SIEMENS

SIMATIC

Distributed I/O
SIMATIC CFU PA

Commissioning Manual

Compact Field Unit with PROFIBUS PA (CFU Version: V1.0)

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
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.

Table of contents

Security information [ID: 100352151819]

1

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 only form one element of such a concept.

Customer is responsible to prevent unauthorized access to its plants, systems, machines and networks. Systems, machines and components should only be connected to the enterprise network or the internet if and to the extent necessary and with appropriate security measures (e.g. use of firewalls and network segmentation) in place.

Additionally, Siemens' guidance on appropriate security measures should be taken into account. For more information about industrial security, please visit:

http://www.siemens.com/industrialsecurity.

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

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under

http://www.siemens.com/industrialsecurity.

What is a Compact Field Unit? [ID: 100352342155]

2

The SIMATIC Compact Field Unit PA (CFU PA) is a field unit for use as an IO device on the PROFINET IO network of an automation system. Redundant connections are possible using media redundancy (MRP) and singular system redundancy (S2). This Compact Field Unit has the following interfaces:

- Fieldbus connections for PA field devices (configuration changes in RUN are possible) and
- Freely configurable channels (digital inputs/outputs for sensors and actuators)

The commissioning of field devices can be executed efficiently through the automatic addressing. Fast replacement of field devices is possible through the use of PA profiles. You can find information on this in section "Replacing field devices (Page 92)" (Recommendation: *Use PROFIBUS PA profile for field device*).
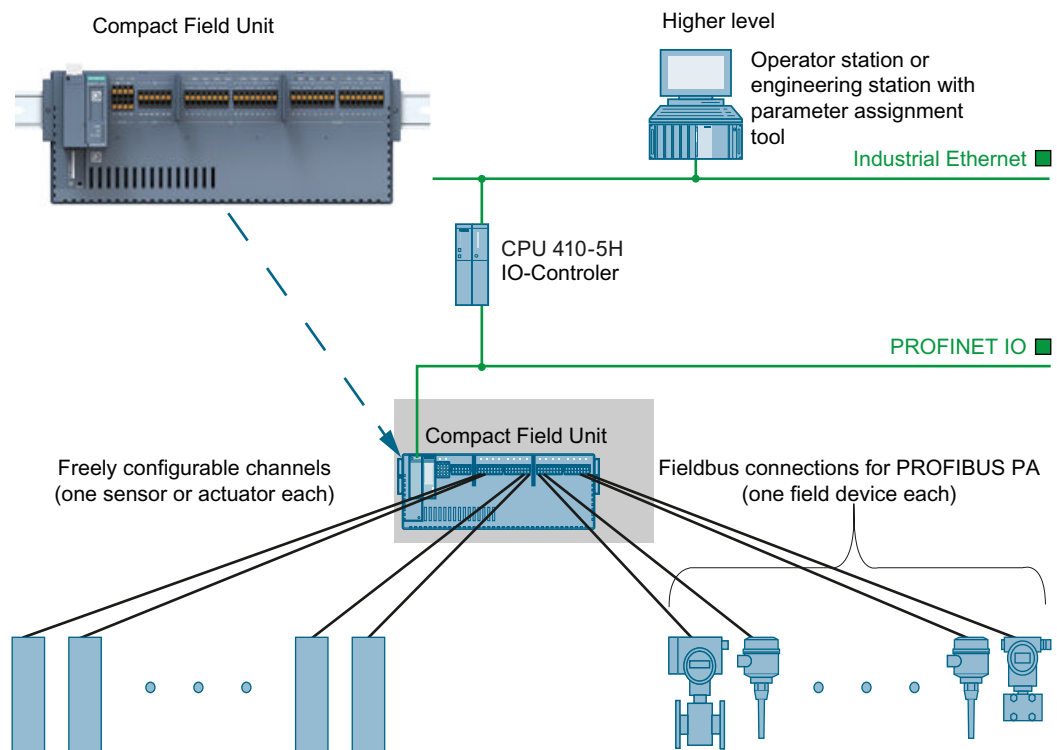
Figure 2-1   Basic integration of a CFU in the automation environment

Purpose of the operating instructions

These operating instructions provide the information required in order to plan, mount, wire and commission a Compact Field Unit in automation systems.

Range of validity of these operating instructions

These operating instructions apply for the following products:

Product	Article number	As of firmware version
SIMATIC CFU PA	6ES7655-5PX11-0XX0	V1.0.0

These operating instructions contain a description of the components that was valid at the time the operating instructions were published. We reserve the right to include product information with information updates with new components and components with a new product status.

Basic knowledge required

To understand these operating instructions you should have general experience in the field of automation engineering.

Basic knowledge in the following areas is also required:

- Commissioning of electrical components
- Configuring and planning of Ethernet networks and fieldbus systems (PROFINET IO, PROFIBUS PA)
- MICROSOFT operating system and SIEMENS software (PCS 7; STEP 7; SIMATIC PDM)

If the Compact Field Unit is to be used in a hazardous area, you require the following additional knowledge:

- Basics of explosion protection
- Identification of explosion-proof devices
- Legal basics of explosion protection

Configuration of the Compact Field Unit

Only field devices with **PROFIBUS PA profiles V3.x** can be operated with the CFU.

You can configure the Compact Field Unit with:

SIMATIC PCS 7 as of V9.0 + PCS 7 V9.0 HUP 02 CFU PA

- STEP 7 as of V5.6 + Upd.1 with HSP278 and HSP285
- SIMATIC PDM as of V9.1 + Upd.1 with EDD CFU PA V1.0
  We recommend "SIMATIC PDM" as the optimal tool for the configuration and diagnostics of connected field devices.

Position in the overall information structure

In addition to these operating instructions, you will need the following manuals, depending on the hardware and software used:

- System and standard functions for S7-300/400 (http://support.industry.siemens.com/cs/ww/en/view/1214574) Reference Manual
- Programming with STEP 7 (http://support.industry.siemens.com/cs/ww/en/view/18652056) manual

- Configuring hardware and connections with STEP 7 (http://support.industry.siemens.com/cs/ww/en/view/18652631) manual

- SIMATIC PROFINET - system description (http://support.industry.siemens.com/cs/ww/en/view/19292127) System Manual

- SIMATIC NET Industrial Ethernet / PROFINET Industrial Ethernet (http://support.industry.siemens.com/cs/ww/en/view/27069465) manual

- SIMATIC PDM (http://support.industry.siemens.com/cs/ww/en/view/109482406) manual

You can find information on explosion protection in the corresponding directives and standards.

Conventions

The following terms are used as synonyms in this document:

Term in the manual	Synonyms	Notes
CFU	CFU PA; Compact Field Unit	Applies, if not otherwise specified, for the product SIMATIC CFU PA.
Fieldbus	PROFIBUS PA	Applies, if not otherwise specified, for the PROFIBUS PA as a fieldbus.
Fieldbus connection	Port or spur line	The interface or spur line to a PROFIBUS PA field device on the CFU.

Observe the notes that are marked as follows:

Note

A note contains important information about the product described, about handling the product or about a specific section of the documentation that requires particular attention.

Recycling and disposal

The described components are ecologically compatible, and thus suitable for recycling. For environmentally sound recycling and disposal of your old devices please contact a certified disposal service company for electronic scrap.

Additional support

- You can reach the Technical Support for all the Industry Automation products via the Web form for the Support Request (http://support.industry.siemens.com/My/ww/en/requests).

- Should you have any questions on the products described in this documentation for which you cannot find any answers here.
  Please contact your SIEMENS contact person: Representatives and offices (http://support.industry.siemens.com/aspa_app/)

- The technical documentation for the various SIMATIC products and systems is available on the Internet (http://support.industry.siemens.com/My/ww/en/requests).

- You can find the online catalog and online ordering system on the Internet (http://www.siemens.com/automation/mall).

Product overview   3

3.1   Inclusion in the automation environment [ID: 100352415499]

Basic integration of a CFU in the automation environment

Distributed I/O devices - field of use

When structuring a system the inputs and outputs from or to the process are often integrated centrally into the automation system.

In the case of large distances of the inputs and outputs from the automation system the wiring can become very extensive and unstructured. Electromagnetic interferences can impair the reliability. The flexibility of a central installation is also limited.

The use of distributed I/Os is suitable for such systems:

- The automation system is located at a central position.

- The I/O devices (inputs and outputs) operate decentrally on site.

- The BusLink between PROFINET IO and PROFIBUS PA that is integrated in the CFU enables decentralized connection of the field devices to the CPU of the automation system.

3.2   Overview of the components [ID: 100352425739]

Basic components of the CFU

The following basic components are available for the CFU:

Table 3-1   Mounting rail

Function	Figure
The mounting rail is the component on which the CFU is fastened. Mounting rail TH 35 in accordance with EN 60715	

Table 3-2   CFU (Article number: 6ES7655-5PX11-0XX0)
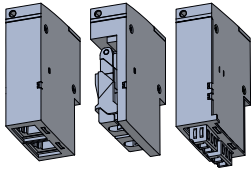
Function	Figure

The CFU:
• Integrate the CFU as an IO device on PROFINET IO in the automation system.
• The CFU has 8 fieldbus connections for each field device on PROFIBUS PA (FIELDBUS).
• The CFU has 8 freely configurable channels (DIQ):
   – Digital input (DI)
   – Digital output (DQ)
• You can find displays for the device status on the interface dome. You can find information about this in section "Diagnostics via LED displays (Page 81)".	

Table 3-3   BusAdapter

Function	Figure
You require approved BusAdapters for the connection of the CFU to PROFINET IO. The BusAdapters give you flexibility in selection of the connection technology for PROFINET IO. The figure shows some typical device implementations of the BusAdapter. There are BusAdapters for pre-fabricated specific bus cables and BusAdapters for special media (fiber-optic cable, electrically conductive cables). The approved variants of the BusAdapter for the connection of the CFU to the PROFINET IO are listed in section "Table A-2 BusAdapter for PROFINET (Page 127)".	

Terminal set required

You need the approved terminal set to operate the CFU PA.

Type and use	Quanti-ty	Area	Terminal
Two-fold double terminals for connection of power supply (PS)	2	24 V DC	X80 and X81
Six-fold terminals for reference potential (ground)	1	GND	X82
Eight-fold terminals	2	DIQ	X10 and X11
• for connecting sensors and/or actuators • for connecting field devices	2	FIELDBUS	X1 and X2

Additional information

- Section "Overview for the Compact Field Unit (Page 17)"

- The article numbers of further components are available in section "Article numbers (accessories / spare parts) (Page 127)".

- You can find information on derating in section "Mechanical and climatic ambient conditions for operation (Page 106)".

Functions   4

4.1 Overview for the Compact Field Unit [ID: 100352513291]

The CFU is an IO device on the higher-level PROFINET IO system.

Interfaces

The CFU has the following interfaces:

Interface	Quantity	Supplementary note
Interfaces for bus systems:		
PROFINET IO	1 connection (terminal X5 of the CFU to a BusAdapter)	BusAdapter with 2 ports (X1) for redundant connection to PROFINET IO or forwarding the PROFINET IO. The approved BusAdapter variants for connecting the CFU to PROFINET IO are listed in section "Article numbers (accessories / spare parts) (Page 127)".
PROFIBUS PA	8 fieldbus connections **FIELDBUS (FB\<n>)**	One field device per connection (FB\<n>). Maximum current per connection/channel: 40 mA
Channels (freely configurable: Digital inputs / outputs)		
• **Channel** configured as an input	Max. 8 channels **DIQ (DIQ\<n>)**	• Input voltage max. 30 V • Integrated sensor supply Maximum current per channel: max. 500 mA
• **Channel** configured as an output	Max. 8 channels **DIQ (DIQ\<n>)**	• Signal voltage max. 30 V • Maximum current per channel: max. 500 mA **Note:** The parallel connection of the DQ channels is impermissible.
Power supply PSx		
24 V terminal	**PSx (X80/X81)**	Redundant supply possible
Connection for reference potential (ground)	6 connections for reference potential (ground) (X82)	For optional connection of a sensor to ground.

Additional information

Section "Technical specifications (Page 99)"

4.2 Functions of the fieldbus connections (FB) [ID: 100352524555]

FIELDBUS

The CFU compiles the protocols between the PROFINET IO and the PROFIBUS PA.

With regard to the field devices the CFU operates like a BusLink (PROFINET IO to PROFIBUS PA) with connected field distributors for PA field devices.

You connect the PA field devices to the "FIELDBUS; FB<n>" connections on the CFU. CFU and PA field devices form a common autonomous PROFIBUS PA system.

Parameters
Information on parameter assignment of the field devices can be found in the documentation of the field device.

Availability

- For the "Fieldbus; FB<n>" connections, the following applies when physical faults occur (such as wire break or short circuit):

  – Faulty connections are automatically deactivated as long as the fault exists.

  – The bus is automatically terminated

- Repairs and extensions at the individual "Fieldbus: FB<n>" connections are possible during operation.

Voltage relationships (galvanic isolation)

In the CFU, there is galvanic isolation between PROFIBUS PA and all other circuit components of the CFU.

Additional information

- Section "Diagnostics via LED displays (Page 81)"

- You can find information on configuring and assigning parameters in section "Commissioning (offline) (Page 62)".

4.3 Functions of the freely configurable channels (DIQ) [ID: 100352535179]

Freely configurable channels (input/output)

With regard to the freely configurable channels the CFU operates like a distributed I/O system.

At the CFU, you connect the sensors/actuators to the connections "DIQ; DIQ<n>".

Parameters
You can find information on parameters in section "Configuring freely configurable channels (parameter overview - DIQ) (Page 73)".

Availability

- During running operation repairs and extensions are possible.

- When errors occur, faulty channels are automatically disconnected from the signal voltage supply.
  Observe the information about this in section "Technical specifications of the Compact Field Unit PA (Page 110)"

Voltage relationships (galvanic isolation)

In the CFU, there is galvanic isolation between PROFIBUS PA and all other circuit components of the CFU.

Additional information

● Section "Diagnostics via LED displays (Page 81)"

● You can find information on configuring and assigning parameters in section "Commissioning (offline) (Page 62)".

Operation planning 5

5.1 Rules for the operation [ID: 100352550795]

Topology

- PROFINET IO
  Line, star and ring topology (MRP), as well as PROFINET system redundancy (S2): Max. number of nodes: 256

- PROFIBUS PA
  Line topology (per "FIELDBUS: FB<n>" connection: 1 field device)

- Freely configurable channels (DIQ)
  Line topology (per channel "DIQ; DIQ<n>: 1 sensor or 1 actuator)

Distances

The permissible distance between the bus nodes depends on the following factors:

- **PROFINET**

  - Cable type (electrical/optical)

  - Transmission path (use of amplifiers / repeaters)

- **PROFIBUS PA**

  - Transmission path: Max. of 120 m to the field device (amplifiers or repeaters are impermissible in the transmission path)

Dependency on the ambient temperature

- **Load current (total current of the encoder supplies "DI" and the outputs "DQ")**
  The total permissible load current of all freely configurable channels of a CFU depends on the ambient temperature and mounting position.
  You can find information on this in section "Mechanical and climatic ambient conditions for operation (Page 106)".

- **Cable temperature**
  You can find information on this in section "Mechanical and climatic ambient conditions for operation (Page 106)".

- **BusAdapter**
  Ensure that the BusAdapter is suitable for use at the respective ambient temperature.

Note

Configuring messages

You can configure alarms for monitoring the power supply and electronics temperature in the "CFU PA Configuration; Commissioning Wizard - Step 2/6" dialog of SIMATIC PDM.
You can find information on this in section "Using CFU PA <V...> Configuration (Page 51)".

Additional information

- Additional information is available in the catalog ST PCS 7.

- You can find information about the technical specifications in section "Technical specifications (Page 99)".

- You can find information about the power supply in section "Connecting the power supply to the CFU (Page 36)".

5.2 System change during operation [ID: 100352564491]

During operation of the CFU, you can carry out the following functions:

- Adding components

- Replacing components

- Deleting components

- Changing parameters
  Parameters you can set in HW Config

Changing the plant during operation (configuring)

- The CPU 410-5H FW 8.2 or higher is used as the IO controller in the AS.

- The required device description is installed.
  Information about installation with the Device Integration Manager is available in the help for SIMATIC PDM.

Basic procedure

You can find additional information on the procedure in section "Servicing and maintenance (Page 89)".

Additional information

Read section "Fundamentals of hazardous areas and intrinsic safety (Page 24)"

5.3 PA profiles for field devices on PROFIBUS PA [ID: 100352574731]

PROFIBUS PA profiles and GSD files

For connection of field devices to the CFU, you must choose between the use of PA profiles and device-specific GSD files.

PROFIBUS PA profiles enable simpler field device replacement than when device-specific GSD files of the manufacturer are used.
Reasons for this are:

- The replacement device does not have to be identical.

- The replacement device only has to support the configured PA profile.

- If you are using SIMATIC PDM, you will find the PROFIBUS PA profiles in the following folder:
  PROFIBUS-PA > Profile > Ident Neutral > Siemens AG

When the PROFIBUS PA profile of the CFU is integrated, you can find the PA profile of the CFU in the catalog in HW Config in folder:
PROFINET IO > I/O > Compact Field Unit > Compact Field Unit PA -> Profibus-PA Profiles...

IOs in the field device

A field device can have multiple IOs. These IOs describe the behavior of the device. The term IO corresponds to the PROFIBUS identification number.

When you use PA profiles, the identification number is replaced by readable text (e.g. 0x9701 corresponds to "Transmitter 2 AI").

Selected IO

A "Selected IO" identifies the behavior of the IO that the CFU sets in the field device (examples: "Transmitter 2 AI", "Discrete Output 1 AO", manufacturer-specific IOs). The configuration in HW Config normally defines the "Selected IO".

The setting of the "IO" in the EDD of the field device is **not** permitted for a CFU.

If you use HW Config or SIMATIC PDM for configuring the field devices and the CFU, the CFU stores the PA profiles read from the field device and the selected IO.

5.4 Fundamentals of hazardous areas and intrinsic safety [ID: 100352587275]

Properties of zones

Hazardous areas are classified into zones. The zones are distinguished according to the probability of the existence of an explosive atmosphere.

> ⚠ **DANGER**
>
> **Explosion hazard**
>
> In the **Zone 2** hazardous area, it is prohibited to disconnect the following cables from a CFU during operation:
> - Power supply
> - PROFINET cable (BusAdapter)
> - Cable to freely configurable channels
>
> The fieldbus connections are implemented as intrinsically-safe connections (Ex ic) and may not be disconnected and connected during operation.
>
> De-energize the CFU before carrying out any work on it.

> ⚠ **CAUTION**
>
> **Use in hazardous areas**
>
> The Compact Field Unit can be used as a fieldbus node in the device category 3G in a Zone 2 hazardous area.
>
> Only intrinsically safe electrical field devices of device category 3G and 3D for Zone 2 and 22 may be connected to the fieldbus lines FB0 to FB7.
>
> Read the information on approval in the product information.

You will find an overview of the zone divisions in the following table:

Table 5-1   Classification of zones

Hazardous areas	Explosion hazard	Example
Zone 2	Rare or short-term presence of potentially explosive gas or dust atmosphere	Areas around Zone 2

For additional information, refer to the Fundamentals of Explosion Protection (https://support.industry.siemens.com/cs/ww/en/view/12521844) system manual.

Labeling of the CFU

Equipment for operation in hazardous areas is marked with an identifier indicating the hazardous environments in which the equipment can be used.

Certificates for the CFU

The EU prototype test certificate and the EU certificates of conformity for the CFU are available under Service & Support on the Internet (https://support.industry.siemens.com/cs/us/en/).

Intrinsic safety

The CFU limits the energy on the fieldbus line to the intrinsically safe PA field devices in hazardous areas and electrically isolates them from the live parts of the CFU (for example, power supply).

The fieldbus connections are designed in Ex [ic] type of protection. Fieldbus cables can be installed up to the Zone 2/22.

⚠ **WARNING**

Risk for intrinsic safety

Ensure that cables to the connections of the CFU are never mixed up (for example a fieldbus connection is mistaken for a freely configurable channel). When a connector is mixed up on the CFU or if the cable is connected incorrectly to the PA field devices, intrinsic safety is at risk.

You can find additional information on intrinsic safety in the product information:

Additional information

- The product information is made available with the product or on the Internet under specification of the article number: Service & Support (https://support.industry.siemens.com/cs/us/en/).

- Section "Technical specifications; Technical specifications of the Compact Field Unit PA (Page 110)"

- Section "Compact Field Unit in the enclosure for use in a hazardous area (Page 117)"

See also

Product information (http://support.automation.siemens.com/WW/view/109748348)

SIMATIC CFU PA
Commissioning Manual, 08/2017, A5E39254279-AA

Installation

6

6.1   Installation rules [ID: 100352777739]

Mounting position

⚠ WARNING
Open devices
Compact Field Units are open equipment. This means that they may only be installed in enclosures (which includes cabinets or electrical equipment rooms), whereby these enclosures may only be accessible via keys or a tool. The enclosures may only be accessed by instructed or approved personnel.

The Compact Field Unit is installed horizontally or vertically:

● Horizontally with the connections towards to the bottom

● Vertically with the BusAdapter in the lower area

Technical setup

The Compact Field Unit is mounted on a mounting rail. To ensure mounting without problems sufficient clearance must be left below and above the modules.
You can find additional information in section "Minimum clearances in the control cabinet (Page 28)".

Installation location in hazardous areas

● Read section "Fundamentals of hazardous areas and intrinsic safety (Page 24)"

● Read the information in the product information of the CFU.
The product information of the CFU is made available together with the product or on the Internet via the article number: (6ES7655-5PX11-0XX0):Customer Support (http://support.industry.siemens.com/cs/)

Additional information

● You can find information about the mounting rail in section "Overview of the components (Page 14)".

● You can find information about the power supply in section "Connecting the power supply to the CFU (Page 36)".

● You can find information about the ambient temperature in section "Rules for the operation (Page 21)".

6.2 Minimum clearances in the control cabinet [ID: 100352792459]

Install the mounting rail so that sufficient space remains for the installation and heat removal of the Compact Field Unit remains.

Observe the following points if you plan to install the Compact Field Unit:

● Ensure that the space in the control cabinet or components in the surrounding area is sufficient for the heat to be removed.

● Leave sufficient space for the wiring and the communication cable connections.

● Route the cables away from the CFU as follows:

– Horizontal installation (see figure below):
Route cables downwards.

– Vertical installation (interface dome at bottom; rotated 90° counterclockwise compared to the figure below):
Route cables to the right.

Table 6-1   Minimum clearances in the control cabinet

	Top 20 mm	
Left 10 mm		Right 10 mm
	Bottom 20 mm	

6.3 Installing the mounting rail [ID: 100352811403]

You mount the CFU on a mounting rail (mounting rail TH 35 in accordance with EN 60715).

You can find article numbers for mounting rails of different lengths in section "Article numbers (accessories / spare parts) (Page 127)".

Lengths and drill holes

The mounting rails are available in the following lengths:

- 482.6 mm (19 inch)
  The mounting rail 482.6 mm has two fixing screws.
  A set of screws for grounding is included.

- 2000 mm
  The 2000 mm-mounting rail is provided for designs with special lengths and has no holes for fixing screws.
  Screws for grounding are not included with the mounting rail.

The specifications of the maximum distances between two drill holes can be found in the table "Dimensions for the drill holes".

Required tools

- Suitable metal saw

- Drill ⌀ 6.5 mm

- Screwdriver

- Size 10 adjustable screw-wrench or socket wrench for grounding cable connection

- Adjustable screw-wrench, matching the selected fixing screws

- Stripping tool and crimp tool for the grounding cable

Required accessories

You can use the following screw types for fastening of the mounting rails:

Table 6-2   Required accessories

For ...	you can use ...	Explanation
outer fixing screws	Cylinder head screw M6 to ISO 1207/ISO 1580 (DIN 84/ DIN 85)	Choose a suitable screw length for your assembly. You also need washers for cylinder head screws with an internal diameter of 6.4 mm and an external diameter of 11 mm in accordance with ISO 7092 (DIN 433).
Additional fixing screws (for mounting rails > 482.6 mm)	Hexagon bolt M6 to ISO 4017 (DIN 4017)	

Additional fixing screws (for mounting rails > 530 mm)

In the case of mounting rails > 530 mm we recommend using fixing screws at distances of ≤ 500 mm along the identification groove.

Preparing mounting rails for installation (for mounting rails > 530 mm)

To prepare the 2000 mm mounting rail for the CFU, follow these steps:

1. Cut the 2000 mm mounting rail to the required length.

2. Mark the holes. The necessary dimensions can be found in the table "Dimensions for the drill holes":

   – Two holes at the beginning and end of the mounting rail (distance 15 mm).

   – Additional drill holes at equal intervals of 500 mm maximum, along the identification groove

3. Drill the marked holes according to the selected type of fastening.

4. Ensure that there are no burrs or shavings on the mounting rail.

Note

For the CFU to be mounted correctly, you must observe the following:

Ensure that the drill holes are positioned centered on the identification groove and that only screws up to the maximum size are used.

Installing the mounting rail

Note

Minimum clearances

Observe the minimum distances in the control cabinet.
You can find additional information in section "Minimum clearances in the control cabinet (Page 28)".

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1. Screw the rail onto the mounting surface.

Additional information

- You can find additional information on the exact dimensions of the mounting rails in section Dimension drawings of the mounting rails (Page 131).

- You can find information on the tightening torques in section "Mounting rules (Page 130)".

- You can find information about grounding in section "Connecting the functional earth to the CFU (Page 45)".

6.4 Installing the CFU [ID: 100352939403]

Required components

Compact Field Unit

Required tools

Screwdriver 4 mm or TORX T15
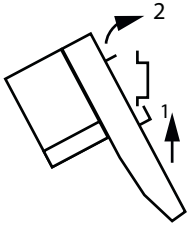
Requirement

- The mounting surface must be level, stable and free from vibrations.
- Select the mounting material that best matches the mounting surface.
- All the connecting cables are prepared.
- Clearance of at least 60 mm below the modules for connection of equipotential bonding spur lines and cables to the sensors and actuators at the freely configurable channels.

Installing a Compact Field Unit

Observe the minimum distances and the bending radii of the cables used during the installation.

You can find information on the tightening torques in section "Mounting rules (Page 130)".

Step	
1	Install the mounting rail (see the section "Installing the mounting rail (Page 28)").
2	Latch the CFU onto the mounting rail **from below**. Press the CFU upward until the supports latch into the mounting rail. Tighten the fixing screws at both sides of the CFU.
Installing the cables The basic procedure applies to all cables (power supply, FB<n> and DIQ<n>), bus cables for PROFI-NET IO and bus cables for PROFIBUS PA)	
3	Connect the cables to the connections of the CFU (FB<n> and DIQ<n>). Observe the pin assignment of the plugs (see section "Terminal assignment of the CFU (Page 128)").
4	Fasten the bus cable to the BusAdapter for the PROFINET IO connection. Observe the pin assignment of the plugs (see section "Terminal assignment of the CFU (Page 128)"). **Recommendation:** When installing the CFU in a enclosure, use cables that are suitable for a FastConnect Ethernet connection. You can fasten them at any time to a PROFINET BusAdapter with a FastConnect Ethernet connection (BA 2×FC).
5	Insert and screw the selected BusAdapter on the CFU.
6	If necessary, fasten the shield connection of the cables. If available and required, you can fasten the cables to the shielding bus with cable ties.
7	Connect the BusAdapter (X5 connector) and the cables of the power supply (PS1 to X80 / PS2 to X81). Observe the pin assignment on the plug connector (see section "Terminal assignment of the CFU (Page 128)").
8	Fasten the grounding cable to the mounting rail.

Uninstalling the Compact Field Unit

If the Compact Field Unit is already in operation, switch off the power supply (24 V DC) of the Compact Field Unit before uninstalling it.
To uninstall the Compact Field Unit, proceed in the reverse order.

Connecting

7

7.1 Hardware-settings [ID: 100352979211]

No hardware settings have to be carried out at the CFU.

Additional information: Restoring the state of delivery (Page 95)

7.2 Electrical configuration of the CFU [ID: 100352989835]

Connection scheme
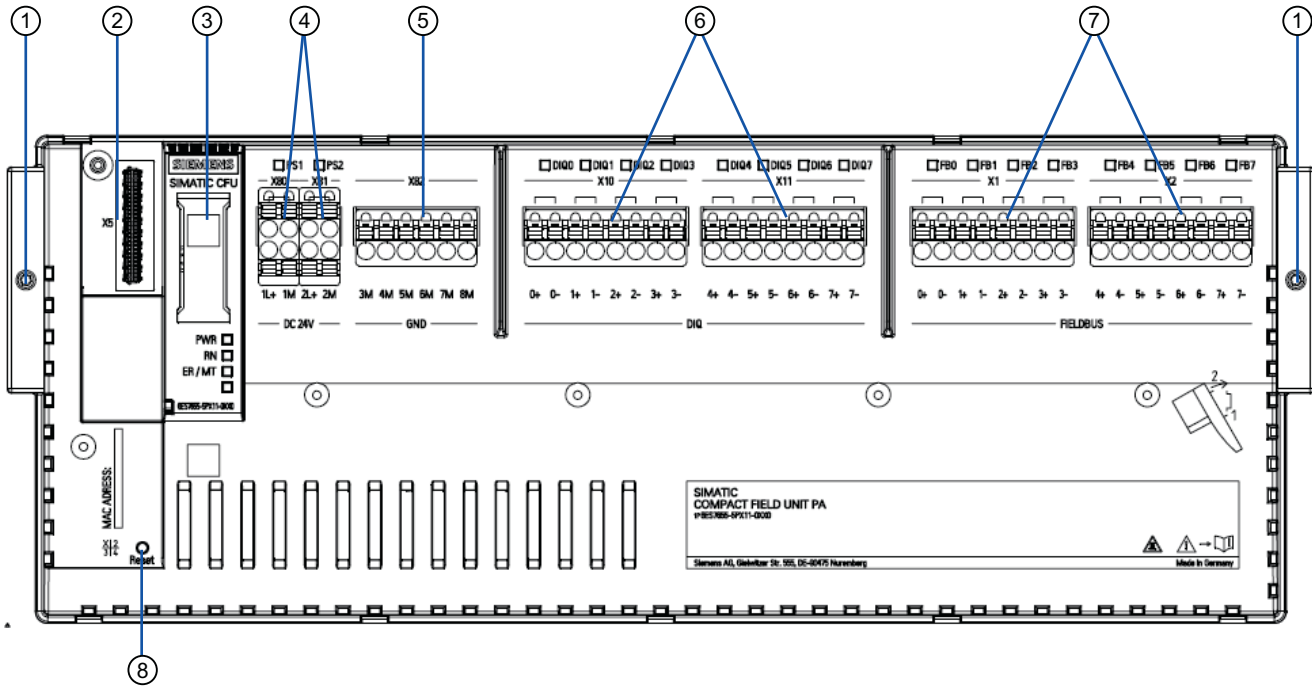
1	Locking the CFU on the mounting rail
2	X5: Connection for a BusAdapter
3	Labeling strips on interface dome
4	X80 and X81: 24 V DC; power supply PS1/PS2 (redundant connection possible)
5	X82: GND: Connection for reference potential (ground)
6	X10/X11: DIQ: Connections of freely configurable channels DIQ<n>:

- <n>+ signal line
- <n>- signal line

7	X1/X2: FIELDBUS; connections for one field device each. Spur line FB<n>: Max. 120 m length; cable termination with automatic bus terminator

- <n>+ data cable (red)
- <n>- data cable (green)

8	Reset: Restore delivery state - reset to factory settings:

Voltage relationships (galvanic isolation)

The CFU has galvanic isolation between the fieldbus and all other circuit components of the CFU.

Additional information

You can find additional information on the connecting terminals in section "Terminal assignment of the CFU (Page 128)".

● Section "Connecting the power supply to the CFU (Page 36)"

● Section "Connecting the PROFIBUS PA field device to the CFU (Page 39)"

● Section "Connecting the cable shields of the PROFIBUS PA cables (Page 43)"

Resetting using the Reset button: You can find information about this in section "Restoring the state of delivery (Page 95)".

7.3 Wiring rules [ID: 100353018251]

8-pin connectors of the CFU

All 8-pin connectors of a CFU are slot-coded. The coding prevents an incorrect placement, for example, when replacing the CFU.

TWIN wire end ferrules for the wires

Due to the space required by TWIN wire end ferrules with 0.75 mm^2 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.

Note

Connecting field devices to FB<n>

Observe section "Connecting the PROFIBUS PA field device to the CFU (Page 39)"

Rules for current consumption and power loss of a CFU

The CFU takes the current it needs for its operation from the power supply.

If necessary, you can operate sensors (DI) or actuators (DQ) with an external power supply.

The power loss of all utilized components in an enclosure must not exceed the maximum power that can be dissipated in the enclosure.

Tip:
When sizing the enclosure, ensure there is always sufficient heat dissipation (even at high outside temperatures).

● You can find additional information in section "Mechanical and climatic ambient conditions for operation (Page 106)".

● You can find information on current consumption and power loss of the CFU in section "Technical specifications of the Compact Field Unit PA (Page 110)".

Additional information

- You can find information about required tools in section "Mounting rules (Page 130)".

- You can find information about cables and wire end ferrules in section "Cable cross-sections and wire end ferrules (Page 130)".

7.4 Connecting the power supply to the CFU [ID: 100353049483]

Introduction

The power supply of the CFU is fed via two 2-pole connection plugs that are capable of feed-through wiring and are located on the front of the CFU.

You can find information on power consumption of the CFU in section "Technical specifications of the Compact Field Unit PA (Page 110)".

Power supply unit

Only use power supply units of type SELV/PELV with safe electrically isolated functional extra low voltage (≤ 28.8 V DC).

⚠ WARNING
Safety extra-low voltage
The device is designed for operation with a directly connectable safety extra-low voltage (SELV) from a limited power source (LPS).
For this reason, only safety extra-low voltages (SELV) with limited power source (LPS) according to IEC 60950-1 / EN 60950-1 / VDE 0805-1 may be connected to the supply connections or the power supply unit for the device must comply with NEC Class 2 according to the National Electrical Code (r) (ANSI / NFPA 70).

⚠ WARNING
Non-permissible power supply
In a configuration with a redundant power supply (two separate power supplies), both must meet these requirements.

Connecting the power supply (X80 and X81)

1L+   Supply voltage: 24 VDC

1M   Supply voltage: Ground

2L+   Supply voltage: 24 VDC

2M   Supply voltage: Ground

x   Spring opener
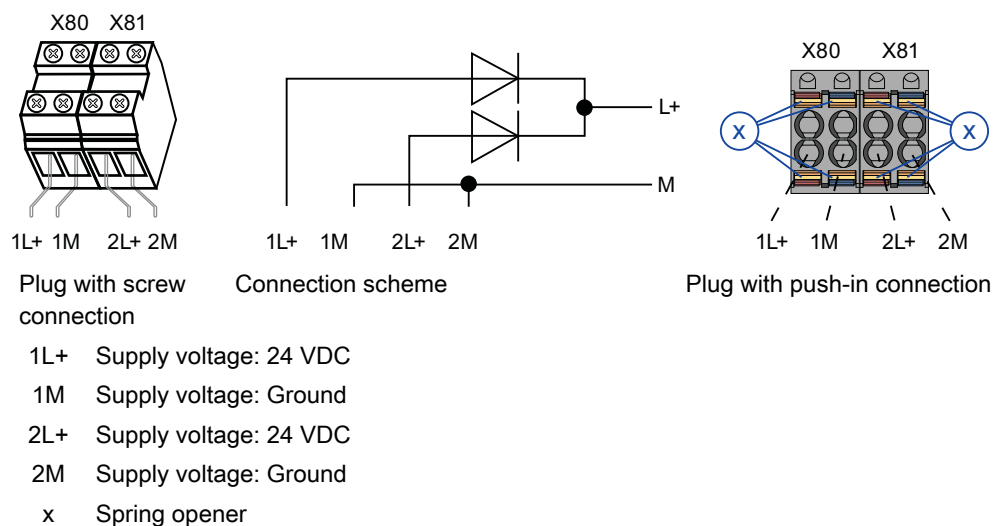
Figure 7-1   Connection supply voltage (plug with screw connection / connection scheme / plug with push-in connection)

NOTICE

Potentials

The freely configurable channels of the CFU are connected to the potentials of the power supplies (not isolated).

In case of polarity reversal of the power supply, a short circuit is possible via the ground connections.

Read section "Fundamentals of hazardous areas and intrinsic safety (Page 24)" if needed.

The M and L+ wires of a power supply must be connected to the plug (X8<n>).

- The power supply is connected using two 2-pin plugs (plug-in terminal blocks).

- A redundant power supply can be connected (plug connectors X80 and X81).

  – Both inputs are decoupled.

  – The ground connections of the plugs (1M and 2M) are connected to each other in the CFU.

  – There is no load distribution.

  – With redundant infeed, the power supply unit with the higher output voltage supplies the device exclusively.

- 2 contacts each are located over each other for each potential (L+ and M). This allows you to loop through the power supply (permissible current 10 A).

- The power supply has a high-impedance connection with the enclosure to enable an ungrounded installation.

● Observe the wiring rules.

● The maximum cross-section of the connection is 2.5 mm². A strain relief is not present.

Note

Diagnostics of the redundant power supply

Diagnostics can be enabled for the redundant power supply in the commissioning wizard of the CFU. You can find information on this in section "Using CFU PA <V...> Configuration (Page 51)".

Requirements

● The plugs are available (X80 or X81, section "Article numbers (accessories / spare parts) (Page 127)").

● Only wire the plugs when the power supply is switched off.

● Observe section "Wiring rules (Page 35)".

Required tools

You require a screwdriver with 3 mm to 3.5 mm blade to connect the power supply.

Connection of conductors: flexible (stranded), without wire end ferrule, unprocessed

To connect a wire without wire end ferrule, follow these steps:

1. Strip 8 to 10 mm of insulation from the wires.

2. Fasten the cable to the plug.

Tool-free connection of conductors: solid without wire end ferrule, flexible (stranded) with wire end ferrule or ultrasonically sealed

To connect a wire without tools, follow these steps:

1. Strip 8 to 10 mm of insulation from the wires.

2. Only for stranded conductors:
   Seal or crimp the wire with wire end ferrules.

3. Fasten the cable to the plug.

Fastening the cable to the plug

Plug with screw connection	Plug with push-in connection
1. Insert the wire into the terminals as far as it will go. 2. Use a screwdriver to tighten the terminal.	1. Using a screwdriver, press the spring release and insert the wire into the terminal as far as it will go. 2. Pull the screwdriver out of the spring release.

Slot for the power supply of the CFU

Insert the plug into the CFU (X80 or X81).

Note

The device can be disconnected by pulling the plug from the power supply.

Display of the supply voltage

The "PS1" and "PS2" LEDs indicate whether a power supply is connected (see section "Diagnostics via LED displays (Page 81)").

If a supply voltage that conforms to the technical specifications of the CFU is connected, the associated LED:

- X80: "PS1" LED lights up green
- X81: "PS2" LED lights up green

Removing a wire

Plug with screw connection	Plug with push-in connection
1. Open the terminal with the screwdriver. 2. Remove the cable from the plug.	1. Using the screwdriver, press the spring opener as far as it will go and pull out the wire. 2. Pull the screwdriver out of the spring release.

7.5 Connecting the device to the CFU PA (PROFIBUS PA field device, sensor, actuator)

7.5.1 Connecting the PROFIBUS PA field device to the CFU [ID: 100353082251]

Note

Field devices with hardware-coded address

Recommendation:

- Even for field devices with hardware-coded address setting, you should choose to have the address set via the software, if possible.
- If you have chosen to have the address set via the software, the CFU automatically adopts the address assignment on the field device.

If you want to connect field devices with a hardware-coded address to a CFU, the address must be set before connecting to the CFU.
Read the information on this in the section "PROFIBUS addresses of the PROFIBUS PA field device on the CFU (FBn) (Page 133)".

You can connect one PROFINET PA field device to each fieldbus connection of the CFU (fieldbus connections FB0 to FB7):

- You can find information on the terminal pin assignment in the section "Terminal assignment of the CFU (Page 128)".

- You can find information on the tightening torques in section "Mounting rules (Page 130)".

Terminals for the bus cable to the field device <n>+ and <n>-	
Plug with screw connection	Plug with push-in connection
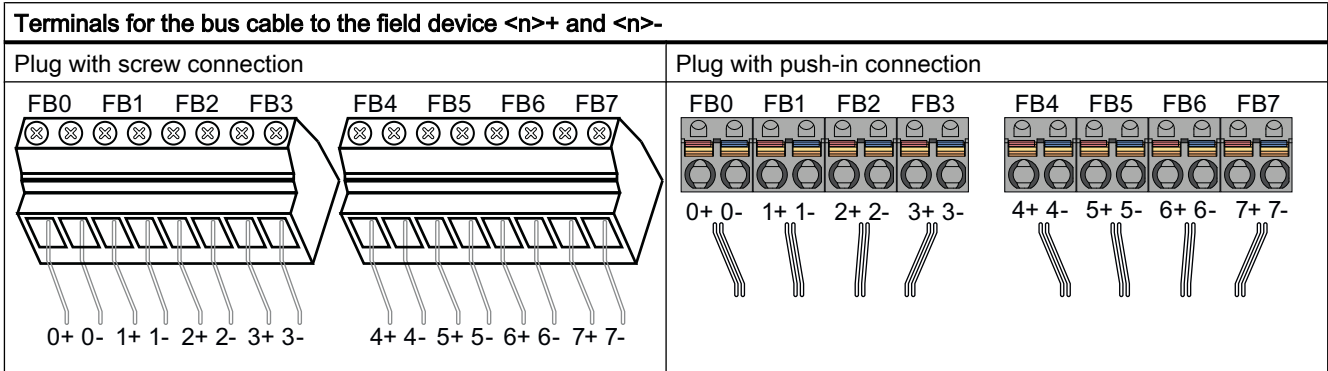
Wiring
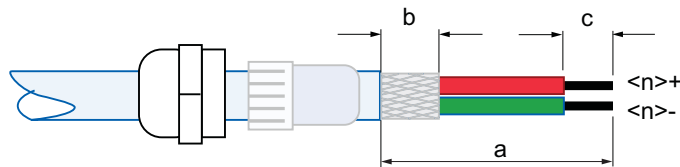
a	75 mm
b	15 mm
c	10 mm
<n>+	Data line +
<n>-	Data line -

Figure 7-2   Fieldbus cable stripped for direct grounding

Note

Grounding

The shield of the PROFIBUS PA cables must be connected to the functional earth in each case.

Recommendation:
You can find ordering information of shielding buses for shield spring terminals and shield spring terminals for the CFU in the section "Article numbers (accessories / spare parts) (Page 127)".

Additional information

- Section "Technical specifications of the Compact Field Unit PA (Page 110)"

7.5.2 Connecting a sensor / final controlling element to the CFU [ID: 100353177483]

Read section "Fundamentals of hazardous areas and intrinsic safety (Page 24)" if needed.

The CFU PA offers 8 freely configurable channels (DIQ; DIQ<n>). You can connect a sensor or an actuator to each freely configurable channel of the CFU.

- You can find information on the terminal pin assignment in the section "Terminal assignment of the CFU (Page 128)".

- You can find information on the tightening torques in section "Mounting rules (Page 130)".

Terminals for the freely configurable channels (DIQ<n> for one sensor or actuator each)	
Plug with screw connection	Plug with push-in connection

Wiring

> ⚠ **CAUTION**
>
> **Current carrying capacity of the CFU**
>
> Observe the total maximum permissible load current of all channels together (total current Us +DQ) and temperature-dependent limits.
> You can find information about this in section "Rules for the operation (Page 21)".
>
> **Parallel connection not permitted**
> - Parallel connection of sensor supplies is not permitted.
> - Parallel connection of digital outputs is not permitted.
>
> **Sensor supply**
> - The connection of an external power supply to a DI sensor supply or DO output triggers an error message of the CFU. **All freely configurable channels are disabled.**

You can find additional information in the following sections:

- Section "Technical specifications of the Compact Field Unit PA (Page 110)"

- Section "Configuring freely configurable channels (parameter overview - DIQ) (Page 73)"

The following tables show the wiring schemes, depending on how the freely configurable channels are used.

- Digital input

- Digital output

Digital input

Table 7-1   Wiring variant "Digital input with 1-wire interface"

Wiring scheme	Terminals	Connection
<n>+ oder <n>- 24VDC .n <n+1>-	• <n>+: Sensor supply, channel DI<n> • <n>-: Input signal, channel DI<n>	Sensor supply for multiple channels: • Internal (US.n or power supply of the CFU) or • External (24 V DC): requires reference potential for the sensor supply

Table 7-2   Wiring variant "Digital input with 2-wire interface"

Wiring scheme	Terminals	Connection
<n>+ <n>-	• <n>+: Sensor supply, channel DI<n> • <n>-: Input signal, channel DI<n>	Sensor supply for a channel of the CFU

Table 7-3   Wiring variant "Digital input with 3-wire interface"

Wiring scheme	Terminals	Connection
M <n>+ <n>-	• M: Reference potential for the sensor supply • <n>+: Sensor supply, channel DI<n> • <n>-: Input signal, channel DI<n>	Sensor supply for a channel of the CFU

Digital output

Table 7-4   Wiring variant "Digital output with 1-wire interface"

Wiring scheme	Terminals	Connection
M <n>+ <n+1>+	• <n>+: Output signal, channel DQ<n> • M: <n> ground	Common ground connection for multiple channels • Internally or • Externally connected

Table 7-5   Wiring variant "Digital output with 2-wire interface"

Wiring scheme	Terminals	Connection
<n>+ <n>-	• <n>+: Output signal, channel DQ<n> • <n>-: Ground, channel DQ<n>	Ground connection to the channel of the CFU

7.6   Connecting the cable shields of the PROFIBUS PA cables [ID: 100353127563]

Introduction

Interference currents on the shielding of the fieldbus cables should be diverted to the functional grounding FE.

- Shield spring terminals are suitable for attaching cable shields (e.g. for cables to fieldbus devices).
  You can fasten the shielding of the fieldbus cables with shield spring terminals to a shielding bus.
  The shield spring terminals are an optional article for the CFU.
  You can find ordering information for them in section "Article numbers (accessories / spare parts) (Page 127)".

- When the shielding bus and mounting rail are connected to the functional grounding FE, the fieldbus cable is automatically connected to the functional grounding FE once the cable shield is mounted. The shield spring terminals conduct the interference currents on the cable shields to ground over the shielding bus.

- The shield spring terminal is suitable for cables with a diameter of 6 to 8 mm.
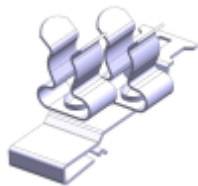
- When installing the CFU in an enclosure:
Fasten shield spring terminals to the shielding bus.
A shield spring terminal can hold 2 fieldbus cables. With no load, securing with cable ties is sufficient.

Requirements

- Shielding bus and shield spring terminal are installed.

- Ensure there is sufficient heat dissipation for the CFU.

- Pay attention to the bending radius of the fieldbus cables.

Required tools

- Wire stripping tool

Procedure

To connect the cable shield, follow these steps:

1. If necessary, disconnect the fieldbus cables from the connections FB<n> on the CFU.

2. Remove the insulation material of the portion of the fieldbus cable near the shield spring terminal.

3. Connect the fieldbus cable to the CFU and press the fieldbus cable into the shield spring terminal.

4. Secure the fieldbus cable with cable ties to the shielding bus.
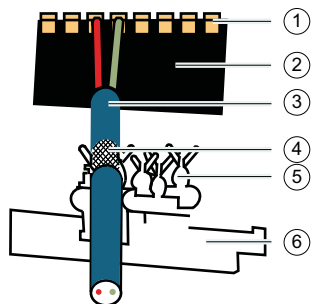
①	Terminals (screw terminal or push-in terminal)	④	Insulation material removed (approx. 20 mm)
②	Terminal block 8x1	⑤	Shield spring terminal
③	Fieldbus cable to field device	⑥	Shielding bus

7.7 Connecting the functional earth to the CFU [ID: 100353325579]

Properties

The mounting rail of the CFU must be connected to the functional earth.

Requirements

- Perform wiring when the supply voltage is switched off.
- Observe the wiring rules.
- Attachment of the grounding cable:
  Zone 2 or safer area: Terminal or cable lug

Cross-section of grounding cable

To prevent possible interference, the cross-section of the grounding cable for the mounting rail must be greater than the cross-section of the grounding cable for the power supply of the CFU.

Note: The grounding cable must have a cross-section of at least 10 mm².

Required tools

- Screwdriver, 3 mm and 7 mm
- Wire stripping tool
- Possibly crimp tool

Grounding the mounting rail

1. Strip insulation from the grounding cable.
2. Attach the connecting terminal for the grounding cable to the mounting rail to the right of the CFU.
   You can find information on the tightening torques in section "Mounting rules (Page 130)".
   Connection in zone 2 and safer area: Terminal or cable lug
3. Attach the other end to the functional earth FE.

Note

Alternative grounding of the mounting rail

If it is ensured that the mounting rail is permanently connected to the protective conductor system using an equivalent installation that complies with standards, for example, by permanent attachment to a grounded control cabinet wall, the additional grounding cable can be omitted.

7.8 Communication via PROFINET

7.8.1 Connecting the CFU to the PROFINET IO [ID: 100353402507]

The following possibilities are available for connecting the CFU to the PROFINET IO:

- Connect cable to BusAdapter with plug connector:
    - PROFINET cable with RJ45-BusAdapter
    - Fiber-optic cable connection with FO BusAdapter
- Connect a FastConnect cable directly to the BusAdapter

Additional information

- Basics for PROFINET (Page 133)

- You can find additional information on approved BusAdapters in section "Article numbers (accessories / spare parts) (Page 127)".

- Information about installing the BusAdapters is available in the documentation *Industrial Ethernet / PROFINET Passive Network Components.*
  You can find this documentation on the Internet under http://support.industry.siemens.com/cs/ww/de/view/84922825 (http://support.industry.siemens.com/cs/ww/en/view/84922825).

Commissioning 8

8.1 Switching on the CFU [ID: 100353421835]

> **⚠ DANGER**
>
> **Explosion hazard**
>
> In the Zone 2 hazardous area it is forbidden to disconnect the wires from the CFU during operation (power supply, PROFINET, freely configurable channels).
> The fieldbus connections are implemented as intrinsically safe connections (Ex ic) and may be removed and inserted during operation.
> Observe the diagnostics for wire break.
>
> De-energize the CFU before carrying out any work on it.

Delivery state of the CFU

In the delivery state, the CFU has no device name and no IP address.

Device name is transferred from the BusAdapter

If a device name is stored in the inserted BusAdapter, the device name is transferred from the BusAdapter when the CFU is switched on.

Observe section "Removing or inserting the BusAdapter (Page 90)".

Automatic name assignment and setting of the IP address on device replacement

If the following conditions are met prior to installation of the CFU, the CPU automatically restores the IO device name and IP address based on neighborhood relationships after installation of the new CFU:

- The new CFU is reset to factory settings.
- The topology of the PROFINET IO system is configured and downloaded to the CPU.

Observe section "Replacing the CFU (Page 90)".

Additional information

Section "Restoring the state of delivery (Page 95)"

8.2 Startup of field devices depending on the configuration [ID: 100353433867]

You can find information on the PROFIBUS PA profiles and Selected IO in section "PA profiles for field devices on PROFIBUS PA (Page 23)".

Field device detected at CFU startup

The power supply of the field devices is activated in the default parameter assignment of the CFU.

1. During the startup phase of the field device, the green LED flashes on the fieldbus connection.

2. When the startup phase is successfully completed, the green LED is continuously lit. Communication between the CFU and field device is then possible.

Diagnostics

If the field device does not support the configured IO, a diagnostic interrupt is triggered. To eliminate the error you must change the configuration.

Section "Diagnostics via LED displays (Page 81)" contains the following information for a fieldbus connection:

- Information for analysis of the cause of errors

- Information on the status

Field device replacement

- During a field device replacement the Selected IO overwrites the profile set in the field device.

- If the field device does not have this profile, this is signaled by an error message. You then have the option of changing the Selected IO to a value available in the field device. The Selected IO of the CFU is **never** automatically overwritten by the PA profile active in the field device.

Configuring an IO

The PA profiles offered by the field device are read in again by the CFU only after a field device replacement.

For connected field devices, the CFU automatically attempts to set the PROFIBUS PA address on the field device.
You can find the assignment of fieldbus connections to the addresses of the PROFINET PA field devices in section "PROFIBUS addresses of the PROFIBUS PA field device on the CFU (FBn) (Page 133)".

You have the following options for configuring an IO:

- **Configuring IO in HW Config (offline)**
  Insert PROFIBUS PA profiles via drag & drop from the catalog.
  You can find information on this in section "Configuring a PROFIBUS PA field device (offline) (Page 67)".

- **Configuring IO in the "CFU PA ... Configuration" wizard (online)**
  Set PROFIBUS PA profiles in SIMATIC PDM using the commissioning wizard of the CFU.
  You can find information on this in section "Parameter assignment of PROFIBUS PA field device (online) (Page 78)".

Disabling fieldbus connections.

You can disable individual fieldbus connections in the parameter assignment of the CFU in the "CFU PA ... Configuration" dialog.

8.3 Commissioning (overview of procedure) [ID: 100353461387]

Procedure

	Offline commissioning with project	Online commissioning with project	PDM stand alone without project
Advantages	Engineering is possible without hardware. You perform the commissioning in conclusion.	Fast commissioning through efficient determination of devices present in the system and direct assignment of parameters in the system	Advance commissioning with real devices and correct parameters without a project in PCS 7 or STEP 7
Procedure	1. Online: Assigning device name (Page 56) 2. CFU: Configuring (Page 79) 3. Optional: Topology: Configuring (Page 58) If you configure the topology, this enables automatic name assignment on device replacement in PCS 7 systems through use of neighborhood relationships. 4. Freely configurable channels: Configuring (Page 64) and assigning parameters (Page 73) 5. Field devices: Configuring (Page 67) 6. Compile the configuration. 7. Download the configuration to the automation system. 8. LED status: Checking (Page 81) If necessary, open the module information in order to receive more precise diagnostic information. 9. Optional: CFU: Assigning parameters via SIMATIC PDM (Page 76) 10. Field devices: Assigning parameters via SIMATIC PDM (Page 78)	1. Online: Assigning device name (Page 56) 2. CFU: Configuring (Page 63) 3. Optional: Topology Configuring (Page 58) If you configure the topology, this enables automatic name assignment on device replacement in PCS 7 systems through use of neighborhood relationships. 4. Using CFU PA <V...> Configuration (Page 51) 5. Read back IOs (Page 77) Assigning parameters for freely configurable channels:	1. Online: Assigning device name (Page 59) 2. Process devices network view: Creating networks and inserting a CFU (Page 79) 3. Using CFU PA <V...> Configuration (Page 51) 4. Read back IOs (Page 77) 5. Field devices: Assigning parameters via SIMATIC PDM (Page 78)
Result	All steps up to step 6 can be performed without hardware. Commissioning is performed starting from step 7.		• CFU and field device parameters are assigned. • CFU is not linked to any project.

The CFU is in data exchange mode with the IO Controller.

Activating PROFIsafe operation mode for field devices

If you want to connect field devices to the CFU that support PROFIsafe operation mode (mode: S4), you must consider the following:

PROFIsafe operation mode may only be activated after commissioning of the field devices. In the PROFIsafe mode S4, the field device prohibits changes of any kind.

- S4 = PROFIsafe operation mode

- S3 = Prepared for safe mode, check completed

- S2 = Prepared for safe mode, not checked

8.4   CFU PA Configuration

8.4.1   Using CFU PA <V...> Configuration [ID: 100353487243]

Use of the "CFU PA <V...> Configuration" wizard

The CFU can be commissioned using the wizard.

Compared to commissioning of the CFU with STEP 7 alone, additional options and functions are available in the CFU when commissioning with the wizard.

- You can find information about this in section ""Commissioning Wizard: Complete" dialog (Page 53)".

Requirement

Online connection to the CFU

Opening the wizard

1. Select the CFU in the component view.

2. Select the shortcut menu command **Edit > Start SIMATIC PDM**.
   SIMATIC PDM opens.

3. In SIMATIC PDM, select the menu command **Device > CFU PA Configuration**.
   The "CFU PA <V...> Configuration" dialog window opens.

You can find detailed information on the use of the wizard in its individual dialog windows.
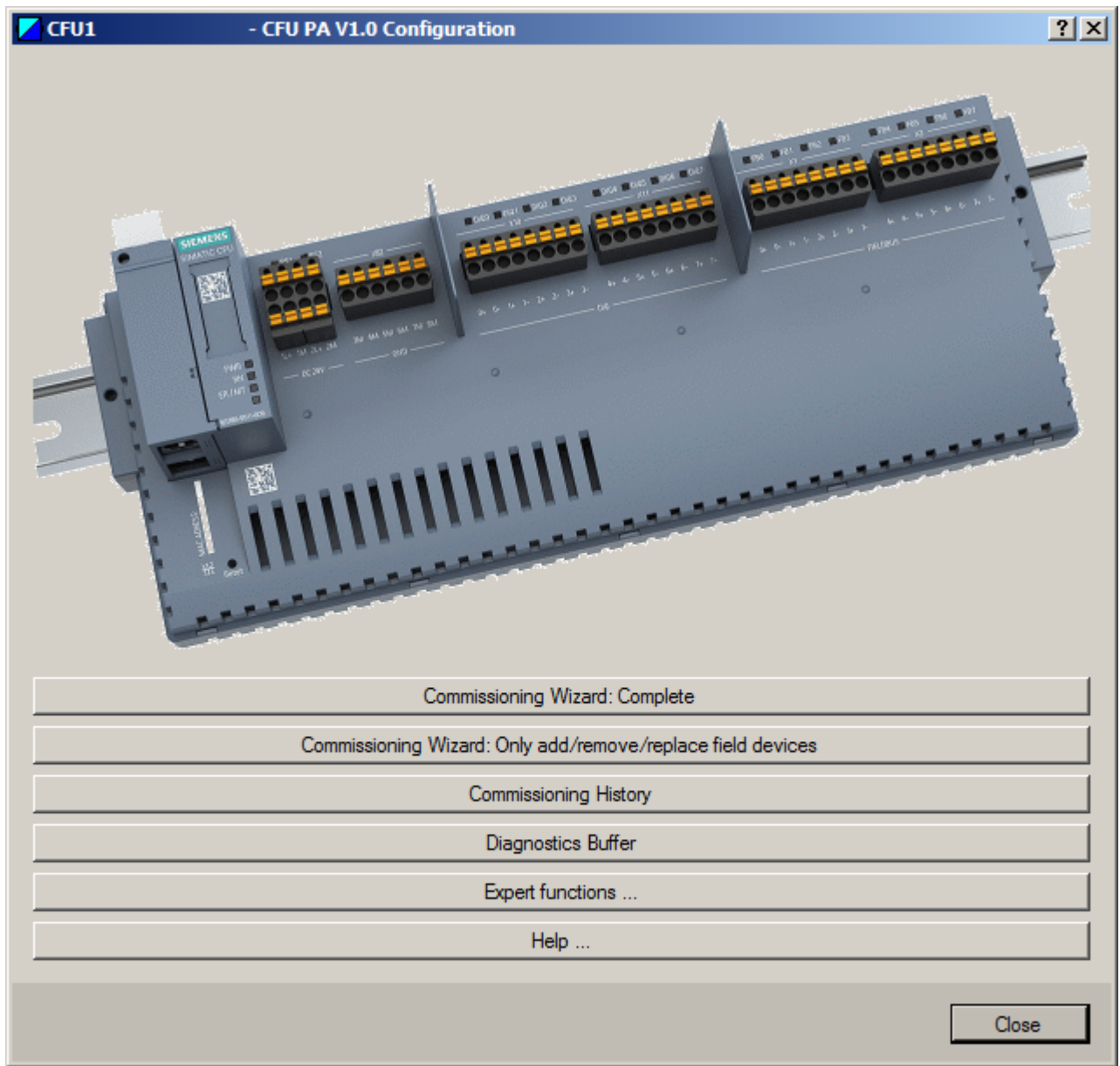
See also

8.4.2 "Commissioning Wizard: Complete" dialog [ID: 100353510795]

You can find detailed information on the use of the wizard in the respective dialog window.

Table 8-1   "CFU PA ... Configuration" wizard

Step	Function in Commissioning Wizard: Complete
1	**Specify I&M data of the CFU PA** • Display of article number, serial number, hardware version and firmware version of the CFU. • Setting of I&M data of the CFU • Only the installation date can be set for a BusAdapter.
2	**Configure power supply and monitoring of electronics temperature** • Monitor redundant power supply – The CFU enables connection of 2 power supplies. – If the power supply is configured as "redundant", a diagnostic interrupt is triggered if one power supply is missing. • Monitor power supply faults – A diagnostic interrupt can be configured for short-term faults. • Monitor electronics temperature of the CFU **Recommendation:** Configure the warning limits for the temperature message according to the installation situation. In particular, in the case of installation in an enclosure and/or vertical installation. The electronics temperature can be higher than the permissible ambient temperature of the CFU. When the permissible electronics temperature is exceeded, an alarm is signaled.
3	**Verify freely configurable channels (DIQ<n>)** • Display of the hardware parameters for the freely configurable channels (DIQ) transferred from HW Config.
4	**Status of the automatic addressing on PROFIBUS PA** • Enabling and disabling of individual fieldbus connections. • Information on commissioning of field devices (automatic addressing, reading out of supported IOs)
5	**Configure type of field devices on PROFIBUS PA (FB<n>)** • Selection of how a connected PROFIBUS PA device is to behave: - Profile (recommended) - Manufacturer-specific device description You can find additional information on this in section "Configuring a PROFIBUS PA field device (offline) (Page 67)". • In the "Change IO ..." drop-down list, select the desired field device behavior.

Step	Function in Commissioning Wizard: Complete
6	**Configure extended diagnostic possibilities for PROFIBUS PA** Extended fieldbus diagnostics • Voltage monitoring for the fieldbus connection (Min alarm) Fixed low alarm limit for each fieldbus connection. • Voltage monitoring for the fieldbus connection (Min warning) User-defined warning limit for each fieldbus connection. • Spur line current deviation (valid for all fieldbus connections): Permissible percentage deviation from the set reference current value • Reference current value Set a reference current value corresponding to the technical specifications of the field device after commissioning.
7	**Commissioning overview** Shows the status of the connected components: • Commissioning status • Power supply X80/X81 • Freely configurable channels DIQ0 to DIQ7 • Fieldbus connections FB0 to FB7

8.4.3 "Commissioning Wizard: Add/remove/replace field devices only" [ID: 100353521419]

If you click the "Commissioning Wizard: Add/remove/replace field devices only" button, you go directly to step 4/6 of the commissioning wizard.

Simplified commissioning of connected field devices

1. Open the "CFU PA ... Configuration" wizard.
   You can find information on this in section "Using CFU PA <V...> Configuration (Page 51)".

2. Click the "Commissioning Wizard: Add/remove/replace field devices only" button.
   The commissioning wizard opens at step 4.

3. Perform the commissioning.

4. Configure the CFU in HW Config (without field devices).

5. Download the configuration to the CPU.

6. Execute the "Read back IOs" function in HW Config. You can find information on this in section "Read back IOs (Page 77)".

Result: The configuration is adopted from the wizard and is consistent.

8.4.4 "Commissioning History" dialog [ID: 100353533067]

The history of changes made with the "CFU PA ... Configuration" wizard is shown in this dialog window.

The memory is non-volatile.

8.4.5 "Diagnostic buffer" dialog [ID: 100353542667]

The history of all diagnostic interrupts is shown in this dialog window.

The memory is volatile.

8.4.6 "Expert Functions" dialog [ID: 100353552267]

You can do the following in this dialog window:

- Reset a thermal overload of the freely configurable channels (DIQ reset)
- Read out supported IOs of a PROFIBUS PA device again

8.5 Preparing the CFU for commissioning

8.5.1 Rules for device names [ID: 100353577611]

A CFU must have a device name so that an IO controller can address the CFU as an IO device. This approach was chosen for PROFINET because names are easier to understand than complex IP addresses.

The device name must be unique in the PROFINET IO system.

The assignment of a device name for the CFU corresponds to the setting of the PROFIBUS address for a DP slave.

Rules for the specification of the device name (in accordance with the standard IEC 61158-6-10)

- A device name may have a maximum length of 240 characters (letters, numbers, hyphen or dot).
- A device name must consist of at least one character.
- In a device name a character string between two dots forms a label. Such a label could, for example, be ".device-a.".
- A label may have a maximum length of 63 characters.
- The minimum length of a label is one character, for example ".a.".
- A device name has one or more labels.
- A label may only contains the letters a to z (no umlauts), the numbers 0 to 9 as well as the hyphen.
- A label must not contain any special characters such as brackets, underscore, slash or blank.
- Umlauts (such as "ä" or "ü") must not be used.
- The hyphen ("-") is the only special character that is allowed.
- A label must not begin with a hyphen, however.

- A label must not end with a hyphen either.

- A device name may not have the form n.n.n.n (n = 0...999).

- A device name must not begin with the character string "port-xyz-" (x,y,z = 0...9).

- A device name must not begin or end with a dot. For example, the character string ".device-a." is not permitted as the device name (only as a component of a device name, as a label).

Automatic addition of suffix to device name (offline configuration)

- If a PROFINET IO system contains multiple devices of the same type, STEP 7 automatically adds a consecutive number to the end of the device name originating from the GSD file. The second device has the suffix "-1", the third device the suffix "-2", etc.

- STEP 7 gives you the option of having the name of the IO system automatically added as a name component of the device name. To do this, select the "Use name in device/ controller" option in the properties of the IO system. The device name then has the form: [Name from GSD file].[Name of IO system]

You can find additional information om address and name assignment for PROFINET IO devices in the STEP 7 online help.

Automated name assignment during device replacement

If the topology is configured in PCS 7, when individual devices are replaced the device name is automatically transferred to the replacement device based on neighborhood detection.

You can find additional information on this in following sections:

- Section "Configuring the topology (Page 58)"

- Section "Removing or inserting the BusAdapter (Page 90)"

Resetting to factory settings

You can find information about this in section "Restoring the state of delivery (Page 95)".

> ⚠ **CAUTION**
>
> **STOP of the CFU can cause dangerous system states**
>
> Ensure that a failure of the CFU **cannot** result in a dangerous system state. This action should **never** be carried out while the system is in operation.

8.5.2 Assigning device names with existing configuration from HW Config [ID: 100353590283]

Observe section "Removing or inserting the BusAdapter (Page 90)".

If you have performed the steps in section "Configuring the topology (Page 58)", the configuration from HW Config is not required.

Requirement

- The device name must be unique in the PROFINET IO system.

- The programming device interface must be connected directly to the PROFINET IO system.

- The device name is stored in the properties dialog of the CFU in HW Config.

- The MAC address of the CFU is known.

Procedure

1. Select the CFU in HW Config.

2. Select the menu command **PLC > Ethernet > Assign Device Name**.

3. For the first assignment of the device name, ensure that the following check boxes are selected:
   - Only show devices of the same type
   - Only show devices without names

4. In the "Available devices" list, select the CFU whose name you want to change.

5. If you want to check whether you have selected the desired IO device: Click the "Flashing on" button.
   The following LEDs flash on the selected device.
   - PWR
   - RN
   - ERR

6. Click the "Assign name" button.
   The device name is assigned directly to the device.
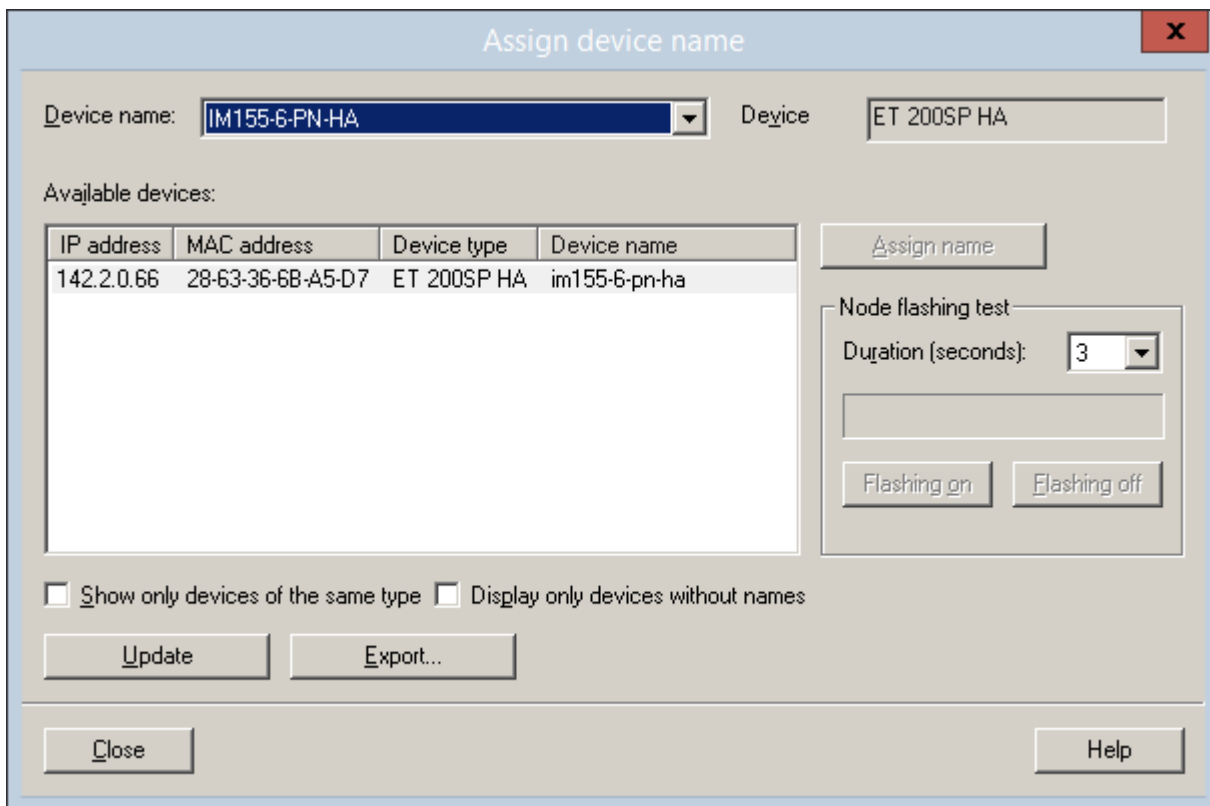
8.5.3   Configuring the topology [ID: 100353614091]

Automatic name assignment during device replacement is possible in PCS 7 systems.

The automatic name assignment is only possible if the topology is configured. The downloaded topology enables the required device name for a replacement device to be determined and set based on neighborhood relationships on the PROFINET IO system.

Requirement

 All components on the PROFINET IO system are created in HW Config.

Procedure

1. Select the PROFINET IO system to which the CFU is connected.

2. Select the menu command **Edit > PROFINET IO > Topology**.
   The "Topology Editor" dialog box opens.

3. Select the "Graphic view" tab.

4. Position the objects according to the order of the cables in the system.

Note

You can move the displayed objects. You can use the miniature view to select the section to be displayed.

5. Using drag-and-drop, connect the connections of the CPU, the CFU and other components on the PROFINET IO system (green rectangles) according to the order of the cables in the system.
On the "Table view" tab, you can make other system-specific settings (e.g. lengths of cables).
You can find additional information about this in the online help of the dialog box.

Additional information

STEP 7 online help

8.5.4   Assigning the CFU parameters without configuration [ID: 100353623691]

Requirement

- The device name must be unique in the PROFINET IO system.

- The programming device interface must be connected directly to the PROFINET IO system.

- The MAC address of the CFU is known.

- SIMATIC PDM is used for parameter assignment.

Assigning the CFU parameters without a project

1. Select the menu command **"PLC > Edit Ethernet Node"**.

2. Click the "Browse" button in the "Ethernet node" area.

3. Select the CFU.
   Set the following in the dialog:

   – IP configuration of the CFU (Set IP configuration" area)

   – Device name ("Device name" area)

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

Figure 8-1   Dialog box: PLC > Ethernet > Edit Ethernet Node

Additional information

Section "Commissioning (online) (Page 76)"

8.6 Requirement for startup of CFU [ID: 100353646091]

- The CFU has a valid PROFINET name (station name).

- The CFU is configured correctly.

See also

Diagnostics via LED displays (Page 81)

Diagnostics with the Maintenance Station (Page 85)

8.7 Commissioning (offline)

8.7.1 Configuring

8.7.1.1 Overview of configuring and assigning parameters [ID: 100353662347]

You configure the CFU using the PCS 7 Engineering System.

The configuration is divided into configuring and assigning parameters:

- Configuration (Page 63)
  The term "Configuring" is used for the layout, setting and networking of devices and modules within an environment (device or network view).

- Parameter assignment (Page 69)
  The term "Assign parameters" is used for the specification of the hardware parameters and the settings for the data exchange.

Configuring the CFU

Take the following information sources for configuring into account:

- "Industrial Ethernet / PROFINET Passive network stations (https://support.industry.siemens.com/cs/ww/en/view/84922825)" manual

- PCS 7 online help

- Help for the topology editor

- Readme (online)

- Current Product Information

8.7.2 Configuration

8.7.2.1 Introduction to configuring [ID: 100353681035]

Configuration of the components is carried out in HW Config. In the device view, you place the CFU on a PROFINET IO system using drag-and-drop.

When the CFU is placed in the automation system, the following data are entered automatically in the configuration table:

- Name of the component (module):
  Can be modified subsequently.

- Data from the hardware catalog:

  – Article number

  – Firmware version (in accordance with the planning)

- IP address and IO addresses:
  Can be modified subsequently.

8.7.2.2 Configuring the CFU [ID: 100353691403]

Requirement

- SIMATIC PDM is installed on the engineering station.

- The device description for the CFU is integrated in the PDM device manager.

- A CPU with PROFINET IO has been created in HW Config as a fieldbus.

- The type of network cable for connecting the CPU to the PROFINET IO is specified.
  This means that the type of required BusAdapter is also specified.

Procedure

1. In the component view, select the SIMATIC station and double-click the "Hardware" object in the detail window.
   HW Config is opened.

2. If the hardware catalog is not visible, select the menu command **View > Catalog**.
   The hardware catalog is opened.

3. Select the fieldbus (PROFINET IO).

Inserting the CFU

1. In the current PCS 7 profile open the folder **PROFINET IO > I/O > Compact Field Unit.**

2. Double-click the **Compact Field Unit PA**.
   The CFU is inserted on the PROFINET IO.

3. Double-click the inserted CFU.

4. Open the "General" tab.

   – Enter the system-specific device name for this CFU.

   – Select the following check boxes in the "Node/PROFINET IO System" area:
     - Check box "Assign IP address via IO Controller"
     - Check box "Configuration with PDM"
     You can also specify the address manually.

5. If the Maintenance Station is used or recommendation:
   Open the "Identification" tab. Enter the system-specific data.

Selecting the BusAdapter

An RJ45 bus adapter is inserted by default.

1. Select the BusAdapter to be replaced in the CFU.

2. In the current PCS 7 profile open the following folder:
   PROFINET IO > I/O > Compact Field Unit > Compact Field Unit PA. **> Submodules > Bus adapter > <"type of bus adapter">**.

3. Double-click the type of the required BusAdapter.
   The BusAdapter is inserted at both ports of the CFU.
   The BusAdapter type can be swapped for the selected CFU. To do so click the required BusAdapter in the hardware catalog.

Note

Note on downloading

The following conditions must be met for the CFU:

● The device name of the CFU (online) must match the device name from the configuration.

● The article number of the configured CFU must be identical to the article number of the CFU present in the system.

● The firmware version of the configured CFU must not be higher than the firmware version of the CFU present in the system.

Additional information

● Section "Configuring a freely configurable channel (DIQ) (Page 64)"

● Section "Configuring a PROFIBUS PA field device (offline) (Page 67)"

8.7.2.3   Configuring a freely configurable channel (DIQ) [ID: 100353703051]

In the following configuration the CFU is shown, as an example, with configured channels at a redundant IO Controller.
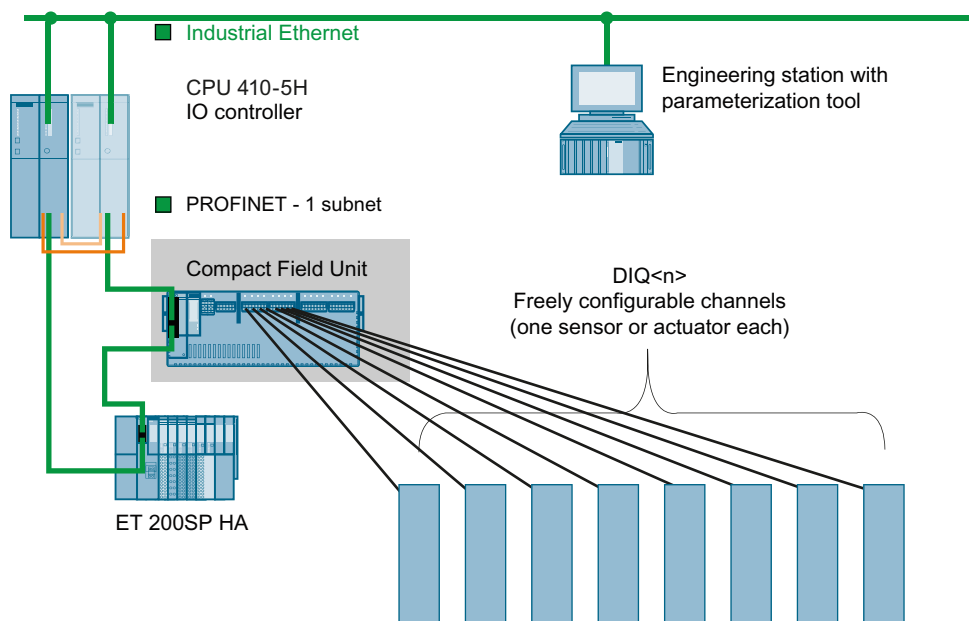
Requirement

The CFU has been created in the automation system.

Configuring freely configurable channels

1. Open HW Config.

2. In the index list, double-click the "DIQ<n>" slot.
   The "Properties - DIQ..." dialog box opens.

3. Enter a name for the "freely configurable channels" in the "General" tab.

4. You can modify addresses manually in the "Addresses" tab.
   Note:
   If PCS 7 is used, the Engineering System applies a correct parameter assignment.
   Modification is not required

5. You specify the properties of the freely configurable channels in the "Parameters" tab.
   You can find information on parameter assignment in section "Configuring freely
   configurable channels (parameter overview - DIQ) (Page 73)".

Specifying names for freely configurable channels

1. In HW Config, select the "DIQ..." slot in the index list.

2. In the shortcut menu select **Edit symbols...** .
   The "Edit symbols - DIQ8..." dialog box is opened.

3. Adapt the signal names manually or assign the names automatically by using the
   "Supplement symbols" function.
   Note: Even if all symbols are assigned, you can use an IO channel only once as an input
   or output.
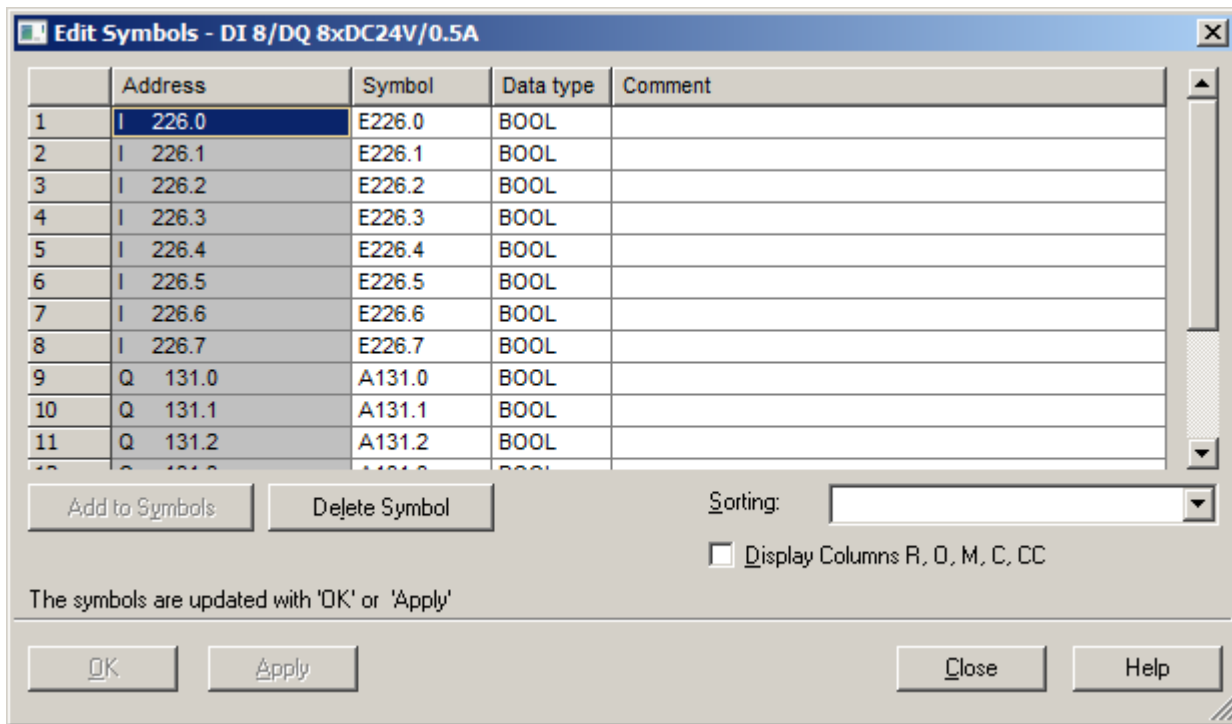
Additional information

You can find additional information on assigning parameters in section "Configuring freely configurable channels (parameter overview - DIQ) (Page 73)".

8.7.2.4 Configuring a PROFIBUS PA field device (offline) [ID: 100353737739]

In the following configuration the connection of the CFU is shown, as an example, with field devices at a redundant IO Controller.
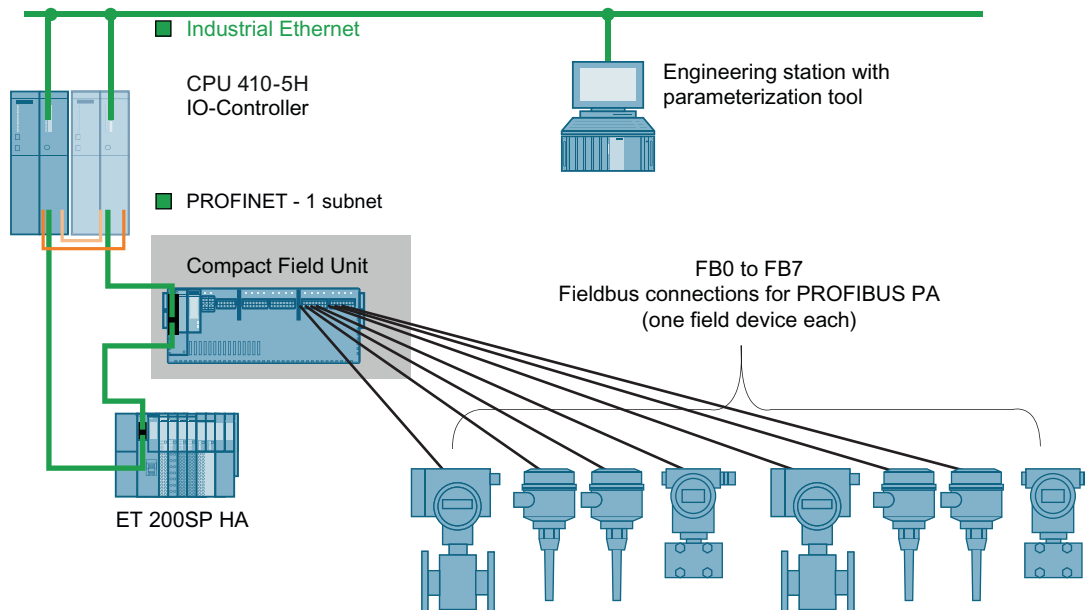
Recommendation: Use PROFIBUS PA profile for the field device

PROFIBUS PA profiles enable simpler field device replacement than when device-specific GSD files of the manufacturer are used.

You can find information on the behavior of the CFU in section "Startup of field devices depending on the configuration (Page 48)".

When the PROFIBUS PA profile of the CFU is integrated, you can find the PA profile of the CFU in the catalog in HW Config in folder:
PROFINET IO > I/O > Compact Field Unit > Compact Field Unit PA -> Profibus-PA Profiles...

If you are using SIMATIC PDM, you will find the PROFIBUS PA profiles in the folder:
PROFIBUS-PA > Profile > Ident Neutral > Siemens AG

Requirements

● SIMATIC PDM is installed on the engineering station.

● The device description for the field device is integrated in the PDM device manager.

● The CFU has been created in the automation system.

Procedure (offline configuration)

1. Open HW Config.

2. If the hardware catalog is not visible, select the menu command **View > Catalog**.
The hardware catalog is opened.

3. Double-click "PROFIBUS PA" in the library.
   Search for the required field device in the catalog.

4. Use drag-and-drop to move the field device onto the slot (FIELDBUS; FB<n>) to which you connect the field device.
   Observe the following paragraph "Detecting field devices online with the CFU commissioning wizard".

Note

Addresses of the field devices

The CFU assigns the addresses for the field devices automatically.

If the address of a field device can only be set using a mechanical switch, you must manually adapt the address to the respective fieldbus connection.

You can find information on the fieldbus addresses of the CFU in section "PROFIBUS addresses of the PROFIBUS PA field device on the CFU (FBn) (Page 133)".

---

5. Optional: Assign the CFU parameters using SIMATIC PDM (redundant power supply and extended fieldbus diagnostics).

6. Optional: Assign parameters of the field devices using SIMATIC PDM.

Dependency of configuration of the CFU

The configuration using HW Config takes effect if the "Change configuration" check box is **not selected** in the "CFU PA Configuration; Commissioning Wizard - Step 5/6" wizard (default setting):

● The IO is **not** configured on the CFU.
   The CFU automatically sets the lowest PA profile available for the IO in the field device.

● The field device is configured on the CFU.
   The configuration determines the "Selected IO". The CFU sets the "Selected IO" in the field device.

Detecting field devices online with the CFU commissioning wizard

The CFU enables easy detection of connected field devices with the commissioning wizard and subsequent transfer of the configuration to the configuration.

Recommendation: Read back IOs

Click the "Read back IOs" button in HW Config. The "Read back field devices" dialog window opens.
The button is only active when an online connection to the CFU exists.

You can find information on this in section "Read back IOs (Page 77)".

Basic procedure for reading back IOs

1. Download the configuration to the CFU.

2. Use the commissioning wizard.
   You can find information about this in section "Assigning parameters to CFU online via SIMATIC PDM (Page 76)".

Additional information

- You can find additional information on parameters of the field devices in the documentation of the field device.

- You can find additional information on using SIMATIC PDM in the SIMATIC PDM help.

- STEP 7 online help

8.7.3 Parameter assignment

8.7.3.1 Introduction to assigning parameters [ID: 100353767947]

The term "Assigning parameters" is used for the specification of the hardware parameters and the settings for the data exchange:

Online parameter assignment

You can find additional information on online parameter assignment in the following sections:

- Section "Assigning parameters to CFU online via SIMATIC PDM (Page 76)"

- Section "Parameter assignment of PROFIBUS PA field device (online) (Page 78)"

Parameters for the CFU

The parameters for the CFU and the connections to the IO Controller are set at different objects in in HW Config.

Object in HW Con-fig	Tab [1]	Explanations	Supplementary information
PROFINET IO system	General	Name for the PROFINET IO system; settings for automatic name assignment	
	Update time	Calculated or configured update time	

CFU	General	Names and addresses of the CFU as node on PROFINET IO
		
		• PROFINET IO system information [1]
		
		• Setting the PROFINET IO system addresses
		  – Subnet information
		  – Subnet redundancy information [1]	

	Identification	Higher level designation; location designation; installation date; supplementary information	
Slot **0** (parameters for the CFU)	General	Information about the CFU	As information only / no change possible except comments.
	Addresses	Diagnostic address for the CFU	

Object in HW Config	Tab [1]	Explanations	Supplementary information
Slot **0/X1** (parameter for interface to the PROFINET IO system)	General	Name for the interface of the BusAdapter to the PROFINET IO system	
	Addresses	Diagnostic address for the interface to the PROFINET IO system	
	Synchronization	Synchronization parameters for the interface to the PROFINET IO system	
	IO cycle	Update time and response monitoring time for the interface to the PROFINET IO system	PROFINET installation > Isochronous mode > PROFINET functions > Isochronous mode > Engineering > Configuring
	Media redundancy	Network configuration for the PROFINET IO system	PROFINET functions > Media redundancy
Slot **0/X1 Pn R** (parameter for a port on the BusAdapter)	General	Name for the PN/IO port on the BusAdapter (Pn = P1 = Port 1 or Pn = P2 = Port 2)	
	Addresses	Diagnostic address for the PN/IO port on the BusAdapter	
	Identification	Higher level designation; location designation; installation date; supplementary information	
	Topology	Partner port; line data **Recommendation**: Set these parameters in the topology editor.	PROFINET installation > Topology PROFINET functions > Topology and STEP 7
	Options	• Transmission medium with transmission rate • Autonegotiation • Boundaries: End of sync domain, End of detection of accessible nodes, End of topology discovery	
Slot **DIQ** (Freely configurable channels)	General	Name for the freely configurable channels of the CFU	
	Addresses	Inputs, outputs You can specify the address range as follows: • Automatically (System specification check box)· • Input of a start address. Clear the "System default" check box and enter the start address in the "Start" field.	
	Parameter	For example channel type (input/output), diagnostics	
Slot **FB M**	General	Display of interface function "PROFIBUS PA Master"	
	Addresses	Diagnostic address for the PA master	
Slot **FB<n>** (configuration places for field devices on PROFIBUS PA [2])	General	Name for the respective field device	
	Addresses	I/O addresses and diagnostic addresses for the field device	
	Parameter	Are set via SIMATIC PDM.	

1)   You can find additional information on the tabs in the STEP 7 online help.

2)   For information only / no modification of the function possible, you can only enter comments.

Basic procedure

1. In HW Config, select the object (see following figure) that is to have parameters assigned to it.
   All objects on the CFU:

Slot	Module	Order number	I address	Q address	Diagnostic address
0	CFU-PN-V1.0	6ES7 655-5PX11-0XX0			16370*
X1	CFU PA V1.0				16369*
X1 P1 R	Port 1 RJ45	6DL1 193-6AR00-0AA0			16372*
X1 P2 R	Port 2 RJ45	6DL1 193-6AR00-0AA0			16371*
DIO	DI 8/DO 8xDC24V/0.5A		0.0...0.7	0.0...0.7	
FB M	PROFIBUS PA Master				16373*
FB 0	SITRANS TH400				16368*
3.1	148	Analog Input (AI) short	512...516		
3.2	148	Analog Input (AI) short	517...521		
3.3	Service				16367*
FB 1	SITRANS T3K				16366*
4.0	148	Temperature	522...526		
4.1	Service				16365*
FB 2					
FB 3					
FB 4					
FB 5					
FB 6					
FB 7					

①   PROFINET IO system (fieldbus system)

②   Setting the CFU parameters for PROFINET IO:

③ Slot 0 of the CFU: Parameters for the CFU (Slot 0)

④ Slot 0/ X1: Parameters for PROFINET IO (PROFINET IO interface of CFU X5)

⑤ Slot 0/ X1 P1 R: Parameters for BusAdapter (port 1 of the PROFINET IO interface X1)

⑥ Slot 0/ X1 P2 R: Parameters for BusAdapter (port 2 of the PROFINET IO interface X1)

The further steps are shown using the setting of the PROFINET node IP address on the CFU ② as an example:

1. Select the menu command **Edit > Object properties**.

2. Enter a unique designation for the interface module in the "Device name" entry field of the "General" tab.
   The unique designation is imperative for the PROFINET node.

Note

Device name

You must also enter this device name locally on the PROFINET device.
You can find additional information about this in section "Assigning device names with existing configuration from HW Config (Page 56)".

---

3. Click the "Ethernet" button in the "Node/PROFINET IO System" section.
   The "Properties - Ethernet interface CFU" dialog box is opened.

4. Enter the IP address of the CFU as a device on PROFINET IO on the "Parameters" tab.
   Assign unique IP addresses in the PROFINET IO system.

5. Select the network in the "Subnet" section.
   If a subnet has not yet been created: Click the "New" button.
   Further settings are not required for the CFU.

6. Click the "OK" button to apply the settings.

Parameters for the PROFINET IO system

You can find additional information in the STEP 7 online help on parameterizing the PROFINET IO system in the "General" tab.

8.7.3.2 Configuring freely configurable channels (parameter overview - DIQ) [ID: 100353794315]

Setting parameters

The following parameter tables contain an overview of all the parameters of the freely configurable channels of the Compact Field Unit (DIQ).

Tab in HW Config

Tab	Settings in the "Properties..." dialog box of a DIQ channel
General	You can enter a name for the DIQ channel.

Tab	Settings in the "Properties..." dialog box of a DIQ channel
Addresses (no change necessary in PCS 7)	You can adapt the following parameters: • Addresses of the inputs and outputs • Process image

Tab	Settings in the "Properties..." dialog box of a DIQ channel

Parameters	You can activate or deactivate the following parameters for each channel:
	
	• **Parameters for the digital inputs**
	   – Enable channel
	   – Wire break (monitoring)
	   – Short-circuit to M (monitoring)
	
	• **Parameters for the digital outputs**
	   – Enable channel
	   – Wire break (monitoring)
	   – Short-circuit to L+ (monitoring)
	   – Short-circuit to M (monitoring)
	   – Response to CPU STOP
	
	• **Diagnostics**
	Missing supply voltage (monitoring): enable/disable

Procedure

1. Open HW Config.

2. In the index list, double-click the "DIQ" slot.
   The "Properties - DIQ8..." dialog opens.
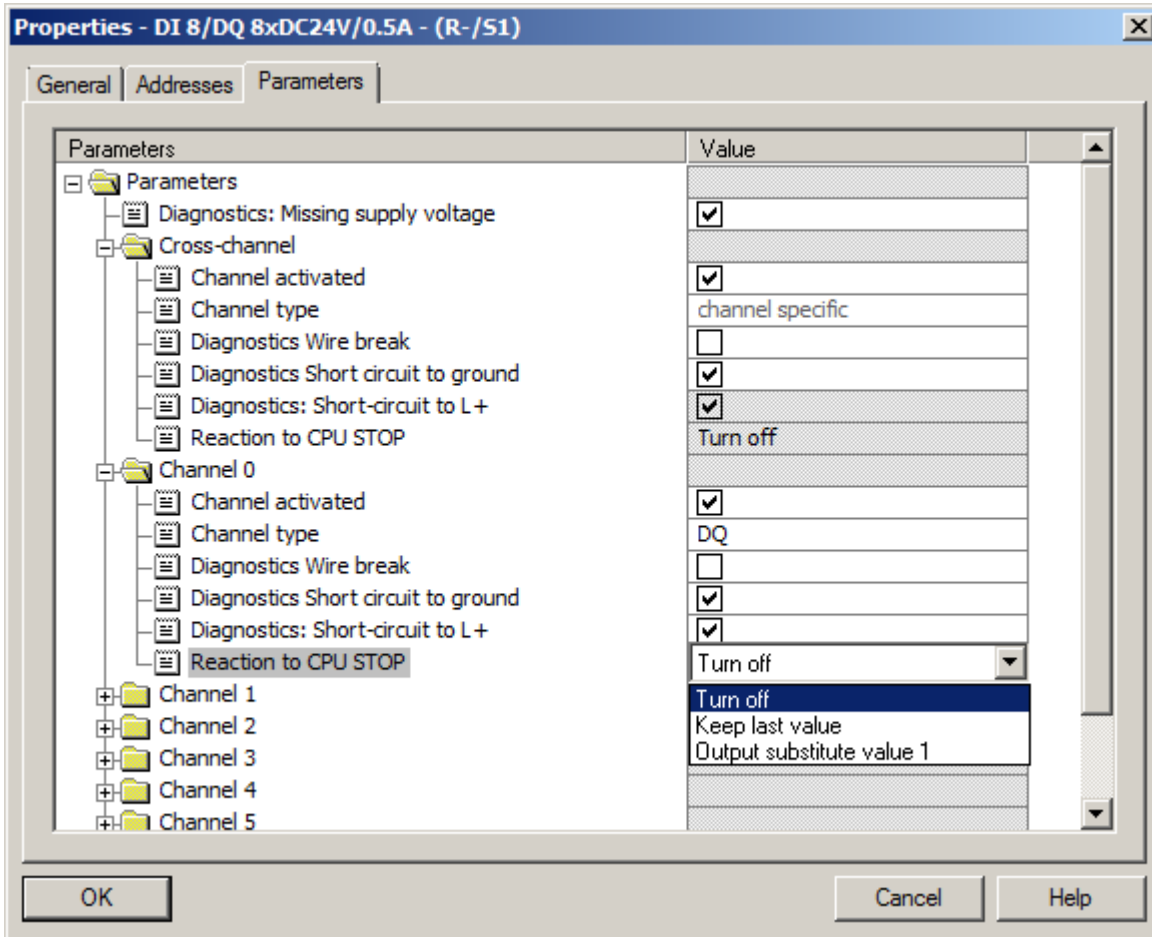
3. Make the system-specific settings.

Standard behavior (non-activated channel)

A channel that is not activated always behaves like a "digital input" without sensor supply.

8.8 Commissioning (online)

8.8.1 Assigning parameters to CFU online via SIMATIC PDM [ID: 100353829003]

Startup phase of a field device

The power supply of the field devices is enabled in the default parameter assignment of the CFU. You can disable individual fieldbus connections in the parameter assignment of the CFU in the "CFU PA Configuration; Commissioning Wizard" dialog of SIMATIC PDM.

- During the startup phase of the field device, the green LED flashes.

- When the startup phase is successfully completed, the green LED is continuously lit.

You can find additional information on this in section "Startup of field devices depending on the configuration (Page 48)".

Communication with the field device is then possible via SIMATIC PDM.

If the commissioning of the field device fails, communication with the PROFIBUS PA field device cannot be established.

- You can find information for analysis of the cause in section "Diagnostics via LED displays (Page 81)".

- If the field device is configured using HW Config, a diagnostic interrupt is generated.

Communication between a field device and the CFU

After connection of a field device, the CFU automatically attempts to set the PROFIBUS PA address on the field device.
You can find the assignment of fieldbus connections to the addresses of the PROFINET PA field devices in section "PROFIBUS addresses of the PROFIBUS PA field device on the CFU (FBn) (Page 133)".

The supported profiles of the PROFIBUS PA field device are read out and made available for selection in PDM.
You can find information on this in section "Startup of field devices depending on the configuration (Page 48)".

Requirements

- The CFU device name is downloaded to the CFU online.
  You can enable automatic address assignment. This function is only successful when the device name is set correctly.

Note

Local parameter assignment of CFU device name

Observe section "Assigning device names with existing configuration from HW Config (Page 56)"

- An online connection between the ES and CFU can be established.

- The electrical wiring is complete (PS, DIQ, FB).

Procedure

1. Select the CFU in the component view.

2. Select the shortcut menu command **Edit > Start SIMATIC PDM**.
   SIMATIC PDM opens.

3. In SIMATIC PDM select the menu command **Device > CFU PA Configuration**.
   The "CFU PA <V...> Configuration" dialog window opens.

4. Click the "Commissioning wizard" button.
   The commissioning wizard is opened.

5. Follow the instructions in the commissioning wizard.
   You can find information on this in section "Using CFU PA <V...> Configuration (Page 51)".

8.8.2 Read back IOs [ID: 100353856523]

The CFU enables easy detection of connected field devices with the commissioning wizard and subsequent transfer of the configuration to the configuration.

Requirements

- The CFU device name is downloaded to the CFU online.

- An online connection exists between the ES and CFU.

- The electrical wiring is complete (DIQ, FB).

Transferring the configuring results to the configuration

1. Open STEP 7 / HW Config.

2. Compile the configuring results and download the configuration to the CFU.

3. Click the "Read back IOs" button in the slot table in HW Config.
   Information on the device type of the connected field devices available in the CFU is read.
   The lowest available PA profile is automatically configured for the IO in HW Config.

4. Transfer this to the configuration.

5. Assign parameters of the freely configurable channels.

6. Compile the configuring results and download the configuration.

7. Optional: Assign parameters of the field devices using SIMATIC PDM.

Additional information

- You can find additional information on parameter assignment of the field devices in the documentation of the field device.

- You can find additional information on using SIMATIC PDM in the SIMATIC PDM help.

- Section "Using CFU PA <V...> Configuration (Page 51)"

8.8.3   Parameter assignment of PROFIBUS PA field device (online) [ID: 100353867147]

Status of the field devices

You can determine the status of the field devices in the "CFU PA Configuration; Commissioning Wizard" dialog of SIMATIC PDM. You can find information on this in section "CFU PA Configuration (Page 51)".

Requirement

A profile is assigned to the field device in HW Config.

The configuration of the CFU using the Commissioning Wizard of SIMATIC PDM takes effect if the "Change configuration" check box **is selected** in step 5/6 of the Commissioning Wizard (check box is not selected by default).

Note

"Change configuration" check box

The configuration in HW Config and the selection of the "Selected IO" in the Commissioning Wizard are performed independent of each other.
Both configurations must match. Otherwise, a diagnostic interrupt is output.

If, at any point in time, the configuration in HW Config and the configuration of the "Selected IO" in the CFU PA Wizard are the same for all field devices, the "Change configuration" check box is automatically reset.

Procedure

1. Select the CFU in HW Config.

2. Double-click the field device in the slot list.
   SIMATIC PDM opens.

3. Assign the field device parameters using SIMATIC PDM.

Dependency of configuration of the CFU

- The field device is **not** configured on the CFU.
  The CFU automatically sets the lowest PA profile available for the IO in the field device.
  You can change the selection at any time. You can find additional information on this in
  section "Using CFU PA <V...> Configuration (Page 51)".

- The field device is configured using the Commissioning Wizard.
  The "Selected IO" is selected (for example: a "Transmitter 2 AI" is selected for FB 2).
  Recommendation:
  Simplified commissioning for field devices.
  The Commissioning Wizard of SIMATIC PDM enables you to manually start reading the
  PA profiles for a particular fieldbus connection:
  To do this, select menu command **Device > CFU PA ... Configuration > Expert Functions**:
  Read field device data again.
  You can find information about this in section "Using CFU PA <V...> Configuration
  (Page 51)"; Commissioning Wizard; Step 5/6; "Change IO ..." drop-down list)

Additional information

- You can find additional information on parameter assignment of the field devices in the
  documentation of the field device.

- You can find additional information on using SIMATIC PDM in the SIMATIC PDM help.

8.9 Configuring with PDM Stand alone [ID: 100353878411]

Creating a network

1. Open the process device network view in SIMATIC Manager.

2. In the left-hand window, select the "Networks" folder in the tree view, and select the shortcut
   menu command **Insert New Object > Object**.
   The "Insert Object" dialog opens.

3. Click the "Assign Device Type" button.

Inserting the CFU

Follow the steps below to insert objects one at a time in higher-level objects.

Higher level object	Object to be inserted
"Networks" folder	**Communication network**
"Communication network" folder	Type of network over which the CFU is connected to the automation system: **PROFINET > PROFINET networks > PROFINET network**
PROFINET network	CFU Enter the following parameters in the dialog window: • Object name • IP address

1. In the right-hand window, select the higher-level object in the tree structure.

2. Select the shortcut menu command Insert New Object > Object.
    The "<Insert ... SIMATIC PDM Object(s)" dialog opens.

3. Enter the name of the tag in the opened dialog.

    ### Note

    The address of the CFU that you set in the "Insert SIMATIC PDM Object(s)" dialog can be changed later on the "Communication" tab of the "Object properties" dialog.

Parameter assignment of CFU with SIMATIC PDM

1. Select the CFU in the tree structure.

2. Select the shortcut menu command **Open Object**.
    SIMATIC PDM opens.
    You can find information on the remaining procedure in section "Assigning parameters to CFU online via SIMATIC PDM (Page 76)".

Detecting and configuring field devices

When the CFU is configured and the communication with the CFU is established, connected field devices are detected and you can configure the field devices.

You can find additional information on this in section "Using CFU PA <V...> Configuration (Page 51)".

Diagnostics of the CFU

<div align="right" style="font-size:3em">9</div>

9.1 Executing diagnostics of the CFU

A wide range of information and tools are available for diagnosing the status of the CFU.

Diagnostic possibilities

- **Displays**
  Some LED displays are located on the front of the CFU. This provides you with an overview of the status of the CFU. You can find information about this in section "Diagnostics via LED displays (Page 81)".

- **Tools**
  Information about the most important tools for diagnosing PCS 7 systems is available in the Service Manual PCS 7 Process Control System; Service support and diagnostics (www.siemens.com/pcs7-documentation).

  - **Maintenance Station**
    With the Maintenance Station, PCS 7 offers you the possibility to call up information about the status of all the PCS 7 components in hierarchically structured diagnostics screens. For this, the data of a component is analyzed with the existing online functions of the associated tools. You can access the ES data from the diagnostics screens (can be controlled via access protection mechanisms).

  - **Module information**
    Select the CFU in HW Config.
    Select menu command **PLC > Module information.**

  - **Connection status**
    Call from Start menu Siemens SIMATIC programs: **STEP 7 > NCM S7 > Diagnostics**

  - **Inventory data**
    Callup via SIEMENS SIMATIC program: **SIMATIC > SIMATIC Management Console** (license required) **> Plant view >** shortcut menu command "Determine inventory data"

  - **Status of the field devices and bus cables**
    Call via SIMATIC PDM
    The CFU does not undertake any detailed diagnostics of the field devices and bus cables. The detail diagnostics is possible, in as far as the required device descriptions are available in suitable programs (for example SIMATIC PDM).
    Open **SIMATIC PDM > Device > CFU PA <V...> Configuration**.

9.2 Diagnostics via LED displays

Below, you will find tables containing information on the status and error messages of the Compact Field Unit.

LEDs of the Compact Field Unit

The following LEDs are located on the front of the CFU.
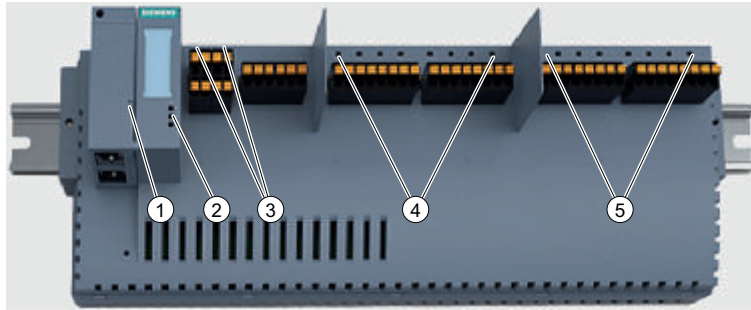
	Identification	Color	Meaning	Brief description
①	**LK1 and LK2**	Green	LED for status display on the BusA-dapter	Connection status
②	• **PWR**	Green	Power supply (Power)	Diagnostics of the CFU (LEDs on the interface dome)
	• **RN**	Green	Operating mode (RUN)	
	• **ER/MT**	Red/yellow	Error indication (Error/Maintenance)	
③	**PS1 and PS2**	Green	Supply voltage PS <x> is available	Power supply
		Red	Problem with supply voltage PS <x> (missing or faulty)	
④	**DIQ0 to DIQ7** LED display on channel (DIQ<n>)	Green or OFF	Signal status 1 or 0	Signal OK
		Red	Error display (Error)	Error
⑤	**FB0 to FB7** LED display on fieldbus con-nection (FB<n>)	Green	Field device connected and OK	Field device connected
		Yellow	Status display (Maintenance)	Maintenance necessary or maintenance required
		Red	Error display (Error)	Error

Table 9-1   Legend for the following tables:

■	▲	▲	**ON**	LED lit
	Off		**Off**	LED not lit
*	*	*	*****	Any status (not relevant)
☼	☼	☼	**Flashes**	Maintenance status (flashes)

LED displays on the interface dome of the Compact Field Unit

Table 9-2   Status and error display

LEDs			Meaning	Solution
PWR (supply)	RN (operation)	ER/MT (error/ main-tenance)		
■ On	■ On	Off	Good status: The CFU has established a connection to the IO controller.	
Off	Off	Off	No or insufficient supply voltage.	Check the supply voltage.
■ ON	■ ON	▲ ON	Startup of the CFU (approx. 5 s)	-
*	*	▲ ON	Maintenance required (after starting of the CFU)	Evaluate the diagnostics and eliminate the error.
☀ (~2 Hz)	☀ (~2 Hz)	☼ (~2 Hz)	Serious internal error. All channel LEDs also flash.	Check whether a firmware update is available and carry out the update. If the error persists, contact Siemens Industry Online Support.
■ ON	☀ (~1 Hz)	☼ (~1 Hz)	Unsupported BusAdapter	Replace the BusAdapter.
■ ON	☀ (~1 Hz)	☀ (~1 Hz)	Internal updates are running after a firmware update (duration: approx. 30 s).	Wait until the update has been completed. The CFU subsequently starts up automatically.
■ ON	☀ Flashes	*	No connection to the CPU	Wait a few seconds until the connection is established. If the connection is not established, check the configuration (device name and IP address of the CFU). Check the LEDs on the BusAdapter
☀ Flashes	☀ Flashes	☼ Flashes	Node flashing test	-
*	*	☼ Flashes	Group fault and group fault channels.	Evaluate the diagnostics and eliminate the error.
*	*	☼ Flashes	Configured structure does not agree with the actual structure of the CFU .	Check the structure of the CPU whether a channel fault or an error at the fieldbus exists.
*	*	☼ Flashes	Parameter assignment error for PROFIBUS PA or DIQ.	Evaluate the display of the channels and fieldbus connections in STEP 7 and eliminate the error.

LED displays on the BusAdapter

Table 9-3   Status display "LK1" and "LK2" on the BusAdapter

LEDs "LK1" and "LK2"	Meaning	Solution
■ ON	There is an Ethernet connection between the PRO-FINET IO interface of the CFU and a communication partner (for example IO controller).	-
Off	There is no Ethernet connection between the PRO-FINET IO interface of the CFU and a communication partner (for example IO controller).	Check whether the bus cable to the switch/IO controller is interrupted.

LED display on channel (DIQ<n>)

Table 9-4   Area: DIQ

ER/MT (error/main-tenance)	DIQ<n> - LED	Maintenance	Message
Off	■ On	Good status (signal on)	-
Off	Off	Good status (signal off)	-
☀ Flashes	☀ Flashes	Interrupt	• Wire break • Short-circuit to L+ • Short-circuit to M
☀ Flashes	*	Interrupt	• Temperature rise • Missing load voltage

LED display on fieldbus connection (FB<n>)

Table 9-5   Area: Fieldbus

ER/MT (error/main-tenance)	FB<n> - LED	Maintenance	Message
Off	■ On	Good status: Device connected and ready for operation	
Off	Off	Good status: No device connected and configured	
Off	☀ Flashes	-	Startup phase of the field device
☀ Flashes	☀ Flashes	Interrupt	• Wire break • Short-circuit

ER/MT (error/main-tenance)	FB<n> - LED	Maintenance	Message
☀️ Flashes	☀️ Flashes	Necessary	Warning limit exceeded

▲
ON
	▲
	ON
		Requirement	• Alarm limit for voltage and/or current exceeded/ fallen below
			• Error during the startup phase of the field device
			  – No communication possible
			  – Automatic addressing failed
			  – Reading out of IOs failed
			  – Setting of Selected IO failed
			• Configuration of HW Config and SIMATIC PDM is different
			You can find additional information on this in section "Startup of field devices depending on the configuration (Page 48)".

9.3 Diagnostics with the Maintenance Station [ID: 100354042123]

The device diagnostics indicates the maintenance statuses of the individual channels of the CFU on the Maintenance Station:

A faulty IO device (sensor, actuator or field device) does not trigger indication of a faulty CFU. The CFU signals the respective status for each channel or for each PROFIBUS PA field device.

Displaying maintenance statuses

The view is displayed for the Compact Field Unit from the Field devices area.

Note

This view is available for the MS Standard version of the Maintenance Station.

Maintenance statuses

In this view the maintenance statuses of the individual channels of the CFU are displayed.

● On the left half of the window, the eight input/output channels are shown:
8 connections for sensors and/or actuators (DIQ: DIQ0 to DIQ7)

● On the right half of the window, the eight fieldbus connections are shown:
8 fieldbus connections (FIELDBUS; FB0 to FB7)

The figure below shows an example of the view:
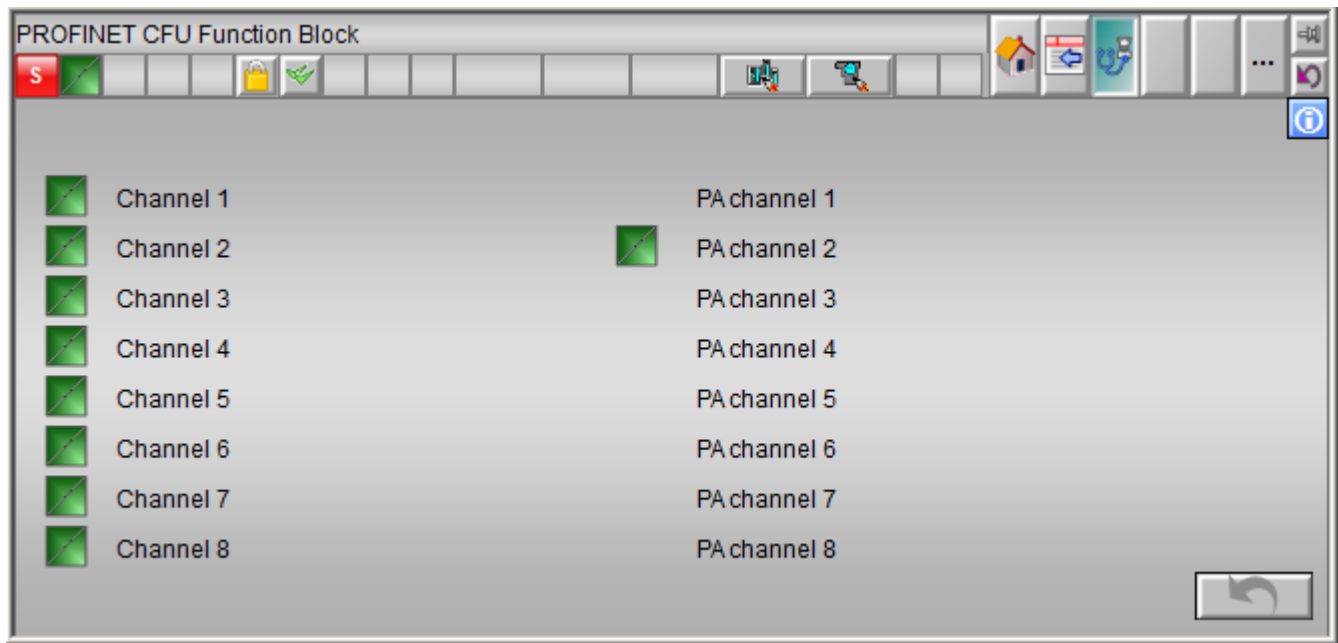
Display

The status of the CFU is marked with the maintenance symbols.
Status display of channels/field devices

The following table shows the symbolic representation of the statuses:

Representation	Meaning
	Maintenance required
	Maintenance demanded
	Maintenance alarm
	Good status
	Maintenance status available and not yet reset
No symbol	The channel is not being used.

Operator controls

Button	Explanation	Authorization
	Clicking the button opens the legend. The legend shows the symbolic identification of the possible statuses and their meaning.	No access protection
	Clicking the button resets the stored maintenance statuses.	"Process operations" for the diagnostics area

Call in the operator control and monitoring system
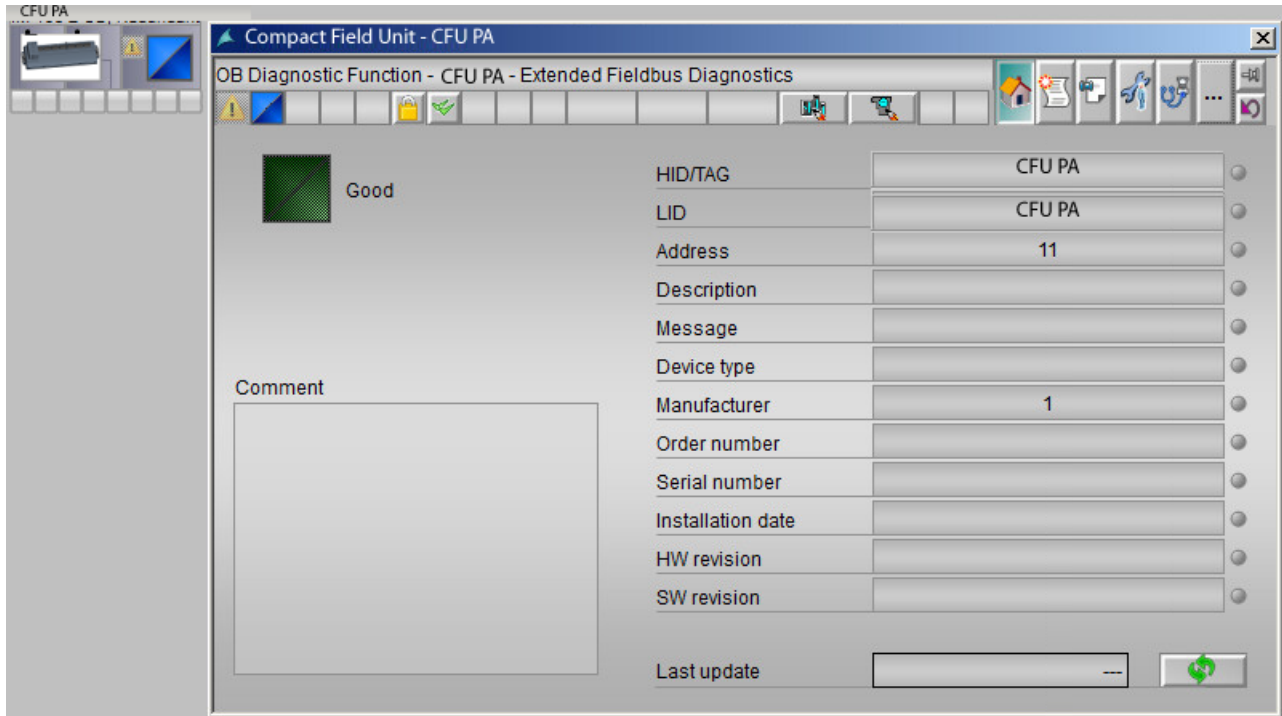
Servicing and maintenance 10

10.1 Identification and maintenance data [ID: 100354162699]

Definition and properties

Identification and maintenance data (I&M) is data that is stored in the CFU that supports you in the following actions:

● Checking the system configuration

● Finding the hardware changes of a system

● Troubleshooting in a system

(I data) are data about the CFU, such as the article number and serial number, that are in part also printed on the housing of the CFU. I data are manufacturer data about the CFU and can only be read.

Maintenance data (M data) are system-dependent data, such as the installation location and installation date. M data are created during configuring and is written to the CFU.

Through the I&M data the CFU can be identified uniquely online.

Reading and writing of the I&M data with PCS 7 and STEP 7

In HW Config the I&M data are displayed in the "Module state – CFU" tabs (see the online help for STEP 7).

10.2 Maintenance [ID: 100354185099]

● **Maintaining the CFU**
Regular maintenance of the CFU itself is not necessary.

● **Maintaining field devices**
During maintenance of a field device, it can make sense to disable the connection for the respective field device.

● **Maintaining sensors/actuators**
During maintenance of a sensor/actuator, it can make sense to disable the respective channel. This ensures that faults cannot influence the system.

10.3 Removing or inserting the BusAdapter [ID: 100354194699]

Note

Replacing a BusAdapter (removing/inserting)

Removing/inserting the BusAdapter under voltage in prohibited.

Automated name assignment during device replacement

The following scenarios arise when replacing one of the two components as a result of saving the device name on the BusAdapter and the CFU:

	CFU unprogrammed (no device name)	Interface with device name
BusAdapter unprogrammed (no device name)	No device names	When the supply voltage is switched on, the device name is copied from the CFU to the BusAdapter.
BusAdapter with device name	When the supply voltage is switched on, the device name is copied from the BusAdapter to the CFU. **Note:** When a faulty BusAdapter is replaced, make certain that the replacement BusAdapter has no device name.	

10.4 Replacing the CFU [ID: 100354204299]

Requirements

- The CFU is de-energized.
- The connected field devices' own supply is switched off.
- The replacement device is in delivery state. You can find information on this in section "Restoring the state of delivery (Page 95)".

Replacing the CFU during process operation

If you are using the CFU in the enclosure, you must observe the following section: "CFU in enclosure (Page 118)"

Note

Replacement of a CFU without disturbing other parts of the system

If one of the following variants is selected for the structure of a CFU, you can replace this CFU without influencing other parts of the system:

- CFU in a star topology
- CFU in a ring topology when MRP is used

Procedure

You can find information on the tightening torques in section "Mounting rules (Page 130)".

Carry out the following steps to replace a CFU:

Step	
1	Disconnect the cables of the sensors/actuators and the field devices at the connections of the CFU (FB<n> and DIQ<n>).
2	Disconnect the power supply (PS1/PS2) and the BusAdapter (terminal X5 of the CFU).
3	Replace the CFU. Recommendation: • Observe the information in the requirements for automatic name assignment and setting of the IP address on device replacement. • Configure the new CFU before installing it in the system. If the CFU has at least the same IO device name as the replaced CFU, the CPU automatically writes the IP address to the CFU.
4	Connect the cables of the sensors/actuators and the field devices to the connections of the CFU (FB<n> and DIQ<n>). Switch on the separate supply of connected field devices.
5	If necessary, fasten the shield connection of the cables. If available and necessary, you can fasten the cables to the shielding bus with cable ties.
6	Connect the power supply (PS1 an X80 /PS2 an X81) and the BusAdapter (terminal X5 of the CFU).

Switching on the CFU

You can find information about this in section "Switching on the CFU (Page 47)".

Note that you have to download the parameters of the CFU using PDM.

10.5 Replacing / modifying a sensor / final controlling element [ID: 100354220427]

NOTICE
Replacing sensors/actuators during process operation (AS in RUN)
Interrupt OBs must be configured in the automation system so that sensors/actuators can be replaced during process operation (implemented as a standard feature in PCS 7).

Read section "Fundamentals of hazardous areas and intrinsic safety (Page 24)" if needed.

Preparation

1. Before replacement (in HW Config), disable the sensor/actuator.

2. Download the parameters to the CFU.
   The sensor/actuator is current-free.

Replacing a sensor/actuator (with one of the same type)

1. Connect the new sensor/actuator to the CFU.
   The new sensor/actuator is ready for operation.

Once the new sensor/actuator is connected, you can enable the sensors/actuators again.

Replacing a sensor/actuator (with one of a different type)

1. Reassign the parameters of the channel (DIQ<n>)
   You can find additional information in section "Configuring freely configurable channels (parameter overview - DIQ) (Page 73)".

2. Ensure that the configured sensor/actuator is connected to the CFU.

3. Download the parameters to the CFU.

Replacing a cable to a sensor/actuator

You can find information on the tightening torques in section "Mounting rules (Page 130)".

Carry out the following steps to replace a cable to a sensor/actuator:

Step	
1	Replace the cable.
2	Connect the new cable. Ensure that the configured sensor/actuator is connected to the cable.

10.6 Overload of freely configurable channels (DIQ<n>) [ID: 100354234123]

At a thermal overload, **all** configurable channels of the CFU are disabled.

Options for enabling the channels (DIQ<n>)

The channels can be enabled again in the following ways:

● In the "CFU PA <V...> Configuration" wizard, call the enable function in the "Expert functions" ("Reset overtemperature alarm" button).

● Restart of the CFU by disconnecting the power supply for at least 1 s.

10.7 Replacing field devices [ID: 100354243723]

The fieldbus connections are implemented as intrinsically-safe connections (Ex ic).

Preparation

The power supply of the field devices is enabled in the default parameter assignment of the CFU.
You can disable the connection for a selected field device with the commissioning wizard of the CFU.

Software addressing is recommended for optimal operation on the CFU. In this case, the CFU adopts the parameter assignment.

● The new field device (without necessary hardware addressing) has been reset to the factory state.
You can find information about this in section "Restoring the state of delivery (Page 95)".

● If you want to use hardware addressing, you must choose the hardware addressing corresponding to the fieldbus connection to which you want to connect the field device. Ensure that the hardware address is set before you connect the field device to the CFU. You can find information about this in section "PROFIBUS addresses of the PROFIBUS PA field device on the CFU (FBn) (Page 133)".

Configuring profiles for field devices

If you configure profiles for field devices, a field device can be replaced by a compatible field device without changing the configuration.

Replacing a field device (with one of the same type)

1. Connect the new field device to the CFU (enable the respective fieldbus connection): The new field device is ready for operation.

2. Download the system-specific device parameters again with SIMATIC PDM.

Replacing a field device (with one of a different type)

Note

Replacing a field device during process operation (AS in RUN / CiR)

Interrupt OBs must be configured in the automation system so that you can replace a field device during process operation.

1. Remove the field device from the configuration in HW Config.

2. Download the configuration.

3. Connect the new field device to the CFU.

4. Reassign parameters of the fieldbus connection of the CFU (FIELDBUS; FB<n>). You can find information on this in section "Configuring a PROFIBUS PA field device (offline) (Page 67)".

5. Download the configuration.

6. Download the system-specific device parameters again with SIMATIC PDM.

Replacing a cable to a field device

You can find information on the tightening torques in section "Mounting rules (Page 130)".

Carry out the following steps to replace a cable to a field device:

Step	
1	Disconnect the cable to the field device (connection FB<n>).
2	Replace the cable.
3	Connect the new cable. Ensure that the required field device is connected to the cable.

Note

Field device parameters are **NOT** stored temporarily in the CFU.

After a device replacement, you must download the system-specific parameters manually.

10.8 Adding field devices [ID: 100354260235]

Requirement

The new field device (without necessary hardware addressing) has been reset to the factory state.
You can find information about this in section "Restoring the state of delivery (Page 95)".

Basic procedure

Observe the following:

● Observe section "CFU in enclosure (Page 118)".

● If the spur line to the field device is not active, the power supply is deactivated via the fieldbus.
The field device is not recognized.

● The user must configure the correct field device and download the configuration to the CFU.

● When the configuration is downloaded, the connection to the field device can be enabled (in PDM).

After the new field device has been connected (and the spur line to the field device has been activated again using PDM), the CFU can communicate with the field device.

10.9 Reading out the fieldbus again [ID: 100354271883]

The CFU allows another readout of the identification numbers of the field devices via the wizard "CFU PA <V...> Configuration".

Reset for a fieldbus connection

The CFU allows a reset of an individual fieldbus connection (FIELDBUS; FB<n>) via the "CFU PA <V...> Configuration" wizard.
The fieldbus connection is then set as if it had never been configured

NOTICE
The field device is disconnected from the process mode
The warning at resetting has to be confirmed since the field device is disconnected from process operation at a reset (fails).

You can find additional information in section "Using CFU PA <V...> Configuration (Page 51)".

10.10 Reading back the parameters [ID: 100354282507]

"Load to PG/PC" function

The reading back of parameters is possible using the "Load to PG/PC" function. Observe the information in the online help for STEP 7 and SIMATIC PDM.

10.11 Restoring the state of delivery [ID: 100354292107]

⚠ CAUTION
STOP of the CFU can cause dangerous system states
The following action must **never** be performed during system operation. Ensure that no dangerous system state can result from failure of a CFU.

Note
Resetting to factory settings

Restoring the factory settings deletes the device name in the CFU and in the BusAdapter.

You have the following possibilities to reset to the factory setting:

● Resetting via the software
● Resetting using the Reset button

Resetting via the software

1. Select the CFU in the SIMATIC Manager.

2. Select the menu command **PLC > Edit Ethernet Node...**.

3. Click the "Reset" button in the "Reset" area.

Resetting using the Reset button

Note

Resetting without the BusAdapter prevents startup of the CFU

Resetting without the BusAdapter is not possible because startup of the CFU is prevented.

You can reset the CFU to factory settings.
Select a pin with the following dimensions for the reset (for example a paper clip):

- Diameter 0.8 mm

- Length at least 10 mm

The Reset button is located on the front of the CFU (see the following figure).
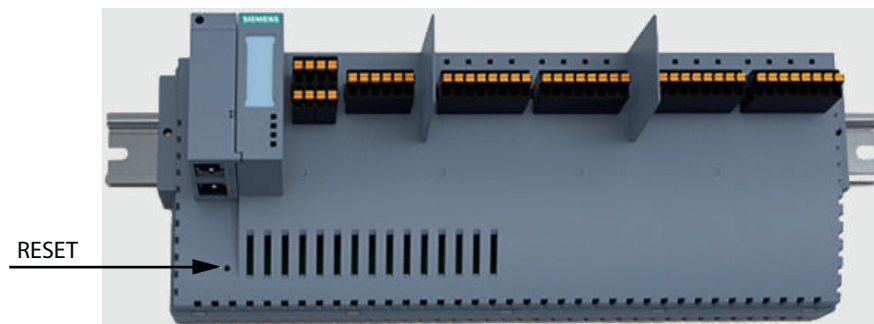
Procedure

1. Press and hold down the Reset button until the ER/MT LED begins to flash (approx. 3 seconds).

2. Release the Reset button.
   The CFU is reset to factory settings and restarts.

Result

The current firmware version remains unchanged.

The following data are deleted:

- Settable I&M data

- IP address, station name, etc.

- Configuration data of the CFU for field devices (FB<n>)
  The parameter assignment of the field devices remains unchanged.

● Configurations and stored data of the freely configurable channels (DIQ<n>)

● Commissioning history

After the reset, the CFU restarts automatically.
The subsequent reaction depends on whether or not the **PROFINET topology** is **configured** in HW Config:

● If the **PROFINET topology is configured** in HW Config:
After the reset, the CFU automatically receives the device name and IP address by means of neighborhood detection.

● If the **PROFINET topology is not configured** in HW Config:
You must enter the device name and IP address for the CFU again and download all data of the CFU.
You can find additional information about this in section "Preparing the CFU for commissioning (Page 55)".

Technical specifications 11

11.1 General technical specifications

[ID: 100354322571]

What are general technical specifications?

The technical specifications contain:

- The standards and test values that observe and fulfil the described components.
- The test criteria used to test the described components.

11.1.1 Standards and Approvals

[ID: 100354334731]

The components described meet the following standards and approvals.

Note

You can find the valid approvals on the rating plate of the respective module

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You can find information about the certificates in the product information.
The product information is made available together with the product or on the Internet under specification of the article number: Service & Support (http://support.automation.siemens.com/WW/view/109748348).

11.1.1.1 CE conformity [ID: 100354344715]

Introduction

The CFU fulfils the requirements and protective aims of the following EU directives and conforms with the harmonized European standards (EN) that have been published for programmable logic controllers in the Official Journals of the European Union:

- Low-Voltage Directive
- EMC Directive
- Explosion Protection Directive
- RoHS Directive

The Declaration of Conformity can be downloaded from the Internet: Industry Online Support International (http://support.industry.siemens.com/cs/ww/en/ps/cert)

Enter the following information on the website for the search:

- Product <article number>

- Entry type "Certificate";

- Type of certificate "Declaration of Conformity".

Low-Voltage Directive

2014/35/EU "Electrical equipment designed for use within certain voltage limits" (Low-Voltage Directive)
The components of the CFU that fall under the Low-Voltage Directive have been tested according to the requirements of EN 61010-2-201.

EMC Directive

2014/30/EU "Electromagnetic Compatibility" (EMC Directive)
You can find additional information in section "Electromagnetic Compatibility (Page 103)".

- **Use in the industrial sector**
  SIMATIC products are designed for industrial applications.

Area of application	Requirements for interference emission	Requirements for interference immunity
Industry	EN 61000-6-4	EN 61000-6-2

- **Use in residential areas**
  The CFU is intended for use in industrial areas.
  If used in residential areas, it may interfere with radio/TV reception.
  If you use the CFU in residential areas, you must ensure compliance with EN 61000-6-3 regarding the emission of radio frequency interference.
  Suitable measures to achieve Limit Class B for radio frequency interference include:

  – Installation of the CFU in grounded control cabinets/control boxes

  – Use of interference filters in the supply lines

Explosion Protection Directive

2014/34/EU "Explosion Protection" (ATEX Directive)
You can find additional information in section "ATEX Approval (Page 101)".

RoHS Directive

(RoHS = Restrictions of the use of certain Harzardous Substances)
2011/95/EU "Restriction of the use of certain hazardous substances in electrical and electronic equipment"
According to the requirements of EN 50581, the product does not contain any dangerous substances.

11.1.1.2 ATEX Approval [ID: 100354387467]

Tests were carried out according to the following standards for the ATEX approval:

- EN 60079-0
- EN 60079-7
- EN 60079-11
- EN 60079-15

Certificate: DEKRA 17ATEX0047 X

> ⚠ **WARNING**
>
> **Personal injury and material damage can be incurred.**
>
> In potentially explosive atmospheres, personal injury and material damage can be incurred if plug connections are disconnected during operation.
>
> Read section "Fundamentals of hazardous areas and intrinsic safety (Page 24)".

11.1.1.3 IECEx approval [ID: 100354397067]

Tests were carried out according to the following standards for the IECEx approval:

- IEC 60079-0
- IEC 60079-7
- IEC 60079-11
- IEC 60079-15

Certificate: IECEx DEK 17.0025X

> ⚠ **WARNING**
>
> **Personal injury and material damage can be incurred.**
>
> In potentially explosive atmospheres, personal injury and material damage can be incurred if plug connections are disconnected during operation.
>
> Read section "Fundamentals of hazardous areas and intrinsic safety (Page 24)".

11.1.1.4 INMETRO approval [ID: 100354422795]

The components described satisfy the requirements of the following standards:

- ABNT NBR IEC 60079-0
- ABNT NBR IEC 60079-7
- ABNT NBR IEC 60079-11
- IEC 60079-15

11.1.1.5 UL / CSA approval [ID: 100354445323]

Underwriters Laboratories Inc. in accordance with

Ordinary locations

- UL 61010-2-201; First Edition, Dated January 24, 2014; IEC 61010-2-201:2017
  (**Note**: This standard is supplemented by UL 61010-1, Third Edition, Dated May 11, 2012)

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

Hazardous locations

- ISA 12.12.01

- CSA C22.2 No. 213

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

Note the following information:

Note

This product must be installed according to the NEC (National Electric Code) stipulations.

When used in environments according to class I, division 2 (see above), the CFU must be mounted in an enclosure that corresponds to at least IP54 according to EN 60529.

> ⚠ **WARNING**
>
> **Installation Instructions according cULus**
>
> WARNING – Explosion Hazard - Do not disconnect while circuit is live unless area is known to be non-hazardous.
>
> WARNING – Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2 or Class I, Zone 2
>
> This equipment is suitable for use in Class I, Division 2, Groups A, B, C or D; Class I, Zone 2, Group IIC, or non-hazardous locations only.

11.1.1.6 FM Approval [ID: 100354483851]

Factory Mutual Research (FM) in accordance with

Approval Standard Class Number 3611, 3600, 3810

Class I, Division 2, Group A, B, C, D Tx;
Class I, Zone 2, Group IIC Tx

11.1.1.7 Tick mark for Australia and New Zealand [ID: 100354509579]

The components described satisfy the requirements of the following standard:
EN 61000-6-4: 2007 + A1: 2011

11.1.1.8 Safety regulations and special requirements [ID: 100354535563]

The components described satisfy the requirements and criteria of the following standard:

IEC 61010-2-201:2017 (Second Edition) / EN 61010-2-201:2017
(Note: These standards were supplemented by IEC 61010-1:2010 (Third Edition) / EN 61010-1:2010)

11.1.1.9 Standards for communication connections [ID: 100354544523]

The components described satisfy the requirements of the following standards:

- IEC 61158
- IEC 61784
  - The following applies for communication with the automation system over PROFINET:
    Compliance to IEC 61784 Ed.2:2007 CPF 3/5
  - The following applies for communication with field devices over PROFIBUS PA:
    Compliance to IEC 61784 Ed.2:2007 CPF 3/2

11.1.2 Electromagnetic Compatibility [ID: 100354616075]

Introduction

This chapter provides you with information on the immunity to interference of the described components as well as on radio interference suppression.

The described components meet, among others, the requirements of the EMC legislation of the European single market.

Definition: EMC

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

EMC in accordance with NE21

The S7 CPU 410-5H automation system with connected CFU meets the EMC requirements according to NAMUR Guideline NE21.

Pulse-shaped Interference

The table below shows the electromagnetic compatibility of the described components with regard to pulse-shaped interference. The prerequisite for this is that the system complies with the relevant requirements and guidelines relating to electrical equipment.

Pulse-shaped disturbance	Tested at
Electrostatic discharge according to IEC 61000-4-2	8 kV
	6 kV
Burst impulses (fast transient interference) according to IEC 61000-4-4	2 kV (supply line)
	2 kV (signal line)
High-energy current surge according to IEC 61000-4-5 The subsequent information for protective circuiting applies for the following **unshielded** connection cables to the CFU: • Power cable • Freely configurable channels Protection element selection: See the documentation SIMATIC; S7-1500, ET 200MP, ET 200SP, ET 200AL; Designing interference-free controllers (http://support.industry.siemens.com/cs/document/59193566); Section "Lightning protection and overvoltage protection"	
• Asymmetric interference	• 1 kV (without protective element) • 2 kV (with protective elements)
• Symmetric interference	• 0.5 kV (without protective element - only power cable tested) • 1 kV (with protective elements)
High-energy current surge according to IEC 61000-4-5 The subsequent information applies to the following shielded connection cables to the CFU: • PROFINET cable • Fieldbus cable	
Coupling (to shield)	• 2 kV (without protective element)

Sinusoidal disturbance

EMC performance of the described components in relation to sinusoidal disturbance variables: The prerequisite for this is that the system complies with the relevant requirements and guidelines relating to electrical equipment.

Sinusoidal disturbance variable	Tested at
HF radiation acc. to IEC 61000-4-3 Electromagnetic HF field, amplitude modulated	• 80 MHz to 1000 MHz / 1.4 GHz to 2 GHz • 10 V/m • 80% AM (1 kHz)
HF coupling according to IEC 61000-4-6	• 0.15 to 80 MHz • 10 Vrms unmodulated • 80% AM (1 kHz) • 150 Ω source impedance

Emission of radio interferences

The following tables show the limits of the emission of electromagnetic fields to which the described components adhere.

Table 11-1   Emission of electromagnetic interference to EN 55016: limit value class A, group 1

from 30 to 230 MHz	< 40 dB (µV/m)Q
from 230 to 1000 MHz	< 47 dB (µV/m)Q
measured at a distance of 10 m	

Table 11-2   Emission of electromagnetic interference to EN 55016: limit value class A, group 1

from 30 to 230 MHz	< 52 dB (µV/m) to 45 dB (µV/m) quasi-peak
from 230 to 1000 MHz	< 52 dB (µV/m) quasi-peak
measured at a distance of 3 m	

Table 11-3   Disturbance via supply lines to EN 55016: Limit Class A, Group 1

from 0.15 to 0.5 MHz	< 79 dB (µV)Q
	< 66 dB (µV)M
from 0.5 to 5 MHz	< 73 dB (µV)Q
	< 60 dB (µV)M
from 5 to 30 MHz	< 73 dB (µV)Q
	< 60 dB (µV)M

See also

http://support.automation.siemens.com/cs (http://support.industry.siemens.com/cs/ww/en/view/59193566)

11.1.3   Shipping and storage conditions [ID: 100354642699]

Transport and storage of modules

The described components fulfill the requirements of IEC 61131 Part 2 with regard to transport and storage conditions. The following specifications apply for modules that are transported or stored in their product packaging.

Table 11-4   Transport and storage conditions

Type of condition	Permitted range
Free fall (in product packaging)	≤0.3 m
Temperature	From -40 °C to + 85 °C

Type of condition	Permitted range
Atmospheric pressure	From 1080 hPa to 606 hPa (corresponding to a height of -1000 m to 4000 m)
Relative humidity	From 5% to 95%, non-condensing
Sinusoidal oscillations to IEC 60068-2-6	5 - 8.4 Hz: 3.5 mm 8.4 - 500 Hz: 9.8 m/s^2
Impact to IEC 60068-2-27	250 m/s^2, 6 ms, 1000 shocks

11.1.4 Mechanical and climatic ambient conditions for operation [ID: 100354651659]

Conditions of use

The described components are designed for use in a fixed, sheltered location. The operating conditions exceed the requirements of IEC 61131 Part 2.

The described components fulfil the conditions of application of the Class 3K3 according to DIN EN 60721-3-3.

Use with additional measures

The described components must not be operated without additional measures:

- at locations with a high degree of ionizing radiation

- in aggressive environments caused, for example, by

  - the development of dust

  - corrosive vapors or gases

  - strong electric or magnetic fields

- in installations requiring special monitoring, for example

  - elevators

  - electrical plants in potentially hazardous areas

An additional measure can be installation in a cabinet or in an enclosure, for instance.

Mechanical ambient conditions

The mechanical ambient conditions for the described components are specified in the table below for sinusoidal vibrations.

Table 11-5   Mechanical ambient conditions

Frequency range in Hz	
5 ≤ f ≤ 8.4	Amplitude 3.5 mm
8.4 ≤ f ≤ 150	Constant acceleration 9.8 m/s^2

Reduction of vibrations

If the described components are subject to big shocks or vibrations appropriate measures must be taken to reduce the acceleration or the amplitude.

We recommend fixing the described components on damping materials (rubber-metal anti-vibration mountings, for example).

Checking mechanical ambient conditions

The following table provides information on the type and scope of checks regarding mechanical environmental conditions.

Table 11-6   Checking mechanical ambient conditions

Tests for ...	Test standard	Remark

Vibrations	Vibration test to IEC 60068-2-6 (sine)	Type of vibration:
		 • Frequency sweeps with a rate of change of 1 octave/minute.
		    – 5 Hz ≤ f ≤ 8.4 Hz, constant amplitude 3.5 mm
		    – 8.4 Hz ≤ f ≤ 150 Hz, constant acceleration 9.8 m/s^2
		 Period of oscillation:
		 • 10 frequency sweeps per axis in each of the 3 axis which are vertical to each other.

Shock	Shock, tested to IEC 60068-2-27	Type of shock: • half-sine Strength of shock: • Peak value 150 m/s^2 • Duration 11 ms Direction of the shock: • 3 shocks each in +/– direction in each of the 3 axes that are vertical to each other

Climatic environmental conditions

The described components can be used in the following climatic environmental conditions:

Table 11-7   Climatic environmental conditions

Ambient conditions	Permitted range	Remarks		
Temperature	From -40°C to 70°C	**Mounting requirement**	**Ambient temperature of the CFU**	**Permissible load current**
		Horizontal mounting	> 60 °C to <= 70 °C [1]	Max. 1 A
			- 40 °C to <= 60 °C [1]	Max. 2 A
		Vertical mounting; the BusAdapter must be at the bottom.	- 40 °C to <= 60 °C [1]	Max. 2 A

Ambient conditions	Permitted range	Remarks
Air pressure	• From 1080 hPa (corresponds to a depth of approximately -1000 m) • Up to 606 hPa (corresponds to a height of approximately 4000 m)	The density of air decreases with increasing altitude. The cooling effect of air in accordance with the elevation is shown in the following table on derating. [1]
Relative humidity	From 10 to 95% Max. 95% at +25 °C	No condensation, corresponds to relative humidity (RH) exposure level 2 according to IEC 61131 Part 2
Contaminant concentration	• SO_2: <0.5 ppm • RH: <60%, no condensation • H_2S: <0.1 ppm • RH: <60%, no condensation	Test: 10 ppm; 4 days Test: 1 ppm; 4 days
	ISA-S71.04 severity level G1; G2; G3	

[1] Observe the information on installation in an enclosure and the following table on derating. Use in Ex Zone 2/22 only permitted at elevations up to 2000 m.

Derating

The cooling effect of air is reduced at higher altitudes due to lower density.

The table shows the derating factor for the maximum permissible ambient temperature as a function of device use at an altitude above sea level.

Table 11-8   Derating when devices are used at an altitude above sea level

Altitude above sea level	Derating factor for ambient temperature [1]
(-1000 m) to 2000 m	1.0
3000 m	0.9
4000 m	0.8

[1] Maximum permissible ambient temperature in °C for 2000 m

Installation in an enclosure

When installing in an enclosure, the maximum permissible temperature is reduced by 10 K.

Cable temperature

Note that the temperature properties of the cables must correspond to the actual measured temperatures:

● When a temperature of 70 °C is reached on the cable or at the cable entry of the enclosure under operating conditions.

● When the temperature at the wire junction can be > 80 °C under operating conditions.

You specify other connection types and material requirements based on the following:

● Electrical characteristic data of the circuits you are using

● Installation environment

See also

Rules for the operation (Page 21)

11.1.5   Specifications for insulation tests, protection class and degree of protection

[ID: 100354661643]

Test voltages

Table 11-9   Test voltages

Circuits with a rated voltage of U_e relative to other circuits or ground	Test voltage
0 V < U_e ≤ 50 V	500 V AC, 60 s

Protection class

Protection class I in compliance with IEC 61140; this means that a grounding terminal to the rail is required!

Protection against foreign bodies and water

Protection class IP 20 according to IEC 60529; that is protection against contact with standard probes.

There is no protection from penetration by water.

11.1.6 Rated voltage [ID: 100354670603]

Nominal voltage for operation

The Compact Field Unit operates with the nominal voltage that is shown in the following table.

- Observe the tolerance range of the nominal voltage.

- When selecting the nominal voltage take into account the permissible supply voltage of the respective module.

Table 11-10   Nominal voltage for operation

Nominal voltage	Tolerance range
24 VDC	19.2 to 28.8 VDC [1]
	18.5 to 30.2 VDC [2]

[1]   Static value: Generation as a functional extra low voltage with safe electrical isolation to IEC 60364-4-41

[2]   Dynamic value: Including ripple, e.g. three-phase current bridge rectification

11.2 Technical specifications of the Compact Field Unit PA [ID: 100354679563]

Note

Mechanical and climatic ambient conditions for operation

Observe section "Mechanical and climatic ambient conditions for operation (Page 106)".

Article number	6ES7655-5PX11-0XX0
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
Short-circuit protection	Yes
Redundant power supply	Yes
Mains buffering	
• Mains/voltage failure stored energy time	5 ms; Bridging for field devices and communication
Input current	
Current consumption (rated value)	2.5 A
Current consumption, max.	2.55 A
Inrush current, max.	8 A
I²t	0.3 A²·s
Encoder supply	
Number of outputs	8
Output voltage encoder supply, min.	18.2 V
Short-circuit protection	Yes; Electronic
Output current	
• up to 60 °C, max.	2 A
• up to 70 °C, max.	1 A
Power loss	
Power loss, typ.	8.2 W; Depending on the type of BusAdapter used (typ. RJ45)
Digital inputs	
Number of digital inputs	8
Source/sink input	Yes; P-reading
Input characteristic curve in accordance with IEC 61131, type 1	Yes
Input characteristic curve in accordance with IEC 61131, type 2	No
Input characteristic curve in accordance with IEC 61131, type 3	Yes
Pulse extension	No
Number of simultaneously controllable inputs	
horizontal installation	
– up to 60 °C, max.	8; Total current must be observed, see DQ
– up to 70 °C, max.	8; Total current must be observed, see DQ
vertical installation	
– up to 60 °C, max.	8; Total current must be observed, see DQ
Input voltage	
• Rated value (DC)	24 V
• for signal "0"	-30 to +5V

Article number	6ES7655-5PX11-0XX0
• for signal "1"	+11 to +30V
Input current	
• for signal "1", typ.	2.5 mA; Typical
Input delay (for rated value of input voltage)	
for standard inputs	
– parameterizable	No
– at "0" to "1", max.	3.2 ms
– at "1" to "0", max.	3.2 ms
Cable length	
• shielded, max.	1 000 m
• unshielded, max.	600 m
Digital outputs	
Type of digital output	Transistor
Number of digital outputs	8
Short-circuit protection	Yes
• Response threshold, typ.	0.7 to 1.3 A
Limitation of inductive shutdown voltage to	Typ. L+ (-50 V)
Controlling a digital input	Yes
Switching capacity of the outputs	
• on lamp load, max.	5 W
Load resistance range	
• lower limit	48 Ω
• upper limit	12 kΩ
Output voltage	
• Type of output voltage	DC
• for signal "1", min.	Ue minus 1 V
Output current	
• for signal "1" rated value	0.5 A
• for signal "0" residual current, max.	0.1 mA
Output delay with resistive load	
• "0" to "1", max.	50 µs
• "1" to "0", max.	100 µs
Parallel switching of two outputs	
• for uprating	No
• for redundant control of a load	No
Switching frequency	
• with resistive load, max.	100 Hz
• with inductive load, max.	2 Hz
• on lamp load, max.	10 Hz
Total current of the outputs	
• Current per channel, max.	0.5 A
horizontal installation	

Article number	6ES7655-5PX11-0XX0
– up to 70 °C, max.	1 A
vertical installation	
– up to 60 °C, max.	2 A
Cable length	
● shielded, max.	1 000 m
● unshielded, max.	600 m
Encoder	
Connectable encoders	
● 2-wire sensor	Yes
– permissible quiescent current (2-wire sensor), max.	1.5 mA
Interrupts/diagnostics/status information	
Diagnostics indication LED	
● RUN LED	Yes; Green LED
● ERROR LED	Yes; Red LED
● MAINT LED	Yes; yellow LED
● Monitoring of the supply voltage (PWR-LED)	Yes
● Digital input status indicator	Yes
● Digital output status indicator	Yes
● Spur line status/fault	Yes
Potential separation	
between the channels and PROFINET	Yes
Potential separation digital inputs	
● between the channels	No
● between the channels and the power supply of the electronics	No
Potential separation digital outputs	
● between the channels	No
● between the channels and the power supply of the electronics	No
Degree and class of protection	
Degree of protection acc. to EN 60529	IP20
Ambient conditions	
Ambient temperature during operation	
● min.	-40 °C
● max.	70 °C
● horizontal installation, min.	-40 °C
● horizontal installation, max.	70 °C; Observe derating
● vertical installation, min.	-40 °C
● vertical installation, max.	60 °C; Observe derating
Ambient temperature during storage/transportation	
● min.	-40 °C

Article number	6ES7655-5PX11-0XX0
● max.	85 °C
Relative humidity	
● Operation, max.	95 %
Connection method	
Design of electrical connection	Connection plug
Spur line	
● Number of spur lines	8
● Type of cable	Type A
● Cable diameter, min.	6 mm
● Cable diameter, max.	12 mm
● Conductor cross-section, min.	0.2 mm²
● Conductor cross-section, max.	2.5 mm²
● Cable length, max.	120 m
● total current output to field devices, max.	320 mA
● Number of connectable field devices	8
● Current limitation per field device, max.	40 mA
● No-load voltage, max.	15.3 V
● short-circuit proof	Yes
● Short-circuit current (test current); max.	8 mA
● intrinsically safe according to FISCO model	Yes
● Debounce logic	Yes
Dimensions	
Width	300 mm; 329 mm
Height	115 mm; 123 mm
Depth	40 mm; 74 mm
Weights	
Weight, approx.	580 g

Supplemental information on the address space

The input and output address space (user data + PROFINET user data qualifier) of the CFU is 1440 bytes.

The number of the user data qualifiers for the actual CFU and the field devices depends on the type:

Type	Number of user data qualifiers
Input address space only	1
Output address space only	1
Diagnostic address only	1
Input and output address space	2

Configuration	Operating mode	Address space
CFU on H system	S2 mode	1000 bytes (986 bytes of which for the address space and PROFI-NET user data qualifier of the field devices)
CFU on single CPU	S1 mode	1000 bytes with CiR capability, or 1440 bytes without CiR capability (986/1426 bytes of which used for address space and PROFINET user data qualifier of the field devices)

Compact Field Unit in the enclosure for use in a hazardous area

12

12.1 Design types of protection on the CFU [ID: 100352596363]

The types of protection include design and electrical measures relating to the equipment to achieve explosion protection in the hazardous areas. The following types of protection are used in the CFU:

Table 12-1   Types of protection

Type of pro-tection	Meaning	Representation
Intrinsic safe-ty i	All voltages, currents, inductance and capacitance occurring are limited by electrical measures (intrinsically safe) - sparks or thermal effects capable of causing ignition cannot occur. The spur line connections of the CFU fieldbus cables have an intrinsically safe design [ic]. **CAUTION** The following applies when the CFU is used in hazardous areas: The spur line connections of the freely configurable channels may **only** be changed in a **DE-ENERGIZED** state.	

12.2 Configuration with CFU [ID: 100352650891]

Introduction

The CFU should be installed in an enclosure suitable for hazardous areas.

The CFU supplies up to eight field devices with its own spur lines up to a length of 120 meters.

Connect a field device to each connector.

12.3 Installing the CFU [ID: 100352672395]

Safety information

> ⚠️ **DANGER**
>
> **Explosion hazard**
>
> Under some circumstances, sparks capable of ignition or unacceptable surface temperatures can occur during installation.
>
> **Never install when an explosive atmosphere is present!**

Principle

Section "CFU in enclosure (Page 118)"

Mounting position

Install the CFU in the enclosure preferably with the connections toward the bottom.

> **NOTICE**
>
> **Strain**
>
> Make sure that the cables are fastened securely and avoid exposure of the cables to strain.

Additional information

For additional information, see *Installation in hazardous areas* in the Explosion Protection - Basics (Page 24) system manual.

12.4 CFU in enclosure [ID: 100352901259]

Requirement

- The substrate must be level, with load-bearing capacity, and it must be vibration free.

- Select appropriate fixing accessories for the substrate.

- Clearance of at least 60 mm below the modules for connections of the field bus cables and cables to the sensors and actuators at the freely configurable channels.

Installing the enclosure

> **Note**
>
> **Notes on cable glands**
>
> **Removing spur lines**
> If you remove spur lines, the openings of the enclosure must be protected with suitable components.
> - Standard: Plastic gland with dummy plug
> - FM approval: Metallic screw-type blank plugs

1. Loosen the enclosure cover.

   > **Note**
   >
   > **Secure fieldbus cable with screw terminals (according to approval)**
   >
   > When screw terminals are used to secure the fieldbus cables, the following wiring direction must be adhered to:
   >
   > The wiring of connections FB<x> is only permissible from below (from the direction of the nameplate).

2. Fasten the enclosure in accordance with the requirements of the plant.

   – Observe the minimum clearances and the bending radii of the utilized cables when mounting.

   – Observe the following notes regarding cable glands.

   – For use of the CFU, observe the information in section"Technical specifications (Page 99)".

Installing CFU in the enclosure

You can find information about this in section "Installing the CFU (Page 30)".
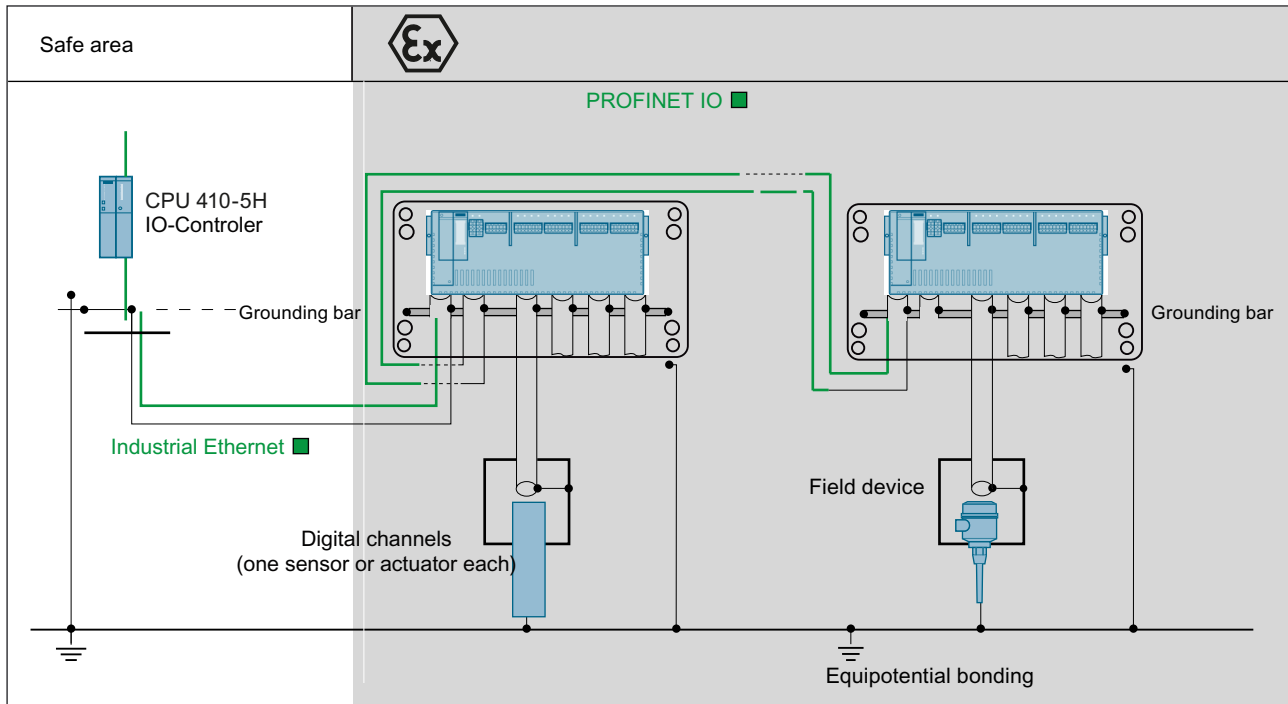
12.5 Grounding [ID: 100352683915]

Equipotential bonding

You must set up an equipotential bonding EB in hazardous areas. This should be in accordance with IEC 60079-14.

The shields of the field bus cables must be connected to the equipotential bonding.

The best EMC protection for the CFU is achieved through direct grounding.

Direct grounding

The shield of the field bus cables is grounded directly in the hazardous area as well as in the safe zone. This is possible when the equipotential bonding from the CFU (in the safe zone) extends all the way to the field devices (in the hazardous area), which means a corresponding equipotential bonding cable was laid.

Note

Direct grounding on the CFU

The protective braided shield of the field bus cable must be grounded securely.

12.6   Grounding the CFU [ID: 100352709131]

Required accessories

- Grounding cable, at least 4.0 mm^2

Grounding a CFU with enclosure

1. Strip the insulation of the grounding cable to 8 mm.

2. Fasten the grounding cable to the mounting rail of the CFU.

> ⚠ **DANGER**
>
> **CFU**
>
> Connect the grounding cable to the equipotential bonding terminal in accordance with EN 60079-14.

12.7 Safety instructions for connection [ID: 100352717835]

Safety information

Read section "Fundamentals of hazardous areas and intrinsic safety (Page 24)".

> ⚠ **DANGER**
>
> **Installation regulations and country-specific regulations**
>
> When laying cables and wiring, make sure that you adhere to the installation regulations in accordance with EN 60079-14 and any regulations specific to your country.
>
> Documentation for installation of PROFINET IO and PROFIBUS PA is available from PROFIBUS & PROFINET International (PI) (http://www.profibus.com):
> - PROFIBUS PA: Technical Guideline *"PROFIBUS PA, User and Installation Guideline"*
> - PROFINET: Guideline *"PROFINET Installation Guideline for Cabling and Assembly"*

> ⚠ **DANGER**
>
> **Explosion hazard**
>
> Ignitable sparks may be generated during connection.
> Therefore use a **non-magnetic** screwdriver when connecting the cables!

> ⚠ **DANGER**
>
> **Explosion hazard**
>
> Strain on the CFU cable glands can affect the degree of protection and it not permitted.
>
> Implement a fixed Installation for inlet of the cable!

Rules for connecting the fieldbus cables (PROFIBUS PA)

Rules you must observe when connecting fieldbus cables:

- The fieldbus cables FB0 to FB7 can be connected during operation.
- See the information in this section.

12.8 Connecting the field bus to the CFU [ID: 100352727563]

Introduction

The PROFIBUS PA cables are introduced into the enclosure by means of cable glands.

The spur lines to the field devices over **FB0** to **FB7**.

Basic procedure

1. Preparing the cables

2. Connecting the cables

   – Open the enclosure.

   – Connect the spur lines to the terminal block.

3. Close the enclosure.

Additional information

- Wiring rules (Page 35)

- Connecting the CFU to the PROFINET IO (Page 46)

- Connecting a sensor / final controlling element to the CFU (Page 41)

- Connecting the PROFIBUS PA field device to the CFU (Page 39)

- Connecting the cable shields of the PROFIBUS PA cables (Page 43)

- Connecting the power supply to the CFU (Page 36)

12.9 Maintenance and cleaning CFU in enclosure [ID: 100352754699]

Permitted activities in hazardous areas

The table below describes which maintenance activities are permitted on the CFU during operation.

⚠ WARNING
Hazardous areas
Zone 2: You may open the enclosure of the CFU briefly for the permitted maintenance work.

⚠ DANGER
Explosion hazard
Observe the safety information in section "Safety instructions for connection (Page 121)".

Table 12-2   Permitted activities in hazardous areas

Activities	Zone 2
Maintenance during operation (visual checks)	allowed
Cleaning	allowed

Maintenance during operation

Carry out maintenance every 6 months in the hazardous area.

The maintenance of the CFU is limited mainly to **visual inspections**. These inspections of the CFU can take place during operation.

Zone 2	
Check that the cable entries and grounding terminal of the enclosure are sealed and intact.	
Check whether there is any water or dust inside the enclosure. If there is, find out how it got there.	
Check that the wiring is secure (connectors, cables).	

Cleaning

Note

Run a function check after cleaning the CFU.

12.10   Replacing / supplementing CFU in enclosure [ID: 100352764427]

⚠ **DANGER**
Explosion hazard
De-energize the CFU before you replace it.

⚠ **DANGER**
Explosion hazard
Observe the safety information in section "Safety instructions for connection (Page 121)".

Replacing / supplementing hardware

You can find information on this in section "Servicing and maintenance (Page 89)".

12.11 Use in zone 2 potentially explosive areas [ID: 100354571403]

See the product information *Use of subassemblies / modules in a Zone 2 Hazardous Area*.

The product information is available as a download in the Internet (http://support.automation.siemens.com/WW/view/109748348).

Using the CFU in hazardous area Zone 2

The following section provides important information about the installation of subassemblies / modules in a hazardous area.

II 3 G Ex nA IIC Tx Gc **to EN 60079-0**: 2007

II 3 G Ex nA IIC Tx Gc **to EN 60079-7**: 2007

II 3 G Ex nA IIC Tx Gc **to EN 60079-15**: 2010

II 3 G Ex nA IIC Tx Gc **to EN 60079-31**: 2010

Reference table

Manufacturing location / Approval	Subassemblies / modules	Test number
Siemens AG, Process Industries and Drives Division Oestliche Rheinbrueckenstr. 50; 76187 Karlsruhe; Germany	CFU	DEKRA 17ATEX0047 X IECEx DEK 17.0025X
	PROFINET BusAdapter • PROFINET BusAdapter with standard Ethernet socket (BA 2×RJ45) • PROFINET BusAdapter with Fast connect Ethernet connection (BA 2×FC) • PROFINET BusAdapter with glass fiber-optic cable connection (BA 2xLC)	DEKRA 16ATEX0127 X IECEx DEK 16.0066X

Note

The CFU with approval ⟨Ex⟩ II 3 G Ex nA II Tx, ⟨Ex⟩ II 3 G Ex nA IIC Tx Gc may only be used in SIMATIC systems of the equipment category 3.

Maintenance

The affected component has to be sent to the manufacturing location for repairs. The repair may only be carried out there.

Special conditions for DEKRA 17ATEX0047 X or IECEx DEK 17.0025X

1. The CFU must be installed in a suitable enclosure.
   This enclosure must ensure at least IP 54 degree of protection (according to EN 60529). The ambient conditions in which the CFU is installed have to be considered. A declaration of the manufacturer for Zone 2 must be available for the enclosure (in accordance with EN 60079-15).

2. If, under operating conditions, a temperature > 60 °C is reached on the cable or at the cable entry of this enclosure or the temperature at the conductor branch can be > 80 °C, the temperature properties of the cables must conform to the temperatures actually measured.

3. The cable entries used must fulfill the required IP degree of protection in accordance with EN 60079-15; section 6.2.

4. Measures have to be taken that the nominal voltage cannot be exceeded by more than 40% through transients.

Special conditions for DEKRA 16ATEX0127 X and IECEx DEK 16.0066X

1. The PROFINET BusAdapters have to be installed in such a manner that they are protected against mechanical danger.

2. If the penetration of moisture and dust cannot be excluded, the CFU must be installed in a suitable enclosure.

3. This enclosure must ensure at least IP 54 degree of protection (according to EN 60529).

4. The PROFINET BusAdapters have to be fastened as prescribed with the supplied screws.

5. The connection and disconnection of live communication cables or the operation of device switches, for example for installation or maintenance purposes, is only allowed if it is ensured that the area is not subject to explosion hazard.

Appendix A

A.1 Article numbers (accessories / spare parts) [ID: 100354702731]

Compact Field Unit PA (CFU PA)

Table A-1   SIMATIC CFU PA

Product	Product name	Packing unit	Article number
SIMATIC CFU PA	Compact Field Unit PA	1 unit	6ES7655-5PX11-0XX0

Table A-2   BusAdapter for PROFINET

Product	Packing unit	Article number
PROFINET BusAdapter with standard Ethernet socket (BA 2×RJ45)	1 unit	6DL1193-6AR00-0AA0
PROFINET BusAdapter with Fast connect Ethernet connection (BA 2×FC)	1 unit	6DL1193-6AF00-0AA0
PROFINET BusAdapter with glass fiber-optic cable connection (BA 2xLC)	1 unit	6DL1193-6AG00-0AA0

Note the use areas of the BusAdapters and the use of suitable PROFINET cable. You can find information about this in the documentation *SIMATIC; Distributed I/O; BusAdapters for Distributed I/O.*

Table A-3   Media converter

Product	Product name	Packing unit	Article number
Media converter	SCALANCE XC206-2SFP	1 unit	6GK5206-2BS00-2AC2

Table A-4   Accessory

Product	Packing unit	Article number
Mounting rails, tinned steel strip		
• Length: 482 mm (for 19" rack)	1 unit	6ES5710-8MA11
• Length: 2000 mm	1 unit	6ES5710-8MA41
Terminals (PS 2x2; ground 1x6; I/O 4x8)		
• Screw terminals	1 set	6ES7655-5PX00-2XX0

Table A-5   Cables

Product	Product name	Packing unit	Article number
Power cable	Standard cable • 1x2x1.5mm² (6.5mm²) 24V powering cable		
PROFIBUS cable	Dependent on the BusAdapter		
PROFIBUS PA cable	Fieldbus cable • PROFIBUS FC Process Cable GP Type A		
Standard cable (inputs and outputs)	Standard cable • 1x2x0.8mm² (5.7 mm²) signal wire • 1x3x0.8mm² (x.x mm²) signal wire		

Components for lightning protection (lightning protection zone transition 0_B to 1, 1 to 2 and 2 to 3)

You have to use overvoltage protection units as lightning protection measures for the Compact Field Unit. You can find additional information in section "Electromagnetic Compatibility (Page 103)".

Online catalog

Further article numbers for the Compact Field Unit can be found in the online catalog and the online ordering system:

http://mall.industry.siemens.com
 (http://mall.industry.siemens.com)

A.2   Terminal assignment of the CFU [ID: 100354718219]

You configure the connections of the Compact Field Unit in HW Config.

Pin assignment

You can find additional information in section "Connecting the power supply to the CFU (Page 36)".

Table A-6   Pin assignment of the inputs / outputs of the CFU

Area / Plug	Connec-tion	Pin assignment					
		Plug	Identification	Plug	Identifica-tion	Allocation	Explanations
		Pin		Pin			
BusAdap-ter / X5	X5						BusAdapter
DC 24V / X80	PS1	1	1L+	2	1M		Supply voltage 1
DC 24V / X81	PS2	1	2L+	2	2M		Supply voltage 2
GND / X82	Ground	1-6	3M; 4M; 5M; 6M; 7M; 8M				6 terminals for ground (M)
DIQ / X10	DIQ0	1	0+	2	0-		Channel 0 (DIQ0)
	DIQ1	3	1+	4	1-		Channel 1 (DIQ1)
	DIQ2	5	2+	6	2-		Channel 2 (DIQ2)
	DIQ3	7	3+	8	3-		Channel 3 (DIQ3)
DIQ / X11	DIQ4	1	4+	2	4-		Channel 4 (DIQ4)
	DIQ5	3	5+	4	5-		Channel 5 (DIQ5)
	DIQ6	5	6+	6	6-		Channel 6 (DIQ6)
	DIQ7	7	7+	8	7-		Channel 7 (DIQ7)
FIELDBUS / X1	FB0	1	0+	2	0-		Fieldbus spur 0 (FIELDBUS - FB0)
	FB1	3	1+	4	1-		Fieldbus spur 1 (FIELDBUS - FB1)
	FB2	5	2+	6	2-		Fieldbus spur 2 (FIELDBUS - FB2)
	FB3	7	3+	8	3-		Fieldbus spur 3 (FIELDBUS - FB3)
FIELDBUS / X2	FB4	1	4+	2	4-		Fieldbus spur 4 (FIELDBUS - FB4)
	FB5	3	5+	4	5-		Fieldbus spur 5 (FIELDBUS - FB5)
	FB6	5	6+	6	6-		Fieldbus spur 6 (FIELDBUS - FB6)
	FB7	7	7+	8	7-		Fieldbus spur 7 (FIELDBUS - FB7)

A.3 Mounting rules [ID: 100354728843]

Distances

Mounting and heat dissipation

- Fixing points on the mounting rail:
  Maximum distance 500 mm - measured between the first and last fixing points

- Horizontal installation of the mounting rail:

  – Distance above

  – Distance below

  – Distance left

  – Distance right

Fastening/unfastening components

Component	Fastening/unfastening	Tool	Tightening torque
Mounting rail	Drill hole: Diameter 6.4 mm Hexagon-head screw M6	Wrench for screw M6	1.5 Nm
Functional earth	Functional earth for the mounting rail (minimum cross-section of grounding cable: 10 mm^2)	Wrench for screw M6	4 Nm
CFU	Fixing screws on both sides of the CFU	TORX T15 screwdriver or 3 to 3.5 mm blade width	0.35 Nm
	Latch/release buttons	Screwdriver 3 to 3.5 mm blade width	None
BusAdapter	Screw is located in the BusAdapter	Screwdriver with 3 to 3.5 mm blade width	0.25 Nm
Cables on the plugs You can find additional information on this in the section "Cable cross-sections and wire end ferrules (Page 130)".	Fixing screw on the terminal	Screwdriver with 3 to 3.5 mm blade width	min 0.4 Nm / max 0.5 Nm
Shield connection for process cable (shield clamp)	Screw is located in the shield terminal Note: Cables with max. ⌀ 7 mm each	Screwdriver with 3 to 3.5 mm blade width	0.5 Nm

A.4 Cable cross-sections and wire end ferrules [ID: 100354739851]

Cables with and without wire end ferrule

Rule for ...	Connections PS\<n\>	Connections FB\<n\> and DIQ\<n\>
Permitted cable cross-sections for solid cables	0.2 to 2.5 mm^2	
	AWG*: 24 to 13	

Rule for ...		Connections PS<n>	Connections FB<n> and DIQ<n>
Permitted cable cross-sections for flexible cables	Without ferrule	0.2 to 2.5 mm^2	
		AWG*: 24 to 13	AWG*: 24 to 14
	With ferrule (with plastic sleeve)***	0.25 mm to 1.5 mm^{2**}	0.14 mm to 1.5 mm^2
		AWG*: 24 to 16	AWG*: 26 to 16
	With TWIN ferrule***	0.5 mm to 1 mm^2	0.5 to 0.75 mm^2 (see below)
		AWG*: 20 to 17	AWG*: 20 to 18
Stripped length of the cables		8 to 10 mm	
Wire end ferrules in accordance with DIN 46228 with plastic sleeve***		8 and 10 mm long	

* AWG: American Wire Gauge

** Ferrules without plastic sleeve: 0.25 to 2.5 mm^2/AWG: 24 to 13

*** See note on ferrules

Note

Ferrules

You can achieve optimum results with respect to a high-quality and durable electrical connection with maximum conductor extraction forces through the use of crimp shapes, preferably with smooth surfaces, as is ensured for example with rectangular and trapezoidal crimp cross-sections.

Due to the variety of crimp shapes used in industry, we recommend other shapes on request. Crimping dies with a pronounced wave profile are unsuitable.

A.5 Dimensional diagrams

A.5.1 Dimension drawings of the mounting rails [ID: 100354751755]

Dimensions for the drill holes

Mounting rails can be ordered in the lengths 482 mm and 2000 mm.

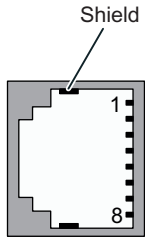The following tables show the spacings of the required drill holes.

Mounting rails

Mounting rail 482 mm			
Mounting rail 482 mm			
Length of the mounting rail	Distance a (at the beginning and end of the mounting rail)	Distance b (to the next drill hole)	Width (to drill hole: distance c)
482.6 mm	8.3 mm	466 mm	35 mm (17.5 mm)

Mounting rail 2000 mm		
Mounting rail 2000 mm		
Length of the mounting rail	Distance a (at the beginning and end of the mounting rail)	Distance b (to the next drill hole)
2000 mm	15 mm	Approx. every 500 mm

A.6 Basics for PROFINET

A.6.1 Pin assignment of the RJ45 connection plug [ID: 100354848907]

Table A-7　　Pin assignment of the RJ45 connector

View RJ45-plug socket	Contact	assignment
Shield　　　1　　8	1	RD (Receive Data +)
	2	RD_N (Receive Data –)
	3	TD (Transmit Data +)
	4	Ground
	5	Ground
	6	TD_N (Transmit Data –)
	7	Ground
	8	Ground

A.7 Basics for PROFIBUS PA

A.7.1 PROFIBUS addresses of the PROFIBUS PA field device on the CFU (FBn)

[ID: 100354877579]

You can connect all field devices that are suitable for PROFIBUS PA to the CFU.

The PROFIBUS addresses are permanently assigned to the fieldbus connections FB<n>.

Fieldbus connection	PROFIBUS PA address
FB0	20
FB1	21
FB2	22
FB3	23
FB4	24
FB5	25
FB6	26
FB7	27

A.7.2 Overview of Contents [ID: 100354899339]

PROFIBUS PA

PROFIBUS PA is the PROFIBUS for **P**rocess-**A**utomation (PA) and is based on
IEC 61784-1:2002 Ed1 CP 3/2 for transmission technology and protocol and on the PA profile.

PROFIBUS PA = PROFIBUS DP communication protocol

+

synchronous transmission technology

+

Power supply of the PA field devices

Connectable field devices

You can connect all field devices that are suitable for PROFIBUS PA to the CFU.

- Measuring transducers, valves, actuators etc.
- For use in the chemicals industry and process engineering
- With field device feed via the data cable
- Also for applications in the potentially explosive area (ignition protection type Ex [ic])

A.7.3 Intrinsic safety [ID: 100354908299]

Intrinsic safety

The basis for the intrinsic safety type of ignition protection consists in the necessity for a specific amount of ignition energy for ignition to take place in a potentially explosive atmosphere. In an intrinsically safe power circuit this minimum ignition energy is not present, neither in normal operation nor in case of fault. The intrinsic safety of a power circuit is achieved by limiting current and voltage so as to avoid sparks and high temperatures as possible sources of ignition. This limits the intrinsic safety type of ignition protection to relatively low output power circuits.

Spark ignition

So-called spark ignition is excluded because sparks that can normally occur owing to short circuit or ground fault during operation when a power circuit is opened or closed are excluded because current and voltage are limited as well as owing to the avoidance of major inductivities.

Heat ignition

In normal operation and in case of failure heat ignition is not possible because excessive heating of the equipment and leads in the intrinsically safe power circuit is excluded.

Additional information

For additional information on the topics intrinsic safety and explosion protection please refer to:

● Automation Systems S7-300, ET 200M Ex I/O Modules manual (https://support.industry.siemens.com/cs/ww/en/view/1096709)

● *Investigation of intrinsic safety for field bus systems*; PTB Report W-53, Braunschweig, March 1993

● *PROFIBUS PA Commissioning Guide*, Notes on using the IEC 61158-2 technology for PROFIBUS, (German art. no. 2.091 , English art. no. 2.092)
 PROFIBUS-Nutzerorganisation e. V. (http://www.profibus.com)

Glossary

Actuator

Actuators can be power relays or contactors for switching on loads, or they can be loads themselves (e.g., directly controlled solenoid valves).

Automation system

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

Availability

Availability is the probability that a system is functional at a specific point in time. Availability can be increased by redundancy, e.g., by using multiple -> sensors at the same measuring point.

Bus

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

BusAdapter

Enables free selection of the connection technology for the PROFINET fieldbus.

Channel number

Channel numbers are used to uniquely identify the inputs and outputs of a module (device - CFU) and to assign channel-specific diagnostic messages.

Configuration

Systematic arrangement of the individual modules.

Configuration control

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

Connection plug

Physical connection between device and cable.

Crimping

Procedure in which two components, e.g. wire end ferrule and cable, are connected with each other by plastic strain.

Dark period

Dark periods occur during shutdown tests and complete bit pattern tests. The fail-safe output module switches test-related zero signals to the active output. This output is then briefly disabled (= dark period). An adequate carrier → actuator will not respond to this and will remain activated.

Derating

See temperature characteristics

Device name

Before an IO device can be addressed by an IO controller, it must have a device name. An IO device is delivered without a device name. An IO device can only be addressed by the IO controller after it has been assigned a device name via the PG/PC or via the topology, e.g. for the transfer of configuration data (such as IP address) during startup or for the exchange of user data during cyclic operation.

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 devices - field of use

When structuring a system the inputs and outputs from or to the process are often integrated centrally into the automation system.

In the case of large distances of the inputs and outputs from the automation system the wiring can become very extensive and unstructured. Electromagnetic interferences can impair the reliability. The flexibility of a central installation is also limited.

The use of distributed I/Os is suitable for such systems:

● The automation system is located at a central position.

● The I/O devices (inputs and outputs) operate decentrally on site.

● The BusLink between PROFINET IO and PROFIBUS PA that is integrated in the CFU enables decentralized connection of the field devices to the CPU of the automation system.

Distributed I/O system

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

DP

→ *Distributed I/O system*

Earth

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

Equipotential bonding

Electrical connection (potential equalization conductor) that brings the bodies of electrical equipment and other conductive bodies to the same or almost the same potential, in order to prevent disruptive or dangerous voltages between these bodies.

Fiber-optic cable

Possibility for transferring data across large distances. A major advantage of fiber-optic cables compared to electrical lines is that the data transfer cannot be influenced by electrical or magnetic fields.

The optical interfaces are specified in the following standards:

- ISO/IEC 9314-3 (multimode)
- ISO/IEC 9314-4 (single-mode)

You can use both multimode fiber-optic cables and single-mode fiber-optic cables as fiber-optic cables for PROFINET networks. Typical manufacturer variants are:

- GOF - *Glass Optical Fibers*
- POF - *Plastic Optical Fibers or POFs are fiber-optic cables made of plastic.*

Firmware update

Upgrade of firmware for devices or modules (interface modules, I/O modules etc.) to the newest firmware version (update), for example after enhancement of functions.

Functional ground

Functional ground is a low-impedance current path between electric circuits and ground. It is not designed as a safety measure but instead, for example, as a measure to improve interference immunity.

GOF

GOF - *Glass Optical Fibers* -> Fiber-optic cables

Ground

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

Grounding

Grounding means connecting an electrically conductive part to a grounding electrode by means of a grounding system.

GSD 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.

LLDP

LLDP (*Link Layer Discovery Protocol*) is a network protocol that is described in the international standard IEEE-802.1AB. As a manufacturer-independent Layer-2 protocol for the recognition of the topology in a network it serves to transfer information to neighboring devices.

Devices that support LLDP send device-specific information via an LLDP agent (software component) to the multicast address 01:80:C2:00:00:0E with the type 0x88C at periodic intervals. Neighboring LLDP-compatible devices store received information in the Management Information Base (MIB) and thus recognize neighboring devices.

Load current supply

Supply of modules like the interface module, power supply modules, I/O modules, and (if applicable) sensors and actuators.

MAC address

Device identification unique worldwide, which is already assigned to each PROFINET device in the factory. Its 6 bytes are divided into 3 bytes for the manufacturer ID and 3 bytes for the device ID (serial number). The MAC address is usually legible on the device.

Module fault

Module faults can be external faults (e.g. missing load voltage) or internal faults (e.g. processor failure). Internal faults always require module replacement.

Node

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

Parameter assignment

Parameter assignment is the transfer of parameters from the IO controller to the IO device.

PELV

Protective Extra Low Voltage

Performance Level

Performance Level (PL) to ISO 13849-1:2006 or EN ISO 13849-1:2008

POF

POF - *Polymer Optical Fibers* -> Fiber-optic cables

Potential group

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

Prewiring

Wiring the electrics on a mounting rail before the I/O modules are connected.

Process image (I/O)

The CPU transfers the values from the input and output modules to this memory area. At the start of the cyclic program, the signal states of the input modules are transmitted to the process image input. At the end of the cyclic program, the process image output is transmitted as signal state to the output modules.

Product version (ES) = Functional status (FS)

The product version or functional status provides information on the hardware version of the module.

PROFIBUS

PROcess **FI**eld **BUS**, process and fieldbus standard that is specified in IEC 61158 Type 3. It specifies functional, electrical and mechanical properties for a bit-serial fieldbus system. PROFIBUS is available with the following protocols: DP (= Distributed Periphery), FMS (= Fieldbus Message Specification), PA (= Process Automation) or TF (= Technological Functions).

PROFINET

PROcess **FI**eld **NET**work, 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 controller

Device used to address connected I/O devices (e.g. distributed I/O systems). This means: The IO controller exchanges input and output signals with assigned I/O devices. The IO controller often corresponds to the CPU in which the automation program is running.

PROFINET IO

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

PROFINET 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).

PROFIsafe

PROFIsafe (**PRO**cess **FI**eld **safe**ty) is defined for PROFIBUS and PROFINET in the standard IEC 61784-3.

PROFIsafe is a current standard for secure communication between safety-related devices and the automation system via the employed fieldbus. The PROFIsafe profile includes both the format of the user data as well as the protocol for secure communication. PROFIsafe enables the realization of safety-related automation tasks up to SIL3 (Safety Integrity Level).

Proof-test interval

Period after which a component must be forced to fail-safe state, that is, it is either replaced with an unused component, or is proven faultless.

Provider-Consumer principle

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

Push-in terminal

Terminal for the tool-free connection of wires.

Redundancy, availability-enhancing

Multiple instances of components with the objective of maintaining component functionality in the event of hardware faults.

Reference potential

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

SELV

Safety Extra Low Voltage

Sensors

Sensors are used for accurate detection of digital and analog signals as well as routes, positions, velocities, rotational speeds, masses, etc.

Slave station

A slave can only exchange data after being requested to do so by the master.

SNMP

SNMP (Simple Network Management Protocol) is the standardized protocol for diagnosing and also configuring the Ethernet infrastructure.

In the office area and in automation technology, devices support a wide range of manufacturers on the Ethernet SNMP.

SNMP-based applications can be operated on the same network in parallel to applications with PROFINET.

Spur

Spur line to a field device

Switch

PROFIBUS is a linear network. The communication nodes are linked by means of a passive cable - the bus.

By contrast, Industrial Ethernet consists of point-to-point connections: each communication node is interconnected directly with precisely one other communication node.

If a communication node is linked to several communication nodes, this communication node is connected to the port of an active network component - the switch. Other communications devices (including switches) can then be connected to the other ports of the switch. The connection between a communication node and the switch remains a point-to-point connection.

The task of a switch is thus to regenerate and distribute received signals. The switch "learns" the Ethernet address(es) of a connected PROFINET device or additional switches and only forwards those signals that are intended for the connected PROFINET device or switch.

A switch has a specific number of connections (ports). You connect at most one PROFINET device or additional switch to each port.

Technology object

A technology object supports you in the configuration and commissioning of a technological function.

The properties of real objects are represented by the technology objects in the controller. Real objects can be, for example, controlled systems or drives.

The technology object includes all data of the real object that is required for its open-loop or closed-loop control, and it signals the status information.

Temperature derating

The derating describes the maximum permissible heat dissipation of components depending on the ambient temperature.

TIA Portal

Totally Integrated Automation Portal

The TIA Portal is the key to the full performance capability of Totally Integrated Automation. The software optimizes all operating, machine and process sequences.

Total current

Sum of currents of all freely configurable channels.

Transmission rate

Speed during the data transfer and specifies the number of transferred bits per second (transfer rate = bit rate).

TWIN wire end ferrule

Wire end ferrule for two cables

Value status

The value status is the binary additional information of a digital signal. The value status is entered in the process image of the input and provides information on the validity of the signal.

SIMATIC CFU PA
Commissioning Manual, 08/2017, A5E39254279-AA

Index

Voltage relationships, 18, 19, 34

W

Wiring
    Rules, 130

Z

Zones, 24