BA01415R/09/EN/04.22-00
71601914
2022-12-15

Valid as of version
ENU000A, V2.04.xx

Operating Instructions
Memograph M, RSG45

Advanced Data Manager
Additional Instructions: PROFINET Device

Endress+Hauser
People for Process Automation

Table of contents

1 General information

1.1 Safety symbols

⚠ DANGER
This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

⚠ WARNING
This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

⚠ CAUTION
This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE
This symbol contains information on procedures and other facts which do not result in personal injury.

The functionality is only possible with a Profibus module, Version V2.15 and higher.

1.2 Scope of delivery

NOTICE
This manual contains an additional description for a special software option.
These additional instructions are not intended as a substitute for the Operating Instructions!
- ▶ Detailed information can be found in the Operating Instructions and the additional documentation.

Available for all device versions via:
- Internet: www.endress.com/deviceviewer
- Smartphone/tablet: Endress+Hauser Operations App

Here you can also download the correct GSD file for your device.

Alternatively, the GSD file can also be downloaded from the product page on the Internet: **www.endress.com/rsg45 → Downloads**

1.3 Firmware history

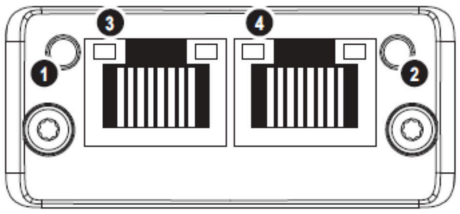
Overview of unit software history:

Unit software Version / date	Software modifications	FDM analysis software version	Version of OPC server	Operating Instructions
V02.00.06 / 12.2015	Original software	V1.3.0 and higher	V5.00.03 and higher	BA01415R/09/EN /01.15
V02.01.03 / 07.2016	Extended functionality/bug fixes			BA01415R/09/EN /02.16
V02.04.02 / 08.2018	Extended functionality/bug fixes			BA01415R/09/EN /03.18
V2.04.06 / 10.2022	Bug fixes	V1.6.3 and higher	V5.00.07 and higher	BA01415R/09/EN /04.22-00

1.4 Connections

View of the PROFINET connection on the device

1	Network status LED
2	Module status LED
3	Port 1 status LED
4	Port 2 status LED



1.4.1 Network status LED

Functional description of the network status LED

Network status LED	Indicator for
Off	Not online/no voltage
Green	Online, data transfer active
Flashing green (1 x flash)	Online, data transfer stopped or transferred data incorrect
Flashing green	Flash test for identifying the device in the network
Red	Critical error in the PROFINET module (module status LED also lit red)
Flashing red (1 x flash)	Device name not assigned
Flashing red (2 x flash)	IP address not assigned
Flashing red (3 x flash)	Slot/subslot configuration in the module differs from the received slot/ subslot configuration

1.4.2 Module status LED

Functional description of the module status LED

Module status LED	Indicator for
Off	No voltage or not initialized
Green	Initialized
Flashing green (1 x flash)	Initialized, diagnostics available
Red	Exception error Critical error in the PROFINET module (network status LED also lit red)
Flashing red/green	Firmware update to the PROFINET module → During this phase the device must not be switched off as this can permanently damage the module.

1.4.3 Port 1/2 status LED

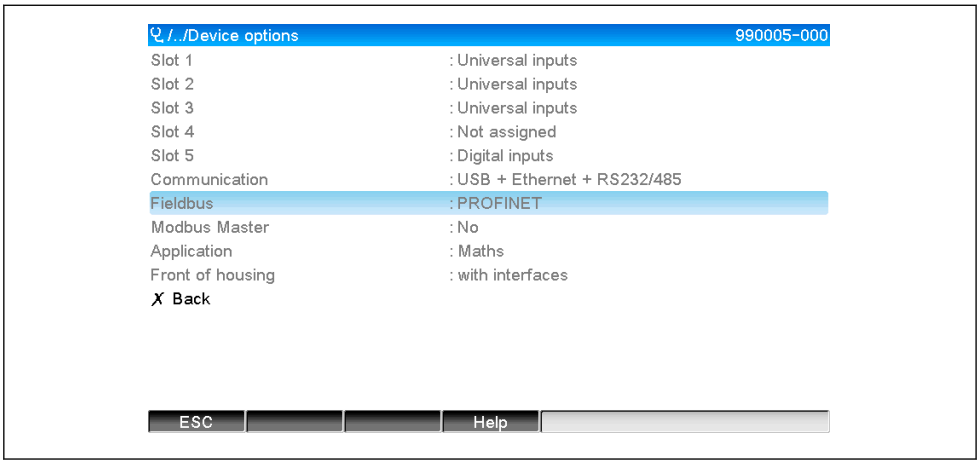
Functional description of the port 1 and port 2 status LED

Port 1/2 status LED	Indicator for
Off	Disconnected from the network
Green	Connected to the network, communication not active
Green, flashing	Connected to the network, communication active

1.5 Checking for the presence of the PROFINET module

The following menus can be used to check whether an installed PROFINET module has been detected:

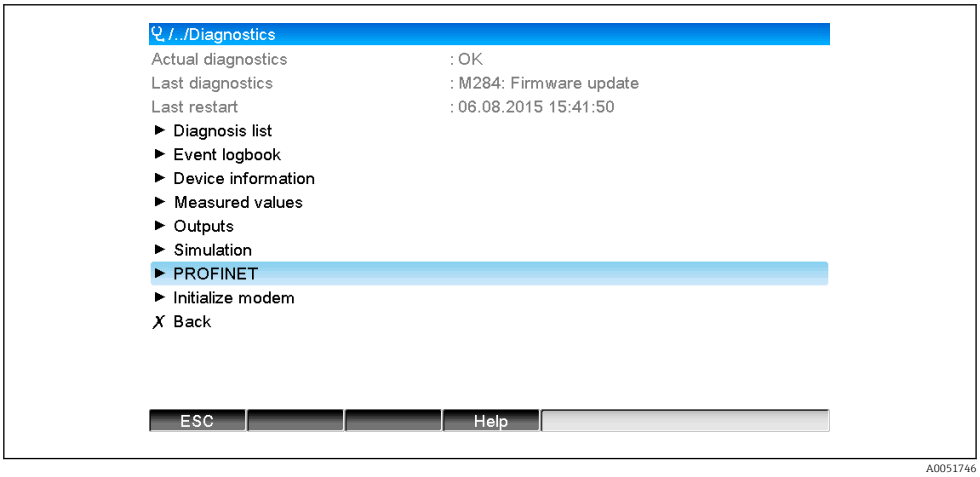
a) **Main menu → Diagnostics → Device information → Device option → Fieldbus:**



1 Checking for the presence of the PROFINET module under "Device options"

The **Fieldbus** menu item indicates whether and which fieldbus module has been detected. If it is a PROFINET module, this is indicated as shown above.

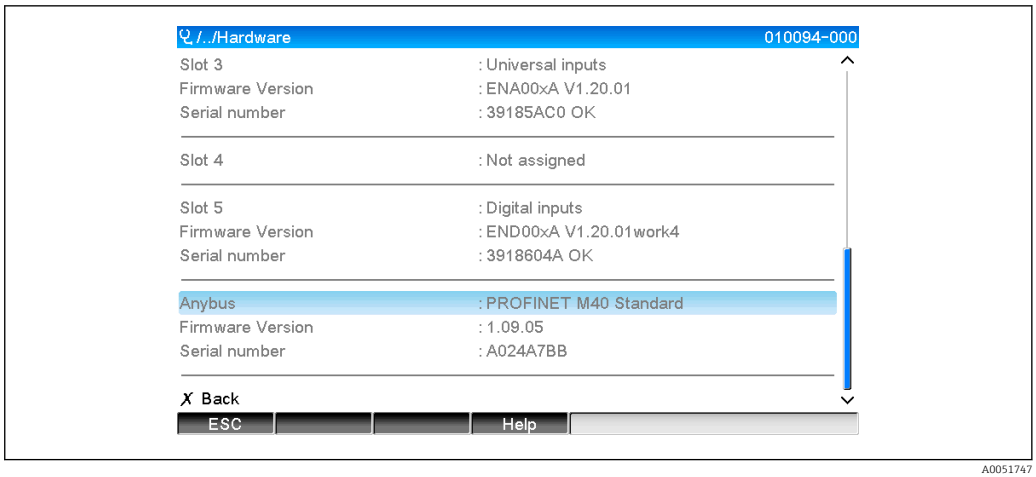
b) **Main menu → Diagnostics → PROFINET:**



2 Checking for the presence of the PROFINET module under "Diagnostics"

In contrast to option **a)** this menu item is only displayed if a PROFINET module has been detected. A more detailed description of this menu can be found in Section 2 "Data transmission" → 🖹 8.

If a PROFINET module has been detected, the additional information **Anybus**, **Firmware version** and **Serial number** relating to the detected module is displayed under **Main menu → Diagnostics → Device information → Hardware**.



3 Information about the detected PROFINET module under "Hardware"

1.6 Protocol-specific data

Protocol	"Application layer protocol for decentral device periphery and distributed automation", version 2.31
Conformance Class	B (additional features: Legacy, MRP, DeviceAccess)
Netload Class	III
Communication type	100 MBit/s
Device profile	Application interface identifier 0xF600 Generic device
Manufacturer ID	0x11
Device ID	0x86FA
Device description files (GSD)	Information and files under: ▪ www.endress.com ▪ www.profibus.org
Baud rates	Automatic 100 Mbps with full-duplex detection
Cycle times	From 1 ms
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs
Supported connections	▪ 1 x AR (Application Relation) ▪ 1 x Input/Output CR (Communication Relation) ▪ 1 x Alarm CR (Communication Relation) ▪ 1 x Record Data CR (Communication Relation) ▪ 2 x AR (Application Relation) 1 x Record Data CR (Communication Relation)
Configuration of the device name	DCP protocol

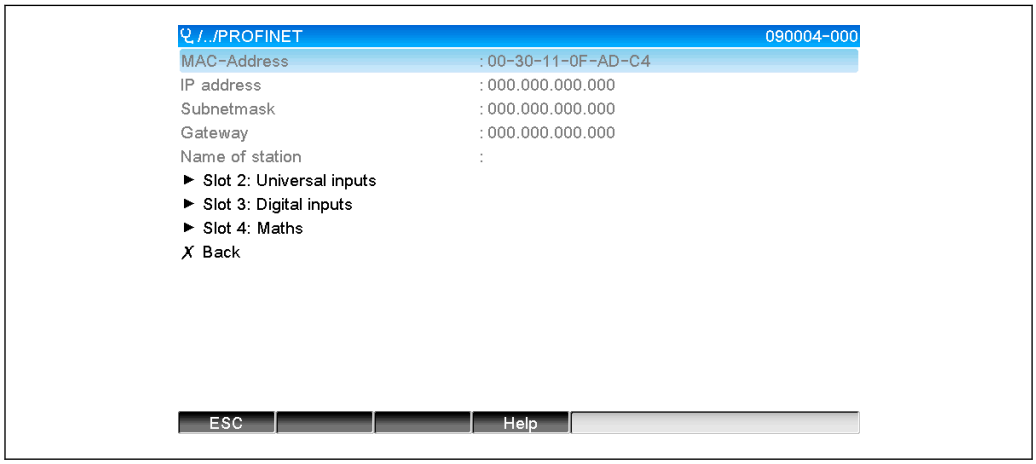
2 Data transmission

All parameters relevant to PROFINET data transmission are grouped together in the main menu under **Diagnostics → PROFINET**.

This is divided into two main areas:
- Communication (see the "Communication settings" section → 8)
- Configuration of the cyclic data transfer (see the "Configuration of the cyclic data transfer" section → 14)

2.1 Communication settings

The settings used for PROFINET communication are displayed in this menu. The parameters (**MAC address** to **Name of station**) and their current values are displayed in "Section 3 PROFINET communication settings":



4 *PROFINET communication settings*

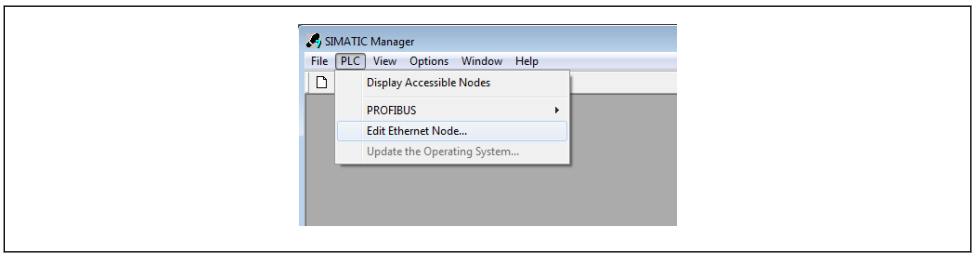
The MAC address is a unique hardware address that is stored in the device and cannot be changed. It is used to identify the device in a network, for example. With the exception of the MAC address, all other parameters are configured via the fieldbus (PROFINET controller or a corresponding tool). This display is used to check whether and which communication settings are used.

The manner in which the parameters **IP address**, **Subnet mask**, **Gateway**, and **Name of station** are configured depends on the tool used. Please refer to the tool for more information.

Manual configuration: (SIMATIC Manager STEP7 V5.5)

One option for manual configuration using the **SIMATIC Manager STEP7 V5.5** tool is explained below. A prerequisite for this is that the computer used (PC, laptop, etc.) is connected to the PROFINET network and that the tool is pre-configured for accessing the PROFINET network.

1.



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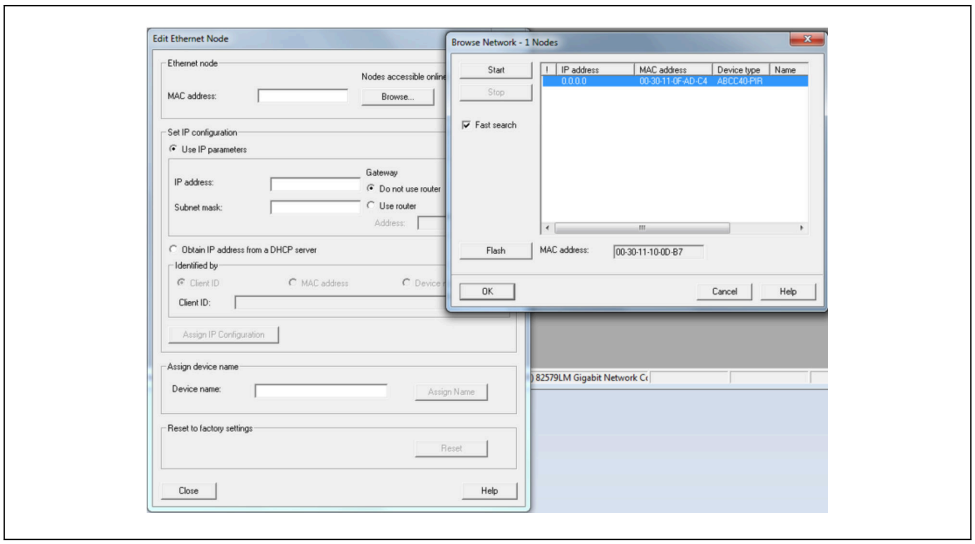
In the SIMATIC Manager main menu, select **PLC → Edit Ethernet node**.

↳ A new window **Edit Ethernet node** opens.

2. Click **Browse...** in this window. Another window opens, which displays the devices in the PROFINET network. Select the PROFINET device to be configured and select **OK** to confirm.

↳ The MAC address can be used to select the device as this is unique to each device.

3.



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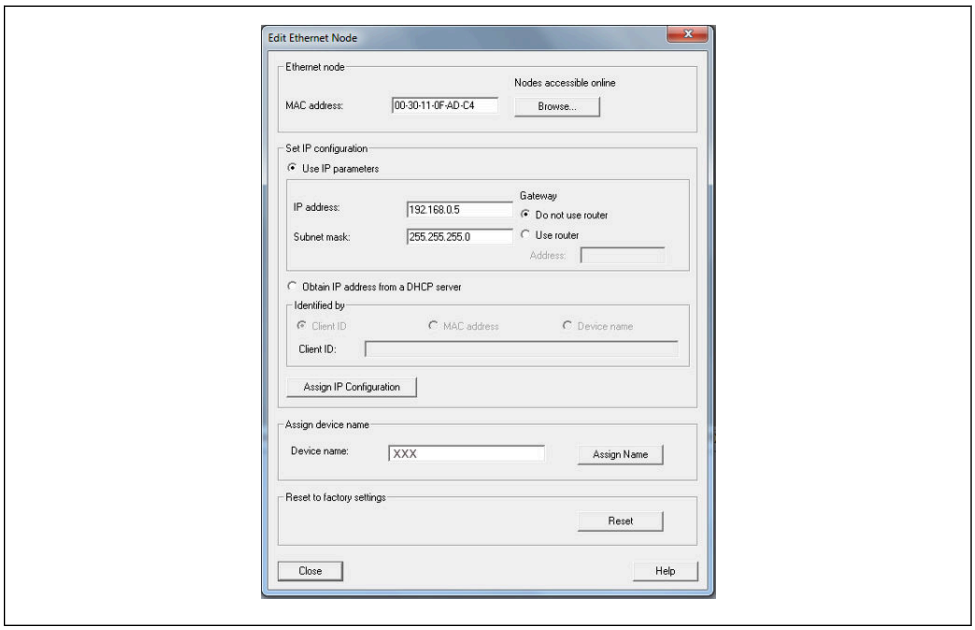
The MAC address of the selected device is now displayed under **Ethernet node**. The **IP address** and **Subnet mask** can now be set under **Set IP configuration** and the device name (= **Name of station**) can be set under **Assign device name**. In this case, the **Gateway** setting is made by the tool itself as the **Do not use router** option is selected.

4.



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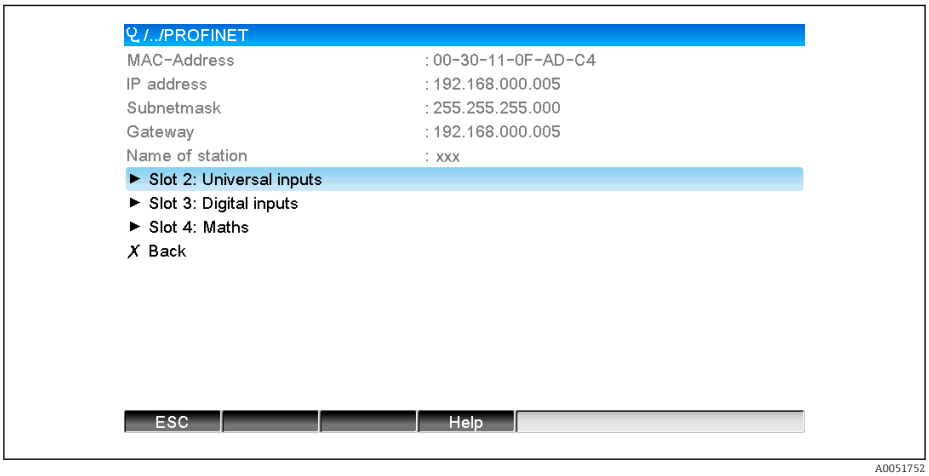
The settings are sent to the device by pressing **Assign IP configuration** and **Assign name**.

↳ The settings are then shown in the device's main menu under **Diagnostics → PROFINET**.



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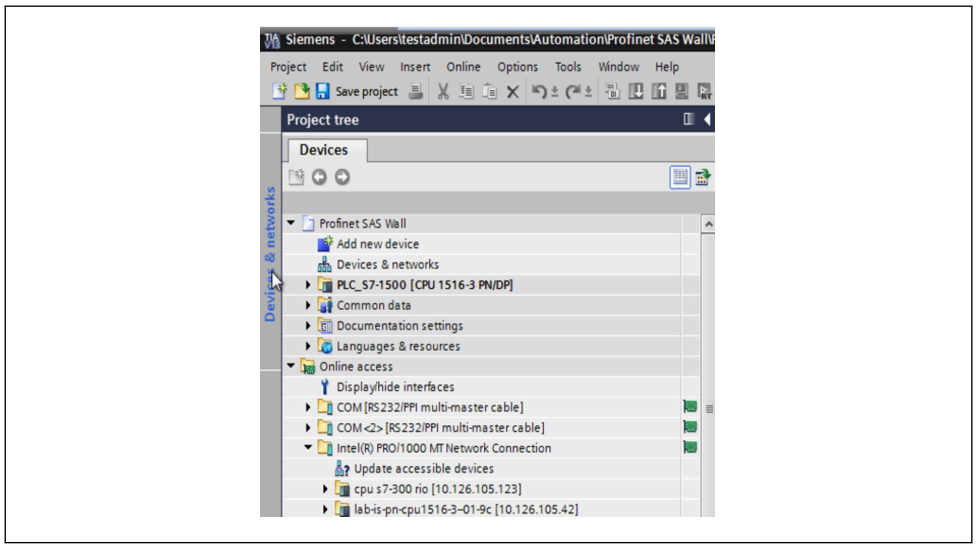
Manual configuration (TIA Portal STEP7 V13):

One option for manual configuration using the **TIA Portal STEP7 V13** tool is explained below. A prerequisite for this is that the computer used (PC, laptop, etc.) is connected to the PROFINET network and that the tool is pre-configured for accessing the PROFINET network.

1.



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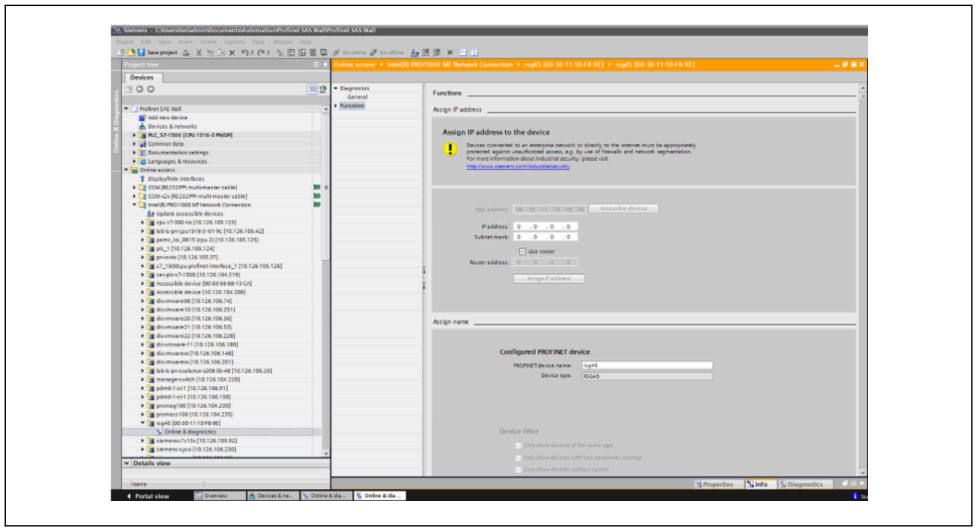
In the TIA Portal project view, select **Project tree → Online access** and then select **Update accessible devices** under the relevant network connection.

2.



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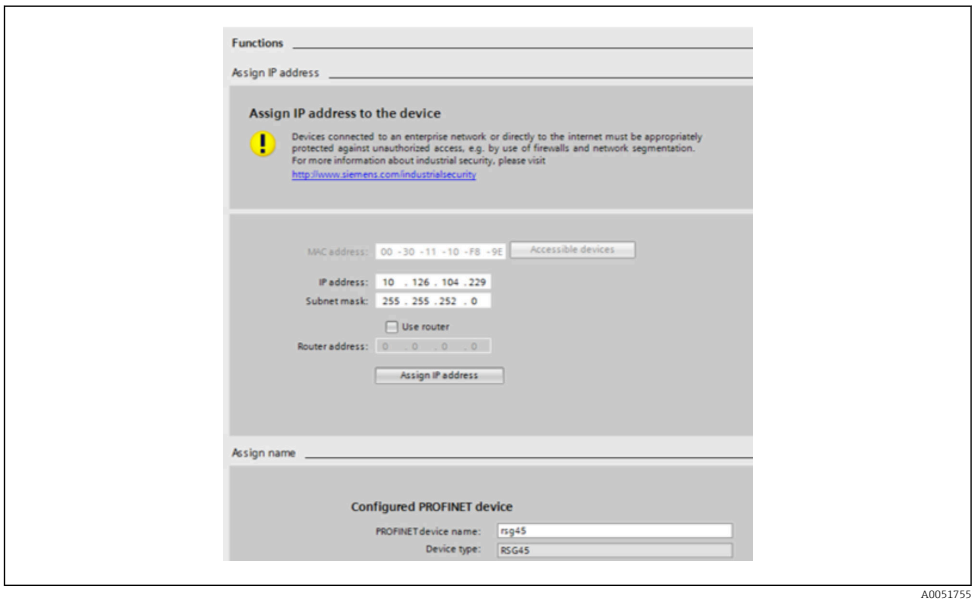
Select the PROFINET device to be configured and double-click to open the **Online & diagnostics** window. The MAC address can be used to select the device as this is unique to each device.

3.



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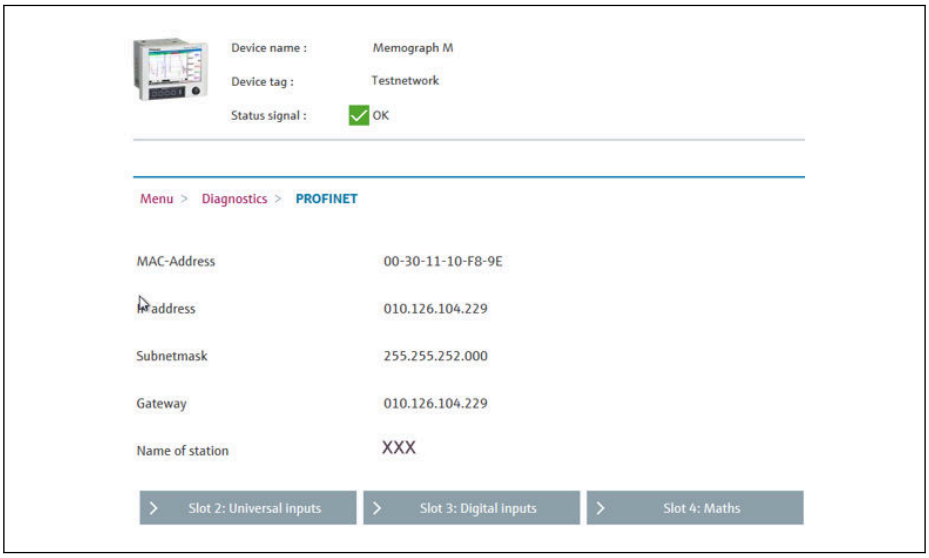
The MAC address of the selected device is now displayed under **Functions**. The **IP address** and **Subnet mask** can now be set under **Assign IP address** and the device name (= **Name of station**) can be set under **Assign name**. In this case, the **Gateway** setting is made by the tool itself as the **Do not use router** option is selected.

4. The settings are sent to the device by pressing **Assign IP configuration** and **Assign name**.

↳



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The settings are then shown in the device's main menu under **Diagnostics → PROFINET** and in the web server.

2.2 Cyclic data transfer

PROFINET can be used to cyclically transfer the values of universal inputs 1-40, digital inputs 1-20, and mathematics channels 1-12.

The cyclic data transfer is configured exclusively via the PROFINET controller, which sends the configuration to the device when the connection for cyclic data transfer is established. The device receives the configuration, checks its validity, and adapts to the new configuration provided this is valid. No settings are made in the device itself. A more detailed description of the process can be found in the "Configuration of the cyclic data transfer" section.

Explanation of the data types used:
- Uint8: 1 byte, integer
- Uint16: 2 bytes, integer
- Float32: 4 bytes, floating point number (IEEE-754, single precision)
- Float64: 8 bytes, floating point number (IEEE-754, double precision)

Every value is always transferred with a status byte, which describes its usability and follows the actual value directly.

Example: Instantaneous value (Float32+Uint8)
- Value: Float32 → 4 bytes
- Status: Uint8 → 1 byte (see the "Coding of the status byte" section → 14)
- Transferred data (5 bytes): Byte 0-3: Float32; Byte 4: Status

2.2.1 Input data: Data transmission, device → PROFINET controller

Input data consists of values that are sent from a device to the PROFINET controller during the cyclic data transfer.

The following values can be sent from the device to the PROFINET controller:

Transferable input data

Value	Data structure	Data size (bytes)	Writable to
Instantaneous value	Value: Float32 Status: Uint8	5	Universal inputs, mathematics channels
Digital state	Value: Uint16 Status: Uint8	3	Digital inputs, mathematics channels
Totalizer (Float32)	Value: Float32 Status: Uint8	5	Universal inputs, digital inputs, mathematics channels
Totalizer (Float64)	Value: Float64 Status: Uint8	9	Universal inputs, digital inputs, mathematics channels

The interpretation of the read value depends on the configuration of the input/channel. The instantaneous value of a universal input, for example, can be the result of a thermocouple measurement or a current measurement.

For a detailed description of how to configure the inputs/channels, see the standard Operating Instructions.

2.2.2 Output data: Data transmission, PROFINET controller → device

Output data consists of values that are sent from a PROFINET controller to the device during the cyclic data transfer.

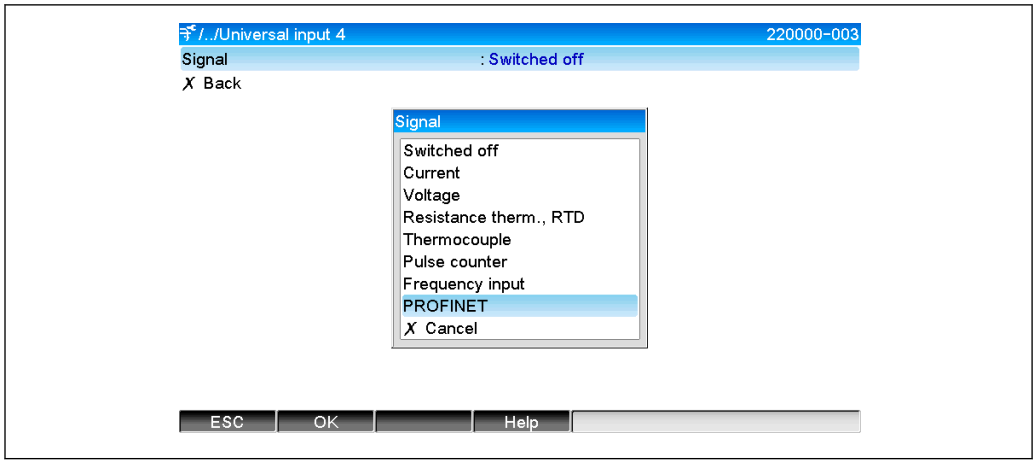
The following values can be sent from the PROFINET controller to the device:

Receivable output data

Value	Data structure	Data size (bytes)	Read from
Instantaneous value	Value: Float32 Status: Uint8	5	Universal inputs
Digital state	Value: Uint16 Status: Uint8	3	Digital inputs

In order to use a value received from the PROFINET controller, the input (universal/digital) must be configured accordingly. For this, **PROFINET** must be selected as the signal in the input. If this is not the case, the received value incl. status byte is only buffered; it is not further processed or saved in the device.

Example for universal input 4:



5 Configuring PROFINET as the input signal

2.2.3 Coding of the status byte

Input data

The status byte of an input/channel that is sent to the PROFINET controller can contain the following values:

Coding of the status byte for input data

Value (in hex format)	Meaning	Possible causes
0x24	Transferred value cannot be used	▪ Cable open circuit ▪ Short-circuit ▪ Sensor/input error ▪ Calculated value invalid
0x28	Transferred value cannot be used	▪ Sensor measuring range undershot ▪ Sensor measuring range exceeded
0x4B	Value uncertain	Input/channel returns equivalent value instead of the calculated value
0x80	Value OK	

Output data

The status byte of an input that is received from the PROFINET controller is interpreted by the device as follows:

Interpretation of the status byte for output data

Value (in hex format)	Meaning
0x00 – 0x3F	Value cannot be used
0x40 – 0x7F	Value uncertain → value is used, but an error is displayed
0x80 – 0xFF	Value OK

2.2.4 Configuration of cyclic data transfer

The cyclic data transfer is configured exclusively in the PROFINET controller. The input/channel or its input and/or output data is selected via the slot/subslot configuration with which a PROFINET controller is configured (see "Slot/subslot configuration" section).

The configuration that is currently used (cyclic data transfer active) or most recently saved (cyclic data transfer not active) is displayed in the device (see the "Display of the slot/subslot configuration in the device" section).

Slot/subslot configuration

The slot configuration defines whether and which channel type is used.

The configuration of the subslot of a slot defines which input and/or output data is used. The subslot number determines the channel number in the device.

The table below shows the allocation of inputs/channels to the slots/subslots:

Figure: Slot/subslot ↔ inputs/channels

Slot	ModulIdentNumber	Channel type	Subslot	Input/channel
2	0x02000028	Universal inputs	1	Universal input 1
			2	Universal input 2
			…	…
			39	Universal input 39
			40	Universal input 40
3	0x03000014	Digital inputs	1	Digital input 1
			2	Digital input 2
			…	…
			19	Digital input 19
			20	Digital input 20
4	0x0400000C	Mathematics channels	1	Mathematics channel 1
			2	Mathematics channel 2
			…	…
			11	Mathematics channel 11
			12	Mathematics channel 12

In order to distinguish which value or combination of values is sent and/or received, the subslots are configured via SubmodulIdentNumbers. The table below provides an overview of the available SubmodulIdentNumbers as well as their assignment to the inputs/channels:

Figure: SubmodulIdentNumber ↔ input/output data

SubmodulIdentNumber	Data source	Data direction	Length (bytes)	Available in
0x01000001	In: Instantaneous value	Input data only	In: 5	Universal inputs, mathematics channels
0x01000002	In: Digital state	Input data only	In: 3	Universal inputs, mathematics channels
0x01000003	In: Totalizer (Float32)	Input data only	In: 5	Universal inputs, digital inputs, mathematics channels
0x01000004	In: Totalizer (Float64)	Input data only	In: 9	Universal inputs, digital inputs, mathematics channels

SubmodulIdentNumber	Data source	Data direction	Length (bytes)	Available in
0x01000005	In: Instantaneous value + totalizer (Float32)	Input data only	In: 10 (=5+5)	Universal inputs, mathematics channels
0x01000006	In: Instantaneous value + totalizer (Float64)	Input data only	In: 14 (=5+9)	Universal inputs, mathematics channels
0x01000007	In: Digital state + totalizer (Float32)	Input data only	In: 8 (=3+5)	Digital inputs
0x01000008	In: Digital state + totalizer (Float64)	Input data only	In: 12 (3+9)	Digital inputs
0x02000001	Out: Instantaneous value	Output data only	Out: 5	Universal inputs
0x02000002	Out: Digital state	Output data only	Out: 3	Digital inputs
0x03000001	In: Totalizer (Float32) Out: Instantaneous value	Input/output data	In: 5 Out: 5	Universal inputs
0x03000002	In: Totalizer (Float64) Out: Instantaneous value	Input/output data	In: 9 Out: 5	Universal inputs
0x03000003	In: Totalizer (Float32) Out: Digital state	Input/output data	In: 5 Out: 3	Digital inputs
0x03000004	In: Totalizer (Float64) Out: Digital state	Input/output data	In: 9 Out: 3	Digital inputs

In the case of value combinations that return several values in one data direction (xx + yy), the order in the list determines the order of transfer. Example: "0x01000005":

In: Instantaneous value + totalizer (Float32)

Data length: 10 bytes

Byte 0-4: Instantaneous value incl. status byte

Byte 5-9: Totalizer (Float32) incl. status byte

Configuration of a PROFINET controller

The device description file **GSDML-Vu.uu-vvvv-wwww-xxxxyyzz.xml** is needed to configure a PROFINET controller for the cyclic data transfer. The final digits (**xxxxyyzz**) in the file name describe the output time:

- xxxx = Year
- yy = Month
- zz = Day

The first released file is called **GSDML-V2.32-EH-RSG45-xxxxyyzz.xml** and is only available in English.

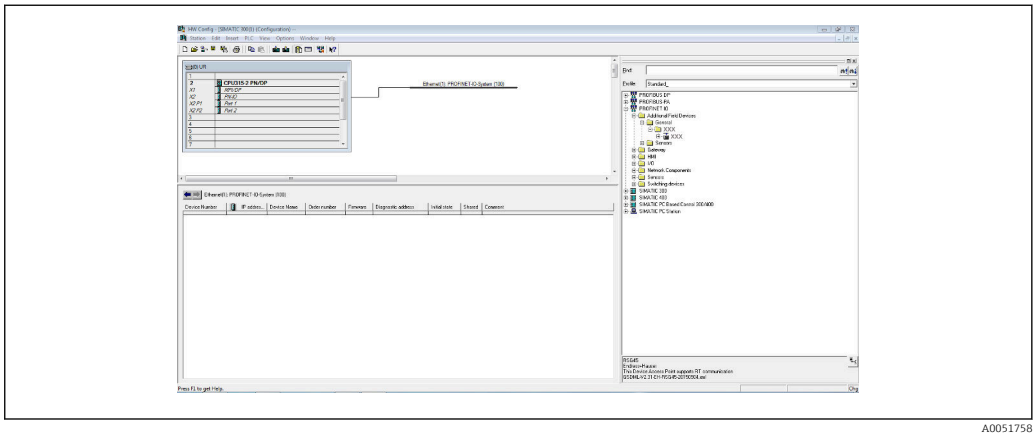
This file contains all the information required for operation and is imported into the tool used to configure the PROFINET controller. The configuration process depends on the tool used. Please refer to the tool for more information.

GSDML file	Compatible firmware
GSDML-V2.32-EH-RSG45-xxxxyyzz.xml	V2.00.06 - V2.01.03
GSDML-V2.34-EH-RSG45-xxxxyyzz.xml	From V2.04.02

Configuration based on a Siemens controller (S7 315-2 PN/DP) using the **SIMATIC STEP 7 V5.5** and **TIA Portal STEP 7 V13** tool is explained below. Some experience with the tool is required (creating a project, importing a GSD file) as these steps are not explained in any more detail here.

Selecting the device in HW-Config (SIMATIC STEP 7 V5.5)

After importing the GSD file, the device can be found in the catalog under **PROFINET IO → Additional field devices → General → ...**:



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6 Display of the device in the HW-Config catalog

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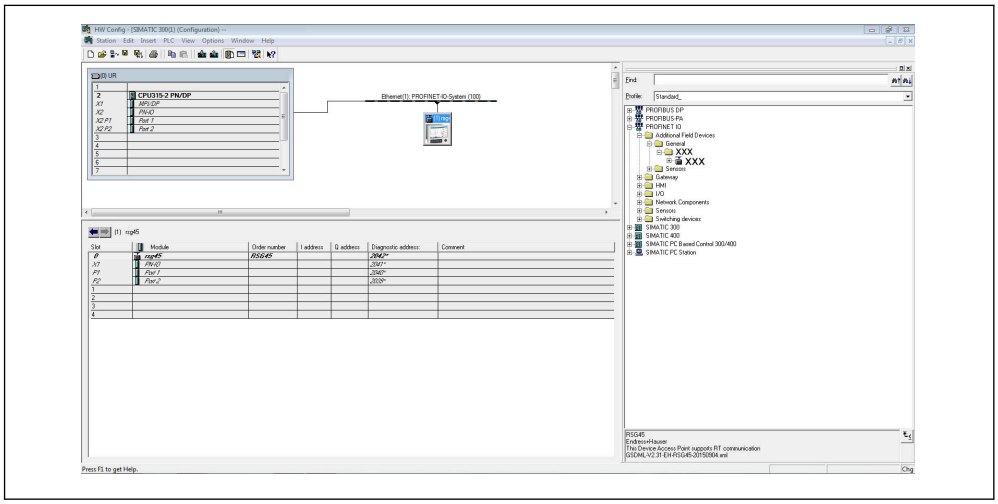

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7 Device connected to PROFINET network

Left-click the **RSG45** device and, keeping the mouse button pressed, connect the device to the PROFINET network.

In the standard configuration all slots are empty, with the exception of slot 0 (corresponds to slot 0 in the figure above). In slot 0, the **Device Access Point** is permanently configured with the following structure:

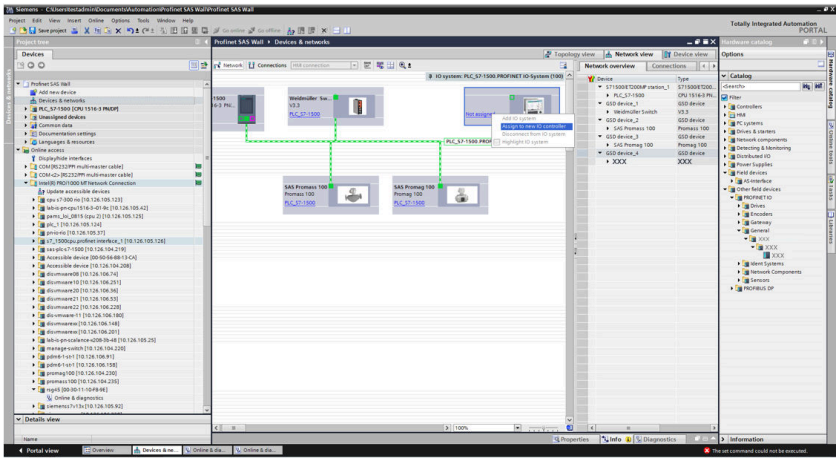
Slot 0: DAP

- 0: rsg45
  Description/configuration of the device: The name assigned in this configuration (=Name of station) is displayed here. The name assigned in the configuration must match the name set in the device, as the device is identified for cyclic data exchange based on its name.
- X1: PN-IO
  Description/configuration of the PROFINET interface: Update times, monitoring times, media redundancy, etc.
- P1: Port 1 / P2: Port2
  Description/configuration of the physical ports: Topology, available options, etc.

Slot 1 is not currently used and cannot currently be configured. Any configuration of this slot will be rejected by the device.

Selecting the device in the TIA Portal STEP 7 V13 hardware catalog

After importing the GSD file, the device can be found in the catalog under **PROFINET IO → Additional field devices → General → E+H Memograph M RSG45**:



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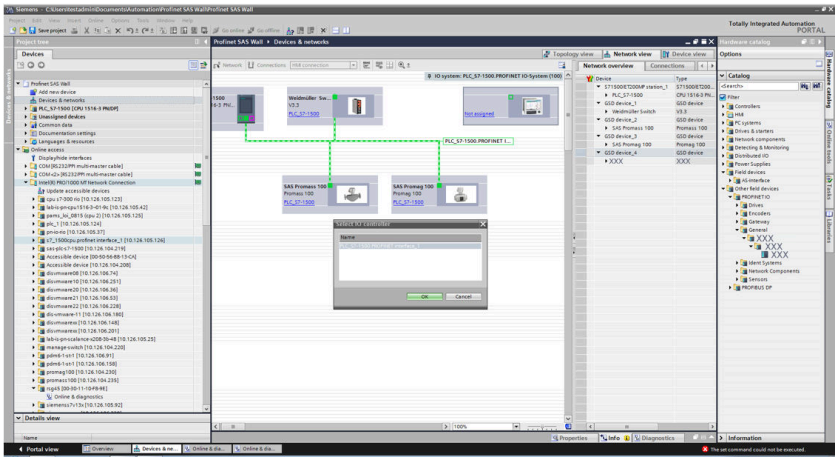
▶



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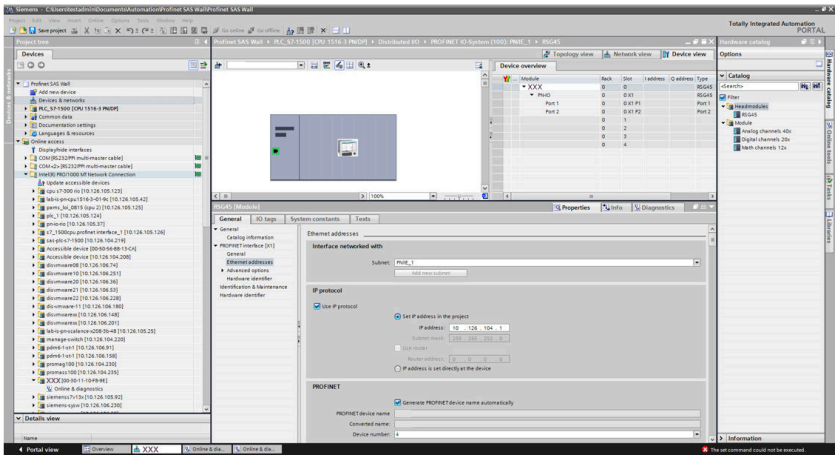

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Left-click the **RSG45** device and, keeping the mouse button pressed, drag the device into the network view and then assign it to a PROFINET network (IO controller).

In the standard configuration all slots are empty, with the exception of slot 0 (corresponds to slot 0 in the figure above). In slot 0, the **Device Access Point** is permanently configured with the following structure:

Slot 0: DAP
- 0: rsg45
  Description/configuration of the device: The name assigned in this configuration (=Name of station) is displayed here. The name assigned in the configuration must match the name set in the device, as the device is identified for cyclic data exchange based on its name.
- X1: PN-IO
  Description/configuration of the PROFINET interface: Update times, monitoring times, media redundancy, etc.
- P1: Port 1 / P2: Port2
  Description/configuration of the physical ports: Topology, available options, etc.

Slot 1 is not currently used and cannot currently be configured. Any configuration of this slot will be rejected by the device.

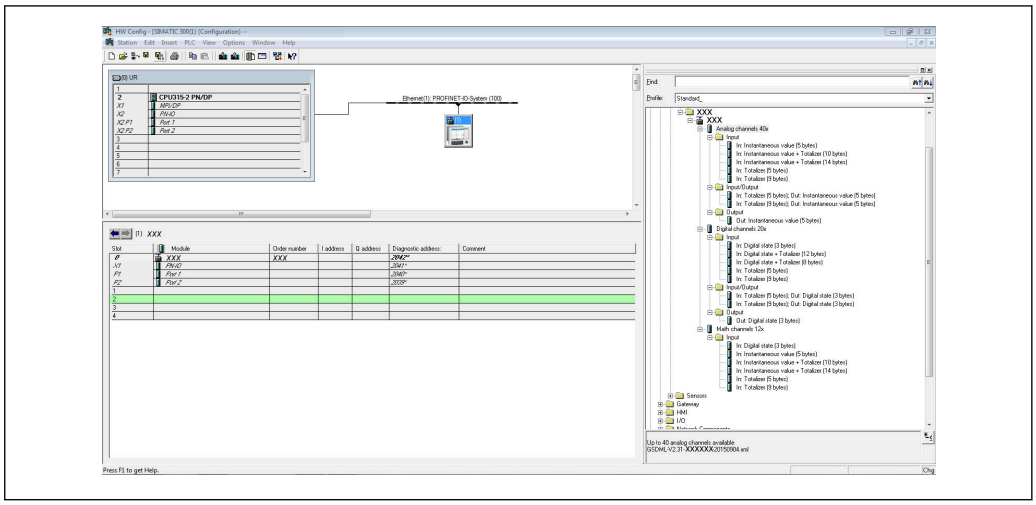
Selecting the data to be transferred (SIMATIC STEP 7 V5.5 and TIA Portal V13)

The cyclic data is configured in two steps:

In the first step, the type and number of available inputs/channels are selected via the configuration of the slot with a module.

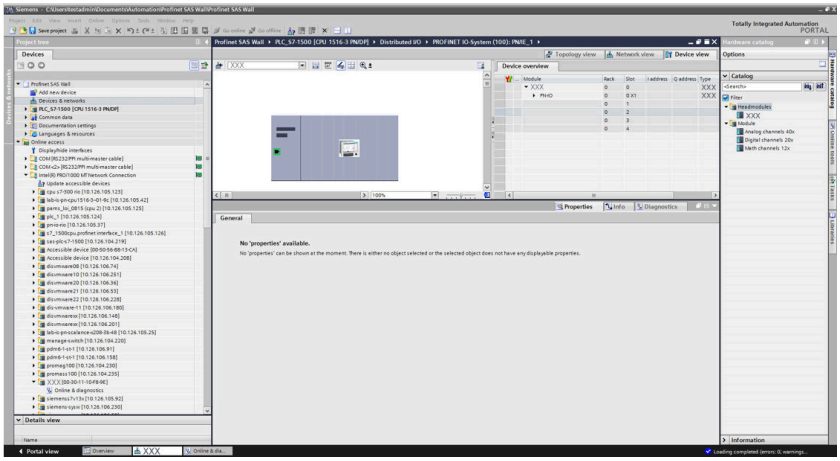
In the second step, the input/channel and the data to be transferred are determined via the configuration of the subslot with a submodule.

The figure below provides an overview of available modules and submodules based on the specifications from **Table, Figure: Slot/subslot ↔ inputs/channels** and **Table, Figure: SubmoduleNumber ↔ input/output data**:



A0051763

8 Slot/subslot configuration in TIA portal



A0051764

9 Slot/subslot configuration in TIA portal

For a better overview, the selectable submodules of a module are divided into three categories:

1. Input:
   All submodules available for selection that only deliver input data are grouped together here.
2. Input/Output:
   All submodules available for selection that both deliver input data and receive output data are grouped together here.
3. Output:
   All submodules available for selection that only receive output data are grouped together here.

Depending on the tool used, either the ModulIdentNumber/SubmodulIdentNumber and/or the text for the ModulIdentNumber/SubmodulIdentNumber stored in the GSD file is displayed. In this case, the stored text is displayed instead of the ModulIdentNumber/SubmodulIdentNumber:

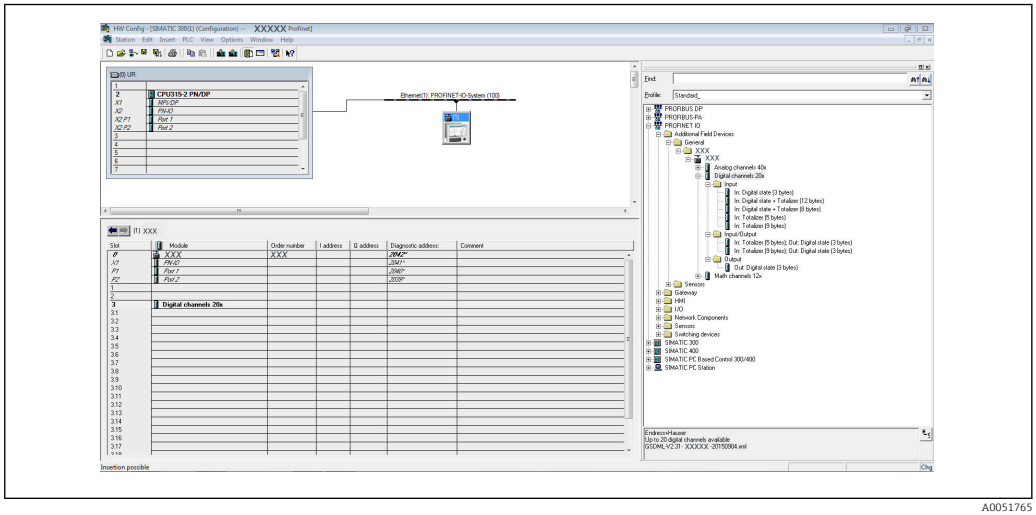
Figure: Module/submodule texts in GSD file ↔ ModulIdentNumber/SubmodulIdentNumber

Displayed text		**ModulIdentNumber**	**SubmodulIdentNumber**
Module	Analog channels 40x	0x02000028	
	Digital channels 20x	0x03000014	
	Math channels 12x	0x0400000C	
SubModule	In: Instantaneous value (5 bytes)		0x01000001
	In: Digital state (3 bytes)		0x01000002
	In: Totalizer (5 bytes)		0x01000003
	In: Totalizer (9 bytes)		0x01000004
	In: Instantaneous value + Totalizer (10 bytes)		0x01000005
	In: Instantaneous value + Totalizer (14 bytes)		0x01000006
	In: Digital state + Totalizer (8 bytes)		0x01000007
	In: Digital state + Totalizer (12 bytes)		0x01000008
	Out: Instantaneous value (5 bytes)		0x02000001
	Out: Digital state (3 bytes)		0x02000002
	In: Totalizer (5 bytes); Out: Instantaneous value (5 bytes)		0x03000001

Displayed text		ModulIdentNumber	SubmodulIdentNumber
	In: Totalizer (9 bytes); Out: Instantaneous value (5 bytes)		0x03000002
	In: Totalizer (5 bytes); Out: Digital state (3 bytes)		0x03000003
	In: Totalizer (9 bytes); Out: Digital state (3 bytes)		0x03000004

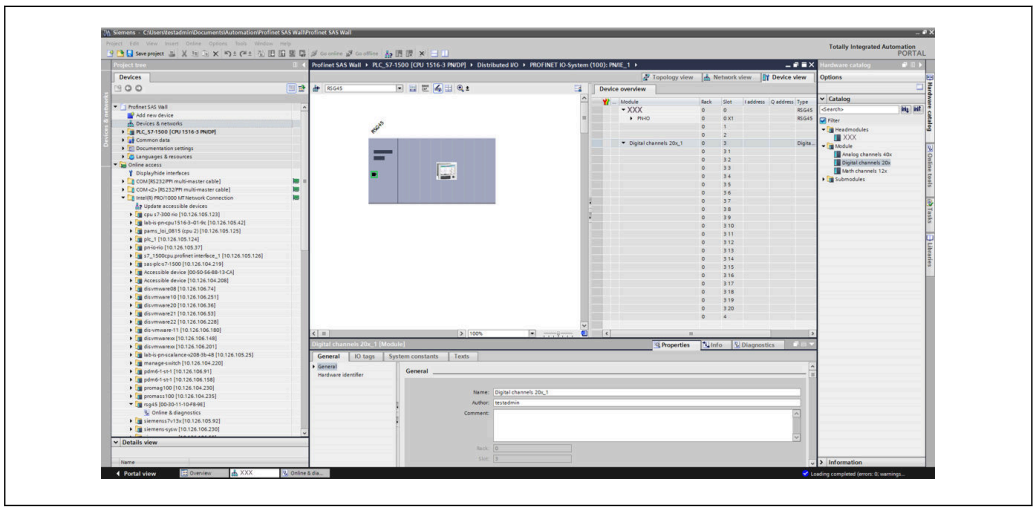
A configuration is shown below based on the digital inputs; this is identical, however, for all other inputs/channels.

First, slot 3 must be configured with the **Digital channels 20x** module. Once this is done, the display expands by the number of configurable subslots:



A0051765

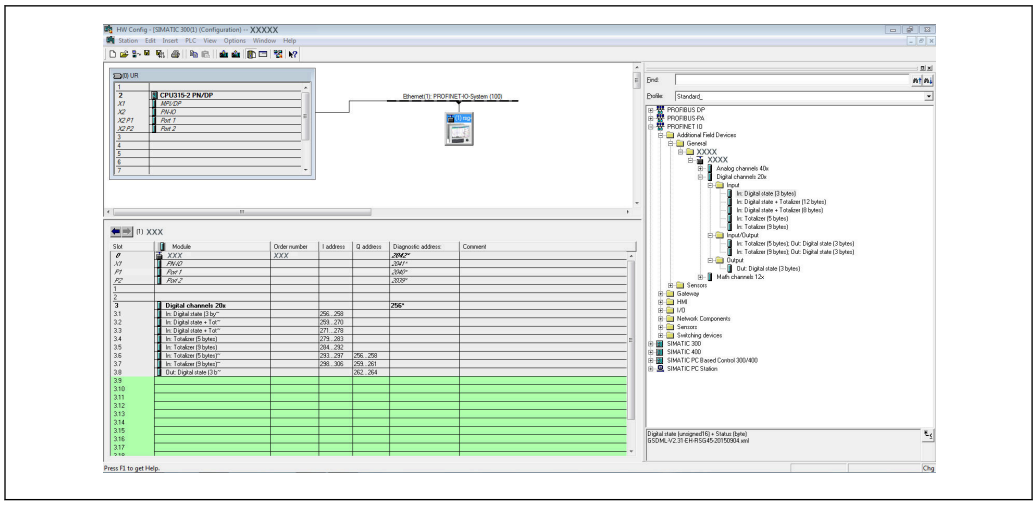
10 Display of configurable subslots in HW-Config



A0051766

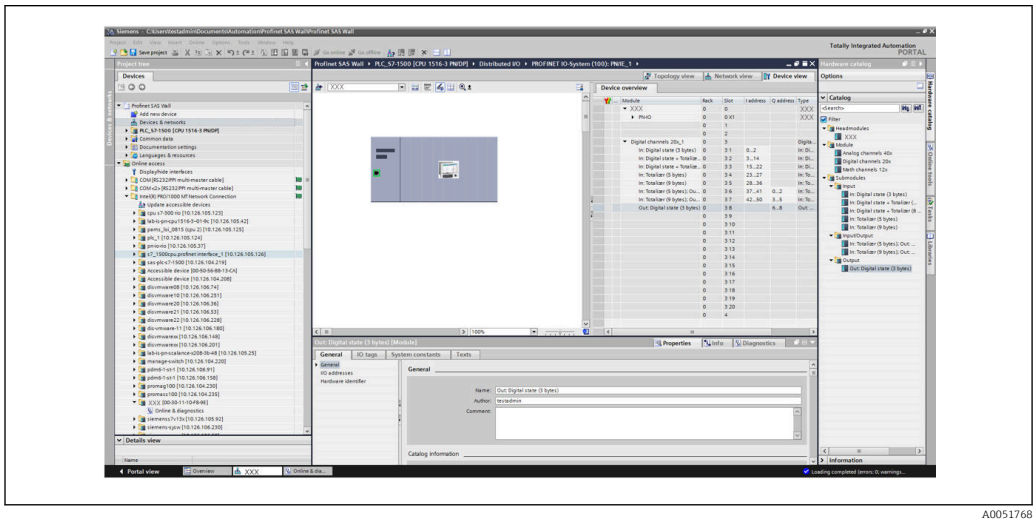
11 Display of configurable subslots in TIA portal

The subslots can now be configured with the corresponding submodules. In this example, all available submodules are distributed between subslots 1-8 (corresponds to digital inputs 1-8) so that each subslot is configured with another submodule:



A0051767

12 *Configuration of digital inputs in HW-Config*



A0051768

13 *Configuration of digital inputs in TIA portal*

During the configuration, the total number of bytes transferred in each data direction must not exceed 280 bytes. These limit values (input: max. 280 bytes; output: max. 280 bytes) are stored in the GSD file and are generally also verified by the tool used.

Once the slot/subslot configuration is complete, this is transferred to the controller.

Once it has received the slot/subslot configuration, the controller attempts to start the cyclic data transfer. When the connection is established, the slot/subslot configuration is sent to the device. During the adaptation phase, the device may disappear briefly from the PROFINET network. This happens if the device has received a configuration that requires the PROFINET interface to be restarted.

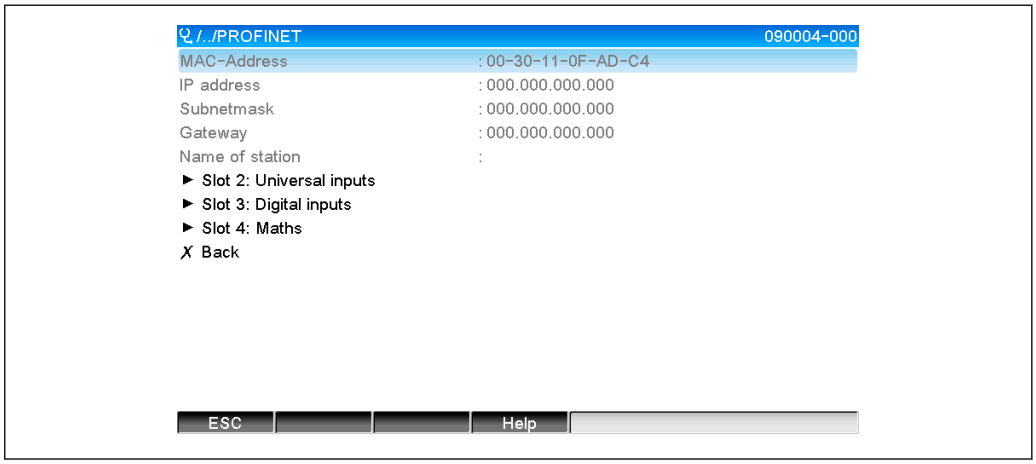
Adapting the device to the received configuration

While establishing the connection, the PROFINET controller sends the slot/subslot configuration to the device, where it is checked for validity. In the event of an invalid configuration, the device ignores the received configuration and retains the current configuration. If the configuration is valid, the device adapts accordingly. If the configuration is identical to the current configuration, the device starts the cyclic data transfer immediately.

If, on the other hand, the received configuration differs from the current configuration, the device disconnects briefly from the PROFINET network in order to restart the PROFINET interface with the new configuration.

The restart can be monitored/checked as follows:

1. **Main menu → Diagnostics → PROFINET**:



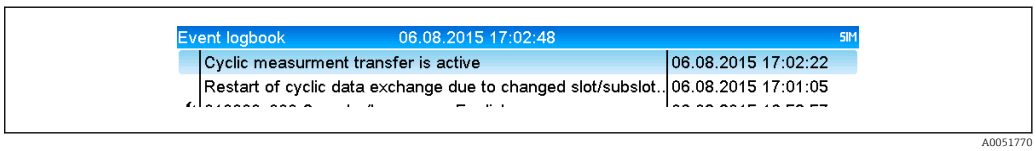
14 *Display of the restart in the PROFINET menu*

While the PROFINET interface is restarting, the **IP address**, **Subnet mask** and **Gateway** connection settings are set to 0 and the name configured under **Name of Station** is set to ------. After the restart, this information is displayed again according to the configured data.

This procedure is carried out every time the PROFINET interface is restarted. A restart can be triggered by the following actions:

a) Adaptation to new slot/subslot configuration
b) Command received to restart the interface
c) Command received to reset the interface to the factory settings

2) Event logbook:

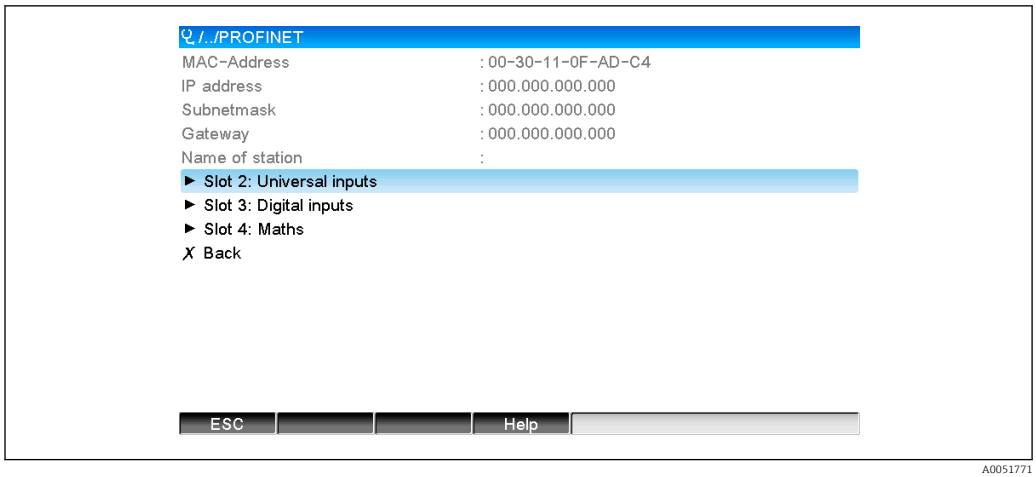


15 *Display of the restart in the event logbook*

An entry is only made in the event logbook if the restart was carried out due to an adaptation to a new slot/subslot configuration.

Display of the slot/subslot configuration in the device

In the main menu under **Diagnostics → PROFINET**, the **Slot2: Universal inputs**, **Slot3: Digital inputs** and **Slot4: Mathematics** submenus are displayed:

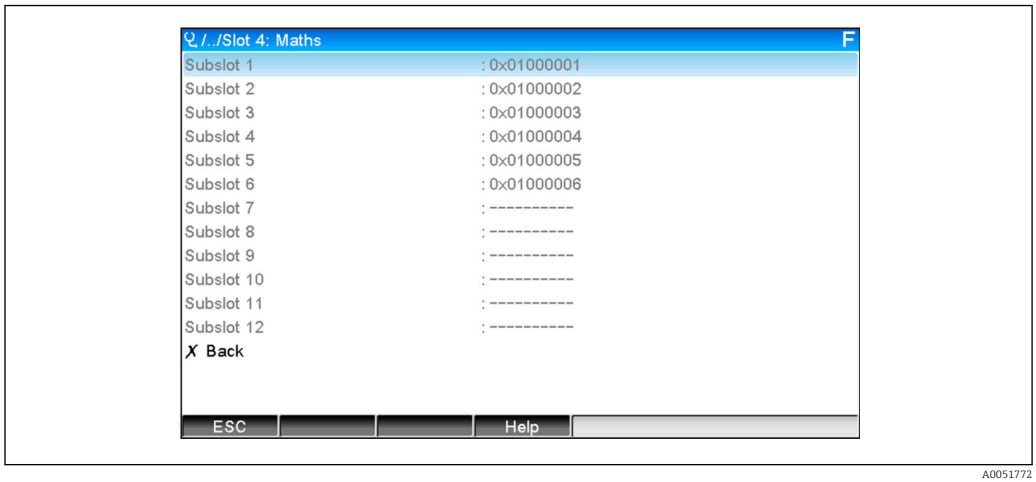


16 *PROFINET configuration of cyclic data transfer*

These submenus show the configuration that is currently used (cyclic data transfer active) or most recently saved (cyclic data transfer not active). The structure of the submenus is always the same and only differs in the number of subslots displayed, which corresponds to the number of inputs/channels.

- **Slot 2:Universal inputs** submenu
  Available universal inputs: 1-40
  Displayed subslots: 1-40
- **Slot 3:Digital inputs** submenu
  Available digital inputs: 1-20
  Displayed subslots: 1-20
- **Slot 4:Mathematics** submenu
  Available mathematics channels: 1-12
  Displayed subslots: 1-12

The display is explained below on the basis of the mathematics channels:



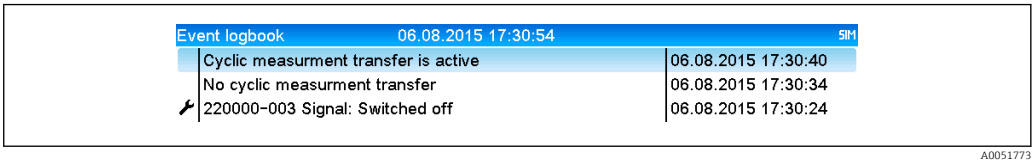
17 *Display of the configuration of mathematics channels*

As shown in the graphic above, the submenu is divided into two areas:

- Left: Specification of the subslot = number of the channel (in this case the mathematics channel)
- Right: Specification of the configured SubmodulIdentNumber. If ------- is displayed instead of the SubmodulIdentNumber, this means that the subslot or the input/channel is not part of the cyclic data transfer. During the cyclic data transfer, only values from the subslots or inputs/channels that have been configured with a corresponding SubmodulIdentNumber are received/sent.

2.2.5 Checking whether cyclic data transfer is active

It is possible to check whether the device is performing cyclic data exchange in the main menu under **Diagnostics → Event logbook**:



18 *Device performing cyclic data exchange*

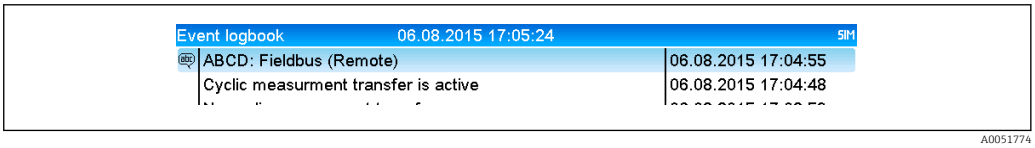
The message **Cyclic measurement transfer is active** is entered here when the device switches to cyclic data transfer with a PROFINET controller. If cyclic data transfer is ended, the message **No cyclic measurement transfer** is displayed.

2.3 Acyclic data transfer

2.3.1 Transferring texts

Texts can be saved in the device's event list. The maximum length is 40 characters. If the text is longer than 40 characters, write access is blocked with an error message. The texts must be written via **Slot 0 → SubSlot 1 → Index 1**.

Once the text has been successfully written, it is entered in the event logbook:



19 *Entry of a text into the event logbook*

The figure above shows that the text **ABCD** has been successfully written.

2.3.2 Batch data

Batches can be started and stopped. The batch name, batch identifier, batch number and preset counter for stopping the batch can also be set. The maximum length of the texts (ASCII) is 30 characters. If the text is longer than 30 characters, write access is blocked with an error message.

The functions and parameters must be written via **Slot 0 → SubSlot1 → Index 2**:

Function	Description	Data
0x01	Start batch	Batch 1 to 4, ID, name
0x02	Stop batch	Batch 1 to 4, ID, name
0x03	Batch identifier	Batch 1 to 4, text (max. 30 characters)
0x04	Batch name	Batch 1 to 4, text (max. 30 characters)
0x05	Batch number	Batch 1 to 4, text (max. 30 characters)
0x06	Preset counter	Batch 1 to 4, text (max. 8 characters)

Starting a batch

If the user administration function is active, an ID (max. 8 characters) and a name (max. 20 characters) must be transmitted. The ID and name must be separated by ';'.

Example: Start batch 2

Byte	0	1
	func	no.
	1	2

The entry **Batch 2 started** is saved in the event list. This message also appears on the screen for a few seconds.

Ending a batch

If the user administration function is active, an ID (max. 8 characters) and a name (max. 20 characters) must be transmitted. The ID and name must be separated by ';'.

Example: Ending batch 2, user administration active (ID: "IDSPS", name "RemoteX")

Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	func	**no.**	**49**	**44**	**53**	**50**	**53**	**3B**	**52**	**65**	**6D**	**6F**	**74**	**65**	**58**
	2	2	'I'	'D'	'S'	'P'	'S'	';'	'R'	'e'	'm'	'o'	't'	'e'	'X'

The message **Batch 2 ended** and **Remote (IDSPS)** is saved in the event list. This message also appears on the screen for a few seconds.

Setting the batch identifier

Can only be set if the batch has not yet been started. Does not need to be set if this is not required by the device settings (Direct access 490005).

Example: "Identifier" batch designation for batch 2

Byte	0	1	2	3	4	5	6	7	8	9	10	11
	func	**no.**	**49**	**64**	**65**	**6E**	**74**	**69**	**66**	**69**	**65**	**72**
	3	2	'I'	'd'	'e'	'n'	't'	'i'	'f'	'i'	'e'	'r'

Setting the batch name

Can only be set if the batch has not yet been started. Does not need to be set if this is not required by the device settings (Direct access 490006).

Example: "Name" batch name for batch 2

Byte	0	1	2	3	4	5
	func	**no.**	**4E**	**61**	**6D**	**65**
	4	2	'N'	'a'	'm'	'e'

Setting the batch number

Can only be set if the batch has not yet been started. Does not need to be set if this is not required by the device settings (Direct access 490007).

Example: "Num" batch number for batch 2

Byte	0	1	2	3	4
	func	**no.**	**4E**	**75**	**6D**
	4	2	'N'	'u'	'm'

Setting the preset counter

Can only be set if the batch has not yet been started. Does not need to be set if this is not required by the device settings (Direct access 490008).

- Maximum 8 characters (including '.', 'E', '-')
- Exponential function permitted; the permitted value range must not be exceeded, e.g. **1.23E-2** = 0.0123 decimal
- Only positive numbers
- Maximum value range: 0 - 99999999

Example: Preset counter to 12.345 for batch 2

Byte	0	1	2	3	4	5	6	7	8	9
	func	**no.**	**31**	**32**	**2E**	**33**	**34**	**35**	**36**	**37**
	6	2	‚1'	‚2'	‚.'	‚3'	‚4'	‚5'	‚6'	‚7'

Reading out the batch status

The status of every batch and the last communication status can be read out here. 6 bytes must be read out via **Slot 0 → SubSlot 1 → Index 2**.

Example: Batch 2 started, communication status "OK"

Byte	0	1	2	3	4	5
		Comm. status	**Status batch 1**	**Status batch 2**	**Status batch 3**	**Status batch 4**
	0	0	0	1	0	0

If, for example, a batch number is set even though the batch is already running, byte 1 would have the value 0x03.

Communication status:

0: OK
1: Not all the required data have been transmitted (mandatory entries)
2: No responsible user is logged in
3: Batch already running
4: Batch not configured
5: Batch controlled by control input
7: Automatic batch number active
9: Error, text contained non-displayable characters, text too long, incorrect batch number, function number out of range

2.3.3 Relays

Relays can be set if they were set to **Remote** in the device settings. Parameters must be written via **Slot 0 → SubSlot 1 → Index 3**.

Setting relays

Example: Setting relay 6 to the active state

Byte	0	1
	RelNo.	Status
	6	1

Reading out the relay status

This reads out the status of every relay. Bit 0 corresponds to relay 1. 2 bytes must be read out via **Slot 0 → SubSlot 1 → Index 3**.

Example: Relay 1 and relay 6 in active state

Byte	0	1
	Relays 12-9 (hex)	Relays 1-8 (hex)
	0	0x21

2.3.4 Changing limit values

Limit values can be changed. The functions and parameters must be written via **Slot 0 → SubSlot1 → Index 4**.

Function	Description	Data
1	Initialization	
2	Accept limit values	
3	Change limit value	Limit value number, value [;dt]
5	Provide reason	Reason text

The following procedure must be followed when changing limit values:

1. Initialize limit value change.
2. Change limit values.
3. Specify the reason for the change.
4. Accept limit values.

The changes since the last initialization can be discarded with a new initialization.

Initializing a change to limit values

This prepares the device for changes to the limit values.

Byte	0	1
	Func	Padding byte
	1	2A

Changing limit values

A limit value in the device is changed, but not yet accepted, with this function.

Examples:

Func	Limit value	Data	Meaning
3	1	5.22;;60	Limit value 1 to 5.22, no span, delay 60 s
3	2	5.34	Limit value 2 to 5.34
3	3	;;10	Limit value 3, delay to 10 seconds
3	4	20;;;50	Limit value 4, inband/outband lower limit value 20, upper limit value 50

Example: Changing limit value 1 (upper limit value for universal input) to 90.5

Byte	0	1	2	3	4	5
	Func	**Limit value**	**39**	**30**	**2E**	**35**
	3	1	‚9'	‚0'	‚.'	‚5'

Example: Changing limit value 3 (gradient for universal input) to 5.7 within 10 seconds

Byte	0	1	2	3	4	5	6	7	8
	Func F	**Limit value**	**35**	**2E**	**37**	**3B**	**3B**	**31**	**30**
	3	3	‚5'	‚.'	‚7'	‚;'	‚;'	‚1'	‚0'

Specifying a reason for changing the limit value

Before you save the limit value change, you can enter a reason for the change, which is saved in the event list. If no reason is specified, the message "Limit values were changed" is entered in the event list.

Texts (according to ASCII table) can be transmitted. The maximum length of a text is 30 characters. If the text is longer than 30 characters, write access is blocked with an error message.

Byte	0	1	2..n
	Func	Padding byte	Text
	5	2A	

Accepting limit values

This function is used to accept the modified limit values in the device and save them in the device settings.

Byte	0	1
	Func	Padding byte
	2	2A

Reading out the execution status

The status of the last limit value function performed can be read out here. 1 byte must be read out via **Slot 0 → SubSlot 1 → Index 4**.

Example: Incorrect function addressed

Byte	0
	Comm. status
	1

Communication status:

0: OK
1: Incorrect function number or limit value number
2: Missing data
3: Limit value not active
4: Gradient → two values
5: Function currently not possible
9: Error

3 Troubleshooting

- Is a PROFINET module installed?
- Is the Ethernet connection between the device and controller OK?
- Is the right GSD file being used?
- Are the **Slots** and **Subslots** configured correctly?

4 List of abbreviations/definition of terms

PROFINET module: The PROFINET plug-in module that is plugged into the front of the device.

PROFINET controller: All instruments such as a PLC, PC plug-in cards etc. that perform a PROFINET controller function.

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