

SIEMENS

SIMATIC

ET 200SP ET 200SP distributed I/O system

System Manual

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.
⚠ WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.
⚠ CAUTION
with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.
CAUTION
without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.
NOTICE
indicates that an unintended result or situation can occur if the relevant information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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⚠ WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Preface

Purpose of the documentation

This documentation provides important information on configuring, installing, wiring and commissioning the ET 200SP distributed I/O system.

Basic knowledge required

A basic knowledge of automation technology is required to understand the documentation.

Conventions

This documentation contains schematic diagrams of the devices described. The diagrams may differ slightly from the devices supplied.

Please observe notes labeled as follows:

Note

The notes contain important information on the product described in the documentation, on the handling of the product or on part of the documentation to which particular attention should be paid.

Recycling and disposal

The products can be recycled due to their low-pollutant content. For environmentally compliant recycling and disposal of your old device, please contact a company certified for the disposal of electronic waste.

Additional support

- Information about the technical support available can be found in the appendix (Page 99) to this documentation.
- The range of technical support for the individual SIMATIC products and systems can be found on the Internet (<http://www.siemens.com/simatic-tech-doku-portal>).
- The online catalog and the ordering system are available on the Internet (<http://mall.automation.siemens.com>).

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Guide to documentation

Introduction

The ET 200SP distributed I/O system documentation has a modular structure. It consists of different documents which contain instructions, reference information or functional descriptions.

The ET 200SP documentation includes the following documents:

- System manual ET 200SP
- Device manuals of the modules (e.g. IM, I/O modules)
- Topic-orientated function manuals (e.g. analog value processing)

Furthermore, the information system in the *STEP 7* online help offers you assistance in configuring and programming your ET 200SP system.

Selecting the documentation using design versions

A typical design version is represented below. You can read which documentation is necessary for the version in question in addition to this system manual.

Documentation for the ET 200SP distributed I/O system with IM, BaseUnits, digital and analog modules

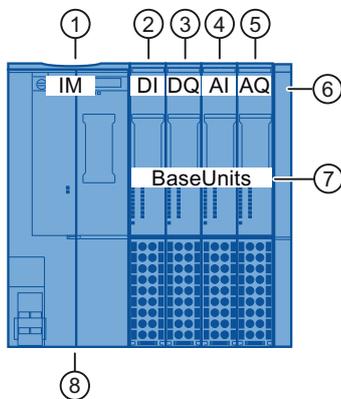


Figure 1-1 Example of a system design

Table 1- 1 Documentation for the ET 200SP distributed I/O system with interface module, I/O modules and server module

Number	Components	Documentation	Important contents
①	IM	Device manual Interface module (http://support.automation.siemens.com/WW/view/en/55683316/133300)	<ul style="list-style-type: none"> • Connecting • Parameter assignment/addressing • Interrupt, error and system messages • Technical specifications • Dimensional diagram
②	DI	Device manuals Digital input modules (http://support.automation.siemens.com/WW/view/en/58532604/133300)	
③	DQ	Device manuals Digital output modules (http://support.automation.siemens.com/WW/view/en/58532394/133300)	
④	AI	Device manuals Analog input modules (http://support.automation.siemens.com/WW/view/en/58532523/133300)	
⑤	AQ	Device manual Analog output module (http://support.automation.siemens.com/WW/view/en/58532217/133300)	
④ ⑤	AI/AQ	ET 200SP product information (http://support.automation.siemens.com/WW/view/en/58650430)	<ul style="list-style-type: none"> • Representation of analog values
⑥	Server module	Device manual Interface module (http://support.automation.siemens.com/WW/view/en/55683316/133300)	See above

Number	Components	Documentation	Important contents
⑦	BaseUnits	Device manual BaseUnits (http://support.automation.siemens.com/WW/view/en/58532597/133300)	<ul style="list-style-type: none"> • Technical specifications • Dimensional diagram
⑧	IM	PROFINET in STEP 7 V11 function manual PROFINET with STEP 7 V11 (http://support.automation.siemens.com/WW/view/en/49948856)	<ul style="list-style-type: none"> • PROFINET basics • PROFINET functions • PROFINET diagnostics
		PROFINET in STEP 7 V5.5 <ul style="list-style-type: none"> • PROFINET system description (http://support.automation.siemens.com/WW/view/en/19292127) system manual • Programming manual From PROFIBUS DP to PROFINET IO (http://support.automation.siemens.com/WW/view/en/19289930) 	

Product overview

2.1 Distributed I/O - overview

Distributed I/O systems – field of application

A plant configuration quite often features a process I/O configuration in a central automation system.

When the inputs/outputs are far away from the automation system, wiring can become very extensive and complex.

Distributed I/O systems are the perfect solution for such plants:

- The CPU controller is located centrally.
- The I/O system (inputs and outputs) work locally on a distributed basis.

What is PROFINET IO?

PROFINET IO is an open transmission system with real-time functionality defined in accordance with the PROFINET standard. This standard defines a cross-manufacturer communication, automation and engineering model.

Industrial-strength connections are available for wiring the PROFINET components.

- PROFINET discards the hierarchical PROFIBUS master/slave concept and deploys a provider/consumer principle instead. The IO devices that will be subscribed to by an IO controller are defined within the configuration phase.
- The quantity structures are extended in accordance with the available quantities for PROFINET IO. Parameter limits are not exceeded during configuration.
- The transmission rate is 100 Mbps.

Configuration of a PROFINET IO network

The figure below illustrates a typical PROFINET IO network configuration. Existing PROFIBUS slaves can be integrated using an IE/PB Link.

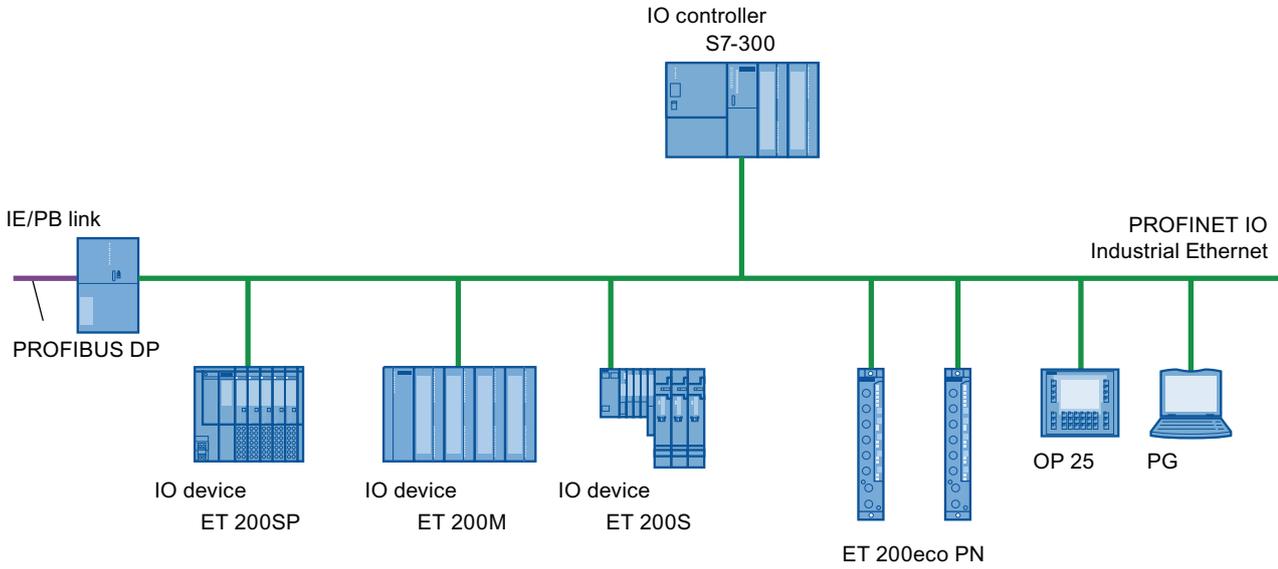


Figure 2-1 Typical configuration of PROFINET IO

2.2 What is the ET 200SP distributed I/O system?

Definition

The ET 200SP distributed I/O system is a scalable and highly flexible distributed I/O system for connecting the process signals to a central controller via a fieldbus.

Field of application

The ET 200SP is a multi-functional distributed I/O system for different fields of application. The scalable design allows you to adapt your configuration exactly to the specific local requirements.

The ET 200SP is approved for IP 20 degree of protection and suitable for installation in a control cabinet.

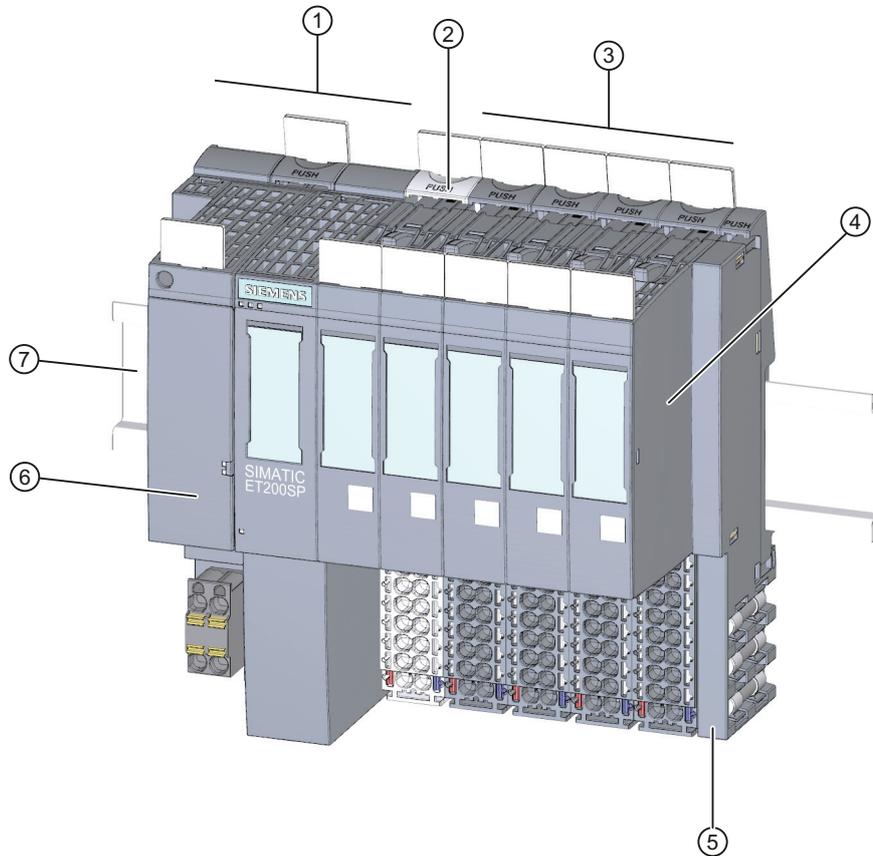
Configuration

The ET 200SP is mounted on a mounting rail and consists of:

- An interface module that communicates with all IO controllers that behave in accordance with the PROFINET standard IEC 61158
- Up to 32 I/O modules that are connected to passive BaseUnits in any combination
- A server module that completes the configuration of the ET 200SP

Configuration example

The following figure shows a configuration example of the ET 200SP distributed I/O system.



- ① Interface module
- ② Light BaseUnit BU..D with the incoming supply voltage or opening of a potential group
- ③ Dark BaseUnits BU..B for conducting the potential group further
- ④ I/O modules
- ⑤ Server module (included in the scope of delivery of the interface module)
- ⑥ BusAdapter
- ⑦ Mounting rail

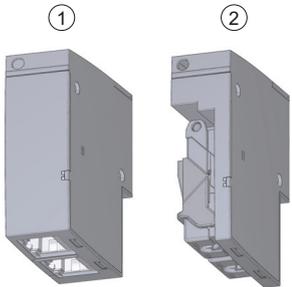
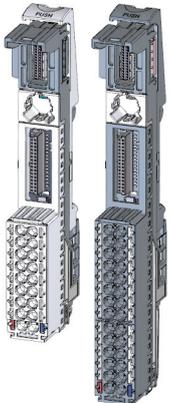
Figure 2-2 Configuration example of the ET 200SP distributed I/O system

2.3 Components of ET 200SP

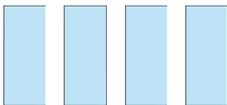
Components of ET 200SP

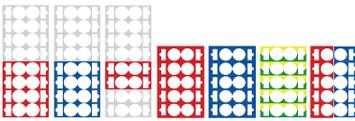
The following table provides an overview of the most important components of the ET 200SP:

Table 2- 1 Components of ET 200SP

Components	Function	View
Mounting rail in accordance with EN 60715	The mounting rail is the rack of the ET 200SP. You mount the ET 200SP on this mounting rail.	
Interface module for PROFINET IO	The interface module <ul style="list-style-type: none"> connects the ET 200SP to the IO controller exchanges data with the I/O modules via the backplane bus. 	
BusAdapter	The BusAdapter allows free selection of the connection technology for PROFINET IO. The following versions are available for the interface module: <ul style="list-style-type: none"> for standard RJ45 plug (BA 2xRJ45) ① for direct connection of the bus cable (BA 2xFC) ② (in preparation) 	
BaseUnit	The BaseUnits provide the electrical and mechanical connection of the ET 200SP modules. Suitable BaseUnits are available for different requirements (see Selection of a suitable BaseUnit (Page 21)).	

2.3 Components of ET 200SP

Components	Function	View
I/O module	The I/O module is connected to the BaseUnit and determines the function in the terminals.	
BU cover	The BU cover is connected to BaseUnits that are not being used or are reserved for future expansion (empty slots). In this instance, a reference identification label for the intended module can be stored inside.	
Server module	<p>The server module completes the configuration of the ET 200SP and can be used as a mount for 3 backup fuses (5 x 20 mm).</p> <p>The server module is included in the scope of delivery of the interface module.</p>	
Shield connector	The shield connector (consisting of a shield contact and a shield terminal) is attached to the BaseUnit and enables the low-impedance application of cable shields with minimum installation times.	
Labeling strip	<p>Labeling strips can be inserted for plant-specific labeling of the modules. The labeling strips can be lettered mechanically.</p> <p>The labeling strips can be ordered as accessories (Page 95) on a roll for thermal transfer and inkjet printers.</p>	

Components	Function	View
Reference identification labels	The labels enable the reference identification labeling of the ET 200SP components. The labels can be ordered as accessories (Page 95) on a sheet for thermal transfer and inkjet printers.	
Color identification labels	The color identification labels are module-specific and can be ordered for the process terminals, AUX terminals and additional terminals as accessories (Page 95).	

2.4 Functions

Introduction

The most important functions of the ET 200SP are described in the following tables.

Functions of the configuration

Table 2- 2 Functions of the configuration

Functions of the configuration	Explanation
Scalable configuration through 1, 2, 4, 8 and 16-channel I/O modules	<ul style="list-style-type: none"> Function-oriented, cost-optimized station design Significant reduction of configuration and documentation effort Space-saving because modules can be installed in any order
Wide range of I/O modules	Broad area of application
Permanent wiring through separation of mechanical and electronic components	<ul style="list-style-type: none"> Pre-wiring possible Module replacement during operation of the ET 200SP ("hot swapping") Startup of the ET 200SP with empty slots (BaseUnit with BU cover)
Individual connection of potential groups	<ul style="list-style-type: none"> Individual formation of potential groups (recognizable by the differently colored BaseUnits) Simple load interruption
Robust design for harsh industrial environments	<ul style="list-style-type: none"> High operating reliability when mounted directly on the machine Increased availability

Functions of the connection technology

Table 2- 3 Functions of the connection technology

Functions of the connection technology	Explanation
Integrated, self-assembling voltage buses	Reduced wiring effort
Free selection of connection technology for PROFINET IO through BusAdapter for the interface module	Not necessary to change the interface module when the connection technology is modified.
1 to 4-wire connection	Optimal selection in terms of space and cost
Push-in terminals	<ul style="list-style-type: none"> • Fast connection technology • Time-saving during wiring • Easy access due to the positioning of the release buttons next to the terminal
Terminal box can be replaced in the BaseUnit	It is not necessary to remove the BaseUnit in the event of damage to the terminals.
Automatic coding of the I/O modules	Quick and safe module replacement
Large label	Sufficient space for clear labeling
Reference identification labels can be inserted on the interface module, BaseUnits and I/O modules	<ul style="list-style-type: none"> • Fixed assignment between BaseUnit and I/O module • During simple module replacement, the reference identification label "migrates" with the module
Data transfer rate of 100 Mbps on PROFINET IO	Short response times

System functions

Table 2- 4 System functions

System functions	Explanation
I&M identification data	Clear identification and/or assignment of the modules used (e.g. for inspection and quality assurance)
Configuration control	Enables flexible adjustment of the actual configuration based on a configured maximum configuration via the user program. Input, output and diagnostics addresses remain unchanged.

Application planning

3.1 Selection of a suitable BaseUnit

Overview

The BaseUnits (BU) are classified according to different types. Each BaseUnit type is characterized by properties that match specific I/O modules (see the following tables and images).

Table 3- 1 Selection of a suitable BaseUnit

I/O module	Selecting a BaseUnit	Explanation
Digital modules (6ES7...A0)	BU type A0 see Digital or analog modules without temperature measurement (Page 22)	The BU type can be read from the last two figures in the I/O module order number. Example: Suitable I/O modules for BU type A0 : <ul style="list-style-type: none"> DI 16×24VDC ST (6ES7131-6BF00-0BA0; AI 4xU/I 2-wire ST (6ES7134-6HD00-0BA1)
Analog module without temperature measurement* (6ES7...A1)		
Analog module with temperature measurement (6ES7...A1)	BU type A1 see Analog modules with temperature measurement (Page 23)	

* for compensation of the reference junction temperature for thermocouples

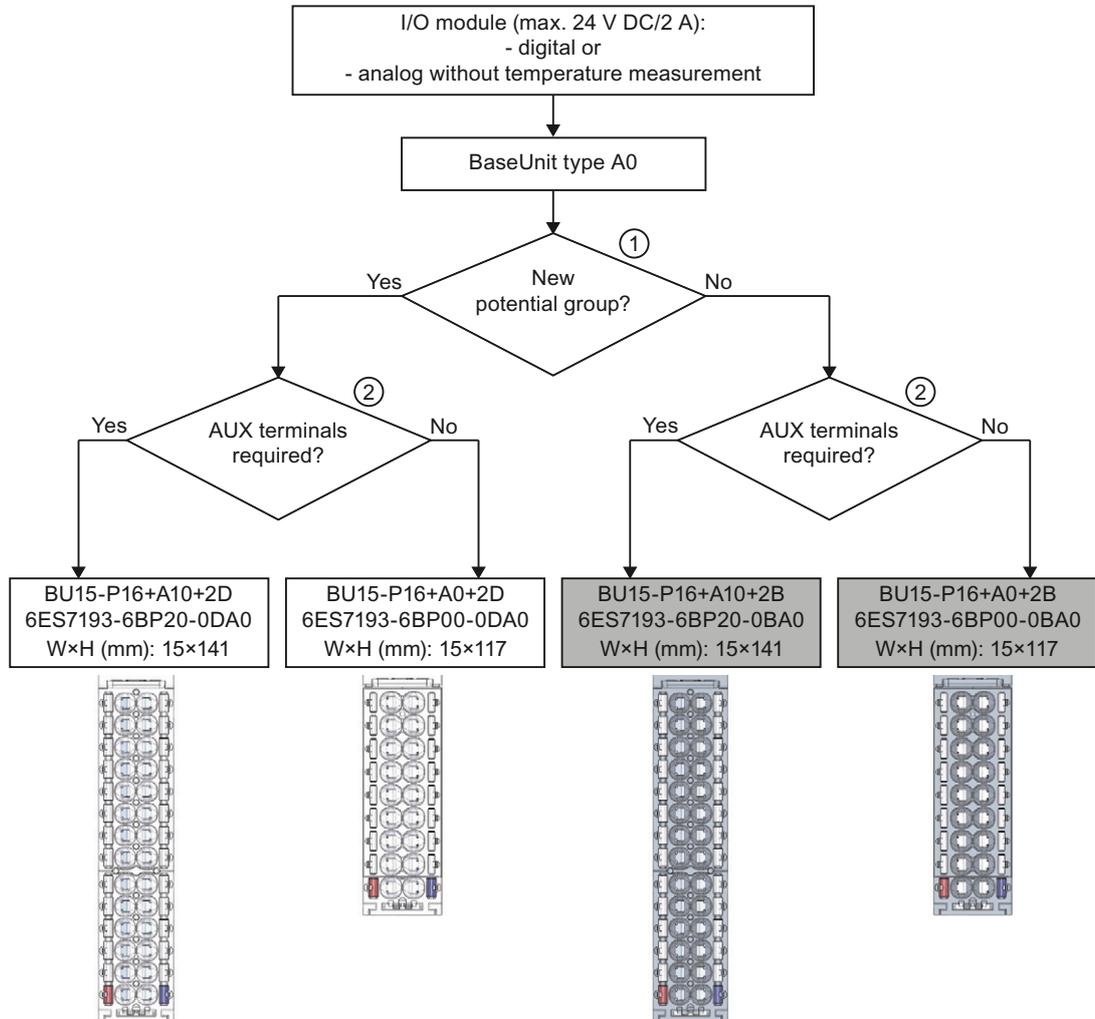
Additional information

Additional information on the functional assignment of the terminals and on the associated BaseUnits can be found in the

- Device manual of the respective I/O module
(<http://support.automation.siemens.com/WW/view/en/55679691/133300>)
- Device manual BaseUnits
(<http://support.automation.siemens.com/WW/view/en/58532597/133300>).

3.1.1 Digital or analog modules without temperature measurement

Selection of a suitable BaseUnit

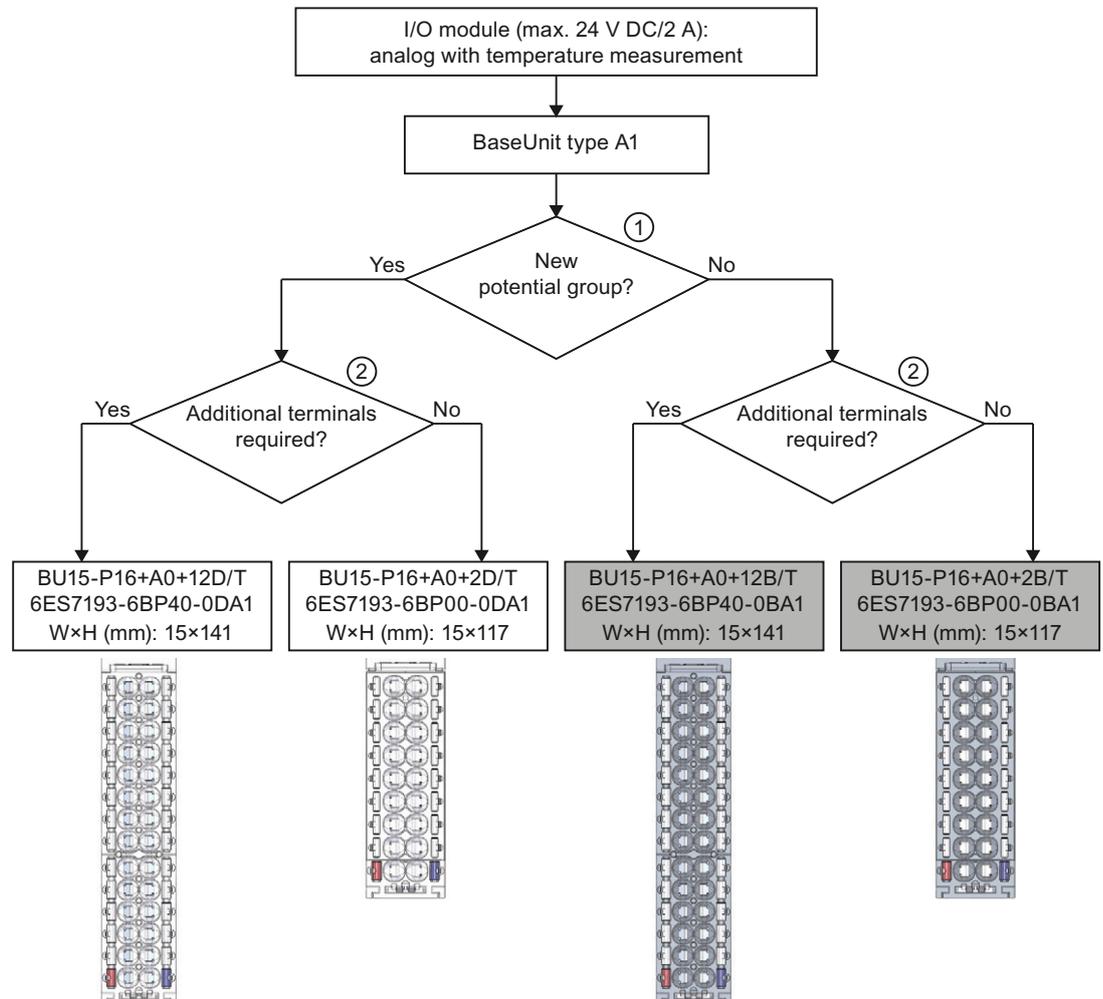


- ① Light BaseUnit: Configuration of a new potential group, electrical isolation from adjacent module on the left. The first BaseUnit of the ET 200SP is always a light BaseUnit for feeding the supply voltage L+.
Dark BaseUnit: Conduction of the internal power and AUX buses from the adjacent module on the left.
- ② AUX terminal: 10 internal bridged terminals for individual use up to 24 V DC/10 A or as protective conductors.
Example: Multiple cable connection for DI 8×24VDC ST

Figure 3-1 Digital or analog modules without temperature measurement

3.1.2 Analog modules with temperature measurement

Selection of a suitable BaseUnit



- ① Light BaseUnit: Configuration of a new potential group, electrical isolation from adjacent module on the left. The first BaseUnit of the ET 200SP is always a light BaseUnit for feeding the supply voltage L+.
Dark BaseUnit: Conduction of the internal power and AUX buses from the adjacent module on the left.
- ② Additional terminals: 2x5 internal bridged terminals for individual use up to 24 V DC/2 A
Example: Sensor supply for AI 4xU/I 2-wire ST

Figure 3-2 Analog modules with temperature measurement

3.2 Maximum configuration

Mechanical maximum configuration

As soon as one of the following rules applies, the maximum configuration of the ET 200SP has been reached:

Table 3- 2 Mechanical maximum configuration

Properties	Rule
Number of modules	maximum 32 I/O modules
Backplane bus length of the ET 200SP	maximum 1 m mounting width (without interface module, including server module)

Electrical maximum configuration

The number of operable I/O modules of a potential group is limited by the

- Power consumption of the I/O modules
- Power consumption of the components supplied via these I/O modules

The maximum current-carrying capability of the terminals on the BaseUnit L+/ground is 10 A.

3.3 Forming potential groups

Introduction

When forming potential groups with ET 200SP, a distinction is made between 2 BaseUnits:

- BaseUnits BU...D (recognizable by the light terminal box and the light mounting rail release button):
 - Opening a new potential group (power and AUX buses interrupted to the left)
 - Feed of the supply voltage L+ to a feed current of 10 A (24 V DC)
- BaseUnits BU...B (recognizable by the dark terminal box and the dark mounting rail release button):
 - Conduction of the potential group (power and AUX bus continued)
 - Tapping of the supply voltage L+ for external components or looping with a maximum total current of 10 A (24 V DC)

Placing and connecting

Each BaseUnit BU...D that you install in the ET 200SP configuration opens a new potential group and supplies all subsequent I/O modules (on BaseUnits BU...B) with the necessary supply voltage. A BaseUnit BU...D may only be located directly to the right of the interface module. Place all other BU...D in any position in the configuration.

If you want to place another BaseUnit BU...D after a BaseUnit BU...B, disconnect the power and AUX buses and open a new potential group at the same time. This allows individual connection of supply voltages.

AUX bus (AUX(iliary) bus)

BaseUnits with additional AUX terminals (e.g. BU15-P16+A10+2D) enable the additional connection of a potential (up to the maximum supply voltage of the module), which you apply through the AUX bus.

The AUX bus can be used individually:

- as a protective conductor bus (requirements in accordance with EN 60998-1 are met).
- For additionally required voltage

The AUX bus is designed as follows:

- Maximum current-carrying capacity (at 60°C ambient temperature): 10 A
- Permitted voltage: 24 V DC

Power bus

The supply voltage L+ must be fed via the BaseUnit BU...D.

Each BaseUnit BU...B enables access to the supply voltage L+ via terminals (red/blue).

Principle of operation

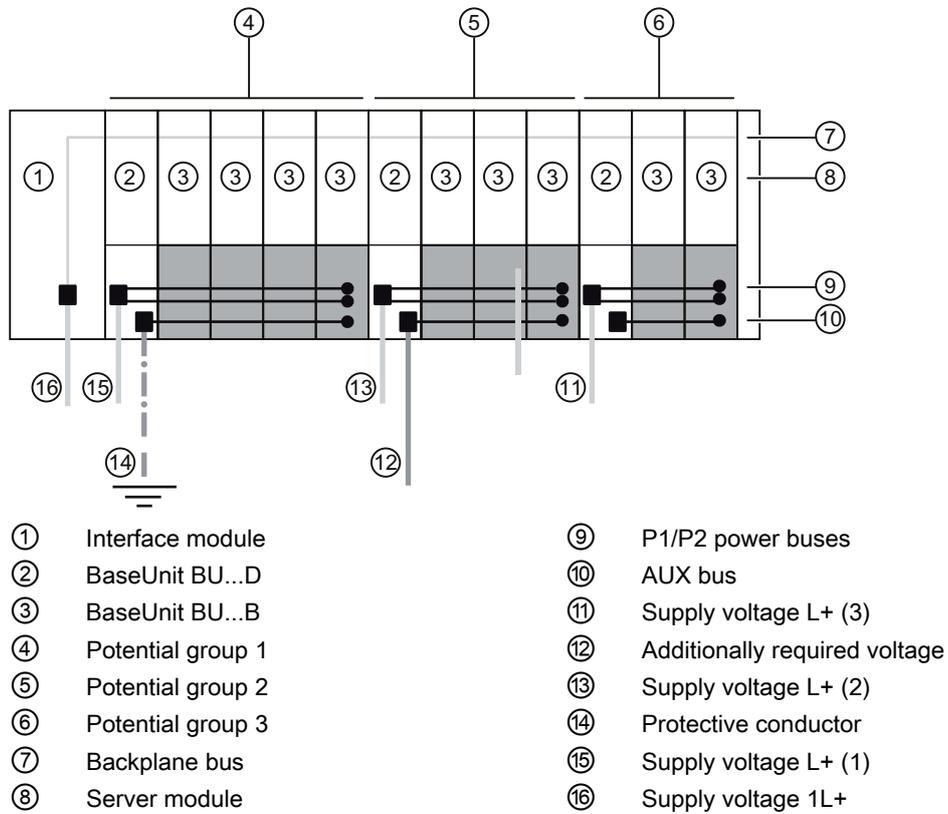


Figure 3-3 Placing the BaseUnits

Connecting different potentials to the AUX bus

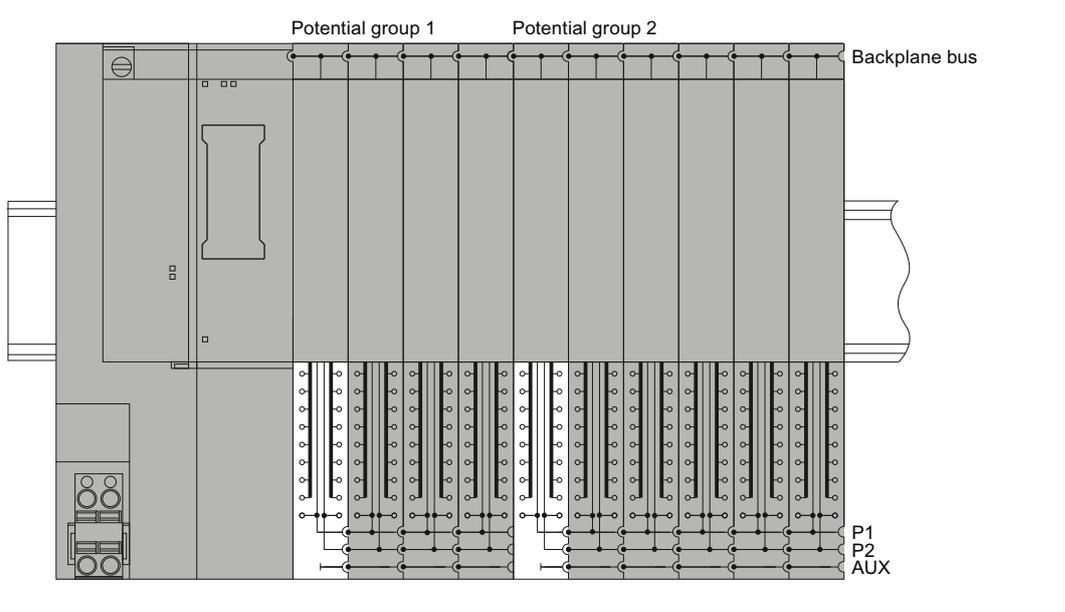
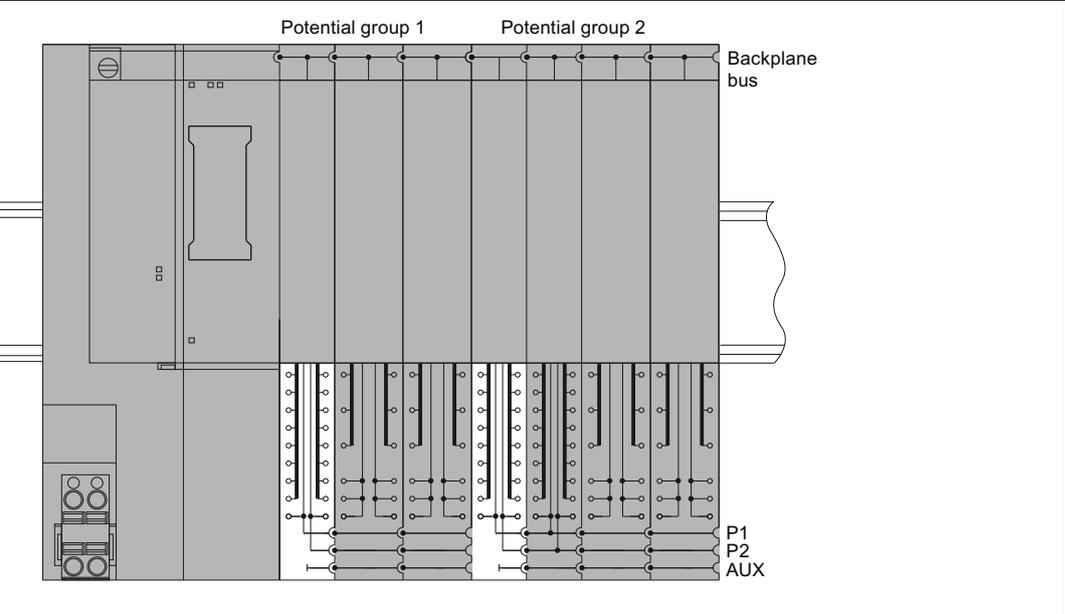
Note

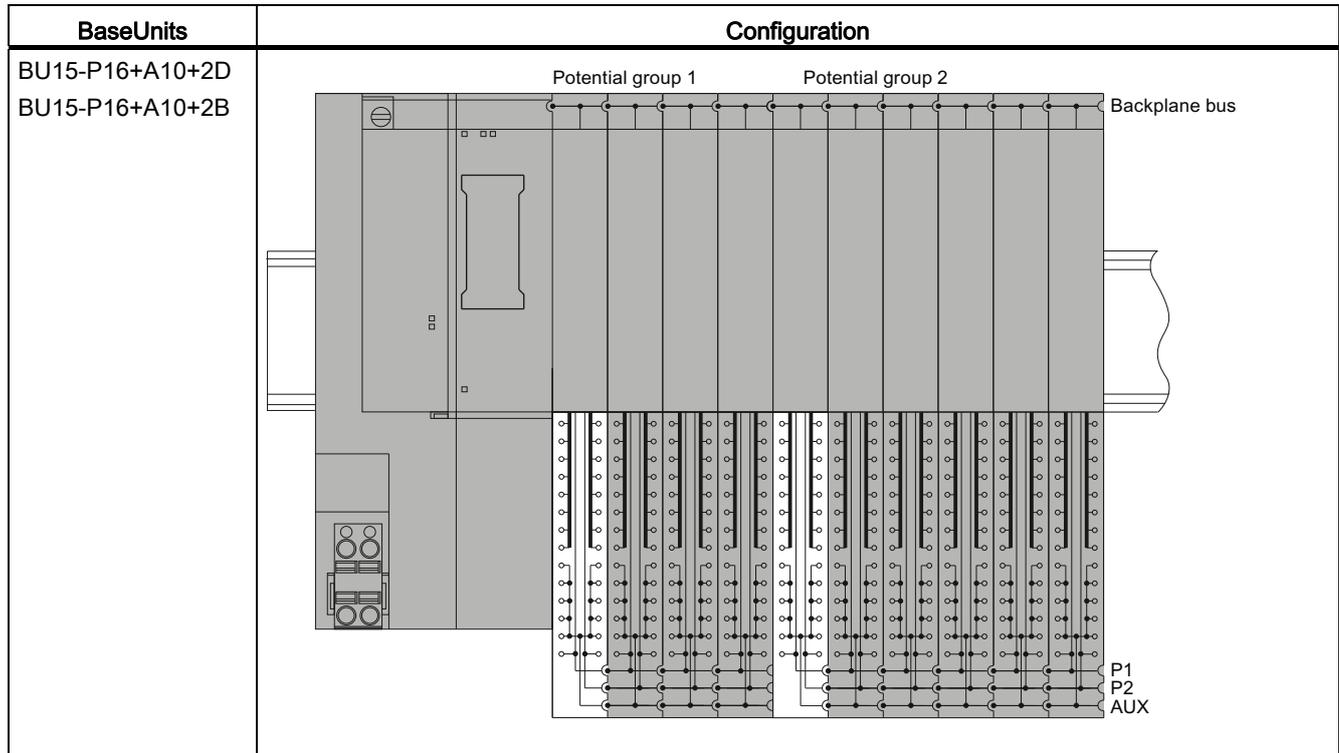
If you apply different potentials to the power or AUX bus within an ET 200SP station, you must separate the potential groups with a BaseUnit BU...D.

3.4 Configuration examples for potential groups

Configuration examples with BaseUnits

Table 3- 3 Configuration examples with BaseUnits

BaseUnits	Configuration
BU15-P16+A0+2D BU15-P16+A0+2B	 <p>Potential group 1 Potential group 2 Backplane bus</p> <p>P1 P2 AUX</p> <p>Detailed description: This diagram shows a rack configuration with two potential groups. The top section is labeled 'Potential group 1' and 'Potential group 2'. A 'Backplane bus' is shown on the right side. The bottom section shows the connection points for 'P1', 'P2', and 'AUX'.</p>
BU15-P16+A0+2D BU15-P16+A0+2B BU20-P12+A0+0B	 <p>Potential group 1 Potential group 2 Backplane bus</p> <p>P1 P2 AUX</p> <p>Detailed description: This diagram shows a rack configuration with two potential groups. The top section is labeled 'Potential group 1' and 'Potential group 2'. A 'Backplane bus' is shown on the right side. The bottom section shows the connection points for 'P1', 'P2', and 'AUX'.</p>



Installation

4.1 Basic principles of installation

Introduction

All modules of the ET 200SP distributed I/O system are open resources. This means that you may only install the ET 200SP distributed I/O system in housings, cabinets or electrical operating areas. These housings, cabinets or electrical operating areas must only be accessible with a key or tool. Access may only be possible for instructed or authorized personnel.

Installation position

The ET 200SP distributed I/O system can be mounted in any position. The preferred installation position is horizontal mounting on a vertical wall. It may be necessary to restrict the ambient temperature in certain installation positions. Additional information can be found in chapter Mechanical and climatic ambient conditions (Page 87).

Mounting rail

The ET 200SP distributed I/O system is mounted on a mounting rail in accordance with EN 60715 (35 × 7.5 mm or 35 × 15 mm)

The mounting rail must be grounded separately in the control cabinet. Exception: If you install the rail on grounded, zinc-plated mounting plates, there is no need to ground the rail separately.

Note

If the ET 200SP distributed IO system is exposed to increased vibrations and shock, we recommend that you screw the mounting rail to the mounting surface at intervals of approx. 200 mm.

Suitable surface finishes are:

- Steel strip in accordance with Appendix A of EN 60715 or
- Tinned steel strip. For this purpose, we recommend the mounting rails in chapter Accessories/spare parts (Page 95).

Note

If you use mounting rails from other manufacturers, ensure that they have the required properties for your climatic ambient conditions.

Minimum clearances

Maintain the following minimum clearances when installing or dismantling the ET 200SP.

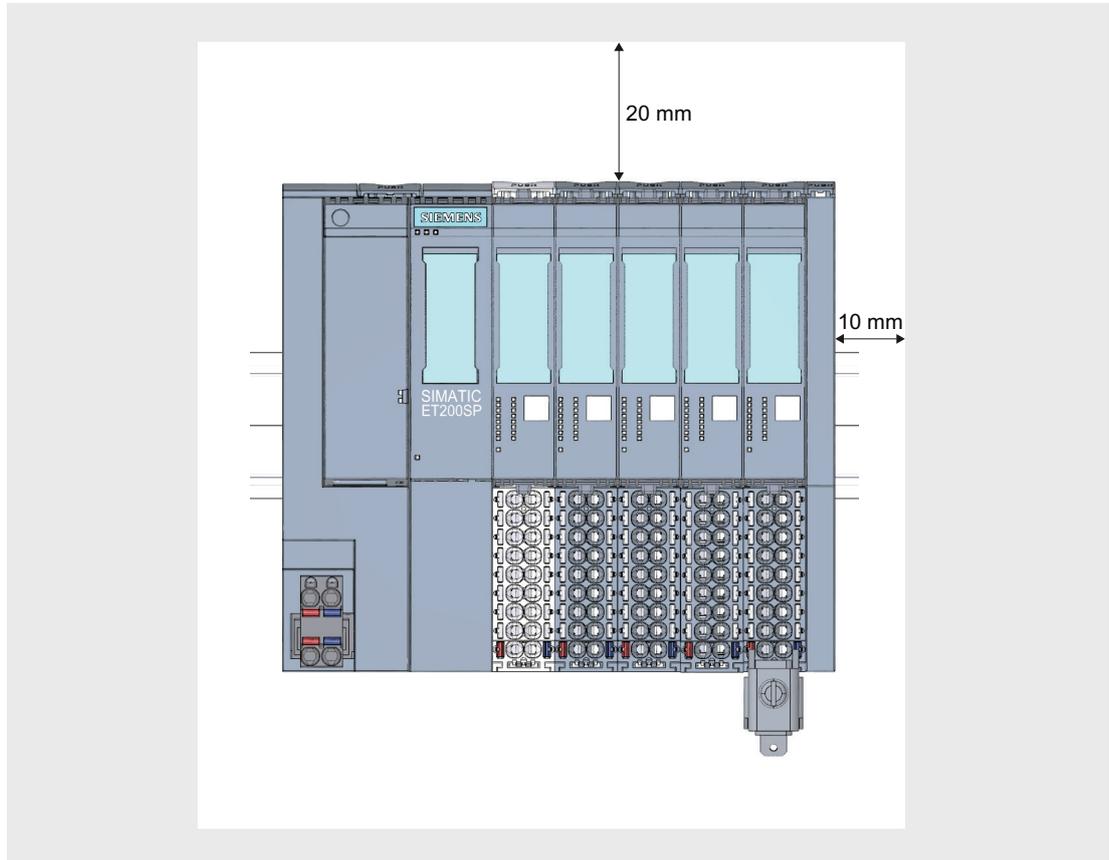


Figure 4-1 Minimum clearances

Installation rules

- The ET 200SP distributed I/O system begins with an interface module.
- After the interface module or at the beginning of each potential group, there is a BaseUnit BU..D with incoming supply voltage L+ (light terminal box).
- BaseUnits BU..B (with dark terminal box) follow this.
- The respective corresponding I/O modules can be connected to the BaseUnits. Suitable combinations of BaseUnits and I/O modules can be found in chapter Selection of a suitable BaseUnit (Page 21).
- The server module completes the configuration of the ET 200SP distributed I/O system.

Note

Only mount the ET 200SP distributed I/O device when the supply voltage is turned off.

4.2 Installing the interface module

Introduction

The interface module connects the ET 200SP with the PROFINET IO and exchanges data between the higher-level controller and the I/O modules.

Requirements

The mounting rail is fitted.

Required tools

3 to 3.5 mm screwdriver (only for dismantling the BusAdapter)

Installing the interface module

1. Install the interface module on the rail.
2. Swivel the interface module back until you hear the mounting rail release button click into place.

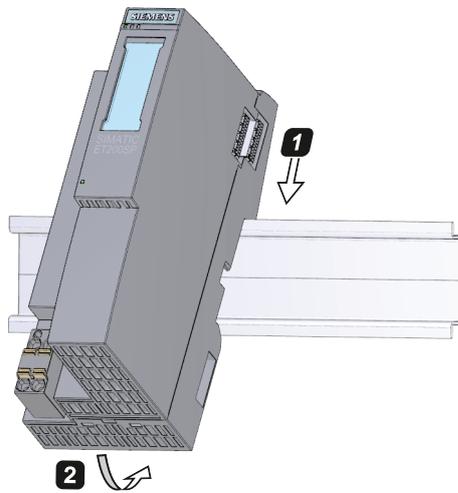


Figure 4-2 Installing the interface module

4.3 Installing BaseUnits

Removing the interface module

The interface module is wired and BaseUnits are located to its right:

1. Switch off the supply voltage on the interface module.
2. Press the mounting rail release button on the first BaseUnit and, at the same time, move the interface module parallel to the left until it comes off the rest of the module group.
Note: The mounting rail release button is located above the interface module or BaseUnit.
3. While pressing the mounting rail release button on the interface module, swivel the interface module out of the mounting rail.

Note

It is not necessary to remove the BusAdapter from the interface module.

4.3 Installing BaseUnits

Introduction

- BaseUnits are used to receive I/O modules.
- BaseUnits can be pre-wired (without I/O modules).
- All BaseUnits are installed to the right of the interface module.

Requirements

The mounting rail is fitted.

Required tools

3 to 3.5 mm screwdriver (only for dismantling the terminal box)

Installing a BaseUnit

1. Install the BaseUnit on the mounting rail.
2. Swivel the BaseUnit backwards until you hear it click into the mounting rail.
3. Move the BaseUnit parallel to the left until you hear it click into the preceding interface module or BaseUnit.

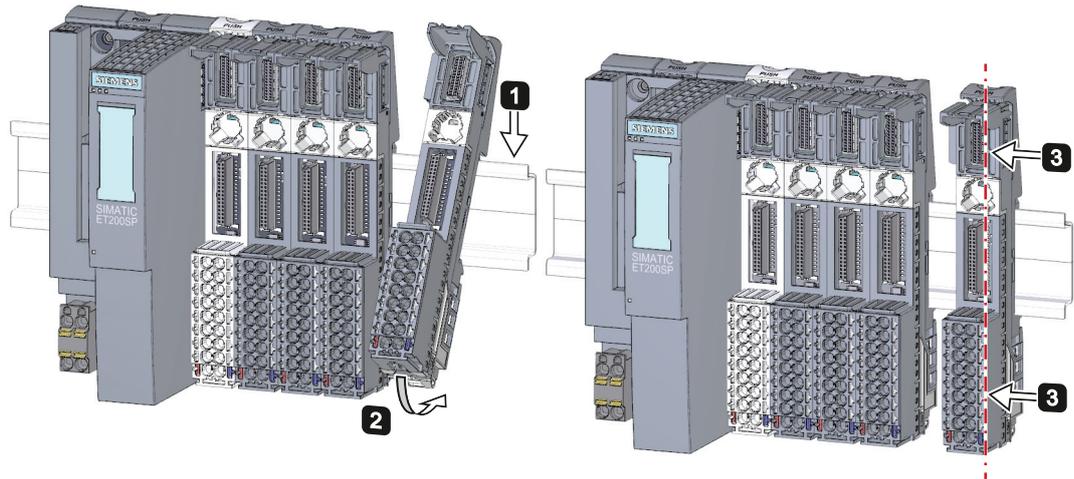


Figure 4-3 Installing a BaseUnit

Removing a BaseUnit

The BaseUnit is wired and there are other BaseUnits to its right and left.

The removal of a particular BaseUnit within the ET 200SP distributed I/O system can only take place if free space of approximately 8 mm has been created to the adjacent BaseUnits (by moving the adjacent modules).

Note

The terminal box can be replaced without disassembling the BaseUnit. See chapter Replacing the terminal box on the BaseUnit (Page 78).

1. Turn off any present supply voltage on the BaseUnit.
2. Loosen the wiring on the BaseUnit (with a 3 to 3.5 mm screwdriver).
3. **Removing (from the right):**

Press the mounting rail release button on the corresponding BaseUnit. Move this parallel to the right and swivel it out of the mounting rail while pressing the mounting rail release button.

Removing (from the left):

Press the mounting rail release button on the corresponding BaseUnit and on the BaseUnit to the right of this. Move the BaseUnit parallel to the left and swivel it out of the mounting rail while pressing the mounting rail release button.

Note: The mounting rail release button is located above the BaseUnit.

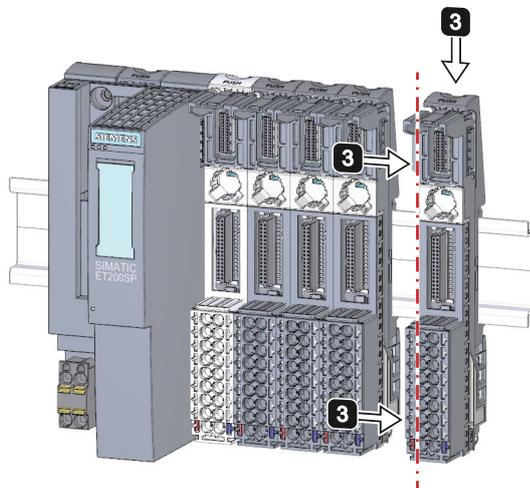


Figure 4-4 Removing the BaseUnit (removing from the right)

4.4 Installing the server module

Introduction

The ET 200SP distributed I/O system is completed by the server module on the right end of the configuration.

Requirements

The last BaseUnit is mounted.

Installing the server module

1. Install the server module on the mounting rail on the right next to the last BaseUnit.
2. Swivel the server module backwards on the mounting rail.
3. Move the server module parallel to the left until you hear it click into the last preceding BaseUnit.

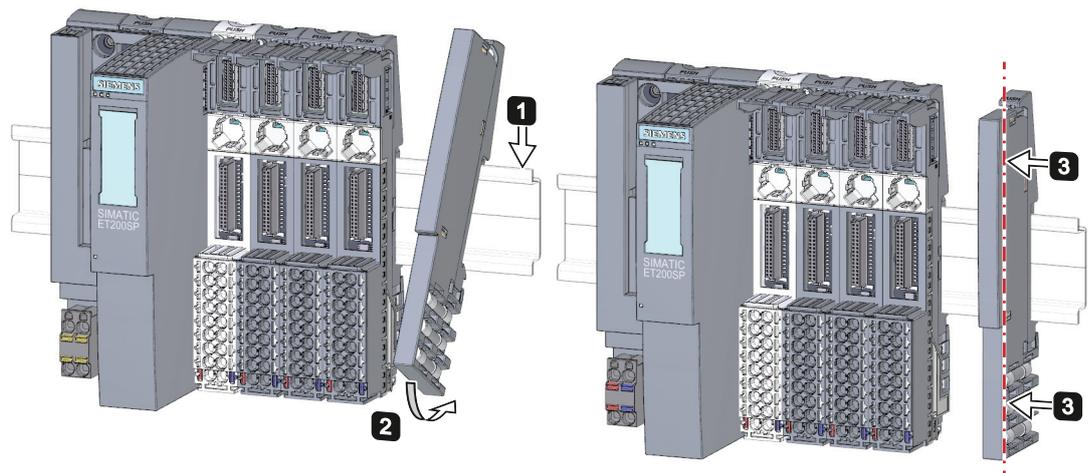


Figure 4-5 Installing the server module

Removing the server module

Press the mounting rail release button on the server module, move the server module parallel to the right and swivel it out of the mounting rail while pressing the mounting rail release button.

Connecting

5.1 Rules and regulations for operating the ET 200SP

Introduction

As part of plants and/or systems, the ET 200SP distributed I/O system requires adherence to special rules and regulations, depending on the field of application.

This chapter provides an overview of the most important rules that must be observed for the integration of the ET 200SP distributed I/O system in a plant or system.

Specific application

Please observe the safety and accident prevention regulations applying to specific applications (e.g. machine protection guidelines).

EMERGENCY-STOP devices

EMERGENCY-STOP devices in accordance with IEC 204 (corresponds to DIN VDE 113) must remain effective in all operating modes of the plant or system.

Startup of the plant

The following describes the aspects that you must pay attention to when starting up a plant:

- No dangerous operating states may occur when
 - the plant starts up after a voltage drop or failure
 - the ET 200SP starts up after disruption of the bus communicationIf necessary, "EMERGENCY-STOP" must be forced.
- After unlocking the "EMERGENCY-STOP" device, an uncontrolled or undefined startup is not permitted.

Line voltage

The following describes what you must pay attention to in terms of the line voltage (see chapter Information on insulation, protection class, degree of protection and rated voltage (Page 89)):

- For fixed plants or systems without a multipole mains switch, a mains switch or a fuse must be available in the building installation.
- For load power supplies and power supply modules, the set rated voltage range must correspond to the local line voltage.
- For all power circuits of the ET 200SP distributed I/O system, the fluctuation/deviation of the line voltage from the rated value must be within the permitted tolerance.

24 V DC supply

The following describes what you must pay attention to in terms of the 24 V DC supply:

- For buildings: In the event of danger through overload, you must provide lightning protection measures for external lightning protection (e.g. lightning protection elements).
- For 24 V DC supply lines and signal lines: In the event of danger through overload, you must provide lightning protection measures for internal lightning protection (e.g. lightning protection elements).
- For 24 V DC supply: Ensure safe (electrical) isolation of the low voltage (SELV/PELV).

Protection against outside electrical influences

The following describes what you must pay attention to in terms of protection against electrical impacts and/or faults:

- For all plants or systems into which the ET 200SP distributed I/O system is integrated, you must ensure that the plant and/or system is connected to a protective conductor for conducting electromagnetic disturbances.
- For supply, signal and bus lines, you must ensure that the laying of the lines and the installation is correct.
- For signal and bus lines, you must ensure that a wire/cable breakage or a cross-wire does not lead to undefined states of the plant or system.

5.2 Operating the ET 200SP on grounded incoming supply

Introduction

The following provides information on the overall configuration of a ET 200SP distributed I/O system on a grounded incoming supply (TN-S network). The specific subjects discussed are:

- Shut-off devices, short circuit and overload protection in accordance with DIN VDE 0100 and DIN VDE 0113
- Load voltage supplies and load circuits.

Grounded incoming supply

In grounded incoming supplies, the neutral conductor of the supply line is grounded. A single fault between a live conductor and ground or a grounded part of the installation results in tripping of the protective devices.

Safe electrical isolation (SELV/PELV in accordance with IEC 60364-4-41)

Network devices/power supply modules with safe, electrical isolation are necessary for operating the ET 200SP. This protection is designated as SELV (Safety Extra Low Voltage)/PELV (Protection Extra Low Voltage) in accordance with IEC 60364-4-41.

Configuration of ET 200SP with ungrounded reference potential

To conduct interference currents, the reference potential of the interface module and the BaseUnits BU...D is connected internally via an RC combination (IM: $R = 10 \text{ M}\Omega / C = 100 \text{ nF}$, BU...D: $R = 10 \text{ M}\Omega / C = 4 \text{ nF}$) with the mounting rail (protective conductor).

- In this way, high-frequency interference currents are conducted and static charges are avoided.
- An ungrounded configuration of the ET 200SP is possible.

Components and protective measures

Various components and protective measures are specified for assembling a full installation. The type of components and the degree to which the protective measures are mandatory depend on which DIN VDE regulations apply to your plant configuration. The table refers to the following image and compares the DIN VDE regulations.

Table 5- 1 Components and protective measures

	Refer to figure	DIN VDE 0100	DIN VDE 0113
Disconnection element for controller, sensors, and actuators	①	... Part 460: Main switch	... Part 1: Disconnecter
Short-circuit / overload protection: In groups for sensors and actuators	②	... Part 725: Single-pole protection of circuits	... Part 1: <ul style="list-style-type: none"> • With grounded secondary circuit: fuse unipolar • otherwise: fuse all poles
	③		
Load current supply for AC load circuits with more than five items of electromagnetic equipment	②	Isolation by transformer recommended	Isolation by transformer recommended

ET 200SP in the overall configuration

The figure below shows the overall configuration of the ET 200SP distributed I/O system (load voltage supply and grounding concept) with infeed from a TN-S network.

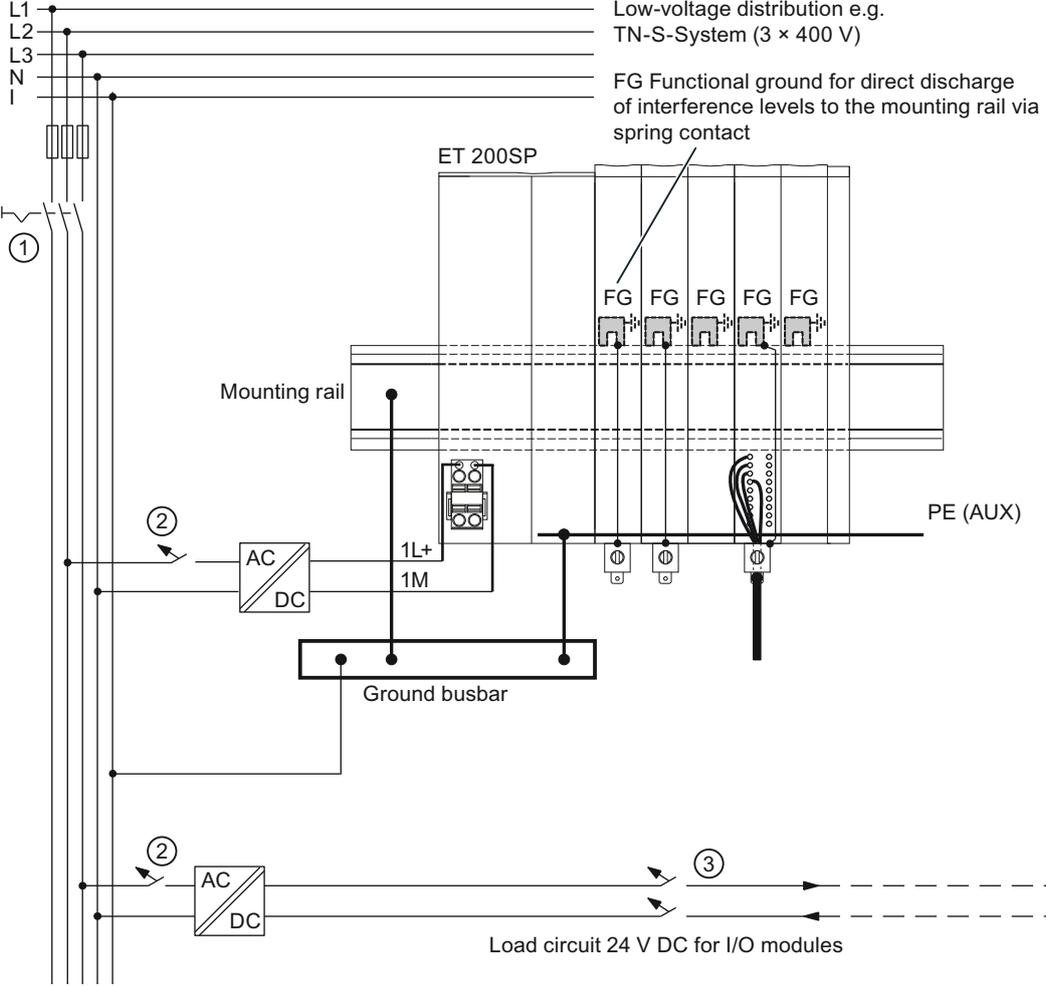


Figure 5-1 Operating the ET 200SP with grounded reference potential

5.3 Electrical configuration of the ET 200SP

Electrical isolation

With ET 200SP, there is electrical isolation between:

- the load circuits/process and all other circuit components of the
- the PROFINET interfaces in the interface module and all other circuit components

The following image shows the potential relationships of the ET 200SP with the interface module (using the example of the IM 155-6 PN ST). Only the most important components are represented in the image.

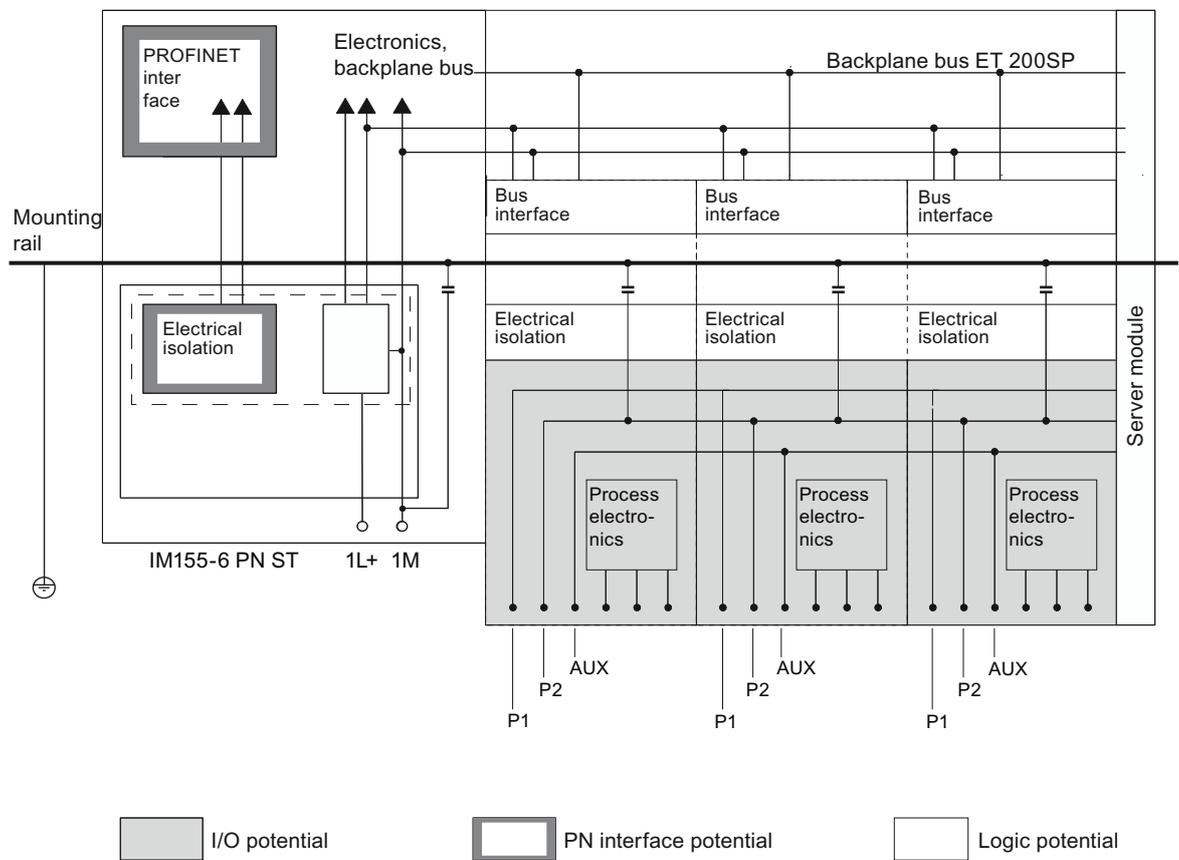


Figure 5-2 Potential relationships for ET 200SP with IM 155-6 PN ST

5.4 Wiring rules

Wiring rules

Table 5-2 Wiring rules

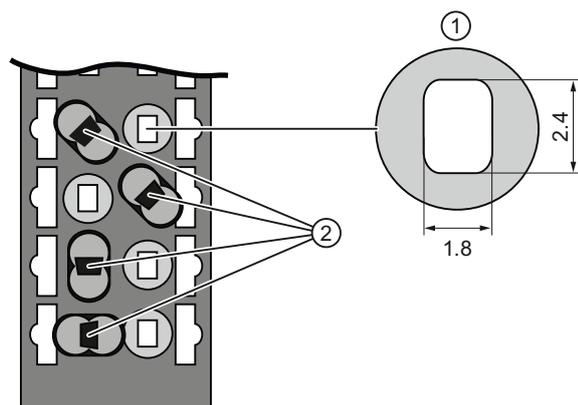
Wiring rules for ...		Interface module (supply voltage)	BaseUnits (push-in terminal)
connectable cable cross sections for solid cables		0.2 to 2.5 mm ² AWG*: 24 to 13	
permitted cable cross-sections of flexible conductors	without wire end ferrule	0.2 to 2.5 mm ² AWG*: 24 to 13	
	with wire end ferrule (with plastic sleeve)	0.25 to 1.5 mm ^{2**} AWG*: 24 to 16	0.14 mm to 1.5 mm ² AWG*: 26 to 16
	with TWIN wire end ferrule	0.5 mm to 1 mm ² AWG*: 20 to 17	0.5 to 0.75 mm ² (see below) AWG*: 20 to 18
Stripping length of the wires		8 to 10 mm	
Wire end ferrules in accordance with DIN 46228 with plastic sleeve.		8 and 10 mm long	

* AWG: American Wire Gauge

** Wire end ferrule without plastic sleeve: 0.25 to 2.5 mm²/AWG: 24 to 13

TWIN wire end ferrules for wires of the push-in terminals

Due to the space required by TWIN wire end ferrules with 0.75 mm² cross-section, you must ensure a correct angle for the conductor arrangement when crimping the TWIN wire end ferrule so that the wires are optimally arranged.



- ① Cross-section of the terminal area
- ② Crimping TWIN wire end ferrules at the correct angle

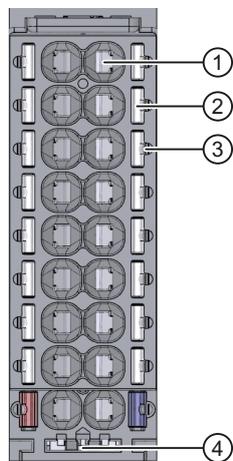
Figure 5-3 TWIN wire end ferrules

5.5 Wiring BaseUnits

Introduction

The BaseUnits connect the ET 200SP to the process. There are different BaseUnit versions:

- BaseUnits (with light terminal box) for opening a potential group: BU..D
- BaseUnits (with dark terminal box) for conducting the potential group: BU..B
- BaseUnits with additional AUX terminals or additional terminals: BU..+10..
- BaseUnits with integrated resistance thermometer for compensation of the reference junction temperature when connecting thermocouples: BU..T



- ① Push-in terminal
- ② Spring NC contacts
- ③ String part
- ④ Mount for shield connector

Figure 5-4 View of the BaseUnit

Note

The pin assignment of the BaseUnit depends on the connected I/O module. Information on the BaseUnits and I/O modules can be found in the associated device manuals.

The chapter Replacing the terminal box on the BaseUnit (Page 78) describes how to replace the terminal box on the BaseUnit.

Requirements

- Only wire the BaseUnits when the supply voltage is turned off.
- Follow the wiring rules.

Required tools

3 to 3.5 mm screwdriver

Tool-free connection of cables: single-wire without wire end ferrule, multi-wire (stranded) with wire end ferrule or ultrasonically sealed.

1. Strip 8 to 10 mm of the wires.
2. Only for multi-stranded wires:
Seal or crimp the wire with wire end ferrules.
3. Insert the wire into the push-in terminal as far as it will go.

Connection of cables: multi-wire (stranded), without wire end ferrule, unprocessed

1. Strip 8 to 10 mm of the wires.
2. Using a screwdriver, press the spring NC contact and insert the wire into the push-in terminal as far as it will go.
3. Pull the screwdriver out of the spring NC contact.

Loosening wires

Using the screwdriver, press the spring NC contact of the terminal as far as it will go and pull out the wire.

5.6 Connecting cable shields

Introduction

- You need the shield connector to fit cable shields (e.g. for analog modules).
- Attach the shield connector to the BaseUnit.
- The shield connector consists of a shield contact and a shield terminal.
- The shield connector is automatically connected to the functional ground (FG) of the mounting rail after assembly.

Requirements

- BaseUnit with a width of 15 mm
- The shield terminal is suitable for cables with max. \varnothing 7 mm each.

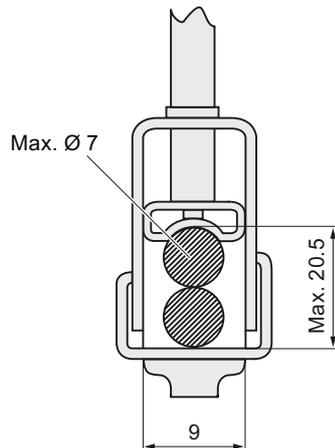


Figure 5-5 Shield terminal

Required tools

- Stripping tool

Proceed as follows

1. If necessary, connect the supply voltage L+ and ground to the BaseUnit.
2. Press the shield contact up into the mount until you hear it click into place.
3. Remove the cable insulation material around the shield terminal.
Connect the cable to the BaseUnit and place the cable in the shield contact.
4. Insert the shield terminal into the shield contact.
5. Tighten the shield terminal with approximately 0.5 Nm.

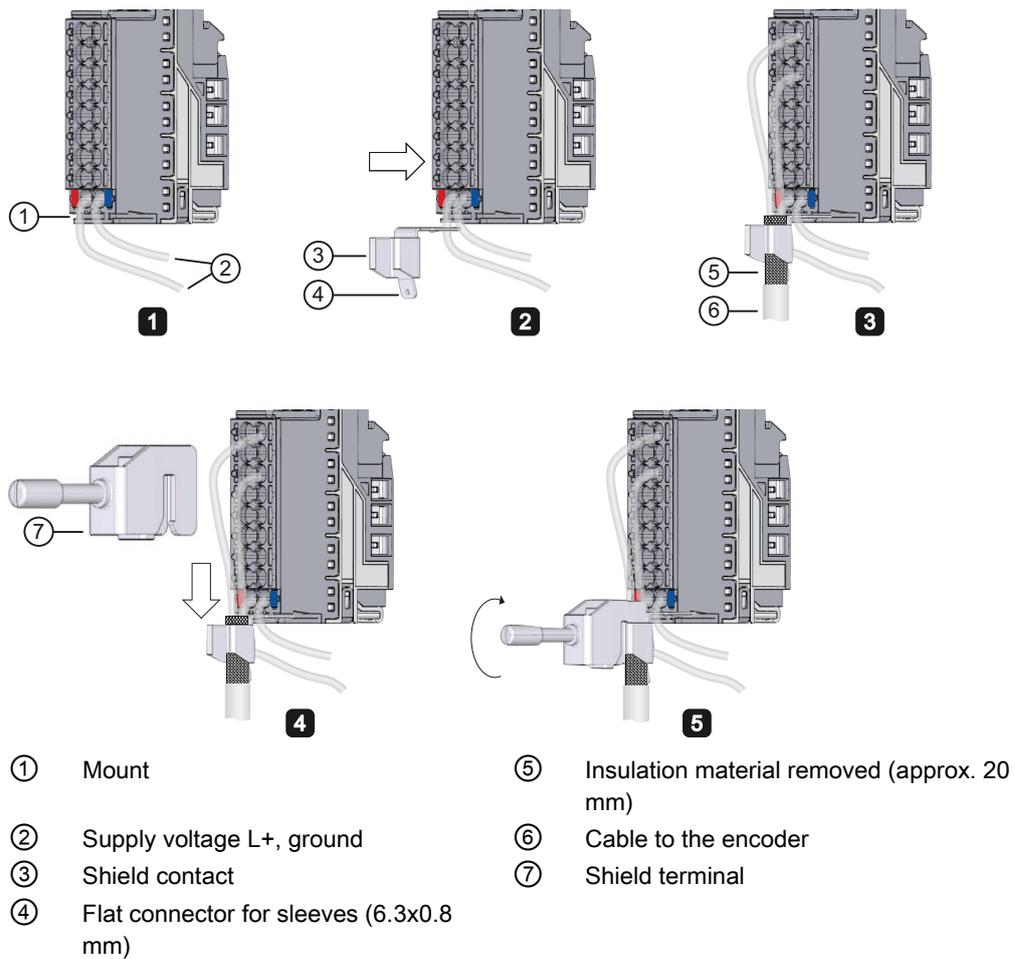


Figure 5-6 Mounting the shield contact

5.7 Connecting supply voltage on the interface module

Introduction

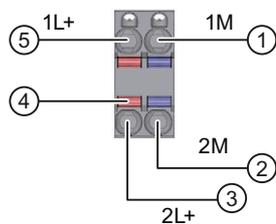
Connect the supply voltage for the ET 200SP on the interface module.

Power supply unit

You must only use SELV/PELV type power supply units with protective extra-low voltage with safe electrical isolation (≤ 60 V DC).

Connection for supply voltage

The connections for the 24 V DC supply voltage are located on the front of the interface module. The connections have the following meaning:



- ① Ground of the supply voltage
- ② Ground of the supply voltage for looping
- ③ + 24 V DC of the supply voltage for looping
- ④ Spring NC contacts
- ⑤ + 24 V DC of the supply voltage

Figure 5-7 Supply voltage connection

The maximum cross-section of the connection is 2.5 mm². A strain relief is not present. The connection plugs offer you the option of looping the supply voltage uninterrupted, even when it is unplugged.

Requirements

- Only wire the connection plug when the supply voltage is turned off.
- Follow the wiring rules.

Required tools

3 to 3.5 mm screwdriver

Tool-free connection of cables: single-wire without wire end ferrule, multi-wire (stranded) with wire end ferrule or ultrasonically sealed.

1. Strip 8 to 10 mm of the wires.
2. Only for multi-stranded wires:
Seal or crimp the wire with wire end ferrules.
3. Insert the wire into the push-in terminal as far as it will go.
4. Push the wired connection plug into the socket in the interface module.

Connection of cables: multi-wire (stranded), without wire end ferrule, unprocessed

1. Strip 8 to 10 mm of the wires.
2. Using a screwdriver, press the spring NC contact and insert the wire into the push-in terminal as far as it will go.
3. Pull the screwdriver out of the spring NC contact.
4. Push the wired connection plug into the socket in the interface module.

Loosening a wire

Using the screwdriver, press the spring NC contact as far as it will go and pull out the wire.

5.8 Connecting PROFINET IO bus adapter BA 2xRJ45 to the interface module

Introduction

You connect PROFINET IO to the interface module via the BusAdapter BA 2xRJ45. To do this, screw the BusAdapter BA 2xRJ45 to the interface module and insert the PROFINET connecting cable. Then, you can loop PROFINET via the integrated 2-port switch.

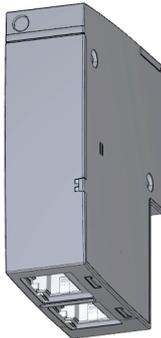


Figure 5-8 BusAdapter BA 2xRJ45

Required tools

3 to 3.5 mm screwdriver

Required accessories

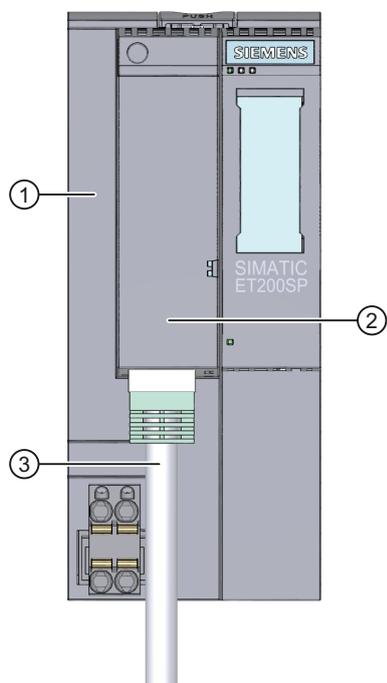
Please observe the specifications in PROFINET Installation Guide (<http://www.profibus.com>).

Mounting the bus connector

Mount the PROFINET connector as per the instructions in PROFINET Installation Guide (<http://www.profibus.com>).

Proceed as follows

1. Install the BusAdapter BA 2xRJ45 into the interface module.
2. Screw the BusAdapter BA 2xRJ45 to the interface module (1 screw with 0.2 Nm tightening torque). To do this, use a screwdriver with a 3 to 3.5 mm blade.
3. Install the RJ45 bus connector(s) into the PROFINET port on the BusAdapter BA 2xRJ45.

BusAdapter BA 2xRJ45 mounted

- ① Interface module
- ② BusAdapter BA 2xRJ45
- ③ PROFINET connecting cable

Figure 5-9 Connecting BusAdapter BA 2xRJ45 to the interface module

Note**Installation guidelines for modules with PROFINET IO interfaces**

You may only operate the modules with PROFINET IO interfaces in LANs (Local Area Networks) if all connected nodes are equipped with SELV/PELV power supplies (or equivalent protection).

A data transfer point is prescribed for connection to the WAN (Wide Area Network) that guarantees this degree of safety.

5.9 Connecting PROFINET IO bus adapter BA 2xFC to the interface module (in preparation)

Introduction

You connect PROFINET IO to the interface module via the BusAdapter BA 2xFC. To do this, screw the BusAdapter BA 2xFC to the interface module and insert the PROFINET connecting cable. Then, you can loop PROFINET via the integrated 2-port switch.

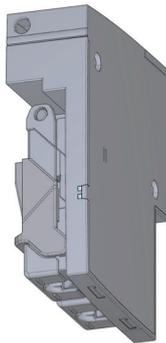


Figure 5-10 BusAdapter BA 2xFC

Required tools

3 to 3.5 mm screwdriver

Required accessories

- If you use Fast Connect Cable, we recommend the Industrial Ethernet Fast Connect Stripping Tool (6GK1901-1GA00) with green knife cassette (6GK1901-1B...). This guarantees fast and safe stripping.
- Please observe the specifications in PROFINET Installation Guide (<http://www.profibus.com>).

Proceed as follows

1. Strip the sleeve of the PROFINET connecting cable as follows:

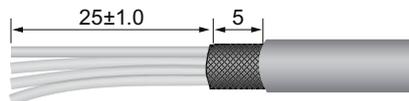
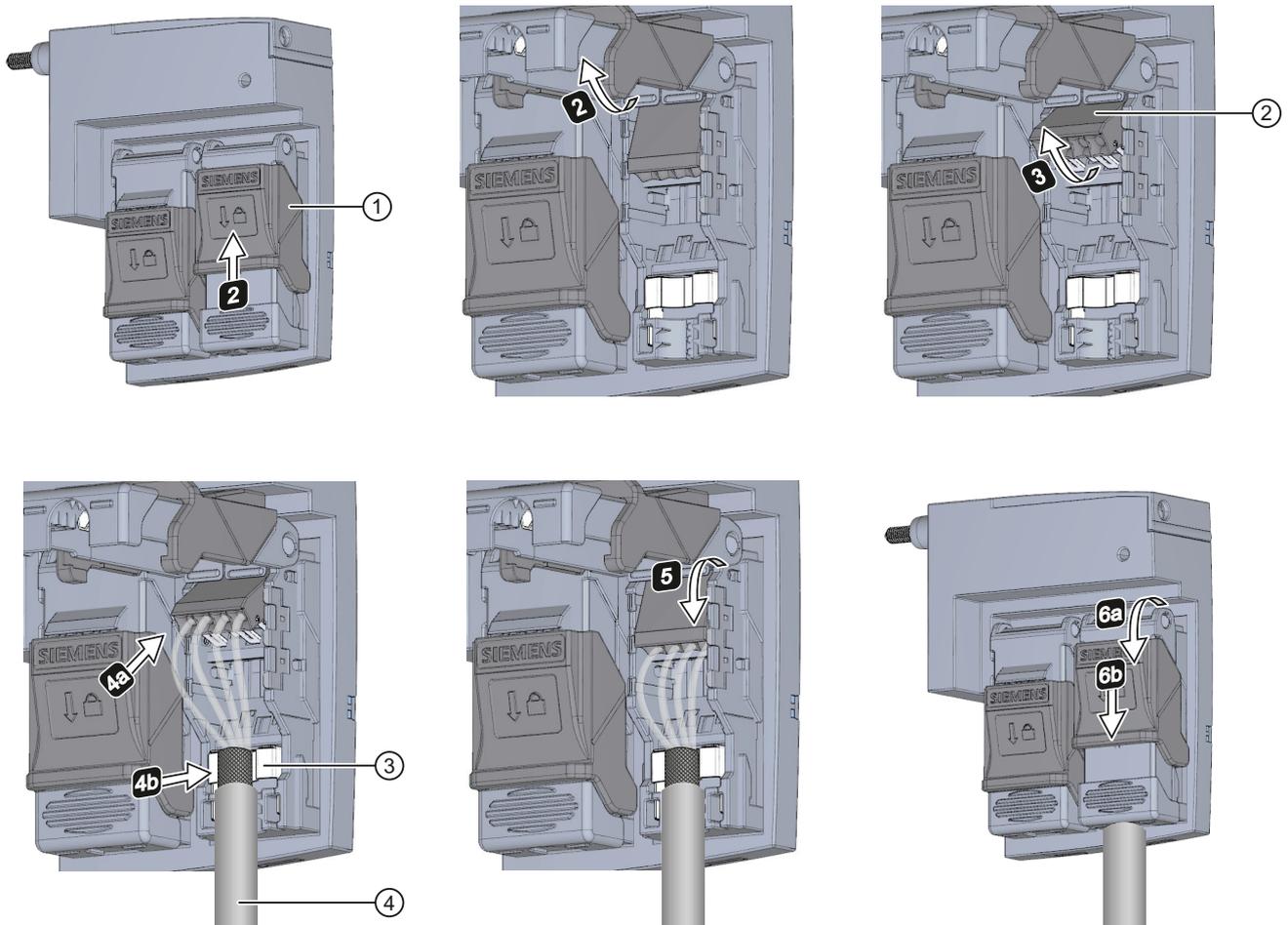


Figure 5-11 PROFINET connecting cable

2. Pull back the locking slide and fold up the cover of the connection element.
3. Lift the cable routing up as far as it will go.

5.9 Connecting PROFINET IO bus adapter BA 2xFC to the interface module (in preparation)

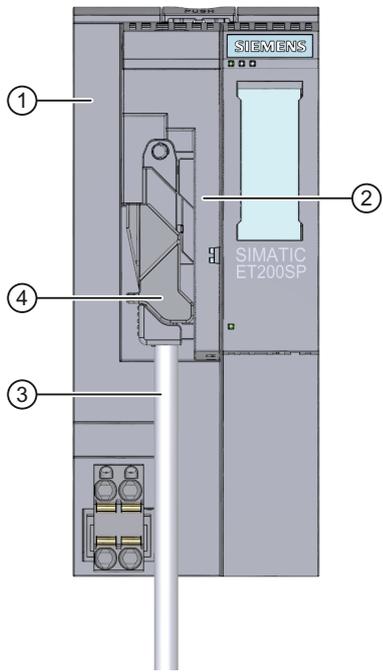
4. Insert the unstripped single cores of the PROFINET connecting cable (according to the imprinted color coding) into the cable routing as far as they will go and press the cable routing down as far as it will go.
5. Close the cover of the connection element and push the locking slide forward.
6. Connect and screw the BusAdapter BA 2xFC to the interface module (1 screw with 0.2 Nm tightening torque.) To do this, use a screwdriver with a 3 to 3.5 mm blade.



- | | |
|-----------------|-----------------------------|
| ① Locking slide | ③ Shield contact |
| ② Cable routing | ④ PROFINET connecting cable |

Figure 5-12 Connection of the PROFINET IO BusAdapter BA 2xFC to the interface module

BusAdapter BA 2xFC mounted



- ① Interface module
- ② BusAdapter BA 2xFC
- ③ PROFINET connecting cable
- ④ Connection element

Figure 5-13 BusAdapter BA 2xFC mounted

Note

Installation guidelines for modules with PROFINET IO interfaces

You may only operate the modules with PROFINET IO interfaces in LANs (Local Area Networks) if all connected nodes are equipped with SELV/PELV power supplies (or equivalent protection).

A data transfer point is prescribed for connection to the WAN (Wide Area Network) that guarantees this degree of safety.

5.10 Installing I/O modules and BU covers

Introduction

- The I/O modules are installed into the BaseUnits. They are self-coding and type-coded.
- The BU covers are installed on BaseUnits whose slots are not equipped with I/O modules.

The BU covers have a mount for the reference identification label on the inside. For future expansion of the ET 200SP, remove the reference identification label from the mount and insert it into the final I/O module.

It is not possible to attach a reference identification label to the BU cover itself.

Requirement

Please note chapter Selection of a suitable BaseUnit (Page 21).

Installing I/O modules and BU covers

Install the I/O module or BU cover parallel into the BaseUnit until you hear both latches click into place.

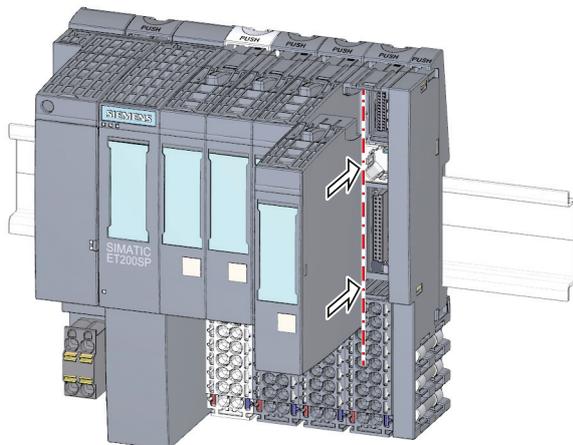


Figure 5-14 Installing I/O modules

5.11 Labeling ET 200SP

5.11.1 Factory markings

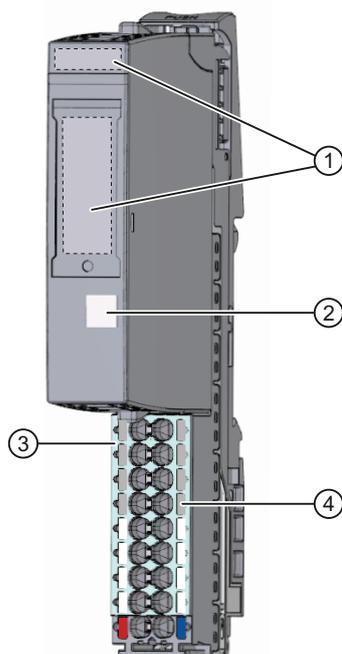
Introduction

For better orientation, the ET 200SP is equipped with various markings ex factory, which help in the configuration and connection of the modules.

Factory markings

- Module labeling
- Color coding of the module classes
 - Digital input modules: white
 - Digital output modules: black
 - Analog input modules: light blue
 - Analog output modules: dark blue
- Color coding of the potential group
 - Opening the potential group: Light terminal box and light mounting rail release button
 - Further conduction of the potential group: Dark terminal box and dark mounting rail release button

- Color coding of the spring NC contacts
 - Process terminals: gray, white
 - AUX terminals: turquoise
 - Additional terminals: turquoise
 - Terminals for power buses P1, P2: red, blue ①



- ① Module labeling
- ② Color coding of the module classes
- ③ Color coding of the potential group
- ④ Color coding of the spring NC contacts (by group)

Figure 5-15 Factory markings

5.11.2 Optional markings

Introduction

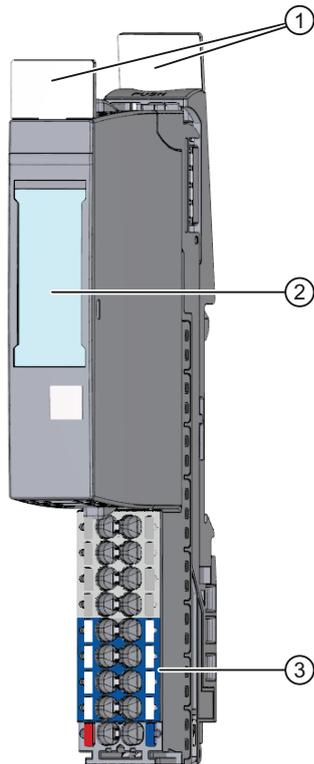
As well as the factory markings, there are also other options for the labeling and/or marking of terminals, BaseUnits and I/O modules with ET 200SP.

Optional markings

- The color identification labels are module-specific labels for color coding the potentials of the I/O modules: A color code (**Colour Code**, e.g. CC01) is printed on each color identification label and I/O module. The color code enables you to read directly from the I/O module which color identification label is required for the terminals of the associated BaseUnit. The color identification labels come in the following designs:
 - Module-specific color combinations for the process terminals (see device manuals I/O modules (<http://support.automation.siemens.com/WW/view/en/55679691/133300>)). The different colors have the following meaning: Gray = input or output signal, red = potential +, blue = ground.
 - For the AUX terminals in the colors yellow-green, blue or red
 - For the additional terminals in the colors blue-red
- The reference identification labels (in accordance with EN 81346) can be inserted onto each interface module, BusAdapter, BaseUnit and I/O module. It is thus possible to create a fixed assignment between the reference identification label of the BaseUnit and the I/O module.

With the standard plotter setting, the reference identification label is suitable for automatic labeling with E-CAD systems.

- The labeling strips can be inserted in the interface module, I/O module and BU cover and enable the marking of the ET 200SP. The labeling strips can be ordered on rolls for thermal transfer printers.



- ① Reference identification labels
- ② Labeling strip
- ③ Color identification labels

Figure 5-16 Optional markings

5.11.3 Applying color identification labels

Requirements

The BaseUnits must not be wired when you apply the color identification labels.

Required tools

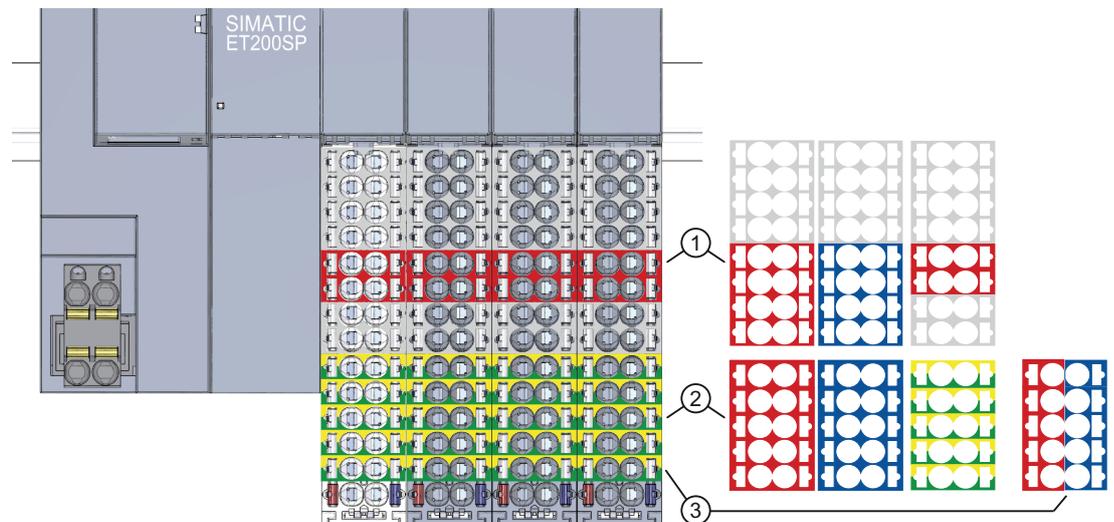
3 mm screwdriver (only for removing the color identification labels)

Applying color identification labels

1. Break off the color identification labels from the strips.
2. Press these into the terminal box of the BaseUnit.

Note

To remove the color identification labels, you must first disconnect the wiring on the BaseUnit and then carefully lever the color identification labels out of the mount using a screwdriver.



- ① Module-specific color identification labels for the process terminals (see device manual I/O Module (<http://support.automation.siemens.com/WW/view/en/55679691/133300>))
- ② Color identification labels for the 10 AUX terminals
- ③ Color identification labels for the 10 additional terminals

Figure 5-17 Applying color identification labels

5.11.4 Applying labeling strips

Proceed as follows

1. Label the strips.
2. Insert the labeling strip into the interface module or I/O module.

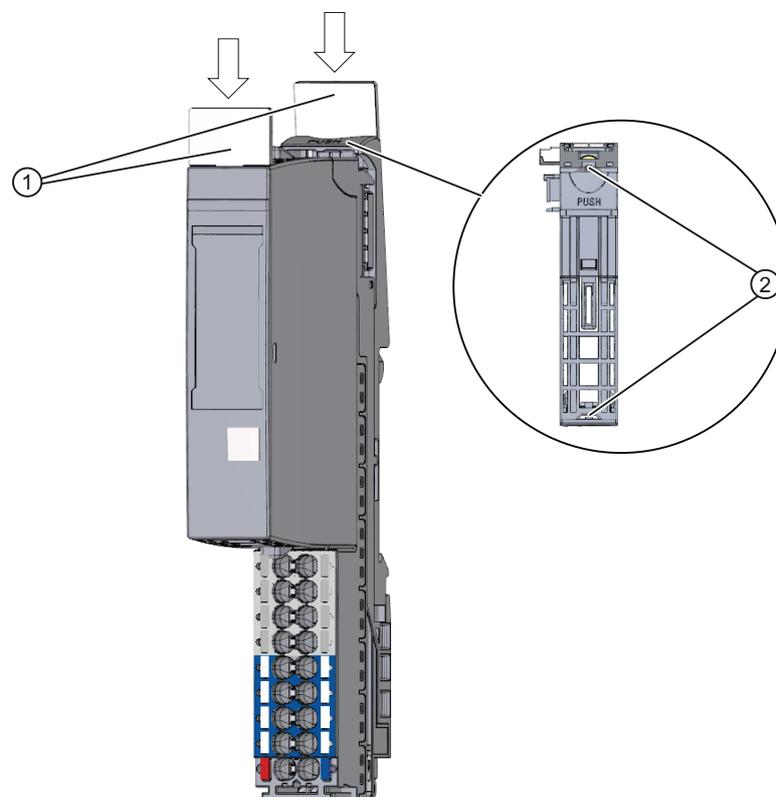
5.11.5 Applying reference identification labels

Proceed as follows

1. Break off the reference identification labels from the sheet.
2. Insert the reference identification labels into the slot on the interface module, BusAdapter, BaseUnit and I/O module. The insert slot is located on the top of the BaseUnit or I/O module.

Note

The printable side of the reference identification label must be facing forward.



- ① Reference identification labels
② Insert slot

Figure 5-18 Applying reference identification labels

Configuring

6.1 Configuring the ET 200SP

Introduction

You configure and assign parameters to the ET 200SP (interface module, I/O modules and server module) with *STEP 7* or in the configuration software of another manufacturer.

Requirements

Configuration software	Requirements		Installation information
<i>STEP 7</i> (TIA Portal) as of V11 SP2*	From support package HSP0024	GSDML file: GSDML-Vx.y-siemens-et200sp-"Date in format yyyyymmdd".xml (http://support.automation.siemens.com/WW/view/en/57138621)	<i>STEP 7</i> online help
<i>STEP 7</i> as of V5.5 SP2	---		Manufacturer documentation
Software of another manufacturer			

* The TIA Portal supports GSDML specification V2.25. ET 200SP is already supplied with a GSDML file based on specification V2.3. However, the GSDML file can be installed and used in the TIA Portal without restrictions.

Configuration of the ET 200SP

Observe the online help on *STEP 7* and/or the documentation of the configuration software manufacturer.

Commissioning

7.1 Commissioning the ET 200 SP

Introduction

You commission the automation system according to the relevant plant configuration. The following describes the commissioning of the ET 200SP on an IO controller.

Requirements for ET 200SP on PROFINET IO

Note

Performing tests

You must ensure the safety of your plant. Therefore, you must perform a complete functional test and the necessary safety checks before the final commissioning of a plant.

Also allow for any possible foreseeable errors in the tests. In this way, you avoid endangering persons or plants during operation.

Table 7- 1 Chapter overview and references

Actions	Reference
ET 200SP mounted	Chapter Installation (Page 29)
ET 200SP wired	Chapter Connecting (Page 37)
ET 200SP configured	Chapter Configuring (Page 63)
Supply voltage to the I/O controller is switched on	I/O controller manual
I/O controller is in RUN	I/O controller manual

Commissioning ET 200SP

Turn on the supply voltages for the ET 200SP.

7.2 Startup of the ET 200SP

Principle of operation

The following diagram illustrates the startup of the ET 200SP as an IO device on PROFINET IO:

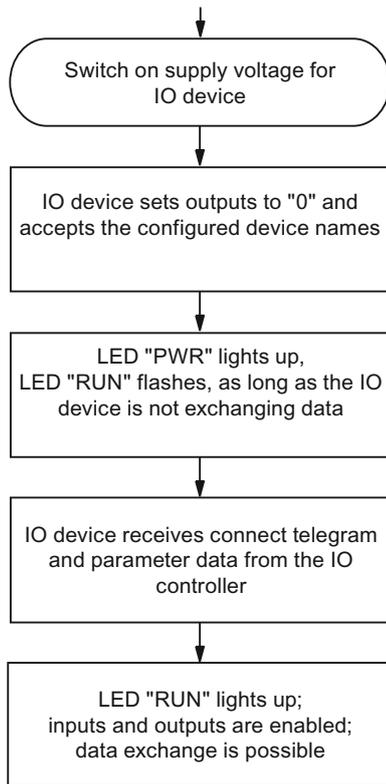


Figure 7-1 Startup of the ET 200SP on PROFINET IO

Note

The ET 200SP distributed IO device can start up even with empty slots:

- The configuration may contain any number of empty slots.
 - All empty slots must be covered with a BU cover.
 - The ET 200SP must be terminated with a server module.
 - A "Module missing in slot x" diagnostic message is generated for empty slots in which I/O modules are configured.
-

7.3 Identification data

Introduction

Identification data is read-only (I data) or read/write (M data) information that is saved on the module.

The identification data supports you in the following activities:

- Checking the system configuration
- Locating hardware changes in a system
- Correcting errors in a system

Modules can be clearly identified online using the identification data.

You can read out the identification data with *STEP 7* (see online help for *STEP 7*).

Identification data

You can directly access specific identification data by selecting **Read data record**. Obtain the corresponding part of the identification data under the associated data record index.

The data records are structured as follows:

Table 7- 2 Basic structure of data records with identification data for PROFINET IO

Content	Length (bytes)	Coding (hex)
Header information		
BlockType	2	I&M0: 0020 I&M1: 0021 I&M2: 0022 I&M3: 0023
BlockLength	2	I&M0: 0038 I&M1: 0038 I&M2: 0012 I&M3: 0038
BlockVersionHigh	1	01
BlockVersionLow	1	00
Identification data		
Identification data (see table below)	I&M0/Index AFF0: 54 I&M1/Index AFF1: 54 I&M2/Index AFF2: 16 I&M3/Index AFF3: 54	

The data structures in the data records correspond to the specifications of PROFINET IO.

7.3 Identification data

Table 7- 3 Identification data for PROFINET IO

Identification data	Access	Default	Explanation
Identification data 0: (data record index AFF0 hex)			
VendorIDHigh	Read (1 byte)	00 hex	The name of the manufacturer is saved here (42 hex = SIEMENS AG).
VendorIDLow	Read (1 byte)	2A hex	
Order_ID	Read (20 bytes)	6ES7155-6AU00-0BN0	Order number of the module (e.g. of the interface module)
IM_SERIAL_NUMBER	Read (16 bytes)	-	Serial number (device-specific)
IM_HARDWARE_REVISION	Read (2 bytes)	1	corresponding HW version
IM_SOFTWARE_REVISION	Read	Firmware version	provides information about the firmware version of the module
• SWRevisionPrefix	(1 byte)	V	
• IM_SWRevision_Functional_Enhancement	(1 byte)	00 - FF hex	
• IM_SWRevision_Bug_Fix	(1 byte)	00 - FF hex	
• IM_SWRevision_Internal_Change	(1 byte)	00 - FF hex	
IM_REVISION_COUNTER	Read (2 bytes)	0000	provides information about parameter changes on the module (not applied)
IM_PROFILE_ID	Read (2 bytes)	0000	Generic Device
IM_PROFILE_SPECIFIC_TYPE	Read (2 bytes)	0005 hex	Interface modules
		0003 hex	I/O modules
IM_VERSION	Read	0101 hex	provides information about the version of the identification data (0101 hex = version 1.1)
• IM_Version_Major	(1 byte)		
• IM_Version_Minor	(1 byte)		
IM_SUPPORTED	Read (2 bytes)	000E hex	provides information about the available identification data (I&M1 to I&M3)
Maintenance data 1: (data record index AFF1 hex)			
IM_TAG_FUNCTION	Read/write (32 bytes)	-	Enter a identifier here that is unique plant-wide.
IM_TAG_LOCATION	Read/write (22 bytes)	-	Enter the installation location of the module here.
Maintenance data 2: (data record index AFF2 hex)			
IM_DATE	Read/write (16 bytes)	YYYY-MM-DD HH:MM	Enter the installation date of the module here.
Maintenance data 3: (data record index AFF3 hex)			
IM_DESCRIPTOR	Read/write (54 bytes)	-	Enter a comment describing the module.

7.4 Resetting interface module to factory settings

Introduction

When you reset to factory settings,

- the interface modules is set to delivery state and
- the properties of the interface modules are set to the following values:

Table 7- 4 Properties of the interface module in delivery state

Properties	Value
Parameters	Default setting
IP address	Not available
Device name	Not available
MAC address	Available
I&M data	I data: existing, M data: Not available
Firmware version	Available

Reset options

- via a reset button on the interface module (on reverse side)
- online via PROFINET IO (with *STEP 7*)

7.4.1 Resetting the interface module to factory settings via a RESET button

Requirements

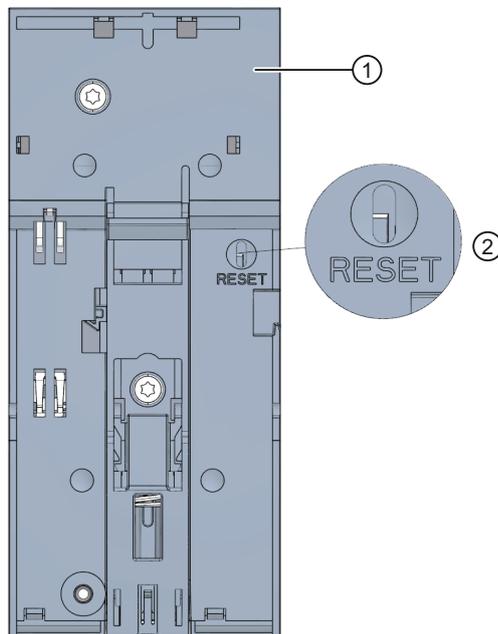
The supply voltage to the interface module must be turned on.

Required tools

3 to 3.5 mm screwdriver (for resetting via RESET button)

Proceed as follows

1. Remove the interface module from the mounting rail (see Installing the interface module (Page 31)) and swivel in a downwards direction.
2. The reset button is located on the reverse side of the interface module behind a small opening: Using a screwdriver, press in the small opening for at least 3 seconds, thus activating the reset button.
3. Mount the interface module on to the mounting rail again (see Installing the interface module (Page 31)).
4. Look at the LED display of the interface module to see whether the reset was successful: RUN LED flashes for 3 seconds, ERROR and MAINT LED are off.
5. Assign parameters to the interface module again.



- ① Reverse side of the interface module
- ② Reset button

Figure 7-2 Reset button

7.4.2 Resetting the interface module to factory settings via PROFINET IO

Requirements

There is an online connection to the interface module that is to be reset to the factory settings.

Proceed as follows

Connect the PG/PC to the PROFINET IO interface of the ET 200SP. The ET 200SP is connected to the higher-level IO controller via PROFINET IO.

You can find additional information on the procedure in the online help for *STEP 7*.

7.5 Reassigning parameters during operation

Introduction

You have the option of reassigning the parameters for the ET 200SP I/O modules during operation.

Changing parameters during operation

The I/O modules are configured by data records. Each I/O module has a separate data record. Transfer the changed parameters to the I/O module with the WRREC instruction.

Note

You must transfer the parameters using the WRREC instruction again after a POWER OFF/POWER ON of the ET 200SP; otherwise, they are overwritten by the configured parameters.

Instruction for parameter assignment

The following instruction is provided for assigning parameters to the I/O module in the user program:

Instruction	Application
WRREC	Transfer the modifiable parameters to the selected ET 200SP module.

Error message

In the event of an error, the following return values are reported:

Table 7- 5 Error message

Error code	Meaning
80E0H	Error in header information
80E1H	Parameter error

Additional information

You can find the configuration of the parameter data record in the device manuals for I/O modules (<http://support.automation.siemens.com/WW/view/en/55679691/133300>).

Maintenance

8.1 Removing and inserting I/O modules

Introduction

The ET 200SP supports removing and installing I/O modules during operation (RUN operating state).

Requirements

- If you want to replace several I/O modules during operation, you must replace them one after the other.
- The following table describes which modules you may insert and remove under which conditions:

Table 8- 1 Removal and installation of modules

Modules	Removal and installation	Conditions
Interface module	No	---
Digital input modules	Yes	---
Digital output modules	Yes	Load switched off
Analog input and output modules	Yes	---
Server module	No	---

CAUTION

Installing digital output modules while a load is switched on can result in dangerous situations in your plant.

Damage to the ET 200SP may occur as a result.

Therefore, the digital output module may only be inserted and removed when the load is switched off.

Principle of operation

1. You can remove **one** I/O module during operation. If you remove another I/O module, this results in a stoppage of the ET 200SP:
 - All I/O modules of the ET 200SP fail → substitute value behavior
 - The interface module continues to exchange data with the IO controller and report diagnostics.
2. If you insert all but one of the I/O modules withdrawn during operation, all I/O modules will start up again.

Note

I/O modules that were inserted into empty slots and then removed also count as being removed in operation.

3. After a POWER OFF/POWER ON of the supply voltage 1L+ of the interface module, all available I/O modules start up again in accordance with the configuration. The evaluation of the I/O modules removed during operation starts again (see 1).

Pulling I/O modules

1. Simultaneously press the top and bottom release buttons of the I/O module.
2. Pull the I/O module out of the BaseUnit, parallel in a forward direction.

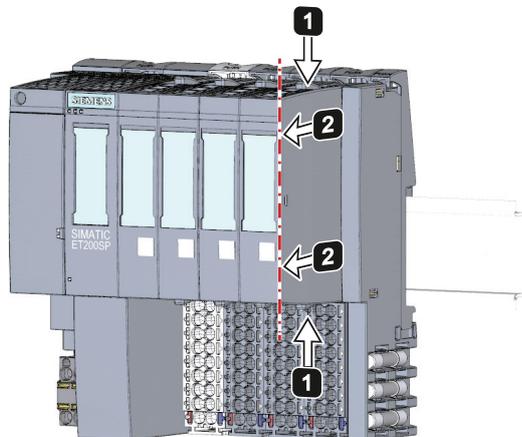


Figure 8-1 Pulling I/O modules

See also

Interface modules (<http://support.automation.siemens.com/WW/view/en/55683316/133300>)

8.2 Changing the type of an I/O module

Introduction

The coding consists of a 2-part coding element.

Both coding elements are located in the I/O module ex-factory.

When an I/O module is installed for the first time, a part of the coding element clicks into the BaseUnit. This means that installing the wrong I/O module is prevented mechanically.

Requirement

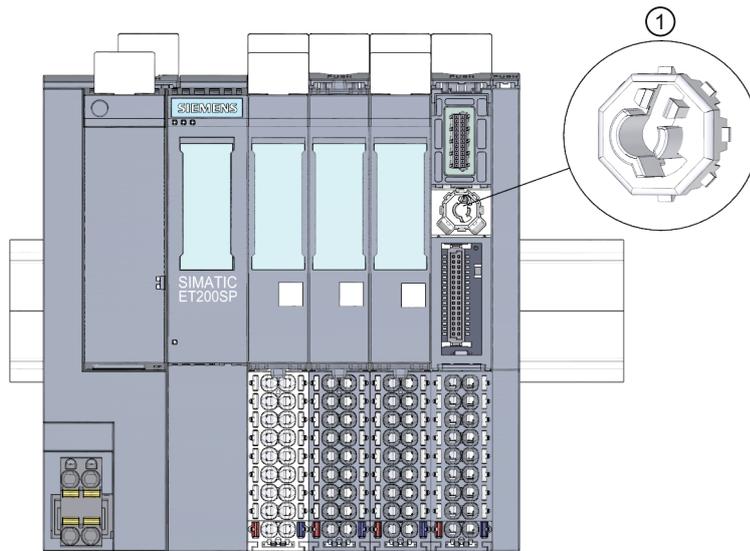
Please note chapter Application planning (Page 21).

CAUTION
Making changes to the coding element may result in dangerous conditions in your plant and/or damages can occur on the outputs of the ET 200SP. To avoid damage, do not manipulate the coding.

Changing the type of an I/O module

You have already disconnected the I/O module:

1. Push the coding element out of the BaseUnit using a screwdriver.
2. Install the coding element back into the I/O module used.
3. Install the new I/O module (other module type) into the BaseUnit until you hear it click into place.
4. Mark the new I/O module.



① Coding element

Figure 8-2 Changing the type of an I/O module

8.3 Replacing the I/O module

Introduction

When an I/O module is installed for the first time, a part of the coding element clicks into the BaseUnit. When you replace an I/O module with the same type of module, the correct coding element is already present in the BaseUnit.

Requirement

Please note chapter Application planning (Page 21).

Replacing the I/O module

You have already disconnected the I/O module:

1. Remove the coding element (part) from the underside of the new I/O module.
2. Insert the new I/O module (same module type) into the BaseUnit until you hear it click into place.
3. Mark the new I/O module.

8.4 Replacing the terminal box on the BaseUnit

Introduction

The terminal box is part of the BaseUnit. You can replace the terminal box if necessary. You do not need to disassemble the BaseUnit to do this.

The power and AUX buses of the potential group are not disconnected when you replace the terminal box.

Requirements

- The BaseUnit is mounted, wired and fitted with an I/O module.
- The terminal may only be replaced when the supply voltage is switched off.

Required tools

3 to 3.5 mm screwdriver

Proceed as follows

1. Turn off any present supply voltage on the BaseUnit.
2. Simultaneously press the top and bottom release buttons of the I/O module and pull the module out of the BaseUnit.
3. Loosen the wiring on the BaseUnit.
4. The release button of the terminal box is located on the underside of the BaseUnit. Use a screwdriver to push in the small opening at an angle from above.
5. Swivel the screwdriver slightly upwards to loosen the locking mechanism of the terminal box and swivel the terminal box out of the BaseUnit in an upwards direction.
6. Insert the new terminal box into the BaseUnit at the top and swivel it downwards until it clips into the BaseUnit.
7. Wire the BaseUnit.
8. Insert the I/O module into the BaseUnit.
9. Switch on any supply voltage on the BaseUnit.

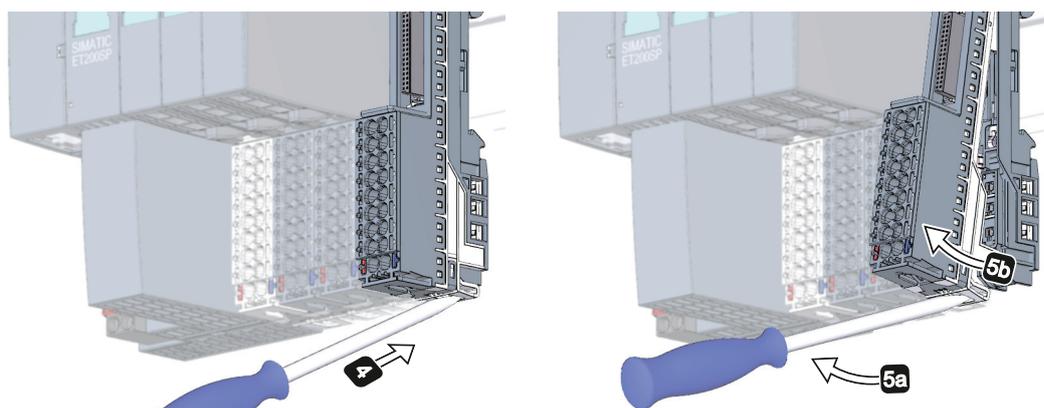


Figure 8-3 Replacing the terminal box on the BaseUnit

8.5 Firmware update

Introduction

It may be necessary to update the firmware during operation (e.g. function expansions).
Update the firmware of the interface module and I/O modules using firmware files.

Requirements

The ET 200SP is accessible online via PROFINET IO.

Firmware update via PROFINET IO

Connect the PG/PC to the PROFINET IO interface of the ET 200SP.

NOTICE
Firmware update of analog I/O modules
For analog I/O modules, L+ supply voltage must be present on the module at the start of and during the firmware update.

You can find additional information on the procedure in the online help for *STEP 7*.

Technical specifications

9.1 Standards and certifications

Introduction

Contents of general technical specifications:

- the standards and test values that the ET 200SP distributed I/O system complies with and fulfills.
- the test criteria according to which the ET 200SP was tested.

Note

Information on the components of the ET 200SP

The current valid markings and permissions are printed on the components of the ET 200SP.

Reference

The certificates for the markings and approvals can be found on the Internet under Service&Support (<http://www.siemens.com/automation/service&support>).

Safety information

 WARNING
<p>Personal injury and damage to property may occur.</p> <p>In potentially explosive atmospheres, injury to persons and material damage may occur if you disconnect plug-in connections during operation of an ET 200SP.</p> <p>Always switch off the power to the ET 200SP when disconnecting plug-in connections in potentially explosive atmospheres.</p>

 WARNING
<p>Explosion hazard</p> <p>If you replace components, compliance with Class I, DIV. 2 could be compromised.</p>

 WARNING
<p>This device is only appropriate for use in Class I, Div. 2, Group A, B, C, D, or in non-hazardous areas.</p>

CE Label



The ET 200SP distributed I/O system meets the requirements and protection targets of the following EC guidelines and complies with the harmonized European standards (EN) for programmable logic controllers published in the official gazettes of the European Community:

- 2006/95/EC "Electrical Equipment Designed for Use within Certain Voltage Limits" (Low-Voltage Directive)
- 2004/108/EC "Electromagnetic Compatibility" (EMC Directive)
- 94/9/EC "Equipment and protective systems intended for use in potentially explosive atmospheres" (Explosion Protection Directive)

The EC declaration of conformity is held on file available to competent authorities at:

Siemens Aktiengesellschaft
Industry Sector
I IA AS FA WF AMB
PO Box 1963
D-92209 Amberg, Germany

These files are also available for download on the Customer Support Internet pages, keyword "Declaration of Conformity".

cULus approval



Underwriters Laboratories Inc., complying with

- UL 508 (Industrial Control Equipment)
- CSA C22.2 No. 142 (Process Control Equipment)

or

cULus HAZ. LOC. approval



Underwriters Laboratories Inc., complying with

- UL 508 (Industrial Control Equipment)
- CSA C22.2 No. 142 (Process Control Equipment)
- ANSI/ISA 12.12.01
- CSA C22.2 No. 213 (Hazardous Location)

APPROVED for use in
Class I, Division 2, Group A, B, C, D Tx;
Class I, Zone 2, Group IIC Tx

FM approval



Factory Mutual Research (FM) to
Approval Standard Class Number 3611, 3600, 3810 (ANSI/ISA 82.02.01)
CSA C22.2 No. 213
CSA C22.2 No. 61010-1
APPROVED for use in Class I, Division 2, Group A, B, C, D T;
Class I, Zone 2, Group IIC Tx

ATEX approval



in accordance with EN 60079-15 (Electrical apparatus for potentially explosive atmospheres; Type of protection "n") and EN 60079-0 (Electrical apparatus for potentially explosive gas atmospheres - Part 0: General Requirements)



II 3 G Ex nA IIC T4..T6 Gc

Tick mark for Australia and New Zealand



The ET 200SP distributed I/O system meets the requirements of the standard AS/NZS CISPR 16.

Korea Certificate KCC-REM-S49-ET200SP



Please note that this device corresponds to limit value class A in terms of the emission of radio frequency interference. This device can be used in all areas, except residential areas.

이 기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며 가정 외의 지역에서 사용하는 것을 목적으로 합니다.

IEC 61131

The ET 200SP distributed I/O system meets the requirements and criteria of the standard IEC 61131-2 (programmable logic controllers, part 2: Equipment requirements and tests).

Marine approval

Classification societies:

- ABS (American Bureau of Shipping)
- BV (Bureau Veritas)
- DNV (Det Norske Veritas)
- GL (Germanischer Lloyd)
- LRS (Lloyds Register of Shipping)
- Class NK (Nippon Kaiji Kyokai)

Use in industrial environments

SIMATIC products are designed for industrial applications.

Table 9- 1 Use in industrial environments

Field of application	Noise emission requirements	Noise immunity requirements
Industry	EN 61000-6-4: 2007	EN 61000-6-2: 2005

Use in residential areas

Note

The ET 200SP is intended for use in industrial areas; use in residential areas may have an impact on the radio/TV reception.

If you want to use the ET 200SP in residential areas, you must ensure that its radio interference emission complies with limit value class B in accordance with EN 55011.

Suitable measures for achieving RF interference level Class B include, for example:

- Installation of the ET 200SP in grounded control cabinets/control boxes
- Use of noise filters in the supply lines

9.2 Electromagnetic compatibility

Definition

Electromagnetic compatibility (EMC) is the ability of an electrical installation to function satisfactorily in its electromagnetic environment without interfering with that environment.

Among other things, the ET 200SP distributed I/O system also meets the requirements of the EMC legislation for the European single market. The prerequisite for this is that the ET 200SP complies with the requirements and guidelines relating to electrical equipment.

EMC in accordance with NE21

The ET 200SP meets the EMC specifications of the NAMUR guideline NE21.

Pulse-shaped disturbance

The following table shows the electromagnetic compatibility of the ET 200SP with regard to pulse-shaped disturbances.

Table 9- 2 Pulse-shaped disturbance

Pulse-shaped disturbance	Test voltage	corresponds with degree of severity
Electrostatic discharge in accordance with IEC 61000-4-2.	Air discharge: ± 8 kV	3
	Contact discharge: ± 6 kV	3
Burst pulses (high-speed transient disturbances) in accordance with IEC 61000-4-4.	2 kV (power supply lines)	3
	2 kV (signal lines > 30 m)	3
	1 kV (signal lines < 30 m)	
High-energy single pulse (surge) in accordance with IEC 61000-4-5 External protective circuit required		3
• asymmetric coupling	2 kV (power supply lines) DC with protective elements 2 kV (signal line/data line only >30 m), possibly with protective elements	
• symmetric coupling	1 kV (power supply lines) DC with protective elements 1 kV (signal line/data line only >30 m), possibly with protective elements	

Sinusoidal disturbance

The following table shows the electromagnetic compatibility of the ET 200SP with regard to sinusoidal disturbance.

- RF radiation

Table 9- 3 Sinusoidal disturbance: RF radiation

RF radiation in accordance with IEC 61000-4-3 Electromagnetic RF field, amplitude-modulated		corresponds with degree of severity
80 to 1000 MHz; 1.4 to 2 GHz	2.0 GHz to 2.7 GHz	3
10 V/m	1 V/m	
80 % AM (1 kHz)		

- RF coupling

Table 9- 4 Sinusoidal disturbance: RF coupling

RF coupling in accordance with IEC 61000-4-6	corresponds with degree of severity
10 to 80 MHz	3
10 V _{rms} unmodulated	
80 % AM (1 kHz)	
150 Ω source impedance	

Emission of radio interference

Interference emission of electromagnetic fields in accordance with EN 55016: Limit value class A, group 1 (measured at a distance of 10 m).

Table 9- 5 Emission of radio interference

Frequency	Emitted interference
30 MHz to 230 MHz	< 40 dB (µV/m)Q
230 MHz to 1000 MHz	< 47 dB (µV/m)Q

9.3 Shipping and storage conditions

Introduction

The ET 200SP distributed I/O system exceeds requirements in terms of shipping and storage conditions according to IEC 61131-2.

Shipping and storage conditions for modules

Table 9- 6 Shipping and storage conditions for modules

Type of condition	Permissible range
Free fall (in shipping package)	≤ 1 m
Temperature	From -40 °C to +70 °C
Barometric pressure	1080 hPa to 660 hPa (corresponds with an altitude of -1000 m to 3500 m)
Relative humidity	5% to 95%, without condensation
Sinusoidal oscillations according to	5 - 9 Hz: 3.5 mm 9 - 500 Hz: 9.8 m/s ²
Impact according to	250 m/s ² , 6 ms, 1000 shocks

9.4 Mechanical and climatic ambient conditions

Operating conditions

The ET 200SP distributed I/O system is suitable for use in weather-proof, fixed locations. The operating conditions exceed requirements according to DIN IEC 60721-3-3:

- Class 3M3 (mechanical requirements)
- Class 3K3 (climatic requirements)

Mechanical ambient conditions

The table below shows the mechanical ambient conditions in the form of sinusoidal oscillations.

Table 9- 7 Mechanical ambient conditions

Frequency band	ET 200SP with bus adapter	ET 200SP with bus adapter BA 2×RJ45
$5 \leq f \leq 8.4$ Hz	3.5 mm amplitude	
$8.4 \leq f \leq 150$ Hz	1 g constant acceleration	
$10 \leq f \leq 60$ Hz	0.35 mm amplitude	-
$60 \leq f \leq 1000$ Hz	5 g constant acceleration	

Test of mechanical ambient conditions

The table below provides important information with respect to the type and scope of the test of ambient mechanical conditions.

Table 9- 8 Test of mechanical ambient conditions

Condition tested	Test Standard	Comment
Vibration	Vibration test according to IEC 60068-2-6 (Sinus)	Type of oscillation: Frequency sweeps with a rate of change of 1 octave/minute. BA 2×RJ45 <ul style="list-style-type: none"> • 5 Hz ≤ f ≤ 8.4 Hz, 3.5 mm constant amplitude • 8.4 Hz ≤ f ≤ 150 Hz, 1 g constant acceleration BA 2×FC <ul style="list-style-type: none"> • 10 Hz ≤ f ≤ 60 Hz, 0.35 mm constant amplitude • 60 Hz ≤ f ≤ 1000 Hz, 5 g constant acceleration Duration of oscillation: 10 frequency sweeps per axis at each of three vertically aligned axes
Shock	Shock, tested according to	Type of shock: Half-sine Shock intensity: 150 m/s ² peak value, 11 ms duration Direction of shock: 3 shocks in each direction (+/-) at each of three vertically aligned axes
Continuous shock	Shock, tested according to	Type of shock: Half-sine Shock intensity: 25 g peak value, 6 ms duration Direction of shock: 1000 shocks in each direction (+/-) at each of three vertically aligned axes

9.5 Information on insulation, protection class, degree of protection and rated voltage

Climatic ambient conditions

The ET 200SP may be used in the following climatic ambient conditions:

Table 9-9 Climatic ambient conditions

Ambient conditions	Permissible range	Comments
Temperature: horizontal mounting position: vertical mounting position:	0 °C to 60 °C 0 °C to 50 °C	
Permitted temperature change	10 °C/h	
Relative humidity	from 10 to 95%	Without condensation, corresponds to relative humidity (RH) class 2 in accordance with IEC 61131 part 2
Barometric pressure	1080 hPa to 795 hPa	Corresponds with an altitude of -1000 m to 2000 m
Concentration of pollutants	SO ₂ : <0.5 ppm; RH <60%, no condensation H ₂ S: < 0.1 ppm; RH < 60 %, no condensation	Test: 10 ppm; 21 days Test: 1 ppm; 21 days
	ISA-S71.04 severity level G1; G2; G3	-

9.5 Information on insulation, protection class, degree of protection and rated voltage

Insulation

The insulation is designed in accordance with the requirements of EN 61131-2: 2007.

Note

For modules with supply voltage 24 V DC, the electrical isolation is designed for max. 60 V AC/75 V DC and basic insulation is designed according to EN 61131-2: 2007.

Contamination level/overvoltage category according to

- Pollution degree 2
- Overvoltage category for U_N = 24 V DC: II
- Overvoltage category for U_N = 400 V AC: II

Protection class

Protection class I in accordance with IEC 61131-2:2007

9.6 Use of the ET 200SP in zone 2 potentially explosive atmospheres

Degree of protection IP20

Degree of protection IP20 in accordance with IEC 60529 for all modules of the ET 200SP, i.e.:

- Protection against contact with standard probe
- Protection against foreign objects with diameters in excess of 12.5 mm
- No special protection against water

Rated voltage for operation

The ET 200SP distributed I/O device works with the rated voltage and corresponding tolerances listed in the following table.

Table 9- 10 Rated voltage for operation

Modules of ET 200SP	rated voltage	Tolerance range
all	24 V DC	19.2 to 28.8 V DC ¹
		18.5 to 30.2 V DC ²

¹ Static value: Creation as functional extra-low voltage with safe electrical isolation in accordance with

² Dynamic value: including ripple, e.g. with three-phase bridge rectification

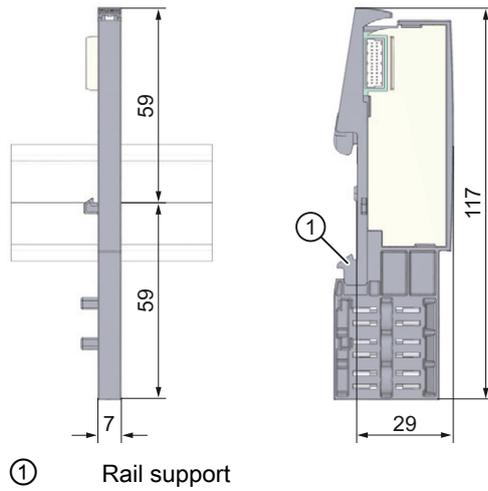
9.6 Use of the ET 200SP in zone 2 potentially explosive atmospheres

See product information Use of subassemblies/modules in a zone 2 hazardous area (<http://support.automation.siemens.com/WW/view/en/19692172>).

Dimension drawings

A.1 Server module

Server module dimensional diagram



① Rail support
Figure A-1 Server module dimensional diagram

A.2 Shield connector

Dimensional diagram of the shield connector

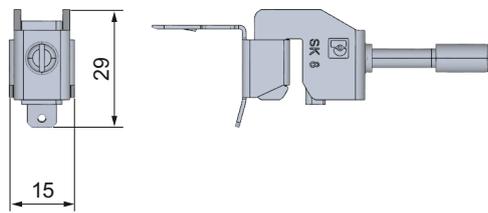


Figure A-2 Dimensional diagram of the shield connector

A.3 Labeling strip

Dimensional diagram of labeling strips and roll

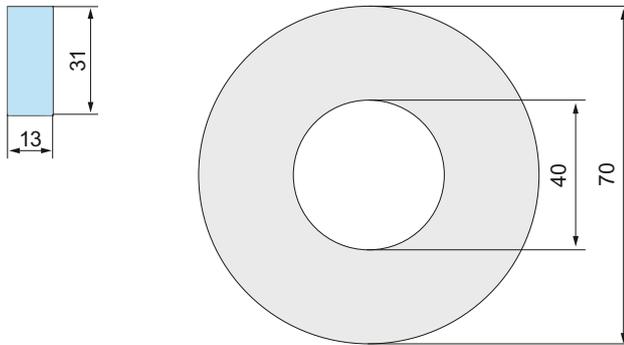


Figure A-3 Dimensional diagram of labeling strips and roll

A.4 Reference identification labels

Dimensional diagram of reference identification label and sheet

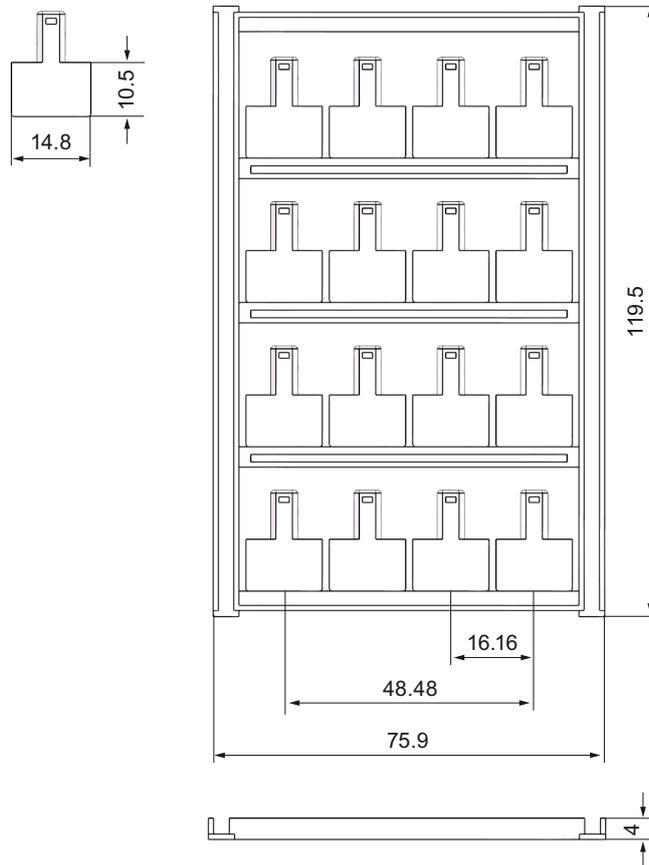


Figure A-4 Dimensional diagram of reference identification label and sheet

Accessories/spare parts

ET 200SP accessories

Table B- 1 ET 200SP accessories

Name	Order number
Bus adapter, 1 unit	
<ul style="list-style-type: none"> BA 2×RJ45 (PROFINET bus adapter with standard Ethernet socket for IM-PN) 	6ES7193-6AR00-0AA0
<ul style="list-style-type: none"> BA 2×FC (PROFINET bus adapter with Fast connect Ethernet connection for IM-PN) 	(in preparation)
Server module (spare part), 1 unit	6ES7193-6PA00-0AA0
BU cover, 15 mm wide, 5 units	6ES7133-6CV15-1AM0
Shield connector for 15 mm wide BaseUnit, 5 units (shield contacts and shield terminals)	6ES7193-6SC00-1AM0
Reference identification label, sheet with 16 labels, 10 units	6ES7193-6LF30-0AW0
Labeling strips (for labeling I/O modules), 500 units	
<ul style="list-style-type: none"> Roll (light gray) 	6ES7193-6LR10-0AA0
Color identification labels for 16 process terminals (push-in terminals), 10 units	
<ul style="list-style-type: none"> gray (terminals 1 to 8), red (terminals 9 to 16); color code CC01 	6ES7193-6CP01-2MA0
<ul style="list-style-type: none"> gray (terminals 1 to 8), blue (terminals 9 to 16); color code CC02 	6ES7193-6CP02-2MA0
<ul style="list-style-type: none"> gray (terminals 1 to 8), red (terminals 9 to 12), gray (terminals 13 to 16); color code CC03 	6ES7193-6CP03-2MA0
Color identification labels for 10 AUX terminals (push-in terminals), 10 units	
<ul style="list-style-type: none"> yellow-green (terminals 1A to 10A); color code CC71 	6ES7193-6CP71-2AA0
<ul style="list-style-type: none"> red (terminals 1A to 10A); color code CC72 	6ES7193-6CP72-2AA0
<ul style="list-style-type: none"> blue (terminals 1A to 10A); color code CC73 	6ES7193-6CP73-2AA0
Color identification labels for 10 additional terminals (push-in terminals), 10 units	
<ul style="list-style-type: none"> red (terminals 1B to 5B), blue (terminals 1C to 5C); color code CC74 	6ES7193-6CP74-2AA0
Mounting rails, tinned steel strip	
<ul style="list-style-type: none"> Length: 483 mm 	6ES5710-8MA11
<ul style="list-style-type: none"> Length: 530 mm 	6ES5710-8MA21
<ul style="list-style-type: none"> Length: 830 mm 	6ES5710-8MA31
<ul style="list-style-type: none"> Length 2000 mm 	6ES5710-8MA41

Online catalog

Additional order numbers for ET 200SP can be found on the Internet in the online catalog and online ordering system.

Calculating the electrical resistance

Introduction

If you wish to protect the ET 200SP using a ground-fault detector or a residual current circuit breaker, then you need the electrical resistance to select the correct safety components.

Ohmic resistance

When determining the electrical resistance of the ET 200SP, you must take into account the Ohmic resistance from the RC combination of the module in question:

Table C- 1 Ohmic resistance

Module	Ohmic resistance from RC network
Interface module	10 M Ω (± 5 %)
BaseUnit BU...D	10 M Ω (± 5 %)

Formula

You can calculate the electrical resistance of the ET 200SP using the following formula if you protect all of the modules listed above with **one** ground-fault detector:

Table C- 2 Formula for calculating the electrical resistance

$R_{ET200SP}$	=	R_{module} / N
$R_{ET200SP}$	=	Electrical resistance of the ET 200SP
R_{module}	=	Electrical resistance of a module
N	=	Number of BaseUnits BU...D and interface module in the ET 200SP
$R_{IM 155}$	=	$R_{BU...D} = R_{Module} = 9.5 \text{ M}\Omega$
$R_{IM 155}$	=	Electrical resistance of the interface module IM 155-6 PN ST
$R_{BU...D}$	=	Electrical resistance of the BaseUnit BU...D

If you protect the modules within a ET 200SP listed above with several ground-fault detectors, you must determine the electrical resistance for each individual ground-fault detector.

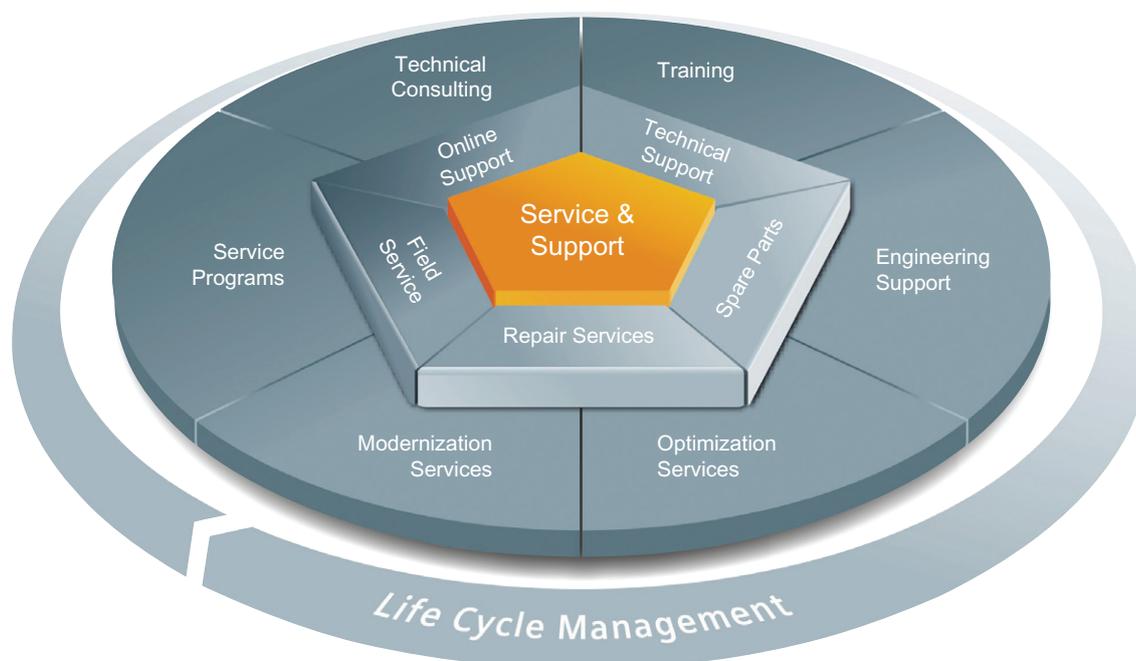
Example

The structure of a ET 200SP consists of an IM 155-6 PN ST and two BaseUnits BU...D and different input and output modules. The entire ET 200SP is protected with **one** ground-fault detector:

$$R_{\text{ET 200SP}} = \frac{9.5 \text{ M}\Omega}{3} = 3.17 \text{ M}\Omega$$

Figure C-1 Calculation example for electrical resistance

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In every sector worldwide, plants and systems are required to operate with constantly increasing reliability. We will provide you with the support you need to prevent a standstill from occurring in the first place: with a worldwide network and optimum logistics chains.

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Downtimes cause problems in the plant as well as unnecessary costs. We can help you to reduce both to a minimum – with our worldwide repair facilities.

Optimization

During the service life of machines and plants, there is often a great potential for increasing productivity or reducing costs.

To help you achieve this potential, we are offering a complete range of optimization services.

Modernization

You can also rely on our support when it comes to modernization – with comprehensive services from the planning phase all the way to commissioning.

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Our service programs are selected service packages for an automation and drives system or product group. The individual services are coordinated with each other to ensure smooth coverage of the entire life cycle and support optimum use of your products and systems.

The services of a Service Program can be flexibly adapted at any time and used separately.

Examples of service programs:

- Service contracts
- Plant IT Security Services
- Life Cycle Services for Drive Engineering
- SIMATIC PCS 7 Life Cycle Services
- SINUMERIK Manufacturing Excellence
- SIMATIC Remote Support Services

Advantages at a glance:

- Reduced downtimes for increased productivity
- Optimized maintenance costs due to a tailored scope of services
- Costs that can be calculated and therefore planned
- Service reliability due to guaranteed response times and spare part delivery times
- Customer service personnel will be supported and relieved of additional tasks
- Comprehensive service from a single source, fewer interfaces and greater expertise

Contact

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You can find your personal contact in our contacts database on the Internet (<http://www.siemens.com/automation/partner>).

Glossary

Aggregate current

Sum of the currents of all output channels of a digital output module.

Automation system

Programmable logic controller for the open-loop and closed-loop control of process chains of the process engineering industry and manufacturing technology. The automation system consists of different components and integrated system functions according to the automation task.

AUX bus

Self-assembling busbar, can be used individually, for example, as a protective conductor bar or for additional required voltage.

BaseUnit

BaseUnits realize the electrical and mechanical connection of the I/O modules with the interface module and the server module.

The inserted I/O module determines the signals at the terminals of the BaseUnits. Depending on the selected BaseUnit, only certain terminals are available.

BaseUnit, dark

Conduction of the internal power and AUX buses from the left adjacent module to the subsequent modules on the right.

BaseUnit, light

Inserted as first BaseUnit, opens a new potential group with electrical isolation. The power and AUX buses are separate from the adjacent module on the left. It feeds the supply voltage.

BU cover

Cover for unused slots on the BaseUnit or placeholders for planned I/O modules. The reference identification label of the planned I/O module for a future expansion can be kept here.

Bus

joint transmission path which all participants of a fieldbus system are connected to; has two defined ends.

Bus connector

physical connection between bus nodes and bus cable.

BusAdapter

allows free selection of the connection technology for the fieldbus.

Configuration control

Function that enables a flexible adjustment of the actual configuration based on a configured maximum configuration via the user program. Input, output and diagnostics addresses remain unchanged.

Connecting to common potential

Configuring a new potential group for which a new infeed is set up for the supply voltage.

Crimping

Procedure whereby two components joined together, e.g. wire end ferrule and cable, are connected with one another through plastic strain.

Diagnostics

Monitoring functions for the recognition, localization, classification, display and further evaluation of errors, faults and alarms. They run automatically during plant operation. This increases the availability of plants because commissioning times and downtimes are reduced.

Distributed I/O system

System with input and output modules that are configured on a distributed basis, far away from the CPU controlling them.

Firmware update

Upgrade of firmware for modules (interface modules, I/O modules etc.), e.g. after functional expansions to the newest firmware version (update).

Ground

Conductive earth whose electrical potential can be set equal to zero at any point.

All interconnected, inactive parts of a piece of equipment that cannot accept any dangerous contact voltage, even in the event of a fault.

Ground

Conductive earth whose electrical potential can be set equal to zero at any point.

All interconnected, inactive parts of a piece of equipment that cannot accept any dangerous contact voltage, even in the event of a fault.

GSDML file

As a Generic Station Description, this file contains all properties of a PROFINET device that are necessary for its configuration in XML format.

I/O modules

All modules that can be operated with a CPU or an interface module.

Identification data

Information that is saved in modules and that supports the user in checking the plant configuration and locating hardware changes.

Interface module

Module in the distributed I/O system. The interface module connects the distributed I/O system via a fieldbus to the CPU (IO controller) and prepares the data for and from I/O modules.

IO controller

A device through which connected IO devices (e.g. distributed I/O systems) are addressed. This means that: the IO controller exchanges input and output signals with assigned IO devices. For IO controllers, this often relates to the CPU in which the user program is running.

IO device

Distributed field device that can be assigned to one or more IO controllers (e.g. distributed I/O system, valve terminals, frequency converters, switches).

MAC address

worldwide, clear device identification, which is already assigned to each PROFINET device in the factory. The 6 bytes of the address consist of a 3-byte manufacturer ID and a 3-byte device ID (serial number). The MAC address is usually legible on the device.

Nodes

Device that can send, receive or amplify data via the bus, e.g. IO device via PROFINET IO.

PELV

Protective Extra Low Voltage = functional extra-low voltage with safe isolation

Potential group

Group of I/O modules that are jointly supplied with voltage.

Power bus

two internal, self-assembling buses (P1 and P2) that supply the I/O modules with voltage.

Prewiring

Wiring the electrics on a profile bus before the I/O modules are connected.

PROFINET

PROcess Field NETwork, open industrial Ethernet standard which continues PROFIBUS and Industrial Ethernet. A cross-manufacturer communication, automation and engineering model by PROFIBUS International e.V., defined as an automation standard.

PROFINET IO

Communication concept for the realization of modular, distributed applications within the scope of PROFINET.

Provider-Consumer principle

Principle of data communication on the PROFINET IO: in contrast to PROFIBUS, both parties are independent providers when sending data.

Push-in terminal

Terminal for the tool-free connection of wires.

Reference identification label

In accordance with EN 81346, a specific object is clearly referenced in relation to the system to whose components the object belongs. Thus, unique labeling of the modules in the entire system is possible.

Reference potential

Potential from which the voltages of the participating circuits are considered and/or measured.

SELV

Safety Extra Low Voltage = safety extra-low voltage

Server module

The server module completes the configuration of the ET 200SP.

TWIN wire end ferrule

Wire end ferrule for two cables

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