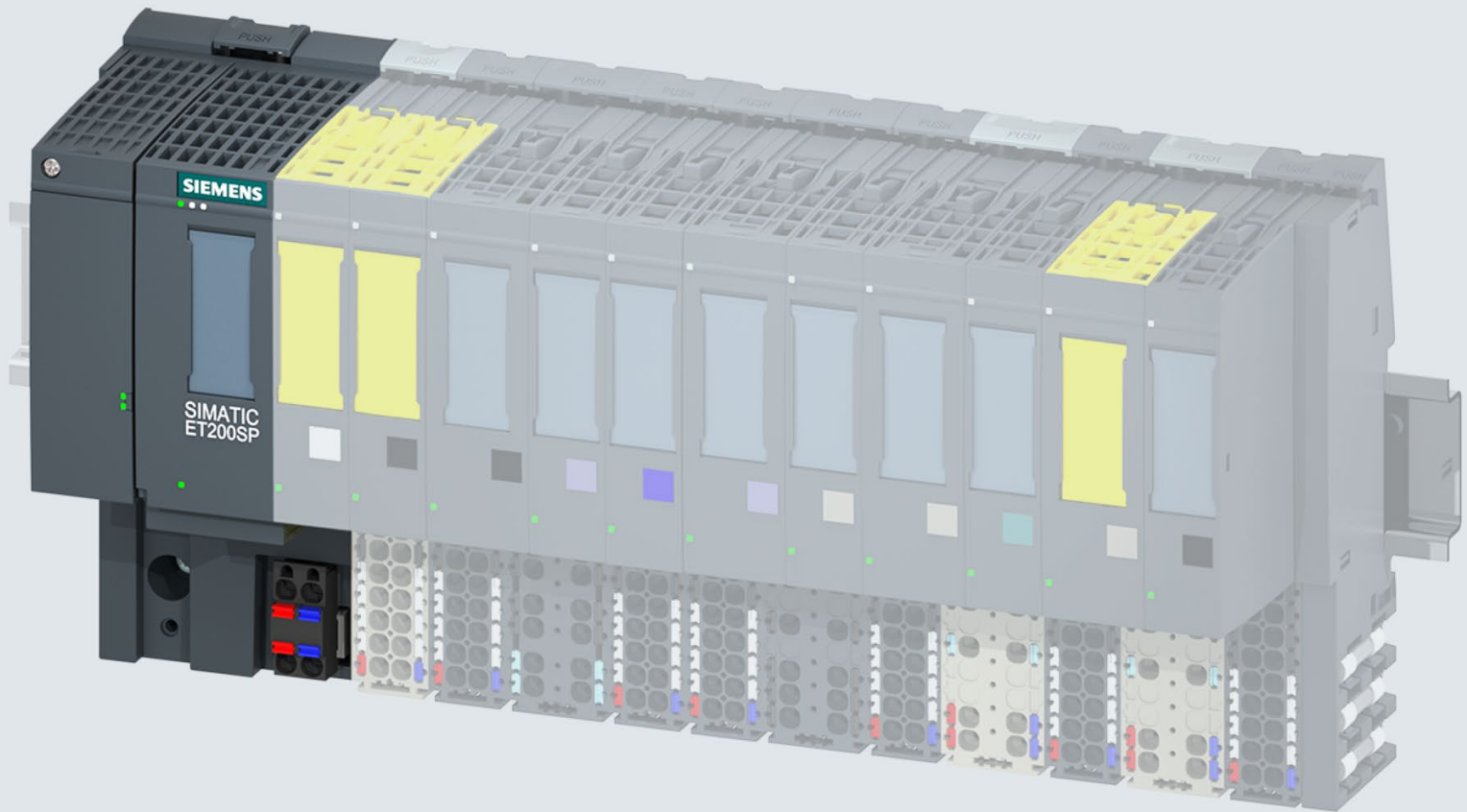


SIEMENS



Manual

SIMATIC

ET 200SP

IM 155-6 PN/2 HF interface module
(6ES7155-6AU01-0CN0)

Edition

10/2018

support.industry.siemens.com

SIMATIC

ET 200SP Interface module IM 155-6 PN/2 HF (6ES7155-6AU01-0CN0)

Manual

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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

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

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.

Proper use of Siemens products

Note the following:

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 manual supplements the ET 200SP distributed I/O system (<http://support.automation.siemens.com/WW/view/en/58649293>) system manual.

Functions that generally relate to the system are described in this manual.

The information provided in this manual and in the system/function manuals supports you in commissioning the ET 200SP distributed I/O system.

Conventions

Please also observe notes labeled as follows:

Note

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

Recycling and disposal

For environmentally friendly recycling and disposal of your old equipment, contact a certified electronic waste disposal company and dispose of the equipment according to the applicable regulations in your country.

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

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Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customers' exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under (<https://www.siemens.com/industrialsecurity>).

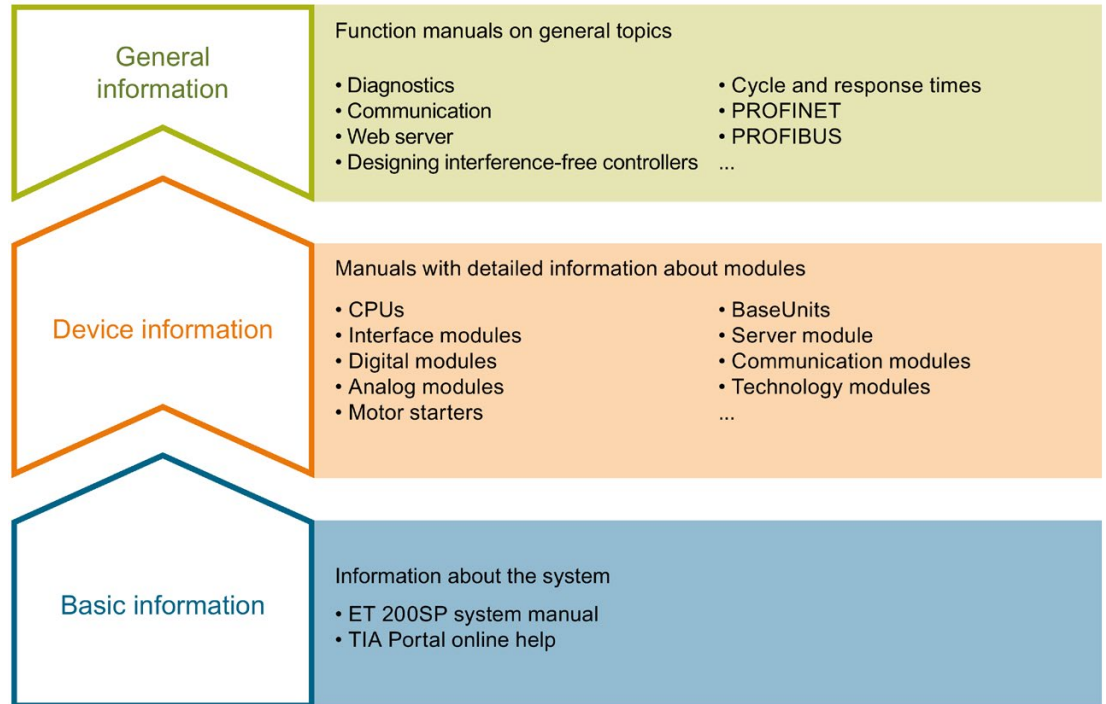
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The documentation for the SIMATIC ET 200SP distributed I/O system is arranged into three areas.

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



Basic information

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

Device information

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

General information

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

You can download the documentation free of charge from the Internet (<https://support.industry.siemens.com/cs/ww/en/view/109742709>).

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

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

Manual Collection ET 200SP

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

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

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With "mySupport", your personal workspace, you make the most of your Industry Online Support.

In "mySupport" you can store filters, favorites and tags, request CAx data and put together your personal library in the Documentation area. Furthermore, your data is automatically filled into support requests and you always have an overview of your current requests.

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In the Documentation area of "mySupport", you have the possibility to combine complete manuals or parts of them to make your own manual.

You can export the manual in PDF format or in an editable format.

You can find "mySupport" - Documentation in the Internet (<https://support.industry.siemens.com/My/ww/en/documentation>).

"mySupport" - CAx Data

In the CAx Data area of "mySupport", you can have access the latest product data for your CAx or CAe system.

You configure your own download package with a few clicks.

In doing so you can select:

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

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

Application examples

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

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

TIA Selection Tool

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

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

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

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

SIMATIC Automation Tool

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

The SIMATIC Automation Tool provides a multitude of functions:

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

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

PRONETA

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

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

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

SINETPLAN

SINETPLAN, the Siemens Network Planner, supports you in planning automation systems and networks based on PROFINET. The tool facilitates professional and predictive dimensioning of your PROFINET installation as early as in the planning stage. In addition, SINETPLAN supports you during network optimization and helps you to exploit network resources optimally and to plan reserves. This helps to prevent problems in commissioning or failures during productive operation even in advance of a planned operation. This increases the availability of the production plant and helps improve operational safety.

The advantages at a glance

- Network optimization thanks to port-specific calculation of the network load
- Increased production availability thanks to online scan and verification of existing systems
- Transparency before commissioning through importing and simulation of existing STEP 7 projects
- Efficiency through securing existing investments in the long term and optimal exploitation of resources

You can find SINETPLAN on the Internet (<https://www.siemens.com/sinetplan>).

Product overview

2.1 Properties

Article number

6ES7155-6AU01-0CN0

View of the module

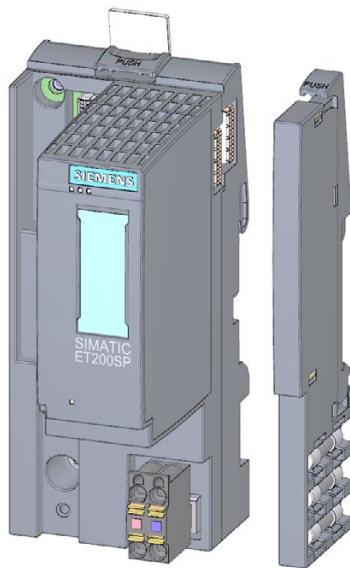


Figure 2-1 View of the AS interface module 155-6 PN/2 HF with included accessory (24 V DC connector and server module) and optional accessories (labeling strips and reference identification label)

Properties

The module has the following technical properties:

- Connects the ET 200SP distributed I/O system with PROFINET IO.
- Power supply 1 L+ 24 V DC (SELV/PELV). The connection plug is included in the scope of delivery of the interface module and is available as replacement part.
- PROFINET IO connection via selectable BusAdapters
 - BA 2×RJ45 for RJ45 bus connector
 - BA 2×FC for direct connection of the bus cable
 - BA 2xLC for glass fiber-optic cable
 - BA 2xSCRJ for POF/PCF fiber-optic cable
 - BA SCRJ/RJ45 as media converter for POF/PCF fiber-optic cable ⇔ standard RJ45 connector
 - BA SCRJ/FC as media converter for POF/PCF fiber-optic cable ⇔ direct connection of the bus cable
 - BA LC/RJ45 as media converter for glass fiber-optic cable ⇔ standard RJ45 connector
 - BA LC/FC as media converter for glass fiber-optic cable ⇔ direct connection of the bus cable

Maximum configuration

- 64 ET 200SP I/O modules + 16 ET 200AL modules
- 1 m backplane bus (without interface and server module)

Maximum amount of I/O data

Gross data length (for input data and output data):

Without system redundancy S2:

- 1440 bytes
- 1440 bytes for shared device with 2 IOC (in total for both IOC)
- 360 bytes for shared device with more than 2 IOC (per IOC)

With system redundancy S2:

- 1000 bytes
- 360 bytes for system redundancy S2 and shared device with min. 1 additional IOC (per IOC)

The number of maximum net data length for input data and output data depends on the number and type of I/O modules used including ET 200AL modules.

Net data length (for input data and output data):

The following minimum lengths can be applied without shared device and without explicit calculation of the maximum net data length.

- 933 bytes without system redundancy S2
- 493 bytes with system redundancy S2

Calculation of the max. net data length:

Max. net data length = Max. gross length - number of I/O submodules (no user data, input or output data) - number of I/O mixed modules (input and output data) - 5 bytes for interface module and server module without ET-Connection (6 bytes for interface module with ET-Connection)

The result of the calculation of the maximum net data length applies equally to input and output data.

Accessories

You order the following accessories separately:

- BA 2×RJ45 BusAdapter
- BA 2×FC BusAdapter
- BA 2×LC BusAdapter
- BA 2xSCRJ BusAdapter
- BA SCRJ/RJ45 BusAdapter
- BA SCRJ/FC BusAdapter
- BA LC/RJ45 BusAdapter
- BA LC/FC BusAdapter
- Strain relief for PROFINET cable
- 24 V DC connector (one included in the scope of delivery)
- Labeling strips
- Reference identification label

Information on the BusAdapters is available in the BusAdapter (<https://support.industry.siemens.com/cs/ww/en/view/109751716>) manual.

You can find more information on accessories in the ET 200SP distributed I/O system (<http://support.automation.siemens.com/WW/view/en/58649293>) system manual.

Server module

The server module is included in the scope of delivery of the interface module and available separately as an accessory.

The server module has the following properties:

- Terminates the backplane bus of the ET 200SP distributed I/O system
- Includes a holder for 3 spare fuses (5 × 20 mm).
- Provides station functions, e.g., group diagnostics: No supply voltage L+, status bytes.
- Identification data I&M 0 to 4

Note

You need to configure and assign parameters to the server module in the configuration software.

Place the server module in the last slot of the configuration. If there are 64 I/O modules, the server module is plugged in slot 65.

You can find more information in the Server module
(<http://support.automation.siemens.com/WW/view/en/63257531>) manual.

First BaseUnit of an ET 200SP in the configuration

The interface modules support plugging a dark-colored BaseUnit in slot 1. This means that modules without a connection to the integrated voltage buses P1 and P2 can now also be configured starting with slot 1. Currently, this applies to the following modules:

- AI Energy Meter ST
- DI 4 x 120...230 V AC ST (6ES7131-6FD00-0BB1)
- DQ 4 x 24...230 V AC/2 A ST (6ES7132-6FD00-0BB1)

Note**First BaseUnit of an ET 200SP in the configuration**

Please note the information on limiting the overvoltage and power rating in the AC I/O module manuals.

You route the infeed of the 24 V DC supply voltage over an external fuse.

The 24 V DC supply voltage is provided by a light-colored BaseUnit.

Requirement for configuration of these modules in slot 1:

- Configuration via GSD or GSDML
- Configuration as of STEP 7 V5.5 SP4 with
 - HSP0255 V3.0 for IM155-6 PN HF
- Configuration as of STEP 7 V13 SP1

See also

Functions (Page 16)

2.2 Functions

Introduction

The interface module supports the following PROFINET IO functions:

- Integrated switch with 2 ports
- Supported Ethernet services: PING, ARP, SNMP, LLDP
- Port diagnostics
- Disabling ports
- Minimum update time 250 µs
- Device replacement without programming device, also without topological configuration
- Reset to factory settings via PROFINET IO or RESET button
- Firmware update via PROFINET IO
- Isochronous real-time communication
- Prioritized startup
- Media redundancy (MRP)
- Shared device
- Distribution of module channels to a maximum of 4 submodules
- Module-internal or submodule-internal Shared Input/Shared Output (MSI/MSO)
- Isochronous mode
- System redundancy S2
- Station extension via ET-Connection
- Alternating IO devices during operation ("docking systems")
 - Docking station
 - Docking unit
- Supports BusAdapter for different connection technologies to PROFINET IO.

The interface module supports additional functions:

- Identification data I&M 0 to I&M 4
- PROFIenergy
- Configuration control (option handling)
- Use of fail-safe modules
- Removal/insertion of multiple I/O modules during operation (Multi Hot Swap)
- Module-to-Module Communication (MtM)

Requirements

The table below shows the software requirements for a configuration with the IM 155-6 PN/2 HF interface module:

Table 2- 1 Version dependencies of the module functions

Function	Functional status of the module as of	Firmware version of the module as of	Configuration software			
			Configuration with GSD file (http://support.automation.siemens.com/WW/view/en/19698639/130000)/s software from a third-party manufacturer ¹	STEP 7 as of V5.5 SP3 with HSP 233	STEP 7 as of V5.5 SP4 with HSP 250/255	STEP 7 (TIA Portal) as of V12.0.1 with HSP 0058
Real-time communication	1	V2.0.0	X	X	X	X
Isochronous real-time communication	1	V2.0.0	X	X	X	X
Prioritized startup	1	V2.0.0	X	X	X	X
Device replacement without programming device	1	V2.0.0	X	X	X	X
Media redundancy (MRP)	1	V2.0.0	X	X	X	X
Shared device	1	V2.0.0	X	X	X	X
Value status	1	V2.0.0	X	X	X	X
PROFInergy	1	V2.0.0	X	X	X	X
Multi Hot Swap	1	V2.0.0	X	X	X	X
Use of fail-safe modules	1	V2.0.0	---	X	X	X
Oversampling	1	V2.1.0	X	X	X	X
Isochronous mode	1	V2.1.0	---	X	X	X
Module-internal Shared Input/Shared Output (MSI/MSO)	1	V2.2.0	X	---	X	X
BusAdapter for fiber-optic cable FOC: BA 2xSCRJ	3	V2.2.0	X	---	X	X (as of V13 SP1)
System redundancy S2 to S7-400H	1	V3.0.0	X	---	X	---
System redundancy S2 IEC-compliant	1	V4.2.0	X	---	---	---
System redundancy S2 to S7-1500R/H	1	V4.2.0	X	---	---	X (as of V15.1)
Station extension via ET-Connection	1	V3.0.0	X	---	X (as of V5.5 SP4)	X (as of V13 SP1)
Maximum user data length per module: 288 bytes	1	V3.1.0	X	X (as of V5.5 SP4)	X (as of V5.5 SP4)	X (as of V13 SP1)

Function	Functional status of the module as of	Firmware version of the module as of	Configuration software			
			Configuration with GSD file (http://support.automation.siemens.com/WW/view/en/19698639/130000)/software from a third-party manufacturer ¹	STEP 7 as of V5.5 SP3 with HSP 233	STEP 7 as of V5.5 SP4 with HSP 250/255	STEP 7 (TIA Portal) as of V12.0.1 with HSP 0058
BA SCRJ/RJ45 BusAdapter	3	V3.1.0	X	---	X (as of V5.5 SP4, HSP0250 V3)	X (as of V13 SP1, HSP0129 V1.0)
BA SCRJ/FC BusAdapter	3	V3.1.0	X	---	X (as of V5.5 SP4, HSP0250 V3)	X (as of V13 SP1, HSP0129 V1.0)
BA 2xLC BusAdapter	3	V3.3.0	X	---	X (as of V5.5 SP4, HSP0250/255 V4)	X (as of V13 SP1, Update 6)
BA LC/RJ45 BusAdapter	3	V3.3.0	X	---	X (as of V5.5 SP4, HSP0250/255 V4)	X (as of V13 SP1, Update 6)
BA LC/FC BusAdapter	3	V3.3.0	X	---	X (as of V5.5 SP4, HSP0250/255 V4)	X (as of V13 SP1, Update 6)
Distribution of module channels to multiple sub-modules	3	V3.3.0	X	---	X (as of V5.5 SP4, HSP0255 V4)	X (as of V13 SP1, Update 6)
Maintenance interrupts of I/O modules	3	V3.3.0	X	---	X (as of V5.5 SP4, HSP0255 V4)	X (as of V13 SP1, Update 6)
Extended Channel Diagnostics	3	V3.3.0	X	---	X (as of V5.5 SP4, HSP0255 V4)	X (as of V13 SP1, Update 6)
Module-to-Module Communication (MtM)	1	V4.2.0	X	---	---	X (as of V15.1)

¹ Systems of third-party manufacturers: Depending on the range of functions of the third-party system

Cabling with fixed connection setting

If you set a fixed connection setting of the port in STEP 7, you must also disable "Autonegotiation/Autocrossover".

You can find more information on this topic in the STEP 7 online help and

- As of STEP 7 (TIA Portal) V12, in the function manual PROFINET with STEP 7 (<http://support.automation.siemens.com/WW/view/en/49948856>).
- As of STEP 7 V5.5, in the system manual PROFINET System Description (<http://support.automation.siemens.com/WW/view/en/19292127>).

Compatibility with the IM 155-6 PN interface module

In an existing plant, the IM 155-6 PN/2 HF replaces the IM 155-6 PN ST without reconfiguration. When the IM 155-6 PN/2 HF replaces the IM 155-6 PN ST, it is possible to insert and remove several I/O modules during operation.

For more information on compatibility, refer to section: Compatibility (Page 48)

See also

ET 200SP distributed I/O system

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

PROFINET with STEP 7 (<http://support.automation.siemens.com/WW/view/en/49948856>)

2.2.1 Device replacement

Device replacement

Device replacement without topological configuration

The device name is also stored on the BusAdapter in addition to the interface module. A device name saved on the BusAdapter is the requirement for device replacement without topological configuration.

Replacing the interface module produces a range of scenarios for using the device name.

Table 2- 2 Scenarios for using the device name

	Interface module empty	Interface module with device name
BusAdapter without device name	No device name available	The device name from the interface module is used and copied to the BusAdapter.
BusAdapter with device name	The device name from the BusAdapter is used and copied to the interface module.	The device name from the BusAdapter is used and copied to the interface module if this has a different device name.

Be aware of the following constraints:

- Resetting to factory settings deletes the device name in both the interface module and the BusAdapter. To prevent the device name from being deleted in the BusAdapter, you can remove the BusAdapter from the interface module before resetting to factory settings.
- When a BusAdapter is replaced, a device name stored in the BusAdapter is applied to the interface module after a POWER ON.
- Do not pull/plug the BusAdapter while under voltage.

Device replacement with topological configuration

IO devices with this function can be replaced in a simple manner:

- The device name does not have to be assigned with the programming device.

The replacement IO device is assigned the device name by the IO controller and not by the programming device. The IO controller uses the configured topology and the neighboring relationships determined by the IO devices for this purpose. All involved devices must support the LLDP protocol (Link Layer Discovery Protocol). The configured target topology must match the actual topology.

If the IO devices were already used in another configuration, reset them to factory settings before reusing them. You can find information on this in the system manual ET 200SP distributed I/O system (<http://support.automation.siemens.com/WW/view/en/58649293>).

You can find more information on this topic in the STEP 7 online help and

- As of STEP 7 (TIA Portal) V12, in the function manual PROFINET with STEP 7 (<http://support.automation.siemens.com/WW/view/en/49948856>).
- As of STEP 7 V5.5, in the system manual PROFINET System Description (<http://support.automation.siemens.com/WW/view/en/19292127>).

2.2.2 Real-time communication

Real-time communication

A transmission method for PROFINET IO based on cyclic data exchange with a provider-consumer model.

2.2.3 Isochronous real-time communication

Isochronous real-time communication

A synchronized transmission method for cyclic exchange of IO data between PROFINET devices. A reserved bandwidth within the send clock is available for the transmission. The reserved bandwidth ensures that the IRT data is also transmitted in reserved, time-synchronized intervals, unaffected by other high network load (e.g. TCP/IP communication or additional real time communication).

A topology configuration is required for IRT.

Note

IO controller as sync master with IRT communication

We recommend operating the IO controller also as a sync master when configuring the IRT communication. Otherwise, IRT- and RT-configured IO devices may fail if the sync master fails.

You can find more information on the configuration of synchronized PROFINET devices in sync domains in the STEP 7 online help and

- As of STEP 7 (TIA Portal) V12, in the function manual PROFINET with STEP 7 (<http://support.automation.siemens.com/WW/view/en/49948856>).
- As of STEP 7 V5.5, in the system manual PROFINET System Description (<http://support.automation.siemens.com/WW/view/en/19292127>).

2.2.4 Prioritized startup

Prioritized startup

Prioritized startup is a PROFINET IO function in a PROFINET IO system with IRT and RT communication. It reduces the time needed for correspondingly configured IO devices to return to cyclic user data exchange.

The function accelerates the startup of IO devices in the following cases:

- After recovery of supply voltage
- After station recovery
- After activation of IO devices

Note

Dependency of the startup time

The interface module permits startup times from 0.5 s.

The startup time depends on the number and type of modules.

You can find more information on this topic in the STEP 7 online help and

- As of STEP 7 (TIA Portal) V12, in the function manual PROFINET with STEP 7 (<http://support.automation.siemens.com/WW/view/en/49948856>).
- As of STEP 7 V5.5, in the system manual PROFINET System Description (<http://support.automation.siemens.com/WW/view/en/19292127>).

2.2.5 Submodules

Submodules

The IM 155-6 PN/2 HF interface module supports the division of I/O modules into up to 4 submodules. This allows parts of an I/O module to be separately configured and parameterized.

A maximum of 256 submodules is supported, whereby 4 submodules are used for the interface module and one submodule for the server module.

You can assign each of these submodules to different IO controllers.

The following functions are only executed if you have configured submodule 1 during configuration:

- Firmware update
- Write I&M data
- Calibration
- PROFIenergy

2.2.6 Media redundancy (MRP)

Media redundancy (MRP)

Function for safeguarding communication and plant availability. A ring topology ensures that an alternative communication path is made available if a transmission route fails.

You can find more information on this topic in the STEP 7 online help and

- As of STEP 7 V12, in the function manual PROFINET with STEP 7 (<http://support.automation.siemens.com/WW/view/en/49948856>).
- As of STEP 7 V5.5, in the system manual PROFINET System Description (<http://support.automation.siemens.com/WW/view/en/19292127>).

2.2.7 Shared device

Shared device

IO device that makes its data available to up to four IO controllers.

The interface module supports shared device at submodule level.

If **there is no validity check of the shared device projects by the Engineering System**, note the following:

- Make sure the configurations are consistent. Assign each module or submodule to only one IO controller. Multiple assignment will result in an error as the module or submodule will only be available in the first controller.
- If you reconfigure the shared device configurations without the validity check mentioned above, you must commission ET 200SP again. This means you must download the projects of all involved IO controllers to the respective CPU again after reconfiguration. If necessary, perform a POWER OFF/POWER ON of the interface module.

You can find more information on this topic in the STEP 7 online help and

- As of STEP 7 V12, in the function manual PROFINET with STEP 7 (<http://support.automation.siemens.com/WW/view/en/49948856>).
- As of STEP 7 V5.5, in the system manual PROFINET System Description (<http://support.automation.siemens.com/WW/view/en/19292127>).

Note

In the case of a shared device application, make sure that all controllers work with the same send clock. If the controller does not have the same send clock, this results in communication relationships not being set up.

If you set up all controllers in one project, the same send clock is ensured. Set the same send clock for engineering in separate projects.

2.2.8 Isochronous mode

Isochronous mode

The input and output data of distributed I/O modules in the system is simultaneously acquired and simultaneously output. For this purpose, the I/O data, the transmission cycle via PROFINET IO, and the user program are synchronized. The constant PROFINET IO cycle forms the corresponding clock generator. The interface module supports isochronous mode of I/O data for the modules starting at 250 µs. The IO device can exchange isochronous process data with a maximum of one IO controller.

Note

When the module is pulled or no written control data record has been written with activated configuration control, the IO controller cannot access a module. In this case, cycle time violations may occur with activated isochronous mode in the synchronous cycle interrupt OB (OB61). The time error OB (OB80) is called in the event of a cycle time violation.

This behavior is associated with updating the process image by means of the "SYNC_PI" (SFC126) and "SYNC_PO" (SFC127) instructions. It depends on the set cycle time and the configuration limits.

You can find additional information in the STEP 7 online help and

- As of STEP 7 V12, in the PROFINET with STEP 7 (<http://support.automation.siemens.com/WW/view/en/49948856>) function manual.
- As of STEP 7 V5.5, in the system manual PROFINET System Description (<http://support.automation.siemens.com/WW/view/en/19292127>).

2.2.9 Module-internal Shared Input/Shared Output (MSI/MSO)

Module-internal Shared Input/Shared Output (MSI/MSO)

The Module-internal Shared Input function allows an input module to make its input data available to up to four IO controllers. Each controller has read access to the same channels.

The Module-internal Shared Output function allows an output module to be operated by up to four IO controllers. One IO controller has write access. Up to three additional IO controllers can have read access to the same channels.

You can find more information on this topic in the STEP 7 online help and:

- As of STEP 7 V12, in the function manual PROFINET with STEP 7 (<http://support.automation.siemens.com/WW/view/en/49948856>).
- As of STEP 7 V5.5, in the system manual PROFINET System Description (<http://support.automation.siemens.com/WW/view/en/19292127>).

2.2.10 System redundancy S2

System redundancy S2

An IO device with S2 system redundancy supports redundant ARs.

In a redundant system, an IO device with system redundancy S2 has a redundant AR for each of the two CPUs (IO controllers). If one CPU fails, the IO device with S2 system redundancy remains accessible to the remaining IO controller via the AR.

The interface module supports system redundancy S2 on CPUs S7-400H (from firmware version V3.0) and on CPUs S7-1500R/H (from firmware version V4.2).

You can find additional information in the STEP 7 online help and

- As of STEP 7 V12, in the function manual PROFINET with STEP 7 (<http://support.automation.siemens.com/WW/view/en/49948856>)
- As of STEP 7 V5.5, in the system manual PROFINET System Description (<http://support.automation.siemens.com/WW/view/en/19292127>)

2.2.11 Alternating IO devices during operation ("docking systems")

Alternating IO devices during operation ("docking systems")

- Docking station
- Docking unit

You can find additional information in the STEP 7 online help and

- As of STEP 7 V12, in the PROFINET with STEP 7 (<http://support.automation.siemens.com/WW/view/en/49948856>) function manual

2.2.12 Oversampling

Oversampling

The IM 155-6 PN/2 HF interface module supports the oversampling mode of HS modules. With oversampling, the modules reduce the respective PROFINET send clocks in isochronous mode.

Additional information on oversampling can be found in the manuals for the I/O modules.

2.2.13 Value status

Value status

The IM 155-6 PN/2 HF interface module supports I/O modules with value status.

Additional information on the value status can be found in the manuals for the I/O modules.

2.2.14 PROFlenergy

Properties

PROFlenergy (for PROFINET) reduces the energy consumption by using PROFlenergy commands during production-free periods.

Reference

You will find additional information on PROFlenergy in the following manuals:

- Manual I/O modules
(<http://support.automation.siemens.com/WW/view/en/55679691/133300>)
- Function manual PROFINET as of STEP 7 V12
(<http://support.automation.siemens.com/WW/view/en/49948856>)
- System manual PROFINET System Description
(<http://support.automation.siemens.com/WW/view/en/19292127>)
- PROFlenergy (<http://support.automation.siemens.com/WW/view/en/66928686>) product information
- Internet (<http://www.profibus.com>) under Common Application Profile PROFlenergy; Technical Specification for PROFINET; Version 1.0; January 2010; Order No: 3.802

2.2.15 Configuration control (option handling)

Properties

Configuration control allows you to prepare your automation system for future expansions or changes. Configuration control means you can configure the planned maximum expansion of your automation system in advance and flexibly vary it later by means of the user program.

Reference

You can find more information on configuration control:

- In the system manual ET 200SP distributed I/O system.
(<http://support.automation.siemens.com/WW/view/en/58649293>)
- On the Internet under the following link: Application collection
(<http://support.automation.siemens.com/WW/view/en/29430270>).
- In the STEP 7 online help.

2.2.16 Use of fail-safe modules

Properties

The IM 155-6 PN/2 HF interface module supports the use of fail-safe modules.

Reference

You can find more information in the ET 200SP distributed I/O system
(<http://support.automation.siemens.com/WW/view/en/58649293>) system manual.

2.2.17 Multi Hot Swap

Properties

You can remove and insert any number of I/O modules during operation. The interface module and the inserted I/O modules remain in operation.

Note

The IM 155-6 PN/2 HF interface module does not support removal and insertion of the server module, interface module and BusAdapter during operation.

Reference

You can find more information on the removal/insertion of modules in the system manual ET 200SP distributed I/O system
(<http://support.automation.siemens.com/WW/view/en/58649293>).

2.2.18 Module-to-Module Communication (MtM)

Introduction

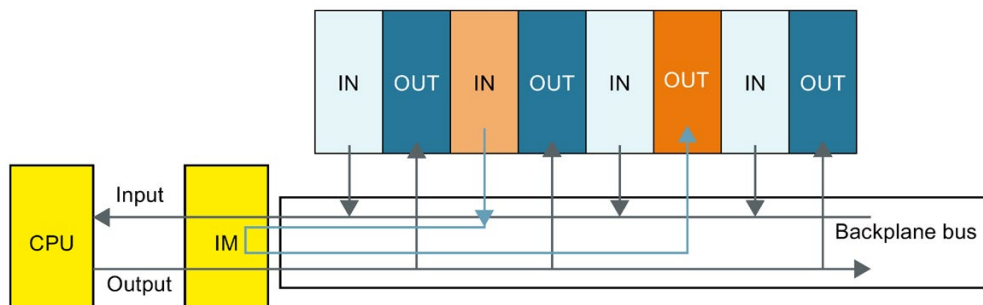
Module-to-Module Communication (MtM) offers the following advantages:

- Improved performance during transmission of data by bypassing the IO controller.
- Deterministic cycle times
- Cost-effective, high-performance solutions for applications where the performance of a specific technology module is not required.

Module-to-Module Communication (MtM)

Module-to-Module Communication (MtM) enables direct exchange of data between specific IO modules within a station via the interface module. This enables you to move small and/or time-critical tasks to the IO module. You achieve better performance while reducing the load on the CPU.

With Module-to-Module Communication (MtM), the interface module copies the input data of an IO module directly to a different IO module via the ET 200SP backplane bus. The IO module (data sink) carries out application-specific processing of the data.



You configure the data source and data sink for Module-to-Module Communication (MtM) in the hardware configuration of the respective output module. Programming of the user program is **not** required in the variant for Module-to-Module Communication (MtM).

Note

The preparation of the input data in the output module (mapping) and the output of the data to the outputs are application- and technology-specific.

Example: The DQ 4x24VDC/2A HS digital output module supports

- the application cam control with Module-to-Module Communication (MtM) under the designation DQ 4x24VDC/2A HS **MCC MtM**

Additional information can be found in the manuals of the corresponding IO modules.

2.2.19 Setting the time

The interface module supports time setting, for example with AI Energy Meter 480VAC/CT HF (6ES7134-6PA00-0CU0).

We show you how to set the time in an application example
(<https://support.automation.siemens.com/WW/view/en/109754890>).

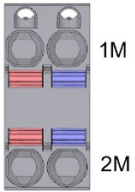
Wiring

3.1 Pin assignment

24 V DC supply voltage

The following table shows the signal names and the descriptions of the pin assignment for a 24 V DC supply voltage.

Table 3- 1 Pin assignment 24 V DC supply voltage

View		Signal name ¹	Description
Connector	IM connection		
		1L+	24 V DC (SELV/PELV)
		2L+	24 V DC (for looping through) ²
		1M	Ground
		2M	Ground (for looping through) ²

¹ 1L+ and 2L+ as well as 1M and 2M are bridged internally.

² Maximum 10 A permitted.

Reference

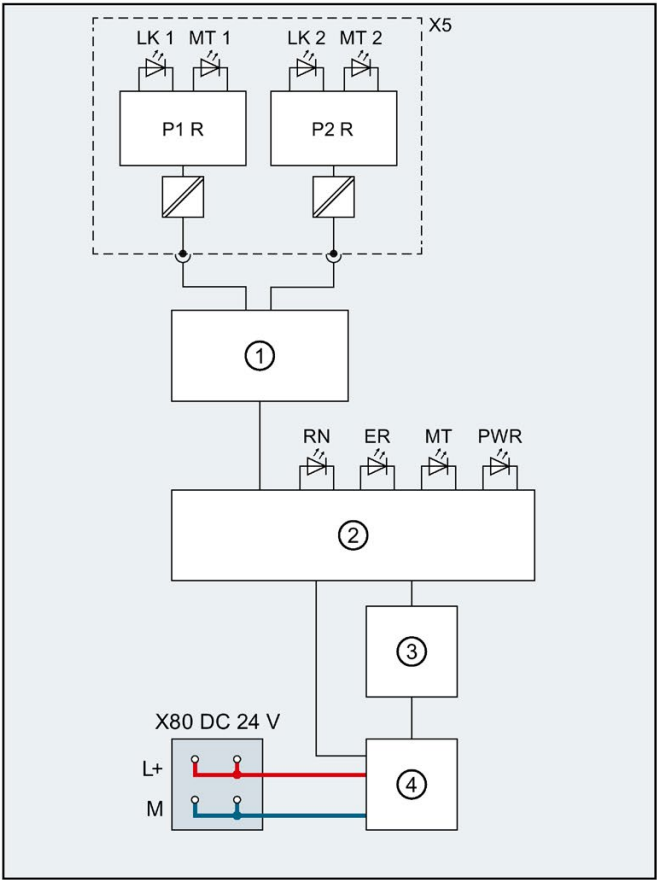
You can find more information on accessories and how to connect the interface module in the ET 200SP distributed I/O system

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

3.2 Block diagram

Block diagram

The following figure shows the block diagram of the IM 155-6 PN/2 HF interface module.



①	Switch	L+	24 V DC supply voltage
②	ET 200SP backplane bus interface and electronics	M	Ground
③	Backplane bus	LK 1,2	Link TX/RX LED (green)
④	Internal power supply	MT	MAINTENANCE FiberOptic LED (SCRJ port, yellow)
		1,2	
X80	Feed supply voltage	RN	RUN LED (green)
24 V DC			
X5	BusAdapter	ER	ERROR LED (red)
P1 R	PROFINET interface X1 Port 1	MT	MAINTENANCE LED (yellow)
P2 R	PROFINET interface X1 Port 2	PWR	POWER LED (green)

Figure 3-1 Block diagram of the IM 155-6 PN/2 HF interface module

Parameters/address space

4.1 Parameters

Parameters for IM 155-6 PN/2 HF interface module

The following table shows the parameters for the interface module IM 155-6 PN/2 HF.

Table 4- 1 Parameters for IM 155-6 PN/2 HF interface module (GSD file)

Parameters	Value range	Default	Effective range
Enable configuration control	Yes/No	No	ET 200SP
Diagnostics (maintenance) undervoltage	Yes/No	No	ET 200SP

4.2 Explanation of parameters

4.2.1 Enable configuration control

Enable configuration control

You use this parameter to enable the configuration control function in the ET 200SP distributed I/O system.

Note

If you configure the enable, the ET 200SP distributed I/O system requires a control data record 196 from the user program in order for the ET 200SP distributed I/O system to operate the I/O modules.

Reference

You can find more information on the control data record in the ET 200SP distributed I/O system (<http://support.automation.siemens.com/WW/view/en/58649293>) system manual and in the STEP 7 online help.

4.2.2 Diagnostics (maintenance) undervoltage

Diagnostics (maintenance) undervoltage

Diagnostics (maintenance) undervoltage is triggered if the supply voltage falls below the value 19.2 V DC. When the supply voltage then exceeds 20.4 V DC, the diagnostics alarm is reported as outgoing.

See also

Channel diagnostics (Page 43)

4.3 Substitute value behavior

Substitute value behavior

The respective output behaves according to its configured substitute value behavior:

- Zero current or zero voltage
- Output substitute value
- Keep last value

The substitute value behavior is triggered in the following cases:

- STOP controller
- Controller failure (connection interrupted)
- Parameter assignment phase during startup
- Deactivating the IO device
- Station stop
 - Missing server module
 - Insertion of invalid I/O modules
 - At least one I/O module is installed on an incorrect BaseUnit

Note

Reducing a configuration

If you reduce the configuration of the ET 200SP distributed I/O system and download the configuration to the CPU, the modules which are no longer configured but still present retain their original substitute value behavior. This applies until the supply voltage is switched off at the interface module.

4.4 Status of the supply voltage L+ of the I/O modules

The "current-free/voltage-free" behavior becomes effective in the following cases:

- Firmware update
- Reset to factory settings
- Configuration control: The IM has not received a valid control data record 196 yet
- Incorrectly configured module
- Module with incorrect parameter assignment

Substitute value behavior for module-internal Shared Output (MSO) and module-internal Shared Input (MSI)

Substitute value behavior for module-internal Shared Output (MSO) and module-internal Shared Input (MSI) corresponds to the behavior described above.

4.4 Status of the supply voltage L+ of the I/O modules

The status of the supply voltage L+ of the ET 200SP I/O modules can be mapped to the server module with the interface module IM 155-6 PN/2 HF.

You can find information on the status of the supply voltage L+ of the I/O modules in the Server module (<http://support.automation.siemens.com/WW/view/en/63257531>) manual.

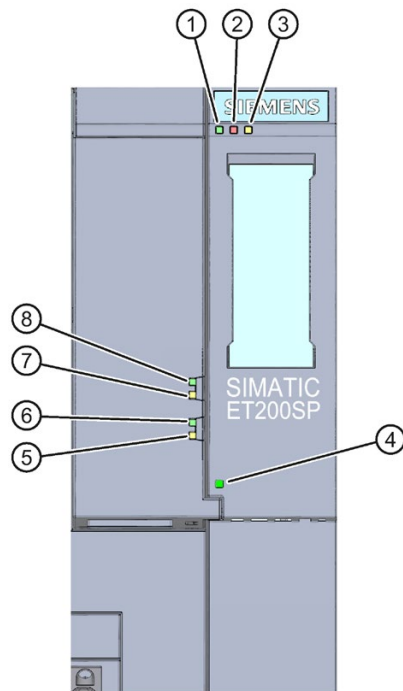
Interrupts, error messages, diagnostics and system alarms

5

5.1 Status and error displays

LED displays

The following figure shows the LED displays on the interface module and BusAdapter.



- ① RN (green)
- ② ER (red)
- ③ MT (yellow)
- ④ PWR (green)
- ⑤ MT2 (yellow), SCRJ port
- ⑥ LK2 (green)
- ⑦ MT1 (yellow), SCRJ port
- ⑧ LK1 (green)

Figure 5-1 LED displays on the interface module and BusAdapter

Meaning of the LED displays

The following tables contain the meaning of the status and error displays.

RN/ER/MT LEDs on the interface module

Table 5- 1 Status and error displays of RN/ER/MT LEDs

LEDs			Meaning	Solution
RN (RUN)	ER (ERROR)	MT (MAINT)		
 Off	 Off	 Off	Missing or insufficient supply voltage on interface module.	Check the supply voltage or turn it on at the interface module.*
 On	 On	 On	Test of LEDs during startup: The three LEDs light up simultaneously for approximately 0.25 s.	-
 Flashes	Not relevant	Not relevant	Interface module is deactivated.	Activate the interface module with the configuration software or via the user program.
			Interface module is not configured.	Configure the interface module with the configuration software.
			ET 200SP starts up.	-
			ET 200SP is being assigned parameters.	
			ET 200SP is being reset to factory settings.	
 On	Not relevant	Not relevant	ET 200SP is currently exchanging data with the IO controller.	-
Not relevant	 Flashes	Not relevant	Group errors and group error channels.	Evaluate the diagnostics and eliminate the error.
			The preset configuration does not match the actual configuration of the ET 200SP.	Check the configuration of the ET 200SP to see whether a module is missing, faulty or not configured.
			Invalid configuration states.	For additional information, see section Invalid configuration states of the ET 200SP on PROFINET IO (Page 46)
			Parameter assignment error in the I/O module.	Evaluate the display of the module status in STEP 7. Eliminate the error in the corresponding I/O module.
Not relevant	Not relevant	 On	Maintenance	For additional information, see section Maintenance events (Page 42)
 Flashes	 Flashes	 Flashes	The "Node flash test" is run (LEDs LK1 and LK2 of the PROFINET interface also flash).	-
			Hardware or firmware defective (LEDs LK1 and LK2 of the PROFINET interface do not flash).	Run a firmware update. If the error persists, contact Siemens Industry Online Support. Replace the interface module.

* PWR LED on (on the interface module): Check the backplane bus for a short-circuit.

PWR LED on the interface module

Table 5- 2 Status display of the PWR LED

PWR LED	Meaning	Solution
□ Off	Supply voltage not present or too small.	Check the supply voltage.
■ On	Supply voltage present. Observe the maintenance messages if the MAIN LED is lit	-

LED display of configuration errors

Configuration errors of the ET 200SP distributed IO system are indicated on the interface module via the red ERROR LED and the yellow MAINT LED.

The following configuration errors are signaled by the LEDs:

- No server module
- Interruptions or short-circuit on the backplane bus

Operating principle

The LED error display provides information on the cause of the error. After notification by the flash signal, the error type is displayed followed by the error location/error code.

The LED error display:

- Is activated during POWER ON and during operation.
- Has priority over all other states that are displayed by means of the ERROR and MAINT LED.
- Remains on until the cause of the error has been eliminated.

Table 5- 3 Display of error type and error location

Sequence	Description
1 The ERROR and MAINT LEDs flash 3x at 0.5 Hz	Indication of the error type
2 The MAINT LED flashes at 1 Hz	Display of error type (decimal)
3 The ERROR and MAINT LEDs flash 3x at 2 Hz	Signaling of error location/error code
4 The ERROR LED flashes at 1 Hz	Display of tens digit (decimal) of the error location/error code
5 The MAINT LED flashes at 1 Hz	Display of ones digit (decimal) of the error location/error code
6 Repetition of 1 to 5 until the cause of the error has been eliminated.	

Error display

Table 5- 4 Error display

Error type (MAINT)	Error location (ERROR/ MAINT)	Cause of error	Solution
1	65	• No server module • Interruptions on the backplane bus • Short circuit of communication on the backplane bus	Check the configuration of the ET 200SP.

Note

A short circuit in the backplane bus supply or the bus connection supply is indicated by the following LEDs:

- PWR LED: On
- RN, ER and MT LED: Off

5.2 Interrupts

Introduction

The I/O device triggers interrupts as a reaction to specific errors. Interrupts are evaluated based on the I/O controller used.

Evaluating interrupts with I/O controllers

The ET 200SP distributed I/O system supports the following interrupts:

- Diagnostic error interrupts
- Hardware interrupts
- Pull/plug interrupts
- Maintenance events

In the event of an interrupt, interrupt OBs are automatically called in the CPU of the IO controller.

Information on the cause and class of the error is already available, based on the OB number and start information.

Detailed information on the error event can be obtained in the error OB using the instruction "RALRM" (read additional interrupt information).

System diagnostics

In STEP 7 (TIA Portal), the innovated system diagnostics is available for the devices of the S7-1500 automation system (IO controller S7-1500 CPU) and ET 200SP (IO device). Independent of the cyclic user program, alarms are made available on the display of the S7-1500 CPU, the CPU web server and the HMI device.

You will find more information on system diagnostics in the Diagnostics (<https://support.industry.siemens.com/cs/ww/en/view/59192926>) function manual.

5.2.1 Triggering of a diagnostics interrupt

Triggering of a diagnostics interrupt

For an incoming or outgoing event (e.g. wire break on a channel of an I/O module), the module triggers a diagnostic error interrupt if this is configured accordingly.

The CPU interrupts processing of the user program and processes the diagnostic error interrupt OB (OB 82). The event that triggered the interrupt is entered in the start information of the diagnostic error interrupt OB.

5.2.2 Triggering a hardware interrupt

Triggering a hardware interrupt

If there is a hardware interrupt, the CPU interrupts user program execution and processes the hardware interrupt block OB, e.g., OB 40. The result that triggered the interrupt is added to the start information of the hardware interrupt OB.

Note**Diagnostics "Hardware interrupt lost" (from I/O module)**

Do not use hardware interrupts for functional purposes (e.g. the cyclic generation of hardware interrupts).

If the hardware interrupt load is too high, hardware interrupts can get lost depending on the number of I/O modules and the communication load.

5.2.3 Triggering of a remove/insert module interrupt

Triggering of a remove/insert module interrupt

In the event of a remove/insert module interrupt, the CPU interrupts processing of the user program and processes the remove/insert module OB, e.g. OB 83. The event that triggered the interrupt is entered in the start information of the remove/insert module OB.

Note

Parameter assignment error after removal/insertion

If you write data records from the user program to the modules of the distributed I/O, make sure that these modules actually exist and are available. You can do this by evaluating OB83. After inserting a module, OB83 is not called until the module has started up and its parameters are assigned. This ensures that data record operations can be executed without errors.

5.3 Alarms

5.3.1 Diagnostics alarms

Actions after a diagnostics alarm

There can be more than one diagnostics alarm at the same time. Each diagnostics alarm initiates the following actions:

- The ERROR LED of the interface module flashes.
- Diagnostics are reported as diagnostic error interrupts to the CPU of the IO controller and can be read via data records.
- Incoming diagnostics alarms are saved to the diagnostics buffer of the I/O controller.
- (S7-300/400) The diagnostic interrupt OB is called. If the diagnostics interrupt OB (OB 82) is not available, the IO controller goes into STOP mode.

You can find more information in the STEP 7 online help.

Reading the diagnostics

Table 5- 5 Reading the diagnostics with STEP 7

Automation system with IO controller	Application	See...
SIMATIC S7	Diagnostics as plain text in STEP 7 using Online and Diagnostics view	STEP 7 online help • as of STEP 7 V12, function manual PROFINET with STEP 7 as of V12 (http://support.automation.siemens.com/WW/view/en/49948856) • as of STEP 7 V5.5, system manual PROFINET System Description (http://support.automation.siemens.com/WW/view/en/19292127)
	Instruction "RDREC" (SFB 52) Read data records from the IO device	
	Instruction "RALRM" (SFB 54) Receive interrupts from the IO device	

Additional information on the data records for PROFINET IO

The structure of the diagnostic data records and programming examples are available in the programming manual From PROFIBUS DP to PROFINET IO (<http://support.automation.siemens.com/WW/view/en/19289930>) and in Example application (<http://support.automation.siemens.com/WW/view/en/24000238>).

Causes of error and troubleshooting

The causes of error and remedies for the diagnostic alarms are described in the manuals for I/O modules (<http://support.automation.siemens.com/WW/view/en/55679691/133300>) in the section, "Interrupts, error messages, and system events".

See also

Channel diagnostics (Page 43)

5.3.2 Maintenance events

Triggering of a maintenance event

The PROFINET IO interfaces of the interface module support the diagnostic concept and maintenance concept in PROFINET IO according to the IEC 61158 Type 10 standard. The goal is to detect and remove potential problems as soon as possible.

For the interface module, maintenance events signal to the user when a plant component must be checked or replaced.

The CPU interrupts user program execution and executes the diagnostic error interrupt OB. The event that triggered the maintenance event is entered in the start information of the diagnostic error interrupt OB.

The interface module signals a maintenance event to the higher-level diagnostic system in the case of the following event:

Table 5- 6 Triggering of a maintenance event

Maintenance alarm	Event	Alarm/Meaning
Maintenance demanded LED MAINT is lit.	Synchronization loss	- No synchronization frame received. No synchronization frame was received by the sync master within the timeout period after parameter assignment or during operation. - Successive synchronization frames are located outside permitted limits (jitter).
	Undervoltage	Diagnostics Undervoltage If the supply voltage of the interface falls below the value 19.2 V DC, this diagnostics is reported as incoming Maintenance demanded.

System alarms in STEP 7 (TIA Portal)

The maintenance information is generated in STEP 7 (TIA Portal) with the following system alarms:

- Maintenance demanded - indicated for each port by a yellow wrench icon  in the device view or in the hardware configuration.

You can find more information in the STEP 7 online help.

5.3.3 Channel diagnostics

Function

Channel-related diagnostics provides information about channel faults in modules.

Channel faults are mapped as channel diagnostics data in IO diagnostics data records.

The data record is read using the instruction "RDREC".

Structure of the diagnostics data records

The data records supported by the ET 200SP distributed I/O system are based on the standard PROFINET IO - Application Layer Service Definition V2.2.

If required, you can find the standard on the Internet (<http://www.profibus.com>) on the PROFIBUS user organization home page.

Codes of the extended channel diagnostics

With the IM 155-6 PN/2 HF interface module, the following extended channel diagnostics are reported:

ChannelErrorType (CET)	ExtendedChannelError-Type (ECET)	Associated value AddValue	Diagnostics
0x0602	0x0691	Slot	Station stop - module parameter "Potential group" faulty or incorrect BaseUnit in actual slot (AddValue)
0x0602	0x0693	0x00	Diagnostics with missing server module
0x0602	0x0698	0x00	Diagnostics backplane bus too large
0x0602	0x0699	Slot	Diagnostics with incorrect bus configuration
0x0602	0x069C	0x00	Diagnostics with incorrectly plugged BusAdapter
0x0610	0x06B0	0x00	Group diagnostics: Missing supply voltage L+ for the potential groups Note: The slot in which the light-colored BaseUnit of the respective load module is located is coded in the "ChannelNumber" element.
0x0610	0x06B4	0x00	Diagnostics "Undervoltage power supply" Note: This diagnostics is not supported by the hardware IM 155-6 PN HF (6ES7155-6AU00-0CN0). If the supply voltage of the interface falls below the value 19.2 V DC, this diagnostics is reported as incoming Maintenance demanded.

Structure of the manufacturer-specific diagnostics data records (IM 155-6 PN HF Version < V3.3)

The structure of the diagnostics data records is differentiated by the BlockVersion. The following BlockVersion applies to the IM 155-6 PN HF interface modules:

Table 5- 7 Structure of the manufacturer-specific diagnostics data records

IM 155-6 PN HF interface module	BlockVersion
6ES7155-6AU00-0CN0	W#16#0101

Note

Manufacturer-specific diagnostics are not reported as of version V3.3 for the interface module IM 155-6 PN HF.

Manufacturer-specific diagnostics in the User Structure Identifier (USI)

The following manufacturer-specific diagnostics are signaled in the USI with the IM 155-6 PN HF interface module:

Table 5- 8 Manufacturer-specific diagnostics in the USI

USI no. W#16#...	Diagnostics
0003	Group diagnostics: Missing supply voltage L+ for the potential groups
0004	Diagnostics with missing server module
0006	Diagnostics with incorrect BaseUnit
0007	Diagnostics with incorrect bus configuration

USI structure = W#16#0003

Table 5- 9 USI structure = W#16#0003

Data block name	Content	Comment	Bytes
USI	W#16#0003	Manufacturer-specific diagnostics with failure of supply voltage L+ as of slot x of the ET 200SP module	2
Followed by the slot as of which the supply voltage L+ has failed.			
Slot	W#16#0001 to W#16#0040	Bit 8 to 15	1
		Bit 0 to 7	1
Followed by 2 reserved bytes:			
	Reserved		1
	Reserved		1

USI structure = W#16#0004

Table 5- 10 USI structure = W#16#0004

Data block name	Content	Comment	Bytes
USI	W#16#0004	Manufacturer-specific diagnostics with missing server module Result: Station stop - The I/O modules fail → substitute value behavior - The interface module continues to exchange data with the IO controller	2
Followed by 4 reserved bytes:			
	Reserved		1
	Reserved		1
	Reserved		1
	Reserved		1

USI structure = W#16#0006

Table 5- 11 USI structure = W#16#0006

Data block name	Content	Comment	Bytes
USI	W#16#0006	Manufacturer-specific diagnostics if an ET 200SP I/O module is installed on an incorrect BaseUnit. Result: Station stop - The I/O modules fail → substitute value behavior - The interface module continues to exchange data with the IO controller	2
Followed by the slot for the I/O module:			
	Slot	W#16#0001 to W#16#0040	Bit 8 to 15
			Bit 0 to 7
			1
			1
Followed by 2 reserved bytes:			
	Reserved		1
	Reserved		1

USI structure = W#16#0007

Table 5- 12 USI structure = W#16#0007

Data block name	Content	Comment	Bytes	
USI	W#16#0007	Manufacturer-specific diagnostics if operation is not possible with existing bus configuration Result: Station stop - The I/O modules fail → substitute value behavior - The interface module continues to exchange data with the IO controller	2	
Followed by the slot for the I/O module:				
	Slot	W#16#0001 to W#16#0040	Bit 8 to 15	1
			Bit 0 to 7	1
If slot 0 is specified, check the width of the station configuration (maximum 1 m).				
Followed by 2 reserved bytes:				
	Reserved		1	
	Reserved		1	

5.3.4 Invalid configuration states of the ET 200SP on PROFINET IO**Invalid configuration states**

The following invalid configuration states of the ET 200SP distributed I/O system lead to the failure of the IO device or prevent data exchange:

- Number of modules exceeds maximum configuration.
- Faulty backplane bus (e.g. defective BaseUnit). ET 200SP backplane bus interruptions do not trigger an interrupt.
- At least one I/O module is plugged into a different BaseUnit as the one configured in the parameters.
- No server module.
- Invalid or incorrectly configured BusAdapter.

Note

Removal of the server module will trigger a station stop. All I/O modules of the ET 200SP distributed I/O system fail (substitute value behavior) but the interface module continues to exchange data.

Revoking the station stop (by correcting the invalid configuration state) leads to a brief failure of the ET 200SP distributed I/O system and automatic restart.

See also

Status and error displays (Page 35)

Channel diagnostics (Page 43)

5.3.5 Failure of supply voltage L+ at BaseUnit BU...D**Failure of the supply voltage L+**

The I/O modules react as follows to failure of the supply voltage L+ on the BaseUnit BU...D:

- If an I/O module is removed during failure of the supply voltage, a pull interrupt is generated.
- If an I/O module is installed during failure of the supply voltage, a plug interrupt is generated.

5.3.6 STOP of the IO controller and recovery of the IO device**STOP of the SIMATIC IO controller**

Diagnostics received from the IO device while the IO controller is in STOP do not initiate a call of any corresponding OBs when the IO controller goes into RUN. Read the E00CH data record in startup OB using the instruction "RDREC". This record contains all diagnostics for the slots assigned to an IO controller in an IO device.

Recovery of the SIMATIC IO devices

If you want to read the occurring diagnostics in the STOP state of the IO controller, you have to read the E00CH data record with the "RDREC" instruction. This record contains all diagnostics for the slots assigned to an IO controller in an IO device.

Compatibility

6.1 Compatibility of modules

Compatibility with the IM 155-6 PN/2 HF interface module

If you exchange or replace an interface module, the following table shows the compatibilities:

- Between the interface modules IM 155-6 PN/2 HF and IM 155-6 PN ST
- Between the various firmware versions

Interface module plugged	Interface module configured											
	IM 155-6 PN ST V1.0	IM 155-6 PN ST V1.1	IM 155-6 PN ST V3.1	IM 155-6 PN ST V3.3	IM 155-6 PN ST V4.1	IM 155-6 PN HF V2.0	IM 155-6 PN HF V2.1	IM 155-6 PN HF V2.2	IM 155-6 PN HF V3.0	IM 155-6 PN HF V3.1	IM 155-6 PN HF V3.3	IM 155-6 PN HF V4.2
IM 155-6 PN HF V2.0	Yes*	---	---	---	---	Yes	---	---	---	---	---	---
IM 155-6 PN HF V2.1	Yes*	Yes*	---	---	---	Yes	Yes	---	---	---	---	---
IM 155-6 PN HF V2.2	Yes*	Yes*	---	---	---	Yes	Yes	Yes	---	---	---	---
IM 155-6 PN HF V3.0	Yes*	Yes*	---	---	---	Yes	Yes	Yes	Yes	---	---	---
IM 155-6 PN HF V3.1	Yes*	Yes*	Yes*	---	---	Yes	Yes	Yes	Yes	Yes	---	---
IM 155-6 PN HF V3.3	Yes*	Yes*	Yes*	Yes*	---	Yes	Yes	Yes	Yes	Yes	Yes	---
IM 155-6 PN/2 HF V4.2	Yes*	Yes*	Yes*	Yes*	Yes*	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* The interface module IM 155-6 PN HF only supports the transmission rate 100 Mbps for Ethernet services.

Station configuration with more than 32 I/O modules

Certain I/O modules with functional status 001 and 002 do not support a station configuration with more than 32 I/O modules.

The table below shows all modules that do not support a station configuration with more than 32 I/O modules:

Table 6- 1 Incompatible modules with functional status

Modules	Article number	Up to functional status
Analog modules		
AI 4xI 2-/4-wire ST	6ES7134-6GD00-0BA1	002
AI 4xU/I 2-wire ST	6ES7134-6HD00-0BA1	002
AI 4xRTD/TC 2-/3-/4-wire HF	6ES7134-6JD00-0CA1	002
AI 4xU/I ST	6ES7135-6HD00-0BA1	002
Digital modules		
DI 16x24VDC ST	6ES7131-6BH00-0BA0	002
DI 8x24VDC ST	6ES7131-6BF00-0BA0	002
DQ 16x24VDC/0.5A ST	6ES7132-6BH00-0BA0	002
DQ 4x24VDC/2A ST	6ES7132-6BD20-0BA0	002
DQ 8x24VDC/0.5A ST	6ES7132-6BF00-0BA0	002

Status of the supply voltage

Load voltage diagnostics are only valid if the station started up with a valid and complete configuration.

- For modules without parameter assignment in the following table, the status of the supply voltage (status byte of the server module) is always signaled as "1" regardless of the actual status of the supply voltage.
- If a potential group is exclusively made up of modules without parameter assignment from the table below, no group diagnostics "Missing supply voltage L+" is signaled for this potential group.

Modules	Article number
DI 8x24VDC ST	6ES7131-6BF00-0BA0
DI 16x24VDC ST	6ES7131-6BH00-0BA0
DI 8x24VDC HF	6ES7131-6BF00-0CA0
DQ 4x24VDC/2A ST	6ES7132-6BD20-0BA0
DQ 8x24VDC/0.5A ST	6ES7132-6BF00-0BA0
DQ 16x24VDC/0.5A ST	6ES7132-6BH00-0BA0
DQ 8x24VDC/0.5A HF	6ES7132-6BF00-0CA0

Resetting an interface module to factory settings via the RESET button

There is a special operation for interface module IM 155-6 PN/2 HF to reset it to the factory settings using the Reset button.

Requirements

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

6.1 Compatibility of modules

Required tools

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

Procedure

1. Remove the interface module from the mounting rail and swivel it downwards.
2. The RESET button is located on the back of the interface module behind a small opening: Push a screwdriver into the small opening, thus pressing the RESET button.
3. Release the RESET button.
4. Press the RESET button for another 3 seconds.
5. 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.
6. Install the interface module back on the mounting rail.
7. Assign parameters to the interface module again.

AQ 4xU/I ST analog output module

Note

For operation of the AQ 4xU/I ST analog output module, firmware version V1.0 (6ES7135-6HD00-0BA1) with the interface module, you need to set the "Reaction to CPU STOP" parameter to "Turn off" with a PROFINET send clock < 1 ms.

Reaction times for fail-safe modules

The following maximum reaction time of the interface module must be taken into account when calculating the reaction times of fail-safe modules: **Maximum reaction time = configured update time + 400 µs (but at least 1.4 ms)**

Operation with activated system redundancy S2

Note

Restrictions in operation with activated system redundancy S2

You cannot use the following functions during operation of the IM155-6 PN/2 HF, firmware version V4.2 with activated system redundancy S2:

- Configuration control (option handling)
 - Module-to-Module Communication (MtM)
-

Interface module IM 155-6 PPN HF (6ES7155-6AU00-0CN0) with version V4.2

Note

You cannot use the following functions during operation of the IM 155-6 PN HF (6ES7155-6AU00-0CN0) with firmware version V4.2:

- Module-to-Module Communication (MtM)
 - Setting the time
 - Diagnostics (maintenance) undervoltage
-

Technical specifications

Technical specifications of the IM 155-6 PN/2 HF

The following table shows the technical specifications as of 08/2018. You will find a data sheet including daily updated technical specifications on the Internet (<https://support.industry.siemens.com/cs/de/en/pv/6ES7155-6AU01-0CN0/td?dl=en>).

Article number	6ES7155-6AU01-0CN0
General information	
Product type designation	IM 155-6 PN/2 HF with server module
Firmware version	V4.2
FW update possible	Yes
Number of MtM communication relationships/connections, max.	16
Product function	
I&M data	Yes; I&M0 to I&M3
Module swapping during operation (hot swapping)	Yes; Multi-hot swapping
Tool changer	Yes; Docking station and docking unit
Local coupling, IO data	No
Local coupling, data records	No
Engineering with	
STEP 7 TIA Portal configurable/integrated as of version	STEP 7 V15.1 or higher
STEP 7 configurable/integrated as of version	Configurable via GSD file
PROFINET as of GSD version/GSD revision	GSDML V2.3
Configuration control	
via dataset	Yes
Supply voltage	
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
Mains buffering	
Mains/voltage failure stored energy time	10 ms

Article number	6ES7155-6AU01-0CN0
Input current	
Current consumption, max.	700 mA
Inrush current, max.	4.5 A
I^2t	0.25 A ² ·s
Power loss	
Power loss, typ.	2.4 W
Address area	
Address space per module	
• Address space per module, max.	288 byte; For input and output data respectively
Address space per station	
• Address space per station, max.	1 440 byte; Dependent on configuration
Hardware configuration	
Rack	
• Modules per rack, max.	64; + 16 ET 200AL modules
Submodules	
• Number of submodules per station, max.	256
Time stamping	
Accuracy	10 ms
Interfaces	
Number of PROFINET interfaces	1; 2 ports (switch)
1. Interface	
Interface types	
• Number of ports	2; via BusAdapter
• integrated switch	Yes
• BusAdapter (PROFINET)	Yes; Compatible BusAdapter: BA 2x RJ45, BA 2x FC, BA 2x SCRJ, BA SCRJ / RJ45, BA SCRJ / FC, BA 2x LC, BA LC / RJ45, BA LC / FC
Protocols	
• PROFINET IO Device	Yes
• Open IE communication	Yes
• Media redundancy	Yes; PROFINET MRP
Interface types	
RJ 45 (Ethernet)	
• Transmission procedure	PROFINET with 100 Mbit/s full duplex (100BASE-TX)
• 10 Mbps	No
• 100 Mbps	Yes; PROFINET with 100 Mbit/s full duplex (100BASE-TX)
• Autonegotiation	Yes
• Autocrossing	Yes

Article number	6ES7155-6AU01-0CN0
Protocols	
PROFINET IO Device	
Services	
– Isochronous mode	Yes; Bus cycle time: min. 250 µs
– Open IE communication	Yes
– IRT	Yes; 250 µs, 500 µs, 1 ms, 2 ms, 4 ms additionally with IRT with high performance: 250 µs to 4 ms in 125 µs frame
– PROFINET energy	Yes
– Prioritized startup	Yes
– Shared device	Yes
– Number of IO Controllers with shared device, max.	4
Redundancy mode	
– MRP	Yes
– MRPD	No
– PROFINET system redundancy (S2)	Yes; NAP S2
– Redundant PROFINET configuration (R1)	No
– H-Sync forwarding	Yes
Open IE communication	
• TCP/IP	Yes
• SNMP	Yes
• LLDP	Yes
Isochronous mode	
Isochronous operation (application synchronized up to terminal)	Yes
Equidistance	Yes
shortest clock pulse	250 µs
max. cycle	4 ms
Bus cycle time (TDP), min.	250 µs
Jitter, max.	1 µs
Interrupts/diagnostics/status information	
Status indicator	Yes
Alarms	Yes
Diagnostic functions	Yes
Diagnostics indication LED	
• RUN LED	Yes; Green LED
• ERROR LED	Yes; Red LED
• MAINT LED	Yes; yellow LED

Article number	6ES7155-6AU01-0CN0
- Monitoring of the supply voltage (PWR-LED) - Connection to network LINK (green)	Yes; green PWR LED Yes; 2x green link LEDs on BusAdapter
Potential separation	
between backplane bus and electronics	No
between PROFINET and all other circuits	Yes
between supply and all other circuits	No
Isolation	
Isolation tested with	707 V DC (type test)
Standards, approvals, certificates	
Network loading class	3
Security level	According to Security Level 1 Test Cases V1.1.1
Ambient conditions	
Ambient temperature during operation	
- horizontal installation, min. - horizontal installation, max. - vertical installation, min. - vertical installation, max.	-30 °C; No condensation 60 °C -30 °C; No condensation 50 °C
Altitude during operation relating to sea level	
Installation altitude above sea level, max.	2 000 m; On request: Installation altitudes greater than 2 000 m
Connection method	
ET-Connection	
via BU/BA Send	Yes; + 16 ET 200AL modules
Mechanics/material	
Strain relief	Yes; Optional
Dimensions	
Width	50 mm
Height	117 mm
Depth	74 mm
Weights	
Weight, approx.	120 g; without BusAdapter

Dimension drawing

This appendix contains a dimension drawing of the module mounted on a mounting rail. Always observe the specified dimensions for installation in cabinets, control rooms, etc.

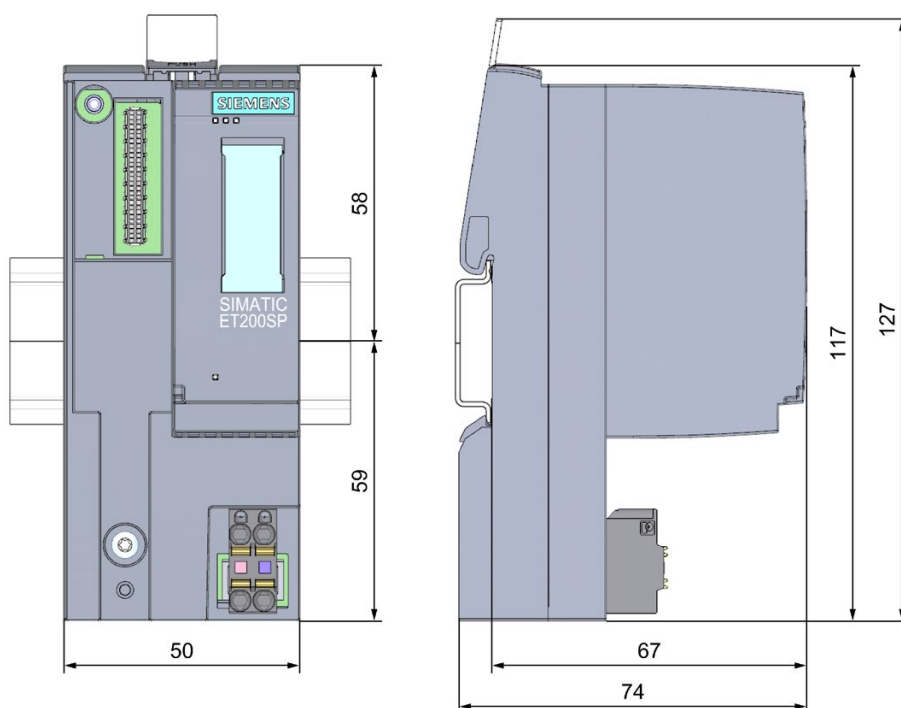


Figure A-1 Dimension drawing of the IM 155-6 PN/2 HF interface module, front and side views