

**SIEMENS**

# SIMOTION, SINAMICS S120 & SIMOTICS

Equipment for Production Machines










Motion Control

Catalog  
PM 21

Edition  
2013

Answers for industry.

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[www.siemens.com/automation/support](http://www.siemens.com/automation/support)
- Dimensional drawings of our motors in PDF/DXF format or via CAD CREATOR  
[www.siemens.com/cadcreator](http://www.siemens.com/cadcreator)
- Glossary for the explanation of terms and functions
- Catalog PM 21 · 2013 in electronic form (PDF format)



### Hardware and software requirements:

- Intel Pentium 1 GHz or higher
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- Screen resolution 1024 × 768 pixels
- CD-ROM drive, at least 16 ×
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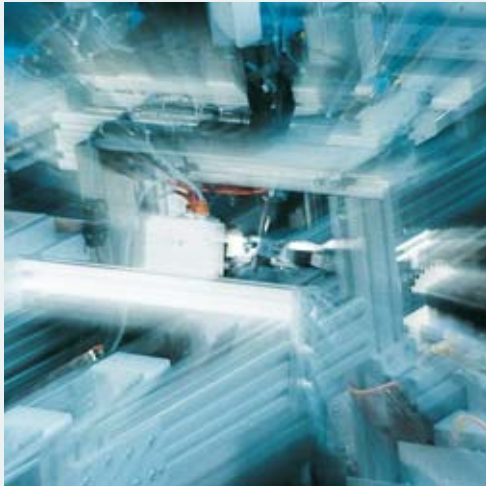
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# Motion Control SIMOTION, SINAMICS S120 & SIMOTICS

Equipment for Production Machines

Catalog PM 21 · 2013



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The products contained in this catalog can also be found in the Interactive Catalog CA 01.

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# SIMOTION Motion Control System

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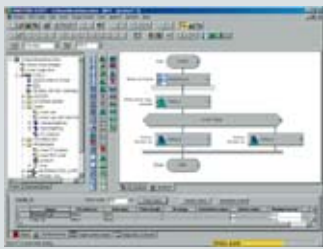
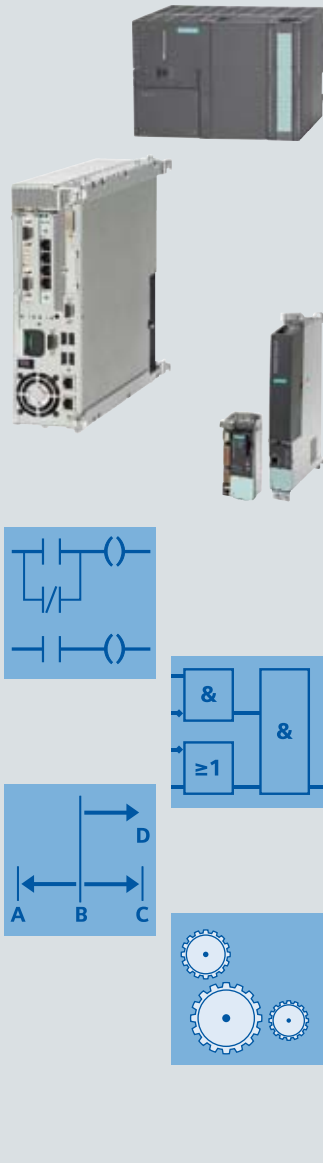
# SIMOTION Motion Control System

## Overview

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# SIMOTION Motion Control System

## Overview

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# SIMOTION Motion Control System

## SIMOTION C – Controller-based

### Overview of SIMOTION C

#### Overview



SIMOTION C is the controller variant of the SIMOTION family with the proven design of the SIMATIC S7-300. Flexible modular expansion of SIMOTION C is possible thanks to use of the SIMATIC S7 module spectrum. The SIMOTION C240 and C240 PN designs represent two powerful Motion Controllers for advanced control and motion control tasks.

Depending on the SIMOTION C platform, HMI devices can be operated directly on the onboard PROFIBUS, Ethernet or PROFINET interfaces for operator control and monitoring. Functions such as remote maintenance, diagnostics and tele-service can also be used via these interfaces.

#### Benefits

- Flexible application thanks to use of the SIMATIC S7-300 module spectrum and thus optimal adaptation to the automation task
- For universal use with digital and analog coupling to servo/ vector, stepper and hydraulic drives (depending on the variant)
- User-friendly mounting and simple design with no moving parts
- Versatile networking through onboard PROFIBUS DP, Industrial Ethernet and PROFINET IO interfaces
- Powerful thanks to a range of integrated functions
- Easy engineering for open-loop control and motion control applications in the same program

#### Application

##### *SIMOTION C can be used wherever:*

- Motion Control, technology and PLC functionalities are to be programmed, configured and executed in a single unit,
- a modularly expandable device is to be placed near or in the machine,
- communication with other programmable controllers is necessary.

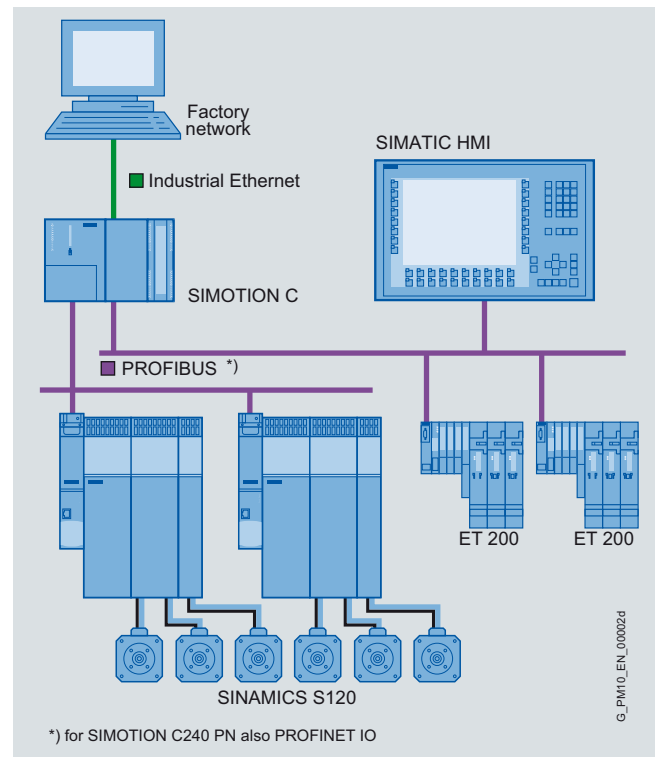
SIMOTION C is universally applicable and meets the highest standards with respect to suitability for industrial use, thanks to high EMC compatibility and resistance against shock and vibration loads.

##### *Important applications include:*

- Packaging machines
- Plastic and rubber processing machines
- Presses, wire-drawing machines
- Textile machines
- Printing machines
- Wood, glass, ceramics and stone working machines
- Retrofit

Due to the increasing use of servo drives, these machines require a high degree of integration of PLC, Motion Control and technology functions.

#### Design



SIMOTION C with central and distributed I/O

The SIMOTION C motion control system is designed with modular principles in mind. It consists of a comprehensive and individually combinable hardware spectrum that uses components of the SIMATIC S7-300 series and Siemens drive technology.

#### Design (continued)

##### Components and interfaces of the SIMOTION C Motion Controller:

- Analog drive interfaces (for C240)
  - For setpoint outputs to servo/vector drives
  - For setpoint outputs to the actuating valves of hydraulic drives
  - As analog outputs for optional use
- Pulse outputs for controlling stepper drives (for C240)
- Interfaces for incremental/absolute encoders for cyclic acquisition of an actual position value or as freely assignable up/down counter (for C240)
- Onboard I/O for high-speed I/O signals
- SIMOTION Micro Memory Card (MMC) for storing:
  - SIMOTION Kernel
  - User programs
  - User variables
- Integrated communications interfaces for linking:
  - Distributed I/Os
  - HMI systems
  - PG/PC
  - Other Motion Control and automation systems
  - Drives with digital setpoint interface
- Various status/error displays and mode selectors

##### The following components make up a SIMOTION C system:

- Motion Controller and Micro Memory Card (MMC)
- Other system components (depending on requirements) such as:
  - Load power supplies (PS) for connecting SIMOTION C to a power supply of 120 V/230 V AC
  - Central (not onboard) and distributed I/O components
  - Servo/vector drives with analog or digital setpoint interface or stepper drives

##### Mounting and connection technology

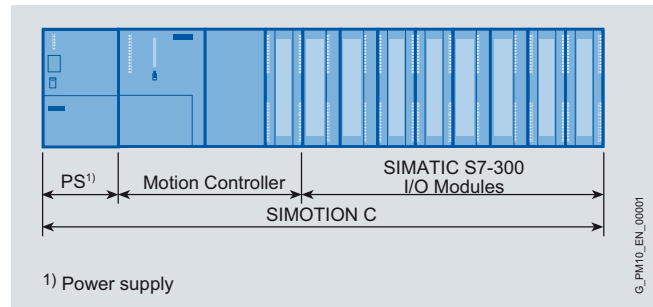
The simple design makes SIMOTION C flexible and easy to maintain:

- Rail mounting  
Simply attach the module to the standard mounting rail, swing it in and screw it tight.
- Integrated backplane bus  
The backplane bus is integrated in the Motion Controller. The Motion Controller is connected to the I/O modules via bus connectors which are plugged into the rear of the housing.
- The front connector design prevents front connectors from being plugged into the wrong module type.
- Screw-type terminals, spring-loaded terminals or FastConnect system for I/O modules.
- TOP connect  
This connection method provides pre-assembled wiring with 1 to 3-wire connection systems with screw-type or spring-loaded terminal as an alternative to wiring directly on the I/O module.
- This system uses a standard mounting depth since all connections and connectors are recessed in the module and are protected and covered by doors on the front.
- No slot rules.

##### Expansion with central I/O modules

Up to 8 slots can be used to the right of the Motion Controller for SIMATIC S7-300 I/O modules.

The IM 365 can be used to connect an expansion rack (two-tier design) to increase the number of slots available for I/O modules from 8 to 16. Multi-tier configuration with IM 360/IM 361 is not supported by SIMOTION C.



SIMOTION C can be mounted horizontally or vertically.

If additional I/O modules are required, the distributed SIMATIC ET 200 I/O can be connected to a SIMOTION C via PROFIBUS DP or PROFINET IO (for C240 PN).

The number of pluggable I/O modules is also limited by the power required from the backplane bus. The power consumption of all modules which are connected to the same backplane bus must not exceed 1.2 A.

##### Expansion using distributed I/Os

Distributed I/Os can be assembled with intelligent I/O system components:

- SIMATIC ET 200S
- SIMATIC ET 200SP (for C240 PN)
- SIMATIC ET 200M
- SIMATIC ET 200pro
- SIMATIC ET 200eco
- SIMATIC ET 200eco PN (for C240 PN)



# SIMOTION Motion Control System

## SIMOTION C – Controller-based

### Overview of SIMOTION C

#### Function

##### Basic functionality

SIMOTION C provides the following basic functionality for a wide variety of automation requirements:

- SIMOTION runtime system
  - User-programmable with several languages conforming to IEC 61131
  - Various methods of program execution (cyclic, sequential, event-driven)
  - PLC and arithmetic functionality
  - Communication and management functions
  - Motion Control functions (Motion Control Basic)
- Testing and diagnostic tools

This basic functionality can be expanded with loadable technology packages, if required.

##### SIMOTION technology packages

A special feature of SIMOTION is that the operating system functionality can be expanded by loading technology packages, such as:

- Motion Control with the functions:
  - POS – Positioning
  - GEAR – Synchronous operation/electronic gear
  - CAM – Cam
  - PATH – Path interpolation
- TControl – Temperature controller
- MIIF – Multipurpose Information Interface

Since the technology functions have modular licenses, you only pay for what you use.

##### Configuring/parameterizing/programming

SIMOTION SCOUT is a powerful and user-friendly engineering tool. It is an integrated system for all engineering steps, from configuring and parameterization, through programming, to testing and diagnostics. Graphical operator prompting, using dialog boxes and wizards, as well as text-based and graphical languages for programming, considerably reduce the familiarization and training periods.

##### Operator control and monitoring (HMI)

Communication utilities which support user-friendly data exchange with HMI devices are integrated in the basic functionality of the SIMOTION C Controller. Operator control and monitoring can be implemented using SIMATIC HMI devices, such as TPs (Touch Panels), OPs (Operator Panels) or MPs (Multi Panels).

These devices can be connected to a SIMOTION C via Industrial Ethernet, PROFIBUS or PROFINET (for C240 PN). They are configured using ProTool/Pro or WinCC flexible.

With the SIMATIC NET communication software, the open, standardized OPC interface is available for accessing SIMOTION from other Windows-based HMI systems.

SIMOTION IT provides SIMOTION C with an integrated Web server on which, for example, user-specific Web pages can be stored. Read and write access can be made to the Motion Controller variables. Java scripts or applets also allow the implementation of active operation and display functions in the Web pages that can be executed on a client PC with an Internet browser.

##### Process and data communication

Thanks to its integrated interfaces, SIMOTION C supports both process and data communication. The SCOUT engineering system is provided for user-friendly communication configuration and diagnostics.

#### More information

##### More information

- about power supplies and I/O modules can be found in chapter SIMOTION I/O components.
- about TOP connect can be found in Catalog KT 10.2 and in the Industry Mall under Automation Technology/Automation Systems/System cabling/ control cabinets/SIMATIC TOP connect system cabling.
- about the functionality of SIMOTION platforms can be found in section Overview of SIMOTION functions.
- about runtime software and engineering software can be found in section SIMOTION software.
- about the communication functions of the Motion Controllers can be found in section SIMOTION Runtime software.
- about operator control and monitoring can be found in chapter SIMOTION HMI devices.
- about SIMATIC NET communication software can be found in section SIMOTION runtime software.

# SIMOTION Motion Control System

## SIMOTION C – Controller-based

### SIMOTION C240/C240 PN Motion Controller

#### Overview



SIMOTION C is a Motion Controller in S7-300 design. In addition to the already integrated interfaces, the controller can be expanded using I/O modules from the SIMATIC S7-300 range.

The Motion Controller is available in two versions: SIMOTION C240 and SIMOTION C240 PN. Although the two C240 and C240 PN versions have the same PLC and motion control performance, they differ in their interfaces.

#### Design

##### Interfaces

###### Operation, display and diagnostics

- 1 × mode selector
- 1 × LED strip for fault and status indicators

###### Integrated I/Os

- 18 digital inputs (C240: of which 2 for local measuring inputs and 4 for global measuring inputs/zero marks, C240 PN: of which four for global measuring inputs)
- 8 digital outputs

###### Drive interfaces (C240)

- 1 × setpoint output interface for up to 4 axes (optionally for analog, stepper or hydraulic drives; also as freely assignable analog outputs)
- 4 × encoder inputs for incremental or absolute encoders (can also be used as freely assignable up/down counters)

###### Communication

- 1 × interface for Industrial Ethernet
- 2 × interfaces for PROFIBUS DP (of which one interface is for MPI)
- 3 × ports for PROFINET IO (C240 PN)

###### Data backup

- 1 × slot for SIMOTION Micro Memory Card (MMC)

###### Additional interfaces

- Power supply terminals

##### Data storage/data backup

SIMOTION C Motion Controllers have an integrated non-volatile data memory for storing process variables.

The data is backed up on a SIMOTION Micro Memory Card (MMC).

##### Expansion with central I/O modules

The central I/O is plugged directly into the SIMOTION C Motion Controller. The I/O configuration for centralized I/O can comprise of two tiers (second tier using IM 365 interface) with up to 8 I/O modules each and a total of 4 analog modules. I/O modules from the SIMATIC S7-300 spectrum can be used here.

##### Expansion using distributed I/Os

The following can be used as distributed I/O components:

###### PROFIBUS DP:

- All certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- SIMATIC ET 200S/M/eco/pro distributed I/O systems
- Servo converters of the MASTERDRIVES, SIMODRIVE and SINAMICS series over PROFIBUS DP interface with PROFIdrive
- MICROMASTER and COMBIMASTER frequency inverters
- Stepper drives over PROFIBUS DP interface with PROFIdrive

###### PROFINET IO (C240 PN):

- SIMATIC ET 200S/SP/M/pro/eco PN distributed I/O systems
- SINAMICS S120 servo converters over PROFINET IO with IRT (PROFIdrive)

# SIMOTION Motion Control System

## SIMOTION C – Controller-based

### SIMOTION C240/C240 PN Motion Controller

#### Function

The control and motion control functionality runs centrally on the SIMOTION C controller.

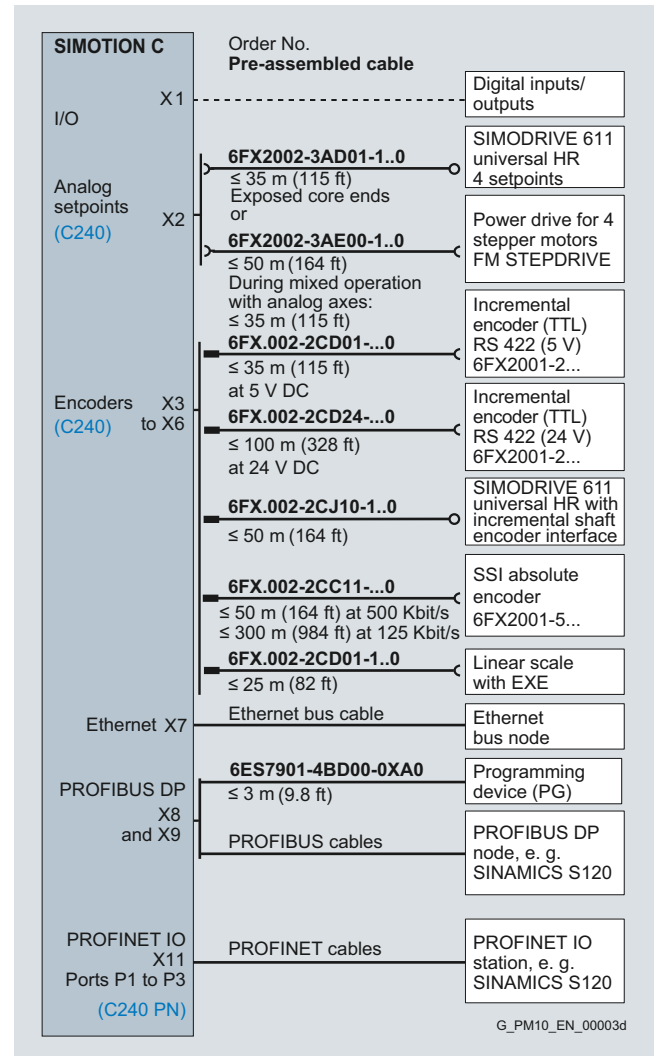
The functionality ranges from simple positioning to complex motion control tasks over cams and interpolation.

#### Position-controlled motion control

##### Setpoint output/actual value acquisition

- Position control with analog setpoint output  
For each axis, the SIMOTION C240 Motion Controller provides one analog output for the speed setpoint and one encoder input for cyclic detection of the actual position value. In the case of hydraulic drives, the setpoint for the positioning valve is specified via the analog output.
- Position control with pulse direction output for stepper drives  
For each axis, the SIMOTION C240 Motion Controller provides one pulse output for the position setpoint. Stepper drives can either be operated without an encoder or be position-controlled with an encoder.
- Position control with digital setpoint output  
The PROFIBUS DP interface with PROFIdrive or the PROFINET interface for the C240 PN is available for this purpose. The actual position value is fetched over PROFIBUS DP or PROFINET and the speed setpoint is output.
- Position control with mixed setpoint output  
Analog, stepper and PROFIBUS drives can be used in a mixed configuration on the SIMOTION C240 Motion Controller. The channels of the 4 onboard interfaces can be used for analog, stepper or hydraulic drives. PROFIBUS and PROFINET drives can be operated as mixed configuration for the C240 PN.
- Incremental position sensing (C240)  
Incremental encoders supply counter pulses for the traversed distance according to their resolution. It is usually necessary to search for homing references. The following can be used:
  - Rotary encoders
  - Linear encoders (length dimensions)
- Absolute position sensing (C240)  
Absolute encoders with serial interface can be used (SSI absolute encoders). It is not necessary to search for homing references.
- Position control/position sensing over ADI 4 or IM 174  
The ADI 4 (Analog Drive Interface for 4 Axes) or IM 174 (Interface Module for 4 Axes) module can be used to connect drives with analog setpoint interfaces. The IM 174 also supports the connection of stepper drives with a pulse direction interface. Both modules are connected over PROFIBUS DP. The following can be connected to an ADI 4 or IM 174 module:
  - 4 drives
  - 4 encoders
  - Digital inputs and outputs
- Isochronous PROFIBUS encoder

#### Integration



Overview of connections for SIMOTION C

The maximum permissible cable lengths should be taken into account when planning the cable layout.

Functional faults can occur when using longer cables.

The permissible length of PROFIBUS DP cables depends on the configuration.

#### Technical specifications

PLC and motion control performance	
Maximum number of axes	32
Minimum PROFIBUS cycle	1 ms
Minimum PROFINET send cycle (C240 PN only)	0.5 ms
Minimum servo/interpolator clock cycle	0.5 ms
Memory	
RAM (Random Access Memory)	50 MB
RAM disk (load memory)	29 MB
Retentive memory	107 KB
Persistent memory (user data on MMC)	50 MB
Communication	
Ethernet interfaces	1
PROFIBUS interfaces	2
PROFINET interfaces (C240 PN only)	<ul style="list-style-type: none"> <li>• 1 interface with 3 ports</li> <li>• Supports PROFINET IO with IRT and RT</li> <li>• Can be configured as PROFINET IO controller and/or device</li> </ul>
General technical specifications	
<b>Supply voltage</b>	
• Rated value	24 V DC
• Permissible range	20.4 ... 28.8 V
<b>Current consumption, typ.</b>	1.2 A
<b>Starting current, typ.</b>	8.0 A
<b>Power loss</b>	15 W
<b>Permissible ambient temperature</b>	
• Storage and transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Permissible relative humidity (without condensation)</b>	5 ... 95 %
<b>Atmospheric pressure</b>	700 ... 1060 hPa
<b>Degree of protection acc. to EN 60529 (IEC 60529)</b>	IP20
<b>Dimensions (W x H x D)</b>	200 x 125 x 118 mm (7.87 x 4.92 x 4.65 in)
<b>Weight</b>	
• SIMOTION C2xx	1150 g (2.54 lb)
• Memory card	16 g (0.56 oz)
<b>Relay outputs</b>	<b>5 (C240)</b> <b>1 (C240 PN)</b>
of which for	
• Controller enable (C240 only)	4
• READY	1
<b>Electrical data</b>	
• Max. operational voltage	50 V DC
• Max. switching current	1 A
• Max. switching capacity	30 W
<b>Operating cycles</b>	
• at 24 V, 1 A	3 x 10 <sup>6</sup>

<b>Drive interfaces (C240 only)</b>	<b>4</b>
Can be optionally used for analog, stepper or hydraulic drives, alternatively also as standard analog outputs	
<b>When used as an analog output</b>	
• Voltage range	± 10.5 V
• Resolution	16 bit, including sign
• Galvanic isolation	No
• Load impedance	≥ 3 kOhm
• Max. cable length	35 m (114 ft)
<b>When used as a pulse output for stepper drives</b>	
• Output voltage for "1" signal, I <sub>O</sub> = -20 mA	3.7 V
• Output voltage for "0" signal, I <sub>O</sub> = 20 mA, max.	1 V
• Load resistance, min.	55 Ω
• Max. cable length	50 m (164 ft)
• Max. pulse frequency	750 kHz
<b>Integrated digital inputs</b>	<b>18</b>
of which with special functions for:	
• Measuring input (C240 only)	2
• BERO connection (can also be used as measuring input for C240, can only be used as measuring input for C240 PN)	4
(all inputs can be used as standard inputs)	
<b>Input voltage</b>	
• Rated value	24 V DC
• For "1" signal	11 ... 30 V
• For "0" signal	-3 ... +5 V
<b>Galvanic isolation</b>	
• Inputs in groups of	18
<b>Input current</b>	
• For signal "1", min. / typ.	6 mA/8 mA
<b>Input delay (at rated value of input voltage)</b>	
• 0 → 1, typ./max.	6 μs/15 μs
• 1 → 0, typ./max.	40 μs/150 μs
<b>Connection of 2-wire BERO</b>	Yes
• Permitted quiescent current	2 mA
<b>Integrated digital outputs</b>	<b>8</b>
• of which for fast output cam, max.	8
<b>Rated load voltage</b>	24 V DC
• Permissible range	20.4 ... 28.8 V
<b>Output voltage</b>	
• For signal "1", max.	L+
<b>Galvanic isolation in groups of</b>	8

# SIMOTION Motion Control System

## SIMOTION C – Controller-based

### SIMOTION C240/C240 PN Motion Controller

#### Technical specifications (continued)

<b>Output current</b>	
• For signal "1", minimum current per channel	5 mA
• For signal "0", max.	0.5 mA
<b>Residual current, max.</b>	2 mA
<b>Derated loading</b>	
• at 40 °C (104 °F)	4 A
• at 55 °C (131 °F)	2 A
<b>Switching frequency of the outputs</b>	
• With resistive load	100 Hz
• With inductive load	2 Hz
<b>Lamp load</b>	5 W
<b>Purge energy/channel</b>	400 mJ (not simultaneous)
<b>Typ. output delay</b>	150 µs
<b>Short-circuit protection</b>	Yes
<b>Encoder inputs, max. (C240 only)</b>	<b>4</b>
Optionally for incremental or absolute encoder Can be used alternatively as up/down counter	
<b>Incremental encoder inputs</b>	
• Interface type (RS 422)	5 V
• Encoder supply	5 V/0.3 A
• Galvanic isolation	No
• Encoder frequency, max.	1 MHz
• Max. cable length	
- at 1 MHz	10 m (32.81 ft)
- at 500 kHz and 300 mA	25 m (82.03 ft)
- at 500 kHz and 210 mA	35 m (114 ft)
<b>Inputs, SSI absolute encoder</b>	
• Interface type (RS 422)	5 V synchronous serial, single or multiterm
• Encoder supply	24 V/0.3 A
• Galvanic isolation	No
• Transfer rate	187.5/375/750/1500 kbit/s
• Message length, max.	25 bit
• Max. cable length	
- at 187.5 kbit/s	250 m (820 ft)
- at 1500 kbit/s	10 m (32.81 ft)
<b>Monitoring</b>	
• Short-circuit of the sensor supply	Yes
• Wire break	Yes
<b>Additional technical specifications</b>	
<b>Real-time clock buffering</b>	
• Buffer time, typ.	4 weeks
• Charging time, typ.	1 h
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>SIMOTION C240 Motion Controller</b> (SIMOTION V4.0 HF2 is required)	<b>6AU1240-1AA00-0AA0</b>
<b>MultiAxes Bundle SIMOTION C240</b> Consists of 1 item each	<b>6AU1240-1AA00-0CA0</b>
• SIMOTION C240 Motion Controller • Micro Memory Card (MMC) 64 MB with MultiAxes Package license for SIMOTION C	
<b>SIMOTION C240 PN Motion Controller</b> (≥ SIMOTION V4.1 SP2 HF 3/4)	<b>6AU1240-1AB00-0AA0</b>
<b>MultiAxes Bundle SIMOTION C240 PN</b> Consists of 1 item each	<b>6AU1240-1AB00-0CA0</b>
• SIMOTION C240 PN Motion Controller • Micro Memory Card (MMC) 64 MB with MultiAxes Package license for SIMOTION C	
<b>Micro Memory Card (MMC) 64 MB</b> for SIMOTION C240/C240 PN <a href="#">Pre-installed license can be obtained using additional order codes <sup>1)</sup></a>	<b>6AU1720-1KA00-0AA0</b>
<b>Micro Memory Card (MMC) 64 MB</b> for SIMOTION C240/C240 PN with MultiAxes Package license for SIMOTION C	<b>6AU1720-1KA00-0AA0 -Z M24</b>

<sup>1)</sup> See Ordering of licenses for runtime software on page 9/63.

# SIMOTION Motion Control System

## SIMOTION C – Controller-based

### SIMOTION C240/C240 PN Motion Controller

#### Accessories

Description	Order No.
<b>Accessories for SIMOTION C240/C240 PN</b>	
<b>Front connector, 40-pin</b> for connection of onboard I/Os	
• With screw contacts	<b>6ES7392-1AM00-0AA0</b>
• With spring-loaded contacts	<b>6ES7392-1BM01-0AA0</b>
• With FastConnect fast connection method	<b>6ES7392-1CM00-0AA0</b>
<b>Connecting comb PS – C2xx</b> for PS307 power supply	<b>6ES7390-7BA00-0AA0</b>
<b>IM 365 Interface Module</b> for expanding the Motion Controller with max. 1 expansion unit, 2 modules with permanent connecting cable (1 m (3.28 ft))	
• Standard temperature range	<b>6ES7365-0BA01-0AA0</b>
<b>SIMATIC S7-300 mounting rail</b>	
• L = 160 mm (6.30 in)	<b>6ES7390-1AB60-0AA0</b>
• L = 480 mm (18.90 in)	<b>6ES7390-1AE80-0AA0</b>
• L = 530 mm (20.87 in)	<b>6ES7390-1AF30-0AA0</b>
• L = 830 mm (32.68 in)	<b>6ES7390-1AJ30-0AA0</b>
• L = 2000 mm (78.74 in)	<b>6ES7390-1BC00-0AA0</b>
<b>Accessories for PROFINET</b>	
<b>RJ45 FastConnect plug connector for Industrial Ethernet/PROFINET</b>	
• 145° cable outlet	
- 1 pack = 1 unit	<b>6GK1901-1BB30-0AA0</b>
- 1 pack = 10 units	<b>6GK1901-1BB30-0AB0</b>
<b>FastConnect cables for Industrial Ethernet/PROFINET<sup>1)</sup></b>	
• IE FC Standard Cable GP 2x2	<b>6XV1840-2AH10</b>
• IE FC Flexible Cable GP 2x2	<b>6XV1870-2B</b>
• IE FC Trailing Cable GP 2x2	<b>6XV1870-2D</b>
• IE FC Trailing Cable 2x2	<b>6XV1840-3AH10</b>
• IE FC Marine Cable 2x2	<b>6XV1840-4AH10</b>
<b>Stripping tool for Industrial Ethernet/PROFINET FastConnect cables</b>	
• IE FC stripping tool	<b>6GK1901-1GA00</b>

#### More information

For more information about PROFIBUS DP, Industrial Ethernet and PROFINET, please refer to Catalog IK PI and the Industry Mall under Automation Technology/Industrial Communication.

#### **SIZER for Siemens Drives engineering tool**

With the SIZER for Siemens Drives engineering tool, you can easily configure the SINAMICS S120 drive family including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting utilization with SIZER for Siemens Drives in accordance with your performance requirements.

For more information about SIZER for Siemens Drives, refer to chapter System description – Dimensioning.

<sup>1)</sup> Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft)

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### Overview of SIMOTION P

#### Overview



#### *SIMOTION P – the PC-based variant*

SIMOTION P is a PC-based, open Motion Control System which is available in two variants:

- SIMOTION P320-3 for **embedded** PC solutions operating on Windows Embedded Standard 2009
- SIMOTION P350-3 for high-performance applications operating on Windows XP.

PLC, Motion Control, and HMI functions are executed together with standard PC applications on one platform. Benefits to the user: Using the PC platform and the Microsoft Windows operating system, with a real-time expansion for SIMOTION – the advantages of both worlds are combined in SIMOTION P:

#### *Openness thanks to the Windows operating system*

With SIMOTION P, you can enhance your machine's performance using technology normally associated with the office environment:

- Flexible networking
- High storage capacity for data
- Data backup concepts
- Integrated communication

Complex data evaluation, visualization tasks and even engineering can be easily implemented with SIMOTION P directly on the PC. When HMI software from other engineering systems is needed, the standardized OPC server interface can be used.

Functions such as remote maintenance, diagnostics and tele-service can also be used via the integrated Ethernet interface. The standard applications of the PC world are also available for your motion applications for example:

- Hardware, such as a printer, keyboard, mouse
- Software, such as visualization software or Microsoft Office programs.

#### *Real-time capability thanks to the SIMOTION operating system*

The fully independent SIMOTION operating system runs parallel with Windows on SIMOTION P. This real-time expansion makes it possible to implement complex motion control applications with high performance requirements on platforms of the SIMOTION P range. A Windows "bluescreen" does not interrupt the motion control application, as the real-time operating system of SIMOTION P can continue running despite this type of error condition.

#### *Powerful PC technology*

- The latest PC processor technology ensures optimum performance.
- Fast instruction execution opens up completely new application possibilities in the mid-performance to high-performance range.

#### Benefits

- Open-loop control, motion control, technology, visualization and standard Microsoft applications on the same platform – ready to use without the need for time-consuming installation
- Performance gains due to the latest, powerful PC processor architecture
- Easy configuration of HMI functions using WinCC flexible
- Openness to standard applications on the basis of the Windows operating system
- Standard PC communication mechanisms can be used over Industrial Ethernet
- Easy software updates
- User-friendly operation
- Flexible networking over the communication interfaces provided. For example, PROFIBUS DP, PROFINET and Industrial Ethernet available.
- Powerful thanks to a range of integrated functions
- Easy engineering for open-loop control and motion control applications in the same program

#### Application

##### *SIMOTION P320-3 is ideal for applications for which*

- the available mounting space is minimal
- rugged hardware is extremely important, without rotating parts such as fan or hard disk
- no display is needed in normal operation (headless mode). Connections are available for operation of a monitor or display.
- Windows Embedded Standard is required as the operating system.

##### *SIMOTION P350-3 is ideal for high-performance applications for which*

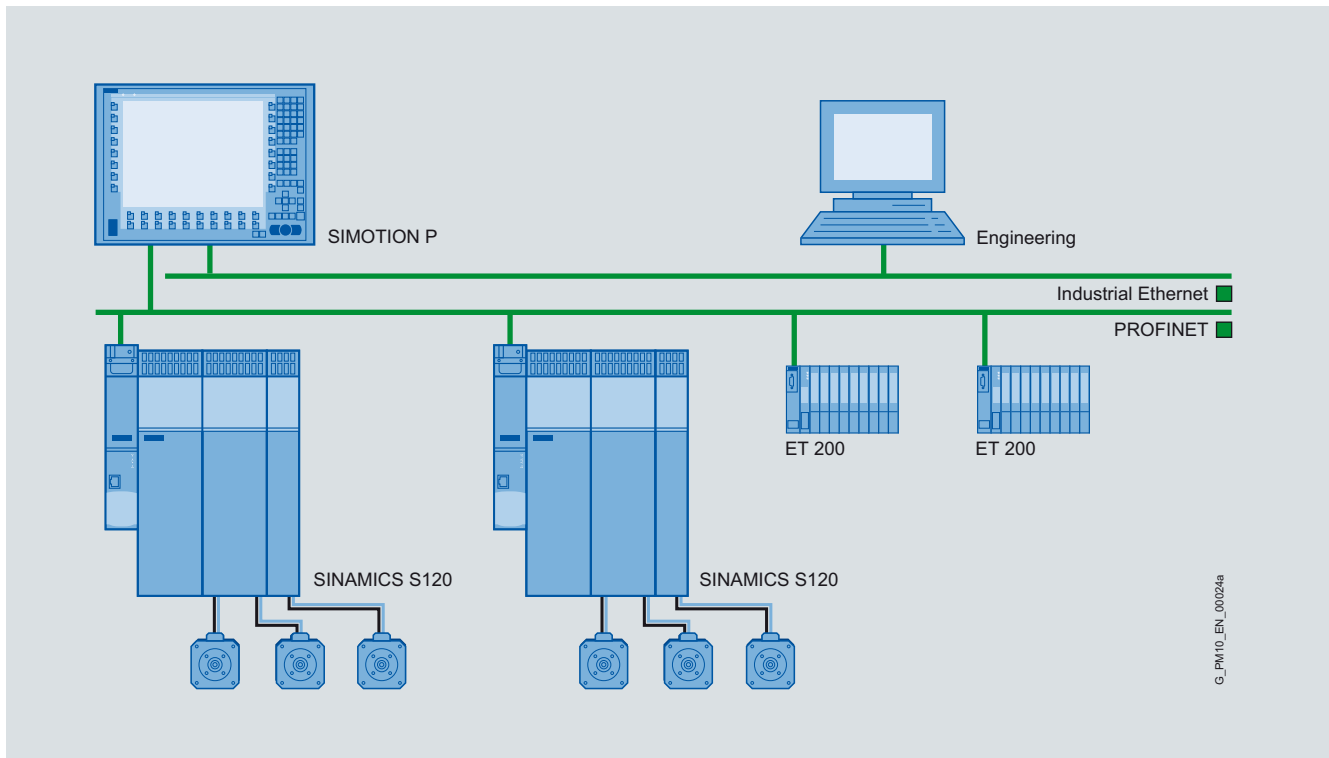
- complex data management and data evaluation are required
- motion control, open-loop control and HMI functions need to be implemented on one platform to save space
- highly dynamic position and pressure control loops are needed for hydraulic applications
- the openness provided by the Windows operating system can be optimally utilized (software, drivers, etc.)

##### *Important applications include:*

- Packaging machines
- Plastic and rubber processing machines
- Presses, wire-drawing machines
- Textile machines
- Printing machines
- Wood, glass, ceramics and stone working machines
- Production lines in the renewable energy sector, e.g. solar technology, wind power installations.

Due to the increasing use of servo drives, these machines require a high degree of integration of PLC, motion control and technology functions.

## Design



Typical design of an automation solution using SIMOTION P

### Equipment provided on SIMOTION P basic units

The SIMOTION P320-3 and P350-3 Motion Controllers are ready-to-run PC systems comprising:

- SIMOTION P320-3 or P350-3 hardware platform
- Windows operating system and real-time expansion for SIMOTION P
- SIMOTION Kernel
- Communication interfaces for flexible networking, e.g. PROFIBUS DP, PROFINET IO and Industrial Ethernet, depending on the device and device variant.

### Power supplies for SIMOTION P

SIMOTION P systems require a 24 V operating voltage. We recommend that you use an uninterruptible power supply (UPS). For the connection to a 120/230/400 V voltage source, you will require one of the following power supplies, for example:

- SIMATIC PS 307 or
- SITOP power and DC-UPS module.

### Operator control and monitoring

Displays and monitors can be directly connected to SIMOTION P320-3 and SIMOTION P350-3 Motion Controllers by means of the graphics interfaces featured on both types of controller. With the Panel PC Remote Kit, it is possible to operate SIMOTION P panel fronts at a distance of up to 30 m (98.4 ft) from Motion Controllers. SIMATIC Flat Panels offer the additional option of distributed configuration.

### Engineering

Engineering is performed either using a separate programming device or, in the case of SIMOTION P350-3, directly on the SIMOTION P system.

### Communication interfaces on SIMOTION P320-3

With its integrated PROFINET Communication Board with 3 ports, SIMOTION P320-3 can be connected to a PROFINET IO network. The PROFINET board supports PROFINET IO with IRT and RT. Standard Ethernet communication (TCP/IP) is also possible over this interface.

### Communication interfaces on SIMOTION P350-3

#### PROFIBUS version

The connection to a PROFIBUS network is made via the integrated IsoPROFIBUS board. This is a PCI card with two ports for PROFIBUS DP (max. 12 Mbit/s). Users can parameterize the clock-pulse rate on the bus. Optionally, the user can define one of the two PROFIBUS DP interfaces as programming interface (MPI protocol).

If required, PROFINET can also be retrofitted to the PROFIBUS version which will then support PROFIBUS and PROFINET communication in the same device.

#### PROFINET version

The connection to a PROFINET network is made via the integrated MCI-PN board. This Programming of motion PCI card with four Ethernet ports and integrated switch functionality. The PROFINET board supports PROFINET IO with IRT and RT. Standard Ethernet communication (TCP/IP) is also possible over this interface.

### Integration in Local Area Networks

With the onboard Industrial Ethernet interface, the SIMOTION P systems are prepared for integration in LANs (Local Area Networks). An external operator station or an engineering system can also be connected (e.g. for remote maintenance).



# SIMOTION Motion Control System

## SIMOTION P – PC-based

### Overview of SIMOTION P

#### Design (continued)

##### Expansion using distributed I/Os

SIMOTION P320-3 and P350-3 Motion Controllers can control (depending on device and device variant) drives and distributed I/O modules over PROFIBUS DP or PROFINET. Suitable I/O systems include, for example:

- SIMATIC ET 200S
- SIMATIC ET 200SP
- SIMATIC ET 200M
- SIMATIC ET 200pro
- SIMATIC ET 200eco, ET 200eco PN

The high-performance I/O systems transfer the required process signals digitally and free of interference to the SIMOTION P system.

##### High-speed I/Os for time-critical applications

Cycle times of 250 µs can be achieved with SIMOTION P, PROFINET and the ET 200S distributed I/O system with interface module IM 151-3 PN High Speed. This is particularly necessary for applications with fast response times (e.g. hydraulic axes).

#### Function

##### System concept

The control and motion control software execute on the SIMOTION Kernel basic system.

The internal PC communication provides high-performance data exchange between the SIMOTION Kernel and the Microsoft Windows operating system. Further processing of this data, e.g. using OPC server, is possible in any Microsoft programs.

##### SIMOTION basic functionality

The SIMOTION P systems provide the following basic functionality for a wide variety of automation requirements:

- SIMOTION runtime system
  - User-programmable with several languages conforming to IEC 61131
  - Various methods of program execution (cyclic, sequential, event-driven)
  - PLC and arithmetic functionality
  - Communication and management functions
  - Technology functions for Motion Control Basic
- Testing and diagnostic tools

This basic functionality can be expanded with loadable technology packages, if required.

##### SIMOTION technology packages

A special feature of SIMOTION is that the operating system functionality can be expanded by loading technology packages, such as:

- Motion Control with the functions
  - POS – Positioning
  - GEAR – Synchronous operation/electronic gear
  - CAM – Cam
  - PATH – Path interpolation
- TControl – Temperature controller
- MIIF – Multipurpose Information Interface

Since the technology functions have modular licenses, you only pay for what you will actually use: "pay only for what you need"

##### Configuring/parameterizing/programming

SIMOTION SCOUT is a powerful and user-friendly engineering tool. It is an integrated system for all engineering steps, from configuring and parameterization, through programming, to testing and diagnostics. Graphical operator prompting, using dialog boxes and wizards, as well as text-based and graphical languages for programming, considerably reduce the familiarization and training periods.

##### Operator control and monitoring (HMI)

Operator control and monitoring can be performed

- separately on an HMI panel or
- directly on the SIMOTION P panel.

Communication utilities which support user-friendly data exchange with HMI systems are integrated in the basic functionality of SIMOTION P. Both PROFIBUS/PROFINET and Industrial Ethernet can be used for communication. The SIMOTION Kernel processes the data exchange independently.

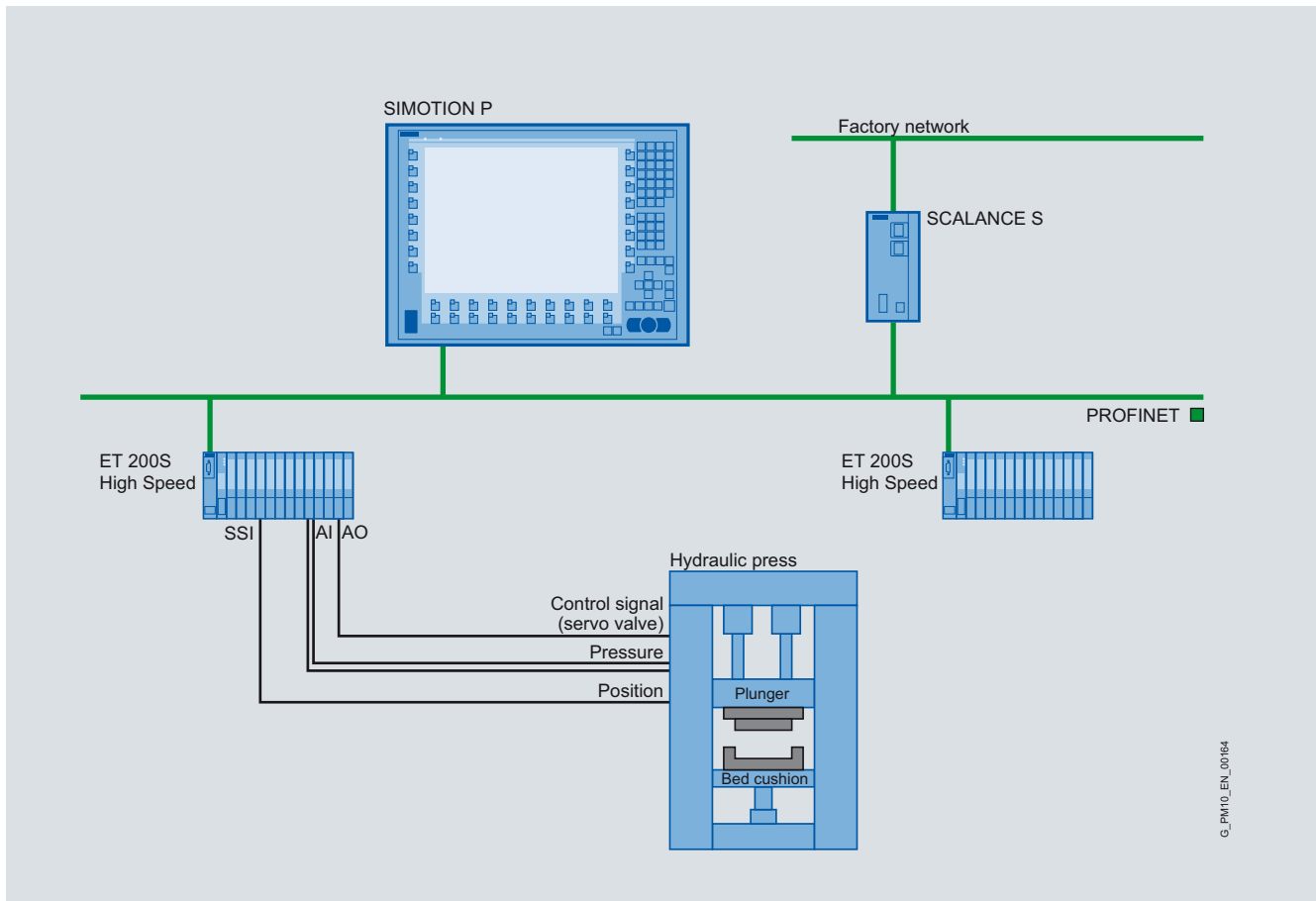
SIMATIC WinCC flexible is the standard HMI system for SIMOTION P. This HMI system can directly configure the data from a SIMOTION project. SIMOTION panel fronts can be used for operation and visualization. SIMOTION P panel fronts are connected directly via the LVDS interface in the case of SIMOTION P350-3 and by means of the Panel PC Remote Kit in the case of SIMOTION P320-3.

With the SIMATIC NET communication software, an open, standardized OPC interface is available for accessing SIMOTION from other Windows-based HMI systems.

##### Process and data communication

Thanks to its integrated interfaces, SIMOTION P supports both process and data communication. The SCOUT engineering system is provided for user-friendly communication configuration and diagnostics.

#### Function (continued)



G\_PM10\_EN\_00164

Example: Closed-loop control of a hydraulic press with SIMOTION P350-3

#### Position-controlled motion control for servo drives

##### Drives with digital setpoint interface

SIMOTION P Motion Controllers enable position-controlled motion control for drives with digital setpoint interfaces via PROFIBUS DP (P350) or PROFINET IO with PROFIdrive.

##### Drives with analog setpoint interface (for retrofitting)

The ADI 4 (Analog Drive Interface for 4 Axes) or IM 174 (Interface Module for 4 Axes) module can be used to connect drives with analog  $\pm 10$  V setpoint interface in the case of SIMOTION P350-3.

The IM 174 Interface Module also supports the connection of stepper drives with a pulse direction interface.

Both modules are connected over PROFIBUS DP.

The following can be connected to an ADI 4 or IM 174 module:

- 4 drives
- 4 encoders
- Digital inputs and outputs.

#### Position control and pressure control for hydraulic drives

With SIMOTION P and the new SIMATIC ET 200S High Speed I/O, cycle times down to 250  $\mu$ s can be achieved over PROFINET with IRT (Isochronous Real Time).

Highly dynamic control loops can therefore be achieved for hydraulic applications with position and pressure control.

The necessary sensors and actuators, such as

- position encoders connected through the SSI interface,
- pressure sensors connected through analog inputs (AI),
- servo valves connected through analog outputs (AO) and
- digital I/O for tool safety and cam signal output

are connected over the SIMATIC ET 200S distributed I/O system, which was equipped with the necessary high-speed I/O modules beforehand to suit the application.

On the basis of PROFINET, it is therefore possible to synchronize hydraulic drives as well as electrical drives. In conveyor systems and press lines in the automotive industry, plant-wide automation solutions can be implemented in which both electrical drives (winders, cross cutters, roller feeds) and hydraulic drives (e.g. deep-drawing presses) are implemented.

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### Overview of SIMOTION P

#### Function (continued)

##### Indication and diagnostics of operating status

A SIMOTION P system does not have any pushbuttons or switches for changing operating modes (RUN/STOP). This task is performed (when a monitor/display is connected) by a software monitor (SIMOTION P State), which is operated using the keyboard or mouse.



SIMOTION P State

This monitor shows the operating states during start-up and operation. Other functions are, for example, loading (Restore) and saving (Save) user programs or starting (Restart) or shutting down (Terminate) the Motion Controller. During shutdown, important data (retain data) are stored on the IsoPROFIBUS board or MCI-PN PROFINET board (internally on SIMOTION P320-3) while the device's power supply is shutting down so that the most up-to-date data is ready for use as soon as the device is restarted.

The SIMOTION P intelligent diagnostic system constantly controls the functionality of the system and registers errors or specific system events (e.g., timing errors, module or network failures). In addition, PC-specific functions, such as fan speeds or temperatures, are continuously controlled and alarms generated in the case of failure on SIMOTION P350-3.

The stability of the SIMOTION Kernel is **independent** of the Windows operating system. Even in the event of a Windows operating system crash (Windows bluescreen), SIMOTION P continues to run and the machine can be shut down safely according to user specifications.

#### More information

##### More information

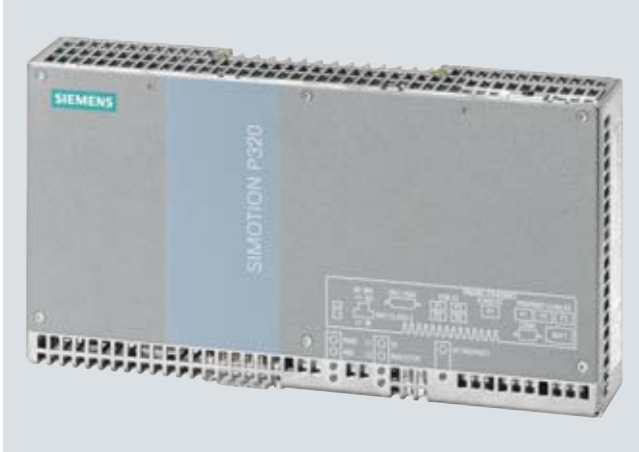
- about suitable I/O modules for SIMOTION can be found in chapter SIMOTION I/O components.
- about the functionality of SIMOTION platforms can be found in section Overview of SIMOTION functions.
- about engineering and the SIMOTION runtime system can be found in section SIMOTION software.
- about operator control and monitoring can be found in chapter SIMOTION HMI devices.
- about SIMATIC NET communication software can be found in section SIMOTION runtime software.
- about the SIMATIC Panel PC Remote Kit can be found in section Supplementary components.

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### SIMOTION P320-3 Motion Controller

#### Overview



The SIMOTION P320-3 Motion Controller is a high-performance, ultra compact and maintenance-free embedded industrial PC. This product expands the PC-based hardware platform of the SIMOTION range by an Embedded PC for motion control tasks.

The SIMOTION P320-3 hardware is based on the latest generation of the SIMATIC Microbox PC and therefore offers the following benefits:

- High performance: Thanks to state-of-the-art Intel processor technology
- Rugged: No rotating parts (no fan, no hard disk)
- Compact: With very small mounting dimensions
- Flexible in use: Thanks to a variety of installation methods.

In addition to the Windows Embedded Standard 2009 operating system, the proven successful real-time expansion for SIMOTION is also installed.

#### Flexible application in operation

SIMOTION P320-3 can be operated in a variety of different modes:

- Headless mode:  
SIMOTION P320-3 can be operated in so-called "headless" mode: In other words, it can be operated without display, monitor or panel front.
- Operation with display or monitor:  
Standard SIMATIC displays or monitors can be connected at a distance of up to 5 m (16.4 ft) via the integrated DVI interface.
- Operation with SIMOTION P panel fronts:  
The SIMATIC Panel PC Remote Kit can be used to connect SIMOTION P320-3 to the panel fronts for SIMOTION P. The panel fronts can be installed at a distance of up to 30 m (98.4 ft) from SIMOTION P320-3.

#### PC-based CompactFlash card replaces hard disk

In order to enhance the rugged design of the system, SIMOTION P320-3 contains no rotating parts at all. A PC-based CompactFlash card is used instead of a hard disk. No tools are needed to insert or remove this card.

#### Enhanced Write Filter (EWF) reduces write cycles

When a computer with Windows operating system is running, large volumes of information are buffered on the hard disk or, alternatively, on a CompactFlash memory. However, frequent write cycles reduce the service life of the hard disk or CompactFlash memory.

Using the Enhanced Write Filter avoids this problem. The data is initially written to RAM. This ensures, for example, that changes made at the commissioning stage do not take effect until they are stored by command on the PC-based CompactFlash card.

Changes made by mistake are not permanent. When the PC is switched on again, it boots to the initial delivery state again until changes have been stored on the CompactFlash card. The PC is always restarted from the data stored on the PC-based CompactFlash card.

The Enhanced Write Filter (EWF) is deactivated in the delivery state.

#### High system availability

The following features of the SIMOTION P320-3 Motion Controller afford an especially high degree of system availability:

- Integrated monitoring functions for battery, temperature and program execution
- LEDs on front panel for efficient diagnosis
- Integrated power supply with bridging of supply failures

#### PC technology

- Processor: Intel Core 2 Solo, 1.2 GHz
- Operating system: Windows Embedded Standard 2009
- Memory: 2 GB DDR3 SDRAM
- 4 GB CompactFlash card
- Data backup/restore using the SIMATIC IPC Image & Partition Creator data backup software (optional)

#### Series commissioning with optional USB Flash Drive

For the purpose of commissioning several Motion Controllers at once, it is possible to copy a pregenerated data image to the CompactFlash drive using SIMATIC IPC Image & Partition Creator (own software).

The SIMATIC IPC Image & Partition Creator must either be ordered separately, or is pre-installed on the SIMATIC IPC USB Flash Drive (USB stick) ([see selection and ordering data](#)).

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### SIMOTION P320-3 Motion Controller

#### Design

##### Interfaces

###### Display and diagnostics

With SIMOTION P320-3, the display and diagnostics functions for the operating states are performed by a software monitor, which takes the form of an application window on a connected screen. This software monitor can be operated using your keyboard, mouse or touch panel.

###### Integrated interfaces

- 1 x COM 1 (V.24)
- 1 x DVI
- 4 x USB 2.0
- 1 x Industrial Ethernet (10/100/1000 Mbit/s)
- 1 x PROFINET IO (1 interface with 3 ports)

##### Operator control and monitoring

- SIMOTION P320-3 can be operated without display, monitor or panel front ("headless" mode).
- Monitors and displays can be connected by means of the integrated DVI interface.
- SIMOTION P panel fronts can be connected to SIMOTION P320-3 by means of the SIMATIC Panel PC Remote Kit.

##### Panel fronts for SIMOTION P

The following SIMOTION P panel fronts are available:

- 12" with membrane-type keys
- 12" for touch screen operation, and
- 15" for touch screen operation.

##### Communication via PROFINET

SIMOTION P320-3 can be linked to a PROFINET IO network by means of the integrated PROFINET interface with 3 ports. This means that in terms of PROFINET, SIMOTION P320-3 is a PROFINET IO controller that offers the following functions:

- Communication as PROFINET-IO controller, I-Device (controller and device simultaneously)
- 100 Mbit/s full duplex
- Supports real-time classes of PROFINET IO:
  - RT (real-time)
  - IRT (Isochronous Real Time)
- Integration of distributed I/O as PROFINET IO devices
- Integration of drives as PROFINET IO devices through PROFIdrive according to the V4 specification
- Support for standard Ethernet communication, e.g.
  - for interfacing with SIMOTION SCOUT
  - for the connection of HMI systems
  - for communication with any other devices over TCP/IP or UDP communication
- Integrated 3-port switch with 3 RJ45 sockets. The optimum topology (line, star, tree) can therefore be configured without additional external switches.

##### SIMOTION IT service and diagnostic functions

SIMOTION IT provides SIMOTION P with an integrated Web server on which, for example, user-specific Web pages can be stored. Read and write access can be made to the Control Unit variables. Java scripts or applets also allow the implementation of active operation and display functions in the Web pages that can be executed on a client PC with standard Internet browser.

##### Expansion with distributed I/O by means of PROFINET

The following distributed I/O can be added to the SIMOTION P320-3 system by means of PROFINET:

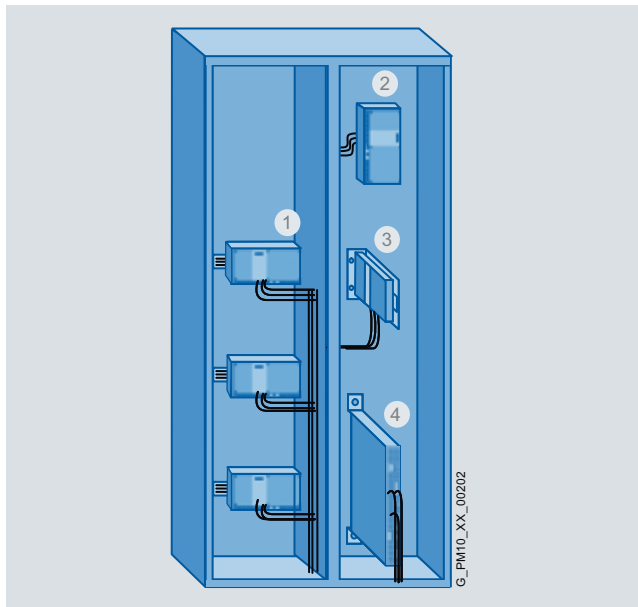
- Distributed drives (e.g. SINAMICS S120)
- Distributed I/O (SIMATIC ET 200S/SP/M/pro/eco PN)
- Engineering systems (PG/PC) or
- HMI devices (e.g.: MP, TP, OP)

##### High-speed I/Os for time-critical applications

Cycle times of 250  $\mu$ s can be achieved with SIMOTION P, PROFINET and the ET 200S distributed I/O system with interface module IM 151-3 PN High Speed. This is particularly necessary for applications with fast response times (e.g. hydraulic axes).

##### Flexible mounting in the control cabinet

SIMOTION P320-3 can be mounted in a variety of positions in the control cabinet, e.g. on a standard rail, cabinet wall or by portrait assembly kit. This means that valuable space inside the cabinet can be saved for other purposes.



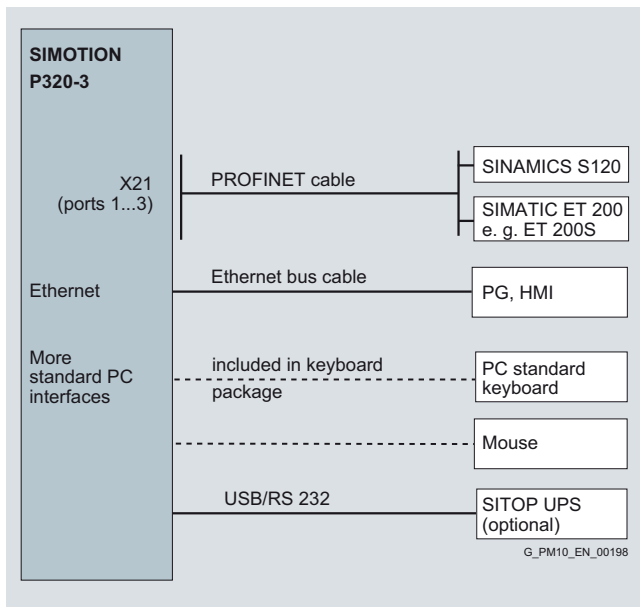
Flexible mounting in the control cabinet: (1) Standard rail mounting, (2) Wall mounting, (3) Portrait assembly, (4) Front portrait assembly

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### SIMOTION P320-3 Motion Controller

#### Integration



Overview of the SIMOTION P320-3 connections

#### Selection and ordering data

Description	Order No.
<b>SIMOTION P320-3 Motion Controller</b> <sup>1)</sup> with Intel Core 2 Solo, 1.2 GHz, Windows Embedded Standard 2009, 2 GB DDR3 SDRAM, 24 V DC, incl. 4 GB CompactFlash card, front portrait assembly and wall mounting kit, with current runtime version (earlier software versions are stored on the recovery CD)	<b>6AU1320-7AB55-3AF0</b>

#### Accessories

Description	Order No.
<b>SIMATIC IPC portrait assembly kit</b>	<b>6ES7648-1AA20-0YB0</b>
<b>SIMATIC IPC Image &amp; Partition Creator V3.2</b>	<b>6ES7648-6AA03-2YA0</b>
<b>SIMATIC IPC USB Flash Drive</b> 8 GB, USB 2.0 SIMATIC IPC Image & Partition Creator software pre-installed	<b>6AV7672-8JD01-0AA0</b>
<b>Touch pen</b> (for use with a touch-operated panel front)	<b>6AV7672-1JB00-0AA0</b>
<b>Spare parts</b> • Motherboard battery	<b>6FC5247-0AA18-0AA0</b>

#### Technical specifications

PLC and motion control performance	
<b>Maximum number of axes</b>	64
<b>Minimum PROFINET transmission cycle</b>	250 µs
<b>Minimum servo/interpolator clock cycle</b>	250 µs
Memory	
<b>RAM (Random Access Memory)</b>	2 GB DDR3 SDRAM
<b>Retentive memory</b>	15 KB (256 KB with UPS)
<b>CompactFlash card</b>	4 GB
<b>Persistent memory</b> (user data on CF)	64 MB
Communication	
<b>USB interfaces</b>	4 x USB 2.0
<b>Ethernet interfaces</b>	1
<b>PROFINET interfaces</b>	<ul style="list-style-type: none"> <li>• 1 interface with 3 ports</li> <li>• Supports PROFINET IO with IRT and RT</li> <li>• Can be configured as PROFINET IO controller and/or device</li> </ul>

#### General technical specifications

<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	72 W
<b>Mains buffering, max.</b>	5 ms
<b>Degree of protection acc. to EN 60529 (IEC 60529)</b>	IP20
<b>Temperature change, max.</b>	10°K/h
<b>Limit values for rel. humidity in accordance with EN 60068-2-78, EN 60068-2-30</b>	
• Storage and transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Permissible ambient temperature</b>	
• Storage and transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	
- Portrait assembly, front and wall mounting	0 ... 45 °C (32 ... 113 °F)
- Standard rail mounting	0 ... 55 °C (32 ... 131 °F)
<b>Weight, approx.</b>	2 kg (4.41 lb)
<b>Dimensions (W x H x D)</b>	262 x 142 x 47 mm (10.31 x 5.59 x 1.85 in)
<b>Approvals, according to</b>	UL/CSA

#### More information

##### *SIZER for Siemens Drives engineering tool*

With the SIZER for Siemens Drives engineering tool, you can easily configure the SINAMICS S120 drive family including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting utilization with SIZER for Siemens Drives in accordance with your performance requirements.

For more information about SIZER for Siemens Drives, refer to chapter System description – Dimensioning.

<sup>1)</sup> Note about licenses for runtime software:  
Licenses for runtime software for SIMOTION P320-3 can be ordered individually or by means of order code (Z option).  
See [Ordering of licenses for runtime software on page 9/63](#).

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### SIMOTION P350-3 Motion Controller

#### Overview



The SIMOTION P350-3 Motion Controller is a PC-based, open Motion Control System. The use of an industrial PC platform facilitates the running of the SIMOTION machine application comprising of PLC, motion control and HMI functions alongside standard PC applications in one platform. This is particularly useful in the case of applications that involve complex PC-based data management and sophisticated analysis systems.

The operating system is Windows XP Professional, with a real-time expansion for SIMOTION.

To facilitate the connection of distributed components, SIMOTION P350-3 is available in both PROFINET and PROFIBUS versions. A PROFINET Communication Board can be retrofitted to the PROFIBUS version for applications which require both PROFIBUS and PROFINET.

#### Design

##### Interfaces

###### Display and diagnostics

With SIMOTION P, the display and diagnostics functions for the operating states are performed by a software monitor, which takes the form of an on-screen application window. This software monitor can be operated using your keyboard, mouse or touch panel.

###### Integrated interfaces

- 1 x COM 1 (V.24), VGA (via DVI adapter)
- 4 x USB 2.0
- 2 x Industrial Ethernet 10/100 Mbits (integrated)
- PROFIBUS version:  
2 x PROFIBUS DP (not isochronous, isolated), one of the interfaces can be used as an MPI interface
- PROFINET version:  
1 x PROFINET interface with 4 ports, supports PROFINET IO with IRT and RT

###### Expansion slots

- 1 x PCI slot 265 mm (10.43 in)
  - PROFIBUS version: occupied by IsoPROFIBUS board
  - PROFINET version: occupied by MCI-PN Communication Board
- 1 x PCI/ISA slot 170 mm (6.69 in) (free)  
e.g., for the purpose of retrofitting an additional Communication Board (simultaneous communication via PROFIBUS and PROFINET)

##### Communication via PROFIBUS

The PROFIBUS version features an integrated IsoPROFIBUS board, which offers two PROFIBUS DP interfaces with PROFIdrive.

The free PCI slot can be used for the purpose of retrofitting an optional MCI-PN Communication Board. This means that the PROFIBUS version can support both PROFIBUS and PROFINET on the same PC.

##### Communication via PROFINET

The MCI-PN Communication Board that has been integrated in the PROFINET version enables the SIMOTION P350-3 to be connected to a PROFINET IO network. From a PROFINET perspective, the SIMOTION P350-3 thus assumes the role of a PROFINET IO controller.

To enable it to communicate with other PROFINET controllers, the SIMOTION P350-3 can be configured as both a PROFINET controller and a PROFINET device at the same time (I-Device).

##### Operator control and monitoring

SIMOTION P350-3 can be operated in a variety of different modes:

- Headless mode:  
It can be operated without display, monitor or panel front.
- Operation with display or monitor:  
Standard SIMATIC displays or monitors can be connected at a distance of up to 5 m (16.4 ft) via the integrated DVI or VGA interface.
- Operation with SIMOTION P panel fronts:  
SIMOTION P350-3 can be directly connected to the panel fronts for SIMOTION P via the internal LVDS interface. In this case, SIMOTION P350-3 and the panel front are operated as a single unit. The SIMATIC Panel PC Remote Kit allows SIMOTION P350-3 and the panel front to be operated at separate locations. The kit is capable of bridging a distance of up to 30 m (98.4 ft).

##### SIMOTION IT service and diagnostic functions

SIMOTION IT provides SIMOTION P with an integrated Web server on which, for example, user-specific Web pages can be stored. Read and write access can be made to the Control Unit variables. Java scripts or applets also allow the implementation of active operation and display functions in the Web pages that can be executed on a client PC with standard Internet browser.

##### Panel fronts for SIMOTION P

Various panel fronts are available for the SIMOTION P Motion Controller:

- 12" with membrane-type keys
- 12" for touch screen operation, and
- 15" for touch screen operation

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### SIMOTION P350-3 Motion Controller

#### Design (continued)

##### Expansion using distributed I/Os

###### PROFINET version

- Distributed I/Os (SIMATIC ET 200S/SP/M/pro/eco PN)
- Distributed drives (e.g. SINAMICS S120)
- Engineering systems (PG/PC) or
- HMI devices (e.g.: MP, TP, OP)

###### PROFIBUS version

- Certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- Distributed I/Os (SIMATIC ET 200S/M/eco/pro)
- Distributed drives (e.g.: SINAMICS S120)
- Engineering systems (PG/PC) or
- HMI devices (e.g.: MP, TP, OP)

##### High-speed I/Os for time-critical applications

Cycle times of 250  $\mu$ s can be achieved with SIMOTION P, PROFINET and the ET 200S distributed I/O system with interface module IM 151-3 PN High Speed. This is particularly necessary for applications with fast response times (e.g. hydraulic axes).

##### PC technology

- Processor: Intel Pentium M 2 GHz
- Operating system: Windows XP Professional, English
- Memory: 512 MB SDRAM, upgradable to 2 GB
- Hard disk with shock damping, approx. 40 GB
- DVD-ROM drive (optional)
- Data backup/restore using the Symantec Ghost data backup software (pre-installed)

#### More information

##### More information

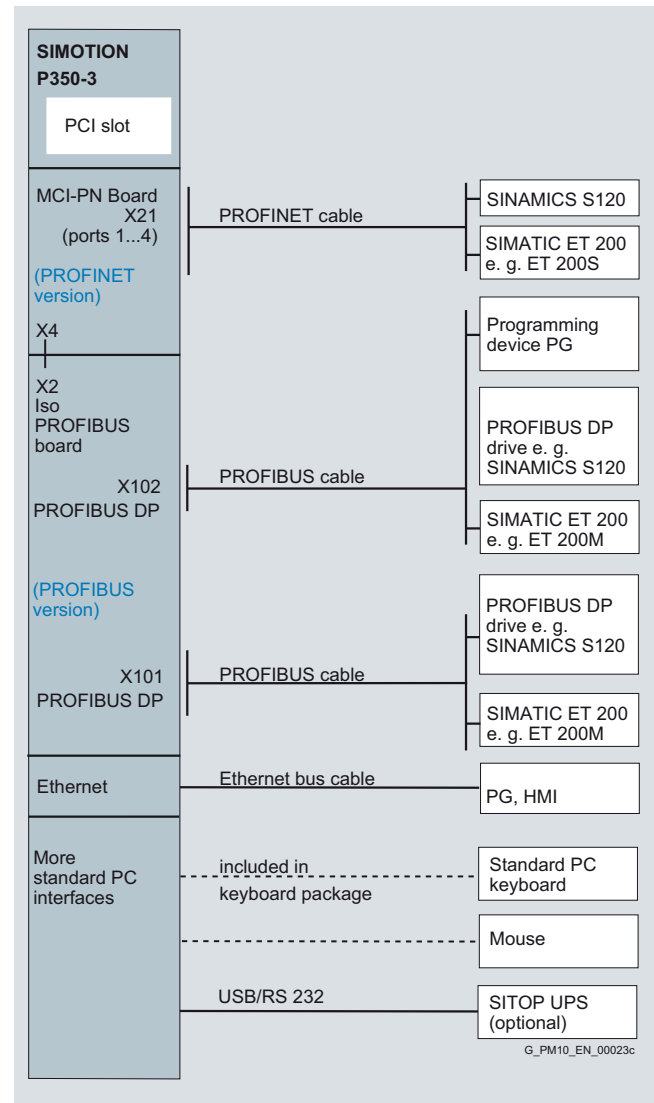
- about connectable I/O modules for SIMOTION can be found in chapter SIMOTION I/O components and section Overview of SIMOTION functions.
- about the connection of panel fronts for SIMOTION P can be found in section Panel fronts for SIMOTION P.

##### SIZER for Siemens Drives engineering tool

With the SIZER for Siemens Drives engineering tool, you can easily configure the SINAMICS S120 drive family including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting utilization with SIZER for Siemens Drives in accordance with your performance requirements.

For more information about SIZER for Siemens Drives, refer to chapter System description – Dimensioning.

#### Integration



Overview of the SIMOTION P350-3 connections



# SIMOTION Motion Control System

## SIMOTION P – PC-based

### SIMOTION P350-3 Motion Controller

#### Technical specifications

PLC and motion control performance	
<b>Number of axes</b>	Up to 64 depending on the set clock-pulse rate
<b>Minimum PROFIBUS cycle</b>	1 ms (PROFIBUS version)
<b>Minimum PROFINET transmission cycle</b>	0.25 ms (PROFINET version)
<b>Minimum servo/interpolator clock cycle</b>	0.25 ms
Memory	
<b>RAM (Random Access Memory)</b>	512 MB SDRAM, upgradable to 2 GB
<b>Retentive memory</b>	15 KB
<b>Persistent memory</b>	64 MB/256 MB when a UPS is used
Communication	
<b>USB interfaces</b>	4 x USB 2.0
<b>Ethernet interfaces</b>	2 x 10/100 Mbit/s
<b>PROFIBUS interfaces</b>	PROFIBUS version: <ul style="list-style-type: none"> <li>• 2 interfaces, of which one can be used as an MPI interface</li> <li>• Not isochronous, isolated</li> </ul>
<b>PROFINET interfaces</b>	PROFINET version: <ul style="list-style-type: none"> <li>• 1 interface with 4 ports</li> <li>• Supports PROFINET IO with IRT and RT</li> <li>• Can be configured as PROFINET IO controller and/or device</li> </ul>
General technical specifications	
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	190 W
<b>Mains buffering, max.</b>	20 ms
<b>Degree of protection acc. to EN 60529 (IEC 60529)</b>	IP20
<b>Temperature change, max.</b>	10°K/h
<b>Relative humidity limit values in accordance with IEC 68-2-3, IEC 68-2-30, IEC 68-2-56</b>	
• Storage and transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Humidity rating based on EN 60721-3-3</b>	Class 3K5 Condensation and icing excluded Low air temperature 0 °C (32 °F)
<b>Permissible ambient temperature</b>	
• Storage and transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	5 ... 45 °C (41 ... 113 °F)
<b>Weight, approx.</b>	6 kg (13.2 lb)
<b>Dimensions (W x H x D)</b>	297 x 267 x 85 mm (11.69 x 10.51 x 3.35 in) (excluding DVD drive) 297 x 267 x 106 mm (11.69 x 10.51 x 4.17 in) (including DVD drive)
<b>Approvals, according to</b>	cULus, C-Tick

#### Selection and ordering data

Description	Order No.
<b>SIMOTION P350-3, PROFIBUS version</b> with Intel Pentium M, 2 GHz, Windows XP Professional, English, 512 MB SDRAM, 24 V DC, <b>with IsoPROFIBUS board</b>	
• Without DVD drive	<b>6AU1350-3AK41-1BE2 -Z<sup>1)</sup></b>
• With DVD drive	<b>6AU1350-3AK43-1BE2 -Z<sup>1)</sup></b>
<b>SIMOTION P350-3, PROFINET version</b> with Intel Pentium M, 2 GHz, Windows XP Professional, English, 512 MB SDRAM, 24 V DC, <b>with MCI-PN board</b>	
• Without DVD drive	<b>6AU1350-3AK41-2BE2 -Z<sup>1)</sup></b>
• With DVD drive	<b>6AU1350-3AK43-2BE2 -Z<sup>1)</sup></b>
	Order code
<b>HMI Bundle</b> SIMOTION P350-3 can be ordered together with the HMI software WinCC flexible for a bundle price.  The following is also included in the scope of supply: WinCC flexible 2008 Runtime, 2048 Powertags  WinCC flexible Runtime, 2048 Powertags, WinCC flexible/Archives + Recipes	<b>A03</b>
<b>Example for ordering</b> SIMOTION P350-3, PROFIBUS version, without DVD drive, with HMI Bundle: <b>6AU1350-3AK41-1BE2 -Z V41 W05 A03</b>	

#### Accessories

Description	Order No.
<b>Memory expansion</b>	
• 512 MB DDR2 533 SODIMM	<b>6ES7648-2AG30-0GA0</b>
• 1 GB DDR2 533 SODIMM	<b>6ES7648-2AG40-0GA0</b>
<b>MCI PN Communication Board</b> (for PROFINET upgrade)	<b>6AU1390-0BA00-0AA0</b>
<b>Replacement parts</b>	
• Motherboard battery	<b>6FC5247-0AA18-0AA0</b>
<b>Hard disk</b>	
• Hard disk 3.5" SATA	On request

<sup>1)</sup> Note about runtime software:  
When ordering SIMOTION P 350-3, the pre-installed runtime version must be specified. The software version is ordered with the order code (Z option) "V" and the service pack with the order code "W". If no options are specified, it will be supplied with the current software version.

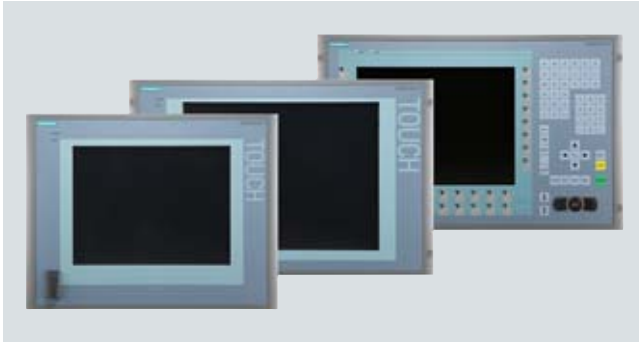
Example:  
When 6AU1350-3AK41-1BE2 -Z V41 W05 is specified, SIMOTION P350-3 with the above order number and runtime version V4.1 SP5 is supplied.

"W00" must be specified to order earlier runtime versions without service pack (V4.0).

Other licenses for runtime software can be ordered individually or by means of order code (Z option).

See [Ordering of licenses for runtime software on page 9/63](#).

#### Overview



Three different panel fronts with TFT color display are available for the SIMOTION P Motion Controller:

- 12" with membrane-type keys, resolution: 800 x 600 pixels
- 12" for touch screen operation, resolution: 800 x 600 pixels, and
- 15" for touch screen operation, resolution: 1024 x 768 pixels

The panel fronts are suitable for installation in consoles, control cabinets and support arm systems.

#### Connection to SIMOTION P320-3

SIMOTION P320-3 is connected to the panel fronts for SIMOTION P by means of the SIMATIC Panel PC Remote Kit. The panel front can be installed at a distance of up to 30 m (98.4 ft) from the Motion Controller.

#### Connection to SIMOTION P350-3

SIMOTION P350-3 can be directly connected to the panel fronts for SIMOTION P via the internal LVDS interface. The standard method of installing the Motion Controller is to mount it directly behind the panel front. Four knurled-head screws are used to form a mechanical interlock between the SIMOTION P350-3 and the panel front. No special tool is needed for this.

The Panel PC Remote Kit also allows SIMOTION P350-3 and the panel front to be operated at separate locations. In this case, a distance of up to 30 m (98.4 ft) can also be bridged.

#### Technical specifications

Panel fronts for SIMOTION P	
<b>Degree of protection at the front according to EN 60529 (IEC 60529)</b>	IP65
<b>Relative humidity limit values in accordance with IEC 68-2-3, IEC 68-2-30, IEC 68-2-56</b>	
• Storage and transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Condensation</b>	Not permissible
<b>Permissible ambient temperature</b>	
• Storage and transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	5 ... 45 °C (41 ... 113 °F)
<b>Weight</b>	
• 12" P012K panel front, membrane keys	6 kg (13.2 lb)
• 12" P012T panel front, touch screen operation	6 kg (13.2 lb)
• 15" P015T panel front, touch screen operation	6 kg (13.2 lb)
<b>Dimensions (W x H x D)</b>	
• 12" P012K panel front, membrane keys	483 x 310 x 100 mm (19.02 x 12.2 x 3.94 in)
• 12" P012T panel front, touch screen operation	400 x 310 x 125 mm (15.75 x 12.2 x 4.92 in)
• 15" P015T panel front, touch screen operation	483 x 310 x 130 mm (19.02 x 12.2 x 5.12 in)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>12" P012K panel front, membrane keys</b>	<b>6AU1300-0DB00-0AA0</b>
<b>12" P012T panel front, touch screen operation</b>	<b>6AU1300-0CB00-0AA0</b>
<b>15" P015T panel front, touch screen operation</b>	<b>6AU1300-0EB00-0AA0</b>

#### Accessories

Description	Order No.
<b>Key labeling strips</b> For labeling softkeys and function keys, blank, plastic, supplied in sets of 3	<b>6AV7671-3CA00-0AA0</b>

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### Supplementary components SIMATIC Panel PC Remote Kit

#### Overview



The SIMATIC Panel PC Remote Kit allows the computer and operating unit to be installed at a distance from one another. It is designed for use with SIMOTION P320-3 and SIMOTION P350-3 Motion Controllers. It can bridge a distance of up to 30 m (98.4 ft) between the computer/Motion Controller and the operating unit.

The Remote Kit must always be operated with the cables supplied with the unit.

#### Benefits

- Operating unit can be located up to 30 m (98.4 ft) from the computer
- Suitable for retrospective conversion/upgrade
- Allows the use of ultra compact operating units
- Pure hardware solution and therefore operating-system-neutral
- Remotely installed front with AC or DC power supply
- 2 additional USB interfaces, on the rear, USB 2.0: High speed up to 5 m (16.4 ft), full speed up to 30 m (98.4 ft)

#### Technical specifications

SIMATIC Panel PC Remote Kit	
<b>Supported operating units</b>	• All panel fronts for SIMOTION P
<b>Front functionality</b>	Same as for central mounting, but with following limits with respect to USB functions: <ul style="list-style-type: none"> <li>• Distance &gt; 5 m (16.4 ft) : USB 1.1, and only one external 1.1 hub</li> </ul>
<b>External interfaces</b>	2 additional USB interfaces on the remote module on the rear of the remote operating unit
<b>Power supply</b>	24 V DC or 110 ... 240 V AC, 50/60 Hz
<b>Certifications and approvals</b>	CE, cULus (UL 508)
<b>Scope of supply</b>	Remote module, cable set, assembly materials, Europe power cable (for the AC option)

#### Design

The Remote Kit consists of the following components:

- Remote module (mounted on the rear of the operating unit)
- Video connecting cable (industrial-grade DVI-D cable)
- USB connecting cable (standard USB cable for a distance up to 5 m (16.4 ft), the USB signal is externally amplified and transferred via a CAT6 cable for distances over 5 m (16.4 ft))
- Mechanical assembly kit (for mounting the computer unit in the control cabinet, console or machine)

#### Selection and ordering data

Description	Order No.
<b>SIMATIC Panel PC Remote Kits</b>	
• With cable set 5 m (16.4 ft), 24 V DC	<b>6AV7671-1EA00-5AA1</b>
• With cable set 10 m (32.8 ft), 24 V DC	<b>6AV7671-1EA01-0AA1</b>
• With cable set 15 m (49.2 ft), 24 V DC	<b>6AV7671-1EA01-5AA1</b>
• With cable set 20 m (65.6 ft), 24 V DC	<b>6AV7671-1EA02-0AA1</b>
• With cable set 30 m (98.4 ft), 24 V DC	<b>6AV7671-1EA03-0AA1</b>
• With cable set 5 m (16.4 ft), 100/240 V AC	<b>6AV7671-1EA10-5AA1</b>
• With cable set 10 m (32.8 ft), 100/240 V AC	<b>6AV7671-1EA11-0AA1</b>
• With cable set 15 m (49.2 ft), 100/240 V AC	<b>6AV7671-1EA11-5AA1</b>
• With cable set 20 m (65.6 ft), 100/240 V AC	<b>6AV7671-1EA12-0AA1</b>
• With cable set 30 m (98.4 ft), 100/240 V AC	<b>6AV7671-1EA13-0AA1</b>

#### Accessories

Description	Order No.
<b>Power cable</b>	
• Europe: D/F/NL/E/B/A/S/FIN <sup>1)</sup>	<b>6ES7900-1AA00-0XA0</b>
• United Kingdom	<b>6ES7900-1BA00-0XA0</b>
• Switzerland	<b>6ES7900-1CA00-0XA0</b>
• USA	<b>6ES7900-1DA00-0XA0</b>
• Italy	<b>6ES7900-1EA00-0XA0</b>
• China	<b>6ES7900-1FA00-0XA0</b>

#### Components of the Remote Kit

(available individually only as spare part)

• Remote module 24 V DC with mounting material	<b>6AV7671-1EX01-0AD0</b>
• Remote module 110 ... 240 V AC with mounting material	<b>6AV7671-1EX01-0BD0</b>
• USB amplifier/CAT6 converter	<b>6AV7671-1EX02-0AA0</b>
• Cable set 5 m (16.4 ft) (DVI, USB standard cable)	<b>6AV7671-1EX10-5AA0</b>
• Cable set 10 m (32.8 ft) (DVI, Cat6 cable)	<b>6AV7671-1EX11-0AA0</b>
• Cable set 15 m (49.2 ft) (DVI, Cat6 cable)	<b>6AV7671-1EX11-5AA0</b>
• Cable set 20 m (65.6 ft) (DVI, Cat6 cable)	<b>6AV7671-1EX12-0AA0</b>
• Cable set 30 m (98.4 ft) (DVI, Cat6 cable)	<b>6AV7671-1EX13-0AA0</b>

<sup>1)</sup> A Europe power cable is included in the scope of supply for AC variants (100 ... 240 V) of the Remote Kit.

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### Supplementary components KBPC CG US standard PC keyboard

#### Overview



Programs and texts can be edited easily with the compact 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 840D with PCU 50.3
- SINUMERIK 840Di sl
- SINUMERIK 840D sl with PCU 50.3
- SINUMERIK 840D sl Type 1B with PCU 50.5
- SIMOTION P3x0

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

#### Technical specifications

	<b>6FC5203-0AC01-3AA0</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 according to EN 60529 (IEC 60529)</b>	IP20
<b>Humidity rating based on 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 (15.95 in)
• Height	44 mm (1.73 in)
• Depth	180 mm (7.09 in)
<b>Weight, approx.</b>	1.3 kg (2.87 lb)
<b>Approvals, according to</b>	FCC, GS, CE, C-Tick, cURus

#### Selection and ordering data

Description	Order No.
<b>SINUMERIK KBPC CG US standard PC keyboard</b> MF-II compatible, 104 key layout, connection: USB, incl. connecting cable, length: 1.7 m (5.58 ft)	<b>6FC5203-0AC01-3AA0</b>

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### Supplementary components

#### MCI-PN Communication Board

#### Overview



The MCI-PN Communication Board for SIMOTION P350-3 enables connection to a PROFINET IO network. This means that in terms of PROFINET, SIMOTION P350-3 is a PROFINET IO controller that offers the following functions:

- Communication as: PROFINET IO Controller, I-Device (controller and device simultaneously)
- 100 Mbit/s full duplex
- Supports real-time classes of PROFINET IO:
  - RT (Real Time)
  - IRT (Isochronous Real Time)
- Integration of distributed I/O as PROFINET IO devices
- Integration of drives as PROFINET IO devices through PROFIdrive according to the V4 specification
- Support for standard Ethernet communication, e.g.
  - for interfacing with SIMOTION SCOUT
  - for the connection of HMI systems
  - for communication with any other devices over TCP/IP or UDP communication
- Integrated 4-port switch with 4 RJ45 sockets. The optimal topology (line, star, tree or ring) can therefore be constructed without the need for additional external switches.

#### Integration

The MCI-PN Communication Board is inserted in the free PCI slot of the SIMOTION P350-3 Motion Controller.

#### Technical specifications

MCI-PN Communication Board	
<b>Current consumption</b>	900 mA at 5 V
<b>Permissible ambient temperature</b>	
• Storage and transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	5 ... 55 °C (41 ... 131 °F)
<b>Weight, approx.</b>	110 g (0.24 lb)
<b>Dimensions (W X H)</b>	107 x 167 mm (4.21 x 6.57 in)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>MCI-PN Communication Board</b>	<b>6AU1390-0BA00-0AA0</b>

#### Accessories

Description	Order No.
<b>RJ45 FastConnect plug connector for Industrial Ethernet/PROFINET</b>	
• 145° cable outlet	
- 1 pack = 1 unit	<b>6GK1901-1BB30-0AA0</b>
- 1 pack = 10 units	<b>6GK1901-1BB30-0AB0</b>
• 180° cable outlet	
- 1 pack = 1 unit	<b>6GK1901-1BB10-2AA0</b>
- 1 pack = 10 units	<b>6GK1901-1BB10-2AB0</b>
<b>FastConnect cables for Industrial Ethernet/PROFINET <sup>1)</sup></b>	
• IE FC Standard Cable GP 2x2	<b>6XV1840-2AH10</b>
• IE FC Flexible Cable GP 2x2	<b>6XV1870-2B</b>
• IE FC Trailing Cable GP 2x2	<b>6XV1870-2D</b>
• IE FC Trailing Cable 2x2	<b>6XV1840-3AH10</b>
• IE FC Marine Cable 2x2	<b>6XV1840-4AH10</b>
<b>Stripping tool for Industrial Ethernet/PROFINET FastConnect cables</b>	
• IE FC stripping tool	<b>6GK1901-1GA00</b>

#### More information

More information about cables for Ethernet/PROFINET can be found in Catalog IK PI (Industrial Communication) and the Industry Mall under Automation Technology/Industrial Communication/PROFINET/Network components.

<sup>1)</sup> Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft).

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Overview of SIMOTION D

#### Overview



SIMOTION D Control Units: D410-2, D4x5-2 (4 performance classes)

SIMOTION D is the compact, drive-based version of SIMOTION based on the SINAMICS S120 drives family.

The SIMOTION D Control Units are available in the following variants:

- SIMOTION D410-2 are compact Control Units for single-axis applications with multi-axis option. The Control Units are available in variants D410-2 DP and D410-2 DP/PN and are snapped onto the SINAMICS S120 PM340 Power Modules in blocksize format.
- SIMOTION D4x5-2 are Control Units for multi-axis applications in the SINAMICS S120 booksize format and are available in the following performance variants:
  - SIMOTION D425-2 DP and D425-2 DP/PN Control Units (BASIC Performance) for up to 16 axes
  - SIMOTION D435-2 DP and D435-2 DP/PN Control Units (STANDARD Performance) for up to 32 axes
  - SIMOTION D445-2 DP/PN (HIGH Performance) Control Unit for up to 64 axes
  - SIMOTION D455-2 DP/PN Control Unit (ULTRA-HIGH Performance) for up to 128 axes or applications with very short control cycle clocks

This fine scalability ensures a quick response to changing requirements in automation without having to change the system.

#### Device concept

With SIMOTION D, the PLC and motion control functionalities as well as the SINAMICS S120 drive software run on a shared control hardware. The IEC 61131-3-compliant PLC integrated in SIMOTION D means that the system is not just capable of controlling motion sequences, but that the entire machine can also be controlled with a single compact unit.

Depending on the SIMOTION D platform, HMI devices can be operated on the onboard PROFIBUS, Ethernet or PROFINET interface for operator control and monitoring. Functions such as remote maintenance, diagnostics and teleservice can also be used via these interfaces.

#### Benefits

- Cost-effective thanks to the integration of PLC, motion control and technology functions direct in the drive
- Employs the innovative SINAMICS S120 design
- Compact form-factor reduces control cabinet size
- Ideally suited to modular and distributed machine concepts
- User-friendly operation
- Variable networking via a wide range of communication interfaces:
  - D410-2 DP, D4x5-2 DP: Industrial Ethernet and PROFIBUS DP onboard
  - D410-2 DP/PN, D4x5-2 DP/PN: Industrial Ethernet, PROFIBUS DP and PROFINET IO onboard
- Powerful thanks to a range of technology functions
- Very simple engineering, from drive commissioning to open-loop control and Motion Control applications
- Easy to service thanks to the CompactFlash card, which can be easily replaced and contains all data (programs, data, drive parameters, and licenses)
- Very dynamic because the interfaces between PLC and Motion Control are no longer required

#### Application

##### *SIMOTION D can be used optimally wherever*

- the SINAMICS S120 drive family is used
- the motion control and PLC functionality are directly executed in the drive (SINAMICS S120)
- compact, space-saving construction is required
- high performance is required for motion control and high-speed I/O
- high electromagnetic compatibility and a high resistance to shock and vibration are required due to harsh ambient conditions
- modular machine concepts with high-speed isochronous coupling is required

##### *The flexible solution for modular machine concepts*

SIMOTION D optimally supports the implementation of modular machine concepts in which single-axis drives and high-performance multi-axis drives have to be combined:

- SIMOTION D410-2 (blocksize format) is the most cost-effective solution for the design of compact drives, ranging from single units to small-scale multi-axis solutions with typically 2 to 3 axes.
- SIMOTION D4x5-2 (booksize format) performs the open-loop and closed-loop control functions for multi-axis groups with up to 128 axes.

##### *Important applications include:*

- Packaging machines
- Plastic and rubber processing machines
- Presses, wire-drawing machines
- Textile machines
- Printing machines
- Wood, glass, ceramics and stone working machines
- Converting
- Handling devices

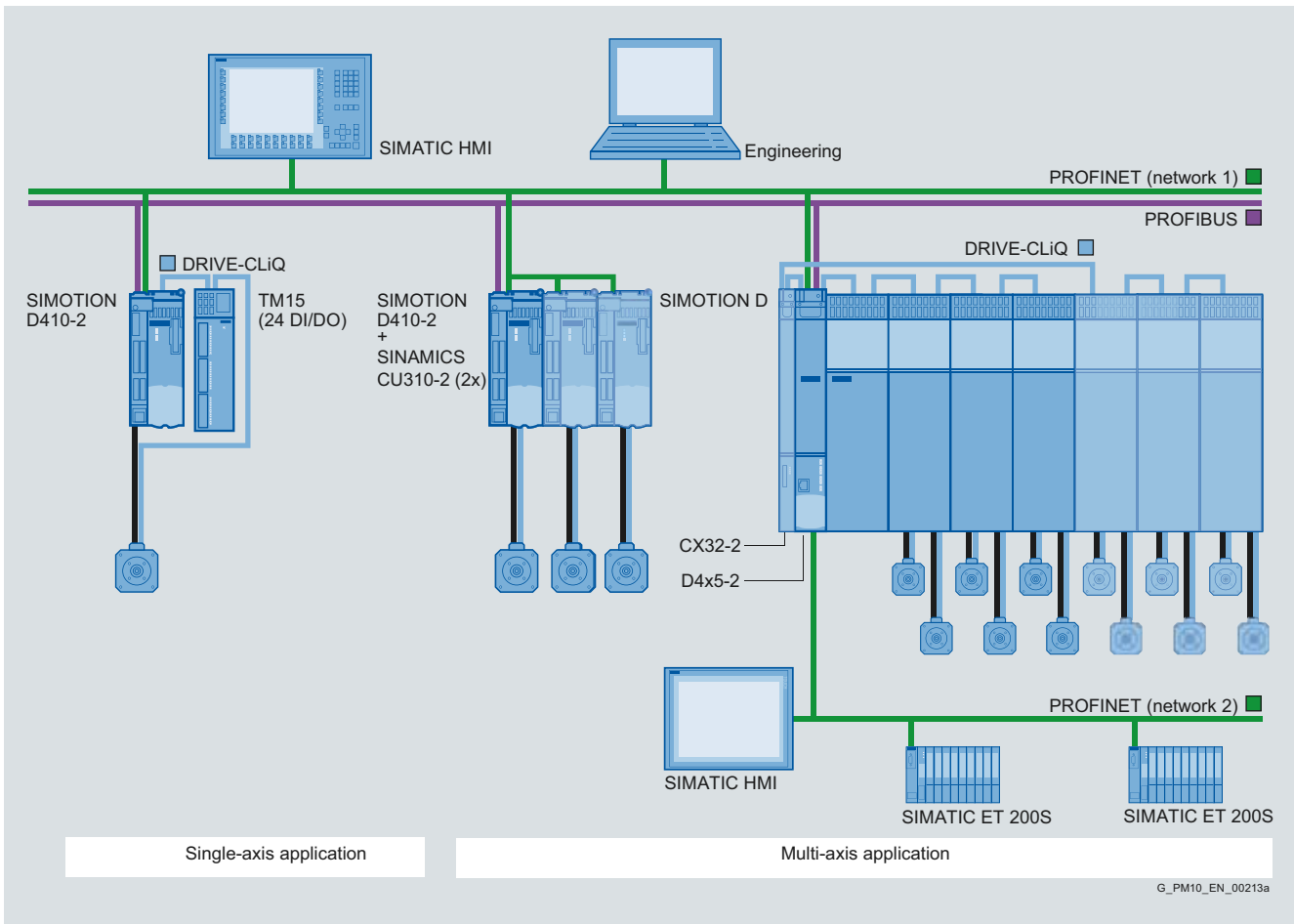
Due to the increasing use of servo and vector drives, these machines require a high degree of integration of PLC, motion control and technology functions.

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Overview of SIMOTION D

#### Design



Typical design of an automation solution using SIMOTION D

#### **SIMOTION D components and interfaces**

- Various status/error displays
- Onboard digital inputs and outputs
- Option slot (receptacle, only for D4x5-2), e.g. for expansion with additional I/Os with the TB30 Terminal Board
- Integrated communications interfaces for linking:
  - SINAMICS S120 drive modules
  - Distributed I/Os
  - HMI systems
  - PG/PC
  - Other motion control and automation systems
  - Other SINAMICS S110/S120 drives with digital setpoint interface
- Slot for CompactFlash card for data backup

#### **Construction of a single axis with SIMOTION D410-2**

The following components make up a SIMOTION D410-2 single axis system:

- A SIMOTION D410-2 Control Unit, designed for open and closed-loop control of a single drive
- A SINAMICS S120 PM340 Power Module, blocksize format (combined infeed and power module)
- Other drive components, such as
  - Power supply
  - Filter
  - Choke, etc.

The connection between SIMOTION D410-2 and the SINAMICS S120 PM340 Power Module is made via the inte-

grated PM-IF interface or, when the CUA31/CUA32 Control Unit Adapter is used, via DRIVE-CLiQ.

#### **Structure of an axis grouping with SIMOTION D410-2**

In order to create a multi-axis grouping with SIMOTION D410-2, additional SINAMICS S110/S120 Control Units are connected to the SIMOTION D410-2 by means of PROFIBUS or PROFINET.

Motion control is performed centrally by the SIMOTION D410-2 using the SIMOTION technology objects.

#### **Structure of an axis grouping with SIMOTION D4x5-2**

The following components comprise a SIMOTION D4x5-2 axis grouping:

- A SIMOTION D4x5-2 Control Unit, designed for open and closed-loop control of a multiple axis grouping
- A SINAMICS S120 Line Module (infeed module)
- One or more SINAMICS S120 Motor Modules (power modules)
- Other drive components, such as
  - Power supply
  - Filter
  - Choke, etc.

The connection between the SIMOTION D Control Unit and the SINAMICS S120 drive modules is made via DRIVE-CLiQ.

#### **Note:**

SINAMICS S120 PM340 Power Modules in blocksize format can be operated on a SIMOTION D4x5-2/CX32-2 with the Control Unit Adapters CUA31/CUA32.

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Overview of SIMOTION D

#### Design (continued)

##### Expansion using I/O

SIMOTION D can be expanded with the following I/O:

- Distributed I/O systems (e.g. SIMATIC ET 200S)
- Drive-based control cabinet I/O (e.g. TM15, TM31 Terminal Modules, etc.)
- I/Os in booksize compact format (e.g. TMC1080 PN, ...)

#### Function

##### Basic functionality

The SIMOTION D basic functionality is supplied with the CompactFlash card (CF) and is loaded when the voltage is switched on. The basic functionality includes:

- SIMOTION runtime system
  - User-programmable with several languages conforming to IEC 61131
  - Various methods of program execution (cyclic, sequential, event-driven)
  - PLC and arithmetic functionality
  - Communication and management functions
  - Motion control functions (Motion Control Basic)
- SINAMICS S120 drive control
  - SIMOTION D410-2:
    - Current/speed control (based on CU310-2, firmware version V4.x) for up to 1 servo axis, 1 vector axis or 1 V/f axis
  - SIMOTION D4x5-2:
    - Current/speed control (based on CU320-2, firmware version V4.x) for up to 6 servo axes, 6 vector axes or 12 V/f axes, closed-loop control for infeed (Active Line Module)
- Testing and diagnostic tools

This basic functionality can be expanded with loadable technology packages, if required.

##### Position-controlled motion control for drives

- Integrated drives (SINAMICS Integrated):
  - The power units are connected over DRIVE-CLiQ or over the integrated PM-IF interface optionally for the SIMOTION D410-2.
- Drives with digital setpoint interface:
  - SIMOTION D enables position-controlled motion control for drives with digital setpoint interfaces via PROFIBUS DP/PROFINET IO with PROFIdrive.
- Drives with analog setpoint interface, e.g. for retrofit or hydraulic applications:
  - The ADI 4 (Analog Drive Interface for 4 Axes) or IM 174 (Interface Module for 4 Axes) module can be used to connect drives with analog  $\pm 10$  V setpoint interfaces. The IM 174 also makes it possible to connect stepper drives with a pulse direction interface.
  - Both modules are connected over PROFIBUS DP. The following can be connected to one ADI 4 or IM 174 module:
    - 4 drives
    - 4 encoders
    - Digital inputs and outputs

##### SIMOTION technology packages

A special feature of SIMOTION is that the basic functionality can be expanded by loading technology packages, such as:

- Motion Control with the technology functions:
  - POS – Positioning
  - GEAR – Synchronous operation/electronic gear
  - CAM – Cam
  - PATH – Path interpolation (not D410-2)

- TControl – Temperature controller
- MIIF – Multipurpose Information Interface

Since the technology functions have modular licenses, you only pay for what you will actually use.

##### Performance

Hardware-supported floating-point arithmetic enables complex arithmetic functions to be used effectively.

Fast instruction execution opens up completely new application possibilities in the mid-performance to high-performance range.

##### Configuring/parameterizing/programming

SIMOTION SCOUT is a powerful and user-friendly engineering tool. It is an integrated system for all engineering steps, from configuring and parameterization, through programming, to testing and diagnostics. Graphical operator prompting, using dialog boxes and wizards, as well as text-based and graphical languages for programming, considerably reduce the familiarization and training periods.

##### Operator control and monitoring (HMI)

Communication services which support user-friendly data exchange with HMI devices are integrated in the basic functionality of SIMOTION D.

Operator control and monitoring can be implemented using SIMATIC HMI devices, such as TPs (Touch Panels), OPs (Operator Panels) or MPs (Multi Panels).

These devices can be connected to SIMOTION D over PROFIBUS, Industrial Ethernet or PROFINET and they are configured using WinCC flexible.

Version V7.0 and higher of the SCADA system WinCC features a SIMOTION channel which is included as standard on the WinCC DVD.

With the SIMATIC NET communications software, an open, standardized OPC interface is available for accessing SIMOTION from other Windows-based HMI systems.

##### SIMOTION IT service and diagnostic functions

SIMOTION IT provides SIMOTION D with an integrated Web server on which, for example, user-specific Web pages can be stored.

Read and write access can be made to the Control Unit variables. Java scripts or applets also allow the implementation of active operation and display functions in the Web pages that can be executed on a client PC with an Internet browser.

##### Process and data communication

Thanks to its integrated interfaces, SIMOTION D supports both process and data communication.

PROFINET IO with IRT is available for exacting motion control applications. In addition to cycle clock synchronization, cycle times of minimum 250  $\mu$ s and safety-related communication (PROFIsafe), the PROFINET interfaces on the SIMOTION D4x5-2 Control Units also support media redundancy (MRP/MRPD).

The SIMOTION SCOUT engineering system is provided for user-friendly communication configuration and diagnostics.



# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Overview of SIMOTION D

#### Function (continued)

##### Safety Integrated functions

The integrated safety functions of SINAMICS S120 allow SIMOTION D to provide practical, highly-effective protection for personnel and machinery.

The following Safety Integrated functions are currently available for the integrated SINAMICS S120 drive system: (Terms in accordance with IEC 61800-5-2)

- Safe Torque Off (STO)
- Safe Brake Control (SBC)
- Safe Stop1 (SS1)
- Safe Stop2 (SS2)
- Safe Operating Stop (SOS)
- Safely Limited Speed (SLS)
- Safe Speed Monitor (SSM)
- Safe Direction (SDI)

##### Activation of Safety Integrated functions

Safety Integrated functions can be activated by the following methods:

- Via terminals on the D4x5-2/CX32-2 and on the power unit (STO, SBC, SS1 only)
- Via fail-safe inputs on the TM54F Terminal Module
- Via fail-safe outputs on the D410-2
- Via PROFINET/PROFIBUS with PROFIsafe.

The Safety Integrated functions are implemented electronically and therefore offer short response times in comparison to solutions with externally implemented monitoring functions.

##### Safety Integrated functions via PROFIsafe

Safety Integrated functions are activated via "PROFINET with PROFIsafe" or "PROFIBUS with PROFIsafe" safe communication. The control (F logic) is implemented using an F-CPU connected via PROFINET or PROFIBUS, for example, a SIMATIC S7-300 F-CPU.

Safety Integrated functions are routed through from the SIMOTION D410-2 and D4x5-2 Control Units to the following drives:

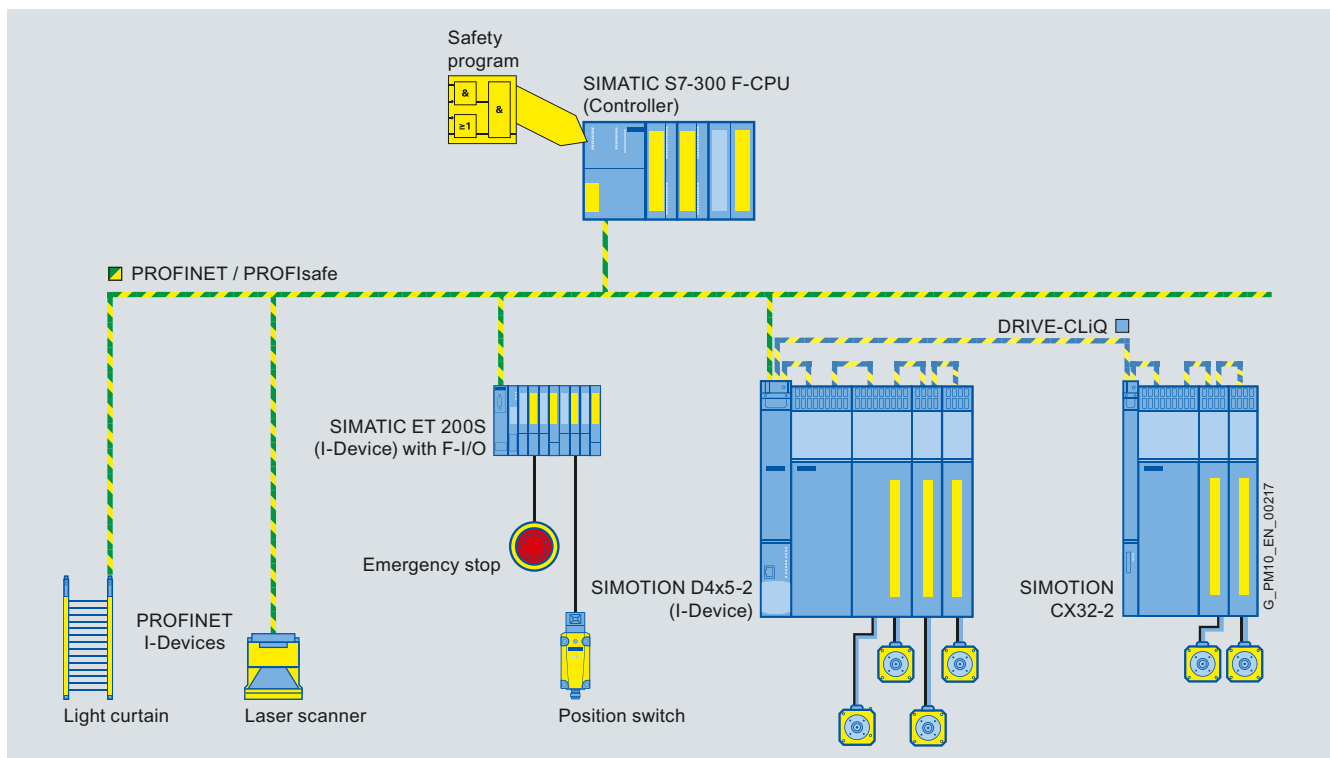
- Integrated SINAMICS S120 drives on SIMOTION D410-2 and D4x5-2
- Drives on the SIMOTION CX32-2 Controller Extension
- Drives on SINAMICS Control Units connected via PROFIBUS to SIMOTION D.
- Drives on SINAMICS Control Units connected to SIMOTION D via PROFINET (F-CPU must be connected via PROFINET in this case).

##### Note

For more information about possible topologies, axis quantity structures and suitable components, please contact your local Siemens sales office.

Detailed information can be found in the SIMOTION D Commissioning Manuals as well as in the SINAMICS documentation.

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Safety Integrated solution using a SIMOTION D4x5-2 as an example: Control of the safety functions via PROFINET with PROFIsafe

#### Overview



Left: SIMOTION D410-2 Control Unit attached to mounting plate  
Right: SIMOTION D410-2 Control Unit, snapped onto PM340 Power Module

SIMOTION D410-2 is the SIMOTION D variant for single-axis applications with multi-axis option in blocksize format. The Control Units form part of the SIMOTION D4x5-2 controller family which is the preferred option for multi-axis applications in book-size format. The SIMOTION D410-2 Control Unit is available in a PROFIBUS variant (D410-2 DP) and in a PROFIBUS/PROFINET variant (D410-2 DP/PN).

The SIMOTION D410-2 Control Units are specially designed for use with the SINAMICS S120 PM340 Power Modules in block-size format and can be directly connected to the Power Modules of this series. The SIMOTION D410-2 can also be installed on a mounting plate if required (to be ordered separately).



SIMOTION D410-2 Control Unit and mounting plate

The SIMOTION D410-2 handles the motion control, technology and PLC functions associated with a single axis and is also responsible for the drive control of that axis. The integrated inputs/outputs support up to 8 high-speed output cams or 8 measuring inputs.

The drive control supports servo control (for a highly dynamic response), vector control (for maximum torque accuracy) and V/f control.

SIMOTION D410-2 can be used in synchronized groups:

- For PROFINET: with controller – controller or controller – device relationship
- For PROFIBUS: with master – slave relationship

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

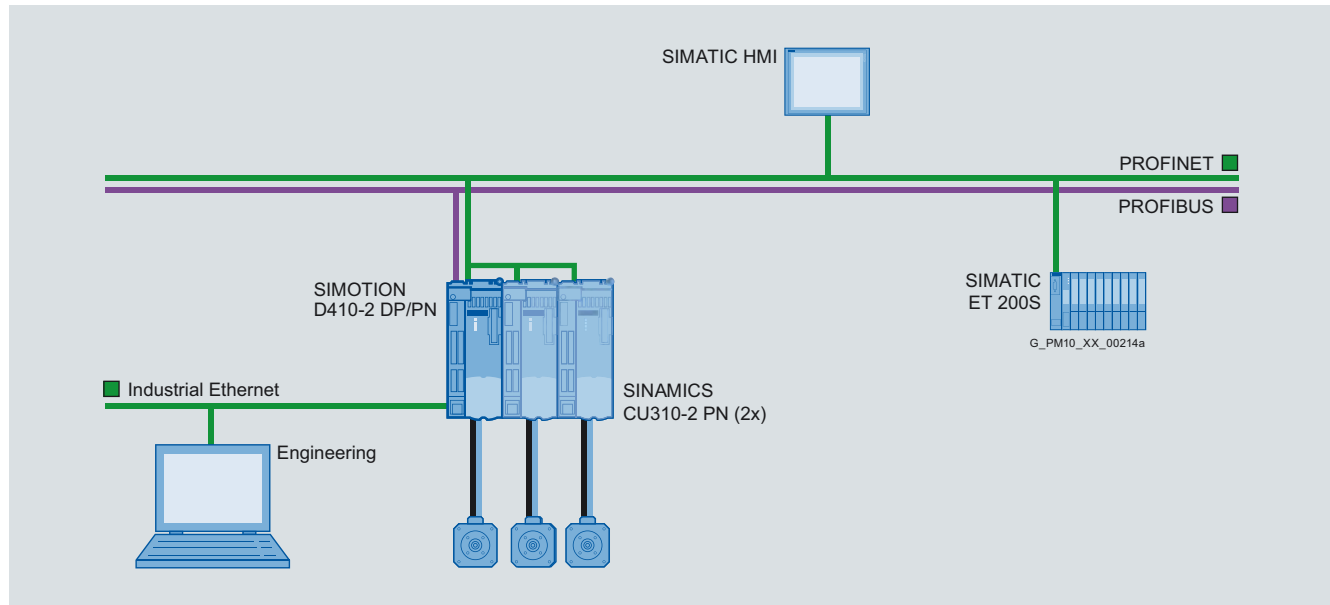
### SIMOTION D410-2 Control Units

#### Application

SIMOTION D410-2 is the ideal solution when motion control for one axis and PLC functionality are required in compact format. However, it can also be used for small multi-axis groupings with typically 2 to 3 axes in blocksize format. With these applications, the SINAMICS Control Units are connected to the SIMOTION D410-2 via PROFIBUS or PROFINET.

Examples of SIMOTION D410-2 applications include:

- Autonomous control of single axes
- Cross cutters
- Winder applications
- Feeder devices/roller infeed/press feeders
- Synchronized machining equipment
- Compact machine modules, e.g.
  - Feeders in post press applications
  - Shrink wrapping machines.
- Small multi-axis groupings (typically 2 to 3 axes) in blocksize format



SIMOTION D410-2 axis grouping with 3 axes (1 × D410-2 DP/PN, 2 × CU310-2 PN)

SIMOTION D410-2 supports motion control with the technology functions "positioning" (POS), "synchronous operation/electronic gear" (GEAR) and "cam" (CAM). "Path interpolation" (PATH) is not supported.

## Design

### Interfaces

#### Display and diagnostics

- LEDs to display operating states and errors
- 3 measuring sockets
- Service switch and mode selector
- Diagnostics button

#### Onboard I/Os

- 5 digital inputs
- 8 digital inputs/outputs (max. 8 as output cams or 8 as measuring inputs)
- 3 fail-safe, two-channel inputs (F-DI); can also be used as 6 DI
- 1 fail-safe output (F-DO); can also be used as 1 DO
- 1 analog input (either  $\pm 10$  V or  $\pm 20$  mA)

#### Communication

- 1  $\times$  DRIVE-CLiQ
- 1  $\times$  PROFINET IO  
(1 interface with 2 ports, D410-2 DP/PN only)
- 1  $\times$  PROFIBUS DP (D410-2 DP: 2  $\times$  PROFIBUS DP)

#### Data backup

- 1  $\times$  slot for SIMOTION CompactFlash card

#### Additional interfaces

- Terminals for 24 V electronics power supply
- 1  $\times$  encoder input for
  - HTL/TTL incremental encoder
  - SSI absolute encoder (without incremental signals)
- 1  $\times$  temperature sensor input (KTY84-130 or PTC)
- PM IF interface (Power Module interface) on rear for direct operation with a SINAMICS S120 PM340 Power Module in blocksize format

### Assembly/Installation

SIMOTION D410-2 can be directly plugged in to the SINAMICS S120 PM340 Power Module in blocksize format.

Alternatively, the SIMOTION D410-2 can be mounted on a mounting plate (to be ordered separately) and connected to the PM340 Power Module via DRIVE-CLiQ. In this case, the CUA31/CUA32 Control Unit Adapter has to be connected to the PM340 Power Module. No more than one Control Unit Adapter can be connected to the SIMOTION D410-2.

#### Note:

It is not possible to use the Safety Integrated Extended Functions via the onboard terminals (F-DI, F-DO) when the PM340 Power Module is connected via CUA31/CUA32.

Power Modules in AC/AC chassis format are connected to the SIMOTION D410-2 over the DRIVE-CLiQ interface. Motor Modules in booksize format cannot be connected to SIMOTION D410-2.

A SIMOTION D410-2 mounted on the mounting plate can also be operated without the PM340, e.g.

- for hydraulic applications using a TM31 for the analog inputs and analog outputs
- for the connection of drives with analog  $\pm 10$  V setpoint interface (IM 174/ADI 4)

### Data storage/data backup

The SIMOTION D410-2 Control Units store the retentive process data permanently in a manner that requires no maintenance (refer to technical data for memory size). The real-time clock is backed up for several days via a SuperCap.

The runtime software, user data and user programs are backed up on the SIMOTION CompactFlash card. The retentive process data of the Control Unit can also be stored on this CompactFlash card via system command, e.g. if spare parts are required.

### Connectable I/Os

#### PROFINET IO: (D410-2 DP/PN only)

- Certified PROFINET devices
- Distributed I/Os SIMATIC ET 200S/SP/M/eco PN/pro and TMC
- HMI

#### PROFIBUS DP:

- Certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- SIMATIC ET 200S/M/eco/pro distributed I/O systems
- HMI

#### DRIVE-CLiQ:

Modules from the SINAMICS range:

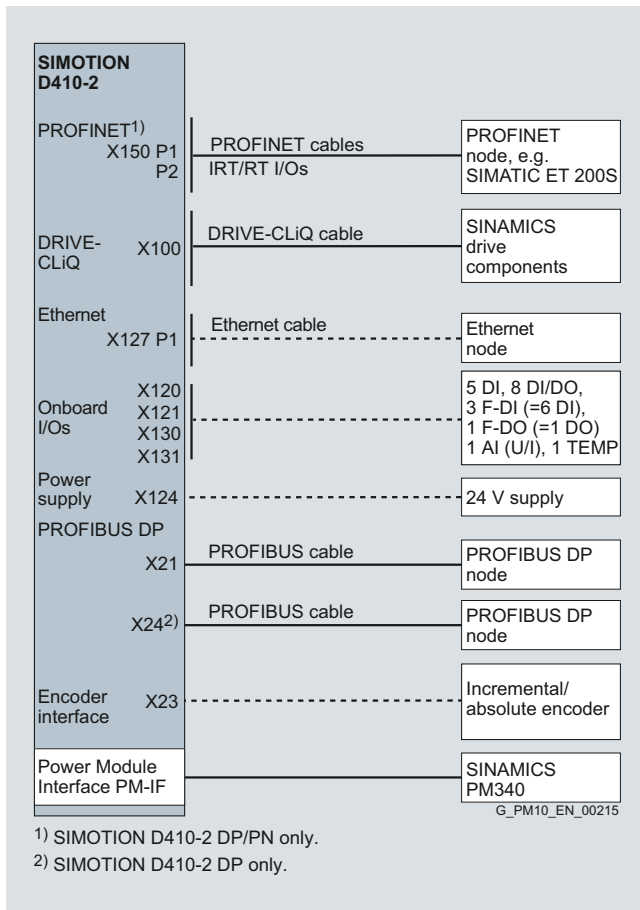
- Terminal Modules (max. 8), of which
  - maximum 3 are TM15, TM17 High Feature, TM41
  - maximum 8 are TM15 DI/DO, TM31
  - maximum 1 is TM54F
- SMC/SME Sensor Modules  
(max. 5 encoder systems via DRIVE-CLiQ)
- DMC20/DME20 DRIVE-CLiQ Hub Module (max. 1)
- Motors with DRIVE-CLiQ interface

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D410-2 Control Units

#### Integration



When dimensioning cables, you must always observe the maximum permissible cable lengths.

If these maximum lengths are exceeded, malfunctions can occur.

The permissible length of PROFIBUS DP cables depends on the configuration.

The DRIVE-CLiQ and encoder cables used for the SINAMICS S120 CU310-2 Control Unit can also be used for SIMOTION D410-2.

For more information about signal cables, refer to chapter MOTION-CONNECT connection systems.

SIMOTION D410-2 connection overview

### Technical specifications

Order No.		6AU1410-2AA00-0AA0	6AU1410-2AD00-0AA0
<b>Product brand name</b>		SIMOTION	SIMOTION
<b>Product-type designation</b>		D410-2 DP	D410-2 DP/PN
<b>Version of the motion control system</b>		Single-axis system with multi-axis option	Single-axis system with multi-axis option
<b>PLC and motion control performance</b>			
<b>Maximum number of axes</b>		8	8
<b>Minimum PROFIBUS cycle clock</b>	ms	1	1
<b>Minimum PROFINET send cycle clock</b>	ms	–	0.25
<b>Minimum servo cycle clock</b>	ms	0.5	0.5
<b>Minimum interpolator cycle clock</b>	ms	0.5	0.5
<b>Servo/IPO clock cycle, remark</b>		1 ms when using the TO axis and the integrated closed-loop drive control	1 ms when using the TO axis and the integrated closed-loop drive control
<b>Integrated drive control</b>			
<b>Maximum number of axes for integrated drive control</b>			
• servo		1	1
• vector		1	1
• V/f		1	1
• remark		Alternative control modes; drive control based on SINAMICS S120 CU310-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU310-2, firmware version V4.x
<b>Memory</b>			
<b>RAM (work memory)</b>	MB	48	48
<b>Additional RAM work memory for Java applications</b>	MB	20	20
<b>RAM disk (load memory)</b>	MB	31	31
<b>Retentive memory</b>	KB	108	108
<b>Persistent memory (user data on CF)</b>	MB	300	300
<b>Communication</b>			
<b>DRIVE-CLiQ interfaces</b>		1	1
<b>Industrial Ethernet interfaces</b>		1	1
<b>PROFIBUS interfaces</b>		2	1
• remark		Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave
<b>PROFINET interfaces</b>		0	1
• remark		–	Interface with 2 ports; supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device
<b>General technical data</b>			
<b>Fan</b>		Integrated	Integrated
<b>DC supply voltage</b>			
• rated value	V	24	24
• permissible range	V	20.4 ... 28.8	20.4 ... 28.8
<b>Current consumption, typ.</b>	mA	800	800
• remark		without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface
<b>Making current, typ.</b>	A	3	3
<b>Power loss, typ.</b>	W	20	20
<b>Ambient temperature</b>			
• during long-term storage	°C (°F)	-25 ... +55 (-13 ... +131)	-25 ... +55 (-13 ... +131)
• during transport	°C (°F)	-40 ... +70 (-40 ... +158)	-40 ... +70 (-40 ... +158)
• during operating	°C (°F)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)
- remark		Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).
<b>Relative humidity without condensation during operating phase</b>	%	5 ... 95	5 ... 95

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D410-2 Control Units

#### Technical specifications (continued)

Order No.		6AU1410-2AA00-0AA0	6AU1410-2AD00-0AA0
<b>Product brand name</b>		SIMOTION	SIMOTION
<b>Product-type designation</b>		D410-2 DP	D410-2 DP/PN
<b>General technical data (continued)</b>			
<b>Air pressure</b>	hPa	620 ... 1 060	620 ... 1 060
<b>Protection class IP</b>		IP20	IP20
<b>Height</b>	mm (in)	186.8 (7.35)	190.7 (7.51)
<b>Width</b>	mm (in)	73 (2.87)	73 (2.87)
<b>Depth</b>	mm (in)	74.4 (2.93)	74.4 (2.93)
<b>Weight, approx.</b>	g (lb)	830 (1.83)	830 (1.83)
<b>Digital inputs</b>			
<b>Number of digital inputs</b>		11	11
• remark		Of which: 5 DI and 3 F-DI (= 6 DI)	Of which: 5 DI and 3 F-DI (= 6 DI)
<b>DC input voltage</b>			
• rated value	V	24	24
• for signal "1"	V	15 ... 30	15 ... 30
• for signal "0"	V	-3 ... +5	-3 ... +5
<b>Electrical isolation</b>		Yes	Yes
<b>Current consumption for "1" signal level, typ.</b>	mA	6	6
<b>Input delay for</b>			
• signal "0" → "1", typ.	µs	50	50
• signal "1" → "0", typ.	µs	150	150
<b>Digital inputs/outputs</b>			
<b>Number of digital inputs/outputs</b>		8	8
<b>Parameterization possibility of the digital inputs/outputs</b>		Can be parameterized as DI, as DO, as measuring input (max. 8), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 8), as output cam (max. 8)
<b>If used as an input</b>			
<b>DC input voltage</b>			
• rated value	V	24	24
• for signal "1"	V	15 ... 30	15 ... 30
• for signal "0"	V	-3 ... +5	-3 ... +5
<b>Electrical isolation</b>		No	No
<b>Current consumption for "1" signal level, typ.</b>	mA	5	5
<b>Input delay for</b>			
• signal "0" → "1", typ.	µs	5	5
• signal "1" → "0", typ.	µs	50	50
<b>Measuring input, reproducibility</b>	µs	5	5
• remark		Typical value	Typical value
<b>Measuring input, resolution</b>	µs	1	1
<b>If used as an output</b>			
<b>Load voltage</b>			
• rated value	V	24	24
• permissible range	V	20.4 ... 28.8	20.4 ... 28.8
<b>Electrical isolation</b>		No	No
<b>Current carrying capacity for each output, max.</b>	mA	500	500
<b>Leakage current, max.</b>	mA	2	2
<b>Output delay for</b>			
• signal "0" → "1", typ.	µs	150	150
• signal "0" → "1", max.	µs	400	400
• signal "1" → "0", typ.	µs	75	75
• signal "1" → "0", max.	µs	100	100
- remark		Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut

### Technical specifications (continued)

Order No.		6AU1410-2AA00-0AA0	6AU1410-2AD00-0AA0
<b>Product brand name</b>		SIMOTION	SIMOTION
<b>Product-type designation</b>		D410-2 DP	D410-2 DP/PN
<b>If used as an output (continued)</b>			
<b>Output cam, reproducibility</b>	μs	125	125
• remark		Typical value	Typical value
<b>Output cam, resolution</b>	μs	125	125
• remark		Typical value	Typical value
<b>Switching frequency of the outputs for</b>			
• ohmic load, max.	Hz	100	100
• inductive load, max.	Hz	0.5	0.5
• lamp load, max.	Hz	10	10
<b>Short-circuit protection</b>		Yes	Yes
<b>Digital outputs</b>			
<b>Number of digital outputs</b>		1	1
<b>Parameterization possibility of the digital outputs</b>		Can be parameterized as F-DO or DO	Can be parameterized as F-DO or DO
<b>Load voltage</b>			
• rated value	V	24	24
• permissible range	V	20.4 ... 28.8	20.4 ... 28.8
<b>Electrical isolation</b>		Yes	Yes
<b>Current carrying capacity for each output, max.</b>	mA	500	500
<b>Leakage current, max.</b>	mA	2	2
<b>Output delay for</b>			
• signal "0" → "1", typ.	μs	150	150
• signal "0" → "1", max.	μs	400	400
• signal "1" → "0", typ.	μs	75	75
• signal "1" → "0", max.	μs	100	100
- remark		Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut
<b>Short-circuit protection</b>		Yes	Yes
<b>Analog input</b>			
<b>Number of analog inputs</b>		1	1
<b>If used as an analog voltage input</b>			
<b>Input voltage</b>	V	-10 ... +10	-10 ... +10
<b>Resolution</b>	bit	12	12
• remark		+ sign	+ sign
<b>Input resistance (Ri)</b>	kΩ	100	100
<b>If used as an analog current input</b>			
<b>Input current</b>	mA	-20 ... +20	-20 ... +20
<b>Resolution</b>	bit	11	11
• remark		+ sign	+ sign
<b>Input resistance (Ri)</b>	Ω	250	250
<b>Onboard encoder interface</b>			
<b>Encoder interface</b>		Optional incremental encoder TTL, incremental encoder HTL or absolute encoder SSI without incremental signals TTL/HTL	Optional incremental encoder TTL, incremental encoder HTL or absolute encoder SSI without incremental signals TTL/HTL
<b>Encoder supply for</b>			
• 24 V DC	A	0.35	0.35
• 5 V DC	A	0.35	0.35
<b>Limiting frequency, max.</b>	kHz	500	500
<b>SSI baud rate</b>	kBd	100 ... 250	100 ... 250
<b>Resolution of absolute position SSI</b>	bit	30	30



# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D410-2 Control Units

#### Technical specifications (continued)

Order No.	6AU1410-2AA00-0AA0	6AU1410-2AD00-0AA0
<b>Product brand name</b>	SIMOTION	SIMOTION
<b>Product-type designation</b>	D410-2 DP	D410-2 DP/PN
<b>Onboard encoder interface (continued)</b>		
<b>Cable length for</b>		
• TTL incremental encoder, max.	m (ft) 100 (328)	100 (328)
• HTL incremental encoder for		
- unipolar signals, max.	m (ft) 100 (328)	100 (328)
- bipolar signals, max.	m (ft) 300 (984)	300 (984)
- remark	TTL only bipolar signals; for bipolar signals, the signal lines must be twisted in pairs and shielded	
• SSI absolute encoder, max.	m (ft) 100 (328)	100 (328)
<b>Additional technical data</b>		
<b>Input for the temperature measurement</b>	KTY84-130 or PTC	KTY84-130 or PTC
<b>Backup of non-volatile data</b>		
• Backup of retentive data	Unlimited buffer duration	Unlimited buffer duration
• Buffer time real-time clock	5 days min.	5 days min.
• remark	Data backup is maintenance-free	Data backup is maintenance-free
<b>Approvals</b>		
• USA	UL 61010-1, 2nd Ed. CAN/CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/CSA-C22.2 NO. 61010-1-04
• Canada	UL 61010-1, 2nd Ed. CAN/CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/CSA-C22.2 NO. 61010-1-04
• Australia	C-Tick	C-Tick

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#### Selection and ordering data

Description	Order No.
<b>SIMOTION D410-2 DP Control Unit</b> (SIMOTION V4.3 SP1 HF2 or higher)	<b>6AU1410-2AA00-0AA0</b>
<b>SIMOTION D410-2 DP/PN Control Unit</b> (SIMOTION V4.3 SP1 HF3 or higher)	<b>6AU1410-2AD00-0AA0</b>
<b>SIMOTION CompactFlash card (CF) 1 GB</b> with the current SIMOTION Kernel and SINAMICS S120 drive software V4.x <i>Pre-installed license can be obtained using additional order codes <sup>1)</sup></i> <b>Note:</b> A separate CompactFlash card is available for the SIMOTION D4x5-2 Control Units. (6AU1400-2PA22-0AA0)	<b>6AU1400-1PA22-0AA0</b>
<b>MultiAxes Package license for SIMOTION D410-2</b> • As Z option • As single license	<b>M41</b> <b>6AU1820-0AA41-0AB0</b>

<sup>1)</sup> Note about licenses for runtime software:  
Runtime software licenses can either be pre-installed on a CompactFlash card (CF) or ordered separately.  
[See Ordering licenses for runtime software on page 9/63.](#)

### Accessories

Description	Order No.
<b>Accessories for SIMOTION D410-2</b>	
<b>Rear panel mounting plate</b> For installing the SIMOTION D410-2 in a different location if you do not wish to connect it to the Power Module.	6AU1400-7AA05-0AA0
<b>Accessories for PROFIBUS</b>	
<b>PROFIBUS RS485 bus connector with axial cable outlet (180°)</b> Max. transmission rate 12 Mbit/s	
<ul style="list-style-type: none"> <li>Without PG socket, with terminal blocks</li> <li>Without PG socket, with FastConnect insulation displacement method</li> </ul>	6GK1500-0EA02 6GK1500-0FC10
<b>PROFIBUS RS485 bus connector with angular cable outlet (35°) and screw-type terminals</b> Max. transmission rate 12 Mbit/s	
<ul style="list-style-type: none"> <li>Without PG interface</li> <li>With PG interface</li> </ul>	6ES7972-0BA42-0XA0 6ES7972-0BB42-0XA0
<b>PROFIBUS FastConnect RS485 bus connector with angular cable outlet (35°) and insulation displacement terminals</b> Max. transmission rate 12 Mbit/s	
<ul style="list-style-type: none"> <li>Without PG interface</li> <li>With PG interface</li> </ul>	6ES7972-0BA60-0XA0 6ES7972-0BB60-0XA0
<b>PROFIBUS RS485 bus connector with cable outlet (90°) and screw-type terminals</b> Max. transmission rate 12 Mbit/s	
<ul style="list-style-type: none"> <li>Without PG interface</li> <li>With PG interface</li> </ul>	6ES7972-0BA12-0XA0 6ES7972-0BB12-0XA0
<b>PROFIBUS FastConnect RS485 bus connector with cable outlet (90°) and insulation displacement terminals</b> Max. transmission rate 12 Mbit/s	
<ul style="list-style-type: none"> <li>Without PG interface</li> <li>With PG interface</li> </ul>	6ES7972-0BA52-0XA0 6ES7972-0BB52-0XA0

Description	Order No.
<b>Accessories for PROFINET</b>	
<b>RJ45 FastConnect connector for Industrial Ethernet/PROFINET</b> 180° cable outlet	
<ul style="list-style-type: none"> <li>1 pack = 1 unit</li> <li>1 pack = 10 units</li> <li>1 pack = 50 units</li> </ul>	6GK1901-1BB10-2AA0 6GK1901-1BB10-2AB0 6GK1901-1BB10-2AE0
<b>RJ45 FastConnect connector for Industrial Ethernet/PROFINET</b> 145° cable outlet	
<ul style="list-style-type: none"> <li>1 pack = 1 unit</li> <li>1 pack = 10 units</li> <li>1 pack = 50 units</li> </ul>	6GK1901-1BB30-0AA0 6GK1901-1BB30-0AB0 6GK1901-1BB30-0AE0
<b>FastConnect cables for Industrial Ethernet/PROFINET<sup>1)</sup></b>	
<ul style="list-style-type: none"> <li>IE FC Standard Cable GP 2x2</li> <li>IE FC Flexible Cable GP 2x2</li> <li>IE FC Trailing Cable GP 2x2</li> <li>IE FC Trailing Cable 2x2</li> <li>IE FC Marine Cable 2x2</li> </ul>	6XV1840-2AH10 6XV1870-2B 6XV1870-2D 6XV1840-3AH10 6XV1840-4AH10
<b>Stripping tool for Industrial Ethernet/PROFINET FastConnect cables</b>	
<ul style="list-style-type: none"> <li>IE FC stripping tool</li> </ul>	6GK1901-1GA00
<b>Other accessories</b>	
<b>Dust-proof blanking plugs</b> (50 units) for sealing unused DRIVE-CLiQ, Ethernet and PROFINET ports	6SL3066-4CA00-0AA0

<sup>1)</sup> Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft).

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D410-2 Control Units

#### More information

##### More information

- about PROFIBUS DP/MPI cables and MOTION-CONNECT can be found in chapter MOTION-CONNECT connection systems.
- about PROFIBUS DP, Industrial Ethernet and PROFINET can be found in Catalog IK PI and the Industry Mall under Automation Technology/Industrial Communication.
- about the ordering data for SINAMICS drive components such as Power Modules, DRIVE-CLiQ cables, etc. can be found in chapter SINAMICS S120 drive system and the Industry Mall under Drive Technology/Converters/...

##### Integrated drive control

The drive control functions integrated in a SIMOTION D410-2 are based on the drive control of a SINAMICS S120 CU310-2 (firmware version V4.x), although there is a slight difference in functionality. For example, the SIMOTION D410-2 does not have a basic positioner function (EPos), as this is already covered by SIMOTION technology functions.

For more information, refer to chapter [System description – Dimensioning](#) and the documentation for SIMOTION and SINAMICS.

##### Licensing notes

SIMOTION D410-2 has an integrated drive control for either a servo, a vector or a V/f axis and is therefore ideal for single-axis applications.

One real axis can be used without license on the Control Unit. Speed-controlled axes and virtual axes never require a license.

SIMOTION D410-2 can be extended with additional SINAMICS S110/S120 Control Units (e.g. CU305) and so can also be used for smaller multi-axis applications (e.g. with 2 – 3 axes). A license is required for any additional axes. Where a license is required for a POS axis, the POS single-axis license is the ideal solution. It is better to use the MultiAxes Package D410-2 in the case of GEAR/CAM or more than one POS license.

The axis license with the highest functionality is covered by the inclusive license (a real axis).

The functionality has the following granularity:  
CAM > GEAR > POS.

##### Example:

Application with 2 real axes: 1 POS, 1 CAM.

Only a POS license needs to be purchased because the higher-order CAM license is already included.

Licenses are also required for runtime functions such as SIMOTION IT Virtual Machine. These can be pre-installed on the CompactFlash card (CF card) or ordered separately.

For more information, refer to section [Ordering of licenses for runtime software](#).

##### SIZER for Siemens Drives engineering tool

With the SIZER for Siemens Drives engineering tool, you can easily configure the SINAMICS S110, S120 drive families including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting utilization with SIZER for Siemens Drives in accordance with your performance requirements.

For more information about SIZER for Siemens Drives, refer to chapter [System description – Dimensioning](#).

#### Overview



SIMOTION D4x5-2 are drive-based Control Units for multi-axis systems. The individual variants essentially differ in terms of their PLC and motion control performance, memory size and interfaces. The main distinguishing features are:

Distinguishing features <sup>2)</sup>	SIMOTION D425-2 DP	SIMOTION D425-2 DP/PN	SIMOTION D435-2 DP	SIMOTION D435-2 DP/PN	SIMOTION D445-2 DP/PN	SIMOTION D455-2 DP/PN
<b>Performance class</b>	BASIC	BASIC	STANDARD	STANDARD	HIGH	ULTRA-HIGH
<b>Maximum number of axes</b>	16	16	32	32	64	128
<b>Second runtime level</b> SERVO <sub>Fast</sub> / IPO <sub>Fast</sub>	–	–	–	•	•	•
<b>DRIVE-CLiQ interfaces</b>	4	4	6	6	6	6
<b>Communication interfaces</b>						
• PROFIBUS	2	2	2	2	2	2
• PROFINET	–	1 (3 ports) <sup>1)</sup>	–	1 (3 ports) <sup>1)</sup>	1 (3 ports) <sup>1)</sup>	1 (3 ports) <sup>1)</sup>
• Ethernet	3	2	3	2	2	2

- available
- not available

The SIMOTION D425-2, D435-2, D445-2 and D455-2 Control Units feature PLC and motion control performance (open-loop control and motion control) for up to 16, 32, 64 or 128 axes, as required.

The integrated drive control enables each D4x5-2 Control Unit to operate up to 6 servo, 6 vector or 12 *V/f* axes.

The integrated drive control is based on the drive control of a SINAMICS S120 CU320-2 Control Unit (firmware version V4.x) and supports servo control (for a highly dynamic response), vector control (for maximum torque accuracy) and *V/f* control.

#### Extension of the drive computing performance

The motion control performance of a SIMOTION D4x5-2 can be utilized in full by expanding the computing performance at the drive in two different ways:

- SINAMICS S120 Control Units (e.g. CU320-2) can be connected together with further SINAMICS S120 drive modules via PROFIBUS or PROFINET.
- The SIMOTION CX32-2 Controller Extension can be connected via DRIVE-CLiQ. This module is extremely compact and can control up to 6 servo, 6 vector or 12 *V/f* axes.

<sup>1)</sup> Optional second PROFINET interface via CBE30-2 (4 ports)

<sup>2)</sup> For further details such as cycle times, memory configuration, etc., refer to technical specifications.

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Application

Field of application for the SIMOTION D4x5-2 Control Units are applications with a large number of coordinated axes and short cycle times.

Typical fields of application are:

- Compact multi-axis machines
- High-performance applications with short machine cycles
- Compact machines
  - Including the complete machine control in the drive
  - With extensive connection possibilities for communication, HMI and I/O
- Distributed drive concepts
  - Applications with a large number of axes
  - Synchronization of several SIMOTION D Control Units via distributed synchronous operation

#### Design



SIMOTION D425-2 DP (on left) and SIMOTION D435-2 DP/PN with CBE30-2 inserted (on right)

#### Interfaces

##### Display and diagnostics

- LEDs to display operating states and errors
- 3 measuring sockets
- Service switch and mode selector
- Diagnostics button

##### Onboard I/Os

- 12 digital inputs
- 16 digital inputs/outputs (max. 16 as high-speed measuring inputs, max. 8 as high-speed output cams)

##### Communication

- 6 x DRIVE-CLiQ (4 x DRIVE-CLiQ for D425-2)
- 2 x Industrial Ethernet (3 x Industrial Ethernet for D4x5-2 DP), of which one interface easily accessible on the module front
- 2 x PROFIBUS DP
- 1 x PROFINET IO (1 interface with 3 ports, with D4x5-2 DP/PN only)
- 2 x USB

##### Data backup

- 1 x slot for SIMOTION CompactFlash card

##### Additional interfaces

- Terminals for 24 V electronics power supply

#### Option modules

With the TB30 Terminal Board, the SIMOTION D4x5-2 Control Units can be extended with 4 digital inputs, 4 digital outputs, 2 analog inputs and 2 analog outputs. The TB30 Terminal Board is plugged into the option slot on the Control Unit.

Using the CBE30-2 Communication Board for PROFINET IO, it is possible to equip the SIMOTION D4x5-2 DP/PN Control Units with a second PROFINET interface with 4 ports.

Applications for a second PROFINET interface:

- 2 separate networks (e.g. one local and one higher-level network)
- Address space can be doubled to 2 x 4 KB
- Maximum number of connectable devices can be doubled to 2 x 64
- Separation into a high-speed and a slow bus system/execution system in order to make efficient use of the controller's capacity (applies only to SIMOTION D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN)
  - PROFINET onboard: SERVO<sub>Fast</sub> and IPO<sub>Fast</sub>
  - PROFINET via CBE30-2: SERVO / IPO / IPO2

#### Note:

The CBE30-2 cannot be used in SIMOTION D4x5-2 DP Control Units. If the CBE30-2 is used without SERVO<sub>Fast</sub> and IPO<sub>Fast</sub>, then both PROFINET interfaces are assigned to SERVO / IPO / IPO2.

#### Assembly/Installation

The SIMOTION D4x5-2 Control Units can be mounted in the control cabinet in one of three ways:

- Mounting with spacers
- Mounting without spacers (D425-2 and D435-2 only)
- Mounting without spacers (external cooling, D445-2 and D455-2 only)

With external air cooling, the cooling fins of the D445-2/D455-2 Control Unit are outside of the control cabinet. A seal (option) is required so that the Control Unit can be hermetically mounted in the rear cabinet panel.

The SIMOTION D4x5-2 Control Units are supplied with pre-assembled spacers. These can be removed if necessary.

#### Data storage/data backup

The SIMOTION D4x5-2 Control Units store the retentive process data permanently in a manner that requires no maintenance (refer to technical data for memory size).

The real-time clock is backed up for several days via a Super-Cap. The backup time can be extended via a battery in the double fan/battery module.

The double fan/battery module incl. battery is contained in the scope of supply of the SIMOTION D4x5-2.

The runtime software, user data and user programs are stored retentively on the CompactFlash card (CF). The retentive process data of the Control Unit can also be stored on this CompactFlash card via system command, e.g. if spare parts are required.

#### Design (continued)

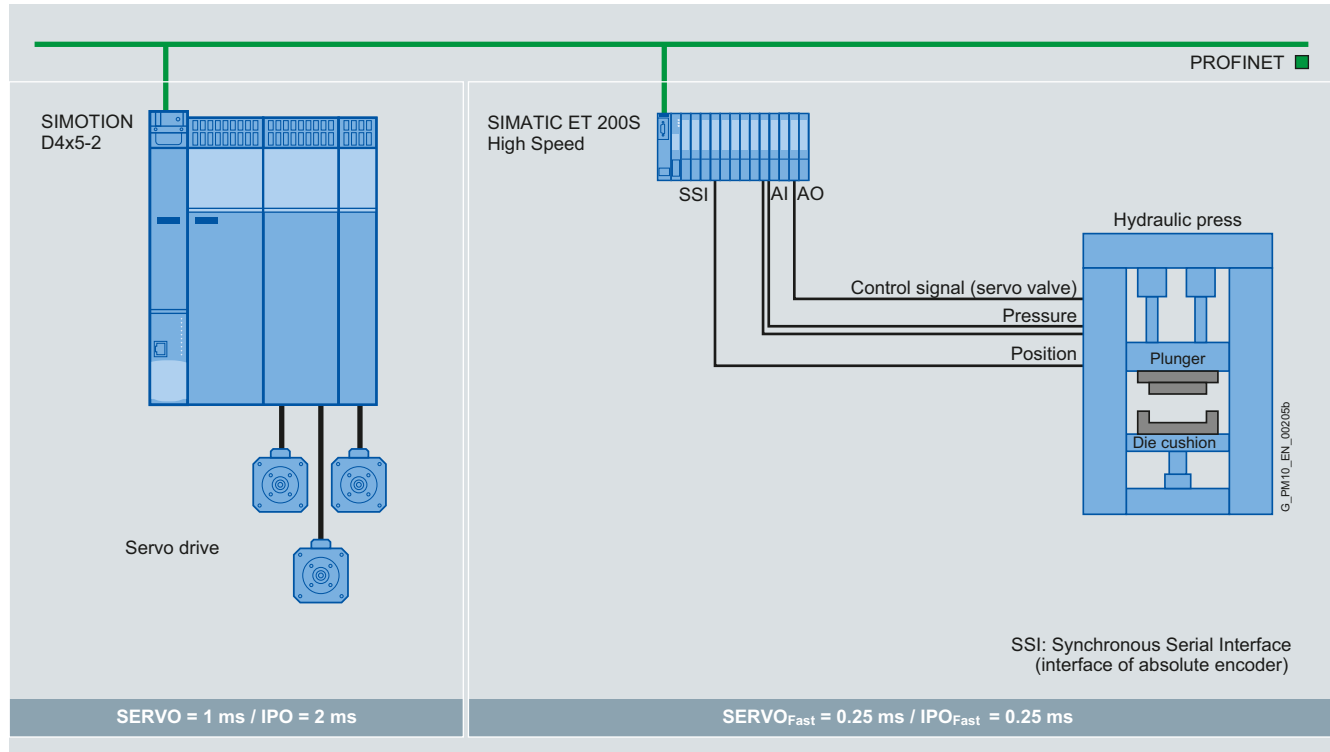
#### Extended execution system ( $SERVO_{Fast}$ / $IPO_{Fast}$ )

The SIMOTION D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN Control Units have (in addition to  $SERVO$ ,  $IPO$  and  $IPO2$ ) an additional second runtime level ( $SERVO_{Fast}$  and  $IPO_{Fast}$ ).

The additional runtime level allows the distribution of electric and/or hydraulic axes with different dynamic responses on a slow and a fast bus system so that the performance of the controller can be used more efficiently.

It also enables a particularly fast I/O processing in conjunction with high-speed PROFINET I/O modules.

Thanks to the extended execution system, electrical positioning drives can be controlled with cycle times in the millisecond range requiring fewer resources and at the same time the pressure-controlled axes of an hydraulic press can be controlled with a high dynamic response and short cycle times.



Closed-loop control of an hydraulic press with  $SERVO_{Fast}$  and  $IPO_{Fast}$

If  $SERVO_{Fast}$  and  $IPO_{Fast}$  are activated, the following assignment applies:

- $SERVO_{Fast}$  and  $IPO_{Fast}$  are assigned to the PROFINET.
- $SERVO$ ,  $IPO$  and  $IPO2$  are assigned to the PROFIBUS or the integrated drives of the SIMOTION D4x5-2/CX32-2.

If a second PROFINET interface is provided by means of a CBE30-2, this will also be assigned to  $SERVO$ ,  $IPO$  and  $IPO2$ . In this case, the onboard PROFINET interface is always assigned to  $SERVO_{Fast}$  and  $IPO_{Fast}$ .

#### Connectable I/Os

##### PROFINET IO:

- Certified PROFINET devices
- Distributed I/Os SIMATIC ET 200S/SP/M/eco PN/pro and TMC
- Drive systems (e.g. SINAMICS S110/S120)

##### PROFIBUS DP:

- Certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- SIMATIC ET 200S/M/eco/pro distributed I/Os
- Drive systems (e.g. SINAMICS S110/S120)

##### DRIVE-CLiQ:

Modules from the SINAMICS S120 range:

- TM15, TM17 High Feature Terminal Modules, TM31, etc.
- SMC/SME Sensor Modules
- DMC20/DME20 DRIVE-CLiQ Hub Module

##### USB:

The integrated USB interface allows, for example, a USB memory stick to be connected for a project or firmware update.

##### Expansion with SINAMICS S120 drive modules

SINAMICS S120 drive modules in booksize format (Line Modules, Motor Modules, etc.) are connected to the SIMOTION D4x5-2 Control Unit via DRIVE-CLiQ.

SINAMICS S120 PM340 Power Modules in blocksize format can be operated on the SIMOTION D4x5-2 Control Units with the CUA31/CUA32 Control Unit Adapters.

##### Note:

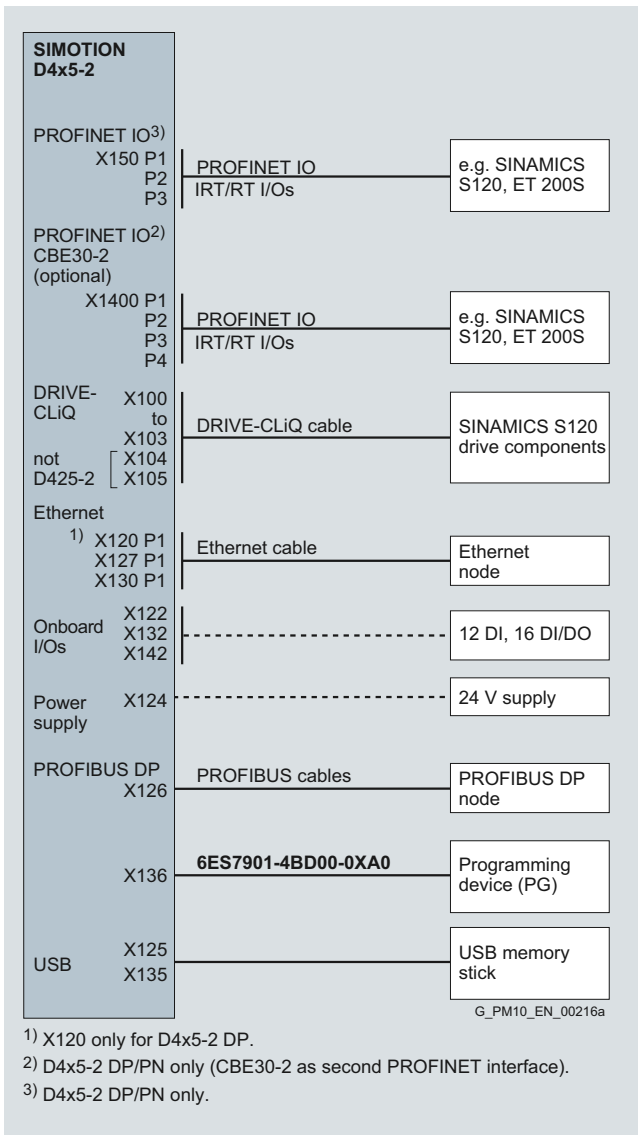
DRIVE-CLiQ cables which are required to connect Line/Motor Modules to SIMOTION D are supplied in a standard length with the Line/Motor Modules.

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Integration



When dimensioning cables, you must always observe the maximum permissible cable lengths.

If these maximum lengths are exceeded, malfunctions can occur.

The permissible length of PROFIBUS DP cables depends on the configuration.

The DRIVE-CLiQ cables used for the SINAMICS S120 CU320-2 Control Unit can also be used for SIMOTION D4x5-2 Control Units.

[For more information about signal cables, refer to chapter MOTION-CONNECT connection systems.](#)

SIMOTION D4x5-2 Control Unit connection overview

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Technical specifications

Order No.		6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
<b>Product brand name</b>		SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
<b>Product-type designation</b>		D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
<b>Performance class for motion control system</b>		BASIC Performance	BASIC Performance	STANDARD Performance	STANDARD Performance	HIGH Performance	ULTRA-HIGH Performance
<b>Version of the motion control system</b>		Multiple-axis system	Multiple-axis system	Multiple-axis system	Multiple-axis system	Multiple-axis system	Multiple-axis system
<b>PLC and motion control performance</b>							
<b>Maximum number of axes</b>		16	16	32	32	64	128
<b>Minimum PROFIBUS cycle clock</b>	ms	1	1	1	1	1	1
<b>Minimum PROFINET send cycle clock</b>	ms	0.25	0.25	0.25	0.25	0.25	0.25
<b>Minimum servo cycle clock</b>	ms	0.5	0.5	0.5	0.25	0.25	0.25
<b>Minimum interpolator cycle clock</b>	ms	0.5	0.5	0.5	0.25	0.25	0.25
<b>Servo / IPO clock cycle, remark</b>		–	–	–	0.5 ms in conjunction with integrated SINAMICS S120 drives (SINAMICS Integrated); 0.25 ms in conjunction with SERVO <sub>FAST</sub> and IPO <sub>FAST</sub>	0.5 ms in conjunction with integrated SINAMICS S120 drives (SINAMICS Integrated); 0.25 ms in conjunction with SERVO <sub>FAST</sub> and IPO <sub>FAST</sub>	0.5 ms in conjunction with integrated SINAMICS S120 drives (SINAMICS Integrated); 0.25 ms in conjunction with SERVO <sub>FAST</sub> and IPO <sub>FAST</sub>
<b>Integrated drive control</b>							
<b>Maximum number of axes for integrated drive control</b>							
• servo		6	6	6	6	6	6
• vector		6	6	6	6	6	6
• V/f		12	12	12	12	12	12
• remark		Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x
<b>Memory</b>							
<b>RAM (work memory)</b>	MB	48	48	64	64	128	256
<b>Additional RAM work memory for Java applications</b>	MB	20	20	20	20	20	20
<b>RAM disk (load memory)</b>	MB	31	31	41	41	56	76
<b>Retentive memory</b>	KB	364	364	364	364	512	512
<b>Persistent memory (user data on CF)</b>	MB	300	300	300	300	300	300



# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Technical specifications (continued)

Order No.	6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
<b>Product brand name</b>	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
<b>Product-type designation</b>	D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
<b>Communication</b>						
<b>DRIVE-CLiQ interfaces</b>	4	4	6	6	6	6
<b>USB interfaces</b>	2	2	2	2	2	2
<b>Industrial Ethernet interfaces</b>	3	2	3	2	2	2
<b>PROFIBUS interfaces</b>	2	2	2	2	2	2
• remark	Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave
<b>PROFINET interfaces</b>	0	1	0	1	1	1
• remark	–	1 interface with 3 ports onboard; 1 interface with 4 ports optional via CBE30-2; functionality: supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device; supports media redundancy (MRP and MRPD)	–	1 interface with 3 ports onboard; 1 interface with 4 ports optional via CBE30-2; functionality: supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device; supports media redundancy (MRP and MRPD)	1 interface with 3 ports onboard; 1 interface with 4 ports optional via CBE30-2; functionality: supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device; supports media redundancy (MRP and MRPD)	1 interface with 3 ports onboard; 1 interface with 4 ports optional via CBE30-2; functionality: supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device; supports media redundancy (MRP and MRPD)
<b>General technical data</b>						
<b>Fan</b>	Double fan/ battery module included in scope of delivery	Double fan/ battery module included in scope of delivery	Double fan/ battery module included in scope of delivery	Double fan/ battery module included in scope of delivery	Double fan/ battery module included in scope of delivery	Double fan/ battery module included in scope of delivery
<b>DC supply voltage</b>						
• rated value	V	24	24	24	24	24
• permissible range	V	20.4 ... 28.8	20.4 ... 28.8	20.4 ... 28.8	20.4 ... 28.8	20.4 ... 28.8
<b>Current consumption, typ.</b>	mA	700	1 000	700	1 000	1 900
• remark		Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface
<b>Making current, typ.</b>	A	5	5	5	5	5
<b>Power loss, typ.</b>	W	17	24	17	24	46
<b>Ambient temperature</b>						
• during long-term storage	°C (°F)	-25 ... +55 (-13 ... +131)	-25 ... +55 (-13 ... +131)	-25 ... +55 (-13 ... +131)	-25 ... +55 (-13 ... +131)	-25 ... +55 (-13 ... +131)
• during transport	°C (°F)	-40 ... +70 (-40 ... +158)	-40 ... +70 (-40 ... +158)	-40 ... +70 (-40 ... +158)	-40 ... +70 (-40 ... +158)	-40 ... +70 (-40 ... +158)
• during operating	°C (°F)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)
- remark		Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Technical specifications (continued)

Order No.		6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
<b>Product brand name</b>		SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
<b>Product-type designation</b>		D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
<b>General technical data (continued)</b>							
<b>Relative humidity without condensation during operating phase</b>	%	5 ... 95	5 ... 95	5 ... 95	5 ... 95	5 ... 95	5 ... 95
<b>Air pressure</b>	hPa	620 ... 1 060	620 ... 1 060	620 ... 1 060	620 ... 1 060	620 ... 1 060	620 ... 1 060
<b>Protection class IP</b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Height</b>	mm (in)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)
<b>Width</b>	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)
<b>Depth</b>	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)
• remark		When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep
<b>Net weight</b>	g (lb)	3600 (7.94)	3600 (7.94)	3600 (7.94)	3600 (7.94)	4400 (9.70)	4400 (9.70)
<b>Digital inputs</b>							
<b>Number of digital inputs</b>		12	12	12	12	12	12
<b>DC input voltage</b>							
• rated value	V	24	24	24	24	24	24
• for signal "1"	V	15 ... 30	15 ... 30	15 ... 30	15 ... 30	15 ... 30	15 ... 30
• for signal "0"	V	-3 ... +5	-3 ... +5	-3 ... +5	-3 ... +5	-3 ... +5	-3 ... +5
<b>Electrical isolation</b>		Yes	Yes	Yes	Yes	Yes	Yes
• remark		In groups of 6	In groups of 6	In groups of 6	In groups of 6	In groups of 6	In groups of 6
<b>Current consumption for "1" signal level, typ.</b>	mA	9	9	9	9	9	9
<b>Input delay for</b>							
• signal "0" → "1", typ.	µs	50	50	50	50	50	50
• signal "1" → "0", typ.	µs	150	150	150	150	150	150
<b>Digital inputs/outputs</b>							
<b>Number of digital inputs/outputs</b>		16	16	16	16	16	16
<b>Parameterization possibility of the digital inputs/outputs</b>		Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)
<b>If used as an input</b>							
<b>DC input voltage</b>							
• rated value	V	24	24	24	24	24	24
• for signal "1"	V	15 ... 30	15 ... 30	15 ... 30	15 ... 30	15 ... 30	15 ... 30
• for signal "0"	V	-3 ... +5	-3 ... +5	-3 ... +5	-3 ... +5	-3 ... +5	-3 ... +5
<b>Electrical isolation</b>		No	No	No	No	No	No
<b>Current consumption for "1" signal level, typ.</b>	mA	9	9	9	9	9	9
<b>Input delay for</b>							
• signal "0" → "1", typ.	µs	5	5	5	5	5	5
• signal "1" → "0", typ.	µs	50	50	50	50	50	50

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Technical specifications (continued)

Order No.		6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
<b>Product brand name</b>		SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
<b>Product-type designation</b>		D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
<b>If used as an input (continued)</b>							
<b>Measuring input, reproducibility</b>	μs	5	5	5	5	5	5
<b>Measuring input, resolution</b>	μs	1	1	1	1	1	1
<b>If used as an output</b>							
<b>Load voltage</b>							
• rated value	V	24	24	24	24	24	24
• permissible range	V	20.4 ... 28.8	20.4 ... 28.8	20.4 ... 28.8	20.4 ... 28.8	20.4 ... 28.8	20.4 ... 28.8
<b>Electrical isolation</b>		No	No	No	No	No	No
<b>Current carrying capacity for each output, max.</b>	mA	500	500	500	500	500	500
<b>Leakage current, max.</b>	mA	2	2	2	2	2	2
<b>Output delay for</b>							
• signal "0" → "1", typ.	μs	150	150	150	150	150	150
• signal "0" → "1", max.	μs	400	400	400	400	400	400
• signal "1" → "0", typ.	μs	75	75	75	75	75	75
• signal "1" → "0", max.	μs	150	150	150	150	150	150
- remark		Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut
<b>Output cam, reproducibility</b>	μs	10	10	10	10	10	10
<b>Output cam, resolution</b>	μs	1	1	1	1	1	1
<b>Switching frequency of the outputs for</b>							
• ohmic load, max.	Hz	100	100	100	100	100	100
• inductive load, max.	Hz	2	2	2	2	2	2
• lamp load, max.	Hz	11	11	11	11	11	11
<b>Short-circuit protection</b>		Yes	Yes	Yes	Yes	Yes	Yes

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Technical specifications (continued)

Order No.	6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
<b>Product brand name</b>	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
<b>Product-type designation</b>	D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
<b>Additional technical data</b>						
<b>Backup of non-volatile data</b>						
• Backup of retentive data	Unlimited buffer duration	Unlimited buffer duration	Unlimited buffer duration	Unlimited buffer duration	Unlimited buffer duration	Unlimited buffer duration
• Buffer time real-time clock	4 days min.	4 days min.	4 days min.	4 days min.	4 days min.	4 days min.
• remark	Longer buffer duration of the real time clock using a battery which is inserted in double fan/ battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/ battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/ battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/ battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/ battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/ battery module
<b>Approvals</b>						
• USA	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04
• Canada	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04
• Australia	C-Tick	C-Tick	C-Tick	C-Tick	C-Tick	C-Tick

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Selection and ordering data

Description	Order No.
<b>SIMOTION D425-2 DP Control Unit</b> incl. double fan/battery module and battery (SIMOTION V4.3 SP1 or higher)	<b>6AU1425-2AA00-0AA0</b>
<b>SIMOTION D425-2 DP/PN Control Unit</b> incl. double fan/battery module and battery (SIMOTION V4.3 SP1 or higher)	<b>6AU1425-2AD00-0AA0</b>
<b>SIMOTION D435-2 DP Control Unit</b> incl. double fan/battery module and battery (SIMOTION V4.3 SP1 or higher)	<b>6AU1435-2AA00-0AA0</b>
<b>SIMOTION D435-2 DP/PN Control Unit</b> incl. double fan/battery module and battery (SIMOTION V4.3 SP1 or higher)	<b>6AU1435-2AD00-0AA0</b>
<b>SIMOTION D445-2 DP/PN Control Unit</b> incl. double fan/battery module and battery (SIMOTION V4.2 SP1 or higher)	<b>6AU1445-2AD00-0AA0</b>
<b>SIMOTION D455-2 DP/PN Control Unit</b> incl. double fan/battery module and battery (SIMOTION V4.2 SP1 or higher)	<b>6AU1455-2AD00-0AA0</b>
<b>CompactFlash card (CF) 1 GB for SIMOTION D4x5-2</b> with the current SIMOTION Kernel and SINAMICS S120 drive software V4.x <i>Pre-installed license can be obtained using additional order codes <sup>1)</sup></i> Note: A separate CompactFlash card is available for the SIMOTION D410-2 Control Units (6AU1400-1PA22-0AA0).	<b>6AU1400-2PA22-0AA0</b>
<b>MultiAxes Package license for SIMOTION D425-x</b> • As Z option • As Z option incl. Safety Extended Functions • As single license • As single license incl. Safety Extended Functions	<b>M42</b> <b>S42</b> <b>6AU1820-0AA42-0AB0</b> <b>6AU1820-0AS42-0AB0</b>
<b>MultiAxes Package license for SIMOTION D435-x</b> • As Z option • As Z option incl. Safety Extended Functions • As single license • As single license incl. Safety Extended Functions	<b>M43</b> <b>S43</b> <b>6AU1820-0AA43-0AB0</b> <b>6AU1820-0AS43-0AB0</b>

Description	Order No.
<b>MultiAxes Package license for SIMOTION D445-x/D455-x</b> • As Z option • As Z option incl. Safety Extended Functions • As single license • As single license incl. Safety Extended Functions	<b>M44</b> <b>S44</b> <b>6AU1820-0AA44-0AB0</b> <b>6AU1820-0AS44-0AB0</b>

#### Note:

MultiAxes bundles are no longer available for the SIMOTION D4x5-2 (packages comprising Control Unit, CompactFlash card + MultiAxes Package license).

You can instead order the Control Unit and CompactFlash card with MultiAxes Package license individually:

Example for SIMOTION D445-2 DP/PN:

- Control Unit: 6AU1445-2AD00-0AA0
- CompactFlash card with MultiAxes Package license: 6AU1400-2PA22-0AA0 -Z M44

#### MultiAxes Packages

The MultiAxes Packages support particularly simple licensing. They contain the license for unlimited use of the POS/GEAR/CAM technology functions on the SIMOTION D Control Unit.

#### MultiAxes and Safety Packages

In addition to unlimited use of the axes licenses, the MultiAxes and Safety Packages also contain the licenses of the Safety Integrated Extended functions for all integrated SINAMICS drives (SIMOTION D and Controller Extensions CX32-2).

<sup>1)</sup> Note about licenses for runtime software:  
Runtime software licenses can either be pre-installed on a CompactFlash card (CF) or ordered separately.  
[See Ordering of licenses for runtime software on page 9/63.](#)

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Accessories

Description	Order No.
<b>Accessories for SIMOTION D4x5-2</b>	
<b>Double fan/battery module</b> incl. battery Spare part for SIMOTION D4x5-2	<b>6FC5348-0AA02-0AA0</b>
<b>Battery</b> Spare part for fan/battery module	<b>6FC5247-0AA18-0AA0</b>
<b>Seal for external air cooling</b> (1 pack = 10 units) With external air cooling, the cooling fins of the Control Unit are outside of the control cabinet. A seal is required so that the D445-2/D455-2 can be hermetically mounted in the rear cabinet panel.	<b>6FC5348-0AA07-0AA0</b>
<b>Accessories for PROFIBUS</b>	
<b>PROFIBUS RS485 bus connector with angular cable outlet (35°) and screw-type terminals</b> Max. transmission rate 12 Mbit/s	
• Without PG interface	<b>6ES7972-0BA42-0XA0</b>
• With PG interface	<b>6ES7972-0BB42-0XA0</b>
<b>PROFIBUS Fast Connect RS485 bus connector with angular cable outlet (35°) and insulation displacement terminals</b> Max. transmission rate 12 Mbit/s	
• Without PG interface	<b>6ES7972-0BA60-0XA0</b>
• With PG interface	<b>6ES7972-0BB60-0XA0</b>
<b>PROFIBUS adapter plug</b> for raising the PROFIBUS connector to create more wiring space	<b>6FX2003-0BB00</b>
<b>Accessories for PROFINET (interface X150)</b>	
<b>RJ45 FastConnect connector for Industrial Ethernet/PROFINET</b> 145° cable outlet (10/100 Mbit/s)	
• 1 pack = 1 unit	<b>6GK1901-1BB30-0AA0</b>
• 1 pack = 10 units	<b>6GK1901-1BB30-0AB0</b>
• 1 pack = 50 units	<b>6GK1901-1BB30-0AE0</b>
<b>FastConnect cables for Industrial Ethernet/PROFINET <sup>1)</sup></b>	
• IE FC standard cable GP 2x2	<b>6XV1840-2AH10</b>
• IE FC flexible cable GP 2x2	<b>6XV1870-2B</b>
• IE FC trailing cable GP 2x2	<b>6XV1870-2D</b>
• IE FC trailing cable 2x2	<b>6XV1840-3AH10</b>
• IE FC marine cable 2x2	<b>6XV1840-4AH10</b>
<b>Stripping tool for Industrial Ethernet/PROFINET FastConnect cables</b>	
• IE FC stripping tool	<b>6GK1901-1GA00</b>

Description	Order No.
<b>Accessory for Industrial Ethernet (interface X120, X127, X130)</b>	
<b>RJ45 FastConnect connector for Industrial Ethernet/PROFINET</b> 180° cable outlet (10/100/1000 Mbit/s)	
• 1 pack = 1 unit	<b>6GK1901-1BB11-2AA0</b>
• 1 pack = 10 units	<b>6GK1901-1BB11-2AB0</b>
• 1 pack = 50 units	<b>6GK1901-1BB11-2AE0</b>
<b>FastConnect cables for Industrial Ethernet/PROFINET <sup>1)</sup></b>	
• IE FC Standard Cable GP 4x2	<b>6XV1878-2A</b>
• IE FC Flexible Cable GP 4x2	<b>6XV1878-2B</b>
<b>Stripping tool for Industrial Ethernet/PROFINET FastConnect cables</b>	
• IE FC stripping tool	<b>6GK1901-1GA00</b>
<b>Other accessories</b>	
<b>Dust-proof blanking plugs</b> (50 units) for sealing unused DRIVE-CLiQ, Ethernet and PROFINET ports	<b>6SL3066-4CA00-0AA0</b>

#### More information

##### More information

- about PROFIBUS DP/MPI cables and MOTION-CONNECT can be found in chapter MOTION-CONNECT connection systems.
- about PROFIBUS DP, Industrial Ethernet and PROFINET can be found in Catalog IK PI and the Industry Mall under Automation Technology/Industrial Communication as well as the chapter Communication.
- about the ordering data for other SINAMICS drive components such as Line Modules, Motor Modules, DRIVE-CLiQ cables, etc. can be found in chapter SINAMICS S120 drive system and the Industry Mall under Drive Technology/Converters/...

##### Integrated drive control

The drive control integrated in the SIMOTION D4x5-2 Control Units is based on the drive control of a SINAMICS S120 CU320-2 Control Unit (firmware version V4.x), whereby there are minor functional differences. For example, the integrated drive control does not have a basic positioner function (EPos), since this is already covered by SIMOTION technology functions.

For more information, refer to chapter System description – Dimensioning and the documentation for SIMOTION and SINAMICS.

##### SIZER for Siemens Drives engineering tool

With the SIZER for Siemens Drives engineering tool, you can easily configure the SINAMICS S110/S120 drive families including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting utilization with SIZER for Siemens Drives in accordance with your performance requirements.

For more information about SIZER for Siemens Drives, refer to chapter System description – Dimensioning.

<sup>1)</sup> Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft).

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### More information (continued)

##### *Connectors and cables*

The adapter plug (Order No. 6FX2003-0BB00) is required for D4x5-2 when the bus cable has to be looped through the left-hand PROFIBUS interface (X126; 2 PROFIBUS cables wired to the plug) and also

- Ethernet interface X120, in the case of D4x5-2 DP or
- Port 3 of the PROFINET interface X150 in the case of D4x5-2 DP/PN

has to be wired to a FastConnect plug. With the adapter plug fitted, the PROFIBUS connector is higher which creates extra wiring space.

Ethernet interfaces X120, X127 and X130 support 10, 100 and 1000 Mbit/s. For 1000 Mbit/s, 8-core cables (4x2) must be used as well as the 1000 Mbit version of the 180° FastConnect plug.

The 145° FastConnect plugs cannot be used for Ethernet interface X130 (cable outlet downwards). They also only support a maximum of 100 Mbit/s.

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Supplementary components SIMOTION CX32-2 Controller Extension

#### Overview



The SIMOTION CX32-2 Controller Extension is a module in SINAMICS S120 booksize format. It enables the extension of the drive-side computing performance of the SIMOTION D4x5-2 Control Units.

The integrated drive computing performance enables the SIMOTION D4x5-2 Control Units to operate up to 6 servo, 6 vector or 12  $V/f$  axes.

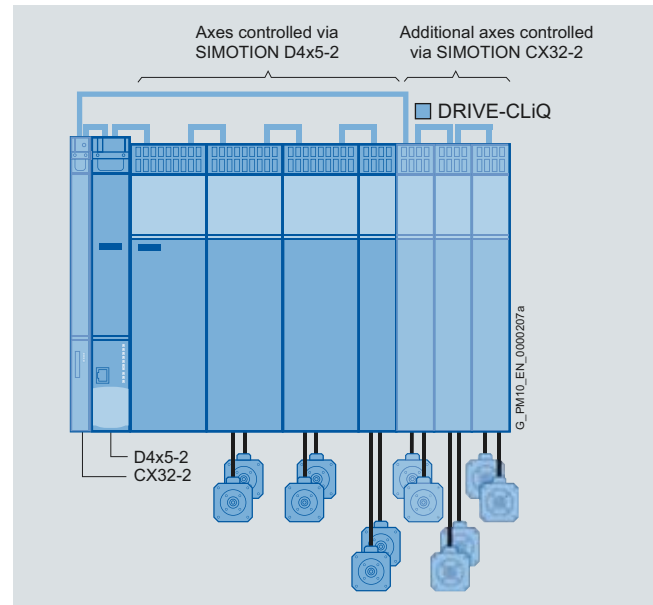
The SIMOTION CX32-2 Controller Extension extends the drive computing performance by up to 6 additional servo, 6 vector or 12  $V/f$  axes. This allows the number of axes of a multi-axis system to be increased according to the requirements of the application.

If required, several CX32-2 Controller Extensions can be operated on one SIMOTION D4x5-2 Control Unit.

#### Benefits

- With a width of 25 mm (0.98 in), the CX32-2 Controller Extension requires very little space and is therefore well-suited for use in compact machines.
- The CX32-2 Controller Extension is connected to the SIMOTION D4x5-2 via DRIVE-CLiQ, so high-performance, isochronous closed-loop control of the drives is possible without the need for additional modules. The communication interfaces on the SIMOTION D4x5-2 remain available for other connections.
- The addressing of the Controller Extension is independent of the addressing on PROFIBUS/PROFINET. This is advantageous for modular machine concepts.
- Simple cabling and configuration
- The "Control operation" signal from an infeed connected to the SIMOTION D4x5-2 is particularly easy to interconnect to the drives of the CX32-2 Controller Extension.
- The CX32-2 Controller Extension does not require its own CompactFlash card. Data is managed centrally on the CompactFlash card of the SIMOTION D4x5-2 Control Unit. This has the following advantages:
  - Simple module replacement (no operator action required on the CX32-2, such as memory card replacement)
  - During firmware upgrades, the CX32-2 Controller Extension is automatically upgraded with the integrated drive of the SIMOTION D4x5-2 Control Unit
  - Central license handling via the SIMOTION D4x5-2

#### Design



Example: Axis grouping for 12 axes with SIMOTION D4x5-2 and SIMOTION CX32-2 Controller Extension

The SIMOTION CX32-2 Controller Extension is connected to the SIMOTION D4x5-2 via DRIVE-CLiQ.

In this way, a very compact axis grouping can be implemented, for example, with 12 servo axes.

If required, several SIMOTION CX32-2 Controller Extensions can be operated on one SIMOTION D4x5-2 Control Unit.

- Max. 3 CX32-2 units on one SIMOTION D425-2
- Max. 5 CX32-2 units on one SIMOTION D435-2, D445-2 or D455-2

In principle, a 4th or 6th CX32-2 Controller Extension can also be connected. In this case, no drives / drive components can be connected any longer to the integrated drive control of the SIMOTION D4x5-2. All drives must then be operated via the connected Controller Extensions. This can be useful, for example, when implementing distributed, modular machine concepts.

Additional drive controls can be implemented with SINAMICS S110/S120 Control Units via PROFIBUS or PROFINET.

#### Note

The SIMOTION CX32-2 Controller Extension can only be used with SIMOTION D4x5-2 Control Units. Operation with SIMOTION D4x5 Control Units is not possible.

The SIMOTION CX32 Controller Extension should be used for the SIMOTION D435 and D445-1 Control Units (Order No. 6SL3040-0NA00-0AA0).



# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Supplementary components SIMOTION CX32-2 Controller Extension

#### Technical specifications

<b>Order No.</b>	<b>6AU1432-2AA00-0AA0</b>	
<b>Product brand name</b>	SIMOTION	
<b>Product-type designation</b>	CX32-2	
<b>Version of the motion control system</b>	Controller Extension	
<b>Integrated drive control</b>		
<b>Maximum number of axes for integrated drive control</b>		
• servo	6	
• vector	6	
• V/f	12	
• remark	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	
<b>Communication</b>		
<b>DRIVE-CLiQ interfaces</b>	4	
<b>General technical data</b>		
<b>Fan</b>	No fan	
<b>DC supply voltage</b>		
• rated value	V	24
• permissible range	V	20.4 ... 28.8
<b>Current consumption, typ.</b>	mA	300
• remark	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ interface	
<b>Making current, typ.</b>	A	1.6
<b>Power loss, typ.</b>	W	7
<b>Ambient temperature</b>		
• during long-term storage	°C (°F)	-25 ... +55 (-13 ... +131)
• during transport	°C (°F)	-40 ... +70 (-40 ... +158)
• during operating	°C (°F)	0 ... +55 (+32 ... +131)
- remark	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 (6562 ft), the maximum ambient temperature decreases by 7° C (44.6 °F) per 1000 m (3281 ft).	
<b>Relative humidity without condensation during operating phase</b>	%	5 ... 95
<b>Air pressure</b>	hPa	620 ... 1 060
<b>Protection class IP</b>	IP20	
<b>Height</b>	mm (in)	380 (14.96)
<b>Width</b>	mm (in)	25 (0.98)
<b>Depth</b>	mm (in)	270 (10.63)
• remark	When the spacer is removed 230 mm (9.05 in) deep	
<b>Net weight</b>	g (lb)	2600 (5.73)
<b>Digital inputs</b>		
<b>Number of digital inputs</b>	6	
<b>DC input voltage</b>		
• rated value	V	24
• for signal "1"	V	15 ... 30
• for signal "0"	V	-3 ... +5

<b>Order No.</b>	<b>6AU1432-2AA00-0AA0</b>	
<b>Product brand name</b>	SIMOTION	
<b>Product-type designation</b>	CX32-2	
<b>Digital inputs (continued)</b>		
<b>Electrical isolation</b>		Yes
• remark	in groups of 6	
<b>Current consumption for "1" signal level, typ.</b>	mA	9
<b>Input delay for</b>		
• signal "0" → "1", typ.	µs	50
• signal "1" → "0", typ.	µs	150
<b>Digital inputs/outputs</b>		
<b>Number of digital inputs/outputs</b>	4	
<b>Parameterization possibility of the digital inputs/outputs</b>	Parameterizable as DI, as DO, as measuring input (max. 4)	
<b>If used as an input</b>		
<b>DC input voltage</b>		
• rated value	V	24
• for signal "1"	V	15 ... 30
• for signal "0"	V	-3 ... +5
<b>Electrical isolation</b>	No	
<b>Current consumption for "1" signal level, typ.</b>	mA	9
<b>Input delay for</b>		
• signal "0" → "1", typ.	µs	5
• signal "1" → "0", typ.	µs	50
<b>Measuring input, reproducibility</b>	µs	5
<b>Measuring input, resolution</b>	µs	1
<b>If used as an output</b>		
<b>Load voltage</b>		
• rated value	V	24
• permissible range	V	20.4 ... 28.8
<b>Electrical isolation</b>	No	
<b>Current carrying capacity for each output, max.</b>	mA	500
<b>Leakage current, max.</b>	mA	2
<b>Output delay for</b>		
• signal "0" → "1", typ.	µs	150
• signal "0" → "1", max.	µs	400
• signal "1" → "0", typ.	µs	75
• signal "1" → "0", max.	µs	100
- remark	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Supplementary components SIMOTION CX32-2 Controller Extension

#### Technical specifications (continued)

<b>Order No.</b>	<b>6AU1432-2AA00-0AA0</b>	
<b>Product brand name</b>	SIMOTION	
<b>Product-type designation</b>	CX32-2	
<b>If used as an output (continued)</b>		
<b>Switching frequency of the outputs for</b>		
• ohmic load, max.	Hz	100
• inductive load, max.	Hz	2
• lamp load, max.	Hz	11
<b>Short-circuit protection</b>	Yes	
<b>Additional technical data</b>		
<b>Backup of non-volatile data</b>		
• Backup of retentive data	Unlimited buffer duration	
<b>Approvals</b>		
• USA	UL 61010-1, 2nd Ed. CAN/CSA-C22.2 NO. 61010-1-04	
• Canada	UL 61010-1, 2nd Ed. CAN/CSA-C22.2 NO. 61010-1-04	
• Australia	C-Tick	

#### Selection and ordering data

Description	Order No.
<b>SIMOTION CX32-2 Controller Extension</b> for SIMOTION D4x5-2	<b>6AU1432-2AA00-0AA0</b>

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Supplementary components CBE30-2 Communication Board

#### Overview



The CBE30-2 Communication Board can be used to provide the SIMOTION D4x5-2 DP/PN with a second PROFINET interface.

#### Application

Applications for a second PROFINET interface are as follows:

- 2 separate networks (e.g. one local and one higher-level network)
- Address space can be doubled to 2 × 4 KB
- Maximum number of connectable devices can be doubled to 2 × 64
- Separation into a high-speed and a slow bus system/execution system in order to make efficient use of the controller's capacity (applies only to SIMOTION D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN)

#### Function

The CBE30-2 Communication Board provides the following functions:

- PROFINET IO controller, I-Device (also controller and device simultaneously)
- 100 Mbit/s full-duplex/autocrossing
- Supports real-time classes of PROFINET IO:
  - RT (Real-Time)
  - IRT (Isochronous Real Time)
- Integration of distributed I/O as PROFINET IO devices
- Integration of drives as PROFINET IO devices through PROFIdrive according to the V4 specification
- Support for standard Ethernet communication, e.g.
  - for interfacing with SIMOTION SCOUT
  - for the connection of HMI systems
  - for communication with any other devices over TCP/IP or UDP communication
- Integrated 4-port switch with four RJ45 sockets. The optimum topology (line, star, tree) can therefore be configured without additional external switches.
- Support of media redundancy (MRP/MRPD).

#### Integration

The CBE30-2 Communication Board is plugged into the option slot on the SIMOTION D4x5-2 DP/PN.

#### Note

The CBE30-2 Communication Board can only be used with the SIMOTION D4x5-2 DP/PN Control Units.

It is not compatible with SIMOTION D425, D435, D445-1 and D4x5-2 DP.

#### Technical specifications

CBE30-2 Communication Board	
<b>Current requirement at 24 V DC</b>	0.25 A
<b>Permissible ambient temperature</b>	
• Storage and transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Weight, approx.</b>	100 g (0.22 lb)
<b>Dimensions (W × H × D)</b>	25 × 95 × 143 mm (0.98 × 3.74 × 5.63 in)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>CBE30-2 Communication Board</b> For SIMOTION D4x5-2 DP/PN (SIMOTION V4.3 SP1 or higher)	<b>6FC5312-0FA00-2AA0</b>

#### Accessories

Description	Order No.
<b>RJ45 FastConnect connector for Industrial Ethernet/PROFINET</b>	
• 145° cable outlet (10/100 Mbit/s)	
- 1 pack = 1 unit	<b>6GK1901-1BB30-0AA0</b>
- 1 pack = 10 units	<b>6GK1901-1BB30-0AB0</b>
- 1 pack = 50 units	<b>6GK1901-1BB30-0AE0</b>
<b>FastConnect cables for Industrial Ethernet/PROFINET <sup>1)</sup></b>	
• IE FC Standard Cable GP 2x2	<b>6XV1840-2AH10</b>
• IE FC Flexible Cable GP 2x2	<b>6XV1870-2B</b>
• IE FC Trailing Cable GP 2x2	<b>6XV1870-2D</b>
• IE FC Trailing Cable 2x2	<b>6XV1840-3AH10</b>
• IE FC Marine Cable 2x2	<b>6XV1840-4AH10</b>
<b>Stripping tool for Industrial Ethernet/PROFINET FastConnect cables</b>	
• IE FC stripping tool	<b>6GK1901-1GA00</b>

#### More information

More information about FastConnect cables can be found in Catalog IK PI (Industrial Communication) and the Industry Mall under Automation Technology/Industrial Communication/Industrial Ethernet/Cabling technology/...

<sup>1)</sup> Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft).

#### Overview

##### **SIMOTION – The scalable system platform for Motion Control applications**

The SIMOTION system has created a scalable system platform for automation tasks, particularly Motion Control applications.

The scalability of the system allows you to implement tailor-made and economic applications.

The modular SIMOTION software is perfectly integrated and offers easy-to-use functions for all phases of the automation process.

##### **SIMOTION – Software for runtime, engineering and commissioning**

The software for SIMOTION is divided into the following categories:

###### Runtime software

SIMOTION Kernel – Basic functionality

The SIMOTION Kernel provides the basic functionality and is a component of all SIMOTION devices.

SIMOTION technology packages

The SIMOTION technology packages support modular expansion of the functionality.

SIMOTION IT – Service and diagnostics functions

Supports simple diagnostics, service or HMI applications without SIMOTION SCOUT.

###### Engineering software

- SIMOTION SCOUT engineering software (with integrated STARTER commissioning tool)
- Optional CamTool package (cam editor)
- Optional Drive Control Chart (DCC) package

The SCOUT engineering system provides high-performance tools that provide simple, optimal support for all engineering steps required in the context of machine automation.

The SIMOTION CamTool is available as an optional package which permits simple creation of cams.

The optional Drive Control Chart package is available for easy graphical configuration of technology functions using pre-defined function blocks (Drive Control Blocks DCB).

The SCOUT engineering system can be used in SIMATIC STEP 7, either with integrated data management and configuration, or as a stand-alone engineering tool.

#### **Supplementary software**

In addition to the SIMOTION software, other standard software products are available, for example, for easy programming of HMIs on Operator, Touch or Multi Panels, as well as Panel PCs or PC systems.

###### SIMATIC HMI software

Optional software packages are:

- WinCC flexible for easy configuration of HMIs on Operator, Touch or Multi Panels, as well as Panel PCs or PC systems (integration of WinCC flexible is possible in SCOUT)
- SCADA system WinCC: PC-based operator control and monitoring system for visualizing and operating production processes.
- SIMATIC NET for implementing HMI over OPC in Windows environments.

###### Further optional SIMATIC software

- SIMATIC Logon for user administration in projects with specific support for validation processes, for example, in the pharmaceutical industry.
- SIMATIC Version Trail for the easy versioning of projects (SIMATIC Logon is required).

###### SIMOTION Utilities & Applications

The SIMOTION Utilities & Applications DVD, which is available free of charge, supplements the SIMOTION software with a wide range of valuable information and tools for SIMOTION applications as well as SIMOTION easyProject.

The project generator SIMOTION easyProject enables basic and modular machine functions to be integrated into SCOUT engineering projects.

#### **More information**

##### **Security note**

In the case of software for remote maintenance or connection to higher-level networks, suitable protection measures must be taken (including IT security, e.g. network segmentation) to guarantee safe operation of the system. You can find more information on Industrial Security on the Internet at:

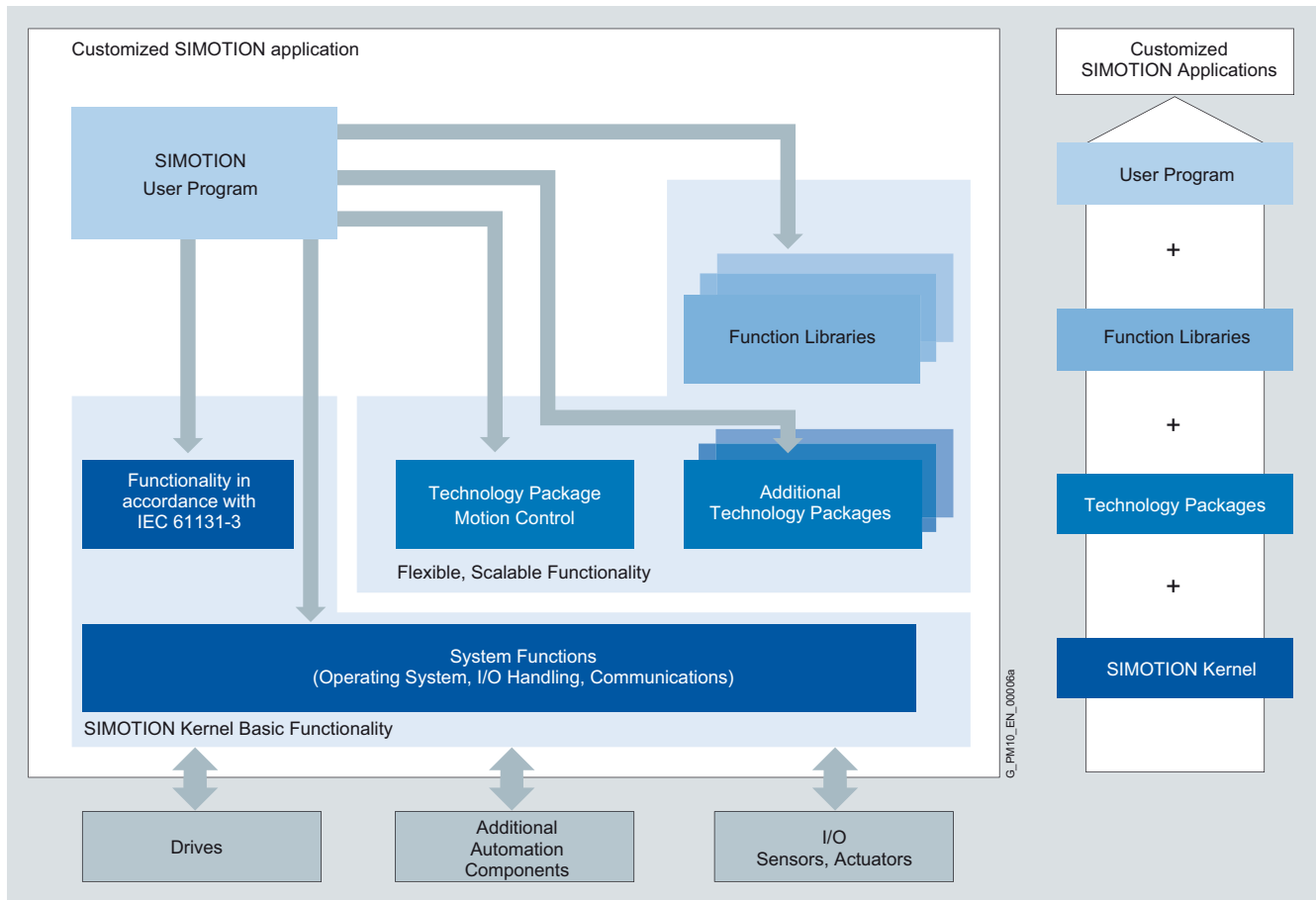
[www.siemens.com/industrialsecurity](http://www.siemens.com/industrialsecurity)

# SIMOTION Motion Control System

## SIMOTION runtime software

### Overview of runtime software

#### Overview



Software structure of a SIMOTION application

#### **SIMOTION Kernel – Basic functionality**

The basic functionalities of the SIMOTION devices are combined within the SIMOTION Kernel.

The SIMOTION Kernel provides, among other features, high-performance functions for

- PLC functionality (according to IEC 61131-3)
- Program control
- Timers, counters
- I/O operation
- Communication

It also provides a powerful runtime system with

- Cyclical (synchronized and cyclic) tasks
- Sequential tasks
- Time-driven tasks
- Event-driven tasks

The scope of the language conforms to the IEC 61131-3 standard and contains all PLC commands required for I/O management, process and machine control. LAD (Ladder Diagram), FBD (Function Block Diagram), ST (Structured Text), MCC (Motion Control Chart) and Drive Control Chart (DCC) are used for programming.

The SIMOTION Kernel basic functionality can be expanded by loading SIMOTION technology packages.

#### **SIMOTION technology packages**

SIMOTION technology packages combine software functions which are required for automation in mechanical engineering in a very wide variety of sectors. They are loaded into the controller during configuration and expand the basic functionality through additional system functions. The functions of the technology packages can be accessed in the SCOUT command library during engineering.

The technology packages enable the generation of technological objects, e.g. technology object "positioning axis", which are all set up, configured and parameterized by the same method.

#### Overview (continued)

##### Motion Control technology package

The comprehensive motion control functions in this technology package offer very open and flexible ways of programming applications and provide users with the assurance that they can implement even complex motion control applications.

The SIMOTION Motion Control technology package contains the following functions:

- Motion Control Basic
- POS – Positioning
- GEAR – Synchronous operation/electronic
- CAM – Cam
- PATH – Path interpolation
- Supplementary technology functions

The technology object functions in the technology package are accessed via additional language commands and system variables, as well as with function blocks in accordance with PLCopen. Programming of motion sequences is therefore simple and integrated.

##### Technology package for temperature control (TControl)

The SIMOTION technology package for temperature control provides temperature channels with extensive functions. These functions are also accessed via additional language commands and system variables.

##### Technology package for Drive Control Chart (DCC)

The SIMOTION technology package for Drive Control Chart (DCC) provides a library of "Drive Control Blocks" (DCBs). These blocks can be used to graphically configure open and closed-loop control functions using an optional DCC editor that can be integrated into SCOUT.

##### Technology package Multipurpose Information Interface (MIIF)

The SIMOTION technology package MIIF functions as a server to permit symbolic access to SIMOTION data and makes them available to clients (e.g. operator panel) via Ethernet.

##### SIMOTION function libraries for I/O interfacing

These function libraries contain standard functions for integrating intelligent I/O and communication modules. They are a component part of the SCOUT command library and make it extremely easy to integrate modules such as FM 350-1/-2, FM 352, CP 340/341, SIWAREX FTA or identification systems into the SIMOTION user program. Programming examples and standard applications are also available in the SIMOTION Utilities & Applications. The SIMOTION Utilities & Applications are supplied free of charge with SCOUT.

##### SIMOTION user program

In the SIMOTION user program, the functions of the technology packages, function libraries and functions of the SIMOTION Kernel are accessed in a uniform manner by means of language commands.

The structure of the SIMOTION application program therefore supports merging of PLC functions with motion control functions and technology functions. This simplifies the optimization of motion sequences (no PLC/Motion interface), reducing engineering costs and increases both product quality and machine productivity (machine cycle and output) by eliminating interfaces and dead times.

A SIMOTION application can be programmed in different ways:

- The graphical programming languages LAD (Ladder Diagram), FBD (Function Block Diagram) and MCC (Motion Control Chart) make graphical programming user-friendly.
- Programming can also be performed textually, using Structured Text (ST).
- Using the optional technology package for Drive Control Chart (DCC), drive-based open and closed-loop control functions can be easily configured graphically.

Direct access to the drive allows:

- Increased uniformity and integration depth as far as the drive (access to control/status words and drive data, flexible torque limits, additive torque setpoint)
- Highly-dynamic applications with servo drives thanks to DSC (Dynamic Servo Control) allows position control cycles of 125 µs
- Highly dynamic applications with hydraulic drives with position control cycles and pressure/force control cycles of 250 µs
- Synchronization with drives and modular open-loop controls

Apart from electrical drives, hydraulic drives within a controller or distributed over several controllers can be synchronized with each other. This supports the implementation of integrated automation solutions such as conveyor systems and press lines in the automotive industry, in which both electrical drives (winders, cross cutters, roller feeds) and hydraulic drives (e.g. deep-drawing presses) are implemented in the same system.

##### SIMOTION isochronous mode

In the SIMOTION system, all the components (one or more control units, drives, isochronous I/Os) are synchronized to the communication cycle of the machine, the PROFIBUS DP/PROFINET cycle. The application is also synchronized with this cycle through synchronous application tasks (in the servo and interpolator cycle). Isochronous mode therefore permeates the whole machine application (also in the case of distributed systems) and this provides considerable advantages:

- Short response times from terminal to terminal and terminal to axis
- High machine cycle times
- Programming of synchronous closed-loop control tasks
- High product quality thanks to a deterministic and reproducible machine response

# SIMOTION Motion Control System

## SIMOTION runtime software

### Overview of runtime software

#### Overview (continued)

##### **Modular concepts – Modular machines**

SIMOTION supports modular machine concepts and thus reduces engineering and commissioning costs through:

- Modular software development with libraries and reusable code
- Division into individual machine modules, which are linked, for example, through distributed synchronous operation (over PROFIBUS DP or PROFINET IO with IRT). Based on a maximum project, the project can be reconfigured, for example, using HMI
- Activation/deactivation of DP slaves/PROFINET IO devices (I/O components) and technology objects (drives, axes, external encoders, and cams) during engineering and at runtime
- Easy, modular configuration of projects using the project generator SIMOTION easyProject

The modular machine concept means scalable solutions and large axis line-ups to be achieved. Standardized modules can be easily adapted to special requirements and separately tested. These modules are then easily combined to form individual machine variants.

##### **Communication via PROFIBUS**

The communication functions are available via PROFIBUS on all platforms:

- I/O communication between SIMOTION and/or SIMATIC controllers
- Communication with programming devices (programming device functions)
- Communication with WinCC flexible
- Communication with PCs on which SIMATIC NET OPC is installed.  
A prerequisite on the PC side is the SIMATIC NET SOFTNET S7 software.

##### **Communication using Ethernet/PROFINET**

The communication functions below are available via Ethernet on all platforms:

- I/O communication between SIMOTION and/or SIMATIC controllers
- Communication with SIMOTION devices, SIMATIC CPUs and non-Siemens devices via UDP and TCP/IP
- Communication with programming devices (programming device functions)
- Communication with WinCC flexible
- Communication through the SCADA system WinCC.
- Communication with PCs on which SIMATIC NET OPC is installed.  
A prerequisite on the PC side is the SIMATIC NET SOFTNET S7 software.

##### **SIMOTION IT**

SIMOTION IT enables additional communication functions via Industrial Ethernet (HTML over standard Internet browser):

- Diagnostics functions via SIMOTION IT DIAG
- Communication via SIMOTION IT OPC XML-DA
- SIMOTION IT Virtual Machine: Creation of Java applications for SIMOTION.

# SIMOTION Motion Control System

## SIMOTION runtime software

### Runtime software licensing Overview of the licensing concept

#### Overview

##### *The basic concept: "pay only for what you need"*

The functionally scalable licenses for SIMOTION runtime software and axis-specific licensing result in a simple pricing structure, allowing you to only pay for what you really need.

Runtime licenses are not bound to specific versions and are therefore valid for all firmware versions. In case of a firmware update the runtime licenses remain valid. The license key generated from the runtime licenses and the serial number of the memory card or SIMOTION P is stored on the memory card or on SIMOTION P.

##### *How can licenses be obtained for runtime software?*

Licenses for SIMOTION runtime software can be obtained as follows:

- Pre-installed licenses can be ordered when purchasing a SIMOTION memory card (SIMOTION C, D) or for SIMOTION P. The order number is expanded with one or more additional order codes (Z options) that specify the required licenses. Alternatively, pre-installed runtime licenses can be ordered using the configurator for SIMOTION runtime licenses in the Industry Mall.  
Homepage: [www.siemens.com/industrymall](http://www.siemens.com/industrymall)
- Licenses can be ordered separately, independently of purchase of a SIMOTION controller or a SIMOTION memory card. The required software options are assigned to hardware (memory cards or SIMOTION P) by generating a license key over the Internet at:  
Homepage: [www.siemens.com/automation/license](http://www.siemens.com/automation/license)

##### *When do licenses need to be obtained for runtime software?*

When configuring using SIMOTION SCOUT, the required licenses are displayed.

A license is required for the runtime software:

- When it is used in a machine or a machine component before it is supplied by the manufacturer
- When it is used by the customer on completion of initial commissioning
- When it is retrofitted following completion of initial commissioning
- In large-scale plants that are installed directly at the production site without previous initial commissioning by the manufacturer, on completion of initial commissioning before test operation commences.

##### *Unlicensed basic functions*

The rights of use for these software components are included when the basic unit is purchased:

- SIMOTION Kernel runtime software  
The SIMOTION Kernel is already installed on the device.
- Motion Control Basic technology functions  
Use of technology functions for speed-controlled axes, single output cams and cam tracks, measuring inputs and external encoders.
- Technology functions for Drive Control Chart  
By installing the optional SCOUT package Drive Control Chart, the technology functions of Drive Control Chart are made available to the SIMOTION runtime system.
- Supplementary technology functions  
Use of supplementary technology functions, such as adders, formula objects and fixed gears.
- Function libraries for I/O interfacing
- Communication functions  
This covers SIMATIC S7 communication functions on the SIMOTION side (PG/OP communication to programming devices, for engineering and communication to TPs/OPs/MPs and PCs with SIMATIC HMI, e.g. WinCC flexible, SIMATIC NET OPC, SIMOTION IT DIAG and SIMOTION IT OPC XML-DA), as well as UDP and TCP/IP communication.

##### *Motion Control technology functions under license*

The Motion Control Basic technology functions can be used without a license. When other technology functions of the Motion Control technology package are used, a license is required for each axis used. Licenses are only necessary for real axes; virtual axes and speed-controlled axes are not subject to license. A license is obtained for the different axis types using a separate order number for each.

##### POS, GEAR, CAM axis licenses

Three different axis licenses are available:

- POS – Use of the positioning technology function for a created positioning axis
- GEAR – Use of the positioning and synchronous operation technology functions for a created synchronous axis as well as additional path interpolation for a created path axis
- CAM – Use of the positioning, synchronous operation, path interpolation and cam technology functions for a created synchronous axis with cam

##### MultiAxes Packages

The platform-independent MultiAxes Package supports particularly simple licensing. It contains the license for unlimited use of the POS/GEAR/CAM technology functions on one SIMOTION Controller. Variably priced, platform-specific packages for C2xx, P320-3, P350-3 or D410-2, D425-x, D435-x and D445-x/D455-x are offered in addition to the platform-independent MultiAxes Package.



# SIMOTION Motion Control System

## SIMOTION runtime software

### Runtime software licensing Overview of the licensing concept

#### Overview (continued)

##### **Other technology functions which are subject to a license**

###### TControl technology functions

The functions of the TControl technology package must be licensed for specific channels in packages, each package containing 8 temperature channels.

###### Multipurpose Information Interface (MIIF) technology functions

To use the functions of the MIIF technology package, a separate license must be obtained for each SIMOTION Controller.

###### SIMOTION IT communication functions

For version V4.2 and higher of SIMOTION Kernel, a license need be purchased only to cover the use of SIMOTION IT Virtual Machine. The licenses for SIMOTION IT DIAG and SIMOTION IT OPC XML-DA are no longer required.

The license SIMOTION IT Virtual Machine can continue to be used as a combined license for SIMOTION IT DIAG, OPC XML-DA and Virtual Machine in the case of version V4.2 and lower of SIMOTION Kernel.

##### **Safety Integrated functions for SINAMICS S120 which are subject to license**

SINAMICS S120 drives with safety functions can be integrated into a SIMOTION D application.

The following must be noted with regard to use of Safety Integrated functions:

- The Safety Integrated basic functions are unlicensed.
- A license is, however, required for each axis with safety functions in the case of Safety Integrated Extended Functions.
- MultiAxes and Safety Packages are available for SIMOTION D4x5-x that, in addition to unlimited use of the axes licenses, also contain the licenses of the Safety Integrated Extended functions for all integrated SINAMICS drives (SIMOTION D and Controller Extensions CX32-2).

##### **Note regarding SIMOTION D410-2**

SIMOTION D410-2 has an integrated drive control for either a servo, a vector or a V/f axis and is therefore ideal for single-axis applications.

One real axis can be used without license on the Control Unit. Speed-controlled axes and virtual axes never require a license.

SIMOTION D410-2 can be extended with additional SINAMICS S110/S120 Control Units (e.g. CU305) and so can also be used for smaller multi-axis applications (e.g. with 2 to 3 axes). A license is required for any additional axes. Where a license is required for a POS axis, the POS single-axis license is the ideal solution; it is better to use the MultiAxes Package D410-2 in the case of GEAR/CAM or more than one POS license.

The axis license with the highest functionality is covered by the inclusive license (a real axis).

The functionality has the following granularity:  
CAM > GEAR > POS.

###### Example:

Application with 2 real axes: 1 POS, 1 CAM.  
Only a POS license needs to be purchased because the higher-order CAM license is already included.

Licenses are also required for runtime functions subject to licensing, such as SIMOTION IT Virtual Machine. These can be pre-installed on the CompactFlash card (CF card) or ordered separately.

## Overview

### Runtime licenses for SIMOTION C and D

For SIMOTION C and D, licenses for runtime software can be ordered individually or as pre-installed software (by order code/Z option) on memory card.

In both cases, the license certificate is enclosed.

### Runtime licenses for SIMOTION P

For SIMOTION P, licenses for runtime software can be ordered individually or by means of order code (Z option).

When ordered by means of order code (Z option), the runtime licenses are not pre-installed, the license certificate is enclosed.

### Ordering individual licenses

The order numbers can be found in column "Single-user license" in the ordering data table.

If several licenses of the same type are needed, e.g. 3 x POS license, the order number must be repeated for each license.

#### Example:

A 1 GB CompactFlash card for SIMOTION D4x5-2 has been purchased, but without pre-installed runtime licenses. During the configuring process with SIMOTION SCOUT, a message is displayed to indicate that the following runtime licenses are needed: 1 x POS axis license, 1 x TControl license.

The ordering data table specifies the following:

- POS axis license: 6AU1820-1AA20-0AB0
- TControl license: 6AU1820-2AA20-0AB0

### Ordering pre-installed licenses

To order pre-installed licenses on memory card, the type and number of required licenses must be specified in the order using order codes (Z options). These order codes are added to the order number for the SIMOTION memory card.

Step 1: The order number of the SIMOTION memory card must be stated first:

- Memory card for SIMOTION C:  
Micro Memory Card 64 MB: 6AU1720-1KA00-0AA0
- Memory card for SIMOTION D410-2:  
CompactFlash card 1 GB: 6AU1400-1PA22-0AA0
- Memory card for SIMOTION D4x5-2:  
CompactFlash card 1 GB: 6AU1400-2PA22-0AA0

Step 2: The following order codes must be stated in order to specify the type and quantity of required runtime licenses:

Each order code begins with the characters "-Z" and is listed in the column headed "Order codes for pre-installed licenses" in the ordering data table.

#### Example 1:

64 MB Micro Memory Card for SIMOTION C240 with

- MultiAxes Package license for SIMOTION C2xx:

Order No.: 6AU1720-1KA00-0AA0 **-Z M24**

#### Example 2:

1 GB CompactFlash card for SIMOTION D4x5-2 with

- 3 POS licenses
- 2 CAM licenses
- 1 TControl license and
- 1 SINAMICS Safety Integrated Extended Functions license:

Order No.: 6AU1400-2PA22-0AA0 **-Z P03 C02 T01 F01**

### Configurator for runtime licenses

An electronic ordering configurator is available in the Industry Mall for ordering SIMOTION hardware with corresponding runtime licenses.

Homepage: [www.siemens.com/industrymall](http://www.siemens.com/industrymall)

This will guide you step by step through the process of selecting and ordering SIMOTION hardware with pre-installed runtime licenses.

# SIMOTION Motion Control System

## SIMOTION runtime software

### Runtime software licensing Ordering of licenses for runtime software

#### Selection and ordering data

License type	Single-user license Order No.	Order codes for pre-installed licenses on SIMOTION memory cards	Licensed functions	License object	Notes
<b>Axis licenses</b>					
• POS axis license	<b>6AU1820-1AA20-0AB0</b>	<b>Pxx</b> – POS license and quantity (e.g. P02 = 2 POS licenses)	Positioning	Per axis	In the case of D410-2, required only for 2 axes or more
• GEAR axis license	<b>6AU1820-1AB20-0AB0</b>	<b>Gxx</b> – GEAR license and quantity (e.g. G03 = 3 GEAR licenses)	Positioning, synchronous operation, path interpolation		
• CAM axis license	<b>6AU1820-1AC20-0AB0</b>	<b>Cxx</b> – CAM license and quantity (e.g. C01 = 1 CAM license)	Positioning, synchronous operation, path interpolation, cam (all functions of the Motion Control technology package)		
<b>MultiAxes packages</b>					
• Platform-independent	<b>6AU1820-0AA20-0AB0</b>	<b>M00</b> – MultiAxes Package license (platform-independent)	Positioning, synchronous operation, path interpolation, cam (all functions of the Motion Control technology package)	Unlimited axes on one controller	
• For C2xx	<b>6AU1820-0AA24-0AB0</b>	<b>M24</b> – MultiAxes Package license for C2xx			
• For P320-3	<b>6AU1820-0AA32-0AB0</b>	<b>M32</b> – MultiAxes Package license for P320-3			
• For P350-3	<b>6AU1820-0AA35-0AB0</b>	<b>M35</b> – MultiAxes Package license for P350-3			
• For D410-2	<b>6AU1820-0AA41-0AB0</b>	<b>M41</b> – MultiAxes Package license for D410-2			
• For D425-x	<b>6AU1820-0AA42-0AB0</b>	<b>M42</b> – MultiAxes Package license for D425-x			
• For D435-x (incl. D425-x)	<b>6AU1820-0AA43-0AB0</b>	<b>M43</b> – MultiAxes Package license for D435-x			
• For D445-x/D455-x (incl. D435-x and D425-x)	<b>6AU1820-0AA44-0AB0</b>	<b>M44</b> – MultiAxes Package license for D445-x/D455-x			
<b>MultiAxes and Safety Package</b>					
• For D425-x	<b>6AU1820-0AS42-0AB0</b>	<b>S42</b> – MultiAxes license and Safety Package for D425-x	Positioning, synchronous operation, path interpolation, cam (all functions of the Motion Control technology package) plus SINAMICS Safety Integrated Extended Functions for SIMOTION D	Unlimited axes (incl. SINAMICS Safety Integrated Extended Functions) on one controller	SINAMICS Safety Integrated Extended Functions for integrated SINAMICS drives with SIMOTION D and CX32-2 Controller Extension
• For D435-x (incl. D425-x)	<b>6AU1820-0AS43-0AB0</b>	<b>S43</b> – MultiAxes license and Safety Package for D435-x			
• For D445-x/D455-x (incl. D435-x and D425-x)	<b>6AU1820-0AS44-0AB0</b>	<b>S44</b> – MultiAxes license and Safety Package for D445-x/D455-x			
<b>Licenses for other technology packages / technology functions</b>					
• TControl	<b>6AU1820-2AA20-0AB0</b>	<b>Txx</b> – TControl license and quantity (e.g. T03 = 3 TControl licenses)	Temperature control	8 temperature channels per license	
• MIIF (Multipurpose Information Interface)	<b>6AU1820-3DA20-0AB0</b>	<b>B02</b> – MIIF license	Multipurpose Information Interface	Per controller	On one C2xx, P3xx or D4xx-2
• Safety Integrated	<b>6AU1820-2AF20-0AB0</b>	<b>Fxx</b> – Safety license and quantity (e.g. F02 = 2 Safety Integrated Extended Functions licenses)	SINAMICS Safety Integrated Extended Functions for SIMOTION D	Per safety axis with Safety Integrated Extended Functions	For integrated SINAMICS drives with SIMOTION D and CX32-2 Controller Extension

# SIMOTION Motion Control System

## SIMOTION runtime software

### Runtime software licensing Ordering of licenses for runtime software

#### Selection and ordering data (continued)

License type	Single-user license Order No.	Order codes for pre-installed licenses on SIMOTION memory cards	Licensed functions	License object	Notes
<b>Licenses for SIMOTION IT communication functions</b>					
• SIMOTION IT DIAG <sup>1)</sup>	<b>6AU1820-8BA20-0AB0</b>	<b>D00</b> – IT DIAG license	Integrated web server	Per controller	On platforms with Ethernet and/or PROFINET interface
• SIMOTION IT OPC XML-DA <sup>1)</sup>	<b>6AU1820-8BB20-0AB0</b>	<b>X00</b> – IT OPC XML-DA license	Communication via OPC XML-DA	Per controller	
• SIMOTION IT Virtual Machine	<b>6AU1820-8BD20-0AB0</b>	<b>J00</b> – SIMOTION IT Virtual Machine license	For SIMOTION Kernel versions earlier than V4.2, usable as combined license for SIMOTION IT DIAG, OPC XML-DA and Virtual Machine.	Per controller	
<b>License for SIMATIC NET OPC server on SIMOTION P</b>					
• License for SIMATIC NET OPC server on SIMOTION P	<b>6AU1380-0AA20-0YB0</b>	<b>K00</b> – OPC server license, on SIMOTION P, XP variant			

<sup>1)</sup> Subject to license for SIMOTION Kernel versions earlier than V4.2

# SIMOTION Motion Control System

## SIMOTION runtime software

### SIMOTION Kernel

#### Function

The SIMOTION Motion Control system uses high-performance CPUs on which a real-time operating system suitable for fast control processes is implemented.

This real-time operating system organizes an execution system comprising different execution levels.

#### Execution system

The SIMOTION execution system makes a distinction between system execution levels and user execution levels (tasks):

System tasks process operations that are necessary for general operation of the system. With technology objects, closed loop position control and characteristic variable calculation is performed in the SERVO, IPO and IPO2 system tasks.

System tasks are regularly executed by the system. The system cycle clock can be specified.

Execution levels with different execution characteristics are available for task-related user programming (user program tasks).

The execution levels define the chronological sequence of programs in the execution system. Each execution level contains one or more tasks. The individual user programs are assigned to these tasks.

All programs – and thus also tasks – can execute PLC, technology and motion control tasks.

Task types for task-related execution are:

- Synchronous tasks
- Cyclic tasks
- Sequential tasks
- Time-triggered tasks, and
- Interrupt-driven tasks

Synchronous tasks are synchronized with the system tasks and the control cycle of the drives or the isochronous PROFIBUS/PROFINET.

With the help of these synchronous tasks, the whole application is in isochronous mode (Application program ↔ Drives ↔ I/O). This results in short response times and the application is easily reproducible.

The following execution levels are available to the application:

#### StartupTask

The StartupTask is executed once at the operating mode transition from STOP to RUN; it controls the system start-up.

#### BackgroundTask

The BackgroundTask is executed cyclically and is used for general PLC tasks. Cycle time monitoring checks the maximum processing time of the BackgroundTask. The BackgroundTask can be compared with the OB1 of a SIMATIC controller.

#### MotionTasks

MotionTasks are used for motion sequences.

Command sequences in the same Motion Task are usually executed sequentially, for example, the next motion command is only started when the previous command has been completed.

The MotionTasks do not require any CPU time during these waiting times, but respond immediately on receipt of the wait event.

#### SynchronousTasks

In servo-synchronous user tasks, time-critical terminal-to-terminal responses for I/O or fast influencing of setpoints can be implemented on the servo level (synchronous to the system cycle SERVO of the technology objects, e.g. position controllers).

The IPO synchronous user tasks are started synchronously immediately before the interpolator cycle IPO or the slower IPO2.

Fast Motion Control reactions can be implemented here, as well as closed-loop control tasks in which the acquisition of actual values and output of setpoints must be synchronized.

The characteristic variables for the technology objects are calculated in system cycles IPO and IPO2.

The user program is therefore synchronized with the control cycle of the drives and with I/O processing. Synchronization ensures short response times and, above all, deterministic and reproducible machine behavior.

#### DCC tasks

Drive Control Chart (option) uses the above-mentioned SynchronousTasks. In addition, further synchronous execution levels (special tasks for DCC) can be assigned to the blocks.

#### TimerInterruptTasks

Several time-triggered tasks are available. The call cycles can be parameterized. Periodically repeated tasks are normally placed here.

#### InterruptTasks

InterruptTasks are used for a fast response to internal events that are signaled using interrupts. InterruptTasks can be activated by system interrupts, such as alarms and timeouts, or by user interrupts.

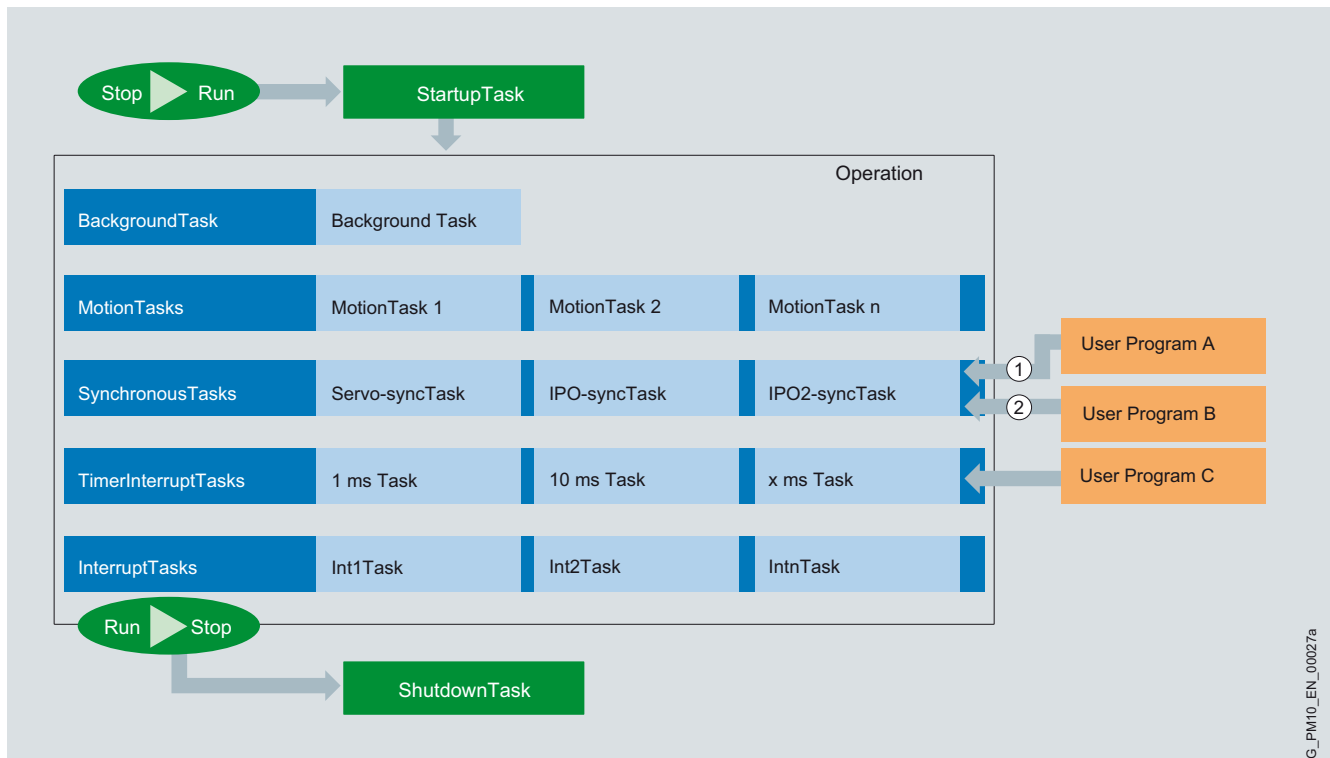
#### ShutdownTask

The ShutdownTask is called when there is a transition to STOP mode. The specific behavior for the transition into this system state can be defined here.

The complete instruction set is available for all user tasks. This allows the current positioning command to be superimposed with an additional movement from a MotionTask which was triggered by a UserInterruptTask, for example.

### Function (continued)

#### Task structure of a SIMOTION application



Task structure of a SIMOTION application

#### Runtime levels of the technology packages

The execution cycle can be set object-specifically for Motion Control technology objects.

Technology objects are executed in the execution levels SERVO cycle and IPO cycle or IPO2 cycle that are synchronized with the PROFIBUS or PROFINET cycle.

- Command evaluation and motion control in the IPO/IPO2 cycle
- Position and setpoint control in the SERVO cycle

The SIMOTION D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN Control Units have an additional runtime level (SERVO<sub>Fast</sub>, IPO<sub>Fast</sub>).

This additional runtime level enables the performance of the controller to be utilized more efficiently. Electrical and/or hydraulic axes can be distributed over one slow and one fast bus system, in accordance with the dynamics required.

Electrical positioning drives, for example, can be controlled with cycle times in the millisecond range requiring fewer resources and at the same time the pressure-controlled axes of an hydraulic press can be controlled with a high dynamic response and short cycle times.

The runtime level (SERVO<sub>Fast</sub>, IPO<sub>Fast</sub>) also enables a particularly fast I/O processing in conjunction with, for example, high-speed PROFINET I/O modules.

#### Further characteristics of the execution system

- Operating states – Run, Stop, StopU (Stop User Program for test and commissioning functions)
- Process images for inputs/outputs, is separate for BackgroundTask, SynchronousTasks and TimerInterruptTasks
- Debug functions such as
  - Controlling and monitoring of variables
  - Display of the program status
  - Breakpoints and single step
  - Trace functions
- Kernel updates can be implemented with new SCOUT versions.

# SIMOTION Motion Control System

## SIMOTION runtime software

### SIMOTION technology packages

#### Overview

##### Scalable functionality through technology packages

The SIMOTION technology packages expand the basic functionality of the SIMOTION devices with additional language commands, which makes adaptation to the respective automation task easy.

The loadable technology packages support the creation of technology objects (e.g. positioning and synchronous axis, cam paths, external encoders, ...) which can be accessed over system functions and system variables for use in every SIMOTION programming language.

#### Function

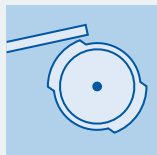
##### SIMOTION Motion Control technology package

The Motion Control Basic technology package can be used without a license. Use of the extended functions of the Motion Control technology package is subject to a license.

The comprehensive functions of the Motion Control technology package offer very open and flexible ways of influencing application programming and ensure that you can also implement future motion control applications.

Using the motion control functions in conjunction with the powerful PLC functionality results in high machine cycles thanks to short response times as well as high product quality thanks to reproducible machine behavior.

##### Technology functions for Motion Control Basic



##### The "speed-controlled axis" technology object

- Speed setpoints are defined in the program (for servo and vector drives)
- In addition, additional torque setpoints and torque limits can be defined, for example, for controlling a winder drive with tension control
- Access to status and control words of the drive  
Release sequence of the PROFIdrive units can be specifically controlled (e.g. for braking signal)
- Reading and writing of drive parameters
- Support for SINAMICS drives which can perform safety-related monitoring functions (SOS=Safe Operating Stop, SLS=Safely Limited Speed, SSM=Safe Speed Monitor, SDI=Safe Direction) or stop reactions (STO=Safe Torque Off, SS1=Safe Stop 1, SS2=Safe Stop 2).

The purpose of this support is to prevent stop reactions by the drive, where SIMOTION uses the application to regulate, e.g. within permissible velocity limits (with SLS) or stop (with SOS) the drive.

Activation and deactivation of SINAMICS Safety Integrated Extended Functions SS1, SS2, SOS, SLS, SSM, SDI as well as their status are indicated on the axis with specific technology alarms and system variables.

*Further information about SINAMICS Safety Integrated can be found in chapter Safety Integrated.*

##### "External encoder" technology object

External encoders can be used to detect actual position values of axes (on PROFIBUS/PROFINET, onboard for C240 and as a second encoder on the drive).

##### "Cam and cam track" technology object

- Generates position-dependent switching signals
- Number of cams and cam tracks depend on available system resources
- Each cam track can have up to 32 cams on one output

The following cam types are available:

- Trip cams
- Position-position cams
- Position-time cams
- Position-time-based cams with maximum ON length
- Counter cams
- Exact time setting of an output, exact time output cams

The cam statuses can be output with:

- Internal variables
- Standard digital outputs (SIMATIC S7-300, SIMATIC ET 200, ...)
- Onboard outputs of SIMOTION C, D and TM15 / TM17 High Feature (for high accuracy requirements in the  $\mu$ s range)
- The output can be inverted

The following can be used as reference points for the switching edges of the cams:

- Setpoints for real and virtual axes
- Actual values of real axes and external encoders

The following functions are available:

- Parameterizable hysteresis and effective direction
- Activation and deactivation times can be specified separately (dead time compensation)
- One-time and cyclic output of cam paths
- Parameterizable start/stop mode for cam paths (immediately, with next path cycle, etc.)
- Edge-triggered enable of cam paths in conjunction with TM17 High Feature terminal module
- The status of each individual cam (activated/deactivated) can be read
- Single output cams on a cam track can also be directly defined as valid/invalid

##### "Sensor" technology object

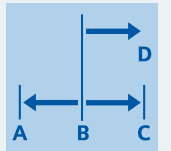
Sensors can be assigned to positioning and synchronous axes, external encoders or virtual axes and supply the axis position at the time of measuring.

The following functions are available:

- One-time measurement
- Cyclic measurement (2 edges per servo/IPO cycle in conjunction with TM17 High Feature or SIMOTION C240, D4x5-2)
- Measuring on virtual axes (in conjunction with TM15, TM17 High Feature, D4xx-2, CX32-2, CUxx or C240)
- Several active measuring inputs on one axis or one measuring input for several axes (in conjunction with TM15, TM17 High Feature, D4xx-2, CX32-2, CUxx or C240)
- Parameterizable edge evaluation (rising, falling, both edges)
- Dynamic resolution range

### Function (continued)

#### POS – Positioning technology functions



#### The positioning axis technology object

- Contains the functions of the speed-controlled axis technology object
- Supported axis types:
  - Linear axis, rotary axis
  - Modulo axis for linear and rotary axes
  - Real and virtual axis
  - Simulation axis
- Position control for:
  - Electrical drives
    - Position control with digital setpoint output
    - The following PROFIBUS DP/PROFINET protocol is used for this purpose: Profile drive technology, PROFIdrive, Version 4 (isochronous mode), use of Dynamic Servo Control (DSC) is possible with position control in the drive in, for example, 125 µs
    - Position control with analog setpoint output (onboard I/Os for C240, ADI 4, IM 174)
  - Hydraulic drives
    - Position control with analog setpoint output (onboard I/Os for C240, ADI 4, IM 174, analog outputs in the I/O range, e.g. in combination with ET 200S High Speed I/Os)
    - The characteristics of the hydraulic valves are specified with cams
  - Stepper motors
    - Position control with pulse direction output for stepper drives (onboard I/Os for C240, IM 174)
    - Alternatively, stepper drives with a PROFIBUS interface can be connected, provided that they support the PROFIdrive profile. Stepper drives can be operated without an encoder or be position-controlled with an encoder.
- Position-controlled positioning:
  - Axes can be manipulated individually without interpolation context by specifying, for example:
    - Axis name
    - Position
    - Velocity
    - Acceleration/delay, jerk
    - Transition behavior to next motion
- Speed-controlled operation of positioning axes
- Monitoring and limiting (standstill, positioning, dynamic following error, standstill signal, controlled variables, hardware/software end positions, encoder limit frequency, velocity error, measuring system difference/slip, limits for the dynamic response)
- Reversing block (prevents the output of setpoints which would cause a reversing motion)
- Movement profiles on axis defined over cams:
  - Path over time
  - Velocity over time
  - Velocity over path
- Force and pressure control of an axis:
  - Direct switchover from position to pressure-controlled operation and vice versa
  - Several pressure sensors possible
  - Pressure difference measurement
- Force and pressure limitation of an axis
- Force and pressure profiles specifiable over cams:
  - For closed-loop control and limitation
  - Force/pressure over time
  - Force/pressure over path
- Traveling to a fixed stop point
  - Stop on reaching a following error limit
  - Stop on reaching a torque limit
  - Stop with defined torque
- Traversing with additive torque, adjustable torque limiting and flexible torque limits B+/B-
- Transition behavior of successive motions:
  - attach, i.e. each motion is completed and the axis stops between motions (exact stop)
  - continuous move, i.e. the transition to the next motion begins when braking starts.
  - replace, i.e. the programmed motion is performed immediately. The active command is aborted.
- An additional motion can be performed during an active motion, for example, an active positioning motion can be performed simultaneously to a compensation motion.
- Concurrent start of positioning axes
- Homing:
  - The following homing types are currently supported:
    - Active homing (reference point approach)/passive homing (homing on-the-fly)
      - o With reference cam and encoder zero mark
      - o With external zero mark only
      - o With encoder zero mark only
      - o BERO proximity switch and hardware limit switch as reversing cam
      - o Hardware limit switch as reference cam
    - Direct homing / setting the home position
    - Relative direct homing (shift by specified offset)
    - Absolute encoder homing / absolute encoder calibration
- Compensations and reference points:
  - Reference point offset
  - Backlash on reversal compensation
  - Static friction compensation
  - Sliding friction compensation for hydraulics
  - Drift compensation for analog drives
- Pressure mark correction
- Encoder switchover:
  - Up to 8 encoders can be specified for an axis:
    - For the position control, only one encoder is active at any one time:
      - The switchover between encoders can be performed on-the-fly (with a change-over smoothing filter).
      - The actual value for the non-active encoder can be read with the application program and used for specific monitoring, for example.
- Override:
  - Factors can be superimposed online on the current traverse velocity and acceleration/deceleration.



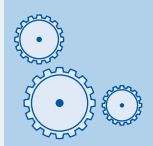
# SIMOTION Motion Control System

## SIMOTION runtime software

### SIMOTION technology packages

#### Function (continued)

##### GEAR – Synchronous operation/electronic gear technological functions

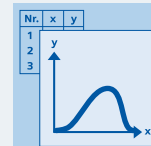


##### Synchronized axis technology object

- Contains the functions of the positioning axis technology object
- Synchronized speed for position-controlled axes
- Angular synchronization, electronic gear:  
Stable, long-time angular synchronization over several axes is ensured. The gear ratio can be adjusted in small steps.
- Absolute and relative gearbox synchronism
- Offset of the following axis
- Leading axis:  
The master value can be changed immediately between master value sources (transition dynamics must be specified). The following can be used as a leading axis or master value sources for the following axes:
  - Virtual axis:  
The virtual axis only exists in the control and therefore does not have a real drive, motor or encoder. A virtual axis can be controlled with commands in the same way as a real axis. The motion control calculates the setpoints with the interpolator which can be used as a master value for synchronous operation, for example.
  - Real axis:  
The real axis is a leading axis which is part of the SIMOTION system and can be coupled over a setpoint and actual value.
  - External encoder:  
The actual value is detected with an external encoder and supplied as a master value after conditioning.
- Setpoint value linkage as well as actual-value linkage with compensation of dead times.
- Angular position and electronic gear ratio for axes can also be changed during operation.
- Engaging/disengaging:  
Following axes can be stopped for one cycle or moved for only one cycle to remove a faulty component, for example. This can be flexibly implemented with the programmable synchronism functionality.
- Synchronization and desynchronization:
  - Following axes can be synchronized and desynchronized while the leading axis is in motion or standing still.
  - The angular position to the leading position can be specified.
- Different synchronization modes are available:
  - Synchronization via a specifiable master value distance
  - Synchronization based on specifiable dynamic response parameters (jerk-limited)
  - Synchronizing position for synchronization and desynchronization at a precision position
  - Position of synchronizing range (before, after and symmetrically with synchronizing position)

- Terminating synchronized operation of/to positioning
- Comprehensive synchronized operation monitoring functions
- External synchronization:  
By flying measurement of, for example, a print-mark and a superimposed positioning function, a material slip can be corrected.
- Simultaneous motion during synchronized operation:  
A positioning motion or other synchronized operation can be performed during synchronized operation.
- Distributed synchronous operation and the option to implement synchronous operation beyond device limits.
  - PROFIBUS: Leading axis to PROFIBUS master, following axes to PROFIBUS slaves.
  - PROFINET: Changeover between leading axes to different SIMOTION controllers possible. Cascading of the synchronous operation over several SIMOTION controllers.
  - Dead times are compensated automatically.
  - Also possible across different projects (independent projects)

##### CAM – Cam technology functions

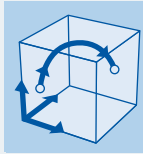


##### Cam technology object

- Contains the functions of the synchronous axis technology object
- The number of cams depends on the available system resources
- The number of support points or segments per cam depends on the available system resources
- Cam functions:
  - Definition over table support point or polynomials up to 6th degree with trigonometrical functions
  - Motion rules implementable to VDI 2143
  - Transition between support points/polynomials: Linear, continuous, spline
- Scalability, cam functions can be offset and switched even during operation:
  - The leading and following axis positions of the cam functions can be scaled and offset during operation.
  - The active cam function can be defined and switched during operation.
- Non-cyclic and cyclic editing of cams
- Absolute and relative curve synchronization
- Absolute and relative master value referencing
- Synchronization and desynchronization (see [synchronous operation technology object](#))
- Overriding of 2 synchronized cams
- Cams can be defined and modified with the SCOUT engineering system or with an application program during runtime.

### Function (continued)

#### **PATH –** Path interpolation technology functions



#### Path interpolation technology object

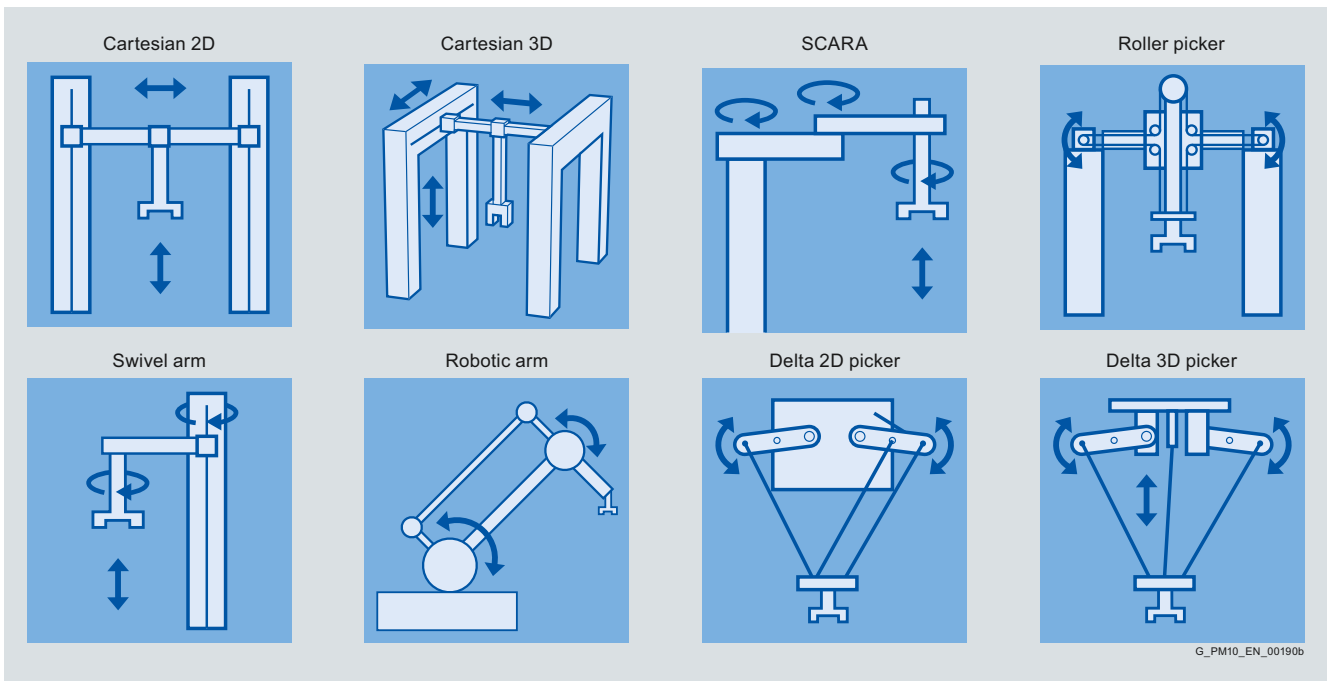
The path interpolation technology object is primarily intended for the automation of handling robots. Interpolation in machines for material machining is covered by the SINUMERIK machine tool controllers. (Further information about SINUMERIK control systems can be found in Catalogs NC 60 and NC 61.)

- The number of path objects is dependent on the performance of the hardware platform used.
- Interpolation types:
  - Linear interpolation in 2D and 3D
  - Circle interpolation in 2D and 3D
  - Polynomial interpolation in 2D and 3D
- Interconnection of a path object is possible with:
  - Up to 3 interpolating path axes
  - One positioning axis for path-synchronized motion (axis moves in synchronism with motion)
  - One cam for specifying velocity profiles along the path
- Connection of path-based cams, cam tracks and measuring inputs over the positioning axis for path-synchronized motion

- Interconnection of the Cartesian path coordinates with positioning axes is possible. Cams, cam tracks and measuring inputs can also be implemented on the path
- The path dynamics (acceleration, jerk) are specified on the path, axis limits are generally applicable regardless of the limits along the path
- Dynamic planning via 3 traversing blocks
- Continuous geometric movement between 2 traversing blocks
- Kinematic transformations for:
  - Cartesian gantry
  - SCARA
  - Robotic arm (toploader)
  - Roller picker
  - Delta 2D and Delta 3D picker
  - Swivel arm
- Synchronization with conveyor belts (conveyor tracking). This facilitates the handling of products which are continuously fed or continuously removed.
- Programming in ST and MCC

A pre-configured sample application can be used for easy implementation of handling robots, which allows both jog mode and the creation of motion programs (see [SIMOTION Utilities & Applications](#) which is supplied with SIMOTION SCOUT).

*More information about handling applications can be found in chapter Sector-specific solutions.*



Kinematics in the Motion Control technology package

# SIMOTION Motion Control System

## SIMOTION runtime software

### SIMOTION technology packages

#### Function (continued)

##### Supplementary technology functions

###### "Fixed gear" technology object

You can use the "Fixed gear" technology object to implement a fixed synchronous operation (without synchronization/desynchronization) using a specified gear ratio. Fixed gearing converts an input variable to an output variable with a configured transmission ratio (gear ratio).

A Fixed Gear technology object can be used as follows, for example:

- To make allowance for diameters in a master variable
- To implement a fixed gear ratio without coupling
- For speed synchronization on speed-controlled axes
- As a motion-coupled gear on master value, following axes are engaged or disengaged. In this way, the gear is always synchronized with the master value. Example: A paper web runs synchronously with the master.

###### "Summator" technology object

The summator object can be used to add up to four input vectors (motion vectors) with one output vector. An addition object can be used as follows, for example:

- To add up superimpositions/offsets in the main signal path, e.g. color register, cut-off register on the paper web

###### "Formula" technology object

Formula object for scalable variables and motion vectors. A formula object can be used between interconnected objects to modify scalar variables in the main signal path, e.g.:

- Superimposition of torque
- Superimposition of master velocity
- Modification of torque variables B+, B-
- Enabling of torque limitations
- Enabling of torque

###### "Sensor" technology object

The sensor object can be used to acquire scalar measuring values. A sensor object reads out a value from the I/O and supplies an actual value as an output signal in standardized formats.

###### "Controller" technology object

The controller object can be used to prepare and control scalar variables.

A controller object can be used as a universal PIDT1 controller for scalar control variables as well as a PI and P controller.

###### Interconnection of technology objects

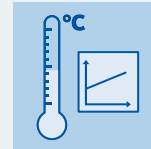
The individual technology objects can be interconnected. The supplementary technology functions, for example, can be used to implement additional winder applications directly on the system level.

###### Note:

No license is necessary for using the supplementary technology functions.

##### SIMOTION TControl technology package

###### TControl – Temperature controller technology functions



###### Temperature Channel technology object

The controller core of the temperature technology package has a DPID structure. Pure heating controllers and cooling controllers as well as combined heating/cooling controllers can be configured and parameterized.

User-assignable functions are available for each temperature channel:

- Each temperature channel can either be configured as a heating or cooling section or as a combined heating/cooling section.
- The controllers either use a PID or DPID control algorithm or use the optional control zone functionality.
- In manual output mode, a replacement value can be output.
- You can select the operating mode for each controller channel separately. In this way, you can switch the output to a fixed value.
  - The following operating modes are available:
    - Closed-loop control for operating setpoint
    - Actual value acquisition and output of the manual manipulated variable value
    - Actual value acquisition and output of 0
    - Self tuning
- Actual value acquisition and processing
  - Plausibility check for each new actual value and correction before corresponding filter measures
  - Filtering (by PT1 element)
- Actuating signal preparation and output
  - Digital, pulse-length modulated actuating signal
  - Prevention of minimal pulse durations for I/O cycles by integration of lost pulses
  - Manual actuating value (for manual output mode)
  - Output value limitation
  - Replacement value (calculated dynamically)
- Self-tuning for heating controllers
  - This ensures fast startup without overshooting and maintains the setpoint value without lasting system deviations.
  - Self-tuning can be used in parallel for all desired channels to ensure optimal parameter acquisition even for strongly coupled temperature sections.
- Monitoring and alarm functions
  - Actual value monitoring by definition of tolerance bands. The inner and outer tolerance bands can be defined independently as absolute or relative tolerance bands.
  - Measuring circuit monitoring for increased operational safety of a plant
  - Plausibility check
  - Alarm functions

The use of the TControl technology package is clarified by an application example. The application example provides functional expansions, function interfaces to the application and data interfaces to the HMI. It is contained in the Utilities & Applications which are supplied with SIMOTION SCOUT.

### Function (continued)

#### SIMOTION technology package for Drive Control Chart (DCC)

##### Technology functions for Drive Control Chart

With Drive Control Chart (DCC), open-loop and closed-loop control functions can be easily configured graphically. Multi-instance function blocks are selected from a block library using drag & drop, graphically interconnected and parameterized. The control structures are presented clearly.

The block library comprises a large selection of

- control,
- arithmetic and
- logic blocks as well as
- comprehensive open-loop and closed-loop control functions.

Further functions:

- For linking, evaluating and acquiring binary signals, all the commonly available logic functions are available, for example, AND, XOR, On/Off delays, RS flip-flops or counters.
- For monitoring and evaluating numerical values, numerous arithmetic functions are available, such as:
  - Summation
  - Divider
  - Minimum/maximum evaluation
- Apart from the automatic speed control, winders, PI controls, ramp-function generators and wobble generators can easily be configured.

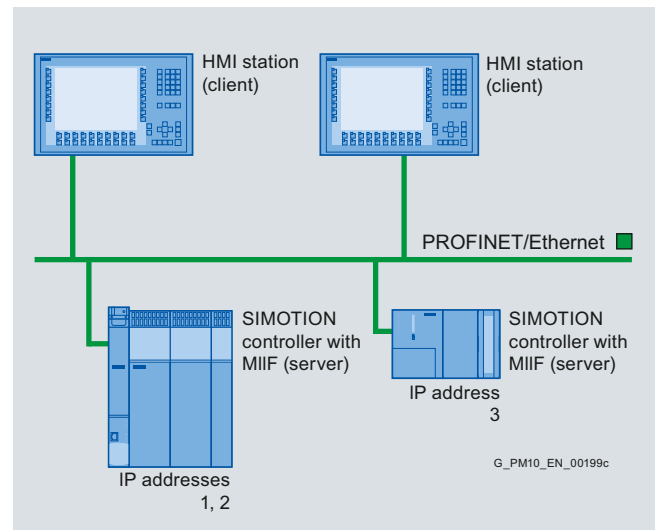
*More information about Drive Control Chart (DCC) can be found in section Optional packages for SIMOTION SCOUT.*

#### SIMOTION technology package Multipurpose Information Interface (MIIF)

The SIMOTION technology package MIIF (Multipurpose Information Interface) functions as a server to permit symbolic access to SIMOTION data and makes them available to clients (e.g. operator panel) via Ethernet.

Access to SIMOTION variables is purely symbolic. The client application is not in any way dependent on the SIMOTION application. The communication is TCP/IP-based. Several controllers and HMI stations can be operated on an Ethernet line.

The server is active after being loaded to the controller. The server does not need to be configured in the application.



#### Symbolic access to SIMOTION data with MIIF

The server allows variables to be read and written within SIMOTION RT. System variables of the device, system variables of technology objects and UNIT global variables are supported here. Global device variables and I/O variables are not supported in the OAMIIF V1.0. If these are displayed/changed, they need to be copied by the application.

The server works at round robin level. This means that response times are longer on a system working at full capacity. Deterministic behavior is not guaranteed.

The technology package MIIF (Multipurpose Information Interface) is compatible with the following SIMOTION controllers:

- SIMOTION C240/C240 PN
- SIMOTION P320-3/P350-3
- SIMOTION D410-2/D4x5-2

Runtime software V4.1 SP4 or higher must be installed on the SIMOTION controller.

# SIMOTION Motion Control System

## SIMOTION runtime software

### SIMOTION PLCopen blocks

#### Overview



#### **Block library containing certified function blocks in accordance with PLCopen**

PLCopen is an association of leading PLC manufacturers that was formed for the purpose of defining international standards in the field of PLC programming and promoting their use.

The PLCopen function blocks integrated into the Motion Control technology package are designed for use in cyclic programs/tasks; they enable motion control programming in a PLC environment. The function blocks can be selected from the SCOUT command library and can therefore be easily used in all SIMOTION programming languages. They should preferably be used in LAD/FBD.

The following certified single-axis and multi-axis PLCopen blocks as well as extended functions are available:

#### Single-axis function blocks

- `_MC_Power` (axis enable)
- `_MC_Stop` (stop axis)
- `_MC_Reset` (reset axis)
- `_MC_Home` (reference point approach for axes)
- `_MC_MoveAbsolute` (absolute positioning of axes)
- `_MC_MoveRelative` (relative positioning of axes)
- `_MC_MoveVelocity` (traversing axes at a specified velocity)
- `_MC_MoveAdditive` (relative traversing of axes by a defined path additively to the remaining path)
- `_MC_MoveSuperimposed` (relative superimposition of a new motion in addition to existing motion)
- `_MC_PositionProfile` (traversing axis by a predefined and specified position/time profile)
- `_MC_VelocityProfile` (traversing axis by a predefined and specified velocity/time profile)
- `_MC_ReadActualPosition` (read actual position of axis)
- `_MC_ReadStatus` (read status of an axis)
- `_MC_ReadAxisError` (read error of an axis)
- `_MC_ReadParameter` (read axis parameter, LREAL data type)
- `_MC_ReadBoolParameter` (read axis parameter, BOOL data type)
- `_MC_WriteParameter` (write axis parameter, LREAL data type)
- `_MC_WriteBoolParameter` (write axis parameter, BOOL data type)

#### Multi-axis function blocks

- `_MC_CamIn` (enable cam with synchronization) contains implicit `_MC_CamTableSelect` (selection of cam)
- `_MC_CamOut` (disengage cam with desynchronization length)
- `_MC_GearIn` (synchronize)
- `_MC_GearOut` (desynchronize)
- `_MC_Phasing` (apply phase shift)

Apart from the standard PLCopen functions, the following additional standard axis function is included:

- `_MC_Jog` (continuous or incremental jogging)

### Overview



OPC (Open Process Communication) is used by the Windows 7 and Windows XP operating systems as a communications interface.

The basic principle of OPC is that OPC client applications can communicate with the OPC server over a standardized, open and multi-vendor interface. COM (Component Object Model) and DCOM (Distributed COM) are applied as basic procedures.

Pre-existing COM-capable Windows applications (MS Office or HMI systems) can be linked.

As a basic rule, however, software for communication via OPC must be installed on all systems.

The OPC servers fulfill the following specifications of the OPC Foundation:

- Data Access Automation Interface
- Data Access Custom Interface
- Alarm and Events Custom Interface

#### OPC on PC and PG

The SIMATIC SOFTNET S7 communication software for PC/PG is available for PROFIBUS DP and PROFINET/Industrial Ethernet and includes software for S7 communication, S5-compatible communication and communication with SIMOTION.

#### OPC on SIMOTION

The SIMATIC NET OPC server is pre-installed on SIMOTION P350-3, but its use is subject to a license. See selection and ordering data.

Communication can thus take place internally on SIMOTION P350-3 from Windows level to SIMOTION runtime level by means of OPC mechanisms and functions.

### Benefits

- Standardized access to SIMATIC S7 and SIMOTION for OPC-capable applications under Windows XP and Windows 7
- Integration of automation products of different manufacturers
- The same, easy-to-use user interface for different components
- Can be accessed from every computer in the LAN
- High-performance data access over the "Custom Interface" (C++)
- Easy to use with the "Automation Interface" (VB) or the supplied OCX data control

### Function

#### Programming

- Synchronous and asynchronous reading and writing of variables
- Monitoring of variables using the OPC server with a signal to the client when a change occurs
- Transmission of alarms and events to client
- Use of batch operations, so a large volume of data can be processed in a short time

#### Interfaces

- Custom Interface (C++) for high OPC performance
- Automation Interface (VB, Excel, Access, Delphi, etc.) for ease-of-use
- Graphics with OCX for configuring instead of programming

#### Bus systems

- Communication over OPC for PROFIBUS and Industrial Ethernet is supported.

#### Operating systems

- Windows XP Professional
- For 32 bit: Windows 7 Professional/Ultimate
- For 64 bit: Windows 7 Professional/Ultimate

# SIMOTION Motion Control System

## SIMOTION runtime software

### OPC server

#### Integration

A variety of different requirements must be fulfilled in order to set up a communication link from a PC/PG to SIMOTION via OPC:

##### Requirements for communication via PROFIBUS

- PC/PG with CP 5621 PCI card and SOFTNET S7 communication software for PROFIBUS DP, or
- PG/Notebook with CP 5512 PCMCIA card and SOFTNET S7 communication software for PROFIBUS DP

##### Requirements for communication via Industrial Ethernet

- PC/PG with standard Ethernet interface and SOFTNET S7 communication software for Industrial Ethernet or SOFTNET S7/LEAN for Industrial Ethernet (only 8 connections)

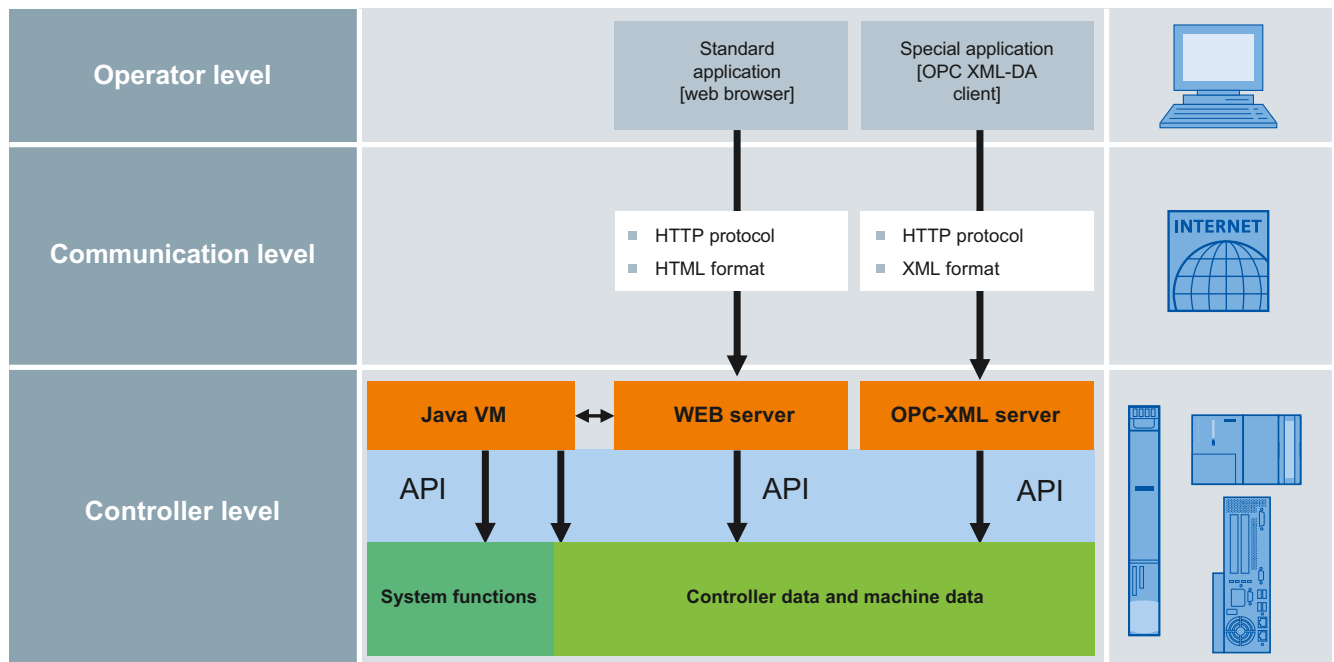
#### Selection and ordering data

Description	Order No.
<b>SOFTNET S7 communication software for PROFIBUS DP</b> Software for S7 communication incl. FDL and S7 OPC server, with electronic manual on CD-ROM, for use with CP 5512 and CP 5621 modules	<b>6GK1704-5CW80-3AA0</b>
<b>CP 5512 communications processor</b> PCMCIA card for connecting a PG or notebook computer to PROFIBUS DP and MPI	<b>6GK1551-2AA00</b>
<b>CP 5621 communications processor</b> PCI card for connecting a PG or AT-PC to PROFIBUS DP or MPI	<b>6GK1562-1AA00</b>
<b>SOFTNET S7 communication software for Industrial Ethernet</b> Software for S7 communication, S5-compatible communication (SEND/RECEIVE), incl. OPC, PG/PC communication, incl. S7 OPC server, with electronic manual	<b>6GK1704-1PW08-1AA0</b>
<b>SOFTNET S7 LEAN communication software for Industrial Ethernet</b> Software for S7/S5-compatible communication, incl. OPC, PG/OP communication and NCM PC, up to 8 connections	<b>6GK1704-1LW08-1AA0</b>
<b>SIMATIC NET OPC server on SIMOTION P</b> License for pre-installed communication software on the SIMOTION P Motion Controller	<b>6AU1380-0AA20-0YB0</b>

#### More information

More information about the SIMATIC NET software package with OPC server can be found in Catalog IK PI and the Industry Mall under Automation Technology/Industrial Communication.

### Overview



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SIMOTION IT: Three different technologies for easy access to control and machine data

#### **SIMOTION IT: Service and diagnostics via the Internet**

The SIMOTION controllers support communication with the outside world through the integrated Ethernet or PROFINET interface using standard IT protocols such as HTTP. Using the web functions integrated in SIMOTION IT, machine manufacturers and users can perform commissioning, diagnostic and service procedures on production machines easily and without additional engineering tools.

The web pages provided by SIMOTION IT supply comprehensive information about the current condition of a SIMOTION controller. This information can be accessed with a standard PC and commercially available Internet browser. Extensive protection has been provided to ensure security against unauthorized access by third parties. The integrated web pages provide users with commissioning and service support, e.g. helping them to detect the causes of faults, and with upgrading the software on the SIMOTION controller.

#### **SIMOTION IT offers three varying technologies**

SIMOTION IT DIAG and SIMOTION IT OPC XML-DA each provide a communications server on the SIMOTION controller. Via Industrial Ethernet/PROFINET, a client PC can then access data in the SIMOTION controller for diagnostic or service purposes or for visualization.

SIMOTION IT Virtual Machine provides a Java runtime environment on the SIMOTION controller. This means that Java applications can be executed on the SIMOTION controller. This allows you to create your own programs for commissioning, service and preventive maintenance.

#### **Licensing of SIMOTION IT**

With SIMOTION Kernel version V4.2 and higher, only a license for SIMOTION IT Virtual Machine is required. Here, the SIMOTION IT functions IT DIAG and OPC XML-DA are part of the standard firmware of the SIMOTION controller and do not require a license.

#### Note:

A license with SIMOTION Kernel < V4.2 is still required for using the functions SIMOTION IT DIAG and OPC XML-DA. These must be licensed using the respective software options. The SIMOTION IT Virtual Machine license can still be used for SIMOTION Kernel < V4.2 as a combined license for SIMOTION IT DIAG, OPC XML-DA and Virtual Machine.



# SIMOTION Motion Control System

## SIMOTION runtime software

### SIMOTION IT

#### Function

##### **SIMOTION IT DIAG**

SIMOTION controllers have a web server integrated into their runtime systems. For implementing applications with SIMOTION IT DIAG, a series of predefined web pages are stored in the SIMOTION controller that offer the following information and functions:

- **Device information**  
Detailed information about the firmware versions, hardware components and technology objects of the device
- **Diagnostics**  
Information about device resources such as: CPU load, memory usage, task duration times and operating state, diagnostic buffer, extended diagnostic buffer and technology object alarms, axis overview, watch tables and runtime trace  
The diagnostic pages for SIMOTION D also display drive alarms, drive diagnostic buffer and parameters of the integrated SINAMICS drive.
- **Runtime trace**  
Recorded data are loaded to the PC with a mouse click. The Web Trace Viewer for Windows XP offers a wide scope of options for evaluating recorded data: Graphical, with zoom and dual measuring cursor.  
SIMOTION D offers the Web Trace Viewer as a direct download.
- **System trace**  
As with SCOUT, a trace can be initiated over different controllers.
- **Access to the device file system**  
An Internet browser can be used to store and access any number of files in the file system of the SIMOTION controller. In this way, documentation and service instructions can be stored directly in the controller, for example.
- **Project update and firmware update**  
A special web page can be used to update the SIMOTION project and also the firmware of the SIMOTION controller.
- **Access protection**  
The web pages are protected with a user name and password. Different user groups can be defined for different pages.
- **User-specific web pages**  
The user can create web pages and save them on the SIMOTION controller. "Server side includes" are used to access SIMOTION variables in these web pages. This is a special HTML syntax extension which allows the values of the selected variable to be inserted on a web page.

Read and write access to the SIMOTION variables is possible. Java scripts or applets can be used to implement active operation and display functions in the web pages that can be executed on a client PC with an Internet browser.

The standard pages of SIMOTION IT DIAG have the same design as the pages on a SIMATIC controller. The service overview and watch table can also be opened in parallel in separate windows.

A horizontal navigation can be created very easily for user-defined pages. No additional software is required.

##### **SIMOTION IT OPC XML-DA**

SIMOTION controllers have an OPC XML-DA server integrated in their runtime system. OPC XML-DA is an interface specified by the OPC Foundation and is based on the standard IT protocol HTTP. The data requests of a client are coded in XML symbolically and transmitted to SIMOTION using the HTTP protocol. These are evaluated by the integrated OPC XML DA server and the response is then sent back to the client over the same path.

It is therefore possible, for example, to create HMI applications in different programming languages (C#, Visual Basic, Java) on any client systems independently of the operating system.

The application works with the symbolic names of the SIMOTION variables and has thus only a loose, symbolic dependence on the SIMOTION SCOUT database. A symbol export, similar to the Windows-based process on the SIMATIC NET OPC DA server, is not required. This ensures that consistency problems between the version of the client application and the project version in SIMOTION are avoided.

The OPC XML-DA server offers the following functions for access to the data of the SIMOTION controller:

- Read and write access to the SIMOTION variables
- Access to diagnostic buffer, extended diagnostic buffer and technology alarm objects
- Symbolic browsing function via the SIMOTION variables
- Cyclical reading of variables using "subscriptions"
- Access protection (password-based) can be configured, if required.

SIMOTION IT OPC XML DA is integrated directly in the SIMOTION Kernel. The functionality responds in accordance with the specification of the OPC Foundation "OPC XML-DA Specification Version 1.01".

##### Note:

SIMOTION offers two different access possibilities over OPC. The method already described over OPC XML-DA and the method over OPC DA. OPC DA requires that the SIMATIC NET package is installed on the client PC and it is described in the "OPC server" section.

[More information about OPC can be found on the Internet at www.opcfoundation.org](http://www.opcfoundation.org)

### Function (continued)

#### **SIMOTION IT Virtual Machine**

SIMOTION controllers have an integrated Java runtime environment (Virtual Machine) in their runtime system. Use of this function is licensed by the "SIMOTION IT Virtual Machine" license.

Java applications can be executed on a SIMOTION controller with SIMOTION IT Virtual Machine. This allows you to develop your own programs and concepts for commissioning, service and preventive maintenance.

The programs can be created with standard development tools that are available on the market, such as Eclipse or Borland JBuilder. When they have been created, the programs can be downloaded into the SIMOTION controller online. There is no dependency on SIMOTION SCOUT.

All Java applications on the SIMOTION controller are executed in asynchronous tasks in the SIMOTION task system, not in real-time tasks.

The Java environment provides an interface (API) to the SIMOTION runtime system over special system functions. The following functions are available:

- Read and write access to the SIMOTION variables
- Read and write access to the non-volatile memory (NVRAM)
- Use of system functions (functions of the technology objects)
- Use of standard Java classes in the device (file access, network functions, string functions, ...)
- Creation of servlets, for the purpose of enhancing menu interfaces in web pages, in particular.

### Selection and ordering data

Description	Order No.
As of SIMOTION Kernel V4.2, the SIMOTION IT functions IT DIAG and OPC XML-DA are included in the standard firmware of the SIMOTION controllers and do not require a license. Use of the function SIMOTION IT Virtual Machine must be licensed through the following software option:	
<b>SIMOTION IT Virtual Machine</b> License for SIMOTION IT Virtual Machine on one controller <b>Note</b> It can be used as a combined license for SIMOTION Kernel < V4.2 for SIMOTION IT DIAG, OPC XML-DA and Virtual Machine.	<b>6AU1820-8BD20-0AB0</b>
The functions SIMOTION IT DIAG and OPC XML-DA remain subject to licensing with SIMOTION Kernel < V4.2. They must be licensed using the following software options:	
<b>SIMOTION IT DIAG</b> License for SIMOTION IT DIAG on SIMOTION Kernel < V4.2	<b>6AU1820-8BA20-0AB0</b>
<b>SIMOTION IT OPC XML-DA</b> License for SIMOTION IT OPC XML-DA on SIMOTION Kernel < V4.2	<b>6AU1820-8BB20-0AB0</b>

#### Note

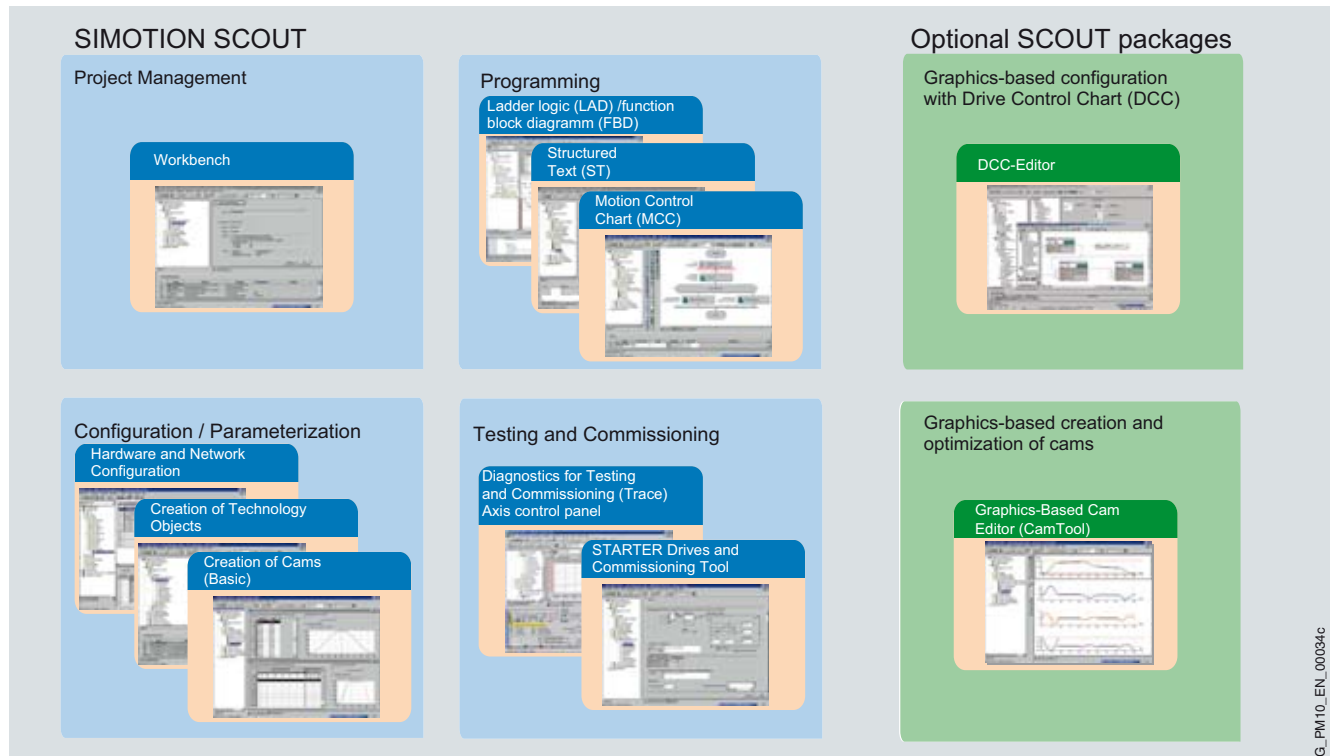
SIMOTION IT is available only on SIMOTION controllers with Ethernet or PROFINET interface.

# SIMOTION Motion Control System

## SIMOTION engineering software

### Overview of engineering software

#### Overview



SIMOTION SCOUT: a uniform view of your automation task

#### **SIMOTION SCOUT – The holistic engineering system for your motion control applications**

The SIMOTION Motion Control system provides a wide variety of preprogrammed functions and you can assign parameters and program it for customized use.

For practical implementation of your automation tasks, you therefore require a tool that will support all the necessary engineering steps in a user-friendly manner: SIMOTION SCOUT

SCOUT is the environment for uniform automation in mechanical engineering. It supports simple engineering of complex production machines with demanding PLC and Motion Control functions.

SCOUT is integrated in STEP 7 and is therefore also integrated into the SIMATIC landscape to ensure Totally Integrated Automation (TIA).

SCOUT provides

- an integrated, function-oriented view of your automation task, combined with
- a high level of user friendliness.

The possible SIMOTION applications range from a simple, parameterizable, speed-controlled single axis through to complex, mechatronically-coupled and programmable multi-axis machines.

Therefore, SCOUT provides views adapted to the task and can be expanded with additional tools (e.g. tool for the graphic creation of cams).

#### **SIMOTION SCOUT – A tool for engineering, testing and diagnostics**

SCOUT supports all the steps required for creating a Motion Control application: configuration, parameterization, programming, testing and diagnostics. The integrated test and diagnostics functions are useful when commissioning and servicing.

The graphical menu system of SCOUT supports the user with important tasks, such as:

- Creation of the hardware and network configuration
- Creation, configuration and parameterization of technology objects such as axes, measuring inputs, output cams, cam tracks and cams.

#### **SIMOTION SCOUT – Support for text-based and graphical programming**

With SCOUT the following programming languages are available for programming a SIMOTION application:

- Structured Text in accordance with IEC 61131
- LAD (Ladder Diagram) and FBD (Function Block Diagram)
- MCC (Motion Control Chart): the graphical "flow diagram language" for easily describing and programming motion sequences for production machines
- DCC (Drive Control Chart): graphical configuration of open and closed-loop control functions

#### **Optional CamTool package (cam editor)**

The optional CamTool package expands SCOUT with a powerful graphical tool for creation and optimization of cams. Simple editors for creating cams are already integrated in SCOUT as standard.

#### **Optional Drive Control Chart (DCC) package**

With Drive Control Chart (DCC), drive-based open and closed-loop control functions can be easily configured graphically. Multi-instance function blocks are selected from a standard function block library, and then graphically linked by means of drag & drop and parameterized. The control structures are presented clearly in SCOUT.

The optional CamTool and Drive Control Chart packages are completely integrated in the SCOUT environment.

### Overview

The SIMOTION SCOUT software package is the basis for implementation of the SIMOTION Motion Control System.

It essentially contains the SIMOTION SCOUT engineering system including the integrated STARTER commissioning tool and the runtime software for all SIMOTION platforms.

SIMOTION SCOUT is available as an optional STEP 7 package or as SIMOTION SCOUT stand-alone.

SCOUT also supports the engineering of SIMOTION platforms with older runtime versions.

### SIMOTION SCOUT

The SIMOTION SCOUT engineering system provides important new features in version V4.2 and higher. The focus is on an improved connection of the SINAMICS S120 drive system, the completion of the comparison functionality and many usability improvements.

#### Improved connection to SINAMICS S120

The most important innovation in the SIMOTION SCOUT engineering system is the significantly simplified connection to the SINAMICS S120 drive system. Drives and their components are integrated automatically to the greatest possible extent. The connections to the drive objects are simply interconnected, whereby the required message frame generation is performed automatically by the engineering system.

#### Project comparison now also in LAD/FBD and MCC

The detail comparison option available when using Structured Text (ST) is now also available in the graphical programming languages LAD/FBD and MCC (Motion Control Chart). This enables the graphical comparison of programs, where the different structures and commands can be recognized through colored highlighting. The comparison function is available for offline-offline and also for offline-online comparison.

#### Uniform display of lists

The display of all lists in the system has now been simplified and adapted to the well-known look and feel of Office applications. The highest possible data security was observed during the implementation. If there are any operation faults (e.g. faulty copy and paste), the system restores the data. In this way, even beginners can become familiar with the engineering software, intuitively, quickly and safely.

#### System trace across several motion controllers

The so-called system trace feature is available for analysis or system optimization. This enables up to 128 signals from SIMOTION controllers networked via PROFINET to be recorded synchronously.

#### Trace for technology objects

With the new TO trace, all events affecting a technology object can be recorded in real-time and displayed in detail in a chronological sequence in the engineering system.

#### New watch tables

The new watch tables provide extended functions and diagnostic options. They allow different variables of the project (also different devices) to be collected. The watch tables can be clearly displayed and controlled with current values. Stored control value tables can also be used to perform comprehensive test sequences quickly and easily.

#### Improved diagnostics and troubleshooting

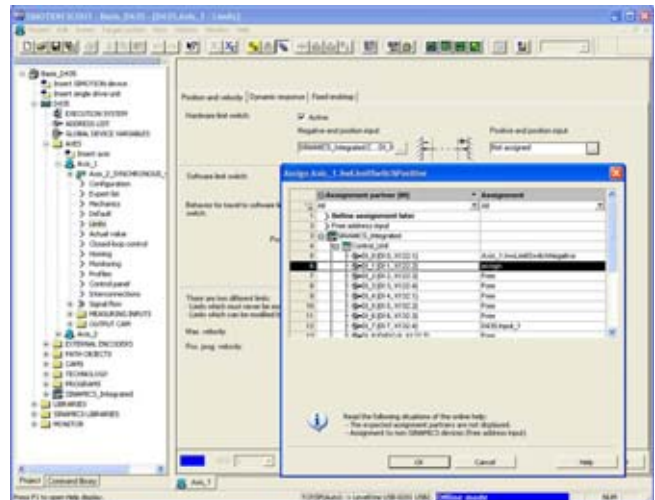
New features such as the "Trace" in the MCC editor, which make the program sequence visible and understandable even with rapid command transitions, provide greater clarity in diagnostics and troubleshooting. Or "talking" icons in the tabs of the opened programs that refer to active status or debug functions.

#### Easier to use during programming

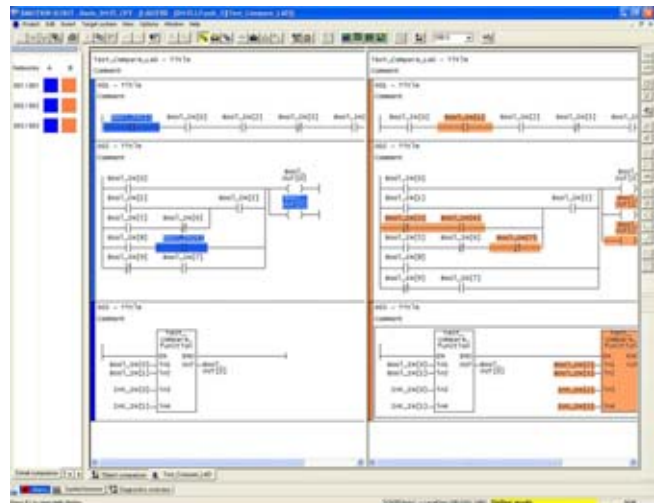
Greater clarity is provided in the general programming through small additions such as the display of the variable type, display of the current value when there is an online connection and language-dependent comments which appear when the cursor is moved over the code ("tooltips").

Rollout tips provide the user with information on input errors or system information that is still missing when working in tables or entry fields.

The system-wide effective automatic completion of user entries ("Auto-Complete") with automatic correction of upper/lower case makes the editing process more efficient and provides an easily readable program code.



Simple interconnection of the drive I/Os



Detail comparison with ladder logic (LAD)

# SIMOTION Motion Control System

## SIMOTION engineering software

### SIMOTION SCOUT software package

#### Overview (continued)

##### Scope of supply

##### SIMOTION SCOUT engineering software

- SCOUT with corresponding license
- License key for SCOUT
- Integrated STARTER commissioning tool

##### Optional packages for SIMOTION SCOUT

- Optional CamTool package without license  
The license must be ordered separately.
- Optional Drive Control Chart (DCC) package without license  
The license must be ordered separately.

##### Documentation

- Complete SIMOTION documentation on DVD

##### Other software

- SIMOTION – Utilities & Applications  
Free utilities (e.g. calculation tools, optimization tools, etc.) and application examples (ready-to-apply solutions such as winders, cross cutters or handling) as well as the project generator SIMOTION easyProject
- SIMATIC NET without license
- SIMATIC software:  
With SCOUT stand-alone, the necessary components of STEP 7.

##### System requirements for V4.3

##### Software

- Windows XP SP3 or Windows 7 Professional or Ultimate (32/64-bit)
- SIMATIC STEP 7 V5.5 SP2 (not required for SCOUT stand-alone)

##### Hardware

Minimum system requirements PG/PC for SCOUT:

- As of Pentium IV 2.5 GHz, 1 GB RAM (2 GB recommended)
- At least 1024 MB main memory for PG/PC and SIMOTION P; 2 GB main memory is recommended
- Screen resolution: 1024 x 768 pixels, 16-bit color depth
- Free hard disk memory: 3 GB

With additional installation of WinCC flexible ES in Scout:

- Pentium IV 2.5 GHz, 4 GB RAM

##### Integrated STARTER commissioning tool

The STARTER commissioning tool is directly integrated in SCOUT. It supports the simple and rapid commissioning, optimization and diagnostics of all new-generation Siemens drives with only one tool.

STARTER supports the drives:

- SINAMICS
- MICROMASTER 420/430/440
- MICROMASTER 411/COMBIMASTER 411
- COMBIMASTER

##### SIMOTION SCOUT stand-alone software package

If STEP 7 is not installed, the SIMOTION SCOUT stand-alone software package can be used. It also contains the components of STEP 7 that are required for SIMOTION SCOUT as well as the license key for SCOUT stand-alone.

It is not possible to operate the SCOUT and SCOUT stand-alone software packages on the same machine.

##### SIMOTION Kernel updates

SIMOTION Kernel updates for all SIMOTION platforms are supplied on DVD and can then be copied from the PG/PC to the SIMOTION Micro Memory Card (C2xx) or SIMOTION CompactFlash card (SIMOTION D) or installed on the P350-3.

A PC card adapter is needed to write to the SIMOTION MMC (Micro Memory Card) or the SIMOTION CF (CompactFlash Card). Adapters can usually be found in PC shops and at electronics shops.

With the device update tool, SIMOTION offers a user-friendly solution to update SIMOTION devices. SIMOTION D4x5-2 can also be updated using a USB stick.

# SIMOTION Motion Control System

## SIMOTION engineering software

### SIMOTION SCOUT software package

#### Selection and ordering data

Description	Order No.
<b>SIMOTION SCOUT software package</b>	
<b>SIMOTION SCOUT V4.3 SP1</b> On DVD, including STARTER, runtime software and documentation Languages: English, French, German, Italian <ul style="list-style-type: none"> <li>• Single license</li> <li>• Upgrade</li> </ul>	  <b>6AU1810-1BA43-1XA0</b> <b>6AU1810-1BA43-1XE0</b>
<b>SIMOTION SCOUT V4.3 SP1 stand-alone</b> On DVD, including STARTER, runtime software and documentation Languages: English, French, German, Italian <ul style="list-style-type: none"> <li>• Single license</li> <li>• Upgrade</li> </ul>	  <b>6AU1810-1CA43-1XA0</b> <b>6AU1810-1CA43-1XE0</b>
<b>Software update service</b> The latest software version is necessary <ul style="list-style-type: none"> <li>• for SIMOTION SCOUT</li> <li>• for SIMOTION SCOUT stand-alone</li> </ul>	  <b>6AU1810-0BA00-0XL0</b> <b>6AU1810-0CA00-0XL0</b>

Description	Order No.
<b>Optional packages for SIMOTION SCOUT</b>	
<b>SIMOTION CamTool V3.0 SP2</b> High-performance graphical cam editor Languages: English, German <ul style="list-style-type: none"> <li>• Single license, with data carrier</li> <li>• Upgrade, with data carrier</li> </ul>	  <b>6AU1810-0FA30-2XA0</b> <b>6AU1810-0FA30-2XE0</b>
<b>DCC SIMOTION/SINAMICS V2.2 SP1 for SCOUT V4.3 SP1 / STARTER V4.3 SP1</b> Graphic programming with Drive Control Chart DCC editor + DCB libraries for use on SIMOTION and SINAMICS S120 <ul style="list-style-type: none"> <li>• Single engineering license, with data carrier</li> <li>• Upgrade, with data carrier</li> </ul>	  <b>6AU1810-1JA22-1XA0</b> <b>6AU1810-1JA22-1XE0</b>
<b>DCC-SINAMICS V2.2 SP1 for STARTER V4.3 SP1</b> Graphic programming with Drive Control Chart DCC editor + DCB libraries for use on SINAMICS S120 <ul style="list-style-type: none"> <li>• Single engineering license, with data carrier</li> <li>• Upgrade, with data carrier</li> </ul>	  <b>6AU1810-1HA22-1XA0</b> <b>6AU1810-1HA22-1XE0</b>

#### More information

A number of additional software products can be used in conjunction with SIMOTION SCOUT. It must be ensured that the corresponding versions of these software products are compatible. Please consult the "Compatibility table of the software products in the SIMOTION environment".

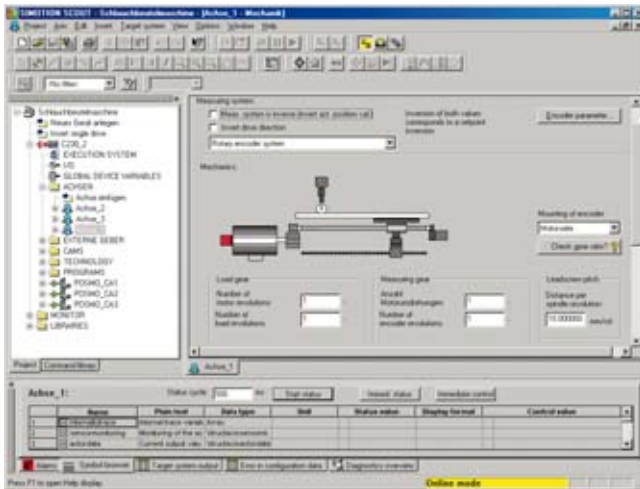
More information can be found on the Internet at <http://support.automation.siemens.com/WW/view/en/18857317>

# SIMOTION Motion Control System

## SIMOTION engineering software

SIMOTION SCOUT software package  
SCOUT Workbench

### Overview



The SCOUT Workbench is the common frame for all tools of the engineering system. The Workbench is thus the central navigation point for the individual engineering steps. It is used for the creation and management of SIMOTION projects and provides a uniform and integrated view of all devices, data and programs.

#### The SCOUT Workbench: Project navigator – Work area – Information area

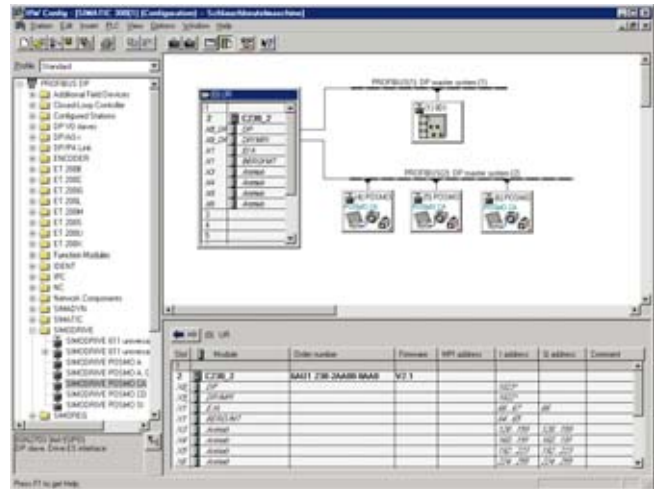
- Project navigator (left): The project navigator displays the technological tree structure of the project. All devices (controller, drives, etc.), all technological objects (axes, cam tracks, cams, etc.) and user programs are displayed in filterable hierarchical views. From here, new objects/programs can be created or existing ones called for modification.
- Work area (right): All editing tools of the engineering system (parameterization dialogs, program editors, etc.) can be integrated (SNAP IN) in this work area. This provides you with an individual view adapted to the situation in a fixed outer frame for each engineering task. If more than one window is open at the same time, they can be arranged as required or you can toggle between them by selecting the tabs.
- Detail area (bottom): The situation-dependent views for data and messages provided by the detailed display can be activated and deactivated. The data involve system variables provided by the devices and the technological objects, the peripheral data (inputs/outputs) and the user variables that you have defined. Their current states for an online connection with the SIMOTION device can be visualized. The message view refers both to the messages and alarms reported online from the SIMOTION devices and to warnings and faults created during the program creation.

### Benefits

- Integrated, function-oriented view optimized for ease-of-use
- Integrated intuitive engineering system
- Central data and program management, even for distributed systems
- Function-oriented, technological project structure with filterable views
- Fast access to individual engineering tools, e. g. configuration, programming, and commissioning

SIMOTION SCOUT software package  
Hardware and network configuration

### Overview



One of the first engineering steps to define the automation topology and assign parameters to the components and networks is to create:

- Hardware configuration
- Network configuration

To do so, SCOUT uses the STEP 7 tools HW-Config and NetPro.

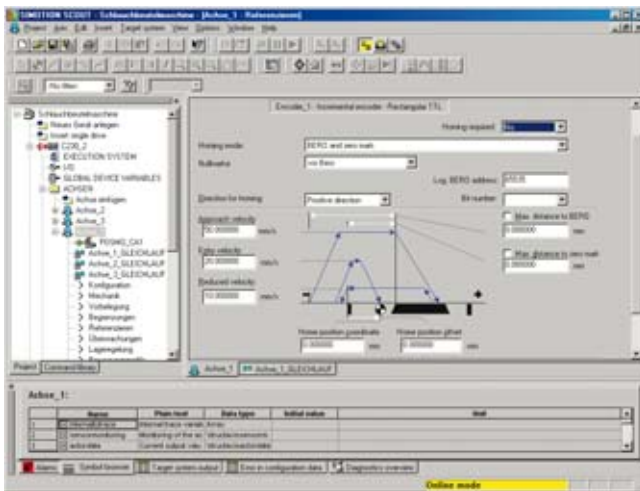
You make selections from a hardware catalog to combine all required hardware components graphically in the work area, assign parameters to the components, and create bus connections between the individual components. You are warned immediately of any illegal inputs, so that only plausible configurations can be generated.

# SIMOTION Motion Control System

## SIMOTION engineering software

### SIMOTION SCOUT software package Creation of technology objects

## Overview



All SIMOTION controllers feature basic functions which are predefined by the SIMOTION Kernel. The scope of the language is compatible with the IEC 61131-3 standard and contains all of the necessary PLC commands for I/O management, process or machine control.

Additional functions such as positioning, synchronous operation, cams and temperature channels are available with loadable technology packages.

These technology packages permit the generation of technology objects which provide you with a very simple and uniform view of the functions of the technology packages.

There are many technology objects, but all are generated, configured and parameterized in the same way.

In addition, the technology objects have programming interfaces through which you can use the functionality from application programs.

### Working with technology objects

A brief description of the individual engineering steps will be given using the example of the technology object "Axis".

#### Generating

A new axis object is generated by double-clicking the "Insert New Axis" tab.

#### Configuration

A wizard helps to specify object properties such as:

- Name of the axis
- Functionality (e.g. positioning axis or synchronized axis)
- Connection to the drive (e.g. SINAMICS S120 over PROFIBUS DP or PROFINET IO or an analog drive on SIMOTION C240)

After the axis has been generated or configured, it is displayed in the project tree along with additional tabs for parameterizing the axis and an option for generating other technological objects associated with the axis (e.g. cam paths, measuring inputs).

#### Assigning parameters

By double-clicking the "Referencing" tab, for example, all parameters for referencing can be set.

The "axis" object generated in this way also has a specified number of system variables which can be displayed in the detailed view when the axis is selected in the project tree.

The system variables are mainly used to visualize axis states such as:

- Display of the following error
- Target position to be reached
- Motion status (axis is accelerating, braking, motionless, etc.)

These system variables can also be used for:

- Online diagnostics
- Display on HMI
- Logging with the SIMOTION trace functionality
- Application programming through querying/comparing these system variables

Application programs access the axis functionality with system functions (selected from the command library), which are part of the "axis" object when it is generated.

The command `_pos(axis:=Axis1, position:=100, velocity:=123)` would cause axis "Axis 1" to move to position 100 with velocity 123 (example for system function in Structured Text).

## Benefits

- Easy generation of the technology object for determining the quantity structure
  - Axes
  - Output cams and cam tracks
  - Measuring inputs
  - Cams, etc.
- Menu-guided parameterization, graphically supported for easy understanding
- Easy visualization and access to functions through system variables and system functions of the technology objects
- User-friendly diagnostic information for function optimization of the technology objects
- Meaningful alarms in the form of numbers and plain text in the event of errors

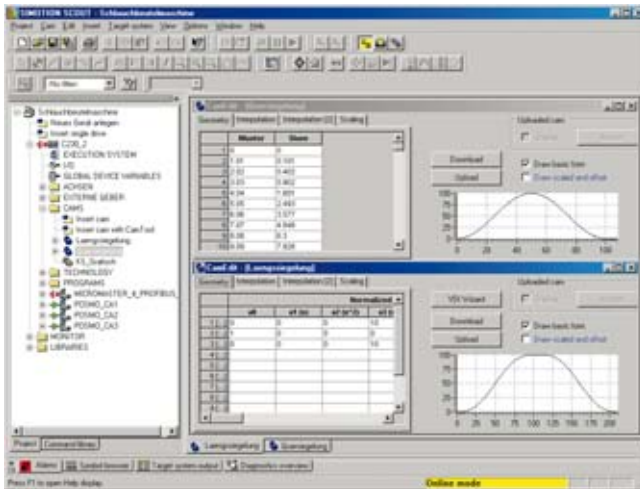


# SIMOTION Motion Control System

## SIMOTION engineering software

### SIMOTION SCOUT software package Creation of cams (basic)

#### Overview



A cam generally specifies the motion relationship between a leading axis (master axis) and a following axis (slave axis). Cams can also mirror velocity profiles, pressure characteristics or valve characteristic compensation for hydraulic axes. The cam technology object can process cams which are defined as interpolation point tables or polynomial descriptions.

The basic scope of SCOUT contains editors to create simple cams in the form of text in a table or using polynomials (VDI wizard) in the form of graphics symbols with configuration support.

#### Creation of cams

When the technological object "Cam" is generated, the type "Interpolation point table" or "Polynomial" is defined.

- Interpolation point table:  
With this type, the master and slave positions are entered in a two-column table. It is also possible to use external interpolation point tables (ASCII file, Excel table).
- Polynomials:  
Polynomials describe motion rules in accordance with VDI 2143. SIMOTION supports polynomials up to the 6th degree. In polynomial mode, the cam is described by a number of consecutive polynomials. Polynomials are entered in the form of a polynomial table. Users can use a polynomial description dialog and/or VDI wizard.

The result of the input is displayed in the right-hand side of the window in the form of a curve in the coordinate system.

In addition, other parameters such as the interpolation type between the curve support points or the scale of the cam can be specified. The SIMOTION CamTool option package can be used to display and optimize cams graphically.

#### Benefits

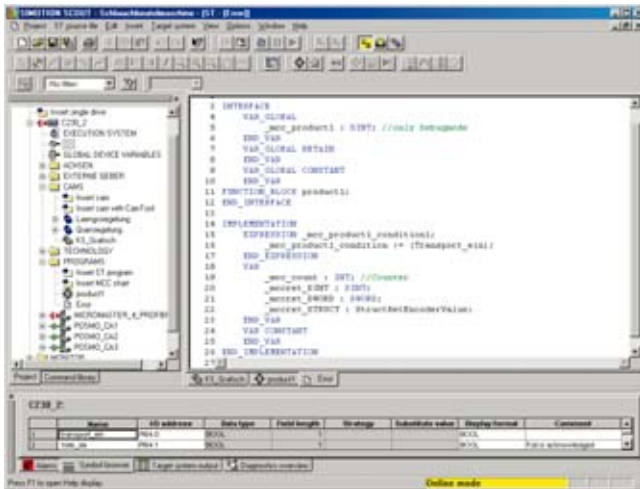
- Editors for simple cams are included in the basic scope of functions of SCOUT
- Graphic visualization of the cam so that input errors can be quickly identified
- Representation as interpolation point table with options to transfer data from external sources (ASCII, Excel)
- Alternative: Representation by polynomials up to the 6th degree with inputs supported by polynomial description dialog and VDI wizard

# SIMOTION Motion Control System

## SIMOTION engineering software

SIMOTION SCOUT software package  
Structured Text (ST)

### Overview



The high-level language ST (Structured Text) provides all language elements as text commands. This enables well-structured applications to be created.

The basic scope of commands includes:

- Commands for data management
- Arithmetic functions
- Control structures
- Commands for accessing I/O and
- Communication functions

The addition of technology packages for Motion Control adds powerful, extremely flexible Motion Control commands to the mix (e.g.: `_pos(...)` for position-controlled positioning axes). The system functions can be selected from a clearly arranged library and can be used in the ST source by means of drag & drop.

An ST source file basically consists of continuous text. This text can be structured by dividing it into sections. These sections represent logical units of an ST source.

These sections can be:

- A program that is assigned to a runtime level
- A function block with its own memory
- A function without its own memory

Function blocks and functions are not allocated to a runtime level, but are instead called in programs and supplied with parameters.

### Benefits

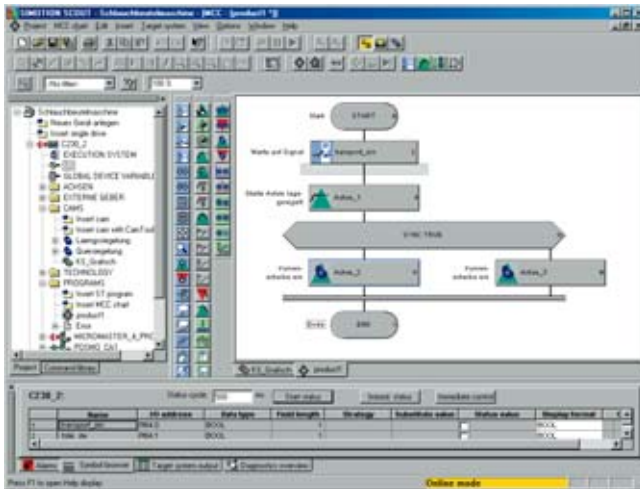
- Motion Control, PLC, and technology functions in one language
- Well-structured programs with comment capability
- Powerful editing functions, such as syntax coloring and automatic indenting
- Easy-to-use debug functions for online testing and diagnostics: e. g. display of actual variable content of the code sequence and break points selected in the editor.

# SIMOTION Motion Control System

## SIMOTION engineering software

### SIMOTION SCOUT software package Motion Control Chart (MCC)

#### Overview



MCC (Motion Control Chart) is a "flow diagram language" that can be used to graphically formulate the process procedures of production in a simple manner. The result is one or more flow diagrams, comprising of MCC blocks that describe the time sequence of the individual machine actions. Due to its special means of expression, MCC (Motion Control Chart) is ideally suited to programming sequential processes.

Motion Control Chart supports the simple description of the motion sequences of machines with the help of powerful Motion Control commands, such as reference axis, position axis, synchronize or desynchronize cam, and many more.

Various MCC blocks are available for controlling the machine, for example, if conditions must be fulfilled, I/O signals can be read or set, calculations can be formulated and different control structures such as condition (IF), cases (CASE) and loops (WHILE, REPEAT UNTIL) can be programmed.

Several MCC programs may be created to describe different process situations. For example, you can create one MCC program to bring the machine to a defined initial state when it is switched on, a second MCC program for the normal production sequence, and a third MCC program to specify what the machine is to do in the event of a fault.

All MCC blocks – a selection of the most important SIMOTION functions – are available in toolbars. They are grouped according to function and are automatically inserted in the flow diagram at the point marked with a click. By clicking on different elements, individual dialog boxes are opened for further parameterization. Of course, it is also possible to include individual comments to document the process sequence. Functions from the SIMOTION command library that are not individually offered as MCC blocks can be used in an MCC program by means of a special command.

#### Benefits

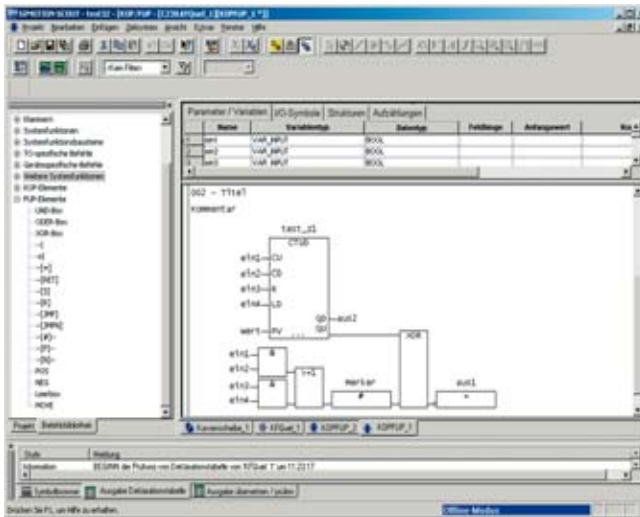
- Representation as graphical flowcharts make programming especially easy
- Hierarchical command library for Motion Control, PLC, and technology functions
- Control structures (IF, WHILE, CASE, etc.)
- Zoom-in functions for LAD, FBD and ST
- Subroutine calls (FB/FC)
- Structuring based on module creation, i.e. combination of command sequences to form a module command. Clicking on the module command invokes the corresponding command sequence.
- Powerful test functions for ONLINE connection with the SIMOTION controller such as graphical step tracing, single-step mode and breakpoints.

# SIMOTION Motion Control System

## SIMOTION engineering software

**SIMOTION SCOUT software package - Ladder Diagram/Function Block Diagram (LAD/FBD)**

### Overview



A powerful editor for LAD/FBD programming is available for ladder diagrams (LAD) or function block diagrams (FBD).

LAD/FBD also include commands for SIMOTION control using standard logic functions. It is recommended that motion control tasks are programmed with PLCopen blocks. Also, blocks which have been programmed in other SIMOTION languages can be called from LAD/FBD. User-friendly functions such as "on the fly" variable declarations or automatic syntax checks are available when programming in LAD or FBD. It is possible to switch over between LAD and FBD in the editor at any time. Any program can be viewed and processed in either LAD or FBD.

### Benefits

- The LAD/FBD blocks are stored in the SIMOTION project
- Existing PLCopen, ST, LAD/FBD or MCC blocks can be called from within the LAD/FBD program.
- Network titles and comments are available.
- Special functions such as automatic syntax checking or "on the fly" variable declaration can be activated.
- The commands are loaded from a library

For startup and troubleshooting purposes, the status of the LAD/FBD program is displayed while in monitoring mode. In addition, break points can also be defined in LAD/FBD programs.

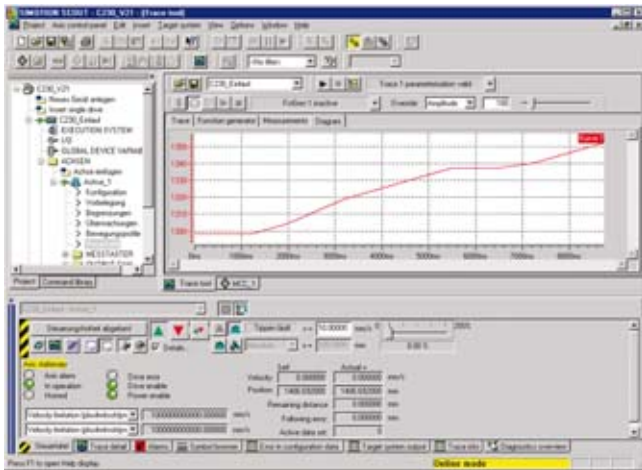
# SIMOTION Motion Control System

## SIMOTION engineering software

### SIMOTION SCOUT software package

#### Diagnostics for testing and commissioning

#### Overview



SCOUT includes a number of diagnostic tools to make testing and startup of SIMOTION applications as simple as possible:

- Device diagnostics can be used to display program execution status, system load and memory usage.
- The diagnostic buffer is used to log the fault history. The following events are logged in the diagnostic buffer of the SIMOTION device:
  - All system status changes (RUN, STOP, etc.)
  - System interrupts with date and time.
- All error messages related to technology objects, e.g. axis errors, are displayed in the Alarms window of SCOUT with the fault number and description.
- All SIMOTION system and application variables can be dynamically updated, monitored and controlled while online with the SIMOTION controller.
- All programming errors are displayed with the location and cause during compilation.
- The status display for programs with possible break points (LAD/FBD, MCC, ST) and additional step-by-step tracing (MCC) helps the user to troubleshoot and optimize their code. During program execution, the values of the variables are displayed as they arise, not only at the end of the cycle when the sum of all changes has been implemented.
- Watch tables can be used to combine important variables of different objects in the project to monitor them, even those of different SIMOTION devices.

#### Axis control panel

The axis control panel can be used to commission the axes with SIMOTION SCOUT. The axes can also be traversed and optimized without any user programs.

#### Trace function

The most powerful tool for testing and commissioning is the trace function integrated in SCOUT.

In this manner, a selection of any of the data in the system (user variables, I/O variables, data of the technology objects such as actual position of an axis) can be recorded and traced, real-time. Up to 32 signals are possible in test mode.

Each SIMOTION device has a trace buffer which can be configured with the trace functionality of SCOUT. When the trace is started, the configured data is logged in the SIMOTION device. On completion of the trace, the contents of the trace buffer is read by SCOUT and displayed graphically.

#### Configuring the trace function

The trace function can be configured using the following parameters:

- Trigger condition (e.g. rising edge of a definable signal) and pre-trigger
- Time Limit Recording (a multiple of the basic cycle of the SIMOTION device)
- Continuous Recording (or endless trace with ring buffer)
- System variables to be logged (system, I/O and user variables)

#### Evaluating the trace data

The logged data is displayed in the form of graphs over time for evaluation. The following functions are offered here:

- Different colors can be selected for the curves. Curves can be switched off and on again.
- The zoom function can be used to show details.
- Rulers support the measuring of, for example, signal level and duration.
- Possible changes can be viewed by superimposing measuring curves from different trace logs.

Apart from recording, the trace function also offers a "function generator" and mathematical functions.

The traced curves can be stored or exported to Microsoft Excel as a table for further evaluation. Of course, the plots can also be stored for documentation purposes, inserted in documents or printed out.

#### Automatic optimization of the control loops

Automatic optimization of the control loops makes commissioning of the axes and drives particularly easy. For SINAMICS S120 drives, the parameters for the speed controller and the position controller are automatically determined (with DSC).

#### Integrated measuring functions

The integrated measuring functions support the recording of, for example, step responses for optimization as well as the detection of electromagnetic weak points or resonant frequencies (using, for example, bode diagrams and FFT analysis). Electronic filters can be optimally placed at these resonant frequencies to achieve higher dynamics.

# SIMOTION Motion Control System

## SIMOTION engineering software

### SIMOTION SCOUT software package Diagnostics for testing and commissioning

### Optional packages for SIMOTION SCOUT Optional CamTool package (graphical cam editor)

#### Overview (continued)

##### Comparison function for projects

With SCOUT V4.1 SP2 and higher, it is possible to compare and, if necessary, merge the components of different projects.

It is therefore possible to perform a CPU-based comparison between the objects of a project.

An overview of the differences between objects is displayed. Objects with differences can be merged.

If necessary, to a highly detailed degree: Objects can be merged right down to data level also for individual data.

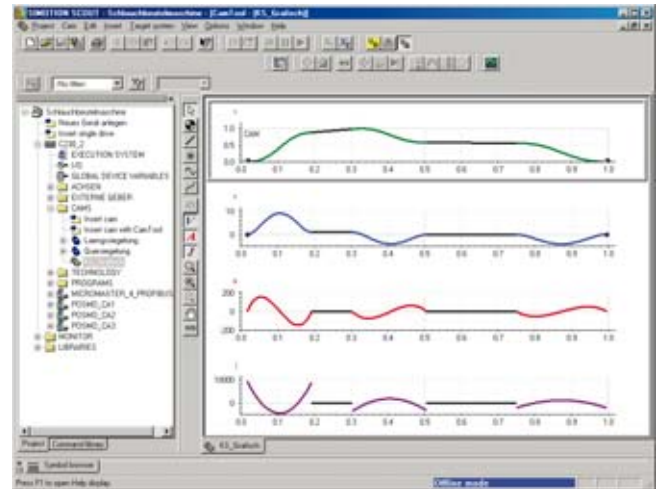
##### Advantages for practical working with SIMOTION:

- Online/offline comparisons allow the target device and project to be merged
- Offline/offline comparisons make it possible to merge programs
- Detailed differences between data can be identified in the detailed comparison
- Data missing from the engineering project are easy to restore if the source data are stored in the target system.

#### Benefits

- Numerous easy-to-use and expressive diagnostic tools are fully integrated in SCOUT
- Extremely useful support with optimizing and troubleshooting
- All information can be printed in the form displayed on the screen for documentation purposes
- Axis control panel for commissioning and optimizing the axes without the need for an application program
- Automatic controller optimization for fast commissioning
- Comprehensive, integrated comparison functions for the ST, MCC and LAD/FBD languages enable differences to be identified between projects or between the current project and the device.

#### Overview



SIMOTION CamTool is a powerful, graphical editor for creating and optimizing cams.

SIMOTION CamTool can be used as an expansion package for SIMOTION SCOUT and is completely integrated in the SCOUT environment.

#### Benefits

- Precise, graphic display of the CAM profile
- Entries can be made quickly and easily by inserting curve elements with drag & drop operation
- Fast and easy optimization of the curve by means of "dragging the profile"
- Simultaneous display of position, speed, acceleration, and jerk characteristics immediately indicates the effect on the maximum speed, the required motor torque, and the mechanical load
- Curve can also be optimized in relation to speed, acceleration, or jerk
- Basic principles of motion correspond to VDI 2143

#### Function

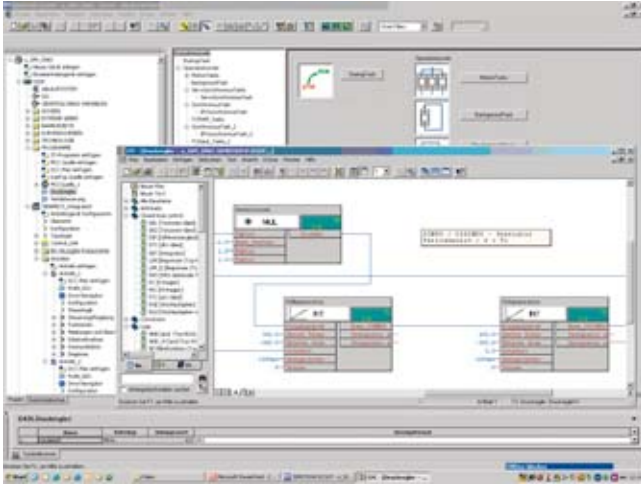
- The curve is displayed graphically in an x-y-diagram (positions of master and following axes). The curve profile is first roughly entered here with individual elements such as fixed points, lines and support points. Lines can be entered as straight lines, sine curves or arc sine curves.
- SIMOTION CamTool then connects these individual elements automatically to form a continuous curve. The transitions between the individual curve sections are automatically shaped as smooth as possible.
- You can optimize the curve by simply moving the specified curve sections with the mouse. The curve profile immediately adapts to your changes.
- In addition, SIMOTION CamTool can display the effects on the velocity, acceleration and jerk of the following axis over the motion of the leading axis.
- SCOUT can be used to convert cams created with CamEdit to the format used by CamTool or vice versa.

# SIMOTION Motion Control System

## SIMOTION engineering software

### Optional packages for SIMOTION SCOUT Optional Drive Control Chart (DCC) package

#### Overview



The Drive Control Chart (DCC) option packages for SIMOTION and SINAMICS extend the possibilities of SIMOTION SCOUT and the STARTER commissioning tool to graphically configure technology functions using predefined function blocks.

Multi-instance function blocks are selected from a library and are graphically interconnected using drag & drop capability. The function block library comprises of a large number of control, calculation and logic blocks as well as extensive open-loop and closed-loop control functions. Numerous calculation functions, such as summation, division and minimum/maximum evaluation are available for monitoring and evaluating numeric variables.

Drive Control Chart (DCC) does not limit the number of functions that can be used.

#### Benefits

- Clear visualization of technical control structures
- High degree of reusability of previously created plans
- Graphical editor for configuring open-loop and closed-loop control functions which can be operated without any programming know-how
- With Drive Control Chart for SIMOTION, closed-loop control structures can be programmed almost without constraints. These can then be combined with other programs to form complete program functionality.
- Drive Control Chart for SINAMICS S120 provides a convenient basis for implementing drive tasks directly in the converter.

# SIMOTION Motion Control System

## SIMOTION engineering software

Free extras for SIMOTION SCOUT  
SIMOTION easyProject project generator

### Overview

You can achieve greater efficiency in the development and commissioning of your machines by using the project generator SIMOTION easyProject.

SIMOTION easyProject is included on the SIMOTION Utilities & Applications DVD that is supplied free of charge with SIMOTION SCOUT.

In recent years, a wide variety of applications have been realized in different sectors using the SIMOTION Motion Control system, and various basic, technology and application modules have been developed and optimized for this purpose. These well-proven software modules that have become quasi standard can now be integrated into a new or existing engineering project in an extremely easy manner with the project generator. This is done by first selecting the SIMOTION components and then the required modules in simple selection screens. Their integral or predefined functions are then configured with a mouse click and, finally, the project as a whole is generated. This saves a lot of programming time and at the same time creates the preconditions for a uniform and therefore standardized project structure.

The basic functions that can be used in practically every SIMOTION application and which are provided by the project generator include:

- **Message handling:**  
Centralized error message handling for all components including archiving and display on a visualization system (HMI)
- **Startup check:**  
A startup check for all connected components (provides information on the status of the configured devices connected to the various field buses or internal connections)
- **OMAC:**  
Operating mode management
- **Ethernet communication:**  
Machine-to-machine coupling via Ethernet communication over TCP/IP
- **Axis function block:**  
Easy activation of basic Motion Control functions (as far as cam synchronization) via a central (generic) axis function block
- **Interpreter:**  
A sequence interpreter for easy configuration of machine sequences using tables

These basic functions alone remove most of the manual programming and configuration work that would normally be necessary and consequently minimize the associated working time and possibilities for error.



### Automatic generation of the project

When the project is generated, all the necessary technology objects (TOs) are created and connected, libraries and program modules (only the currently selected modules) are automatically linked into the project and the programs are assigned to the respective execution levels. This results in a loadable and executable SIMOTION SCOUT project comprising the required machine functions without having to write a single line of code. You can concentrate fully on the special functions of your machine (sequence, signal connections, special functions, etc.) saving a considerable amount of work so that you achieve your objective much more quickly.

SIMOTION easyProject is also designed so that it can integrate its own blocks in this generic workflow of the automatic application creation.

The uniform structure also makes a project generated in this manner extremely easy to maintain. The generated program modules can be edited and modified by the user. If standard modules of the project have been changed centrally or if new standard modules need to be linked into the project, this can be done simply by running the project generator again. During the generator run, the originally used and, where applicable, updated modules and libraries will be recognized and displayed. These can then also be updated in the project automatically.



# SIMOTION Motion Control System

## SIMOTION engineering software

Free extras for SIMOTION SCOUT  
SIMOTION easyProject project generator

### Overview (continued)



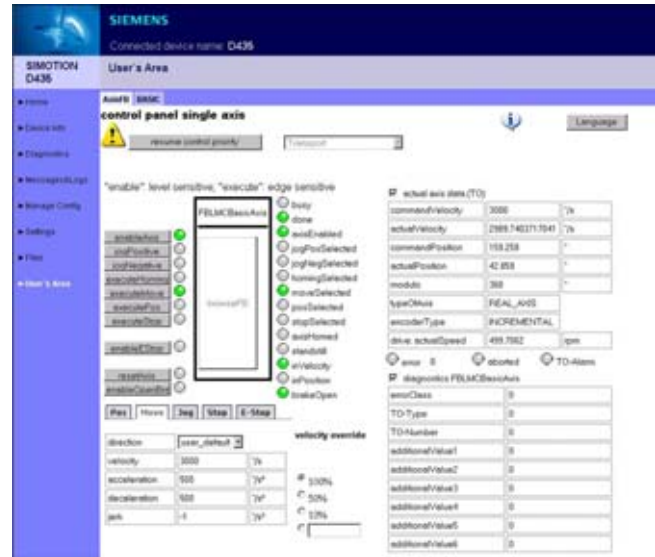
### Web-based diagnostics

The project generator also creates specific web pages for the separate modules. These can be loaded into the SIMOTION controller, if required, to offer additional customized diagnostic functions to those provided by every device via the integrated web server and the standard diagnostic pages of SIMOTION IT. This means that commissioning or specific service tasks can also be performed using a standard web browser – without the need for an engineering system. It is of no consequence here whether you connect to the controller via a network cable or via a secure connection over the Internet (e.g. through a VPN tunnel).

### Standard blocks – two examples:

#### 1. Axis function block:

The standard axis function block covers a range of requirements that concern the activation of axis technology objects and simplifies programming, commissioning and testing of each axis object due to its central interface. The integrated HTML control panel enables the axes controlled by the axis function block to be tested easily – without any HMI or engineering system.



#### 2. Message handling

The core tasks of the generic basic module "Message handling" include the chronological collection of system, TO, drive, I/O and user messages and their conditioning for display on the operator panel – or their direct display via a web browser.

The specific diagnostic pages are a huge advantage during initial commissioning, but particularly in the event of a fault or during servicing, because fault states can be diagnosed without the need for an engineering system and standstill times can be minimized.

### Modular machine functions

The project generator also supports the modularization of machine functions in accordance with the specification of international standard ISA-88. The module structure is precisely defined in ISA-88. This ensures a simple and uniform structure for machines. Basic, technology and application modules are combined to implement clearly comprehensible modularization for machines using functional units. You can find details about this in chapter Sector-specific solutions.

# SIMOTION Motion Control System

## SIMOTION engineering software

Free extras for SIMOTION SCOUT  
SIMOTION Utilities & Applications

### Overview

The SIMOTION Utilities & Applications DVD, which is available free of charge, provides you with a wide range of valuable information and tools for SIMOTION:

- SIMOTION easyProject project generator
- Applications
- SIMOTION IT
- FAQs
- Examples
- Tools and documentation
- Scripts for SIMOTION

SIMOTION Utilities & Applications are part of the scope of delivery of SIMOTION SCOUT.

#### **SIMOTION easyProject project generator**

See "SIMOTION easyProject project generator" for further details.

#### **Applications for sector-specific solutions**

So that you don't have to reinvent the wheel every time, we have developed a range of applications for SIMOTION that are available as well-documented master solutions and that can be easily adapted to your specific projects with minimal engineering outlay.

Simple faceplates are also included for the visualization system WinCC flexible that have been adapted to the application. The diagram of industrial sector solutions shown below provides an overview of the applications that are currently available.

#### **SIMOTION IT**

Diagnostics, maintenance and operation can be performed locally or remotely using a PC with standard browser installed thanks to the web servers available on all SIMOTION devices. You will find helpful examples and tools here for creating your own HTML pages.



#### **FAQs (Frequently Asked Questions)**

We provide answers to the questions most frequently asked about SIMOTION.

#### **Examples**

Based on comprehensively documented examples, we make it easy to get started with SIMOTION and show how even complex applications can be easily implemented.

#### **Tools and documentation**

You will find easy-to-use tools for many tasks, as well as detailed documentation.

#### **Scripts for SIMOTION**

Numerous engineering tasks can be automated with the SIMOTION scripting function. The selection of documents and scripts provided here show how you can use scripts in your projects.

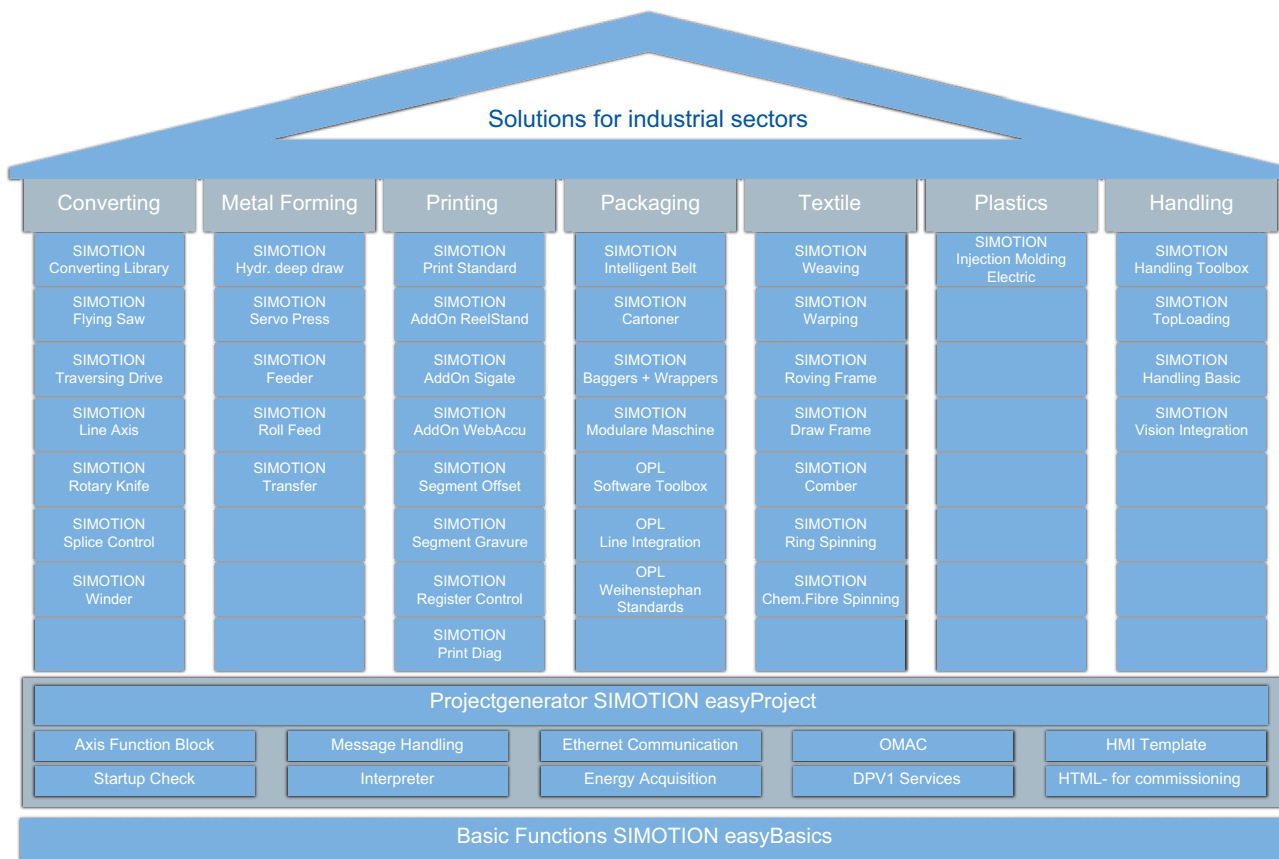
A number of example scripts that you can implement directly will make working with SIMOTION even easier.

# SIMOTION Motion Control System

## SIMOTION engineering software

Free extras for SIMOTION SCOUT  
SIMOTION Utilities & Applications

**Overview** (continued)



G\_PM10\_EN\_00218

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>System cycles</b>					
<b>PROFIBUS cycle</b>	SIMOTION D: For integrated drives and drives on connected CX32-2: 0.5 ... 8 ms	C240/C240 PN: 1 ... 8 ms  (in 0.25 ms steps)	P350-3 DP: 1 ... 8 ms  (in 0.125 ms steps)	1 ... 8 ms  (in 0.125 ms steps)	1 ... 8 ms  (in 0.125 ms steps)
<b>PROFINET cycle</b>		C240 PN: 0.5 ... 4 ms  (in 0.25 ms steps)	P320-3, P350-3 PN: 0.25 ... 4 ms  (in 0.125 ms steps)	D410-2 DP/PN: 0.25 ... 4 ms  (in 0.125 ms steps)	D4x5-2 DP/PN: 0.25 ... 4 ms  (in 0.125 ms steps)
<b>Position control and interpolation cycle</b>					
<ul style="list-style-type: none"> <li>• Minimum position control cycle</li> </ul>	The position control cycle (SERVO) includes the position controller, the actual-value and setpoint system and the axis monitoring functions.	0.5 ms	0.25 ms	1/0.5 ms <sup>3)</sup>	0.5/0.25 ms <sup>1)</sup>
<ul style="list-style-type: none"> <li>• Position control cycle to PROFIBUS cycle</li> </ul>		1:1, 2:1	1:1, 2:1	1:1 ... 8:1	1:1 ... 8:1
<ul style="list-style-type: none"> <li>• Position control cycle to PROFINET cycle</li> </ul>		1:1 ... 16:1	1:1 ... 16:1	1:1 ... 16:1	1:1 ... 16:1 (1:1) <sup>2)</sup>
<ul style="list-style-type: none"> <li>• Interpolation cycle 1 (IPO) to position control cycle</li> </ul>	The axis motion control functions are performed in the interpolation cycle. The position control cycle and the interpolation cycle are a multiple of the PROFIBUS/PROFINET cycle. The transformation ratios are adjustable.	1:1 ... 6:1	1:1 ... 6:1	1:1 ... 6:1	1:1 ... 6:1 (1:1 ... 4:1) <sup>2)</sup>
<ul style="list-style-type: none"> <li>• Interpolation cycle 2 (IPO2) to interpolation cycle 1 (IPO1)</li> </ul>		2:1 ... 64:1	2:1 ... 64:1	2:1 ... 64:1	2:1 ... 64:1
<ul style="list-style-type: none"> <li>• Fast position control cycle (SERVO<sub>Fast</sub>) to PROFIBUS cycle</li> </ul>	Values with SERVO <sub>Fast</sub> and IPO <sub>Fast</sub> activated for D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN (for details, see SIMOTION D4x5-2 manuals)	–	–	–	1:1
<ul style="list-style-type: none"> <li>• Fast interpolation cycle (IPO<sub>Fast</sub>) to fast position control cycle (SERVO<sub>Fast</sub>)</li> </ul>		–	–	–	1:1 ... 4:1

Notes:**Communication via PROFIBUS and PROFINET**

The availability of a PROFIBUS or PROFINET interface depends on the controller variant implemented.

The SIMOTION controllers are equipped with PROFIBUS and/or PROFINET as standard.

For SIMOTION P350-3 DP, PROFINET can be retrofitted with an optional communication module.

This must be taken into account with regard to the connection possibilities and functions over PROFIBUS and PROFINET.

**SIZER for Siemens Drives engineering tool**

The performance requirements for a SIMOTION application can be estimated using the engineering tool SIZER for Siemens Drives.

For more information about SIZER for Siemens Drives, refer to chapter System description – Dimensioning.

<sup>1)</sup> 0.5 ms in combination with integrated SINAMICS S120 drives, 0.25 ms in combination with the runtime levels SERVO<sub>Fast</sub> and IPO<sub>Fast</sub> (D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN only).

<sup>2)</sup> Values in brackets with SERVO<sub>Fast</sub> and IPO<sub>Fast</sub> activated (for details, see SIMOTION D4x5-2 manuals)

<sup>3)</sup> 1 ms when using the TO axis and the integrated drive control

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Dynamic Servo Control (DSC)</b>					
<ul style="list-style-type: none"> <li>● With Dynamic Servo Control (DSC), the control loop of the position controller is located in the drive (with cycles of 125 µs or higher).</li> </ul>	With SINAMICS S120 and SIMODRIVE drives	●	●	●	●
<b>Memory for system data</b>					
<ul style="list-style-type: none"> <li>● Memory media</li> </ul>	MMC: Micro Memory Card CF: CompactFlash card HDD: Hard Disk Drive	MMC 64 MB	P320-3: CF 4 GB P350-3: HDD 40 GB	CF 1 GB	CF 1 GB
<ul style="list-style-type: none"> <li>● Retentive memory (for retained user data/retain variables)</li> </ul>	SIMOTION P: with UPS up to 256 KB	107 KB	15 KB	108 KB	D425-2/ D435-2: 364 KB D445-2/ D455-2: 512 KB
<ul style="list-style-type: none"> <li>● Permanent memory (for user data/data storage on exchangeable memory medium)</li> </ul>		50 MB	Any, dependent on memory configuration	300 MB	300 MB
<ul style="list-style-type: none"> <li>● RAM disk (load memory for user data/ for downloading the configuration and programs)</li> </ul>	Memory sizes can be configured with SIMOTION P	29 MB	18 MB	31 MB	D425-2: 31 MB D435-2: 41 MB D445-2: 56 MB D455-2: 76 MB
<ul style="list-style-type: none"> <li>● RAM (user memory for code and data)</li> </ul>	D410-2 and D4x5-2: additional 20 MB for Java applications	50 MB	37 MB Adjustable to a maximum of 200 MB	48 MB	D425-2: 48 MB D435-2: 64 MB D445-2: 128 MB D455-2: 256 MB
<b>Address ranges</b>					
<ul style="list-style-type: none"> <li>● Logical I/O address space in KB</li> </ul>		4	4	8	16
<ul style="list-style-type: none"> <li>● Physical I/O address space in KB</li> <li>- PROFIBUS: max. per ext. subnet each for inputs and outputs</li> <li>- PROFINET: max. for inputs and outputs (each)</li> </ul>	When PROFIBUS and PROFINET are used, the total address space applies	1	1	1	1
	D4x5-2 DP/PN: If CBE30-2 is used as a second PROFINET interface, 2 × 4 KB physical address space is available.	4	4	4	4
<ul style="list-style-type: none"> <li>● Permanent process image for background task (I/O variables) in bytes</li> </ul>		64	64	64	64
<ul style="list-style-type: none"> <li>● Additional configurable process image for each cyclic task (I/O variables)</li> </ul>		●	●	●	●
<ul style="list-style-type: none"> <li>● Address space per PROFIBUS DP station in bytes</li> </ul>		244	244	244	244
<ul style="list-style-type: none"> <li>● Address space per PROFINET device in bytes</li> </ul>		1400	1400	1400	1400

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Drives on SIMOTION</b>					
<b>Maximum number of axes</b>	Higher number of axes possible using multiple synchronized devices	32 axes	128 axes	8 axes (typ. 2 to 3 axes)	D425-2: 16 axes D435-2: 32 axes D445-2: 64 axes D455-2: 128 axes
<b>Integrated drive control</b> The drive control integrated in SIMOTION D is based on SINAMICS S120 Control Units: <ul style="list-style-type: none"> <li>● With SIMOTION D410-2 on the CU310-2 Control Unit, firmware version V4.x</li> <li>● With SIMOTION D4x5-2/CX32-2 on the CU320-2 Control Unit, firmware version V4.x</li> </ul> The BOP20 Basic Operator Panel and the basic positioner EPos are not supported by the integrated drive control.	SIMOTION D4x5-2: CX32-2 Controller Extension can be used to provide additional drive controls: D425-2: max. 3 CX32-2 <sup>1)</sup> D435-2: max. 5 CX32-2 <sup>1)</sup> D445-2: max. 5 CX32-2 <sup>1)</sup> D455-2: max. 5 CX32-2 <sup>1)</sup>  Per CX32-2: Servo: 1..6 Vector: 1..6 V/f: 1..12 (alternatively)	–	–	Servo: 1 Vector: 1 V/f: 1 (alternatively)	Servo: 1..6 Vector: 1..6 V/f: 1..12 (alternatively)
<b>Speed-controlled axis over PROFIBUS DP</b> <ul style="list-style-type: none"> <li>● SINAMICS S/SINAMICS G (servo, vector control)</li> <li>● SIMODRIVE 611 universal</li> <li>● MICROMASTER/MICROMASTER Vector</li> <li>● Drives with speed profile in accordance with standard message frames (PROFdrive profile 1-6)</li> </ul>	SIMOTION D: SINAMICS as the standard drive technology	●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●
<b>Intelligent positioning motor over PROFIBUS DP</b> <ul style="list-style-type: none"> <li>● SIMODRIVE POSMO A</li> </ul>	Standard functions available in SCOUT command library	●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●

<sup>1)</sup> In principle, a fourth or sixth CX32-2 Controller Extension can also be connected, e.g. for implementing modular machine concepts. In this case, no drives/drive components can be connected any longer to the integrated drive control of the SIMOTION D4x5-2. All drives must then be operated via the Controller Extensions.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Drives on SIMOTION (continued)</b>					
<b>Position-controlled axis over PROFIBUS DP with PROFdrive</b> <ul style="list-style-type: none"> <li>● SINAMICS S110 (blocksize format) <ul style="list-style-type: none"> <li>- Servo control</li> </ul> </li> <li>● SINAMICS S120 (blocksize, booksize and chassis formats) <ul style="list-style-type: none"> <li>- Servo control</li> <li>- Vector control</li> </ul> </li> <li>● SIMODRIVE 611 universal</li> <li>● MICROMASTER MM4</li> <li>● Certified servo/vector/stepper drives in acc. with standard message frames (PROFdrive profile 1-6)</li> </ul>	SIMOTION D: SINAMICS as the standard drive technology	<ul style="list-style-type: none"> <li>● (C240)</li> <li>● (C240 PN)</li> </ul>	<ul style="list-style-type: none"> <li>– (P320-3)</li> <li>● (P350-3 DP)</li> <li>○ (P350-3 PN)</li> </ul>	●	●
	Also linear motor <sup>1)</sup>				
	With external encoder (limited dynamic response)				
	Also linear motor <sup>1)</sup>				
<ul style="list-style-type: none"> <li>● SIMODRIVE 611 universal</li> <li>● MICROMASTER MM4</li> <li>● Certified servo/vector/stepper drives in acc. with standard message frames (PROFdrive profile 1-6)</li> </ul>	With external encoder (limited dynamic response)				
	Also linear motor <sup>1)</sup>				
	With external encoder (limited dynamic response)				
<b>Speed and position-controlled axis over PROFINET IO with IRT (PROFdrive)</b> <ul style="list-style-type: none"> <li>● SINAMICS S110 (blocksize format) <ul style="list-style-type: none"> <li>- Servo control</li> </ul> </li> <li>● SINAMICS S120 (blocksize, booksize and chassis formats) <ul style="list-style-type: none"> <li>- Servo control</li> <li>- Vector control</li> </ul> </li> <li>● Certified servo/vector/stepper drives in acc. with standard message frames (PROFdrive profile 1-6)</li> </ul>		<ul style="list-style-type: none"> <li>– (C240)</li> <li>● (C240 PN)</li> </ul>	<ul style="list-style-type: none"> <li>● (P320-3)</li> <li>○ (P350-3 DP)</li> <li>● (P350-3 PN)</li> </ul>	<ul style="list-style-type: none"> <li>– D410-2 DP</li> <li>● D410-2 DP/PN</li> </ul>	<ul style="list-style-type: none"> <li>– D4x5-2 DP</li> <li>● D4x5-2 DP/PN</li> </ul>
	Also linear motor <sup>1)</sup>				
	With external encoder (limited dynamic response)				
<b>Analog interface with ±10 V setpoint interface</b> <ul style="list-style-type: none"> <li>● Via onboard drive interface</li> <li>● Via ADI 4 (Analog Drive Interface for 4 axes)</li> <li>● Via IM 174 (Interface Module for 4 axes)</li> </ul>	Configuration either as analog or stepper drive	4 (C240) – (C240 PN)	–	–	–
	See chapter <a href="#">SIMOTION I/O components</a> .	●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●
		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●
<b>Hydraulic drives over ±10 V setpoint interface</b> <ul style="list-style-type: none"> <li>● Via onboard drive interface</li> <li>● Via ADI 4 (Analog Drive Interface for 4 axes)</li> <li>● Via IM 174 (Interface Module for 4 axes)</li> <li>● Analog outputs through I/O</li> <li>● Encoders through I/O</li> </ul>		4 (C240) – (C240 PN)	–	–	–
		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●
		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●
		●	●	●	●
		●	●	●	●

<sup>1)</sup> See chapter [SIMOTICS linear and torque motors](#).

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Drives on SIMOTION (continued)</b>					
<b>Stepper drives</b>					
<ul style="list-style-type: none"> <li>● Onboard pulse direction interface for stepper drives</li> <li>● Via IM 174 (Interface Module for 4 axes)</li> </ul>	Configuration either as analog or stepper drive	4 (C240) – (C240 PN)	–	–	–
		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●
<b>Encoders on SIMOTION</b>					
<b>Measuring systems that can be connected over the integrated interface</b>					
<ul style="list-style-type: none"> <li>● Quantity</li> </ul>	See chapter <a href="#">Measuring systems.</a>				
<ul style="list-style-type: none"> <li>● Absolute encoder with SSI interface</li> </ul>	SIMOTION D/CX32-2: Encoder connection via DRIVE-CLiQ	4 (C240) – (C240 PN)	–	1	–
		● (C240) – (C240 PN)	–	●	–
<ul style="list-style-type: none"> <li>● Incremental measuring systems</li> </ul>	C240: TTL D410-2: TTL/HTL	● (C240) – (C240 PN)	–	●	–
<b>Measuring systems that can be connected over the bus</b>					
<ul style="list-style-type: none"> <li>● Resolver, absolute encoder (SSI and EnDat), incremental encoder (TTL and sin/cos)</li> </ul>	Connected through drive or ADI 4/IM 174 (ADI 4/IM 174 for SSI absolute encoder and TTL incremental encoder)	●	●	●	●
<b>Connection options for 2nd encoder (external encoder)</b>					
<ul style="list-style-type: none"> <li>● Via onboard interfaces</li> </ul>		● (C240) – (C240 PN)	–	●	–
<ul style="list-style-type: none"> <li>● Via SINAMICS S110/S120</li> </ul>	SIMOTION D/CX32-2: Encoder connection via DRIVE-CLiQ	●	●	●	●
<ul style="list-style-type: none"> <li>● SIMODRIVE 611 universal over 2nd axis control (2-axis module)</li> </ul>	Option for SIMODRIVE 611 universal	●	●	●	●
<ul style="list-style-type: none"> <li>● Isochronous PROFIBUS encoder</li> </ul>	See chapter <a href="#">Measuring systems.</a>	●	●	●	●
<ul style="list-style-type: none"> <li>● PROFINET encoder with IRT</li> </ul>	See chapter <a href="#">Measuring systems.</a>	– (C240) ● (C240 PN)	● (P320-3) ○ (P350-3 DP) ● (P350-3 PN)	– D410-2 DP ● D410-2 DP/PN	– D4x5-2 DP ● D4x5-2 DP/PN
<ul style="list-style-type: none"> <li>● Encoder on ADI 4 (Analog Drive Interface for 4 axes)</li> </ul>	At least one electric or hydraulic axis must be configured on ADI 4/IM 174.	●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●
<ul style="list-style-type: none"> <li>● Encoder on IM 174 (Interface Module for 4 Axes)</li> </ul>		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●



# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Measuring inputs</b>					
<b>On-board measuring inputs</b>					
• Quantity		C240: 2+4 C240 PN:4	–	8	16
• Reproducibility		6 μs	–	Typ. 5 μs	5 μs
<b>Measuring inputs on the drives</b>					
• SIMODRIVE 611 universal		1/axis	1/axis	1/axis	1/axis
• SINAMICS S110 (CU305)		2/closed-loop control	2/closed-loop control	2/closed-loop control	2/closed-loop control
• SINAMICS S120 (CU310-2)		8/closed-loop control	8/closed-loop control	8/closed-loop control	8/closed-loop control
• SINAMICS S120 (CU320-2)		8/closed-loop control	8/closed-loop control	8/closed-loop control	8/closed-loop control
• SIMOTION CX32-2	D425-2: max. 3 CX32-2 <sup>1)</sup> D435-2: max. 5 CX32-2 <sup>1)</sup> D445-2: max. 5 CX32-2 <sup>1)</sup> D455-2: max. 5 CX32-2 <sup>1)</sup>	–	–	–	4/closed-loop control
• Over TM15 Terminal Module on SINAMICS S120 or SIMOTION D/CX32-2	See chapter SIMOTION I/O components.	24	24	24	24
- Number of measuring inputs per Terminal Module, max.		125 μs	125 μs	125 μs	125 μs
- Reproducibility					
• Over TM17 Terminal Module High Feature on SINAMICS S120 or SIMOTION D/CX32-2		16	16	16	16
- Number of measuring inputs per Terminal Module, max.		≤ 1 μs	≤ 1 μs	≤ 1 μs	≤ 1 μs
- Reproducibility					
<b>Output cams</b>					
<b>High-speed output cams</b> (hardware-supported output cams with higher resolution)					
• On-board output cams		●	–	●	●
- Reproducibility		70 μs	–	Typ. 125 μs	10 μs
• Over TM15 Terminal Module on SINAMICS S120 or SIMOTION D/CX32-2	See chapter SIMOTION I/O components.	125 μs	125 μs	125 μs	125 μs
- Reproducibility					
• Over TM17 Terminal Module High Feature on SINAMICS S120 or SIMOTION D/CX32-2			≤ 10 μs	≤ 10 μs	≤ 10 μs
- Reproducibility					

<sup>1)</sup> In principle, a fourth or sixth CX32-2 Controller Extension can also be connected, e.g. for implementing modular machine concepts. In this case, no drives/drive components can be connected any longer to the integrated drive control of the SIMOTION D4x5-2. All drives must then be operated via the Controller Extensions.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Output cams (continued)</b>					
<b>Standard output cams</b> (update in position controller or IPO cycle, reproducibility of the output cam depends on the implemented I/O)					
<ul style="list-style-type: none"> <li>● On-board output cams</li> </ul>		●	–	●	●
<ul style="list-style-type: none"> <li>● Over TM15/TM17 Terminal Module High Feature on SINAMICS S120 or SIMOTION D/CX32-2</li> </ul>	See chapter <a href="#">SIMOTION I/O components</a> .	●	●	●	●
<ul style="list-style-type: none"> <li>● Over S7-300 backplane bus of SIMOTION C</li> </ul>		●	–	–	–
<ul style="list-style-type: none"> <li>● Over PROFIBUS DP</li> </ul>		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●
<ul style="list-style-type: none"> <li>● Over PROFINET IO</li> </ul>		– (C240) ● (C240 PN)	● (P320-3) ○ (P350-3 DP) ● (P350-3 PN)	– D410-2 DP ● D410-2 DP/PN	– D4x5-2 DP ● D4x5-2 DP/PN
<ul style="list-style-type: none"> <li>● Output to internal system variable</li> </ul>		●	●	●	●
<b>Integrated I/O interfaces</b>					
<b>Programmable digital inputs/ outputs</b> (can be parameterized individually as either input or output) <ul style="list-style-type: none"> <li>● of which for output cam, max.</li> <li>● of which as measuring inputs, max.</li> </ul>	Further inputs/outputs can be implemented for output cam or measuring inputs via the TM15 or TM17 High Feature Terminal Modules.	–	–	8	16
		–	–	8	8
		–	–	8	16
<b>Digital inputs</b> (fixed inputs, cannot be parameterized) <ul style="list-style-type: none"> <li>● of which inputs with specific functions <ul style="list-style-type: none"> <li>- Measuring inputs, max.</li> </ul> </li> <li>- External zero mark signal for referencing, max.</li> <li>- Fail-safe digital inputs (F-DI)</li> </ul>	D410-2: The 3 F-DI can also be used as 6 DI.	18	–	5 + 6 (3 F-DI)	12
		2+4 (C240) 4 (C240 PN)	–	–	–
		4 (C240)	–	–	–
		–	–	3	–
<b>Digital outputs</b> (fixed outputs, cannot be parameterized) <ul style="list-style-type: none"> <li>● of which for outputs with specific functions <ul style="list-style-type: none"> <li>- High-speed outputs of output cams, max.</li> <li>- Fail-safe digital outputs (F-DO)</li> </ul> </li> </ul>	D410-2: The F-DO can also used as DO.	8	–	1 (1 F-DO)	–
		8	–	–	–
		–	–	1	–
<b>Relay outputs with specific functions</b> <ul style="list-style-type: none"> <li>● Controller enable</li> <li>● Ready</li> </ul>		4 (C240)	–	–	–
		1	–	–	–
<b>Analog inputs</b> SIMOTION D: D410-2: Also over TM31 D4x5-2: Over TM31 or TB30	See chapter <a href="#">SIMOTION I/O components</a> .	–	–	1 (on-board) ○ (TM31)	○

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Integrated I/O interfaces</b> (continued)					
<b>Analog outputs</b> SIMOTION C240: Can be used as drive interface or standard analog outputs. SIMOTION D: D410-2: Over TM31 D4x5-2: Over TM31 or TB30	See chapter <a href="#">SIMOTION I/O components</a> .	4 (C240)	–	○	○
<b>Pulse direction interface for stepper drives</b>	SIMOTION C240: Configuration either as analog or stepper drive.	4 (C240)	–	–	–
<b>SIMOTION C centralized I/O modules</b>					
<ul style="list-style-type: none"> <li>• Centralized I/O modules per system, max.</li> </ul>		16	–	–	–
<ul style="list-style-type: none"> <li>• Central/expansion rack, max.</li> </ul>	SIMOTION C: max. two-tier configuration with IM 365 interface module	○	–	–	–
<ul style="list-style-type: none"> <li>• Connectable central SIMATIC S7-300 I/Os</li> </ul>	For suitable modules see chapter <a href="#">SIMOTION I/O components</a> .	●	–	–	–
<b>Connectable distributed I/O modules</b>					
<b>Distributed I/O (over PROFIBUS DP)</b>  <ul style="list-style-type: none"> <li>• SIMATIC ET 200S</li> <li>• SIMATIC ET 200pro</li> <li>• SIMATIC ET 200M</li> <li>• SIMATIC ET 200eco</li> <li>• ADI 4 (Analog Drive Interface for 4 Axes)</li> <li>• IM 174 (Interface Module for 4 Axes)</li> <li>• All certified standard slaves (DP-V0, DP-V1, DP-V2)</li> </ul>	For suitable modules see chapter <a href="#">SIMOTION I/O components</a> .  Isochronous: SIMATIC ET 200S SIMATIC ET 200M ADI 4 IM 174	●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●
<b>Distributed I/O (over PROFINET IO)</b>  <ul style="list-style-type: none"> <li>• TMC</li> <li>• SIMATIC ET 200S, ET 200SP</li> <li>• SIMATIC ET 200M</li> <li>• SIMATIC ET 200pro</li> <li>• SIMATIC ET 200eco PN</li> <li>• All certified PROFINET devices</li> </ul>	Isochronous: SIMATIC ET 200S SIMATIC ET 200SP (available soon) TMC	– (C240) ● (C240 PN)	● (P320-3) ○ (P350-3 DP) ● (P350-3 PN)	– D410-2 DP ● D410-2 DP/PN	– D4x5-2 DP ● D4x5-2 DP/PN
<b>SINAMICS drive I/O (over DRIVE-CLiQ)</b>  <ul style="list-style-type: none"> <li>• Via Terminal Modules TM15, TM17 High Feature, TM31, TM41, TM54F</li> <li>• Via TB30 Terminal Board</li> </ul>	For connection to SIMOTION C and P over SINAMICS S120  Plug-in card for SIMOTION D4x5-2 and SINAMICS CU320-2	●	●	●	●
		●	●	–	●

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>SIMOTION HMI devices</b>					
<b>Connection over PROFIBUS DP (configured using WinCC flexible)</b> <ul style="list-style-type: none"> <li>● SIMATIC MP 177 DP Mobile Panel</li> <li>● SIMATIC MP 277 Mobile Panel</li> <li>● SIMATIC TP 177B and TP 277 Touch Panel</li> <li>● SIMATIC OP 177B and OP 277 Operator Panel</li> <li>● SIMATIC MP 277 and MP 377 Multi Panel</li> <li>● SIMATIC Panel PC 477, PC 677, PC 877</li> </ul>		●	<ul style="list-style-type: none"> <li>– (P320-3)</li> <li>● (P350-3 DP)</li> <li>○ (P350-3 PN)</li> </ul>	●	●
<b>Connection over Ethernet/PROFINET (when configured using WinCC flexible)</b> <ul style="list-style-type: none"> <li>● SIMATIC MP 177 PN Mobile Panel <sup>1)</sup></li> <li>● SIMATIC MP 277 Mobile Panel <sup>1)</sup></li> <li>● SIMATIC TP 277 Touch Panel <sup>1)</sup></li> <li>● SIMATIC TP 177B Touch Panel Color <sup>1)</sup></li> <li>● SIMATIC OP 177B Operator Panel Color <sup>1)</sup></li> <li>● SIMATIC MP 177</li> <li>● SIMATIC OP 277 Operator Panel <sup>1)</sup></li> <li>● SIMATIC MP 277 <sup>1)</sup> and MP 377 Multi Panel <sup>1)</sup></li> <li>● SIMATIC Panel PC 277, PC 477, PC 577, PC 677, PC 877</li> </ul>		●	●	●	●
<b>HMI software for SIMOTION</b>					
<ul style="list-style-type: none"> <li>● WinCC flexible</li> <li>● WinCC (SCADA system, Version V7.0 and higher)</li> </ul>		○	○	○	○
<b>Software for extended communication with SIMOTION</b>					
<ul style="list-style-type: none"> <li>● SIMATIC NET OPC server</li> <li>● SIMOTION IT OPC XML-DA (over Ethernet) <ul style="list-style-type: none"> <li>- Open communication over TCP/IP and SOAP standard protocols</li> <li>- Clients on any hardware with various operating systems (Windows, Linux, etc.)</li> <li>- According to OPC Foundation standard OPC XML-DA V1.01</li> </ul> </li> </ul>	<a href="#">See section SIMOTION runtime software.</a>	○	● <sup>2)</sup>	○	○
		● <sup>3)</sup>	● <sup>3)</sup>	●	●

<sup>1)</sup> PROFINET IO-capable.

<sup>2)</sup> Subject to license.

<sup>3)</sup> Subject to license for SIMOTION Kernel < V4.2.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Software for extended communication with SIMOTION (continued)</b>					
<ul style="list-style-type: none"> <li>● SIMOTION MIIF: Multipurpose Information Interface               <ul style="list-style-type: none"> <li>- Symbolic access to SIMOTION data via Ethernet</li> <li>- SIMOTION as server, e.g. operator panels as clients</li> </ul> </li> </ul>		○	○	○	○
<b>Communication</b>					
<b>Ethernet interfaces</b>					
<ul style="list-style-type: none"> <li>● Number and transmission rates</li> </ul>		1 × 10/100 Mbit/s	P320-3: 1 × 10/100/1000 Mbit/s P350-3: 2 × 10/100 Mbit/s	1 × 10/100 Mbit/s	D4x5-2 DP: 3 × 10/100/1000 Mbit/s D4x5-2 DP/PN: 2 × 10/100/1000 Mbit/s
<b>PROFIBUS DP interfaces</b>					
<ul style="list-style-type: none"> <li>● On-board/support isochronous communication</li> </ul>	One interface can be used as an MPI. SIMOTION P350-3: The PROFIBUS version can be optionally retrofitted with PROFINET.	2/2	P320-3: –/– P350-3 DP: 2/2 P350-3 PN: –/–	D410-2 DP: 2/2 D410-2 DP/PN: 1/1	2/2
<ul style="list-style-type: none"> <li>● On-board CP5621</li> <li>● Transmission rates in Mbit/s</li> <li>● Number of PROFIBUS DP slaves</li> </ul>	For PG/PC and HMI Per PROFIBUS DP subnet	– 64	P350-3: 1 1.5 / 3 / 6 /12 64	– 1.5 / 3 / 6 /12 64	– 1.5 / 3 / 6 /12 64
<b>PROFINET interfaces</b>					
<ul style="list-style-type: none"> <li>● On-board ports</li> </ul>	SIMOTION P350-3 DP: PROFINET can be optionally retrofitted by means of MCI-PN Communication Board	C240: – C240 PN: 3	P320-3: 3 P350-3 DP: 4, ○ P350-3 PN: 4	D410-2 DP: – D410-2 DP/PN: 2	D4x5-2 DP: – D4x5-2 DP/PN: 3
<ul style="list-style-type: none"> <li>● Number of PROFINET devices (provided that PROFINET interface is onboard or optionally retrofitted)</li> </ul>	D4x5-2: CBE30-2 can be implemented as second PROFINET interface for D4x5-2 DP/PN. Per PROFINET interface	64	64	64	64
<ul style="list-style-type: none"> <li>● Media redundancy (MRP and MRPD)</li> </ul>		●	P320-3: ● P350-3: –	–	●
<b>Further communication interfaces</b>					
<ul style="list-style-type: none"> <li>● Serial interfaces</li> <li>● USB interfaces</li> </ul>		–	1	–	–
	D4x5-2: for upgrading from D4x5-2 Control Units using a USB memory stick	–	P320-3: 4 × USB 2.0 P350-3: 4 × USB 2.0	–	2
<ul style="list-style-type: none"> <li>● DRIVE-CLiQ interfaces</li> </ul>		–	–	1	D425-2: 4 D435-2: 6 D445-2: 6 D455-2: 6

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Communication (continued)</b>					
<b>Connections over PROFIBUS DP and Ethernet/PROFINET</b> <ul style="list-style-type: none"> <li>● PROFIBUS DP</li> <li>● Ethernet/PROFINET</li> </ul>	SIMOTION C: PROFINET with C240 PN only  The connection resources can be assigned as required, over PROFIBUS DP or Ethernet.	C240: ● C240 PN: ●	P320-3: – P350-3 DP: ● P350-3 PN: –	●	●
		C240: ●/– C240 PN: ●/●	P320-3: ●/● P350-3 DP: ●/○ P350-3 PN: ●/●	D410-2 DP: ●/– D410-2 DP/PN: ●/●	D4x5-2 DP: ●/– D4x5-2 DP/PN: ●/●
<b>Online connections, max.</b>		16	16	16	16
<ul style="list-style-type: none"> <li>● SIMOTION SCOUT engineering system (SCOUT occupies up to 3 online connections)</li> </ul>		2	2	2	2
<ul style="list-style-type: none"> <li>● HMI</li> </ul>		5	5	5	5
<ul style="list-style-type: none"> <li>● OPC</li> </ul>		●	●	●	●
<ul style="list-style-type: none"> <li>● Basic communication Xsend / Xreceive (not via Ethernet)</li> </ul>		5	5	5	5
<ul style="list-style-type: none"> <li>● Standard TCP/IP connections</li> </ul>		45	75	45	75
<ul style="list-style-type: none"> <li>● SIMOTION IT</li> </ul>		●	●	●	●
<b>Communication functions over PROFIBUS between:</b> <ul style="list-style-type: none"> <li>● SIMOTION – SIMATIC HMI/WinCC flexible               <ul style="list-style-type: none"> <li>- HMI data exchange: Support from the SIMOTION operating system</li> <li>- Plant-wide access to process data and displays</li> <li>- Interrupt mechanism: Alarms are event-driven</li> </ul> </li> <li>● SIMOTION – SIMOTION               <ul style="list-style-type: none"> <li>- Distributed I/O mechanisms Process image, e.g. (% I1.3) I/O variables (symbolic)</li> <li>- XSND/XRCV, max. 200 bytes</li> </ul> </li> <li>● SIMOTION – SIMATIC S7               <ul style="list-style-type: none"> <li>- Distributed I/O mechanisms Process image, e.g. (% I1.3) I/O variables</li> <li>- XSND/XRCV, max. 76 bytes</li> </ul> </li> <li>● SIMOTION – SIMATIC NET OPC</li> <li>● SIMOTION – PG/PCs with STEP 7 and SCOUT</li> <li>● PROFIBUS DP slave-to-slave communication</li> </ul>	Basic version with regard to SIMOTION	●	●	●	●

# SIMOTION Motion Control System

## Overview of SIMOTION functions

<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2	
<b>Communication</b> (continued)						
<b>Communication functions over PROFINET IO between:</b> <ul style="list-style-type: none"> <li>● SIMOTION – SIMOTION               <ul style="list-style-type: none"> <li>- Distributed I/O mechanisms</li> <li>Process image, e.g. (% I1.3)</li> <li>I/O variables (symbolic)</li> </ul> </li> <li>● SIMOTION – SIMATIC S7               <ul style="list-style-type: none"> <li>- Distributed I/O mechanisms</li> <li>Process image, e.g. (% I1.3)</li> <li>I/O variables                   <ul style="list-style-type: none"> <li>- For SIMATIC – SIMOTION: SIMOTION as I-Device</li> <li>- For SIMOTION – SIMATIC: over SIMATIC CP</li> </ul> </li> </ul> </li> <li>● Slave-to-slave communication between SIMOTION controllers</li> </ul>		Basic version with regard to SIMOTION PROFINET standard feature on C240 PN, P320-3, P350-3 PN, D410-2 DP/PN and D4x5-2 DP/PN On P350-3 DP optionally by means of PROFINET board.	●	●	●	●
<b>Communication functions over Ethernet/PROFINET between:</b> <ul style="list-style-type: none"> <li>● SIMOTION – SIMATIC HMI/WinCC flexible               <ul style="list-style-type: none"> <li>- HMI data exchange: Support from the SIMOTION operating system</li> <li>- Plant-wide access to process data and displays</li> <li>- Interrupt mechanism: Alarms are event-driven</li> </ul> </li> <li>● SIMOTION – SIMATIC NET OPC</li> <li>● SIMOTION IT OPC XML-DA (over Ethernet)               <ul style="list-style-type: none"> <li>- Open communication over TCP/IP and SOAP standard protocols</li> <li>- Clients on any hardware with various operating systems (Windows, Linux, etc.)</li> <li>- According to OPC Foundation standard OPC XML-DA V1.01</li> </ul> </li> <li>○ SIMOTION MIIF: Multipurpose Information Interface               <ul style="list-style-type: none"> <li>- Symbolic access to SIMOTION data via Ethernet</li> <li>- SIMOTION as server, e.g. operator panels as clients</li> </ul> </li> <li>● SIMOTION – PG/PCs with STEP 7 and SCOUT</li> <li>● S7 routing Ethernet/PROFIBUS DP</li> </ul>			●	●	●	●
<ul style="list-style-type: none"> <li>● SIMOTION – SIMATIC NET OPC</li> <li>● SIMOTION IT OPC XML-DA (over Ethernet)</li> </ul>			● <sup>1)</sup>	● <sup>1)</sup>	●	●
<ul style="list-style-type: none"> <li>○ SIMOTION MIIF: Multipurpose Information Interface</li> </ul>			○	○	○	○

<sup>1)</sup> Subject to license for SIMOTION Kernel < V4.2.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Communication (continued)</b>					
<b>UDP and TCP/IP communication functions over Ethernet/PROFINET between:</b> <ul style="list-style-type: none"> <li>• SIMOTION – SIMOTION</li> <li>• SIMOTION – SIMATIC</li> <li>• SIMOTION – PC</li> </ul>		●	●	●	●
<b>Serial communication via a point-to-point connection</b> <ul style="list-style-type: none"> <li>• CP 340 and CP 341 communication modules</li> <li>• 1SI communication module (connected over ET 200S)</li> </ul>	Basic version with regard to SIMOTION	●	●	●	●
<b>Communication via AS-Interface</b> <ul style="list-style-type: none"> <li>• CP 343-2 P communication module</li> <li>• DP/AS-Interface Link 20E/ Link Advanced</li> <li>• IE/AS-Interface link PN IO</li> </ul>	Basic version with regard to SIMOTION	●	●	●	●
<b>Connectable network couplers</b> <ul style="list-style-type: none"> <li>• DP/DP coupler for connecting two PROFIBUS DP networks</li> <li>• PN/PN coupler for connecting two PROFINET IO networks</li> </ul>	Basic version with regard to SIMOTION	●	●	●	●
<b>PROFIsafe drives on SIMOTION</b>					
<b>Max. number of PROFIsafe drives on SIMOTION with SINAMICS S120 drive system:</b> <ul style="list-style-type: none"> <li>• via PROFIBUS with PROFIsafe <ul style="list-style-type: none"> <li>- with 1 × PROFIBUS interface</li> <li>- with 2 × PROFIBUS interface</li> </ul> </li> <li>• via PROFINET with PROFIsafe</li> </ul>	SIMOTION as I-Slave on SIMATIC F-CPU over PROFIBUS  SIMOTION as I-Device on SIMATIC F-CPU over PROFINET Configuration: A higher-level SIMATIC F-CPU controls the safety functions of the SINAMICS S120 drives that are assigned to SIMOTION via the I-Slave/ I-Device interface of the SIMOTION controller. SIMOTION routes the safety telegrams through to the drives.	16	P320-3: – P350-3 DP: 16 P350-3 PN: –	8	16
		32	P320-3: – P350-3 DP: 32 P350-3 PN: –	8	32
		32	P320-3: 64 P350-3 DP: – P350-3 PN: 64	D410-2 DP: – D410-2: DP/PN: 8	64



# SIMOTION Motion Control System

## Overview of SIMOTION functions

<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<b>SIMOTION Kernel</b>					
<b>Execution system</b>					
<ul style="list-style-type: none"> <li>● System tasks for motion control               <ul style="list-style-type: none"> <li>- SERVO (position control cycle)</li> <li>- IPO (interpolation cycle)</li> <li>- SERVO<sub>Fast</sub></li> <li>- IPO<sub>Fast</sub></li> </ul> </li> </ul>	SERVO <sub>Fast</sub> and IPO <sub>Fast</sub> allow axes with differing dynamic responses to be assigned to a slow bus system and a fast bus system, as well as especially fast I/O processing. High-speed PROFINET I/O modules are used for this purpose.	●	●	●	●
<ul style="list-style-type: none"> <li>- MotionTasks (sequential)</li> <li>- ServoSynchronousTask (cyclic, synchronous with the position control cycle)</li> </ul>		–	–	–	D425-2 DP: – D425-2 DP/PN: – D435-2 DP: – D435-2 DP/PN: ● D445-2 DP/PN: ● D455-2 DP/PN: ●
<ul style="list-style-type: none"> <li>- Task structure/program execution               <ul style="list-style-type: none"> <li>- BackgroundTask (cyclic)</li> </ul> </li> </ul>	Adjustable monitoring time	20	32	32	32
<ul style="list-style-type: none"> <li>- TimerInterruptTasks (time-controlled down to 1 ms)</li> </ul>		1	1	1	1 (2) <sup>1)</sup>
<ul style="list-style-type: none"> <li>- IPOSynchronousTask (cyclic, synchronous with the interpolation cycle)</li> </ul>		2	2	2	2 (3) <sup>1)</sup>
<ul style="list-style-type: none"> <li>- InterruptTasks (for user) (event-driven)</li> </ul>		2	2	2	2
<ul style="list-style-type: none"> <li>- TControlTasks (temperature control)</li> </ul>		5	5	5	5
<ul style="list-style-type: none"> <li>- StartupTask (for transition from STOP to RUN)</li> <li>- ShutdownTask (for transition from RUN to STOP)</li> </ul>	1	1	1	1	
<ul style="list-style-type: none"> <li>- Task structure / error processing (SystemInterruptTasks)               <ul style="list-style-type: none"> <li>- ExecutionFaultTask (starts in the event of an error when executing a program)</li> <li>- TechnologicalFaultTask (starts in the event of an error on a technology object)</li> <li>- PeripheralFaultTask (starts in the event of an error on the I/O)</li> <li>- TimeFaultTask (starts in the event of a TimerInterruptTask timeout)</li> <li>- TimeFaultBackgroundTask (starts in the event of a BackgroundTask timeout)</li> </ul> </li> </ul>	Central troubleshooting is possible	1	1	1	1
<ul style="list-style-type: none"> <li>- ExecutionFaultTask (starts in the event of an error when executing a program)</li> </ul>		1	1	1	1
<ul style="list-style-type: none"> <li>- TechnologicalFaultTask (starts in the event of an error on a technology object)</li> </ul>		1	1	1	1
<ul style="list-style-type: none"> <li>- PeripheralFaultTask (starts in the event of an error on the I/O)</li> </ul>		1	1	1	1
<ul style="list-style-type: none"> <li>- TimeFaultTask (starts in the event of a TimerInterruptTask timeout)</li> </ul>		1	1	1	1
<ul style="list-style-type: none"> <li>- TimeFaultBackgroundTask (starts in the event of a BackgroundTask timeout)</li> </ul>	1	1	1	1	

<sup>1)</sup> Values in brackets with SERVO<sub>Fast</sub> and IPO<sub>Fast</sub> activated for D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>SIMOTION Kernel</b> (continued)					
<b>Execution system</b> (continued)					
<ul style="list-style-type: none"> <li>● Program organization               <ul style="list-style-type: none"> <li>- Units (source program)</li> <li>- Programs</li> <li>- Function blocks (FBs)</li> <li>- Functions (FCs)</li> <li>- System functions (SFs)</li> <li>- Libraries</li> </ul> </li> </ul>		●	●	●	●
<b>PLC command set</b> (according to IEC 61131-3; optionally expandable by technology functions)					
System functions, e.g. for		●	●	●	●
<ul style="list-style-type: none"> <li>● Interrupt and error handling</li> <li>● Copying data</li> <li>● Clock functions</li> <li>● Diagnostic functions</li> <li>● Module parameterization</li> <li>● Operating mode transitions, Run/Stop</li> <li>● Reading and writing of data blocks from the user program to an exchangeable memory medium</li> <li>● DPV1 communication to DP slaves</li> <li>● Read/write drive parameters</li> <li>● DP slaves/PROFINET devices can be connected to and disconnected from application</li> <li>● DP slave and IP address can be set in user program</li> <li>● DP station diagnostics</li> <li>● Activate/deactivate technology objects</li> <li>● Counter (IEC commands)</li> <li>● Timer (IEC commands)</li> <li>● Real-time clock, format [DATE_AND_TIME]</li> </ul>		●	●	●	●

# SIMOTION Motion Control System

## Overview of SIMOTION functions

<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<b>Motion Control technology package</b>					
<b>Technology functions</b>					
<ul style="list-style-type: none"> <li>• Motion Control Basic</li> <li>• POS – Positioning</li> <li>• GEAR – Synchronous operation</li> <li>• CAM – Cam</li> <li>• PATH – Path interpolation</li> </ul> <p>The technology package functions are accessed via language commands, system variables and through function blocks in accordance with PLCopen.</p>	No license required	●	●	●	●
	Use of the functions during runtime is subject to license. SIMOTION D410-2 already contains the technology functions for precisely one axis. (D410-2 no PATH)	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
		● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
		● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
		● <sup>1)</sup>	● <sup>1)</sup>	–	● <sup>1)</sup>
<b>Axis types</b>					
<ul style="list-style-type: none"> <li>• Electrical/hydraulic/stepper motor axes</li> </ul>		●	●	●	●
<ul style="list-style-type: none"> <li>• Speed-controlled axis</li> </ul>		●	●	●	●
<ul style="list-style-type: none"> <li>• Positioning axes               <ul style="list-style-type: none"> <li>- Rotary axis</li> <li>- Linear axis</li> <li>- Modulo for linear and rotary axes</li> <li>- Force/pressure-controlled axis</li> <li>- Force/pressure-limited axis</li> </ul> </li> </ul>	Included with POS license or higher	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
<ul style="list-style-type: none"> <li>• Synchronous axis</li> </ul>	Included with GEAR license or higher	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
<ul style="list-style-type: none"> <li>• Path axis</li> </ul>	Included with GEAR license or higher	● <sup>1)</sup>	● <sup>1)</sup>	–	● <sup>1)</sup>
<ul style="list-style-type: none"> <li>• Cam axis</li> </ul>	Included with CAM license or higher	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
<ul style="list-style-type: none"> <li>• Virtual axis</li> </ul>		●	●	●	●
<ul style="list-style-type: none"> <li>• Simulation axis</li> </ul>		●	●	●	●
<b>Systems of units</b>					
<ul style="list-style-type: none"> <li>• Metric (mm, m, Nm, Pa, ...)</li> </ul>		●	●	●	●
<ul style="list-style-type: none"> <li>• US (inch, feet, PSI, lb, ...)</li> </ul>		●	●	●	●
<b>Axis monitoring functions</b>					
<p>The activated monitoring functions are executed cyclically.</p> <ul style="list-style-type: none"> <li>• Watchdog</li> <li>• Hardware and software limit switches</li> <li>• Position/zero-speed monitoring</li> <li>• Dynamic following error monitoring</li> <li>• Encoder monitoring, cable break</li> <li>• Force/pressure monitoring</li> <li>• Setpoint</li> <li>• Plausibility in data exchange</li> </ul>		●	●	●	●

<sup>1)</sup> Use of the functions during runtime is subject to license. Exception: SIMOTION D410-2 already contains the Motion Control technology functions for just one axis.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Other technology packages</b>					
<b>TControl technology package</b> <ul style="list-style-type: none"> <li>• With technology functions for temperature control</li> </ul>	Technology package integrated in SCOUT	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
<b>Technology package Drive Control Chart (DCC)</b> <ul style="list-style-type: none"> <li>• With technology functions for Drive Control Chart</li> </ul>	Technology package integrated in SCOUT	●	●	●	●
<b>Technology package Multipurpose Information Interface (MIIF)</b> <ul style="list-style-type: none"> <li>• With multi-functional communication functions</li> </ul>	Technology package can be purchased via your Siemens contact	○ <sup>1)</sup>	○ <sup>1)</sup>	○ <sup>1)</sup>	○ <sup>1)</sup>
<b>SIMOTION IT</b>					
<b>SIMOTION IT DIAG</b> <p>Integrated web server on the SIMOTION controller</p> <ul style="list-style-type: none"> <li>• Service and diagnostic functions provided via Internet browser with extensive information functions (hardware/software version display, process utilization, memory usage, diagnostic buffer, task runtimes, user logbook, operating state, time of day, etc.)</li> <li>• Access to all variables on the control system using variable browser functions</li> <li>• Watch tables (control variable diagnostics in status and control tables that can be permanently saved)</li> <li>• Trace (control variable tracing for one controller or several synchronously)</li> <li>• Generation of diagnostic data (diagnostic buffer, alarms, states of variables, ...)</li> <li>• Project update</li> <li>• Firmware update</li> <li>• Password-protected access</li> <li>• Remote access to SIMOTION file system</li> <li>• User-defined service and diagnostic pages</li> </ul>		● <sup>2)</sup>	● <sup>2)</sup>	●	●

<sup>1)</sup> Use of the functions during runtime is subject to license.

<sup>2)</sup> Subject to license for SIMOTION Kernel < V4.2.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>SIMOTION IT (continued)</b>					
<b>SIMOTION IT OPC XML-DA</b> Integrated OPC XML-DA server on the SIMOTION controller <ul style="list-style-type: none"> <li>● Read/write variables</li> <li>● Browse variables</li> <li>● Trace interface via SOAP</li> <li>● Password-protected access</li> </ul>		● <sup>1)</sup>	● <sup>1)</sup>	●	●
<b>SIMOTION IT Virtual Machine</b> (integrated Java runtime environment on the SIMOTION controller) <ul style="list-style-type: none"> <li>● Read and write access to the SIMOTION variables</li> <li>● Read and write access to the non-volatile memory (NVRAM)</li> <li>● Use of system functions (functions of the technology objects)</li> <li>● Use of standard Java classes in the device (file access, network functions, string functions, etc.)</li> <li>● Creation of servlets, for the purpose of enhancing the display of menu interfaces in HTML pages</li> </ul>	Licensing through SIMOTION IT Virtual Machine  Note: For SIMOTION Kernel < V4.2, can be used as combined license for SIMOTION IT DIAG, OPC XML-DA and Virtual Machine.	●	●	●	●
<b>SIMOTION SCOUT engineering system</b>					
<b>SIMOTION SCOUT basic functions</b> <ul style="list-style-type: none"> <li>● SCOUT Workbench</li> <li>● STARTER Drive commissioning/parameterization</li> <li>● Hardware and network configuration</li> <li>● Diagnostics for testing and commissioning</li> <li>● Axis control panel</li> <li>● Program editors/programming languages (command set in accordance with IEC 61131-3)               <ul style="list-style-type: none"> <li>- Structured Text (ST)</li> <li>- Ladder Logic (LAD)</li> <li>- Function Block Diagram (FBD)</li> <li>- Motion Control Chart (MCC)</li> </ul> </li> <li>● Creation of cams (basic)</li> <li>● Creation of technology objects</li> <li>● Technology tools (function generator)</li> <li>● Operator interface, online help and documentation in English, French, German and Italian</li> </ul>		●	●	●	●
<b>SIMOTION SCOUT optional packages</b> <ul style="list-style-type: none"> <li>● CamTool (graphical cam editor)</li> <li>● DCC editor (graphical editor for Drive Control Chart)</li> </ul>		○	○	○	○
		○	○	○	○

<sup>1)</sup> Subject to license for SIMOTION Kernel < V4.2.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Testing and diagnostics with SIMOTION SCOUT</b>					
<b>Information functions</b>					
<ul style="list-style-type: none"> <li>• Hardware/software version</li> <li>• Processor utilization</li> <li>• Memory utilization</li> <li>• Diagnostic buffer</li> <li>• Task runtimes</li> <li>• User logbook</li> <li>• Operating status</li> <li>• Time</li> </ul>		●	●	●	●
<b>Comparison functions for projects</b>					
<ul style="list-style-type: none"> <li>• Comparison of objects in projects: <ul style="list-style-type: none"> <li>- between offline projects</li> <li>- between online and offline projects</li> </ul> </li> <li>• Detailed comparison: Shows differences between objects in detail</li> <li>• Matching: Projects and objects can be merged</li> </ul>		●	●	●	●
<b>Program test functions</b>					
<ul style="list-style-type: none"> <li>• Control/status variables</li> <li>• Watch tables</li> <li>• Status program/FB/FC (with specification of the call point)</li> <li>• Single-step MCC</li> <li>• Breakpoints in all languages (ST, MCC, LAD/FBD)</li> <li>• Tracer for MCC (for fast program sequences)</li> <li>• Trace technology object (recording of all technology object commands)</li> </ul>		●	●	●	●
<b>Trace</b>					
<ul style="list-style-type: none"> <li>• Recording of I/O, system and program variables (on one controller as well as over several synchronously)</li> <li>• Recording from position control cycle onwards (<math>n \times</math> position control cycle)</li> <li>• Trigger: Instantaneous, rising/falling edge, at code point system variable</li> <li>• Measuring functions for optimizing the speed/position controller (step response, ramp, frequency curve)</li> <li>• Automatic setting of the speed controller/position controller</li> <li>• Bode diagram, FFT analysis, function generator, mathematical functions</li> <li>• Endless trace</li> <li>• Recording over defined measuring period</li> </ul>		●	●	●	●

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Testing and diagnostics with SIMOTION SCOUT (continued)</b>					
<b>Further diagnostic functions</b>					
<ul style="list-style-type: none"> <li>● Module diagnostics               <ul style="list-style-type: none"> <li>- Centralized</li> <li>- Distributed (e.g. ET 200M)</li> </ul> </li> <li>● PROFIBUS DP station diagnostics</li> <li>● PROFINET station diagnostics</li> </ul>		●	●	●	●
	PROFINET standard feature on C240 PN, P320-3, P350-3 PN, D410-2 DP/PN and D4x5-2 DP/PN. Optional on P350-3 DP by means of PROFINET board.	●	●	●	●
<ul style="list-style-type: none"> <li>● Diagnostic buffer               <ul style="list-style-type: none"> <li>- No. of entries, max.</li> </ul> </li> <li>● Process fault diagnostics (Alarm_S)               <ul style="list-style-type: none"> <li>- Messages from user program</li> <li>- No. of entries, max.</li> </ul> </li> </ul>	On SIMOTION D, one diagnostic buffer is provided for SIMOTION and another for the integrated SINAMICS drive.	200	200	2 × 100	2 × 200
		●	●	●	●
		40	40	40	40
<b>Engineering drives</b>					
<b>STARTER (integrated in SCOUT)</b>					
Drive/commissioning software for:					
<ul style="list-style-type: none"> <li>● SINAMICS S / SINAMICS G</li> <li>● MICROMASTER 410/420/430/440</li> </ul>		●	●	●	●
<b>Drive ES BASIC</b>					
Engineering tools and integrated data storage in SIMATIC S7/SIMOTION projects for:					
<ul style="list-style-type: none"> <li>● SINAMICS S/SINAMICS G (STARTER)</li> <li>● MICROMASTER 410/420/430/440 (STARTER)</li> <li>● SIMODRIVE (SimoCom U/SimoCom A)</li> </ul>	Drive ES BASIC is included complete with license in the SIMOTION SCOUT software package.	●	●	●	●

# SIMOTION I/O components

# 10



<b>10/2</b>	<b>Overview</b>
<b>10/3</b>	<b>Compact I/O modules</b>
10/3	SIMOTION TMC
<b>10/9</b>	<b>Power supplies</b>
10/9	Power supplies for SIMOTION C / SIMATIC ET 200M
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10/14	Digital Modules
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10/24	SIMATIC ET 200S
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	SIMATIC Interface Module IM 174
10/40	AS-Interface
<b>10/44</b>	<b>SINAMICS drive I/O</b>
10/47	TM15 and TM17 High Feature Terminal Modules
<b>10/50</b>	<b>Other I/O modules</b>
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# SIMOTION I/O components

## Overview

	Designation	Description	Page
<b>Compact I/O</b>			
	SIMOTION TMC	SIMOTION TMC – compact I/O modules with high channel densities, designed for SINAMICS S120 booksize compact	<b>10/3</b>
			<b>10/3</b>
<b>Power supplies</b>			
	Power supplies for SIMOTION C/SIMATIC ET 200M	Power supplies for snapping onto the SIMATIC S7-300 routing rail	<b>10/9</b>
	Universal SITOP power supplies	Power supplies for snapping onto 35 mm (1.38 in) standard rails (EN 50022)	<b>10/10</b>
	Uninterruptible SITOP power supplies with battery module	Power supplies for completely bridging power failures or fluctuations	<b>10/11</b>
	Uninterruptible SITOP power supply with capacitor module		<b>10/12</b>
<b>SIMATIC S7-300 I/O</b>			
	Digital Modules	For the connection of digital sensors and actuators	<b>10/14</b>
	Analog Modules	For the connection of analog sensors and actuators	<b>10/15</b>
	FM 350-1, FM 350-2 Counter Modules	For simple and universal counting and measuring tasks	<b>10/16</b>
	FM 352 Cam controller	High-speed, electronic cam controller	<b>10/17</b>
	FM 352-5 High Speed Boolean Processor	For applications with an extremely short response time	<b>10/17</b>
	CP 340, CP 341 Communication Modules	For a point-to-point connection	<b>10/18</b>
	SM 374 Simulator Module	For program testing during commissioning and operation	<b>10/19</b>
	DM 370 Dummy Module	For reserving slots for unconfigured Signal Modules	<b>10/19</b>
	Accessories		<b>10/20</b>
	<b>Distributed I/O</b>		
	SIMATIC ET 200SP	Extremely flexible and modular distributed I/O system	<b>10/21</b>
	SIMATIC ET 200M	With high channel densities	<b>10/22</b>
	SIMATIC ET 200S	Multi-talent with comprehensive function range	<b>10/23</b>
	SIMATIC ET 200eco	Digital block I/O	<b>10/24</b>
	SIMATIC ET 200eco PN	Digital block I/O with PROFINET connection	<b>10/35</b>
	SIMATIC ET 200pro	Modular and multi-functional	<b>10/36</b>
	SINUMERIK Analog Drive Interface for 4 Axes ADI 4	For the connection of drives with analog $\pm 10$ V interface and stepper drives	<b>10/37</b>
	SIMATIC Interface Module IM 174	For the connection of drives with analog $\pm 10$ V interface and stepper drives	<b>10/38</b>
	AS-Interface	Modules and accessories for gateway to AS-Interface	<b>10/38</b>
			<b>10/40</b>
<b>SINAMICS drive I/O</b>			
	TM15 and TM17 High Feature Terminal Modules	For digital inputs and outputs with short signal delay times	<b>10/44</b>
			<b>10/47</b>
<b>Other I/O modules</b>			
	SIPLUS extreme	For extremely harsh industrial environmental conditions	<b>10/50</b>
	SIMATIC RFID systems	For controlling and optimizing the material flow and logistics	<b>10/50</b>
	SIMATIC Machine Vision	For the visual inspection and recognition of products	<b>10/51</b>
	SIWAREX Weighing systems	For weighing and filling systems	<b>10/51</b>
	Other I/O modules/Notes on use	For the connection of standard components	<b>10/52</b>
	Function blocks for I/O modules	For the transfer into the application program	<b>10/52</b>

### Overview



Left: SIMOTION TMC1080 PN  
Right: SIMOTION TMC2040 PN

SIMOTION TMC compact I/O is available in two function variants and two wiring variants:

	TMC1080 PN	TMC1180 PN	TMC2040 PN <sup>1)</sup>	TMC2140 PN <sup>1)</sup>
Number of I/Os	80	80	40	40
DI, DO	✓	✓	✓	✓
High speed DI, DO	–	–	✓ (16)	✓ (16)
Technology Measuring Input, Output Cam <sup>2)</sup>	–	–	✓	✓
Module width	75 mm (2.95 in)	75 mm (2.95 in)	50 mm (1.97 in)	50 mm (1.97 in)
I/O wired to the module directly via terminal blocks	✓	–	✓	–
I/O wired indirectly through wiring modules	–	✓	–	✓

✓ Available

– Not available

### Features

The function variant TMC1x80 PN has 80 channels with

- 32 digital inputs,
- 32 digital inputs/outputs and
- 16 digital outputs.

The function variant TMC2x40 PN <sup>1)</sup> has 40 channels with

- 16 high speed digital inputs/outputs with technology (Output Cam, Measuring Input) and push-pull drivers,
- 16 digital inputs/outputs with technology (Output Cam, Measuring Input) and
- 8 digital inputs/outputs.

16 outputs of the TMC2x40 have special push-pull output drivers. The push-pull technology ensures that extremely steep input and output edges are achieved. This offers the advantages of extremely short OFF delay times and maximum repeat accuracy. This is particularly useful when signals have to be switched position-specifically with a high degree of accuracy, e.g. for accurate positioning of a drop of glue when the web of material is passing through at high speed.

The push-pull technology ensures that especially short terminal-to-terminal response times are achieved.

SIMOTION TMC are compact I/O modules with high channel densities designed for SINAMICS S120 Booksize Compact.

The modules have two PROFINET IO connections with real-time functionality (IRT) for connecting to the SIMOTION controller or for networking with other PROFINET components.

The performance of the digital inputs and outputs whose functions can be parameterized has been optimized for Motion Control applications – with regard to a strict real-time response, shortest possible signal runtimes and the most stringent requirements for reproducibility of signal acquisition and signal output.

### Benefits

The compact digital I/O SIMOTION TMC is a perfectly integrated part of the high-performance control and drive concept of SIMOTION/SINAMICS thanks to its format, high density of channels and excellent performance.

- The high channel density saves space in the control cabinet
- Easy configuration and integration due to connection over PROFINET IO
- Optimized for Motion Control applications with SIMOTION and SINAMICS
- High performance and high precision
- I/O functionality parameterizable per channel
- Flexible wiring through wiring variants
- Adjustable input filters for particularly short delay times or maximum suppression of noise pulses

<sup>1)</sup> Available soon.

<sup>2)</sup> Only in combination with the SIMOTION Motion Control system .

# SIMOTION I/O components

## Compact I/O modules

### SIMOTION TMC

#### Application

SIMOTION TMC is predestined for applications in which a high channel density of digital inputs/outputs is required in accordance with the SINAMICS S120 Booksize Compact format.

With the TMC2x40 PN technology module, applications can also be implemented that require fast and highly accurate acquisition or output of signals.

Examples for precise sensing of signals:

- Edge detection
- Quality monitoring (e.g. product is good/bad)
- Product tracing (e.g. product is available/not available)
- Print-mark detection
- Tool monitoring (e.g. presses)
- Machine status monitoring (e.g. plastic injection molding machines)
- Weft thread break monitoring (e.g. textile machines)

Examples for precise output of signals:

- Position-dependent switching of actuators
  - Camera trigger signal (quality assurance)
  - Control of an air nozzle for blowing away cut-offs
  - Controlling nozzles for applying glue
- Product extraction from production line
- Implementation of line Motion Control systems

#### Design

In addition to the 2 function variants TMC1x80/2x40 PN, the modules are also available in 2 wiring variants – so there are 4 variants in total.

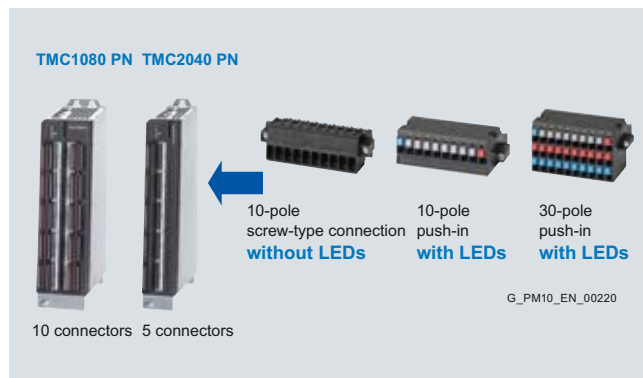
#### I/O wired directly to TMC

With TMC1080 PN and TMC2040 PN, the I/O is wired up to the module directly at terminal blocks. The terminal blocks are available in 3 designs:

- 10-pole screw-type connection without LEDs
- 10-pole push-in with 9 LEDs
- 30-pole push-in with 9 LEDs

The 30-pole terminal block supports wiring in a 3-wire system, i.e. one ground and one 24 V terminal are available for each DI or DO.

The LEDs of the terminal blocks indicate channel status as well as the presence of the load current supply.



#### Indirectly wired I/O

With TMC1180 PN and TMC2140 PN, the I/O is wired through separate wiring modules. The wiring modules, connecting cables and the 10-pole connector for the load current supply must be ordered separately.



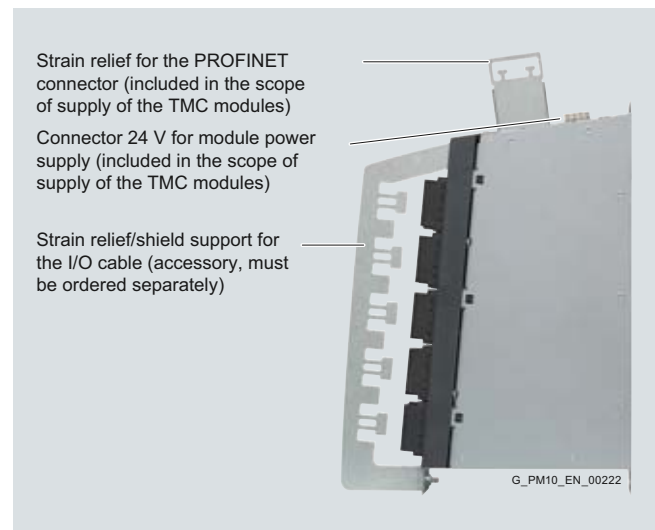
#### Strain relief/shield support

The 24 V connector for the module power supply as well as the strain relief for the PROFINET connectors are included in the scope of supply of the TMC modules.

The strain relief/shield support for the I/O wiring is available as an optional accessory and is required in the following cases:

- When digital inputs are operated with short filter times, a shield support is required.
- Strain relief is necessary due to the local conditions.

Alternatively, the shield may also be attached to a shield busbar in the control cabinet.



### Function

#### Functionality of the digital inputs/outputs

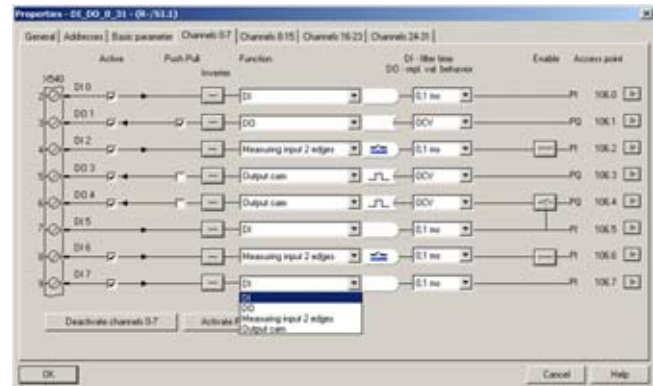
The TMC compact I/O is configured using the SIMOTION SCOUT engineering system. The digital inputs/outputs are galvanically isolated in groups of 8. The functionality of each I/O channel can be individually parameterized and therefore optimized to the specific requirements.

- The DI/DO channels of TMC1x80 PN can be parameterized as DI or DO as required.
- With TMC2x40 PN:
  - 8 DI/DO channels can be parameterized as DI or DO as required,
  - 32 DI/DO channels can be parameterized as DI, DO, measuring input or output cam as required and
  - channels can be parameterized as enable inputs.
- Adjustable filter time for digital inputs (from 1  $\mu$ s to 3.2 ms in steps of 5)
- Adjustable substitute value response for digital outputs
- Signals can be inverted

Parameterized enable inputs can enable measuring inputs and output cams (gate function).

For measuring inputs and output cams, TMC2x40 PN supports up to 2 edges of each servo/interpolator cycle of the SIMOTION controller.

The measuring input and cam functionality is supported by the SIMOTION technology objects Measuring Input, Cam and Cam Track.



#### Status indications

The status of the TMC compact I/O is indicated via four two-color LEDs on the module front.

- SF, group fault
- BF, bus fault
- SY/MT status "SY" (SYNC) and "MT" (maintenance)
- ON – Power on

The LINK and ACTIVITY status are also signaled on the two PROFINET ports.

On TMC1080 PN and TMC2040 PN, the channel status and the presence of the load current supply are indicated via green LEDs on the terminal block, depending on the terminal block used.

### Technical specifications

	TMC1x80 PN		TMC2x40 PN <sup>1)</sup>
<b>PROFINET interface</b>			
<b>Number of ports</b>		2	2
<b>Functionality</b>		PROFINET IO with IRT and RT	PROFINET IO with IRT and RT
• Note			IRT is required for Output Cam/Measuring Input
<b>Minimum PROFINET transmission cycle</b>	$\mu$ s	250	250
<b>Module power supply</b>			
<b>DC supply voltage</b>			
• Nominal value	V	24	24
• Permitted range	V	20.4 ... 28.8	20.4 ... 28.8
<b>Current consumption, typ.</b>			
• Note	A	0.1 Without digital inputs/outputs	0.2 Without digital inputs/outputs
<b>Power loss, max.</b>	W	3	5
<b>I/O</b>			
<b>Quantity structure</b>			
		32 DI, 32 DI/DO, 16 DO	16 high speed DI/DO with technology and push-pull drivers, 16 DI/DO with technology, 8 DI/DO
• Note		DI/DO parameterizable as DI or DO	8 DI/DO parameterizable as DI or DO; 32 DI/DO parameterizable as DI, DO, measuring input or output cam
<b>Isolation</b>			
• Note		Yes In groups of 8	Yes In groups of 8
<b>Max. cable length</b>	m (ft)	30 (98.4)	30 (98.4)

<sup>1)</sup> Technical data subject to change without notice.  
For up-to-date information, see Industry Mall.

# SIMOTION I/O components

## Compact I/O modules

### SIMOTION TMC

#### Technical specifications (continued)

	TMC1x80 PN		TMC2x40 PN <sup>1)</sup>
<b>Digital inputs</b>			
<b>DC load voltage supply</b>			
• Nominal value	V	24	24
• Permitted range	V	20.4 ... 28.8	20.4 ... 28.8
<b>Current consumption at 24 V DC</b>			
• DI	mA	15	15
• High speed DI	mA	–	0
• Note		Current consumption from load supply per group	Current consumption from load supply per group
<b>DC input voltage at digital input</b>			
• Permitted range	V	-3 ... 30	-3 ... 30
• For "0" signal	V	-3 ... 5	-3 ... 5
• For "1" signal	V	15 ... 30	15 ... 30
• Note		An unconnected digital input is interpreted as "Low"	An unconnected digital input is interpreted as "Low"
<b>Current consumption per channel</b>			
• DI	mA	2.5	2.5
• High speed DI	mA	–	5.3
• Note		IEC 61131-2 Type 1	IEC 61131-2 Type 1
<b>Input impedance</b>			
• DI	kΩ	8.8	8.8
• High speed DI	kΩ	–	4.5
<b>Input delay time, typ.</b>			
• DI	μs	15	15
• High speed DI	μs	–	1
<b>Input delay time, max.</b>			
• DI	μs	20	20
• High speed DI	μs	–	1
<b>Adjustable filter times</b>			
		1 μs/0.1 ms/0.4 ms/1.6 ms/3.2 ms	1 μs/0.1 ms/0.4 ms/1.6 ms/3.2 ms
<b>Measuring input, resolution</b>			
	μs	–	1
<b>Reproducibility of signal acquisition</b>			
• DI	μs	15	15
• High speed DI	μs	–	1
• Note		Data is based on filter time of 1 μs	Data is based on filter time of 1 μs
<b>Digital outputs</b>			
<b>DC load current supply</b>			
• Nominal value	V	24	24
• Permitted range	V	20.4 ... 28.8	20.4 ... 28.8
<b>Load current per channel</b>			
	A	0.5	0.5
<b>Lamp load, max.</b>			
	W	5	2
<b>Extinguishing power, max.</b>			
• DO	J	0.5	0.5
• High speed DO (push-pull)	J	–	0.2
• Note		Per channel, one-off pulse	Per channel, one-off pulse
<b>Output delay time</b>			
• Signal "0" -> "1", max.	μs	120	120
• Signal "1" -> "0", max.	μs	170	170
• Note		Resistive load, R <sub>L</sub> = 47 Ω	Resistive load, R <sub>L</sub> = 47 Ω
<b>Output delay time (high speed DO, push-pull)</b>			
• Signal "0" -> "1", max.	μs	–	1
• Signal "1" -> "0", max.	μs	–	1
• Note		–	Resistive load, R <sub>L</sub> = 47 Ω
<b>Output cam, resolution</b>			
	μs	–	1
<b>Reproducibility of signal output</b>			
• DO	μs	40	40
• High speed DO (push-pull)	μs	–	1

<sup>1)</sup> Technical data subject to change without notice.  
For up-to-date information, see Industry Mall.

### Technical specifications (continued)

	TMC1x80 PN		TMC2x40 PN <sup>1)</sup>
<b>Digital outputs (continued)</b>			
<b>Switching frequency, max.</b>			
• Resistive load	kHz	2	2
• Inductive load	kHz	0.002	0.002
<b>Switching frequency, max. (high speed DO, push-pull)</b>			
• Resistive load	kHz	–	64
• Inductive load	kHz	–	0.002
<b>Leakage current in switched off state, max.</b>	µA	50	50
• Note		Per channel	Per channel
<b>Voltage drop at output</b>			
• DO	V	0.7	0.7
• High speed DO (push-pull)	V	–	0.6
• Note		Load current supply to output	Load current supply to output
<b>Total current of outputs, max.</b>			
• Up to 40 °C (104 °F)	A	4	4
• Up to 55 °C (131° F) (derating)	A	2	2
• Note		Current per group of 8	Current per group of 8
<b>Outputs protected against continuous short-circuit, overload and reverse-polarity</b>	V	36	36
<b>Other technical specifications</b>			
<b>Ambient temperature up to an altitude of 2000 m</b>			
• Without derating	°C (°F)	0 ... +40 (+32 ... +104)	0 ... +40 (+32 ... +104)
• With derating	°C (°F)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)
<b>Storage Temperature</b>	°C (°F)	-40 ... +85 (-40 ... +185)	-40 ... +85 (-40 ... +185)
<b>Relative humidity</b>	%	5 ... 95	5 ... 95
• Note		No condensation	No condensation
<b>Degree of protection</b>		IP 20	IP 20
<b>Weight</b>	kg (lb)	1.5 (3.31)	1.3 (2.86)
<b>Height</b>	mm (in)	286 (11.26)	286 (11.26)
<b>Width</b>	mm (in)	75 (2.95)	50 (1.97)
<b>Depth</b>	mm (in)	165 (6.50)	165 (6.50)
• Note		Dimensions without connector, strain relief/shield support	Dimensions without connector, strain relief/shield support
<b>Approvals</b>			
<b>USA</b>		UL 508c	UL 508c
<b>Canada</b>		–	–

<sup>1)</sup> Technical data subject to change without notice.  
For up-to-date information, see Industry Mall.

# SIMOTION I/O components

## Compact I/O modules

### SIMOTION TMC

#### Selection and ordering data

Description	Order No.
<b>TMC1080 PN</b> Compact I/O designed in SINAMICS S120 Booksize Compact format, for PROFINET IO, for direct wiring to terminal blocks, 32 DI, 32 DI/DO, 16 DO <i>Requires SIMOTION SCOUT V4.3 SP1 HF3</i>	<b>6AU1101-0AB00-0AA0</b>
<b>TMC1180 PN</b> Compact I/O designed in SINAMICS S120 Booksize Compact format, for PROFINET IO, for indirect wiring through wiring modules, 32 DI, 32 DI/DO, 16 DO <i>Requires SIMOTION SCOUT V4.3 SP1 HF3</i>	<b>6AU1101-1AB00-0AA0</b>
<b>TMC2040 PN</b> Compact I/O designed in SINAMICS S120 Booksize Compact format, for PROFINET IO, for direct wiring to terminal blocks, 16 high speed DI/DO with technology drivers and push-pull drivers, 16 DI/DO with technology, 8 DI/DO <i>Requires SIMOTION SCOUT V4.3.x<sup>1)</sup></i>	<b>6AU1102-0AB00-0AA0<sup>2)</sup></b>
<b>TMC2140 PN</b> Compact I/O designed in SINAMICS S120 Booksize Compact format, for PROFINET IO, for indirect wiring through wiring modules, 16 high speed DI/DO with technology drivers and push-pull drivers, 16 DI/DO with technology, 8 DI/DO <i>Requires SIMOTION SCOUT V4.3.x<sup>1)</sup></i>	<b>6AU1102-1AB00-0AA0<sup>2)</sup></b>

#### Accessories

Description	Order No.
<b>Accessories for TMC1x80 PN and TMC2x40 PN</b>	
<b>Connector set, screw-type 1-wire system, without LEDs</b> 5 terminal blocks (10-pole)	<b>6AU1100-0AA00-0AA0</b>
<b>Connector set, push-in 1-wire system, with LEDs</b> 5 terminal blocks (10-pole)	<b>6AU1100-0AB00-0AA0</b>
<b>Connector set, push-in 3-wire system, with LEDs</b> 5 terminal blocks (30-pole)	<b>6AU1100-0AC00-0AA0</b>
<b>Strain relief/shield support</b> For I/O cable, for commercially available clamps up to 12 mm (0.47 in)	<b>6AU1100-1AB00-0AA0</b>
<b>Accessories for PROFINET</b>	
<b>RJ45 FastConnect connector for Industrial Ethernet/PROFINET</b> 180° cable outlet • 1 pack = 1 unit • 1 pack = 10 units • 1 pack = 50 units	<b>6GK1901-1BB10-2AA0</b> <b>6GK1901-1BB10-2AB0</b> <b>6GK1901-1BB10-2AE0</b>

Description	Order No.
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#### Accessories for PROFINET (continued)

<b>FastConnect cables for Industrial Ethernet/PROFINET<sup>3)</sup></b> • IE FC Standard Cable GP 2x2 • IE FC Flexible Cable GP 2x2 • IE FC Trailing Cable GP 2x2 • IE FC Trailing Cable 2x2 • IE FC Marine Cable 2x2	<b>6XV1840-2AH10</b> <b>6XV1870-2B</b> <b>6XV1870-2D</b> <b>6XV1840-3AH10</b> <b>6XV1840-4AH10</b>
<b>Stripping tool for Industrial Ethernet/PROFINET FastConnect cables</b> IE FC stripping tool	<b>6GK1901-1GA00</b>

Description	Type/Item No.
	Available from: Phoenix Contact <a href="https://catalog.phoenixcontact.net">https://catalog.phoenixcontact.net</a>

#### Accessories for SIMOTION TMC1180 PN and TMC2140 PN

<b>Wiring module</b> 50-pole without LEDs (VARIOFACE module with tension clamp spring connection)	Type: UM 45-FLK50/ZFKDS Item No.: 293585
<b>Wiring module</b> 50-pole with LEDs (VARIOFACE module with screw-type connection)	Type: VIP-3/SC/FLK50/LED Item No.: 2322113
<b>Connecting cable</b> For connecting the separate wiring modules to the TMC compact I/O (pre-assembled round cable with two 50-pole spring-loaded terminal strips)	Type: FLK50/EZ-DR/100/KONFEK/S (example for 1 m (3.28 ft) cable length)
<b>Connecting cable</b> For connecting the separate wiring modules to the TMC compact I/O (pre-assembled round cable with two overmolded 50-pole spring-loaded terminal strips)	Type: VIP-CAB-FLK50/0.14/3.0M (example for 3 m (9.84 ft) cable length)

#### Note on connector sets

Two connector sets (2 × 5 connectors) are required for TMC1080 PN. One connector set is sufficient for TMC2040 PN. Connectors from the different sets can be used together on the same module (e.g. when only a subset of the I/O channels is required in a 3-wire system).

Two 10-pole terminal blocks are required for the load current supply of the digital inputs and outputs with TMC1180 PN and one 10-pole terminal block is required with TMC2140.

#### Note on wiring modules

With TMC1180 PN, two wiring modules and two connecting cables are required. One wiring module and one connecting cable are sufficient for TMC2140 PN.

One (TMC2140 PN) or two (TMC1180 PN) 10-pole terminal blocks are also required alternatively with or without LEDs for load current supply of the I/O channels.

#### More information

You will find information about integrating TMC compact I/O into automation solutions that do not use SIMOTION controllers on the Internet at:

<http://support.automation.siemens.com/WWW/view/en/59886631>

<sup>1)</sup> For the applicable SCOUT version, see the delivery release announcement at:  
<http://support.automation.siemens.com/WWW/view/en/10805436/133400>

<sup>2)</sup> Available soon.

<sup>3)</sup> Sold by the meter. Max. delivery unit 1000 m (3281 ft), minimum order quantity 20 m (65.62 ft).

# SIMOTION I/O components

## Power supplies

Power supplies for  
SIMOTION C / SIMATIC ET 200M

### Overview



PS307 power supply, 5 A

The PS305/PS307 power supplies convert the line voltage (120 V/230 V AC, 24 V to 110 V DC) into the 24 V DC operating voltage and are directly snapped onto the SIMATIC S7-300 mounting rail.

The following versions are available for the output currents:

- 2 A
- 5 A
- 10 A

The required summation current should be taken into account when sizing in the power supply (e.g. current draw of SIMOTION C, supply for the digital outputs).

### Application

Controlled 24 V DC power supply for:

- SIMOTION C
- Distributed I/O (e.g. SIMATIC ET 200M)
- Sensors
- Actuators

### Design

The power supplies are snapped onto the SIMATIC S7-300 mounting rail to the left of the SIMOTION C Motion Controller or SIMATIC ET 200M interface (IM 153).

The front of the module contains:

- An LED (signals that the 24 V DC output voltage is ON)
- Supply voltage selector switch with protective cap for selecting the input voltage of 120 V AC or 230 V AC
- ON/OFF switch for 24 V DC output voltage
- Terminals for input voltage, output voltage and ground, covered by the front door

The power supplies can also be mounted onto a 35 mm DIN rail (EN 50022). Mounting adapters are required for this purpose:

- 1 adapter for PS307, 24 V DC/2 A, 24 V DC/5 A
- 2 adapters for PS307, 24 V DC/10 A

### Selection and ordering data

Description	Order No.
<b>SIMATIC S7-300, controlled power supply, 1-phase</b>	
• 120/230 V AC; 24 V DC/2 A	<b>6ES7307-1BA01-0AA0</b>
• 24 V ... 110 V DC; 24 V DC/2 A (extended temperature range)	<b>6ES7305-1BA80-0AA0</b>
• 120/230 V AC; 24 V DC/5 A	<b>6ES7307-1EA01-0AA0</b>
• 120/230 V AC; 24 V DC/5 A (extended temperature range)	<b>6ES7307-1EA80-0AA0</b>
• 120/230 V AC; 24 V DC/10 A	<b>6ES7307-1KA02-0AA0</b>
<b>Mounting adapter</b> for snapping the PS307 onto 35 mm (1.38 in) standard rails (EN 50022)	<b>6ES7390-6BA00-0AA0</b>

### More information

For further information, see [Catalog ST 70](#) and the [Industry Mall](#) under [Automation technology/Automation systems/SIMATIC Industrial automation systems/Controllers/SIMATIC S7 modular controllers/S7-300/S7-300F/Power supplies](#).



# SIMOTION I/O components

## Power supplies

### Universal SITOP power supplies

#### Overview



Power supplies (one, two or three-phase)

The controlled SITOP power supplies are snapped onto a 35 mm (1.38 in) standard mounting rail (EN 50022). They cannot be snapped onto the SIMATIC S7-300 mounting rail.

#### SITOP modular

The SITOP modular power supply comprises of standard devices with 5 A, 10 A, 20 A and 40 A options which can be expanded with additional modules. The modularity offers advantages with respect to flexibility and simple handling. The wide-range input, Class B radio interference category according to EN 55022 and limitation of input current harmonics to EN 61000-3-2 make these power supplies suitable for use in many different application areas.

#### Basic units/features

- 5 A and 10 A basic units with 120/230 to 500 V AC wide-range input for operation on 1-phase network as well as 2-phase operation on 3-phase network (connection to two phases of a 3-phase supply network)
- 20 A and 40 A basic units with 120/230 V AC input voltage for 1-phase operation or with 400 to 500 V 3 AC wide-range input for 3-phase operation
- Extremely small width of the 3-phase 20 A basic unit (70 mm (2.76 in) wide)
- Selectable "constant current" or "stored tripping" short-circuit behavior
- 3 LEDs for signaling "24 V OK", "Overload" and "Stored tripping"
- Adjustable output voltage up to 28.8 V to compensate for voltage drops
- Power boost supports up to three times the rated current

#### Supplementary modules for function expansions

Buffer module for extending the network failure buffering time to 100 ms for 40 A load currents and up to 800 ms for 5 A load currents

Signaling module for providing signals about the operating status of the power supply ("DC Voltage OK", "Ready") as well as for remote activation/deactivation of the power supply

Redundancy module for decoupling two power supplies during parallel operation (continued)

#### SITOP select diagnostics module

The SITOP select diagnostics module is used for dividing the load current into four current paths for monitoring the individual subcurrents.

#### SITOP smart

The 1-phase power supply for universal applications with a narrow construction; 150 % extra power and 120 % rated power up to 45 °C (113 °F). Without limitation of the line harmonics according to EN 61000-3-2 with the industrial version (-2AA01 types).

#### SITOP power in flat design

SITOP power in flat design is preferred where only small mounting depths are available, for example, when distributed I/O is used, in machines or recesses.

#### Selection and ordering data

Description	Order No.
<b>SITOP modular power supply</b>	
• 1-phase/2-phase	
- 120/230 ... 500 V AC; 24 V DC/5 A	<b>6EP1333-3BA00</b>
- 120/230 ... 500 V AC; 24 V DC/10 A	<b>6EP1334-3BA00</b>
- 120/230 V AC; 24 V DC/20 A	<b>6EP1336-3BA00</b>
- 120/230 V AC; 24 V DC/40 A	<b>6EP1337-3BA00</b>
• 3-phase	
- 400 ... 500 V AC; 24 V DC/20 A	<b>6EP1436-3BA10</b>
- 400 ... 500 V AC; 24 V DC/40 A	<b>6EP1437-3BA00</b>
<b>Add-on modules for SITOP modular</b>	
• Buffer module	<b>6EP1961-3BA01</b>
• Signaling module	<b>6EP1961-3BA10</b>
• Redundancy module	<b>6EP1961-3BA21</b>
<b>SITOP select diagnostics module, 4 channels</b>	<b>6EP1961-2BA00</b>
<b>SITOP smart power supply, 1-phase</b>	
• 120/230 V AC; 24 V DC/2.5 A	<b>6EP1332-2BA10</b>
• 120/230 V AC; 24 V DC/5 A	<b>6EP1333-2BA01</b>
• 120/230 V AC; 24 V DC/5 A (industrial version)	<b>6EP1333-2AA01</b>
• 120/230 V AC; 24 V DC/10 A	<b>6EP1334-2BA01</b>
• 120/230 V AC; 24 V DC/10 A (industrial version)	<b>6EP1334-2AA01</b>
<b>Power supply SITOP power, slimline design, 1-phase</b>	
• 120/230 V AC; 24 V DC/5 A	<b>6EP1333-1AL12</b>
• 120/230 V AC; 24 V DC/10 A	<b>6EP1334-1AL12</b>

#### More information

For further information, see Catalog KT 10.1 and the Industry Mall under Automation technology/Power supplies/SITOP Power Supplies.

### Uninterruptible SITOP power supplies with battery module

#### Overview



DC UPS module with battery module

By combining a DC UPS module with at least one 24 V battery module and one SITOP power supply, longer power failures can be completely bridged.

This combination can be used e.g. in

- mechanical engineering
- textile industry
- all types of production lines and filling systems

This prevents the negative effects which often result due to power failures.

Siemens offers the uninterruptible power supplies DC UPS 6 A, DC UPS 15 A and DC UPS 40 A as well as the battery modules 1.2 Ah, 2.5 Ah, 3.2 Ah, 7 Ah and 12 Ah for "NONSTOP" applications.

#### Benefits

DC UPS modules for complete uninterruptible bridging of power failures including exhaustive discharge protection, battery life time monitoring and ON/OFF control current circuit.

- 24 V DC input voltage (supply through SITOP power supply from 5 A rated current)
- Rated output power 144 W (DC UPS 6 A) and 360 W (DC UPS 15 A)
- Rated output power 480 W or 960 W (DC UPS 40 A with one or two battery modules)
- High efficiency of approx. 95 to 97 %
- Power ON threshold adjustable through DIP switch between 22 V and 25.5 V
- Bridging time adjustable with DIP switch in the range between 5 and 635 s or until switched off automatically due to complete discharge
- Option: Signals can be output via serial interface or USB interface, automatic reset of industrial PCs supported through selectable shut-down behavior

#### Function

The rechargeable battery is connected to the system as soon as the load voltage or the voltage between the connections L+/M of the DC UPS module falls below the set value of the 22 to 25.5 V threshold.

After a power failure the battery module is disconnected automatically from the loads by electronic means and immediately recharged with a 0.2/0.4 A (DC UPS module 6 A), 0.35/0.7 A (DC UPS module 15 A) or 1/2 A (DC UPS module 40 A) constant current (U/I characteristic with 26.3 to 29.3 V end-of-charge voltage).

For increased load current demands (e.g., when incandescent lamps, power contactors with DC auto-connected windings, DC motors, DC/DC converters, electronic modules with high input capacity are connected to the system), electronically limited peak currents are supplied automatically.

The operating state (mains/battery operation, battery level > 85 % as well as buffer ready/alarm) is signaled with LEDs and isolated relay contacts.

For SIMOTION P350 and SIMOTION P320 applications, the UPS module can be used with a serial interface or USB interface. The operating state is indicated on an SP\_SITOP application that is already installed on SIMOTION P350 and SIMOTION P320. An action can be defined for each status change of the UPS during configuration of the application. The operating status of the UPS is also available to the user program via a system variable.

#### Selection and ordering data

Description	Order No.
<b>SITOP DC UPS module</b>	
• 24 V / 6 A	<b>6EP1931-2DC21</b>
• 24 V / 6 A, with serial interface	<b>6EP1931-2DC31</b>
• 24 V / 6 A, with USB interface	<b>6EP1931-2DC42</b>
• 24 V / 15 A	<b>6EP1931-2EC21</b>
• 24 V / 15 A, with serial interface	<b>6EP1931-2EC31</b>
• 24 V / 15 A, with USB interface	<b>6EP1931-2EC42</b>
• 24 V / 40 A	<b>6EP1931-2FC21</b>
• 24 V / 40 A, with USB interface	<b>6EP1931-2FC42</b>
<b>SITOP battery module</b>	
• 24 V / 1.2 Ah for DC UPS module, 6 A	<b>6EP1935-6MC01</b>
• 24 V / 2.5 Ah for DC UPS module, 6 A and 15 A	<b>6EP1935-6MD31</b>
• 24 V / 3.2 Ah for DC UPS module, 6 A and 15 A	<b>6EP1935-6MD11</b>
• 24 V / 7 Ah for DC UPS module, 6 A, 15 A and 40 A	<b>6EP1935-6ME21</b>
• 24 V / 12 Ah for DC UPS module, 6 A, 15 A and 40 A	<b>6EP1935-6MF01</b>

#### More information

For further information, see Catalog KT 10.1 and the Industry Mall under Automation technology/Power supplies/SITOP Power Supplies/24 V DC uninterruptible power supplies.

# SIMOTION I/O components

## Power supplies

### Uninterruptible power supplies with capacitor module

#### Overview



DC UPS with capacitor module

Uninterruptible power supplies normally store the electrical energy in lead-acid batteries. The temperatures that prevail inside the cabinet, however, shorten the service life of the batteries considerably and require regular replacement, e.g. annually at ambient temperatures of 40 °C (104 °F). The innovative SITOP UPS500 is, however, based on completely maintenance-free capacitors with a long service life. Even at temperatures of 50 °C (122 °F) they still have more than 80 % of their capacity after 8 years, so there is no need to replace the energy stores. Because the capacitors do not emit any gas, the control cabinet does not have to be ventilated. Another advantage are the significantly shorter charging times of the double-layer capacitors which ensure that the buffer is ready very quickly after loss of power.

#### Benefits

##### Basic device 15 A, SITOP UPS500S

- Compact design, degree of protection IP20
- Integrated energy storage: 2.5 kW or 5 kW
- Easily expanded with the 5 kW expansion module (up to 3 expansion modules can be connected)
- Signaling of the operating states and capacitor discharge > 85 %
- Support for automatic reset of industrial PCs through selectable shutdown characteristics
- USB interface

##### Basic device 7 A, SITOP UPS500P

- Compact design, degree of protection IP65
- For distributed applications without control cabinet
- Integrated energy storage: 5 kW or 10 kW
- High efficiency of approx. 96.6 %
- Low power losses of approx. 6 W at 7 A load current
- Signaling of the operating states and capacitor discharge > 85 %
- USB interface

#### Function

Communication with the control can be implemented via the USB interface. In the case of the UPS500S, also via relay contacts.

The backup time is shorter than with lead-acid battery solutions, but in many cases it suffices in order to back up data and shut down the machine in a controlled manner.

#### Selection and ordering data

Description	Order No.
<b>SITOP UPS500S with capacitor</b>	
• 24 V / 15 A, with USB interface and 2.5 kW	<b>6EP1933-2EC41</b>
• 24 V / 15 A, with USB interface and 5 kW	<b>6EP1933-2EC51</b>
<b>SITOP UPS500P with capacitor</b>	
• 24 V / 7 A, with USB interface and 5 kW	<b>6EP1933-2NC01</b>
• 24 V / 7 A, with USB interface and 10 kW	<b>6EP1933-2NC11</b>
<b>Accessories</b>	
SITOP UPS501S expansion module For extension of the buffering time for connection to a SITOP UPS500S	
• 24 V / 15 A and 5 kW	<b>6EP1935-5PG01</b>
Connector set for UPS500P Input/output connector, USB signal cable 2 m (6.56 ft)	<b>6EP1975-2ES00</b>

#### More information

For further information, see Catalog KT 10.1 and the Industry Mall under Automation technology/Power supplies/SITOP Power Supplies/24 V DC uninterruptible power supplies.

### Overview



SIMATIC S7-300 I/O Modules

The following SIMATIC S7-300 I/O modules can be used as:

- Central I/O within SIMOTION C240.  
The I/O configuration comprises two tiers for central I/O with up to 8 I/O Modules per tier, of which up to 4 can be Analog Modules. The second tier is connected over the IM 365 interface module.
- Distributed I/O in the modular I/O system SIMATIC ET 200M with the IM 153 Head Module (up to 8 or 12 I/O Modules per SIMATIC ET 200M, depending on the Head Module)

I/O modules transform the levels of the external digital and analog process signals into the internal signal levels for SIMOTION and vice versa. In addition, signal-preprocessing Function Modules and Communication Modules are available.

### Benefits

#### User benefits through use of SIMATIC S7-300 I/O modules

- **Optimal adaptation**  
The number of inputs/outputs can be adapted to the corresponding task with the help of modules which can be combined as required. Unnecessary investments can be avoided.
- **Flexible process connection**  
SIMOTION can be connected to the process over different digital and analog actuators and sensors.
- **Powerful analog technology**  
Various input/output ranges and high resolution allows for the connection of many different analog sensors and actuators.
- **Intelligent function modules**  
Function Modules (FM) relieve the CPU from time-intensive tasks such as counting and output cams.
- **Communication modules**  
Communication modules (CP) implement serial data exchange over point-to-point connections and connection of AS-Interface slaves.

### Design

SIMATIC S7-300 I/O Modules for digital and analog inputs/outputs have the following mechanical characteristics:

- **Compact design**  
The rugged plastic casing contains:
  - Green LEDs for indicating the signal states on the inputs/outputs
  - Red LED to indicate that a diagnosis is being performed (for modules capable of diagnostics)
  - Sockets for front connectors, protected behind front door
  - Labeling area on front door
- **Simple assembly**  
The modules are mounted one after the other on the mounting rail from the left to the right and connected to neighboring modules with bus connectors. There are no slot rules.
- **User-friendly wiring**  
The modules are wired with front connectors. When the module is connected for the first time, a coding latches in the connector so that the connector now only fits onto modules of the same type. When a module is replaced, the front connector can be plugged onto the new module of the same type with the complete wiring. The front connectors are available with screw-type or spring-loaded terminals or with the FastConnect connection system.

### Integration

#### Connectable devices

The following can be connected to SIMOTION over I/O Modules:

- Digital and analog sensors/actuators
- Switches
- Encoders
- Printers, barcode readers, ...
- AS-Interface slaves
- Identification systems
- Weighing systems
- ...

### More information

For further information, see Catalog ST 70 and the Industry Mall under [Automation technology/Automation Systems/SIMATIC Industrial Automation Systems/Controllers/SIMATIC S7 modular controllers/S7-300/S7-300F](#).

The I/O Modules which can be used with SIMOTION are listed in a compatibility list which can be found at:

<http://support.automation.siemens.com/WW/view/en/11886029>

# SIMOTION I/O components

## SIMATIC S7-300 I/O

### Digital Modules

#### Selection and ordering data

Description	Order No.
<b>Digital Input Modules SM 321 <sup>1)</sup>, isolated</b>	
• <b>16 DI</b> , 24 V DC	
- Standard	<b>6ES7321-1BH02-0AA0</b>
- Isochronous, High Speed	<b>6ES7321-1BH10-0AA0</b>
- Active low input	<b>6ES7321-1BH50-0AA0</b>
• <b>32 DI</b> , 24 V DC, 40-pole	<b>6ES7321-1BL00-0AA0</b>
• <b>64 DI</b> , 24 V DC, active high/low (parameterizable)	<b>6ES7321-1BP00-0AA0</b>
• <b>8 DI</b> , 120/230 V AC	
- Standard, 20-pole	<b>6ES7321-1FF01-0AA0</b>
- With single-root, 40-pole	<b>6ES7321-1FF10-0AA0</b>
• <b>16 DI</b> , 24 ... 48 V AC/DC with single root, 40-pole	<b>6ES7321-1CH00-0AA0</b>
• <b>16 DI</b> , 48 ... 125 V DC, 20-pole	<b>6ES7321-1CH20-0AA0</b>
• <b>16 DI</b> , 120/230 V AC, 20-pole	<b>6ES7321-1FH00-0AA0</b>
• <b>32 DI</b> , 120 V AC, 40-pole	<b>6ES7321-1EL00-0AA0</b>
• <b>16 DI</b> , 24 V DC, 20-pole Process alarm, diagnostics, parameterizable input delay, isochronous	<b>6ES7321-7BH01-0AB0</b>
<b>Digital Output Modules SM 322 <sup>1)</sup>, isolated</b>	
• <b>8 DO</b> , 24 V DC, 2 A, 20-pole	<b>6ES7322-1BF01-0AA0</b>
• <b>8 DO</b> , 48 ... 125 V DC, 1.5 A, 20-pole	<b>6ES7322-1CF00-0AA0</b>
• <b>16 DO</b> , 24 V DC, 0.5 A, 20-pole	
- Standard	<b>6ES7322-1BH01-0AA0</b>
- Isochronous, High Speed	<b>6ES7322-1BH10-0AA0</b>
• <b>32 DO</b> , 24 V DC, 0.5 A, 40-pole	<b>6ES7322-1BL00-0AA0</b>
• <b>64 DO</b> , 24 V DC, 0.3 A	
- Current sourcing	<b>6ES7322-1BP00-0AA0</b>
- Current sinking	<b>6ES7322-1BP50-0AA0</b>

Description	Order No.
<b>Digital Output Modules SM 322 <sup>1)</sup>, isolated</b>	
• <b>8 DO</b> , 120/230 V AC, 1 A, 20-pole	<b>6ES7322-1FF01-0AA0</b>
• <b>8 DO</b> , 120/230 V AC, 2 A, 40-pole with single root and selectable failure mode	<b>6ES7322-5FF00-0AB0</b>
• <b>16 DO</b> , 120/230 V AC, 1 A, 20-pole	<b>6ES7322-1FH00-0AA0</b>
• <b>32 DO</b> , 120/230 V AC, 1 A, double-width, 2 × 20-pole	<b>6ES7322-1FL00-0AA0</b>
• <b>8 DO</b> (relay), 24 V DC, 2 A or 230 V AC, 2 A, 20-pole	<b>6ES7322-1HF01-0AA0</b>
• <b>8 DO</b> (relay), 120 V DC, 5 A or 230 V AC, 5 A, 40-pole, connector with spring-loaded terminal, can be used for 6ES7392-1BM01-0AA0 and higher	<b>6ES7322-1HF10-0AA0</b>
• <b>8 DO</b> (relay), 24 V DC, 120 ... 230 V AC, 5 A, 40-pole with RC filter overvoltage protection	<b>6ES7322-5HF00-0AB0</b>
• <b>16 DO</b> , solid state relay, 24 ... 48 V AC/DC, 0.5 A, 40-pole with single root	<b>6ES7322-5GH00-0AB0</b>
• <b>16 DO</b> (relay), 24 ... 120 V DC, 2 A or 48 ... 230 V AC, 2 A, 20-pole	<b>6ES7322-1HH01-0AA0</b>
• <b>8 DO</b> , 24 V DC, 0.5 A, 20-pole Short-circuit protection, diagnostics	<b>6ES7322-8BF00-0AB0</b>
<b>SM323 / SM327 Digital Input/Output Modules <sup>1)</sup>, isolated</b>	
• <b>8 DI</b> , 8 DO, 24 V DC, 0.5 A, 20-pole	<b>6ES7323-1BH01-0AA0</b>
• <b>16 DI</b> , 16 DO, 24 V DC, 0.5 A, 40-pole	<b>6ES7323-1BL00-0AA0</b>
• <b>8 DI</b> , 8 DX, 24 V DC, 0.5 A, 20-pole, 8 DX per single channel parameterizable as DI or DO	<b>6ES7327-1BH00-0AB0</b>

#### More information

For further information, see [Catalog ST 70](#) and the [Industry Mall](#) under [Automation technology/Automation Systems/SIMATIC Industrial Automation Systems/Controllers/SIMATIC S7 modular controllers/S7-300/S7-300F/Signal modules/Digital modules](#).

<sup>1)</sup> Incl. labeling strips and bus connectors, front connector required (if not specified otherwise).  
64-channel modules require special terminal blocks and connecting cables, see Accessories and spare parts.

### Selection and ordering data

Description	Order No.
<b>Analog Input Modules SM 331<sup>1)</sup>, isolated</b>	
<ul style="list-style-type: none"> <li>• <b>2 AI</b>, 20-pole (1 AI for resistance-based sensor), U/I/thermoelement/resistor/ Pt 100/Ni 100, alarm, diagnostics, resolution 9/12/14 bit (+ sign)</li> </ul>	<b>6ES7331-7KB02-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>8 AI</b>, 20-pole (4 AI for resistance-based sensor), U/I/thermoelement/resistor/ Pt 100/Ni 100, alarm, diagnostics, resolution 9/12/14 bit (+ sign)</li> </ul>	<b>6ES7331-7KF02-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>8 AI</b>, 40-pole U/I/resistor/Pt 100/Ni 100/Ni 1000/LG-Ni 1000 (standard, air-conditioned), resolution 12 bit + sign/13 bit</li> </ul>	<b>6ES7331-1KF02-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>8 AI</b>, 40-pole U/I, alarm and diagnostics, resolution 13 bit + sign/14 bit, isochronous, High Speed</li> </ul>	<b>6ES7331-7HF01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>8 AI</b>, 40-pole U/I, alarm and diagnostics, resolution 15 bit (+ sign)</li> </ul>	
- 2 channels with limit value monitoring, isolation between channels and backplane bus	<b>6ES7331-7NF00-0AB0</b>
- Fast measured value update, 8 channels with limit value monitoring, isolation between channels and backplane bus as well as between channels in groups of 2	<b>6ES7331-7NF10-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>8 AI</b>, 40-pole 2/3/4-wire, resistor, Pt 100/200/500/1000, Ni 100/120/200/500/1000, Cu 10, characteristics acc. to GOST, 16 bit (24 bit internally)</li> </ul>	<b>6ES7331-7PF01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>8 AI</b>, 40-pole thermoelements Types B, E, J, K, L, N, R, S, T, U, TXK/TXK(L) according to GOST, 16 bit (24 bit internally)</li> </ul>	<b>6ES7331-7PF11-0AB0</b>
<b>Analog Output Modules SM 332<sup>1)</sup>, isolated</b>	
<ul style="list-style-type: none"> <li>• <b>AO</b>, 0 ... 10 V, ± 10 V, 1 ... 5 V, 0/4 ... 20 mA, ± 20 mA 11 bit + sign/12 bit</li> </ul>	
- 2 AO, 20-pole	<b>6ES7332-5HB01-0AB0</b>
- 4 AO, 20-pole	<b>6ES7332-5HD01-0AB0</b>
- 8 AO, 40-pole	<b>6ES7332-5HF00-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>4 AO</b>, 20-pole 0 ... 10 V, ± 10 V, 1 ... 5 V, 0/4 ... 20 mA, ± 20 mA 14 bit + sign/15 bit + sign, isochronous, High Speed</li> </ul>	<b>6ES7332-7ND02-0AB0</b>

Description	Order No.
<b>Fast analog Input/Output Modules SM 334<sup>1)</sup></b>	
<ul style="list-style-type: none"> <li>• <b>4 AI, 2 AO</b>, 20-pole non-isolated, 0 to 10 V, 0 ... 20 mA, 8 bit</li> </ul>	<b>6ES7334-0CE01-0AA0</b>
<ul style="list-style-type: none"> <li>• <b>4 AI, 2 AO</b>, 20-pole (2 AI under power), isolated, 12 bit, Input: 0 ... 10 V, Pt 100 (climatic range only), resistance measurement 10 kΩ, Output: 0 ... 10 V</li> </ul>	<b>6ES7334-0KE00-0AB0</b>
<b>Fast analog Input/Output Modules SM 335<sup>1)</sup></b>	
4 fast analog inputs (basic conversion time for 4 channels, max. 1 ms), 4 fast analog outputs (conversion time per channel, max. 0.8 ms), encoders supplied with 10 V/25 mA, 1 counter input (24 V/500 Hz), special operating modes: "Measuring only" and "Comparator"	
<ul style="list-style-type: none"> <li>• <b>4 AI, 4 AO</b>, 20-pole isolated, alarm and diagnostics, Input: ±1 V, ±2.5 V, ±10 V, 0 ... 2 V, 0 ... 10 V, ±10 mA, 0/4 ... 20 mA, 13 bit + sign, 14 bit; (up to 2 channels parameterizable) Output: ±10 V, 0 ... 10 V, 11 bit + sign, 12 bit</li> </ul>	<b>6ES7335-7HG02-0AB0</b>
<b>Accessories</b>	<a href="#">See Accessories and spare parts</a>

### More information

For further information, see Catalog ST 70 and the Industry Mall under Automation technology/Automation Systems/SIMATIC Industrial Automation Systems/Controllers/SIMATIC S7 modular controllers/S7-300/S7-300F/Signal modules/Analog modules.

<sup>1)</sup> Incl. labeling strips and bus connectors, front connector required (if not specified otherwise).

# SIMOTION I/O components

## SIMATIC S7-300 I/O

### FM 350-1 Counter Module

#### Overview



- Single-channel, intelligent Counter Module for simple counting tasks
- For direct connection of 24 V incremental encoders
- Compare function with two definable comparison values
- Integrated digital outputs for response output when the comparison value is reached
- Operating modes:
  - Continuous counting
  - One-time counting
  - Periodic counting
- Special functions:
  - Set counter
  - Latch counter
  - Start/stop counter via gate function
- Plug-in option for 20-pole front connector

#### Integration

The single-channel FM 350-1 Counter Module can be operated as follows:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The standard functions required to use the FM 350-1 Counter Module in combination with SIMOTION are part of the SCOUT command library.

#### Selection and ordering data

Description	Order No.
<b>FM 350-1 Counter Module</b> max. 500 kHz, 1 channel, incl. SIMATIC configuration package on CD-ROM	<b>6ES7350-1AH03-0AE0</b>

### FM 350-2 Counter Module

#### Overview



- 8-channel intelligent Counter Module for universal counting and measuring tasks
- For direct connection of 24 V incremental encoders, direction encoders, initiators, or NAMUR encoders
- Compare function with definable comparison values (number depends on operating mode)
- Integrated digital outputs for response output when the comparison value is reached
- Operating modes:
  - Continuous/one-time/periodic counting
  - Frequency/speed measurement
  - Period measurement
  - Dosing
- Plug-in option for 40-pole front connector

#### Integration

The 8-channel FM 350-2 Counter Module can be operated as follows:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The standard functions required to use the FM 350-2 Counter Module in combination with SIMOTION are part of the SCOUT command library.

#### Selection and ordering data

Description	Order No.
<b>FM 350-2 Counter Module</b> max. 20 kHz, 8 channels, incl. SIMATIC configuration package on CD-ROM	<b>6ES7350-2AH01-0AE0</b>

### FM 352 Electronic cam controller

#### Overview



- High-speed electronic cam controller
- Economical alternative to mechanical cam controllers
- 32 cam tracks, 13 onboard digital outputs for the direct output of actions
- Position sensing by means of incremental encoder or absolute encoder with synchronous serial transmission (SSI)
- Plug-in option for 20-pole front connector

#### Integration

The FM 352 Electronic cam controller can be operated:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The standard functions required to use the FM 352 cam controller in combination with SIMOTION are part of the SCOUT command library.

#### Selection and ordering data

Description	Order No.
<b>FM 352 Electronic cam controller</b> Incl. SIMATIC configuration package on CD-ROM	<b>6ES7352-1AH02-0AE0</b>
<b>Sub-D connector</b> 15-pole, pins; for encoder cable	<b>6ES5750-2AA21</b>

### FM 352-5 High-speed Boolean processor

#### Overview



- High-speed processor for Boolean operations (LAD, FBD); processes them at a fixed cycle time of 1  $\mu$ s.
- Designed for applications that require an extremely fast response time
- 12 integrated digital inputs
- 8 integrated digital outputs
- 1 channel for connection of a 24 V incremental encoder, a 5 V incremental encoder (RS 422) or an SSI absolute encoder
- The application program is written with the STEP 7 program editor and stored on the Micro Memory Card (MMC) in compiled form after successful simulation
- Plug-in option for 40-pole front connector

#### Integration

The FM 352-5 High-speed Boolean processor can be operated:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

#### Selection and ordering data

Description	Order No.
<b>FM 352-5 High-speed Boolean processor</b>	
• With current sinking digital outputs	<b>6ES7352-5AH01-0AE0</b>
• With current sourcing digital outputs	<b>6ES7352-5AH11-0AE0</b>
<b>Micro Memory Card</b>	
• 128 KB	<b>6ES7953-8LG20-0AA0</b>
• 512 KB	<b>6ES7953-8LJ30-0AA0</b>



# SIMOTION I/O components

## SIMATIC S7-300 I/O

### CP 340 Communication Module

#### Overview



- The cost-effective, complete solution for serial communication over a point-to-point connection
- 3 versions with various physical transmission characteristics:
  - RS 232 C (V.24),
  - 20 mA (TTY),
  - RS 422/RS 485 (X.27)
- Implemented protocols: ASCII, 3964 (R) and printer driver (3964; not for RS 485)
- Simple configuration over SCOUT with integrated parameterization tool

#### Integration

The CP 340 Communication Module can be operated:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The standard functions required to use the CP 340 Communication Module in combination with SIMOTION are part of the SCOUT command library.

#### Selection and ordering data

Description	Order No.
<b>CP 340 Communication Module</b> Incl. SIMATIC configuration package on CD-ROM with: <ul style="list-style-type: none"> <li>• 1 RS 232 C interface (V.24)</li> <li>• 1 20 mA interface (TTY)</li> <li>• 1 RS 422/485 (X.27) interface</li> </ul>	<b>6ES7340-1AH02-0AE0</b> <b>6ES7340-1BH02-0AE0</b> <b>6ES7340-1CH02-0AE0</b>
<b>RS 232 C signal cable</b> each 9-pole Sub-D socket <ul style="list-style-type: none"> <li>• 5 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 15 m (49.22 ft)</li> </ul>	<b>6ES7902-1AB00-0AA0</b> <b>6ES7902-1AC00-0AA0</b> <b>6ES7902-1AD00-0AA0</b>
<b>20 mA (TTY) signal cable</b> each 9-pole Sub-D connector <ul style="list-style-type: none"> <li>• 5 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 50 m (164 ft)</li> </ul>	<b>6ES7902-2AB00-0AA0</b> <b>6ES7902-2AC00-0AA0</b> <b>6ES7902-2AG00-0AA0</b>
<b>RS 422/485 signal cable</b> each 15-pole Sub-D connector <ul style="list-style-type: none"> <li>• 5 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 50 m (164 ft)</li> </ul>	<b>6ES7902-3AB00-0AA0</b> <b>6ES7902-3AC00-0AA0</b> <b>6ES7902-3AG00-0AA0</b>

### CP 341 Communication Module

#### Overview



- The fast and powerful serial data exchange over a point-to-point connection
- 3 versions with various physical transmission characteristics:
  - RS 232 C (V.24),
  - 20 mA (TTY),
  - RS 422/RS 485 (X.27)
- Implemented protocols: ASCII, 3964 (R), RK 512
- Simple configuration over SCOUT with integrated parameterization tool

#### Integration

The CP 341 Communication Module can be operated:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The loadable special drivers of the CP 341 Communication Module are not supported by SIMOTION.

The standard functions required to use the CP 341 Communication Module in combination with SIMOTION are part of the SCOUT command library.

#### Selection and ordering data

Description	Order No.
<b>CP 341 Communication Module</b> Incl. SIMATIC configuration package on CD-ROM with: <ul style="list-style-type: none"> <li>• 1 RS 232 C interface (V.24)</li> <li>• 1 20 mA interface (TTY)</li> <li>• 1 RS 422/485 (X.27) interface</li> </ul>	<b>6ES7341-1AH02-0AE0</b> <b>6ES7341-1BH02-0AE0</b> <b>6ES7341-1CH02-0AE0</b>
<b>RS 232 C signal cable</b> each 9-pole Sub-D socket <ul style="list-style-type: none"> <li>• 5 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 15 m (49.22 ft)</li> </ul>	<b>6ES7902-1AB00-0AA0</b> <b>6ES7902-1AC00-0AA0</b> <b>6ES7902-1AD00-0AA0</b>
<b>20 mA (TTY) signal cable</b> each 9-pole Sub-D connector <ul style="list-style-type: none"> <li>• 5 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 50 m (164 ft)</li> </ul>	<b>6ES7902-2AB00-0AA0</b> <b>6ES7902-2AC00-0AA0</b> <b>6ES7902-2AG00-0AA0</b>
<b>RS 422/485 signal cable</b> each 15-pole Sub-D connector <ul style="list-style-type: none"> <li>• 5 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 50 m (164 ft)</li> </ul>	<b>6ES7902-3AB00-0AA0</b> <b>6ES7902-3AC00-0AA0</b> <b>6ES7902-3AG00-0AA0</b>

### SM 374 Simulator Module

### DM 370 Dummy Module

#### Overview



- Simulator Module for program testing during commissioning and operation
- Simulation of sensor signals over switches
- Display of signal states on outputs with LEDs

#### Design

The front panel is equipped with:

- 16 switches for the simulation of input signals
- 16 LEDs for displaying the signal state at outputs
- Mode selector  
With the aid of a screwdriver, you can set three operating modes:
  - 16 inputs (input simulation only)
  - 16 outputs (output simulation only)
  - 8 inputs and 8 outputs (input and output simulation)

#### Function

The SM 374 Simulator Module is mounted onto the SIMATIC S7-300 mounting rail instead of a Digital Input or Output Module.

The CPU reads the set input signal states of the Simulator Module and processes these in the user program. The output signal states are sent to the module as a result and are indicated with LEDs.

#### Selection and ordering data

Description	Order No.
<b>SM 374 Simulator Module</b> For simulating 16 inputs or 16 outputs or 8 inputs and 8 outputs (16 switches, 16 LEDs)	<b>6ES7374-2XH01-0AA0</b>

#### Overview



- Dummy Module for reserving slots for unconfigured Signal Modules
- When replaced with a Signal Module (SM), configuration and address assignment remain unchanged

#### Application

The DM 370 Dummy Module reserves a slot for an unconfigured Signal Module.

When replaced with a Signal Module, the mechanical configuration and address assignment of the overall configuration remain unchanged.

#### Selection and ordering data

Description	Order No.
<b>DM 370 Dummy Module</b> Incl. bus connector, labeling strips	<b>6ES7370-0AA01-0AA0</b>

# SIMOTION I/O components

## SIMATIC S7-300 I/O

### Accessories and spare parts

#### Selection and ordering data

Description	Order No.
<b>Bus connector</b>	<b>6ES7390-0AA00-0AA0</b>
<b>Slot label</b> Labeling sheet, DIN A4, film, perforated, for printing with laser printer; 10 sheets  For signal modules (16 channels) • petrol • light-beige • yellow • red  For signal modules (32 channels) • petrol • light-beige • yellow • red	<b>6ES7912-0AA00-0AA0</b>  <b>6ES7392-2AX00-0AA0</b> <b>6ES7392-2BX00-0AA0</b> <b>6ES7392-2CX00-0AA0</b> <b>6ES7392-2DX00-0AA0</b>  <b>6ES7392-2AX10-0AA0</b> <b>6ES7392-2BX10-0AA0</b> <b>6ES7392-2CX10-0AA0</b> <b>6ES7392-2DX10-0AA0</b>
<b>Labeling strips</b> 10 units • For modules with 20-pole front connector • For modules with 40-pole front connector	<b>6ES7392-2XX00-0AA0</b> <b>6ES7392-2XX10-0AA0</b>
<b>Cover foil for labeling strips</b> 10 units (spare part) • For modules with 20-pole front connector • For modules with 40-pole front connector	<b>6ES7392-2XY00-0AA0</b> <b>6ES7392-2XY10-0AA0</b>
<b>Shield connection element</b> 80 mm (3.15 in) wide, with 2 rows for 4 shield terminal elements each	<b>6ES7390-5AA00-0AA0</b>
<b>Shield terminal element</b> 2 units per packaging unit • For 2 cables with 2 ... 6 mm (0.08 ... 0.24 in) Ø • For 1 cable with 3 ... 8 mm (0.12 ... 0.31 in) Ø • For 1 cable with 4 ... 13 mm (0.16 ... 0.51 in) Ø	<b>6ES7390-5AB00-0AA0</b> <b>6ES7390-5BA00-0AA0</b> <b>6ES7390-5CA00-0AA0</b>
<b>Front door</b> Raised design 5 units per packaging unit	<b>6ES7328-0AA00-7AA0</b>

Description	Order No.
<b>Front connector</b> with screw-type terminals • 20-pole, 1 unit • 20-pole, 100 units • 40-pole, 1 unit • 40-pole, 100 units	<b>6ES7392-1AJ00-0AA0</b> <b>6ES7392-1AJ00-1AB0</b> <b>6ES7392-1AM00-0AA0</b> <b>6ES7392-1AM00-1AB0</b>
<b>Front connector</b> with spring-loaded terminals • 20-pole, 1 unit • 20-pole, 100 units • 40-pole, 1 unit • 40-pole, 100 units	<b>6ES7392-1BJ00-0AA0</b> <b>6ES7392-1BJ00-1AB0</b> <b>6ES7392-1BM01-0AA0</b> <b>6ES7392-1BM01-1AB0</b>
<b>Front connector</b> with FastConnect terminals • 20-pole, 1 unit • 40-pole, 1 unit	<b>6ES7392-1CJ00-0AA0</b> <b>6ES7392-1CM00-0AA0</b>
<b>Terminal block and signal cable for 64-channel modules</b> 2 terminal blocks and 2 connecting cables are required per module • Length 1 m (3.28 ft), 2 units • Length 2.5 m (8.20 ft), 2 units • Length 5 m (16.41 ft), 2 units • Terminal block with screw-type terminals, 2 units • Terminal block with spring-loaded terminals, 2 units	<b>6ES7392-4BB00-0AA0</b> <b>6ES7392-4BC50-0AA0</b> <b>6ES7392-4BF00-0AA0</b> <b>6ES7392-1AN00-0AA0</b> <b>6ES7392-1BN00-0AA0</b>
<b>Effective Range Modules for analog inputs</b> 2 units	<b>6ES7974-0AA00-0AA0</b>
<b>Fuse set</b> 10 fuses 8 A, quick-response, 2 fuse holders	<b>6ES7973-1HD00-0AA0</b>
<b>Sub-D connector</b> • 9-pole, pins • 9-pole, socket • 15-pole, pins	<b>6ES5750-2AA11</b> <b>6ES5750-2AB11</b> <b>6ES5750-2AA21</b>
<b>Mounting rail, SIMATIC S7-300</b> • Length 160 mm (6.30 in) • Length 480 mm (18.90 in) • Length 530 mm (20.87 in) • Length 830 mm (32.68 in) • Length 2000 mm (78.74 in)	<b>6ES7390-1AB60-0AA0</b> <b>6ES7390-1AE80-0AA0</b> <b>6ES7390-1AF30-0AA0</b> <b>6ES7390-1AJ30-0AA0</b> <b>6ES7390-1BC00-0AA0</b>
<b>SIMATIC Manual Collection</b> Electronic manuals on DVD, multilingual	<b>6ES7998-8XC01-8YE0</b>
<b>SIMATIC Manual Collection Update service for 1 year</b> Current manual collection DVD as well as the three subsequent updates	<b>6ES7998-8XC01-8YE2</b>

#### More information

For further information, see Catalog ST 70 and the Industry Mall under Automation technology/Automation Systems/SIMATIC Industrial Automation Systems/Controllers/SIMATIC S7 modular controllers/S7-300/S7-300F.

### Overview



SIMATIC ET 200 variants

#### Perfect communication on all levels

Distributed machine and plant configurations have now become common practice in automation technology. This reduces the wiring layout and significantly increases flexibility and reliability.

PROFINET and PROFIBUS DP are available for connecting distributed I/O. And the AS-Interface handles communication on the actuator/sensor level. This allows problem-free data exchange throughout the whole automation world.

#### PROFIBUS DP

PROFIBUS DP is a fast, standardized bus system for the field level.

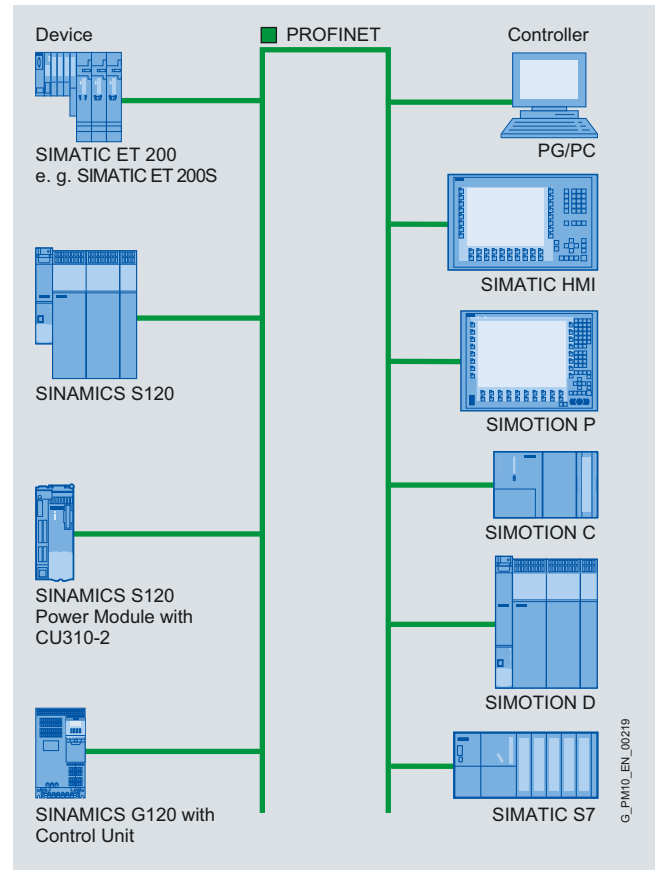
With the distributed SIMATIC ET 200 I/O system, digital and analog inputs and outputs can be connected to SIMOTION. Intelligent I/O modules can also be used distributedly with SIMATIC ET 200.

The isochronous mode functionality also allows PROFIBUS DP to be used for high-speed, deterministic I/O processing as well as for integrating drives.

#### PROFINET

PROFINET is the innovative and open Industrial Ethernet standard (IEC 61158) for industrial automation. With PROFINET, devices can be linked up from the field level through to the management level. PROFINET is supported by the SINAMICS drive system and the SIMATIC ET 200S, SIMATIC ET 200M, SIMATIC ET 200pro and SIMATIC ET 200eco PN distributed I/O systems.

With Isochronous Real-Time (IRT) and the new SIMATIC ET 200S High Speed I/O, cycle times of 250 µs are achieved on the basis of PROFINET.



Controller device configuration on PROFINET

#### AS-Interface

With AS-Interface, actuators and sensors on the field level can be connected with a simple two-wire line. In addition to communication, this two-wire line is also used to supply the individual stations with power.

# SIMOTION I/O components

## Distributed I/O

### Summary

#### Overview (continued)

##### **SIMATIC ET 200 distributed I/O**

The distributed SIMATIC ET 200 I/O provide I/O systems for many different applications:

- SIMATIC ET 200M: The modular I/O system for control cabinet installation and high channel densities
- SIMATIC ET 200S: The finely scalable I/O system for control cabinet installation and time-critical applications in particular; including motor starters, safety technology and individual grouping of load groups
- SIMATIC ET 200pro: The modular I/O system with IP65/67 degree of protection for cabinet-free use close to the machine; with features such as small frame size, integrated PROFIsafe safety technology, PROFINET connection and hot swapping of modules
- SIMATIC ET 200eco: The compact, economical I/O system with IP65/67 degree of protection for local use without a control cabinet with flexible and fast ECOFAST or M12 connection system over PROFIBUS DP
- SIMATIC ET 200eco PN: The compact, economical I/O system with IP65/67 degree of protection for local use without a control cabinet with flexible and fast M12 connection system over PROFIBUS IO

- SIMATIC ET 200SP: The SIMATIC ET 200SP distributed I/O system is a scalable and extremely flexible distributed I/O system for interfacing the process signals to a central control system via PROFINET. The distributed I/O system is particularly easy to use and, with its compact design, offers maximum economy in the control cabinet. High speed and transmission rates provide significantly stronger performance than conventional systems. SIMATIC ET 200SP I/O is not integrated in STEP 7 HW Config as standard and is supported for SIMOTION only via the GSDML (device description file) in SCOUT.

#### **Complete list of I/O that can be used**

A list of all the I/O modules that can currently be used with SIMOTION is available under the following link:

<http://support.automation.siemens.com/WW/view/en/11886029>

#### **More information**

For further information, see [Catalog IK PI and the Industry Mall under Automation technology/Automation Systems/SIMATIC Industrial Automation Systems/SIMATIC ET 200 Distributed I/O](#) or at [www.siemens.com/et200](http://www.siemens.com/et200)

### Overview



SIMATIC ET 200M with power supply

SIMATIC ET 200M is a modular I/O system with IP20 degree of protection.

It can be expanded with Signal Modules, Communication Modules and Function Modules of the SIMATIC S7-300 automation system.

Due to the wide range of modules available, the SIMATIC ET 200M I/O system is especially well-suited for complex automation tasks with a high channel density.

For SIMATIC ET 200M, interface modules are available with PROFIBUS DP or PROFINET interfaces.

Signal states can be detected and output synchronously and at specified times via the isochronous PROFIBUS DP in combination with the IM 153-2 High Feature interface module. Isochronous mode is supported by selected I/O modules (see [SIMATIC S7-300 I/O or SIMATIC ET 200M manual](#)). It is possible to combine isochronous and non-isochronous modules in a single station.

### Design

The SIMATIC ET 200M modular distributed I/O system consists of

- one IM 153 interface module,
- depending on the IM 153 interface module, 8 or 12 I/O modules of the SIMATIC S7-300 automation system and
- a PS307 power supply, if required.

The I/O modules can be combined as required and therefore optimally adapted to requirements.

The SIMATIC ET 200M I/O system is connected to PROFIBUS DP or PROFINET over an IM 153 interface module.

It can be connected to PROFIBUS DP with fiber-optic cables through integrated interfaces on the IM 153-2 FO or through additional OLMs (Optical Link Modules) or OBTs (Optical Bus Terminals).

#### Connection with bus connectors

The simple design with bus connectors of the SIMATIC S7-300 series makes SIMATIC ET 200M flexible and service-friendly:

- Module installation  
The modules are simply hooked onto the rail, swung into place and screwed tight.
- Integral backplane bus  
The backplane bus is integrated in the modules. Module interfacing takes place by means of bus connectors inserted into back of the housing.

### Function

The user program in the SIMOTION Motion Control System can access the inputs and outputs of the SIMATIC ET 200M modular I/O system in the same manner as central inputs and outputs.

Communication over the bus system is handled completely by the SIMOTION Master and the IM 153 interface module. The diagnostics function is used to check that the SIMATIC ET 200M is operating correctly.

The SIMATIC ET 200M I/O system diagnoses the following:

- Module faults
- Short-circuits (outputs)
- Bus faults, i.e. faulty data transfer
- 24 V DC load voltage supply

### Selection and ordering data

Ordering data	Order No.
<b>IM 153-1 Interface Module</b> For connecting to PROFIBUS DP, with RS 485 interface, for max. 8 SIMATIC S7-300 modules	<b>6ES7153-1AA03-0XB0</b>
<b>IM 153-2 High Feature Interface Module</b> For connecting to PROFIBUS DP, with RS 485 interface, for max. 12 SIMATIC S7-300 modules, isochronous	<b>6ES7153-2BA02-0XB0</b>
<b>IM 153-4 PN Interface Module</b> For connecting to PROFINET, for max. 12 SIMATIC S7-300 modules	<b>6ES7153-4AA01-0XB0</b>
<b>IM 153-4 PN High Feature Interface Module</b> For connecting to PROFINET, for max. 12 SIMATIC S7-300 modules with integrated switch	<b>6ES7153-4BA00-0XB0</b>

# SIMOTION I/O components

## Distributed I/O

### SIMATIC ET 200S

#### Overview



#### SIMATIC ET 200S Compact

- Extended block I/O with IP20 degree of protection and 32 integrated channels, comprising of terminal block and electronic block
- 2 variants: 32 DI or 16 DI/16 DO
- Finely scalable expansion to a maximum of 128 channels or 12 modules
- The complete SIMATIC ET 200S module spectrum can be used (with the exception of PROFI-safe modules and reserve modules)
- Minimal width supports installation in particularly small, compact terminal boxes
- Separation of connections and electronics with permanent wiring
- Screw-type and spring-loaded terminal connections
- Standard terminal block with 2-wire connection system; 3-wire and 4-wire systems available using optional add-on terminals
- Installation on a DIN rail
- Hot swapping of expansion modules
- Communication via PROFIBUS
- Up to 100 bytes inputs and outputs (address space)
- The system characteristics meet high machine and plant availability requirements.
- SIMATIC ET 200 Configurator software for designing the SIMATIC ET 200S Compact and creating order lists



#### SIMATIC ET 200S

- Distributed I/O system with IP20 degree of protection with minimal wiring
- Can be used with integrated SIMATIC S7-CPU as mini PLC:
  - also available as a fail-safe PROFI-safe version
  - with optional lower-level PROFIBUS DP
- Finely modular design for adaptation to the automation task at hand.
- Interface modules available with PROFIBUS DP or PROFINET interfaces
- PROFINET modules with integrated 2-port switch for a line topology
- The optimum solution for extremely time-critical tasks
  - Cycle times down to 250  $\mu$ s based on PROFINET IO with Isochronous Real-Time (IRT)
  - Short terminal-to-terminal times through High Speed analog modules with conversion times of  $\leq 20 \mu$ s per channel
- Combine digital and analog input or output modules, technology modules, motor starters and frequency converters
- Modules can be replaced during operation (hot swapping)
- Channel-specific diagnostics for high availability
- Can be supplied with integrated fiber optic interface if required
- Transfer rate up to 12 Mbit/s (PROFIBUS) or 100 Mbit/s (PROFINET)
- Flexible connection method (2/3/4-wire connections as screwtype and spring-loaded terminals and FastConnect which requires no insulation stripping)
- Variable potential groups through power modules
- Option handling with or without reserve modules
- SIMATIC ET 200 Configurator software for designing the SIMATIC ET 200S and creating order lists

### Application

The comprehensive module range with uniform handling for configuration, assembly and programming allows the SIMATIC ET 200S to be used as a universal I/O system.

The finely scalable design permits fast and optimal adaptation to the requirements of the automation task:

- No reserves
- No unnecessary channels

Even if requirements change frequently, setup times can be reduced significantly by replacing or combining different I/O modules.

The transmission rate of up to 12 Mbit/s with PROFIBUS DP and 100 Mbit/s with PROFINET IO as well as the powerful internal data transmission makes the SIMATIC ET 200S also perfectly suited for extremely time-critical applications such as highly dynamic hydraulic applications with position and pressure control.

In combination with the interface module

- IM 151-1 High Feature (PROFIBUS) or
- IM 151-3 PN High Speed (PROFINET)

signal states can be synchronously acquired or output over the isochronous PROFIBUS DP or over PROFINET IO with IRT at precisely defined points in time. Isochronous mode is supported by selected I/O modules ([see SIMATIC S7-300 I/O or SIMATIC ET 200S manual](#)). It is possible to combine isochronous and non-isochronous modules in a single station.

In addition to Interface Modules for connecting the SIMATIC ET 200S to PROFIBUS DP or PROFINET IO (either electrical or optical interface) for distributed automation tasks, an Interface Module with an integrated CPU is also available. The maintenance free CPU (without battery) integrated in the Interface Module is based on the SIMATIC S7-300 CPU 314 and is programmed with STEP 7. The CPU permits distributed on-site preprocessing of process data and communicates with the high-level motion control system as a PROFIBUS DP slave or PROFINET IO Device.

Two different variants are available for integrating safety technology with SIMATIC ET 200S:

- Over local safety components in motor starter applications
- Over PROFIsafe components that replace the wiring-based safety logic with a freely programmable controller (up to SIL 3 according to IEC 61508 and Category 4 according to EN 954-1).

The construction of the SIMATIC ET 200S allows it to be used under increased mechanical load. The system features support high machine availability requirements.

### Design

The SIMATIC ET 200S distributed I/O system consists of:

- IM 151 Interface Module
- Digital and Analog Electronic Modules
- Technology modules, e. g., for counter/position detection tasks
- Motor starters and frequency converters
- Terminating module (part of the scope of supply of the IM 151)
- Power modules

One SIMATIC ET 200S station comprises of up to 63 I/O modules. The I/O modules can be combined as required.

The SIMATIC ET 200S is installed with permanent wiring:

All modules are plugged onto purely mechanical Terminal Modules. These Terminal Modules contain the complete wiring and can be mounted on standard 35 × 15 mm (1.38 × 0.59 in) or 35 × 7.5 mm (1.38 × 0.30 in) mounting rails.

This results in the following advantages:

- Simple implementation of the wiring without additional electronics components
- Fast and safe testing of wiring even under power
- Tool-free replacement of Electronics Modules
- Automatic coding of Electronics Modules for safe replacement (protected against polarity reversal)

The SIMATIC ET 200 Configurator software for designing the SIMATIC ET 200S and creating order lists is available for download:

[www.siemens.com/ET200](http://www.siemens.com/ET200)



# SIMOTION I/O components

## Distributed I/O

### SIMATIC ET 200S

#### Function

##### **IM 151-3 PN High Speed Interface Module:** **Ideal for fast I/O processing with SIMATIC ET 200S and PROFINET**

The IM 151-3 PN High Speed Interface Module supports the following on a PROFINET IO basis with Isochronous Real-Time (IRT):

- Isochronous acquisition/output of signal states, synchronized with the user program
- Implementation of fast cycle times of 250  $\mu$ s.

In comparison to PROFIBUS applications, much shorter terminal-to-terminal times can be implemented on the basis of PROFINET.

- The high data transmission rate of 100 Mbit/s and full-duplex mode (simultaneous transmitting and receiving) enable larger I/O volumes to be transmitted with the same bus cycle time as compared to PROFIBUS (125 bytes are transferred in approximately 10  $\mu$ s).
- This communication performance is available on every PROFINET port of the controller – i.e. 3 ports on the SIMOTION D4x5-2 DP/PN, C240 PN and P320-3 or 4 ports on the SIMOTION P350-3 with MCI-PN Communication Board.
- The IM 151-3 PN High Speed Interface Module as well as the associated I/O modules have extremely short signal processing times (e.g. conversion time of  $\leq 20$   $\mu$ s per channel for Analog Modules) so that even during the same bus cycle significantly shorter terminal-to-terminal times can be achieved with PROFINET than with a comparable PROFIBUS cycle. The big advantage: the terminal-to-terminal times are reduced without reducing the computing time available to the application.
- Apart from Isochronous Real-Time (IRT) communication, Real-Time (RT) communication and standard TCP/IP communication can also be executed without losing the deterministic response of the IRT message frames due to the bandwidth reserved for IRT.

The minimum cycle times are usually dependent on the application to be implemented (computing load) and the performance capability of the controller used, for example:

- SIMOTION P320-3/SIMOTION P350-3: Minimum 250  $\mu$ s.
- SIMOTION D435-2/SIMOTION D445-2/SIMOTION D455-2: Minimum 250  $\mu$ s.

SIMATIC ET 200S is the optimum I/O system for closed-loop control and motion control applications in which short cycle times, isochronous/equidistant signal acquisition and signal output are required.

SIMATIC ET 200S also supports the accurate and high-speed acquisition of digital inputs as well as time or position-based switching of digital outputs. For position-based switching of digital outputs, the SIMATIC ET 200S output is assigned to the SIMOTION technology object "TO Output Cam" or "TO Cam Track".

#### Applications with high-speed isochronous I/O devices

##### Closed-loop control/Motion control

- Hydraulic applications
  - with closed-loop position control (e.g. folding, pipe bending)
  - with closed-loop position and pressure control (e.g. hydraulic universal, IHU and powder metal presses as well as bed cushions)
- Speed and position detection
- Dancer control

##### Acquisition of signals

- Time/position-based acquisition of binary signals
  - Quality control
  - Product tracking
  - Tool monitoring
  - Monitoring of machine states

##### Output of signals

- Time/position-based setting of binary signals
  - Time/position-based switching of actuators
  - Product rejection
  - Trigger signal for measuring systems

#### Isochronous and equidistant acquisition/output of signals with short terminal-to-terminal times by means of:

- High-speed peripheral modules
- Synchronization of control system, bus and I/O
- Short cycle times in the controller

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#### The modules listed below support isochronous operation with bus cycle times of 250 $\mu$ s minimum:

Description	
Interface Modules	IM 151-3 PN High Speed
Power Modules	PM-E 24 V DC Standard PM-E 24 ... 48 V DC
Digital Electronic Modules	4 DI 24 V DC, High Feature 4 DO 24 V DC/0.5 A Standard 4 DO 24 V DC/2 A Standard
Analog Electronic Modules	2 AI, U, High Speed 2 AI, I, 2-wire High Speed 2 AI, I, 4-wire High Speed 2 AO, U, High Speed 2 AO, I, High Speed
Technology Modules	SSI module, 1 channel Counter module 1 COUNT, 24 V/100 kHz, 1 channel Counter module 1 COUNT, 5 V/500 kHz, 1 channel

## Selection and ordering data

Description	Order No.
<b>IM 151-1 Compact Interface Module for PROFIBUS DP</b> Transmission rate up to 12 Mbit/s; for connecting to PROFIBUS DP, with RS 485 interface; expandable with up to 12 power, electronic and motor starter modules (except F and reserve modules); including termination module	
<ul style="list-style-type: none"> <li>• <b>32 DI, 24 V DC</b> 32 digital inputs</li> </ul>	<b>6ES7151-1CA00-1BL0</b>
<ul style="list-style-type: none"> <li>• <b>16 DI, 24 V DC; 16 DO, 24 V DC/0.5 A</b> 16 digital inputs and 16 digital outputs</li> </ul>	<b>6ES7151-1CA00-3BL0</b>
<b>Terminal Modules for SIMATIC ET 200S Compact</b>	
<ul style="list-style-type: none"> <li>• <b>TM-C120S Compact</b> With screw terminals</li> </ul>	<b>6ES7193-4DL10-0AA0</b>
<ul style="list-style-type: none"> <li>• <b>TM-C120C Compact</b> With spring-loaded terminals</li> </ul>	<b>6ES7193-4DL00-0AA0</b>
<b>Add-on terminals for Terminal Modules for SIMATIC ET 200S Compact</b>	
<ul style="list-style-type: none"> <li>• SIMATIC DP, add-on terminals for SIMATIC ET 200S and SIMATIC ET 200S Compact, screw-type</li> </ul>	<b>6ES7193-4FL10-0AA0</b>
<ul style="list-style-type: none"> <li>• SIMATIC DP, add-on terminals for SIMATIC ET 200S and SIMATIC ET 200S Compact, spring-loaded</li> </ul>	<b>6ES7193-4FL00-0AA0</b>
Please order two units for 4-wire connection.  The add-on terminals can also be attached to TM-E/TM-P Terminal Modules, provided at least 120 mm (4.72 in) of the construction width attains the same overall height as the Terminal Module.	
<b>Interface Modules for PROFIBUS DP</b> Transmission rate up to 12 Mbit/s; incl. termination module	
<ul style="list-style-type: none"> <li>• <b>IM 151-1 Basic</b> Data volume 88 bytes each for inputs and outputs; up to 12 power, electronic and motor starter modules can be connected (except F modules), with RS 485 interface</li> </ul>	<b>6ES7151-1CA00-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-1 Standard</b> Data volume 244 bytes each for inputs and outputs; up to 63 I/O modules can be connected, with RS 485 interface</li> </ul>	<b>6ES7151-1AA05-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-1 High Feature</b> As IM 151-1 Standard, but also for use with isochronous I/O and F modules</li> </ul>	<b>6ES7151-1BA02-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-1 FO</b> As IM 151-1 Standard, but with 128 byte data volume each for inputs and outputs; with fiber-optic interface</li> </ul>	<b>6ES7151-1AB05-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-7 CPU</b> With integrated PROFIBUS DP interface (RS 485 interface); 96 Kbyte work memory</li> </ul>	<b>6ES7151-7AA21-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-7 CPU FO</b> As IM 151-7 CPU, but with fiber-optic interface, 48 Kbyte work memory</li> </ul>	<b>6ES7151-7AB00-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-7 F-CPU</b> Integrated, fail-safe CPU</li> </ul>	<b>6ES7151-7FA21-0AB0</b>

Description	Order No.
<b>Master interface module</b> Expands the IM 151-7 CPU/IM 151-7 F-CPU/IM 151-8 PN DP CPU interface module with a DP master interface; up to one module per CPU	<b>6ES7138-4HA00-0AB0</b>
<b>Interface Modules for PROFINET</b> Transmission rate up to 100 Mbit/s, 2 x bus connection via RJ45, incl. termination module	
<ul style="list-style-type: none"> <li>• <b>IM 151-3 PN Standard</b> Max. 63 I/O modules can be connected (except F modules; reserve modules)</li> </ul>	<b>6ES7151-3AA23-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-3 PN High Feature</b> As IM 151-3 PN Standard, but F modules can be used</li> </ul>	<b>6ES7151-3BA23-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-3 PN FO</b> As IM 151-3 PN High Feature, but with 2 PROFINET fiber-optic interfaces</li> </ul>	<b>6ES7151-3BB23-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-3 PN High Speed</b> Max. 32 power modules and electronic modules can be connected; for the use of isochronous I/O with cycle times of 250 µs minimum; only for use with selected I/O modules <a href="#">For further details, see Functions</a></li> </ul>	<b>6ES7151-3BA60-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-8 PN/DP CPU</b> With integrated PROFINET IO interface (3 RJ45 ports) 128 Kbyte work memory</li> </ul>	<b>6ES7151-8AB01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-8F PN/DP F-CPU</b> With integrated PROFINET IO interface (3 RJ45 ports) 128 Kbyte work memory</li> </ul>	<b>6ES7151-8FB01-0AB0</b>
<b>Micro Memory Card (MMC)</b>	
<ul style="list-style-type: none"> <li>• With IM 151-7 CPU, essential for program back-up</li> <li>• With IM 151-3 PN essential for saving the device name (64 KB)</li> <li>• Required for firmware updates (more than 2 MB)               <ul style="list-style-type: none"> <li>- 64 KB</li> <li>- 128 KB</li> <li>- 512 KB</li> <li>- 4 MB</li> <li>- 8 MB</li> </ul> </li> </ul>	<b>6ES7953-8LF20-0AA0</b> <b>6ES7953-8LG20-0AA0</b> <b>6ES7953-8LJ30-0AA0</b> <b>6ES7953-8LM20-0AA0</b> <b>6ES7953-8LP20-0AA0</b>
<b>External EPROM programming device</b> For programming Micro Memory Cards (MMC); connectable via USB interface	<b>6ES7792-0AA00-0XA0</b>

# SIMOTION I/O components

## Distributed I/O

### SIMATIC ET 200S

#### Selection and ordering data (continued)

Description	Order No.
<b>Power Modules</b> 1 unit, Width 15 mm (0.59 in)	
<ul style="list-style-type: none"> <li>• <b>PM-E 24 V DC Standard</b> For electronic modules, with diagnostics</li> </ul>	<b>6ES7138-4CA01-0AA0</b>
<ul style="list-style-type: none"> <li>• <b>PM-E 24 V DC High Feature <sup>1)</sup></b> For electronic modules, with diagnostics</li> </ul>	<b>6ES7138-4CA60-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>PM-E 24 ... 48 V DC</b> For electronic modules, with diagnostics</li> </ul>	<b>6ES7138-4CA50-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>PM-E 24 ... 48 V DC, 24 ... 230 V AC</b> For electronic modules, with diagnostics and fuse</li> </ul>	<b>6ES7138-4CB11-0AB0</b>
<b>Potential Distributor Module for SIMATIC ET 200S</b> For preparing the load voltage on additional terminals, 1 unit, width 15 mm (0.59 in)	<b>6ES7138-4FD00-0AA0</b>
<b>TM-P Terminal Modules for Power Modules <sup>2)</sup></b> 1 unit, Width 15 mm (0.59 in)	
<ul style="list-style-type: none"> <li>• <b>2 × 3 terminals</b> <b>With terminal access to AUX1, AUX1 connected through to the left</b> <ul style="list-style-type: none"> <li>- TM-P15S23-A1, screw-type terminal</li> </ul> </li> </ul>	<b>6ES7193-4CC20-0AA0</b>
<ul style="list-style-type: none"> <li>- TM-P15C23-A1, spring-loaded terminals</li> </ul>	<b>6ES7193-4CC30-0AA0</b>
<ul style="list-style-type: none"> <li>- TM-P15N23-A1, FastConnect</li> </ul>	<b>6ES7193-4CC70-0AA0</b>
<ul style="list-style-type: none"> <li>• <b>2 × 3 terminals</b> <b>With terminal access to AUX1, AUX1 interrupted to the left</b> <ul style="list-style-type: none"> <li>- TM-P15S23-A0, screw-type terminal</li> </ul> </li> </ul>	<b>6ES7193-4CD20-0AA0</b>
<ul style="list-style-type: none"> <li>- TM-P15C23-A0, spring-loaded terminals</li> </ul>	<b>6ES7193-4CD30-0AA0</b>
<ul style="list-style-type: none"> <li>- TM-P15N23-A0, FastConnect</li> </ul>	<b>6ES7193-4CD70-0AA0</b>
<ul style="list-style-type: none"> <li>• <b>2 × 2 terminals</b> <b>Without terminal access to AUX1, AUX1 connected through to the left</b> <ul style="list-style-type: none"> <li>- TM-P15S22-01, screw-type terminal</li> </ul> </li> </ul>	<b>6ES7193-4CE00-0AA0</b>
<ul style="list-style-type: none"> <li>- TM-P15C22-01, spring-loaded terminals</li> </ul>	<b>6ES7193-4CE10-0AA0</b>
<ul style="list-style-type: none"> <li>- TM-P15N22-01, FastConnect</li> </ul>	<b>6ES7193-4CE60-0AA0</b>

Description	Order No.
<b>Digital Electronic Modules</b> 5 units, (unless specified otherwise) Width 15 mm (0.59 in)	
<ul style="list-style-type: none"> <li>• 2 DI, 24 V DC, Standard</li> </ul>	<b>6ES7131-4BB01-0AA0</b>
<ul style="list-style-type: none"> <li>• 4 DI, 24 V DC, Standard</li> </ul>	<b>6ES7131-4BD01-0AA0</b>
<ul style="list-style-type: none"> <li>• 8 DI, 24 V DC, Standard (1 unit)</li> </ul>	<b>6ES7131-4BF00-0AA0</b>
<ul style="list-style-type: none"> <li>• 4 DI, 24 V DC, SOURCE INPUT, active low inputs</li> </ul>	<b>6ES7131-4BD51-0AA0</b>
<ul style="list-style-type: none"> <li>• 8 DI, 24 V DC, SOURCE INPUT, active low inputs (1 unit)</li> </ul>	<b>6ES7131-4BF50-0AA0</b>
<ul style="list-style-type: none"> <li>• 4 DI, 24 V DC, NAMUR (1 unit)</li> </ul>	<b>6ES7131-4RD02-0AB0</b>
<ul style="list-style-type: none"> <li>• 2 DI, 120 V AC</li> </ul>	<b>6ES7131-4EB00-0AB0</b>
<ul style="list-style-type: none"> <li>• 2 DI, 230 V AC</li> </ul>	<b>6ES7131-4FB00-0AB0</b>
<ul style="list-style-type: none"> <li>• With parameterizable input delay and diagnostics               <ul style="list-style-type: none"> <li>- 2 DI, 24 V DC, High Feature <sup>3)</sup></li> <li>- 4 DI, 24 V DC, High Feature <sup>3)</sup></li> <li>- 4 DI, 24 ... 48 V DC <sup>1)</sup></li> </ul> </li> </ul>	<b>6ES7131-4BB01-0AB0</b> <b>6ES7131-4BD01-0AB0</b> <b>6ES7131-4CD02-0AB0</b>
<ul style="list-style-type: none"> <li>• 2 DO, 24 V DC/0.5 A, Standard</li> </ul>	<b>6ES7132-4BB01-0AA0</b>
<ul style="list-style-type: none"> <li>• 4 DO, 24 V DC/0.5 A, Standard <sup>3)</sup></li> </ul>	<b>6ES7132-4BD02-0AA0</b>
<ul style="list-style-type: none"> <li>• 8 DO, 24 V DC/0.5 A, Standard <sup>3)</sup> (1 unit)</li> </ul>	<b>6ES7132-4BF00-0AA0</b>
<ul style="list-style-type: none"> <li>• 4 DO, 24 V DC/0.5 A, current sinking <sup>3)</sup></li> </ul>	<b>6ES7132-4BD50-0AA0</b>
<ul style="list-style-type: none"> <li>• 8 DO, 24 V DC/0.5 A, current sinking <sup>3)</sup> (1 unit)</li> </ul>	<b>6ES7132-4BF50-0AA0</b>
<ul style="list-style-type: none"> <li>• 2 DO, 24 V DC/2 A, Standard</li> </ul>	<b>6ES7132-4BB31-0AA0</b>
<ul style="list-style-type: none"> <li>• 4 DO, 24 V DC/2 A, Standard <sup>3)</sup></li> </ul>	<b>6ES7132-4BD32-0AA0</b>
<ul style="list-style-type: none"> <li>• With diagnostics for short-circuit and wire break, output of replacement value               <ul style="list-style-type: none"> <li>- 2 DO, 24 V DC/0.5 A, High Feature <sup>1)</sup></li> <li>- 2 DO, 24 V DC/2 A, High Feature <sup>1)</sup></li> </ul> </li> </ul>	<b>6ES7132-4BB01-0AB0</b> <b>6ES7132-4BB31-0AB0</b>
<ul style="list-style-type: none"> <li>• 2 DO, 24 ... 230 V AC/1 A, output of substitute value</li> </ul>	<b>6ES7132-4FB01-0AB0</b>
<ul style="list-style-type: none"> <li>• 2 DO, 24 V DC ... 230 V AC/5 A, relay, NO contact, output of substitute value</li> </ul>	<b>6ES7132-4HB01-0AB0</b>
<ul style="list-style-type: none"> <li>• 2 DO, 24 V DC ... 230 V AC/5 A, relay, changeover contact, output of substitute value</li> </ul>	<b>6ES7132-4HB12-0AB0</b>
<ul style="list-style-type: none"> <li>• 2 DO, 24 V ... 48 V DC/5A 24 V ... 230 V DC/5 A, relay, changeover contact, output of substitute value, with manual operation (1 unit)</li> </ul>	<b>6ES7132-4HB50-0AB0</b>
<ul style="list-style-type: none"> <li>• 4 DO, 24 V DC/0.5A, High Feature <sup>3)</sup></li> </ul>	<b>6ES7132-4BD00-0AB0</b>
<ul style="list-style-type: none"> <li>• 4 DO, 24 V DC/2A, High Feature <sup>3)</sup></li> </ul>	<b>6ES7132-4BD30-0AB0</b>
<ul style="list-style-type: none"> <li>• 8 DO, 24 V DC/0.5A, High Feature <sup>3)</sup></li> </ul>	<b>6ES7132-4BF00-0AB0</b>

<sup>1)</sup> Can be used for all electronic and technology modules except 2 DI 120 V AC / 2 DI 230 V AC / 2 DO 120/230 V AC.

<sup>2)</sup> Consult corresponding TM-P/TM-E manual or SIMATIC ET 200 Configurator software for selection.

<sup>3)</sup> Can be used as isochronous I/O.

### Selection and ordering data (continued)

Description	Order No.	Description	Order No.
<b>Analog Electronic Modules</b> Width 15 mm (0.59 in)			
<ul style="list-style-type: none"> <li>• <b>2 AI, U, Standard,</b> Cycle time 65 ms per channel, <math>\pm 5\text{ V}</math>, <math>\pm 10\text{ V}</math>, 1 ... 5 V, 13 bit (+ sign)</li> </ul>	<b>6ES7134-4FB01-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AI, TC, High Feature,</b> With internal temperature compensation, Cycle time 80 ms per channel, characteristic linearization for thermoelements of types: B, C, E, J, K, L, N, R, S, T, voltage measuring: <math>\pm 80\text{ mV}</math>, 15 bit (+ sign) (special TM required)</li> </ul>	<b>6ES7134-4NB01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, U, High Feature</b><sup>1)</sup>, Process and diagnostic alarm, cycle time 0.5 ms (both channels), <math>\pm 5\text{ V}</math>, <math>\pm 10\text{ V}</math>, 1 ... 5 V, 15 bit (+ sign), basic error limit <math>\pm 0.1\%</math></li> </ul>	<b>6ES7134-4LB02-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AI, RTD, Standard,</b> Cycle time 130 ms per channel, Pt 100, Ni 100, (standard, air-conditioned) Resistance: 150 <math>\Omega</math>, 300 <math>\Omega</math> and 600 <math>\Omega</math>, 14 ... 15 bit (+ sign)</li> </ul>	<b>6ES7134-4JB51-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, U, High Speed</b><sup>1)</sup>, Process and diagnostic alarm, cycle time 100 <math>\mu\text{s}</math> (both channels), <math>\pm 2.5\text{ V}</math>, <math>\pm 5\text{ V}</math>, <math>\pm 10\text{ V}</math>, 1 ... 5 V, 15 bit (+ sign)</li> </ul>	<b>6ES7134-4FB52-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AI, RTD, High Feature</b> As RTD standard, but with additional functions such as higher accuracy, additional measuring ranges, internal compensation of cable resistances</li> </ul>	<b>6ES7134-4NB51-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, I, 2-wire, Standard,</b> Cycle time 65 ms per channel, 4 ... 20 mA, 13 bit</li> </ul>	<b>6ES7134-4GB01-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AO, U, Standard,</b> Cycle time &lt; 1.5 ms (both channels), <math>\pm 10\text{ V}</math>, 13 bit (+ sign), 1 ... 5 V, 12 bit</li> </ul>	<b>6ES7135-4FB01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>4 AI, I, 2-wire, Standard,</b> Cycle time 40 ms (both channels), 4 ... 20 mA, 13 bit</li> </ul>	<b>6ES7134-4GD00-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AO, U, High Feature</b><sup>1)</sup>, Cycle time &lt; 0.5 ms (both channels), <math>\pm 5\text{ V}</math>, <math>\pm 10\text{ V}</math>, 15 bit + sign, 1 ... 5 V, 15 bit, basic error limit <math>\pm 0.05\%</math></li> </ul>	<b>6ES7135-4LB02-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, I, 4-wire, standard,</b> Cycle time 65 ms per channel, 4 ... 20 mA, <math>\pm 20\text{ mA}</math>, 13 bit (+ sign)</li> </ul>	<b>6ES7134-4GB11-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AO, U, High Speed</b><sup>1)</sup>, Cycle time 100 <math>\mu\text{s}</math> (both channels), <math>\pm 5\text{ V}</math>, 14 bit + sign, <math>\pm 10\text{ V}</math>, 15 bit + sign, 1 ... 5 V, 14 bit</li> </ul>	<b>6ES7135-4FB52-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, I, 2/4-wire, High Feature</b><sup>1)</sup>, Cycle time 0.5 ms (both channels), 4 ... 20 mA, <math>\pm 20\text{ mA}</math>, 15 bit (+ sign), basic error limit <math>\pm 0.05\%</math></li> </ul>	<b>6ES7134-4MB02-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AO, I, Standard,</b> Cycle time &lt; 1.5 ms (both channels), <math>\pm 20\text{ mA}</math>, 13 bit (+ sign), 4 ... 20 mA, 13 bit</li> </ul>	<b>6ES7135-4GB01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, I, 2-wire, High Speed</b><sup>1)</sup>, Process and diagnostic alarm, cycle time 100 <math>\mu\text{s}</math> (both channels), 0/4 ... 20 mA, 15 bit</li> </ul>	<b>6ES7134-4GB52-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AO, I, High Feature</b><sup>1)</sup>, Cycle time &lt; 0.5 ms (both channels), <math>\pm 20\text{ mA}</math>, 15 bit + sign, 4 ... 20 mA, 15 bit, basic error limit <math>\pm 0.05\%</math></li> </ul>	<b>6ES7135-4MB02-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, I, 4-wire, High Speed</b><sup>1)</sup>, Process and diagnostic alarm, cycle time 100 <math>\mu\text{s}</math> (both channels), 0/4 ... 20 mA, <math>\pm 20\text{ mA}</math>, 15 bit (+ sign)</li> </ul>	<b>6ES7134-4GB62-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AO, I, High Speed</b><sup>1)</sup>, Cycle time 100 <math>\mu\text{s}</math> (both channels), <math>\pm 20\text{ mA}</math>, 15 bit (+ sign), 4 ... 20 mA, 15 bit</li> </ul>	<b>6ES7135-4GB52-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, TC, Standard,</b> Cycle time 65 ms per channel, characteristic linearization for thermoelements of types: B, E, J, K, L, N, R, S, T, voltage measuring: <math>\pm 80\text{ mV}</math>, 15 bit (+ sign)</li> </ul>	<b>6ES7134-4JB01-0AB0</b>		

<sup>1)</sup> Can be used as isochronous I/O.

# SIMOTION I/O components

## Distributed I/O

### SIMATIC ET 200S

#### Selection and ordering data (continued)

Description	Order No.	Description	Order No.
<b>Technology modules</b>			
<ul style="list-style-type: none"> <li>• <b>SSI module, 1 channel</b> <sup>1)</sup> For connecting SSI absolute encoders, with latch input and comparison value, width 15 mm (0.59 in)</li> </ul>	<b>6ES7138-4DB03-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>1 SI interface module</b> Serial interface (1 channel): RS 232C, RS 422, RS 485, protocols: ASCII, 3964 (R), width 15 mm (0.59 in) <i>The standard functions required to use the module in connection with SIMOTION are included in the SCOUT Function Library.</i></li> </ul>	<b>6ES7138-4DF01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>Pulse generator 2 PULSES, 2 channels</b> Pulse generator and Timer Module for controlling actuators, valves, heating elements, etc., optionally over PWM modulation, pulse trains or time-limited permanent signals at the 24 V output, width 15 mm (0.59 in)</li> </ul>	<b>6ES7138-4DD01-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>1 STEP stepper module, 1 channel</b> For controlled positioning of stepper motor axes, interface to RS 422 and 2 DI, width 15 mm (0.59 in)</li> </ul>	<b>6ES7138-4DC01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>Counter module 1 COUNT, 24 V/100 kHz, 1 channel</b> <sup>1)</sup> Connection of incremental encoders, direction encoders and initiators; with DI, DO and comparison value; operating modes: counting, measuring, position detection; width 15 mm (0.59 in)</li> </ul>	<b>6ES7138-4DA04-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>IO-Link module</b> 4SI IO-Link, 4 point-to-point interfaces, IO-Link master width 15 mm (0.59 in)</li> </ul>	<b>6ES7138-4GA50-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>Counter module 1 COUNT, 5 V/500 kHz, 1 channel</b> <sup>1)</sup> Connection of RS 422 incremental encoders; with DI, DO and comparison value; operating modes: counting, measuring, position detection; width 30 mm (1.18 in)</li> </ul>	<b>6ES7138-4DE02-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>1 POS U Positioning module, 1 channel</b> For controlled positioning with digital outputs for 5 V/24 V incremental encoder, SSI encoder, width 30 mm (1.18 in)</li> </ul>	<b>6ES7138-4DL00-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>Sensor module 4 IQ-Sense</b> For connecting up to 4 IQ-Sense sensors, with SF-LED, width 15 mm (0.59 in), 5 units</li> </ul>	<b>6ES7138-4GA00-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>SIWAREX CS</b> Electronic weighing system for scales in SIMATIC ET 200S for applications with and without verified calibration, with EU type approval 2000 d, width 30 mm (1.18 in)</li> </ul>	<b>7MH4910-0AA01</b>
		<ul style="list-style-type: none"> <li>• <b>SIWAREX CF</b> Transmitter for connecting DMS sensors, e.g. for force and torque measurement, width 30 mm (1.18 in)</li> </ul>	<b>7MH4920-0AA01</b>
		<p>You can find more information on SIWAREX weighing systems at: <a href="http://www.siemens.com/siwarex">www.siemens.com/siwarex</a></p>	

<sup>1)</sup> Can be used as isochronous I/O.

## Selection and ordering data (continued)

Description	Order No.	Description	Order No.
<b>Reserve Module for reserving space in unused slots</b> <ul style="list-style-type: none"> <li>• Width 15 mm (0.59 in), 5 units</li> <li>• Width 30 mm (0.59 in), 1 unit</li> </ul>	<b>6ES7138-4AA01-0AA0</b> <b>6ES7138-4AA11-0AA0</b>	<b>TM-E Terminal Modules for Electronic Modules <sup>1)</sup></b> Width 15 mm (0.59 mm), 5 units	
<b>TM-E Terminal Modules for Electronic Modules <sup>1)</sup></b> Width 30 mm (1.18 in) for 1 COUNT 5 V/500 kHz, 1 POS U and SIWAREX CS/CF		<ul style="list-style-type: none"> <li>• <b>2 × 4 terminals</b>                With terminal access to AUX1, AUX1 connected through to the left             </li> <li>- TM-E15S24-A1, screw-type terminals</li> <li>- TM-E15C24-A1, spring-loaded terminals</li> <li>- TM-E15N24-A1, FastConnect</li> </ul>	<b>6ES7193-4CA20-0AA0</b> <b>6ES7193-4CA30-0AA0</b> <b>6ES7193-4CA70-0AA0</b>
<ul style="list-style-type: none"> <li>• <b>4 × 4 terminals</b>                Without terminal access to AUX1, AUX1 connected through to the left             </li> <li>- TM-E30S44-01, screw-type terminals</li> <li>- TM-E30C44-01, spring-loaded terminals</li> </ul>	<b>6ES7193-4CG20-0AA0</b> <b>6ES7193-4CG30-0AA0</b>	<ul style="list-style-type: none"> <li>• <b>2 × 6 terminals</b>                With terminal access to AUX1, AUX1 connected through to the left             </li> <li>- TM-E15S26-A1, screw-type terminals</li> <li>- TM-E15C26-A1, spring-loaded terminals</li> <li>- TM-E15N26-A1, FastConnect</li> </ul>	<b>6ES7193-4CA40-0AA0</b> <b>6ES7193-4CA50-0AA0</b> <b>6ES7193-4CA80-0AA0</b>
<ul style="list-style-type: none"> <li>• <b>4 × 6 terminals</b>                With terminal access to AUX1, AUX1 connected through to the left             </li> <li>- TM-E30S46-A1, screw-type terminals</li> <li>- TM-E30C46-A1, spring-loaded terminals</li> </ul>	<b>6ES7193-4CF40-0AA0</b> <b>6ES7193-4CF50-0AA0</b>	<ul style="list-style-type: none"> <li>• <b>2 × 3 terminals</b>                Without terminal access to AUX1, AUX1 connected through to the left             </li> <li>- TM-E15S23-01, screw-type terminals</li> <li>- TM-E15C23-01, spring-loaded terminals</li> <li>- TM-E15N23-01, FastConnect</li> </ul>	<b>6ES7193-4CB00-0AA0</b> <b>6ES7193-4CB10-0AA0</b> <b>6ES7193-4CB60-0AA0</b>
<b>TM-E Terminal Modules for Electronic Modules <sup>1)</sup></b> 1 unit, width 15 mm (0.59 in), for 2 AI TC High Feature		<ul style="list-style-type: none"> <li>• <b>2 × 4 terminals</b>                Without terminal access to AUX1, AUX1 connected through to the left             </li> <li>- TM-E15S24-01, screw-type terminals</li> <li>- TM-E15C24-01, spring-loaded terminals</li> <li>- TM-E15N24-01, FastConnect</li> </ul>	<b>6ES7193-4CB20-0AA0</b> <b>6ES7193-4CB30-0AA0</b> <b>6ES7193-4CB70-0AA0</b>
<ul style="list-style-type: none"> <li>• <b>Terminal Modules for internal temperature compensation for 2 AI TC High Feature</b></li> <li>- TM-E15S24-AT, screw-type terminals</li> <li>- TM-E15C24-AT, spring-loaded terminals</li> </ul>	<b>6ES7193-4CL20-0AA0</b> <b>6ES7193-4CL30-0AA0</b>		

<sup>1)</sup> Consult corresponding TM-P/TM-E manual or SIMATIC ET 200 Configurator software for selection.

# SIMOTION I/O components

## Distributed I/O

### SIMATIC ET 200S

#### Selection and ordering data (continued)

Description	Order No.
<b>Standard motor starter</b> With diagnostics, electromechanical, fuseless, expandable with Brake Control Module	
• <b>DS1-x direct-on-line starters</b>	<b>3RK1301- ■ ■ B00-0AA2</b>
• <b>RS1-x reversing starters</b>	<b>3RK1301- ■ ■ B00-1AA2</b>
< 0.06 kW <sup>1)</sup> ; 0.14 ... 0.20 A <sup>2)</sup>	<b>0 B</b>
0.06 kW <sup>1)</sup> ; 0.18 ... 0.25 A <sup>2)</sup>	<b>0 C</b>
0.09 kW <sup>1)</sup> ; 0.22 ... 0.32 A <sup>2)</sup>	<b>0 D</b>
0.10 kW <sup>1)</sup> ; 0.28 ... 0.40 A <sup>2)</sup>	<b>0 E</b>
0.12 kW <sup>1)</sup> ; 0.35 ... 0.50 A <sup>2)</sup>	<b>0 F</b>
0.18 kW <sup>1)</sup> ; 0.45 ... 0.63 A <sup>2)</sup>	<b>0 G</b>
0.21 kW <sup>1)</sup> ; 0.55 ... 0.80 A <sup>2)</sup>	<b>0 H</b>
0.25 kW <sup>1)</sup> ; 0.70 ... 1.0 A <sup>2)</sup>	<b>0 J</b>
0.37 kW <sup>1)</sup> ; 0.9 ... 1.25 A <sup>2)</sup>	<b>0 K</b>
0.55 kW <sup>1)</sup> ; 1.1 ... 1.6 A <sup>2)</sup>	<b>1 A</b>
0.75 kW <sup>1)</sup> ; 1.4 ... 2.0 A <sup>2)</sup>	<b>1 B</b>
0.90 kW <sup>1)</sup> ; 1.8 ... 2.5 A <sup>2)</sup>	<b>1 C</b>
1.1 kW <sup>1)</sup> ; 2.2 ... 3.2 A <sup>2)</sup>	<b>1 D</b>
1.5 kW <sup>1)</sup> ; 2.8 ... 4.0 A <sup>2)</sup>	<b>1 E</b>
1.9 kW <sup>1)</sup> ; 3.5 ... 5.0 A <sup>2)</sup>	<b>1 F</b>
2.2 kW <sup>1)</sup> ; 4.5 ... 6.3 A <sup>2)</sup>	<b>1 G</b>
3.0 kW <sup>1)</sup> ; 5.5 ... 8.0 A <sup>2)</sup>	<b>1 H</b>
4.0 kW <sup>1)</sup> ; 7.0 ... 10 A <sup>2)</sup>	<b>1 J</b>
5.5 kW <sup>1)</sup> ; 9.0 ... 12 A <sup>2)</sup>	<b>1 K</b>
<b>High Feature motor starters</b> With diagnostics, fuseless, expandable with Brake Control Module	
• <b>DS1e-x direct-on-line starters</b>	<b>3RK1301- ■ ■ B10-0AB4</b>
• <b>RS1e-x reversing starters</b>	<b>3RK1301- ■ ■ B10-1AB4</b>
• <b>DSS1e-x soft starters</b>	<b>3RK1301- ■ ■ B20-0AB4</b>
0.3 ... 3.0 A <sup>2)</sup>	<b>0 A</b>
2.4 ... 8.0 A <sup>2)</sup>	<b>0 B</b>
2.4 ... 16.0 A <sup>2)</sup>	<b>0 C</b>

Description	Order No.
<b>Power Module for motor starter</b>	
• <b>PM-D Power Module</b> for 24 V DC with diagnostics	<b>3RK1903-0BA00</b>
• <b>Terminal Module for</b> motor starter power module PM-D TM-P15-S27-01	<b>3RK1903-0AA00</b>
<b>Accessories for standard motor starters</b>	
<b>Control kit</b>	
• For manually operating the contacts during start-up and servicing (one set contains five control kits)	<b>3RK1903-0CA00</b>
• For direct control of contactor (manual control) 24 V DC	<b>3RK1903-0CG00</b>
<b>Terminal Modules for direct-on-line starter</b>	
• <b>TM-DS45-S32</b> With supply cable connection for power bus; incl. three caps for terminating the power bus	<b>3RK1903-0AB00</b>
• <b>TM-DS45-S31</b> Without supply cable connection for power bus	<b>3RK1903-0AB10</b>
<b>Terminal Modules for reversing starter</b>	
• <b>TM-RS90-S32</b> With supply cable connection for power bus; incl. three caps for terminating the power bus	<b>3RK1903-0AC00</b>
• <b>TM-RS90-S31</b> Without supply cable connection for power bus	<b>3RK1903-0AC10</b>
<b>Accessories for DS1-x, RS1-x motor starters</b>	
<b>DM-V15 Distance Module</b>	<b>3RK1903-0CD00</b>
• For direct-on-line starters with high temperature and current load; width 15 mm (0.59 in)	
<b>Terminal block PE/N</b>	
• <b>M45-PEN-F</b> , width 45 mm (1.77 in), incl. 2 caps; in combination with TM-DS45-S32 or TM-RS90-S32	<b>3RK1903-2AA00</b>
• <b>M45-PEN-S</b> , width 45 mm (1.77 in), in combination with TM-DS45-S31 or TM-RS90-S31	<b>3RK1903-2AA10</b>

<sup>1)</sup> Motor output for three-phase standard motor at 400 V.

<sup>2)</sup> Setting range of the overcurrent release.

### Selection and ordering data (continued)

Description	Order No.
<b>Accessories for standard and High Feature motor starters</b>	
<b>Jumper module</b>	
<ul style="list-style-type: none"> <li>M30-PEN, 30 mm (1.18 in) wide; for bridging a 30 mm (1.18 in) module</li> </ul>	<b>3RK1903-0AJ00</b>
<ul style="list-style-type: none"> <li>M15-PEN, 15 mm (0.59 in) wide; for bridging a 15 mm (0.59 in) module</li> </ul>	<b>3RK1903-0AH00</b>
<ul style="list-style-type: none"> <li>M30-L123, 30 mm (1.18 in) wide; jumper module; for bridging a 30 mm (1.18 in) module</li> </ul>	<b>3RK1903-0AF00</b>
<ul style="list-style-type: none"> <li>M15-L123, 15 mm (0.59 in) wide; bridge module; for bridging a 15 mm (0.59 in) module</li> </ul>	<b>3RK1903-0AE00</b>
<b>Brake Control Module</b>	
For motors with a mechanical brake	
<ul style="list-style-type: none"> <li>xB1 24 V DC/4 A</li> </ul>	<b>3RK1903-0CB00</b>
<ul style="list-style-type: none"> <li>xB2 500 V DC/0.7 A</li> </ul>	<b>3RK1903-0CC00</b>
<ul style="list-style-type: none"> <li>xB3 24 V DC/4 A, 2 DI 24 V DC Local control with diagnostics: with 2 inputs with quick-stop function</li> </ul>	<b>3RK1903-0CE00</b>
<ul style="list-style-type: none"> <li>xB4 500 V DC/0.7 A, 2 DI 24 V DC Local control with diagnostics: with 2 inputs with quick-stop function</li> </ul>	<b>3RK1903-0CF00</b>
<b>Terminal Modules</b>	
<ul style="list-style-type: none"> <li>TM-xB15 S24-01 for xB1 or xB2</li> </ul>	<b>3RK1903-0AG00</b>
<ul style="list-style-type: none"> <li>TM-xB215 S24-01 for xB3 ... xB4</li> </ul>	<b>3RK1903-0AG01</b>

Description	Order No.
<b>Accessories for High Feature motor starters</b>	
<b>Control Module 2DI, 24 V DC COM</b>	
Digital input module with two inputs	
<ul style="list-style-type: none"> <li>For local motor start functions for mounting to the front of a motor starter</li> </ul>	<b>3RK1903-0CH10</b>
<ul style="list-style-type: none"> <li>For local motor start functions or manual operation for mounting to the front of a motor starter</li> </ul>	<b>3RK1903-0CH20</b>
<b>LOGO! PC signal cable</b>	
For connecting the High Feature motor starter with Switch ES interface to a PC	
<b>Terminal Modules</b>	
<ul style="list-style-type: none"> <li><b>TM-DS65-S32</b> For direct-on-line starters DS1e-x, DSS1e-x, with supply cable connection for power bus; incl. three caps for terminating the power bus</li> </ul>	<b>3RK1903-0AK00</b>
<ul style="list-style-type: none"> <li><b>TM-DS65-S31</b> For direct-on-line DS1e-x, DSS1e-x, without supply cable connection for power bus</li> </ul>	<b>3RK1903-0AK10</b>
<ul style="list-style-type: none"> <li><b>TM-RS130-S32</b> For RS1e-x reversing starter, with supply cable connection for power bus; incl. three caps for terminating power bus</li> </ul>	<b>3RK1903-0AL00</b>
<ul style="list-style-type: none"> <li><b>TM-RS130-S31</b> For RS1e-x reversing starter, without supply cable connection for power bus</li> </ul>	<b>3RK1903-0AL10</b>
<b>M65-PEN-F Infeed Module</b>	
65 mm (2.56 in) wide, incl. two caps, in combination with TM-DS65-S32/ TM-RS130-S32	
<b>3RK1903-2AC00</b>	
<b>M65-PEN-S Connection Module</b>	
65 mm (2.56 in) wide, in combination with TM-DS65-S31/TM-RS130-S31	
<b>3RK1903-2AC10</b>	



# SIMOTION I/O components

## Distributed I/O

### SIMATIC ET 200S

#### Selection and ordering data (continued)

Description	Order No.
<b>Local Safety Modules</b>	
<b>• Safety Modules</b>	
- PM-D F1, with diagnostics, for EMERGENCY-STOP applications, monitored startup	<b>3RK1903-1BA00</b>
- PM-D F2, with diagnostics, for protective door monitoring, automatic startup	<b>3RK1903-1BB00</b>
- PM-D F3, with diagnostics, for expansion of PM-D F1/2 for an additional voltage group, time-delayed 0 ... 15 s	<b>3RK1903-1BD00</b>
- PM-D F4, with diagnostics, for expansion of PM-D F1 to F4 with an additional voltage group	<b>3RK1 903-1BC00</b>
- PM-D F5 with diagnostics for expansion of PM-D F1 to F4 with four isolated enabling circuits, contact multiplier	<b>3RK1 903-1BE00</b>
- PM-X, with diagnostics; connection module for connecting a safety group and an external incoming supply contactor or external safety circuit	<b>3RK1903-1CB00</b>
<b>• Terminal Modules for Safety Modules</b>	
- TM-PF30 S47-B1, for PM-D F1/2 with incoming supply U1/U2 and sensor connection	<b>3RK1903-1AA00</b>
- TM-PF30 S47-B0, for PM-D F1/2 with sensor connection	<b>3RK1903-1AA10</b>
- TM-PF30 S47-C1, for PM-D F 3/4 with incoming supply U1/U2 and IN+/IN- control input	<b>3RK1903-1AC00</b>
- TM-PF30 S47-C0, for PM-D F3/4 with incoming supply U2	<b>3RK1903-1AC10</b>
- TM-PF30 S47-D0, for PM-D F5	<b>3RK1903-1AD10</b>
<b>• TM-X15 S27-01</b> for connection module PM-X	<b>3RK1903-1AB00</b>
<b>• F kit 1</b> Failsafe equipment for DS1-x standard motor starter <sup>1)</sup>	<b>3RK1903-1CA00</b>
<b>• F kit 2</b> Failsafe equipment for RS1-x standard motor starter <sup>1)</sup>	<b>3RK1903-1CA01</b>

Description	Order No.
<b>SIMATIC ET 200S accessories</b>	
<b>Shield connection element</b> Pluggable on TM-E and TM-P, 5 units	<b>6ES7193-4GA00-0AA0</b>
<b>Shield terminal</b> for 3 × 10 mm (0.39 in) busbar, 5 units	<b>6ES7193-4GB00-0AA0</b>
<b>Grounding terminal</b> for cable cross-sections up to 25 mm <sup>2</sup> , 1 unit	<b>8WA2 868</b>
<b>Busbar 3 × 10 mm × 1000 mm</b>	<b>8WA2 842</b>
<b>SIMATIC, DIN rail</b>	
• 35 mm (1.38 in), length 483 mm (19.02 in) for 19" cabinets	<b>6ES5710-8MA11</b>
• 35 mm (1.38 in), length 530 mm (20.87 in) for 600 mm (23.62 in) cabinets	<b>6ES5710-8MA21</b>
• 35 mm (1.38 in), length 830 mm (32.68 in) for 900 mm (35.43 in) cabinets	<b>6ES5710-8MA31</b>
• 35 mm (1.38 in), length 2 m (6.56 ft)	<b>6ES5710-8MA41</b>
<b>Labeling sheets DIN A4</b> 10 units Each sheet contains 60 labeling strips for I/O Modules and 20 labeling strips for Interface Modules	
• petrol	<b>6ES7193-4BH00-0AA0</b>
• red	<b>6ES7193-4BD00-0AA0</b>
• yellow	<b>6ES7193-4BB00-0AA0</b>
• light beige	<b>6ES7193-4BA00-0AA0</b>
<b>Accessories for coding</b>	
<b>Color coding plates</b> For TM-P, TM-E, 200 units	
• white	<b>6ES7193-4LA20-0AA0</b>
• yellow	<b>6ES7193-4LB20-0AA0</b>
• yellow/green	<b>6ES7193-4LC20-0AA0</b>
• red	<b>6ES7193-4LD20-0AA0</b>
• blue	<b>6ES7193-4LF20-0AA0</b>
• brown	<b>6ES7193-4LG20-0AA0</b>
• turquoise	<b>6ES7193-4LH20-0AA0</b>
<b>Labels, inscribed</b> 200 units	
• For slot numbering (1 to 20) 10 ×	<b>8WA8861-0AB</b>
• For slot numbering (1 to 40) 5 ×	<b>8WA8861-0AC</b>
• For slot numbering (1 to 64) 1 ×, (1 to 68) 2 ×	<b>8WA8861-0DA</b>
<b>Labels, blank</b> 100 units	
• For slot numbering	<b>8WA8848-2AY</b>

<sup>1)</sup> The function of the failsafe kit is already integrated into High Feature motor starters.

### Overview



- Compact, cost-effective I/O devices for processing digital signals
- Designed for use without a control cabinet with IP65/67 degree of protection with flexible and fast connections
- Comprises of a basic module and various connection blocks for application-specific implementations
  - ECOFAST: 2 × RS 485 hybrid fieldbus connection with identification plug for setting the PROFIBUS address
  - M12: 2 × M12 and 2 × 7/8" with 2 rotary coding switches for assigning the PROFIBUS address
- Connection block contains T-functionality for PROFIBUS DP and power supply so that during commissioning and service, the modules can be disconnected and reconnected to the PROFIBUS without interruption
- Module variants:
  - 8 DI, 16 DI, 8 DI/8 DO (1.3 A), 8 DI/8 DO (2.0 A), 8 DO (2.0 A), 16 DO (0.5 A)
- Module diagnostics for load voltage and encoder short-circuit
- Transmission rates up to 12 Mbit/s

### Application

SIMATIC ET 200eco is the compact block I/O with IP65/67 degree of protection and is distinguished by simple handling and installation.

SIMATIC ET 200eco allows the user to cost-effectively process digital signals over PROFIBUS DP.

Thanks to its high degree of protection and ruggedness, it is particularly suitable for use close to the machine.

The flexible connection blocks can be used to connect PROFIBUS DP over M12 or a standardized hybrid fieldbus connection (ECOFAST).

The compact block I/O SIMATIC ET 200eco can be used as an expansion for applications with high degree of protection in addition to the SIMATIC ET 200pro modular I/O family.

### Design

ET 200eco comprises a basic module and a connection block.

For applications in many different industries, a compact, perfectly matched module spectrum of digital I/Os is available:

Number of channels	Type of connection
8 DI	8 individual channels over 8 × M12 screw connections for 8 digital input signals
16 DI	16 channels over 8 × M12 screw connections with double assignment for 16 digital input signals
8 DO	8 individual channels over 8 × M12 screw connections for 8 digital output signals (2 A)
16 DO	16 channels over 8 × M12 screw connections with double assignment for 16 digital output signals (0.5 A)
8 DI/8 DO (2 variants)	16 channels over 8 × M12 screw connections with double assignment for 8 digital input and 8 digital output signals (2 A or 1.3 A)

With the variable and flexible connection blocks, PROFIBUS DP can be connected over 2 × M12, 2 × 7/8" or 2 × hybrid fieldbus interfaces (ECOFAST).

The T-functionality for PROFIBUS DP and power supply are integrated in the connection block so that machines can be operated without interruption during commissioning and service of bus lines and without having to use supplementary components.

The pin assignment for the actuators and sensors are modeled on the IP65/67 standardization trends.

The PROFIBUS address can be set and seen from the outside or plugged. The proven identification connector is used for ECOFAST interfaces. For M12 7/8" interfaces, two rotary coding switches which can be seen from the outside are used to set the PROFIBUS address.

### Function

Communication is handled completely over PROFIBUS DP.

Diagnostic functions are available for checking the mode of operation of the ET 200eco:

- BF (bus fault)
- SF (system fault)
- Encoder and power supply

The diagnostic data is indicated by LEDs on the module and can be evaluated by software on the PG/PC or by SIMOTION.

Short-circuits of the encoder supply as well as missing load voltages are diagnosed for each module.

The connection block can be removed from and screwed back to the basic module while the power is on so that PROFIBUS and the power supply remain active for the application all the time.

# SIMOTION I/O components

## Distributed I/O

### SIMATIC ET 200eco PN

#### Overview



SIMATIC ET 200eco PN is a compact block I/O with a PROFINET connection with IP65/IP67 degree of protection for cabinet-free installation directly at the machine.

Due to the fully potted, zinc die-cast housing, SIMATIC ET 200eco PN is extremely rugged and resistant to vibration, dust, oil and humidity.

SIMATIC ET 200eco PN can be flexibly expanded via PROFINET and supports star and line topologies within the same system.

#### Benefits

- Compact block I/O for processing digital, analog and IO-Link signals for connecting to the PROFINET bus system
- Cabinet-free installation with IP65/IP67 degree of protection with M12 connection system
- Extremely rugged and strong metal enclosure and fully potted
- Compact module in two types of enclosures
- 100 Mbit/s data transmission rate
- LLDP proximity detection without PG and fast startup (boot up within approx. 0.5 s)
- Channel-specific diagnostics

#### Application

The SIMATIC ET 200eco PN is ideal for applications directly at the machine in which space is at a premium. Due to its ruggedness and high degree of protection, it is implemented in a wide range of applications demanding a high degree of protection alongside the modular SIMATIC ET 200pro I/O family.

#### Design

SIMATIC ET 200eco PN comprises a basic module and a connection block.

For applications in many different industries, a compact, perfectly matched module spectrum of digital I/Os is available:

Number of channels	Type of connection
8 DI	8 channels over 4 × M12 screw connections with double assignment for 8 digital input signals
8 DI	8 individual channels over 8 × M12 screw connections for 8 digital input signals
16 DI	16 channels over 8 × M12 screw connections with double assignment for 16 digital input signals
8 DO	8 channels over 4 × M12 screw connections with double assignment for 8 digital output signals (1.3 A)
8 DO	8 individual channels over 8 × M12 screw connections for 8 digital output signals (1.3 A)
8 DO	8 individual channels over 8 × M12 screw connections for 8 digital output signals (2 A)
16 DO	16 channels over 8 × M12 screw connections with double assignment for 16 digital output signals (1.3 A)
8 DI/DO	8 individual channels over 8 × M12 screwed connections for 8 digital input/output signals (1.3 A)
8 AI	8 individual channels over 8 × M12 screwed connections for 4 analog input signals (U/I) and 4 RTD/TC signals
4 AO	4 individual channels over 4 × M12 screwed connections for 4 analog output signals (U/I)
IO-Link master	16 channels over 8 × M12 screwed connections with double assignment for 4 IO-Link channels, 8 digital input signals and 4 digital output signals (1.3 A)

2 × M12 screwed connections with an integrated 2-port switch are used for connection to PROFINET IO, so line topologies can be configured.

The supply and load voltage connections are also implemented as 2 × M12 screwed connections. This makes supply voltage loop-through extremely easy. Using an optional terminal block, the supply voltage can be connected via insulating piercing terminals.

#### Function

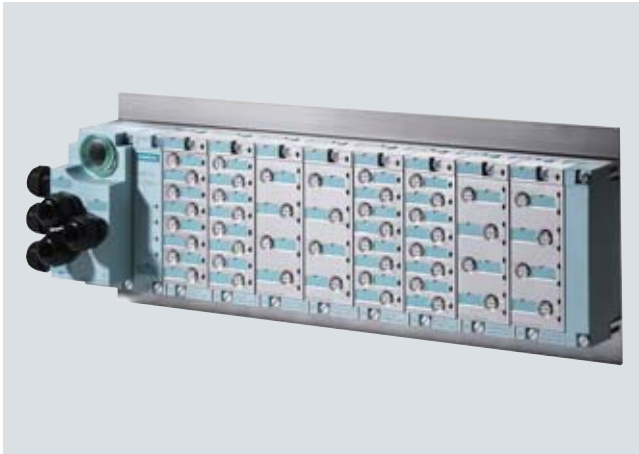
The communication is performed exclusively via PROFINET IO.

Diagnostic functions are available for checking the mode of operation of ET 200eco PN:

- BF (bus fault)
- SF (system fault)
- Encoder and power supply

The diagnostic data are indicated by LEDs on the module and can be evaluated by software on the PG/PC or by SIMOTION. Short-circuits of the encoder supply as well as missing load voltages are diagnosed for each module.

### Overview



SIMATIC ET 200pro is the modular I/O system with high IP65/67 degree of protection for local, cabinet-free applications. ET 200pro distinguishes itself through a small frame size and an innovative installation concept. The ET 200pro station can be easily adapted to the requirements of the corresponding automation task with respect to the connection method, required I/O and fieldbus connection. New features such as the integrated PROFI-safe safety technology, the PROFINET interface and the ability to hotswap modules permit it to be used for a wide range of applications.

### Benefits

- Distributed I/O system with high IP65/67 degree of protection
- Flexible fieldbus connection through interface modules for PROFIBUS DP and PROFINET
- Modular design with up to 16 expansion modules for flexible adaptation to the automation task
- Comprehensive module range
  - Digital and Analog Input and Output Modules
  - Power Module for simple implementation of 24 V load groups
  - Motor starter
  - PROFI-safe module
- Simple, quick assembly and high vibration strength of the module carrier
- Integration of safety technology with PROFI-safe
- High plant availability through permanent wiring and the ability to replace Electronic Modules during operation (hot swapping)
- Low space requirements through small footprint (I/O module e.g. 130 mm (5.12 in) high and 45 mm (1.77 in) wide)
- Graduated diagnostics concept, optionally with module-specific or channel-specific diagnosis of faults of connected sensors or actuators
- Simple configuration through ET 200pro configurator software

### Design

SIMATIC ET 200pro comprises of an interface module which contains the fieldbus interface and is expandable with a comprehensive module range.

The system bus and 24 V power wiring are configured with a busbar system which is integrated in the modules. Wiring using connecting cables is therefore not necessary.

Quick assembly and high vibration strength is achieved through a rack which is available in different options and is an integral part of the system. The modules are first latched onto this rack and then secured with a few screws to achieve a good fit and very high vibration strength.

SIMATIC ET 200pro is usually designed in two or three parts. Interface and Power Modules as well as Digital and Analog Expansion Modules comprise:

- one bus connector which constitutes the backplane bus of the system,
- one Electronics Module or Interface Module and
- one Connection Module.

The separation of module and bus/power connection technology, which has already been used for the ET 200eco, is now also used for the Digital and Analog Expansion Modules of the ET 200pro. For the interface module, this allows use of the T-functionality for the bus and 24 V power supply, and for the Expansion Modules it permits pre-wiring of sensor/actuator connections. This permanent wiring allows exactly one Electronics Module to be hotswapped in the event of a fault without having to switch off the whole station. This ensures very high machine and plant availability. When an electronics component is replaced, the whole I/O wiring can remain on the Connection Module and does not have to be marked or removed.

Power Modules can be added to the system if selective load groups have to be configured within a station or if a 24 V back-feed is required. The power modules interrupt the busbar integrated into the system for the 24 V load supply and feed the power back into the system at the point of connection.

- Up to 16 expansion modules can be used (max. station width: 1 meter (3.28 ft))
- Build-as-you-go busbars for 24 V power and communication within the station
- Flexible connection system
  - Connection for PROFIBUS DP and 24 V power supply over direct coupling (M20 cable gland), ECOFAST or M12 / 7/8"
  - Connection for PROFINET and 24 V power supply over M12 / 7/8"
  - Sensors and actuators for 8-channel I/O modules can be optionally connected to 4 × M12 or 8 × M12.

# SIMOTION I/O components

## Distributed I/O

### SINUMERIK Analog Drive Interface for 4 Axes ADI 4 • SIMATIC Interface Module IM 174

#### Overview



The ADI 4 Analog Drive Interface for 4 Axes and the IM 174 Interface Module can be used to connect drives with analog  $\pm 10$  V setpoint interfaces.

The IM 174 Interface Module also allows stepper drives with pulse/direction interfaces to be connected.

#### Application

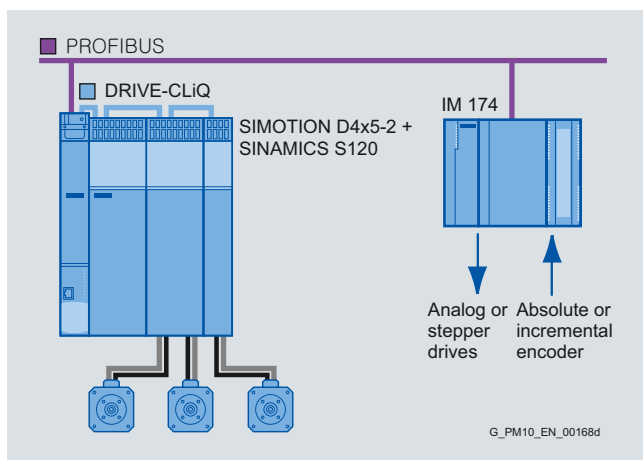
Up to four drives with analog setpoint interfaces can be operated on each of these modules. The isochronous PROFIBUS DP is used for coupling to SIMOTION.

The following can be connected:

- Electrical servo drives with analog  $\pm 10$  V setpoint interface
- Hydraulic drives with analog  $\pm 10$  V setpoint interface (e.g. for servo hydraulic valve)
- Stepper drives with pulse/direction interface (IM 174 Interface Module only)

ADI 4 and IM 174 can also be used for external encoders; at least one axis must be created.

Mixed operation of the 4 drive interfaces is possible.



Connection of an IM 174 to a SIMOTION D module via PROFIBUS DP

#### Design

##### Interfaces

##### Display and diagnostics

- Onboard status display on 4 diagnostics LEDs

##### Drive interfaces

- 4 analog outputs  $\pm 10$  V for connecting drives with analog setpoint interface
- For IM 174 only: 4 interfaces for controlling stepper drives with or without encoder connection
- 4 relay contacts for drive enable axes 1 to 4

##### Encoder interfaces

- 4 encoder inputs for position acquisition. Each input can be connected either to an RS422 incremental encoder or to an SSI absolute encoder. Encoders with SINE/COSINE signals (1 Vpp) can be connected using external pulse shaping electronics (EXE) which convert the signals to the 5 V TTL level.

##### Communication

- PROFIBUS DP interface with Motion Control functionality (isochronous, max. 12 Mbit/s)

##### Digital inputs and outputs

- 10 DI, 24 V DC (e.g. for BERO, probe and "Drive Ready" signal)
- 8 DO, 24 V DC, 0.5 A (e.g. for drive enable)

##### Additional interfaces

- 2 relay contacts for "Ready" signal

An external power source (24 V DC) is required for supplying the module and the digital outputs.

All connections are at the front panel.

#### Function

The following functions are available in connection with SIMOTION:

- Speed-controlled axes
- Position-controlled axes
- External encoder for SIMOTION (at least one axis must be configured)
- Homing over BERO or
- Homing over zero marks (non-distance-coded zero marks/reference marks)
- Measuring over Sensor 1 and Sensor 2 (one edge, rising or falling)

#### Integration

The modules are not certified PROFIBUS DP standard slaves and can therefore only be used in combination with the controllers intended for this purpose (e.g. SIMOTION C/P/D). The modules do not support acyclic communication and the I/O interfaces can only be used in combination with the encoder or drive functions.

ADI 4 and IM 174 must be operated on an isochronous PROFIBUS DP.

Supported PROFIBUS DP cycles:

- ADI 4: 1 ms and above (isochronous, max. 12 Mbit/s)
- IM 174: 1.5 ms and above (isochronous, max. 12 Mbit/s)

#### Technical specifications

	ADI 4	IM 174
<b>Input voltage</b>	24 V DC	24 V DC
<b>Power consumption, max.</b>	30 W	typ. 12 W
<b>Inputs/outputs</b>	Isolated	Isolated
<b>Relay contacts</b>	Max. current carrying capacity: 2 A for 150 V DC or 125 V AC  Switching cycles: - for 24 V DC, 1 A: $1 \times 10^7$ - for 24 V DC, 2 A: $1 \times 10^5$	Max. current carrying capacity: 1 A for 30 V DC  Switching cycles: - for 30 V DC, 1 A: at least. $5 \times 10^5$
<b>Encoder inputs</b> Can be used alternatively for incremental encoders (symmetrical) or absolute encoders (SSI)	4	4
<b>Drive interfaces</b>	4	4
• Analog drives (over analog output $\pm 10$ V)	Yes	Yes
• Hydraulic drives (hydraulic valve over analog output, $\pm 10$ V)	Yes	Yes
• Stepper drives (over pulse/direction interface)	No	Yes
<b>Communication</b>		
• PROFIBUS DP interfaces	1 (isochronous, max. 12 Mbit/s)	1 (isochronous, max. 12 Mbit/s)
• Minimum PROFIBUS DP cycle	1 ms	1.5 ms
<b>Degree of protection to EN 60529</b>	IP20	IP20
<b>Condensation</b>	Not permissible	Not permissible
<b>Permissible ambient temperature</b>		
• Storage	-20 ... +55 °C (-4 ... +131 °F)	-40 ... +70 °C (-40 ... +158 °F)
• Transportation	-40 ... +70 °C (-40 ... +158 °F)	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... +55 °C (+32 ... +131 °F)	0 ... +60 °C (+32 ... +140 °F)
<b>Design</b>	Housing in booksize format; fixed by screwing	SIMATIC S7-300 design (no backplane bus, connected over PROFIBUS)
<b>Weight, approx.</b>	1.5 kg (3.31 lb)	1 kg (2.21 lb)
<b>Dimensions (W x H x D)</b>	48.5 x 325 x 154.4 mm (1.91 x 12.80 x 6.08 in)	160 x 125 x 118 mm (6.30 x 4.92 x 4.65 in)

#### Selection and ordering data

Description	Order No.
<b>SINUMERIK Analog Drive Interface for 4 Axes ADI 4</b>	<b>6FC5211-0BA01-0AA4</b>
<b>SIMATIC Interface Module IM 174</b> (Interface Module for 4 Axes)	<b>6ES7174-0AA10-0AA0</b>
<b>Accessories</b>	
<b>Front connector with screw-type contacts</b> 40-pole, 100 units	<b>6ES7392-1AM00-1AB0</b>
<b>Front connector with spring-loaded contacts</b> 40-pole, 100 units	<b>6ES7392-1BM01-1AB0</b>
<b>Front connector FastConnect</b> 40-pole, 1 unit	<b>6ES7392-1CM00-0AA0</b>

# SIMOTION I/O components

## Distributed I/O

### AS-Interface

#### Overview



An important characteristic of the AS-Interface technology is the use of an unshielded two-core cable for data transmission and distribution of auxiliary power to the sensors and actuators. The special AS-Interface power supply unit supports the AS-Interface transmission method. The mechanically coded and thus polarized AS-Interface cable is used for wiring. The AS-Interface Modules are connected to the AS-Interface cable with insulation piercing contacts.

The ASIsafe concept supports direct integration of safety-related components, such as EMERGENCY-STOP switches, protective door switches or safety light arrays, in the AS-Interface network.

#### Application

##### *Process or field communication*

Complex control cable wiring in the control cabinet and control cabinets full of terminal blocks can be replaced with AS-Interface. Thanks to a specially developed ribbon cable (easily recognized by its yellow color) and insulation piercing technology, the AS-Interface cable can be connected anywhere. This concept results in enormous flexibility and significant cost savings. AS-Interface is an open standard (EN 50295 / IEC 62026-2). Leading manufacturers of actuators and sensors worldwide support AS-Interface.

AS-Interface is used where individual actuators/sensors are spatially distributed over a machine (e.g. in a bottling plant or production line). AS-Interface replaces complex cable harnesses as well as connects binary and analog actuators and sensors such as proximity switches, measuring sensors, valves or indicator lights with a SIMOTION control. In practice this means: Installation runs smoothly because data and power are transported together over a single line. No special expertise is required for installation and commissioning. Furthermore, through simple cable laying, the freely configurable network topology as well as the special design of the cable, you not only significantly reduce the risk of errors, but also service and maintenance costs.

##### *Safety included*

The ASIsafe concept supports direct integration of safety-related components, such as EMERGENCY-STOP switches, protective door switches or safety light arrays, in the AS-Interface network. These are fully compatible with the other AS-Interface components (masters, slaves, power supply units, repeaters, etc.) and are operated together on the yellow AS-Interface cable.

The signals of the safety sensors are evaluated by a safety monitor. The safety monitor not only monitors the switching signals of the safety sensors, but also continuously checks whether data transmission is functioning properly. Depending on the variant, the safety monitor has one or two release circuits which are used to put the machine or plant into a safe state. Each release circuit has two switching contacts to fulfill Safety Category 4 in accordance with EN 954-1 or SIL 3 to IEC 61508. Sensors and monitor can be connected at any point in the AS-Interface network. It is also possible to use several safety monitors on a single network.

A fail-safe control or special master is not necessary. The master treats safety slaves in the same way as all other slaves. The safety data is evaluated in the safety monitor. In this way, existing AS-Interface networks can also be expanded.

### Design

#### AS-Interface network topology

AS-Interface is a single master system. A communications processor (CP 343-2 P), which controls the process or field communication as a master, is used for central application with SIMOTION C or distributed applications over SIMATIC ET 200M. The DP/AS-Interface Link 20E and DP/AS-Interface Link Advanced are used to establish a direct connection between ASInterface and PROFIBUS DP.

IE/AS-Interface Link PN IO can also be used to connect AS-Interface to PROFINET.

The gateways enable AS-Interface to be used as a subnet for PROFIBUS DP or PROFINET on SIMOTION.

Up to 62 slaves can be operated on the AS-Interface. SIMOTION supports all digital and analog AS-Interface slaves (with Analog Profile 7.3 and higher).

The maximum extension of an AS-Interface network is 200 m (656 ft) (with AS-i extension plug) or 100 m (328 ft) (without AS-i extension plug). This length can be increased with the help of repeaters.

The following AS-Interface masters are available for SIMOTION:

- DP/AS-Interface Link 20E and DP/AS-Interface Link Advanced connect PROFIBUS DP to AS-Interface.
- The IE/AS-Interface Link PN IO connects PROFINET IO with AS-Interface.
- The CP 343-2 P is the AS-Interface master for central application with SIMOTION C or for the SIMATIC ET 200M distributed I/O system.

DP/AS-Interface Link Advanced and IE/AS-Interface Link PN IO support particularly easy diagnostics and commissioning on site over the integrated pixel graphics display and control keys or over the web interface using a standard browser.

The modules operate in compliance with the latest AS-i specification 3.0 and therefore also support the operation of digital A/B slaves with 4 inputs and 4 outputs as well as analog A/B slaves.

If the optional C-PLUG is used, modules can be replaced without the need to set PROFIBUS or Ethernet addresses.

The SCOUT command library contains standard functions for easy handling of the AS-Interface components, e.g.

- for operating the command interface of the AS-Interface master
- for reading out the diagnostic information from the ASIsafe safety monitor

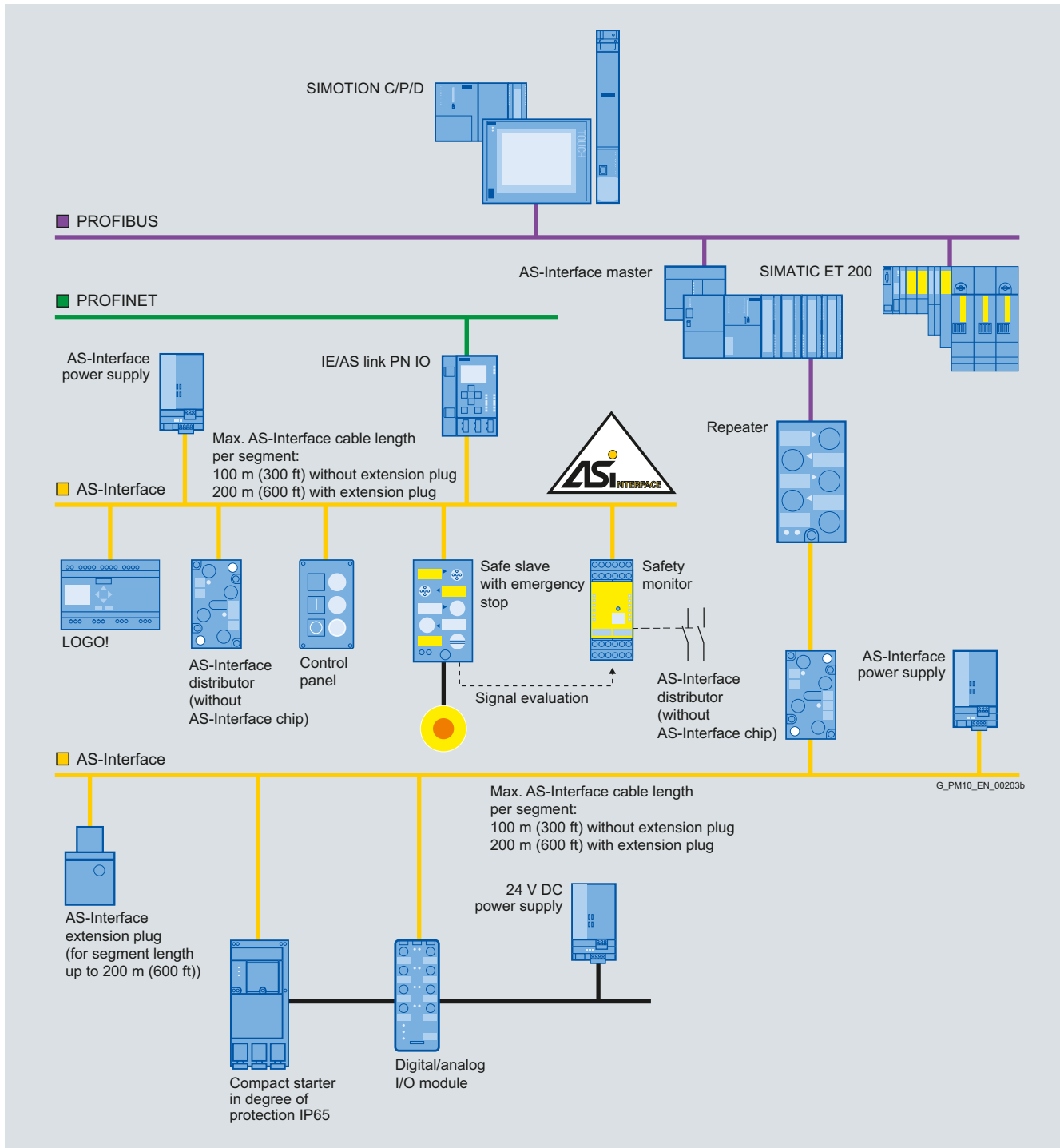


# SIMOTION I/O components

## Distributed I/O

### AS-Interface

#### Design (continued)



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### Selection and ordering data

Description	Order No.
<b>DP/AS-Interface Link 20E</b> Router between the PROFIBUS DP and AS-Interface with IP20 degree of protection	<b>6GK1415-2AA10</b>
<b>IE/AS-Interface LINK PN IO</b> Router between Industrial Ethernet and AS-Interface with master profiles M3, M4 in accordance with extended AS-I specification V3.0 for integration in PROFINET IO; IP20 degree of protection	
• Single master with display	<b>6GK1411-2AB10</b>
• Dual master with display	<b>6GK1411-2AB20</b>
<b>DP/AS-Interface Link Advanced</b> Router between PROFIBUS DP and AS-Interface; master profiles M3 and M4, extended AS-Interface specification V3.0; IP20 degree of protection; manual on CD-ROM	
• Single master with display	<b>6GK1415-2BA10</b>
• Dual master with display	<b>6GK1415-2BA20</b>
<b>C-PLUG</b> Swap medium for easy replacement of the devices in the event of a fault; for storing configuration data or engineering data and user data	<b>6GK1900-0AB00</b>
<b>RS 485 bus connector with angled cable outlet (35°)</b> With screw-type terminals, without PG interface	<b>6ES7972-0BA42-0XA0</b>
<b>IE FC RJ45 Plug 90</b> RJ45 plug-in connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; with 90° cable outlet	
• 1 pack = 1 unit	<b>6GK1901-1BB20-2AA0</b>
• 1 pack = 10 units	<b>6GK1901-1BB20-2AB0</b>
• 1 pack = 50 units	<b>6GK1901-1BB20-2AE0</b>
<b>CP 343-2 P communications processor</b> For connecting SIMOTION C and SIMATIC ET 200M to the AS-Interface; without front connector	<b>6GK7343-2AH11-0XA0</b>
<b>Front connector for CP 343-2 P</b>	
• With screw contacts	
- 20-pole, 1 unit	<b>6ES7392-1AJ00-0AA0</b>
- 20-pole, 100 units	<b>6ES7392-1AJ00-1AB0</b>
• With spring-loaded contacts	
- 20-pole, 1 unit	<b>6ES7392-1BJ00-0AA0</b>
- 20-pole, 100 units	<b>6ES7392-1BJ00-1AB0</b>
• With FastConnect	
- 20-pole, 1 unit	<b>6ES7392-1CJ00-0AA0</b>

### More information

For further information about AS-Interface slaves, ASIsafe and ordering data, see Catalog I K PI and the Industry Mall under Automation technology/Industrial Communication/AS-Interface and on the Internet at:

[www.siemens.com/as-interface](http://www.siemens.com/as-interface)

DP/AS-Interface manuals are available as PDF files at:

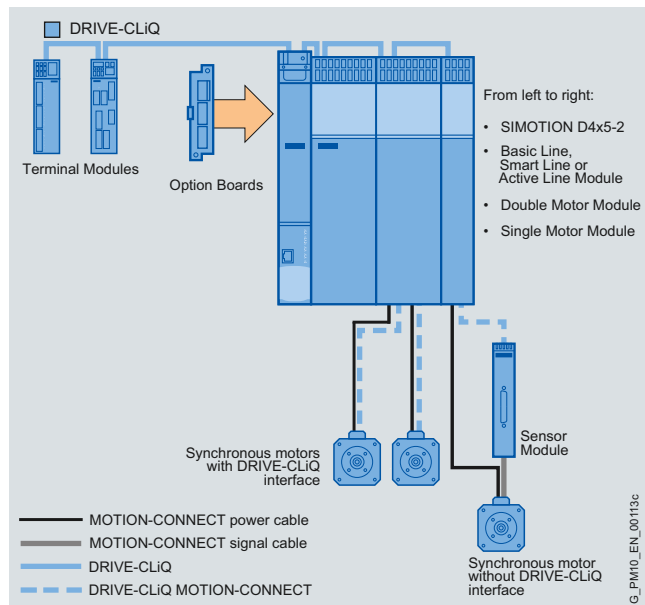
<http://support.automation.siemens.com/WW/view/com/47052644>

# SIMOTION I/O components

## SINAMICS drive I/O

### Summary

#### Overview



#### SINAMICS drive I/O

With the modules of the SINAMICS drive I/O, the SIMOTION Motion Control system as well as the SINAMICS S120 drive system can be expanded with digital and analog inputs and outputs as well as encoder interfaces. The following modules are available:

- TB30 Terminal Board that is plugged into the option slot of the SINAMICS CU320-2/SIMOTION D4x5-2 Control Unit. It provides additional digital and analog inputs and outputs.
- TM Terminal Modules that are connected to SINAMICS/SIMOTION over DRIVE-CLiQ. The Terminal Modules expand SINAMICS/SIMOTION with additional digital and analog inputs/outputs.
- SMC/SME Sensor Modules that are connected to the SINAMICS/SIMOTION Control Unit over DRIVE-CLiQ. The SMC Sensor Modules (for control cabinet installation) and SME (IP67 version for installation outside the control cabinet) are required if motors are to be connected without DRIVE-CLiQ and/or if other encoders must be evaluated in addition to the motor encoder.

#### Connection to SINAMICS/SIMOTION

The modules of the SINAMICS drive I/O are connected to SINAMICS/SIMOTION over DRIVE-CLiQ. The only exception is the TB30 Terminal Board, which is plugged directly into the SINAMICS or SIMOTION Control Unit as a plug-in card.

DRIVE-CLiQ is used to connect SINAMICS Control Units and SIMOTION controllers to other drive-based components, such as Line Modules, Motor Modules, motors and encoders. Set-points and actual values, control commands, status messages and electronic nameplate data for the connected components are transferred via DRIVE-CLiQ.

#### Benefits

- DRIVE-CLiQ significantly simplifies commissioning and diagnostics since all connected components are identified with the help of an electronic nameplate.
- The standardized cables and connectors reduce the variety of different parts and cut storage costs.

#### Application

##### Terminal Board TB30

#### Application

Expansion of the Control Unit with additional digital and analog inputs/outputs.

#### Main features

- Slide-in module for the option slot of Control Units SIMOTION D4x5-2 and SINAMICS S120 CU320-2
- 4 DI, 4 DO, 2 AI, 2 AO

##### TM15/TM17 High Feature Terminal Modules

#### Application

Implementation of measuring inputs and cam outputs as well as drive-related digital inputs and outputs with short signal delay times (TM17 High Feature can only be used in conjunction with SIMOTION)

#### Main features of TM15

24 isolated, bidirectional DI/DO with measuring input and cam functionality (measuring input and cam functionality is available only in connection with SIMOTION)

#### Main features of TM17 High Feature

16 non-isolated, bidirectional DI/DO with measuring input and cam functionality for the highest requirements with respect to resolution, accuracy and short input delay times. In addition, enabling inputs can be parameterized.

##### TM31 Terminal Module

#### Application

Expansion of digital and analog inputs and outputs over DRIVE-CLiQ

#### Main features

- 8 DI, 4 bidirectional DI/DO, 2 relay outputs
- 2 AI, 2 AO
- 1 temperature sensor input (KTY84-130 or PTC)

##### TM41 Terminal Module

#### Application

The TM41 Terminal Module is used for incremental encoder emulation. A master value (incremental signal) can be made available to a second control unit as an external encoder signal via the TM 41.

#### Main features

- 4 DI, 4 DI/O
- 1 AI
- 1 interface for TTL incremental encoder emulation (RS422)

##### TM54F Terminal Module

#### Application

The TM54F provides safe digital inputs and outputs for controlling the Safety Integrated functions of SINAMICS.

#### Main features

- 4 fail-safe digital outputs (F-DO)
- 10 fail-safe digital inputs (F-DI)

### Application (continued)

#### Terminal Modules TM120/TM150

##### Application

Temperature sensors can be evaluated using Terminal Modules TM120/TM150.

##### Main features of TM120

Terminal Module TM120 can be used to evaluate 4 temperature sensors (KTY84-130 or PTC). The temperature sensor inputs are safely electrically isolated from the evaluation electronics in Terminal Module TM120 and are suitable for temperature monitoring of special motors, e.g. 1FN linear motors and 1FW6 built-in torque motors.

##### Main features of TM150

Terminal Module TM150 can be used to evaluate temperature sensors (KTY, PT100, PT1000, PTC and normally closed bimetal contacts). Apart from motor temperature, other temperatures from the process can be acquired. Temperature sensor evaluation can be performed using a 2, 3 or 4-wire system. 12 temperature sensors can be evaluated with 2-wire evaluation, and 6 temperature sensors can be evaluated with 3 and 4-wire evaluation.

#### Sensor Modules SMC10/SMC20/SMC30

##### Application

Motor encoder and temperature evaluation of motors without DRIVE-CLiQ or when additional encoders are used (for example, machine encoders)

##### Main features of SMC10

One encoder connection for evaluating the resolver signals (two-pole and multi-pole). In addition, the motor temperature can be monitored with a KTY84-130 or PTC thermistor.

##### Main features of SMC20

One encoder connection for evaluating

- Incremental encoders (sin/cos 1 Vpp)
- Absolute encoders (EnDat 2.1) and
- SSI encoders with incremental signals (sin/cos 1 Vpp)

In addition, the motor temperature can be monitored with a KTY84-130 or PTC thermistor.

##### Main features of SMC30

One encoder connection for evaluating

- Incremental encoders (TTL/HTL)
- SSI encoders with and without incremental signals (TTL/HTL)

In addition, the motor temperature can be monitored with a KTY84-130 or PTC thermistor.

#### SME20/SME25 Sensor Modules External

##### Application

The SME20/SME25 Sensor Modules External are encoder evaluation units for machine encoders (direct measuring systems). The devices are designed with IP67 degree of protection. This means that the units can be installed outside the control cabinet near the machine encoder.

##### Main features of SME20

One encoder connection for evaluating incremental encoders (sin/cos 1 Vpp) without rotor position track (C and D track).

##### Main features of SME25

An encoder connection for evaluating absolute encoders (EnDat) and SSI absolute encoders with incremental signals (sin/cos 1 Vpp).

#### SME120/SME125 Sensor Modules External

The SME120/SME125 Sensor Modules External are encoder evaluation units with IP67 degree of protection, especially suitable for use in linear and torque applications in which the temperature signals must be reliably electrically isolated from the encoder signals and the 24 V supply. They can be installed close to the motor systems and encoders in the machine.

##### Main features of SME120

One encoder connection for evaluating incremental encoders (sin/cos 1 V<sub>pp</sub>).

##### Main features of SME125

One encoder connection for evaluating absolute encoders (EnDat).

With SME120 and SME125, the motor temperature can also be detected using KTY84-130 or PTC thermistors.

#### DRIVE-CLiQ Hub Module DMC20/DME20

##### Application

The DMC20/DME20 can be used to increase the number of DRIVE-CLiQ interfaces.

##### Main features

DRIVE-CLiQ hub with 6 DRIVE-CLiQ sockets for connecting 5 additional DRIVE-CLiQ nodes.

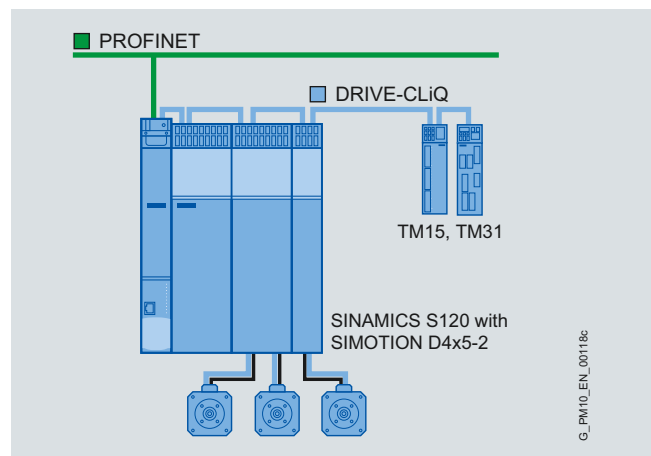
- DMC20 is the hub for mounting in the control cabinet
- DME20 is the hub for mounting outside the control cabinet (IP67 degree of protection).

### Integration

#### Integration of the SINAMICS drive I/O in a SIMOTION system

Two main options are available for SIMOTION for integrating the SINAMICS drive I/O via DRIVE-CLiQ:

- System configuration with integrated drives:  
In this configuration, the drive I/O are connected directly to SIMOTION D or to the SIMOTION CX32-2 Controller Extension (not shown in the figure).
- System configuration with external drives:  
In this configuration, the drive I/O are connected to a SINAMICS CU310-2 or CU320-2 Control Unit, which is connected to SIMOTION C, P or D (see figure) via PROFIBUS DP or via PROFINET IO.



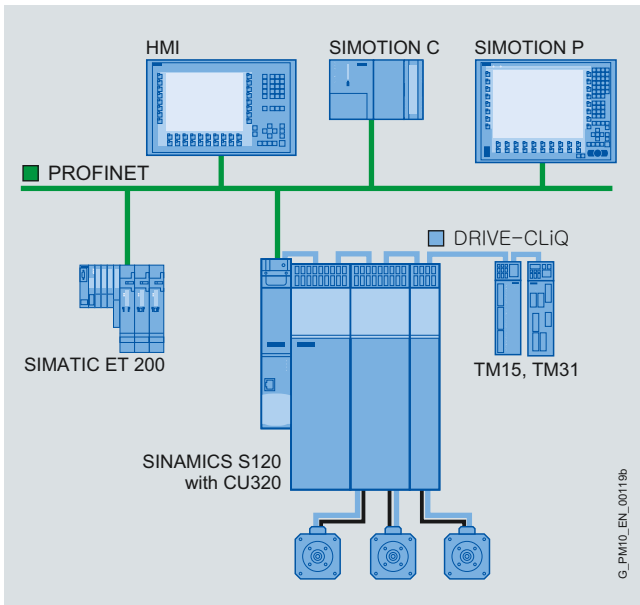
Coupling of TM15 and TM31 with SIMOTION D4x5-2

# SIMOTION I/O components

## SINAMICS drive I/O

### Summary

#### Integration (continued)

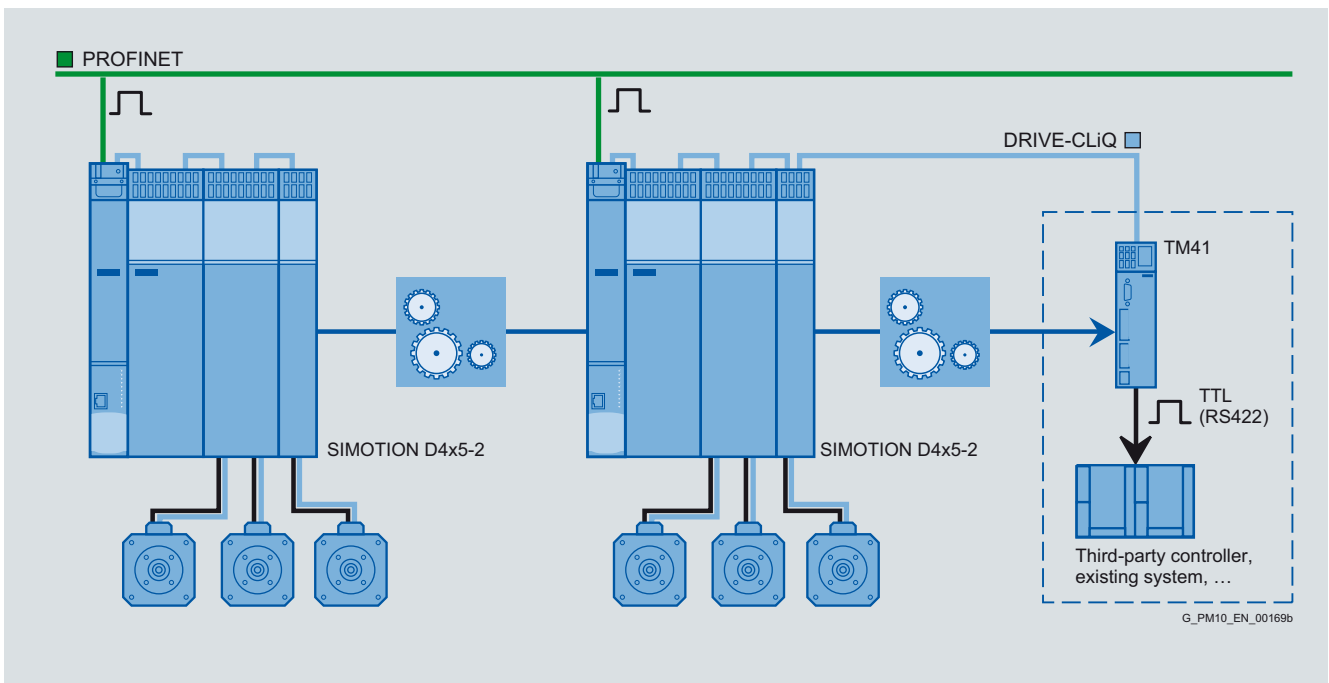


Coupling of TM15 and TM31 with SIMOTION C, P over CU320-2

#### Use of the TM41 as incremental encoder emulation

The TM41 Terminal Module supplies TTL signals for incremental encoder emulation, e.g. for a higher-level control. The encoder interface (incremental encoder emulation) can be linked to an encoder signal from the Control Unit, e.g. incremental encoder sin/cos, by parameter assignment.

Alternatively, as far as SIMOTION is concerned, TM41 can be handled in the same manner as an axis. This allows you to return the axis position (a master value) as an encoder signal to a second controller, for example.



TM41 Terminal Module as incremental encoder emulation

#### More information

Further information

- on the TM15 and TM17 High Feature Terminal Modules can be found on the next pages.
- on the remaining components of the SINAMICS drive I/O can be found in the chapter "SINAMICS S120".

### TM15 and TM17 High Feature Terminal Modules

#### Overview



Terminal Modules TM15 (left) and TM17 High Feature (right)

TM15 and TM17 High Feature Terminal Modules provide the measuring inputs and output cams for the Motion Control System SIMOTION. Furthermore, the Terminal Modules provide drive-related digital inputs and outputs with short signal delay times.

The "Measuring input", "Cam" and "Cam Track" technology objects support easy integration in SIMOTION.

#### Application

The main field of application for the TM15 and TM17 High Feature Terminal Modules are applications which in addition to digital inputs and output cams require very accurate measuring inputs and output cams. Several measuring inputs or output cams can be assigned to a real axis, virtual axis, or external encoder.

Examples for precise sensing with binary signals:

- Edge detection
- Quality monitoring (e.g. product is good/bad)
- Product tracing (e.g. product is available/not available)
- Detection of print marks
- Print mark correction
- Tool monitoring (e.g. for presses)
- Machine status monitoring (e.g. for broken threads in the textile industry)

Examples for precise output of binary signals

- Position-dependent switching of actuators
  - Camera trigger signal (quality assurance)
  - Control of an air nozzle for blowing away cut-offs
  - Controlling a nozzle for applying glue
- Product extraction from production line
- Implementation of line Motion Control systems
- Output of pulse patterns

#### Design

##### Interfaces

##### Display and diagnostics

- The status of the TM15 and TM17 High Feature Terminal Modules is indicated via a multi-color LED.
- The logical status of a channel is indicated with the corresponding green status LED.

##### Interfaces for I/O

- TM15: 24 DI/DO, parameterizable channel-by-channel
- TM17 High Feature: 16 DI/DO, parameterizable channel-by-channel

##### Communication

- 2 DRIVE-CLiQ sockets

##### Power supply

- Connection for the electronic power supply over the 24 V DC infeed connector

##### Installation

The signal cable shield is connected to the TM15 and TM17 High Feature Terminal Modules with a shield connection terminal, e.g. type SK8 by Phoenix Contact or type KLBÜ CO 1 by Weidmüller.

The TM15 and TM17 High Feature Terminal Modules are snapped onto a standard mounting rail according to EN 50022 (35 mm × 15 mm / 7.5 mm (1.38 in × 0.59 in / 0.30 in)).

# SIMOTION I/O components

## SINAMICS drive I/O

### TM15 and TM17 High Feature Terminal Modules

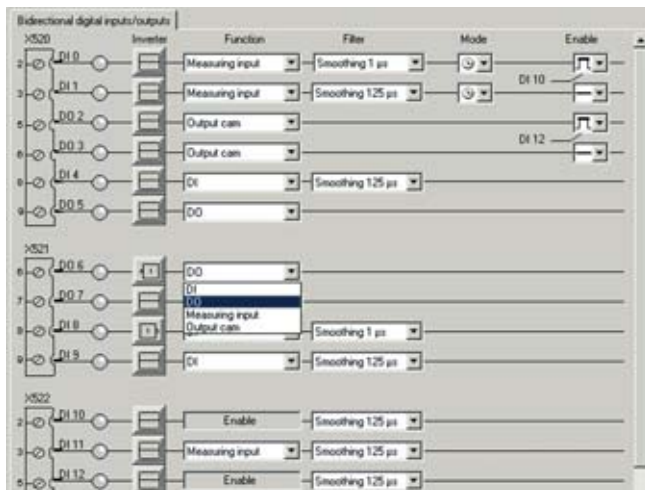
#### Function

Each of the 24 DI/DO (TM15) or 16 DI/DO (TM17 High Feature) can be parameterized channel-by-channel as:

- Digital input (DI) or digital output (DO)
- Measuring input
- Output cam

Each channel can also be inverted, as required.

Parameterization is performed with the SIMOTION SCOUT engineering software.



Parameterization of the TM17 High Feature Terminal Module

The differences between the TM15 and TM17 High Feature Terminal Modules depend on the field of application. TM17 High Feature has fewer I/O channels than TM15, but more functionality.

TM17 High Feature is distinguished by especially high resolution and accuracy as well as a parameterizable input filter and enabling inputs.

Parameterized enable inputs can enable measuring inputs or output cams (gate function).

- Level-controlled enable for measuring inputs
- Level or edge-controlled enable for output cams

TM17 High Feature also supports cyclic measuring of up to 2 edges per servo/interpolator cycle.

Due to their high accuracy, the DI/DO channels of the TM17 High Feature are non-isolated.

#### Integration

The TM15 and TM17 High Feature Terminal Modules can be connected directly to SIMOTION D via DRIVE-CLiQ. Alternatively, TM15 and TM17 High Feature can be connected to a SINAMICS CU310-2 or CU320-2 Control Unit, which is connected with SIMOTION C/P/D over PROFIBUS or PROFINET.

The number of Terminal Modules which can be used depends on the number of axes configured with SIMOTION as well as the functionality configured for TM15 and TM17 High Feature.

[For further information, refer to the Commissioning Manual of the TM15 and TM17 High Feature Terminal Modules.](#)

#### Note:

TM17 High Feature can only be used on a SINAMICS CU310-2 or CU320-2 Control Unit in conjunction with the SIMOTION motion control system.

#### Technical specifications

General data	TM15 Terminal Module	TM17 High Feature Terminal Module
Power supply (rated value)	24 V DC	24 V DC
Current consumption (no-load), max.	0.15 A	0.2 A
Power loss, max.	3 W	4 W
Conductor cross-section, max.	2.5 mm <sup>2</sup>	2.5 mm <sup>2</sup>
<b>Number of DRIVE-CLiQ interfaces</b>	2	2
<b>I/O</b>		
• Digital inputs/outputs	24 DI/DO, parameterizable channel-by-channel	16 DI/DO, parameterizable channel-by-channel
• Isolation	Yes, in groups of 8	No
• Connections	Plug-in screw-type terminals	Plug-in screw-type terminals
• Conductor cross-section, max.	1.5 mm <sup>2</sup>	1.5 mm <sup>2</sup>
<b>Digital inputs</b>	Each channel can be parameterized as: Digital input/measuring input	Each channel can be parameterized as: Digital input/measuring input/enabling input (max. 6 units)
<b>Input voltage (rated value)</b>	24 V DC	24 V DC
• For "0" signal	min. -30 V max. 5 V	-30 V 5 V
• For "1" signal	min. 15 V max. 30 V	15 V 30 V
<b>Input delay</b> at rated value of input voltage	0 → 1 / 1 → 0: typical 50 µs/100 µs	1 µs/125 µs ± 15 % (parameterizable in 2 steps)
<b>Probe function</b>		
• Reproducibility	± 125 µs	≤ ± 1 µs
• Resolution	125 µs	1 µs
<b>Digital outputs</b>	Each channel can be parameterized as: Digital output/output cam The logical status of the digital outputs can be read back for diagnostic purposes	Each channel can be parameterized as: Digital output/output cam The logical status of the digital outputs can be read back for diagnostic purposes
<b>Output voltage (rated value)</b>	24 V DC	24 V DC
• Sustained-short-circuit-proof	Yes	Yes
• Output current per channel	0.5 A	0.5 A
<b>Total current of outputs (per group)</b>		
• Up to 60 °C (140 °F), max.	2 A	2 A
• Up to 50 °C (122 °F), max.	3 A	3 A
• Up to 40 °C (104 °F), max.	4 A	4 A
<b>Output delay (resistive load)</b>		
At "0" to "1" transition		
• Typical	50 µs	50 µs
• Max.	100 µs	100 µs
At "1" to "0" transition		
• Typical	150 µs	75 µs
• Max.	225 µs	150 µs
<b>Cam function</b>		
• Reproducibility	± 125 µs	≤ ± 10 µs
• Resolution	125 µs	1 µs
<b>Weight, approx.</b>	0.86 kg (1.90 lb)	0.86 kg (1.90 lb)
<b>Dimensions (W x H x D)</b>	50 x 150 x 111 mm (1.97 x 5.91 x 4.37 in)	50 x 150 x 111 mm (1.97 x 5.91 x 4.37 in)
<b>Approvals, according to</b>	UL and cULus	UL and cULus

#### Selection and ordering data

Description	Order No.
<b>TM15 Terminal Module</b> 24 DI/DO; 24 V/0.5 A DC (without DRIVE-CLiQ cable)	<b>6SL3055-0AA00-3FA0</b>
<b>TM17 High Feature Terminal Module</b> 16 DI/DO; 24 V DC/0.5 A (without DRIVE-CLiQ cable)	<b>6SL3055-0AA00-3HA0</b>

#### More information

For further information about accessories that can be used and about the DRIVE-CLiQ cables, see the section "MOTION-CONNECT connection systems".

For the Terminal Modules TM15 and TM17 High Feature, the same DRIVE-CLiQ cables for the Terminal Module TM31 can be used.



# SIMOTION I/O components

## Other I/O modules

### SIPLUS extreme

#### Overview



SIPLUS extreme is the product family with hardened/specially designed components based on standard products (e.g. SIMATIC S7, ET 200, MICROMASTER, POSMO A). SIPLUS permits distributed use of automation components, even under demanding environmental conditions.

- Ambient temperature range from -40/-25 °C (-40/-13 °F) to +60/+70 °C (+140/+158 °F)
- Condensation, increased humidity, increased degree of protection (dust, water)
- Extreme atmospheric exposure, e.g. toxic atmospheres
- Increased mechanical load, increased noise immunity
- Voltage ranges deviating from the standard
- Sector-specific solutions

#### More information

For further information on SIPLUS, see:

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

### SIMATIC RFID systems

#### Overview



SIMATIC RFID systems control and optimize the material flow. They identify reliably, quickly and economically, are unaffected by contamination and store data directly on the product.

The data exchange between the tag (mobile data memory) and the reader (write/read device) is fully automatic and contactless by means of radio frequencies (RF) and does not require a direct line of sight.

SIMATIC RFID systems are available for different fields of application, e.g. for smart labels (ultra-slim data memory) for logistics, rugged tags for production lines or "long-range" tags for locating and localization.

For user-friendly, standardized data exchange between the SIMOTION system and the standard profile RFID systems (PIB = Proxy Ident Block), function blocks (FB) are available in the SCOUT command library. This standard profile is, for example, supported by the SIMATIC RFID system ASM 456, which is connected to SIMOTION over PROFIBUS DP.

#### More information

For further information on SIMATIC RFID systems, see:

[www.siemens.com/simatic-sensors/rf](http://www.siemens.com/simatic-sensors/rf)

### SIMATIC Machine Vision

#### Overview



Visual inspection and recognition of products in manufacturing is becoming more important because the demands on quality and production speed are increasing. The advantages:

- Increased productivity
- Reliable, automatic visual inspection saves time and costs
- Optimization of the material flow
- Reduced machine standstill times

The intelligent SIMATIC MV420, MV440, VS 120 and VS 130 vision sensors have been developed especially for application-specific image processing. Thanks to their user-friendly operation, no special image processing knowledge is required since the intelligent vision sensors are trained rather than programmed.

#### More information

For further information on Machine Vision, see:

[www.siemens.com/simatic-sensors/vs](http://www.siemens.com/simatic-sensors/vs)

### SIWAREX Weighing systems

#### Overview



Wherever forces or weights have to be measured in automation and process engineering today, modern weighing systems are involved in monitoring and controlling the different production sequences.

They are used in simple applications for monitoring forces, detecting fill levels of containers and even in complex portioning tasks such as filling containers with liquid and bagging solid material.

In the case of the SIWAREX FTA Weighing module in SIMATIC S7-300 design, the function block (FB) is an integral component of the SCOUT command library. SIWAREX FTA is therefore the optimum solution for applications that can be calibrated such as filling systems, loading stations, bagging stations, rotary packers or inspection stations.

Apart from SIWAREX FTA, the SIMATIC S7-300 module SIWAREX U as well as the ET 200S modules SIWAREX CS and SIWAREX FTC are available for simple applications such as load and force measurements for SIMOTION.

#### More information

For further information on SIWAREX Weighing systems, see:

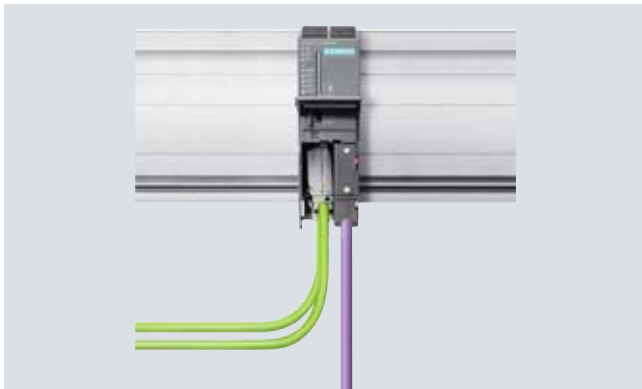
[www.siemens.com/siwarex](http://www.siemens.com/siwarex)

# SIMOTION I/O components

## Other I/O modules

### Other I/O modules / Notes on use

#### Overview



The PROFIBUS DP and the PROFINET IO fieldbuses are powerful, open and rugged bus systems for fast, cyclic data exchange between field devices. The openness of PROFIBUS DP or PROFINET IO permits connection of standard components from other manufacturers.

In addition to the I/O modules approved for SIMOTION, all certified standard slaves or PROFINET IO Devices can, in principle, be connected to SIMOTION if they support PROFIBUS DP with:

- Cyclic data traffic (DP-V0) and, possibly,
- Acyclic data traffic (DP-V1) or
- Isochronous data traffic (DP-V2)

and PROFINET IO

- Real-time communication (RT) or
- Isochronous Real-time Communication (IRT)

These modules are integrated via the GSD file or GSDML file of the respective device manufacturer. Please note that in individual cases further boundary conditions must be fulfilled in order to integrate standard slaves or PROFINET IO Devices into SIMOTION. Thus, "driver modules" that permit or simplify a linking, for example, in the form of function blocks, are required for some modules.

#### More information

For further information about industrial communication and field devices, see Catalog IK PI and the Industry Mall under Automation technology/Industrial Communication and on the Internet at:

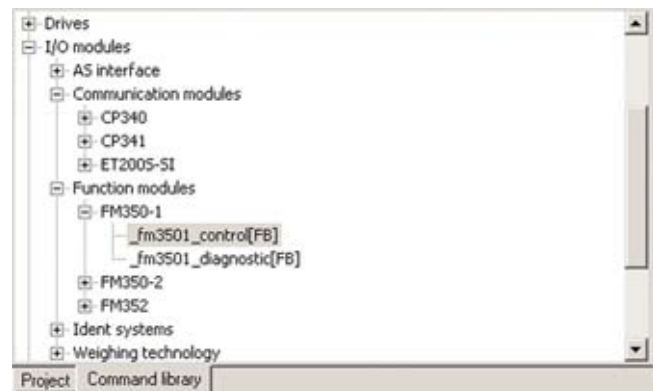
[www.siemens.com/simatic-net](http://www.siemens.com/simatic-net)

A list of all the I/O modules that can currently be used with SIMOTION (centralized, distributed PROFIBUS/PROFINET, DRIVE-CLiQ) is available under the following link:

<http://support.automation.siemens.com/WW/view/en/11886029>

### Function blocks for I/O modules

#### Overview



Function blocks for I/O modules are available as an integral component of the SCOUT command library. The function blocks are easily copied into the application program by means of drag & drop. Sample programs are also provided in SIMOTION Utilities & Applications which demonstrate integration of the function blocks. SIMOTION Utilities & Applications are included in the scope of supply of SIMOTION SCOUT.

Function blocks are available in the SCOUT command library for the following I/O modules:

- SIMODRIVE POSMO A, intelligent positioning motor
- FM 350-1, single-channel Counter Module
- FM 350-2, 8-channel Counter Module
- FM 352, cam controller
- CP 340, Communication Module
- CP 341, Communication Module
- SIWAREX FTA, Weighing Module
- ET 200S, 1SI serial Interface Module (3964R, ASCII)
- ET 200S, frequency converter
- ASM 456, RFID system
- AS-Interface master (function block for operation of the command interface)
- ASIsafe safety monitor (with one or two enabling circuits)

## SIMOTION HMI devices



<b>11/2</b>	<b>Overview</b>
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<b>11/4</b>	<b>Mobile Panels</b>
11/4	SIMATIC Mobile Panel 177 SIMATIC Mobile Panel 277
<b>11/5</b>	<b>Touch Panels / Operator Panels</b>
11/5	SIMATIC TP 177B / SIMATIC TP 177B Widescreen / SIMATIC OP 177B
11/6	SIMATIC TP 277 / SIMATIC OP 277
<b>11/7</b>	<b>Multi Panels</b>
11/7	SIMATIC MP 177 / SIMATIC MP 277
11/8	SIMATIC MP 377
<b>11/9</b>	<b>Panel PCs</b>
11/9	SIMATIC HMI IPC277D
11/10	SIMATIC HMI IPC477C
11/12	SIMATIC HMI IPC577C
11/14	SIMATIC HMI IPC677C
<b>11/16</b>	<b>SIMATIC WinCC flexible ES engineering software</b>
<b>11/17</b>	<b>SIMATIC WinCC flexible RT visualization software</b>

# SIMOTION HMI devices

## Overview

	Designation	Description	Page
<b>Mobile devices</b>			
	SIMATIC Mobile Panel 177	Mobile HMI devices for direct operator control of the plant and machine from any point 5.7" STN display with touch screen, 256 colors, 14 configurable function keys	<b>11/4</b>
	SIMATIC Mobile Panel 277	Mobile HMI devices for direct operator control of the plant and machine from any point 7.5"/10" TFT display with touch screen, 65536 colors, 18 configurable function keys	<b>11/4</b>
<b>Touch Panels / Operator Panels</b>			
	SIMATIC TP 177B SIMATIC TP 177B Widescreen SIMATIC OP 177B	Touch Panel/Operator Panel with comprehensive functionality for demanding machine visualization Universal entry-level device with 4.3" color TFT Widescreen or 5.7" STN display	<b>11/5</b>
	SIMATIC TP 277 SIMATIC OP 277	Touch Panel/Operator Panel with comprehensive functionality for demanding machine visualization Comprehensive functionality 5.7" TFT display	<b>11/6</b>
<b>Multi Panels</b>			
	SIMATIC MP 177	Multi Panels combine the rugged construction of Operator Panels with the flexibility of PCs 5.7"/10.4" TFT display and touch screen	<b>11/7</b>
	SIMATIC MP 277	Multi Panels combine the rugged construction of Operator Panels with the flexibility of PCs 7.5"/10.4" TFT display	<b>11/7</b>
	SIMATIC MP 377	Multi Panels combine the rugged construction of Operator Panels with the flexibility of PCs 12.1"/15.1"/19" TFT display	<b>11/8</b>
<b>Panel PCs</b>			
	SIMATIC HMI IPC277D	For implementing simple visualization and control tasks	<b>11/9</b>
	SIMATIC HMI IPC477C	Industry-standard PC platform for PC-based automation Ultra-compact, rugged and maintenance-free	<b>11/10</b>
	SIMATIC HMI IPC577C	Industry-standard PC platform for PC-based automation Full PC-openness	<b>11/12</b>
	SIMATIC HMI IPC677C	Industry-standard PC platform for PC-based automation High performance, flexibility and safety	<b>11/14</b>
<b>Engineering / visualization software SIMATIC WinCC flexible</b>			
	SIMATIC WinCC flexible ES	Engineering tool for the configuration of SIMATIC HMI devices, of the SIMATIC Panel PCs as well as PLC-based visualization system WinCC flexible RT	<b>11/16</b>
	SIMATIC WinCC flexible RT	PC-based visualization software for single user systems directly at the machine	<b>11/17</b>

### Overview



#### HMI devices

A finely graded range of HMI devices is available for local operator control and monitoring.

#### Mobile Panels

The portable operator panels facilitate operator control and monitoring at the actual scene of the event with direct access and visual contact to the process. They offer simple and secure hot-swapping and can be used flexibly on individual machines or with entire systems.

#### Graphic panels of the 177/277 series

The graphic panels of the 177/277 series with full graphic display support the realistic presentation of process sequences (with 177B upwards, also in color). Either as Touch Panels (TP) with touch-sensitive display or as Operator Panels (OP) with membrane keyboard.

#### Multi Panels of the 177/277/377 series

The Multi Panels of the 177/277/377 series in variants with touch screen or membrane keyboard can be used like the Panels for operator control and monitoring. Multi Panels (MPs), however, also support the installation of additional applications.

#### Rugged and compact for use at machine level

With IP65/NEMA 4 degree of protection at the front, high EMC and extreme vibration resistance, the SIMATIC operator panels are ideally suited for use at the machine level in harsh industrial environments. Thanks to their compact design with a shallow mounting depth, the stationary operator panels can be fitted anywhere, even where only restricted space is available.

The extremely rugged and shock-proof enclosure with degree of protection IP65 makes the Mobile Panels especially suitable for industrial applications. Their low weight and ergonomic design means that they are user-friendly and easy to operate.

#### One configuration software for everything

SIMATIC WinCC flexible is the tool for the universal configuration of all SIMATIC Panels as well as PC-based systems with the visualization software WinCC flexible Runtime.

Graded variants are available for every task. The software permits simple and efficient configuration. Programming experience is not required.

Once created, configurations can be reused within the family.

#### Innovative operator control and monitoring

The Mobile Panels, panels and Multi Panels of the 177, 277 and 370 series, which are based on the Windows CE operating system, allow innovative operator control and monitoring combined with ruggedness, stability and simplicity. Standard hardware and software interfaces provide more flexibility and openness to the Office world via the MMC/PC/CF card, USB, Ethernet, PROFIBUS DP, Visual Basic scripts or customer-specific ActiveX controls.

#### HMI software

With the SIMATIC WinCC flexible and SIMATIC WinCC product families, SIMATIC HMI offers visualization and configuration software for the entire spectrum.

#### SIMATIC WinCC flexible

is the consistent further development of the SIMATIC HMI software products. WinCC flexible offers a significant boost in configuring efficiency and new innovative automation concepts for machine-level applications. For process-oriented plant and mechanical engineering as well as series production of machines, SIMATIC WinCC flexible 2008 also offers:

- Further productivity improvements (configuration efficiency) when creating HMI projects
- Implementation of innovative TCP/IP and web-based automation and HMI concepts
- Reduced downtime of the machines and systems through new service concepts
- Secure, flexible and world-wide access to process data
- New SIMATIC HMI devices

#### SIMATIC WinCC

SIMATIC WinCC is the process visualization system for plant monitoring with single-user and multi-user solutions and is a platform for IT & Business Integration with Windows 2000, XP Professional and Windows 7. A SIMOTION channel has been available since WinCC Version V7.0 SP2 for interfacing with SIMOTION. This software is available on the WinCC product DVD.

#### Other HMI systems

HMI systems from other manufacturers can be connected to SIMOTION over TCP/IP using the technology package MIIF.

#### More information

Further information on HMI can be found in

- the Catalog ST 80
- the Industry Mall under Automation technology/SIMATIC HMI Operator Control and Monitoring Systems

or on the Internet at:

- [www.siemens.com/panels](http://www.siemens.com/panels)
- [www.siemens.com/panel-pc](http://www.siemens.com/panel-pc)
- [www.siemens.com/winncc-flexible](http://www.siemens.com/winncc-flexible)

# SIMOTION HMI devices

## Mobile Panels

**SIMATIC Mobile Panel 177**  
**SIMATIC Mobile Panel 277**

### Overview



- Mobile HMI devices for direct operator control of the plant and machine from any point
- Support optimized monitoring of the workpiece or process providing at the same time direct access and direct line of sight to the HMI device
- Flexible implementation thanks to hot swapping
- Pixel graphics, brilliant 5.7" color STN display with touch screen (analog/resistive), 256 colors (MP 177)
- Pixel graphics, brilliant 7.5"/10" color TFT display with touch screen, 65536 colors (MP 277)
- PROFIBUS or PROFINET variants
- 14 user-configurable and user-label function keys (8 with LED) for MP 177
- 18 user-configurable and user-label function keys (18 with LED) for MP 277 7.5"
- Two three-stage enabling buttons
- Communication is supported via a serial, MPI/PROFIBUS or PROFINET link
- Connection point detection
- Fast system availability after plugging into the junction boxes
- Connected to the PLC and power supply via the junction box and the connecting cable

### Benefits

- Hot swapping without interruption of the emergency stop circuit (with junction box variants PLUS) and without the occurrence of bus faults
- Fast, accurate setup and positioning
- Ergonomic, compact and light-weight (approx. 1.3 kg)
- Rugged enough to withstand industrial use
- Graphics library available with off-the-shelf picture objects
- The data in the message buffer is retained without battery backup even when the Mobile Panel is disconnected from the supply
- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 5 languages can be selected online on MP 177
  - Up to 16 languages can be selected online on MP 277

- Reduction of service and commissioning costs through:
  - Backup/restore via a process interface or via a standard Multi Media Card
  - Updates of the configuration with automatic transfer recognition via all device interfaces
  - Long service life of the backlit display
- Simple engineering with comprehensive documentation on the SIMATIC HMI Manual Collection DVD

### Application

Regardless of the industry or application, if mobility is required for the on-site control and monitoring of machines and plants, SIMATIC Mobile Panels offer many crucial advantages: The machine operators and commissioning engineers are therefore able to work exactly where they have the best view of the workpiece or process. Even with larger production facilities, complex or enclosed machines, long materials handling or production lines and conveyor systems, mobile HMI devices allow faster and more precise setting up and positioning during commissioning. They also ensure shorter downtimes during retooling, maintenance or repairs.

### Design

- Ergonomic and compact with different holding and gripping points (suitable for right-handed and left-handed personnel)
- Pixel graphics, brilliant color displays with touch screen (analog/resistive)
- User-configurable and user-label function keys with LED (not MP 277 10")
- The front is resistant to various oils, greases and standard detergents
- Two three-stage enabling buttons
- Extremely impact-resistant due to twin-wall construction and rounded enclosure
- Dust-proof and jet-proof enclosure with IP65 degree of protection on all sides
- Slot for a standard Multi Media Card for backups and restoring or for storing recipes
- Connection to the PLC via the rugged and reliable junction boxes with IP65 degree of protection
  - Junction box variant BASIC: Enables the STOP pushbutton to be integrated into the safety circuit
  - Junction box variant PLUS: Enables the STOP pushbutton to be integrated into the safety circuit. The emergency stop circuit remains closed regardless of whether a Mobile Panel is plugged in or not. If the Mobile Panel is disconnected during operation, the emergency stop circuit in the junction box is automatically closed which prevents triggering of the emergency stop circuit.
- Fast system availability after plugging into the junction boxes:
  - By using an optional rechargeable battery pack, the connection boot-up time of the Mobile Panel – after a short period of separation from the junction box – can again be significantly reduced.
- Detection of the connection point can be used to perform machine-specific HMI authorizations or actions depending on the selected connection point

### MP 277 IWLAN

For use in combination with SIMOTION from Mobile Panel 277 IWLAN V2 upwards and WinCC flexible 2008 SP3.

To use the MP277 IWLAN you will need an IWLAN infrastructure.

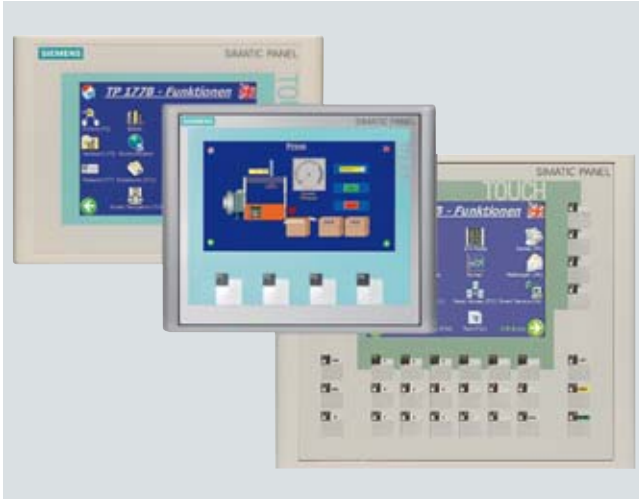
You will find further details in catalog ST80.

# SIMOTION HMI devices

## Touch Panels / Operator Panels

### SIMATIC TP 177B / SIMATIC TP 177B Widescreen / SIMATIC OP 177B

#### Overview



- Touch Panels TP 177B/TP 177B Widescreen and Operator Panel OP 177B for operator control and monitoring of machines and plants
- Touch/Key combination for OP 177B and TP 177B Widescreen
- Universal entry-level device in the touch panel class with graphics capability featuring an extensive range of functions
- Pixel graphics display with analog touch screen (analog/resistive)
  - 4.3" color TFT Widescreen (256 colors) or
  - 5.7" Blue mode/color STN (4 blue levels/256 colors)
- Configurable system keys for OP 177B and TP 177B Widescreen
- Interfaces for communication with SIMATIC S7 and SIMOTION are integrated (e.g. MPI, PROFIBUS DP, Ethernet interface for color variant)
- USB interface for I/O, e.g. for downloads, printer

#### Benefits

- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced life-cycle costs
- Reduction of service and commissioning costs through:
  - Backup/restore via a process interface, USB or via a standard Multi Media Card
  - Remote downloading of the configuration with automatic transfer recognition even via WAN (Wide Area Network) using TeleService adapter
  - Maintenance-free design (no battery) and long service life of the backlit display
- Non-volatile, maintenance-free message buffer
- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 16 online languages can be selected directly on the device
- Graphics library available with off-the-shelf picture objects

- Standard hardware and software interfaces for increased flexibility
- Standard Multi Media Card slot
  - Used for recipe data records and for backups of configuration/system data
- Integrated printer port
- Extensive documentation on the SIMATIC HMI Manual Collection DVD

#### Application

The TP/OP 177B Touch Panels can be used wherever machines and systems are controlled and monitored directly on-site – whether in production, process or building automation. They are used in all types of sectors and applications.

#### Design

- Display variants:
  - 4.3" TFT Widescreen display with 256 colors or
  - 5.7" STN display with 256 colors or 4 blue levels
- LED or CCFL<sup>1)</sup> backlit display with long service life
- Resistive analog touch screen
- Numerical "on-screen" system keyboard for decimal, binary and hexadecimal number formats
- On-screen alpha keyboard (English font)
- Compact design with low mounting depth
- Rugged plastic enclosure
- The front is resistant to various oils, greases and standard detergents
- A protective cover is available as an option to achieve NEMA 4 degree of protection and as additional protection against scratching
- Plug-in terminals for connecting the power supply
- Interfaces for connection of PLC, printer and engineering computer are integrated
- Standard Multi Media Card slot

<sup>1)</sup> Cold Cathode Fluorescence Lamps



# SIMOTION HMI devices

## Touch Panels / Operator Panels

### SIMATIC TP 277 / SIMATIC OP 277

#### Overview



- Touch Panel TP 277 and Operator Panel OP 277 with comprehensive functionality for demanding machine visualization
- Display:
  - TP 277: Pixel graphics 5.7" TFT touch screen (analog/resistive)
  - OP 277: TFT display, color (256 colors)
- Keyboard:
  - TP 277: Numeric and alphanumeric on-screen keyboard
  - OP 277: Membrane keyboard with 36 system keys, 24 user-programmable function keys, 18 of which with LEDs
- All interfaces are on-board, e.g. MPI/PROFIBUS DP, USB, PROFINET/Ethernet
- Maintenance-free, non-volatile (retentive) message buffer

#### Benefits

- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced life-cycle costs
- Modular expansion possible with options such as:
  - WinCC flexible/Sm@rtAccess for communication between different SIMATIC HMI systems
  - WinCC flexible Sm@rtService for remote maintenance and servicing of machines/plants via the Intranet/Internet
- Reduction of service and commissioning costs through:
  - Backup/restore via USB, MPI, PROFIBUS DP, RS 232 (serial) and optional via Ethernet (TCP/IP) or CompactFlash card (CF card)
  - Remote download/upload of configuration and firmware
  - Specific drivers can be reloaded
  - Long service life of the backlit display
- Graphics library available with off-the-shelf picture objects
- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 16 languages can be selected online
- Standard hardware and software interfaces for increased flexibility
- External Multi Media Card can be used for recipe data records, archives and for backups of configuration/system data
- Integrated USB interface for "hot swapping" of peripherals (printer, keyboard, mouse, barcode reader)
- Standard Windows storage formats (CSV) for archives and recipes for use with other standard tools (e.g. Microsoft Excel)
- The Smart Access and Smart Services options can be used

#### Application

The SIMATIC TP 277 Touch Panels/SIMATIC OP 277 Operator Panels can be used wherever machines and systems are controlled and monitored on-site – whether in production, process or building automation. They are used in all types of sectors and applications.

Diskless and fan-free operation, real-time capability and short boot-up times support demanding machine visualization even under harsh industrial conditions.

#### Design

- Display:
  - TP 277: Pixel graphics 5.7" TFT touch screen (analog/resistive)
  - OP 277: TFT display, color (256 colors)
- Keyboard:
  - TP 277: Numeric and alphanumeric on-screen keyboard
  - OP 277: Membrane keyboard with 36 system keys, 24 user-programmable function keys (18 with LEDs)
- Scripts and archives
- Compact design with low mounting depth
- IP65/NEMA 4/NEMA 12 (front) or IP20 (rear)
- The front is resistant to various oils, greases and standard detergents
- High electromagnetic protection and extreme vibration strength
- Plug-in terminals for 24 V DC power supply
- Interfaces:
  - MPI, PROFIBUS DP (up to 12 Mbit/s) as well as USB 1.1 (max. 100 mA) on-board
  - Ethernet (PROFINET IO capable)
- External Multi Media Card, can be used for the recipe data, records, archives and for backups of configuration and system data.

#### Overview



- Like Operator Panels, Multi Panels (MP) are used for on-site machine operation and monitoring
- Their functionality can be expanded with the installation of additional Windows CE applications (Multi Panel and Panel options)
- The SIMATIC MP 177/MP 277 Multi Panels running Windows CE combine the ruggedness of Operator Panels with the flexibility of PCs
- Pixel graphics TFT display, color (64 k colors) with 5.7" display diagonal for MP 177, with 7.5" or 10.4" display diagonals for MP 277
- MP 177, touch screen (analog/resistive)
- MP 277 8" Keys: 26 function keys or direct keys (e.g. over PROFINET IO)
- MP 277 10" Keys: 36 function keys or direct keys (e.g. over PROFINET IO)
- MP 277 8" and 10" Touch: Touch screen (analog/resistive)
- All interfaces are on-board, e.g. MPI, PROFIBUS DP, USB, Ethernet, serial
- Maintenance-free, non-volatile (retentive) message buffer
- Windows CE 5.0

#### Benefits

- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced lifecycle costs
- Modular expansion possible with options such as:
  - ThinClient/MP for use as a terminal client on a Windows terminal server
  - WinCC flexible/Sm@rtAccess for communication between different SIMATIC HMI systems
  - WinCC flexible/Sm@rtService for remote maintenance and servicing of machines/plants via the Intranet/Internet
  - WinCC flexible/OPC server for communication with applications from various manufacturers
  - MS Pocket Internet Explorer (already included in scope of delivery)
- Reduction of service and commissioning costs through:
  - Backup/restore via Ethernet (TCP/IP), USB, MPI, PROFIBUS DP, RS 232 (serial) or optional via PC/CF card
  - Remote download/upload for configuration and firmware
  - Specific drivers can be reloaded
  - Long service life of the backlit display
- Graphics library available with off-the-shelf picture objects

- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 16 languages can be selected online
- Standard hardware and software interfaces for increasing flexibility:
  - SD/Multi Media Card combination slot for memory expansions, backup/restore or additional interfaces
  - Ethernet (TCP/IP) for central data and project management; when configuring with WinCC flexible, and for communication with the control link to SIMATIC S7
  - Standard Windows storage formats (CSV) for archives and recipes permit use with other standard tools (e.g. Microsoft Excel)

#### Application

The SIMATIC MP 177/SIMATIC MP 277 Multi Panels can be used wherever machines and systems are operated and monitored directly on-site – whether in production, process or building automation. These are used in the most popular branches and applications and can be expanded in their applications with the Multi Panel options, e.g. displaying HTML documents via the Microsoft Pocket Internet Explorer.

Windows CE meets the basic prerequisites for applications in rough industrial environments. The diskless and fan-free design enables implementation in areas where high vibration or dust load limits the operation of a PC. Short boot-up times make the Multi Panels ready for operation quickly.

#### Design

- Compact design with low mounting depth
- The front is resistant to various oils, greases and standard detergents
- Degree of protection IP65/NEMA 4x/NEMA 12 (front) or IP20 (rear)
- Plug-in terminals for 24 V DC power supply
- Interfaces:
  - RS 485/RS 422 or Ethernet interface for process connections (MPI, PROFIBUS DP up to 12 Mbit/s, PROFINET)
  - USB for mouse, keyboard, printer, barcode reader and downloading/uploading the configuration
  - Ethernet (TCP/IP), for exchanging data with a higher-level PC, connection of a network printer and downloading/uploading the configuration
- SD/Multi Media Card combination slot

# SIMOTION HMI devices

## Multi Panels

### SIMATIC MP 377

#### Overview



- Like Operator Panels, Multi Panels (MP) are used for on-site machine operation and monitoring
- Their functionality can be expanded with the installation of additional Windows CE applications (Multi Panel and Panel options)
- SIMATIC MP 377 devices running Windows CE combine the rugged construction of Operator Panels with the flexibility of PCs
- Pixel graphics 12.1", 15.1" and 19" TFT display, color (64 k colors)
- MP 377 12" Keys: 38 system keys, 36 user-configurable and user-label function keys
- MP 377 12", 15", and 19" Touch: Touch screen (analog/resistive)
- All interfaces are on-board, e.g. MPI, PROFIBUS DP, PROFINET IO, USB, Ethernet, serial

#### Benefits

- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced lifecycle costs
- Modular expansion possible with options such as:
  - Software PLC SIMATIC WinAC MP
  - WinCC flexible/Sm@rtAccess for communication between different SIMATIC HMI systems
  - WinCC flexible/Sm@rtService for remote maintenance and servicing of machines/plants via the Intranet/Internet
  - WinCC flexible/OPC server for communication with applications from various manufacturers
  - MS Pocket Internet Explorer (already included in scope of delivery)
  - Multimedia: Viewer for .pdf, .xls, .doc files; Internet Explorer, Media Player and cameras over standard interfaces
- Reduction of service and commissioning costs through:
  - Backup/restore via Ethernet (TCP/IP), USB, MPI, PROFIBUS DP, RS 232 (serial) or optional via PC/CF card
  - Remote download/upload for configuration and firmware changes
  - Specific drivers can be reloaded
  - Long service life of the backlit display
- Graphics library with off-the-shelf picture objects
- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 5 languages can be selected online

- Standard hardware and software interfaces for increasing flexibility:
  - PC/CF card slot for memory expansions, backup/restore or for additional interfaces
  - Ethernet (TCP/IP) for central data and project management
  - Standard Windows storage formats (CSV) for archives and recipes permit use with other standard tools (e.g. Microsoft Excel)

#### Application

The SIMATIC MP 377 Multi Panels can be used wherever machines and systems are operated and monitored directly on-site – whether in production, process or building automation. These are used in the most popular branches and applications and can be expanded with the Multi Panel options, e.g. by displaying HTML documents via the Microsoft Pocket Internet Explorer.

Windows CE meets the basic prerequisites for applications in rough industrial environments. The diskless and fan-free design enables implementation in areas where high vibration or dust load limits the operation of a PC. Short boot-up times make the Multi Panels ready for operation quickly.

#### Design

- Compact design with low mounting depth
- The front is resistant to various oils, greases and standard detergents
- Degree of protection IP65/NEMA 4x/NEMA 12 (front) or IP20 (rear)
- Plug-in terminals for 24 V DC power supply
- Interfaces:
  - TTY/RS 232, RS 485/RS 422 interface for process connections (MPI, PROFIBUS DP up to 12 Mbit/s)
  - USB for mouse, keyboard, printer, barcode reader and downloading/uploading the configuration
  - Ethernet (TCP/IP), PROFINET for exchanging data with a higher-level PC, connection of a network printer and downloading/uploading the configuration
- Retentive, maintenance-free message buffer
- Slot for CompactFlash card (CF card)
- Slot for PC card

### Overview



SIMATIC HMI IPC277D for implementing simple visualization and control tasks

- Offers great flexibility in the selection of rugged widescreen fronts
- From 7" to 12" for more freely-configurable display area
- High resolution, large viewing angle, and up to 100 % dimmable backlighting for a brilliant display with optimized power consumption
- Absolutely maintenance-free due to the use of CompactFlash and SSD as mass storage and fanless operation up to 50 °C (122 °F) ambient temperature
- Maximum industrial functionality due to non-volatile retentive memory
- Ready-to-run embedded bundles with visualization or/and control software

The following front installation versions are available:

- 7" Touch
- 9" Touch
- 12" Touch
- 15" / 19" available soon
- All fronts in widescreen design

### Application

The SIMATIC HMI IPC277D is a particularly compact and energy-saving Nanopanel PC with integrated touch displays with 7" screen diagonal or larger. The heart of the SIMATIC HMI IPC277D are high-performance Intel Atom processors of the latest generation. The Nanopanel PCs are designed for maintenance-free 24-hour continuous use as well as for high temperature, vibration, shock and EMC requirements in the following applications:

- Simple visualization and control tasks, for example in mechanical engineering, plant construction, transportation systems or power transmission.
- Acquisition, further processing and visualization of data

### Design

The HMI IPC277D is a compact device comprising an operator control unit with integral computer unit.

#### Computer unit:

- Rugged metal installation housing, resistant to vibration and shock, with high electromagnetic compatibility
- Processor / main memory configuration:
  - Intel Atom E640 1.0 GHz, 1 GB RAM GHz
  - Intel Atom E660 1.3 GHz, 2 GB RAM GHz available soon
- Interfaces (accessible from one side):
  - 2 x LAN 10/100/1000 Mbit/s Ethernet interface (RJ45)
  - 3 x high-speed USB V2.0
  - 1 x COM1 (RS232)
- Fieldbus
  - PROFINET Realtime via Standard Ethernet interface
- Retentive memory
  - 512 KB retentive memory (MRAM), of which 128 KB within the buffer time (optional)
- Isolated power supply: 24 V DC (20.4 to 28.8 V)
- Drives:
  - CompactFlash drive (replaceable, accessible): 2 GB, 4 GB or 8 GB
  - Solid-State Drive 50 GB (SLC technology)
- Preinstalled operating systems:
  - Windows XP Embedded Standard 2009
  - Windows XP Professional Multi-Language
  - Windows Embedded Standard 7 / Windows 7 available soon

#### Components of the operator control unit:

The operator control units are available in the following versions:

##### 7" Touch

- 7" TFT color display, 800 x 480 pixels
- Resistive analog touch screen

##### 9" Touch

- 9" TFT color display, 800 x 480 pixels
- Resistive analog touch screen

##### 12" Touch

- 12" TFT color display, 1280 x 800 pixels
- Resistive analog touch screen

##### 15" / 19" Touch available soon

# SIMOTION HMI devices

## Panel PCs

### SIMATIC HMI IPC477C

#### Overview



- Embedded PC platform with extremely high industrial compatibility for demanding tasks in the field of PC-based automation
- Maintenance-free (no rotating components such as fan and hard disk)
- Rugged construction:  
The PC can withstand the most harsh mechanical stresses while maintaining reliable operation
- Compact design (only 75 mm (2.95 in) mounting depth)
- High investment security
- Fast integration capability
- Front panel versions:
  - 12", 15" and 19" TFT Touch
  - 12" and 15" TFT Key

#### Benefits

- Excellent industrial compatibility due to rugged construction, even when subjected to extreme vibration and shock
- High investment protection thanks to assured spare parts availability of the components (for 5 years following the end of active marketing)
- Excellent continuity of components for long-term machine concepts without any new engineering costs
- Front and rear USB 2.0 interfaces for quick and easy connection of additional hardware components
- High degree of industrial functionality thanks to integrated PROFIBUS DP/MPI and Ethernet interfaces
- Maintenance-free since there are no rotating parts (fans and hard disk)
- Reduction in downtime thanks to high system availability
  - Efficient self-diagnostics (SIMATIC PC DiagMonitor)
  - The high security and reliability of an embedded platform
- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced lifecycle costs
- Ready-to-run, complete solutions (software is already installed and preconfigured) for visualization and automation with WinCC flexible and WinAC RTX

#### Application

The SIMATIC HMI IPC477C is designed for use directly on-site at the machine, when a combination of ruggedness and reliability (i.e. the reliability of an embedded platform) and the openness of a PC are required (e.g. module expansions and the connection of I/O devices such as printers, keyboards, etc.).

Due to the low mounting depth of only 75 mm (2.95 in), it can also be used in confined spaces.

The PC can be used in production automation as well as in process automation and can be mounted in control cabinets, consoles, 19" cabinets/racks and in swing arms (booms).

SIMATIC Panel PCs are the ideal platform for PC-based automation:

- PC-based visualization on site at the machine with SIMATIC WinCC flexible
- PC-based control with SIMATIC WinAC RTX
- SIMATIC WinCC Web Client for web-based solutions with WinCC/Web Navigator

Siemens offers a complete modular system of automation components that are designed to integrate perfectly.

#### Design

Compact powerful industrial PC in embedded technology, comprising operator control unit with integrated computer unit.

##### Components of the computer unit:

- Rugged metal installation housing, resistant to vibrations and shocks, with high electromagnetic protection.
- Processor, configurable: Intel Celeron M 1.2 GHz, Intel Core 2 Solo 1.2 GHz and Intel Core Duo 1.2 GHz
- Main memory: 1 DIMM socket, DDR3, 1 GB, alternatively 2 GB or 4 GB
- Battery-backed retentive memory 2 MB
- Compact Flash Drive (internal) with pre-installed Windows XP Embedded (Image) operating system and optional software
- Graphics on-board (VGA analog, 1024 x 768)

##### Interfaces

- 2 x Ethernet on-board (10/100/1000 Mbit/s)
- 5 x USB 2.0 port, 500 mA (1 x front)
- 1 x COM 1 (RS 232)
- 1 x DVI-I interface (for connecting a second display unit)
- 2 x slot for CF card (2 GB, 4 GB or 8 GB) Solid State Disc (at least. 32 GB)
- Fieldbus: Configurable with PROFINET or PROFIBUS onboard

##### Power supply

- 24 V DC, with On/Off switch

### Design (continued)

#### Components of the operator control unit:

The operator control units are available in the following versions:

##### 12" Key

- 12.1" TFT color display, 800 x 600 pixels (SVGA)
- Membrane keyboard with international PC character set and 36 additional function keys with LED and an integrated mouse

##### 12" Touch

- 12.1" TFT color display, 800 x 600 pixels (SVGA)
- Touch screen (analog/resistive)

##### 15" Key

- 15.1" TFT color display, 1024 x 768 pixels (XGA)
- Membrane keyboard with international PC character set and 36 additional function keys with LED and an integrated mouse

##### 15" Touch

- 15.1" TFT color display, 1024 x 768 pixels (XGA)
- Touch screen (analog/resistive)

##### 19" Touch

- 19.1" TFT color display, 1280 x 1024 pixels (SXGA)
- Touch screen (analog/resistive)

The operator control units feature a USB 2.0 port on the front for connecting external peripheral devices, such as a mouse or keyboard. They fulfill the requirements of degrees of protection IP65 and NEMA 4. All operator control units are also available without a USB port on the front.

The computer unit is connected via a connecting cable attached at the rear of the operator control unit.

#### Expansion components

##### SIMATIC PC DiagMonitor

- PC diagnostics/alarm software for the early detection and diagnostics of PC problems
- Comprehensive monitoring of temperature and watchdog
- Operating hours counter for preventive maintenance
- Integrated log functions, comprehensive text messages, online help (English/German)
- Network-wide monitoring via SNMP and OPC interface possible

##### SIMATIC PC/PG Image & Partition Creator

- Software tool for data backup of mass storage contents (CF cards, hard disks)
- Fast, bit-exact restoration of system and data partitions; application software and special installations are also backed up
- Software tool for adaptation of mass storage partitioning

##### 3.5" USB disk drive

The USB disk drive is provided for the high-speed exchange of user data, such as recipes, or files. The drive should not be used as a cyclic archiving drive. The front-panel mounting and degree of protection IP54 permit data exchange from the front without opening the control cabinet door.

The device is connected via the USB interface of the Panel PC. The power is also supplied over the USB interface. A USB cable of 1 m (3.28 ft) length is included in the scope of supply. The disk drive complies with the USB 1.1 standard. 3.5" high density disks can be used (1.44 MB).

##### SIMATIC PC USB FlashDrive

- Mobile memory medium for SIMATIC PC/PG
- High-speed data transfer (USB 2.0) and high memory capacity
- Ultra-compact and rugged

##### Industrial USB Hub 4

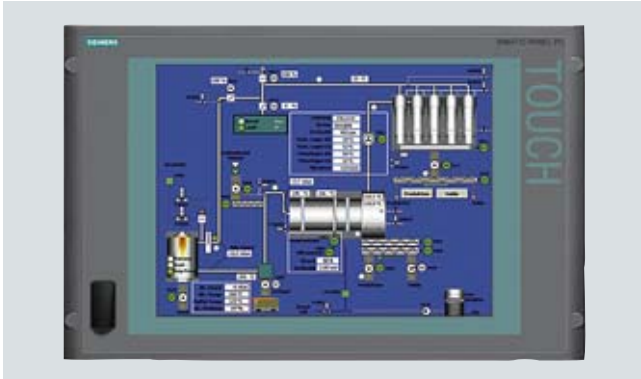
- USB peripherals can be connected and operated via the USB Hub 4 without opening the control cabinet door
- Industry-standard USB 2.0 Hub, Front IP65
- Mounting in control cabinet door or on DIN rail
- Inspection window and LEDs for each of the four interfaces

# SIMOTION HMI devices

## Panel PCs

### SIMATIC HMI IPC577C

#### Overview



- Industry-standard PC platform for demanding operator control and monitoring tasks
- Maximum performance thanks to high processor performance at an attractive entry-level price
- Fast integration capability
- Intel Core 2 Duo processors up to 1.86 GHz
- RAM DDR3 technology from 1 to 4 GB
- Gigabit Ethernet ports
- High-speed USB 2.0 port on front
- Front panel versions:
  - 12", 15" and 19" TFT Touch

#### Benefits

- Suitable for industrial environments subject to vibration and shock loads
- High investment protection thanks to guaranteed availability of spare parts
- Excellent continuity of components for long-term machine concepts without any new engineering costs
- USB interface for quick and easy connection of required components
- Reduction in downtime thanks to high system availability
  - Efficient self-diagnostics (SIMATIC PC DiagMonitor)
  - Solutions for data backup
- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced lifecycle costs

#### Application

The SIMATIC HMI IPC577C is used in production and process automation and can be installed in control cabinets and switchboards.

SIMATIC Panel PCs are a flexible platform for PC-based automation:

- PC-based visualization on site at the machine with SIMATIC WinCC flexible
- Complex solutions with SIMATIC WinCC process visualization
- PC-based control with SIMATIC WinAC Software PLC or with SIMATIC WinAC Slot PLC

Siemens offers a complete modular system of automation components that are designed to integrate perfectly.

The SIMATIC HMI IPCs can be ordered together with WinCC flexible or WinCC as SIMATIC HMI Packages at a lower price (see SIMATIC HMI complete system).

#### Design

The SIMATIC HMI IPC577C comprises a computer unit and an operator control unit.

##### **Components of the computer unit:**

- Rugged metal installation housing, resistant to vibrations and shocks, with high electromagnetic protection.
- Processor:
  - Intel Celeron M 1.2 GHz, 1 MB L2 cache, 800 MHz FSB
  - Intel Core 2 Solo 1.2 GHz, 3 MB L2 cache, 800 MHz FSB
  - Intel Core 2 Duo 1.86 GHz, 6 MB L2 cache, 1066 MHz FSB
- Main memory: 1 DIMM socket, DDR3, basic configuration 1 GB, expandable up to 4 GB
- 3.5" hard disk drive: ≥ 80 GB
- DVD-RW drive
- Interfaces:
  - 2 x Gbit Ethernet onboard
  - 4 x USB 2.0 port, 1 x USB at front
  - 1 x serial V.24 (9-pin)
  - 1 x parallel
  - 1 x slot for CF card
  - 1 x ext. graphics (DVI-I)
- Free slots for expansion:
  - 1 x PCI slot
- Fieldbus (configurable with PROFIBUS or PROFINET onboard)
- Power supply:
  - 100/240 V AC (autorange), 50/60 Hz
  - 24 V DC

### Design (continued)

#### Components of the operator control unit:

The operator control units are available in the following versions:

##### 12" Touch

- 12.1" TFT color display, 800 x 600 pixels (SVGA)
- Touch screen (analog/resistive)
- USB 2.0 port on front

##### 15" Touch

- 15.1" TFT color display, 1024 x 768 pixels (XGA)
- Touch screen (analog/resistive)
- USB 2.0 port on front

##### 19" Touch

- 19.1" TFT color display, 1280 x 1024 pixels (SXGA)
- Touch screen (analog/resistive)

#### Expansion components

##### SIMATIC PC/PG Image & Partition Creator

- Software tool for data backup of hard disk contents
- Fast, bit-exact restoration of system and data partitions; application software and special installations are also backed up
- Software tool for hard disk partitioning

##### 3.5" USB disk drive

The USB disk drive is provided for the high-speed exchange of user data, such as recipes, or files. The drive should not be used as a cyclic archiving drive. The front-panel mounting and degree of protection IP54 permit data exchange from the front without opening the control cabinet door.

The device is connected via the USB interface of the SIMATIC HMI IPC. The power is also supplied over the USB interface. A USB cable of 1 m (3.28 ft) length is included in the scope of supply. The disk drive complies with the USB 1.1 standard. 3.5" high density disks can be used (1.44 MB).

Operation of the USB disk drive with SIMATIC HMI IPCs:

- Windows XP: possible without separate driver
- Windows 2000: the required driver is included in the scope of supply of the operating system

##### Industrial USB Hub 4

- USB peripherals can be connected and operated via the USB Hub 4 without opening the control cabinet door
- Industry-standard USB 2.0 Hub, Front IP65
- Mounting in control cabinet door or on DIN rail
- Inspection window and LEDs for each of the four interfaces



# SIMOTION HMI devices

## Panel PCs

### SIMATIC HMI IPC677C

#### Overview



- PC platform with high degree of industrial compatibility for demanding tasks in the area of PC-based automation
- Rugged construction:  
The PC can withstand the most harsh mechanical stresses while maintaining reliable operation
- Compact design
- High investment security
- Fast integration capability
- Front panel versions:
  - 12", 15" and 19" TFT Touch
  - 12" and 15" TFT Key
- Operator control unit can be located at a distance of up to 30 m (98.4 ft) from the computer unit (optional)

#### Benefits

- Excellent industrial compatibility due to rugged construction, even when subjected to extreme vibration and shock
- High investment protection thanks to spare parts availability of the components (for 5 years following the end of active marketing)
- Excellent continuity of components for long-term machine concepts without any new engineering costs
- Savings in time and costs due to service-friendly equipment construction:
  - The operating unit and computing unit can be simply hinged apart for the rapid replacement of components or for future expansions
  - Front and rear USB 2.0 interfaces for quick and easy connection of additional hardware components
- High degree of industrial functionality thanks to integrated PROFIBUS DP/MPI and two Gigabit Ethernet interfaces
- Operational reliability:  
Using the optional direct key module, the process can be controlled without delay over PROFIBUS DP independently of the operating system
- 2 x ≥ 80 GB SATA hard disk system (configured as a single disk system or RAID1)
- Reduction in downtime thanks to high system availability
- Efficient self-diagnostics (SIMATIC PC DiagMonitor)
- Solutions for preventive data backup

- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced life-cycle costs
- Additional mounting possibilities available due to separation of the computing unit and operating unit by means of the Remote Kit (up to 30 m (98.4 ft), optionally available as accessory)

#### Application

The SIMATIC HMI IPC677C is designed for use directly on-site at the machine. Due to the minimal mounting depth of only 105/130 mm (4.13/5.12 in), it can also be used in confined spaces.

The PC can be used in production automation as well as in process automation and can be installed in control cabinets and consoles, 19" cabinets/racks and in swing arms (booms).

The Dual Core CPUs with Intel Core Duo technology support high-performance control and visualization.

With PCIe (x4), the new PCI express (PCIe) cards (x1 and x4) are also supported.

A SIMATIC Panel PC is the ideal platform for PC-based automation:

- PC-based visualization on site at the machine with SIMATIC WinCC flexible
- Complex solutions with SIMATIC WinCC process visualization
- PC-based control with SIMATIC WinAC Software PLC or with SIMATIC WinAC Slot PLC

Siemens offers a complete modular system of automation components that are designed to integrate perfectly.

The SIMATIC Panel PCs can be ordered in combination with WinCC flexible or WinCC as SIMATIC HMI packages at a lower price.

#### Design

The SIMATIC HMI IPC677C comprises a computer unit and an operator control unit.

##### Components of the computer unit:

- Rugged metal installation housing, resistant to vibrations and shocks, with high electromagnetic protection.
- Processor:
  - Mobile processors
  - Core 2 Duo T7400, 2.16 GHz, Dual Core, 4 MB SLC
  - Core 2 Duo T5500, 1.66 GHz, Dual Core, 2 MB SLC
  - Celeron M 440, 1.86 GHz, 1 MB SLC
- Intel chipset: 945 GM Express with ICH7R - integrated RAID controller
- Intel graphics media accelerator GMA950 for high-performance graphics
- Standard main memory configuration:
  - 512 MB, expandable up to 4 GB (DDR2 667 RAM)
- SATA hard disks with up to 160 GB capacity and NCQ technology, the special vibration-absorbing hard disk support ensures reliable operation even under extreme mechanical stress
- On-board graphics
- Interfaces:
  - 2 x Ethernet 10/100/1000 Mbit/s ports (Gbit LAN)
  - 4 x high-speed USB 2.0 ports on the computing unit
  - PROFIBUS DP/MPI on-board, isolated
  - 1 x serial RS 232 C (9-pin)
  - DVI-I interface (for VGA and/or DVI-D monitor)

### Design (continued)

- Second monitor with identical screen content (Clone) or in extended monitor mode (Extended)
- Latching mechanism for innovative RJ45 FastConnect plug
- Slot for CompactFlash card externally accessible
- Diskless version (optional with Windows XPe on CompactFlash card)
- Slots either 2 x PCI or 1 x PCI and 1 x PCIe x4
- Power supply: 110 V/230 V AC (autorange), 50/60 Hz or 24 V DC
- 2 MB battery-backed SRAM memory on-board (for use with WinAC RTX 2005 SP2)

#### Optional additional components:

- Main memory expansion to 1 GB, 2 GB or 4 GB
- SATA hard disk  $\geq$  160 GB
- Double hard disk module 2 x  $\geq$  60 GB SATA
- DVD-ROM drive
- DVD $\pm$ RW $\pm$ R combo drive
- Direct key module

#### **Components of the operator control unit:**

The operator control units are available in the following versions:

##### 12" Key

- 12.1" TFT color display, 800 x 600 pixels (SVGA)
- Membrane keyboard with international PC character set and 36 additional function keys with LED and an integrated mouse

##### 15" Key

- 15.1" TFT color display, 1024 x 768 pixels (XGA)
- Membrane keyboard with international PC character set and 36 additional function keys with LED and an integrated mouse

##### 12" Touch

- 12.1" TFT color display, 800 x 600 pixels (SVGA)
- Touch screen (analog/resistive)

##### 15" Touch

- 15.1" TFT color display, 1024 x 768 pixels (XGA)
- Touch screen (analog/resistive)

##### 19" Touch

- 19.1" TFT color display, 1280 x 1024 pixels (SXGA)
- Touch screen (analog/resistive)

The operator control units feature a USB 2.0 port on the front for connecting external peripheral devices, such as a mouse or keyboard. They fulfill the requirements of degrees of protection IP65 and NEMA 4. All operator control units are also available without a USB port on the front.

The computer unit is connected via a connecting cable attached at the rear of the operator control unit.

### Expansion components

#### SIMATIC Panel PC Remote Kit

- Separate mounting of computer and operator control unit is possible
- At a maximum distance of 30 m (98.4 ft)
- Pure hardware solution, no need to install additional software
- Maintaining the panel PC front functionality

#### SIMATIC PC DiagMonitor

- PC diagnostics/alarm software for the early detection and diagnostics of PC problems
- Comprehensive monitoring of temperature, fans, hard disks (SMART), watchdog
- Operating hours counter for preventive maintenance
- Integrated log functions, comprehensive text messages, online help (English/German)
- Network-wide monitoring via SNMP and OPC interface possible

#### SIMATIC PC/PG Image & Partition Creator

- Software tool for data backup of hard disk contents
- Fast, bit-exact restoration of system and data partitions; application software and special installations are also backed up
- Software tool for hard disk partitioning

#### 3.5" USB disk drive

The USB disk drive is provided for the high-speed exchange of user data, such as recipes, or files. The drive should not be used as a cyclic archiving drive. The front-panel mounting and degree of protection IP54 permit data exchange from the front without opening the control cabinet door.

The device is connected via the USB interface of the Panel PC. The power is also supplied over the USB interface. A USB cable of 1 m (3.28 ft) length is included in the scope of supply. The disk drive complies with the USB 1.1 standard. 3.5" high density disks can be used (1.44 MB).

#### SIMATIC PC USB FlashDrive

- Mobile memory medium for SIMATIC PC/PG
- High-speed data transfer (USB 2.0) and high memory capacity
- Ultra-compact and rugged

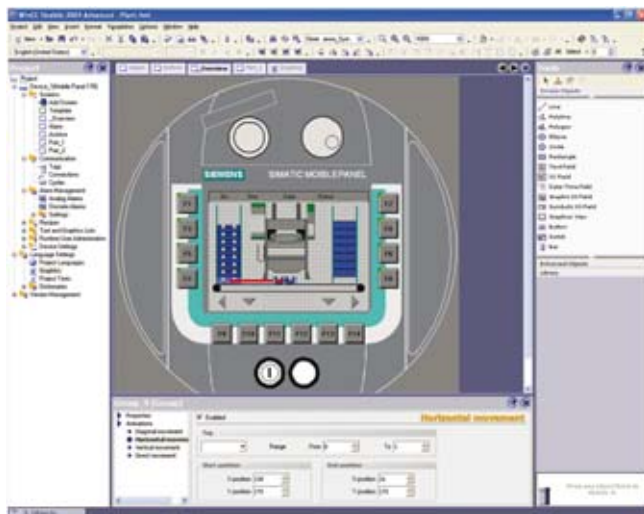
#### Industrial USB Hub 4

- USB peripherals can be connected and operated via the USB Hub 4 without opening the control cabinet door
- Industry-standard USB 2.0 Hub, Front IP65
- Mounting in control cabinet door or on DIN rail
- Inspection window and LEDs for each of the four interfaces

# SIMOTION HMI devices

## SIMATIC WinCC flexible ES engineering software

### Overview



- Uniform family of engineering tools for configuration SIMATIC HMI Operator Panels, the operator control part of SIMATIC C7 units, SIMOTION/SINUMERIK Panel PCs as well as the PC-based visualization software WinCC flexible Runtime.
- Runs under Windows XP Professional / Windows 7 Professional, Ultimate, Enterprise
- Current version:
  - SIMATIC WinCC flexible 2008 SP3 Micro
  - SIMATIC WinCC flexible 2008 SP3 Compact
  - SIMATIC WinCC flexible 2008 SP3 Standard
  - SIMATIC WinCC flexible 2008 SP3 Advanced

### Benefits

- The integrated configuration software reduces training, maintenance and service overhead and protects the customer's investments
- Minimized configuration overhead due to reuse of scalable and dynamizable objects
- Tools for efficient and simple configuration:
  - Wizard for defining the basic structure of the HMI project
  - Table-based editors simplify the generation and processing of similar types of object, e.g. for tags, texts, or alarms
  - Complex configuration tasks such as the definition of paths of motion or the creation of the fundamental operator prompting are simplified by means of graphical configuration
- Comprehensive support of multi-language configurations for worldwide use
  - Selectable views for entering configuration data in several languages
  - System and user-specific text lexicons
  - Export/import of language-dependent texts

### Design

The engineering tools of the SIMATIC WinCC flexible range are based on one another. The available editors largely depend on the respectively configured target systems and their functions. A more comprehensive engineering tool such as WinCC flexible Standard also offers the facilities of the smaller engineering tools, e.g. WinCC flexible Compact or Micro.

Upgrading of a smaller engineering tool to a larger one is possible using a Powerpack. An exception is WinCC flexible Micro.

The scope of functions of the WinCC flexible engineering tools already includes project support for the Runtime options available for SIMATIC Panels or WinCC flexible Runtime, independent of the RT licenses purchased. Separate licensing is required for the target system in order to use the configured Runtime options.

### Function

#### Integration into automation systems

- Integration into SIMATIC STEP 7/SIMOTION
  - Management of HMI projects within the SIMATIC Manager
  - Shared use of communication settings and process point definitions, i.e. symbols and messages
  - Display of the HMI configuring objects in the SIMATIC Manager
  - Transfer of configuring data via MPI/PROFIBUS/Ethernet using routing

#### Option for WinCC flexible Engineering

##### SIMATIC WinCC flexible/ChangeControl

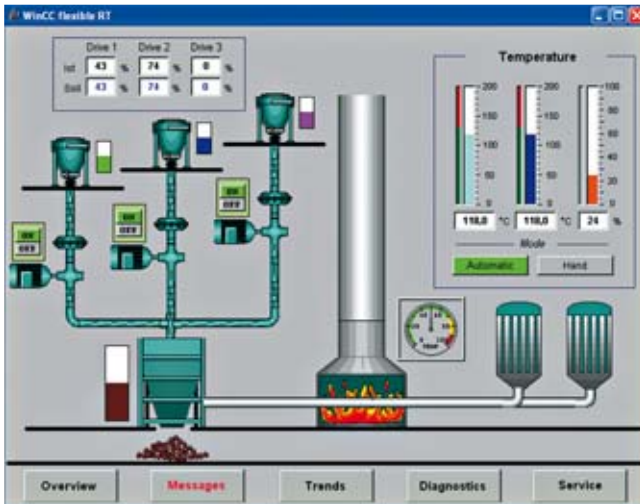
WinCC flexible/ChangeControl enables consistent backup of configuration data. The history of changes can be precisely traced in applications requiring uninterrupted tracking over the complete life cycle of a product.

- Delivered customer projects, approved reference states or development stages are managed in a database.
- Changes to the project data can be integrated without problems into the version management by means of new versions.
- A rollback is possible at any time.

# SIMOTION HMI devices

## SIMATIC WinCC flexible RT visualization software

### Overview



PC-based visualization software for single-user systems directly at the machine.

- Runs under Windows XP Professional and Windows 7 Professional, Ultimate, Enterprise
- Current version: SIMATIC WinCC flexible 2008 SP3 Runtime

SIMATIC WinCC flexible Runtime is configured with the SIMATIC WinCC flexible Advanced configuration software.

### Benefits

- Optimum price/performance ratio thanks to individually scalable system functionality
- Functions for all visualization tasks: Operator functions, graphical and trend displays, signaling system, log system, archiving (option), recipe management (option), Audit Trail (option), process fault diagnostics (option)
- Flexible runtime functionality thanks to Visual Basic scripts
- Innovative service concepts with remote operation, diagnostics and administration via intranet and Internet as well as e-mail communication to increase availability (option)
- Support for simple distributed automation solutions based on TCP/IP networks at the machine level (option)

### Application

SIMATIC WinCC flexible Runtime is the high-performance visualization software for simple visualization tasks at machine level. It can be used as a single-user solution for all automation applications in production automation, process automation and building services automation.

SIMATIC WinCC flexible Runtime can be employed in connection with the following operator devices:

- SIMATIC Panel PCs
  - Panel PC 277D
  - Panel PC 477B/477C
  - Panel PC 577/HMI IPC577C
  - Panel PC 677B
- SIMOTION P350
- Standard PCs with resolutions (W x H in pixels) of:
  - from 640 x 480 to 1600 x 1200 or Widescreen Displays 1440 x 900 and 1920 x 1200.

### Design

SIMATIC WinCC flexible Runtime is available as a software package with 128, 512, 2048 or 4096 PowerTags. The term PowerTags is used exclusively to identify process variables and range pointers that have a process link to the controller. Variables without process link, constant limit values of variables, and messages (up to 4000 bit-triggered messages) are also available for additional system performance.

The range of functions of WinCC flexible Runtime includes the centralized HMI components for visualizing and reporting, and it can be expanded to suit requirements and costs by using optional packages.

SIMATIC WinCC flexible Runtime is configured with the SIMATIC WinCC flexible Advanced configuration software.

### Options

WinCC flexible RT can be expanded with the following features:

- WinCC flexible Archives for logging process values and messages
- WinCC flexible Recipes for managing data sets which contain associated machine or production data
- SIMATIC WinCC flexible /Audit for
  - Recording of operator actions in an Audit Trail
  - The ChangeControl option restricts users based on plant validation
  - Checking for later changes via security mechanisms
  - Simplified compliance with GPM guidelines
- SIMATIC Logon for central, plant-wide user administration
- WinCC flexible Sm@rtAccess for communication between different Simatic HMI systems
- WinCC flexible Sm@rtService for remote maintenance and servicing of machines/plants via the Intranet/Internet
- WinCC flexible OPC server for use as a data server (OPC server) for higher-level automation components such as control systems or systems in the office area.

# SIMOTION HMI devices

Notes

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