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SIMATIC S7-1500

Brochures

For brochures serving as selection guides for SIMATIC products refer to:

www.siemens.com/simatic/printmaterial

Siemens ST 70 · 2013

SIMATIC S7-1500
Introduction

■ **Overview**

- Modular, scalable, and universally usable system in IP20 level of protection
- The system solution for a variety of automation applications in discrete automation
- Highest performance with excellent usability
- Configurable exclusively in the Totally Integrated Automation Portal with STEP 7 Professional V12

Performance

- Performance increase through
  - Faster command execution
  - Language extensions
  - New data types
  - Faster backplane bus
  - Optimized code generation
- Powerful communication:
  - PROFINET IO (2-port switch) as standard interface
  - Optional additional PROFINET interface, e.g. for network separation
  - Expandable with communication modules for bus systems and point-to-point connection

Integrated technology

- Motion Control integrated without additional modules:
  - Standardized blocks (PLCopen) for connection of analog and PROFIdrive-capable drives
  - The Motion Control functionality supports speed-controlled and positioning axes as well as external encoders
- Comprehensive trace functions for all CPU variables for real-time diagnosis and sporadic error detection;
  for effective commissioning and quick optimization of drives and controls
- Comprehensive control functionalities:
  e.g. easily configurable blocks for automatic optimization of the control parameters for optimum control quality
- Additional functions through available technology modules:
  e.g. high-speed counting, position detection, or measurement functions for signals up to 1 MHz

Security Integrated

- Password-based know-how protection against unauthorized reading and modification of program blocks
- Copy protection for greater protection against unauthorized copying of program blocks:
  With copy protection, individual blocks on the SIMATIC memory card can be tied to its serial number so that the block can only be run if the configured memory card is inserted into the CPU.
- Rights concept with four different authorization levels:
  Different access rights can be assigned to various user groups. The new protection level 4 makes it possible to also restrict communication to HMI devices.
- Improved manipulation protection:
  Changed or unauthorized transfers of engineering data are detected by the controller.
- For use of an Ethernet CP (CP 1543-1):
  - Additional access protection by means of a firewall
  - Setup of secure VPN connections (V12 SP1 or higher)

Design and handling

- CPUs with display for plain text information:
  - Information about order numbers, firmware version, and the serial number of all connected modules can be displayed
  - Setting the IP address of the CPU and additional network settings directly on site, without programming device
  - Display of occurring error messages directly as plain text message, meaning reduction in downtime
- Uniform front connectors for all modules and integrated potential bridges for flexible potential group formation simplify stock keeping and reduce wiring costs
- Integrated DIN rail in the S7-1500 mounting rail:
  quick and easy installation of additional components such as miniature circuit breakers, relays, etc.
- Central expansion with signal modules:
  for flexible adaptation to any application
- System cabling for digital signal modules:
  for fast and clearly arranged connecting to sensors and actuators in the field and simple wiring inside the control cabinet
- Power supply:
  - Load current supply modules (power modules) to supply the module with 24 V
  - Power supply modules to supply power to the internal module electronics via the backplane bus
- Distributed expansion:
  - Use of up to 30 signal modules, communication modules, and technology modules via the PROFINET interface module IM 155-5 for the ET 200MP I/O system
  - No difference in terms of handling and system functions in central and distributed operation

Integrated system diagnostics

- Integrated system diagnostics for CPUs, activated by default:
  - Consistent plain text display of system diagnostic information in the display, TIA Portal, HMI, and web server, even for drive messages. Messages are updated even if the CPU is in STOP state.
  - System diagnostics integrated in the CPU firmware. Configuration by user not required. The diagnostics is automatically updated on configuration changes.

Overview (continued)

Datalog (archives) and recipes

- SIMATIC memory card:
  - Plug-in load memory
  - Permits firmware updates
  - Storage option for STEP 7 projects (including comments and symbols), additional documentation, or csv files (for recipes and archives)
  - Easy access to plant-relevant operating data and configuration data with Office tools via the SD Card reader (two-way data exchange from and to the controller)
- Integrated web server:
  - Easy access to plant-relevant operating data and configuration data via a Web browser

Approvals

At the start of delivery, the SIMATIC S7-1500 complies with national and international standards:

- CE
- cULus
- C-TICK
- CFMus
- ATEX
- EN 61000-6-4
- EN 60068-2-1/ -2/ -6/ -14/ -27/ -30/ -32
- EN 61131-2

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Technical specifications

General technical specifications

Degree of protection	IP20 acc. to IEC 60 529
Ambient temperature	
• Horizontal installation	0...60 °C (display: at an operating temperature of typ. 50 °C, the display is switched off.)
• Vertical installation	0... 40 °C (display: at an operating temperature of typ. 40 °C, the display is switched off.)
Relative humidity	5%...95%, no condensation
Atmospheric pressure	From 1080 to 795 hPa (corresponds to an altitude of -1000 to +2000 m)
Insulation	
• < 50 V	707 V DC test voltage (type test)
• < 150 V	2200 V DC test voltage
• < 250 V	2500 V DC test voltage
Electromagnetic compatibility	Requirements of the EMC directive; interference immunity according to IEC 61000-6-2
• Pulse-shaped disturbance variables	Test according to: Electrostatic discharge according to IEC 61000-4-2, burst pulses according to IEC 61000-4-4, energy single pulse (surge) according to IEC 61000-4-5,
• Sinusoidal disturbance variables	Test according to: HF irradiation according to IEC 61000-4-3, HF decoupling according to IEC 61000-4-6
	Requirements of the EMC directive; interference emission according to EN 61000-6-4
• Emission of radio frequency interference	Interference emission according to 61000-6-4
	Interference emission of electro-magnetic fields according to EN 61000-6-4
Mechanical stress	
• Vibrations	Testing according to EN 60068-2-6 Tested with: 5 Hz ≤ f ≤ 8.4 Hz, constant amplitude 7 mm; 9 Hz ≤ f ≤ 150 Hz, constant acceleration 2 g; duration of vibration: 10 frequency passes per axis in each direction of the 3 mutually perpendicular axes
• Shock	Testing according to EN 60068-2-27 Tested with: Half-wave: strength of shock 15 g peak value, 11 ms duration; shock direction: 3 shocks each in ± direction in each of the 3 mutually vertical axes

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SIMATIC S7-1500
Central processing units

Standard CPUs

Overview CPU 1511-1 PN

- Entry-level CPU in the S7-1500 controller product range
- Suitable for applications with medium requirements for program scope and processing speed
- Used as central controller in production lines with central and distributed I/O
- PROFINET IO IRT interface with 2-port switch
- PROFINET IO Controller for operating distributed I/O on PROFINET
- PROFINET I-Device for connecting the CPU as an intelligent PROFINET device under a SIMATIC or non-Siemens PROFINET I/O controller
- Isochronous mode
- SIMATIC memory card required for operation of the CPU

Overview CPU 1513-1 PN

- The CPU for applications with medium/high requirements for program/data storage in the S7-1500 controller product range
- High processing speed for binary and floating-point arithmetic
- Used as central controller in production lines with central and distributed I/O
- PROFINET IO IRT interface with 2-port switch

- PROFINET IO Controller for operating distributed I/O on PROFINET
- PROFINET I-Device for connecting the CPU as an intelligent PROFINET device under a SIMATIC or non-Siemens PROFINET I/O controller
- Isochronous mode
- SIMATIC memory card required for operation of the CPU

Overview CPU 1516-3 PN/DP

- The CPU with large program and data memory in the S7-1500 controller product range for applications with high program scope requirements.
- High processing speed for binary and floating-point arithmetic
- Used as central controller in production lines with central and distributed I/O
- PROFINET IO IRT interface with 2-port switch
- Additional PROFINET interface with separate IP address
- PROFINET IO controller for operating distributed I/O on PROFINET.
- PROFINET I-Device for connecting the CPU as an intelligent PROFINET device under a SIMATIC or non-Siemens PROFINET IO controller.
- PROFIBUS DP master interface
- Isochronous mode on PROFIBUS and PROFINET
- SIMATIC memory card required for operation of the CPU

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■ Technical specifications

	6ES7 511-1AK00-0AB0 CPU 1511-1 PN	**6ES7 513-1AL00-0AB0** CPU 1513-1 PN	**6ES7 516-3AN00-0AB0** CPU 1516-3 PN/DP
General information			
Engineering with			
• STEP 7 TIA Portal can be configured/ integrated as of version	V12.0	V12.0	V12.0
Display			
Screen diagonal (cm)	3.45 cm	3.45 cm	6.1 cm
Supply voltage			
Type of supply voltage	24 V DC	24 V DC	24 V DC
Power losses			
Power loss, typ.	5.7 W	5.7 W	7 W
Memory			
Work memory			
• integrated (for program)	150 kbyte	300 kbyte	1 Mbyte
• integrated (for data)	1 Mbyte	1.5 Mbyte	5 Mbyte
Load memory			
• Plug-in (SIMATIC Memory Card), max.	2 Gbyte	2 Gbyte	2 Gbyte
CPU processing times			
for bit operations, typ.	60 ns	40 ns	10 ns
for word operations, typ.	72 ns	48 ns	12 ns
for fixed point arithmetic, typ.	96 ns	64 ns	16 ns
for floating point arithmetic, typ.	384 ns	256 ns	64 ns
Counters, timers and their retentivity			
S7 counter			
• Number	2 048	2 048	2 048
IEC counter			
• Number	Any (only limited by the main memory)	Any (only limited by the main memory)	Any (only limited by the main memory)
S7 times			
• Number	2 048	2 048	2 048
IEC timer			
• Number	Any (only limited by the main memory)	Any (only limited by the main memory)	Any (only limited by the main memory)
Data areas and their retentivity			
Flag			
• Number, max.	16 kbyte	16 kbyte	16 kbyte
Address area			
I/O address area			
• Inputs	32 kbyte; All inputs are in the process image	32 kbyte; All inputs are in the process image	32 kbyte; All inputs are in the process image
• Outputs	32 kbyte; All outputs are in the process image	32 kbyte; All outputs are in the process image	32 kbyte; All outputs are in the process image
Time of day			
Clock			
• Type	Hardware clock	Hardware clock	Hardware clock

SIMATIC S7-1500
Central processing units

Standard CPUs

■ **Technical specifications** (continued)

	6ES7 511-1AK00-0AB0 CPU 1511-1 PN	6ES7 513-1AL00-0AB0 CPU 1513-1 PN	6ES7 516-3AN00-0AB0 CPU 1516-3 PN/DP
Interfaces			
1st interface			
• Interface types			
- Number of ports	2	2	2
- Integrated switch	Yes	Yes	Yes
- RJ 45 (Ethernet)	Yes	Yes	Yes
• Protocols			
- PROFINET IO Controller	Yes	Yes	Yes
- PROFINET IO Device	Yes	Yes	Yes
- SIMATIC communication	Yes	Yes	Yes
- Open IE communication	Yes	Yes	Yes
- Web server	Yes	Yes	Yes
- Media redundancy	Yes	Yes	Yes
2nd interface			
• Interface types			
- Number of ports			1
- Integrated switch			No
- RJ 45 (Ethernet)			Yes
• Protocols			
- PROFINET IO Controller			No
- PROFINET IO Device			No
- SIMATIC communication			Yes
- Open IE communication			Yes
- Web server			Yes
3rd interface			
• Interface types			
- Number of ports			1
- RS 485			Yes
• Protocols			
- SIMATIC communication			Yes
- PROFIBUS DP master			Yes
- PROFIBUS DP slave			No
Interface types			
Number of connections			
• Number of connections, max.	96	128	256
Protocols			
PROFINET IO Controller			
• Services			
- Max. number of connectable IO devices for RT	128	128	256
- Number of IO Devices with IRT and the option "high performance", max.	64	64	64
PROFIBUS			
• Services			
- Number of DP slaves			125; In total, up to 768 distributed I/O devices can be connected via CPs/CMs via PROFIBUS or PROFINET.
Isochronous mode			
Isochronous operation (application synchronized up to terminal)	Yes	Yes	Yes

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■ Technical specifications (continued)

	6ES7 511-1AK00-0AB0 CPU 1511-1 PN	6ES7 513-1AL00-0AB0 CPU 1513-1 PN	6ES7 516-3AN00-0AB0 CPU 1516-3 PN/DP
Supported technology objects			
Motion	Yes	Yes	Yes
• Speed-controlled axis			
- Number of speed-controlled axes, max.	6; Up to 6 axes in total (speed-controlled, positioning axis, external encoders) are supported	6; Up to 6 axes in total (speed-controlled, positioning axis, external encoders) are supported	20; Up to 20 axes in total (speed-controlled, positioning axis, external encoders) are supported
• Positioning axis			
- Number of positioning axes, max.	6; Up to 6 axes in total (speed-controlled, positioning axis, external encoders) are supported	6; Up to 6 axes in total (speed-controlled, positioning axis, external encoders) are supported	20; Up to 20 axes in total (speed-controlled, positioning axis, external encoders) are supported
• External encoders			
- Number of external encoders, max.	6; Up to 6 axes in total (speed-controlled, positioning axis, external encoders) are supported	6; Up to 6 axes in total (speed-controlled, positioning axis, external encoders) are supported	20; Up to 20 axes in total (speed-controlled, positioning axis, external encoders) are supported
Controller			
• PID_Compact	Yes; Universal PID controller with integrated optimization	Yes; Universal PID controller with integrated optimization	Yes; Universal PID controller with integrated optimization
• PID_3Step	Yes; PID controller with integrated optimization for valves	Yes; PID controller with integrated optimization for valves	Yes; PID controller with integrated optimization for valves
Counting and measuring			
• High-speed counter	Yes	Yes	Yes
Ambient conditions			
Operating temperature			
• horizontal installation, min.	0 °C	0 °C	0 °C
• horizontal installation, max.	60 °C; Display: 50 °C, at an operating temperature of typically 50 °C, the display is switched off	60 °C; Display: 50 °C, at an operating temperature of typically 50 °C, the display is switched off	60 °C; Display: 50 °C, at an operating temperature of typically 50 °C, the display is switched off
• vertical installation, min.	0 °C	0 °C	0 °C
• vertical installation, max.	40 °C	40 °C	40 °C
Configuration			
Programming			
• Programming language			
- LAD	Yes	Yes	Yes
- FBD	Yes	Yes	Yes
- STL	Yes	Yes	Yes
- SCL	Yes	Yes	Yes
Know-how protection			
• User program protection	Yes	Yes	Yes
• Copy protection	Yes	Yes	Yes
• Block protection	Yes	Yes	Yes
Access protection			
• Password for display	Yes	Yes	Yes
• Protection level: Write protection	Yes	Yes	Yes
• Protection level: Read/write protection	Yes	Yes	Yes
• Protection level: Complete protection	Yes	Yes	Yes
Dimensions			
Width	35 mm	35 mm	70 mm
Height	147 mm	147 mm	147 mm
Depth	129 mm	129 mm	129 mm
Weight			
Weight, approx.	430 g	430 g	845 g

SIMATIC S7-1500
Central processing units

Standard CPUs

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Ordering data	Order No.		Order No.
CPU 1511-1 PN	**6ES7 511-1AK00-0AB0**	**PROFIBUS FastConnect bus connector RS485 with 90° cable outlet**	
Work memory 150 KB for program, 1 MB for data, PROFINET IO IRT interface, SIMATIC memory card required		with insulation displacement, max. transmission rate 12 Mbit/s	
CPU 1513-1 PN	**6ES7 513-1AL00-0AB0**	without PG interface, grounding via control cabinet contact surface; 1 unit	**6ES7 972-0BA70-0XA0**
Work memory 300 KB for program, 1.5 MB for data, PROFINET IO IRT interface, SIMATIC memory card required		with PG interface, grounding via control cabinet contact surface; 1 unit	**6ES7 972-0BB70-0XA0**
CPU 1516-3 PN	**6ES7 516-3AN00-0AB0**	**PROFIBUS FC Standard Cable GP**	**6XV1 830-0EH10**
1 MB RAM for program, 5 MB for data, PROFINET IO IRT interface, PROFINET/PROFIBUS interface; SIMATIC memory card required		Standard type with special design for fast mounting, 2-core, shielded; sold by the meter; max. delivery unit 1000 m, minimum order quantity 20 m	
Accessories		**PROFIBUS FC Robust Cable**	**6XV1 830-0JH10**
SIMATIC memory card		2-wire, shielded; sold by the meter; max. delivery unit 1000 m, minimum order quantity 20 m	
4 MB	**6ES7 954-8LC01-0AA0**		
12 MB	**6ES7 954-8LE01-0AA0**		
24 MB	**6ES7 954-8LF01-0AA0**	**PROFIBUS FC Flexible Cable**	**6XV1 831-2K**
2 GB	**6ES7 954-8LP01-0AA0**	2-wire, shielded; sold by the meter; max. delivery unit 1000 m, minimum order quantity 20 m	
SIMATIC S7-1500 mounting rail			
Fixed lengths, with grounding elements		**PROFIBUS FC Trailing Cable**	
• 160 mm	**6ES7 590-1AB60-0AA0**	2-wire, shielded; sold by the meter; max. delivery unit 1000 m, minimum order quantity 20 m	
• 482 mm	**6ES7 590-1AE80-0AA0**		
• 530 mm	**6ES7 590-1AF30-0AA0**		
• 830 mm	**6ES7 590-1AJ30-0AA0**		
For cutting to length by customer, without drill holes; grounding elements must be ordered separately		Sheath color: Petrol	**6XV1 830-3EH10**
• 2000 mm	**6ES7 590-1BC00-0AA0**	Sheath color: Violet	**6XV1 831-2L**
PE connection element for mounting rail 2000 mm	**6ES7 590-5AA00-0AA0**	**PROFIBUS FC Food Cable**	**6XV1 830-0GH10**
20 units		2-wire, shielded; sold by the meter; max. delivery unit 1000 m, minimum order quantity 20 m	
Power supply			
For supplying the backplane bus of the S7-1500		**PROFIBUS FC Ground Cable**	**6XV1 830-3FH10**
24 V DC input voltage, power 25 W	**6ES7 505-0KA00-0AB0**	2-wire, shielded; sold by the meter; max. delivery unit 1000 m, minimum order quantity 20 m	
24/48/60 V DC input voltage, power 60 W	**6ES7 505-0RA00-0AB0**		
120/230 V AC input voltage, power 60 W	**6ES7 507-0RA00-0AB0**	**PROFIBUS FC FRNC Cable GP**	**6XV1 830-0LH10**
Power connector	**6ES7 590-8AA00-0AA0**	2-wire, shielded, flame-retardant, with copolymer outer sheath FRNC; sold by the meter; max. delivery unit 1000 m, minimum order quantity 20 m	
With coding element for power supply module; spare part, 10 units			
Load power supply		**PROFIBUS FastConnect Stripping Tool**	**6GK1 905-6AA00**
24 V DC/3A	**6EP1 332-4BA00**	Preadjusted stripping tool for fast stripping of PROFIBUS FastConnect bus cables	
24 V DC/8A	**6EP1 333-4BA00**		
Power supply connector			
Spare part; for connecting the 24 V DC supply voltage			
• with push-in terminals	**6ES7 193-4JB00-0AA0**		

■ **Ordering data**	Order No.		Order No.

		Display	**6ES7 591-1AA00-0AA0**
IE FC RJ45 plugs		for CPU 1511-1 PN and CPU 1513-1 PN; spare part	
RJ45 plug connector for Industrial Ethernet with a rugged metal enclosure and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables		**Display**	**6ES7 591-1BA00-0AA0**
		for CPU 1516-3 PN/DP; spare part	
IE FC RJ45 Plug 180		**SIMATIC S7-1500 Starter Kit**	**6ES7 511-1AK00-4YB5**
180° cable outlet		Comprising: CPU 1511-1 PN, SIMATIC memory card 4 MB, digital input DI 16 x 24 V DC HF, digital output DO 16 x 24 V DC/0.5 A ST, 160 mm mounting rail, front connector, STEP 7 Professional V12, 365-day license, power supply 60 W AC 120/230 V, Standard Ethernet CAT 5 cable (2 m), screwdriver, documentation	
1 unit	**6GK1 901-1BB10-2AA0**		
10 units	**6GK1 901-1BB10-2AB0**		
50 units	**6GK1 901-1BB10-2AE0**		
IE FC TP Standard Cable GP 2x2	**6XV1 840-2AH10**		
4-core, shielded TP installation cable for connection to IE FC Outlet RJ45/ IE FC RJ45 Plug; PROFINET-compliant; with UL approval; sold by the meter; max. delivery unit 1000 m, minimum order quantity 20 m		**SIMATIC STEP 7 V12**	
		Target system: SIMATIC S7-1200, S7-1500, S7-300, S7-400, WinAC, SIMATIC Basic Panels	
		Requirement: Microsoft Windows XP Professional SP3 (32-bit) Microsoft Windows 7 Professional SP1 (32/64-bit) Microsoft Windows 7 Enterprise SP1 (32/64-bit) Microsoft Windows 7 Ultimate SP1 (32/64-bit) Microsoft Server 2003 R2 Std. SP2 (32-bit) Microsoft Server 2008 Std. SP2 (32/64-bit)	
IE FC TP Trailing Cable 2 x 2 (Type C)	**6XV1 840-3AH10**		
4-core, shielded TP installation cable for connection to IE FC Outlet RJ45/ IE FC RJ45 Plug 180/90 for use as trailing cable; PROFINET-compatible; with UL approval; sold by the meter; max. delivery unit 1000 m, minimum order quantity 20 m		Type of delivery: German, English, Chinese, Italian, French, Spanish	
		STEP 7 Professional V12, Floating License	**6ES7 822-1AA02-0YA5**
IE FC TP Marine Cable 2 x 2 (Type B)	**6XV1 840-4AH10**		
4-core, shielded TP installation cable for connection to IE FC Outlet RJ45/ IE FC RJ45 Plug 180/90 with marine approval, sold by the meter; max. delivery unit 1000 m, minimum order quantity 20 m			
IE FC Stripping Tool	**6GK1 901-1GA00**		
Preadjusted stripping tool for fast stripping of Industrial Ethernet FC cables			

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SIMATIC S7-1500
Digital modules

SM 521 digital input modules

Overview

- 16 and 32-channel digital input modules
- For flexible adaptation of the controller to the corresponding task
- For subsequent expansion of the system with additional inputs

Technical specifications

	6ES7 521-1BH00-0AB0 DI 16x24 V DC HF	6ES7 521-1BL00-0AB0 DI 32x24 V DC HF	6ES7 521-1BH50-0AA0 DI 16x24 V DC SRC BA	6ES7 521-1FH00-0AA0 DI 16x230 V AC BA
General information				
Product function				
• I&M data	Yes; IM0 to IM3	Yes; IM0 to IM3	Yes; IM0 to IM3	Yes; IM0 to IM3
Engineering with				
• STEP 7 TIA Portal can be configured/integrated as of version	V12.0 / V12.0	V12.0 / V12.0	V12.0 / V12.0	V12.0 / V12.0
• STEP 7 can be configured/ integrated as of version	as of V5.5 SP3 / -	as of V5.5 SP3 / -	as of V5.5 SP3 / -	as of V5.5 SP3 / -
Supply voltage				
Type of supply voltage	DC	DC		
Rated voltage/DC	24 V	24 V		
Reverse polarity protection	Yes	Yes		
Digital inputs				
Number/binary inputs	16	32	16	16
m/p-reading	p-reading	p-reading	m-reading	
Input characteristic curve acc. to IEC 61131, Type 1				Yes
Input characteristic curve acc. to IEC 61131, Type 3	Yes	Yes	Yes	
Input voltage				
• Type of input voltage	DC	DC	DC	AC
• Rated value, AC				230 V; 120/230 V AC; 60/50 Hz
• Rated value, DC	24 V	24 V	24 V	
• for signal "0"	-30 to +5 V	-30 to +5 V	30 to -5 V	0 to 40 V AC
• for signal "1"	11 to 30 V	11 to 30 V	-11 to -30 V	79 to 264 V AC
Input current				
• for signal "1", typ.	2.5 mA	2.5 mA	4.5 mA	11 mA; At 230 V AC and 5.5 mA at 120 V AC
Input delay (for rated value of input voltage)				
• for standard inputs				
- Parameterizable	Yes; 0.05 / 0.1 / 0.4 / 1.6 / 3.2 / 12.8 / 20 ms	Yes; 0.05 / 0.1 / 0.4 / 1.6 / 3.2 / 12.8 / 20 ms	No	No
• for interrupt inputs				
- Parameterizable	Yes	Yes	No	No
Cable length				
• Cable length, shielded, max.	1 000 m	1 000 m	1 000 m	1 000 m
• Cable length unshielded, max.	600 m	600 m	600 m	600 m

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■ Technical specifications (continued)

	6ES7 521-1BH00-0AB0 DI 16x24 V DC HF	6ES7 521-1BL00-0AB0 DI 32x24 V DC HF	6ES7 521-1BH50-0AA0 DI 16x24 V DC SRC BA	6ES7 521-1FH00-0AA0 DI 16x230 V AC BA
Encoder Connectable encoders				
• 2-wire sensor	Yes	Yes	Yes	Yes
- Permissible quiescent current (2-wire sensor), max.	1.5 mA	1.5 mA	1.5 mA	2 mA
Isochronous mode Isochronous operation (application synchronized up to terminal)	Yes	Yes	No	No
Filtering and processing time (TCI), min.	80 μs; At 50 μs filter time	80 μs; At 50 μs filter time		
Bus cycle time (TDP), min.	250 μs	250 μs		
Interrupts/diagnostics/ status information Alarms				
• Diagnostic alarm	Yes	Yes	No	No
• Hardware interrupt	Yes	Yes	No	No
Diagnostic messages				
• Diagnostics	Yes	Yes	No	
• Monitoring the supply voltage	Yes	Yes	No	No
• Wire break	Yes; to I < 350 μA	Yes; to I < 350 μA	No	No
• Short circuit	No	No	No	No
• Fuse blown	No	No	No	No
Diagnostics indication LED				
• RUN LED	Yes; Green LED	Yes; Green LED	Yes; Green LED	Yes; Green LED
• ERROR LED	Yes; Red LED	Yes; Red LED	Yes; Red LED	Yes; Red LED
• Monitoring the supply voltage	Yes; Green LED	Yes; Green LED	No	No
• Channel status display	Yes; Green LED	Yes; Green LED	Yes; Green LED	Yes; Green LED
• for channel diagnostics	Yes; Red LED	Yes; Red LED	No	No
• for module diagnostics	Yes; Red LED	Yes; Red LED	No	Yes; Red LED
Galvanic isolation Electrical isolation channels				
• between the channels and the backplane bus	Yes	Yes	Yes	Yes
Isolation Isolation checked with	707 V DC (type test)	707 V DC (type test)	707 V DC (type test)	2500 V DC
Decentralized operation Supports fast startup	Yes; 500 ms	Yes; 500 ms	Yes; 500 ms	Yes; 500 ms
Dimensions				
Width	35 mm	35 mm	35 mm	35 mm
Height	147 mm	147 mm	147 mm	147 mm
Depth	129 mm	129 mm	129 mm	129 mm
Weight Weight, approx.	240 g	260 g	230 g	300 g

SIMATIC S7-1500
Digital modules

SM 521 digital input modules

Ordering data	Order No.		Order No.
SM 521 digital input modules		**Accessories**	
16 inputs, 24 V DC, isolated, parameterizable diagnostics and hardware interrupts	**6ES7 521-1BH00-0AB0**	**Front connectors**	**6ES7 592-1AM00-0XB0**
		Including four potential bridges, cable ties, and individual labeling strips; 40-pole screw-type terminal	
32 inputs, 24 V DC, isolated, parameterizable diagnostics and hardware interrupts	**6ES7 521-1BL00-0AB0**	**Potential bridges for front connectors**	**6ES7 592-3AA00-0AA0**
16 inputs, 24 V DC, isolated, input delay 3.2 ms	**6ES7 521-1BH50-0AA0**	20 units; spare part	
		DIN A4 labeling sheets	**6ES7 592-2AX00-0AA0**
16 inputs, 230 V AC, isolated, input delay 20 ms	**6ES7 521-1FH00-0AA0**	10 sheets with 10 labeling strips each for I/O modules; perforated, Al grey	
		U connector	**6ES7 590-0AA00-0AA0**
		5 units; spare part	
		Universal front door for I/O modules	**6ES7 528-0AA00-7AA0**
		5 front doors; with 5 labeling strips (front) and 5 cabling diagrams per front door; spare part	

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Overview

- 8, 16 and 32-channel digital output modules
- For flexible adaptation of the controller to the corresponding task
- For subsequent expansion of the system with additional outputs

Technical specifications

	6ES7 522-1BH00-0AB0	6ES7 522-1BL00-0AB0	6ES7 522-1BF00-0AB0	6ES7 522-5HF00-0AB0	6ES7 522-5FF00-0AB0
General information					
Product function					
• I&M data	Yes; IM0 to IM3	Yes; IM0 to IM3	Yes; IM0 to IM3	Yes; IM0 to IM3	Yes; IM0 to IM3
Engineering with					
• STEP 7 TIA Portal can be configured/integrated as of version	V12.0 / V12.0	V12.0 / V12.0	V12.0 / V12.0	V12.0 / V12.0	V12.0 / V12.0
• STEP 7 can be configured/ integrated as of version	as of V5.5 SP3 / -	as of V5.5 SP3 / -	as of V5.5 SP3 / -	as of V5.5 SP3 / -	as of V5.5 SP3 / -
Supply voltage					
Type of supply voltage	DC	DC	DC	DC	
Rated voltage/DC	24 V	24 V	24 V	24 V	
Reverse polarity protection	Yes; through internal protection with 7 A per group	Yes; through internal protection with 7 A per group	Yes; through internal protection with 10 A per group	Yes	
Digital outputs					
Type of digital output	Transistor	Transistor	Transistor	Relays	Triac
Number/binary outputs	16	32	8	8	8
Digital outputs, configurable	Yes	Yes	Yes	Yes	Yes
Functionality/short-circuit strength	Yes; Clocked electronically	Yes; Clocked electronically	Yes; Clocked electronically	No	No
Limitation of inductive shutdown voltage to	L+ (-53 V)	L+ (-53 V)	-17 V		
Low energy/fluorescent lamps with electronic control gear				10 X 58 W (25,000 operating cycles)	
Fluorescent tubes, conventionally compensated				1 X 58 W (25,000 operating cycles)	
Fluorescent tubes, uncompensated				10 X 58 W (25,000 operating cycles)	
Controlling a digital input	Yes	Yes	Yes	possible	
Switching capacity of the outputs					
• with resistive load, max.	0.5 A	0.5 A	2 A		2 A
• on lamp load, max.	5 W	5 W	10 W	1 500 W; (10,000 operating cycles)	50 W
Load resistance range					
• lower limit	48 Ω	48 Ω	12 Ω		
• upper limit	12 kΩ	12 kΩ	4 kΩ		
Output voltage					
• Type of output voltage	DC	DC	DC		AC
• for signal "1", min.	L+ (-0.8 V)	L+ (-0.8 V)	L+ (-0.8 V)		L1 (-1.5 V) at maximum output current; L1 (-8.5 V) at minimum output current

SIMATIC S7-1500
Digital modules

SM 522 digital output modules

Technical specifications (continued)

	6ES7 522-1BH00-0AB0	6ES7 522-1BL00-0AB0	6ES7 522-1BF00-0AB0	6ES7 522-5HF00-0AB0	6ES7 522-5FF00-0AB0
Output current					
• for signal "1" rated value	0.5 A	0.5 A	2 A	5 A	2 A
• for signal "0" residual current, max.	0.5 mA	0.5 mA	0.5 mA	0 A	2 mA
Output delay with resistive load					
• "0" to "1", max.	100 µs	100 µs	100 µs		1 AC cycle
• "1" to "0", max.	500 µs	500 µs	500 µs		1 AC cycle
Parallel switching of 2 outputs					
• for logic links	Yes	Yes	Yes	Yes	No
• for increased power	No	No	No	No	No
• for redundant control of a load	Yes	Yes	Yes	Yes	Yes
Switching frequency					
• with resistive load, max.	100 Hz	100 Hz	100 Hz	2 Hz	10 Hz
• with inductive load, max.	0.5 Hz; to IEC 947-5-1, DC13	0.5 Hz; to IEC 947-5-1, DC13	0.5 Hz; to IEC 947-5-1, DC13	0.5 Hz	0.5 Hz
• on lamp load, max.	10 Hz	10 Hz	10 Hz	2 Hz	1 Hz
Aggregate current of the outputs					
• Max. current per channel	0.5 A; (see additional description in the manual)	0.5 A; (see additional description in the manual)	2 A; (see additional description in the manual)	8 A; (see additional description in the manual)	2 A; (see additional description in the manual)
• Max. current per group	4 A; (see additional description in the manual)	4 A; (see additional description in the manual)	8 A; (see additional description in the manual)	8 A; (see additional description in the manual)	2 A; (see additional description in the manual)
• Max. current per module	8 A; (see additional description in the manual)	16 A; (see additional description in the manual)	16 A; (see additional description in the manual)	64 A; (see additional description in the manual)	10 A; (see additional description in the manual)
Relay outputs					
• Number of relay outputs				8	
• Rated input voltage of relay coil L+ (DC)				24 V	
• Current consumption of relays (coil current of all relays), max.				80 mA	
• external protection for relay outputs				With miniature circuit breaker with characteristic B for: cos φ 1.0: 600 A cos φ 0.5 ... 0.7: 900 A with 8 A Diazed fuse: 1000 A	
• Contact connection (internal)				No	
• Size of motor starters according to NEMA, max.				5	5
• Number of operating cycles, max.				4 000 000; (see additional description in the manual)	
• Relay approved acc. to UL 508				Yes; 250 V AC/5 A g.p.; 120 V AC TV-4 tungsten; A300, R300	
• Switching capacity of contacts					
- with inductive load, max.				(see additional description in the manual)	
- Switching frequency/contacts/at ohmic load/maximum				(see additional description in the manual)	
Cable length					
• Cable length, shielded, max.	1 000 m	1 000 m	1 000 m	1 000 m	1 000 m
• Cable length unshielded, max.	600 m	600 m	600 m	600 m	600 m
Isochronous mode					
Isochronous operation (application synchronized up to terminal)	Yes	Yes	No	No	No
Execution and activation time (TCO), min.	70 µs	70 µs			
Bus cycle time (TDP), min.	250 µs	250 µs			

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Technical specifications (continued)

	6ES7 522-1BH00-0AB0	6ES7 522-1BL00-0AB0	6ES7 522-1BF00-0AB0	6ES7 522-5HF00-0AB0	6ES7 522-5FF00-0AB0
Interrupts/diagnostics/status information					
Substitute values connectable	Yes	Yes	Yes	Yes	Yes
Alarms					
• Diagnostic alarm	Yes	Yes	Yes	Yes	No
Diagnostic messages					
• Diagnostics	Yes	Yes	Yes	Yes	No
• Monitoring the supply voltage	Yes	Yes	Yes	Yes	No
• Wire break	No	No	No	No	No
• Short circuit	Yes	Yes	Yes	No	No
• Fuse blown	No	No	No	No	No
Diagnostics indication LED					
• RUN LED	Yes; Green LED	Yes; Green LED	Yes; Green LED	Yes; Green LED	Yes; Green LED
• ERROR LED	Yes; Red LED	Yes; Red LED	Yes; Red LED	Yes; Red LED	Yes; Red LED
• Monitoring the supply voltage	Yes; Green LED	Yes; Green LED	Yes; Green LED	Yes; Green LED	No
• Channel status display	Yes; Green LED	Yes; Green LED	Yes; Green LED	Yes; Green LED	Yes; Green LED
• for channel diagnostics	No	No	Yes; Red LED	No	No
• for module diagnostics	Yes; Red LED	Yes; Red LED	Yes; Red LED	Yes; Red LED	Yes; Red LED
Galvanic isolation					
Electrical isolation channels					
• between the channels and the backplane bus	Yes	Yes	Yes	Yes	Yes
Isolation					
Isolation checked with	707 V DC (type test)	707 V DC (type test)	707 V DC (type test)	Between the channels: 2500 V DC; between the channels and backplane bus: 2500 V DC; between L+ backplane bus 707 V DC (type test)	2500 V DC
Decentralized operation					
Supports fast startup	Yes; 500 ms	Yes; 500 ms	Yes; 500 ms	Yes; 500 ms	Yes; 500 ms
Dimensions					
Width	35 mm	35 mm	35 mm	35 mm	35 mm
Height	147 mm	147 mm	147 mm	147 mm	147 mm
Depth	129 mm	129 mm	129 mm	129 mm	129 mm
Weight					
Weight, approx.	230 g	280 g	240 g	350 g	290 g

SIMATIC S7-1500
Digital modules

SM 522 digital output modules

Ordering data	Order No.		Order No.
SM 522 digital output modules		**Accessories**	
8 outputs, 24 V DC; 2 A, isolated	**6ES7 522-1BF00-0AB0**	**Front connectors**	**6ES7 592-1AM00-0XB0**
16 outputs, 24 V DC; 0.5 A, isolated	**6ES7 522-1BH00-0AB0**	Including four potential bridges, cable ties, and individual labeling strips; 40-pole screw-type terminal	
32 outputs, 24 V DC; 0.5 A, isolated	**6ES7 522-1BL00-0AB0**	**Potential bridges for front connectors**	**6ES7 592-3AA00-0AA0**
8 relay outputs, 230 V AC, 5 A	**6ES7 522-5HF00-0AB0**	20 units; spare part	
8 outputs (triac), 230 V AC, 2 A	**6ES7 522-5FF00-0AB0**	**DIN A4 labeling sheets**	**6ES7 592-2AX00-0AA0**
		10 sheets with 10 labeling strips each for I/O modules; perforated, Al grey	
		U connector	**6ES7 590-0AA00-0AA0**
		5 units; spare part	
		Universal front door for I/O modules	**6ES7 528-0AA00-7AA0**
		5 front doors; with 5 labeling strips (front) and 5 cabling diagrams per front door; spare part	

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SIPLUS SM 521 digital input modules

Overview

- 16 and 32-channel digital input modules
- For flexible adaptation of the controller to the corresponding task
- For subsequent expansion of the system with additional inputs

Note:

SIPLUS extreme products are based on Siemens Industry standard products. The contents listed here were taken from the respective standard products. SIPLUS extreme-specific information was added.

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Technical specifications

The technical data correspond to those of the based-on modules apart from the values listed in the table:

	6AG1 521-1BH00-7AB0	6AG1 521-1BL00-7AB0
based on	6ES7 521-1BH00-0AB0	6ES7 521-1BL00-0AB0
Ambient conditions		
Operating temperature		
• Horizontal mounting position	-40...+70 °C	-40...+70 °C
• Vertical mounting position	-40...+50 °C	-40...+50 °C
Extended ambient conditions		
• with reference to ambient temperature, air pressure and altitude	Tmin ... Tmax at 1080 hPa ... 795 hPa (-1000 m ... +2000 m) // Tmin ... (Tmax - 10K) at 795 hPa ... 658 hPa (+2000 m ... +3500 m) // Tmin ... (Tmax - 20K) at 658 hPa ... 540 hPa (+3500 m ... +5000 m)	Tmin ... Tmax at 1080 hPa ... 795 hPa (-1000 m ... +2000 m) // Tmin ... (Tmax - 10K) at 795 hPa ... 658 hPa (+2000 m ... +3500 m) // Tmin ... (Tmax - 20K) at 658 hPa ... 540 hPa (+3500 m ... +5000 m)
Relative humidity		
• with condensation / maximum / tested in accordance with IEC 60068-2-38	100%; RH incl. condensation/frost (no commissioning in bedewed state)	100%; RH incl. condensation/frost (no commissioning in bedewed state)
Resistance		
• to biologically active substances / compliance with EN 60721-3-3	Yes; Class 3B2 mold and fungal spores (except fauna); the supplied plug covers must remain in place on the unused interfaces during operation.	Yes; Class 3B2 mold and fungal spores (except fauna); the supplied plug covers must remain in place on the unused interfaces during operation.
• to chemically active substances / compliance with EN 60721-3-3	Yes; Class 3C4 (RH < 75%) incl. salt spray in accordance with EN 60068-2-52 (severity 3); the supplied plug covers must remain in place on the unused interfaces during operation.	Yes; Class 3C4 (RH < 75%) incl. salt spray in accordance with EN 60068-2-52 (severity 3); the supplied plug covers must remain in place on the unused interfaces during operation.
• to mechanically active substances / compliance with EN 60721-3-3	Yes; Class 3S4 incl. sand, dust; the supplied plug covers must remain in place on unused interfaces during operation.	Yes; Class 3S4 incl. sand, dust; the supplied plug covers must remain in place on unused interfaces during operation.

Ordering data | Order No.

SIPLUS SM 521 digital input modules	
(extended temperature range and medial exposure)	
16 inputs, 24 V DC, isolated, parameterizable diagnostics and hardware interrupts	**6AG1 521-1BH00-7AB0**
32 inputs, 24 V DC, isolated, parameterizable diagnostics and hardware interrupts	**6AG1 521-1BL00-7AB0**
Accessories	See SIMATIC S7-1500 SM 521 digital input modules, page 4/12

SIMATIC S7-1500
SIPLUS digital modules

SIPLUS SM 522 digital output modules

Overview

- 16 and 32-channel digital output modules
- For flexible adaptation of the controller to the corresponding task
- For subsequent expansion of the system with additional outputs

Note:

SIPLUS extreme products are based on Siemens Industry standard products. The contents listed here were taken from the respective standard products. SIPLUS extreme-specific information was added.

Technical specifications

The technical data correspond to those of the based-on modules apart from the values listed in the table:

	6AG1 522-1BH00-7AB0	6AG1 522-1BL00-7AB0
based on	6ES7 522-1BH00-0AB0	6ES7 522-1BL00-0AB0
Ambient conditions		
Operating temperature		
• Horizontal mounting position	-40...+70 °C	-40...+70 °C
• Vertical mounting position	-40...+50 °C	-40...+50 °C
Extended ambient conditions		
• with reference to ambient temperature, air pressure and altitude	Tmin ... Tmax at 1080 hPa ... 795 hPa (-1000 m ... +2000 m) // Tmin ... (Tmax - 10K) at 795 hPa ... 658 hPa (+2000 m ... +3500 m) // Tmin ... (Tmax - 20K) at 658 hPa ... 540 hPa (+3500 m ... +5000 m)	Tmin ... Tmax at 1080 hPa ... 795 hPa (-1000 m ... +2000 m) // Tmin ... (Tmax - 10K) at 795 hPa ... 658 hPa (+2000 m ... +3500 m) // Tmin ... (Tmax - 20K) at 658 hPa ... 540 hPa (+3500 m ... +5000 m)
Relative humidity		
• with condensation / maximum / tested in accordance with IEC 60068-2-38	100%; RH incl. condensation/frost (no commissioning in bedewed state)	100%; RH incl. condensation/frost (no commissioning in bedewed state)
Resistance		
• to biologically active substances / compliance with EN 60721-3-3	Yes; Class 3B2 mold and fungal spores (except fauna); the supplied plug covers must remain in place on the unused interfaces during operation.	Yes; Class 3B2 mold and fungal spores (except fauna); the supplied plug covers must remain in place on the unused interfaces during operation.
• to chemically active substances / compliance with EN 60721-3-3	Yes; Class 3C4 (RH < 75%) incl. salt spray in accordance with EN 60068-2-52 (severity 3); the supplied plug covers must remain in place on the unused interfaces during operation.	Yes; Class 3C4 (RH < 75%) incl. salt spray in accordance with EN 60068-2-52 (severity 3); the supplied plug covers must remain in place on the unused interfaces during operation.
• to mechanically active substances / compliance with EN 60721-3-3	Yes; Class 3S4 incl. sand, dust; the supplied plug covers must remain in place on unused interfaces during operation.	Yes; Class 3S4 incl. sand, dust; the supplied plug covers must remain in place on unused interfaces during operation.

Ordering data

	Order No.
SIPLUS SM 522 digital output modules	
(extended temperature range and medial exposure)	
16 outputs, 24 V DC; 0.5 A, isolated	**6AG1 522-1BH00-7AB0**
32 outputs, 24 V DC; 0.5 A, isolated	**6AG1 522-1BL00-7AB0**
Accessories	See SIMATIC S7-1500 SM 522 digital output modules, page 4/16

Overview

- 8-channel analog input modules
- Optionally with extremely short conversion times
- For the connection of analog sensors without additional amplifiers
- Even solves more complex automation tasks

Technical specifications

	6ES7 531-7KF00-0AB0 AI 8xU/I/RTD/TC ST	6ES7 531-7NF10-0AB0 AI 8xU/I HS
General information		
Product function		
• I&M data	Yes; IM0 to IM3	Yes; IM0 to IM3
Engineering with		
• STEP 7 TIA Portal can be configured/ integrated as of version	V12.0 / V12.0	V12.0 / V12.0
• STEP 7 can be configured/ integrated as of version	as of V5.5 SP3 / -	as of V5.5 SP3 / -
CiR - Configuration in RUN		
Reparameterization possible in RUN	Yes	Yes
Calibration possible in RUN	Yes	Yes
Supply voltage		
Type of supply voltage	DC	DC
Rated voltage/DC	24 V	24 V
Reverse polarity protection	Yes	Yes
Analog inputs		
Number of analog inputs	8	8
Number of analog inputs with current measurement	8	8
Number of analog inputs for voltage measurement	8	8
Number of analog inputs for resistance/resistance thermometer measurement	4	
Number of analog inputs with thermocouple measurement	8	
permissible input voltage for voltage input (destruction limit), max.	28.8 V	28.8 V
Technical unit for temperature measurement adjustable	Yes	
Input ranges (rated values), voltages		
• 1 to 5 V	Yes	Yes
• -1 V to +1 V	Yes	
• -10 V to +10 V	Yes	Yes
• -2.5 V to +2.5 V	Yes	
• -250 mV to +250 mV	Yes	
• -5 V to +5 V	Yes	Yes
• -50 mV to +50 mV	Yes	
• -500 mV to +500 mV	Yes	
• -80 mV to +80 mV	Yes	
Input ranges (rated values), currents		
• 0 to 20 mA	Yes	Yes
• -20 to +20 mA	Yes	Yes
• 4 to 20 mA	Yes	Yes

SIMATIC S7-1500
Analog modules

SM 531 analog input modules

■ **Technical specifications** (continued)

	6ES7 531-7KF00-0AB0 AI 8xU/I/RTD/TC ST	6ES7 531-7NF10-0AB0 AI 8xU/I HS
Input ranges (rated values), thermoelements		
• Type B	Yes	
• Type E	Yes	
• Type J	Yes	
• Type K	Yes	
• Type N	Yes	
• Type R	Yes	
• Type S	Yes	
• Type T	Yes	
Input ranges (rated values), resistance thermometers		
• Ni 100	Yes; Standard/climate	
• Ni 1000	Yes; Standard/climate	
• LG-Ni 1000	Yes; Standard/climate	
• Pt 100	Yes; Standard/climate	
• Pt 1000	Yes; Standard/climate	
• Pt 200	Yes; Standard/climate	
• Pt 500	Yes; Standard / climate	
Input ranges (rated values), resistors		
• 0 to 150 ohms	Yes	
• 0 to 300 ohms	Yes	
• 0 to 600 ohms	Yes	
• 0 to 6000 ohms	Yes	
• PTC	Yes	
Thermocouple (TC)		
• Technical unit for temperature measurement	°C/°F/K	
• Temperature compensation		
- Parameterizable	Yes	
Resistance thermometer (RTD)		
• Technical unit for temperature measurement	°C/°F/K	
Cable length		
• Cable length, shielded, max.	800 m; for U/I, 200 m for R/RTD, 50 m for TC	800 m
Analog value creation		
Integrations and conversion time/resolution per channel		
• Resolution with overrange (bit including sign), max.	16 bit	16 bit
• Integration time, parameterizable	Yes	
• Integration time, ms	2.5 / 16.67 / 20 / 100	
• Basic conversion time, including integration time, ms	9 / 23 / 27 / 107 ms	
- additional conversion time for wire break monitoring	9 ms	
- additional conversion time for resistance measurement	150 ohm, 300 ohm, 600 ohm, Pt100, Pt200, Ni100: 2 ms 6000 ohm, Pt500, Pt1000, Ni1000, LG-Ni1000, PTC: 4 ms	
• Interference voltage suppression for interference frequency f1 in Hz	400 / 60 / 50 / 10	
• Basic execution time of the module (all channels released)		62.5 µs
Smoothing of measured values		
• Parameterizable	Yes	Yes
Encoder		
Connection of signal encoders		
• for voltage measurement	Yes	Yes
• for current measurement as 2-wire transducer	Yes	Yes
• Burden of 2-wire transmitter, max.	820 Ω	820 Ω
• for current measurement as 4-wire transducer	Yes	Yes
• for resistance measurement with 2-conductor connection	Yes; Only for PTC	
• for resistance measurement with 3-conductor connection	Yes; All measuring ranges except PTC; internal compensation of the cable resistance;	
• for resistance measurement with 4-conductor connection	Yes; All measuring ranges except PTC	

■ **Technical specifications** (continued)

	6ES7 531-7KF00-0AB0 AI 8xU/I/RTD/TC ST	6ES7 531-7NF10-0AB0 AI 8xU/I HS
Errors/accuracies Basic error limit (operational limit at 25 °C)		
• Resistance-type thermometer, relative to input area	Pt xxx standard: +/- 0.7 K Pt xxx climate: +/- 0.2 K Ni xxx standard: +/- 0.3 K Ni xxx climate: +/- 0.15 K	
• Thermocouple, relative to input area	Type B: >600 °C +/- 1.7 K type E: >-200 °C +/- 0.7 K type J: >-210 °C +/- 0.8 K type K: >-200 °C +/- 1.2 K type N: >-200 °C +/- 1.2 K type R: >0 °C +/- 1.9 K type S: >0 °C +/- 1.9 K type T: >-200 °C +/- 0.8 K	
Interference voltage suppression for f = n x (f1 +/- 1%), f1 = interference frequency		
• Series mode interference (peak value of interference < rated value of input range), min.	40 dB	
• Common mode voltage, max.	10 V	10 V
• Common mode interference, min.	60 dB	60 dB; (At 400 Hz: 50 dB)
Isochronous mode Isochronous operation (application synchronized up to terminal)		Yes
Filtering and processing time (TCI), min.		100 µs
Bus cycle time (TDP), min.		250 µs
Interrupts/diagnostics/status information Alarms		
• Diagnostic alarm	Yes	Yes
• Limit value alarm	Yes; Two upper and two lower limit values in each case	Yes; Two upper and two lower limit values in each case
Diagnostic messages		
• Diagnostics	Yes	Yes
• Monitoring the supply voltage	Yes	Yes
• Wire break	Yes; Only for 1 to 5 V, 4 to 20 mA, TC, R, and RTD	Yes; Only for 1 ... 5V and 4 ... 20mA
• Overflow/underflow	Yes	Yes
Diagnostics indication LED		
• RUN LED	Yes; Green LED	Yes; Green LED
• ERROR LED	Yes; Red LED	Yes; Red LED
• Monitoring the supply voltage	Yes; Green LED	Yes; Green LED
• Channel status display	Yes; Green LED	Yes; Green LED
• for channel diagnostics	Yes; Red LED	Yes; Red LED
• for module diagnostics	Yes; Red LED	Yes; Red LED
Galvanic isolation Electrical isolation channels		
• between the channels and the backplane bus	Yes	Yes
Isolation Isolation checked with	707 V DC (type test)	707 V DC (type test)
Decentralized operation Supports fast startup	No	No
Dimensions Width	35 mm	35 mm
Height	147 mm	147 mm
Depth	129 mm	129 mm
Weight Weight, approx.	310 g	300 g
Other Note:	Additional basic error and noise for integration time = 2.5 ms: Voltage: +/- 250 mV: +/- 0.02% +/- 80 mV: +/- 0.05% +/- 50 mV: +/- 0.05% resistance: 150 ohms: +/- 0.02% resistance thermometer: Pt100 climate: +/- 0.08 K Ni100 climate: +/-0.08 K thermo- couple: Type B, R, S: +/- 3 K type E, J, K, N, T: +/-1 K	

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SIMATIC S7-1500
Analog modules

SM 531 analog input modules

Ordering data	Order No.		Order No.
SM 531 analog input modules		**Accessories**	
8 analog inputs ±10 V, ±5 V, 1 ... 5 V or 0/4 ... 20 mA, ±20 mA, 16 bit + sign	**6ES7 531-7NF10-0AB0**	**Front connectors**	**6ES7 592-1AM00-0XB0**
8 analog inputs ±10 V, ±5 V, ±2.5 V, ±1 V, ±500 mV, ±250 mV, ±80 mV, ±50 mV, 1 ... 5 V, 0/4 ... 20 mA, ±20 mA, thermocouples type B, E, J, K, N, R, S, T, resistance thermometers Ni 100, Ni 1000, LG-Ni 1000, Pt 100, Pt 1000, Pt 250, Pt 500, resistors 0...150/300/600/6000 Ohm, 16 bit	**6ES7 531-7KF00-0AB0**	Including four potential bridges, cable ties, and individual labeling strips; 40-pole screw-type terminal	
		DIN A4 labeling sheets	**6ES7 592-2AX00-0AA0**
		10 sheets with 10 labeling strips each for I/O modules; perforated, Al grey	
		U connector	**6ES7 590-0AA00-0AA0**
		5 units; spare part	
		Universal front door for I/O modules	**6ES7 528-0AA00-7AA0**
		5 front doors; with 5 labeling strips (front) and 5 cabling diagrams per front door; spare part	
		Shielding set I/O	**6ES7 590-5CA00-0AA0**
		Infeed element, shield clamp, and shield terminal; 5 units, spare part	
		Shield terminal element	**6ES7 590-5BA00-0AA0**
		10 units; spare part	

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Overview

- 4 and 8-channel analog output modules
- Optionally with extremely short conversion times
- For connecting analog actuators without additional amplifiers
- Even solves more complex automation tasks

Technical specifications

	6ES7 532-5HD00-0AB0 AQ 4xU/I ST	6ES7 532-5HF00-0AB0 AQ 8xU/I HS
General information Product function • I&M data	 Yes; IM0 to IM3	 Yes; IM0 to IM3
Engineering with • STEP 7 TIA Portal can be configured/integrated as of version	 V12.0 / V12.0	 V12.0 / V12.0
• STEP 7 can be configured/integrated as of version	as of V5.5 SP3 / -	as of V5.5 SP3 / -
CiR - Configuration in RUN Reparameterization possible in RUN	 Yes	 Yes
Calibration possible in RUN	Yes	Yes
Supply voltage Type of supply voltage	 DC	 DC
Rated voltage/DC	24 V	24 V
Reverse polarity protection	Yes	Yes
Analog outputs Number of analog outputs	 4	 8
Cycle time (all channels), min.	3.2 ms; (independent of number of activated channels)	125 µs; (independent of number of activated channels)
Output ranges, voltage • 0 to 10 V • 1 to 5 V • -10 to +10 V	 Yes Yes Yes	 Yes Yes Yes
Output ranges, current • 0 to 20 mA • -20 to +20 mA • 4 to 20 mA	 Yes Yes Yes	 Yes Yes Yes
Connection of actuators • for voltage output 2-conductor connection • for voltage output 4-conductor connection • for current output 2-conductor connection	 Yes Yes Yes	 Yes Yes Yes
Load impedance (in rated range of output) • with voltage outputs, min. • with voltage outputs, capacitive load, max. • with current outputs, max. • with current outputs, inductive load, max.	 1 kΩ; 0.5 kOhm at 1 to 5 V 1 µF 750 Ω 10 mH	 1 kΩ 100 nF 500 Ω 1 mH
Cable length • Cable length, shielded, max.	 800 m; for current, 200 m for voltage	 200 m

SIMATIC S7-1500
Analog modules

SM 532 analog output modules

■ **Technical specifications** (continued)

	6ES7 532-5HD00-0AB0 AQ 4xU/I ST	6ES7 532-5HF00-0AB0 AQ 8xU/I HS
Analog value creation Integrations and conversion time/ resolution per channel		
• Conversion time (per channel)	0.5 ms	50 µs
Settling time		
• for resistive load	1.5 ms	30 µs; (see additional description in the manual)
• for capacitive load	2.5 ms	100 µs; (see additional description in the manual)
• for inductive load	2.5 ms	100 µs; (see additional description in the manual)
Isochronous mode Isochronous operation (application synchronized up to terminal)		Yes
Execution and activation time (TCO), min.		100 µs
Bus cycle time (TDP), min.		250 µs
Interrupts/diagnostics/status information Substitute values connectable	Yes	Yes
Alarms		
• Diagnostic alarm	Yes	Yes
Diagnostic messages		
• Diagnostics	Yes	Yes
• Monitoring the supply voltage	Yes	Yes
• Wire break	Yes; Only for output type "current"	Yes; Only for output type "current"
• Short circuit	Yes; Only for output type "voltage"	Yes; Only for output type "voltage"
• Overflow/underflow	Yes	Yes
Diagnostics indication LED		
• RUN LED	Yes; Green LED	Yes; Green LED
• ERROR LED	Yes; Red LED	Yes; Red LED
• Monitoring the supply voltage	Yes; Green LED	Yes; Green LED
• Channel status display	Yes; Green LED	Yes; Green LED
• for channel diagnostics	Yes; Red LED	Yes; Red LED
• for module diagnostics	Yes; Red LED	Yes; Red LED
Galvanic isolation Electrical isolation channels		
• between the channels and the backplane bus	Yes	Yes
Isolation Isolation checked with	707 V DC (type test)	707 V DC (type test)
Decentralized operation Supports fast startup	Yes; 500 ms	Yes; 500 ms
Dimensions		
Width	35 mm	35 mm
Height	147 mm	147 mm
Depth	129 mm	129 mm
Weight Weight, approx.	310 g	325 g

4

SM 532 analog output modules

Ordering data

	Order No.			Order No.
SM 532 analog output modules			**U connector**	**6ES7 590-0AA00-0AA0**
4 analog outputs ±10 V, 1 ... 5 V, 0 ... 10 V or ±20 mA, 0/4 ... 20 mA, 16 bit	**6ES7 532-5HD00-0AB0**		5 units; spare part	
8 analog outputs ±10 V, 1 ... 5 V, 0 ... 10 V or ±20 mA, 0/4 ... 20 mA, 16 bit	**6ES7 532-5HF00-0AB0**		**Universal front door for I/O modules**	**6ES7 528-0AA00-7AA0**
Accessories			5 front doors; with 5 labeling strips (front) and 5 cabling diagrams per front door; spare part	
Front connectors	**6ES7 592-1AM00-0XB0**		**Shielding set I/O**	**6ES7 590-5CA00-0AA0**
Including four potential bridges, cable ties, and individual labeling strips; 40-pole screw-type terminal			Infeed element, shield clamp, and shield terminal; 5 units, spare part	
DIN A4 labeling sheets	**6ES7 592-2AX00-0AA0**		**Shield terminal element**	**6ES7 590-5BA00-0AA0**
10 sheets with 10 labeling strips each for I/O modules; perforated, Al grey			10 units; spare part	

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SIMATIC S7-1500
SIPLUS analog modules

SIPLUS SM 531 analog input modules

Overview

- 8-channel analog input modules
- Optionally with extremely short conversion times
- For the connection of analog sensors without additional amplifiers
- Even solves more complex automation tasks

Note:

SIPLUS extreme products are based on Siemens Industry standard products. The contents listed here were taken from the respective standard products. SIPLUS extreme-specific information was added.

Technical specifications

The technical data correspond to those of the based-on modules apart from the values listed in the table:

	6AG1 531-7KF00-7AB0
based on	6ES7 531-7KF00-0AB0
Ambient conditions	
Operating temperature	
• Horizontal mounting position	-25...+70 °C
• Vertical mounting position	-25...+50 °C
Extended ambient conditions	
• with reference to ambient temperature, air pressure and altitude	Tmin ... Tmax at 1080 hPa ... 795 hPa (-1000 m ... +2000 m) // Tmin ... (Tmax - 10K) at 795 hPa ... 658 hPa (+2000 m ... +3500 m) // Tmin ... (Tmax - 20K) at 658 hPa ... 540 hPa (+3500 m ... +5000 m)
Relative humidity	
• with condensation / maximum / tested in accordance with IEC 60068-2-38	100%; RH incl. condensation/frost (no commissioning in bedewed state)
Resistance	
• to biologically active substances / compliance with EN 60721-3-3	Yes; Class 3B2 mold and fungal spores (except fauna); the supplied plug covers must remain in place on the unused interfaces during operation.
• to chemically active substances / compliance with EN 60721-3-3	Yes; Class 3C4 (RH < 75%) incl. salt spray in accordance with EN 60068-2-52 (severity 3); the supplied plug covers must remain in place on the unused interfaces during operation.
• to mechanically active substances / compliance with EN 60721-3-3	Yes; Class 3S4 incl. sand, dust; the supplied plug covers must remain in place on unused interfaces during operation.

Ordering data

	Order No.
SIPLUS SM 531 analog input modules (extended temperature range and medial exposure) 8 analog inputs ±10 V, ±5 V, ±2.5 V, ±1 V, ±500 mV, ±250 mV, ±80 mV, ±50 mV, 1 ... 5 V , 0/4 ... 20 mA, ±20 mA, thermocouples type B, E, J, K, N, R, S, T, resistance thermometers Ni 100, Ni 1000, LG-Ni 1000, Pt 100, Pt 1000, Pt 250, Pt 500, resistors 0...150/300/600/6000 Ohm, 16 bit	**6AG1 531-7KF00-7AB0**
Accessories	See SIMATIC S7-1500 SM 531 analog input modules, page 4/22

Overview

- 4-channel analog output modules
- Optionally with extremely short conversion times
- For connecting analog actuators without additional amplifiers
- Even solves more complex automation tasks

Note:

SIPLUS extreme products are based on Siemens Industry standard products. The contents listed here were taken from the respective standard products. SIPLUS extreme-specific information was added.

Technical specifications

The technical data correspond to those of the based-on modules apart from the values listed in the table:

	6AG1 532-5HD00-7AB0
based on	6ES7 532-5HD00-0AB0
Ambient conditions	
Operating temperature	
• Horizontal mounting position	-25...+70 °C
• Vertical mounting position	-25...+50 °C
Extended ambient conditions	
• with reference to ambient temperature, air pressure and altitude	Tmin ... Tmax at 1080 hPa ... 795 hPa (-1000 m ... +2000 m) // Tmin ... (Tmax - 10K) at 795 hPa ... 658 hPa (+2000 m ... +3500 m) // Tmin ... (Tmax - 20K) at 658 hPa ... 540 hPa (+3500 m ... +5000 m)
Relative humidity	
• with condensation / maximum / tested in accordance with IEC 60068-2-38	100%; RH incl. condensation/frost (no commissioning in bedewed state)
Resistance	
• to biologically active substances / compliance with EN 60721-3-3	Yes; Class 3B2 mold and fungal spores (except fauna); the supplied plug covers must remain in place on the unused interfaces during operation.
• to chemically active substances / compliance with EN 60721-3-3	Yes; Class 3C4 (RH < 75%) incl. salt spray in accordance with EN 60068-2-52 (severity 3); the supplied plug covers must remain in place on the unused interfaces during operation.
• to mechanically active substances / compliance with EN 60721-3-3	Yes; Class 3S4 incl. sand, dust; the supplied plug covers must remain in place on unused interfaces during operation.

Ordering data

	Order No.
SIPLUS SM 532 analog output modules	
(extended temperature range and medial exposure)	
4 analog outputs, ±10 V, 1 ... 5 V, 0 ... 10 V or ±20 mA, 0/4 ... 20 mA, 16 bit	**6AG1 532-5HD00-7AB0**
Accessories	See SIMATIC S7-1500 SM 532 analog output modules, page 4/25

SIMATIC S7-1500
Technology modules

TM Count 2x24V counter modules

■ Overview

- 2-channel high-speed counter module
- With comprehensive parameterization options for an optimum adaptation to the task and reduction of control load
- Speed and time period measuring
- Storage and comparison functions
- Connection of 24 V encoders

4

■ Technical specifications

	6ES7 550-1AA00-0AB0 TM Count 2x24V
General information	
Product function	
• I&M data	Yes; I&M 0
Engineering with	
• STEP 7 TIA Portal can be configured/ integrated as of version	V12.0 / V12.0
• STEP 7 can be configured/integrated as of version	as of V5.5 SP3 / -
• PROFINET as of GSD version/GSD revision	V2.3
Installation type/mounting	
Mounting rail installation possible	Yes; S7-1500 mounting rail
Supply voltage	
Load voltage L+	
• Rated value (DC)	24 V
• permissible range, lower limit (DC)	19.2 V
• permissible range, upper limit (DC)	28.8 V
• Reverse polarity protection	Yes
Input current	
Current consumption, max.	75 mA; without load
Encoder supply	
Number of outputs	1; A common 24 V encoder supply for both channels
24 V encoder supply	
• 24 V	Yes; L+ (-0.8 V)
• Short-circuit protection	Yes
• Output current, max.	1 A; total current of all encoders/ channels
Power	
Power available from the backplane bus	1.3 W
Power losses	
Power loss, typ.	4 W
Digital inputs	
Number/binary inputs	6; 3 per channel
Digital inputs, configurable	Yes
Input characteristic curve acc. to IEC 61131, Type 3	Yes
Digital input functions, parameterizable	
• Gate start/stop	Yes
• Capture	Yes
• Synchronization	Yes
• Freely usable digital input	Yes

	6ES7 550-1AA00-0AB0 TM Count 2x24V
Input voltage	
• Type of input voltage	DC
• Rated value, DC	24 V
• for signal "0"	-30 to +5 V
• for signal "1"	+11 to +30 V
• Permissible voltage at input, max.	30 V
• Permissible voltage at input, min.	-30 V
Input current	
• for signal "1", typ.	2.5 mA
Input delay (for rated value of input voltage)	
• for standard inputs	
- Parameterizable	Yes; none / 0.05 / 0.1 / 0.4 / 0.8 / 1.6 / 3.2 / 12.8 / 20 ms
- at "0" to "1", min.	6 μs; for parameterization "none"
- at "1" to "0", min.	6 μs; for parameterization "none"
• for counter/technological functions	
- Parameterizable	Yes
Cable length	
• Cable length, shielded, max.	1 000 m
• Cable length unshielded, max.	600 m
Digital outputs	
Type of digital output	Transistor
Number/binary outputs	4; 2 per channel
Digital outputs, configurable	Yes
Functionality/short-circuit strength	Yes; electronic/thermal
Limitation of inductive shutdown voltage to	L+ (-33 V)
Controlling a digital input	Yes
Digital output functions, parameterizable	
• Switching tripped by comparison values	Yes
• Freely usable digital output	Yes
Switching capacity of the outputs	
• with resistive load, max.	0.5 A; Per digital output
• on lamp load, max.	5 W
Load resistance range	
• lower limit	48 Ω
• upper limit	12 kΩ

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Technical specifications (continued)

	6ES7 550-1AA00-0AB0 TM Count 2x24V
Output voltage	
• Type of output voltage	DC
• for signal "1", min.	23.2 V; L+ (-0.8 V)
Output current	
• for signal "1" rated value	0.5 A; Per digital output
• for signal "1" permissible range, max.	0.6 A; Per digital output
• for signal "1" minimum load current	2 mA
• for signal "0" residual current, max.	0.5 mA
Output delay with resistive load	
• "0" to "1", max.	50 µs
• "1" to "0", max.	50 µs
Switching frequency	
• with resistive load, max.	10 kHz
• with inductive load, max.	0.5 Hz; Acc. to IEC 947-5-1, DC-13; observe derating curve
• on lamp load, max.	10 Hz
Aggregate current of the outputs	
• Max. current per module	2 A
Cable length	
• Cable length, shielded, max.	1 000 m
• Cable length unshielded, max.	600 m
Encoder	
Connectable encoders	
• 2-wire sensor	Yes
- Permissible quiescent current (2-wire sensor), max.	1.5 mA
Encoder signals, incremental encoder (asymmetrical)	
• Input frequency, max.	200 kHz
• Counting frequency, max.	800 kHz; with quadruple evaluation
• Signal filter, can be parameterized	Yes
• Cable length, shielded, max.	600 m; depending on input frequency, encoder and cable quality; max. 50 m at 200 kHz
• Incremental encoder with A/B tracks, 90° out of phase	Yes
• Incremental encoder with A/B tracks, 90° out of phase and zero track	Yes
• Pulse encoder	Yes
• Pulse encoder with direction	Yes
• Pulse encoder with one impulse signal per count direction	Yes
• Encoder signal 24 V	
- Permissible voltage at input, max.	30 V
- minimum permissible	-30 V
Interface types	
• Input characteristic curve in accordance with IEC 61131, type 3	Yes
• m/p-reading	Yes
Isochronous mode	
Isochronous operation (application synchronized up to terminal)	Yes
Filtering and processing time (TCI), min.	130 µs
Bus cycle time (TDP), min.	250 µs
Interrupts/diagnostics/status information	
Alarms	
• Diagnostic alarm	Yes
• Hardware interrupt	Yes

	6ES7 550-1AA00-0AB0 TM Count 2x24V
Diagnostic messages	
• Monitoring the supply voltage	Yes
• Wire break	Yes
• Short circuit	Yes
• A/B transition error at incremental encoder	Yes
Diagnostics indication LED	
• RUN LED	Yes; Green LED
• ERROR LED	Yes; Red LED
• Monitoring the supply voltage	Yes; Green LED
• Channel status display	Yes
• for channel diagnostics	Yes
• Status indicator backward counting (green)	Yes
• Status indicator forward counting (green)	Yes
Integrated Functions	
Number of counters	2
Counter frequency (counter) max.	800 kHz; with quadruple evaluation
Counting functions	
• Continuous counting	Yes
• Hardware gate via digital input	Yes
• Software gate	Yes
• Event-controlled stop	Yes
• Synchronization via digital input	Yes
• Counting range, parameterizable	Yes
• Comparator	
- Number of comparators	2; Per channel
- Direction dependency	Yes
- Can be changed from user program	Yes
Position detection	
• Incremental acquisition	Yes
• Suitable for S7-1500 Motion Control	Yes
Measuring functions	
• Measuring time, parameterizable	Yes
• Dyn. measuring time adjustment	Yes
• Number of thresholds, parameterizable	2
• Measuring range	
- Frequency measurement, max.	800 kHz
- Frequency measurement, min.	0.04 Hz
- Period measurement, max.	25 s
- Period measurement, min.	1.25 µs
• Accuracy	
- Frequency measurement	100 ppm; depending on measuring interval and signal evaluation
- Speed measurement	100 ppm; depending on measuring interval and signal evaluation
- Cycle duration measurement	100 ppm; depending on measuring interval and signal evaluation
Galvanic isolation	
Electrical isolation channels	
• between the channels	No
• between the channels and the backplane bus	Yes
• between the channels and the load voltage L+	No
Permissible potential difference	
between different circuits	75 VDC / 60 VAC
Isolation	
Isolation checked with	707 V DC

SIMATIC S7-1500
Technology modules

TM Count 2x24V counter modules

■ Technical specifications (continued)

	6ES7 550-1AA00-0AB0 TM Count 2x24V
Ambient conditions Operating temperature	
• horizontal installation, min.	0 °C
• horizontal installation, max.	60 °C; Please note derating for inductive loads
• vertical installation, min.	0 °C
• vertical installation, max.	40 °C; Please note derating for inductive loads
Decentralized operation to SIMATIC S7-1500	Yes
to standard PROFINET controller	Yes
Dimensions Width	35 mm
Height	147 mm
Depth	129 mm
Weight Weight, approx.	250 g

■ Ordering data | Order No.

TM Count 2x24V counter module With 2 channels, max. 200 kHz; for 24 V encoder	**6ES7 550-1AA00-0AB0**
Accessories	
Front connectors Including four potential bridges, cable ties, and individual labeling strips; 40-pole screw-type terminal	**6ES7 592-1AM00-0XB0**
DIN A4 labeling sheets 10 sheets with 10 labeling strips each for I/O modules; perforated, Al grey	**6ES7 592-2AX00-0AA0**
U connector 5 units; spare part	**6ES7 590-0AA00-0AA0**
Universal front door for I/O modules 5 front doors; with 5 labeling strips (front) and 5 cabling diagrams per front door; spare part	**6ES7 528-0AA00-7AA0**
Shielding set I/O Infeed element, shield clamp, and shield terminal; 5 units, spare part	**6ES7 590-5CA00-0AA0**
Shield terminal element 10 units; spare part	**6ES7 590-5BA00-0AA0**

4

Overview

- Modules for serial communication connections, scaled according to interface types, protocols, and performance
- 4 versions with different physical transmission characteristics:
  - RS 232C, max. 19.2 Kbit/s
  - RS 232C, max.115.2 Kbit/s
  - RS 422/RS 485, max. 19.2 Kbit/s
  - RS 422/RS 485, max. 115.2 Kbit/s
- Protocols supported
  - Freeport: User-parameterizable telegram format for universal communication
  - 3964(R) for improved transmission reliability
  - Modbus RTU Master
  - Modbus RTU Slave
  - USS, implemented through instructions

Technical specifications

	6ES7 540-1AD00-0AA0 CM PtP RS232 BA	6ES7 541-1AD00-0AB0 CM PtP RS232 HF	6ES7 540-1AB00-0AA0 CM PtP RS422/485 BA	6ES7 541-1AB00-0AB0 CM PtP RS422/485 HF
General information				
Product function				
• I&M data	Yes; I&M 0	Yes; I&M 0	Yes; I&M 0	Yes; I&M 0
Engineering with				
• STEP 7 TIA Portal can be configured/integrated as of version	V12.0 / V12.0	V12.0 / V12.0	V12.0 / V12.0	V12.0 / V12.0
• STEP 7 can be configured/ integrated as of version	V5.5 SP2 or higher with a GSD file	V5.5 SP2 or higher with a GSD file	V5.5 SP2 or higher with a GSD file	V5.5 SP2 or higher with a GSD file
• PROFINET as of GSD version/ GSD revision	V2.3	v2.3 / -	V2.3	v2.3 / -
Installation type/mounting				
Mounting rail installation possible	Yes; S7-1500 mounting rail	Yes; S7-1500 mounting rail	Yes; S7-1500 mounting rail	Yes; S7-1500 mounting rail
Supply voltage				
Type of supply voltage	system power supply	system power supply	system power supply	system power supply
Input current				
Current consumption (rated value)	35 mA; From the backplane bus	35 mA; From the backplane bus	33 mA; From the backplane bus	33 mA; From the backplane bus
Power				
Power available from the backplane bus	0.65 W	0.65 W	0.65 W	0.65 W
Power losses				
Power loss, typ.	0.6 W	0.6 W	0.6 W	0.6 W
Interfaces				
1st interface				
• Interface types				
- RS 232	Yes	Yes		
- RS 422			Yes	Yes
- RS 485			Yes	Yes
Interface types				
RS 232				
• Transmission rate, max.	19.2 kbit/s	115.2 kbit/s		
• Cable length, max.	15 m	15 m		
• RS-232 accompanying signals	RTS, CTS, DTR, DSR, RI, DCD	RTS, CTS, DTR, DSR, RI, DCD		
RS 485				
• Transmission rate, max.			19.2 kbit/s	115.2 kbit/s
• Cable length, max.			1 200 m	1 200 m
RS 422				
• Maximum			19.2 kbit/s	115.2 kbit/s
• Cable length, max.			1 200 m	1 200 m
• 4-wire full duplex connection			Yes	Yes
• 4-wire multipoint connection			No	No

SIMATIC S7-1500
Communication

CM PtP

■ **Technical specifications** (continued)

	6ES7 540-1AD00-0AA0 CM PtP RS232 BA	6ES7 541-1AD00-0AB0 CM PtP RS232 HF	6ES7 540-1AB00-0AA0 CM PtP RS422/485 BA	6ES7 541-1AB00-0AB0 CM PtP RS422/485 HF
Protocols				
Integrated protocols				
• Freeport				
- Telegram length, max.	1 kbyte	4 kbyte	1 kbyte	4 kbyte
- Bits per character	7 or 8	7 or 8	7 or 8	7 or 8
- Number of stop bits	1 or 2 bit	1 or 2 bit	1 or 2 bit	1 or 2 bit
- Parity	None, even, odd, always 1, always 0, any	None, even, odd, always 1, always 0, any	None, even, odd, always 1, always 0, any	None, even, odd, always 1, always 0, any
• 3964 (R)				
- Telegram length, max.	1 kbyte	4 kbyte	1 kbyte	4 kbyte
- Number of bits per character	7 or 8	7 or 8	7 or 8	7 or 8
- Number of stop bits	1 or 2 bit	1 or 2 bit	1 or 2 bit	1 or 2 bit
- Parity	None, even, odd, always 1, always 0, any	None, even, odd, always 1, always 0, any	None, even, odd, always 1, always 0, any	None, even, odd, always 1, always 0, any
• Modbus RTU master				
- Address area		1 to 247, extended 1 to 65 535		1 to 247, extended 1 to 65 535
- Number of slaves, max.		1		32
• MODBUS RTU slave				
- Address area		1 to 247, extended 1 to 65 535		1 to 247, extended 1 to 65 535
Frame buffer				
• Buffer memory for message frames	2 kbyte	8 kbyte	2 kbyte	8 kbyte
• Number of message frames which can be buffered	255	255	255	255
Interrupts/diagnostics/status information				
Alarms				
• Diagnostic alarm	Yes	Yes	Yes	Yes
• Hardware interrupt	No	No	No	No
Diagnostic messages				
• Diagnostics	Yes	Yes	Yes	Yes
• Wire break	Yes	Yes	Yes	Yes
Diagnostics indication LED				
• RUN LED	Yes; Green LED	Yes; Green LED	Yes; Green LED	Yes; Green LED
• ERROR LED	Yes; Red LED	Yes; Red LED	Yes; Red LED	Yes; Red LED
• Receive RxD	Yes; yellow LED	Yes; yellow LED	Yes; yellow LED	Yes; yellow LED
• Send TxD	Yes; yellow LED	Yes; yellow LED	Yes; yellow LED	Yes; yellow LED
Galvanic isolation				
Between the backplane bus and interface	Yes	Yes	Yes	Yes
Isolation				
Isolation checked with	707 V DC (type test)	707 V DC (type test)	707 V DC (type test)	707 V DC (type test)
Ambient conditions				
Operating temperature				
• horizontal installation, min.	0 °C	0 °C	0 °C	0 °C
• horizontal installation, max.	60 °C	60 °C	60 °C	60 °C
• vertical installation, min.	0 °C	0 °C	0 °C	0 °C
• vertical installation, max.	40 °C	40 °C	40 °C	40 °C
Decentralized operation				
to SIMATIC S7-300	Yes	Yes	Yes	Yes
to SIMATIC S7-400	Yes	Yes	Yes	Yes
to SIMATIC S7-1500	Yes	Yes	Yes	Yes
to standard PROFINET controller	Yes	Yes	Yes	Yes
Supports fast startup	Yes	Yes	Yes	Yes
Dimensions				
Width	35 mm	35 mm	35 mm	35 mm
Height	147 mm	147 mm	147 mm	147 mm
Depth	127 mm	127 mm	127 mm	127 mm
Weight				
Weight, approx.	0.22 kg	0.22 kg	0.22 kg	0.22 kg

4

Ordering data

	Order No.
CM PtP RS232 BA communication module	**6ES7 540-1AD00-0AA0**
Basic communication module with 1 interface RS232, Freeport, 3964(R) and USS protocols, 9-pin sub D connector, max. 19.2 Kbit/s	
CM PtP RS232 HF communication module	**6ES7 541-1AD00-0AB0**
High Feature communication module with 1 interface RS232, Freeport, 3964(R), USS and Modbus RTU protocols, 9-pin sub D connector, max. 115.2 Kbit/s	
CM PtP RS422/485 BA communication module	**6ES7 540-1AB00-0AA0**
Basic communication module with 1 interface RS422/485, Freeport, 3964(R) and USS protocols, 15-pin sub D socket, max. 19.2 Kbit/s	
CM PtP RS422/485 HF communication module	**6ES7 541-1AB00-0AB0**
High Feature communication module with 1 interface RS422/485, Freeport, 3964(R), USS and Modbus RTU protocols, 15-pin sub D socket, max. 115.2 Kbit/s	

	Order No.
Accessories	
RS 232 connecting cable	
For linking to SIMATIC S7	
5 m	**6ES7 902-1AB00-0AA0**
10 m	**6ES7 902-1AC00-0AA0**
15 m	**6ES7 902-1AD00-0AA0**
RS 422/485 connecting cable	
For linking to SIMATIC S7	
5 m	**6ES7 902-3AB00-0AA0**
10 m	**6ES7 902-3AC00-0AA0**
50 m	**6ES7 902-3AG00-0AA0**

4

SIMATIC S7-1500
Communication

CM 1542-5

Overview

DP-M	DP-S	FMS	PG/OP	S7/S5	
●	●		●	●	

The CM 1542-5 communication module expands the SIMATIC S7-1500 controller with an additional PROFIBUS connection for communication with lower-level PROFIBUS devices in bandwidths from 9.6 kbps to 12 Mbps. The module also allows the implementation of separate PROFIBUS lines; in other words, the control of multiple field devices via several PROFIBUS segments. The CM 1542-5 handles all communication tasks, thus reducing the CPU load.

Apart from classic PROFIBUS communication; the CM 1542-5 is also suitable for S7 communication. This makes it possible to establish communication between the S7-1500 controller and other devices, for example those from the SIMATIC S7-300/400 range.

- PROFIBUS DP master or DP slave with electrical interface for connecting the SIMATIC S7-1500 to PROFIBUS at up to 12 Mbps (including 45.45 Kbps)
- Communication services:
  - PROFIBUS DP
  - PG/OP communication
  - S7 communication
- Time synchronization
- Simple programming and configuration over PROFIBUS
- Cross-network PG communication using S7 routing
- Module replacement without a PG
- Data record routing (PROFIBUS DP)
- Adding or modifying distributed I/O during operation

Technical specifications

Order No.	6GK7 542-5DX00-0XE0
Product-type designation	**CM 1542-5**
Transmission rate	
Transmission rate at interface 1	
• in accordance with PROFIBUS	9.6 kbit/s … 12 Mbit/s
Interfaces	
Number of electrical connections at interface 1	
• in accordance with PROFIBUS	1
Design of electrical connection at interface 1	
• in accordance with PROFIBUS	9-pin Sub-D socket (RS485)
Supply voltage, current consumption, power loss	
Type of voltage of supply voltage	DC
Supply voltage 1	
• from backplane bus	15 V
Resistive loss	3 W
Permitted ambient conditions	
Ambient temperature	
• for vertical installation during operating phase	0 … 40 °C
• for horizontal installation during operating phase	0 … 60 °C
• during storage	-40 … +70 °C
• during transport	-40 … +70 °C
• Comment	-
Relative humidity at 25 °C without condensation during operating maximum	95 %
Protection class IP	IP20
Design, dimensions and weight	
Module format	
Width	35 mm
Height	142 mm
Depth	129 mm
Net weight	0.4 kg
Type of mounting S7-1500 rail mounting	Yes
Product properties, functions, components general	
Number of modules	
• per CPU maximum	8
• note	depending on CPU type

Technical specifications (continued)

Order No.	6GK7 542-5DX00-0XE0
Product-type designation	**CM 1542-5**
Performance data	
Performance data PROFIBUS DP	
Service as DP master DPV1	Yes
Number of DP slaves on DP master usable	125
Amount of data	
• of the address area of the inputs as DP master overall	8 192 byte
• of the address area of the outputs as DP master overall	8 192 byte
• of the address area of the inputs per DP slave	244 byte
• of the address area of the outputs per DP slave	244 byte
• of the address area of the diagnostic data per DP slave	-
Service as DP slave	
• DPV0	Yes
• DPV1	Yes
Amount of data	
• of the address area of the inputs as DP slave overall	240 byte
• of the address area of the outputs as DP slave overall	240 byte
Performance data S7 communication	
Number of possible connections for S7 communication	
• maximum	40
• note	
Performance data multi-protocol mode	
Number of active connections with multi-protocol mode	
Product functions management, configuration	
Configuration software required	
Product functions Time	
Product function pass on time synchronization	Yes

Ordering data

	Order No.
CM 1542-5 communication module [1]	
Communication module for electrical connection of SIMATIC S7-1500 to PROFIBUS as a DP master or DP slave	**6GK7 542-5DX00-0XE0**
Accessories	
PROFIBUS FastConnect connector RS485	
With 90° cable outlet; insulation displacement technology, max. transmission rate 12 Mbps	
• Without PG interface	**6ES7 972-0BA52-0XA0**
• with PG interface	**6ES7 972-0BB52-0XA0**
PROFIBUS FC Standard Cable	
2-core bus cable, shielded, special design for fast mounting, delivery unit: max. 1000 m, minimum order 20 m, sold by the meter	**6XV1 830-0EH10**
PROFIBUS FastConnect Stripping Tool	
Stripping tool for fast stripping of the PROFIBUS FastConnect bus cable	**6GK1 905-6AA00**
PROFIBUS bus terminal 12M	
Bus terminal for connection of PROFIBUS nodes up to 12 Mbps with plug-in cable	**6GK1 500-0AA10**
Engineering software STEP 7 Professional V12	
Target system: SIMATIC S7-1200, S7-1500, S7-300, S7-400, WinAC, SIMATIC Basic Panels	
Requirement: Microsoft Windows XP Professional SP3 (32 bit) Microsoft Windows 7 Professional SP1 (32/64 bit) Microsoft Windows 7 Enterprise SP1 (32/64 bit) Microsoft Windows 7 Ultimate SP1 (32/64 bit) Microsoft Server 2003 R2 Std. SP2 (32 bit) Microsoft Server 2008 Std. SP2 (32/64 bit)	
Type of delivery: German, English, Chinese, Italian, French, Spanish	
STEP 7 Professional V12, floating license	**6ES7 822-1AA02-0YA5**

[1] Available soon

4

SIMATIC S7-1500
Communication

CP 1543-1

■ Overview

ISO	TCP/ UDP	PN	MRP	IT	IP-R	PG/OP	S7/S5
●	●			●		●	●

The SIMATIC CP 1543-1 communications processor securely connects the new SIMATIC S7-1500 controller to Industrial Ethernet networks. By combining a variety of security features such as an SPI (Stateful Packet Inspection) firewall and data encryption protocols such as FTPS and SNMPv3, the communications processor protects individual S7-1500 stations or even entire automation cells against unauthorized access.

The CP can also be used for linking the S7-1500 station into an IPv6-based network. All functions are configured with STEP 7 Professional V12 of the TIA Portal V12.

The CP 1543-1 supports the following communications services:

- PG/OP communication
- S7 communication
- Open communication (SEND/RECEIVE, FETCH/WRITE)
- IT communication
  - FTP functions (File Transfer Protocol FTP/FTPS) for file management and access to data blocks in the CPU (client and server function)
  - Sending e-mails via SMTP or ESMTP with "SMTP-Auth" for authentication on an e-mail server (also with IPv6).
- Security functions
  - Stateful Packet Inspection (layers 3 and 4) firewall
  - For monitoring purposes, events can be stored in log files that can be read using the configuration tool or sent automatically to a Syslog server.
  - Secure file transfer using FTPS.
  - Secure NTP for secure time synchronization and transfer.
  - SNMPv3 for tap-proof transfer of network analysis information
- Linking the S7-1500 into IPv6 based networks. For the following communications services, an IP address according to IPv6 can be used:
  - FETCH/WRITE access (CP as server)
  - FTP server mode
  - FTP client mode with addressing by program block
  - E-mail transfer with addressing by program block

■ Technical specifications

Order No.	**6GK7 543-1AX00-0XE0**
Product-type designation	**CP 1543-1**
Transmission rate	
Transfer rate	
• at the interface 1	10 … 1 000 Mbit/s
Interfaces	
Number of electrical connections	
• at interface 1 in accordance with Industrial Ethernet	1
Design of electrical connection	
• at interface 1 in accordance with Industrial Ethernet	RJ45 port
Supply voltage, current consumption, power loss	
Type of voltage of supply voltage	DC
Supply voltage 1 from backplane bus	15 V
Resistive loss	5.3 W
Permitted ambient conditions	
Ambient temperature	
• for vertical installation during operating phase	0 … 40 °C
• for horizontal installation during operating phase	0 … 60 °C
• during storage	-40 … +70 °C
• during transport	-40 … +70 °C
Relative humidity at 25 °C without condensation during operating maximum	95 %
Protection class IP	IP20
Design, dimensions and weight	
Module format	
Width	35 mm
Height	142 mm
Depth	129 mm
Net weight	0.35 kg
Type of mounting S7-1500 rail mounting	Yes
Product properties, functions, components general	
Number of modules	
• per CPU maximum	8
• note	depending on CPU type
Performance data	
Number of possible connections for open communication by means of T blocks maximum	118
Data volume as user data per ISO on TCP connection for open communication by means of T blocks maximum	65 536 byte
Number of Multicast stations	118

■ Technical specifications (continued)

Order No.	6GK7 543-1AX00-0XE0
Product-type designation	**CP 1543-1**
Performance data S7 communication	
Number of possible connections for S7 communication	
• maximum	118
• note	
Performance data multi-protocol mode	
Number of active connections with multiprotocol mode	118
Performance data IT functions	
Number of possible connections	
• as client by means of FTP maximum	32
• as server	
- by means of FTP maximum	16
- by means of HTTP maximum	4
• as e-mail client maximum	1
Amount of data as useful data for e-mail maximum	64 Kibyte
Product functions management, configuration	
Product function MIB support	Yes
Protocol is supported	
• SNMP v1	Yes
• DCP	Yes
• LLDP	No
Configuration software required	
Identification & maintenance	
• I&M0 - device-specific information	Yes
• I&M1 - plant identification/location name	Yes
Product functions Security	
Design of the firewall	stateful inspection
Product function	
• switchoff of non-required services	Yes
• blocking of communication via physical ports	No
• log file for unauthorized access	Yes
Product functions Time	
Product function	
• SICLOCK support	Yes
• pass on time synchronization	Yes
Protocol is supported NTP	Yes

■ Ordering data

	Order No.
CP 1543-1 communications processor [1]	6GK7 543-1AX00-0XE0
for connection of SIMATIC S7-1500 to Industrial Ethernet via TCP/IP, ISO and UDP and Security functions; 1 x RJ45 interface with 10/100/1000 Mbit/s; electronic manual on DVD	
Accessories	
IE FC TP Standard Cable GP 2 x 2 (Type A)	6XV1 840-2AH10
4-core, shielded TP installation cable for connection to IE FC outlet RJ45/IE FC RJ45 plug; PROFINET-compatible; with UL approval; sold in meters, max. quantity 1000 m, minimum order 20 m	
IE FC TP Standard Cable GP 4x2	
8-core, shielded TP installation cable for connection to IE FC RJ45 Modular Outlet for universal application; with UL approval; sold by the meter, max quantity 1000 m, minimum order 20 m	
• AWG22, for connection to IE FC RJ45 Modular Outlet	6XV1 870-2E
• AWG24, for connection to IE FC RJ45 Plug 4 x 2	6XV1 878-2A
Industrial Ethernet Switch SCALANCE X204-2	6GK5 204-2BB10-2AA3
Industrial Ethernet switches with integral SNMP access, online diagnostics, copper cable diagnostics and PROFINET diagnostics for configuring line, star and ring topologies; four 10/100 Mbit/s RJ45 ports and two fiber-optic cable ports	
Industrial Ethernet Switch SCALANCE X308-2	6GK5 308-2FL00-2AA3
2 x 1000 Mbit/s multimode fiber-optic cable ports (SC sockets), 1 x 10/100/1000 Mbit/s RJ45 port, 7 x 10/100 Mbit/s RJ45 ports; for glass fiber-optic cable (multimode) up to max. 750 m	
IE FC RJ45 Plug 180 2 x 2	
RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation-displacement/terminal contacts for connecting Industrial Ethernet FC installation cables; with a 180° cable outlet; for network components and CPs/CPUs with Industrial Ethernet interface	
• 1 pack = 1 unit	6GK1 901-1BB10-2AA0
• 1 pack = 10 units	6GK1 901-1BB10-2AB0
• 1 pack = 50 units	6GK1 901-1BB10-2AE0

[1] Available soon

SIMATIC S7-1500
Communication

CP 1543-1

▪ Ordering data

	Order No.		Order No.
IE FC RJ45 Plug 4 x 2		**Engineering Software STEP 7 Professional V12**	
RJ45 plug connector for Industrial Ethernet (10/100/1000 Mbit/s) with a rugged metal enclosure and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; 180° cable outlet; for network components and CPs/CPUs with Industrial Ethernet interface		Target system: SIMATIC S7-1200, S7-1500, S7-300, S7-400, WinAC, SIMATIC Basic Panels	
		Requirement: Microsoft Windows XP Professional SP3 (32 bit) Microsoft Windows 7 Professional SP1 (32/64 bit) Microsoft Windows 7 Enterprise SP1 (32/64 bit) Microsoft Windows 7 Ultimate SP1 (32/64 bit) Microsoft Server 2003 R2 Std. SP2 (32 bit) Microsoft Server 2008 Std. SP2 (32/64 bit)	
• 1 pack = 1 unit	**6GK1 901-1BB11-2AA0**	Type of delivery: German, English, Chinese, Italian, French, Spanish	
• 1 pack = 10 units	**6GK1 901-1BB11-2AB0**		
• 1 pack = 50 units	**6GK1 901-1BB11-2AE0**	STEP 7 Professional V12, floating license	**6ES7 822-1AA02-0YA5**
IE FC Stripping Tool	**6GK1 901-1GA00**		
Preadjusted stripping tool for fast stripping of the Industrial Ethernet FC cables			

4

Overview

- Uniform 40-pin front connector, suitable for all 35 mm wide SIMATIC S7-1500 I/O modules
- With screw-type terminals (push-in terminals available soon)
- To be ordered separately.
- Connectable core cross-sections: 0.25 mm^2 to 1.5 mm^2 (AWG 24 to 16)

Ordering data

	Order No.
Front connectors Including four potential bridges, cable ties, and individual labeling strips; 40-pole screw-type terminal	**6ES7 592-1AM00-0XB0**
Potential bridges for front connectors 20 units; spare part	**6ES7 592-3AA00-0AA0**

4

SIMATIC S7-1500
Connection system

**SIMATIC TOP connect system cabling
for SIMATIC S7-1500 and ET 200MP**

4

Overview

With two cabling systems, SIMATIC TOP connect ensures efficient wiring of the input and output module of the SIMATIC S7-1500: Fully modular connection for fast and clearly arranged connecting to sensors and actuators in the field, and flexible connection for simple wiring inside the control cabinet.

With the TIA Selection Tool, you can select suitable system cabling for the individual I/O modules with a simple mouse click. Suitable components for the respective I/O module are always offered. These can be transferred to the order list and then ordered in the Industry Mall.

Further information can be found on the Internet at

http://www.siemens.com/tia-selection-tool

Design

Two cabling variants are available for a wide range of control cabinet concepts:

Fully modular connection

The system consists of:
- Front connector module
- Connecting cable
- Terminal modules in the following versions: Basic module, signal module and function module

Connection errors are thus practically excluded and installation overhead is significantly reduced. Systematic connection of the SIMATIC system. The assembly overhead for the connecting cables is drastically reduced thanks to the use of pre-assembled or easily assembled cables sold by the meter.
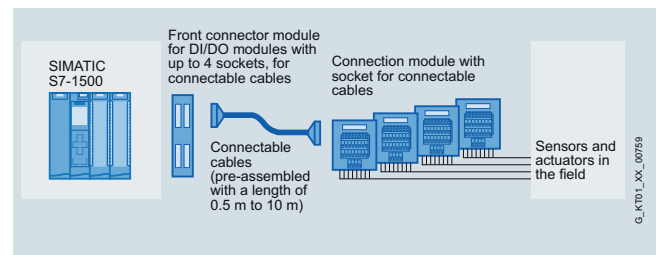
Flexible connection

Flexible connection with front connectors is available with 20 (Pin1 – 20) or 40 wired single cores.

These are available in lengths from 2.5 m to 10.0 m.

The single cores are available in different versions:
- Core type H05V-K is used for industrial applications
- The UL/CSA-approved core is available for export to North America
- The halogen-free version is used where low smoke gas density in the event of fire is required, e.g. in building automation

The blue wires are numbered sequentially and can be routed directly to each element in the control cabinet. The numbering of the single cores corresponds to the coding of the front connector contacts.

In comparison to conventional single wiring, there is a cost saving of 50 % for assembly, since the single cores that have already been checked on the connector are fixed.

Complex pre-assembly of up to two times 40 single cores per module is no longer necessary.
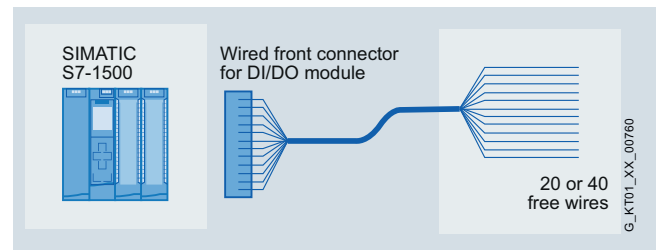
Overview

The fully modular connection for connecting to the I/O modules of the SIMATIC S7-1500 or ET 200MP consists of modified front connectors, called front connector modules, preassembled connecting cables of various lengths, and terminal modules. Suitable components can be selected for the application in question and joined by means of simple plug-in connections. The terminal modules are used instead of conventional terminal blocks and act as the interface to the sensors and actuators.

Benefits

- Easy plugging in of front connector module, connecting cable and terminal module
- Fast and low-cost wiring
- In the case of digital signals, the supply voltage can be connected to the front connector module or the terminal module
- Reduction in wiring errors, clear control cabinet wiring
- Byte-by-byte distribution of the signals in the case of digital signals
- Each component can be replaced individually
- Every cable length can be configured without cutting, or pre-assembled cables can be used

Design
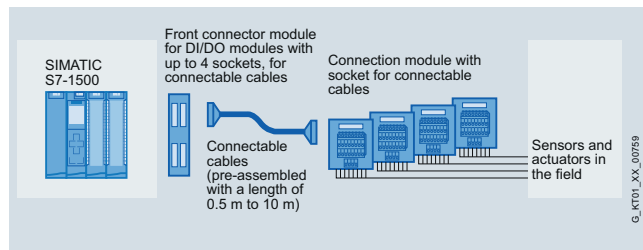
Front connector module

Modified front connectors, called front connector modules, are available for connecting to the I/O modules. These are plugged into the I/O module to be wired instead of the front connector. The front connector modules are available in the most diverse versions for digital I/O modules and for the 24 V 2-ampère module. The connecting cables are plugged into these front connector modules.

Connecting cable

The connecting cable is available in two different versions.

As a pre-assembled 16-pole round cable (shielded or unshielded) up to a length of 10 m or the round-sheath ribbon cable to be simply used. The round-sheath ribbon cable is available 16-pole shielded as well as 2 x 16-pole without shield.

When assembled, there are one or two insulation displacement connectors (female ribbon connectors) at both ends of the cable.

The round-sheath ribbon cable is assembled by the user with the aid of pliers (can be ordered separately). The cable transmits 8 or 2 x 8 channels over a distance of up to 30 m.

The connecting cable connects the front connector module with the terminal module.

Terminal module

The system has digital and analog terminal modules for connecting the I/O signals. These are snapped onto the standard mounting rail.

Terminal modules are available for two different connection methods: as spring-loaded or screw-type terminals. The potential can be fed in at the terminal module or at the front connector module.

Basic module:

Terminal modules with basic functionality for getting the signal from the field to the module or from the module to the field quickly and easily. For digital signals.

Signal module:

Expands the digital basic module with LEDs for signaling the active high signal. This makes commissioning easier for you, and you always have an overview of the signal states of your I/O. One LED signals the availability of the supply voltage.

Function module:

Digital terminal modules that are fitted with relays or optocouplers.

If other voltage or power levels are required in the field, the terminal module for output signals TPRo or TPOo is used. For the TPRo terminal module, relays are used for the implementation. For the TPOo terminal module, optocouplers are used for the implementation. This converts the 24 V DC output signal simply and reliably to another voltage or power level. If 230 V AC input signals have to be transmitted to the controller in the field, a terminal module with relay TPRi is available that simply converts the 230 V AC signal to 24 V DC. This means that there is always the same voltage level on the module side.

Use with optocouplers for the TPRo relay modules

If higher switching frequencies of the relay terminal module are required for the output signals, the relay can simply be replaced with an optocoupler (note technical specifications) in order to increase the switching frequency here.

SIMATIC S7-1500
Connection system

SIMATIC TOP connect for SIMATIC S7
Fully modular connection

▪ Technical specifications Front connector module

Rated operating voltage	DC 24 V
Max. permissible operating voltage	DC 60 V
Max. permissible continuous current • per connector pin	1 A
Max. permissible total current	4 A/Byte
Permissible ambient temperature	0 bis + 60 °C
Test voltage	0.5 kV, 50 Hz, 60 s
Air gaps and creepage distances	IEC 664 (1980), IEC 664 A (1981), acc. to DIN VDE 0110 (01.89), overvoltage class II, pollution degree 2

Wiring rules for the front connector modules

SIMATIC TOP connect front connector module, connection for potential infeed		
	Push-in	Screw terminals
	Modules up to 4 connections	
Connectable cable cross-sections • Solid conductors • Flexible cables with/without wire end ferrule	No 0.25 to 1.5 mm^2	
Number of conductors per connection	1 or a combination of 2 wires up to 1.5 mm^2 (total) in a common wire end ferrule	
Max. diameter of the cable insulation	3.1 mm	
Stripping length of the wires • Without insulating collar • with insulating collar	6 mm -	
Wire end ferrules according to DIN 46228 • Without insulating collar • with insulating collar 0.25 to 1.0 mm^2 • with insulating collar 1.5 mm^2	Form A; 5 to 7 mm long - -	
Blade width of the screwdriver	3.5 mm (cylindrical design)	
Tightening torque for connecting the cables	-	0.4 to 0.7 Nm

▪ Technical specifications Connecting cable

Technical data of connecting cable from SIMATIC S7 to connection module	
Operating voltage	60 V DC
Continuous current per signal conductor	1 A
Max. summation current	4 A/byte
Operating temperature	0 to +60°C
Outer diameter of pre-assembled round cable in mm, unshielded/shielded	Approx. 6.5/7.0
Outer diameter of round-sheath ribbon cable in mm, 16-pole/2 x 16-pole	Approx. 9.5/11.5

▪ Technical specifications Basic module

Connection module TP1, TP3 and TPK	
Max. operating voltage	60 V DC
Continuous current per signal	1 A
Max. summation current (voltage infeed)	4 A/byte
Operating temperature	0 to + 60°C
Mounting position	Any
Air gaps and creepage distances	IEC Report 664, IEC 664 A, IEC 1131 T2, CSA C22.2 No 142 UL 508, VDE 0160 (12.90), overvoltage category II, pollution degree 3
Dimensions (W x H x D) in mm • 1-wire connection 6ES7924-0AA10-0A_0 • for 3-wire initiators 6ES7924-0CA10-0A_0 • for 2 x 8 signals 6ES7924-1AA10-0A_0	Approx. 55 x 43.2 x 63 Approx. 68 x 43.2 x 80 Approx. 100 x 43.2 x 80

Connection module TP2	
Max. operating voltage	60 V DC
Continuous current signal conductor	2 A
Operating temperature	0 to + 60°C
Mounting position	Any
Air gaps and creepage distances	IEC Report 664, IEC 664 A, IEC 1131 T2, CSA C22.2 No 142 UL 508, VDE 0160 (12.90), overvoltage category II, pollution degree 3
Dimensions (W x H x D) in mm • for 2 ampere modules 6ES7924-0BB10-0A_0	Approx. 68 x 43.2 x 80

Connection module TPA	
Max. operating voltage	60 V DC
Continuous current signal conductor	1 A
Operating temperature	0 to + 60°C
Mounting position	Any
Air gaps and creepage distances	IEC Report 664, IEC 664 A, IEC 1131 T2, CSA C22.2 No 142 UL 508, VDE 0160 (12.90), overvoltage category II, pollution degree 3
Dimensions (W x H x D) in mm • for 2 analog modules 6ES7924-0CC10-0A_0	Approx. 68 x 43.2 x 80

▪ Technical specifications Basic module (continued)

Wiring rules for connection modules

Connection module TPA, TP1, TP2, TP3, TPK		
	Spring connection	Screw connection
Connectable cable cross-sections		
• solid cables	No	
• flexible cables without wire end ferrule	0.5 to 2.5 mm^2	
• flexible cables with wire end ferrule in accordance with DIN 46228/1	0.5 to 1.5 mm^2	0.5 to 2.5 mm^2 (2.5 mm^2 with a crimp in accordance with EN 60947-1)
• flexible cables with wire end ferrule and plastic collar in accordance with DIN 46228/4	0.5 to 1.5 mm^2	
Number of cables per connection	1 or a combination of 2 cables up to the cross-sections specified above (total) in a shared wire end ferrule	
Blade width of the screwdriver	3.5 mm (cylindrical shape)	
Tightening torque for connecting the cables	-	0.4 to 0.7 Nm

Wiring rules for connection modules

Connection module TP1 LED, TPK LED, TP2 LED, TP3 LED		
	Spring connection	Screw connection
Connectable cable cross-sections		
• solid cables	No	
• flexible cables without wire end ferrule	0.5 to 2.5 mm^2	
• flexible cables with wire end ferrule in accordance with DIN 46228/1	0.5 to 1.5 mm^2	0.5 to 2.5 mm^2 (2.5 mm^2 with a crimp in accordance with EN 60947-1)
• flexible cables with wire end ferrule and plastic collar in accordance with DIN 46228/4	0.5 to 1.5 mm^2	
Number of wires per connection	1 or a combination of 2 conductors up to the cross-sections specified above (total) in a shared wire end ferrule	
Blade width of the screwdriver	3.5 mm (cylindrical shape)	
Tightening torque for connecting the cables	-	0.4 to 0.7 Nm

▪ Technical specifications Signal module

Connection module TP1, TP3 and TPK with LED	
Max. operating voltage	24 V DC
Continuous current per signal	1 A
Max. summation current (voltage infeed)	4 A/byte
Operating temperature	0 to + 60 °C
Mounting position	Any
Air gaps and creepage distances	IEC Report 664, IEC 664 A, IEC 1131 T2, CSA C22.2 No 142 UL 508, VDE 0160 (12.90), overvoltage category II, pollution degree 3
Dimensions (W x H x D) in mm	
• 1-wire connection with LED 6ES7924-0AA10-0B_0	Approx. 55 x 43.2 x 63
• for 3-wire initiators with LED 6ES7924-0CA10-0B_0	Approx. 68 x 43.2 x 80
• for 2 x 8 signals with LED 6ES7924-1AA10-0B_0	Approx. 100 x 43.2 x 80

Connection module TP2 with LED	
Max. operating voltage	24 V DC
Continuous current per signal conductor	2 A
Operating temperature	0 to + 60 °C
Mounting position	Any
Air gaps and creepage distances	IEC Report 664, IEC 664 A, IEC 1131 T2, CSA C22.2 No 142 UL 508, VDE 0160 (12.90), overvoltage category II, pollution degree 3
Dimensions (W x H x D) in mm	
• for 2-ampere modules with LED 6ES7924-0BB10-0B_0	Approx. 68 x 43.2 x 80

▪ Technical specifications Function module

Connection module with relay for outputs (TPRo)	
Energizing side	
Operating voltage for coil	24 V DC
Input circuit	Reverse polarity protection and freewheeling diodes
Contact side	
Number of relay outputs	8 (NO contacts)
Contact design	Single contact, 1 NO contact
Switching capacity (resistive load)	max. 4 A/250 V AC max. 3 A/30 V DC max. 0.6 A/48 V DC max. 0.4 A/60 V DC recommended minimum load ≥ 10 mA
Switching frequency	20 cycles/minute
Service life • Mechanical • Electrical	5 x 10^6 switching cycles 3 x 10^4 operating cycles at 230 V AC/2 A/ cos ϒ = 1
Operating temperature	0 ... +60 °C
Mounting position	Any
Clearance and creepage distances	Basic standard IEC 60664-1; UL 508; CuI (Reference CSA C22.2 No. 142) Overvoltage category III Pollution degree 2
Dimensions (W x H x D) in mm	
6ES7924-0BD10-0B_0	Approx. 100 x 45 x 80

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SIMATIC S7-1500
Connection system

4

■ Technical specifications Function module (continued)

Connection module with optocoupler for outputs (TPOo)

Input data	
Power supply	
Potential connection (L1/M1)	24 V DC (20.4 ... 28.8 V DC)
Status indicator "L1"	Green LED
Switching inputs	
Number	8 channels (channel 0 ... 7) with reverse polarity protection
Input voltage "off"	0 V DC (0 ... 5 V DC)
Input voltage "on"	24 V DC (15 ... 28.8 V DC)
Input current	min. 5 mA with 20 V DC, per channel
Status indicator "on"	Green LED per channel
Output data	
Power supply	
Operating voltage U_B (L2/M2, L3/M3)	24 V DC (20 ... 30 V DC) per group of 4 one V_B
U_B conditionally protected against polarity reversal [1]	Up to 30 V DC
Current consumption	approx. 10 mA for 24 V DC + output currents per group of 4
Aggregate current	max. 8 A per group of 4
Switching outputs	
Number	8 channels (channel 0 ... 7)
Short-circuit protection [2]	for U_B < 24 V DC or 24 ... 30 V DC/max. 20 A
Output voltage	typ. U_B – 1 V (for input "on")
Output current • Lamp load	Max. 4 A per channel max. 20 W at 24 V per channel
Demand factor per group of 4	50 %, max. 2 outputs active under full load (4 A)
Short-circuit response	Clocked output signal (approx. 2 ... 20 ms)
On/off-delay	typ. 100 µs/250 µs with resistive load
Switching frequency	max. 500 Hz with 4 A resistive load (square wave voltage, pulse/pause 1:1)
"Overload" fault indication	Red LED per channel, in the event of wire breakage or short-circuit
• Wire break indication	Active I_{out} < 0.1 A/ inactive I_{out} ≥ 0.9 A
Group fault messages SF1, SF2	
Monitored channels	SF1: Channels 0 ... 3, SF2: for channels 4 ... 7
Voltage U_{SF1}, U_{SF2} • No error at the switching output • Wire break at the switching output • Short-circuit at the switching output	 typ. U_B – 2 V Approx. 0 V 0 V to U_B, clocked
Current I_{SF1}, I_{SF2}	min. 4 mA/max. 200 mA
General data	
Degree of protection	IP20
Operating temperature	0 ... 60 °C
Mounting position	Any, except overhead
Connecting terminals	Screw-type or spring-loaded terminals
Stripped length	9 mm
Conductor cross-section • Finely stranded without end sleeve • with end sleeve for screw-type terminals • with end sleeve for spring-loaded terminals	 0.5 ... 2.5 mm^2 0.5 ... 2.5 mm^2 according to DIN 46228-1 0.5 ... 1.5 mm^2 according to DIN 46228-1 and DIN 46228-4

Screwdriver	according to DIN 5264 B 0.6 x 3.5 mm
Tightening torque of screw-type terminals	0.4 Nm
Weight	Approx. 400 g
Dimensions (W x H x D) in mm	134 x 84 x 77

Connection module with relay for inputs (TPRi)

Energizing side	
Operating voltage for coil	230 V AC from 207 – 280 V AC
Input circuit	Varistors
Contact side	
Number of relay outputs	8 (NO contacts)
Contact design	Single contact, 1 NO contact
Switching capacity (resistive load)	max. 50 A/24 V AC, max. 50 mA/48 V DC max. 50 mA/60 V DC recommended minimum load ≥ 5 mA
Switching frequency	200 cycles/minute
Service life • Mechanical • Electrical	 10 x 10^6 switching cycles 3 x 10^6 operating cycles at 230 V AC/50 mA/cos ϒ = 1
Operating temperature	0 ... +60 °C
Mounting position	Any
Clearance and creepage distances	Basic standard IEC 60664-1; UL 508; Cul (Reference CSA C22.2 No. 142) Overvoltage category III Pollution degree 2
Dimensions (W x H x D) in mm	
6ES7924-0BE10-0B_0	Approx. 130 x 45 x 80

Wiring rules for the connection modules

Connection modules TPRo and TPRi		
	Spring-loaded connection	Screw-type connection
Connectable cable cross-sections • Solid conductors • Flexible cables without end sleeve • Flexible cables with end sleeve according to DIN 46228/1	 No 0.5 ... 2.5 mm^2 0.5 ... 1.5 mm^2	 0.5 to 2.5 mm^2 (2.5 mm^2 with a crimp in accordance with EN 60947-1)
• Flexible cables with end sleeve and plastic collar according to DIN 46228/4	0.5 ... 1.5 mm^2	
Number of conductors per connection	1 or a combination of 2 conductors up to the cross-sections specified above (total) in a shared end sleeve	
Blade width of the screwdriver	3.5 mm (cylindrical design)	
Tightening torque for connecting the cables	-	0.4 ... 0.7 Nm

[1] Protected against polarity reversal, if the ground potential of the output load is directly connected to the 0 V supply of the power supply unit

[2] Not sustained short-circuit-proof, max. duration approx. 60 min.

**SIMATIC TOP connect for SIMATIC S7
Fully modular connection**

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Ordering data	Order No.
Front connector module	
Front connector module (digital 4 x 8 I/O)	
Power supply via	
• Push-in	**6ES7 921-5AH20-0AA0**
• Screw-type terminals	**6ES7 921-5AB20-0AA0**
Front connector module (1 x 8 outputs) for 2-ampère digital outputs	
Power supply via	
• Push-in	**6ES7 921-5AJ00-0AA0**
• Screw-type terminals	**6ES7 921-5AD00-0AA0**

Ordering data	Order No.
Connecting cable	
Pre-assembled round cable	
16-pole, 0.14 mm^2	
Unshielded	
• 0.5 m	**6ES7923-0BA50-0CB0**
• 1.0 m	**6ES7923-0BB00-0CB0**
• 1.5 m	**6ES7923-0BB50-0CB0**
• 2.0 m	**6ES7923-0BC00-0CB0**
• 2.5 m	**6ES7923-0BC50-0CB0**
• 3.0 m	**6ES7923-0BD00-0CB0**
• 4.0 m	**6ES7923-0BE00-0CB0**
• 5.0 m	**6ES7923-0BF00-0CB0**
Shielded	
• 1.0 m	**6ES7923-0BB00-0DB0**
• 2.0 m	**6ES7923-0BC00-0DB0**
• 2.5 m	**6ES7923-0BC50-0DB0**
• 3.0 m	**6ES7923-0BD00-0DB0**
• 4.0 m	**6ES7923-0BE00-0DB0**
• 5.0 m	**6ES7923-0BF00-0DB0**
Round-sheath ribbon cable	
16-pole, 0.14 mm^2	
Unshielded	
• 30 m	**6ES7923-0CD00-0AA0**
• 60 m	**6ES7923-0CG00-0AA0**
Shielded	
• 30 m	**6ES7923-0CD00-0BA0**
• 60 m	**6ES7923-0CG00-0BA0**
Round-sheath ribbon cable	
2 x 16-pole, 0.14 mm^2	
Unshielded	
• 30 m	**6ES7923-2CD00-0AA0**
• 60 m	**6ES7923-2CG00-0AA0**
Connector (female ribbon connector)	**6ES7921-3BE10-0AA0**
16-pole, insulation displacement system, with strain relief devices; packing unit: 8 connectors and 8 cable grips	
Accessories	
Manual pliers	**6ES7928-0AA00-0AA0**
For preparing the connectors (female ribbon connector)	

Ordering data	Order No.
Basic module	
Connection module TP1	
for 1-wire initiators	
Packaging unit (1 unit)	
• Spring terminals	**6ES7924-0AA10-0AB0**
• Screw terminals	**6ES7924-0AA10-0AA0**
Connection module TP3	
for 3-wire initiators	
Packaging unit (1 unit)	
• Spring terminals	**6ES7924-0CA10-0AB0**
• Screw terminals	**6ES7924-0CA10-0AA0**
Connection module TPK	
for 2 x 8 signals	
Packaging unit (1 unit)	
• Spring terminals	**6ES7924-1AA10-0AB0**
• Screw terminals	**6ES7924-1AA10-0AA0**
Connection module TP2	
for 2 A modules	
for 2-wire initiators	
Packaging unit (1 unit)	
• Spring terminals	**6ES7924-0BB10-0AB0**
• Screw terminals	**6ES7924-0BB10-0AA0**
Connection module TPA	
for analog signals	
Packaging unit (1 unit)	
• Spring terminals	**6ES7924-0CC10-0AB0**
• Screw terminals	**6ES7924-0CC10-0AA0**
Accessories	
Labeling plates for connection modules	
Insertable labeling plate PU = 200 units	**6ES7928-2AB00-0AA0**
Self-adhesive labeling plate PU = 200 units	**6ES7928-2BB00-0AA0**
Shield plate	**6ES7928-1BA00-0AA0**
for analog connection module (4 units)	
Shield connection terminal	
for shield plate, 2 units, with cable diameter	
• 2 to 6 mm (2 cables)	**6ES7390-5AB00-0AA0**
• 3 to 8 mm	**6ES7390-5BA00-0AA0**
• 4 to 13 mm	**6ES7390-5CA00-0AA0**

SIMATIC S7-1500
Connection system

SIMATIC TOP connect for SIMATIC S7
Fully modular connection

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Ordering data	Order No.	Ordering data	Order No.
Signal module		**Function module**	
Connection module TP1 with LED		**Connection module TPRo for output signals**	
for 1-wire initiators		for 2-wire connection	
Packaging unit (1 unit)		Packaging unit 1 unit	
• Spring terminals	**6ES7924-0AA10-0BB0**	• Spring-loaded terminals	**6ES7924-0BD10-0BB0**
• Screw terminals	**6ES7924-0AA10-0BA0**	• Screw-type terminals	**6ES7924-0BD10-0BA0**
Connection module TP3 with LED		**Connection module optocoupler**	
for 3-wire initiators		Packaging unit 1 unit	
Packaging unit (1 unit)		• Spring-loaded terminals	**6ES7924-0BF10-0BB0**
• Spring terminals	**6ES7924-0CA10-0BB0**	• Screw-type terminals	**6ES7924-0BF10-0BA0**
• Screw terminals	**6ES7924-0CA10-0BA0**	**Connection module TPRi for input signals**	
Connection module TPK with LED		for 2-wire connection	
for 2 x 8 signals		Packaging unit 1 unit	
Packaging unit (1 unit)		• Spring-loaded terminals	**6ES7924-0BE10-0BB0**
• Spring terminals	**6ES7924-1AA10-0BB0**	• Screw-type terminals	**6ES7924-0BE10-0BA0**
• Screw terminals	**6ES7924-1AA10-0BA0**	**Accessories**	
Connection module TP2 with LED		**Labeling plates** for connection modules	
for 2 A modules		**Insertable labeling plates** PU = 200 units	**6ES7928-2AB00-0AA0**
for 2-wire initiators		**Self-adhesive labeling plates** PU = 200 units	**6ES7928-2BB00-0AA0**
Packaging unit (1 unit)		**Replacement relay for relay connection module** PU = 4 units	
• Spring terminals	**6ES7924-0BB10-0BB0**	**Replacement relay for TPRi**	**6ES7928-3BA00-4AA0**
• Screw terminals	**6ES7924-0BB10-0BA0**	**Replacement relay for TPRo**	**6ES7928-3AA00-4AA0**
Accessories		**Optocoupler DC alternative** for relay in the case of TPRo PU = 4 units	**6ES7928-3DA00-4AA0**
Labeling plates for connection modules		**Optocoupler AC alternative** for relay in the case of TPRo PU = 4 units	**6ES7928-3CA00-4AA0**
Insertable labeling plates PU = 200 units	**6ES7928-2AB00-0AA0**		
Self-adhesive labeling plates PU = 200 units	**6ES7928-2BB00-0AA0**		

4

Overview

Flexible connection of the cabling system consists of a S7-1500 front connector which has the 20 or 40 single cores already in place and which directly connects the I/O modules with the sensors and actuators inside the control cabinet. With a cross-section of 0.5 square mm, the single wires are also suitable for higher currents and are available in different lengths and versions: as H05V-K cores (PVC insulation), H05Z-K (halogen-free insulation) or with UL/CSA certified cores. The halogen-free version has a low smoke gas density in the event of a fire and is thus particularly well suited for use in buildings.

Technical specifications

Front connector with single cores for 16 channels (pins 1-20)

Rated operating voltage	24 V DC
Permissible continuous current with simultaneous load of all cores, max.	1.5 A
Permissible ambient temperature	0 to 60 °C
Core type	H05V-K, UL 1007/1569; CSA TR64, or halogen-free
Number of single cores	20
Core cross-section	0.5 mm^2; Cu
Bundle diameter in mm	Approx. 15
Core color	Blue, RAL 5010
Designation of cores	Numbered from 1 to 20 (front connector contact = core number)
Assembly	Screw contacts

Front connector with single cores for 32 channels (pins 1-40)

Rated operating voltage	24 V DC
Permissible continuous current with simultaneous load of all cores, max.	1.5 A
Permissible ambient temperature	0 to 60 °C
Core type	H05V-K, UL 1007/1569; CSA TR64, or halogen-free
Number of single cores	40
Core cross-section	0.5 mm^2; Cu
Bundle diameter in mm	Approx. 17
Core color	Blue, RAL 5010
Designation of cores	Numbered from 1 to 40 (front connector contact = core number)
Assembly	Screw-type or crimp contacts

Ordering data

	Order No.
Front connector with single cores for 32 channels (pins 1-40)	
Core type H05V-K (0.5 mm^2 with screwed connection)	
• 2.5 m	6ES7 922-5BC50-0AC0
• 3.2 m	6ES7 922-5BD20-0AC0
• 5.0 m	6ES7 922-5BF00-0AC0
• 6.5 m	6ES7 922-5BG50-0AC0
• 8.0 m	6ES7 922-5BJ00-0AC0
• 10.0 m	6ES7 922-5CB00-0AC0
Core type H05Z-K, halogen-free (0.5 mm^2 with screwed connection)	
• 2.5 m	6ES7 922-5BC50-0HC0
• 3.2 m	6ES7 922-5BD20-0HC0
• 5.0 m	6ES7 922-5BF00-0HC0
• 6.5 m	6ES7 922-5BG50-0HC0
• 8.0 m	6ES7 922-5BJ00-0HC0
• 10.0 m	6ES7 922-5CB00-0HC0
Core type UL/CSA-certified (0.5 mm^2 with screw connection)	
• 3.2 m	6ES7 922-5BD20-0UC0
• 5.0 m	6ES7 922-5BF00-0UC0
• 6.5 m	6ES7 922-5BG50-0UC0
Front connector with single cores for 16 channels (pins 1-20)	
Core type H05V-K (0.5 mm^2 with screwed connection)	
• 2.5 m	6ES7 922-5BC50-0AB0
• 3.2 m	6ES7 922-5BD20-0AB0
• 5.0 m	6ES7 922-5BF00-0AB0
• 6.5 m	6ES7 922-5BG50-0AB0
• 8.0 m	6ES7 922-5BJ00-0AB0
• 10.0 m	6ES7 922-5CB00-0AB0
Core type H05Z-K, halogen-free (0.5 mm^2 with screwed connection)	
• 2.5 m	6ES7 922-5BC50-0HB0
• 3.2 m	6ES7 922-5BD20-0HB0
• 5.0 m	6ES7 922-5BF00-0HB0
• 6.5 m	6ES7 922-5BG50-0HB0
• 8.0 m	6ES7 922-5BJ00-0HB0
• 10.0 m	6ES7 922-5CB00-0HB0
Core type UL/CSA-certified (0.5 mm^2 with screw connection)	
• 3.2 m	6ES7 922-5BD20-0UB0
• 5.0 m	6ES7 922-5BF00-0UB0
• 6.5 m	6ES7 922-5BG50-0UB0

SIMATIC S7-1500
Power supplies

4

Overview

- Power supplies for the SIMATIC S7-1500
- For conversion of AC or DC line voltages to the operating voltages required for the internal electronics
- 25 or 60 W output power
- Can be used for S7-1500 or ET 200MP
- Configuration via STEP 7 V12

Technical specifications

	6ES7 505-0KA00-0AB0 PS 25W 24VDC	6ES7 505-0RA00-0AB0 PS 60W 24/48/60V DC	6ES7 507-0RA00-0AB0 PS 60W 120/230V AC/DC
General information Hardware product version	E01	E01	E01
Engineering with • STEP 7 TIA Portal can be configured/ integrated as of version	V12.0 / V12.0	V12.0 / V12.0	V12.0 / V12.0
FH technology Redundancy • Redundant capability - for increased power	 Yes Yes	 Yes Yes	 Yes Yes
Supply voltage Rated voltage/DC	24 V; SELV		
permissible range, lower limit (DC)	Static 19.2 V, dynamic 18.5 V	Static 19.2 V, dynamic 18.5 V	88 V
permissible range, upper limit (DC)	Static 28.8 V, dynamic 30.2 V	Static 72 V, dynamic 75.5 V	300 V
permissible range, lower limit (AC)			85 V
permissible range, upper limit (AC)			264 V
Reverse polarity protection	Yes	Yes	
Short-circuit protection	Yes	Yes	Yes
Line frequency • Rated value 50 Hz • Frequency of the supply voltage • Frequency of the supply voltage			Yes 47 Hz 63 Hz
Mains buffering • Mains buffering time	20 ms	20 ms	20 ms
Input current Rated value at 48 V DC		1.5 A	
Rated value at 60 V DC		1.2 A	
Rated value at 120 V DC			0.6 A
Rated value at 230 V DC			0.3 A
Rated value at 120 V AC			0.6 A
Rated value at 230 V AC			0.34 A
Output current Short-circuit protection	Yes	Yes	Yes

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Technical specifications (continued)

	6ES7 505-0KA00-0AB0 PS 25W 24VDC	6ES7 505-0RA00-0AB0 PS 60W 24/48/60V DC	6ES7 507-0RA00-0AB0 PS 60W 120/230V AC/DC
Power Infeed power to the backplane bus	25 W	60 W	60 W
Power losses Power loss at nominal rating conditions	6.2 W	12 W	12 W
Interrupts/diagnostics/status information Status indicator	Yes	Yes	Yes
Galvanic isolation primary/secondary	Yes	Yes	Yes
Isolation Isolation checked with	707 V DC (type test)		
EMC Surge immunity • on the supply lines acc. to IEC 61000-4-5	Yes	Yes	Yes
Degree and class of protection Protection class	3; with protective conductor	1; with protective conductor	1; with protective conductor
Dimensions Width	35 mm	70 mm	70 mm
Height	147 mm	147 mm	147 mm
Depth	129 mm	129 mm	129 mm
Weight Weight, approx.	350 g	600 g	600 g

Ordering data

	Order No.		Order No.
Power supply		**Accessories**	
For supplying the backplane bus of the S7-1500		**SIMATIC S7-1500 mounting rail**	
24 V DC input voltage, power 25 W	**6ES7 505-0KA00-0AB0**	Fixed lengths, with grounding elements • 160 mm • 482 mm • 530 mm • 830 mm	**6ES7 590-1AB60-0AA0** **6ES7 590-1AE80-0AA0** **6ES7 590-1AF30-0AA0** **6ES7 590-1AJ30-0AA0**
24/48/60 V DC input voltage, power 60 W	**6ES7 505-0RA00-0AB0**		
120/230 V AC input voltage, power 60 W	**6ES7 507-0RA00-0AB0**	For cutting to length by customer, without drill holes; grounding elements must be ordered separately • 2000 mm	**6ES7 590-1BC00-0AA0**
		PE connection element for mounting rail 2000 mm Spare part, 20 units	**6ES7 590-5AA00-0AA0**
		Power connector With coding element for power supply module; spare part, 10 units	**6ES7 590-8AA00-0AA0**

SIMATIC S7-1500
Power supplies

Load power supplies

■ Application

The design and functionality of the SIMATIC PM 1507 single-phase load power supply (PM = power module) with automatic range selection of the input voltage are an optimal match to the SIMATIC S7-1500 PLC. It supplies the S7-1500 system components such as CPU, system power supply (PS), I/O circuits of the input and output modules and, if necessary, the sensors and actuators with 24 V DC.

■ Technical specifications

Order No.	6EP1 332-4BA00	6EP1 333-4BA00
Product	S7-1500 PM1507	S7-1500 PM1507
Power supply, type	24 V/3 A	24 V/8 A
Input		
Input	1-phase AC	1-phase AC
Supply voltage		
• 1 for AC rated value	120 V	120 V
• 2 for AC rated value	230 V	230 V
• Note	Automatic range selection	Automatic range selection
Input voltage		
• 1 for AC	85 … 132 V	85 … 132 V
• 2 for AC	170 … 264 V	170 … 264 V
Overvoltage strength	2.3 x $U_{in\ rated}$, 1.3 ms	2.3 x $U_{in\ rated}$, 1.3 ms
Mains buffering at $I_{out\ rated}$, min.	20 ms	20 ms
Mains buffering	at U_{in} = 93/187 V	at U_{in} = 93/187 V
Rated line frequency		
• 1	50 Hz	50 Hz
• 2	60 Hz	60 Hz
Line frequency range	45 … 65 Hz	45 … 65 Hz
Input current		
• at rated value of input voltage 120 V rated value	1.4 A	3.7 A
• at rated value of input voltage 230 V rated value	0.8 A	1.7 A
Switch-on current limitation (+ 25 °C), max.	23 A	62 A
I²t, max.	1.3 A²·s	12 A²·s
Built-in input fuse	T 3.15 A/250 V (not accessible)	T 6.3 A/250 V (not accessible)
Protection in the supply feeder (IEC 898)	Recommended miniature circuit breaker: 10 A, characteristic B or 6 A, characteristic C	Recommended miniature circuit breaker: 16 A, characteristic B or 10 A, characteristic C

Order No.	6EP1 332-4BA00	6EP1 333-4BA00
Product	S7-1500 PM1507	S7-1500 PM1507
Power supply, type	24 V/3 A	24 V/8 A
Output		
Output	Controlled, isolated DC voltage	Controlled, isolated DC voltage
Rated voltage $U_{out\ rated}$ DC	24 V	24 V
Total tolerance, static ±	1 %	1 %
Static mains compensation, approx.	0.1 %	0.1 %
Static load compensation, approx.	0.1 %	0.1 %
Residual ripple, peak-peak, max.	50 mV	50 mV
Residual ripple, peak-peak, typ.		
Spikes peak-peak, max. (bandwidth approx. 20 MHz)	150 mV	150 mV
Product function: output voltage is adjustable	No	No
Status display	LED green for 24 V O.K.; LED red for fault; LED yellow for stand-by	LED green for 24 V O.K.; LED red for fault; LED yellow for stand-by
Signaling		
On/Off behavior	No overshoot of Uout (soft start)	No overshoot of Uout (soft start)
Startup delay, max.	1.5 s	1.5 s
Voltage rise, typ.	10 ms	10 ms
Rated current Iout rated	3 A	8 A
Current range	0 … 3 A	0 … 8 A
typical active power output	72 W	192 W
short-term overload current in the event of a short circuit during startup, typical	12 A	35 A
Duration of the overload capability overcurrent in the event of a short circuit during startup	70 ms	70 ms
short-term overload current in the event of a short circuit during operation, typical	12 A	35 A
Duration of the overload capability overcurrent in the event of a short circuit during operation	70 ms	70 ms

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■ Technical specifications (continued)

Order No.	6EP1 332-4BA00	6EP1 333-4BA00
Product	S7-1500 PM1507	S7-1500 PM1507
Power supply, type	24 V/3 A	24 V/8 A
Parallel switching for enhanced performance	Yes	Yes
Note	Parallel connection of 3 A and 8 A possible; devices must be activated simultaneously, at I load max. 75 % per device	Parallel connection of 3 A and 8 A possible; devices must be activated simultaneously, at I load max. 75 % per device
Number of devices that can be switched in parallel to increase performance, units	2	2
Efficiency		
Efficiency at $U_{out\ rated}$, $I_{out\ rated}$, approx.	87 %	90 %
Power loss at $U_{out\ rated}$, $I_{out\ rated}$, approx.	11 W	21 W
Closed-loop control		
Dynamic mains compensation ($U_{in\ rated}$ ±15 %), max.	0.1 %	0.1 %
Dynamic load compensation (I_{out}: 50/100/50 %), U_{out} ± typ.	1 %	2 %
Setting time, maximum	5 ms	5 ms
Protection and monitoring		
Output overvoltage protection	additional control loop, differentiation (closed-loop control) at < 28.8 V	additional control loop, differentiation (closed-loop control) at < 28.8 V
Response value current limitation		
• minimum	3.15 A	8.4 A
• maximum	3.6 A	9.6 A
Current limitation, typ.	3.4 A	9 A
Property of the output, short-circuit-proof	Yes	Yes
Short-circuit protection	electronic shutdown, automatic restart	Electronic shutdown, automatic restart
Security		
Primary/secondary isolation	Yes	Yes
Electrical isolation	Safety extra-low output voltage U_{out} acc. to EN 60950-1 and EN 50178 and EN 61131-2	Safety extra-low output voltage U_{out} acc. to EN 60950-1 and EN 50178 and EN 61131-2
Protection class	Class I	Class I
Leakage current		
• maximum	3.5 mA	3.5 mA
• typical	0.4 mA	1.3 mA
CE marking	Yes	Yes
UL/cUL (CSA) approval	Available soon	Available soon
Explosion protection	Available soon	Available soon
CB approval	Yes	Yes
Degree of protection (EN 60529)	IP20	IP20

Order No.	6EP1 332-4BA00	6EP1 333-4BA00
Product	S7-1500 PM1507	S7-1500 PM1507
Power supply, type	24 V/3 A	24 V/8 A
EMC		
Emitted interference	EN 55022 Class B	EN 55022 Class B
Supply harmonics limitation	EN 61000-3-2	EN 61000-3-2
Noise immunity	EN 61000-6-2	EN 61000-6-2
Operating data		
Ambient temperature		
• during operation	0 … 60 °C	0 … 60 °C
- Note	with natural convection	with natural convection
Ambient temperature		
• during transport	-40 … +85 °C	-40 … +85 °C
• during storage	-40 … +85 °C	-40 … +85 °C
Humidity class according to EN 60721	Climate class 3K3, without condensation	Climate class 3K3, without condensation
Mechanical system		
Connections	Screw/spring-type connection technology	Screw/spring-type connection technology
Connections		
• Supply input	L, N, PE: 1 screw terminal each for 0.5 ... 2.5 mm²	L, N, PE: 1 screw terminal each for 0.5 ... 2.5 mm²
• Output	L+, M: 2 screw terminals each for 0.5 ... 2.5 mm²	L+, M: 2 screw terminals each for 0.5 ... 2.5 mm²
• Auxiliary contacts		
Width of enclosure	50 mm	75 mm
Height of enclosure	147 mm	147 mm
Depth of enclosure	129 mm	129 mm
Mounting width	50 mm	75 mm
Mounting height	205 mm	205 mm
Weight, approx.	0.45 kg	0.74 kg
Product property of the enclosure: side-by-side enclosure	Yes	Yes
Type of mounting		
• Wall mounting	No	No
• DIN rail mounting	No	No
• S7-300 rail mounting	No	No
Installation	can be mounted onto S7-1500 rail	can be mounted onto S7-1500 rail

■ Ordering data

	Order No.
SIMATIC S7-1500 PM 1507	
Input 120/230 V AC, output 24 V DC, 3 A	**6EP1 332-4BA00**
Input 120/230 V AC, output 24 V DC, 8 A	**6EP1 333-4BA00**

SIMATIC S7-1500
SIPLUS power supplies

SIPLUS system power supplies

4

Overview

- System power supplies for the SIMATIC S7-1500
- For conversion of DC line voltages to the operating voltages required for the internal electronics
- Output power 25 W
- Can be used for S7-1500 or ET 200MP
- Configuration via STEP 7 V12

Note:

SIPLUS extreme products are based on Siemens Industry standard products. The contents listed here were taken from the respective standard products. SIPLUS extreme-specific information was added.

Technical specifications

The technical data correspond to those of the based-on modules apart from the values listed in the table:

based on	6AG1 505-0KA00-7AB0 6ES7 505-0KA00-0AB0
Ambient conditions	
Operating temperature	
• Horizontal mounting position	-25...+70 °C
• Vertical mounting position	-25...+50 °C
Extended ambient conditions	
• with reference to ambient temperature, air pressure and altitude	Tmin ... Tmax at 1080 hPa ... 795 hPa (-1000 m ... +2000 m) // Tmin ... (Tmax - 10K) at 795 hPa ... 658 hPa (+2000 m ... +3500 m) // Tmin ... (Tmax - 20K) at 658 hPa ... 540 hPa (+3500 m ... +5000 m)
Relative humidity	
• with condensation / maximum / tested in accordance with IEC 60068-2-38	100%; RH incl. condensation/frost (no commissioning in bedewed state)
Resistance	
• to biologically active substances / compliance with EN 60721-3-3	Yes; Class 3B2 mold and fungal spores (except fauna); the supplied plug covers must remain in place on the unused interfaces during operation.
• to chemically active substances / compliance with EN 60721-3-3	Yes; Class 3C4 (RH < 75%) incl. salt spray in accordance with EN 60068-2-52 (severity 3); the supplied plug covers must remain in place on the unused interfaces during operation.
• to mechanically active substances, compliance with EN 60721-3-3	Yes; Class 3S4 incl. sand, dust; the supplied plug covers must remain in place on unused interfaces during operation.

Ordering data — Order No.

SIPLUS system power supply	
(extended temperature range and medial exposure)	
For supplying the backplane bus of the S7-1500	
24 V DC input voltage, power 25 W	**6AG1 505-0KA00-7AB0**
Accessories	See SIMATIC S7-1500, system power supplies, page 4/49

4

Overview Mounting rails

- Aluminum mounting rail for mounting the SIMATIC S7-1500 or ET 200MP
- With integrated DIN rail for snapping on a wide range of standard components
- Attachment of modules with a single screw
- Installation by screwing to the control cabinet wall
- Entire length of rail can be used

Ordering data	Order No.
SIMATIC S7-1500 mounting rail	
Fixed lengths, with grounding elements	
• 160 mm	**6ES7 590-1AB60-0AA0**
• 482 mm	**6ES7 590-1AE80-0AA0**
• 530 mm	**6ES7 590-1AF30-0AA0**
• 830 mm	**6ES7 590-1AJ30-0AA0**
For cutting to length by customer, without drill holes; grounding elements must be ordered separately	
• 2000 mm	**6ES7 590-1BC00-0AA0**
PE connection element for mounting rail 2000 mm	**6ES7 590-5AA00-0AA0**
20 units	

Overview Labeling sheets
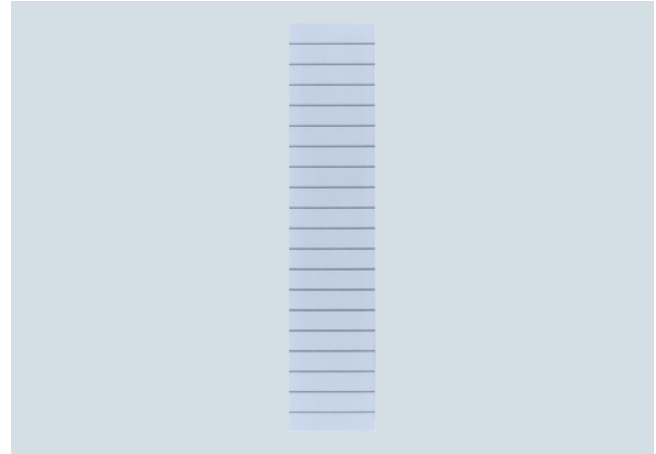
- Film sheets for the application-specific, automatic labeling of I/O modules of the SIMATIC S7-1500 using standard laser printers
- Printing direct from the TIA Portal possible
  - No double entry of symbols and/or addresses
  - Saves time and avoids typing errors
- Plain color films, tear-resistant, dirt-repellent
- Simple handling:
  - Perforated labeling sheets in DIN A4 format for easy separation of the labeling strips.
  - Detached strips can be inserted directly into the I/O modules.
- Different colors to differentiate module types; yellow reserved for failsafe systems

Ordering data	Order No.
DIN A4 labeling sheet	**6ES7 592-2AX00-0AA0**
10 sheets with 10 labeling strips each for I/O modules; perforated, color Al grey	

SIMATIC S7-1500
## Accessories

Spare parts

Overview

Front doors

- Versions:
  - Universal front doors for digital and analog I/O modules
  - Universal front doors for the interface module IM155-5 PN ST
- Included in the scope of delivery of the respective modules. Can be ordered as a spare part in a set consisting of five universal (unlabeled) front doors.
- Front doors for I/O modules: Universal labeling sheets and cabling diagrams are included. Cabling diagrams can be detached from preperforated sheets and inserted inside the door.

U connector
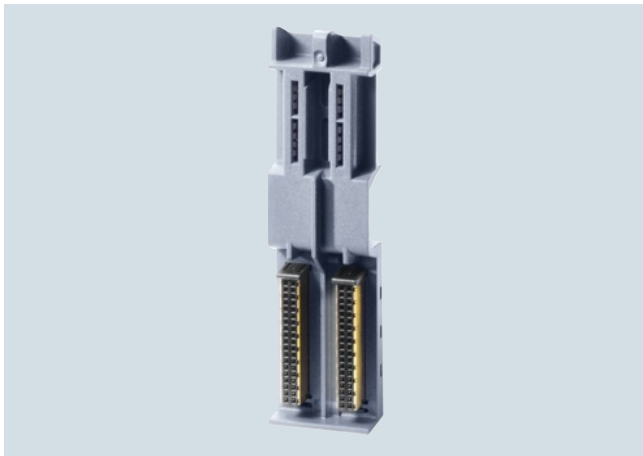
- To interconnect the modules (self-assembling backplane bus)
- Implementation of a rugged, interference-free station setup through
  - consistent separation of supply voltage of modules and data signals
  - fully shielded, gold-plated contacts for the data bus
- Included in the scope of delivery of each module. Available as spare part in sets of 5.

Shielding

- Components for implementing the integrated shielding concept of the S7-1500:
  - 24 V DC infeed element for supplying the analog module: strict separation of infeed and analog signals ensures high EMC stability.
  - Shield clamp for insertion in the front connector: allows a low-impedance connection and optimally dissipates interference.
  - Universal shield terminal: connects the cable shield with the shield clamp and is simultaneously used for mechanical fixing.
- Included in the scope of delivery of the analog modules. Available as a spare part in two versions:
  - Shielding set, comprising infeed element, shield clamp, and shield terminal (pack of 5 units each)
  - Individual shield terminals (pack of 20)
- No tool required for assembly/disassembly

Ordering data	Order No.
Universal front door for IM 155-5 PN ST 5 front doors; spare part	**6ES7 528-0AA70-7AA0**
Universal front door for I/O modules 5 front doors; with 5 labeling strips (front) and 5 cabling diagrams per front door; spare part	**6ES7 528-0AA00-7AA0**
U connector 5 units; spare part	**6ES7 590-0AA00-0AA0**
Shielding set I/O Infeed element, shield clamp, and shield terminal; 5 units, spare part	**6ES7 590-5CA00-0AA0**
Shield terminal element 10 units; spare part	**6ES7 590-5BA00-0AA0**