A101-A2</b>
• English	<b>E86060-K4461-A101-A2-7600</b>
• French	<b>E86060-K4461-A101-A2-7700</b>
• Italian	<b>E86060-K4461-A101-A2-7200</b>
• Spanish	<b>E86060-K4461-A101-A2-7800</b>
<b>Catalog ST 70 · 2009</b>	
• German	<b>E86060-K4670-A101-B2</b>
• English	<b>E86060-K4670-A101-B2-7600</b>
• French	<b>E86060-K4670-A101-B2-7700</b>
• Italian	<b>E86060-K4670-A101-B2-7200</b>
• Spanish	<b>E86060-K4670-A101-B2-7800</b>
<b>Decentralizing with PROFIBUS DP</b>	<b>ISBN 3-89578-074-X</b>
<b>Safety Integrated System Manual</b>	
• German	<b>6ZB5000-0AA01-0BA1</b>
• English	<b>6ZB5000-0AA02-0BA1</b>
<b>Safety Integrated System Manual Supplement</b>	
• German	<b>6ZB5000-0AB01-0BA0</b>
• English	<b>6ZB5000-0AB02-0BA0</b>
<b>DOC-on-CD</b>	
SINUMERIK 802S/802C/802D SINUMERIK 802D sl SINUMERIK 810D/840Di/840D SINUMERIK 840D sl SIMODRIVE 611 SINAMICS S120	
User and Manufacturer Documentation on CD-ROM with Help Tool Edition: October 2008	
• English/German	<b>6FC5398-0AC10-0YA3</b>
<b>Update service for DOC-on-CD</b>	
• English/German	<b>6FC5298-0CD00-0YG2</b>

## SINUMERIK 802S/802C

## SINUMERIK 810D powerline/840D powerline

## Selection and ordering data

Designation	Order No.
<i>User documentation</i>	
<b>Turning SINUMERIK 802S/802C Operating/Programming</b>	
• German	6FC5598-3AA00-0AP2
• English	6FC5598-3AA00-0BP2
• Italian	6FC5598-3AA00-0CP2
• French	6FC5598-3AA00-0DP2
• Spanish	6FC5598-3AA00-0EP2
<b>Milling SINUMERIK 802S/802C Operating/Programming</b>	
• German	6FC5598-3AA10-0AP2
• English	6FC5598-3AA10-0BP2
• Italian	6FC5598-3AA10-0CP2
• French	6FC5598-3AA10-0DP2
• Spanish	6FC5598-3AA10-0EP2
<b>Diagnostics Guide SINUMERIK 802S/802C</b>	
• German	6FC5598-3AA20-0AP2
• English	6FC5598-3AA20-0BP2
<i>Manufacturer documentation</i>	
<b>Installation &amp; Start-Up Guide SINUMERIK 802C</b>	
• German	6FC5597-3AA20-0AP2
• English	6FC5597-3AA20-0BP2
<b>Description of Functions SINUMERIK 802S/802C</b>	
• German	6FC5597-3AA10-0AP2
• English	6FC5597-3AA10-0BP2
<i>User and manufacturer documentation</i>	
<b>Operating/Programming Turning SINUMERIK 802S base line/ 802C base line</b>	
• German	6FC5598-4AA01-0AP0
• English	6FC5598-4AA01-0BP0
• Italian	6FC5598-4AA01-0CP0
• French	6FC5598-4AA01-0DP0
• Spanish	6FC5598-4AA01-0EP0
<b>Installation &amp; Start-up Guide SINUMERIK 802S base line</b>	
• German	6FC5597-4AA01-0AP0
• English	6FC5597-4AA01-0BP0
<b>Operating/Programming Milling SINUMERIK 802S base line/ 802C base line</b>	
• German	6FC5598-4AA11-0AP0
• English	6FC5598-4AA11-0BP0
• French	6FC5598-4AA11-0DP0
• Spanish	6FC5598-4AA11-0EP0
<b>Installation &amp; Start-up Guide SINUMERIK 802C base line</b>	
• German	6FC5597-4AA21-0AP0
• English	6FC5597-4AA21-0BP0
<b>Diagnostics Guide SINUMERIK 802S base line/ 802C base line</b>	
• German	6FC5598-4AA21-0AP0
• English	6FC5598-4AA21-0BP0
<b>Description of Functions SINUMERIK 802S base line/ 802C base line</b>	
• German	6FC5597-4AA11-0AP0
• English	6FC5597-4AA11-0BP0

## Selection and ordering data

Designation	Order No.
<i>User documentation</i>	
<b>Operating Manual HMI-Advanced SINUMERIK 840D sl/840D</b>	
• German	6FC5398-2AP10-3AA0
• English	6FC5398-2AP10-3BA0
• Italian	6FC5398-2AP10-3CA0
• French	6FC5398-2AP10-3DA0
• Spanish	6FC5398-2AP10-3EA0
<b>Operator's Guide HMI-Embedded SINUMERIK 840D/810D</b>	
• German	6FC5298-6AC00-0AP3
• English	6FC5298-6AC00-0BP3
• Italian	6FC5298-6AC00-0CP3
• French	6FC5298-6AC00-0DP3
• Spanish	6FC5298-6AC00-0EP3
<b>Short Guide Operation SINUMERIK 840D/840Di/810D</b>	
• German	6FC5298-6AA10-0AP0
• English	6FC5298-6AA10-0BP0
• Italian	6FC5298-6AA10-0CP0
• French	6FC5298-6AA10-0DP0
• Spanish	6FC5298-6AA10-0EP0
<b>Operating Instructions ShopMill SINUMERIK 840D/840Di/810D</b>	
• German	6FC5298-6AD10-0AP3
• English	6FC5298-6AD10-0BP3
• Italian	6FC5298-6AD10-0CP3
• French	6FC5298-6AD10-0DP3
• Spanish	6FC5298-6AD10-0EP3
<b>Short Guide ShopMill SINUMERIK 840D/810D</b>	
• German	6FC5298-5AD30-0AP0
• English	6FC5298-5AD30-0BP0
• Italian	6FC5298-5AD30-0CP0
• French	6FC5298-5AD30-0DP0
• Spanish	6FC5298-5AD30-0EP0
<b>Operating Instructions ShopTurn SINUMERIK 840D/840Di/810D</b>	
• German	6FC5298-6AD50-0AP2
• English	6FC5298-6AD50-0BP2
• Italian	6FC5298-6AD50-0CP2
• French	6FC5298-6AD50-0DP2
• Spanish	6FC5298-6AD50-0EP2
<b>Short Guide ShopTurn SINUMERIK 840D/810D</b>	
• German	6FC5298-6AF20-0AP0
• English	6FC5298-6AF20-0BP0
• Italian	6FC5298-6AF20-0CP0
• French	6FC5298-6AF20-0DP0
• Spanish	6FC5298-6AF20-0EP0
<b>Operator's Guide HT 6 SINUMERIK 840D/840Di/810D</b>	
• German	6FC5298-0AD60-0AP3
• English	6FC5298-0AD60-0BP3
• Italian	6FC5298-0AD60-0CP3
• French	6FC5298-0AD60-0DP3
• Spanish	6FC5298-0AD60-0EP3
<b>Programming Manual Fundamentals SINUMERIK 840D sl/840D/ 840Di sl/840Di/810D</b>	
• German	6FC5398-1BP10-2AA0
• English	6FC5398-1BP10-2BA0
• Italian	6FC5398-1BP10-2CA0
• French	6FC5398-1BP10-2DA0
• Spanish	6FC5398-1BP10-2EA0

### SINUMERIK 810D powerline/840D powerline

#### Selection and ordering data (continued)

Designation	Order No.
<i>User documentation</i> (continued)	
<b>Programming Manual Job Planning SINUMERIK 840D sl/840D/ 840Di sl/840Di/810D</b> • German • English • Italian • French • Spanish	6FC5398-2BP10-2AA0 6FC5398-2BP10-2BA0 6FC5398-2BP10-2CA0 6FC5398-2BP10-2DA0 6FC5398-2BP10-2EA0
<b>Short Guide Programming SINUMERIK 840D/840Di/810D</b> • German • English • Italian • French • Spanish	6FC5298-6AB30-0AP0 6FC5298-6AB30-0BP0 6FC5298-6AB30-0CP0 6FC5298-6AB30-0DP0 6FC5298-6AB30-0EP0
<b>Programming Manual Cycles SINUMERIK 840D sl/840D/ 840Di sl/840Di/810D</b> • German • English • Italian • French • Spanish	6FC5398-3BP10-0AA0 6FC5398-3BP10-0BA0 6FC5398-3BP10-0CA0 6FC5398-3BP10-0DA0 6FC5398-3BP10-0EA0
<b>Programming Manual SINUMERIK 840D sl/840D/ 840Di sl/840Di/810D Measuring cycles</b> • German • English • Italian • French • Spanish	6FC5398-4BP10-0AA0 6FC5398-4BP10-0BA0 6FC5398-4BP10-0CA0 6FC5398-4BP10-0DA0 6FC5398-4BP10-0EA0
<b>Programming Guide ISO Milling SINUMERIK 802D sl/840D sl/ 840D/ 840Di sl/840Di/810D</b> • English	6FC5398-7BP10-0BA0
<b>Programming Guide ISO Turning SINUMERIK 802D sl/840D sl/840D/ 840Di sl/840Di/810D</b> • English	6FC5398-5BP10-0BA0
<b>Diagnostics Manual SINUMERIK 840D/840Di/810D</b> • German • English • Italian • French • Spanish	6FC5298-7AA20-0AP3 6FC5298-7AA20-0BP3 6FC5298-7AA20-0CP3 6FC5298-7AA20-0DP3 6FC5298-7AA20-0EP3
<i>Manufacturer and service documentation</i>	
<b>Manual SINUMERIK 810D Configuring</b> • German • English	6FC5297-6AD10-0AP2 6FC5297-6AD10-0BP2
<b>Manual SINUMERIK 840D Configuring</b> • German • English	6FC5297-6AC10-0AP3 6FC5297-6AC10-0BP3
<b>Manual Operator Components SINUMERIK 840D/840Di/810D</b> • German • English	6FC5297-7AA50-0AP2 6FC5297-7AA50-0BP2

Designation	Order No.
<i>Manufacturer and service documentation</i> (continued)	
<b>Start-up Guide SINUMERIK 810D</b> • German • English	6FC5297-4AD20-0AP1 6FC5297-4AD20-0BP1
<b>Start-up Guide SINUMERIK 840D</b> • German • English	6FC5297-6AB10-0AP2 6FC5297-6AB10-0BP2
<b>Commissioning Manual CNC Part 2 (HMI) SINUMERIK 840D sl/840D/ 840Di/810D</b> • German • English • Italian • French • Spanish	6FC5397-3AP10-1AA0 6FC5397-3AP10-1BA0 6FC5397-3AP10-1CA0 6FC5397-3AP10-1DA0 6FC5397-3AP10-1EA0
<b>Commissioning Manual CNC Part 5 (Basic software) SINUMERIK 840D sl/840D/ 840Di/810D</b> • German • English • Italian • French • Spanish	6FC5397-2CP10-2AA0 6FC5397-2CP10-2BA0 6FC5397-2CP10-2CA0 6FC5397-2CP10-2DA0 6FC5397-2CP10-2EA0
<b>Description of Functions SINUMERIK 840D/810D ShopMill</b> • German • English	6FC5297-6AD80-0AP3 6FC5297-6AD80-0BP3
<b>Description of Functions SINUMERIK 840D/810D ShopTurn</b> • German • English	6FC5297-6AD70-0AP2 6FC5297-6AD70-0BP2
<b>Lists (Book 1) SINUMERIK 840D/840Di/810D SIMODRIVE 611 digital</b> • German • English	6FC5297-7AB70-0AP2 6FC5297-7AB70-0BP2
<b>Lists (Book 2) SINUMERIK 840D/840Di/810D SIMODRIVE 611 digital</b> • German • English	6FC5297-7AB71-0AP0 6FC5297-7AB71-0BP0
<b>Function Manual SINUMERIK 840D sl/840D/ 840Di sl/840Di/810D Basic Functions</b> • German • English	6FC5397-0BP10-3AA0 6FC5397-0BP10-3BA0
<b>Function Manual SINUMERIK 840D sl/840D/ 840Di sl/840Di/810D Extended Functions</b> • German • English	6FC5397-1BP10-3AA0 6FC5397-1BP10-3BA0
<b>Function Manual SINUMERIK 840D sl/840D/ 840Di sl/840Di/810D Special Functions</b> • German • English	6FC5397-2BP10-3AA0 6FC5397-2BP10-3BA0

## SINUMERIK 810D powerline/840D powerline

## Motors

## Selection and ordering data (continued)

Designation	Order No.
<i>Manufacturer and service documentation</i> (continued)	
<b>Description of Functions</b> <b>SINUMERIK 840D/840Di/810D</b> <b>Tool Management</b> • German • English	6FC5297-6AC60-0AP1 6FC5297-6AC60-0BP1
<b>Description of Functions</b> <b>SINUMERIK 840D</b> <b>Safety Integrated</b> • German • English	6FC5297-7AB80-0AP1 6FC5297-7AB80-0BP1
<b>Function Manual</b> <b>SINUMERIK 840D sl/840D/ 840Di sl/840Di/810D</b> <b>Synchronized Actions</b> • German • English	6FC5397-5BP10-2AA0 6FC5397-5BP10-2BA0
<b>Description of Functions</b> <b>SINUMERIK 840D</b> <b>C PLC Programming</b> • German • English	6FC5297-3AB60-0AP0 6FC5297-3AB60-0BP0
<b>Description of Functions</b> <b>SINUMERIK 840D/840Di/810D</b> <b>Remote Diagnosis</b> • German • English	6FC5297-0AF00-0AP3 6FC5297-0AF00-0BP3
<b>Description of Functions</b> <b>HMI-Embedded Configuring Package</b> • German • English	6FC5297-6EA10-0AP0 6FC5297-6EA10-0BP0
<b>Description of Functions</b> <b>SINUMERIK 840D Digitizing</b> • German • English	6FC5297-4AC50-0AP0 6FC5297-4AC50-0BP0
<b>Description of Functions</b> <b>ISO Dialects for SINUMERIK</b> <b>SINUMERIK 840D sl/840D/ 840Di sl/840D/810D</b> • German • English	6FC5397-7BP10-0AA0 6FC5397-7BP10-0BA0
<b>EMC Guidelines</b> • German • English	6FC5297-0AD30-0AP2 6FC5297-0AD30-0BP2
<b>Description of Functions</b> <b>MCIS RPC Computer Link</b> • German • English	6FC5297-6AD61-0AP1 6FC5297-6AD61-0BP1
<b>Description of Functions</b> <b>MCIS TDI Ident Connection</b> • German • English	6FC5297-1AE60-0AP0 6FC5297-1AE60-0BP0
<b>Description of Functions</b> <b>MCIS</b> <b>NC Program Management</b> <b>DNC Machine</b> • German • English	6FC5297-1AE81-0AP0 6FC5297-1AE81-0BP0
<b>Description of Functions</b> <b>MCIS</b> <b>NC Program Management DNC</b> • German • English	6FC5297-2AE80-0AP1 6FC5297-2AE80-0BP1
<b>Operating Instructions</b> <b>MCIS Tool Data Information TDI</b> • German • English • French	6FC5297-6AE01-0AP4 6FC5297-6AE01-0BP4 6FC5297-6AE01-0DP4

## Selection and ordering data

Designation	Order No.
<i>Manufacturer and service documentation</i>	
<b>Configuration Manual</b> <b>1FT6 Synchronous Motors</b> • German • English • Italian • French • Spanish	6SN1197-0AD02-0AP1 6SN1197-0AD02-0BP1 6SN1197-0AD02-0CP1 6SN1197-0AD02-0DP1 6SN1197-0AD02-0EP1
<b>Configuration Manual</b> <b>1FT7 Synchronous Motors</b> • German • English • Italian • French • Spanish	6SN1197-0AC13-0AP1 6SN1197-0AC13-0BP1 6SN1197-0AC13-0CP1 6SN1197-0AC13-0DP1 6SN1197-0AC13-0EP1
<b>Configuration Manual</b> <b>1FK7 Synchronous Motors</b> • German • English • Italian • French • Spanish	6SN1197-0AD06-0AP1 6SN1197-0AD06-0BP1 6SN1197-0AD06-0CP1 6SN1197-0AD06-0DP1 6SN1197-0AD06-0EP0
<b>Configuration Manual</b> <b>General Information for</b> <b>1FT/1FK Motors</b> • German • English • Italian • French • Spanish	6SN1197-0AD07-0AP4 6SN1197-0AD07-0BP4 6SN1197-0AD07-0CP2 6SN1197-0AD07-0DP2 6SN1197-0AD07-0EP2
<b>Configuration Manual</b> <b>General Information for</b> <b>Asynchronous Motors</b> • German • English • Italian • French • Spanish	6SN1197-0AC62-0AP0 6SN1197-0AC62-0BP0 6SN1197-0AC62-0CP0 6SN1197-0AC62-0DP0 6SN1197-0AC62-0EP0
<b>Configuration Manual</b> <b>1PH2 Asynchronous Motors</b> • German • English • Italian • French • Spanish	6SN1197-0AC63-0AP0 6SN1197-0AC63-0BP0 6SN1197-0AC63-0CP0 6SN1197-0AC63-0DP0 6SN1197-0AC63-0EP0
<b>Configuration Manual</b> <b>1PH4 Asynchronous Motors</b> • German • English • Italian • French • Spanish	6SN1197-0AC64-0AP2 6SN1197-0AC64-0BP2 6SN1197-0AC64-0CP2 6SN1197-0AC64-0DP2 6SN1197-0AC64-0EP2
<b>Configuration Manual</b> <b>1PH7 Asynchronous Motors</b> • German • English • Italian • French • Spanish	6SN1197-0AC65-0AP1 6SN1197-0AC65-0BP1 6SN1197-0AC65-0CP1 6SN1197-0AC65-0DP1 6SN1197-0AC65-0EP1
<b>Configuration Manual</b> <b>Hollow-Shaft Motors for Main</b> <b>Spindle Drives 1PM4/1PM6</b> • German • English • Italian • French • Spanish	6SN1197-0AD03-0AP1 6SN1197-0AD03-0BP1 6SN1197-0AD03-0CP1 6SN1197-0AD03-0DP1 6SN1197-0AD03-0EP1
<b>Configuration Manual</b> <b>1FN1/1FN3 Linear Motors</b> • German • English	6SN1197-0AB70-0AP6 6SN1197-0AB70-0BP6

# Services Documentation

## Motors

### Selection and ordering data (continued)

Designation	Order No.
<i>Manufacturer and service documentation</i>	
<b>Configuration Manual 1FN3 Linear Motors (Peak Load Motors)</b> • German	6SN1197-0AB73-0AP1
<b>Configuration Manual 1FN3 Linear Motors (Continuous Load Motors)</b> • German • English • Italian • French • Spanish	6SN1197-0AB74-0AP3 6SN1197-0AB74-0BP3 6SN1197-0AB74-0CP2 6SN1197-0AB74-0DP2 6SN1197-0AB74-0EP2
<b>Configuration Manual 1FE1 Synchronous Built-In Motors</b> • German • English • Italian • French • Spanish	6SN1197-0AC00-0AP7 6SN1197-0AC00-0BP7 6SN1197-0AC00-0CP7 6SN1197-0AC00-0DP7 6SN1197-0AC00-0EP7
<b>Configuration Manual 1FW6 Built-In Torque Motors</b> • German • English • Italian • French • Spanish	6SN1197-0AD00-0AP5 6SN1197-0AD00-0BP5 6SN1197-0AD00-0CP3 6SN1197-0AD00-0DP3 6SN1197-0AD00-0EP3
<b>Configuration Manual 2SP1 Motor Spindles</b> • German • English • Italian • French • Spanish	6SN1197-0AD04-0AP3 6SN1197-0AD04-0BP3 6SN1197-0AD04-0CP3 6SN1197-0AD04-0DP3 6SN1197-0AD04-0EP3

## SIMODRIVE 611

### Selection and ordering data

Designation	Order No.
<i>Manufacturer and service documentation</i>	
<b>Description of Functions SIMODRIVE 611 digital/ SINUMERIK 840D/810D Drive Functions</b> • German • English	6SN1197-0AA80-1AP6 6SN1197-0AA80-1BP6
<b>Function Manual SIMODRIVE 611 digital Hydraulics Module</b> • German • English	6SN1197-0AB60-0AP4 6SN1197-0AB60-0BP4
<b>Description of Functions SIMODRIVE 611 digital/ SINUMERIK 840D ANA Module</b> • German • English	6SN1197-0AB80-0AP0 6SN1197-0AB80-0BP0
<b>Configuration Manual Drive Converters SIMODRIVE 611 digital</b> • German • English • Italian • French • Spanish	6SN1197-0AA00-1AP1 6SN1197-0AA00-1BP1 6SN1197-0AA00-1CP0 6SN1197-0AA00-1DP0 6SN1197-0AA00-1EP0
<b>Description of Functions SIMODRIVE 611 universal/ universal E Control Units for Speed control and Positioning</b> • German • English • Italian • French • Spanish	6SN1197-0AB20-1AP8 6SN1197-0AB20-1BP8 6SN1197-0AB20-1CP7 6SN1197-0AB20-1DP7 6SN1197-0AB20-1EP7

## Measuring systems

### Selection and ordering data

Designation	Order No.
<i>Manufacturer and service documentation</i>	
<b>User Manual SIMODRIVE sensor Absolute Encoder with PROFIBUS</b> • German/English	6SN1197-0AB10-0YP4



## Appendix



12/2	<b>Approvals</b>
12/6	<b>Siemens Contacts Worldwide</b>
12/7	<b>Online Services</b> Information and ordering in the Internet and on DVD-ROM
12/8	<b>Customer Support</b>
12/9	<b>Notes on software</b>
12/9	Software licenses
12/10	Setup texts and Software Update Services
12/11	<b>Indexes</b>
12/11	Subject index
12/17	Order number index
12/25	<b>Suggestions for improving the catalog</b> Fax form
12/26	<b>Conversion tables</b>
12/28	<b>Metal surcharges</b>
12/30	<b>Conditions of sale and delivery</b> Export regulations

# Appendix

## Approvals

### Overview

Many products in this catalog are in compliance with UL/CSA and FM requirements and are labeled with the appropriate certification markings.

All certifications, certificates, declarations of conformance, test certificates, e.g. CE, UL, Safety Integrated have been performed with the associated system components as they are described in the Catalogs and Configuration Manuals.

The certificates are only valid if the products are used with the described system components, are installed according to the Installation Guidelines and are used for their intended purpose.

For cases that deviate from these conditions, the company or person marketing these products is responsible in having the certificates appropriately re-issued.

#### **UL: Underwriters Laboratories** *Independent public testing institution in North America*

Approval marks:

- **UL** for end-products, tested by UL in accordance with UL standard
- **cUL** for end-products, tested by UL in accordance with CSA standard
- **cULus** for end-products, tested by UL in accordance with UL and CSA standards
- **UR** for mounting parts in end products, tested by UL in accordance with UL standard
- **cUR** for mounting parts in end products, tested by UL in accordance with CSA standard
- **cURus** for mounting parts in end-products, tested by UL in accordance with UL and CSA standards

Test standards:

- SINUMERIK: Standard UL 508
- SIMODRIVE: Standard UL 508C
- Motors: Standard UL 547

Product category/File No.:

- SINUMERIK: E164110
- SIMODRIVE: NMMS2/E192450
- Motors: E93429

#### **TUV: TUV Rheinland of North America Inc.** *Independent public testing institution in North America* *National recognized testing laboratory (NRTL)*

Approval mark:

- **cTUVus** tested by TUV in accordance with UL and CSA standards

Test standards:

- SIMODRIVE: NRTL listing according to standard UL 508C

Product category/File No.:

- SIMODRIVE: TUV.COM/4335304002

#### **CSA: Canadian Standard Association** *Independent public testing institution in Canada*

Approval mark:

- **CSA** Tested by CSA in accordance with CSA standard

Test standard:

- Standard CAN/CSA-C22.2/No. 0-M91/No. 14-05/No. 142-M1987

File No.:

- SINUMERIK FM ... : LR 102527

#### **FMRC: Factory Mutual Research Corporation** *Independent public testing institution in North America*

Approval mark:

- **FM** Tested by FM in accordance with the FM standard


Test standard:

- Standard FMRC 3600, FMRC 3611, FMRC 3810 Class I, Div.2, Group A, B, C, D


File No.:

- SINUMERIK FM... : 4Y1A7.AX  
5B0A2.AX  
2D7A2.AX  
3007320


#### **SINUMERIK Operator components**

Type	Approval mark	
6FC5203-0AC..-0	cULus	
6FC5203-0AF00- .	cULus	
6FC5203-0AF01- .	cULus	
6FC5203-0AF02- .	cULus	
6FC5203-0AF03- .	cULus	
6FC5203-0AF04- .	cULus	
6FC5235-0AA05- .	cULus	
6FC5247-0AF11-0AA.	cULus	
6FC5312-0DA00-0AA0	cULus	
6FC9320-5D	1)	
6FX2007-1AC..	cULus	

#### **SINUMERIK 810D powerline**

Type	Approval mark	
6FC5410-.....-....	cULus	
6FC5411-0AA00-....	cULus	
6FC5412-0FA10-...	cULus	
6FC5447-0AA00-....	cULus	
6FC5447-0AA01-....	cULus	


#### **SINUMERIK 840D powerline**

Type	Approval mark	
6FC5203-0AB00-....	cULus	
6FC5203-0AB1.-A...	cULus	
6FC5203-0AB2.-....	cULus	
6FC5203-0AC0.-1...	cULus	
6FC5203-0AD1.-0AA0	cULus	
6FC5203-0AD1.-1AA0	cULus	
6FC5203-0AE.-....	cULus	
6FC5203-0AF22-1AA0	cULus	
6FC5203-0AF50-2AA0	cULus	
6FC5203-0AF50-3AA0	cULus	
6FC5203-0AF50-4AA0	cULus	
6FC5210-0DA.-....	cULus	
6FC5235-0AA06-0AA.	cULus	
6FC5247-0AA00-....	cULus	
6FC5247-0AA02-....	cULus	


1) Product is declared in file as "shown for reference only". It has no UL or UR marking.

## Overview (continued)


## SINUMERIK 840D powerline (continued)

Type	Approval mark	
6FC5247-0AF20-0AA0	cULus	
6FC5247-0AF21-0AA0	cULus	
6FC5247-0AF22-0AA0	cULus	
6FC5247-0AF22-1AA0	cULus	
6FC5247-0AF22-2AA0	cULus	
6FC5357-0B...-....	cULus	
6FC5403-0AA00-0AA.	cULus	
6FC5403-0AA10-....	cULus	




## SINUMERIK DMP

Type	Approval mark	
6FC5111-0CA01-....	cULus	
6FC5111-0CA02-....	cULus	
6FC5111-0CA03-....	cULus	
6FC5111-0CA04-....	cULus	
6FC5111-0CA05-....	cULus	
6FC5211-0AA00-....	cULus	
6FC5211-0AA10-....	cULus	


## SINUMERIK I/O modules

Type	Approval mark	
6FC5611-0CA01-0AA0	cULus	


## SINUMERIK FM ...

Type	Approval mark	  
6ES7353-1AH00-....	UL/CSA/FM	
6ES7353-1AH01-....	UL/CSA/FM	
6ES7354-1AH00-....	UL/CSA/FM	
6ES7354-1AH01-....	UL/CSA/FM	
6ES7357-4AH...-....	UL/CSA/FM	
6ES7357-4AH01-....	UL/CSA/FM	
6FC5357-0BH0.-0XE0	UL/CSA/FM	
6FC5357-0BH0.-0XE1	UL/CSA/FM	
6SN1227-2ED1.-0HA0...	UL/CSA/FM	

## Motors

Type	Approval mark	
1FT	cURus	
1FK	cURus	
1FN3	cURus	
1FW6...-...B...-C2	cURus	
1PH	cURus	
1PM	cURus	
6SN1113-1AA00-1JA1	cULus	
6SN1113-1AA00-1KA.	cULus	

## Measuring systems SIMODRIVE sensor

Type	Approval mark	
6FX2001-..	cULus	

\*) 1 to 9.

## SIMODRIVE 611

Type	Approval mark	
6SN1111-0AB00-0AA *)	cULus	
6SN1112-0AC01-0AA *)	cULus	
6SN1113-1AA00-0CA *)	cULus	
6SN1113-1AA00-0DA0	cULus	
6SN1113-1AB01-0BA *)	cULus	
6SN1114-0AA01-....	cULus	
6SN1114-0AA02 -....	cULus	
6SN1114-0NA0-....	cULus	
6SN1114-0NB0-....	cULus	
6SN1115-0BA11-....	cULus	
6SN1117-0DG21-0AA *)	cULus	
6SN1118-NH00-....	cULus	
6SN1118-NH01-....	cULus	
6SN1118-NH10-....	cULus	
6SN1118-NH11-....	cULus	
6SN1118-NJ00-....	cULus	
6SN1118-NJ01-....	cULus	
6SN1118-NK00-....	cULus	
6SN1118-NK01-....	cULus	
6SN1118-0AA11-....	cULus	
6SN1118-0AD11-....	cULus	
6SN1118-0AE11-....	cULus	
6SN1118-0BJ11-....	cULus	
6SN1118-0BK11-....	cULus	
6SN1118-0DG21-...	cULus	
6SN1118-0DG22-...	cULus	
6SN1118-0DG23-...	cULus	
6SN1118-0DH21-...	cULus	
6SN1118-0DH22-...	cULus	
6SN1118-0DH23-...	cULus	
6SN1118-0DJ21-...	cULus	
6SN1118-0DJ23-...	cULus	
6SN1118-0DK21-...	cULus	
6SN1118-0DK23-...	cULus	
6SN1118-0DK33-...	cULus	
6SN1118-0DM11-...	cULus	
6SN1118-0DM13-...	cULus	
6SN1118-0DM21-...	cULus	
6SN1118-0DM23-...	cULus	
6SN1118-0DM31-...	cULus	
6SN1118-0DM33-...	cULus	
6SN1121-0BA11-....	cULus	
6SN1122-0BA11-....	cULus	
6SN1123-1AA00-0AA *)	cULus	
6SN1123-1AA00-0BA *)	cULus	
6SN1123-1AA00-0CA *)	cULus	
6SN1123-1AA00-0DA *)	cULus	
6SN1123-1AA00-0EA *)	cULus	
6SN1123-1AA00-0HA *)	cULus	
6SN1123-1AA00-0JA *)	cULus	
6SN1123-1AA00-0KA *)	cULus	

# Appendix


## Approvals

### Overview (continued)


#### SIMODRIVE 611 (continued)

Type	Approval mark	
6SN1123-1AA00-0LA *)	cULus	
6SN1123-1AA01-0FA *)	cULus	
6SN1123-1AA02-0FA *)	cULus	
6SN1123-1AA02-0JA *)	cULus	
6SN1123-1AA02-0KA *)	cULus	
6SN1123-1AB00-0AA *)	cULus	
6SN1123-1AB00-0BA *)	cULus	
6SN1123-1AB00-0CA *)	cULus	
6SN1123-1AB00-0HA *)	cULus	
6SN1124-1AA00-0AA *)	cULus	
6SN1124-1AA00-0BA *)	cULus	
6SN1124-1AA00-0CA *)	cULus	
6SN1124-1AA00-0DA *)	cULus	
6SN1124-1AA00-0EA *)	cULus	
6SN1124-1AA00-0HA *)	cULus	
6SN1124-1AA00-0JA *)	cULus	
6SN1124-1AA00-0KA *)	cULus	
6SN1124-1AA00-0LA *)	cULus	
6SN1124-1AA01-0FA *)	cULus	
6SN1124-1AB00-0AA *)	cULus	
6SN1124-1AB00-0BA *)	cULus	
6SN1124-1AB00-0CA *)	cULus	
6SN1124-1AB00-0HA *)	cULus	
6SN1125-1AA00-0CA *)	cURus	
6SN1125-1AA00-0DA *)	cURus	
6SN1125-1AA00-0EA *)	cURus	
6SN1125-1AA00-0KA *)	cURus	
6SN1145-1AA00-0CA *)	cULus	
6SN1145-1AA01-0AA *)	cULus	
6SN1145-1BA01-0BA *)	cULus	
6SN1145-1BA01-0DA *)	cULus	
6SN1145-1BA02-0CA *)	cULus	
6SN1145-1BB00-0DA *)	cULus	
6SN1145-1BB00-0EA *)	cULus	
6SN1145-1BB00-0FA *)	cULus	
6SN1146-1AA00-0CA *)	cULus	
6SN1146-1AB00-0BA *)	cULus	
6SN1146-1BB00-0DA *)	cULus	
6SN1146-1BB00-0EA *)	cULus	
6SN1146-1BB00-0FA *)	cULus	
6SN1146-1BB01-0BA *)	cULus	
6SN1146-1BB02-0CA *)	cULus	
6SN1147-1BB00-0CA *)	cURus	
6SN1147-1BB00-0DA *)	cURus	
6SN1147-1BB00-0FA *)	cURus	
6SN1161-1DA00-0AA *)	cULus	

#### External pulsed resistor

Type	Approval mark	
6SN1113-1AA00-0DA0	cULus	


#### Line filters

Type	Approval mark	
6SN1111-0AA01-1BA0	UR	
6SN1111-0AA01-1AA0	UR	
6SN1111-0AA01-1CA0	UR	
6SL3000-0BE21-6AA0	UR	
6SL3000-0BE23-6AA0	UR	
6SL3000-0BE25-5AA0	UR	
6SL3000-0BE28-0AA0	UR	
6SL3000-0BE31-2AA0	UR	

#### Commutating reactors

Type	Approval mark	
6SN1111-0AA00-0CA1	cURus	


#### Matching transformers in economy circuit for SIMODRIVE

Type	Approval mark	
4AU3695-0SB00-0CN2	cURus	
4AU3695-0SB02-0CN2	cURus	
4AU3695-0SB10-0CN2	cURus	
4AU3695-0SB12-0CN2	cURus	
4AU3695-0SB20-0CN2	cURus	
4AU3695-0SB22-0CN2	cURus	
4AU3995-0SA30-0CN2	cURus	
4AU3995-0SA32-0CN2	cURus	
4AU3995-0SA40-0CN2	cURus	
4AU3995-0SA42-0CN2	cURus	
4AU3995-0SA50-0CN2	cURus	
4AU3995-0SA52-0CN2	cURus	
4BU4395-0SA70-0C	cURus	
4BU4395-0SA80-0C	cURus	
4BU4395-0SB00-0C	cURus	
4BU4795-0SC30-0C	cURus	
4BU4795-0SC40-0C	cURus	
4BU4795-0SC50-0C	cURus	
4BU5595-0SA40-0C	cURus	
4BU5595-0SA50-0C	cURus	
4BU5595-0SA60-0C	cURus	
4BU5895-0SA60-0C	cURus	
4BU5895-0SA70-0C	cURus	
4BU5895-0SA80-0C	cURus	
4BU6095-0SA60-0C	cURus	
4BU6095-0SA70-0C	cURus	
4BU6095-0SA80-0C	cURus	
6SN1111-0AA00-0BB1	cURus	
6SN1111-0AA00-0CB0	cURus	
6SN1111-0AA00-0DB0	cURus	
6SN1111-0AA00-0EB0	cURus	
6SN1111-0AA00-0FB1	cURus	


\*) 1 to 9.

## Overview (continued)

## Cables for SINUMERIK and SIMODRIVE

Type	Approval mark	
6ES7368-3...1-0AA0	1)	
6FC5247-0AA35-0AA0	1)	
6FC5411-0AA80-0AA0	1)	
6FC5412-0FA80-0AA0	1)	
6FX200.-1AA13-1..0	1)	
6FX200.-1BA01	1)	
6FX200.-1CA01-1..0	1)	
6FX200.-1CB01-1AB0	1)	
6FX200.-1CC00-....	1)	
6FX200.-1DB01-1..0	1)	
6FX200.-2BB01-1..0	1)	
6FX200.-3AD01-1..0	1)	
6FX200.-3AD02-1..0	1)	
6FX2006-1BF00	cULus	
6FX2007-1AC..	cULus	
6FX2008-1BD71	UR	
6FX5..8-.....-....	UR/CSA	
6FX5..2-5-.....-....	UR/CSA	
6FX7..2-5-.....-....	2)	
6FX7..8-.....-....	UR/CSA	
6FX8..2-5-.....-....	2)	
6FX8..8-.....-....	UR/CSA	
6SN1161-1CA00-0.A0	1)	
6SN1161-1CA00-0.A1	1)	
6SN1161-1CA00-1.A1	1)	

## Connectors for SINUMERIK and SIMODRIVE

Order No.	Approval mark	
6FX2003-0CC11	cURus	
6FX2003-0CC21	cURus	
6FX2003-0CG10	cURus	
6FX2003-0CG20	cURus	
6FX2003-1CG10	cURus	
6FX2003-1CG20	cURus	

1) Product is declared in file as "shown for reference only". It has no UL or UR marking.

2) No separate marking necessary.

# Appendix

## Siemens Contacts Worldwide

### Overview



At

[www.siemens.com/automation/partner](http://www.siemens.com/automation/partner)

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

You can obtain in most cases a contact partner for

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

You start by selecting a

- Country,
- Product or
- Sector.

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

**Siemens Industry Automation and Drive Technologies in the WWW**

A detailed knowledge of the range of products and services available is essential when planning and configuring automation systems. It goes without saying that this information must always be fully up-to-date.

Siemens Industry Automation and Drive Technologies has therefore built up a comprehensive range of information in the World Wide Web, which offers quick and easy access to all data required.

Under the address

[www.siemens.com/automation](http://www.siemens.com/automation)

you will find everything you need to know about products, systems and services.

**Product Selection Using the Offline Mall**

Detailed information together with convenient interactive functions:

The Offline Mall CA 01 covers more than 80 000 products and thus provides a full summary of the Siemens Industry Automation and Drive Technologies product base.

Here you will find everything that you need to solve tasks in the fields of automation, switchgear, installation and drives. All information is linked into a user interface which is easy to work with and intuitive.

After selecting the product of your choice you can order at the press of a button, by fax or by online link.

Information on the Offline Mall CA 01 can be found in the Internet under

[www.siemens.com/automation/ca01](http://www.siemens.com/automation/ca01)

or on DVD-ROM.

**Easy Shopping with the A&D Mall**

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

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

Numerous functions are available to support you.

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

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

[www.siemens.com/automation/mall](http://www.siemens.com/automation/mall)

# Appendix

## Customer Support

### Knowledge Base on CD-ROM



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

The CD-ROM also includes a full-text search and our Knowl-

edge Manager for targeted searches for solutions. The CD-ROM will be updated every 4 months.

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

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

Order no. **6ZB5310-0EP30-0BA2**

Orders via the Internet  
(with Automation Value Card or credit card) at:

[www.siemens.com/automation/service&support](http://www.siemens.com/automation/service&support)

in the Shop domain.

### Automation Value Card



#### Small card – great support

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

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

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

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

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

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

#### Automation Value Card order numbers

Credits	Order no.
200	<b>6ES7997-0BA00-0XA0</b>
500	<b>6ES7997-0BB00-0XA0</b>
1000	<b>6ES7997-0BC00-0XA0</b>
10000	<b>6ES7997-0BG00-0XA0</b>

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

[www.siemens.com/automation/service&support](http://www.siemens.com/automation/service&support)

Service & Support à la Card: Examples

#### Technical Support

"Priority"	Priority processing for urgent cases
"24 h"	Availability round the clock
"Extended"	Technical consulting for complex questions

#### Support Tools in the Support Shop

"System Utilities"	Tools that can be used directly for configuration, analysis and testing
"Applications"	Complete topic solutions including ready-tested software
"Functions & Samples"	Adaptable blocks for accelerating your developments



**Overview****Software types**

Software requiring a license is categorized into types. The following software types have been defined:

- Engineering software
- Runtime software

**Engineering software**

This includes all software products for creating (engineering) user software, e.g. for configuring, programming, parameterizing, testing, commissioning or servicing.

Data generated with engineering software and executable programs can be duplicated for your own use or for use by third-parties free-of-charge.

**Runtime software**

This includes all software products required for plant/machine operation, e.g. operating system, basic system, system expansions, drivers, etc.

The duplication of the runtime software and executable programs created with the runtime software for your own use or for use by third-parties is subject to a charge.

You can find information about license fees according to use in the ordering data (e.g. in the catalog). Examples of categories of use include per CPU, per installation, per channel, per instance, per axis, per control loop, per variable, etc.

Information about extended rights of use for parameterization/configuration tools supplied as integral components of the scope of delivery can be found in the readme file supplied with the relevant product(s).

**License types**

Siemens Automation & Drives offers various types of software license:

- Floating license
- Single license
- Rental license
- Trial license
- Factory 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.

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 device, 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 number of hours (the operating hours do not have to be consecutive).

One license is required for each installation of the software.

**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.

**Factory license**

With the Factory License the user has the right to install and use the software at one permanent establishment only. The permanent establishment is defined by one address only. The number of hardware devices on which the software may be installed results from the order data or the Certificate of License (CoL).

**Certificate of license**

The Certificate of License (CoL) is the licensee's proof that the use of the software has been licensed by Siemens. A CoL is required for every type of use and must be kept in a safe place.

**Downgrading**

The licensee is permitted to use the software or an earlier version/release of the software, provided that the licensee owns such a version/release and its use is technically feasible.

**Delivery versions**

Software is constantly being updated. The following delivery versions

- PowerPack
- Upgrade

can be used to access updates.

Existing bug fixes are supplied with the ServicePack version.

**PowerPack**

PowerPacks can be used to upgrade to more powerful software. The licensee receives a new license agreement and CoL (Certificate of License) with the PowerPack. This CoL, together with the CoL for the original product, proves that the new software is licensed.

A separate PowerPack must be purchased for each original license of the software to be replaced.

**Upgrade**

An upgrade permits the use of a new version of the software on the condition that a license for a previous version of the product is already held.

The licensee receives a new license agreement and CoL with the upgrade. This CoL, together with the CoL for the previous product, proves that the new version is licensed.

A separate upgrade must be purchased for each original license of the software to be upgraded.

**ServicePack**

ServicePacks are used to debug existing products. ServicePacks may be duplicated for use as prescribed according to the number of existing original licenses.

**License key**

Siemens Automation & Drives supplies software products with and without license keys.

The license key serves as an electronic license stamp and is also the "switch" for activating the software (floating license, rental license, etc.).

The complete installation of software products requiring license keys includes the program to be licensed (the software) and the license key (which represents the license).



Detailed explanations concerning license conditions can be found in the "Terms and Conditions of Siemens AG" or under [www.siemens.com/automation/mall](http://www.siemens.com/automation/mall) (A&D Mall Online-Help System)

# Appendix

## Notes on software

### Setup texts and Software Update Services

#### Overview

The "General License Conditions for Software Products for Automation and Drives" are applicable for supplies and deliveries of I DT software products.

#### **Legal notes during setup for new software products**

All software products feature a uniform reference to the license conditions. The license conditions are enclosed either with the documentation or in the software pack. When software is downloaded from the Internet, the license contract is displayed before the ordering procedure and must be accepted by the user before downloading can continue.

#### Notice:

This software is protected by German and/or US copyright laws and the regulations of international agreements. Unauthorized reproduction or sale of this software or parts of it is a criminal offense. This will lead to criminal and civil prosecution, and may result in significant fines and/or claims for damages. Prior to installing and using the software, please read the applicable license conditions for this software. You will find these in the documentation or packaging.

If you have received this software on a CD-ROM that is marked "Trial version", or accompanying software that is licensed for your use, the software is only permitted to be used for test and validation purposes in accordance with the accompanying conditions for the trial license. To this end, it is necessary for programs, software libraries, etc. are installed on your computer. We therefore urgently recommend that installation is performed on a single-user computer or on a computer that is not used in the production process or for storing important data, since it cannot be completely excluded that existing files will be modified or overwritten. We accept no liability whatsoever for damage and/or data losses that result from this installation or the non-observance of this warning. Every other type of use of this software is only permitted if you are in possession of a valid license from Siemens is obtained.

If you are not in possession of a valid license that can be proven by presenting an appropriate Certificate of License/software product certificate, please abort installation immediately and contact a Siemens office without delay to avoid claims for damages.

#### **Software Update Services**

##### **Order**

To order the Software Update Service, an order number must be specified. The Software Update Service can be ordered when the software products are ordered or at a later date. Subsequent orders require that the ordering party is in possession 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.

## Numeric

1FE1 built-in motors	6/86
1FK7-DYA compact geared motors	6/62
1FN3 linear motors	6/66
1FN3 linear motors - Version for continuous load	6/72
1FN3 linear motors - Version for peak load	6/68
1FW6 built-in torque motors	6/78
1PH2 built-in motors	7/27
2nd machining channel and maximum memory configuration	2/6
2SP1 motor spindles	6/98
3.5" floppy disk drive	3/52
3.5" floppy disk drive, USB 1.1	3/51
3-axis PARACOP transformation for parallel kinematics	2/18
3D error compensation SEC 3D	2/44
3D Form Inspect Software	4/48
3D simulation	4/6
3D tool radius compensation	2/34
3D workpiece measurement	4/48
4 machining channels and 13 axes	2/6

## A

Absolute encoders	8/6
ACfeed	4/53
Actuating element	3/32, 3/33, 3/35, 3/36, 5/5, 5/7
Adapter block	5/5, 5/7
Adapter set	3/29
Adapter set for Wideband Line Filters	9/26
Adapter terminals	9/35
Adapter terminals to connect the DC link	9/34
Adaptive control	4/53
Additional axis/spindle + channel	2/4
Additional interpolation axis/spindle	2/6
Additional languages	3/25, 4/2, 4/3, 4/5, 4/6
Additional machining channel	2/4
Additional MG	2/4
Additional positioning axis	2/6
ADDM - Data Management	4/39
Add-on modules	5/34
Adhesive warning label	9/32, 9/34
Advanced Position Control APC	2/12
al-deco	11/12
Analog axis ANA	9/16
Analog input modules	5/27
Analog output modules	5/27
Angle socket	3/28
Approvals	12/2
Automatic	2/32
Automatic residual material detection and machining	4/5
Automation Value Card	12/8
Axes/spindles	2/6
Axial coupling in the machine coordinate system	
MCS coupling	2/16
Axial data output via PROFIBUS (ADAS)	2/48
Axis container	2/12
Axis expansion plug-in unit	5/13
Axis monitoring functions	2/44
Axis monitoring functions, positioning modules	2/57

## B

Backup battery	5/12, 5/26
Balancing and process monitoring system	4/55
Basic and further training	11/15
Basic Line Filter	9/27
Battery	5/18
Battery compartment	5/18
Battery modules	5/35
Bearing version	7/20
Blanking cover	9/28, 9/29
Brake	7/20
Buffer module	5/34
Built-on fan	9/33, 9/34
Built-on optoelectronic rotary encoders	8/2

## C

Cable carrier	10/2
Cable distributor	5/12, 5/18
Cable extensions	10/9, 10/10
Cable lengths	10/2
Cable set	3/30, 3/32, 3/35, 3/36
Cable set for external SIMODRIVE 611 control	5/13
CAD CREATOR	6/142
CAD generator	6/142
CAD Reader for PC	4/9
Capacitor module	9/31
Caps	3/4-3/13
Card reader USB 2.0	3/47
CCU 3.4 module	5/12
CCU box	5/12
CCU system software	5/12
Central drive systems	9/4
Certificate of license	12/9
Clamp strap	8/10
Clamps, set of	3/4-3/13, 3/32-3/35, 3/44, 3/45
Clearance control	2/22
CNC functionality: Axis functions	2/10
CNC functionality: Couplings	2/14
CNC functionality: Interpolations	2/14
CNC functionality: Measuring	2/18
CNC functionality: Motion-synchronous actions	2/20
CNC functionality: Program functions	2/10
CNC functionality: Spindle functions	2/12
CNC functionality: Technologies	2/20
CNC functionality: Transformations	2/18
CNC main memory	2/4
CNC programming, positioning modules	2/55
CNC programming: Cycles	2/26
CNC programming: Language	2/24
CNC programming: Program support	2/28
CNC user memory	5/18
Coding elements	9/32
Coding slider	9/34
Coding spring	9/34
Coiled connecting cable	3/26
Collision and vibration monitoring	4/54
Combi adapter	6/75
Combi distributor	6/75
Combi end piece	6/75

# Appendix

## Indexes

### Subject index

<b>C</b>		<b>D</b>	
Communication	2/38	Direct key module	3/8, 3/10, 3/12, 3/14
Communication, positioning modules	2/56	Direct key module mounting kit	3/10, 3/12, 3/14
Communications module	5/27	Direct key/handwheel connection	3/32, 3/35
Commutating reactor	9/22	Distributor	3/25, 3/27
CompactFlash Card	3/16, 3/19, 3/47, 3/48	DMP compact	5/24
Compensations	2/44	DNC – Direct Numeric Control	4/15
Compensations and reference points, positioning modules	2/57	DNC Cell	4/18
Compile cycles	5/19	DNC Compare	4/21
Complete equipment	11/13	DNC HMI	4/19
Computer coupling	4/34	DNC IFC Dialog	4/20
Conditions of sale and delivery	12/30	DNC IFC Filesystem	4/21
Configuration Manual SIMODRIVE 611 digital	9/6	DNC IFC Serial	4/20
Connecting cable	5/22, 5/26, 9/33	DNC IFC SINUMERIK	4/19
Connection box	3/26	DNC Machine	4/16
Connection kit	3/28	DNC Plant	4/18
Connection module	3/26	Documentation	11/24
Connection overviews	10/3	Downgrading	12/9
Connector box	6/76	Drill break detection PROSIN	4/52
Consulting	11/3, 11/4	Drive bus cable	5/18
Contact block	3/32, 3/33, 3/35-3/37, 5/5, 5/7	Drive bus cable for SIMODRIVE 611 digital	9/34
Contacts	12/6	Drive ES	9/40
Continue machining at the contour (retrace support)	2/14	Drive modules	9/5
Contour handwheel	2/20	Drives	2/4
Contour monitoring with tunnel function	2/44	DU box connector	5/12, 5/18
Control cabinet manufacture	11/13	Dyna Systems full CNC keyboard	3/46
Control structure/configuration	2/4		
Control unit management for each PCU	2/40	<b>E</b>	
Control unit with analog setpoint interface or PROFIBUS DP	9/7	EasyMask	4/13
Control unit with digital setpoint interface for HLA/ANA	9/16	EasyMon	4/14
Control unit, digital, High Standard/High Performance	9/11	EasyTrans	4/13
Converter system SIMODRIVE 611	9/5	EditFM	5/29, 5/30, 5/32
Cooler types	6/78	EFM single I/O module	5/22
Cooling	9/5, 9/33	eLearning	11/19
Cooling connection adapter	6/83	Electronic gear unit EG	2/16
Cooling principle	7/30	Electronic handwheel	3/29
Cooling unit manufacturers	6/77, 7/30	Electronic transfer	2/20
Country groups	11/9	Electronic weight counterbalance	2/44
Coupling	8/10	EMB 7000 ring balancer	4/47
Cover	3/47, 3/51, 3/52	Emergency stop button	5/5, 5/7
Cover end pieces for secondary section cover	6/75	Enabling of internal drive control of 6th axis for interpolation tasks	2/6
CP Basic	2/16	Enabling of internal drive control of 6th axis for positioning tasks	2/6
CP Comfort	2/16	Encoder connection box SME91	6/84
CP Expert	2/16	Encoder connection box SME92	6/84
CP Standard	2/16	Encoder connection box SME93	6/84
Cross mode actions	2/22	Encoder connection box SME94	6/84
Current carrying capacity	10/3	EnDat absolute encoder	8/7
Cycle storage separate from CNC main memory	2/26	Engineering software	12/9
		Engineering software Drive ES	9/40
		Enhanced stock removal with residual material detection	4/7
		ePS Network Services	1/7, 2/38, 4/41
		ePS Value Account 1000Cr	4/41
		Evaluation of internal drive variables	2/22
		Evaluation software	4/49
		Expansion card	3/37, 3/40
		Expansion of CNC main memory	2/4
		Expansion of the PLC user memory	2/46
		Expansion panel	3/40
		Export information	2/2
		Export regulations	12/30
		Export versions	2/2
		Extended stop and retract ESR	2/48
		Extension cable	3/27
		Extensions	10/9, 10/10
		External pulsed resistor plus	9/30
		External pulsed resistors	9/30

### D

Damping resistor	9/30
Data management	2/40, 4/39
DC link busbars	9/32, 9/34
DC UPS modules	5/35
Decentralizing with PROFIBUS DP	8/9
Degree of protection	6/103, 7/33
Delivery versions	12/9
Derating factors	10/3
Device bus cable	5/13, 5/18, 9/34
Diagnostic functions	2/50
Diagnostic functions, positioning modules	2/58
Dial	3/33
Digital I/O module 16I/16O	5/5, 5/7
Digital input modules	5/26
Digital output modules	5/26
Dimension sheet generator	6/142
DIMES	11/12

<b>F</b>		<b>I</b>	
Factory license	12/9	I/O interfacing via PROFIBUS DP	2/38, 5/18
Fast interpolation link	2/12	I/R modules	9/20
Fault correction	11/8	IE FC RJ45 Plug	3/21
Fault diagnostics	11/8	IE FC Standard Cable	3/21
Feedforward control, acceleration-dependent	2/44	IE FC Trailing Cable	3/21
Filter module	9/32, 9/34	Inclined axis	2/18
Fire-extinguishing systems	11/12	Incremental encoders	8/3
Fixing screws	3/36	Industrial Ethernet Switch	3/21
Flange socket	3/29	Industrial USB Hub 4	3/49
Floating license	12/9	Infeed modules	9/21
FM 353	2/54, 5/29	Infeed/regenerative feedback modules	9/20
FM 354	2/54, 5/30	Intelligent feedrate control	4/46
FM 357-2	5/32	Interface module	5/26
FM 357-2H	2/54, 5/32	Interference suppression filter	5/27
FM 357-2L	2/54, 5/32	Interrupt routines with fast retraction from the contour	2/22
FM 357-2LX	2/54, 5/32	Involute interpolation	2/14
Forced ventilation	6/19, 6/21		
Front connector	5/26, 5/29, 5/30	<b>K</b>	
Front screw connector	5/32	KBPC CG US standard PC keyboard	3/43
Functional restrictions for export versions	2/3	Key cover	3/7, 3/33, 3/36
Functionality, positioning modules	2/54	Key set	3/32, 3/33, 3/35
		Key switch	3/32, 3/35
		Keyboard tray	3/43
		Keyboards	3/3, 3/43
		Knowledge Base	12/8
<b>G</b>		<b>L</b>	
Gearboxes	6/44, 7/31	Laser inscription	3/42
Generator operation	2/48	Laser switching signal, high-speed	2/22
Generic couplings CP	2/16	Laser tool inspection	4/49
Graphic programming package	4/47	Length codes	10/14
Grommet nipple	6/75	Length definition	10/14
		License conditions	12/10
		License key	12/9
		License types	12/9
		LIFDES	11/12
		LIMANDA	3/54
		Line filters	9/23
		Line interfaces	9/37
		Linear measuring systems for 1FN3 linear motors	6/77
		Link axis	2/12
		Link module	5/18
		Liquid cooling	6/77, 7/30
		Load power supply	5/26
		Logistics services	11/14
<b>H</b>		<b>M</b>	
Hall-effect sensor box	6/76	Machine analysis	11/3
Handheld units	3/2, 3/24	Machine Condition Indicator	4/53
Handheld unit type B-MPI	3/27	Machine control panels	3/3, 3/31
Handling transformation package	2/18	Machine I/Os	5/25
Handwheel connection module	3/30	Machine modernization	11/10
Hard disk	3/19	Machine optimization	11/3
Heatsink profile	6/75	Machine Push Button Panel	3/39
HEXAPOD transformation 6 axes	2/18	Machine simulation	11/3
HF (high-frequency) clamp	10/11	Machine Simulator	11/5
HFD commutating reactor	9/20	Machining channels	2/4
HFD components	9/22	Machining package 5 axes	2/18
HFD package	9/22	Machining package milling	2/18
HFD reactor	9/24	Maintenance	1/7, 4/36
High Performance control	9/12	Manual FM 353	5/29
High Standard control	9/12	Manual FM 354	5/30
High-Speed series, 4-pole	6/92	Manual FM 357-2	5/32
High-Torque series, 6-pole	6/88	Manufacturer documentation	11/25
High-Torque series, 8-pole	6/90	Master-slave for drives	2/16
HMI Lite CE	4/10	Master-value coupling and curve table interpolation LEAD	2/16
HMI Open Architecture	4/11		
HMI PRO RT	4/10		
HMI-Advanced	3/19, 4/3		
HMI-Embedded	4/2		
Holder	3/27-3/29		
Hose cooling packages	9/33, 9/34		
HotWin	4/14		
Housing systems	3/3, 3/53, 3/54		
HT 6 handheld terminal	3/25		
HT 6 system software	3/25		
HT 8 handheld terminal	3/26		
HTL incremental encoder	8/3		
Hydraulic linear drive HLA	9/16		

# Appendix

## Indexes

### Subject index

<b>M</b>		<b>N</b>	
Matching transformers	9/39	NCK OA package	5/19
Mating connector	8/10	NCSD configurator	1/9
MCI	4/53	NCU 561.5	5/18
MCIS	1/8, 2/38, 4/15	NCU 571.5	5/18
MDA – Machine Data Acquisition	4/30	NCU 572.5	5/18
MDA Cell	4/31	NCU 573.5	5/18
MDA IFC	4/32	NCU box	5/18
MDA Machine	4/33	NCU system software	5/18
Measuring cycles	4/9	NCU terminal block	5/24
Measuring functions	4/8	Network/floppy disk drive management	3/16, 4/3, 4/5, 4/6, 4/38
Measuring stage 2	2/18	Non-contact tool inspection	4/51
Measuring systems	6/77, 8/2		
Measuring systems that can be connected	2/8		
Measuring systems that can be connected, positioning modules	2/54		
Mechatronics	11/2	<b>O</b>	
Mechatronics Support	11/2	OEM service levels	11/9
Memory Card	5/26	Online ISO dialect interpreter	2/26
Memory expansion	3/19	Online Services	12/7
Metal surcharges	12/28	Open Architecture	2/22, 4/11
Milling Simulation	4/2	Operating modes	2/30
Mini handheld unit	3/28	Operating modes and machine functions, positioning modules	2/56
Mode groups (MGs)	2/4	Operation	2/40
Modular tool and process monitoring system	4/52	Operation with tool management	2/36
Modules	9/5	Operation, positioning modules	2/56
Mold making	1/2	Operator control and programming	4/2
Monitoring functions	2/48	Operator panels	3/2, 3/4
Monitoring module	9/28	Optimization of machining quality	11/4
Motion Control Information System MCIS	1/8, 2/38, 4/15	Optimization of machining time	11/4
MOTION-CONNECT 500	10/2	Option module Motion Control with PROFIBUS DP	9/8
MOTION-CONNECT 500 PLUS	10/2	Option module PROFIBUS DP	9/8
MOTION-CONNECT 700	10/2	Option module Terminal expansion	9/8
MOTION-CONNECT 800	10/2	Optipanel	3/53
Motors		Oscillation functions	2/20
1FE1 motors	6/86	Override	3/30, 3/32, 3/33, 3/35
1FK7 Compact motors	6/38, 6/40	Override rotary switch	3/36, 3/37
1FK7 High Dynamic motors	6/38, 6/42	Overview of options	2/52
1FT6 motors	6/4	Overvoltage limiter module	9/28
1FT7 Compact motors	6/24		
1FW6 motors	6/78	<b>P</b>	
1PH4 motors	7/18	Pair of synchronized axes (gantry axes)	2/16
1PH7 motors	7/4	Parameters	2/28
1PM4 motors	7/22	Path length evaluation	2/44
1PM6 motors	7/23	Path switch signals/cam controller	2/10
2SP1 motors	6/98	Path velocity-dependent analog output (laser power control)	2/20
Mounting accessories	8/10	PC card	5/12, 5/18
Mounting adapter	5/26	PCI interface card	3/19
Mounting bracket	3/19, 3/21, 3/23	Planetary gearbox, single-stage	6/45, 6/50, 6/55, 6/61
Mounting flange	10/11	Planetary gearbox, two-stage	6/47, 6/52, 6/57, 6/58
Mounting location number labels	5/26	PLC area	2/46
Mounting position	7/33	PLC area, positioning modules	2/58
Mounting rail	5/26	PLC user memory	5/18
MPI bus cables	10/12	Plug-in coupling	6/75
MPI interface	3/41	Pocket milling with islands	4/7
Multi-axis interpolation (> 4 interpolating axes)	2/14	Polynomial interpolation	2/14
Multi-channel step sequence programming	2/28	Positioning and path control module FM 357-2	5/32
Multiple clamping of different workpieces	4/5	Positioning module FM 353	5/29
Multi-turn encoders	8/6	Positioning module FM 354	5/30
		Power cables	10/6
		Power connector	6/83
		Power modules	9/18
		Power supplies	5/33
		PowerPack	12/9
		Powertrain	1/4

<b>P</b>		<b>S</b>	
Precision cooler	6/74	ShopMill machining step programming	4/5
PROFIBUS cables	10/13	ShopTurn	1/3, 4/6
PROFIBUS DP	11/24	ShopTurn machining step programming	4/6
PROFIBUS DP absolute encoder	8/7	SI axis/spindle	2/48, 5/21
PROFIBUS tool and process monitoring	2/48	SI axis/spindle package	2/48, 5/21
Program preprocessing	2/10	SI Basic	2/48, 5/21
PROMOS 2	4/52	SI Comfort	2/48, 5/21
PROSIN	4/52	Signal amplifier electronics	9/32, 9/34
Prototyping	11/2	Signal cables	3/25, 3/26, 3/30, 6/83, 10/10
Pulsed resistor module	9/29	Signal connector	6/83
Punching/nibbling functions	2/20	Signaling module	5/34
Push Button Panel	3/37	SIMATIC PC USB FlashDrive	3/50
<b>Q</b>		SIMATIC STEP 7 for SINUMERIK hardware	4/42
Quadrant error compensation, automatic (neural network)	2/44	SIMATIC WinCC flexible 2008 Advanced	4/12
<b>R</b>		SIMATIC WinCC flexible 2008 Compact	4/12
Raised buttons	3/37	SIMATIC WinCC flexible 2008 Standard	4/12
RCS – Remote Control System	4/36	SimoCom U/611 universal toolbox	9/8
RCS Host	4/37	SIMODRIVE 611	9/4
RCS Host Embedded	4/38	SIMODRIVE 611 universal HRS	2/4, 2/54, 9/8
RCS Viewer	4/37	SIMODRIVE sensor	8/2
RCS Viewer Embedded	4/38	Simulation	2/30
Real-time feedrate optimization	4/51	Simultaneous recording	2/30, 4/5, 4/6
Redundancy module	5/34	sin/cos 1 V <sub>pp</sub> incremental encoder	8/3
Re-export approval, requirements	2/2	Single license	12/9
Reinforced DC link busbars	9/32, 9/34	Single-axis power modules	9/19
Remote diagnostics	4/37, 4/38	Single-turn encoders	8/6
Rental license	12/9	Sinorix	11/12
Repair service contract	11/8	SinuCom ARC	4/43
Replacement connectors with external thread for encoders	8/10	SinuCom FFS	4/43
Residual material detection and machining	4/5, 4/6	SinuCom NC	4/42
Retrofit	11/10	SinuCom NC SI	4/43
ROBOX	9/10	SinuCom NC Trace	4/43
Rotor with sleeve	6/86	SinuCom PCIN	4/43
Rotor without sleeve	6/86	SinuCom startup/service tools	4/43
RPC SINUMERIK	4/34	SinuCom Update Agent	4/44
Runtime software	12/9	SINUMERIK 802C base line	5/7
<b>S</b>		SINUMERIK 802S base line	5/5
S7-300 manual	5/27	SINUMERIK 810D powerline	5/8
Safety functions	2/48, 5/20	SINUMERIK 840D powerline	5/14
Safety Integrated	5/21, 9/11	SINUMERIK card reader USB 2.0	3/47
Safety Integrated System Manual	11/24	SINUMERIK direct key module	3/8, 3/10, 3/12, 3/14
Sag compensation, multi-dimensional	2/44	SINUMERIK HMI configuring package WinCC flexible	4/12
Secondary section cover	6/74	SINUMERIK HMI copy license CE	4/12
Selection aid	1/9	SINUMERIK HMI copy license OA	4/2, 4/3, 4/12
Self-study courses	11/20	SINUMERIK HMI programming package	4/12
Series LP+ planetary gearbox for 1FK7 motors	6/60	SINUMERIK HT 6	3/25
Series SP+ planetary gearbox for 1FT6 motors	6/44	SINUMERIK HT 8	3/26
Series SP+ planetary gearbox for 1FT7 motors	6/49	SINUMERIK KB 310C	3/44
Service & Support	11/7	SINUMERIK KB 483C	3/45
Service documentation	11/26	SINUMERIK MCP 310	3/32
ServicePack	12/9	SINUMERIK MCP 483	3/35
Setpoint exchange	2/10	SINUMERIK MCP 483C	3/33
Setpoint linkage for multiple NCUs	2/12	SINUMERIK MPP 483	3/39
Shaft and flange accuracy	7/20	SINUMERIK NCK Runtime OA	2/22
Shaft extension	7/20	SINUMERIK OP 010	3/5
Shaft seal	7/20	SINUMERIK OP 010C	3/7
Shield connection	9/35, 9/36	SINUMERIK OP 010S	3/6
Shield connection element	5/26	SINUMERIK OP 012	3/8
Shield connection plate	9/35, 9/36	SINUMERIK OP 015	3/9
Shield connection terminals	5/26	SINUMERIK OP 015A	3/10
Shopfloor manufacturing	1/3	SINUMERIK OP 015AT	3/11
Shopfloor-oriented cutting applications	4/48	SINUMERIK OP 032S machine control panel	3/36
ShopMill HMI	1/3, 4/5	SINUMERIK OP 08T	3/4
		SINUMERIK PCU 20	3/16
		SINUMERIK PCU 50.3	3/19
		SINUMERIK Safety Integrated	2/48, 5/21
		SINUMERIK Service Pack	3/19

# Appendix

## Indexes

### Subject index

<b>S</b>		<b>T</b>	
SINUMERIK Solution Partners	4/45	TPM – Total Productive Maintenance	4/35
SINUMERIK TP 015A	3/12	TPM Cell for Windows-based PC	4/36
SINUMERIK TP 015AT	3/13	TPM demo version	4/36
SinuTrain	11/15	TPM HMI for Windows-based PC	4/36
SIRIUS 3SB3	3/42	TPM IFC for SINUMERIK PCU 50.3	4/36
SITOP	5/33	TPM Machine for SINUMERIK PCU 50.3	4/36
SITRAIN	11/23	Training	11/23
Slide-in labels	3/4, 3/5, 3/8, 3/10-3/13, 3/32, 3/35	Training booklet	11/19
Slim Line Commander	3/54	Training case	11/21
Software types	12/9	Training equipment	11/21
Software Update Services	12/10	Training keyboard	11/17
Solution Partner	4/45, 9/10, 11/11	Training rack	11/22
Spare parts	11/8	Transformation Dynamic Swivel Tripod (DST)	2/18
Speed	7/20, 7/25	Transformation for pantograph kinematics, 2 axes	2/18
Spline interpolation for 3-axis machining	2/14	Transformation TRICEPT 5 axes	2/18
Spline interpolation for 5-axis machining	2/14	TRANSLINE	1/4
Spring disk coupling	8/10	TRANSLINE HMI	4/10
SSI absolute encoder	8/7	TRANSMIT/peripheral surface transformation	2/18, 4/6
Standard versions	2/2	Travel to fixed stop	2/10, 4/6
Startup	2/48	Trial license	12/9
Start-up box	9/8, 9/10	TTL (RS 422) double-track incremental encoder	8/3
Startup software for		TTL (RS 422) incremental encoder	8/3
SINAMICS S120/SIMODRIVE 611 digital	4/43	Turning	2/30
Startup/parameterization, positioning modules	2/58	Tutorials	11/20
Storage devices	3/3, 3/47	Two-axis power modules	9/19
Structure/application, positioning modules	2/54	Two-speed gearboxes	7/31
Suggestions for improvement	12/25	Type of construction	6/103, 7/33
Support Tools	12/8	<b>U</b>	
Synchronized action stage 2	2/20	UI modules	9/20
Synchronous spindle	4/6	Universal empty housing	9/32, 9/34
Synchronous spindle/multi-edge turning COUP	2/14	Upgrade	12/9
System firmware	5/32	USB FlashDrive	3/19, 3/50
<b>T</b>		USB mouse	3/8, 3/10-3/13
Tangential control	2/10	User documentation	11/25
TDI – Tool Data Information	4/22	User Manual	8/9
TDI Cell	4/26	<b>V</b>	
TDI Ident Connection	4/29	Vibration magnitude	7/20
TDI IFC	4/25	Video link	3/22
TDI Machine	4/27	Video link cable	3/23
TDI Overview	4/23	Video link receiver	3/23
TDI Planning	4/24	Video link transmitter	3/23
TDI Plant	4/26	VIP 6000	3/53
TDI Statistic	4/25	Virtual product	11/4
TDI Toolhandling	4/24	Virtual Production	11/4
TDI Toolplan Generation	4/28	Virtual prototyping	1/6
Teach In	2/32	Voltage Protection Module	6/97
Technical Support	12/8	<b>W</b>	
Technology cycles	4/7	Wall holder	3/26
Teleservice with video	4/50	Water cooling	6/23
Temperature compensation	2/44	Wideband Line Filter	9/25
Terminal box location	7/20		
Terminal strip converter	5/22		
Terminator for drive bus	5/13, 5/24, 9/34		
Thermally conductive plate	9/29		
Thin Client Unit TCU	3/21		
Tool and process monitoring	4/46, 4/50		
Tool Data Information	4/22		
Tool making	1/2		
Toolbox	5/12, 5/18		
Tools	2/32, 2/50, 4/42		



Type	Page	Type	Page	Type	Page	Type	Page
<b>1FE104.-...</b>		<b>1FK701.-...</b>		<b>1FN3050-...</b>		<b>1FN3450-...</b>	
1FE1041-6WM.0-1BA.	6/88	1FK7011-5AK71-1..3	6/40	1FN3050-0TB00-1..0	6/74	1FN3450-0TB00-1..0	6/74
1FE1042-6W..0-1BA.	6/88	1FK7015-5AK71-1..3	6/40	1FN3050-0TC00-0AA0	6/74	1FN3450-0TC00-0AA0	6/74
<b>1FE105.-...</b>		<b>1FK702.-...</b>		1FN3050-0T.01-0AA0	6/75	1FN3450-0T.01-0AA0	6/75
1FE1051-4HC.0-1BA.	6/92	1FK7022-5AK71-1...	6/40	1FN3050-1ND00-0.A1	6/72	1FN3450-.PK00-0AA0	6/74
1FE1051-4WN.1-1BA.	6/92	<b>1FK703.-...</b>		1FN3050-.PK10-0AA0	6/74	1FN3450-.PK10-0AA0	6/74
1FE1051-6W..0-1B..	6/88	1FK7032-5AK71-1...	6/40	1FN3050-2NB80-0.A1	6/72	1FN3450-2NC50-0BA1	6/72
1FE1052-4HD.0-1BA.	6/92	1FK7032-5AK71-1..3-Z	6/64	1FN3050-2PK00-0AA0	6/74	1FN3450-2WA50-0BA1	6/70
1FE1052-4HG.1-1BA.	6/92	1FK7033-7AK71-1...	6/42	1FN3050-2WC00-0.A1	6/68	1FN3450-2W.00-0BA1	6/70
1FE1052-4W..1-1BA.	6/92	1FK7034-5AK71-1...	6/40	1FN3050-4SA00-0AA0	6/68,	1FN3450-3NC50-0BA1	6/72
1FE1052-6W..0-1B..	6/88	1FK7034-5AK71-1..3-Z	6/64		6/72	1FN3450-3W..0-0BA1	6/70
1FE1053-4HH.1-1BA.	6/92	<b>1FK704.-...</b>		1FN3050-4TP00-1A..	6/74	1FN3450-4NB80-0BA1	6/72
1FE1053-4W..1-1BA.	6/92	1FK7040-5AK71-1...	6/40	<b>1FN3100-...</b>		1FN3450-4SA00-0AA0	6/70,
1FE1054-6WN.0-1BA.	6/88	1FK7040-5AK71-1..3-Z	6/64	1FN3100-0TB00-1..0	6/74		6/72
<b>1FE106.-...</b>		1FK7042-5AF71-1...	6/40	1FN3100-0TC00-0AA0	6/74	1FN3450-4TP00-1A..	6/74
1FE1061-6W..0-1B..	6/88	1FK7042-5AK71-1...	6/40	1FN3100-0T.01-0AA0	6/75	1FN3450-4W..0-0BA1	6/70
1FE1064-6W..1-1BA.	6/88	1FK7042-5AK71-1..3-Z	6/64	1FN3100-1NC00-0BA1	6/72	<b>1FN3600-...</b>	
<b>1FE107.-...</b>		1FK7043-7AH71-1...	6/42	1FN3100-.PK00-0AA0	6/74	1FN3600-0TB00-1..0	6/74
1FE1072-4W..1-1BA.	6/92	1FK7043-7AK71-1...	6/42	1FN3100-.PK10-0AA0	6/74	1FN3600-0TJ01-0AA0	6/75
1FE1073-4W..1-1BA.	6/92	1FK7044-7AF71-1...	6/42	1FN3100-1WC00-0BA1	6/68	1FN3600-.PK00-0AA0	6/74
1FE1074-4W..1-1BA.	6/92	1FK7044-7AH71-1...	6/42	1FN3100-2NC80-0BA1	6/72	1FN3600-.PK10-0AA0	6/74
<b>1FE108.-...</b>		<b>1FK706.-...</b>		1FN3100-2W.00-0BA1	6/68	1FN3600-2NB80-0BA1	6/72
1FE1082-4W..1-1BA.	6/92	1FK7060-5AF71-1...	6/40	1FN3100-3NC00-0BA1	6/72	1FN3600-2WA50-0BA1	6/70
1FE1082-6W..0-1B..	6/88	1FK7060-5AH71-1...	6/40	1FN3100-3W.00-0BA1	6/68	1FN3600-3NB80-0BA1	6/72
1FE1082-6W..1-1B..	6/88	1FK7060-5AH71-1..3-Z	6/64	1FN3100-4NC80-0BA1	6/72	1FN3600-3W.00-0BA1	6/70
1FE1083-4WN.1-1BA.	6/92	1FK7061-7AF71-1...	6/42	1FN3100-4SA00-0AA0	6/68,	1FN3600-4NB80-0BA1	6/72
1FE1084-4W..1-1BA.	6/92	1FK7061-7AH71-1...	6/42		6/72	1FN3600-4SA00-0AA0	6/70,
1FE1084-6W..1-1B..	6/88	1FK7063-5AF71-1...	6/40	1FN3100-4TP00-1A..	6/74		6/72
1FE1085-4W..1-1BA.	6/92	1FK7063-5AH71-1...	6/40	1FN3100-4W.00-0BA1	6/68	1FN3600-4TP00-1A..	6/74
<b>1FE109.-...</b>		1FK7063-5AH71-1..3-Z	6/64	1FN3100-5WC00-0BA1	6/68	1FN3600-4W..0-0BA1	6/70
1FE1091-6W..0-1B..	6/88	1FK7064-7AF71-1...	6/42	<b>1FN3150-...</b>		<b>1FN3900-...</b>	
1FE1092-4W..1-1B..	6/94	1FK7064-7AH71-1...	6/42	1FN3150-0TB00-1..0	6/74	1FN3900-0TB00-1..0	6/74
1FE1092-6W..0-1B..	6/88	<b>1FK708.-...</b>		1FN3150-0TC00-0AA0	6/74	1FN3900-0TJ01-0AA0	6/75
1FE1092-6W..1-1B..	6/88	1FK7080-5AF71-1...	6/40	1FN3150-0T.01-0AA0	6/75	1FN3900-.PK00-0AA0	6/74
1FE1093-4W..1-1B..	6/94	1FK7080-5AH71-1...	6/40	1FN3150-1NC20-0BA1	6/72	1FN3900-.PK10-0AA0	6/74
1FE1093-6W..0-1B..	6/88	1FK7080-5AH71-1..3-Z	6/64	1FN3150-.PK00-0AA0	6/74	1FN3900-2NB20-0BA1	6/72
1FE1093-6W..1-1B..	6/88	1FK7083-5AF71-1...	6/40	1FN3150-.PK10-0AA0	6/74	1FN3900-2W.00-0BA1	6/70
1FE1094-4W..1-1B..	6/94	1FK7083-5AH71-1...	6/40	1FN3150-1WC00-0BA1	6/68	1FN3900-3NB20-0BA1	6/72
1FE1095-4WN.1-1B..	6/94	1FK7083-5AH71-1..3-Z	6/64	1FN3150-2NB80-0BA1	6/72	1FN3900-3WB00-0BA1	6/70
1FE1096-4WN.1-1B..	6/94	1FK7085-7AF71-1...	6/42	1FN3150-2WC00-0BA1	6/68	1FN3900-4NB20-0BA1	6/72
<b>1FE110.-...</b>		1FK7086-7AF71-1...	6/42	1FN3150-3NC70-0BA1	6/72	1FN3900-4SA00-0AA0	6/70,
1FE1103-4WN.1-1BA.	6/94	<b>1FK710.-...</b>		1FN3150-3WC00-0BA1	6/68		6/72
1FE1104-4WN.1-1BA.	6/94	1FK7100-5AF71-1...	6/40	1FN3150-4NB80-0BA1	6/72	1FN3900-4TP00-1A..	6/74
1FE1105-4WN.1-1BA.	6/94	1FK7101-5AC71-1...	6/40	1FN3150-4SA00-0AA0	6/68,	1FN3900-4W..0-0BA1	6/70
1FE1106-4W..1-1BA.	6/94	1FK7101-5AF71-1...	6/40		6/72	<b>1FT6021-...</b>	
<b>1FE111.-...</b>		1FK7103-5AC71-1...	6/40	1FN3150-4TP00-1A..	6/74	1FT6021-6AK71-....	6/16
1FE1113-6W..1-1B..	6/90	1FK7103-5AF71-1...	6/40	1FN3150-4WC00-0BA1	6/68	<b>1FT6024-...</b>	
1FE1114-6W..1-1B..	6/90	1FK7105-5AC71-1...	6/40	1FN3150-5WC00-0BA1	6/68	1FT6024-6AK71-....	6/16
1FE1115-6WT.1-1BC.	6/90	1FK7105-5AF71-1...	6/40	<b>1FN3300-...</b>		<b>1FT6031-...</b>	
1FE1116-6W..1-1B..	6/90	<b>1FN1910-...</b>		1FN3300-0TB00-1..0	6/74	1FT6031-4AK71-....	6/16
<b>1FE112.-...</b>		1FN1910-0AA00-0AA0	6/76	1FN3300-0TC00-0AA0	6/74	<b>1FT6034-...</b>	
1FE1124-4WN.1-1BA.	6/94	1FN1910-0AA20-.AA0	6/84	1FN3300-0T.01-0AA0	6/75	1FT6034-1AK71-...1	6/6
1FE1125-4W..1-1BA.	6/94	<b>1FN300.-...</b>		1FN3300-1NC10-0BA1	6/72	1FT6034-4AK71-....	6/16
1FE1126-4W..1-1BA.	6/94	1FN3002-0PH00-0AA0	6/76	1FN3300-.PK00-0AA0	6/74	<b>1FT6041-...</b>	
<b>1FE114.-...</b>		1FN3002-0PH01-0AA0	6/76	1FN3300-.PK10-0AA0	6/74	1FT6041-4AF71-....	6/12
1FE1144-8WL.1-1B..	6/90	1FN3002-0TK0.-1..0	6/75	1FN3300-1WC00-0BA1	6/68	1FT6041-4AK71-....	6/16
1FE1145-8W..1-1B..	6/90	1FN3003-0PH00-0AA0	6/76	1FN3300-2NC10-0BA1	6/72	<b>1FT6044-...</b>	
1FE1147-8W..1-1B..	6/90	1FN3003-0PH01-0AA0	6/76	1FN3300-2W.00-0BA1	6/68	1FT6044-1AF71-...1	6/6
		1FN3003-0TK0.-1..0	6/75	1FN3300-3NC40-0BA1	6/72	1FT6044-4AF71-....	6/12
		1FN3004-0TK0.-1..0	6/75	1FN3300-3W.00-0BA1	6/68	1FT6044-4AK71-....	6/16
		1FN3005-0PH00-0AA0	6/76	1FN3300-4NB80-0BA1	6/72		
		1FN3005-0PH01-0AA0	6/76	1FN3300-4SA00-0AA0	6/68,		
		1FN3005-0TK0.-1..0	6/75		6/72		
		1FN3006-0PH00-0AA0	6/76	1FN3300-4TP00-1A..	6/74		
		1FN3006-0PH01-0AA0	6/76	1FN3300-4W.00-0BA1	6/68		

# Appendix

## Indexes

### Order number index

Type	Page	Type	Page	Type	Page	Type	Page
<b>1FT6061-...</b>		<b>1FT6132-...</b>		<b>1FT7105-...</b>		<b>1PH416-...</b>	
1FT6061-6AC7-.....	6/10	1FT6132-6AB71-.....	6/8	1FT7105-1AC7.-1..1	6/26	1PH4163-...	7/20
1FT6061-6AF7-.....	6/12	1FT6132-6AC71-.....	6/10	1FT7105-5AB7.-1..1	6/28	1PH4167-...	7/20
1FT6061-6AH7-.....	6/14	1FT6132-6AF71-.....	6/12	1FT7105-5AC7.-1..1	6/30	1PH4168-...	7/20
1FT6061-6AK7-.....	6/16	1FT6132-6S.71-.....	6/18, 6/20	1FT7105-5AF7.-1..1	6/32	<b>1PH710-...</b>	
<b>1FT6062-...</b>		<b>1FT6134-...</b>		<b>1FT7108-...</b>		1PH7101-...	7/8
1FT6062-1A.71-...1	6/6	1FT6134-6AB71-.....	6/8	1FT7108-5AB7.-1..1	6/28	1PH7103-...	7/6, 7/8
1FT6062-6AC7-.....	6/10	1FT6134-6AC71-.....	6/10	1FT7108-5AC7.-1..1	6/30	1PH7105-...	7/8
1FT6062-6AF7-.....	6/12	1FT6134-6S.71-.....	6/18, 6/20	1FT7108-5AF7.-1..1	6/32	1PH7107-...	7/6, 7/8
1FT6062-6AH7-.....	6/14	<b>1FT6136-...</b>		<b>1FW6090-...</b>		<b>1PH713-...</b>	
1FT6062-6AK7-.....	6/16	1FT6136-6AB71-.....	6/8	1FW6090-0.B05-0..2	6/80	1PH7131-...	7/10
1FT6062-6W.7-.....	6/22	1FT6136-6AC71-.....	6/10	1FW6090-0.B07-...2	6/80	1PH7133-...	7/6, 7/10
<b>1FT6064-...</b>		1FT6136-6S.71-.....	6/18, 6/20	1FW6090-0.B10-...2	6/80	1PH7135-...	7/10
1FT6064-1A.71-...1	6/6	<b>1FT7034-...</b>		1FW6090-0.B15-J.2	6/80	1PH7137-...	7/6, 7/10
1FT6064-6AC7-.....	6/10	1FT7034-1AK7.-1..1	6/26	<b>1FW6130-...</b>		<b>1PH716-...</b>	
1FT6064-6AF7-.....	6/12	1FT7034-5AK7.-1..1	6/36	1FW6130-0.B05-...2	6/80	1PH7163-...	7/6, 7/12
1FT6064-6AH7-.....	6/14	<b>1FT7036-...</b>		1FW6130-0.B07-...2	6/80	1PH7167-...	7/6, 7/12
1FT6064-6AK7-.....	6/16	1FT7036-5AK7.-1..1	6/36	1FW6130-0.B10-J.2	6/80	<b>1PH718-...</b>	
1FT6064-6W.7-.....	6/22	<b>1FT7042-...</b>		1FW6130-0.B15-J.2	6/80	1PH7184-...	7/14
<b>1FT6081-...</b>		1FT7042-5AF7.-1..1	6/32	<b>1FW6150-...</b>		1PH7186-...	7/14
1FT6081-8AC7-.....	6/10	1FT7042-5AK7.-1..1	6/36	1FW6150-0.B05-...2	6/80	<b>1PH7224-...</b>	
1FT6081-8AF7-.....	6/12	<b>1FT7044-...</b>		1FW6150-0.B07-...2	6/80	1PH7224-...	7/16
1FT6081-8AH7-.....	6/14	1FT7044-1AF7.-1..1	6/26	1FW6150-0.B10-...2	6/80	<b>1PM41-...</b>	
1FT6081-8AK7-.....	6/16	1FT7044-5AF7.-1..1	6/32	1FW6150-0.B15-...2	6/80	1PM4101-...	7/24
<b>1FT6082-...</b>		1FT7044-5AK7.-1..1	6/36	<b>1FW6160-...</b>		1PM4105-...	7/24
1FT6082-1AF71-...1	6/6	<b>1FT7046-...</b>		1FW6160-0.B05-J.2	6/82	1PM4133-...	7/24
1FT6082-8AC7-.....	6/10	1FT7046-5AF7.-1..1	6/32	1FW6160-0.B07-J.2	6/82	1PM4137-...	7/24
1FT6082-8AF7-.....	6/12	1FT7046-5AH7.-1..1	6/34	1FW6160-0.B10-J.2	6/82	<b>1PM61-...</b>	
1FT6082-8AH7-.....	6/14	<b>1FT7062-...</b>		1FW6160-0.B15-...2	6/82	1PM6101-...	7/24
1FT6082-8AK7-.....	6/16	1FT7062-1A.7.-1..1	6/26	1FW6160-1BA00-OAA0	6/83	1PM6105-...	7/24
<b>1FT6084-...</b>		1FT7062-5AF7.-1..1	6/32	<b>1FW6190-...</b>		1PM6133-...	7/24
1FT6084-1A.71-...1	6/6	1FT7062-5AK7.-1..1	6/36	1FW6190-0.B05-J.2	6/82	1PM6137-...	7/24
1FT6084-8AC7-.....	6/10	<b>1FT7064-...</b>		1FW6190-0.B07-J.2	6/82	1PM6138-...	7/24
1FT6084-8AF7-.....	6/12	1FT7064-1A.7.-1..1	6/26	1FW6190-0.B10-J.2	6/82	<b>2LG4-...</b>	
1FT6084-8AH7-.....	6/14	1FT7064-5AF7.-1..1	6/32	1FW6190-0.B15-...2	6/82	2LG4250-1JC11	7/32
1FT6084-8AK7-.....	6/16	1FT7064-5AK7.-1..1	6/36	<b>1FW6230-...</b>		2LG4260-1JC21	7/32
1FT6084-8S.7-.....	6/20	<b>1FT7066-...</b>		1FW6230-0.B05-J.2	6/82	2LG4312-3CC31	7/32
1FT6084-8W.7-.....	6/22	1FT7066-5AF7.-1..1	6/32	1FW6230-0.B07-J.2	6/82	2LG4315-3FC11	7/32
<b>1FT6086-...</b>		1FT7066-5AH7.-1..1	6/34	1FW6230-0.B10-...2	6/82	2LG4315-3FD11	7/32
1FT6086-1A.71-...1	6/6	<b>1FT7068-...</b>		1FW6230-0.B15-...2	6/82	2LG4320-3JC11	7/32
1FT6086-8AC7-.....	6/10	1FT7068- 5AF7.-1..1	6/32	<b>1FW6290-...</b>		2LG4320-3JD11	7/32
1FT6086-8AF7-.....	6/12	<b>1FT7082-...</b>		1FW6290-0.B15-7A.2	6/82	<b>2SP120-...</b>	
1FT6086-8AH7-.....	6/14	1FT7082-1AF7.-1..1	6/26	1FW6290-1BA00-OAA0	6/83	2SP1202-1HA.-1D..	6/100
1FT6086-8S.7-.....	6/20	1FT7082- 5AC7.-1..1	6/30	<b>1PH209-...</b>		2SP1202-1HB.-2D..	6/100
1FT6086-8W.7-.....	6/22	1FT7082- 5AF7.-1..1	6/32	1PH2093-...	7/28	2SP1204-1HA.-1D..	6/100
<b>1FT6102-...</b>		1FT7082- 5AH7.-1..1	6/34	1PH2095-...	7/28	2SP1204-1HB.-2D..	6/100
1FT6102-1AC71-...1	6/6	<b>1FT7084-...</b>		<b>1PH211-...</b>		<b>2SP125-...</b>	
1FT6102-8AB7-.....	6/8	1FT7084-1A.7.-1..1	6/26	1PH2113-...	7/28	2SP1253-1HA0-.....	6/100
1FT6102-8AC7-.....	6/10	1FT7084-5AC7.-1..1	6/30	1PH2115-...	7/28	2SP1253-1HB0-.....	6/100
1FT6102-8AF7-.....	6/12	1FT7084-5AF7.-1..1	6/32	1PH2117-...	7/28	2SP1253-8HA0-.....	6/100
1FT6102-8AH7-.....	6/14	1FT7084-5AH7.-1..1	6/34	1PH2118-...	7/28	2SP1255-1HA0-.....	6/100
<b>1FT6105-...</b>		<b>1FT7086-...</b>		<b>1PH410-...</b>		2SP1255-1HB0-.....	6/100
1FT6105-1AC71-...1	6/6	1FT7086-1A.7.-1..1	6/26	1PH4103-...	7/20	2SP1255-8HA0-.....	6/100
1FT6105-8AB7-.....	6/8	1FT7086-5AC7.-1..1	6/30	1PH4105-...	7/20	<b>3RN1013-...</b>	
1FT6105-8AC7-.....	6/10	1FT7086-5AF7.-1..1	6/32	1PH4107-...	7/20	3RN1013-1GW10	6/87,
1FT6105-8AF7-.....	6/12	1FT7086-5AH7.-1..1	6/34	<b>1PH413-...</b>		6/89, 6/91, 6/93, 6/95	
1FT6105-8S.7-.....	6/18, 6/20	<b>1FT7102-...</b>		1PH4133-...	7/20	<b>3SB3000-...</b>	
1FT6105-8W.7-.....	6/22	1FT7102-1AC7.-1..1	6/26	1PH4135-...	7/20	3SB3000-1HA20	3/32,
<b>1FT6108-...</b>		1FT7102-5AB7.-1..1	6/28	1PH4137-...	7/20	3/33, 3/35, 3/36, 5/5, 5/7	
1FT6108-8AB7-.....	6/8	1FT7102-5AC7.-1..1	6/30	1PH4138-...	7/20	3SB3400-OA	3/32,
1FT6108-8AC7-.....	6/10	1FT7102-5AF7.-1..1	6/32	<b>3SB3400-...</b>		3/33, 3/35, 3/36, 5/5, 5/7	
1FT6108-8AF7-.....	6/12			3SB3400-OE	3/37		
1FT6108-8S.7-.....	6/18, 6/20						
1FT6108-8W.7-.....	6/22						

Type	Page	Type	Page	Type	Page	Type	Page
<b>4AM4096-...</b>		<b>6AV6574-...</b>		<b>6ES7153-...</b>		<b>6ES7365-...</b>	
4AM4096-0EM50-0AA0	9/21	6AV6574-1AF04-4AA0	3/26	6ES7153-1AA03-0XB0	5/26	6ES7365-0BA01-0AA0	5/26
4AM4096-0EM70-0FA0	9/21	<b>6AV66-...</b>		<b>6ES7307-...</b>		<b>6ES7368-...</b>	
<b>4AP2796-...</b>		6AV6611-0AA51-3CA5	4/12	6ES7307-1BA00-0AA0	5/26	6ES7368-3BB01-0AA0	5/26
4AP2796-0EL40-2XA0	9/39	6AV6612-0AA51-3CA5	4/12	6ES7307-1EA00-0AA0	5/26	6ES7368-3BC51-0AA0	5/26
4AP2796-0EL40-2XC0	9/39	6AV6613-0AA51-3CA5	4/12	6ES7307-1EA80-0AA0	5/26	6ES7368-3BF01-0AA0	5/26
<b>4AU3695-...</b>		6AV6671-3AH00-0AX0	3/49	6ES7307-1KA01-0AA0	5/26	6ES7368-3CB01-0AA0	5/26
4AU3695-0SB0.-0CN2	9/39	6AV6671-5AE01-0AX0	3/26	<b>6ES7321-...</b>		<b>6ES7390-...</b>	
4AU3695-0SB1.-0CN2	9/39	6AV6671-5AE11-0AX0	3/26	6ES7321-1BH02-0AA0	5/26	6ES7390-1AB60-0AA0	5/26
4AU3695-0SB2.-0CN2	9/39	<b>6BQ3030-...</b>		6ES7321-1BH50-0AA0	5/26	6ES7390-1AE80-0AA0	5/26
<b>4AU3696-...</b>		6BQ3030-1AA...-....	4/39	6ES7321-1BL00-0AA0	5/26	6ES7390-1AF30-0AA0	5/26
4AU3696-0ER20-2XA0	9/39	6BQ3030-1AB...-....	4/39	6ES7321-1EL00-0AA0	5/26	6ES7390-1AJ30-0AA0	5/26
4AU3696-0ER20-2XC0	9/39	6BQ3030-4AA...-....	4/39	6ES7321-1FF01-0AA0	5/26	6ES7390-1BC00-0AA0	5/26
4AU3696-0ER30-2XA0	9/39	<b>6EP13-...</b>		6ES7321-1FH00-0AA0	5/26	6ES7390-5AA00-0AA0	5/26
4AU3696-0ER30-2XC0	9/39	6EP1332-2BA10	5/33	6ES7321-7BH01-0AB0	5/26	6ES7390-5AB00-0AA0	5/26
4AU3696-2NA00-2XA0	9/39	6EP1333-1AL12	5/33	<b>6ES7322-...</b>		6ES7390-5BA00-0AA0	5/26
4AU3696-2NA00-2XC0	9/39	6EP1333-2BA01	5/33	6ES7322-1BF01-0AA0	5/26	6ES7390-5CA00-0AA0	5/26
<b>4AU3995-...</b>		6EP1333-3BA00	5/34	6ES7322-1BH01-0AA0	5/26	6ES7390-6BA00-0AA0	5/26
4AU3995-0SA3.-0CN2	9/39	6EP1334-1AL12	5/33	6ES7322-1BL00-0AA0	5/26	<b>6ES7392-...</b>	
4AU3995-0SA4.-0CN2	9/39	6EP1334-2BA01	5/33	6ES7322-1FF01-0AA0	5/26	6ES7392-1AJ00-0AA0	5/26, 5/29, 5/30
4AU3995-0SA5.-0CN2	9/39	6EP1334-3BA00	5/34	6ES7322-1FH00-0AA0	5/26	6ES7392-1AM00-0AA0	5/26, 5/32
<b>4AU3996-...</b>		6EP1336-3BA00	5/34	6ES7322-1HF01-0AA0	5/26	6ES7392-1BJ00-0AA0	5/26
4AU3996-0EQ80-2XA0	9/39	6EP1436-3BA01	5/34	6ES7322-1HF10-0AA0	5/26	6ES7392-1BM01-0AA0	5/26
4AU3996-0EQ80-2XC0	9/39	6EP1337-3BA00	5/34	6ES7322-8BF00-0AB0	5/26	<b>6ES7398-...</b>	
<b>4BU4395-...</b>		<b>6EP14-...</b>		<b>6ES7323-...</b>		6ES7398-8FA10-8.A0	5/27
4BU4395-0CB50-8B	9/39	6EP1436-3BA00	5/34	6ES7323-1BH01-0AA0	5/27	<b>6ES7648-...</b>	
4BU4395-0CB52-8B	9/39	6EP1437-3BA00	5/34	6ES7323-1BL00-0AA0	5/27	6ES7648-0DC40-0AA0	3/19, 3/50
4BU4395-0CB58-8B	9/39	6EP1456-2BA00	5/33	<b>6ES7331-...</b>		6ES7648-2AG30-0GA0	3/19
4BU4395-0CB60-8B	9/39	6EP1457-3BA00	5/34	6ES7331-1KF01-0AB0	5/27	6ES7648-2AG40-0GA0	3/19
4BU4395-0CB62-8B	9/39	<b>6EP1931-...</b>		6ES7331-7KB02-0AB0	5/27	6ES7648-2CA01-0AA0	3/19
4BU4395-0CB68-8B	9/39	6EP1931-2DC21	5/35	6ES7331-7KF02-0AB0	5/27	<b>6ES7912-...</b>	
4BU4395-0SA7.-0C	9/39	6EP1931-2DC31	5/35	6ES7331-7NF00-0AB0	5/27	6ES7912-0AA00-0AA0	5/26
4BU4395-0SA8.-0C	9/39	6EP1931-2DC42	5/35	6ES7331-7PF01-0AB0	5/27	<b>6ES7953-...</b>	
4BU4395-0SB0.-0C	9/39	6EP1931-2EC21	5/35	6ES7331-7PF11-0AB0	5/27	6ES7953-8LF20-0AA0	5/26
<b>4BU4595-...</b>		6EP1931-2EC31	5/35	<b>6ES7332-...</b>		6ES7953-8LG11-0AA0	5/26
4BU4595-0BD00-8B	9/39	6EP1931-2EC42	5/35	6ES7332-5HB01-0AB0	5/27	6ES7953-8LJ20-0AA0	5/26
4BU4595-0BD02-8B	9/39	6EP1931-2FC21	5/35	6ES7332-5HD01-0AB0	5/27	6ES7953-8LL20-0AA0	5/26
4BU4595-0BD08-8B	9/39	6EP1931-2FC42	5/35	6ES7332-5HF00-0AB0	5/27	6ES7953-8LM20-0AA0	5/26
<b>4BU4795-...</b>		<b>6EP1935-...</b>		6ES7332-7ND02-0AB0	5/27	6ES7953-8LP20-0AA0	5/26
4BU4795-0SC3.-0C	9/39	6EP1935-6MC01	5/35	<b>6ES7334-...</b>		<b>6ES7971-...</b>	
4BU4795-0SC4.-0C	9/39	6EP1935-6MD11	5/35	6ES7334-0CE01-0AA0	5/27	6ES7971-1AA00-0AA0	5/26
4BU4795-0SC5.-0C	9/39	6EP1935-6MD31	5/35	6ES7334-0KE00-0AB0	5/27	<b>6ES7997-...</b>	
<b>4BU5295-...</b>		6EP1935-6ME21	5/35	<b>6ES7335-...</b>		6ES7997-0BA00-0XA0	12/8
4BU5295-0AE40-8B	9/39	6EP1935-6MF01	5/35	6ES7335-7HG00-....	5/27	6ES7997-0BB00-0XA0	12/8
4BU5295-0AE42-8B	9/39	<b>6EP1961-...</b>		6ES7335-7HG01-0AB0	5/27	6ES7997-0BC00-0XA0	12/8
4BU5295-0AE48-8B	9/39	6EP1961-3BA00	5/34	<b>6ES7353-...</b>		6ES7997-0BG00-0XA0	12/8
<b>4BU5495-...</b>		6EP1961-3BA10	5/34	6ES7353-1AH01-0AE0	5/29	<b>6FC3988-...</b>	
4BU5495-1AA10-8B	9/39	6EP1961-3BA20	5/34	6ES7353-1AH01-8.G0	5/29	6FC3988-7BJ10	3/36
4BU5495-1AA12-8B	9/39	<b>6EP1935-...</b>		<b>6ES7354-...</b>		<b>6FC5088-...</b>	
4BU5495-1AA18-8B	9/39	6EP1935-6MC01	5/35	6ES7354-1AH01-0AE0	5/30	6FC5088-1....	11/3
<b>4BU5595-...</b>		6EP1935-6MD11	5/35	6ES7354-1AH01-8.G0	5/30	6FC5088-1....-2...	11/4
4BU5595-0SA4.-0C	9/39	6EP1935-6MD31	5/35	<b>6ES7357-...</b>		6FC5088-2....	11/3
4BU5595-0SA5.-0C	9/39	6EP1935-6ME21	5/35	6ES7357-4AH00-8.G0	5/32	6FC5088-2....-2...	11/4
4BU5595-0SA6.-0C	9/39	6EP1935-6MF01	5/35	6ES7357-4AH01-0AE0	5/32	6FC5088-3....	11/3
<b>4BU5895-...</b>		<b>6EP1961-...</b>		6ES7357-4AH03-3AE0	5/32	6FC5088-3....-2...	11/4
4BU5895-0SA6.-0C	9/39	6EP1961-3BA00	5/34	6ES7357-4BH03-3AE0	5/32	6FC5088-4....	11/3
4BU5895-0SA7.-0C	9/39	6EP1961-3BA10	5/34	6ES7357-4CH03-3AE0	5/32	6FC5088-5....	11/3
4BU5895-0SA8.-0C	9/39	<b>6EP1935-...</b>		<b>6ES7360-...</b>		6FC5088-6....	11/3
<b>4BU6095-...</b>		6EP1935-6MC01	5/35	6ES7360-3AA01-0AA0	5/26	<b>6ES73610-...</b>	
4BU6095-0SA6.-0C	9/39	6EP1935-6MD11	5/35	6ES7361-3CA01-0AA0	5/26		
4BU6095-0SA7.-0C	9/39	6EP1935-6ME21	5/35				
4BU6095-0SA8.-0C	9/39	6EP1935-6MF01	5/35				

# Appendix Indexes

## Order number index

Type	Page	Type	Page	Type	Page	Type	Page
<b>6FC5095-...</b>		<b>6FC5247-...</b>		<b>6FC5250-...</b>		<b>6FC5251-...</b>	
6FC5095-0AA50-0.P2	11/19	6FC5247-0AA00-0AA3	5/18	6FC5250-.AX00-.AB.	4/7	6FC5251-0AD00-0AA0	2/4
6FC5095-0AA50-1.P2	11/19	6FC5247-0AA06-0AA0	5/18	6FC5250-.AX30-.AH.	5/18	6FC5251-0AD01-0AA0	2/6
6FC5095-0AA50-0YGO	11/19	6FC5247-0AA11-0AA3	5/12, 5/18	6FC5250-.AY30-.AH.	5/18	6FC5251-0AD02-0AA0	2/4, 5/18
6FC5095-0AA60-0.P2	11/19			6FC5250-.BX00-.AB.	4/9		
6FC5095-0AA60-1.P2	11/19	6FC5247-0AA11-1AA3	5/12, 5/18	6FC5250-.BX30-.AH.	5/18	6FC5251-0AD04-0AA0	2/22
6FC5095-0AA71-0.G0	11/20			6FC5250-.BY30-.AH.	5/18	6FC5251-0AD05-0AA0	2/3, 2/20
6FC5095-0AA80-0. P1	11/19	6FC5247-0AA18-0AA0	5/12, 5/18	6FC5250-.CX30-.AH.	5/18	6FC5251-0AD06-0AA0	2/3, 2/16
6FC5095-0AA80-1. P1	11/19			6FC5250-.CY30-.AH.	5/18	6FC5251-0AD07-0AA0	2/3, 2/18
6FC5095-0AA80-0YGO	11/19	6FC5247-0AA20-0AA0	3/47, 3/51, 3/52	6FC5250-.DY30-.AH.	5/18	6FC5251-0AD08-0AA0	2/4
6FC5095-0AB00-0.G0	11/20			6FC5250-.HY30-.AH.	5/18	6FC5251-0AD10-0AA0	2/12
6FC5095-0AB00-0.P1	11/19	6FC5247-0AA23-0AA0	5/18	6FC5250-0AA07-0AA0	2/44	6FC5251-0AD11-0AA0	2/16
6FC5095-0AB00-1.P1	11/19	6FC5247-0AA34-0AA1	3/36, 3/37	6FC5250-0AD00-0AA0	2/18	6FC5251-0AE00-0AA0	2/3, 2/16
6FC5095-0AB00-0YGO	11/19			6FC5250-0AD05-0AA0	2/3, 2/20	6FC5251-0AE01-0AA0	2/12
<b>6FC5111-...</b>		6FC5247-0AA35-0AA0	3/30, 3/32, 3/35, 3/36	6FC5250-0AE01-0AA0	2/48	6FC5251-0AE01-0AA0	2/18
6FC5111-0CA01-0AA0	5/24			6FC5250-0FX01-0AB0	4/7	6FC5251-0AE01-0AA0	2/18
6FC5111-0CA02-0AA2	5/24	6FC5247-0AA40-0AA0	3/43	6FC5250-0FX01-3AB0	4/7	6FC5251-0AE50-0AA0	2/3, 2/18
6FC5111-0CA03-0AA2	5/24	6FC5247-0AA41-0AA0	3/37	6FC5250-0FX01-0AB1	4/7	6FC5251-0AE51-0AA0	2/3, 2/18
6FC5111-0CA04-0AA0	5/24	6FC5247-0AA42-0AA0	3/37, 3/40	6FC5250-0GX01-0AB0	4/7	6FC5251-0AE53-0AA0	2/3, 2/18
6FC5111-0CA05-0AA0	5/24			6FC5250-0GX01-3AB0	4/7	6FC5251-0AE60-0AA0	2/3, 2/18
<b>6FC5148-...</b>		6FC5247-0AA43-1AA0	3/40	6FC5250-0GX01-0AB1	4/7	6FC5251-0AE61-0AA0	2/3, 2/18
6FC5148-0AA03-0AA0	3/32, 3/33, 3/35	6FC5247-0AF01-0AA0	3/8, 3/10, 3/11, 3/12, 3/13	6FC5250-0AG00-0AA0	2/48, 5/21	6FC5251-0AE71-0AA0	2/48
						6FC5251-0AE72-0AA0	2/14
6FC5148-0AA13-0AA0	3/36	6FC5247-0AF02-0AA0	3/32, 3/35	6FC5250-0AG10-0AA0	2/48, 5/21	6FC5251-0AE74-0AA0	2/22
6FC5148-0AA14-0AA0	3/36					6FC5251-0AE76-0AA0	2/10
<b>6FC5203-...</b>		6FC5247-0AF08-4AA0	3/19	6FC5250-0AG11-0AA0	2/48, 5/21	6FC5251-0AF00-0AA0	2/26
6FC5203-0AC01-3AA0	3/43	6FC5247-0AF11-0AA0	3/8, 3/10, 3/12, 3/14			6FC5251-0AF01-0AA0	2/14
6FC5203-0AC55-0AA0	11/17			6FC5250-0AG12-0AA0	2/48, 5/21	6FC5251-0AF02-0AA0	2/12
6FC5203-0AD10-1AA0	3/36	6FC5247-0AF12-1AA0	3/30, 3/32, 3/33, 3/35			6FC5251-0AF03-0AA0	2/12
6FC5203-0AE00-0AA0	3/41			6FC5250-0AX00-0AB.	4/7	6FC5251-0AF04-0AA0	2/12
6FC5203-0AF00-0AA1	3/5	6FC5247-0AF13-1AA0	3/30, 3/32, 3/33, 3/35	6FC5250-0AY00-0AG.	4/43	6FC5251-0AF05-0AA0	2/44
6FC5203-0AF01-0AA0	3/7			6FC5250-0BX00-0AB.	4/9	6FC5251-0AF14-0AA0	2/14
6FC5203-0AF02-0AA1	3/8	6FC5247-0AF22-0AA0	3/23	6FC5250-7AY00-.AG.	4/43	6FC5251-0AF33-0AA0	2/44
6FC5203-0AF03-0AA0	3/9	6FC5247-0AF22-1AA0	3/23	<b>6FC5251-...</b>		6FC5251-0AF44-0AA0	2/48
6FC5203-0AF04-0AA0	3/6	6FC5247-0AF30-0AA0	3/10, 3/12, 3/14	6FC5251-0AA00-0AA0	2/22	6FC5251-0AF75-0AA0	2/3, 2/18
6FC5203-0AF04-1BA0	3/4			6FC5251-0AA03-0AA0	2/6	6FC5251-0AG00-0AA0	2/3, 2/18
6FC5203-0AF05-0AB0	3/10	<b>6FC5248-...</b>		6FC5251-0AA04-0AA0	2/6	6FC5251-0AG01-0AA0	2/3, 2/16
6FC5203-0AF05-1AB0	3/11	6FC5248-0AF04-1BA0	3/4	6FC5251-0AA07-0AA0	2/4	<b>6FC5251-...</b>	
6FC5203-0AF08-0AB0	3/12	6FC5248-0AF05-0AA0	3/5, 3/6, 3/7, 3/8, 3/9, 3/10, 3/11, 3/12, 3/13	6FC5251-0AA10-0AA0	2/3, 2/18	6FC5251-0AG02-0AA0	2/3, 2/16
6FC5203-0AF08-1AB0	3/13			6FC5251-0AA13-0AA0	2/44	6FC5251-0AG03-0AA0	2/3, 2/16
6FC5203-0AF20-0AA1	3/45	6FC5248-0AF05-0BA0	3/4	6FC5251-0AA14-0AA0	2/14	6FC5251-0AG04-0AA0	2/20
6FC5203-0AF21-0AA1	3/44	6FC5248-0AF06-0AA0	3/5, 3/6, 3/7, 3/8, 3/9	6FC5251-0AA15-0AA0	2/14	<b>6FC5252-...</b>	
6FC5203-0AF22-0AA2	3/33			6FC5251-0AA16-0AA0	2/3, 2/14	6FC5252-.AX21-.AG0	5/12, 5/18
6FC5203-0AF22-1AA2	3/35	6FC5248-0AF07-0AA0	3/5	6FC5251-0AA20-0AA0	2/3, 2/22	6FC5252-.AX21-.AG3	5/12, 5/18
6FC5203-0AF23-1AA0	3/32	6FC5248-0AF08-0AA0	3/8	6FC5251-0AB01-0AA0	2/18, 4/6		
6FC5203-0AF24-0AA0	3/37	6FC5248-0AF12-0AA0	3/7, 3/33	6FC5251-0AB04-0AA0	2/20	6FC5252-.AY01-.AG0	4/42
6FC5203-0AF25-1AA0	3/37			6FC5251-0AB06-0AA0	2/18	6FC5252-0AA03-0AA0	2/46, 5/18
<b>6FC5210-...</b>		6FC5248-0AF14-0AA0	3/4, 3/10, 3/11, 3/12, 3/13, 3/32, 3/33, 3/35, 3/44, 3/45	6FC5251-0AB07-0AA0	2/10		
6FC5210-0DF00-0AA2	3/16			6FC5251-0AB11-0AA0	2/10	6FC5252-0AD00-0AA0	2/38, 5/18
6FC5210-0DF00-1AA2	3/16			6FC5251-0AB12-0AA0	2/36		
6FC5210-0DF31-2AA0	3/19	6FC5248-0AF20-0AA0	3/21, 3/23	6FC5251-0AB13-0AA0	2/34	6FC5252-0AF00-0AA0	3/32, 3/35
6FC5210-0DF33-2AA0	3/19			6FC5251-0AB14-0AA0	2/44		
<b>6FC5211-...</b>		6FC5248-0AF20-1AA0	3/21, 3/23	6FC5251-0AB15-0AA0	2/3, 2/44	6FC5252-0AX21-0AB0	5/12, 5/18
6FC5211-0AA00-0AA0	5/24			6FC5251-0AB16-0AA0	2/44		
6FC5211-0AA10-0AA0	5/24	6FC5248-0AF20-2AA0	3/19, 3/21, 3/23	6FC5251-0AB17-0AA0	2/22	6FC5252-0AX21-0AB1	5/12, 5/18
<b>6FC5212-...</b>				6FC5251-0AC00-0AA0	2/20	6FC5252-0AX21-0AB2	5/12, 5/18
6FC5212-0AA01-1AA0	5/18	6FC5248-0AF20-3AA0	3/23	6FC5251-0AC02-0AA0	2/10		
<b>6FC523-...</b>		6FC5248-0AF21-0AA0	3/33	6FC5251-0AC04-0AA0	2/20	6FC5252-.AY0-.AG.	4/42
6FC5235-0AA05-0AA1	3/52	6FC5248-0AF22-1AA1	3/35	6FC5251-0AC05-0AA0	2/3, 2/22		
6FC5235-0AA05-1AA2	3/51	6FC5248-0AF23-1AA0	3/32	6FC5251-0AC07-0AA0	2/16		
		6FC5248-0AF24-0AA0	3/10, 3/11, 3/12, 3/13				
		6FC5248-0AF30-0AA0	3/33				

Type	Page	Type	Page	Type	Page	Type	Page
<b>6FC5253-...</b>		<b>6FC5270-...</b>		<b>6FC5348-...</b>		<b>6FC5463-...</b>	
6FC5253-.BX00-.AG.	4/2	6FC5270-0AX70-0AG0	11/16	6FC5348-0AA08-3AA0	3/26	6FC5463-.FA20-.AG.	4/5
6FC5253-.BX10-.AF0	3/19	6FC5270-.AX70-.AG3	11/16	<b>6FC5356-...</b>		6FC5463-.GA20-.AG.	4/6
6FC5253-.BX10-.AG.	4/3	6FC5270-0AX72-0AG0	11/16	6FC5356-0BB15-0AA0	5/18	6FC5463-0FA01-0AA0	4/5
6FC5253-.BX10-.XG0	3/25, 4/2, 4/3, 4/5, 4/6	6FC5270-.AX72-.AG3	11/16	<b>6FC5357-...</b>		6FC5463-0FA02-0AA0	4/5
6FC5253-.BX10-.XG8	4/3	6FC5270-0AX74-0AG0	11/16	6FC5357-0BB15-0AA0	5/18	6FC5463-0FA03-0AA0	4/5, 4/6
6FC5253-.BX20-.AG.	4/12	6FC5270-0AX76-0AG0	11/16	6FC5357-0BB25-0AA0	5/18	6FC5463-0FA04-0AA0	4/5
6FC5253-.BX40-.AG.	4/3	6FC5270-0AX80-0AG0	11/16	6FC5357-0BB35-0AA0	5/18	6FC5463-0FA20-0A..	4/5
6FC5253-.CX25-.AG.	4/12	6FC5270-0AX82-0AG0	11/16	<b>6FC5397-...</b>		6FC5463-0FA21-0AA0	4/5
6FC5253-0AE00-0AA0	2/26	6FC5270-1AX10-0AG0	11/17	6FC5397-0BP10-3.A0	11/27	6FC5463-0FA41-0AG0	11/16
6FC5253-0AE01-0AA0	3/16, 4/3, 4/38	6FC5270-1AX12-0AG0	11/17	6FC5397-1BP10-3.A0	11/27	6FC5463-0FA43-0AG0	11/16
6FC5253-0AE02-0AA0	4/2	6FC5270-6AX70-3AG7	11/16	6FC5397-2BP10-3.A0	11/27	6FC5463-0GA1-.0AA0	4/6
6FC5253-0AE03-0AA0	2/40	<b>6FC5297-...</b>		6FC5397-2CP10-2.A0	11/27	6FC5463-0GA20-0A..	4/6
6FC5253-0AF00-0AA0	4/2, 4/3, 4/12	6FC5297-0AD30-0.P2	11/27	6FC5397-3AP10-1.A0	11/27	6FC5463-0GA21-0AA0	4/6
6FC5253-0AF03-0AA0	2/28	6FC5297-0AF00-0.P3	11/27	6FC5397-5BP10-2.A0	11/27	6FC5463-0GA41-0AG0	11/17
6FC5253-0AG03-0AA0	4/12	6FC5297-1AE60-0.P0	11/27	6FC5397-7BP10-0.A0	11/27	6FC5463-0GA43-0AG0	11/17
6FC5253-0BX00-0AG.	4/2	6FC5297-1AE81-0.P0	11/27	<b>6FC5398-...</b>		6FC5463-0GA51-0AG0	11/17
6FC5253-0BX10-0AF0	3/19	6FC5297-2AE80-0.P1	11/27	6FC5398-0AC10-0YA3	11/24	6FC5463-0GA53-0AG0	11/17
6FC5253-0BX10-0AG.	4/3	6FC5297-3AB60-0.P0	11/27	6FC5398-1BP10-2.A0	11/25	<b>6FC5500-...</b>	
6FC5253-0BX10-0XG1	3/25, 4/2, 4/3, 4/5, 4/6	6FC5297-4AC50-0.P0	11/27	6FC5398-2AP10-3.A0	11/25	6FC5500-0AA00-1AA0	5/5
6FC5253-0BX20-0AG.	4/12	6FC5297-4AD20-0.P1	11/26	6FC5398-2BP10-2.A0	11/26	6FC5500-0AA11-1AA0	5/7
6FC5253-0BX40-0AG.	4/3	<b>6FC5297-...</b>		6FC5398-3BP10-0.A0	11/26	<b>6FC5511-...</b>	
6FC5253-0CX25-0AG.	4/12,	6FC5297-6AB10-0.P2	11/26	6FC5398-4BP10-0.A0	11/26	6FC5511-0CA00-0AA0	5/5, 5/7
6FC5253-8CX10-0XU8	3/19	6FC5297-6AC10-0.P3	11/26	6FC5398-5BP10-0BA0	11/26	6FC5511-0CB00-0AA0	5/5, 5/7
<b>6FC5255-...</b>		6FC5297-6AC60-0.P1	11/27	<b>6FC5403-...</b>		<b>6FC5571-...</b>	
6FC5255-0AB00-0AA0	2/16	6FC5297-6AD10-0.P2	11/26	6FC5403-0AA10-0AA1	3/25	6FC5571-0AA01-0BF0	2/32
6FC5255-0AB01-0AA0	2/14, 4/6	6FC5297-6AD61-0.P1	11/27	6FC5403-0AA20-0AA0	3/26	<b>6FC5597-...</b>	
6FC5255-0AB02-0AA0	2/10, 4/6	6FC5297-6AD70-0.P2	11/26	<b>6FC5410-...</b>		6FC5597-3AA10-0.P2	11/25
6FC5255-0AC00-0AA0	2/44	6FC5297-6AD80-0.P3	11/26	6FC5410-0AY03-1AA0	5/12	6FC5597-3AA20-0.P2	11/25
6FC5255-0AE00-0AA0	2/48	6FC5297-6AE01-0.P4	11/27	<b>6FC5411-...</b>		6FC5597-4AA01-0.P0	11/25
<b>6FC5260-...</b>		6FC5297-6EA10-0.P0	11/27	6FC5411-0AA00-0AA0	5/22	6FC5597-4AA11-0.P0	11/25
6FC5260-.AY00-.AG.	4/9	6FC5297-7AA50-0.P2	11/26	6FC5411-0AA80-0AA0	5/22, 5/25	6FC5597-4AA21-0.P0	11/25
<b>6FC5263-...</b>		6FC5297-7AB70-0.P2	11/26	<b>6FC5412-...</b>		<b>6FC5598-...</b>	
6FC5263-.PY11-.AG0	4/10	6FC5297-7AB71-0.P0	11/26	6FC5412-0FA10-0AA0	5/13	6FC5598-3AA00-0.P2	11/25
6FC5263-.PY50-.AG0	4/10	6FC5297-7AB80-0.P1	11/27	6FC5412-0FA12-0AA0	5/13	6FC5598-3AA10-0.P2	11/25
6FC5263-0AA03-0AB0	5/29, 5/30, 5/32	<b>6FC5298-...</b>		6FC5412-0FA80-0AA0	5/13	6FC5598-3AA20-0.P2	11/25
6FC5263-0AY.0-0AB1	4/13	6FC5298-0AD60-0.P3	11/25	<b>6FC5447-...</b>		6FC5598-4AA01-0.P0	11/25
6FC5263-0AY20-0AB1	4/14	6FC5298-0CD00-0YG2	11/24	6FC5447-0AA00-0AA1	5/12	6FC5598-4AA11-0.P0	11/25
6FC5263-0AY30-0AG1	4/14	6FC5298-5AD30-0.P0	11/25	6FC5447-0AA01-0AA0	5/12	6FC5598-4AA21-0.P0	11/25
6FC5263-0PY11-0AG.	4/10	6FC5298-6AA10-0.P0	11/25	<b>6FC5450-...</b>		<b>6FC5880-...</b>	
6FC5263-0PY50-0AG.	4/10	6FC5298-6AB30-0.P0	11/26	6FC5450-0AX03-.AH0	5/12	6FC5880-0YC05-0AA0	11/6
6FC5263-7AY00-0AB0	4/13	6FC5298-6AC00-0.P3	11/25	6FC5450-.AX03-.AH3	5/12	6FC5880-1YC05-0AA0	11/6
6FC5263-7AY10-0AB0	4/13	6FC5298-6AD10-0.P3	11/25	6FC5450-.AY03-.AH0	5/12	6FC5880-2YC05-0AA0	11/6
6FC5263-7AY20-0AB0	4/14	6FC5298-6AD50-0.P2	11/25	6FC5450-.AY03-.AH3	5/12	6FC5880-3YC05-0AA0	11/6
6FC5263-7AY30-0AG0	4/14	6FC5298-6AF20-0.P0	11/25	6FC5450-0AX03-0AH0	5/12	6FC5880-4YC05-0AA0	11/6
		6FC5298-7AA20-0.P3	11/26	6FC5450-0AY03-0AH0	5/12	<b>6FC5862-...</b>	
		<b>6FC5303-...</b>		6FC5450-0AY03-0AH2	5/12	6FC5862-2YC..-YAO	4/44
		6FC5303-0AA01-1AA0	3/26	6FC5450-0AX03-0AH2	5/12	6FC5862-2YC00-0YAO	4/44
		6FC5303-0AA02-0AA0	3/30	<b>6FC5451-...</b>			
		6FC5303-1AF00-0AA1	3/39	6FC5451-0AF01-0AA0	2/6		
		6FC5303-1AF00-1AA1	3/39	6FC5451-0AF02-0AA0	2/6		
		6FC5303-1AF00-8AA1	3/39	6FC5451-0AF03-0AA0	2/6		
		6FC5303-1AF01-0AA1	3/39	<b>6FC5453-...</b>			
		<b>6FC531-...</b>		6FC5453-.AX10-.AG3	3/25		
		6FC5312-0DA00-0AA1	3/21	6FC5453-0AX10-0AG2	3/25		
		6FC5313-4AG00-0AA2	3/16				
		6FC5313-5AG00-0AA0	3/19, 3/47, 3/48				
		<b>6FC5335-...</b>					
		6FC5335-0AA00-0AA0	3/47				

# Appendix Indexes

## Order number index

Type	Page	Type	Page	Type	Page	Type	Page
<b>6FC6000-...</b>		<b>6FC8506-...</b>		<b>6FX.002-...</b>		<b>6FX2001-...</b>	
6FC6000-0AC...-A.0	4/16	6FC8506-0.X0...-AA1	11/9	6FX.002-2CJ10-....	5/30,	6FX2001-7KF06	8/10
6FC6000-0AF00-0AB0	4/16	6FC8506-0.X0...-AA2	11/9		5/32, 9/8, 9/9	6FX2001-7KF10	8/10
6FC6000-0BC0...-A.0	4/18	6FC8506-1.X0...-0AA0	11/9	6FX.002-2EQ...-....	10/10	6FX2001-7KP01	8/10
6FC6000-0BF00-0AB0	4/18	6FC8506-2.X0...-0AA0	11/9	6FX.002-2EQ10-....	5/10,	6FX2001-7KS06	8/10
6FC6000-0CC0...-AA0	4/18	6FC8506-3SX01-0AA0	11/9		9/9, 9/14	6FX2001-7KS10	8/10
6FC6000-0CF00-0AB0	4/18	6FC8506-3SX02-0AA0	11/9	6FX.002-2EQ20-....	9/9, 9/14	<b>6FX2002-...</b>	
6FC6000-0DF00-0AB0	4/19	6FC8506-3SX03-0AA0	11/9	6FX.002-5.A05-....	10/9	6FX2002-1AA23-....	3/24,
6FC6000-0EF00-0AB0	4/19	6FC8506-3SX04-0AA0	11/9	6FX.002-5.A15-....	10/9		3/25, 5/9, 5/16, 5/32
6FC6000-0FF00-0AB0	4/20	<b>6FC9302-...</b>		6FX.002-5.A.8-....	10/9	6FX2002-1AA83-....	3/25
6FC6000-0GF00-0AB0	4/20	6FC9302-2AA	5/22	6FX.002-5.X18-....	10/9	6FX2002-1AB04-1...	3/27
6FC6000-0HF00-0AB0	4/21	6FC9302-2AB	5/22	6FX.002-5.X28-....	10/9	6FX2002-1AB14-1...	3/27
6FC6000-0KF00-0AB0	4/21	6FC9302-2BB01	5/22	6FX.002-5.CA...-....	10/6	6FX2002-1AB24-1...	3/27
6FC6000-1AC...-AA0	4/36	<b>6FC9320-...</b>		6FX.002-5.CB...-....	10/8	6FX2002-1AB84-1...	3/27
6FC6000-1AC02-1AF0	4/36	6FC9320-5DB01	3/29	6FX.002-5.CC...-....	10/8	6FX2002-1CA01-....	5/10,
6FC6000-1AC00-0AT7	4/36	6FC9320-5DC01	3/29	6FX.002-5.DA...-....	10/7		5/15, 9/13, 9/14, 10/10
6FC6000-1AF00-0AB0	4/36	6FC9320-5DE02	3/29	6FX.002-5.DX38-....	10/9	6FX2002-1CB01-....	5/10,
6FC6000-1BC...-AA0	4/36	6FC9320-5DF01	3/29	<b>6FX.008-...</b>			10/10
6FC6000-1BF00-0AB0	4/36	6FC9320-5DH01	3/29	6FX.008-.....-1FA0	10/14	6FX2002-1CC00-....	9/13,
6FC6000-1DF00-0AB0	4/36	6FC9320-5DM00	3/29	6FX.008-.....-2AA0	10/14		9/14, 9/34, 10/10
6FC6000-1EC...-AA0	4/36	6FC9320-5DN00	3/29	6FX.008-.....-3AA0	10/14	6FX2002-1VL00-....	3/22, 3/23
6FC6000-1EF00-0AB0	4/36	<b>6FC9340-...</b>		6FX.008-.....-6AA0	10/14	6FX2002-1YB02-....	3/25
6FC6000-2AC0...-AA0	4/27	6FC9340-8XY00-....	5/22	6FX.008-1BA...-...0	10/7	6FX2002-2AS...-....	5/9,
6FC6000-2AF00-0AB0	4/27	<b>6FC9341-...</b>		6FX.008-1BB...-....	10/6		5/15, 5/22, 5/25, 10/10
6FC6000-2BC0...-AA0	4/26	6FC9341-1AQ	3/29	<b>6FX.012-...</b>		6FX2002-3AD01-....	5/6,
6FC6000-2BF00-0AB0	4/26	<b>6FC9348-...</b>		6FX.012-2C...-....	10/10		5/32, 9/8, 9/9
6FC6000-2EC0...-AA0	4/23	6FC9348-7BA	9/34	<b>6FX.042-...</b>		6FX2002-4EA04-....	10/10
6FC6000-2EF00-0AB0	4/23	6FC9348-7BB	9/34	6FX.042-2C...-....	10/10	6FX2002-4EB...-....	10/12,
6FC6000-2FC0...-AA0	4/24	<b>6FX..02-...</b>		6FX.042-5...-....	10/6		10/13
6FC6000-2FF00-0AB0	4/24	6FX..02-5CA...-....	10/6	<b>6FX2001-...</b>		<b>6FX2003-...</b>	
6FC6000-2GC0...-AA0	4/24	6FX..02-5DA...-....	10/7	6FX2001-2C... ..	8/5	6FX2003-0DA00	5/13,
6FC6000-2GF00-0AB0	4/24	<b>6FX..08-...</b>		6FX2001-2D... ..	8/5		5/18, 5/24, 9/34
6FC6000-2HC0...-AA0	4/29	6FX..08-1BA...-...0	10/7	6FX2001-2E... ..	8/5	6FX2003-0FA00	5/12, 5/18
6FC6000-2HF00-0AB0	4/29	6FX..08-1BB...-....	10/6	6FX2001-2F... ..	8/5	6FX2003-0SA12	8/10
6FC6000-2JC0...-AA0	4/28	<b>6FX.002-...</b>		6FX2001-2G... ..	8/5	6FX2003-0SU12	8/10
6FC6000-2JF00-0AB0	4/28	6FX.002-2AD00-....	9/14,	6FX2001-2H... ..	8/5	6FX2003-0SU17	8/10
6FC6000-2KC0...-AA0	4/25		9/17, 10/10	6FX2001-2M... ..	8/5	6FX2003-0TAX00	10/11
6FC6000-2KF00-0AB0	4/25	6FX.002-2AD04-....	10/10	6FX2001-2N... ..	8/5	6FX2003-0TAX00	10/11
6FC6000-3AC...-A..	4/33	6FX.002.2AH...-....	10/10	6FX2001-2P... ..	8/5	6FX2003-0TAX00	10/11
6FC6000-3AF00-0AB0	4/33	6FX.002-2CA11-....	9/13,	6FX2001-2Q... ..	8/5	6FX2003-0TAX00	10/11
6FC6000-3BC0...-A.0	4/31		9/14, 9/17, 10/10	6FX2001-2R... ..	8/5	6FX2003-0TAX00	10/11
6FC6000-3BF00-0AB0	4/31	6FX.002-2CA.4-....	10/10	6FX2001-2S... ..	8/5	6FX2003-0TAX00	10/11
6FC6000-3EF00-0AB0	4/32	6FX.002-2CA20-....	9/9,	6FX2001-2U000	8/5	6FX2003-0TAX00	10/11
6FC6000-6AF00-0BB0	4/37		9/14, 10/10	6FX2001-3C... ..	8/5	6FX2003-0TAX00	10/11
6FC6000-6AF88-8BB0	4/38	6FX.002-2CA31-....	5/10,	6FX2001-3E... ..	8/5	<b>6FX2006-...</b>	
6FC6000-6DC...-BA0	4/37		9/9, 9/14	6FX2001-3G... ..	8/5	6FX2006-1BA02	5/9,
6FC6000-6DC8...-BA0	4/38	6FX.002-2CB.4-....	10/10	6FX2001-4D... ..	8/5		5/12, 5/16, 5/18
6FC6000-6DF00-0BB0	4/37	6FX.002-2CC11-....	5/30,	6FX2001-4F... ..	8/5	6FX2006-1BC01	3/25, 3/27
6FC6000-6DF88-8BB0	4/38		5/32, 10/10	6FX2001-4H... ..	8/5	6FX2006-1BG03	3/28
6FC6000-7AC...-A.0	4/34	6FX.002-2CD01-....	5/30,	6FX2001-4N... ..	8/5	6FX2006-1BG11	3/28
6FC6000-7AF00-0AB0	4/34		5/32, 10/10	6FX2001-4Q... ..	8/5	6FX2006-1BG13	3/28
<b>6FC6001-...</b>		6FX.002-2CD24-....	5/32,	6FX2001-4S... ..	8/5	6FX2006-1BG56	3/28
6FC6001-0EE00-0A.8	4/41		10/10	6FX2001-5FE... ..	8/9	6FX2006-1BG70	3/28, 3/29
		6FX.002-2CF02-....	9/8,	6FX2001-5FP... ..	8/9	6FX2006-1BH01	3/25, 3/27
			10/10	6FX2001-5FS... ..	8/9	6FX2006-1HA00	3/27
		6FX.002-2CF.4-....	10/10	6FX2001-5HE... ..	8/9	<b>6FX2007-...</b>	
		6FX.002-2CF20-....	9/8,	6FX2001-5HS... ..	8/9	6FX2007-1AC04	3/27
			10/10	6FX2001-5QE... ..	8/9	6FX2007-1AC14	3/27
		6FX.002-2CG00-....	5/10,	6FX2001-5QP... ..	8/9	6FX2007-1AD03	3/28
			9/9, 10/10	6FX2001-5QS... ..	8/9	6FX2007-1AD13	3/28
		6FX.002-2CH00-....	5/10,	6FX2001-5SE... ..	8/9	6FX2007-1AE04	3/27
			9/9, 10/10	6FX2001-5SS... ..	8/9	6FX2007-1AE14	3/27
				6FX2001-5WP... ..	8/9		

Type	Page	Type	Page	Type	Page	Type	Page
<b>6FX5002-...</b>		<b>6SL3000-...</b>		<b>6SN1123-...</b>		<b>6SN1161-...</b>	
6FX5002-1AA00-....	10/10	6SL3000-0BE21-6DA0	9/27	6SN1123-1AA00-0AA1	9/19	6SN1161-1AA00-0AA1	9/34
6FX5002-2CJ10-....	5/6	6SL3000-0BE23-6DA0	9/27	6SN1123-1AA00-0BA1	9/19	6SN1161-1AA00-0BA0	5/13, 9/34
6FX5002-5CC-....	10/8	6SL3000-0BE25-5DA0	9/27	6SN1123-1AA00-0CA2	9/19		
6FX5002-5CD-....	10/8	<b>6SL3060-...</b>		6SN1123-1AA00-0DA2	9/19	6SN1161-1AA01-0AA0	9/34
6FX5002-5DA-....	10/7	6SL3060-1FE21-6AA0	9/26	6SN1123-1AA00-0EA2	9/19	6SN1161-1AA01-0BA0	9/34
6FX5002-5DX-....	10/9	<b>6SL3075-...</b>		6SN1123-1AA00-0HA1	9/19	6SN1161-1AA02-6AA0	9/34
<b>6FX5008-...</b>		6SL3075-0AA00-0AG0	6/142	6SN1123-1AA00-0JA1	9/19	6SN1161-1CA00-....	5/15, 9/13, 9/14
6FX5008-1BA-....0	10/7	<b>6SL3100-...</b>		6SN1123-1AA00-0KA1	9/19	6SN1161-1CA00-0AA0	5/18, 9/34
6FX5008-1BB-....	10/6	6SL3100-1BE22-5AA0	9/30	6SN1123-1AA00-0LA3	9/19		
<b>6FX7002-...</b>		<b>6SN1111-...</b>		6SN1123-1AA01-0FA1	9/19	6SN1161-1CA00-0AA1	9/34
6FX7002-2CA31-....	9/15	6SN1111-0AA00-0BV0	9/22	6SN1123-1AA02-0FA1	9/19	6SN1161-1CA00-0BA0	9/34
6FX7002-2EQ10-....	9/15	6SN1111-0AA00-0BV1	9/22	6SN1123-1AB00-0AA1	9/19	6SN1161-1CA00-0BA1	9/34
6FX7002-2SL0-....	9/15	6SN1111-0AA00-0CA1	9/22	6SN1123-1AB00-0BA1	9/19	6SN1161-1CA00-0CA0	9/34
6FX7002-2SL10-....	9/15	6SN1111-0AA00-0CVA	9/22	6SN1123-1AB00-0CA3	9/19	6SN1161-1CA00-0CA1	9/34
6FX7002-5LM-....	10/8	6SN1111-0AA00-0CV1	9/22	6SN1123-1AB00-0HA1	9/19	6SN1161-1CA00-0DA0	9/34
<b>6FX7008-...</b>		6SN1111-0AA00-0DV0	9/22	<b>6SN1124-...</b>		6SN1161-1CA00-0EA1	9/34
6FX7008-1BB-....	10/8	6SN1111-0AA00-0EV0	9/22	6SN1124-1AA00-0AA1	9/19	6SN1161-1CA00-0FA0	9/34
<b>6FX8002-...</b>		6SN1111-0AA00-0FV0	9/22	6SN1124-1AA00-0BA1	9/19	6SN1161-1DA00-0AA0	9/14, 9/17, 9/34
6FX8002-1AA01-....	3/15, 3/24, 5/4, 5/6	6SN1111-0AA00-1BV0	9/25	6SN1124-1AA00-0CA2	9/19		
		6SN1111-0AA00-1BV1	9/25	6SN1124-1AA00-0DA2	9/19	<b>6SN1162-...</b>	
6FX8002-2BA00-....	9/17	6SN1111-0AA00-1CV0	9/25	6SN1124-1AA00-0EA2	9/19	6SN1162-0BA01-0AA0	9/29
6FX8002-2BA10-....	9/17	6SN1111-0AA00-1CV1	9/25	6SN1124-1AA00-0HA1	9/19	6SN1162-0BA02-0AA2	9/34
6FX8002-2BA20-....	9/17	6SN1111-0AA00-1DV0	9/25	6SN1124-1AA00-0JA1	9/19	6SN1162-0BA03-0AA1	9/34
6FX8002-2BB01-....	5/4, 5/6	6SN1111-0AA00-1EV0	9/25	6SN1124-1AA00-0KA1	9/19	6SN1162-0BA03-0CA1	9/34
6FX8002-2CA-....	10/10	6SN1111-0AA00-1FV0	9/25	6SN1124-1AA00-0LA3	9/19	6SN1162-0BA04-0AA1	9/19
6FX8002-2CA15-....	9/13	6SN1111-0AA01-1AA1	9/23	6SN1124-1AA01-0FA1	9/19	6SN1162-0BA04-0BA1	9/19, 9/21
6FX8002-2CA80-....	9/9, 9/13	6SN1111-0AA01-1BA1	9/23	6SN1124-1AB00-0AA1	9/19		
6FX8002-2CC80-....	9/14, 9/17	6SN1111-0AA01-1CA1	9/23	6SN1124-1AB00-0BA1	9/19	6SN1162-0BA04-0CA1	9/19
6FX8002-2CD01-....	5/4, 5/6	6SN1111-0AB00-0AA0	9/28	6SN1124-1AB00-0CA2	9/19	6SN1162-0BA04-0DA1	9/21
6FX8002-2CP00-....	3/18, 3/30	<b>6SN1112-...</b>		6SN1124-1AB00-0HA1	9/19	6SN1162-0BA04-0EA0	9/19, 9/21
6FX8002-3AB01-....	5/30, 9/8, 9/9	6SN1112-1AB00-0BA0	9/31	<b>6SN1145-...</b>			
		6SN1112-1AB00-0CA0	9/31	6SN1145-1AA00-0CA0	9/21	6SN1162-0BA04-0FA1	9/19
6FX8002-4AA21-....	5/9, 5/16	6SN1112-1AB00-1AA0	9/31	6SN1145-1AA01-0AA2	9/21	6SN1162-0BA04-0GA1	9/19
6FX8002-4AA41-....	5/9, 5/16	6SN1112-1AB00-1BA0	9/31	6SN1145-1BA01-0BA2	9/21	6SN1162-0BA04-0HA1	9/21
6FX8002-4EB-....	10/12	6SN1112-1AC01-0AA1	9/28	6SN1145-1BA01-0DA1	9/21	6SN1162-0BA04-0JA0	9/21, 9/28, 9/29
6FX8002-5CA-....	10/8	<b>6SN1113-...</b>		6SN1145-1BA02-0CA2	9/21		
6FX8002-5DA-....	10/7	6SN1113-1AA00-0DA0	9/30	6SN1145-1BB00-0DA1	9/21	6SN1162-0EA00-0AA0	9/36
6FX8002-5DC-....	10/8	6SN1113-1AA00-1JA1	6/97	6SN1145-1BB00-0EA1	9/21	6SN1162-0EA00-0BA0	9/36
6FX8002-5DD-....	10/8	6SN1113-1AA00-1KA1	6/97	6SN1145-1BB00-0FA1	9/21	6SN1162-0EA00-0CA0	9/36
6FX8002-5DX-....	10/9	6SN1113-1AA00-1KC1	6/97	<b>6SN1146-...</b>		6SN1162-0EA00-0DA0	9/36
6FX8002-5YP02-....	10/8	6SN1113-1AB01-0BA1	9/29	6SN1146-1AB00-0BA1	9/21	6SN1162-0EA00-0JA0	9/36
<b>6FX8008-...</b>		<b>6SN1114-...</b>		6SN1146-1AB00-0CA0	9/21	6SN1162-0EA00-0KA0	9/36
6FX8008-1BA-....0	10/7	6SN1114-0NA00-0AA0	9/8	6SN1146-1BB00-0DA1	9/21	6SN1162-0EB00-0AA0	9/36
6FX8008-1BB-....	10/8	6SN1114-0NB00-0AA2	9/8	6SN1146-1BB00-0EA1	9/21	6SN1162-0EB00-0BA0	9/36
6FX8008-1BD71-....	9/9	6SN1114-0NB01-0AA1	9/8	6SN1146-1BB00-0FA1	9/21	6SN1162-0EB00-0CA0	9/36
<b>6GK1901-...</b>		<b>6SN1115-...</b>		6SN1146-1BB01-0BA2	9/21	6SN1162-0EB00-0DA0	9/36
6GK1901-1BB10-2AA0	3/21	6SN1115-0AA12-0AA0	9/34	6SN1146-1BB02-0CA2	9/21	6SN1162-0EB00-0JA0	9/36
<b>6GK5108-...</b>		6SN1115-0BA11-0AA1	9/16	<b>6SN1153-...</b>		6SN1162-0FA00-0AA1	9/36
6GK5108-0BA00-2AA3	3/21	<b>6SN1118-...</b>		6SN1153-2NX21-2AG0	9/8	6SN1162-0FA00-0AA2	9/36
<b>6GK5208-...</b>		6SN1118-0DJ21-0AA2	9/12			6SN1162-0GA00-0CA0	9/26
6GK5208-0BA10-2AA3	3/21	6SN1118-0DJ23-0AA2	9/12			6SN1162-1AA00-0AA0	9/34
6GK5208-0HA00-2AA6	3/21	6SN1118-0DK21-0AA2	9/12			6SN1162-8YY00-0AA0	9/34
<b>6GK734-...</b>		6SN1118-0DK23-0AA2	9/12				
6GK7342-5DA02-0XE0	5/27	6SN1118-0DM31-0AA2	9/12				
6GK7343-2AH01-0XA0	5/27	6SN1118-0DM33-0AA2	9/12				
		6SN1118-0NH01-0AA1	9/8				
		6SN1118-0NJ01-0AA1	9/8				
		6SN1118-0NK01-0AA1	9/8				
		6SN1118-1NH01-0AA1	9/8				
		6SN1118-1NJ01-0AA1	9/8				
		6SN1118-1NK01-0AA1	9/8				

# Appendix Indexes

## Order number index

Type	Page	Type	Page	Type	Page	Type	Page
<b>6SN1197-...</b>		<b>6XV1...-...</b>		<b>Order codes</b>		<b>2K ...</b>	
6SN1197-0AA00-1AP1	9/6, 11/28	6XV1440-4B...	3/18, 3/26	G46	7/20	2K 120	7/32
6SN1197-0AA00-1BP1	9/6, 11/28	6XV1840-2AH10	3/21	J02	6/45, 6/50, 6/55	2K 250	7/32
6SN1197-0AA00-1CP0	9/6, 11/28	6XV1840-3AH10	3/21	J03	6/45, 6/50, 6/55	2K 300	7/32
6SN1197-0AA00-1DPO	9/6, 11/28	<b>6ZB2410-...</b>		J05	6/45, 6/50, 6/55	2K 800	7/32
6SN1197-0AA00-1EPO	9/6, 11/28	6ZB2410-0AP00	11/22	J09	6/45, 6/50, 6/55	2K 801	7/32
6SN1197-0AA80-1.P6	11/28	<b>6ZB2420-...</b>		J12	6/47, 6/52, 6/57, 6/58	2K 802	7/32
6SN1197-0AB10-0YP4	8/9, 11/28	6ZB2420-0AA02	11/21	J13	6/47, 6/52, 6/57, 6/58	<b>ERA ...</b>	
6SN1197-0AB20-1.P7	11/28	6ZB2420-0AB00	11/21	J15	6/47, 6/52, 6/57, 6/58	ERA 700/800	9/15
6SN1197-0AB20-1.P8	11/28	6ZB2420-0AD00	11/21	J16	6/47, 6/52, 6/57, 6/58	<b>ISBN 3-...</b>	
6SN1197-0AB60-0.P4	11/28	<b>6ZB3300-...</b>		J17	6/47, 6/52, 6/57, 6/58	ISBN 3-89578-074-X	8/8, 11/24
6SN1197-0AB70-0.P6	11/27	6ZB3300-0BD01-6AA0	11/20	J22	6/45, 6/50, 6/55	<b>LB ...</b>	
6SN1197-0AB73-0AP1	11/28	6ZB3300-0BF00-6AA0	11/20	J23	6/45, 6/50, 6/55	LB 382 (C)	5/10, 9/9, 9/14, 9/17
6SN1197-0AB74-0.P2	11/28	6ZB3300-0BG00-6AA0	11/20	J25	6/45, 6/50, 6/55	<b>LC ...</b>	
6SN1197-0AB74-0.P3	11/28	6ZB3300-0BK00-6AA0	11/20	J29	6/45, 6/50, 6/55	LC 183	5/10, 6/77, 9/9, 9/14, 9/15, 9/17
6SN1197-0AB80-0.P0	11/28	<b>6ZB5000-...</b>		J32	6/47, 6/52, 6/57, 6/58	LC 483	5/10, 6/77, 9/9, 9/14, 9/15, 9/17
6SN1197-0AC00-0.P7	11/28	6ZB5000-0AA01-0BA1	11/24	J33	6/47, 6/52, 6/57, 6/58	<b>LF ...</b>	
6SN1197-0AC13-0.P1	11/27	6ZB5000-0AA02-0BA1	11/24	J35	6/47, 6/52, 6/57, 6/58	LF 183 (C)	5/10, 9/9, 9/14, 9/17
6SN1197-0AC62-0.P0	11/27	6ZB5000-0AB01-0BA0	11/24	J36	6/47, 6/52, 6/57, 6/58	LF 481 (C)	5/10, 9/9, 9/14, 9/17
6SN1197-0AC63-0.P0	11/27	6ZB5000-0AB02-0BA0	11/24	J37	6/47, 6/52, 6/57, 6/58	<b>LIDA ...</b>	
6SN1197-0AC64-0.P2	11/27	<b>6ZB5310-...</b>		K00	7/20	LIDA 185	6/77
6SN1197-0AC65-0.P1	11/27	6ZB5310-0EP30-0BA2	12/8	K02	7/20	LIDA 485	6/77
6SN1197-0AD00-0.P3	11/28	<b>9AK1014-...</b>		K03	7/20	<b>LS ...</b>	
6SN1197-0AD00-0.P5	11/28	9AK1014-1AA00	9/8, 9/10	K04	7/20	LS 187 (C)	5/10, 6/77, 9/9, 9/14, 9/15, 9/17
6SN1197-0AD02-0.P1	11/27	<b>E20001-...</b>		K05	7/20	LS 487 (C)	5/10, 6/77, 9/9, 9/14, 9/15, 9/17
6SN1197-0AD03-0.P1	11/27	E20001-A770-P610	11/10	K09	7/20	<b>RCN ...</b>	
6SN1197-0AD04-0.P3	11/28	E20001-A770-P610-X-7600	11/10	K10	7/20	RCN 226	9/15
6SN1197-0AD06-0.P1	11/27	<b>E80001-...</b>		K18	7/20	RCN 727	9/15
6SN1197-0AD06-0EP0	11/27	E80001-V211-E73-X-7400	11/19	K31	7/20	<b>RG2</b>	
6SN1197-0AD07-0.P2	11/27	<b>E86060-K4460-...</b>		K42	7/20	RG2	6/77
6SN1197-0AD07-0.P4	11/27	E86060-K4460-A101-B3	11/24	K83	7/20	<b>RON ...</b>	
<b>6SW1700-...</b>		E86060-K4460-A101-B3-7600	11/24	K84	7/20	RON 786	9/15
6SW1700-0JA00-0AB2	9/40			K85	7/20	<b>SME..</b>	
6SW1700-0JA00-1AB2	9/40	<b>E86060-K4461-...</b>		L37	7/20, 7/25	SME91	9/15
6SW1700-0JC00-0AB2	9/40	E86060-K4461-A101-A2	11/24	L69	7/20	SME93	9/15
6SW1700-0JD00-0AB2	9/40	E86060-K4461-A101-A2-7200	11/24	V40	6/61		
6SW1700-5JA00-4AA0	9/40	E86060-K4461-A101-A2-7600	11/24	V42	6/61		
6SW1700-5JA00-4AA1	9/40						
6SW1700-5JA00-4AA4	9/40	<b>E86060-K4670-...</b>					
6SW1700-5JC00-1AC0	9/40	E86060-K4670-A101-B2	11/24				
6SW1700-5JC00-4AA0	9/40	E86060-K4670-A101-B2-7200	11/24				
6SW1700-5JC00-4AA4	9/40						
6SW1700-5JD00-1AC0	9/40	E86060-K4670-A101-B2-7600	11/24				
6SW1700-6JD00-1AA0	9/40						
6SW1700-6JD00-1AA4	9/40	E86060-K4670-A101-B2-7700	11/24				
		E86060-K4670-A101-B2-7800	11/24				



# Appendix

## Suggestions for improving the catalog

Fax form

**To****Your address**

**Siemens AG**  
**I DT MC MS 1**  
**NC 60 · 2009**  
**Postfach 31 80**  
**91050 ERLANGEN,**  
**GERMANY**

**Fax: +49 (0) 9131-98-1145**

**E-mail:**  
**docu.motioncontrol@**  
**siemens.com**

Name

Function

Company/Department

Street/No.

ZIP, town

Tel./Fax No.

**Your opinion is important to us!**

Our catalog should be an important and convenient reference for you. For this reason, we are constantly striving to improve the catalog.

That's why we would ask you to complete this questionnaire and fax it back to us.

Thank you!

**For the following points, please enter your personal assessment with values from 1 (= good) to 6 (= bad):**

Do the contents meet your requirements?

Do the technical details satisfy your requirements?

Is it easy to find the information you need?

How do you assess the quality of the graphics and diagrams?

Is the text easy to understand?

**Do you have any suggestions for improvement?****Have you found any printing errors?**

## Appendix

## Conversion tables

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

A \ B	lb-in <sup>2</sup>	lb-ft <sup>2</sup>	lb-in-s <sup>2</sup>	lb-ft-s <sup>2</sup> slug-ft <sup>2</sup>	kg-cm <sup>2</sup>	kg-cm-s <sup>2</sup>	gm-cm <sup>2</sup>	gm-cm-s <sup>2</sup>	oz-in <sup>2</sup>	oz-in-s <sup>2</sup>
lb-in <sup>2</sup>	1	$6.94 \times 10^{-3}$	$2.59 \times 10^{-3}$	$2.15 \times 10^{-4}$	2.926	$2.98 \times 10^{-3}$	$2.92 \times 10^3$	2.984	16	$4.14 \times 10^{-2}$
lb-ft <sup>2</sup>	144	1	0.3729	$3.10 \times 10^{-2}$	421.40	0.4297	$4.21 \times 10^5$	429.71	2304	5.967
lb-in-s <sup>2</sup>	386.08	2.681	1	$8.33 \times 10^{-2}$	$1.129 \times 10^3$	1.152	$1.129 \times 10^6$	$1.152 \times 10^3$	$6.177 \times 10^3$	16
lb-ft-s <sup>2</sup> slug-ft <sup>2</sup>	$4.63 \times 10^3$	32.17	12	1	$1.35 \times 10^4$	13.825	$1.355 \times 10^7$	$1.38 \times 10^4$	$7.41 \times 10^4$	192
kg-cm <sup>2</sup>	0.3417	$2.37 \times 10^{-3}$	$8.85 \times 10^{-4}$	$7.37 \times 10^{-5}$	1	$1.019 \times 10^{-3}$	1000	1.019	5.46	$1.41 \times 10^{-2}$
kg-cm-s <sup>2</sup>	335.1	2.327	0.8679	$7.23 \times 10^{-2}$	980.66	1	$9.8 \times 10^5$	1000	$5.36 \times 10^3$	13.887
gm-cm <sup>2</sup>	$3.417 \times 10^{-4}$	$2.37 \times 10^{-6}$	$8.85 \times 10^{-7}$	$7.37 \times 10^{-8}$	$1 \times 10^{-3}$	$1.01 \times 10^{-6}$	1	$1.01 \times 10^{-3}$	$5.46 \times 10^{-3}$	$1.41 \times 10^{-5}$
gm-cm-s <sup>2</sup>	0.335	$2.32 \times 10^{-3}$	$8.67 \times 10^{-4}$	$7.23 \times 10^{-5}$	0.9806	$1 \times 10^{-3}$	980.6	1	5.36	$1.38 \times 10^{-2}$
oz-in <sup>2</sup>	0.0625	$4.34 \times 10^{-4}$	$1.61 \times 10^{-4}$	$1.34 \times 10^{-5}$	0.182	$1.86 \times 10^{-4}$	182.9	0.186	1	$2.59 \times 10^{-3}$
oz-in-s <sup>2</sup>	24.13	0.1675	$6.25 \times 10^{-2}$	$5.20 \times 10^{-3}$	70.615	$7.20 \times 10^{-2}$	$7.09 \times 10^4$	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	$8.333 \times 10^{-2}$	16	0.113	1.152	$1.152 \times 10^{-2}$	$1.152 \times 10^3$	$1.129 \times 10^6$
lb-ft	12	1	192	1.355	13.825	0.138	$1.382 \times 10^4$	$1.355 \times 10^7$
oz-in	$6.25 \times 10^{-2}$	$5.208 \times 10^{-3}$	1	$7.061 \times 10^{-3}$	$7.200 \times 10^{-2}$	$7.200 \times 10^{-4}$	72.007	$7.061 \times 10^4$
N-m	8.850	0.737	141.612	1	10.197	0.102	$1.019 \times 10^4$	$1 \times 10^7$
kg-cm	0.8679	$7.233 \times 10^{-2}$	13.877	$9.806 \times 10^{-2}$	1	$10^{-2}$	1000	$9.806 \times 10^5$
kg-m	86.796	7.233	$1.388 \times 10^3$	9.806	100	1	$1 \times 10^5$	$9.806 \times 10^7$
gm-cm	$8.679 \times 10^{-4}$	$7.233 \times 10^{-5}$	$1.388 \times 10^{-2}$	$9.806 \times 10^{-5}$	$1 \times 10^{-3}$	$1 \times 10^{-5}$	1	980.665
dyne-cm	$8.850 \times 10^{-7}$	$7.375 \times 10^{-8}$	$1.416 \times 10^{-5}$	$10^{-7}$	$1.0197 \times 10^{-6}$	$1.019 \times 10^{-8}$	$1.019 \times 10^{-3}$	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	$1.09 \times 10^{-2}$	10	0.01
yd	36	3	91.44	1	914.4	0.914
mm	0.03937	0.00328	0.1	$1.09 \times 10^{-3}$	1	0.001
m	39.37	3.281	100	1.09	1000	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	$4.448 \times 10^5$	4.4482
oz	0.0625	1	28.35	$2.780 \times 10^4$	0.27801
gm	$2.205 \times 10^{-3}$	0.03527	1	$1.02 \times 10^{-3}$	N.A.
dyne	$2.248 \times 10^{-6}$	$3.59 \times 10^{-5}$	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	$6.25 \times 10^{-2}$	1	28.35	0.02835	$1.93 \times 10^{-3}$
gm	$2.205 \times 10^{-3}$	$3.527 \times 10^{-2}$	1	$10^{-3}$	$6.852 \times 10^{-5}$
kg	2.205	35.27	$10^3$	1	$6.852 \times 10^{-2}$
slug	32.17	514.8	$1.459 \times 10^4$	14.59	1

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

A \ B	HP	Watts
HP (English)	1	745.7
(lb-in) (deg./sec)	$2.645 \times 10^{-6}$	$1.972 \times 10^{-3}$
(lb-in) (rpm)	$1.587 \times 10^{-5}$	$1.183 \times 10^{-2}$
(lb-ft) (deg./sec)	$3.173 \times 10^{-5}$	$2.366 \times 10^{-2}$
(lb-ft) (rpm)	$1.904 \times 10^{-4}$	0.1420
Watts	$1.341 \times 10^{-3}$	1

**Rotation** (to convert from A to B, multiply by entry in table)

A \ B	rpm	rad/sec.	degrees/sec.
rpm	1	0.105	6.0
rad/sec.	9.55	1	57.30
degrees/sec.	0.167	$1.745 \times 10^{-2}$	1

## Conversion tables

## Temperature Conversion

°F	°C	°C	°F
0	-17.8	-10	14
32	0	0	32
50	10	10	50
70	21.1	20	68
90	32.2	30	86
98.4	37	37	98.4
212	100	100	212
subtract 32 and multiply by $\frac{5}{9}$		multiply by $\frac{9}{5}$ and add 32	

## Mechanism Efficiencies

Acme-screw with brass nut	~0.35–0.65
Acme-screw with plastic nut	~0.50–0.85
Ball-screw	~0.85–0.95
Chain and sprocket	~0.95–0.98
Preloaded ball-screw	~0.75–0.85
Spur or bevel-gears	~0.90
Timing belts	~0.96–0.98
Worm gears	~0.45–0.85
Helical gear (1 reduction)	~0.92

## Friction Coefficients

Materials	$\mu$
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	$\mu$
Ball bushings	<0.001
Linear bearings	<0.001
Dove-tail slides	~0.2++
Gibb ways	~0.5++

## Material Densities

Material	lb-in <sup>3</sup>	gm-cm <sup>3</sup>
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<sup>1)</sup>

Cross-section mm <sup>2</sup>	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

<sup>1)</sup> The table shows approximate SWG/AWG sizes nearest to standard metric sizes; the cross-sections do not match exactly.

## Metal surcharges

### Explanation of the metal factor

Surcharges will be added to the prices of products that contain silver, copper, aluminum, lead and/or gold if the respective basic official prices for these metals are exceeded.

The surcharges will be determined based on the following criteria:

- Official price of the metal  
Official price on the day prior to receipt of the order or prior to the release order (=daily price) for
  - silver (sale price of the processed material),
  - gold (sale price of the processed material)
 Source: Umicore, Hanau  
([www.metalsmanagement.umicore.com](http://www.metalsmanagement.umicore.com))  
and for
  - copper (low DEL notation + 1 %),
  - aluminum (aluminum in cables) and
  - lead (lead in cables)
 Source: German Trade Association for Cables and Conductors  
([www.kabelverband.de](http://www.kabelverband.de))
- Metal factor of the products  
Certain products are assigned a metal factor. The metal factor determines the official price as of which the metal surcharges are charged 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 method of calculation refers to the list price or a discounted price (customer net price)  
(L = list price / N = customer net price).

The remaining digits indicate the method of calculation used for the respective metal. If no surcharge is added, 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)

### 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 result is then multiplied by the raw material weight.

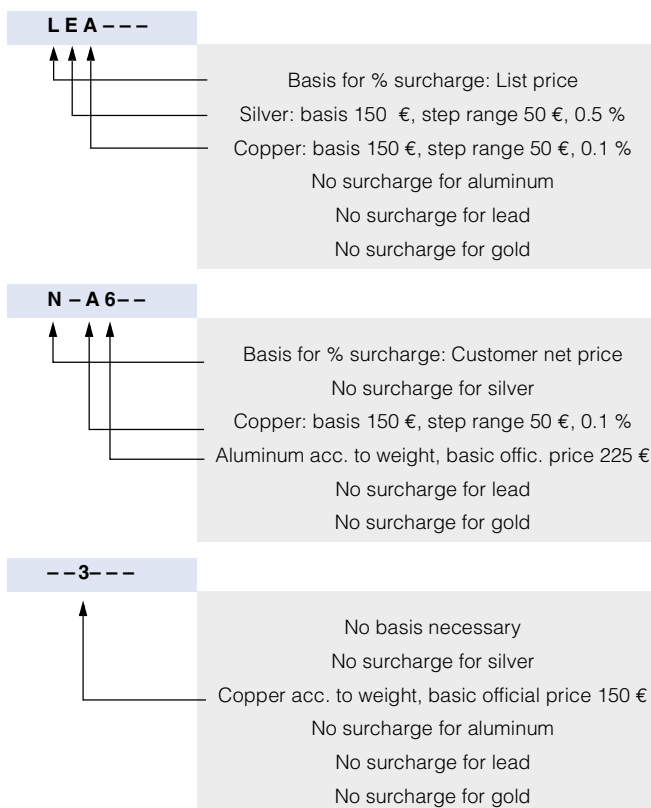
The basic official price can be found in the table below using the number (2 to 9) of the respective digit of the metal factor. The raw material weight can be found in the respective product descriptions.

### 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



A&amp;D/MZ\_1/En 05.09.06

## Metal surcharges

## Values of the metal factor

Percentage method	Basic official price	Step range	% surcharge	% surcharge	% surcharge	% surcharge	% surcharge
			1st step	2nd step	3rd step	4th step	per additional step
			Official price	Official price	Official price	Official price	
			151 € – 200 €	201 € – 250 €	251 € – 300 €	301 € – 350 €	
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	0.7	1.4	2.1	2.8	0.7
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
K	150	50	2.0	3.5	5.0	6.5	1.5
L	150	50	2.2	4.4	6.6	8.8	2.2
M	150	50	2.5	5.0	7.5	10.0	2.5
			176 € – 225 €	226 € – 275 €	276 € – 325 €	326 € – 375 €	
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
Q	175	50	0.3	0.6	0.9	1.2	0.3
R	175	50	0.5	1.0	1.5	2.0	0.5
			226 € – 275 €	276 € – 325 €	326 € – 375 €	376 € – 425 €	
S	225	50	0.2	0.4	0.6	0.8	0.2
T	225	50	0.5	1.0	1.5	2.0	0.5
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
			126 € – 150 €	151 € – 175 €	176 € – 200 €	201 € – 225 €	
X	125	25	1.9	3.8	5.7	7.6	1.9
			151 € – 175 €	176 € – 200 €	201 € – 225 €	226 € – 250 €	
Y	150	25	0.3	0.6	0.9	1.2	0.3
			401 € – 425 €	426 € – 450 €	451 € – 475 €	476 € – 500 €	
Z	400	25	0.1	0.2	0.3	0.4	0.1
<b>Price basis (1st digit)</b>							
L	Charged on the list price						
N	Charged on the customer net price or discounted list price						
<b>Weight method</b>	<b>Basic official price</b>						
2	100						
3	150						
4	175						
5	200	Calculation based on raw material weight					
6	225						
7	300						
8	400						
9	555						
<b>Misc.</b>							
–	No metal surcharge						

A&amp;D/MZ\_2/En 05.09.06

## Conditions of sale and delivery

### Export regulations

#### Terms and Conditions of Sale and Delivery

By using this catalog you can acquire hardware and software products described therein from Siemens AG subject to the following terms. Please note! The scope, the quality and the conditions for supplies and services, including software products, by any Siemens entity having a registered office outside of Germany, shall be subject exclusively to the General Terms and Conditions of the respective Siemens entity. The following terms apply exclusively for orders placed with Siemens AG.

#### For customers with a seat or registered office in Germany

The "General Terms of Payment" as well as the "General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry" shall apply.

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

#### For customers with a seat or registered office outside of Germany

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

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

#### General

The dimensions are in mm. In Germany, according to the German law on units in measuring technology, data in inches only apply to devices for export.

Illustrations are not binding.

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

The prices are in € (Euro) ex works, exclusive packaging.

The sales tax (value added tax) is not included in the prices. It shall be debited separately at the respective rate according to the applicable legal regulations.

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

Surcharges will be added to the prices of products that contain silver, copper, aluminum, lead and/or gold, if the respective basic official prices for these metals are exceeded. These surcharges will be determined based on the official price and the metal factor of the respective product.

The surcharge will be calculated on the basis of the official price on the day prior to receipt of the order or prior to the release order.

The metal factor determines the official price as of which the metal surcharges are charged and the calculation method used. The metal factor, provided it is relevant, is included with the price information of the respective products. An exact explanation of the metal factor can be found on the page entitled "Metal surcharges".

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

- 6ZB5310-0KR30-0BA1  
(for customers based in Germany)
- 6ZB5310-0KS53-0BA1  
(for customers based outside of Germany)

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

#### Export regulations

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

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

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

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

Even without a label or with an "AL: N" or "ECCN: N", authorization may be required due to the final destination and purpose for which the goods are to be used.

The deciding factors are the AL or ECCN export authorization indicated on order confirmations, delivery notes and invoices.

Errors excepted and subject to change without prior notice.

A&D/VuL\_mit MZ/En 05.09.06

## Industry Automation, Drive Technologies and Electrical Installation Technology

Further information can be obtained from our branch offices listed in the appendix or at [www.siemens.com/automation/partner](http://www.siemens.com/automation/partner)

<b>Interactive catalog on DVD</b> for Industry Automation, Drive Technologies and Electrical Installation Technology	<i>Catalog</i> <b>CA 01</b>		
<b>Drive Systems</b>			
<u>Variable-Speed Drives</u>			
SINAMICS G110/SINAMICS G120 Inverter Chassis Units	D 11.1		
SINAMICS G120D Distributed Frequency Inverters			
SINAMICS G130 Drive Converter Chassis Units, SINAMICS G150 Drive Converter Cabinet Units	D 11		
SINAMICS GM150/SINAMICS SM150 Medium-Voltage Converters	D 12		
SINAMICS S150 Drive Converter Cabinet Units	D 21.3		
Asynchronous Motors Standardline	D 86.1		
Synchronous Motors with Permanent-Magnet Technology, HT-direct	D 86.2		
DC Motors	DA 12		
SIMOREG DC MASTER 6RA70 Digital Chassis Converters	DA 21.1		
SIMOREG K 6RA22 Analog Chassis Converters	DA 21.2		
<i>PDF: SIMOREG DC MASTER 6RM70 Digital Converter Cabinet Units</i>	DA 22		
SIMOVERT PM Modular Converter Systems	DA 45		
SIEMOSYN Motors	DA 48		
MICROMASTER 420/430/440 Inverters	DA 51.2		
MICROMASTER 411/COMBIMASTER 411	DA 51.3		
SIMOVERT MASTERDRIVES Vector Control	DA 65.10		
SIMOVERT MASTERDRIVES Motion Control	DA 65.11		
Synchronous and asynchronous servomotors for SIMOVERT MASTERDRIVES	DA 65.3		
SIMODRIVE 611 universal and POSMO	DA 65.4		
<u>Low-Voltage Three-Phase-Motors</u>			
IEC Squirrel-Cage Motors	D 81.1		
MOTOX Geared Motors	D 87.1		
<u>Automation Systems for Machine Tools SIMODRIVE</u>	NC 60		
• Motors			
• Converter Systems SIMODRIVE 611/POSMO			
<u>Automation Systems for Machine Tools SINAMICS</u>	NC 61		
• Motors			
• Drive System SINAMICS S120			
SIMOTION, SINAMICS S120 and Motors for Production Machines	PM 21		
<u>Drive and Control Components for Hoisting Equipment</u>	HE 1		
<u>Mechanical Driving Machines</u>			
Flender Standard Couplings	MD 10.1		
<b>Electrical Installation Technology</b>			
<i>PDF: ALPHA Distribution Boards and Terminal Blocks</i>	ETA 1		
<i>PDF: ALPHA 8HP Molded-Plastic Distribution System</i>	ETA 3		
<i>PDF: BETA Low-Voltage Circuit Protection</i>	ET B1		
<i>PDF: DELTA Switches and Socket Outlets</i>	ET D1		
<i>PDF: GAMMA Building Management Systems</i>	ET G1		
<b>Motion Control</b>	<i>Catalog</i>		
SINUMERIK & SIMODRIVE Automation Systems for Machine Tools	NC 60		
SINUMERIK & SINAMICS Automation Systems for Machine Tools	NC 61		
SIMOTION, SINAMICS S120 and Motors for Production Machines	PM 21		
<b>Low-Voltage</b>			
Controls and Distribution – SIRIUS, SENTRON, SIVACON	LV 1		
Controls and Distribution – Technical Information	LV 1 T		
SIRIUS, SENTRON, SIVACON			
SIDAC Reactors and Filters	LV 60		
SIVENT Fans	LV 65		
SIVACON 8PS Busbar Trunking Systems	LV 70		
<b>Process Instrumentation and Analytics</b>			
Field Instruments for Process Automation	FI 01		
<i>PDF: Indicators for panel mounting</i>	MP 12		
SIREC Recorders and Accessories	MP 20		
SIPART, Controllers and Software	MP 31		
<i>PDF: Products for Weighing Technology</i>	WT 10		
Process Analytical Instruments	PA 01		
<i>PDF: Process Analytics, Components for the System Integration</i>	PA 11		
<b>SIMATIC HMI</b>			
Human Machine Interface Systems	ST 80		
<b>SIMATIC Industrial Automation Systems</b>			
Products for Totally Integrated Automation and Micro Automation	ST 70		
SIMATIC PCS 7 Process Control System	ST PCS 7		
Add-ons for the SIMATIC PCS 7 Process Control System	ST PCS 7.1		
Migration solutions with the SIMATIC PCS 7 Process Control System	ST PCS 7.2		
pc-based Automation	ST PC		
SIMATIC Control Systems	ST DA		
<b>SIMATIC NET</b>			
Industrial Communication	IK PI		
<b>SIMATIC Sensors</b>			
Sensors for Factory Automation	FS 10		
<b>Systems Engineering</b>			
Power supplies SITOP power and LOGO! Power	KT 10.1		
System cabling SIMATIC TOP connect	KT 10.2		
<b>System Solutions</b>			
Applications and Products for Industry are part of the interactive catalog CA 01			
<b>TELEPERM M Process Control System</b>			
<i>PDF: AS 488/TM automation systems</i>	PLT 112		

*PDF: These catalogs are only available as pdf files.*

[www.siemens.com/sinumerik](http://www.siemens.com/sinumerik)

**Siemens AG**

Industry Sector  
Drive Technologies  
Motion Control Systems  
Postfach 31 80  
91050 ERLANGEN  
GERMANY

[www.siemens.com/motioncontrol](http://www.siemens.com/motioncontrol)

*The information provided in this catalog contains descriptions or characteristics of performance which in case of actual use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of contract. Availability and technical specifications are subject to change without notice.*

*All product designations may be trademarks or product names of Siemens AG or supplier companies whose use by third parties for their own purposes could violate the rights of the owners.*

**Order No. E86060-K4460-A101-B3-7600**

**Token fee: 10.00 €**