SIEMENS

SENTRON

Expansion module PAC PROFIBUS DP

Manual

06/2007
A5E01168846B-02

Safety Guidelines

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

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

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

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:

⚠ WARNING

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks

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Disclaimer of Liability

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

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Ordernumber: A5E01168846B-02
℗ 08/2007

Table of contents

1 Introduction

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 the design of the PAC PROFIBUS DP expansion module
- Permissible conditions of use for the PAC PROFIBUS DP expansion module

Required basic knowledge

General knowledge in the fields of automation and electrical engineering is required to understand this manual.

1.2 Orientation aids

General information

The manual includes the following orientation aids:

- Table of contents
- List of figures and tables
- List of abbreviations
- Glossary
- Index

1.3 Manual version

Overview

Table 1-1 Version

No.	Name	Drawing number	Edition
1	PAC PROFIBUS DP expansion module	A5E01168846A	06 / 2007
2	PAC PROFIBUS DP expansion module	A5E01168846A-02	08 / 2007

1.4 Scope of supply

Description

The package includes:

- The PAC PROFIBUS DP expansion module
- The operating instructions for the PAC PROFIBUS DP expansion module

1.5 Contents of the CD for the SENTRON PAC power meter

CD contents

The SENTRON PAC CD includes the following files:

- The manual for the SENTRON PAC power meter in all available languages
- The operating instructions for the SENTRON PAC power meter in all available languages
- The manual for the PAC PROFIBUS DP expansion module in all available languages
- The operating instructions for the PAC PROFIBUS DP expansion module in all available languages
- The GSD file for the PAC PROFIBUS DP expansion module and the SENTRON PAC power meter.

Note

Specific GSD file

This GSD file is only designed for the use of the PAC PROFIBUS DP expansion module with a specific type of the SENTRON PAC power meter.

This CD is supplied with the SENTRON PAC power meter.

1.6 Technical support

Contact for technical problems and other questions

Help is available from:

- Service and support contacts in your region - worldwide
- Online service and support
- Technical support

Contacts in the region

Contacts in your region can provide support worldwide.

Table 1-2 Contacts in your region - worldwide

Utility	Address, number
Internet:	Service and support (http://www.siemens.com/automation/service&support) under "Contact us > Contacts"

Table 1-3 Local regional service

Utility	Address, number
Phone:	+49 (0)180-50-50-444
Fax:	+49 (0)180-50-50-445

Table 1-4 Regional contacts: Repairs, spare parts, emergency spare parts service

Utility	Address, number
Phone:	+49 (0)180-50-50-448
Fax:	+49 (0)180-50-50-449

Support address:

SIEMENS AG
A&D CD MM1
Gleiwitzerstr. 555

D-90475 Nuremberg

Online support

This comprehensive information system is available day and night via the Internet. Online service and support offers product support, services and support, and support tools from the shop.

Table 1-5 Online service and support

Utility	Address, number
Internet:	Online service and support (http://www.siemens.com/automation/service&support)

Technical Support

Technical support offers:

- Expert advice on technical queries over a broad subject area
- Tailored services relating to our products and systems

If you require technical support or you have questions about the product, contact Technical Support.

Table 1-6 Technical support

Utility	Address, number
Phone:	+49 (0)180-50-50-222
Fax:	+49 (0)180-50-50-223
Internet:	Support request (http://www.siemens.com/automation/support-request)

1.7 Further documentation

Overview

You can find further details in the following manuals:

- Manual for the SENTRON PAC power meter
- Operating instructions for the SENTRON PAC power meter
- Operating instructions for the PAC PROFIBUS DP expansion module
- SIMATIC NET PROFIBUS Network Manual"
- SIMATIC "Configuring Hardware and Connections with STEP 7"
- "PROFIBUS RS485-IS User and Installation Guideline" PROFIBUS RS485-IS User and Installation Guide (http://www.profibus.com/pall/meta/downloads/article/00332/)

See also

Technical support (Page 7)

Safety instructions 2

2.1 Safety instructions

General safety notes

⚠ WARNING

Danger! High voltage

During operation of the SENTRON PAC power meter, certain parts of the device are at hazardous voltage levels. If you do not follow the safety information provided on the device, in the operating instructions, and in the manual, this could result in death, serious injury and severe damage to property.

Always observe the following five safety rules when installing and carrying out all other tasks:

- Disconnect the system
- Protect against reconnection.
- Make sure the equipment is de-energized.
- Ground and short-circuit.
- Cover or enclose adjacent components that are still live

CAUTION

Short-circuits can cause damage to the power supply

A short-circuit can destroy the power supply to the SENTRON PAC power meter. Avoid short-circuits.

Description

3

3.1 Area of application

The PAC PROFIBUS DP expansion module is designed for use with a SENTRON PAC power meter.

Area of application of the PAC PROFIBUS DP expansion module

The PAC PROFIBUS DP expansion module connects the SENTRON PAC power meter to the PROFIBUS network. This integrates the SENTRON PAC power meter into power management systems and automation systems.

The PAC PROFIBUS DP expansion module therefore has to communicate with the SENTRON PAC power meter and the PROFIBUS DP master.

NOTICE
Intended use of the PAC PROFIBUS DP expansion module The PAC PROFIBUS DP expansion module is only intended for use with a SENTRON PAC power meter. The guidelines for the SENTRON PAC power meter also apply to the PAC PROFIBUS DP expansion module.

3.2 Features

You can use the PAC PROFIBUS DP expansion module to access the measuring stations during operation.

Overview

Features include:

- Communication based on the master-slave principle
- Function: PROFIBUS DP slave
- Configuration via class 1 master
- Cyclic data transfer
- Separate GSD file for power meter, e.g., SENTRON PAC3200. This ensures correct project planning.
- Automatic baud rate detection
- Watchdog function

  The PROFIBUS DP slave uses the watchdog function to monitor data traffic to ensure that the PROFIBUS DP master is enabled and that data are being transferred.

3.3 Tasks

Description

The tasks of the PAC PROFIBUS DP expansion module are as follows:

- To supply values measured by the SENTRON PAC power meter to the PROFIBUS DP master
- To receive information, e.g., commands, from the PROFIBUS DP master and send them to the SENTRON PAC power meter.
- To ensure galvanic isolation between the SENTRON PAC power meter and the PROFIBUS

3.4 Structure

Structure of the PAC PROFIBUS DP expansion module

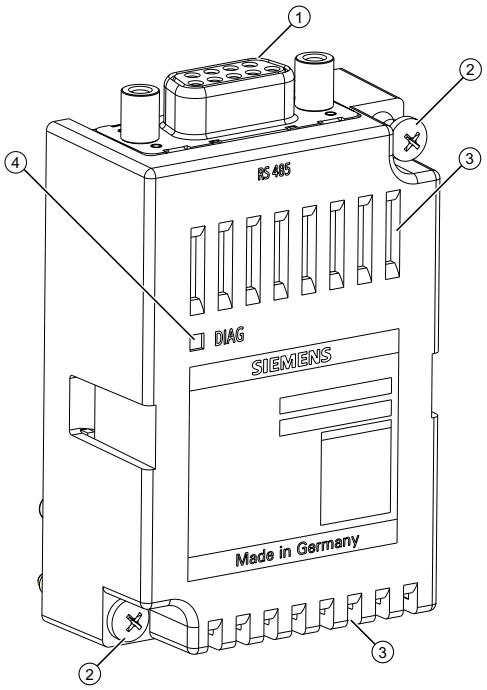

Figure 3-1 Schematic view of the side and front of the PAC PROFIBUS DP expansion module

(1)	Sub D socket
(2)	Screw for mounting the PAC PROFIBUS DP expansion module on the SENTRON PAC power meter
(3)	Ventilation slots
(4)	LED

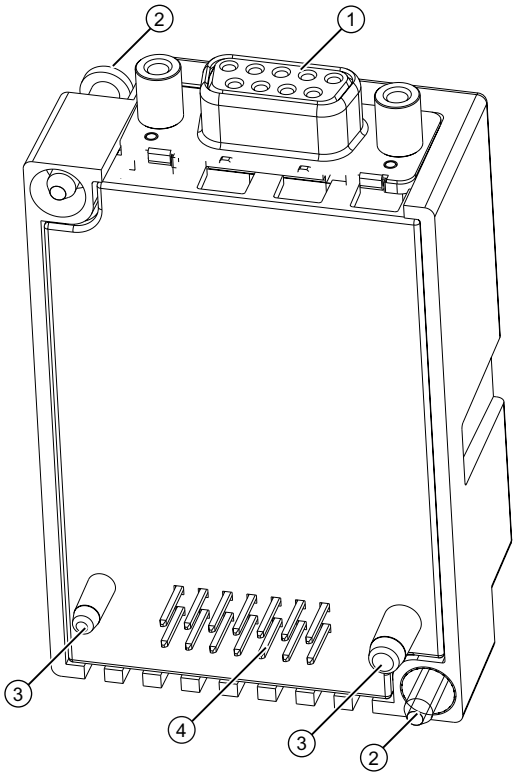

Figure 3-2 Schematic view of the rear of the PAC PROFIBUS DP expansion module

(1) Sub D socket

(2) Screw for mounting the PAC PROFIBUS DP expansion module on the SENTRON PAC power meter

(3) Guide pins; their guide for correct position ensures that the PAC PROFIBUS DP expansion module is plugged into the SENTRON PAC power meter correctly

(4) Pins

3.5 PROFIBUS functions

Overview

The following PROFIBUS functions are not supported:

- SYNC / UNSYNC
- FREEZE / UNFREEZE

Installation

4

4.1 Procedure for installation and commissioning

The following system configuration information must be available:

- Installation location of the device
- Baud rate
- Planned PROFIBUS address

Procedure

1. Mount the SENTRON PAC poewr meter and the PAC PROFIBUS DP expansion module.
2. Connect the SENTRON PAC power meter.
3. Connect the PAC PROFIBUS DP expansion module to the PROFIBUS network.
4. Set the language on the SENTRON PAC power meter.
5. Parameterize the SENTRON PAC power meter.
6. Set the planned PROFIBUS address on the SENTRON PAC power meter.
7. Configure the PAC PROFIBUS DP expansion module. The STEP 7 hardware configuration, for example, can be used as the configuring tool.
   - Assign the SENTRON PAC power meter to the PROFIBUS network.
   - Link the device-specific GSD file for the PAC PROFIBUS DP expansion module.
   - Parameterize the SENTRON PAC power meter.
   - Transfer the parameter assignment to the PROFIBUS DP master.
8. Check all connections and settings.
9. Apply supply voltage to the SENTRON PAC power meter. The SENTRON PAC power meter and expansion module are then ready for operation.

See also

Unpacking (Page 16)
Installation and connection (Page 17)
Equipotential bonding (Page 20)
Measures to be performed prior to start-up (Page 21)
Cyclic data exchange (Page 23)
Default settings (Page 37)
Configuration scenarios (Page 37)
Changing the address (Page 38)
Configuring by means of the GSD file (Page 39)
Contents of the CD for the SENTRON PAC power meter (Page 6)

4.2 Unpacking

Observe the ESD guidelines. Open the packaging with care. Do not use excessive force.

Checks

After receiving the module, and before installing it, you should make the following checks:

- Check the packaging for damage.
- Make sure that the package contents are complete.
- Check the module for external damage.

Please contact your Siemens sales partner in the following cases:

- The packaging is damaged
- The contents of the package are not complete
- The module is damaged

Storage

Store the PAC PROFIBUS DP expansion module in a dry place.

See also

Electrostatic sensitive devices (ESD) (Page 73)

4.3 Installation and connection

NOTICE
Avoid condensation Sudden fluctuations in temperature can lead to condensation. Condensation can affect the function of the PAC PROFIBUS DP expansion module. Store the PAC PROFIBUS DP expansion module in the operating room for at least 2 hours before commencing installation.

Tools

To install the PAC PROFIBUS DP expansion module you will need the following tool:

- A Z1 cross-tip screwdriver, 2.9 mm, cal ISO 6789

Assembly

Install the PAC PROFIBUS DP expansion module before operating the SENTRON PAC. Observe the ESD guidelines.

CAUTION
Faulty sub D connector and faulty connector to the SENTRON PAC power meter Dirty or bent pins can affect the function of the connectors. The connectors can be destroyed. Do not allow the pins to become dirty. Make sure that: • There are no metal parts between the pins. • There are no metal parts adhering to the pins. • The pins do not bend. Do not touch the pins.

NOTICE
Danger of overheating If the ventilation slots are covered, the PAC PROFIBUS DP expansion module can overheat. Make sure that the ventilation slots are not covered.

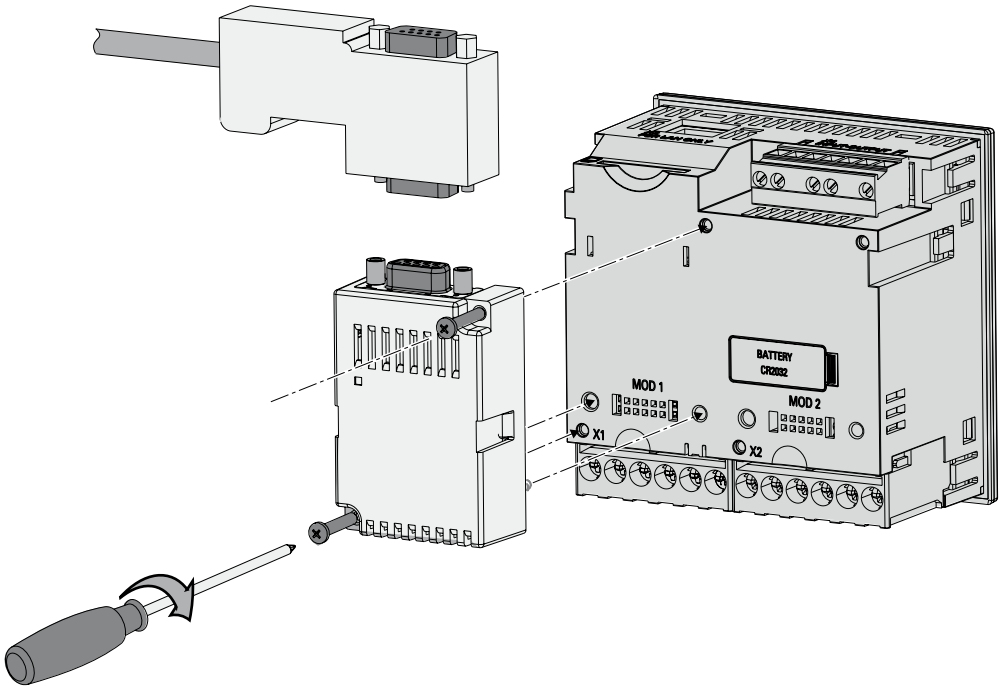

Figure 4-1 Mounting the PAC PROFIBUS DP expansion module

1. Ensure safe isolation from supply.
2. Discharge yourself.
3. Mount the SENTRON PAC power meter.
4. Connect the current terminals and voltage terminals to the SENTRON PAC.
5. Only attach the PAC PROFIBUS DP expansion module to the plastic enclosure.
6. Connect the PAC PROFIBUS DP expansion module to the SENTRON PAC. The guide for correct position of the guide pins will help you to plug in the PAC PROFIBUS DP expansion module correctly. You can find more information about the slot in the SENTRON PAC manual.
7. Tighten the SN62217-B3x22 screws connecting the PAC PROFIBUS DP expansion module to the SENTRON PAC with a torque of 0.5 Nm.
8. Plug the sub D connector into the sub D socket.
9. Screw the sub D connector into place.

More information

Installing the SENTRON PAC power meter

You can find information about how to install the SENTRON PAC power meter in the operating instructions and manual for the SENTRON PAC power meter.

NOTICE
Damage due to moisture Moisture or wetness can affect the operating capability of the PAC PROFIBUS DP expansion module. Make sure that no moisture or wetness can find its way into the PAC PROFIBUS DP expansion module. Clean the PAC PROFIBUS DP expansion module using a dry, lint-free cloth only. Do not operate the PAC PROFIBUS DP expansion module in an environment affected by high humidity or wetness. Note the environmental requirements of the SENTRON PAC power meter.

Bus termination

Note

Bus terminating resistor

There is no bus terminating resistor in the PAC PROFIBUS DP expansion module. Bus termination is provided by the PROFIBUS adaptor plug, which includes a bus terminating resistor. You can find more information in the operating instructions for the PROFIBUS adaptor plug.

If you use the recommended bus connector, you can switch the bus terminating resistor on and off with a switch. If you do not use this bus connector, you must install a bus terminator at the first and last device on the bus. Proceed as shown in the diagram below.

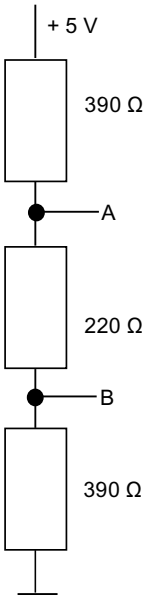

Figure 4-2 Bus termination of the ANSI TIA/EIA 485 A connection

More information

Bus connectors and PROFIBUS cables

You can find information about the bus connector and PROFIBUS cables, etc., in the catalog. The cable length depends on the baud rate. At 12 Mbps the maximum type A cable length is 100 m. You can find more information about cable lengths for PROFIBUS communication in section 22.1 of the standard IEC 61158-2:2004.

See also

Disassembly (Page 21)

Safety instructions (Page 9)

Electrostatic sensitive devices (ESD) (Page 73)

Unpacking (Page 16)

Measures to be performed prior to start-up (Page 21)

4.4 Equipotential bonding

Equipotential bonding of the PAC PROFIBUS DP expansion module

The PAC PROFIBUS DP expansion module has a non-metal housing. You should therefore carry out the equipotential bonding of the PAC PROFIBUS DP expansion module in accordance with the PROFIBUS installation guidelines.

For further information

Refer to the "SIMATIC NET PROFIBUS Network Manual".

See also

Further documentation (Page 8)

4.5 Measures to be performed prior to start-up

CAUTION
Impairment and endangering of operation Damaged components can impair and endanger operation. Never use damaged components.

NOTICE
Formation of condensation Store the device in the service room for at least two hours before applying voltage to the device for the first time. This will equalize the temperature and prevent the formation of condensation.

Checks

Once you have correctly installed the PAC PROFIBUS DP expansion module, you should carry out the following checks:

1. Check that the PAC PROFIBUS DP expansion module is connected to the SENTRON PAC power meter correctly.
2. Check that the connector of the PROFIBUS cable is plugged into the sub D socket of the PAC PROFIBUS DP expansion module correctly and screwed down tightly.
3. Check that the ventilation slots are not covered.

4.6 Disassembly

Disassembling

1. Ensure safe isolation from supply.
2. Observe the ESD Guidelines. Discharge yourself. Only attach the PAC PROFIBUS DP expansion module to the plastic enclosure.
3. Unfasten the screws securing the sub D connector into the sub D socket.
4. Pull the sub D connector out of the sub D socket.
5. Unscrew the PAC PROFIBUS DP expansion module from the SENTRON PAC power meter.
6. Remove the PAC PROFIBUS DP expansion module from the SENTRON PAC power meter.
7. If necessary, disassemble the SENTRON PAC power meter.

More information

Disassembling the SENTRON PAC power meter

You can find information about how to disassemble the SENTRON PAC power meter in the manual for the SENTRON PAC power meter.

See also

Installation and connection (Page 17)

Electrostatic sensitive devices (ESD) (Page 73)

Technical support (Page 7)

Further documentation (Page 8)

Parameter assignment/Addressing 5

5.1 Cyclic data exchange

5.1.1 Introduction

Description

In cyclic data exchange, each message frame transfers a fixed 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 associated SENTRON PAC power meter. For time-saving commissioning and efficient data transfer, there are two basic types with predefined measured variables. The user can also define individual measured variables to be transferred.

Choosing the basic type

You can configure each SENTRON PAC power meter individually. During the configuration process you use the PROFIBUS DP configuring tool to select:

- The GSD file
- A suitable combination of basic type 1, basic type 2 and measured variables

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Note

Note the quantity structure

The maximum quantity structure for PROFIBUS is 244 bytes.

See also

Measured variables (Page 29)

Standards (Page 61)

Further documentation (Page 8)

5.1.2 Basic type 1

Structure

Basic type 1 contains the control bytes. The structure of basic type 1 is fixed. You cannot change it. The length of the message is 20 bytes of input data and 2 bytes of control bytes (output data). The following information is transferred in basic type 1.

Table 5-1 Structure of basic type 1

Number of bytes	Data value	Format	Unit
0 ... 3	Digital status information	Unsigned long	-
4 ... 7	Phase current a	Float	A
8 ... 11	Phase current b	Float	A
12 ... 15	Phase current c	Float	A
16 ... 19	Total active power	Float	W

See also

Digital status information in the cyclic channel (Page 26)

Control bytes (Page 27)

Basic type 2 (Page 24)

5.1.3 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 module. The standard basic type 2 contains no control bytes. These are already contained in basic type 1. You can also add the control bytes during the project design phase. The structure of basic type 2 is fixed. You cannot change it. The message length is 24 bytes.

Table 5-2 Basic type 2 transfers the following input data

Number of bytes	Data value	Format	Unit
0 ... 3	Voltage V_{a-b}	Float	V
4 ... 7	Voltage V_{b-c}	Float	V
8 ... 11	Voltage V_{c-a}	Float	V
12 ... 19	Active energy import tariff 1	Double	Wh
20 ... 23	Total power factor	Float	-

See also

Basic type 1 (Page 24)

5.1.4 Freely definable basic type

Structure

In another basic type you can specify individual values to be transferred. This basic type has a maximum length of 244 bytes. You must observe the following structure:

Table 5-3 Structure of the further basic type

Number of bytes	Data value	Format	Unit
0 ... 3	•••	•••	•••
• • •	•••	•••	•••
236 ... 243	•••	•••	•••

This basic type contains no control bytes as standard. You can add individual control bytes during the project design phase.

See also

Digital status information in the cyclic channel (Page 26)

5.1.5 Digital status information in the cyclic channel

Digital status information

In cyclic data traffic the digital status information is sent on every data exchange at the beginning of a basic type 1 data structure. The status information is treated as static diagnostics data for the device.

For basic type 2 and basic type 3 data structures the digital status information is optional. You can add the digital status information during the configuration phase.

Table 5-4 Structure of the 4 bytes of the digital status information - static diagnostics

Byte	Bit	Description
Byte n System status	0	No synchronization pulse
	1	Device Configuration menu is active
	2	Voltage overload
	3	Current overload
	4	Reserved
	5	Reserved
	6	Reserved
	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	Relevant parameter changes
	17	Upper or lower limit violation
	18	Maximum pulse rate exceeded
	19	Reserved
	20	Reserved
	21	Reserved
	22	Reserved
	23	Reserved

Byte	Bit	Description
Byte n + 3 Component diagnostics	24	Reserved
	25	Reserved
	26	Reserved
	27	Reserved
	28	Reserved
	29	Reserved
	20	Reserved
	31	Reserved

See also

Measured variables (Page 29)

5.1.6 Control bytes

Description

The control bytes are delivered with basic type 1 as standard. Alternatively you can add the control bytes during the project design 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.

Structure

Table 5-5 Structure of the control bytes

Byte	Bit	Activation	Description
Byte n	0	Rising edge transition[1)]	Resets the maximum values
	1	Rising edge transition[1)]	Resets the minimum values
	2	Rising edge transition[1)]	Resets the energy counter
	3	Rising edge transition[1)]	Acknowledge device diagnostics
	4	-	Reserved
	5	-	Reserved
	6	-	Reserved
	7	-	Reserved
Byte n + 1	8	Rising edge transition[1)]	Switches over to "on peak"
	9	Rising edge transition[1)]	Switches over to "off peak"
	10	Level sensitive	Switch outputs: • ON = 1 • OFF = 0
	11	-	Reserved
	12	-	Reserved
	13	-	Reserved
	14	-	Reserved
	15	-	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.			

See also

Basic type 1 (Page 24)

5.1.7 Measured variables

Measured variables of the SENTRON PAC power meter

The measured variables can be read on the LCD of the SENTRON PAC power meter.

Table 5-6 Available measured variables

Name	Abb. EN + IEC	Abb. EN + NAFTA	Format	Unit	Range of values	Access
Voltage V_{a-n}	U_{L1-N}	V_{a-n}	Float	V	-	R
Voltage V_{b-n}	U_{L2-N}	V_{b-n}	Float	V	-	R
Voltage V_{c-n}	U_{L3-N}	V_{c-n}	Float	V	-	R
Voltage V_{a-b}	U_{L1-L2}	V_{a-b}	Float	V	-	R
Voltage V_{b-c}	U_{L2-L3}	V_{b-c}	Float	V	-	R
Voltage V_{c-a}	U_{L3-L1}	V_{c-a}	Float	V	-	R
Current a	I_{L1}	I_a	Float	A	-	R
Current b	I_{L2}	I_b	Float	A	-	R
Current c	I_{L3}	I_c	Float	A	-	R
Apparent Power a	S_{L1}	VA_a	Float	VA	-	R
Apparent Power b	S_{L2}	VA_b	Float	VA	-	R
Apparent Power c	S_{L3}	VA_c	Float	VA	-	R
Active Power a	± P_{L1}	± W_a	Float	W	-	R
Active Power b	± P_{L2}	± W_b	Float	W	-	R
Active Power c	± P_{L3}	± W_c	Float	W	-	R
Reactive Power a	± Q_{L1}	± var_a	Float	var	-	R
Reactive Power b	± Q_{L2}	± var_b	Float	var	-	R
Reactive Power c	± Q_{L3}	± var_c	Float	var	-	R
Power Factor a	$\|LF_{L1}\|$	$\|PF_a\|$	Float	-	0 ... 1	R
Power Factor b	$\|LF_{L2}\|$	$\|PF_b\|$	Float	-	0 ... 1	R
Power Factor c	$\|LF_{L3}\|$	$\|PF_c\|$	Float	-	0 ... 1	R
THD-R Voltage a	THD-U_{L1}	THD-V_a	Float	%	0 ... 100	R
THD-R Voltage b	THD-U_{L2}	THD-V_b	Float	%	0 ... 100	R
THD-R Voltage c	THD-U_{L3}	THD-V_c	Float	%	0 ... 100	R
THD-R Current a	THD-I_{L1}	THD-I_a	Float	%	0 ... 100	R
THD-R Current b	THD-I_{L2}	THD-I_b	Float	%	0 ... 100	R
THD-R Current c	THD-I_{L3}	THD-I_c	Float	%	0 ... 100	R
Frequency	f	f	Float	Hz	45 ... 65	R
Average Voltage V_{ph-n}	$U_{L-L\ MW}$	$V_{ph-n\ AVG}$	Float	V	-	R
Average Voltage V_{ph-ph}	$U_{L-L\ MW}$	$V_{ph-ph\ AVG}$	Float	V	-	R
Average Current	I_{MW}	I_{AVG}	Float	A	-	R
Total Apparent Power	∑S	Total VA	Float	VA	-	R

Name	Abb. EN + IEC	Abb. EN + NAFTA	Format	Unit	Range of values	Access
Total Active Power	∑P	Total W	Float	W	-	R
Total Reactive Power	∑Q	Total var	Float	var	-	R
Total Power Factor	Ges. LF	Total PF	Float		-	R
Amplitude Unbalance - Voltage	Unsym. U	Unbal. V	Float	%	0 ... 100	R
Amplitude Unbalance - Current	Unsym. I	Unbal. A	Float	%	0 ... 100	R
Maximum Voltage V_{a-n}	▲U_{L1-N}	▲V_{a-n}	Float	V	-	R
Maximum Voltage V_{b-n}	▲U_{L2-N}	▲V_{b-n}	Float	V	-	R
Maximum Voltage V_{c-n}	▲U_{L3-N}	▲V_{c-n}	Float	V	-	R
Max. Voltage V_{a-b}	▲U_{L1-L2}	▲V_{a-b}	Float	V	-	R
Max. Voltage V_{b-c}	▲U_{L2-L3}	▲V_{b-c}	Float	V	-	R
Max. Voltage V_{c-a}	▲U_{L3-L1}	▲V_{c-a}	Float	V	-	R
Maximum Current a	▲I_{L1}	▲I_a	Float	A	-	R
Maximum Current b	▲I_{L2}	▲I_b	Float	A	-	R
Maximum Current c	▲I_{L3}	▲I_c	Float	A	-	R
Maximum Apparent Power a	▲S_{L1}	▲VA_a	Float	VA	-	R
Maximum Apparent Power b	▲S_{L2}	▲VA_b	Float	VA	-	R
Maximum Apparent Power c	▲S_{L3}	▲VA_c	Float	VA	-	R
Maximum Active Power a	▲± P_{L1}	▲± W_a	Float	W	-	R
Maximum Active Power b	± W_{L2}	▲± W_b	Float	W	-	R
Maximum Active Power c	▲± P_{L3}	▲± W_c	Float	W	-	R
Maximum Reactive Power a	▲± Q_{L1}	▲± var_a	Float	var	-	R
Maximum Reactive Power b	▲± Q_{L2}	▲± var_b	Float	var	-	R
Maximum Reactive Power c	▲± Q_{L3}	▲± var_c	Float	var	-	R
Maximum Power Factor a	▲$\|LF_{L1}\|$	▲$\|PF_a\|$	Float		0 ... 1	R
Maximum Power Factor b	▲$\|LF_{L2}\|$	▲$\|PF_b\|$	Float		0 ... 1	R
Maximum Power Factor c	▲$\|LF_{L3}\|$	▲$\|PF_c\|$	Float		0 ... 1	R
Maximum THD-R Voltage a	▲THD-U_{L1}	▲THD-V_a	Float	%	0 ... 100	R
Maximum THD-R Voltage b	▲THD-U_{L2}	▲THD-V_b	Float	%	0 ... 100	R
Maximum THD-R Voltage c	▲THD-U_{L3}	▲THD-V_c	Float	%	0 ... 100	R
Maximum THD-R Current a	▲THD-I_{L1}	▲THD-I_a	Float	%	0 ... 100	R
Maximum THD-R Current b	▲THD-I_{L2}	▲THD-I_b	Float	%	0 ... 100	R
Maximum THD-R Current c	▲THD-I_{L3}	▲THD-I_c	Float	%	0 ... 100	R
Max. Frequency	▲f	▲f	Float		45 ... 65	R
Max. Average Voltage V_{ph-n}	▲$V_{L-N\ MW}$	▲$V_{ph-n\ AVG}$	Float	V	-	R
Max. Average Voltage V_{phL-ph}	▲$V_{L-L\ MW}$	▲$V_{ph-ph\ AVG}$	Float	V	-	R
Max. Average Current	▲I_{MW}	▲I_{AVG}	Float	A	-	R
Max. Total Apparent Power	▲∑S	▲Total VA	Float	VA	-	R
Max. Total Active Power	▲∑P	▲Total W	Float	W	-	R
Max. Total Reactive Power	▲∑Q	▲Total var	Float	var	-	R
Maximum Total Power Factor	▲Ges. LF	▲Total PF	Float		-	R
Minimum Voltage V_{a-n}	▼U_{L1-N}	▼V_{a-n}	Float	V	-	R

Name	Abb. EN + IEC	Abb. EN + NAFTA	Format	Unit	Range of values	Access
Minimum Voltage V_{b-n}	▾U_{L2-N}	▾V_{b-n}	Float	V	-	R
Minimum Voltage V_{c-n}	▾U_{L3-N}	▾V_{c-n}	Float	V	-	R
Min. Voltage U_{L1-L2}	▾U_{L1-L2}	▾V_{a-b}	Float	V	-	R
Min. Voltage U_{L2-L3}	▾U_{L2-L3}	▾V_{b-c}	Float	V	-	R
Min. Voltage U_{L3-L1}	▾U_{L3-L1}	▾V_{c-a}	Float	V	-	R
Minimum Current a	▾I_{L1}	▾I_a	Float	A	-	R
Minimum Current b	▾I_{L2}	▾I_b	Float	A	-	R
Minimum Current c	▾I_{L3}	▾I_c	Float	A	-	R
Minimum Apparent Power a	▾S_{L1}	▾VA_a	Float	VA	-	R
Minimum Apparent Power b	▾S_{L2}	▾VA_b	Float	VA	-	R
Minimum Apparent Power c	▾S_{L3}	▾VA_c	Float	VA	-	R
Minimum Active Power a	± W_{L1}	▾± W_a	Float	W	-	R
Minimum Active Power b	▾± P_{L2}	▾± W_b	Float	W	-	R
Minimum Active Power c	± W_{L3}	▾± W_c	Float	W	-	R
Minimum Reactive Power a	▾± Q_{L1}	▾± var_a	Float	var	-	R
Minimum Reactive Power b	▾± Q_{L2}	▾± var_b	Float	var	-	R
Minimum Reactive Power c	▾± Q_{L3}	▾± var_c	Float	var	-	R
Minimum Power Factor a	▾$\|LF_{L1}\|$	▾$\|PF_a\|$	Float	-	0 ... 1	R
Minimum Power Factor b	▾$\|LF_{L2}\|$	▾$\|PF_b\|$	Float	-	0 ... 1	R
Minimum Power Factor c	▾$\|LF_{L3}\|$	▾$\|PF_c\|$	Float	-	0 ... 1	R
Min. Frequency	▾f	▾f	Float	Hz	45 ... 65	R
Min. Average Voltage V_{ph-n}	▾$U_{L-N\ MW}$	▾$V_{ph-n\ AVG}$	Float	V	-	R
Min. Average Voltage V_{ph-ph}	▾$U_{L-L\ MW}$	▾$V_{ph-ph\ AVG}$	Float	V	-	R
Min. Average Current	▾I_{MW}	▾I_{AVG}	Float	A	-	R
Min. Total Apparent Power	▾∑S	▾Total VA	Float	VA	-	R
Min. Total Active Power	▾∑P	▾Total W	Float	W	-	R
Min. Total Reactive Power	▾∑O	▾Total var	Float	var	-	R
Minimum Total Power Factor	▾Ges. LF	▾Total PF	Float	var	-	R
Limit Violations	-	-	Unsigned long	-	Byte 3 Bit 0 Limit value 0	R
Device Diagnostics and Device Status	-	-	Unsigned long	-	Byte 0 System status	R
Status of the Digital Outputs	-	-	Unsigned long	-	Byte 3 Bit 0 Output 0	R
Status of the Digital Inputs	-	-	Unsigned long	-	Byte 3 Bit 0 Input 0	R
Active Tariff	-	-	Unsigned long	-	-	R
Working Hours Counter	-	-	Unsigned long	s-	0 ... 999999999	RW
Universal Counter	-	-	Unsigned long	-	0 ... 999999999	RW

Name	Abb. EN + IEC	Abb. EN + NAFTA	Format	Unit	Range of values	Access
Counter of Relevant Parameter Changes	-	-	Unsigned long	-	-	R
Counter of all Parameter Changes	-	-	Unsigned long	-	-	R
Counter Limit Violations	-	-	-	-	-	R
Demand Active Power - Import	-	-	Float	W	-	R
Demand Reactive Power - Import	-	-	Float	var	-	R
Demand Active Power - Export	-	-	Float	W	-	R
Demand Reactive Power - Export	-	-	Float	var	-	R
Maximum Active Power Reading during the period	-	-	Float	W	-	R
Minimum Active Power Reading during the period	-	-	Float	W	-	R
Maximum Reactive Power Reading during the period	-	-	Float	var	-	R
Minimum Reactive Power Reading during the period	-	-	Float	var	-	R
Demand Period	-	-	Unsigned long	s	-	R
Time Since Start of the active demand period	-	-	Unsigned long	s	-	R
Active Energy Import Tariff 1	-	-	Double	Wh	Overflow 1.0e+12	RW
Active Energy Import Tariff 2	-	-	Double	Wh	Overflow 1.0e+12	RW
Active Energy Export Tariff 1	-	-	Double	varh	Overflow 1.0e+12	RW
Active Energy Export Tariff 2	-	-	Double	varh	Overflow 1.0e+12	RW
Reactive Energy Import Tariff 1	-	-	Double	Wh	Overflow 1.0e+12	RW
Reactive Energy Import Tariff 2	-	-	Double	Wh	Overflow 1.0e+12	RW
Reactive Energy Export Tariff 1	-	-	Double	varh	Overflow 1.0e+12	RW
Reactive Energy Export Tariff 2	-	-	Double	varh	Overflow 1.0e+12	RW
Apparent Energy Tariff 1	-	-	Double	VAh	Overflow 1.0e+12	RW
Apparent Energy Tariff 2	-	-	Double	VAh	Overflow 1.0e+12	RW

Abbrev.: Abbreviation
R Read; read access
W Write; write access
RW Read Write; read and write access

See also

Introduction (Page 23)
Working measured variables in double and float format (Page 33)
Configuring by means of the GSD file (Page 39)
Limit values (Page 34)
Digital status information in the cyclic channel (Page 26)
Digital input statuses and output statuses (Page 35)

5.1.8 Working measured variables in double and float format

Working measured variables

The SENTRON PAC power meter delivers the measured variables listed in the table below in double format. The PROFIBUS DP expansion module makes these measured variables available in float format too. This means that they can be evaluated in SIMATIC, for example. Numbers in float format are accurate to 7 to 8 decimal places.

Table 5-7 Measured variables made available in float format by the PAC PROFIBUS DP expansion module

Name	Value range
Active Energy Import Tariff 1	Overflow 1.0e+12
Active Energy Import Tariff 2	Overflow 1.0e+12
Active Energy Export Tariff 1	Overflow 1.0e+12
Active Energy Export Tariff 2	Overflow 1.0e+12
Reactive Energy Import Tariff 1	Overflow 1.0e+12
Reactive Energy Import Tariff 2	Overflow 1.0e+12
Reactive Energy Export Tariff 1	Overflow 1.0e+12
Reactive Energy Export Tariff 2	Overflow 1.0e+12
Apparent Energy Tariff 1	Overflow 1.0e+12
Apparent Energy Tariff 2	Overflow 1.0e+12

Note

Reset on SENTRON PAC

If you are using measured variables in float format, reset the SENTRON PAC power meter at regular intervals.

See also

Measured variables (Page 29)

5.1.9 Limit values

In the SENTRON PAC menu you can define how the individual limit values are formed. These limit values are available via the PROFIBUS in the "Limit violations" measured variable.

Limit values of the SENTRON PAC power meter

Table 5-8 Available limit values

Name	Byte	Bit	Format	Value range	Access
Limit value logic	0	0	Bit	0.1	R
Limit value 0	3	0	Bit	0.1	R
Limit value 1		1	Bit	0.1	R
Limit value 2		2	Bit	0.1	R
Limit value 3		3	Bit	0.1	R
Limit value 4		4	Bit	0.1	R
Limit value 5		5	Bit	0.1	R

R	Read; write access
RLO	Result of logic operation

See also

Measured variables (Page 29)

5.1.10 Digital input statuses and output statuses

Input statuses and output statuses of the SENTRON PAC power meter

The following are available via the PROFIBUS:

- Input statuses in the "Status of the Digital Inputs" measured variable
- Output statuses in the "Status of the Digital Outputs" measured variable

Table 5-9 Available input statuses and output statuses

Name	Length	Byte	Bit	Value range	Access
Digital input 0	32 bits	3	0	0.1	R
Digital output 0	32 bits	3	0	0.1	R

R Read; read access

See also

Measured variables (Page 29)

Configuring

6

6.1 Default settings

Factory default settings

Table 6-1 Factory settings

Parameter	Value
Address	126
Baud rate	Automatic recognition
Type of SENTRON PAC power meter connected	Automatic recognition
Language	The communication parameters are displayed in the language set on the SENTRON PAC power meter. Default setting: English

6.2 Configuration scenarios

In the SIMATIC environment you can configure the SENTRON PAC power meter and the PAC PROFIBUS DP expansion module in the following way.

- Integration of PROFIBUS via STEP 7 and the device-specific GSD file

Configuring the integration of PROFIBUS via STEP 7 and the GSD file

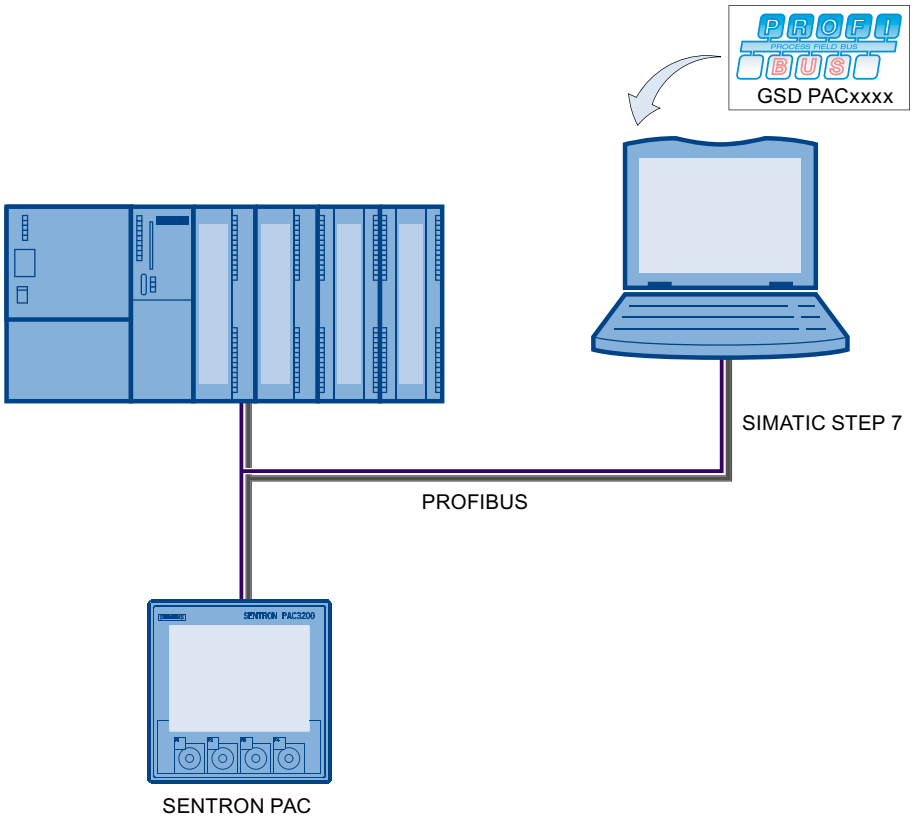


Figure 6-1 Configuring the integration of PROFIBUS via STEP 7 and the GSD file

Note

Configuration with other tools

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

6.3 Changing the address

Setting a unique address

Every device requires a unique address. The address is stored in the non-volatile memory of the PAC PROFIBUS DP expansion module. Address 126 is used for commissioning purposes only. It must not be used for data communication.

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

- Via the menu of the SENTRON PAC power meter
- With the PROFIBUS configuring software, e.g., STEP 7

CAUTION
Address change on device immediately valid When you change the address of the PROFIBUS DP slave on the SENTRON PAC, the new address is accepted as soon as you quit the "Change Address" menu. Reconfigure the PROFIBUS DP master with the new address. Communication is interrupted until this change takes effect.

6.4 Configuring by means of the GSD file

Task of the GSD file

The GSD file is a text file in ASCII format. It describes:

- The device features
- The communication characteristics

The GSD file makes this data available to the master. The GSD file is the basis for the configuration of a device.

PROFIBUS devices have a unique PROFIBUS ID number and a GSD file. The GSD file is matched to the SENTRON PAC power meter. This supports correct project planning and differentiation between devices at a project level.

Language of the GSD file

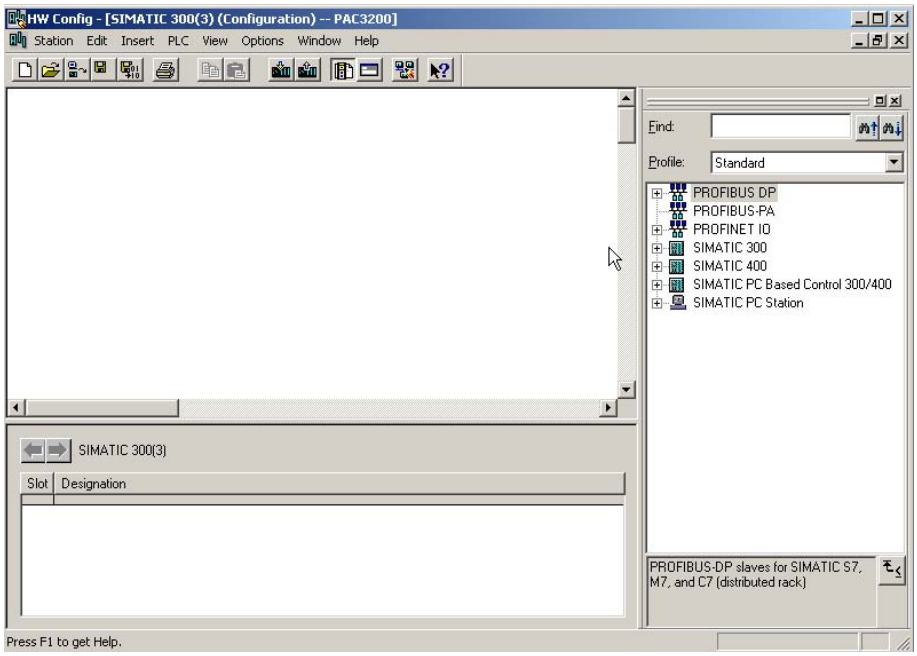
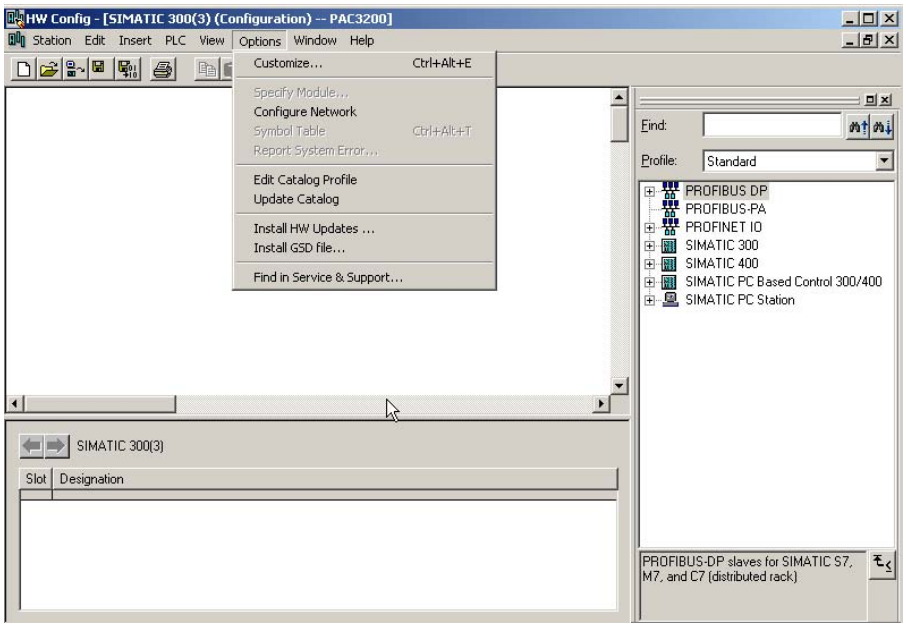
The GSD file is language-dependent.

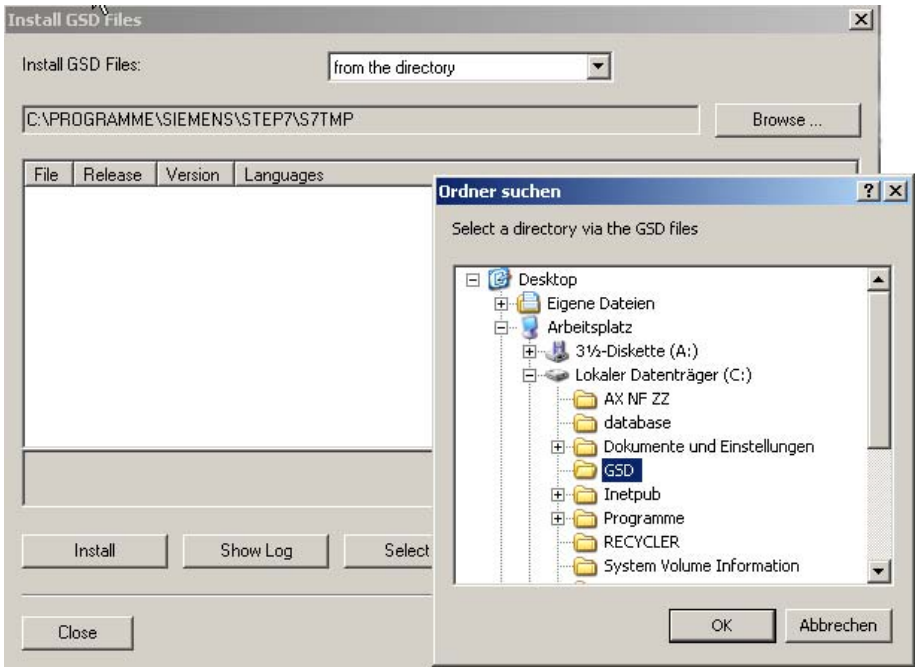
Table 6-2 GSD file extensions

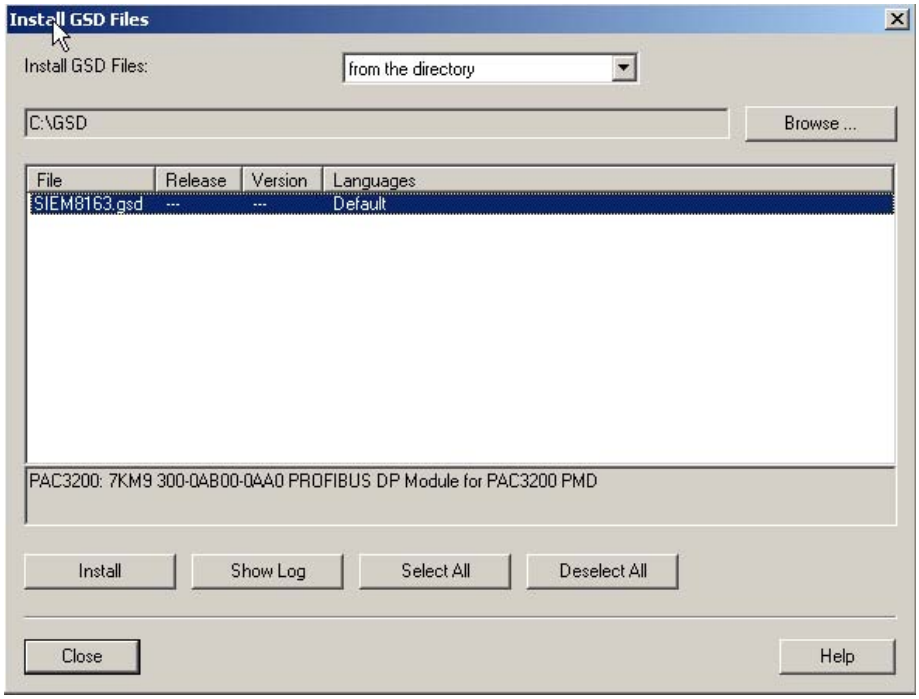
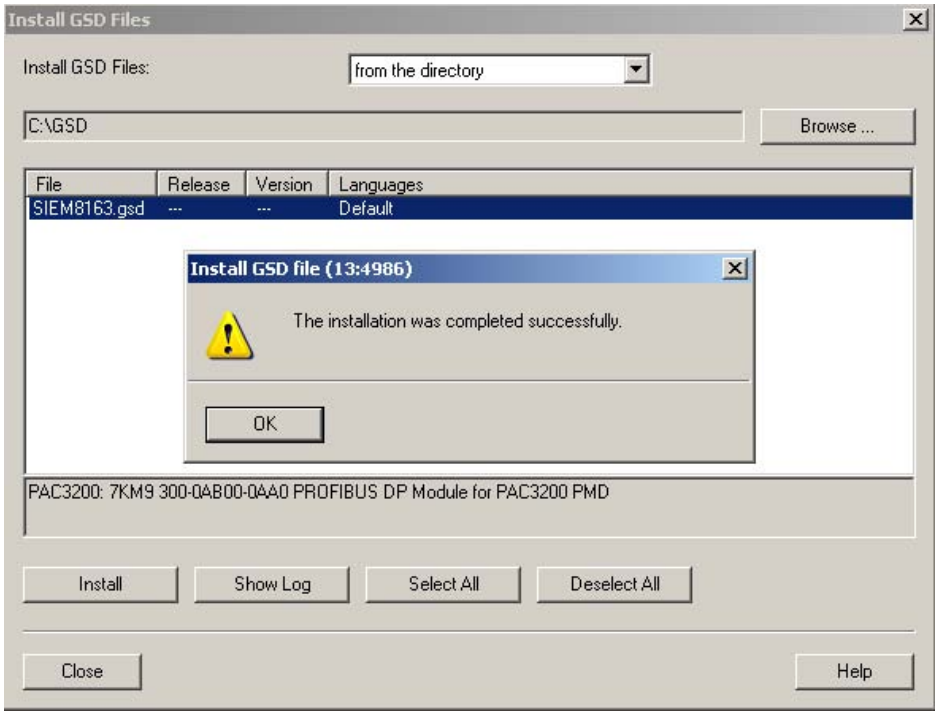
Language-dependent GSD file extension	Language
GSE	English (ANSI)
GSG	German
GSF	French
GSI	Italian
GSP	Portuguese
GSS	Spanish
GSD	Language-neutral (English IEC)

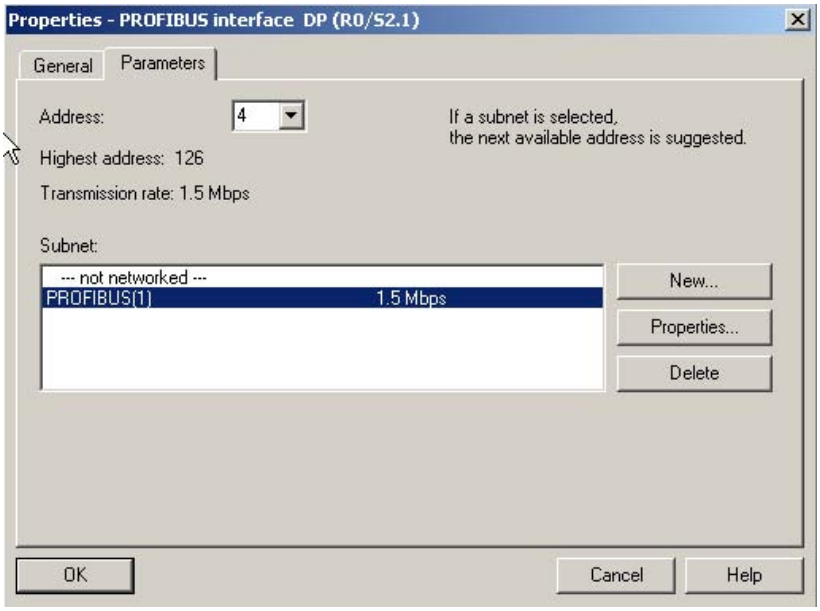
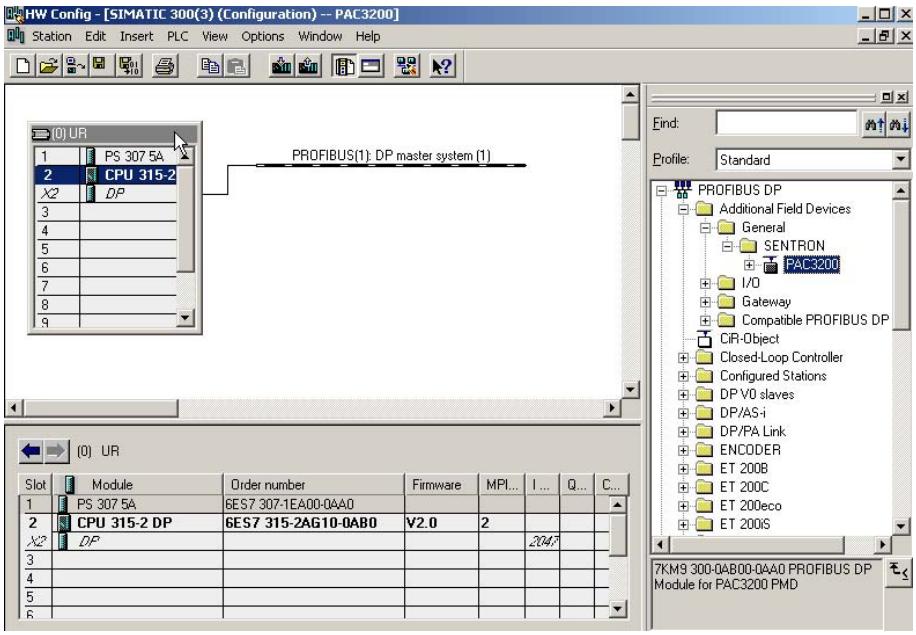
Configuring by means of the GSD file, based on STEP 7

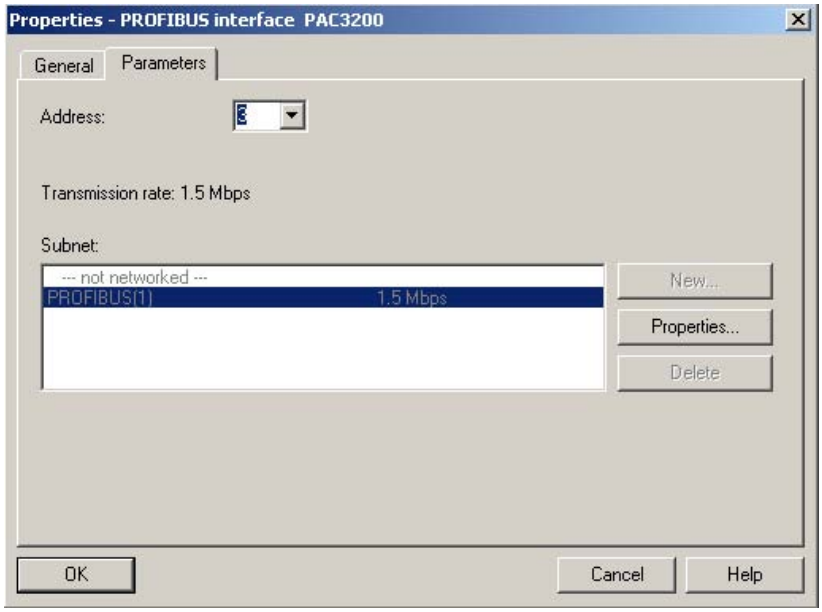
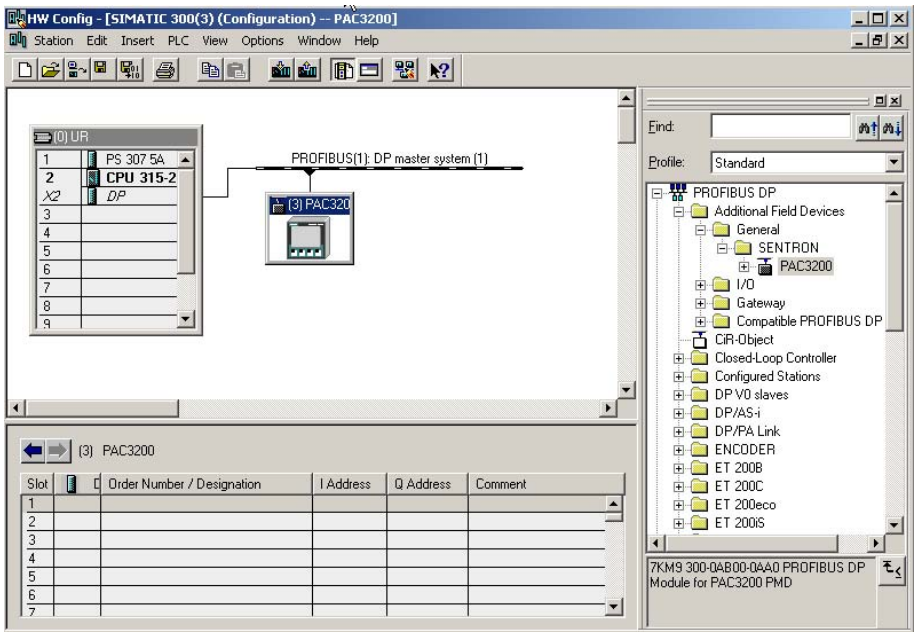
Table 6-3 Procedure

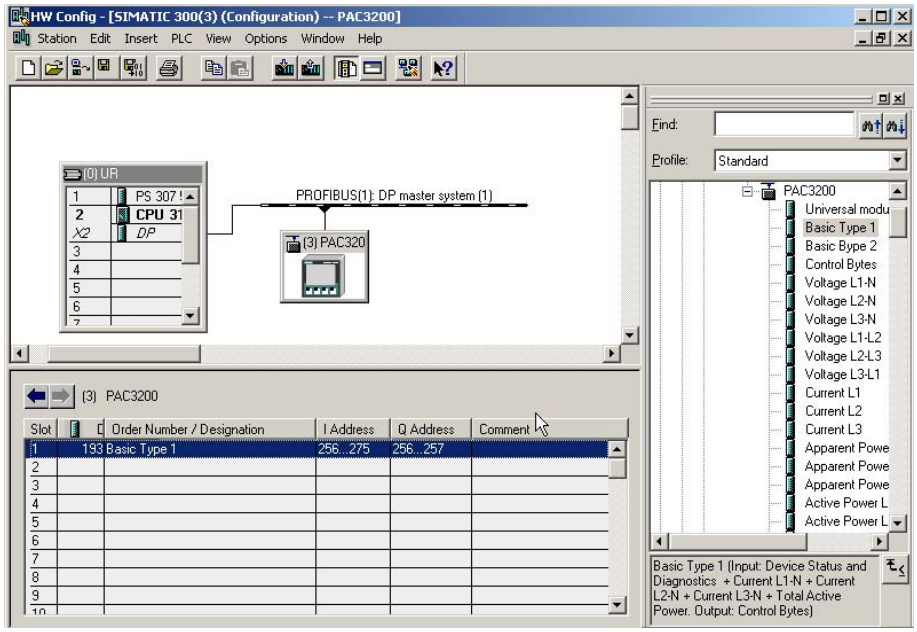
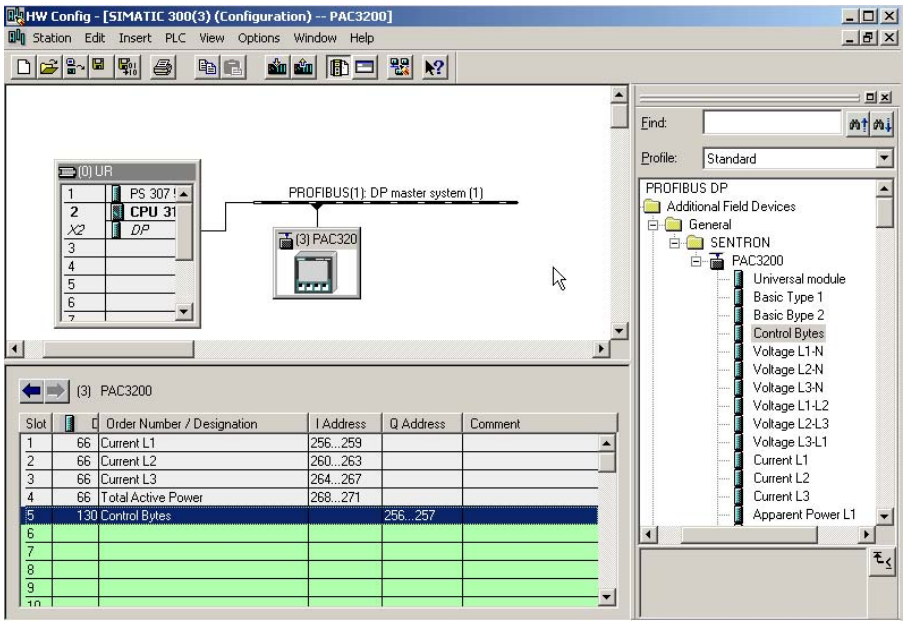
Sequence		Screen
1	Start HW Config in the SIMATIC Manager.	 HW Config after start-up
2	Confirm in the "Options" > "Install GSD File" menu.	 Call the "Install GSD File" function

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 SENTRON PAC power meter in the hardware tree: "PROFIBUS DP" > "Additional Devices" > "SENTRON" > "PACxxxx"	 Add the power meter to HW Config

Sequence		Screen
7	Drag the power meter, e.g., the SENTRON PAC3200, from the hardware tree to the PROFIBUS DP master system 1. Set the address of the PAC PROFIBUS DP expansion module.	 Set the address of the PAC PROFIBUS DP expansion module
8	Click on the icon for the SENTRON PAC power meter.	 HW Config with the integrated PAC PROFIBUS DP expansion module

Sequence		Screen
9	Parameterize the SENTRON PAC power meter. To do this, drag the components onto the slots one by one.	 Parameterize the PAC PROFIBUS DP expansion module - example 1: Add basic type 1 to slot 1  Parameterize the PAC PROFIBUS DP expansion module - example 2: Assign individual measured variables in connection with the freely definable basic type.

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

NOTICE
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.

See also

Default settings (Page 37)

Contents of the CD for the SENTRON PAC power meter (Page 6)

Technical support (Page 7)

Measured variables (Page 29)

Maintenance, service and disposal 7

7.1 Cleaning

Description

The PAC PROFIBUS DP expansion module is maintenance-free.

NOTICE
Damage due to detergents Detergents can damage the device. Do not use detergents.

NOTICE
Faulty connector Be careful not to bend the pins of the connector. Bent pins can destroy the connector.

1. Use only a dry, lint-free, antistatic cloth to clean the housing.
2. Clean the pins carefully using a brush.

7.2 Repair

Procedure

CAUTION
Loss of certification and warranty If you open the module, the module certification will be lost and the Siemens warranty will be invalidated. Only the manufacturer is permitted to carry out repairs on the module. Return faulty or damaged modules to Siemens for repair or replacement.

If the module is faulty or damaged, proceed as follows:

1. Discharge yourself.
2. Remove the module.
3. Pack the module in a suitable manner to prevent it from being damaged during transport.
4. Return the module to Siemens. You can obtain the address from:
   - Your Siemens sales partner
   - Technical support

See also

Electrostatic sensitive devices (ESD) (Page 73)

Disassembly (Page 21)

Technical support (Page 7)

7.3 Disposal

Disposal and recycling

Dispose of or recycle the module in accordance with the applicable laws and regulations in your country.

8 Interrupt, error, and system messages

8.1 Diagnostics concept

Diagnostic information

The following PROFIBUS DP diagnostic information is available:

1. Slave diagnostics in accordance with standard
2. Enhanced diagnostics
   - Device diagnostics

8.2 Slave diagnostics

Structure of the slave diagnostics

Table 8-1 Structure of the slave diagnostics of the SENTRON PAC power meter

<table>
<tr><th colspan="6">Slave diagnostics in accordance with standard</th><th colspan="6">Device diagnostics</th></tr>
<tr><td>Byte 0</td><td>Byte 1</td><td>Byte 2</td><td>Byte 3</td><td>Byte 4</td><td>Byte 5</td><td>Byte 6</td><td>Byte 7</td><td>Byte 8</td><td>Byte 9</td><td>Byte 10</td><td>Byte 11</td></tr>
<tr><td colspan="3" rowspan="3">Device status 1 to 3</td><td rowspan="3">PROFIBUS address of the master[1)]</td><td>High byte</td><td>Low byte</td><td rowspan="3">-</td><td rowspan="3">-</td><td rowspan="3">-</td><td rowspan="3">-</td><td rowspan="3">-</td><td rowspan="3">-</td></tr>
<tr><td>81</td><td>63</td></tr>
<tr><td colspan="2">Manufacturer's ID[2)]</td></tr>
<tr><td colspan="12">1) This is the address of the master with read and write access to the slave. If the value here is FF_H, the slave has not been parameterized.
2) The manufacturer's ID identifies the slave model, e.g., "8163_H" for the SENTRON PAC3200.</td></tr>
</table>

8.3 Diagnostics LED

Description

The diagnostics LED indicates the communication status.

Table 8-2 Status and fault display by the LED

Color	Status	Description	Measures
Green	Off	No voltage applied to the PAC PROFIBUS DP expansion module	1. Check that the PAC PROFIBUS DP expansion module is connected to the SENTRON PAC power meter correctly. 2. Switch on the supply voltage to the SENTRON PAC power meter.
Green	On	PROFIBUS DP communications are OK. Cyclic data exchange with the class 1 master.[1)]	-
Green	Flashing	PROFIBUS DP communications are OK. Data exchange with the class 2 master.[2)]	-
Red	Static	Bus fault. Communication is not possible. No communication with a class 1 or class 2 master.	• Set a valid PROFIBUS address on the SENTRON PAC power meter. • Check the bus installation. • Check that the bus connector is correctly inserted. • Check if the connecting cable to the PROFIBUS DP master has been disconnected. • Check the bus terminator.
Red	Flashing	Parameter assignment error: • The slave has not been parameterized or has been wrongly parameterized. • An incorrect station address has been assigned.	• Check the communication and the parameter assignment. • Check the PROFIBUS address.
Orange	Static	Communication between the PAC PROFIBUS DP expansion module and the SENTRON PAC power meter has been interrupted.	Check the operating capability of the SENTRON PAC power meter.
		The orange LED lights up for just a short time: • 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.

Color	Status	Description	Measures
Orange	Flashing	Hardware fault on the expansion module or the SENTRON PAC power meter, e.g.: • 12 V too weak or not present • SRAM fault • Flash fault • EEPROM fault	Replace the PAC PROFIBUS DP expansion module and/or the SENTRON PAC power meter.
1) A parallel connection to a class 2 master 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.			

8.4 Structure of the device statuses

Statuses 1 to 3 give an overview of the status of a PROFIBUS DP slave.

Status 1

Table 8-3 Structure of status 1 in byte 0

Bit	Status	Meaning	Cause/remedy
0	1	The master cannot address the slave. The bit in the slave is always 0.	Check: • Is the correct PROFIBUS address set on the slave? • Are the bus connectors connected? • Has voltage been applied to the SENTRON PAC power meter?
1	1	The slave is not yet ready for the data exchange.	The slave is in the initialization phase. Wait for a short time.
2	1	The configuration data sent to the slave by the master does not match the actual configuration of the slave.	Check that the device-specific GSD file and the device belong together.
3	1	External diagnostics have been activated.	Evaluate the device diagnostics. Once all errors have been remedied, bit 3 is reset.
4	1	The slave does not support the requested function.	Check the configuration.
5	1	The master cannot interpret the answer from the slave.	Check the bus installation.
6	1	The slave type does not match the software configuration.	Match the actual configuration to the planned configuration.
7	1	The slave was parameterized by a different master from the one that currently has access to the slave.	"1" is set whenever you access the slave with a programming device or a different master, for example. The PROFIBUS address of the master which parameterized the slave can be found in byte 3.

Status 2

Table 8-4 Structure of status 2 in byte 1

Bit	Status	Meaning	Cause/Remedy
0	1	Parameters have to be reassigned to the slave.	Check: • The parameter assignment • The configuration • Whether the device-specific GSD file and the power meter go together.
1	1	There is a diagnostic message.	Clear the fault.
2	1	The bit in the slave is always set to "1".	-
3	1	Response monitoring is enabled for this slave.	-
4	1	The slave has received the "FREEZE" control command.	The "FREEZE" function is not supported. Check the configuration.
5	1	The slave has received the "SYNC" control command.	The "SYNC" function is not supported. Check the configuration.
6	0	This bit is always set to "0".	-
7	1	The slave is deactivated. It has been removed from the current process.	Activate the slave from the master if necessary.

Status 3

Table 8-5 Structure of status 3 in byte 2

Bit	Status	Meaning
0 ... 6	0	These bits are always set to "0".
7	1	There are more device diagnostic messages than can be displayed in the diagnostic telegram.

8.5 Structure of the device diagnostics

The device diagnostics identify problems that occur while the SENTRON PAC power meter is running.

Structure

Table 8-6 Structure of the device diagnostics in byte 10

Bit	Status	Meaning
0	0	Reserved
1	0	Reserved
2	0	Reserved
3	0	Reserved
4	0	Reserved
5	0	Reserved
6	0	Reserved
7	1	The device diagnostics data are available.
	0	The device diagnostics data are not available.

Table 8-7 Structure of the device diagnostics in byte 11

Bit	Status	Message
0	1	Internal com. not ready.
1	1	Internal com. failed
2	0	Reserved
3	1	Data invalid - internal fault (CRC error)
4	0	Reserved
5	1	Data invalid - internal fault (frame error)
6	1	Data invalid - internal fault (timeout)
7	1	Firmware PAC,Module incompatible

See also

Device diagnostic messages (Page 54)

8.6 Device diagnostic messages

SENTRON PAC diagnostic messages

You can call the device diagnostic interrupts online, e.g., in STEP 7 in the SIMATIC Manager.

Table 8-8 Implemented device diagnostic interrupts

Message	Meaning	Remedy
Internal com. not ready	Communication between the expansion module and the SENTRON PAC power meter is not ready, e.g., during the initialization phase.	-
Firmware PAC, Module incompatible	The firmware of the SENTRON PAC power meter and of the PAC PROFIBUS DP expansion module are not compatible.	Update the firmware.
Internal com. failed	A permanent communication error has occurred between the SENTRON PAC power meter and the expansion module.	Replace the expansion module.
Data invalid	The actual data for the expansion module are not up-to-date.	The data are updated automatically. If the message does not disappear, replace the expansion module.

See also

Structure of the device diagnostics (Page 52)

8.7 Initializing the module

Starting communication between the PAC PROFIBUS DP expansion module and the SENTRON PAC power meter

During the start phase the LED on the PAC PROFIBUS DP expansion module lights up orange.

1. Power ON:

   When the SENTRON PAC power meter is switched on, the SENTRON PAC power meter and the PAC PROFIBUS DP expansion module are in the RESET position.

2. Initialization phase:

   If a timeout occurs, PROFIBUS communication is started. The static diagnostics report this error to PROFIBUS.

   Error messages, e.g.:

   – Internal com. not ready

   – Internal com. failed

3. Set the language:

   When the SENTRON PAC power meter is ready for communication, the PAC PROFIBUS DP expansion module checks the language on the SENTRON PAC power meter and sets this as its own language. If a problem occurs, the default language of English is set and PROFIBUS communication is started. The static diagnostics report this error to PROFIBUS.

   Error message, e.g.:

   – Internal com. not ready

   – Internal com. failed

4. Send parameters to the SENTRON PAC power meter:

   The PAC PROFIBUS DP expansion module sends configuration parameters to the SENTRON PAC power meter, e.g., the device address.

   You can configure the PAC PROFIBUS DP expansion module:

   – On the SENTRON PAC power meter in the "Configuration" menu

   If an error occurs, PROFIBUS communication is started. The static diagnostics report this error to PROFIBUS.

   Error message, e.g.:

   – Internal com. not ready

   – Internal com. failed

5. Retrieve data from the SENTRON PAC power meter:

   When all parameters have been sent to the SENTRON PAC power meter, the communication module loads the measured values and status bytes from the SENTRON PAC power meter into its memory. If an error occurs, PROFIBUS communication is started. The static diagnostics report this error to PROFIBUS.

   Error message, e.g.:

   – Data invalid.

6. The PAC PROFIBUS DP expansion module reads these data cyclically from the SENTRON PAC power meter.

Troubleshooting/FAQs

9

9.1 Power failure

Data

With the exception of the measurement data, all critical data for the expansion module are retained, e.g., PROFIBUS address, serial number, etc.

Actions after rectifying the power failure

Switch on the power supply again.

Technical data

10

10.1 Standards

Description

Table 10-1 The device meets the following standards

Standard	Title
IEC 61158-2:2004	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 2: Physical layer specification and service definition"
IEC 61158-3:2003	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 3: Data link service definition"
IEC 61158-4:2004	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 4: Data link protocol specification"
IEC 61158-5:2004	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 5: Application layer service definition"
IEC 61158-6:2004	"Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 6: Application layer protocol specification"
IEC 61784-1:2004	PROFIBUS Standard

Note

Other standards

In addition to the above-mentioned standards, those listed in the "SENTRON PAC3200" manual also apply.

10.2 Technical data

Mechanical data

Table 10-2 Mechanical data for the PAC PROFIBUS DP expansion module

	Values
Dimensions of housing (height x width x depth)	63 mm x 43 mm x 22 mm
Dimensions of housing with sub D socket (height x width x depth)	69 mm x 43 mm x 22 mm
Overall depth of SENTRON PAC power meter with mounted PAC PROFIBUS DP expansion module	73 mm with a maximum plate thickness of 4 mm
Mounting position	Vertical on the SENTRON PAC power meter
Housing design	VDT 3400 structure 36
Tolerances	According to DIN 16901:1982-11
Weight	45 g
Connector to SENTRON PAC power meter	14-pin connector
Length of cable	Dependent on baud rate. More information about cable lengths can be found in section 21.1 of standard IEC 61158-2:2004 and IEC 61158-2:2003
Max. cable length for 12 Mbps[1)]	100 m (cable type A only)
Max. cable length for 9.6 kbps[1)]	1200 m
Non-volatile memory	256 kB
Power supply	Power supplied by SENTRON PAC
Cooling	Passive air cooling in form of ventilation slots
Flammability class	V0
1) More information about cable lengths can be found in section 22.1 of standard IEC 61158-2.	

Electrical data

Table 10-3 Electrical data for the PAC 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 SENTRON PAC power meter and the PROFIBUS DP interface		500 V
Galvanic isolation		In expansion module
Insulating voltage	Maximum insulating voltage	500 V
	Maximum permissible overvoltage for < 10 seconds	4000 V
1) Formerly RS 485		

Ambient and environmental conditions

Table 10-4 Ambient and environmental conditions

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

Note

Other technical data

The other mechanical and electrical data and ambient and environmental conditions are identical to those for the SENTRON PAC power meter. You can find more information in the operating instructions and manual for the SENTRON PAC power meter.

See also

Standards (Page 61)

10.3 Communication interface

Technical data

Table 10-5 Technical data for the communication interface

	Values
Connector	9-pin, sub D socket
Thread	UNC4-40
PROFIBUS DP data transfer: supported baud rate in kbps	9.6 / 19.2 / 45.45 /, 93.75 / 187.5 / 500 / 1500 / 3000 / 6000 / 12000
Supported address range	1 to 126 [1)]
Supported communication protocols	• PROFIBUS DP V0 for cyclic data exchange with class 1 master
Bus cycle	The bus cycle depends on: 1. The number of nodes 2. The data volume 3. The baud rate

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 for the PROFIBUS DP connection

The PAC PROFIBUS DP expansion module uses a 9-pin sub D socket.

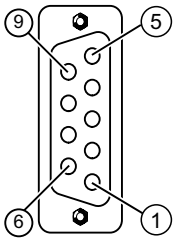


Figure 10-1 9-pin sub D socket

Table 10-6 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 at output	5 V / 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) Formerly RS 485			

10.4 Labeling

Description

The graphic below shows the positioning of the label on the housing of the PAC PROFIBUS DP expansion module.

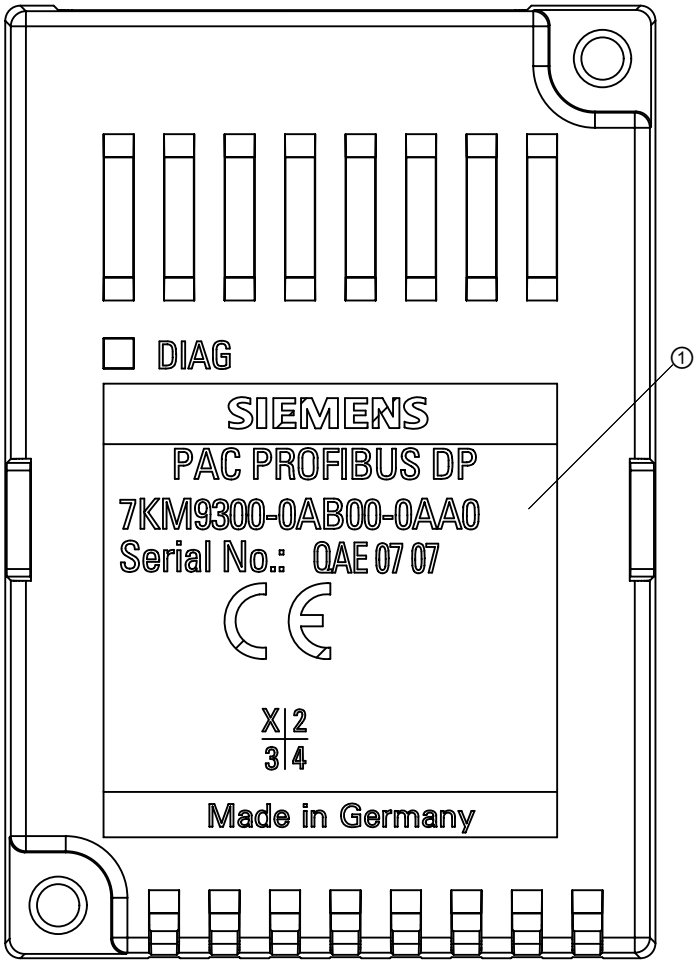


Figure 10-2 The PAC PROFIBUS DP expansion module with label

(1) Type plate

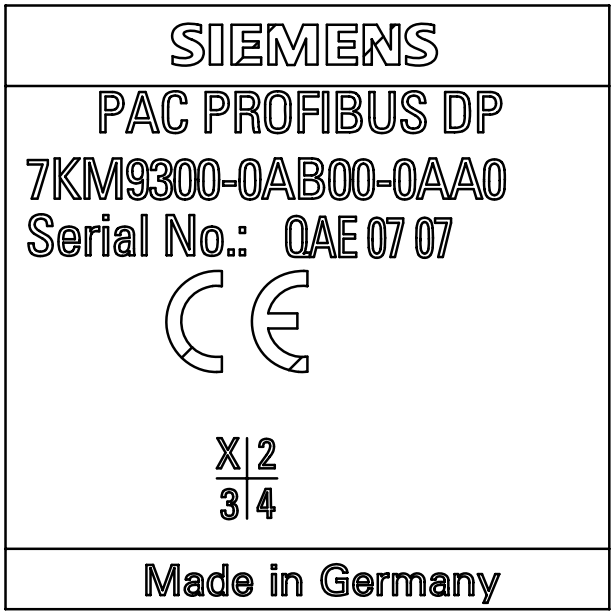


Figure 10-3 Type plate of the PAC PROFIBUS DP expansion module with order number (MLFB) and serial number

Dimension sheets

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11.1 Dimension sheets

PAC PROFIBUS DP expansion module

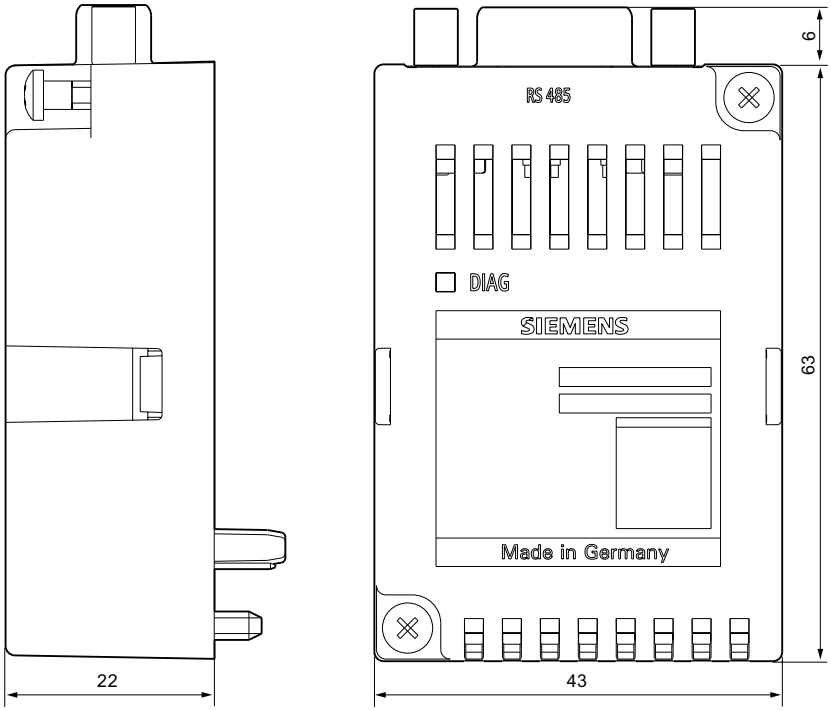

Figure 11-1 Side view and front view with sub D socket

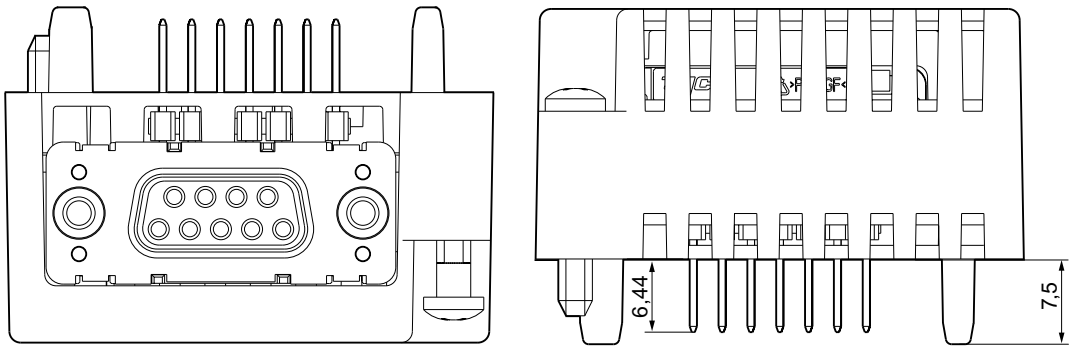

Figure 11-2 Bottom view and top view with sub D socket

Appendix

A

Correction sheet

Have you noticed any errors while reading this manual? If so, please use this form to tell us about them. We welcome comments and suggestions for improvement.

Fax response

	From (please complete):
To	Name
SIEMENS AG	
A&D CD MM3	Company/Department
P.O. Box 1954	
	Address
92220 Amberg / Germany	

Fax: +49 (0)96-21-80-33-37

Manual title:

Table A-1 Errors, comments, and suggestions for improvements

ESD directives

B

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

CAUTION
Electrostatic sensitive devices Electronic modules contain components that can be destroyed by electrostatic discharge. These modules can be easily destroyed or damaged by improper handling. • You must discharge your body electrostatically immediately before touching an electronic component. 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. metallized plastic or metal containers. Leave the component in its packaging until installation.

CAUTION
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.

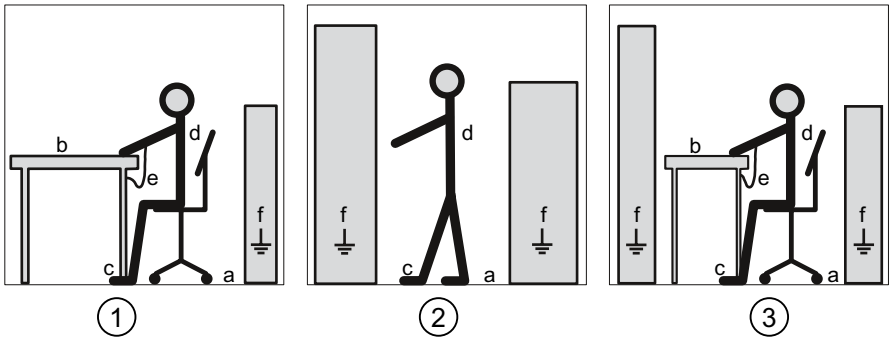

Figure B-1 ESD work center

(1) ESD seat
(2) ESD standing position
(3) ESD seat and ESD standing position

Table B-1 Protective measures

a	Conductive floor
b	ESD table
c	ESD footwear
d	ESD smock
e	ESD bracelet
f	Cubicle ground connection

List of abbreviations

C

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
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
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
ISM	Industrial, Scientific and Medical
ISO	International Standardization Organization
LED	Light Emitting Diode
LT	Low Tariff
NAFTA	North American Free Trade Agreement

Abbreviation	Meaning
NEMA	National Electrical Manufacturers Association
PAC	Power Analysis & Control
RMS	Root Mean Square
RS	Formerly: Radio Selector; now usually: Recommended Standard
TIA	Totally Integrated Automation
THD	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

Glossary

Baud rate

The baud rate is the rate of data transmission. It indicates the number of bits transferred in one second.

Bus

Shared transmission path over which all bus nodes 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.

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.

FREEZE

FREEZE is a control command from the PROFIBUS DP master to a group of PROFIBUS DP slaves.

Upon receiving the FREEZE control command, the PROFIBUS DP slave freezes the inputs at their current states and transfers them to the PROFIBUS DP master in cycles. The PROFIBUS DP slave freezes its input status again after each new FREEZE command.

The input data will be cyclically transferred to the PROFIBUS DP master again only after the PROFIBUS DP master has issued the UNFREEZE control command.

Master

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

Node

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. Specifies the functional, electrical and mechanical characteristics of a serial bit stream fieldbus 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 bus node receives a unique PROFIBUS address. The bus node 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.

Slave

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

SYNC

With the SYNC control command the PROFIBUS DP master prompts the PROFIBUS DP slave to freeze the output statuses at their value at that moment. With the subsequent frames, the PROFIBUS DP slave stores the output data, but the output statuses remain unchanged.

After each new SYNC control command, the PROFIBUS DP slave sets the outputs it has saved as output data. The outputs are not updated cyclically again until the PROFIBUS DP master has sent an UNSYNC control command.

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