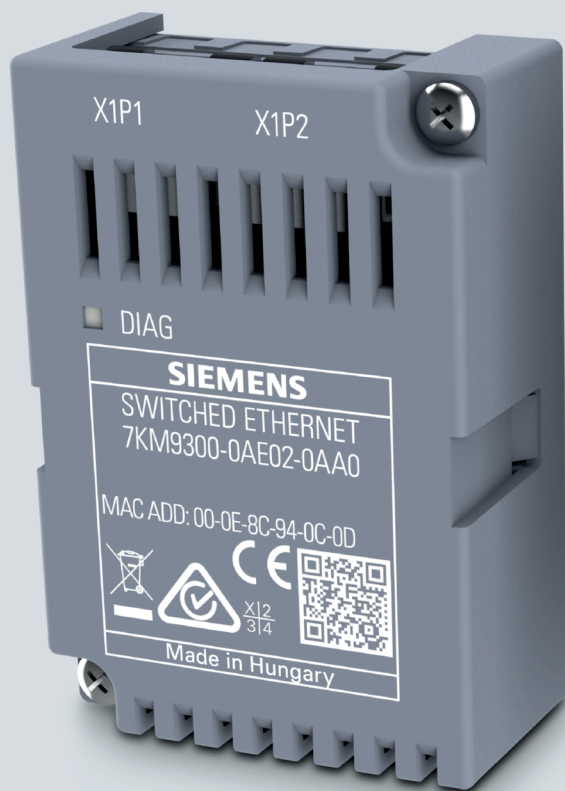# SIEMENS

Manual

SENTRON

Expansion Modules

7KM PROFIBUS DP
7KM Switched Ethernet PROFINET

Edition   01/2020

siemens.com/SENTRON

SIEMENS

SENTRON

Expansion modules
7KM PAC PROFIBUS DP,
7KM PAC SWITCHED ETHERNET
PROFINET

Equipment Manual

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.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

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

Introduction

<div style="text-align: right; font-size: 3em;">1</div>

1.1 Purpose of this document

This manual is intended for:

- Planners
- Plant operators
- Commissioning engineers
- Service and maintenance personnel

This manual contains:

- Details of how to use the 7KM PROFIBUS DP expansion module in conjunction with a 7KM PAC measuring device or 3VA breaker data server COM100/COM800
- Permissible operating conditions for the 7KM PROFIBUS DP. expansion module
- Details of how to use the 7KM Switched Ethernet PROFINET expansion module in conjunction with a 7KM PAC measuring device or 3VA breaker data server COM100/COM800
- Permissible operating conditions for the 7KM Switched Ethernet PROFINET. expansion module

Required basic knowledge

General knowledge of the field of automation, and basic knowledge of PROFIBUS and PROFINET are required to understand this manual.

1.2 Components of the product

1.2.1 Scope of delivery of the 7KM PROFIBUS DP expansion module

Description

The package includes:

- 1x 7KM PROFIBUS DP expansion module
- 1x operating instructions for the 7KM PROFIBUS DP expansion module

1.2.2 Scope of delivery of the 7KM Switched Ethernet PROFINET expansion module

Description

The package includes:

- 1x 7KM Switched Ethernet PROFINET expansion module
- 1x operating instructions for the 7KM Switched Ethernet PROFINET expansion module

1.3 Technical Support

You can find further support on the Internet at:

Technical Support (https://www.siemens.com/lowvoltage/technical-support)

1.4   General safety instructions

General safety instructions

> ⚠ **DANGER**
>
> **Hazardous voltage.**
>
> **Will cause death or serious injury.**
>
> Turn off and lock out all power supplying this equipment before working on this device.

Note

Only qualified personnel are permitted to install, commission or service this device.

- Wear the prescribed protective clothing.
- Observe the general equipment regulations and safety regulations for working on high-voltage installations (e.g. DIN VDE, NFPA 70E) as well as national or international regulations.
- Before commissioning the device, check that all the connections have been made correctly.
- Before power is applied to the device for the first time, it must have been located in the operating area for at least two hours in order to reach temperature balance and avoid humidity and condensation.
- The limits given in the technical specifications must not be exceeded even during commissioning or testing of the device.
- Condensation on the device is not permissible during operation.

Note

These operating instructions do not purport to cover all details or variations in equipment, or to provide for every possible contingency in connection with installation, operation, or maintenance. Should you require more information, or should particular problems arise that are not discussed in enough detail in the operating instructions, please contact Technical Support (https://www.siemens.com/lowvoltage/technical-support) for assistance.

Note

This Equipment Manual only contains information about the installation, parameterization and addressing of 7KM expansion modules used in conjunction with 7KM PAC measuring devices. Information about the operation of 7KM expansion modules used in conjunction with the 3VA breaker data server COM100/COM800 can be found in Communication Manual – SENTRON 3VA IEC/UL Molded Case Circuit Breakers (https://support.industry.siemens.com/cs/ww/en/view/98746267).

1.5 Open Source Software

This product, solution or service ("Product") contains third-party software components. These components are Open Source Software licensed under a license approved by the Open Source Initiative (www.opensource.org (http://www.opensource.org)) or similar licenses as determined by SIEMENS ("OSS") and/or commercial or freeware software components. With respect to the OSS components, the applicable OSS license conditions prevail over any other terms and conditions covering the Product. The OSS portions of this Product are provided royalty-free and can be used at no charge.

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Siemens AG
Smart Infrastructure
Low Voltage Products
Technical Support
Postfach 10 09 53
93009 Regensburg
Germany

www.siemens.com/lowvoltage/support-request
(https://support.industry.siemens.com/cs/us/en/ps)

Keyword: Open Source Request (please specify Product name and version, if applicable)

SIEMENS may charge a handling fee of up to 5 EUR to fulfil the request.

Warranty regarding further use of the Open Source Software

SIEMENS' warranty obligations are set forth in your agreement with SIEMENS. SIEMENS does not provide any warranty or technical support for this Product or any OSS components contained in it if they are modified or used in any manner not specified by SIEMENS. The license conditions may contain disclaimers that apply between you and the respective licensor. For the avoidance of doubt, SIEMENS does not make any warranty commitment on behalf of or binding upon any third-party licensor. The Open Source Software used in the product and the license agreements concerning this software can be found in the Readme_OSS.

1.6 Security information

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

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

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the Internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit (https://www.siemens.com/industrialsecurity).

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

To keep up to date with all the latest product updates, subscribe to the Siemens Industrial Security RSS Feed at (https://www.siemens.com/industrialsecurity).

1.7 Further documentation

Overview

You can find more information, e.g. parameters, values, and setting options for the 7KM PAC measuring device in the following manuals:

- SENTRON PAC4200 Power Monitoring Device

    – System Manual (https://support.industry.siemens.com/cs/ww/en/view/34261595)

    – Operating Instructions
      (https://support.industry.siemens.com/cs/ww/en/view/34261817)

- SENTRON PAC3200 Power Monitoring Device

    – Equipment Manual (https://support.industry.siemens.com/cs/ww/en/view/26504150)

    – Operating Instructions
      (https://support.industry.siemens.com/cs/ww/en/view/26504261)

- 7KM PAC3120 and 7KM PAC3220 Measuring Devices

    – Equipment Manual (https://support.industry.siemens.com/cs/ww/en/view/109767307)

    – Operating Instructions
      (https://support.industry.siemens.com/cs/ww/en/view/109770272)

You can find more information about connection, parameterization and addressing in conjunction with the 3VA breaker data server COM100/COM800 in the manual:

- Communication Manual – SENTRON 3VA IEC/UL Molded Case Circuit Breakers
  (https://support.industry.siemens.com/cs/ww/en/view/98746267)

You can find more information on SIMATIC in the following manuals:

- SIMATIC NET "PROFIBUS Network Manual"

- SIMATIC "Configuring Hardware and Connections with STEP 7"

- SIMATIC TIA Portal V15 and higher

- SIMATIC PCS 7 Library PAC/3WL/3VA

- TIA Portal Energy Suite

For more information, see (https://support.automation.siemens.com).

You can find more information on PROFIBUS and PROFINET at:

- PROFIBUS RS485-IS User and Installation Guide
  (http://www.profibus.com/pall/meta/downloads/article/00332/)

- PROFIBUS and PROFINET documentation from PI International
  (http://www.profibus.com/)

- PROFIenergy profile (http://www.profibus.com/nc/downloads/downloads/common-application-profile-profienergy/display/)

Description

2

2.1 Area of application

The 7KM PROFIBUS DP and 7KM Switched Ethernet PROFINET expansion modules are designed for use with a 7KM PAC measuring device or a 3VA breaker data server COM100/COM800.

Area of application of the 7KM PROFIBUS DP expansion module

The 7KM PROFIBUS DP expansion module connects the 7KM PAC measuring device or the 3VA breaker data server COM100/COM800 to the PROFIBUS network. This integrates the devices into power management systems and automation systems, e.g.:

- TIA environment
- SIMATIC, e.g.:
    - The block libraries display the measured values in faceplates and make these available in the SIMATIC S7 for further processing.
    - SIMATIC S7 CPUs contain system function blocks (SFB 52, SFB 53, SFB 54). With these, the CPUs can read and write the data sets, and read the interrupt messages.

Area of application of the 7KM Switched Ethernet PROFINET expansion module

The 7KM Switched Ethernet PROFINET expansion module connects the 7KM PAC measuring device or the 3VA breaker data server COM100/COM800 to PROFINET including IRT (Isochronous Real-Time). This integrates the devices into power management systems and automation systems, e.g.:

- TIA environment
- SIMATIC, e.g.:
    - PROFIenergy (https://support.automation.siemens.com/WW/view/en/41986454)
    - With the SFB 52, SFB 53 and SFB 54 system function blocks, users can program the PROFIenergy protocol themselves.

The 7KM Switched Ethernet PROFINET expansion module supports the PROFIenergy profile. This allows values to be communicated acyclically via PROFINET.

- Other systems that support PROFIenergy "Query_Measurement" can access the measured values.
- Ethernet switch function for Modbus TCP communication of the aforementioned SENTRON devices.

See also

Further documentation (Page 12)

2.2 Performance features of the 7KM PROFIBUS DP expansion module

You can use the 7KM PROFIBUS DP expansion module to access 7KM PAC measuring devices or 3VA molded case circuit breakers during operation.

Overview

Performance features of the 7KM PROFIBUS DP expansion module include:

- The 7KM PROFIBUS DP expansion module is a prerequisite for integration of the aforementioned devices in TIA Portal V15 and higher.

- Communication based on the PROFIBUS DPV1 and DPV2 master-slave principle:

  The 7KM PROFIBUS DP expansion module makes measured values and status values of the 7KM PAC measuring device or 3VA molded case circuit breaker available to the PROFIBUS DP master.
  It receives information, e.g. commands, from the PROFIBUS DP master and forwards this information to the 7KM PAC measuring device or 3VA molded case circuit breaker.

- Function: PROFIBUS DP slave

- Communication with the DPV1 master and the class 2 masters

- Cyclic data transfer

- Acyclic data transfer

- Specific GSD file for every measuring device type and the 3VA circuit breakers. This enables correct integration in the engineering system of any controller.

- Automatic detection of the baud rate

- Clock synchronization depending on the device type

- Setting the PROFIBUS address:
  - On the PAC measuring device
  - With powerconfig parameterization software
  - Per PROFIBUS

- Generation of diagnostic and hardware interrupts

- Diagnostics also via the local display for the 7KM PAC measuring device

- Status indication via LED

- Galvanic isolation between the 7KM PAC measuring device and PROFIBUS

- No external supply voltage required

2.2.1 Functions with limited support

You can operate the SENTRON device downstream of a Y link in the DPV0 mode only. Downstream of the Y link, the device can only be configured as a DPV0 slave. All acyclic services and interrupts are switched off, as is usual with DPV0. As a result, the SENTRON device does not supply any interrupts. Instead of interrupts, the master evaluates the device-specific diagnostic messages.

2.2.2 Unsupported functions

The following PROFIBUS functions are not supported:

- SYNC / UNSYNC
- FREEZE / UNFREEZE

2.3 Performance features of the 7KM Switched Ethernet PROFINET expansion module

You can use the 7KM Switched Ethernet PROFINET expansion module to access 7KM PAC measuring devices or 3VA molded case circuit breakers during operation.

Overview

Performance features of the 7KM Switched Ethernet PROFINET expansion module include:

- Plug-in communication module
- Direct connection between SENTRON devices and other Ethernet nodes thanks to the integral Ethernet switch. The 7KM Switched Ethernet PROFINET expansion module is a prerequisite for integration of the aforementioned devices in TIA Portal V15 and higher.
- Supports ring redundancy (MRP: Media Redundancy Protocol) thanks to the integral Ethernet switch
- Supports S2 system redundancy for high-availability systems (H-systems)
- Supports PROFINET DR (Dynamic Reconfiguration) / Configuration in Run (CiR)
- The SENTRON devices communicate directly with SIMATIC S7 and SIMOTION via PROFINET IO.
  This means:
  The 7KM Switched Ethernet PROFINET expansion module (PROFINET IO device) supplies measured variables and statuses of the SENTRON devices to the PROFINET IO controller.
  The module receives information, e.g. commands, from the PROFINET IO controller and forwards this information to the other nodes.
- Thanks to support for PROFINET IRT, the SENTRON basic devices can be used directly in production automation networks, e.g. alongside SIMATIC S7, SINUMERIK, SINAMICS and SIMOTION.

- With the 7KM Switched Ethernet PROFINET expansion module, the measured variables of the SENTRON devices can be read out and addressed using the "Query_Measurement" service according to the PROFIenergy standard.

- Simple engineering with SIMATIC STEP 7 or other engineering systems thanks to use of the GDSML files

- Optimal use of the process image of a controller thanks to the selection of individual measured variables and statuses

- Application-specific profiles (e0 to e3) for energy management in cyclic data

- Flexible selection of cyclic data for the 3VA molded case circuit breaker

- You can use all the previous functions of the SENTRON devices via the 7KM Switched Ethernet PROFINET expansion module. It is then possible to make use of the powermanager and powerconfig software.

- The 100 Mbps data rate is supported via the two RJ45 sockets.

- No external supply voltage required

- Clock synchronization, if supported by the SENTRON device

- IP settings: IP address, subnet, gateway

    – At the device

    – With the powerconfig parameterization software

    – Via PROFINET, e.g. in the STEP 7 HW Config

- Generation of diagnostic and hardware interrupts

- Diagnostics also via the local display

- Status indication via LED

- Galvanic isolation between the SENTRON basic devices and the 7KM Switched Ethernet PROFINET expansion module

7KM PAC PROFIBUS DP, 7KM PAC SWITCHED ETHERNET PROFINET

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2.4 Structure

Design of the 7KM PROFIBUS DP expansion module

①	Sub D socket
②	Screw for installing the 7KM PROFIBUS DP expansion module
③	Ventilation slots
④	LED
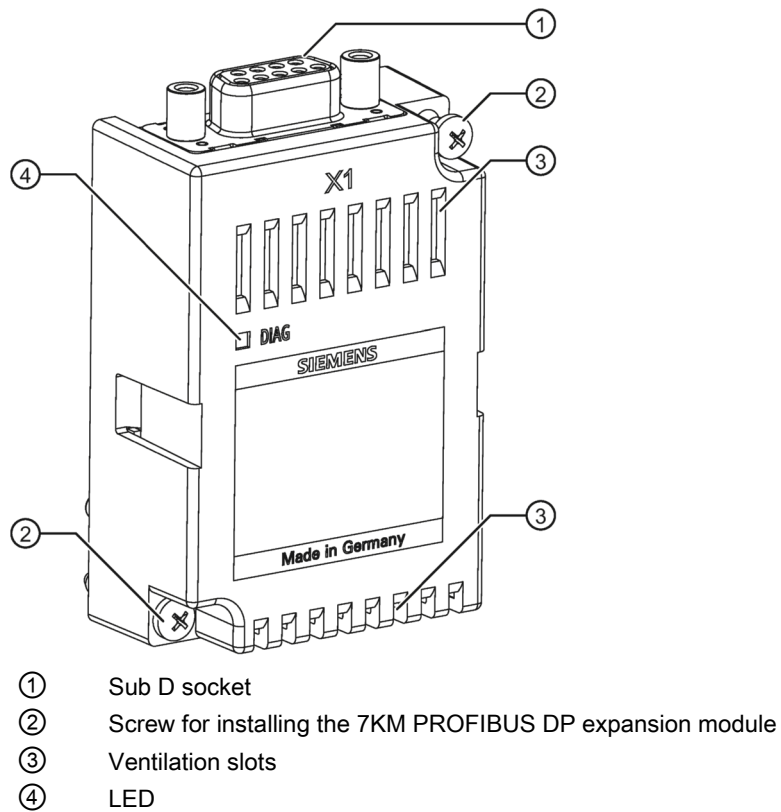
Figure 2-1   Schematic view of the side and front of the 7KM PROFIBUS DP expansion module

Design of the 7KM Switched Ethernet PROFINET expansion module
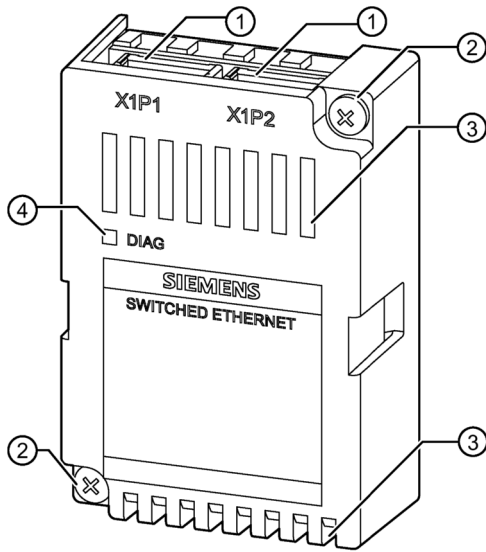
① RJ45 socket
② Screw for installing the 7KM Switched Ethernet PROFINET expansion module
③ Ventilation slots
④ LED

Figure 2-2   Schematic view of the side and front of the 7KM Switched Ethernet PROFINET expansion module

Installation

3

3.1   Installation location

The expansion module can be installed in the following slots:

- With 7KM PAC3200, only ever insert the expansion module in the "MOD1" slot.
- With 7KM PAC3220 and 7KM PAC4200, you can insert the expansion module in the "MOD1" or the "MOD2" slot.
- With the 3VA breaker data server COM100/COM800, insert the expansion module in the "X5" slot.

NOTICE
Condensation may cause the device to malfunction.
The device must be in the operating environment for at least two hours before use to prevent condensation due to sudden temperature changes.

General information for use of the 7KM Switched Ethernet PROFINET expansion module

NOTICE
Faults are possible in the device
Use the 7KM Switched Ethernet PROFINET expansion module only if all the connected nodes are located within the same building and are supplied via a single power supply system: • In a LAN • In a segment of the LAN

General information for use of the 7KM PROFIBUS DP expansion module

Note
Bus terminating resistor
When using the 7KM PAC PROFIBUS DP expansion module, make sure that terminating resistors are correctly connected. Consult the following in this context: • The specifications in the "PROFIBUS RS485-IS User and Installation Guideline" • The SIMATIC NET PROFIBUS Network Manual (https://support.industry.siemens.com/cs/ww/en/view/35222591)

3.2 Installation steps

Install the expansion module before starting up the PAC device.

⚠ CAUTION
Electrostatic discharge
The expansion modules contain electronic components that can be irreparably damaged by electrostatic discharge.
When handling modules, make sure that all objects in the handling environment (persons, workstation and packaging) are properly grounded. Do not touch the module contacts.

NOTICE
Overheating of the device
The expansion module can overheat if the ventilation slots are covered. Overheating shortens the service life of the expansion module.
Ensure that the ventilation slots are not covered.

NOTICE
Damage to measuring devices and modules
The modules must not be installed on measuring devices while they are connected to voltage and in operation.

Installation on a 7KM PAC measuring device

The figure below shows the installation of a 7KM Switched Ethernet PROFINET expansion module on a 7KM PAC measuring device. The PROFIBUS expansion module is installed in the same way.
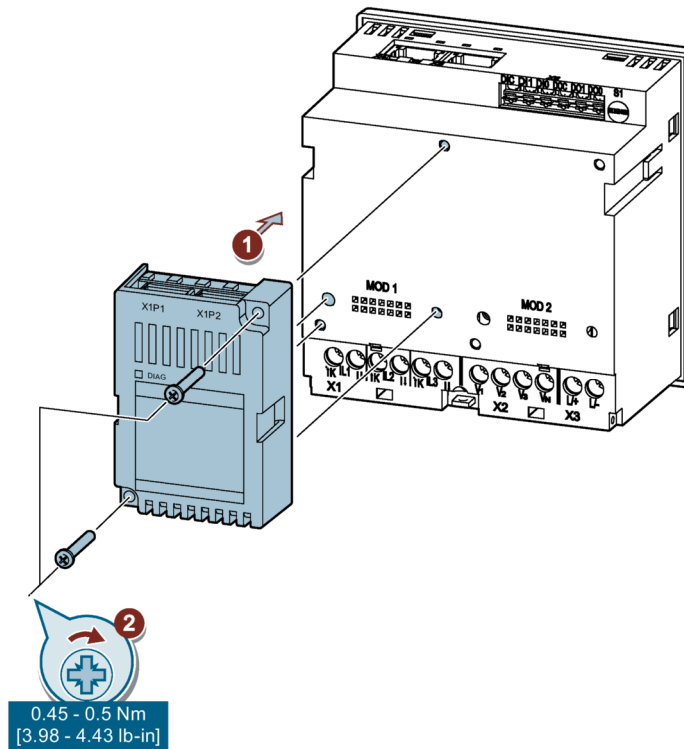
Figure 3-1   Installation of a 7KM Switched Ethernet PROFINET expansion module on a 7KM PAC measuring device

1. Position the expansion module on the 7KM PAC measuring device such that the screw holes shown in the figure are aligned.

2. Screw the expansion module onto the 7KM PAC measuring device using a PZ2 screwdriver and the indicated tightening torque.

Installation on a 3VA breaker data server COM100/COM800

The figure below shows the installation of a 7KM Switched Ethernet PROFINET expansion module on a 3VA breaker data server COM100/COM800. The PROFIBUS expansion module is installed in the same way.
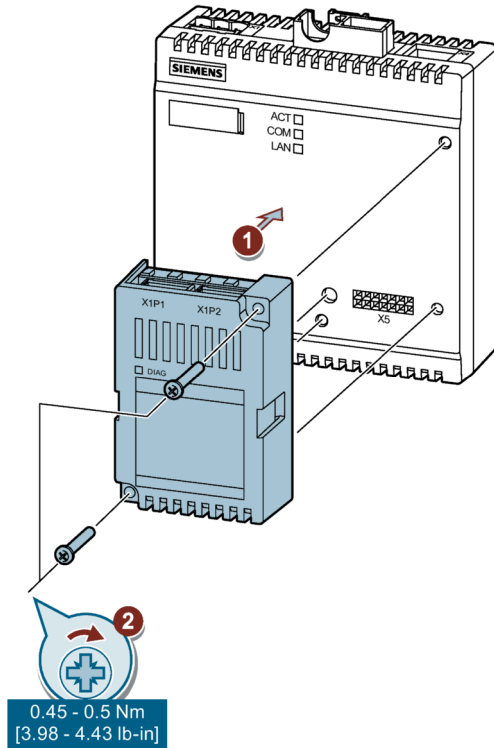
Figure 3-2   Installation of a 7KM Switched Ethernet PROFINET expansion module on a 3VA breaker data server COM100/COM800.

1. Position the expansion module on the 3VA breaker data server COM100/COM800 such that the screw holes shown in the figure are aligned.

2. Screw the expansion module onto the 3VA breaker data server COM100/COM800 using a PZ2 screwdriver and the indicated tightening torque.

Connection 4

4.1 Safety information

Instructions

Note

Only qualified personnel are permitted to install, commission or service this device.

- Wear the prescribed protective clothing. Observe the general equipment regulations and safety regulations for working with high-voltage installations (e.g. DIN VDE, NFPA 70E as well as national or international regulations).
- The limits given in the technical specifications must not be exceeded even during commissioning or testing of the device.
- Before connecting the device, check that the system voltage matches the voltage specified on the rating plate.
- Always hold the expansion module by the plastic enclosure only.
- Ensure that there are no metal parts between the pins, that no metal parts are attached to the pins and that the pins are not bent.
- Make sure that there is sufficient mechanical strain relief for the data cable.
- Before commissioning the device, check that all the connections have been made correctly.
- Before power is applied to the device for the first time, it must have been located in the operating area for at least two hours in order to reach temperature balance and avoid humidity and condensation.
- Condensation on the device is not permissible during operation.

4.2 Grounding of the data cable

Note

The upper limit values will be exceeded if the cable is not grounded

Compliance with the technical limit values for noise radiation and noise immunity is only guaranteed if the cable is correctly grounded. The operator of the system is responsible for ensuring compliance with the statutory limit values (CE mark).

Make a shield connection on both sides as described here.

Ethernet cable

The Ethernet cable must be grounded in the vicinity of the basic device for data transmission according to the Fast Ethernet standard.

PROFIBUS cable

The data cable must be grounded in the immediate vicinity of the basic device. Ground the cable shield at both ends.

Type of shield grounding

To do this, expose the foil shield of the data cable. Connect the exposed shield to a suitable grounding point on the control cabinet, preferably a shielding bus.
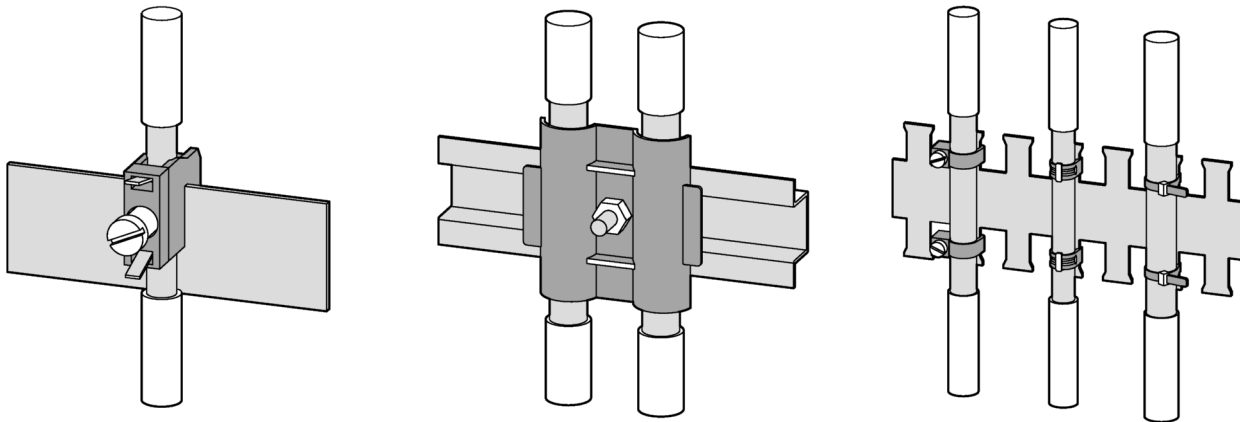
Figure 4-1   Examples of correct shield grounding

- Be careful not to damage the foil shield of the cable when removing the cable jacket.
- Fasten the exposed shield with a metal cable clamp or alternatively with a hose tie. The clamp must clasp around a large portion of the shield and provide good contact.
- To allow good contact, a tin-plated or galvanically stabilized surface is ideal.
  With galvanized surfaces, the contact should be achieved using suitable screw connections. A painted surface at the contact point is not suitable.

Note

Loss of contact if the shield connection is incorrectly used for strain relief

If the shield connection is used for strain relief, the grounding contact can deteriorate or be completely lost.

Don't use the contact point on the cable shield for strain relief.

Commissioning 5

5.1 Introduction

Requirements for commissioning

The expansion module and the basic device have been connected up correctly.

Note

Check the connections

Incorrect connection can result in malfunctions and failure of the device. Before you start up the device, check that all the connections have been made correctly.

Note

Insulation test

When performing an insulation test of the entire installation with AC or DC, the device should be disconnected before starting the test.

5.2 Configuring the expansion module

The parameters for the expansion module can be set either via PROFINET or PROFIBUS, directly on the display of the 7KM PAC measuring device, or via the communication interface of the SENTRON device using the SENTRON powerconfig configuration software.

The SENTRON powerconfig configuration software is available as a download on the Internet (https://support.industry.siemens.com/cs/ww/en/view/63452759).
Please refer to the relevant documentation and online help for information about operation.

5.2.1 Configuration on the 7KM PAC measuring device

After you have mounted the 7KM switch Ethernet PROFINET or 7KM PROFIBUS DP expansion module on a 7KM PAC measuring device, you can make configuration settings on the expansion module.

In the menu of the 7KM PAC measuring device, select the "SETTINGS" menu item. In the menu item "EXPANSION MODULES", select the connected "SWITCHED ETHERNET" or "PROFIBUS MODULE".

For unambiguous module identification, the expansion module slot "MOD 1" or "MOD 2" that is used is specified in addition to the module designation.
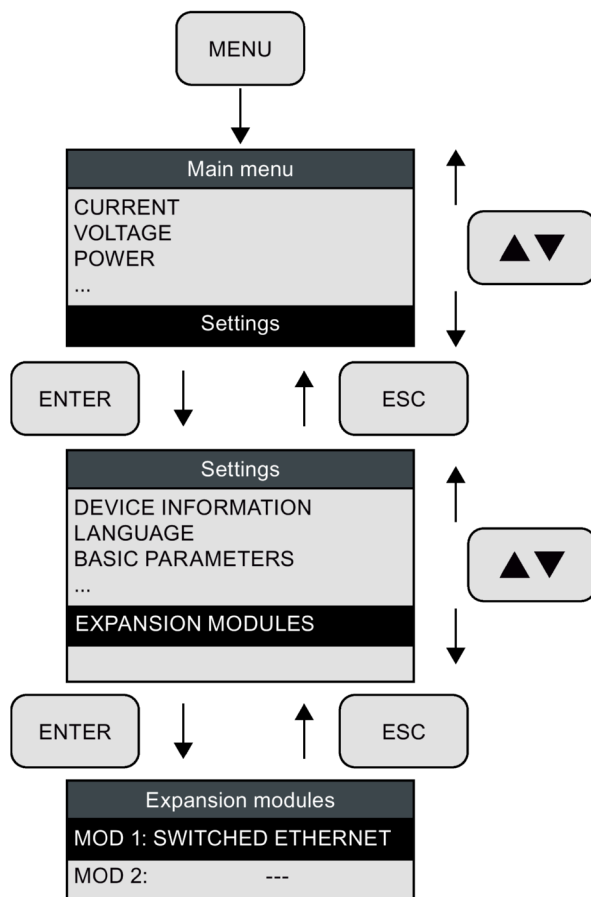
Configuration menu of the 7KM Switched Ethernet PROFINET expansion module
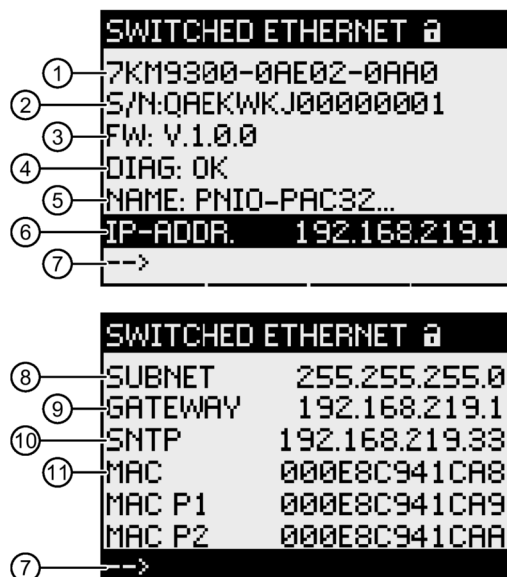
Num-ber	Meaning	Access / format
①	Order number of the expansion module	Read only
②	Serial number of the expansion module	Read only
③	Firmware version of the expansion module	Read only
④	In the "DIAG" field, you can see the communication status of the expansion module.	Read only
⑤	The first characters of the NameOfStation (maximum length of 240 characters) of the expansion module are shown here.	Read only
⑥	Manual setting of the IP address. A PROFINET IO controller can change these settings based on its configuration.	Adjustable. Format: 000.000.000.000
⑦	Switch to the next page of the configuration menu. A PROFINET IO controller can change these settings based on its configuration.	-
⑧	Manual setting of the subnet. A PROFINET IO controller can change these settings based on its configuration.	Adjustable. Format: 000.000.000.000
⑨	Manual setting of the gateway. A PROFINET IO controller can change these settings based on its configuration.	Adjustable. Format: 000.000.000.000
⑩	Manual configuration of the SNTP IP address. This is for time synchronization purposes.	Adjustable. Format: 000.000.000.000
⑪	MAC address of the expansion module.	Read only

Meaning of the status display of the 7KM Switched Ethernet PROFINET expansion module in the "DIAG" field.

Status	Meaning	Remedy
OK	The expansion module is ready for operation.	-
INIT	The expansion module is in the start phase.	-
SYS_ERR	The hardware and/or firmware of the 7KM PAC measuring device and the expansion module do not match.	Please contact Support (https://support.automation.siemens.com).

Configuration menu of the 7KM PROFIBUS DP expansion module
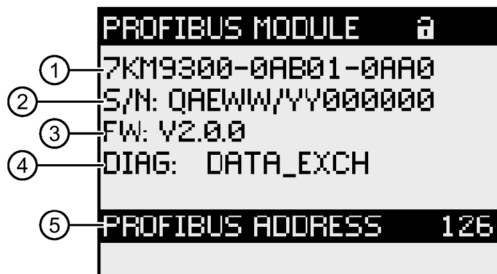
Num-ber	Meaning	Access / value range
①	Order number of the expansion module	Read only
②	Serial number of the expansion module	Read only
③	Firmware version of the expansion module	Read only
④	In the "DIAG" field, you can see the communication status of the expansion module.	Read only
⑤	Manual setting of the PROFIBUS address. Factory setting: 126	Adjustable. Range: 1 …126

Meaning of the status display of the 7KM PROFIBUS expansion module in the "DIAG" field

Status	Meaning
BAUD_SRCH	Searches the PROFIBUS master to detect the baud rate.
WAIT_PRM	The 7KM PROFIBUS DP expansion module is waiting for parameterization or a request from the PROFIBUS master.
PRM_FAULT	Incorrect parameterization, e.g. wrong GSD file.
WAIT_CFG	Parameterization is OK. The 7KM PROFIBUS DP expansion module is waiting for configuration.
CFG_FAULT	Incorrect configuration message frame, e.g. incorrect measured variable configured.
DATA_EXCH	Configuration is OK. Data is exchanged with a class 1 PROFIBUS master.
CON_MC2	Configuration is OK. The connection to a class 2 PROFIBUS master has been established.

5.2.1.1 Configuration of the 7KM PAC measuring device in the SIMATIC environment

You can configure the 7KM PAC measuring device and the expansion modules as follows in the SIMATIC environment:

- Integration of the 7KM PAC measuring device with PROFIBUS into STEP 7 via the device-specific **GSD** file.

- Integration of the 7KM PAC measuring device with PROFINET into STEP 7 via the device-specific **GSDML** file.

Configuration of the integration into PROFIBUS/PROFINET in STEP 7 via the GSD/GSDML file
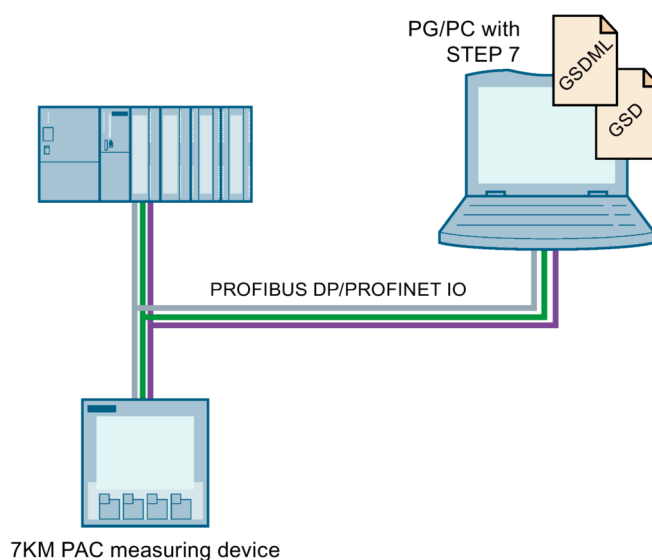
Figure 5-1   Configuration of the integration into PROFIBUS/PROFINET in STEP 7 via the GSD/GSDML file

---

Note

Configuration with other tools

You can also use tools from other manufacturers for the configuration.

5.2.1.2 Changing the address of the 7KM PROFIBUS DP expansion module

Setting a unique address

Every device requires a unique address. The address is stored in the 7KM PROFIBUS DP expansion module.

Address 126 is used for commissioning purposes only. Do **not** use this address for data communication.

Change the address of each device before you begin transferring data. You can change the address as follows:

- Via the display of the 7KM PAC measuring device
- Using *powerconfig* via the Ethernet interface of the SENTRON basic device
- With the PROFIBUS configuring software, e.g. STEP 7
- Via the PROFIBUS interface by means of a class 2 master

NOTICE
Address change on device immediately valid
If you change the address of the PROFIBUS DP slave on the 7KM PAC measuring device, the 7KM PROFIBUS DP expansion module is automatically restarted as soon as you quit the menu. The new address is then active. Enter the new address in the configuration of the PROFIBUS DP master. Communication is interrupted until this change takes effect.

5.2.1.3 Configuring by means of the GSD/GSDML file

Task of the GSD/GSDML file

The GSD or GSDML file forms the basis for the configuration of a device.

The GSD file makes the following data available to the class 1 master; the GSDML file makes the data available to the PROFINET IO controller:

- Measured variables
- Status and control information
- Communication characteristics

PROFIBUS devices have a unique PROFIBUS ID number and a GSD file. The GSD file is specific to the 7KM PAC measuring device that is in use.

Naming convention of the PROFIBUS GSD file

The name of the GSD file contains the following information:

Table 5- 1   Composition of the file name

Places	Meaning
1 ... 2	"SI" for Siemens
3 ... 4	Version of the GSD file, e.g. "01" for the first version
5 ... 8	Identification number; this is assigned by PI.

Naming convention of the PROFINET GSDML file

The PROFINET GSDML file is language-independent. All devices and all languages are described in it. The name of the GSDML file contains the following information:

Table 5- 2   Composition of the file name

Fields	Meaning
1	"GSDML"
2	Version number of the GSD file in Vx.y format
3	Name of the manufacturer
4	Name of the device family
5	Issue data of the GSDML file in the format: YYYY.MM.DD
6	Optional issue time of the GSDML file in the format: hh.mm.ss hh values are 00 … 24.
7	Extension of the filename "XML"

Language of the PROFIBUS GSD file

The GSD file is language-dependent.

Table 5- 3   GSD file extensions

Language-dependent GSD file extension	Language
GSE	English (ANSI)
GSG	German
GSF	French
GSI	Italian
GSP	Portuguese
GSS	Spanish
GSD	Language-neutral (English IEC)

Assignment of the PROFIBUS GSD file to the device and firmware version of the expansion module

Table 5- 4   Name of the GSD file, e.g.

Name of the GSD file	Meaning
SI028163.GSx	Version "02" of the GSD file for the 7KM PAC3200 measuring device with a PAC PROFIBUS DPV1 expansion module with firmware version 4.0.0
SI028173.GSx	Version "02" of the GSD file for the 7KM PAC4200 measuring device with a PAC PROFIBUS DPV1/V2 expansion module with firmware version 4.0.0
SI038163.GSx	Version "03" of the GSD file for the 7KM PAC3220 measuring device with a PAC PROFIBUS DP expansion module with firmware version 4.0.0
SI0281A6.GSx	Version "02" of the GSD file for the 3VA breaker data server COM800 with a PAC PROFIBUS DP expansion module with firmware version 4.0.0
SI0281B6.GSx	Version "02" of the GSD file for the 3VA breaker data server COM100 with a PAC PROFIBUS DP expansion module with firmware version 4.0.0

Note

Latest version of the GSD file

You can find the latest versions of the GSD file on the Internet (https://support.industry.siemens.com/cs/ww/en/view/84054777).

Configuration by means of the GSD file, based on the example of STEP 7
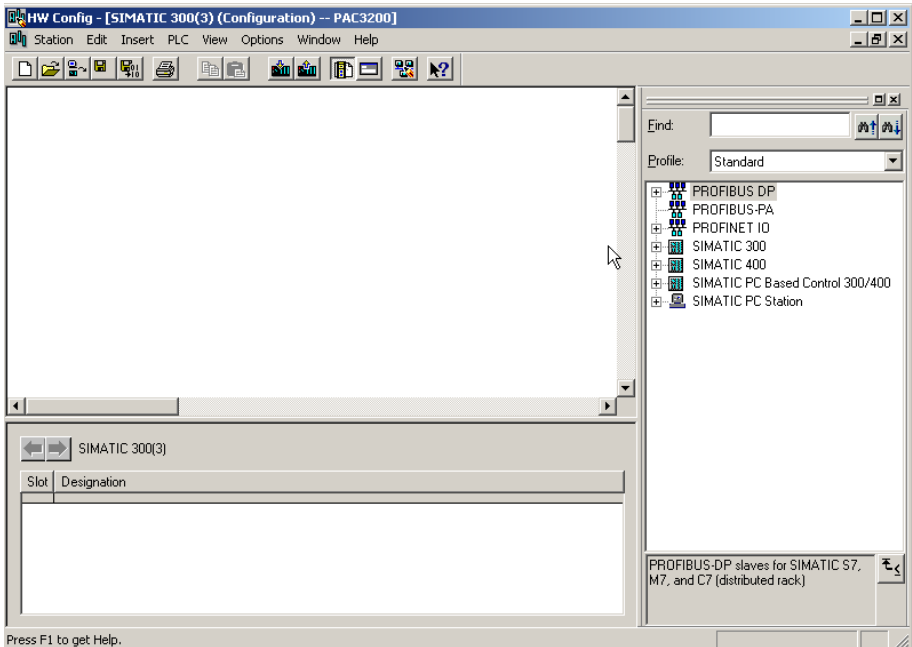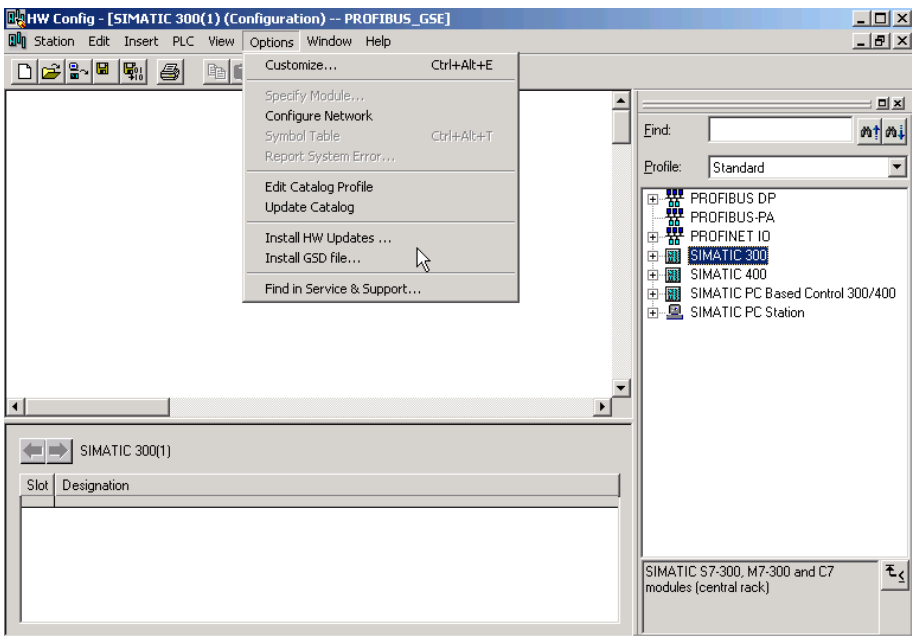
Note
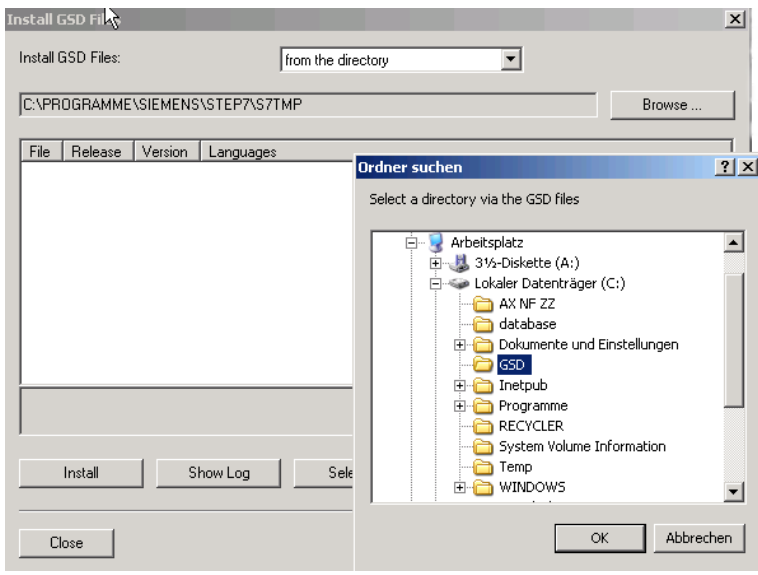
7KM Switched Ethernet PROFINET expansion module
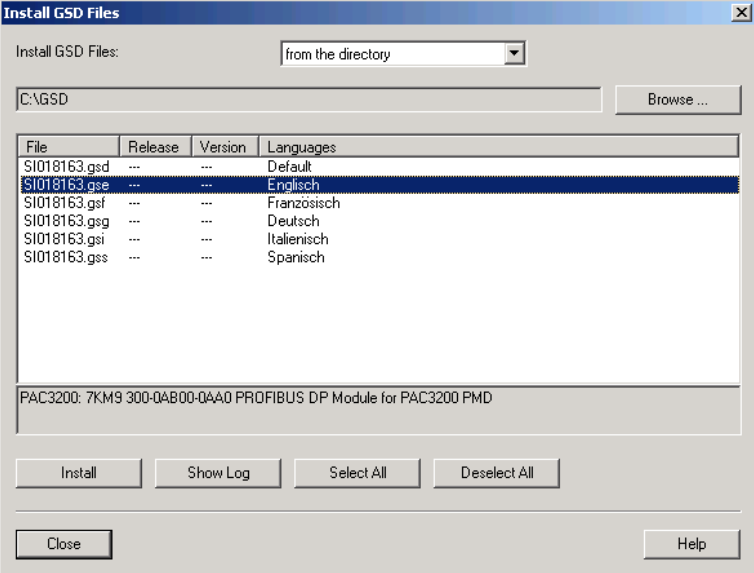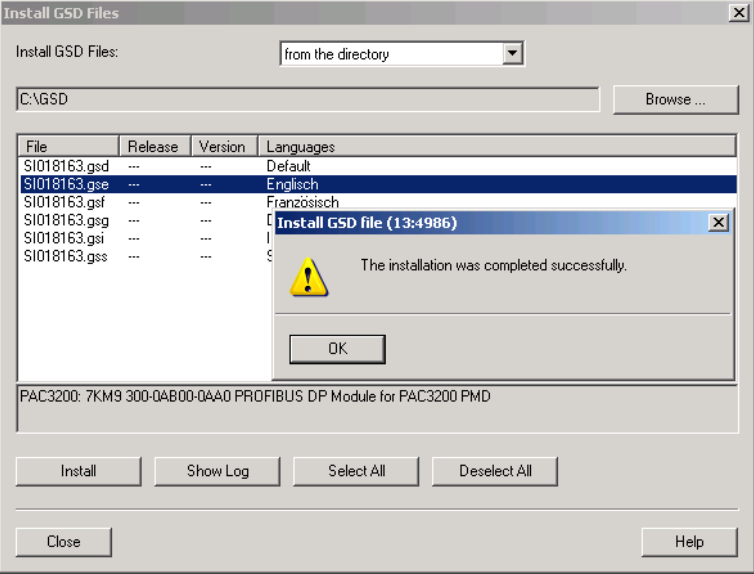
The same procedure applies when using the 7KM Switched Ethernet PROFINET for configuration with GSDML.
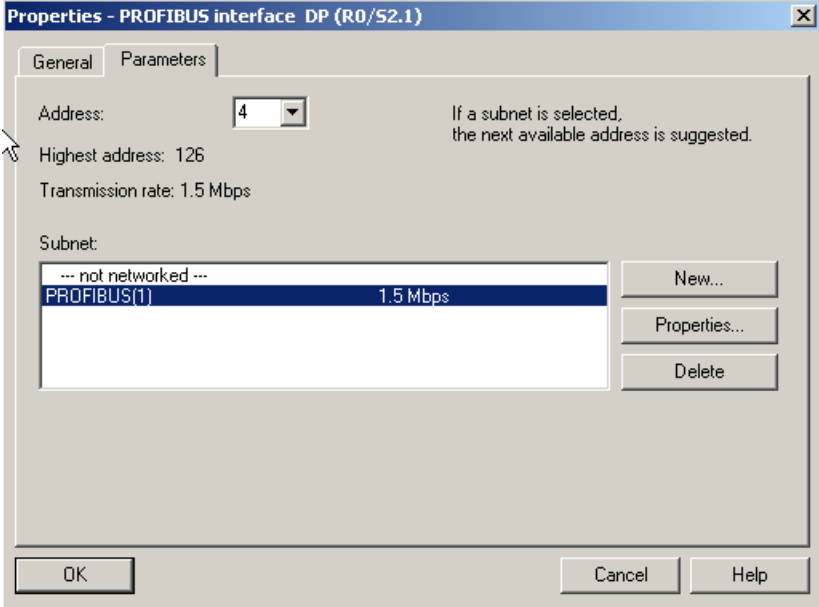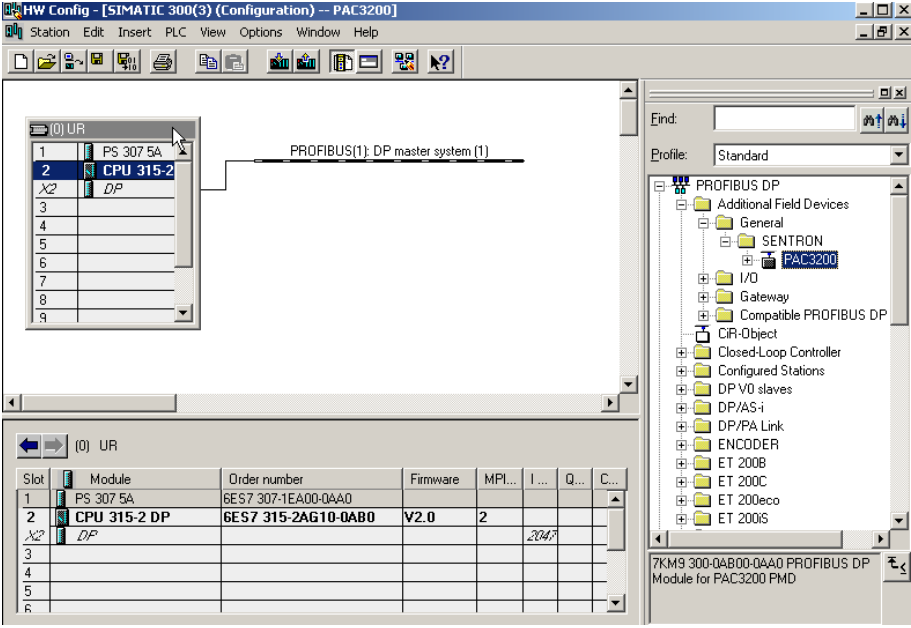
You can find the latest version of the required GSDML file on the Internet (https://support.industry.siemens.com/cs/ww/en/view/59840946).
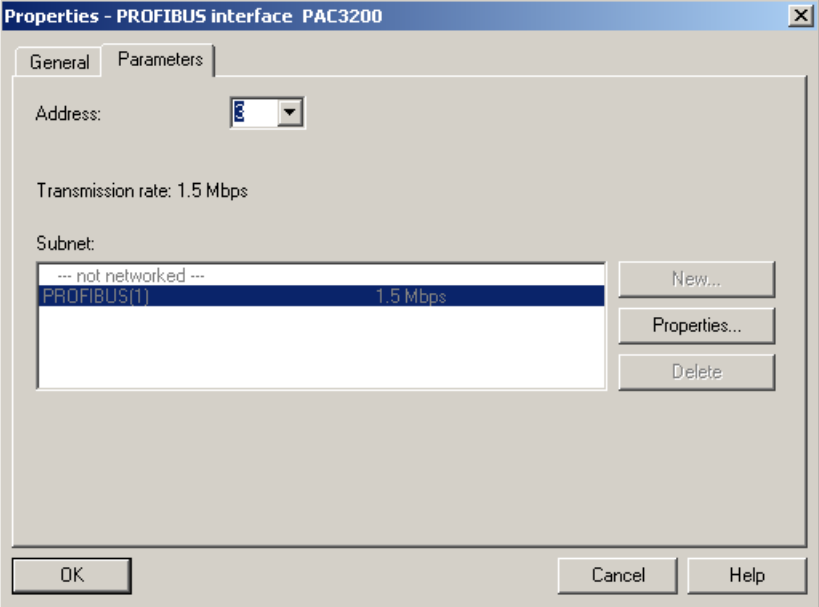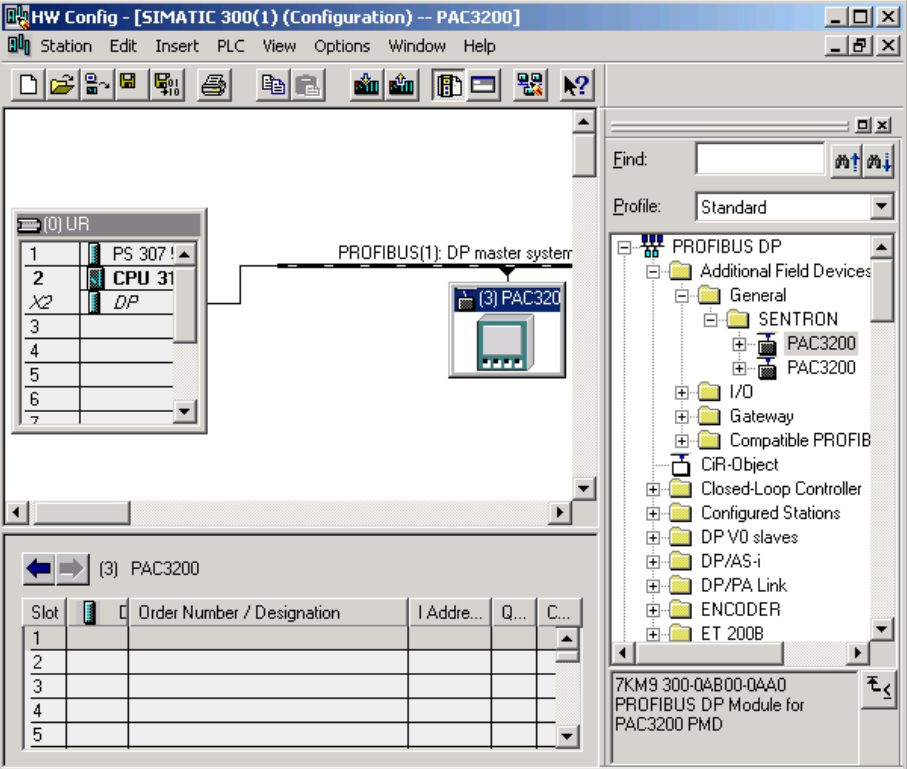
Table 5- 5   Example of how to proceed

Sequence	Screen
1	Start HW Config in the SIMATIC Manager.

HW Config after start-up

| 2 | Confirm in the "Options" > "Install GSD File" menu. |

Call the "Install GSD File" function

Sequence	Screen
3 Select the directory in which the GSD file is stored.	
	Select the directory with the GSD file

Sequence	Screen
4	Install the GSD file.

Installing GSD file

On successful completion of the installation of the GSD file, the following message is displayed:

Installation of the GSD file successfully completed

Sequence	Screen
5 Add a rack and insert in it the modules that are required, e.g. the CPU with PROFIBUS DP interface. After inserting the CPU, a window is opened. Enter the address of the PROFIBUS master here.	 Setting the PROFIBUS address of the master
6 Select the 7KM PAC measuring device in the hardware tree: "PROFIBUS DP" > "Additional Devices" > "SENTRON" > "PAC"	 Add the measuring device to HW Config

Sequence	Screen
7	Drag the 7KM PAC measuring device from the hardware tree to the PROFIBUS DP master system 1. Set the address of the 7KM PAC PROFIBUS DP expansion module.	 Set the address of the 7KM PAC PROFIBUS DP expansion module
8	Click on the icon for the 7KM PAC measuring device.	 HW Config with the integrated 7KM PAC PROFIBUS DP expansion module

Note

Do not use the universal module

Because of the predefined data types and the available measured values, the use of the STEP 7 universal module in the configuration is not supported.

5.3 Configuration with TIA Portal

With TIA Portal V15.0 and higher, the SENTRON devices 7KM PAC3200, 7KM PAC4200 and 3VA molded case circuit breakers including breaker data server COM100/COM800 form an integral part of the hardware library. There is no longer any need to import the GSD or GSDML files; the TIA Portal is already familiar with the aforementioned devices.

You can position and link up the SENTRON devices directly in the network view of the TIA Portal. The SENTRON devices will be treated as objects of the TIA Portal from now on, i.e. you can also parameterize the devices via the TIA Portal.
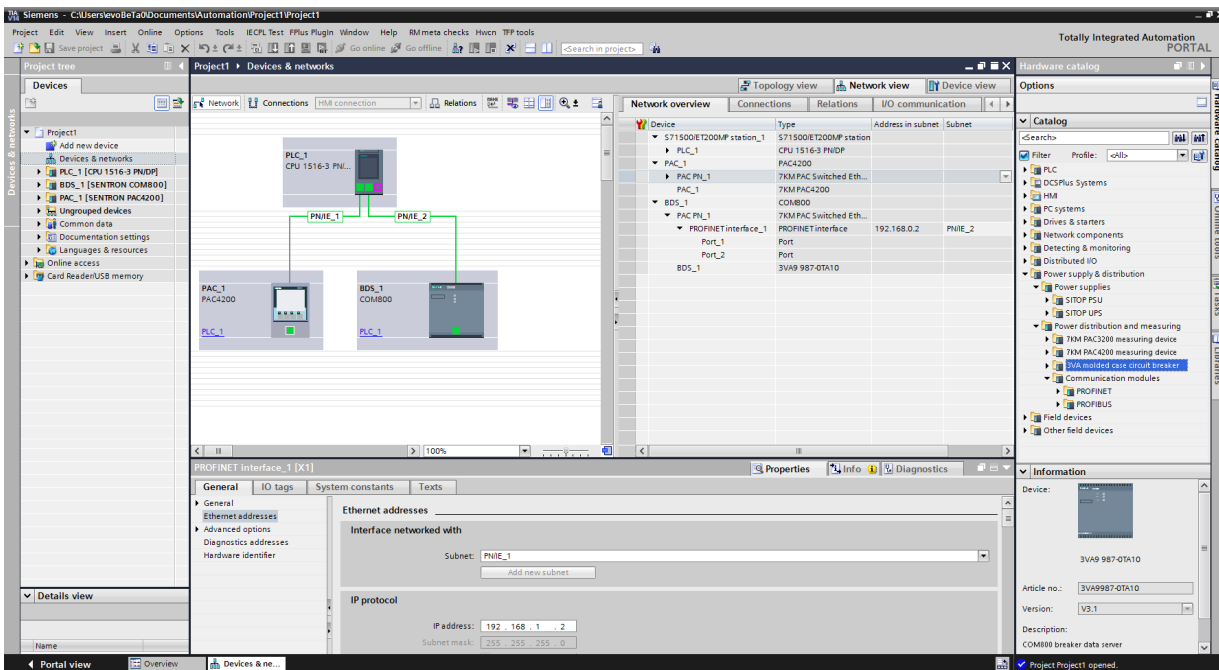
Figure 5-2   Network view of the TIA Portal: 7KM PAC measuring device and 3VA breaker data server to PROFINET IO controller
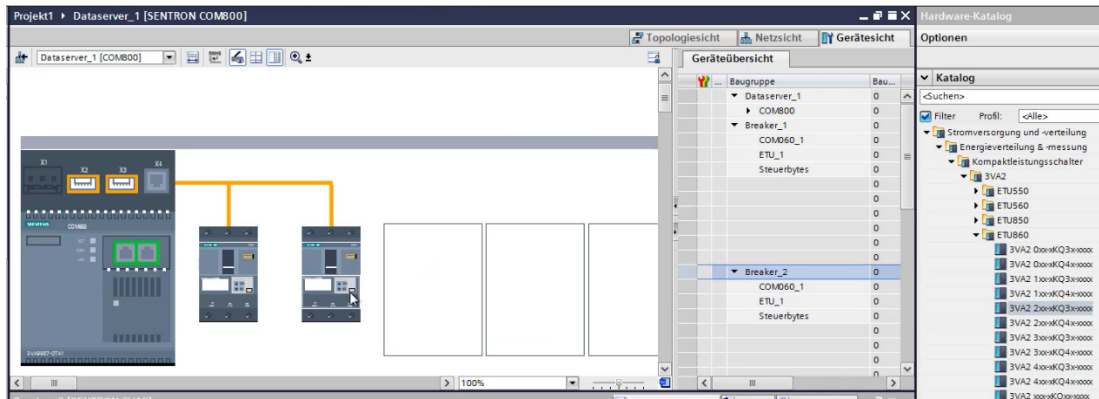
Figure 5-3   Network view of the TIA Portal: 3VA breaker data server to 3VA molded case circuit breakers

Some of the SENTRON devices are already installed and wired locally and networked with PROFIBUS or PROFINET, in which case parameters can be generated in the TIA Portal based on the online information and edited as required.
You can use the hardware detection function of the TIA Portal to automatically detect the PROFINET-capable preinstalled SENTRON devices.

You can find more information in the online help of the TIA Portal.

Data traffic 6

6.1 Measured variables and statuses

The measured variables and status information of the SENTRON devices are available to the higher-level power management system or automation system via PROFIBUS or PROFINET.

The measured variables include, for example:

- The measured values
- The maximum/minimum values of the measured values
- The energy values

The status information includes, for example:

- The set limit values
- The device statuses

You can find a detailed description of the measured variables in the manuals of the relevant SENTRON device. In this manual, you will find the measured variables for PROFIBUS DP and PROFINET.

The measured variables and status information are offered both in cyclic data traffic and acyclic data traffic.

In cyclic data traffic, the measured variables and status information are offered as:

- Pre-defined structures
  - Basic types
  - Energy data profiles e0 to e3
- Individual measured variables

In acyclic data traffic, the measured variables and status information are offered as data sets.

Note

Block libraries for SIMATIC

SENTRON devices offer extensive and diverse measured variables and status information. The PCS 7 Library function block libraries PAC/3WL/3VA SIMATIC simplify and facilitate integration into PCS 7. You can find the libraries on the Internet (https://support.industry.siemens.com/cs/ww/en/ps/19787).

Note

Parameterization/addressing of the expansion modules in conjunction with breaker data server COM100/COM800

You can find detailed information about parameterization and addressing in conjunction with the 3VA breaker data server in the system manual 3VA IEC/UL Molded Case Circuit Breaker Communication (https://support.industry.siemens.com/cs/ww/en/view/98746267).

Transfer of measured variables and statuses

Measured variables and statuses are transferred with the

- Cyclic data traffic and

- Acyclic data traffic

of PROFINET IO and PROFINET DP. PROFINET uses the PROFIenergy profile, which standardizes acyclic data traffic for energy management.

See also

Energy counters (Page 74)

Further documentation (Page 12)

Introduction (Page 7)

6.2 Cyclic data traffic

You can find more information on cyclic data traffic with 3VA molded case circuit breakers on the Internet (https://support.industry.siemens.com/cs/ww/en/view/98746267).

6.2.1 Cyclic data traffic on PROFIBUS DP

Description

In cyclic data traffic, each message frame transfers an optional number of user data. Cyclic data exchange is especially suitable for transferring information that is required continuously and quickly. The time interval between two message frames depends on:

- The number of nodes

- The data volume

- The baud rate

All available data types that PROFIBUS can transfer are defined in the GSD file for the SENTRON device. There are three basic types with predefined measured variables for time-saving commissioning and efficient data transfer. The user can also define individual measured variables to be transferred.

Choosing the basic type

You can configure each SENTRON device individually. During the configuration process, you use the PROFIBUS DP configuring tool to select the following from the GSD file:

- A suitable combination of basic type 1, basic type 2 and other measured variables

- A suitable combination of basic type 3, and other measured variables

---

Note

Note the quantity structure

In the case of 7KM9300-0AB01-0AA0, the maximum quantity structure of the SENTRON devices for PROFIBUS is 240 bytes of input data and 2 bytes of output data.

See also

Standards (Page 99)

Further documentation (Page 12)

6.2.2 Cyclic data traffic on PROFINET IO

Description

In cyclic data traffic, each message frame transfers an optional number of user data. Cyclic data exchange is especially suitable for transferring information that is required continuously and quickly. The 7KM Switched Ethernet PROFINET expansion module fits into the time control of PROFINET Real-Time (RT).

- The PROFINET IO controller specifies the parameterizable updating time.

- The 7KM Switched Ethernet PROFINET expansion module supports updating times from 500 µs to 512 ms.

All available data types that PROFINET can transfer are defined in the GSDML file for the respective SENTRON basic device. There are basic types with predefined measured variables for time-saving commissioning and efficient data transfer. The user can also define individual measured variables to be transferred.

Choosing the basic type

You can configure each SENTRON basic device individually. During the configuration process, use the configuring tool to select the following from the GSDML file:

- A suitable combination of basic type 1 or basic type 2 in the case of 7KM PAC and other measured variables

- A suitable combination of basic type 3 in the case of 7KM PAC , and other measured variables

---

Note

Note the quantity structure

The maximum quantity structure of the SENTRON devices for PROFINET is 240 bytes of input data and 2 bytes of output data.

6.2.3 Basic type 1

Structure

The structure of basic type 1 is fixed. The length of basic type 1 is 20 bytes of input data and 2 control bytes (output data). The following information is transferred in basic type 1.

Table 6- 1   Structure of basic type 1

Byte	Data value	Format	Unit
0 ... 3	Status information	Unsigned long	—
4 ... 7	Current L1	Float32	A
8 ... 11	Current L2	Float32	A
12 ... 15	Current L3	Float32	A
16 ... 19	Total active power	Float32	W

Sample configuration for the 7KM PAC with basic type 1
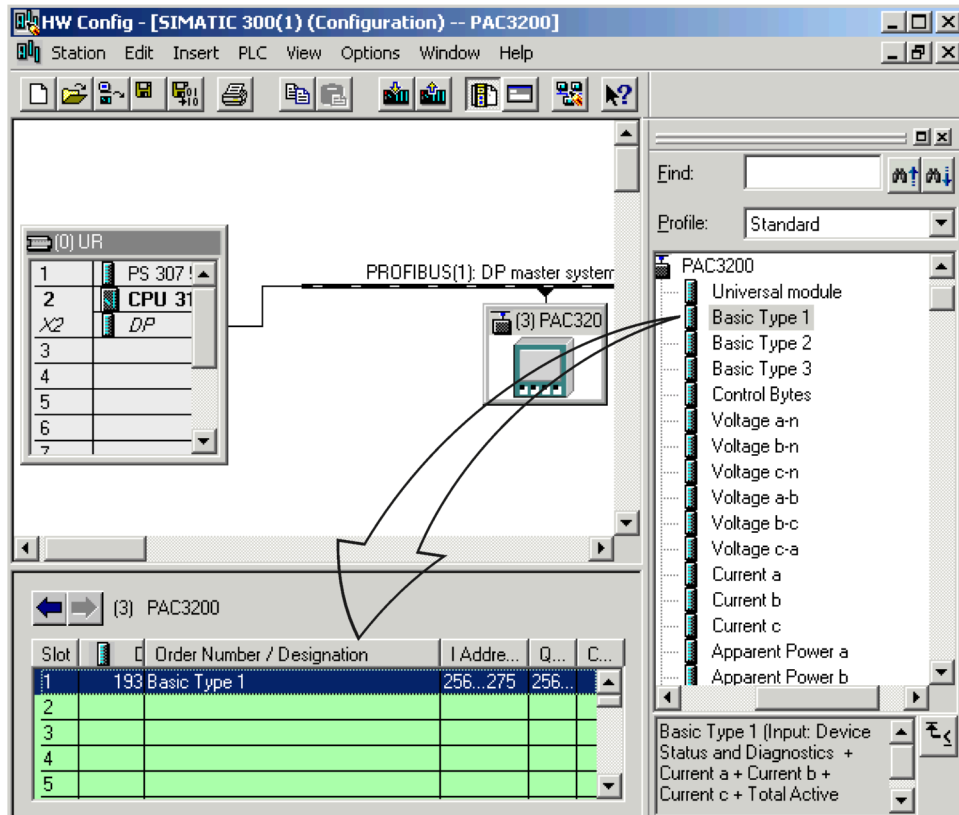
Figure 6-1   Parameterizing the 7KM PROFIBUS DPV1 expansion module - example 1: Add basic type 1 to slot 1

Note

Parameterization of the 7KM Switched Ethernet PROFINET expansion module

You parameterize the 7KM Switched Ethernet PROFINET expansion module in the same way as the 7KM PROFIBUS DP expansion module.

See also

Status information in the cyclic channel (Page 52)

Control bytes (Page 54)

Basic type 2 (Page 46)

Basic type 1 and basic type 2 DS51 (Page 63)

6.2.4 Basic type 2

Structure

Basic type 2 is an extension of basic type 1. This means that you can easily add basic type 1 and basic type 2 during the project design phase. You can also use basic type 2 as a separate unit. The structure of basic type 2 is fixed. Basic type 2 is 24 bytes long.

Table 6- 2 Basic type 2 transfers the following input data

Byte	Data value	Format	Unit
0 ... 3	Voltage L1-L2	Float32	V
4 ... 7	Voltage L2-L3	Float32	V
8 ... 11	Voltage L3-L1	Float32	V
12 ... 19	Active energy import tariff 1	Float64	Wh
20 ... 23	Total power factor	Float32	—

See also

Basic type 1 (Page 44)

Basic type 1 and basic type 2 DS51 (Page 63)

6.2.5 Basic type 3

Structure

The structure of basic type 3 is fixed. Basic type 3 contains the control bytes.

Table 6- 3 Length of basic type 3

Device	Length in bytes
PAC3200/PAC3220	112
PAC4200	116

Table 6- 4   Basic type 3 transfers the following input data:

Byte	Data value	Format	Unit
0 ... 3	Status information	Unsigned long	—
4 ... 7	Voltage L1-N	Float32	V
8 ... 11	Voltage L2-N	Float32	V
12 ... 15	Voltage L3-N	Float32	V
16 ... 19	Voltage L1-L2	Float32	V
20 ... 23	Voltage L2-L3	Float32	V
24 ... 27	Voltage L3-L1	Float32	V
28 ... 31	Current L1	Float32	A
32 ... 35	Current L2	Float32	A
36 ... 39	Current L3	Float32	A
40 ... 43	Power factor L1	Float32	—
44 ... 47	Power factor L2	Float32	—
48 ... 51	Power factor L3	Float32	—
52 ... 55	THD voltage L1[1]	Float32	%
56 ... 59	THD voltage L2[1]	Float32	%
60 ... 63	THD voltage L3[1]	Float32	%
64 ... 67	THD current L1[1]	Float32	%
68 ... 71	THD current L2[1]	Float32	%
72 ... 75	THD current L3[1]	Float32	%
76 ... 79	Line frequency	Float32	Hz
80 ... 83	3-phase average current	Float32	A
84 ... 87	Total apparent power	Float32	VA
88 ... 91	Total active power	Float32	W
92 ... 95	Total reactive power (VARn)	Float32	Var
96 ... 99	Total power factor	Float32	—
100 ... 103	Amplitude unbalance voltage	Float32	%
104 ... 107	Amplitude unbalance current	Float32	%
108 ... 111	Length of last period	Unsigned long	s
112 ... 115	Neutral conductor current[2]	Float32	A

1) On the 7KM PAC3200 THD-R
2) Not on 7KM PAC3200

See also

Status information in the cyclic channel (Page 52)

Control bytes (Page 54)

6.2.6 Energy data profile e0

Energy data profile e0 is a simple profile which can be used to create criteria for a trend analysis based on the current. You can use this profile efficiently with 3VA molded case circuit breakers and 5-series ETUs.

Byte	Data value	Format	Unit
0..3	Current L1	Float32	A
4..7	Current L2	Float32	A
8..11	Current L3	Float32	A

6.2.7 Energy data profile e1

Energy data profile e1 is a basic profile for devices which cannot calculate energy. Only devices which measure three-phase symmetrical loads should be included in this profile.

Byte	Data value	Format	Unit
0..3	Total active power	Float32	W

6.2.8 Energy data profile e2

Energy data profile e2 satisfies all the typical requirements necessary for energy management.

Byte	Data value	Format	Unit
0..3	Total active power	Float32	W
4..7	Total active energy import	Float32	Wh
8..11	Total active energy export	Float32	Wh

6.2.9 Energy data profile e3

Energy data profile e3 satisfies all the typical requirements necessary for energy management.

Byte	Data value	Format	Unit
0..3	Active power L1	Float32	W
4..7	Active power L2	Float32	W
8..11	Active power L3	Float32	W
12..15	Reactive power L1	Float32	var
16..19	Reactive power L2	Float32	var
20..24	Reactive power L3	Float32	var

Byte	Data value	Format	Unit
25..31	Total active energy import	Float64	Wh
32..39	Total active energy export	Float64	Wh
40..47	Total reactive energy import	Float64	varh
48..55	Total reactive energy export	Float64	varh
56..59	Voltage UL1-N	Float32	V
60..63	Voltage UL2-N	Float32	V
64..67	Voltage UL3-N	Float32	V
68..71	Voltage UL1-UL2	Float32	V
72..75	Voltage UL2-UL3	Float32	V
76..79	Voltage UL3-UL1	Float32	V
80..83	Current L1	Float32	A
84..87	Current L2	Float32	A
88..91	Current L3	Float32	A
92..95	Power factor L1	Float32	-
96..99	Power factor L2	Float32	-
100..103	Power factor L3	Float32	-

6.2.10   Free choice of measured variables

Procedure

You can group the measured variables to be transferred as required or add them in addition to the basic types.
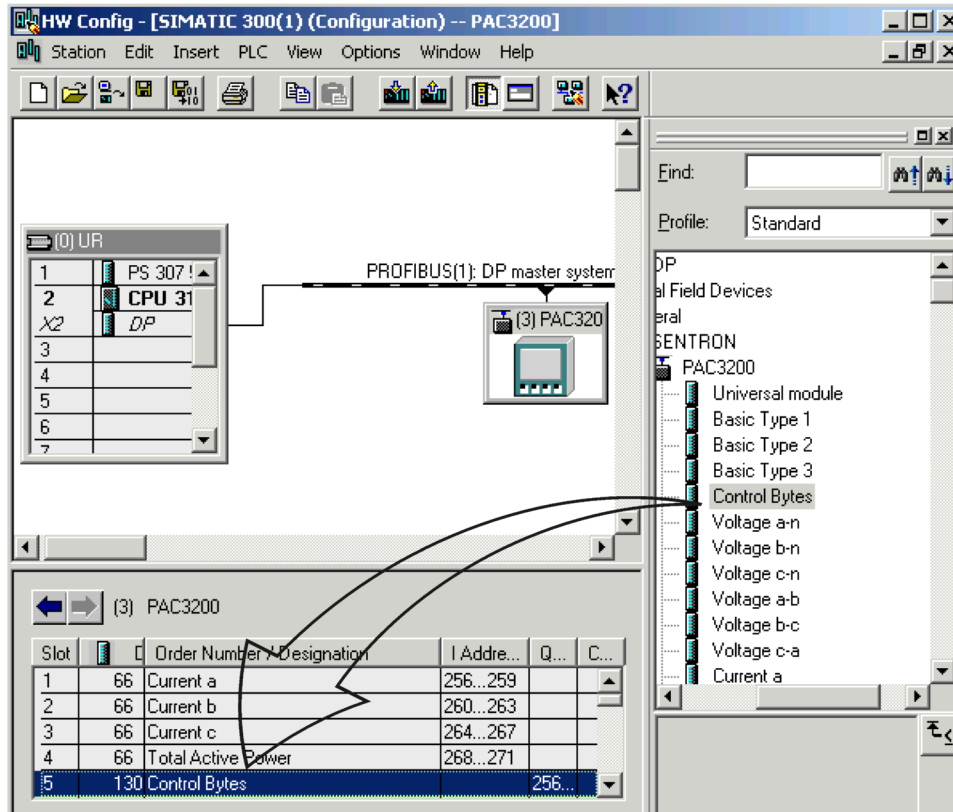
Figure 6-2   Configuring the 7KM PROFIBUS DP expansion module – example 2: Inserting measured variables

Note

You parameterize the 7KM Switched Ethernet PROFINET expansion module in the same way.

6.2.11   Digital inputs and digital outputs on the PAC4200

Procedure

You can read the digital inputs and digital outputs of the SENTRON device and the 7KM PAC 4DI/2DO expansion module via PROFIBUS DP/PROFINET IO.

Figure 6-3   Configuring the digital inputs and digital outputs on the 7KM PAC4200 via PROFIBUS DP

Note

You parameterize the 7KM Switched Ethernet PROFINET expansion module in the same way.

Status of digital inputs and digital outputs of the SENTRON device

The following are available via PROFIBUS/PROFINET:

- "Digital Inputs Status": The input status of the internal inputs of the SENTRON device
- "Digital Outputs Status": The output status of the internal outputs of the SENTRON device

Table 6- 5   Scheme: Digital inputs status and digital outputs status of the 7KM PAC measuring device

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	MSB	—	—	—	—	—	—	—
Byte 1	—	—	—	—	—	—	—	—
Byte 2	—	—	—	—	—	—	—	—
Byte 3	—	—	—	—	—	—	DI / DO 0.1[1)][2)][3)]	DI / DO 0.0[1)][2)], LSB

[1)]   = Read access
[2)]   "0" = OFF; "1" = ON
[3)]   For PAC4200 and PAC3220 only

Status of digital inputs and digital outputs of the 7KM PAC 4DI/2DO expansion module

- "Status Digital Inputs Module 1": The input status of the relevant 7KM PAC 4DI/2DO expansion module
- "Status Digital Outputs Module 1": The output status of the relevant 7KM PAC 4DI/2DO expansion module
- "Status Digital Inputs Module 2": The input status of the relevant 7KM PAC 4DI/2DO expansion module
- "Status Digital Outputs Module 2": The output status of the relevant 7KM PAC 4DI/2DO expansion module

Table 6- 6   Scheme: Digital inputs status and digital outputs status of the 7KM PAC 4DI/2DO

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	MSB	—	—	—	—	—	—	—
Byte 1	—	—	—	—	—	—	—	—
Byte 2	—	—	—	—	—	—	—	—
Byte 3	—	—	—	—	DI 0.3 [1)][2)]	DI 0.2 [1)][2)]	DI / DO 0.1[1)][2)]	DI / DO 0.0[1)][2)], LSB

[1)]   = Read access
[2)]   "0" = OFF; "1" = ON

6.2.12   Status information in the cyclic channel

You can find more information on cyclic data traffic with 3VA molded case circuit breakers on the Internet (https://support.industry.siemens.com/cs/ww/en/view/98746267).

Status information

In cyclic data traffic, the status information is sent on every data exchange at the beginning of a basic type 1 and basic type 3 data structure. You can add the status information during the configuration phase. The status information is treated as diagnostics data for the device.

Table 6- 7   Structure of the 4 bytes of the status information - static diagnostics

Byte	Bit	Description
Byte n System status	0	Synchronization for the average power value is missing or has failed
	1	Device configuration is active
	2	Voltage out of range
	3	Current out of range
	4	Reserved
	5	Reserved
	6	Write protection activated
	7	Reserved
Byte n + 1 Device status	8	Reserved
	9	Maximum pulse rate exceeded
	10	Reserved
	11	Reserved
	12	Reserved
	13	Reserved
	14	Reserved
	15	Reserved
Byte n + 2 Device diagnostics	16	Basic configuration changed
	17	Upper or lower limit violation incoming or outgoing
	18	Maximum pulse rate exceeded
	19	Reserved
	20	Reserved
	21	Reserved
	22	Reserved
	23	Reserved
Byte n + 3 Component diagnostics	24	Reserved
	25	Reserved
	26	Reserved
	27	Reserved
	28	Reserved
	29	Reserved
	20	Reserved
	31	Reserved

The diagnostics information remains active until acknowledged. The status information remains active as long as the cause exists. Status information is not acknowledged.

6.2.13   Control bytes

You can find more information on cyclic data traffic with 3VA molded case circuit breakers on the Internet (https://support.industry.siemens.com/cs/ww/en/view/98746267).

Description

The control bytes are delivered with basic type 1 and basic type 3 as standard. Alternatively, you can add the control bytes during the configuration phase.

These commands can be used to clear the memory contents or to change the tariff, for example. When you set a bit, the function belonging to the bit is activated. You must reset the control bit afterwards. The class 1 master/PROFINET IO controller sends these commands to the PROFIBUS DP slave/PROFINET IO device.

Note

Commands can be lost

If you change a bit of the control byte with a cycle < 1 second, commands can be lost. Changes to bits only become effective with a cycle of ≥ 1 second.

Structure

Table 6- 8   Structure of the control bytes

Byte	Bit	Activation	Description	
Byte n	0	Rising edge transition[1]	Reset the maximum values	
	1	Rising edge transition[1]	Reset the minimum values	
	2	Rising edge transition[1]	Reset the energy counters	
	3	Rising edge transition[1]	Acknowledge device diagnostics	
	4	Rising edge transition[1]	Synchronization of the demand period	
	5	Level sensitive	Process counter start/stop	
	6	Rising edge transition[1]	Copy and reset process counter	
	7	Rising edge transition[1]	Reset process counter	
Byte n + 1	0	Rising edge transition[1]	Switch to high tariff (HT)	
	1	Rising edge transition[1]	Switch to low tariff (LT)	
	2	Level sensitive	Switch output 0.0:	• ON = 1 • OFF = 0
	3	Level sensitive	Switch output 0.1[2]:	• ON = 1 • OFF = 0
	4	—	Reserved	
	5	—	Reserved	
	6	—	Reserved	
	7	—	Reserved	

1) Only a change from 0 to 1 activates this function, e.g. changing bit 8 from 0 to 1 brings about a changeover to the highest tariff. The value 1 or a reset from 1 to 0 has no effect.

2) 7KM PAC4200 and PAC3220

Note

Only one set of control bytes

There can only be one set of control bytes per device. If you add basic type 1 or basic type 3 during the parameterization stage, then you must not add control bytes separately.

See also

Basic type 1 (Page 44)

6.3 Acyclic data traffic

Requirements

For acyclic data traffic, you require:

- For PROFINET IO: a PROFINET IO controller
- For PROFIBUS DP: a DPV1-capable class 1 master or a DPV1-capable class 2 master

Description

In addition to cyclic data traffic, acyclic data can be transferred, e.g. parameters, diagnostics information, commands, further data. Acyclic data transfer takes place in parallel with cyclic data traffic.

You can use acyclic data traffic by means of the following methods:

- The 7KM PAC block libraries for SIMATIC display the measured values in faceplates and make these available in the SIMATIC S7 for further processing.
- SIMATIC S7 CPUs contain system function blocks (SFB 52, SFB 53, SFB 54). With these, the CPUs can read and write the data sets individually and read the interrupt messages.
- Every other PROFIBUS DP master can implement the data sets.

Note

Acyclic connections to masters

The expansion module supports up to five acyclic connections simultaneously:
up to four with class 2 masters and one with a class 1 master.

You can find more information in chapter Protocol sequence for read data record and write data record (Page 70).

6.3.1 Content of the data sets

Data sets for the 7KM PAC measuring devices

Table 6- 9   Data sets of the 7KM PAC measuring devices addressed via slot number 1

PROFINET	PROFIBUS	Data set number	Description	Access
—	X	DS1	System diagnostics	R
X	X	DS47	Flexible data access, reading	RW
X	X	DS48	Flexible data access, writing	RW
—	X	DS51	Basic type 1 and basic type 2	R
X	X	DS93	Commands	W
X	X	DS205	Energy counters	RW
X	X	DS255	I&M device identification	IM0: R IM1 to IM4: RW

Data sets for the 7KM PROFIBUS DP expansion module

In addition, there is a data set for the 7KM PROFIBUS DP expansion module itself. You address this via slot number 0.

Table 6- 10   DPV1 data sets for the 7KM PROFIBUS DP expansion module

Data set number	Description	Access
DS255	I&M data sets	RW

Abbreviation	Meaning
R	Read
W	Write
RW	Read and write

See also

Addressing parameter (Page 68)

6.3.2 System diagnostics DS1 (PROFIBUS DP)

DS1

Data set DS1 contains the data for system diagnostics.

Table 6- 11   Structure of data set DS1 – read access only

Byte	Bit position	Length in bits	Format	Description
0	—	32	Unsigned char	Header
4	—	32	Unsigned long	Reserved
8	—	16	Unsigned short	Reserved
10	—	8	Unsigned char	Length of the diagnostics signal
11	—	8	Unsigned char	Status type of the diagnostics
12	—	8	Unsigned char	Slot number of the diagnostics
13	—	8	Unsigned char	Specifier for the diagnostics
14	0	1	Bit	Reserved
	1	1	Bit	Reserved
	2	1	Bit	Reserved
	3	1	Bit	Reserved
	4	1	Bit	Reserved
	5	1	Bit	Reserved
	6	1	Bit	Reserved
	7	1	Bit	The device diagnostics data is available.
15	0	1	Bit	Internal communication not ready
	1	1	Bit	Internal communication is faulty
	2	1	Bit	Reserved
	3	1	Bit	Data invalid - internal fault (CRC error)
	4	1	Bit	Reserved
	5	1	Bit	Data invalid - internal fault (frame error)
	6	1	Bit	Data invalid - internal fault (timeout)
	7	1	Bit	Firmware PAC, Module incompatible
16	0	1	Bit	Voltage out of range
	1	1	Bit	Current out of range
	2	1	Bit	Maximum pulse rate exceeded
	3	1	Bit	Limit violations
	4	1	Bit	Reserved
	5	1	Bit	Reserved
	6	1	Bit	Reserved
	7	1	Bit	Reserved

Byte	Bit position	Length in bits	Format	Description
17	0	1	Bit	Output not remote operated
	1	1	Bit	Invalid values for operating hours or universal counter[1]
	2	1	Bit	Invalid values for energy counters
	3	1	Bit	Invalid values for PAC parameters[1]
	4	1	Bit	Invalid values for parameterization of limit values[1]
	5	1	Bit	Reserved (invalid data for DSxx)
	6	1	Bit	Reserved (invalid data for DSxx)
	7	1	Bit	Reserved (invalid data for DSxx)
Total bytes: 18				

1) On 7KM PAC3200 only

6.3.3 Flexible data access: Reading/writing of data sets

With flexible data access, the read and write accesses defined for Modbus are mapped in data sets DS47 and DS48 and transferred via PROFIBUS DPV1 or PROFINET IO.

When DS47 (Read DS request) is transferred by the PROFIBUS DP master or PROFINET IO controller, the 7KM expansion module is requested to read the data structures out of the SENTRON device.

When DS48 (Write DS request) is transferred by the PROFIBUS DP master or PROFINET IO controller, the 7KM expansion module is requested to write the transferred values to the SENTRON device.
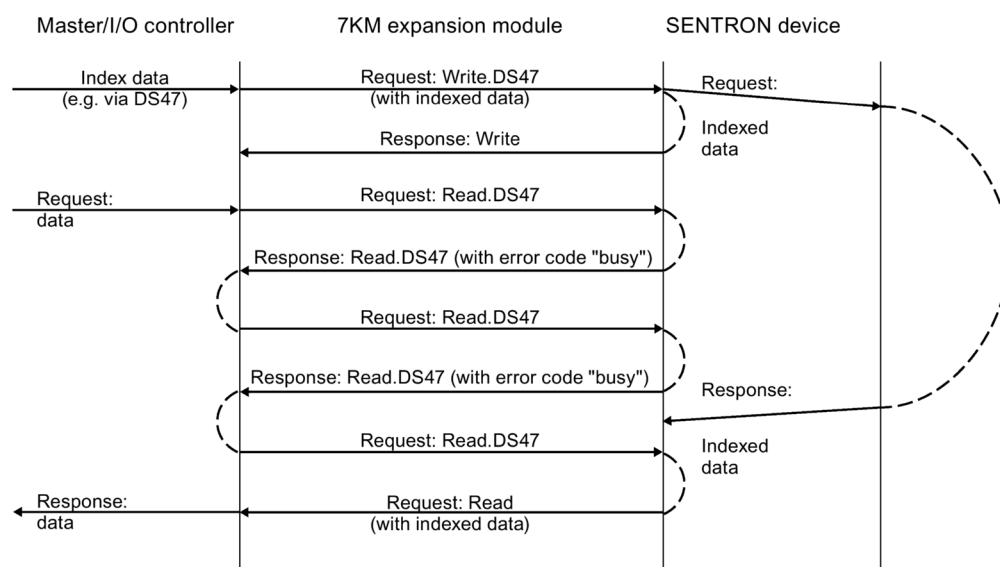
Procedure

Figure 6-4   Example: Reading DS47

The master/controller indexes the data with the Write DS47/48 request. During this procedure, the list of data points to be read/written is written to the SENTRON device (=indexed). The data set may have a maximum length of 240 bytes. If another master/controller attempts to fetch this data, its Read DS request is rejected with the error code 0xB5.

All subsequent Read DS requests of this master/controller and the indexing attempts of all other masters/controllers will be rejected with the error code 0xC2 until the requested data are made available and the original master/controller fetches the requested data.

The data structures for flexible read and write access for the SENTRON devices are described in the following chapters.

You can find the register addresses and data formats in the manuals for the relevant 7KM PAC measuring device or 3VA breaker data server COM100/COM800.

An overview of these manuals is provided in chapter Further documentation (Page 12).

Note

Maximum length of the data structures for read/write access

The data structures which you wish to read/write access may have a maximum length of 200 bytes.

6.3.4 Data structures for flexible read access DS47

You can flexibly read access the data scope of the SENTRON devices you are using by means of data set DS47.

Table 6- 12   Structure of data set DS47 – Read request

Byte	Length (bits)	Format	Data (examples)	Description
0	16	Unsigned short	0x0002	Register address for value 1 *
2	8	Unsigned char	0x01	Device address 1 **
3	8	Unsigned char	0x02	Register number 1 ***
4	16	Unsigned short	0x007A	Register address for value 2 *
6	8	Unsigned char	0x02	Device address 2 **
7	8	Unsigned char	0x04	Register number 2 ***
...				
Max. 200				

* You can find the register address of the measured variable or the status in the manual for the device you are using.

** Internal device address.
  With 7KM PAC measuring devices and the 3VA breaker data server COM100/COM800 = 00.
  In this case, enter the address of the breaker for the individual 3VA molded case circuit breakers in order to read out the same measured variables from several 3VA molded case circuit breakers with a single Read request.

*** Enter the number of registers here. One register is the equivalent of 2 bytes; two registers are the equivalent of 4 bytes, etc.

Table 6- 13   Structure of data set DS47 – Read response

Byte	Length (bits)	Format	Data (examples)	Description
0	16	Float32	65.6	Value 1, e.g. current L1
3	8	Float64	123456789.01	Value 2, e.g. active energy import
11	...			
...				
Max. 200				

The Read response supplies the requested values in the order of their request.

6.3.5   Data structures for flexible write access DS48

You can write individual data items, such as counter statuses and commands, to the SENTRON devices by means of data set DS48.

The table below shows how to set values for the imported and exported active energy of a 3VA molded case circuit breaker, e.g. following a breaker replacement.

Table 6- 14   Structure of data set DS4 – Write request

Byte	Length (bits)	Format	Data (examples)	Description
0	16	Unsigned short	0x007A	Register address for value 1 *
2	8	Unsigned char	0x01	Device address 1 **
3	8	Unsigned char	0x04	Register number 1 ***
4	64	Float64	123456789.01	Value for register 1
12	16	Unsigned short	0x007E	Register address for value 2 *
14	8	Unsigned char	0x02	Device address 2 **
15	8	Unsigned char	0x04	Register number 2 ***
16	64	Float64	000056789.01	Value for register 2
24	...			
...				
Max. 200				

* You can find the register address of the measured variable or the status in the manual for the device you are using.

** Internal device address.
  With 7KM PAC measuring devices and the 3VA breaker data server COM100/COM800 = 00.
  In this case, enter the address of the breaker for the individual 3VA molded case circuit breakers in order to read out the same measured variables from several 3VA molded case circuit breakers with a single Read request.

*** Enter the number of registers here. One register is the equivalent of 2 bytes; two registers are the equivalent of 4 bytes, etc.

6.3.6 Use of flexible data access

Flexible data access is already used by SIEMENS applications such as TIA Portal and powerconfig for communication via PROFINET IO and PROFIBUS DP.
You can find an overview of further documentation in chapter Further documentation (Page 12).

Use of flexible data access with a SIMATIC S7 controller

You can find an example of an application for using flexible data access in the PLC programs of a SIMATIC S7 controller and the blocks associated with it in an FAQ on the Internet (https://support.industry.siemens.com/cs/ww/en/view/109765658).

Use of flexible data access with a PG/PC

You can execute the read and write accesses to the data sets of the SENTRON devices defined in chapters Data structures for flexible read access DS47 (Page 60) and Data structures for flexible write access DS48 (Page 61) by means of an application program from any PG/PC with a PROFINET IO or PROFIBUS DP interface.

You can find a detailed description of how to integrate the program in your PG/PC in the following documents on the Internet:

- SIMATIC NET System Manual: PC Software – Industrial Communication with PG/PC Volume 1 – Basics (https://support.industry.siemens.com/cs/ww/en/view/77376110)

- SIMATIC NET Programming Manual: PC Software – Industrial Communication with PG/PC Volume 2 – Interfaces (https://support.industry.siemens.com/cs/ww/en/view/77378184)

6.3.7 Basic type 1 and basic type 2 DS51

DS51

Data record DS51 contains basic type 1 and basic type 2.

Table 6- 15   Structure of data record DS51 - read access only

Byte	Number of bits	Format	Description
0	32	Struct	Header
4	32	Unsigned long	Reserved
8	16	Unsigned short	Reserved
10	160	Struct	Basic type 1
30	192	Struct	Basic type 2
Total bytes: 54			

See also

Basic type 1 (Page 44)

Basic type 2 (Page 46)

Reading of data sets (Page 73)

6.3.8 Commands DS93

DS93

Data set DS93 contains command information.

Table 6- 16   Structure of data set DS93 – write access only

Byte	Bit position	Number of bits	Format	Description
0	—	32	Struct	Header
4	—	32	Unsigned long	Reserved
8	—	16	Unsigned short	Reserved
10	—	8	Unsigned char	Command counter
11	0	1[1]	Bit	Reset the maximum values
	1	1[1]	Bit	Reset the minimum values
	2	1[1]	Bit	Reset the energy counters
	3	1[1]	Bit	Acknowledge device diagnostics
	4	1[1]	Bit	Synchronization of the demand period
	5	1	Bit	Process counter start/stop
	6	1	Bit	Copy and reset process counter
	7	1	Bit	Reset process counter
12	0	1[1]	Bit	Switch to high tariff (HT)
	1	1[1]	Bit	Switch to low tariff (LT)
	2	1[2]	Bit	Switch output 0.0 [3] (if parameterized)
	3	1[2]	Bit	Switch output 0.1 [3] [4] (if parameterized)
	4	1	Bit	Reserved
	5	1	Bit	Reserved
	6	1	Bit	Reserved
	7	1	Bit	Reserved
13	0	1[1]	Bit	Reset the device to the factory settings
	1	1[1]	Bit	Reset the device (no change to the IP address)
	2	1	Bit	Reset the 7KM PROFIBUS DP expansion module to the factory setting
	3	1	Bit	Reserved
	4	1	Bit	Reserved
	5	1	Bit	Reserved
	6	1	Bit	Reserved
	7	8	Bit	Reserved

Byte	Bit po-sition	Number of bits	Format	Description
14	—	8	Unsigned char	Reserved
Total bytes: 15				

1) "1" means: The action is executed.
   "0" means: The action is not executed.
2) "1" means: Signal = 1
   "0" means: Signal = 0
3) If parameterized and available
4) Not on 7KM PAC3200

6.3.9 Energy counter DS205

DS205

The master can read out and set all energy counters in the Float64 format via data set DS205.

Table 6- 17   Structure of data set DS205 – read access and write access

Byte	Number of bits	Format	Description
0	32	Struct	Header
4	32	Unsigned long	Reserved
8	16	Unsigned short	Reserved
10	64	Float64	Active energy import tariff 1[1]
18	64	Float64	Active energy import tariff 2[1]
26	64	Float64	Active energy export tariff 1[1]
34	64	Float64	Active energy export tariff 2[1]
42	64	Float64	Reactive energy import tariff 1[1]
50	64	Float64	Reactive energy import tariff 2[1]
58	64	Float64	Reactive energy export tariff 1[1]
66	64	Float64	Reactive energy export tariff 2[1]
74	64	Float64	Apparent energy tariff 1[1]
82	64	Float64	Apparent energy tariff 2[1]
Total bytes: 90			

1) 0xFFFFFFFFFFFFFFFF means: No action. Every other value is accepted.

See also

6.3.10 I&M device identification DS255

Data set DS255 contains the I&M data for the unique identification of a 7KM PAC measuring device.

Addressing the I&M data sets

I&M data sets for the SENTRON device: Address slot number 1 and index 255.

I&M data sets for the 7KM PROFIBUS DP ex- Address slot number 0 and index 255. pansion module:

You can address the slot number 0 with the diagnostics address you have defined in the properties of the DP slave in the HW Config, for example.

Table 6- 18   Structure of data set DS255, IM0 data read access only

Byte	Number of bits	Format	Standard	Description
0	8	Unsigned char	0x08	Extended function NUM
1	8	Unsigned char	0x00	Reserved
2	16	Unsigned short	65000	I&M index:= I&M 0
4	80	10 bytes	0x00	I&M header
I&M data block 0				
14	16	Unsigned short	42	IM0 manufacturer ID[1]
16	160	Char 20	—	IM0 order number
36	128	Char 16	—	IM0 serial number
52	16	Unsigned short	—	IM0 hardware version
54	32	1*char 3*unsigned short	—	IM0 firmware version
58	16	Unsigned short	0x0000	IM0 counter for changes
60	16	Unsigned short	F600	IM0 profile ID
62	16	Unsigned short	0x00	IM0 profile-specific ID
64	16	Unsigned short	0x0101	IM0 version of the I&M data
66	16	Unsigned short	001E	IM0-supported I&M data
Total bytes: 68				

1) Standard: 42. "42" stands for Siemens AG.

Table 6- 19   Structure of data set DS255, IM1 data - read access and write access

Byte	Number of bits	Format	Standard	Description
0	8	Unsigned char	0x08	Extended function NUM
1	8	Unsigned char	0x00	Reserved
2	16	Unsigned short	65001	I&M index:= I&M 1
4	80	10 bytes	0x00	I&M header
I&M data block 1				
14	256	Char 32	20h	IM1 plant identifier
46	176	Char 22	20h	IM1 location identifier
Total bytes: 68				

Table 6- 20   Structure of data set DS255, IM2 data - read access and write access

Byte	Number of bits	Format	Standard	Description
0	8	Unsigned char	0x08	Extended function NUM
1	8	Unsigned char	0x00	Reserved
2	16	Unsigned short	65002	I&M index:= I&M 2
4	80	10 bytes	0x00	I&M header
I&M data block 2				
14	128	Char 16	"YYY-MM-DD"	IM2 installation date
30	304	Char 38	20h	Reserved
Total bytes: 68				

Table 6- 21   Structure of data set DS255, IM3 data - read access and write access

Byte	Number of bits	Format	Standard	Description
0	8	Unsigned char	0x08	Extended function NUM
1	8	Unsigned char	0x00	Reserved
2	16	Unsigned short	65003	I&M index:= I&M 3
4	80	10 bytes	0x00	I&M header
I&M data block 3				
14	432	Char 54	20h	IM3 comment
Total bytes: 68				

Table 6- 22   Structure of data set DS255, IM4 data - read access and write access

| Byte	Number of bits	Format	Standard	Description
0	8	Unsigned char	0x08	Extended function NUM
1	8	Unsigned char	0x00	Reserved
2	16	Unsigned short	65004	I&M index:= I&M 4
4	80	10 bytes	0x00	I&M header
I&M data block 2				
14	432	Char 54	00h	IM4 signature
Total bytes: 68				

6.3.11   Addressing parameter

When addressing data, PROFIBUS assumes that the slaves have a modular physical design or that they are structured internally into function units or "modules".

Modular system design

In acyclic data traffic, all data records enabled for write or read accesses are assigned to the modules. You can address these data records with the help of the slot number and the index. The slot number addresses the module and the index addresses the data records belonging to the module. Each data record can be up to 240 bytes in size. Each slot can have its own data records.

You can address each slot individually and access special information of the slot, such as its I&M data.
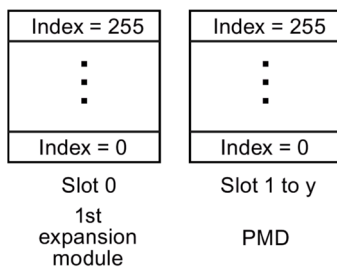
Y   Maximum number of slots for the relevant 7KM PAC measuring device

Figure 6-5   Measuring device: Modular concept

See also

Reading of data sets (Page 73)

PROFIenergy

The 7KM Switched Ethernet PROFINET expansion module supports acyclic data traffic in accordance with the PROFIenergy (Query_Measurement) standard.

See also

Further documentation (Page 12)

6.4 Reading and writing data record with SIMATIC S7

The SIMATIC S7 and other PROFIBUS DP masters offer functions for reading and writing data records.

SIMATIC S7

The SIMATIC S7 offers the following system function blocks:

- SFB 52 "RDREC" (read record): Read a data record
- SFB 53 "WRREC" (write record): Write data record
- SFB 54 "RALRM" (read alarm): Read alarm

The description, functional principle, and use of the system function blocks is contained in the manuals for the SIMATIC and the STEP 7 Online Help.

6.5 Reading and writing data record with other PROFIBUS DP masters

PROFIBUS DP master

Other PROFIBUS DP masters offer the following functions from the PROFIBUS Guideline "Communication and Proxy Function Blocks according to IEC 61131-3":

- Function block"RDREC" (read record): Read a data record
- Function block"WRREC" (write record): Write data record
- Function block"RALRM" (read alarm): Read alarms

6.6 Protocol sequence for read data record and write data record

Fundamentals

The class 1 master has sent authorization and corresponds cyclically over the MS0 channel consecutively with slave 1, slave 2 etc. by means of request and response. Following this, it passes the send authorization to the class 2 master. The class 2 master can establish an acyclic connection with any slave in the remaining time of the programmed cycle, and exchange data with this slave over the MS2 channel. At the end of the current cycle time, it returns the send authorization to the class 1 master. The class 1 master can exchange acyclic data with slaves in a similar way over the MS1 channel.

Different data sets have been defined for the 7KM PAC measuring device. Each data set should have a maximum length of 200 bytes. This supports the routing property of the acyclic data.

The DPV1 protocol is used for acyclic data exchange between a PROFIBUS DP class 1 master or a class 2 master and the slave. The DPV1 protocol is downward compatible. This allows you to connect PROFIBUS DP-V0 and PROFIBUS DP-V1 devices on one segment.

With a class 2 master, you can establish communication with slaves

● that have not been configured and parameterized by this master

● that still have a connection to a class 1 master.

Up to four class 2 DP masters can simultaneously access the SENTRON device via the PROFIBUS DP module.

Message frame formats for DPV1

Function number	Slot	Index	Length

Figure 6-6   DPV1 message frame format Read request

Function number	Slot	Index	Length	Data

Figure 6-7   DPV1 message frame format Read response

Function number	Slot	Index	Length	Data

Figure 6-8   DPV1 message frame format Write request

Function number	Slot	Index	Length

Figure 6-9   DPV1 message frame format Write response

Ensure that the length is exactly correct when writing.

Function number	Slot	Interrupt type	Specifier

Figure 6-10   DPV1 message frame format interrupt response

Function number	Error Decode	Error Code 1	Error Code 2

Function number	• If an error occurs:
	Boolean OR operation of the function number from DPV1 with 0x80
	= B#16#DE in the case of "Read data set"
	= B#16#DF in the case of "Write data set"
Error Decode	Location of error detection: 7KM PROFIBUS DPV1 0x80 expansion module
Error Code 1	Error detection (see also the "Causes for sending Error Code 1" table)
Error Code 2	—

Figure 6-11   DPV1 error message frame

Note

The structures of the error message frame and the error codes comply with the PROFIBUS standard.

You can find more information in IEC 61158 and in "PROFIBUS Profile Guidelines Part 1: Identification & Maintenance Functions".

Function numbers

Table 6- 23   Meanings of the most important function numbers

Function number	Meaning
0x48	Idle
0x51	Data Transport
0x56	Resource Manager Response
0x57	Initiate
0x58	Abort
0x5C	Alarm Acknowledge (on MS1 only)
0x5E	Read
0x5F	Write

Causes

Table 6- 24   Causes for sending Error Code 1

Error Code 1	Error	Meaning
0xA0	Reading error	Occurs during read access to a DSx with "Write only" access authorization
0xA1	Write error	Occurs during write access to a DSx with "Read only" access authorization
0xA9	The function is not supported	Occurs during write access to IM0 data
0xB0	Invalid index	Occurs when DSx not implemented, e.g.: • If the index in the I&M header of the DS255 is invalid. • If the Extended_Func_Num 0x08 in the I&M header of the DS255 is missing.
0xB1	"Write" length error	Occurs when length specification for Write DSx is incorrect
0xB2	Invalid slot	Occurs when invalid slot specified for Read and Write DSx
0xB5	Status conflict	Occurs in the following cases: • Read DS255 without previous indexing • Read DSx without previous indexing • Read DSx, if this DSx has not previously been initialized via Write DSx.[1]
0xC2	Temporarily not possible.	Occurs in the following cases: • Write DS. The 7KM PROFIBUS DP expansion module is busy with another job. • Read DS. The 7KM PROFIBUS DP expansion module is busy with the current job.

1) From 7KM PAC4200

See also

6.7 Reading of data sets

Data sets are read using the CALL mechanism similar to the I&M data of DS255.

Note

More information

You can find more information on the CALL mechanism in IEC 61158-6, Chapter 6, and in "PROFIBUS Profile Guidelines Part 1: Identification & Maintenance Functions".
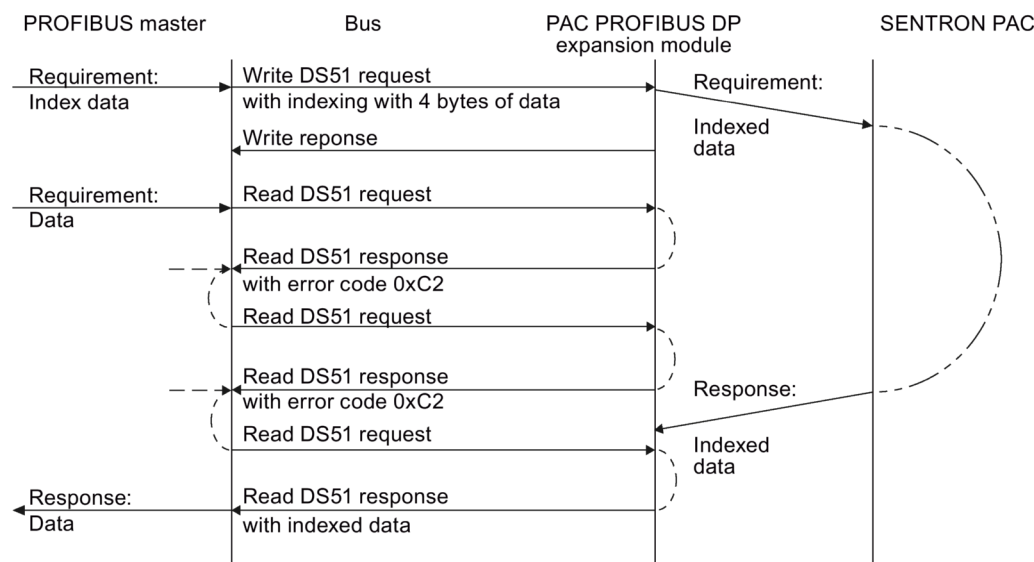

Procedure

Figure 6-12   Example: Reading DS51

The DP master indexes the data with the Write DSxx request. Indexing is carried out with a 4-byte-long header whose content is irrelevant. After indexing the Read DS request, only this DP master is permitted to fetch the data. If another master attempts to fetch this data, its Read DS request will be rejected with error code 0xB5.

All subsequent Read DS requests of this DP master, and the indexing attempts of all other DP masters, will also be rejected with the error code 0xC2 until the DP master fetches the requested data.

Each indexed Read DS request has a maximum life cycle of approximately 10 s. After this, the 7KM PROFIBUS DP expansion module is ready for a new indexing job.

The 7KM PROFIBUS DP expansion module checks the formal correctness of the Write request for:

- Message frame length: e.g. 4 bytes at indexing

- Index

If an error occurs, the request is rejected, and an error code is sent

See also

Protocol sequence for read data record and write data record (Page 70)

Addressing parameter (Page 68)

6.8 Data formats

6.8.1 Energy counters

Energy counters in Float format

The 7KM PAC measuring devices supply the measured variables listed in the table below in Float and Double Float format via PROFIBUS/PROFINET. The values can be more easily evaluated in Float in the SIMATIC, for example. High statuses of the energy counters are resolved in Float format with up to 7 decimal places.

Table 6- 25   Energy counters available in Float format

Name	Format	Value range
Active energy import tariff 1	Float	Overflow 1.0e+12
Active energy import tariff 2	Float	Overflow 1.0e+12
Active energy export tariff 1	Float	Overflow 1.0e+12
Active energy export tariff 2	Float	Overflow 1.0e+12
Reactive energy import tariff 1	Float	Overflow 1.0e+12
Reactive energy import tariff 2	Float	Overflow 1.0e+12
Reactive energy export tariff 1	Float	Overflow 1.0e+12
Reactive energy export tariff 2	Float	Overflow 1.0e+12
Apparent energy tariff 1	Float	Overflow 1.0e+12
Apparent energy tariff 2	Float	Overflow 1.0e+12

In the GSD file, the measured variables in Double Float format are indicated by (D), and the measured variables in Float format by (F).

Note

Resetting the energy counters

If you carry out calculations with these measured variables in Float format, e.g. to calculate the daily or monthly consumption, inaccuracies arise in the case of values with more than 7 representable digits. You can ensure the accuracy of the measured values by resetting the energy counters before the counter value exceeds 7 digits.

See also

Measured variables and statuses (Page 41)

6.8.2 Limits

The 7KM PAC3200 offers limit values. These limit values are available via the PROFIBUS in the "Limit Violations" measured variable.

Limit values of 7KM PAC3200/PAC3220 measuring devices

Table 6- 26   Available limit values

Name	Byte	Bit	Format	Value range	Access
Limit value logic	0	0	Bit	0, 1	R
Limit 0	3	0	Bit	0, 1	R
Limit 1		1	Bit	0, 1	R
Limit 2		2	Bit	0, 1	R
Limit 3		3	Bit	0, 1	R
Limit 4		4	Bit	0, 1	R
Limit 5		5	Bit	0, 1	R

R	Read; read access

Note

Limit violations can trigger diagnostic interrupts.

Limit values of PAC4200 and 3VA molded case circuit breakers

You can find the limit values in the relevant manual.

- System Manual – SENTRON PAC4200 Power Monitoring Device (https://support.industry.siemens.com/cs/ww/en/view/34261595)

- System Manual – 3VA IEC/UL Communication (https://support.industry.siemens.com/cs/ww/en/view/98746267)

See also

Equipment Manual – 7KM PAC3120 and 7KM PAC3220 Monitoring Devices (https://support.industry.siemens.com/cs/ww/en/view/109767307)

6.8.3 Digital inputs status and digital outputs status

Input status and output status of the 7KM PAC measuring device

The following are available via the PROFIBUS:

- The input status of the internal input of the 7KM PAC measuring device in the "Digital inputs status" measured variable

- The output status of the internal output of the 7KM PAC measuring device in the "Digital outputs status" measured variable

Table 6- 27   Scheme: Input status and output status of the 7KM PAC measuring device

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	MSB	—	—	—	—	—	—	—
Byte 1	—	—	—	—	—	—	—	—
Byte 2	—	—	—	—	—	—	—	—
Byte 3	—	—	—	—	—	—	DI / DO 0.1[1) 2)]	DI /DO 0.0[1) 2),] LSB

1) = Read access
2) "0" = OFF; "1" = ON[1)]

Abbreviation	Meaning
LSB	Least significant byte
MSB	Most significant byte

6.9 Acyclic data traffic on PROFINET IO

6.9.1 I&M device identification

This data set contains the I&M0 data for the unique identification of a SENTRON device.

Addressing the I&M0 data set

Switched Ethernet PROFINET expansion module 7KM9300-0AE02-0AA0

I&M data set for SENTRON devices	Address slot: slot number 0 and subslot 1.
I&M data sets for the 7KM Switched Ethernet PROFINET expansion module	Address slot: slot number 0 and subslot 0x8000.

You can address the slot and the subslot with the slot's diagnostics address you have defined in the properties of the PROFINET device in the HW Config, for example.

Switched Ethernet PROFINET expansion module 7KM9300-0AE01-0AA0

I&M data sets for SENTRON devices	Address slot: slot number 0 and subslot 0x8000.
I&M data sets for the 7KM Switched Ethernet PROFINET expansion module	Address slot: slot number 0 and subslot 1.

You can address the slot and the subslot with the slot's diagnostics address you have defined in the properties of the PROFINET device in the HW Config, for example.

Table 6- 28   Structure of data set 0xaff0, IM0 data read access only

Byte	Number of bits	Format	Standard	Description
0	16	Unsigned short	0x0020	Block type: IM0
2	16	Unsigned short	0x0038	Block length
4	8	Unsigned char	0x01	Block version High
5	8	Unsigned char	0x00	Block version Low
I&M data block 0				
0006	16	Unsigned short	42	IM0 manufacturer ID[1]
0008	160	Char 20	—	IM0 order number
0028	128	Char 16	—	IM0 serial number
0044	16	Unsigned short	—	IM0 hardware version
0046	32	1*char 3*unsigned short	—	IM0 firmware version
0050	16	Unsigned short	0x0000	IM0 counter for changes
0052	16	Unsigned short	F600	IM0 profile ID
0054	16	Unsigned short	0x00	IM0 profile-specific ID
0056	16	Unsigned short	0x0101	IM0 version of the I&M data
0058	16	Unsigned short	001E	IM0-supported I&M data
Total bytes: 60				

[1]   Standard: 42. "42" stands for Siemens AG.

Addressing data sets I&M1...4:

Data sets I&M1...4 are stored (read and written) in the SENTRON device.

Table 6- 29   Structure of data set 0xaff1, IM1 data - read access and write access

Byte	Number of bits	Format	Standard	Description
0	16	Unsigned short	0x0021	Block type: IM1
2	16	Unsigned short	0x0038	Block length
4	8	Unsigned char	0x01	Block version High
5	8	Unsigned char	0x00	Block version Low
I&M data block 1				
0006	256	Char 32	20h	IM1 plant identifier
0040	176	Char 22	20h	IM1 location identifier
Total bytes: 60				

Table 6- 30   Structure of data set 0xaff2, IM2 data – read access and write access

Byte	Number of bits	Format	Standard	Description
0	16	Unsigned short	0x0022	Block type: IM2
2	16	Unsigned short	0x0038	Block length
4	8	Unsigned char	0x01	Block version High
5	8	Unsigned char	0x00	Block version Low
I&M data block 2				
0006	128	Char 16	"YYY-MM-DD"	IM2 installation date
0022	304	Char 38	20h	Reserved
Total bytes: 60				

Table 6- 31   Structure of data set 0xaff3, IM3 data - read access and write access

Byte	Number of bits	Format	Standard	Description
0	16	Unsigned short	0x0023	Block type: IM3
2	16	Unsigned short	0x0038	Block length
4	8	Unsigned char	0x01	Block version High
5	8	Unsigned char	0x00	Block version Low
I&M data block 3				
0006	432	Char 54	20h	IM3 comment
Total bytes: 60				

Table 6- 32   Structure of data set 0xaff4, IM4 data - read access and write access

Byte	Number of bits	Format	Standard	Description
0	16	Unsigned short	0x0023	Block type: IM4
2	16	Unsigned short	0x0038	Block length
4	8	Unsigned char	0x01	Block version High
5	8	Unsigned char	0x00	Block version Low
I&M data block 2				
0006	432	Char 54	00h	IM4 signature
Total bytes: 60				

7 Maintenance, service and disposal

7.1 Calibration

The expansion module was calibrated by the manufacturer before shipping. Recalibration is not required provided the environmental conditions are maintained.

7.2 Firmware update

The 7KM PROFIBUS DP and 7KM Switched Ethernet PROFINET expansion modules support firmware updates.

Always use the latest version of the SENTRON powerconfig configuration software for a firmware update. You can find detailed instructions on how to perform firmware updates with SENTRON powerconfig in the related documentation and the online help.

All the device settings remain unchanged during a firmware update.

Note

Performing a firmware update

Before updating the firmware, consult Technical Support to confirm that an update is necessary. Update the firmware only when this is absolutely necessary.

Firmware update of the 7KM PROFIBUS DP expansion module

A firmware update of the 7KM PROFIBUS DP expansion module is performed via the Ethernet interface of the SENTRON basic device you are using.

Firmware update of the 7KM Switched Ethernet PROFINET expansion module

A firmware update of the 7KM Switched Ethernet PROFINET expansion module is performed via the Ethernet interface of the expansion module.

The firmware of the module is signed for security reasons, i.e. the module can only perform an update with original firmware from Siemens and it can never revert to an older version.

A firmware update via the Ethernet interface of the SENTRON device is **not** possible with devices 7KM PAC3200 and 3VA COM100/COM800.

NOTICE
A power failure during a firmware update disables the functionality of the expansion module.
To update the firmware of the expansion module, connect the SENTRON basic device and the expansion module to a fail-safe power supply. If the power fails despite this safety measure, try to restart the firmware update of the expansion module in powerconfig.

Firmware update of host systems via the 7KM Switched Ethernet PROFINET expansion module

With some host systems, e.g. PAC3220 or PAC4200, you can perform the firmware update via the 7KM Switched Ethernet PROFINET expansion module.

7.3   Fault rectification

Error	Measure
Device is not working. Diagnostics LED of the expansion module is Off.	• Check the connection to the SENTRON basic device and tighten the fastening screws if necessary. • Check the supply voltage of the SENTRON basic device.
The module cannot be successfully configured using the SENTRON powerconfig configuring software.	• Check the communication settings (IP address, protocol, subnet, gateway). • The firewall may be preventing access to the SENTRON basic device.
Communication error. The diagnostics LED is not green.	Locate the cause of the error with the help of chapter Diagnostics LED (Page 96) and take action accordingly.

7.4 Warranty

Procedure

> **Note**
>
> **Loss of warranty**
>
> Opening the device invalidates the Siemens warranty. Return defective or damaged devices to Siemens.

If the device is defective or damaged, proceed as follows (only during the warranty period):

1. Uninstall the device.

2. Pack the device such that it cannot be damaged during transport.

3. Return the device to Siemens. You can obtain the address from:

   – Your Siemens sales partner

   – Technical Assistance (https://www.siemens.com/lowvoltage/support-request)

> **Note**
>
> The contents of this manual do not form part of an earlier or existing agreement, commitment or legal relationship, nor shall they modify same. All obligations on the part of Siemens derive from the respective purchase agreement, which also contains the complete and exclusively valid warranty regulation. These contractual warranty provisions are neither extended nor restricted by the implementation of this manual.

7.5 Disposal of waste electronic equipment

Disposal of waste electronic equipment

Waste electronic equipment must not be disposed of as unsorted municipal waste, e.g. household waste. When disposing of waste electronic equipment, the current local national/international regulations must be observed.

Interrupt, error, and system messages 8

8.1 Diagnostic and hardware interrupts for PROFIBUS DP

SENTRON devices can trigger:

- Diagnostic interrupts and
- Hardware interrupts according to PROFIBUS DPV1.

Communication between the SENTRON device (= DP slave) and the PROFIBUS master, e.g. SIMATIC S7 or PC, is based on the protocol sequences defined for PROFIBUS.

The data described below is made available to users through local interfaces.

In the SIMATIC environment, interrupts are signaled via OB40 and OB82. Diagnostic data is read via SFB54.

8.1.1   Diagnostic interrupts according to PROFIBUS DPV1

The table below shows the structure of diagnostic interrupt messages in PROFIBUS DPV1.

Item	Contents	Bit	Value	Contents	
Byte 0	Station status			Contents and values according to PROFIBUS Profile Guidelines Part 3	Slave diagnostics in accordance with standard
Byte 1					
Byte 2					
Byte 3	Master address				
Byte 4	Identification number (high)				
Byte 5	Identification number (low)				
Byte 6	Header		Type + length		Diagnostic interrupt
Byte 7	Interrupt type		1 = Diagnostic interrupt		
Byte 8	Slot no.		0 = module 1 = PAC		
Byte 9	Specifier		1 = incoming 2 = outgoing		
Byte 10	Interrupt data 1	Bit 0	1	Communication with PAC not yet ready	
		Bit 1	1	Communication with PAC not possible	
		Bit 2	d.c.	Reserved	
		Bit 3	1	Internal fault (CRC error)	
		Bit 4	d.c.	Reserved	
		Bit 5		Internal fault (frame error)	
		Bit 6	1	Internal fault (timeout)	
		Bit 7	1	PAC and module firmware versions do not match → Firmware update required	
Byte 11	Interrupt data 2		d.c.	Reserved	
Byte 12	Interrupt data 3	Bit 0	1	Digital outputs not remotely controllable	
		Bit 1	d.c.	Reserved	
		Bit 2	1	Energy counter write operation failed	
		Bit 3	1	Write operation rejected due to write protection or write protection connection changed.	
		Bit 4	d.c.	Reserved	
		Bit 5	1	Internal communication error	
		Bit 6	1	Internal communication error	
		Bit 7	1	Internal communication error	

8.1.2 Process interrupt according to PROFIBUS DPV1

Core statement

The structure of the hardware interrupt message is very similar to that of the diagnostic interrupt messages

Item	Contents	Bit	Value	Contents	
Byte 0	Station status			Contents and values according to PROFIBUS Profile Guidelines Part 3	Slave diagnostics in accordance with standard
Byte 1					
Byte 2					
Byte 3	Master address				
Byte 4	Identification number (high)				
Byte 5	Identification number (low)				
Byte 6	Header		Type + length = 6 without limit violation = 10 with limit violation		Hardware interrupt
Byte 7	Interrupt type		2 = Hardware interrupt		
Byte 8	Slot no.		0 = module 1 = PAC		
Byte 9	Specifier		1 = incoming 2 = outgoing		
Byte 10	Interrupt data 1	Bit 0	1	Voltage out of range	
		Bit 1	1	Current out of range	
		Bit 2	1	Maximum pulse rate exceeded	
		Bit 3	1	Limit violation combination See bytes 12 to 15 for details	
		Bits 4 ... 7	d.c.	Reserved	
Byte 11	Interrupt data 2		d.c.	Reserved	
Byte 12	Interrupt data 3	Bit 0	1	Limit violation combination	
		Bit 1	1	Status combination 1:	
		Bit 2	1	Status combination 2:	
		Bit 3	1	Status combination 3:	
		Bit 4	1	Status combination 4:	
		Bits 5 ... 7	d.c.	Reserved	
Byte 13	Interrupt data 4		d.c.	Reserved	
Byte 14	Interrupt data 5	Bit 0	1	Limit violation 8	
		Bit 1	1	Limit violation 9	
		Bit 2	1	Limit violation 10	
		Bit 3	1	Limit violation 11	

Item	Contents	Bit	Value	Contents	
		Bits 4 ... 7	d.c.	Reserved	
Byte 15	Interrupt data 6	Bit 0	1	Limit violation 0	
		Bit 1	1	Limit violation 1	
		Bit 2	1	Limit violation 2	
		Bit 3	1	Limit violation 3	
		Bit 4	1	Limit violation 4	
		Bit 5	1	Limit violation 5	
		Bit 6	1	Limit violation 6	
		Bit 7	1	Limit violation 7	

8.2 Diagnostic and hardware interrupts for the 7KM Switched Ethernet PROFINET expansion module

The 7KM Switched Ethernet PROFINET expansion module acts as a diagnostics-capable IO device. It is able to detect internal and external faults and to generate corresponding diagnostic interrupts, which you can act upon with the help of interrupt OBs (organization blocks).

You obtain detailed information on the error event using the SFB54 (system function block) in the corresponding interrupt OB. The interrupts of the 7KM Switched Ethernet PROFINET expansion module are implemented as diagnostic interrupts with channel information.

Structure of the diagnostic message

The following sections describe the basic structure of the diagnostic data sets with the individual data blocks:

Diagnostic/maintenance interrupt

BlockType	2 bytes
BlockLength	2 bytes
BlockVersion	2 bytes
InterruptType	2 bytes
API	4 bytes
SlotNumber	2 bytes
SubslotNumber	2 bytes
ModuleIdentNumber	4 bytes
SubmoduleIdentNumber	4 bytes
AlarmSpecifier	2 bytes
UserStructureIdentifier	2 bytes
ChannelNumber	2 bytes
ChannelProperties	2 bytes
ChannelErrorTypes	2 bytes
UserData	x bytes

Hardware interrupt

BlockType	2 bytes
BlockLength	2 bytes
BlockVersion	2 bytes
InterruptType	2 bytes
API	4 bytes
SlotNumber	2 bytes
SubslotNumber	2 bytes
ModuleIdentNumber	4 bytes
SubmoduleIdentNumber	4 bytes
AlarmSpecifier	2 bytes
UserStructureIdentifier	2 bytes
UserData	x bytes

BlockType:

- 0x0002: AlarmNotification "Low" for diagnostic interrupts
- 0x0001: AlarmNotification "High" for hardware interrupts

"BlockLength" data block

The number of subsequent bytes of the diagnostic data set is coded in the "BlockLength" data block. This corresponds to the length of the diagnostic data set without the number of bytes for the "BlockType" and "BlockLength" data fields, each of which has a length of 2 bytes.

"BlockVersion" data block

W#16#0100 := Block version of this diagnostic data set is 1.0.

InterruptType

- W#16#0001 Diagnostic interrupt
- W#16#0002 Hardware interrupt

"API" data block

API = Application Process Identifier. The 7KM Switched Ethernet PROFINET expansion module uses the standard API "0".

"SlotNumber" and "SubslotNumber" data blocks

The 7KM Switched Ethernet PROFINET expansion module is a modular PROFINET IO device with the following structure:

Designation	SlotNumber	SubslotNumber
Head module • Interface • Port1 • Port2	0	0x0001 0x8000 0x8001 0x8002
Module/Breaker	0x0001..x	0x0001..8 (3VA only)

"ModuleIdentNumber" and "SubmoduleIdentNumber" data blocks

These data blocks contain the module and submodule identification number of the module causing the interrupt.

"AlarmSpecifier" data block / sequence

Bits	Designation
Bit 0 - 10	Sequence number
Bit 11	Channel diagnostics available
Bit 12	Manufacturer-specific status information available
Bit 13	At least one channel diagnosis available
Bit 14	Reserved
Bit 15	At least one of the modules configured within this AR signals a diagnosis.

"UserStructureIdentifier" data block

UserStruc- tureIdentifier	Meaning
0x0000 - 0x7FFF	User-specified
0x8000	Channel diagnostics
0x8002	Extended channel diagnostics

The subsequent message frame structure describes the structure of the diagnostic interrupts.

All diagnostic interrupts are signaled as "Channel diagnostics". For that reason, the value of the "UserStructureIdentifier" field is always "0x8000" in the case of diagnostic interrupts.

Hardware interrupts are signaled as "User-specified" and have the values 0x0000 to 0x7FFF. The precise structure of the hardware interrupts is described below.

"ChannelNumber" data block

Channel-Number	Meaning
0x0000 - 0x7FFF	Manufacturer-specific
0x8000	Submodule

"ChannelProperties" data block

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
											.Type				
							.Acc								
					.Qualifier										
			.Specifier												
.Direction															

"ChannelProperties.Type" data block (bits 0 to 7)

Value	Meaning
0	If "ChannelNumber" has the value 0x8000
1	1 bit
2	2 bits
3	4 bits
4	8 bits
5	16 bits
6	32 bits
7	64 bits

"ChannelProperties.Acc" data block (bit 8)

Value	Meaning
0	If "ChannelNumber" has the value 0x8000
1	Channel error group signal (more than one channel affected)

Combination of "ChannelProperties.Qualifier" (bits 9/10) and "ChannelProperties.Specifier" (bits 11/12)

Maintenance required (bit 9)	Maintenance demanded (bit 10)	Specifier bits 11/12	Meaning	Diagnostics in user programs
0	0	00	All lower-level diagnostics are no longer pending.	Evaluation of diagnostic interrupts with SFB54 and OB82
		01	Diagnostics is pending.	Evaluation of diagnostic interrupts with SFB54 and OB82 Read data set with SFB52
		10	Diagnostics is no longer pending.	Evaluation of diagnostic interrupts with SFB54 and OB82
		11	Status message – only possible for manufacturer-specific errors.	
0	1	00	Reserved	-
		01	Maintenance required is pending.	Evaluation of diagnostic interrupts with SFB54 and OB82 Read data set with SFB52
		10	Maintenance required is no longer pending.	Evaluation of diagnostic interrupts with SFB54 and OB82
		11	Maintenance required is no longer pending – all others are still pending.	
1	0	00	Reserved	-
		01	Maintenance demanded is pending.	Evaluation of diagnostic interrupts with SFB54 and OB82 Read data set with SFB52
		10	Maintenance demanded is no longer pending.	Evaluation of diagnostic interrupts with SFB54 and OB82
		11	Maintenance demanded is no longer pending – all others are still pending.	
1	1	00	Reserved	-
		01	Graded diagnostics is pending.	Evaluation of diagnostic interrupts with SFB54 and OB82 Read data set with SFB52

Maintenance required (bit 9)	Maintenance demanded (bit 10)	Specifier bits 11/12	Meaning	Diagnostics in user programs
		10	Graded diagnostics is no longer pending.	Evaluation of diagnostic interrupts with SFB54 and OB82
		11	Graded diagnostics is no longer pending – all others are still pending.	

"ChannelProperties.Direction" data block (bits 13 to 15)

Value	Meaning
000	Manufacturer-specific
001	Input
010	Output
011	Input/Output
100 - 111	Reserved

"ChannelErrorType" data block

The messages for the diagnostic and maintenance interrupts are signaled in the "ChannelErrorType" field.
Specifically for 7KM PAC measuring devices and the 3VA breaker data server COM100/COM800, more precise interrupt information is defined as follows in the "ChannelErrorType" field:

ChannelError-Type (decimal)	Interrupt type	Device
16	Internal communication not ready	All
17	Internal communication failed	All
18	Data invalid (CRC error)	All
19	Data invalid (frame error)	All
20	Data invalid (timeout)	All
21	Firmware PAC, module incompatible	All
26	Output not remote operated	PACx200
27	Invalid values for operating hours or universal counter	PACx200
28	Invalid value for energy counter	PACx200
29	Invalid settings for PMD	PACx200
30	Invalid settings for limits	PACx200
257	Write access denied	PAC4200 + COMx00
258	Breaker maintenance required	COMx00
260	Invalid data for DS47	All
261	Invalid data for DS48	All
262	Invalid data for DS207	All
263	Delayed acknowledge alarm	COMx00
264	Invalid action (write protection)	All

Hardware interrupt

The structure of the hardware interrupt differs from the diagnostic interrupt from the "UserStructureIdentifier" field. The hardware interrupt messages for the 7KM PAC measuring devices and the 3VA breaker data server COM100/COM800 are defined as follows:

UserStruc-tureIdentifier (hex)/message	UserData
0x7FFF Status changes of breakers (ON > Trip, OFF > ON, ON > OFF, Trip > OFF), COM100/COM800 only	Byte0 := 0x01 ... 0x08: Breaker number Byte1 := New status 1: OFF 2: ON 3: Trip
0x7FFE Change of "Volt-age out of range" (7KM PAC meas-uring devices only)	1: Voltage out of range active 0: Voltage out of range inactive
0x7FFD Change of "Cur-rent out of range" (7KM PAC meas-uring devices only)	1: Current out of range active 0: Current out of range inactive
0x7FFC Change of "Maxi-mum pulse rate exceeded" status (7KM PAC meas-uring devices only)	1: Maximum pulse rate exceeded active 0: Maximum pulse rate exceeded inactive
0x7FFB Change of limit vi-olation status (all devices)	You can find detailed information in chapter Limit values (Page 75).
0x7FFA Change of warn-ing in overload state (3VA breaker data server COM100/COM800 only)	1: Breaker in overload state (active) 0: Breaker not in overload state (inactive)

8.3 Diagnostics LED

Description

The diagnostics LED indicates the communication status.

Table 8- 1   Status and fault display by the LED

Color	Status	Description	Measures
Green	Off	No voltage on the 7KM PROFIBUS DP / 7KM SWITCHED ETHERNET PROFINET expansion module	1. Check that the 7KM PAC PROFIBUS DP / 7KM SWITCHED ETHERNET PROFINET expansion module is connected to the 7KM PAC measuring device correctly. 2. Switch on the supply voltage to the 7KM PAC measuring device.
Green	Static ON	PROFIBUS DP communication OK. Cyclic data exchange with the class 1 master.[1] PROFINET IO communication is OK. Cyclic data exchange with the PROFINET IO controller.	—
Green	Flashing	PROFIBUS DP communication OK. Data exchange with the class 2 master.[2] PROFINET IO communication is OK. Data exchange with the PROFINET IO supervisor.	—
Red	Static ON	Bus fault. Communication is not possible. No PROFIBUS DP communication with a class 1 or class 2 master.	7KM PROFIBUS DP expansion module: • Set a valid PROFIBUS address on the 7KM PAC measuring device. • Check the bus installation. • Check that the bus connector is correctly inserted. • Check whether the bus cable to the PROFIBUS DP master is interrupted. • Check the bus terminator.

Color	Status	Description	Measures
		No PROFINET IO communication with a PROFINET IO controller or a PROFINET IO supervisor.	7KM SWITCHED ETHERNET PROFINET expansion module: • Set a valid NameOfStation. • If necessary, correct the IP settings. • Check the bus installation. • Check that the bus connector is correctly inserted. • Check if the connecting cable to the PROFINET IO controller has been disconnected.
Red	Flashing	Parameter assignment error • The slave/device has not been parameterized or has been wrongly parameterized. • An incorrect station address has been assigned. • An incorrect GSD/GSDML file has been used. Error in configuration: • The configuration message frame is incorrect.	• Check the communication and the parameter assignment. • Check the PROFIBUS address or, in the case of the 7KM SWITCHED ETHERNET PROFINET expansion module, the NameOfStation and IP settings. • Check whether the GSD/GSDML file matches the firmware version and the hardware version of the expansion module.
Orange	Static ON	Communication between the module and the 7KM PAC measuring device has been interrupted.	Check the operating capability of the 7KM PAC measuring device.
		The orange LED lights up briefly, e.g. during the initialization phase • The LED turns green when communication has been restored.	The usual diagnostics options on the master, e.g. error OB8x, are available for use.
		The LED lights up orange for a longer time: An internal fault has occurred.	• Restart the device. • Replace the expansion module and/or the device.
Orange	Flashing	No parameters for the expansion module are displayed on the 7KM PAC measuring device. Hardware fault on the expansion module or the 7KM PAC measuring device, e.g.: 12 V too weak or not present	Replace the module and/or the 7KM PAC measuring device.
Green, red, orange	Flashing	A firmware update is active.	Allow the firmware update to run to the end! The firmware update of the expansion module takes approximately 8 to 13 minutes. **Do not interrupt the operation!**
1) A parallel connection to a class 2 master/PROFINET IO supervisor has no effect on the green status of the LED. 2) This is only the case if there is no connection to the class 1 master/PROFINET IO controller.			

Technical data

9

9.1 Standards

Description

Table 9- 1   The device meets the following standards

Standard	Title
IEC 60603-7	Connectors for electronic equipment - Part 7: Detail specification for 8-way, shielded, free and fixed connectors
IEC 61158-2	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 2: Physical layer specification and service definition"
IEC 61158-3	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 3: Data link service definition"
IEC 61158-4	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 4: Data link protocol specification"
IEC 61158-5	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 5: Application layer service definition"
IEC 61158-6	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 6: Application layer protocol specification"
IEC 61784-1	PROFIBUS and PROFINET standard
EN 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments
EN 61000-6-3	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments
SN 27095	Testing of switching and control equipment for marine applications (Siemens standard)

Note
Other standards

In addition to the above-mentioned standards, those listed in the "SENTRON PACxxxx" manual also apply.

Approvals

Symbol	Approval
CE	**CE conformity** Applied directives and standards can be found in the EU Declaration of Conformity.
	Approval for Australia and New Zealand Regulatory Compliance Mark
EAC	Approval for Eurasian Economic Union
cULus	Approvals for USA and Canada Products bearing this mark meet both Canadian (CSA) and American (UL) requirements.

You can download the relevant certificates from the Siemens Support website.

See also

Siemens Support (https://support.industry.siemens.com/cs/ww/en/ps/cert)

9.2 Technical specifications of the 7KM PROFIBUS DP expansion module

Mechanical data

Table 9- 2   Mechanical data of the 7KM PROFIBUS DP expansion module

	Values
Dimensions of housing (height x width x depth)	63 mm x 43 mm x 22 mm
	2.5 in x 1.7 in x 0.9 in
Dimensions of housing with sub D socket (height x width x depth)	69 mm x 43 mm x 22 mm
	2.7 in x 1.7 in x 0.9 in
Mounting position	Vertical on the 7KM PAC measuring device
Housing design	VDT 3400 structure 36
Tolerances	According to DIN 16901:1982-11
Weight	45 g
Connector for the 7KM PAC measuring device	14-pin connector
Length of cable	Dependent on baud rate. You can find more information about cable lengths in the IEC 61158-2 standard.
Power supply	No external power supply necessary. Power supply via the SENTRON basic unit.
Cooling	Passive air cooling in form of ventilation slots
Flammability class	V-0

Electrical data

Table 9- 3   Electrical data of the 7KM PROFIBUS DP expansion module

	Values
ANSI TIA/EIA-485-A[1)] Protective circuit for PROFIBUS interface, galvanically isolated from the device	5 V ± 5%
Maximum current (of 5 V on PROFIBUS DP connector)	10 mA, maximum
Electrical isolation between the 7KM PAC measuring device and the PROFIBUS DP interface	500 V
Galvanic isolation	In expansion module
Insulating voltage	Max. 500 V

1) Previously RS 485

Ambient and environmental conditions

Table 9- 4   Ambient and environmental conditions

Ambient and environmental conditions	Values
Degree of protection in accordance with EN 60529	IP20
Permissible degree of pollution	2 in accordance with IEC 61010-1:2001
Operation in enclosed dry rooms only	
Recycling symbol	> PC / ABC <

Note

Other technical specifications

The other mechanical and electrical data and ambient and environmental conditions are identical to those of the 7KM PAC measuring devices or 3VA COM100/COM800 you are using. You can find more information in the operating instructions and equipment manuals for the 7KM PAC measuring device or 3VA COM100/COM800 you are using.

See also

Standards (Page 99)

9.3 Technical specifications of the 7KM Switched Ethernet PROFINET expansion module

Mechanical data

Table 9- 5   Mechanical data

	Values
Dimensions of housing (height x [1] width x depth)	63 mm x 43 mm x 22 mm 2.5 in x 1.7 in x 0.9 in
Mounting position	Vertical on the 7KM PAC measuring device
Housing design	VDT 3400 structure 36
Tolerances	According to DIN 16901:1982-11
Weight	36 g
Connector for the 7KM PAC measuring device	14-pin connector
Length of cable	At least CAT5, < 100 m You can find more information on the cable lengths on the Internet (http://www.profibus.com/nc/downloads/downloads/profinet-cabling-and-interconnection-technology/display/).
Power supply	No external power supply necessary. Power supply via the SENTRON basic unit.
Cooling	Passive air cooling in form of ventilation slots
Flammability class	V-0

Electrical data

Table 9- 6   Electrical data

	Values
Electrical isolation between the 7KM PAC measuring device and the Ethernet interface of the 7KM Switched Ethernet PROFINET expansion module.	1500 V AC
Galvanic isolation	In expansion module
Electrical isolation between the Ethernet interface and the Ethernet shield	500 V AC
Note the information in the installation instructions: AUTOHOTSPOT	

Ambient and environmental conditions

Table 9- 7   Ambient and environmental conditions

Ambient and environmental conditions	Values
Degree of protection in accordance with EN 60529	IP20
Permissible degree of pollution	2 according to IEC 61131
Operation in enclosed dry rooms only.	

Note
Other technical specifications

The other mechanical and electrical data and ambient and environmental conditions are identical to those of the 7KM PAC measuring devices or 3VA COM100/COM800 you are using. You can find more information in the operating instructions and equipment manuals for the 7KM PAC measuring device or 3VA COM100/COM800 you are using.

9.4   Communication interface of the 7KM PROFIBUS DP expansion module

Technical specifications

Table 9- 8   Technical specifications for the communication interface

	Values
Connector	9-pin, sub D socket
PROFIBUS DP data transfer: supported baud rate in kbps	9.6 / 19.2 / 45.45 /, 93.75 / 187.5 / 500 / 1 500 / 3 000 / 6 000 / 12 000
Supported address area	1 to 126 [1]
Supported communication protocols	PROFIBUS DPV1 for: • Cyclic data exchange with class 1 master • Acyclic data exchange with class 1 master and class 2 master • DPV2 with clock synchronization
Measured variables to be transferred	Definable via GSD file or acyclically via data sets
1) Each device on the bus must have a unique address. Address 126 is only used for commissioning purposes. It must not be used for data communication.	

Pin assignment of the 7KM PROFIBUS DP connection

The 7KM PROFIBUS DP expansion module uses a 9-pin sub D socket.
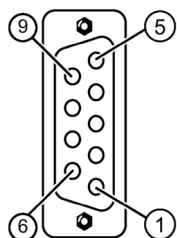
Figure 9-1   9-pin sub D socket

Table 9- 9   Pin assignment for the PROFIBUS connection

Pin	Designation	Meaning	Range
1	NC	Not assigned	—
2	NC	Not assigned	—
3	RxD/TxD-P	Receive/transmit data-P	ANSI TIA/EIA-485-A[1]
4	Control-P (RTS)	Control signal	TTL
5	DGND	PROFIBUS data reference potential	GND
6	VP	Power supply output [2]	5 V_{EXT} / 10 mA
7	NC	Not assigned	—
8	RxD/TxD-N	Receive/transmit data-N	ANSI TIA/EIA-485-A[1]
9	NC	Not assigned	—

1) Previously RS 485
2) Only for the bus terminating resistors

9.5 Communication interface of the 7KM Switched Ethernet PROFINET expansion module

Technical specifications

Table 9- 10   Technical specifications for the communication interface

	Values
Industrial Ethernet: IRT-enabled switch	• Auto crossover • Auto negotiation
Connector	2 shielded 8-pin RJ45 sockets [1]
PROFINET IO data transfer: Supported data transfer rate in Mbps	10 / 100
NameOfStation [2]	Maximum 26 characters
Supported communication protocols	PROFINET infrastructure protocols, such as • SNTP • LLDP • SNMP • SR (system redundancy) • MRP • MRPD • DR
Measured variables to be transferred	Definable via GSDML file or acyclically via the PROFIenergy profile

[1] The connector must comply with the requirements of the PROFINET guideline for cable lengths in Section 8.1.2. – Internet (http://www.profibus.com/nc/downloads/downloads/profinet-cabling-and-interconnection-technology/display/)

[2] Each device on the bus must have a unique NameOfStation and a corresponding IP configuration.

9.6 Labeling

7KM PROFIBUS DP expansion module

The figure below shows the inscriptions of the 7KM Switched Ethernet PROFINET and 7KM PROFIBUS DP expansion modules.
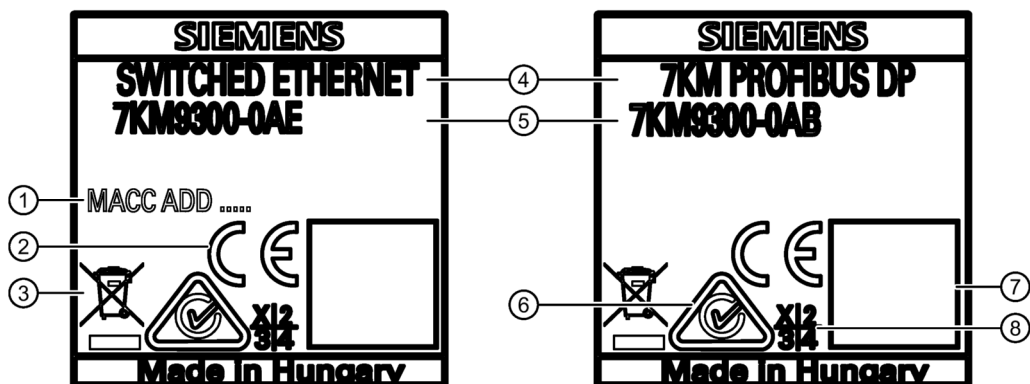
① MAC address
② CE marking (European Union)
③ The device must not be disposed of with general domestic waste.
④ Module designation
⑤ Article number
⑥ RCM test symbol
⑦ 2D code (serial number of the device)
⑧ Product version ID

Dimension sheets

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7KM PROFIBUS DP expansion module
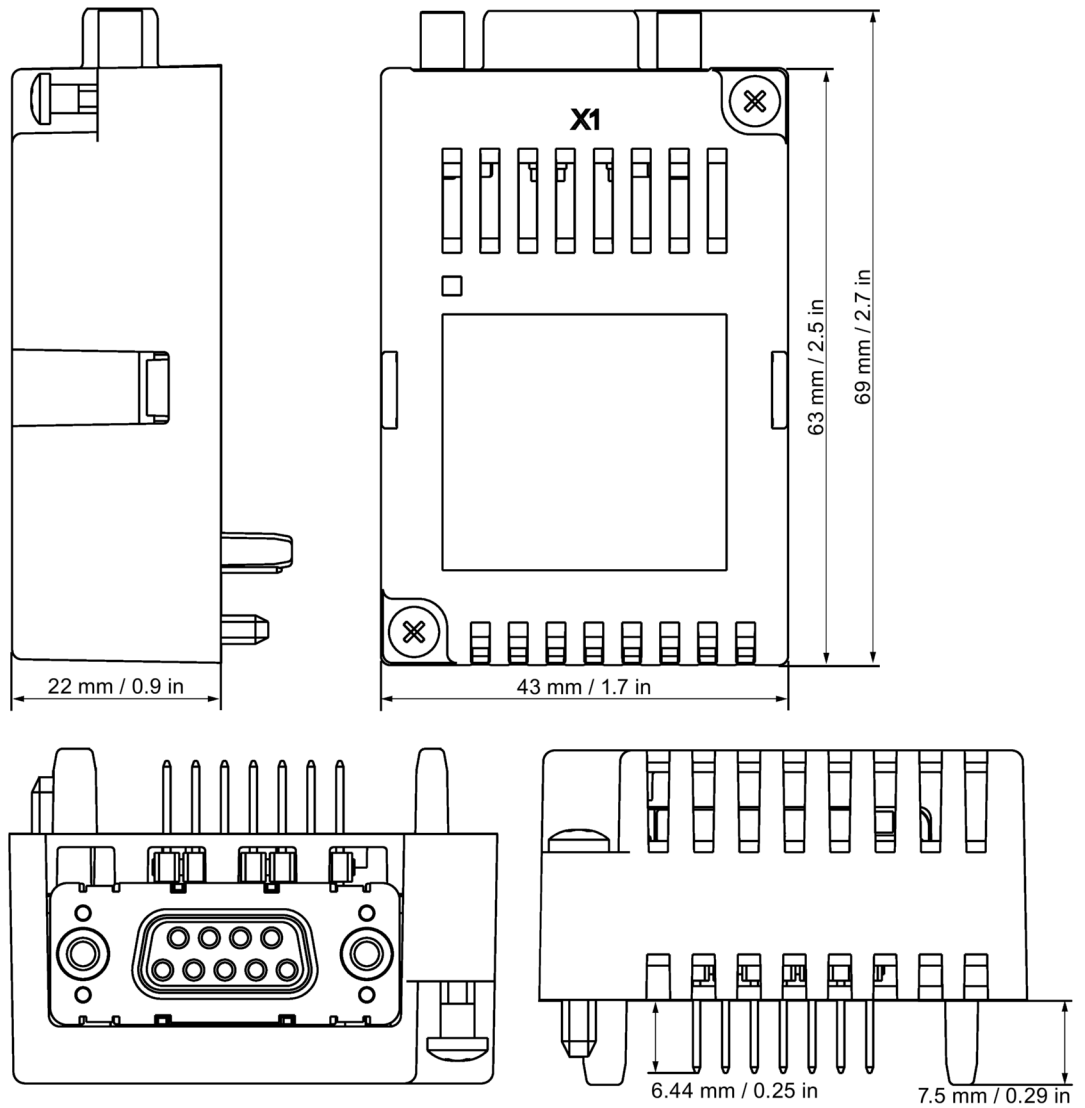
7KM Switched Ethernet PROFINET expansion module
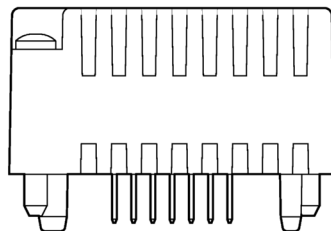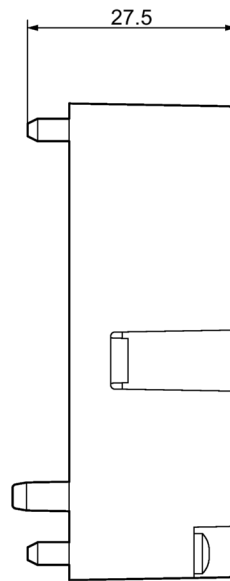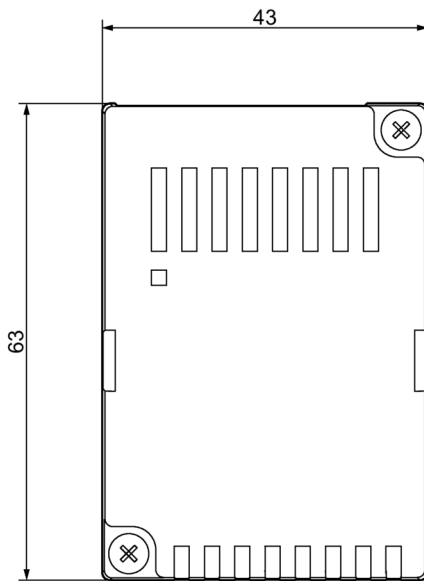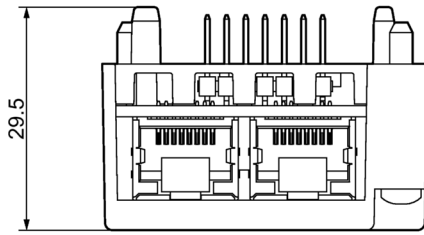
Appendix A

A.1   Comprehensive support from A to Z

For more information, please see the following links:

Useful links

Table A- 1   Product information

Website	The website provides rapid and targeted in-formation on our pioneering products and systems.	Link (http://www.siemens.com/lowvoltage)
Newsletter	Constantly updated information on the sub-ject of low-voltage power distribution.	Link (http://www.siemens.com/lowvoltage/newsletter)

Table A- 2   Product information / product and system selection

Information and Down-load Center	• Current catalogs • Customer magazines • Brochures • Demonstration software • Promotion packages	Link (http://www.siemens.com/lowvoltage/infomaterial)

Table A- 3   Product and system selection

Industry Mall	Platform for e-business and product infor-mation. 24/7 access to a comprehensive in-formation and ordering platform for our complete low-voltage controls and distribu-tion portfolio, etc.: • Selection tools • Product and system configurators • Availability check • Order tracking	Link (http://www.siemens.com/lowvoltage/mall)

Table A- 4   Product documentation

Service & Support Portal	Comprehensive technical information from the planning phase through configuration to operation. Around the clock. 365 days a year. • Product data sheets • Manuals / operating instructions • Certificates • Characteristic curves • Downloads • FAQs	Link (http://www.siemens.com/lowvoltage/support)
CAx DVD	Configuration-relevant CAx data on SENTRON is available on DVD: • Commercial and technical product master data • 2D dimension drawings • Isometric illustrations • 3D models • Product data sheets • Tender specifications	Link (http://www.siemens.com/lowvoltage/mall) Article number: E86060-D1000-A207-A6-6300
Image Database	Free downloads in several different versions are available from the image database: • All current product photos • 2D dimension drawings • Isometric illustrations • 3D models • Device circuit diagrams • Symbols	Link (http://www.siemens.com/lowvoltage/picturedb)

Table A- 5   Product training

SITRAIN Portal	Comprehensive training program to expand your knowledge about our products, systems, and engineering tools	Link (http://www.siemens.com/lowvoltage/training)

ESD guidelines

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B

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B.1   Electrostatic sensitive devices (ESD)

ESD components are destroyed by voltage and energy far below the limits of human perception. Voltages of this kind occur as soon as a device or an assembly is touched by a person who is not electrostatically discharged. ESD components which have been subject to such voltage are usually not recognized immediately as being defective, because the malfunction does not occur until after a longer period of operation.

ESD Guidelines

> **NOTICE**
>
> **Electrostatic sensitive devices**
>
> Electronic modules contain components that can be damaged by electrostatic discharge as a result of improper handling.
>
> - You must discharge your body electrostatically immediately before touching an electronic module. To do this, touch a conductive, grounded object, e.g., a bare metal part of a switch cabinet or the water pipe.
> - Always hold the component by the plastic enclosure.
> - Electronic modules should not be brought into contact with electrically insulating materials such as plastic film, plastic parts, insulating table supports or clothing made of synthetic fibers.
> - Always place electrostatic sensitive devices on conductive bases.
> - Always store and transport electronic modules or components in ESD-safe conductive packaging, e.g. metalized plastic or metal containers. Leave the component in its packaging until installation.

> **NOTICE**
>
> **Storage and transport**
>
> If you have to store or transport the component in non-conductive packaging, you must first pack the component in ESD-safe, conductive material, e.g., conductive foam rubber, ESD bag.

The diagrams below illustrate the required ESD protective measures for electrostatic sensitive devices.
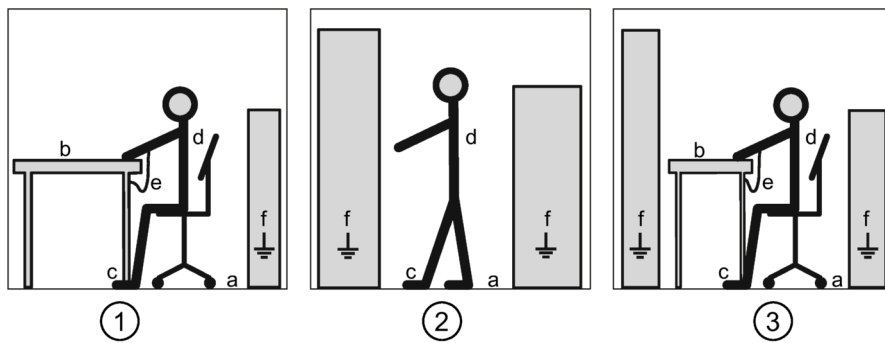
(1)   ESD seat

(2)   ESD standing position

(3)   ESD seat and ESD standing position

Protective measures

a   Conductive floor

b   ESD table

c   ESD footwear

d   ESD smock

e   ESD bracelet

f   Cubicle ground connection

List of abbreviations

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C

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C.1 Abbreviations

Overview

Table C- 1　Meaning of abbreviations

Abbreviation	Meaning
ANSI	American National Standards Institute
CAN	Controller Area Network
CE	Communautés Européennes
CEI	Commission Electrotechnique Internationale
CISPR	Comité international spécial des perturbations radioélectriques
CRC	Cyclic Redundancy Check
CSA	Canadian Standards Association
DIN	Deutsches Institut für Normierung e. V.
DP	Distributed I/Os
DR	Data record
ESD	Electrostatic sensitive devices
EIA	Electronic Industries Alliance
EMC	Electromagnetic compatibility
EN	European Standard
EU	European Union
FCC	Federal Communications Commission
GSD	Device master data
GSDML	General Station Description Markup Language
HT	High Tariff
HW Config	"Hardware configuration" module in the SIMATIC Manager
I&M	Information and Maintenance
ID	Identification number
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IP	International Protection
IRT	Isochronous real time
ISM	Industrial, Scientific and Medical
ISO	International Organization for Standardization
LED	Light Emitting Diode
LSB	Least Significant Bit
LT	Low Tariff

Abbreviation	Meaning
MSB	Most Significant Bit
MS0	Cyclic Master Slave Communication (master class 1)
MS1	Acyclic Master Slave Communication (master class 1)
MS2	Acyclic Master Slave Communication (master class 2)
NAFTA	North American Free Trade Agreement
NEMA	National Electrical Manufacturers Association
PAC	Power Analysis & Control
PMD	Power Monitoring Device
PI	PROFIBUS user organization
PTCP	Precision Transparent Clock Protocol
RALRM	Read alarm
RDREC	Read record
RET_VAL	Return value: "Return value"
RMS	Root Mean Square RMS
RJ	Registered Jack
RS	Formerly: Radio Selector; now usually: Recommended Standard
RT	Real Time
SFB	System function block
SFC	System function
TIA	Totally Integrated Automation
THD	Total Harmonic Distortion Total Harmonic Distortion
THD-R	Relative THD
UL	Underwriters Laboratories Inc.
VDE	Association of Electrical Engineering, Electronics and Information Technology (Germany)
RLO	Result of logic operation
WRREC	Write record

Glossary

Bus

Shared transmission path over which all devices on the communication bus are connected. It has two defined ends. In the case of PROFIBUS, the bus is a twisted pair or optical fiber cable.

Bus system

All nodes physically connected to a bus cable form a bus system.

Class 1 DP master

The class 1 DP master handles user data traffic with the DP slaves assigned to it.

Class 2 DP master

The DP master provides services such as reading the input data, output data, diagnostics, and control bytes.

Cycle time

The cycle time of a PROFIBUS segment is made up of the number of nodes. It is set, for example, in STEP 7 in the HW Config.

Cyclic execution

The DP master accesses the DP slaves regularly. In doing so, the DP master reads the input data of the slaves and forwards output data to the slaves.

Diagnostics

The detection, localization, visualization and further evaluation of errors, disturbances and messages.

Diagnostics offers monitoring functions that automatically run while the system is in operation. This reduces startup times and standstill times. Plant availability increases.

Equipotential bonding

Electrical connection (equipotential bonding conductor) which brings the bodies of electronic equipment and foreign conductive bodies to an equal or approximately equal potential. This prevents disruptive or dangerous voltages between these bodies.

Master

When a master is in possession of the token, it can send data to other nodes and request data from other nodes.

Nodes

Device which can send, receive or amplify data on the bus, e.g., PROFIBUS DP master, PROFIBUS DP slave.

PROFIBUS

PROCESS FIELDBUS, a European process and fieldbus standard defined in the PROFIBUS standard EN 50170, Volume 2 PROFIBUS. This standard specifies the operational, electrical and mechanical properties of a bit-serial field bus system.

PROFIBUS is a bus system that connects PROFIBUS-compatible automation systems and field devices together at the cell level and field level.

PROFIBUS address

Every device on the communication bus receives a unique PROFIBUS address. The device on the communication bus is identified on PROFIBUS with this address.

The factory address setting for the PAC PROFIBUS DP expansion module is address 126. Addresses 1 to 126 are permissible.

PROFINET IO controller

A PROFINET IO controller is the station in an automation system in which the control programs runs. It handles process data traffic with the PROFINET IO devices.

PROFINET IO device

Distributed field device that is assigned to the PROFINET IO controller.

PROFINET IO supervisor

The PROFINET IO supervisor is a PG/PC or HMI device for commissioning or diagnostics.

Slave

A slave can only exchange data after being requested to by the master.

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Further Information

Always at your disposal: our extensive support
www.siemens.com/online-support

SI LP
Online