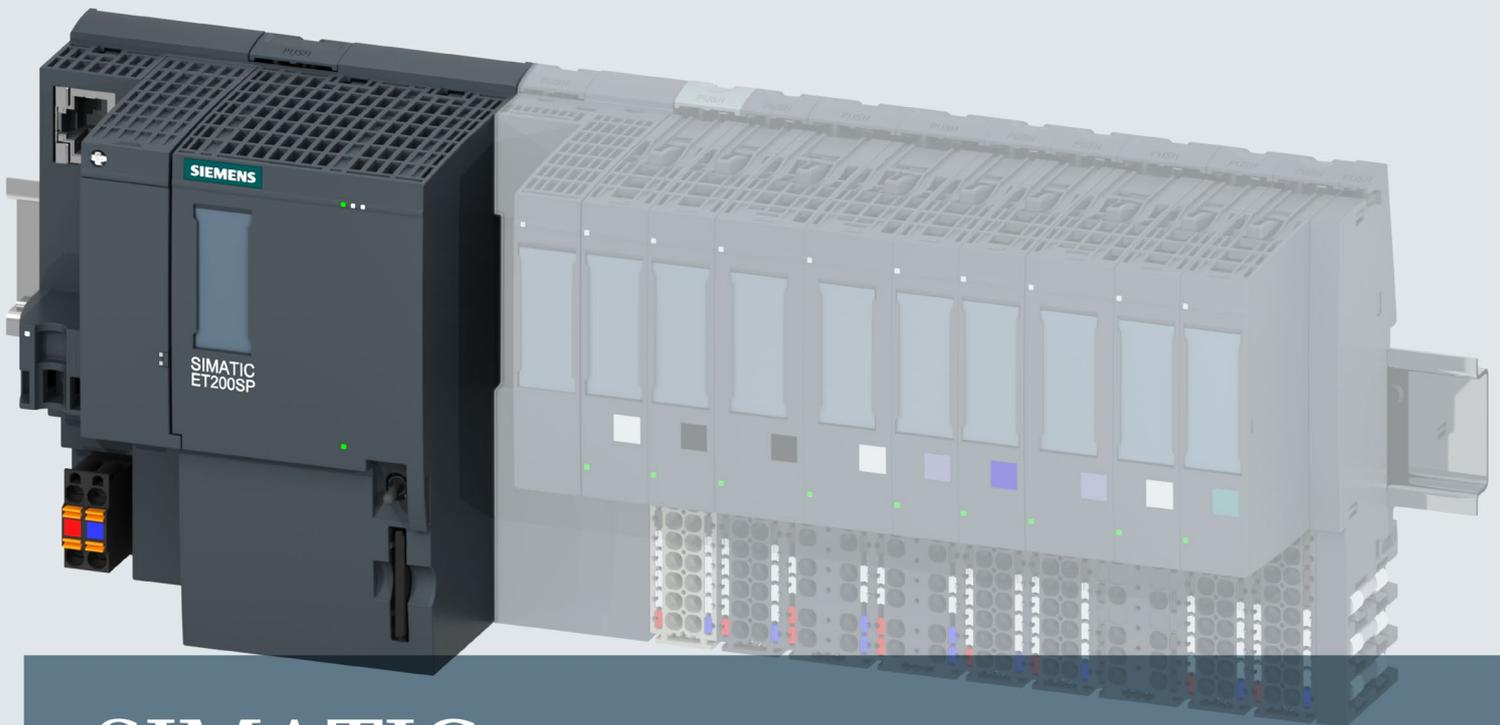


**SIEMENS**



# SIMATIC

ET 200SP

CPU 1512SP-1 PN (6ES7512-1DK01-0AB0)

Manual

Edition

09/2016

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# SIEMENS

## SIMATIC

ET 200SP  
CPU 1512SP-1 PN  
(6ES7512-1DK01-0AB0)

Manual

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## Legal information

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indicates that death or severe personal injury <b>will</b> result if proper precautions are not taken.
 <b>WARNING</b>
indicates that death or severe personal injury <b>may</b> result if proper precautions are not taken.
 <b>CAUTION</b>
indicates that minor personal injury can result if proper precautions are not taken.
<b>NOTICE</b>
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# Preface

## Purpose of the documentation

This manual supplements the ET 200SP distributed I/O system (<http://support.automation.siemens.com/WW/view/en/58649293>) system manual as well as the function manuals. This manual contains a description of the module-specific information. The system-related functions are described in the system manual. All system-spanning functions are described in the function manuals.

The information provided in this manual and the system manual allows you to commission the CPU 1512SP-1 PN.

## Conventions

STEP 7: In this documentation, "STEP 7" is used as a synonym for all versions of the configuration and programming software "STEP 7 (TIA Portal)".

Please also observe notes marked as follows:

---

### Note

A note contains important information on the product described in the documentation, on the handling of the product or on the section of the documentation to which particular attention should be paid.

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- **Application examples**

Tools and examples to solve your automation tasks – as well as function blocks, performance information and videos.

- **Services**

Information about Industry Services, Field Services, Technical Support, spare parts and training offers.

- **Forums**

For answers and solutions concerning automation technology.

- **mySupport**

Your personal working area in Industry Online Support for messages, support queries, and configurable documents.

This information is provided by the Siemens Industry Online Support in the Internet (<http://www.siemens.com/automation/service&support>).

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The Industry Mall is the catalog and order system of Siemens AG for automation and drive solutions on the basis of Totally Integrated Automation (TIA) and Totally Integrated Power (TIP).

Catalogs for all the products in automation and drives are available on the Internet (<https://mall.industry.siemens.com>).

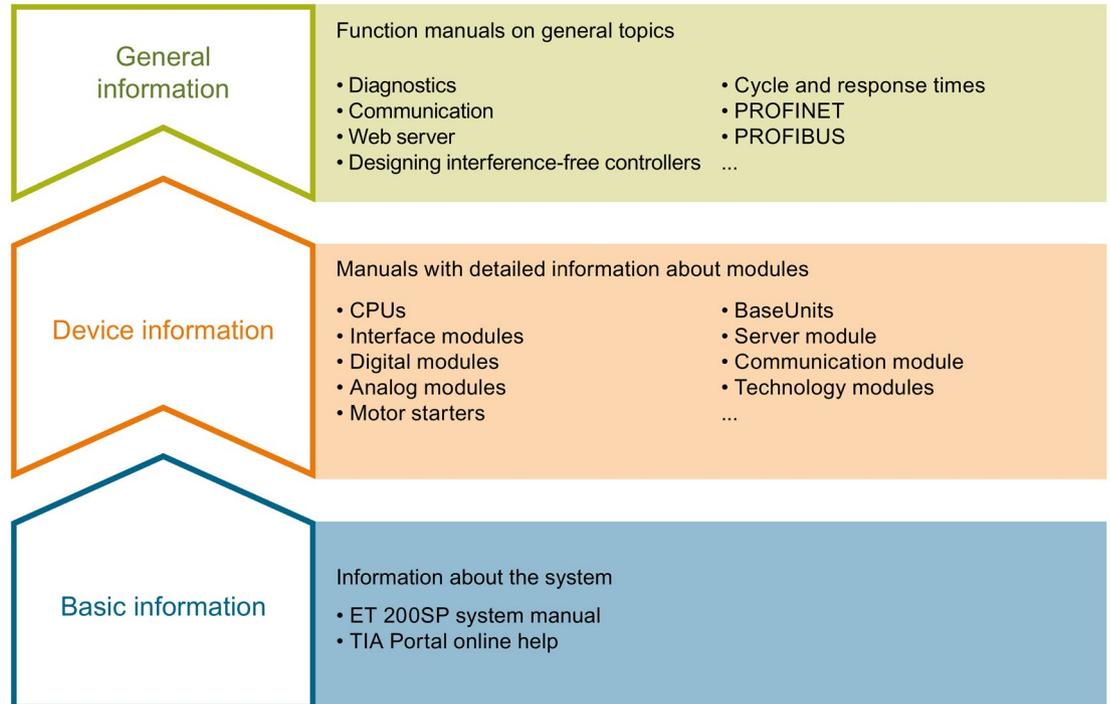
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# Documentation guide

The documentation for the SIMATIC ET 200SP distributed I/O system is arranged into three areas.

This arrangement enables you to access the specific content you require.



## Basic information

The system manual describes in detail the configuration, installation, wiring and commissioning of the SIMATIC ET 200SP. distributed I/O system. The STEP 7 online help supports you in the configuration and programming.

## Device information

Product manuals contain a compact description of the module-specific information, such as properties, wiring diagrams, characteristics and technical specifications.

### General information

The function manuals contain detailed descriptions on general topics regarding the SIMATIC ET 200SP distributed I/O system, e.g. diagnostics, communication, Web server, motion control and OPC UA.

You can download the documentation free of charge from the Internet (<http://w3.siemens.com/mcms/industrial-automation-systems-simatic/en/manual-overview/tech-doc-et200/Pages/Default.aspx>).

Changes and supplements to the manuals are documented in a Product Information.

You can download the product information free of charge from the Internet (<https://support.industry.siemens.com/cs/us/en/view/73021864>).

### Manual Collection ET 200SP

The Manual Collection contains the complete documentation on the SIMATIC ET 200SP distributed I/O system gathered together in one file.

You can find the Manual Collection on the Internet (<http://support.automation.siemens.com/WW/view/en/84133942>).

### "mySupport"

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## "mySupport" - CAx Data

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You configure your own download package with a few clicks.

In doing so you can select:

- Product images, 2D dimension drawings, 3D models, internal circuit diagrams, EPLAN macro files
- Manuals, characteristics, operating manuals, certificates
- Product master data

You can find "mySupport" - CAx Data in the Internet (<http://support.industry.siemens.com/my/ww/en/CAxOnline>).

## Application examples

The application examples support you with various tools and examples for solving your automation tasks. Solutions are shown in interplay with multiple components in the system - separated from the focus in individual products.

You can find the application examples on the Internet (<https://support.industry.siemens.com/sc/ww/en/sc/2054>).

## TIA Selection Tool

With the TIA Selection Tool, you can select, configure and order devices for Totally Integrated Automation (TIA).

This tool is the successor of the SIMATIC Selection Tool and combines the known configurators for automation technology into one tool.

With the TIA Selection Tool, you can generate a complete order list from your product selection or product configuration.

You can find the TIA Selection Tool on the Internet (<http://w3.siemens.com/mcms/topics/en/simatic/tia-selection-tool>).

## SIMATIC Automation Tool

You can use the SIMATIC Automation Tool to run commissioning and maintenance activities simultaneously on various SIMATIC S7 stations as a bulk operation independently of the TIA Portal.

The SIMATIC Automation Tool provides a multitude of functions:

- Scanning of a PROFINET/Ethernet network and identification of all connected CPUs
- Address assignment (IP, subnet, gateway) and station name (PROFINET device) to a CPU
- Transfer of the data and the programming device/PC time converted to UTC time to the module
- Program download to CPU
- Operating mode switchover RUN/STOP
- Localization of the CPU by means of LED flashing
- Reading out CPU error information
- Reading the CPU diagnostic buffer
- Reset to factory settings
- Updating the firmware of the CPU and connected modules

You can find the SIMATIC Automation Tool on the Internet (<https://support.industry.siemens.com/cs/ww/en/view/98161300>).

## PRONETA

With SIEMENS PRONETA (PROFINET network analysis), you analyze the plant network during commissioning. PRONETA features two core functions:

- The topology overview independently scans PROFINET and all connected components.
- The IO check is a fast test of the wiring and the module configuration of a system.

You can find SIEMENS PRONETA on the Internet (<https://support.industry.siemens.com/cs/ww/en/view/67460624>).

# Product overview

## 2.1 New functions in firmware version V2.0

### New functions of the CPU in firmware version V2.0

This section lists the new features of the CPU with firmware version V2.0.

You can find additional information in the sections of this manual.

Table 2- 1 New functions of the CPU with firmware version 2.0 compared with firmware version V1.8

New functions	Applications	Customer benefits
<b>OPC UA server</b>	<p>You realize the data communication between different systems, both within the process level and on the control and enterprise levels:</p> <ul style="list-style-type: none"> <li>To embedded systems with controllers</li> <li>To controllers with MES systems and systems of the enterprise level (ERP, asset systems)</li> <li>To Siemens controllers with controllers from other manufacturers</li> <li>To intelligent sensors with controllers</li> </ul> <p>Supported standard: OPC Data Access, DA.</p>	<p>OPC UA is a unified standard for data communication and is independent of any particular operating system platforms.</p> <p>You have integrated security mechanisms on different automation systems, for example, for data exchange, on the application level, for authentication of the user.</p> <p>OPC UA servers provide a large amount of data:</p> <ul style="list-style-type: none"> <li>Values of PLC tags that clients can access</li> <li>Data types of these PLC tags</li> <li>Information about the OPC UA server itself and the CPU</li> </ul> <p>In this way, clients can gain an overview and can read and write values.</p>
<b>PROFINET IO</b>		
MRPD: Media Redundancy for Planned Duplication for IRT	PROFINET IO IRT enables you to realize applications that place particularly high demands on failure safety and accuracy (isochronous).	By sending the cyclic IO data in both directions in the ring, the communication to the IO devices is maintained even when the ring is interrupted and does not result in device failure even with fast update times. You achieve higher failure safety than with MRP.
PROFINET performance upgrade	You can develop applications with high demands on speed and clock cycles. This is interesting for applications with high demands on performance.	Better utilization of the bandwidth results in short reaction times.
Limitation of the data infeed into the network	You limit the network load for standard Ethernet communication to a maximum value.	You smooth peaks in the data infeed. You share the remaining bandwidth based on requirements.

2.1 New functions in firmware version V2.0

New functions	Applications	Customer benefits
<b>Web server</b>		
Backing up and restoring via the Web server	You can, for example, backup and restore the configuration of the CPU to the PG/PC on which the Web server is running.	You can make a backup copy of an operational project without STEP 7. In an "emergency", you can simply use an existing configuration without STEP 7, for example, during commissioning or after a program download.
Web server provides up to three project languages for comments and alarm texts	When you export your plants worldwide, for example, comments or alarm texts can be stored on the card in up to 3 languages. For example, German - author's language, English - internationally usable, Portuguese - end user's language.	You provide customers with better service.
Trace via Web server	When you enable trace functions via the Web server, you have better service support. You can send your trace recordings via Web service, for example, to your service partner.	You get plant/project information for diagnostics and maintenance requirements without STEP 7. You can provide trace recordings for each Web server.
Monitoring of configured technology objects via a Web server	You can monitor statuses, errors, technology alarms and the current values of technology objects (TOs) with the Web server.	You save time in troubleshooting.
<b>Motion control</b>		
Greater number of axes for Motion Control applications and new technology objects: Output cam, cam track and measuring input	Speed specification, e.g. for: <ul style="list-style-type: none"> <li>• Pumps, fans, mixers</li> <li>• Conveyor belts</li> <li>• Auxiliary drives</li> </ul> Positioning tasks, e.g.: <ul style="list-style-type: none"> <li>• Lifting and vertical conveyors</li> <li>• Feeding and gate control</li> <li>• Palletizing equipment</li> </ul> Output cams and cam tracks make other applications possible, e.g.: <ul style="list-style-type: none"> <li>• Applying glue tracks</li> <li>• Triggering switching operations with precise positioning</li> <li>• Very precise processing of products on a conveyor belt</li> </ul> Measuring inputs are used, for example: <ul style="list-style-type: none"> <li>• For measuring products</li> <li>• For detecting the position of the product on a conveyor belt</li> </ul>	You can implement additional Motion Control applications with a CPU. The scalable configuration limits allow you to handle all types of application. High machine speeds result in greater productivity with better accuracy.

New functions	Applications	Customer benefits
<b>ET 200SP</b>		
Support for ET 200AL in a central configuration	<p>You can set up a simple connection of IP 65/67 I/O to the CPU.</p> <p>You can connect up to 16 ET 200AL I/O modules via a BA send module on the central bus of the ET 200SP CPU. The distance between two ET 200AL modules can be up to 15 m.</p> <p>You can realize the use of ET 200AL in assembly and handling engineering directly at moving parts, for example in linear axes or drag chains.</p>	<p>You do not have to individually run sensors or actuators at the central control cabinet to the different sections of a machine or assembly line.</p> <p>You save time and costs:</p> <ul style="list-style-type: none"> <li>• Through lightweight construction</li> <li>• Reduction of wear and exposure to vibration</li> <li>• Increased productivity</li> </ul>
Increasing the address space in the station	For example, you can use up to 49 ET 200SP energy meter modules behind an ET 200SP CPU.	<p>A larger address space of 2560 bytes (2048 bytes for ET 200SP module + 512 bytes for ET 200AL modules) is available in the station.</p> <p>The address space has been increased to 288 bytes per module.</p>
BusAdapter with glass-fiber interface	You can achieve long distances (up to 3 km) between the PROFINET devices.	
Support for communications processors		
CP 1542SP-1	Flexible expansion of the ET 200SP system with an additional Ethernet interface; network separation.	
CP 1542SP-1 IRC	Seamless data recording with time stamping, support for standardized telecontrol protocols DNP3 and IEC.	
CP 1543SP-1 ISEC	With the integrated security functions firewall (Stateful Inspection) and VPN protocol (IPSec), the communications processor protects ET200SP stations and subordinate networks against unauthorized access, and employs encryption to protect data transmission against manipulation and espionage.	

## 2.2 Operating principle

The CPU contains the operating system and executes the user program. The user program is located on the SIMATIC memory card and is processed in the work memory of the CPU.

The PROFINET interfaces on the CPU allow simultaneous communication with PROFINET devices, PROFINET controllers, HMI devices, programming devices, other controllers and other systems. The CPU 1512SP-1 PN supports operation as an IO controller, I-device or standalone CPU.

With its optional PROFIBUS interface, CM DP, CPU 1512SP-1 PN supports the configuration of PROFIBUS networks in addition to PROFINET IO. When you use the interface as a PROFIBUS DP interface, you can configure the CPU 1512SP-1 PN as a DP master or as an intelligent DP slave (I-slave).

### IO controller

CPU 1512SP-1 PN sends and receives data from the connected IO devices within a PROFINET IO system. You can operate the CPU with a maximum of 128 connected IO devices, a maximum of 64 of which use IRT (Isochronous Realtime).

### I-device

The "I-device" (intelligent IO device) functionality allows you to exchange data with an IO controller. CPU 1512SP-1 PN thus fulfills the role of an intelligent distributed pre-processing unit for sub-processes. The I-device is connected as an IO device to a higher-level IO controller for this purpose.

Advantages:

- Interference-resistant configuration due to short signal and encoder wiring
- Reduced wiring requirements for transmission of the data via PROFINET

### Standalone CPU

You can also use the CPU 1512SP-1 PN in the ET 200SP distributed I/O system as a "central system" without a higher-level controller.

### DP master

To use the ET 200SP as a DP master, you need the CPU and the optional communication module, CM DP. When used as a DP master, ET 200SP exchanges data with the connected DP slaves via PROFIBUS DP.

### Intelligent DP slave (I-slave)

To use the ET 200SP as an intelligent DP slave (I-slave), you need the CPU and the optional communication module, CM DP. As an I-slave, the ET 200SP CPU is connected via PROFIBUS DP to a higher-level DP master and exchanges data with it.

## 2.3 Properties

### Article number

6ES7512-1DK01-0AB0

### View of the module

The following figure shows the CPU 1512SP-1 PN.

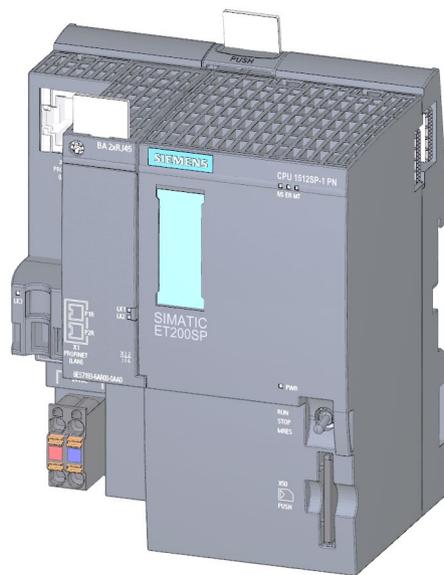


Figure 2-1 CPU 1512SP-1 PN

## Properties

The CPU 1512SP-1 PN has the following technical properties:

1. Communication:

– Interfaces

The CPU 1512SP-1 PN has a PROFINET interface (X1 P3) with an integrated 3-port switch. Port 1 and port 2 are located on the optionally pluggable BusAdapter. Port 3 is integrated in the housing of the CPU. You connect the PROFINET IO to the CPU via the BusAdapter. You will find information on the BusAdapters supported by the CPU in section Wiring (Page 22).

In addition to PROFINET basic functionality, the interface also supports PROFINET IO RT (real-time) and IRT (isochronous real-time). PROFINET IO communication or real-time settings can be configured. The basic functionality of PROFINET supports HMI communication, communication with the configuration system, communication with a higher-level network (backbone, router, Internet) and communication with another machine or automation cell.

Port 1 and port 2 can also be used as ring ports for the configuration of redundant ring structures in Ethernet.

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**Note**

The CPU is delivered without a BusAdapter. You can find the article numbers of the supported BusAdapters in the "Accessories/spare parts" section of the ET 200SP distributed automation system

(<http://support.automation.siemens.com/WW/view/en/58649293>) system manual.

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The CM DP is optionally available with a PROFIBUS interface (X2). You can find additional information about this expansion module in the manual Communication module CM DP (<http://support.automation.siemens.com/WW/view/en/90156526>).

You can find information about connecting the PROFINET IO BusAdapter to the CPU as well as connecting the optional PROFIBUS interface to the interface module in the system manual ET 200SP distributed I/O system

(<http://support.automation.siemens.com/WW/view/en/58649293>).

– OPC UA

With OPC UA, data is exchanged via an open and vendor-neutral communication protocol. The CPU, as OPC UA server, can communicate with OPC UA clients such as HMI panels, SCADA systems, etc.

- Integrated Web server:

A Web server is integrated in the CPU. You can read out the following information with the Web server:

  - Start page with general CPU information
  - Identification information
  - Contents of the diagnostics buffer
  - Query of module states
  - Firmware update
  - Alarms (without acknowledgment option)
  - Information about communication
  - PROFINET topology
  - Tag status, writing tags
  - Watch tables
  - Memory usage
  - User pages
  - Data logs (if used)
  - Online backup and restoration of the configuration.
  - Diagnostic information for the motion control technology objects
  - Display of trace recordings stored on the SIMATIC memory card
  - Readout service data
  - Basic Web pages
  - Display of the Web server in 3 project languages, for example, comments and message texts
  - Recipes
  - User-defined Web pages
- Integrated technology:
  - Motion Control

The Motion Control functionality uses technology objects to support speed-controlled axes, positioning axes, synchronous axes, external encoders, cams, cam tracks and measuring inputs, as well as PLCopen blocks for programming the motion control functionality.

You can find a detailed description of the use of Motion Control and its configuration in the S7-1500 Motion Control (<http://support.automation.siemens.com/WW/view/en/109739589>) function manual.

You can also use the TIA Selection Tool (<http://w3.siemens.com/mcms/topics/en/simatic/tia-selection-tool>) or the SIZER (<http://w3.siemens.com/mcms/mc-solutions/en/engineering-software/drive-design-tool-sizer/Pages/drive-design-tool-sizer.aspx>) to create or configure axes.
  - Integrated closed-loop control functionality
    - PID Compact (continuous PID controller)
    - PID 3Step (step controller for integrating actuators)
    - PID Temp (temperature controller for heating and cooling with two separate actuators)

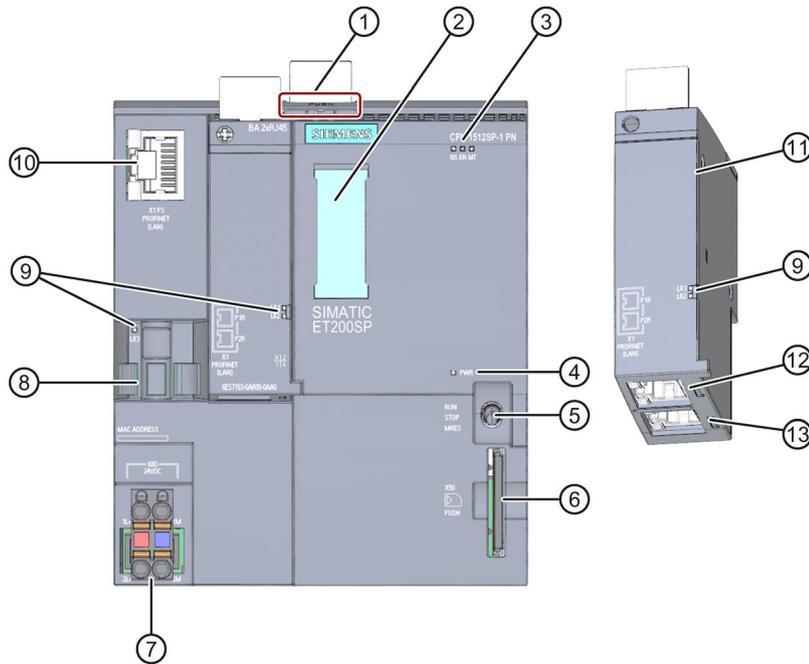
- Trace functionality:
  - Trace functionality supports you in troubleshooting and optimizing the user program, especially for motion control or closed-loop control applications. Trace only supports saves measurements on a SIMATIC memory card.  
You will find additional information on "Trace" in the Using the trace and logic analyzer function (<http://support.automation.siemens.com/WW/view/en/64897128>) function manual.
- Integrated system diagnostics:
  - The alarms for the system diagnostics are automatically created by the system and displayed on a PG/PC, HMI device or the Web server. System diagnostics information is also available when the CPU is in STOP mode.
- Integrated security:
  - Know-how protection  
The assignment of passwords protects user blocks against unauthorized access and modifications.
  - Copy protection  
Copy protection links user blocks to the serial number of the SIMATIC memory card or to the serial number of the CPU. User programs cannot run without the corresponding SIMATIC memory card or CPU.
  - Access protection  
Extended access protection provides high-quality protection against unauthorized configuration changes. You can use authorization levels to assign separate rights to different user groups.
  - Integrity protection  
The system protects the data transferred to the CPU against manipulation. The CPU detects erroneous or manipulated engineering data.  
You can find additional information on the topic of "Protection" in the system manual ET 200SP distributed I/O system (<http://support.automation.siemens.com/WW/view/en/58649293>).
- Support for ET 200AL
  - Simple connection of IP 65/67 I/O modules to the CPU.
- Communication CPs
  - CP 1542SP-1: Flexible expansion of the ET 200SP system with an additional Ethernet interface; network separation.
  - CP 1542SP-1 IRC: Seamless data recording with time stamping, support for standardized telecontrol protocols DNP3 and IEC.
  - CP 1543SP-1 ISEC: With the integrated security functions firewall (Stateful Inspection) and VPN protocol (IPSec), the communications processor protects ET200SP stations and subordinate networks against unauthorized access, and employs encryption to protect data transmission against manipulation and espionage.

- Address space
  - A larger address space of 2560 bytes (2048 bytes for ET 200SP module + 512 bytes for ET 200AL modules) is available within the station.
- CPU 1512SP-1 PN supports the following additional functions:
  - PROFlenergy  
You can find information on the topic of "PROFlenergy" in the PROFINET function manual (<https://support.industry.siemens.com/cs/ww/en/view/49948856>) and in the PROFINET specification on the Internet (<http://www.profibus.com>).
  - Shared device  
You can find information on the topic of "Shared device" in the PROFINET function manual (<https://support.industry.siemens.com/cs/ww/en/view/49948856>).
  - Configuration control  
You can find information on the topic of "Configuration control" in the system manual ET 200SP distributed I/O system (<http://support.automation.siemens.com/WW/view/en/58649293>).
  - Isochronous mode  
You can find information about the "Isochronous mode" topic in the PROFINET (<https://support.industry.siemens.com/cs/ww/en/view/49948856>) function manual.

## 2.4 Operating and display elements

### 2.4.1 Front view of the module with BusAdapter

The figure on the left shows the CPU 1512SP-1 PN including a plugged BA 2xRJ45 BusAdapter. The figure on the right shows a separate view of the BA 2xRJ45 BusAdapter.



- ① Mounting rail release
- ② Labeling strips
- ③ LEDs for status and error displays
- ④ LED for display of the supply voltage
- ⑤ Mode switch
- ⑥ Slot for the SIMATIC memory card
- ⑦ Connection for supply voltage (included in product package)
- ⑧ Cable support and attachment for port P3 of the PROFINET interface
- ⑨ LEDs for status displays of the PROFINET interface: LK1 and LK2 on BusAdapter, LK3 on CPU
- ⑩ Port P3 of the PROFINET interface: RJ45 socket
- ⑪ Separate view of the BusAdapter
- ⑫ Port P1 R of the PROFINET interface: RJ45 socket on BusAdapter BA 2xRJ45  
R: Ring port for configuring a ring topology with media redundancy
- ⑬ Port P2 R of the PROFINET interface: RJ45 socket on BusAdapter BA 2xRJ45  
R: Ring port for configuring a ring topology with media redundancy

Figure 2-2 Front view of the CPU 1512SP-1 PN with BusAdapter

## 2.5 Mode switch

Use the mode switch to set the CPU operating mode.

The following table shows the position of the switch and the corresponding meaning.

Table 2- 2 Mode switch settings

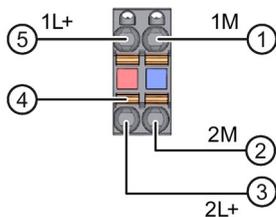
Position	Meaning	Explanation
RUN	RUN mode	The CPU is executing the user program.
STOP	STOP mode	The user program is not being executed.
MRES	Memory reset	Position for CPU memory reset.

This section provides information on the pin assignment of the individual interfaces and the block diagram of the CPU 1512SP-1 PN.

### 24 V DC supply voltage (X80)

The connector for the supply voltage is plugged in when the CPU ships from the factory.

The figure below shows the pin assignment for 24 V DC supply voltage.



- ① Ground of the supply voltage
- ② Ground of the supply voltage for loop-through (maximum of 10 A permitted)
- ③ +24 V DC of the supply voltage for loop-through (maximum of 10 A permitted)
- ④ Spring NC contacts
- ⑤ + 24 V DC of the supply voltage

Internally jumpered:

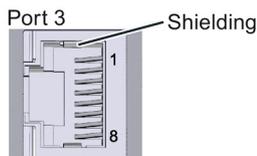
- ① and ②
- ③ and ⑤

Figure 3-1 Supply voltage connection

### PROFINET IO interface on the CPU (X1 P3)

The assignment corresponds to the Ethernet standard for an RJ45 connector.

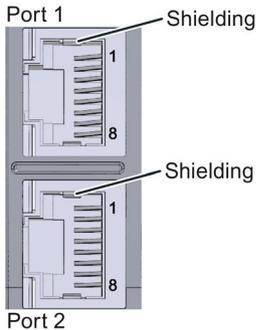
- When autonegotiation is deactivated, the RJ45 socket is allocated as a switch (MDI-X).
- If autonegotiation is activated, then autocrossing is active and the RJ45 socket has either a device assignment (MDI) or switch assignment (MDI-X).



### PROFINET IO interface on the BusAdapter BA 2xRJ45 (X1 P1 R and X1 P2 R)

The assignment at the BA 2xRJ45 BusAdapter corresponds to the Ethernet standard for an RJ45 connector.

Table 3- 1 Pin assignment PROFINET IO interface on the BusAdapter BA 2xRJ45

View	Designation
 <p>The diagram shows two RJ45 ports, Port 1 and Port 2, stacked vertically. Each port has a central shielded area and two rows of pins. The top row of pins is labeled '1' and the bottom row is labeled '8'. Labels 'Shielding' point to the central area of each port. The top port is labeled 'Port 1' and the bottom port is labeled 'Port 2'.</p>	<ul style="list-style-type: none"> <li>• When autonegotiation is deactivated, the RJ45 socket is allocated as a switch (MDI-X).</li> <li>• If autonegotiation is activated, then autocrossing is active and the RJ45 socket has either a device assignment (MDI) or switch assignment (MDI-X).</li> </ul>

### PROFINET IO interface on the BusAdapter BA 2xFC (X1 P1 R and X1 P2 R)

The following table shows the pin assignment for the PROFINET IO interface on the BusAdapter BA 2xFC.

Table 3- 2 Pin assignment PROFINET IO interface on the BusAdapter BA 2xFC

View	Signal name	Designation
	1	TD Transmit data +
	2	TD_N Transmit data -
	3	RD Receive data +
	4	RD_N Receive data -

### PROFINET IO interface with BusAdapter BA 2×LC (X1 P1 R and X1 P2 R) (as of V2.0)

The following table shows the signal names and description of the pin assignment for the BA 2×LC BusAdapter.

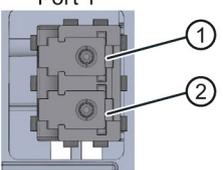
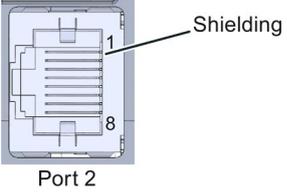
Table 3- 3 Pin assignment PROFINET IO with BusAdapter BA 2×LC

View	Signal name	Designation
	①	Receiver/Receive data
	②	Sender/Transmit data

### PROFINET IO interface with BusAdapter BA LC/RJ45 (X1 P1 R and X1 P2 R) (as of V2.0)

The following table shows the signal names and description of the pin assignment for the BA LC/RJ45 BusAdapter.

Table 3- 4 Pin assignment PROFINET IO with BusAdapter BA LC/RJ45

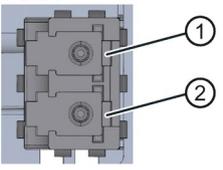
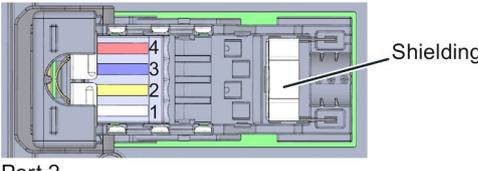
View	Signal name	Designation
	①	Receiver/Receive data
	②	Sender/Transmit data
	<b>RJ45, Port2</b> <ul style="list-style-type: none"> <li>When autonegotiation is deactivated, the RJ45 socket is allocated as a switch (MDI-X).</li> <li>If autonegotiation is activated, then auto-crossing is active and the RJ45 socket has either a device assignment (MDI) or switch assignment (MDI-X).</li> </ul>	

### PROFINET IO interface with BusAdapter BA LC/FC (X1 P1 R and X1 P2 R) (as of V2.0)

The following table shows the signal names and description of the pin assignment for the BA LC/FC BusAdapter.

The I/Os of the BA LC/FC BusAdapter are shown individually for a clearer overview.

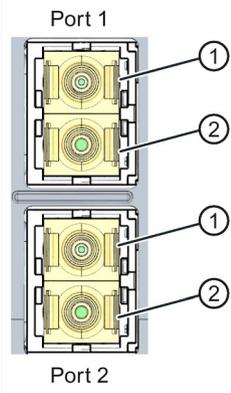
Table 3- 5 PROFINET IO pin assignment with BusAdapter BA LC/FC

View	Signal name	Designation	
	①	Receiver/Receive data	
	②	Sender/Transmit data	
	1	TD	Transmit data +
	2	TD_N	Transmit data -
	3	RD	Receive data +
	4	RD_N	Receive data -

### PROFINET IO interface with BusAdapter BA 2×SCRJ (X1 P1 R and X1 P2 R)

The following table shows the signal names and description of the pin assignment for the BA 2×SCRJ BusAdapter.

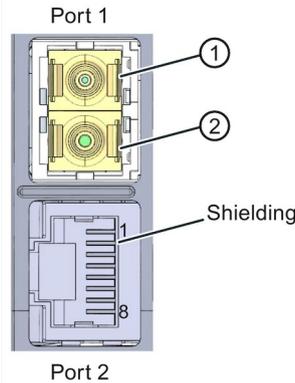
Table 3- 6 PROFINET IO pin assignment with BusAdapter BA 2×SCRJ

View	Signal name	Designation
	①	Receiver/Receive data
	②	Sender/Transmit data

### PROFINET IO interface with BusAdapter BA SCRJ/RJ45 (X1 P1 R and X1 P2 R)

The following table shows the signal names and description of the pin assignment for the BA SCRJ/RJ45 BusAdapter.

Table 3- 7 Pin assignment PROFINET IO with BusAdapter BA SCRJ/RJ45

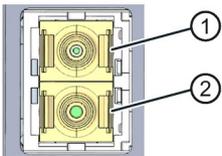
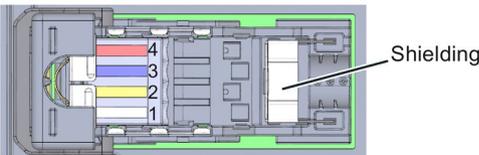
View	Signal name	Designation
	①	Receiver/Receive data
	②	Sender/Transmit data
<b>RJ45, Port2</b> <ul style="list-style-type: none"> <li>When autonegotiation is deactivated, the RJ45 socket is allocated as a switch (MDI-X).</li> <li>If autonegotiation is activated, then auto-crossing is active and the RJ45 socket has either a device assignment (MDI) or switch assignment (MDI-X).</li> </ul>		

## PROFINET IO with BusAdapter BA SCRJ/FC (X1 P1 R and X1 P2 R)

The following table shows the signal names and description of the pin assignment for the BA SCRJ/FC BusAdapter.

The pin assignment for the BA SCRJ/FC BusAdapter is shown individually for a clearer overview.

Table 3- 8 PROFINET IO pin assignment with BusAdapter BA SCRJ/FC

View	Signal name	Designation
Port 1 	①	Receiver/Receive data
	②	Sender/Transmit data
 Port 2	1 TD	Transmit data +
	2 TD_N	Transmit data -
	3 RD	Receive data +
	4 RD_N	Receive data -

## Reference

You can find additional information on the topics of "Connecting the CPU" and "Accessories/spare parts" in the system manual ET 200SP distributed I/O system (<http://support.automation.siemens.com/WW/view/en/58649293>).

## Assignment of the MAC addresses

The MAC address is a globally unique device identifier that is assigned to each PROFINET device in the factory. Its 6 bytes are divided into 3 bytes for the manufacturer ID and 3 bytes for the device ID (serial number). The front of the CPU 1512SP-1 PN is lasered with the MAC address of the PROFINET interface.

The PROFINET interface (X1) of the CPU 1512SP-1 PN has three ports. Port 3 is located on the CPU. Ports 1 and 2 are located on the optional BusAdapter. In addition to the PROFINET interface, each PROFINET port also has a separate MAC address. There is therefore a total of four MAC addresses for the CPU 1512SP-1 PN.

The MAC addresses of the PROFINET ports are needed for the LLDP protocol, for example for the neighborhood discovery function.

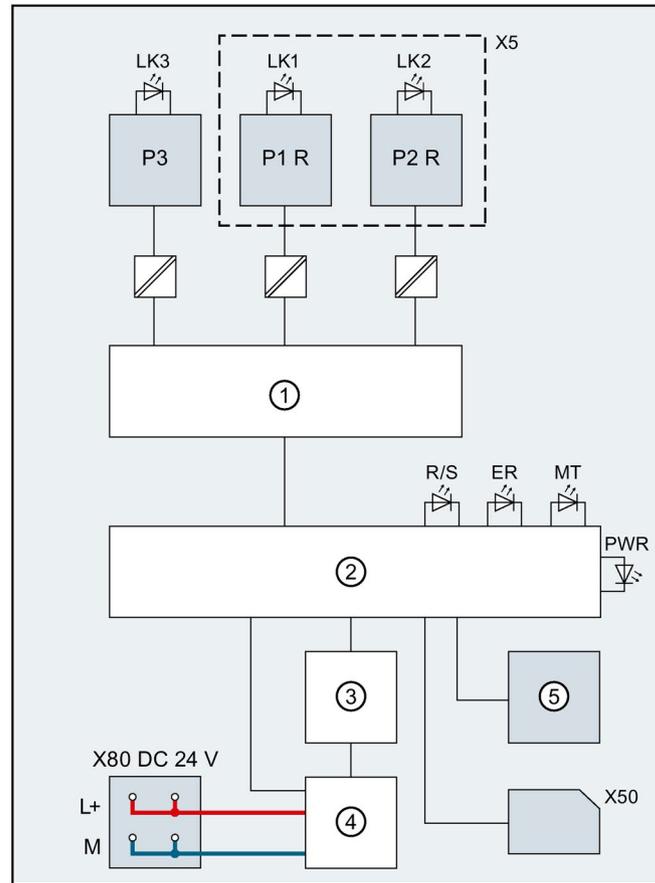
The table below shows how the MAC addresses are assigned.

Table 3- 9 Assignment of the MAC addresses

	<b>Assignment</b>
<b>MAC address 1</b>	PROFINET interface X1 <ul style="list-style-type: none"><li>• Visible in STEP 7 for accessible devices</li><li>• Lasered on the front of the CPU (start of the number range)</li></ul>
<b>MAC address 2</b>	Port X1 P1 R (required for LLDP, for example)
<b>MAC address 3</b>	Port X1 P2 R (required for LLDP, for example)
<b>MAC address 4</b>	Port X1 P3 (required for LLDP, for example)

### Block diagram

The following figure shows the block diagram of the CPU 1512SP-1 PN.



- |             |                             |           |                              |
|-------------|-----------------------------|-----------|------------------------------|
| ①           | PROFINET switch             | P1 R      | PROFINET interface X1 Port 1 |
| ②           | Electronics                 | P2 R      | PROFINET interface X1 Port 2 |
| ③           | Backplane bus interface     | P3        | PROFINET interface X1 Port 3 |
| ④           | Internal supply voltage     | L+        | 24 V DC supply voltage       |
| ⑤           | RUN/STOP/MRES mode selector | M         | Ground                       |
| X5          | BusAdapter                  | LK1, 2, 3 | LED Link TX/RX               |
| X50         | SIMATIC memory card         | R/S       | RUN/STOP LED (yellow/green)  |
| X80 24 V DC | Infeed of supply voltage    | ER        | ERROR LED (red)              |
|             |                             | MT        | MAINT LED (yellow)           |
|             |                             | PWR       | POWER LED (green)            |

Figure 3-2 Block diagram of the CPU 1512SP-1 PN

# Interrupts, error messages, diagnostics and system alarms

# 4

The status and error displays of the CPU 1512SP-1 PN are described below.

You will find additional information on "Interrupts" in the STEP 7 online help.

You can find additional information on the topics of "Diagnostics" and "System alarms" in the Diagnostics (<http://support.automation.siemens.com/WW/view/en/59192926>) function manual.

## 4.1 Status and error display of the CPU

### LED displays

The figure below shows the LED displays of the CPU 1512SP-1 PN and the BA 2xRJ45 BusAdapter.

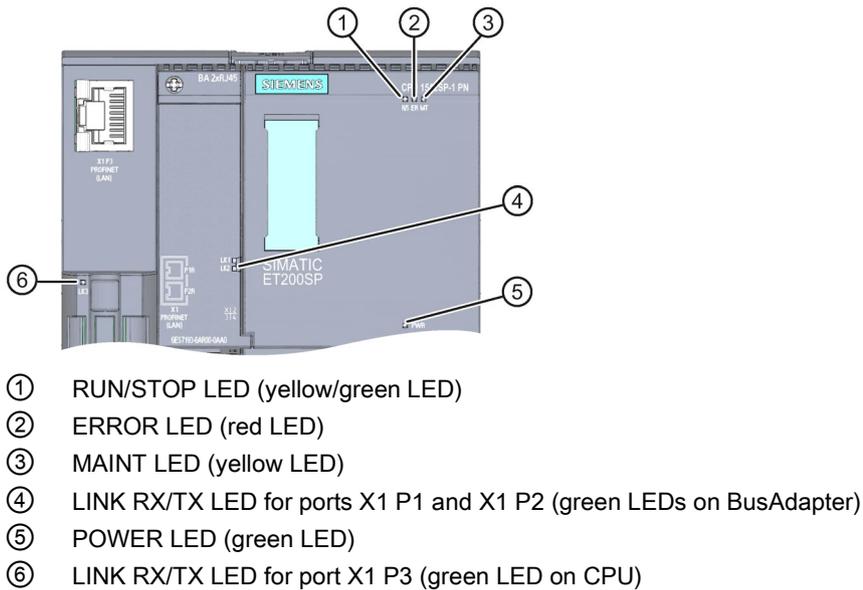


Figure 4-1 LED displays on the CPU and BusAdapter

### Meaning of the POWER, RUN/STOP, ERROR and MAINT LEDs

CPU 1512SP-1 PN features an LED for monitoring the supply voltage of the electronics (PWR) and three LEDs for displaying the current operating and diagnostics status. The following table shows the meaning of the various combinations of colors for the POWER, RUN/STOP, ERROR and MAINT LEDs.

Table 4- 1 Meaning of the LEDs

POWER LED	RUN/STOP LED	ERROR LED	MAINT LED	Meaning
 LED off	 LED off	 LED off	 LED off	Missing or insufficient supply voltage on the CPU.
 LED lit green	 LED off	 LED flashes red	 LED off	An error has occurred.
 LED lit green	 LED lit green	 LED off	 LED off	CPU is in RUN mode.
 LED lit green	 LED lit green	 LED flashes red	 LED off	A diagnostics event is pending.
 LED lit green	 LED lit green	 LED off	 LED lit yellow	Maintenance demanded for the plant. The affected hardware must be checked/replaced within a short period of time.
				Active Force job
				PROFenergy pause
 LED lit green	 LED lit green	 LED off	 LED flashes yellow	Maintenance required for the plant. The affected hardware must be checked/replaced within a foreseeable period of time.
				Bad configuration
 LED lit green	 LED lit yellow	 LED off	 LED flashes yellow	Firmware update successfully completed.
 LED lit green	 LED lit yellow	 LED off	 LED off	CPU is in STOP mode.
 LED lit green	 LED lit yellow	 LED flashes red	 LED flashes yellow	The program on the SIMATIC memory card is causing an error.
				CPU defective
 LED lit green	 LED flashes yellow	 LED off	 LED off	CPU is performing internal activities during STOP, e.g. startup after STOP.
				Download of the user program from the SIMATIC memory card
 LED lit green	 LED flashes yellow/green	 LED off	 LED off	Startup (transition from RUN → STOP)
 LED lit green	 LED flashes yellow/green	 LED flashes red	 LED flashes yellow	Startup (CPU booting)
				Test of LEDs during startup, inserting a module.
				LED flashing test

4.1 Status and error display of the CPU

**Meaning of the LINK LED**

Each port has a LINK LED (LK1, LK2, LK3). The table below shows the various "LED scenarios" of ports for the CPU 1512SP-1 PN.

Table 4- 2 Meaning of the LEDs

<b>LINK LED</b>	<b>Meaning</b>
 LED off	There is no Ethernet connection between the PROFINET interface of the PROFINET device and the communication partner. No data is currently being sent/received via the PROFINET interface. There is no LINK connection.
 LED flashes green	The "LED flashing test" is being performed.
 LED lit green	There is an Ethernet connection between the PROFINET interface of your PROFINET device and a communication partner.

# Technical specifications

<b>6ES7512-1DK01-0AB0</b>	
<b>General information</b>	
Product type designation	CPU 1512SP-1 PN
Hardware function version	FS03
Firmware version	V2.0
<b>Engineering with</b>	
STEP 7 TIA Portal can be configured/integrated as of version	V14
<b>Configuration control</b>	
Via data record	Yes
<b>Operator controls</b>	
Mode selector	1
<b>Supply voltage</b>	
Type of supply voltage	24 V DC
Low limit of permitted range (DC)	19.2 V
High limit of permitted range (DC)	28.8 V
Reverse polarity protection	Yes
<b>Power and voltage failure buffering</b>	
Power/voltage failure buffer time	5 ms
<b>Input current</b>	
Current consumption (rated value)	0.6 A
Inrush current, max.	4.7 A; rated value
$I^2t$	0.14 A <sup>2</sup> s
<b>Power</b>	
Incoming power to the backplane bus	8.75 W
<b>Power loss</b>	
Power loss, typ.	5.6 W
<b>Memory</b>	
Number of slots for SIMATIC memory card	1
SIMATIC memory card required	Yes
<b>Work memory</b>	
Integrated (for program)	200 KB
Integrated (for data)	1 MB
<b>Load memory</b>	
Plug-in (SIMATIC memory card), max.	32 GB
<b>Buffering</b>	
Maintenance-free	Yes

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<b>CPU processing times</b>	
For bit operations, typ.	48 ns
For word operations, typ.	58 ns
For fixed-point arithmetic, typ.	77 ns
For floating-point arithmetic, typ.	307 ns
<b>CPU blocks</b>	
Number of elements (total)	2000; blocks (OB/FB/FC/DB) and UDTs
<b>DB</b>	
Number range	1 ... 60 999; divided into: Number range that can be used by user: 1 ... 59 999 and number range for DBs generated by SFC 86: 60 000 ... 60 999
Size, max.	1 MB; for absolutely addressed DBs, the max. size is 64 KB
<b>FB</b>	
Number range	0 ... 65 535
Size, max.	200 KB
<b>FC</b>	
Number range	0 ... 65 535
Size, max.	200 KB
<b>OB</b>	
Size, max.	200 KB
Number of free-cycle OBs	100
Number of time-of-day interrupt OBs	20
Number of time-delay interrupt OBs	20
Number of cyclic interrupt OBs	20
Number of hardware interrupt OBs	50
Number of DPV1 interrupt OBs	3
Number of isochronous mode OBs	1
Number of technology synchronous interrupt OBs	2
Number of startup OBs	100
Number of asynchronous error OBs	4
Number of synchronous error OBs	2
Number of diagnostic interrupt OBs	1
<b>Nesting depth</b>	
Per priority class	24
<b>Counters, timers and their retentivity</b>	
<b>S7 counters</b>	
Quantity	2048
Retentivity	Yes
• can be set	

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<b>IEC counters</b>	
Quantity	Any (only limited by the work memory)
Retentivity	
<ul style="list-style-type: none"> <li>can be set</li> </ul>	Yes
<b>S7 timers</b>	
Quantity	2048
Retentivity	
<ul style="list-style-type: none"> <li>can be set</li> </ul>	Yes
<b>IEC timers</b>	
Quantity	Any (only limited by the work memory)
Retentivity	
<ul style="list-style-type: none"> <li>can be set</li> </ul>	Yes
<b>Data areas and their retentivity</b>	
Total retentive data area (including timers, counters, bit memories), max.	128 KB; for bit memories, timers, counters, DBs and technological data (axes), usable retentive memory: 88 KB
<b>Bit memory</b>	
Number, max.	16 KB
Number of clock memories	8; there are 8 clock memory bits, grouped in one clock memory byte
<b>Data blocks</b>	
Retentivity can be set	Yes
Retentivity preset	No
<b>Local data</b>	
Per priority class, max.	64 KB; max. 16 KB per block
<b>Address area</b>	
Number of IO modules	2048; max. number of modules/submodules
<b>I/O address area</b>	
Inputs	32 KB; all inputs are in the process image
Outputs	32 KB; all outputs are in the process image
Of which per integrated IO subsystem	
<ul style="list-style-type: none"> <li>Inputs (volume)</li> </ul>	8 KB
<ul style="list-style-type: none"> <li>Outputs (volume)</li> </ul>	8 KB
Of which per CM/CP	
<ul style="list-style-type: none"> <li>Inputs (volume)</li> </ul>	8 KB
<ul style="list-style-type: none"> <li>Outputs (volume)</li> </ul>	8 KB
<b>Process image partitions</b>	
Number of process image partitions, max.	32
<b>Address space per module</b>	
Address space per module, max.	288 bytes; for both input and output data

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<b>Address space per station</b> Address space per station, max.	2560 bytes; for central inputs and outputs; depending on configuration; 2048 bytes for ET 200SP modules + 512 bytes for ET 200AL modules
<b>Hardware configuration</b>	
Number of distributed IO systems	32; a distributed IO system is understood to mean the integration of distributed I/O via PROFINET or PROFIBUS communication modules as well as the connection of I/O via AS-i master modules or links (e.g. IE/PB link)
<b>Number of DP masters</b>	
Via CM	1
<b>Number of IO controllers</b>	
Integrated	1
Via CM	0
<b>Rack</b>	
Modules per rack, max.	80; CPU + 64 modules + server module (configuration width max. 1 m) + 16 ET 200AL modules
Number of rows, max.	1
<b>PtP CM</b>	
Number of PtP CMs	The number of PtP CMs that can be connected is only limited by the available slots
<b>Time</b>	
<b>Clock</b>	
Type	Hardware clock
Backup duration	6 wk; at 40 °C ambient temperature, typ.
Deviation per day, max.	10 s; typ.: 2 s
<b>Operating hours counter</b>	
Quantity	16
<b>Time-of-day synchronization</b>	
Supported	Yes
On DP, master	Yes; via CM DP module
On DP, slave	Yes; via CM DP module
In AS, master	Yes
In AS, slave	Yes
On Ethernet via NTP	Yes
<b>Interfaces</b>	
Number of PROFINET interfaces	1
Number of PROFIBUS interfaces	1; via CM DP module
With optical interface	Yes; via BusAdapter
<b>1st interface</b>	

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<b>Interface hardware</b>	
Number of ports	3; 1st integrated + 2nd via BusAdapter
Integrated switch	Yes
RJ45 (Ethernet)	Yes; X1 P3; opt. X1 P1 and X1 P2 via BusAdapter BA 2xRJ45
BusAdapter (PROFINET)	Yes; usable BusAdapters: BA 2x RJ45, BA 2x FC, BA 2x SCRJ, BA SCRJ / RJ45, BA SCRJ / FC, BA 2x LC, BA LC / RJ45, BA LC / FC
<b>Protocols</b>	
PROFINET IO controller	Yes
PROFINET IO device	Yes
SIMATIC communication	Yes
Open IE communication	Yes
Web server	Yes
Media redundancy	Yes
<b>PROFINET IO controller</b>	
Services	
<ul style="list-style-type: none"> <li>• PG/OP communication</li> <li>• S7 routing</li> <li>• Isochronous mode</li> <li>• Open IE communication</li> <li>• IRT</li> <li>• MRP</li> <li>• MRPD</li> <li>• PROFIenergy</li> <li>• Prioritized startup</li> <li>• Number of connectable IO devices, max.</li> <li>• of these, IO devices with IRT, max.</li> <li>• Number of connectable IO devices for RT, max.</li> <li>• of these, in a line topology, max.</li> <li>• Number of IO devices that can be activated/deactivated simultaneously, max.</li> <li>• Number of IO devices per tool, max.</li> <li>• Update times</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes; as MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50</p> <p>Requirement: IRT</p> <p>Yes</p> <p>Yes; max. 32 PROFINET devices</p> <p>128; a total of up to 512 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET</p> <p>64</p> <p>128</p> <p>128</p> <p>8; in total over all interfaces</p> <p>8</p> <p>The minimum value of the update time also depends on the communication allocation setting for PROFINET IO, the number of IO devices and the amount of configured user data</p>

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Update time with IRT	
<ul style="list-style-type: none"> <li>• With send clock of 250 <math>\mu</math>s</li> <li>• With send clock of 500 <math>\mu</math>s</li> <li>• With send clock of 1 ms</li> <li>• with send clock of 2 ms</li> <li>• with send clock of 4 ms</li> <li>• with IRT and "odd" send clock parameter assignment</li> </ul>	<p>250 <math>\mu</math>s to 4 ms; note: with IRT with isochronous mode, the minimum update time of 500 <math>\mu</math>s of the isochronous OB is decisive</p> <p>500 <math>\mu</math>s to 8 ms</p> <p>1 ms to 16 ms</p> <p>2 ms to 32 ms</p> <p>4 ms to 64 ms</p> <p>Update time = set "odd" send clock (any multiple of 125 <math>\mu</math>s: 375 <math>\mu</math>s, 625 <math>\mu</math>s to 3 875 <math>\mu</math>s)</p>
Update time with RT	
<ul style="list-style-type: none"> <li>• With send clock of 250 <math>\mu</math>s</li> <li>• With send clock of 500 <math>\mu</math>s</li> <li>• With send clock of 1 ms</li> <li>• with send clock of 2 ms</li> <li>• with send clock of 4 ms</li> </ul>	<p>250 <math>\mu</math>s to 128 ms</p> <p>500 <math>\mu</math>s to 256 ms</p> <p>1 ms to 512 ms</p> <p>2 ms to 512 ms</p> <p>4 ms to 512 ms</p>
<b>PROFINET IO device</b>	
Services	
<ul style="list-style-type: none"> <li>• PG/OP communication</li> <li>• S7 routing</li> <li>• Isochronous mode</li> <li>• Open IE communication</li> <li>• IRT</li> <li>• MRP</li> <li>• MRPD</li> <li>• PROFIenergy</li> <li>• Shared device</li> <li>• Number of IO controllers with shared device, max.</li> </ul>	<p>Yes</p> <p>Yes</p> <p>No</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes; requirement: IRT</p> <p>Yes</p> <p>Yes</p> <p>4</p>
<b>2nd interface</b>	
<b>Interface hardware</b>	
Number of ports	1
RS 485	Yes; via CM DP module
<b>Protocols</b>	
PROFIBUS DP master	Yes
PROFIBUS DP slave	Yes
SIMATIC communication	Yes

	6ES7512-1DK01-0AB0
<b>Interface hardware</b>	
<b>RJ45 (Ethernet)</b>	
100 Mbps	Yes
Autonegotiation	Yes
Autocrossing	Yes
Industrial Ethernet status LED	Yes
<b>RS 485</b>	
Transmission rate, max.	12 Mbps
<b>Protocols</b>	
<b>Number of connections</b>	
Number of connections, max.	128
Number of connections reserved for ES/HMI/Web	10
Number of connections via integrated interfaces	88
Number of connections per CP/CM	32
Number of S7 routing connections	16
<b>SIMATIC communication</b>	
S7 communication, as server	Yes
S7 communication, as client	Yes
User data per job, max.	See online help (S7 communication, user data size)
<b>Open IE communication</b>	
TCP/IP	Yes
<ul style="list-style-type: none"> <li>Data length, max.</li> </ul>	64 KB
<ul style="list-style-type: none"> <li>Multiple passive connections per port, supported</li> </ul>	Yes
ISO-on-TCP (RFC1006)	Yes
<ul style="list-style-type: none"> <li>Data length, max.</li> </ul>	64 KB
UDP	Yes
<ul style="list-style-type: none"> <li>Data length, max.</li> </ul>	1472 bytes
DHCP	No
SNMP	Yes
DCP	Yes
LLDP	Yes
<b>Web server</b>	
HTTP	Yes; standard and user-defined pages
HTTPS	Yes; standard and user-defined pages

<b>6ES7512-1DK01-0AB0</b>	
<b>PROFIBUS DP master</b>	
Number of connections, max.	48
Services	
<ul style="list-style-type: none"> <li>• PG/OP communication</li> <li>• S7 routing</li> <li>• Data record routing</li> <li>• Isochronous mode</li> <li>• Constant bus cycle time</li> <li>• Number of DP slaves</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>No</p> <p>No</p> <p>125; a total of up to 512 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET</p>
<ul style="list-style-type: none"> <li>• Activation/deactivation of DP slaves</li> </ul>	Yes
<b>OPC UA</b>	
OPC UA server	Yes; Data Access (Read, Write, Subscribe), Runtime license required
<ul style="list-style-type: none"> <li>• Application authentication</li> <li>• Security Policies</li> </ul>	<p>Yes</p> <p>Available Security Policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256</p>
<ul style="list-style-type: none"> <li>• User authentication</li> </ul>	"Anonymous" or with user name and password
<b>Additional protocols</b>	
MODBUS	Yes; MODBUS TCP
<b>Media redundancy</b>	
Switchover time in the case of cable break, typ.	200 ms; with MRP; bumpless with MRPD
Number of devices in the ring, max.	50
<b>Isochronous mode</b>	
Isochronous mode (application synchronized up to terminal)	Yes; only with PROFINET; with a minimum OB 6x cycle of 625 µs
<b>S7 signaling functions</b>	
Number of stations that can be logged in for signaling functions, max.	32
Block-related alarms	Yes
Number of configurable interrupts, max.	5000
Number of simultaneously active interrupts in interrupt pool	
<ul style="list-style-type: none"> <li>• Number of reserved user interrupts</li> <li>• Number of reserved interrupts for system diagnostics</li> <li>• Number of reserved interrupts for motion control technology objects</li> </ul>	<p>300</p> <p>100</p> <p>80</p>

	6ES7512-1DK01-0AB0
<b>Test/commissioning functions</b>	
Shared commissioning (Team Engineering)	Yes; parallel online access possible for up to 3 engineering systems
Status block	Yes; up to 8 simultaneously (in total over all ES clients)
Single-step	No
<b>Status/modify</b>	
Status/modify tag	Yes
Tags	Inputs/outputs, bit memory, DB, peripheral inputs/outputs, timers, counters
Number of tags, max.	
• Of which are status tags, max.	200; per job
• Of which are modify tags, max.	200; per job
<b>Forcing</b>	
Forcing	Yes
Forcing, tags	Peripheral inputs/outputs
Number of tags, max.	200
<b>Diagnostics buffer</b>	
Available	Yes
Number of entries, max.	1000
• Of which are power failure-proof	500
<b>Traces</b>	
Number of configurable traces	4; up to 512 KB data possible per trace
<b>Interrupts/diagnostics/status information</b>	
<b>Diagnostics display LED</b>	
RUN/STOP LED	Yes
ERROR LED	Yes
MAINT LED	Yes
Monitoring of the supply voltage (PWR LED)	Yes
Connection display LINK TX/RX	Yes
<b>Supported technology objects</b>	
Motion control	Yes; note: the number of axes affects the cycle time of the PLC program; selection guide via the TIA Selection Tool or SIZER
• Number of available motion control resources for technology objects (except cams)	800
• Required Motion Control resources	
– per speed-controlled axis	40
– per positioning axis	80
– per synchronous axis	160
– per external encoder	80
– per output cam	20
– per cam track	160
– per measuring input	40

<b>6ES7512-1DK01-0AB0</b>	
Controller	
<ul style="list-style-type: none"> <li>• PID_Compact</li> <li>• PID_3Step</li> <li>• PID temp</li> </ul>	<p>Yes; universal PID controller with integrated optimization</p> <p>Yes; PID controller with integrated optimization for valves</p> <p>Yes; PID controller with integrated optimization for temperature</p>
Counting and measuring	
<ul style="list-style-type: none"> <li>• High-speed counter</li> </ul>	Yes
<b>Standards, approvals, certificates</b>	
Suitable for safety functions	No
<b>Highest safety class achievable in safety mode</b>	
Performance level according to EN ISO 13849-1:2008	None
SIL according to IEC 61508	No
<b>Ambient conditions</b>	
<b>Ambient temperature during operation</b>	
Horizontal mounting position, min.	0 °C
Horizontal mounting position, max.	60 °C
Vertical mounting position, min.	0 °C
Vertical mounting position, max.	50 °C
<b>Ambient temperature during storage/transport</b>	
Min.	-40 °C
Max.	70 °C
<b>Configuring</b>	
<b>Programming</b>	
Programming language	
<ul style="list-style-type: none"> <li>• LAD</li> <li>• FBD</li> <li>• STL</li> <li>• SCL</li> <li>• GRAPH</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>
<b>Know-how protection</b>	
User program protection	Yes
Copy protection	Yes
Block protection	Yes
<b>Access protection</b>	
Protection level: Write protection	Yes
Protection level: Read/write protection	Yes
Protection level: Complete protection	Yes

6ES7512-1DK01-0AB0	
<b>Cycle time monitoring</b>	
Low limit	Configurable minimum cycle time
High limit	Configurable maximum cycle time
<b>Dimensions</b>	
Width	100 mm
Height	117 mm
Depth	75 mm
<b>Weights</b>	
Weight, approx.	310 g

### Technical specifications of the BusAdapter BA 2×RJ45

Table 5- 1 Technical specifications of the BusAdapter BA 2×RJ45

6ES7193-6AR00-0AA0	
<b>Interfaces</b>	
<b>PROFINET IO</b>	
Number of PROFINET interfaces	1
RJ45	Yes; 2 x
Cable length	
• Copper cables	100 m
<b>Dimensions</b>	
Width	20 mm
Height	69.5 mm
Depth	59 mm
<b>Weights</b>	
Weight, approx.	46 g

### Technical specifications of the BusAdapter BA 2×FC

Table 5- 2 Technical specifications of the BusAdapter BA 2×FC

6ES7193-6AF00-0AA0	
<b>Interfaces</b>	
<b>PROFINET IO</b>	
Number of PROFINET interfaces	1
FC (FastConnect)	Yes; 2 x
Cable length	
• Copper cables	100 m
<b>Dimensions</b>	
Width	20 mm
Height	69.5 mm
Depth	59 mm
<b>Weights</b>	
Weight, approx.	53 g

## Technical specifications of the BusAdapter BA 2×LC

Table 5- 3 Technical specifications of the BusAdapter BA 2×LC

<b>6ES7193-6AG00-0AA0</b>	
<b>Interfaces</b>	
Number of PROFINET interfaces	1; 2 ports (switch) LC multimode glass-fiber
<b>PROFINET IO</b>	
RJ45	No
FC (FastConnect)	No
SCRJ	0
LC	2
Cable length	
• Multimode gradient-index fiber 50/125 µm	3 km
• Multimode gradient-index fiber 62.5/125 µm	3 km
<b>Ambient conditions</b>	
<b>Ambient temperature during operation</b>	
Min.	0 °C
Max.	60 °C
<b>Dimensions</b>	
Width	20 mm
Height	69.5 mm
Depth	59 mm
<b>Weights</b>	
Weight, approx.	40 g

## Technical specifications of the BusAdapter BA 2×SCRJ

Table 5- 4 Technical specifications of the BusAdapter BA 2×SCRJ

<b>6ES7193-6AP00-0AA0</b>	
<b>Interfaces</b>	
<b>PROFINET IO</b>	
Number of PROFINET interfaces	1; 2 ports (switch) SCRJ FO
SCRJ	2
Cable length	
• PCF	100 m
• Plastic FOC (POF)	50 m
• PCF-GI	300 m
<b>Dimensions</b>	
Width	20 mm
Height	69.5 mm
Depth	59 mm
<b>Weights</b>	
Weight, approx.	50 g

## Technical specifications of the BusAdapter BA LC/RJ45

Table 5- 5 Technical specifications of the BusAdapter BA LC/RJ45

<b>6ES7193-6AG20-0AA0</b>	
<b>Interfaces</b>	
Number of PROFINET interfaces	1; 2 ports (switch) LC / RJ45
<b>PROFINET IO</b>	
RJ45	Yes; 1x
FC (FastConnect)	No
SCRJ	0
LC	1
Cable length	
• Copper cables	100 m
• Multimode gradient-index fiber 50/125 µm	3 km
• Multimode gradient-index fiber 62.5/125 µm	3 km
<b>Ambient conditions</b>	
<b>Ambient temperature during operation</b>	
Min.	0 °C
Max.	60 °C
<b>Dimensions</b>	
Width	20 mm
Height	69.5 mm
Depth	59 mm
<b>Weights</b>	
Weight, approx.	32 g

## Technical specifications of the BusAdapter BA LC/FC

Table 5- 6 Technical specifications of the BusAdapter BA LC/FC

	6ES7193-6AG40-0AA0
<b>Interfaces</b>	
Number of PROFINET interfaces	1
<b>PROFINET IO</b>	
RJ45	No
FC (FastConnect)	Yes; 1x
SCRJ	0
LC	1
Cable length	
• Copper cables	100 m
• Multimode gradient-index fiber 50/125 µm	3 km
• Multimode gradient-index fiber 62.5/125 µm	3 km
<b>Ambient conditions</b>	
<b>Ambient temperature during operation</b>	
Min.	0 °C
Max.	60 °C
<b>Dimensions</b>	
Width	20 mm
Height	69.5 mm
Depth	59 mm
<b>Weights</b>	
Weight, approx.	50 g

## Technical specifications of the BusAdapter BA SCRJ/RJ45

Table 5- 7 Technical specifications of the BusAdapter BA SCRJ/RJ45

	6ES7193-6AP20-0AA0
<b>Interfaces</b>	
<b>PROFINET IO</b>	
Number of PROFINET interfaces	1; 2 ports (SCRJ + RJ45)
RJ45	Yes; 1 x
SCRJ	1
Cable length	
• PCF	100 m
• Plastic FOC (POF)	50 m
• PCF-GI	300 m
• Copper cables	100 m
<b>Dimensions</b>	
Width	20 mm
Height	69.5 mm
Depth	59 mm
<b>Weights</b>	
Weight, approx.	50 g

## Technical specifications of the BusAdapter BA SCRJ/FC

Table 5- 8 Technical specifications of the BusAdapter BA SCRJ/FC

<b>6ES7193-6AP40-0AA0</b>	
<b>Interfaces</b>	
<b>PROFINET IO</b>	
Number of PROFINET interfaces	1; 2 ports (SCRJ + FC)
FC (FastConnect)	Yes; 1 x
SCRJ	1
Cable length	
<ul style="list-style-type: none"> <li>• PCF</li> <li>• Plastic FOC (POF)</li> <li>• PCF-GI</li> <li>• Copper cables</li> </ul>	100 m 50 m 300 m 100 m
<b>Dimensions</b>	
Width	20 mm
Height	69.5 mm
Depth	59 mm
<b>Weights</b>	
Weight, approx.	50 g

### General technical specifications

You can find information on the general technical specifications, such as standards and approvals, electromagnetic compatibility, protection class, etc., in the system manual ET 200SP distributed I/O system

(<http://support.automation.siemens.com/WW/view/en/58649293>).

