VLX-F231-B17

VLX PROFINET IO interface module

Manual

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1 Introduction

1.1 Content of this Document

This document contains information required to use the product in the relevant phases of the product life cycle. This may include information on the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal

i **Note**

For full information on the product, refer to the further documentation on the Internet at www.pepperl-fuchs.com.

i **Note**

For specific device information such as the year of construction, scan the QR code on the device. As an alternative, enter the serial number in the serial number search at www.pepperl-fuchs.com.

The documentation comprises the following parts:

- This document
- Datasheet

In addition, the documentation may comprise the following parts, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Instruction manual
- Functional safety manual
- Other documents

1.2 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

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1.3 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:

Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.

Warning!

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.

Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Informative Symbols

Note

This symbol brings important information to your attention.

Action

1. This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

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2 Product Description

2.1 Use and Application

The VLX-F231-B17 interface module—from now on referred to as the interface module or the device—is used as an interface between SmartRunner sensors—from now on referred to as sensors—and the PROFINET input card of the control panel. Data is transferred between the sensor or sensors and the interface module via the RS-485 interface and from the interface module to the control panel via the PROFINET protocol.

You can connect up to four sensors. If you connect several sensors, they must have different addresses.

The interface module has two PROFINET ports. Possible port uses include as an outgoing PROFINET port.

2.2 Dimensions

The interface module housing has the following dimensions.

Figure 2.1   Dimensions

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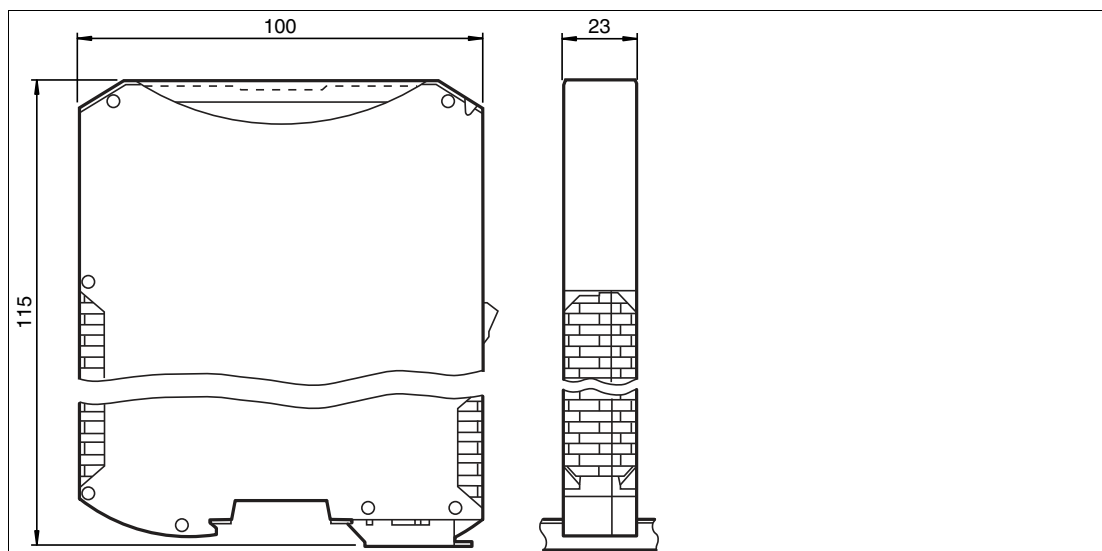## 2.3 Design of the Device

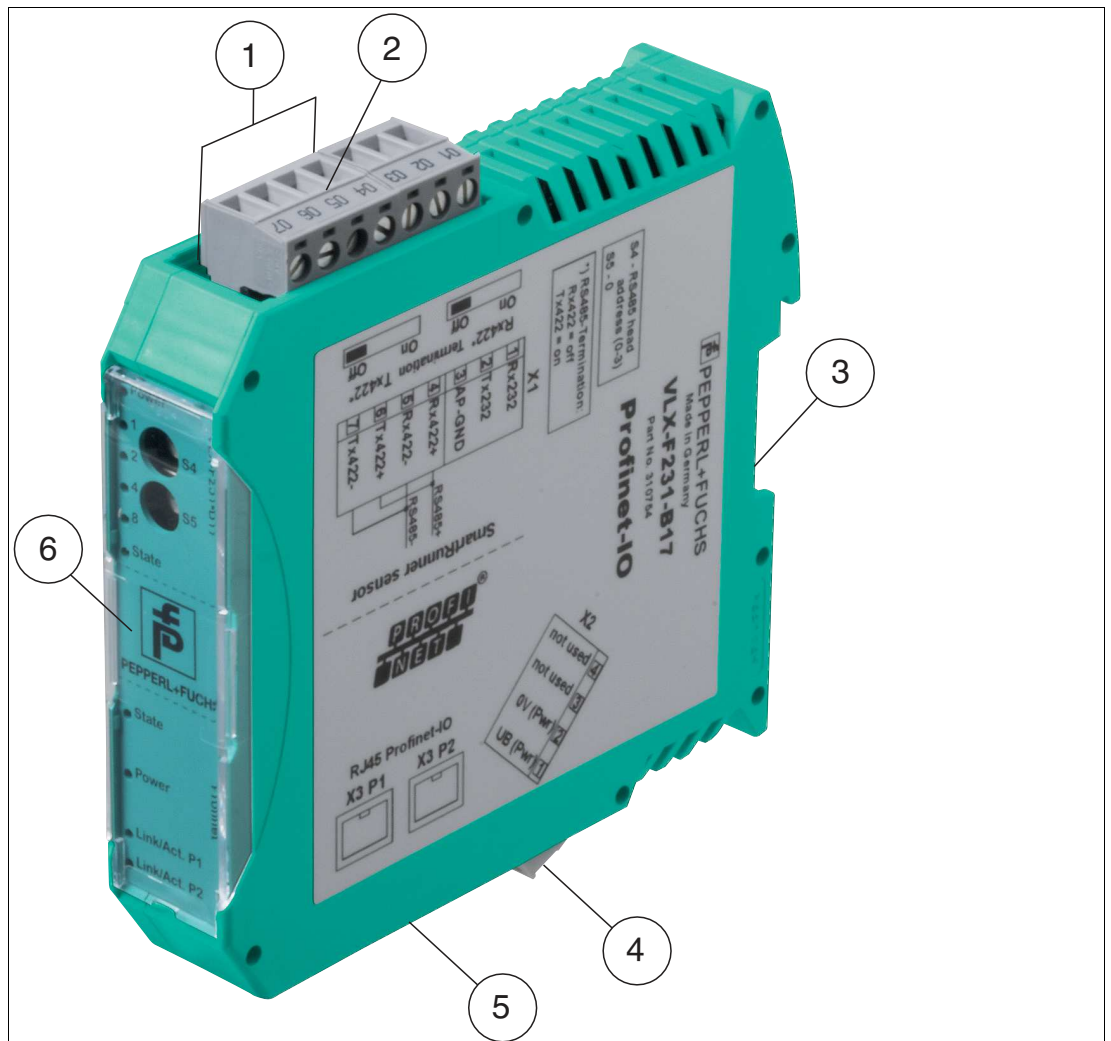### Device Components

Figure 2.2   Interface module overview

1   RS-485 bus connection sliding switch

2   X1: RS-485 interface

3   Mounting bracket

4   X2: Connection for power supply

5   X3: PROFINET IO communication interface

6   Front panel with rotary coding switches and indicator lights
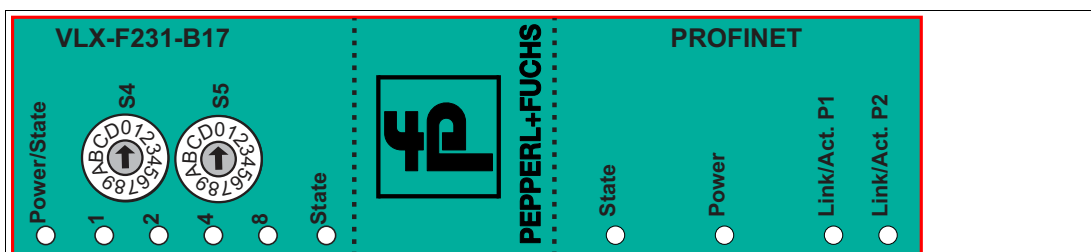
Front Panel

Figure 2.3   Front panel overview

Sensor

Power:

The "Power" LED lights up green: power supply is present.

State:

The "State" LED is green: Data is being exchanged with the sensor(s). The four "Error No/Select ID" LEDs are used to display the number of the currently polled sensor.

Error No/Select ID				Reader address
8	**4**	**2**	**1**	
0	0	0	1	0
0	0	1	0	1
0	1	0	0	2
1	0	0	0	3

Table 2.1   Display via the four "ErrorNo/Select ID" LEDs when the "State" LED lights up green

The "State" LED is red: The interface module has detected an error or a warning. The interface module displays the binary coded error and/or warning number via the "Error No/Select ID" LEDs.

Error (No. 1...5):   Switch the interface module off and back on. If the error occurs again, the module must be replaced.

Warning (No. 6...15):   The warning provides information. The interface module displays the warning for one minute and then resets automatically.

Error No/Select ID LED				Error number	Error description
LED8	**LED4**	**LED2**	**LED1**		
0	0	0	0	0	Reserved
0	0	0	1	1	Hardware error
0	0	1	0	2	EEPROM error
0	0	1	1	3	Internal memory error
0	1	0	0	4	Fieldbus hardware error or incorrect fieldbus ID
0	1	0	1	5	Script error
0	1	1	0	6	Reserved
0	1	1	1	7	Sensor communication, RS send buffer overflow
1	0	0	0	8	Sensor communication, RS receive buffer overflow
1	0	0	1	9	Sensor communication, RS timeout

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Error No/Select ID LED				Error number	Error description
LED8	LED4	LED2	LED1		
1	0	1	0	10	General fieldbus error
1	0	1	1	11	Parity error or frame check error
1	1	0	0	12	Reserved
1	1	0	1	13	Fieldbus configuration error
1	1	1	0	14	Fieldbus data buffer overflow
1	1	1	1	15	Reserved

Table 2.2   Meaning of the error codes (display via the four "Error No/Select ID" LEDs when the "State" LED lights up red and thus indicates an error or a warning)

Rotary Coding Switch S4:

Configuration	Switch position S4
1 sensor	0
2 sensors	1
3 sensors	2
4 sensors	3

Rotary Coding Switch S5:

Make sure that the switch is in **switch position 0**.

PROFINET

State:

LED "PROFINET State"	PROFINET interface state
Lights up green	Data exchange in progress
Flashes green	PROFINET is initialized, waiting for connection to IO controller
Lights up red	Error with PROFINET hardware
Flashes red	Error during PROFINET initialization

Power:

The "PROFINET Power" LED is green: The LED is connected directly to the electrically isolated supply voltage of the PROFINET side.

Link/Activity P1:

The "Link/Activity" LED on port 1 is controlled directly by the PROFINET processing unit and lights up green if Ethernet link pulses are found. When there is data traffic on the network, the LED flashes green at the same speed as the sent/received data.

Link/Activity P2:

The "Link/Activity" LED on port 2 is controlled directly by the PROFINET processing unit and lights up green if Ethernet link pulses are found. When there is data traffic on the network, the LED flashes green at the same speed as the sent/received data.

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3 Installation

3.1 Mounting

Mounting the Modules

The module is fastened to a DIN mounting rail with a width of 35 mm using a snap-on fixing method.
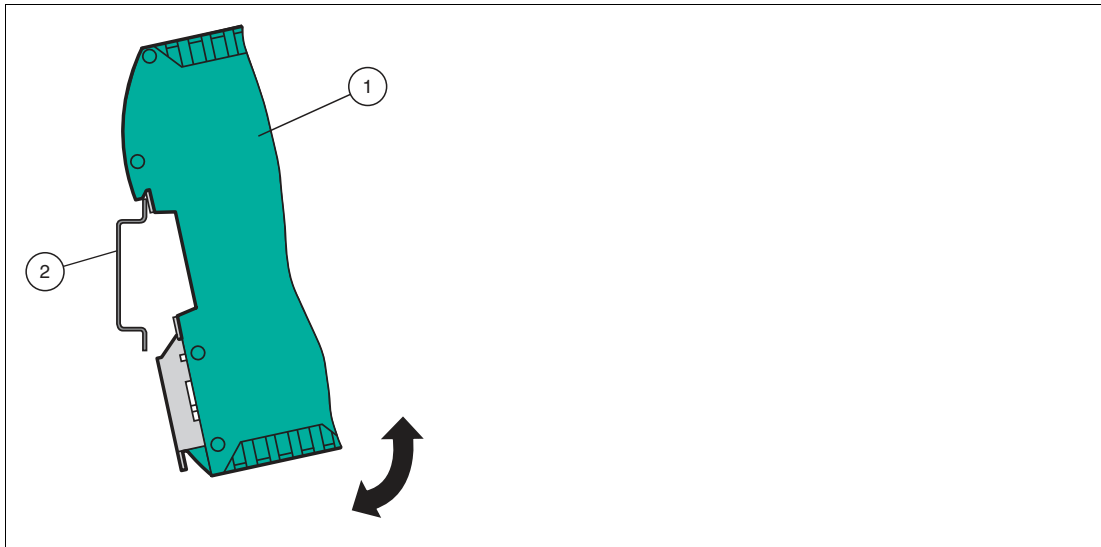

Figure 3.1   Mounting

1. Hook the module (1) onto the DIN mounting rail (2) from above and press it down until it snaps into place.

   ↳ The module is mounted.

   > **i** **Note**
   >
   > **Heat Dissipation**
   >
   > You may place other modules to the left and right of the module.
   > Above and below the modules, there must be at least 5 cm of free space for heat dissipation.

2. You must connect the DIN mounting rail to the switch cabinet's equipotential busbar. The connection wire must have a cross section of at least 10 mm^2.

   > **i** **Note**
   >
   > **Vertical Installation**
   >
   > You can also install the DIN mounting rail vertically, so that the modules can be rotated by 90° for mounting.

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3.2 Electrical Connection

⚠️ **Danger!**

Device damage due to incorrect installation

Incorrect installation of cables and connection lines can endanger the function and the electrical safety of the device.

- Note the permissible core cross section of the conductor.
- If you are using stranded conductors, crimp the stranded conductors with wire end ferrules.
- Make sure that the insulation on the conductors extends all the way to the terminal.
- Observe the tightening torque for the screws on the terminal. The tightening torque is 0.5 Nm.
- Using an inappropriate tool may damage the screw heads. Use a slot-head screwdriver of size 3.5 x 0.5.
- Connecting an alternating current can damage the device or cause the device to malfunction. Connect the device to direct current (DC).
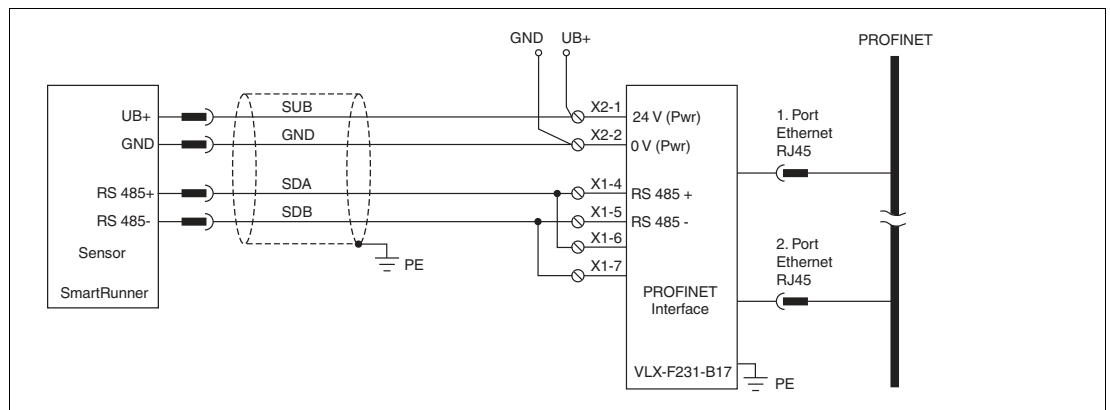

Figure 3.2   Electrical Connection

Plug X1 is located on the top side of the interface module, and plug X2 is located on the underside.

Connection Technology

You must/may use the following connection technology when wiring the assembly:

- Standard screw/plug connection (supply + RS)
- 8 pin RJ45 connector (PROFINET IO connection)

When using standard screw terminals, one cable per connection point can be clamped. To tighten the screws, use a screwdriver with a blade width of 3.5 mm.
Permissible cable cross section:

- Flexible cable with wire end ferrule: 1 x 0.25 ... 1.5 mm^2
- Solid cable: 1 x 0.25 ... 1.5 mm^2

The plug-in terminal strip combines a standard screw connection and a plug connector. The plug connector is coded and therefore cannot be plugged in incorrectly.

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Connecting the power supply

1. Connect the operating voltage (10 VDC...30 VDC) to terminals 1 and 2 of the 4 pin plug X2 on the interface module. In addition, note the label on the module.

↳ The "Power" LED lights up green.

Terminal		Description
1	UB (Pwr)	Operating voltage interface module/ operating voltage sensor
2	0 V (Pwr)	Ground interface module/ground sensor
3	not used	not used
4	not used	not used

Table 3.1   Terminal X2

Equipotential bonding connection

The connection to equipotential bonding occurs automatically when attaching to the DIN mounting rail.

PROFINET IO communication interface

This interface can be found on the module in the form of two 8 pin RJ45 sockets on the bottom of the housing.

1. Insert the PROFINET connector into the RJ45 socket(s) with the label "RJ45 PROFINET IO."

> **i**
>
> **Note**
>
> Ensure that the cable length to the neighboring Ethernet devices is at least 0.6 m.

Preparing for Operation on the RS-485 Interface

For operation on an RS-485 interface, the terminals on connector X1 must be connected as follows:

1. Connect terminal 4 "Rx 422+" to terminal 6 "Tx 422+."

2. Connect terminal 5 "Rx 422-" to terminal 7 "Tx 422-."

Terminal		Description
4	Rx 422+	Data line RS-485+ to sensor
5	Rx 422-	Data line RS-485- to sensor
6	Tx 422+	Connect terminal 6 "Tx 422+" to terminal 4 "Rx 422+"
7	Tx 422-	Connect terminal 7 "Tx 422-" to terminal 5 "Rx 422-"

Table 3.2   Terminal X1

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> **RS-485 Bus Termination**
>
> If the interface module is operated as the first or last physical device in an RS-485 bus or if you operate one read head on the interface module, a bus termination must be performed on this interface module.
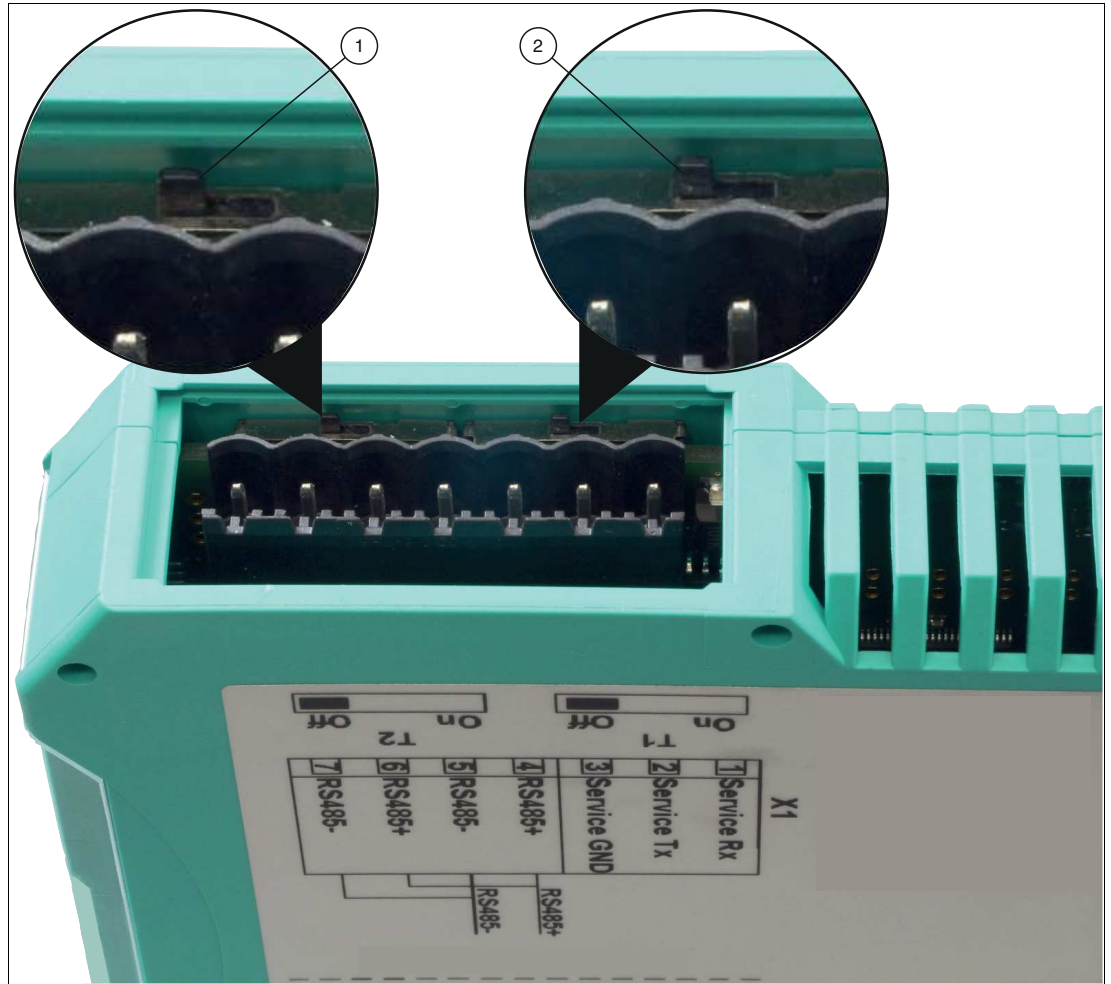

Figure 3.3   RS-485 bus termination

1. Set the T2 slide switch (1) to "On" to activate the bus termination (150 Ω) or to "Off" to deactivate the bus termination.

2. Set the T1 slide switch (2) permanently to "Off."

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3.3   Dismounting

Dismounting the modules

Use a suitable slot-head screwdriver for dismounting the module.

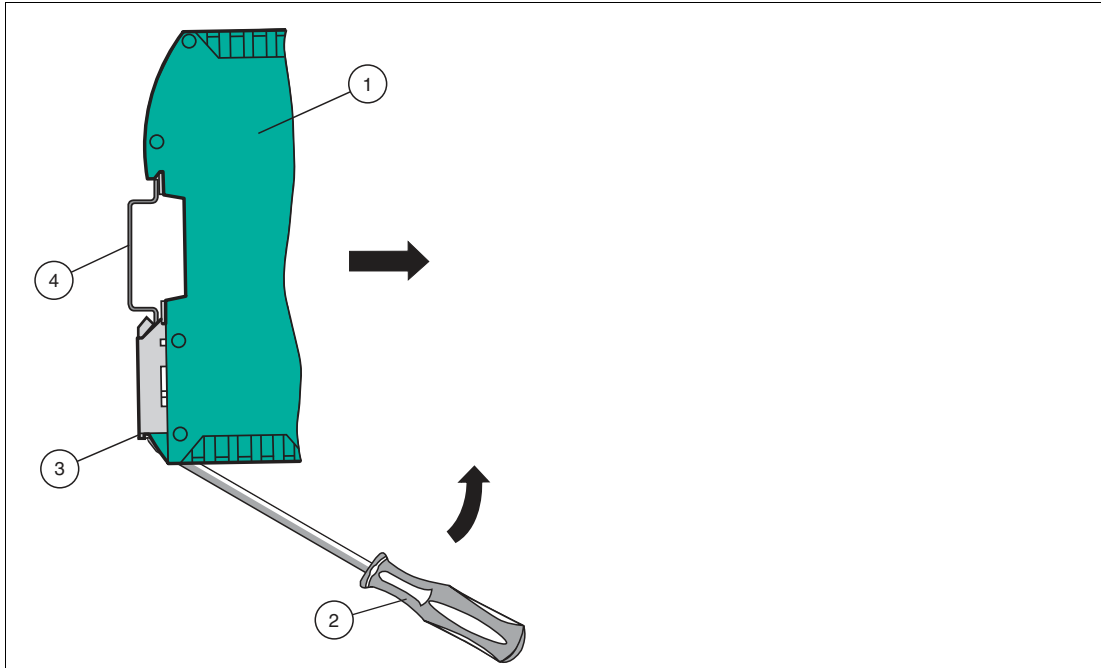1.   Disconnect all the supply and signal lines.

Figure 3.4   Dismounting

2.   Insert the screwdriver (2) into the groove of the mounting bracket (3).

3.   Press the screwdriver (2) in the specified direction until the lock on the DIN mounting rail (4) opens, see figure.

4.   Then press the module (1) upwards and lift it out of the DIN mounting rail.

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4 Commissioning

4.1 Introduction

⚠ **Warning!**

Danger to life due to defective work

Errors during installation and commissioning can cause life-threatening injuries and significant property damage.

- Installation and commissioning must only be carried out by trained personnel in accordance with safety regulations.

Components

To commission the module, you will require the following components:

- VLX-F231-B17 interface module
- Cordset from the interface module to the sensor
- Connector for the PROFINET connection to the interface module
- Ethernet cable
- 10 ... 30 VDC power supply
- GSDML file (the GSDML file can be downloaded free of charge from our website www.pepperl-fuchs.com).

Connecting the interface module

To ensure that the assembly functions correctly, you must carry out the following steps during commissioning:

1. Assign a PROFINET device name.

   ℹ **Note**

   For the interface module to be addressed as a PROFINET device, this interface module requires a unique PROFINET device name.

   On delivery, the interface module does not yet have a device name. The device name is assigned to the interface module via the configuration software.

2. There is the option to assign a PROFINET address.

   ℹ **Note**

   On delivery, the module does not yet have an IP address. In normal operation, the IP address is usually assigned to the module by the PROFINET controller (PLC).

3. Connect the module to PROFINET using the interface labeled "RJ45 PROFINET IO."

4. For information on commissioning the process device, (the sensor) please refer to its manual.

5. Ground the DIN mounting rail onto which the assembly is clipped.

6. Connect the direct current to the terminals provided.

7. Use any programming tool for configuration. The GSDML file can be downloaded from our website: www.pepperl-fuchs.com. Simply enter the product name or item number in the product/keyword field and click the "Search" icon.

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> **i** **Note**
>
> A more detailed description of the individual steps is provided on the following pages.

4.2 Connecting the Sensor

If you connect several sensors to one interface module, the sensors must have different addresses. The different addresses will allow the programmable logic controller to allocate the data to the right sensors. If you connect only one sensor to an interface module, this sensor always receives the address 0. You can connect up to four sensors to an interface module via an RS-485 cable. Each sensor is supplied with the default address of 0. Details of how to change the address of the sensor can be found in the instruction manual for the sensor.

Sensor connection pin	Interface module terminal
1	X2-1
2	X1-4
4	X1-5
3	X2-2

Table 4.1   Connecting the sensor/sensors

Setting the Number of Connected Sensors

Set the number of connected sensors with the rotary switch S4 in accordance with the table "Rotary switch S4".

Rotary switch S4

Switch position S4	Number of sensors	Sensor address
0	1 sensor	0
1	2 sensors	0.1
2	3 sensors	0, 1, 2
3	4 sensors	0, 1, 2, 3

Table 4.2   Position of rotary switch S4 for setting the number of sensors

Setting the baud rate of the SmartRunner sensor

Make sure you have set the correct baud rate on the SmartRunner sensor to be able to connect the interface module. The baud rate must be set to the value **115,200**.

A detailed description how to set the build rate in the sensor can be found in the respective manual of the SmartRunner sensor.

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4.3 Connecting the VLX-F231-B17 to the Network

The connection to the PROFINET IO is made via the two "RJ45 PROFINET IO" sockets on the underside of the interface module. The front socket is labeled "X3 P1," and the rear socket is labeled "X3 P2."

Pinout X3 P1 & X3 P2

Terminal		Description
1	TD+	Transmission line +
2	TD-	Transmission line -
3	RD+	Receive line +
4	n.c.	Not connected
5	n.c.	Not connected
6	RD-	Receive line -
7	n.c.	Not connected
8	n.c.	Not connected

Table 4.3   Terminals of the 8 pin "RJ45 PROFINET IO" sockets

Note

The cable to the surrounding Ethernet devices must be at least 0.6 m long.

Connecting the Device to the Controller

1. Plug the PROFINET connector into the RJ45 socket. Use a Cat. 5 data cable.

Setting data exchange mode

1. Set rotary switch "S5" to position 0. The rotary switch "S4" is set in accordance with the connected readers.

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4.4 Integrating the Interface Module into the Network

Warning!

Risk of injury due to incorrect configuration

An error during the configuration of the device can override the fail-safe function, causing a danger to people and machinery.

- Ensure that the device is programmed exclusively by qualified personnel.
- Only put devices into operation after they have been configured correctly.

PROFINET Device Name

For the interface module to be addressed as a PROFINET device, this interface module requires a unique PROFINET device name.

On delivery, the module does not yet have a device name. The device name is assigned to the module via the configuration software.

PROFINET Address

In normal operation (data exchange mode), the IP address is usually assigned to the module by the PROFINET controller (PLC). For this purpose, the module has a device name that is used to address it.

Note

Various configuration tools are available to allow you to configure the interface module. By way of example, this manual describes the configuration of a Siemens control panel with the VLX-F231-B17 interface module using the TIA Portal V14. If you are using a programmable logic controller (PLC) from a different manufacturer, the process will be similar to the one described here.

Installing the GSDML File

A **GSDML file** is required to operate the device. The GSDML file can be downloaded from our website: www.pepperl-fuchs.com. Simply enter the product name or item number in the prod-uct/keyword field and click the "Search" icon. Select your product from the list of search results. Click on the information you require in the product information list, e.g., Software. A list of all available downloads is displayed.

1. Start "TIA Portal V14."
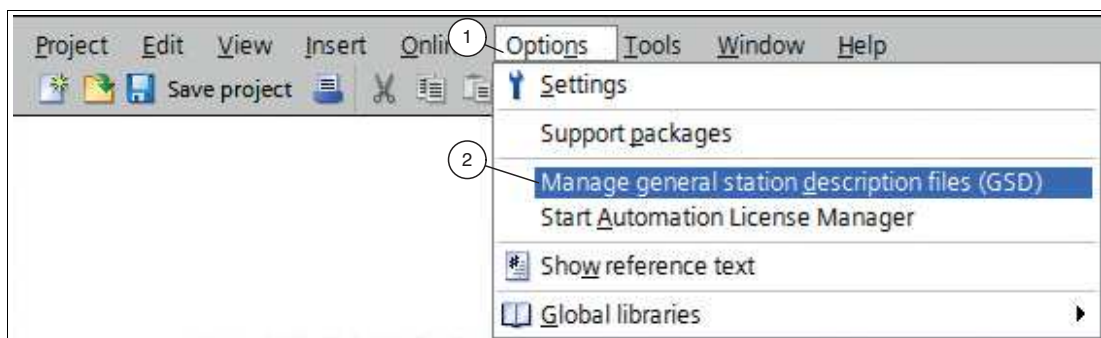

Figure 4.1   GSDML File

2. Under *"Options"* (1) in the menu bar, select the command *"Manage general station description files (GSD)"* (2).

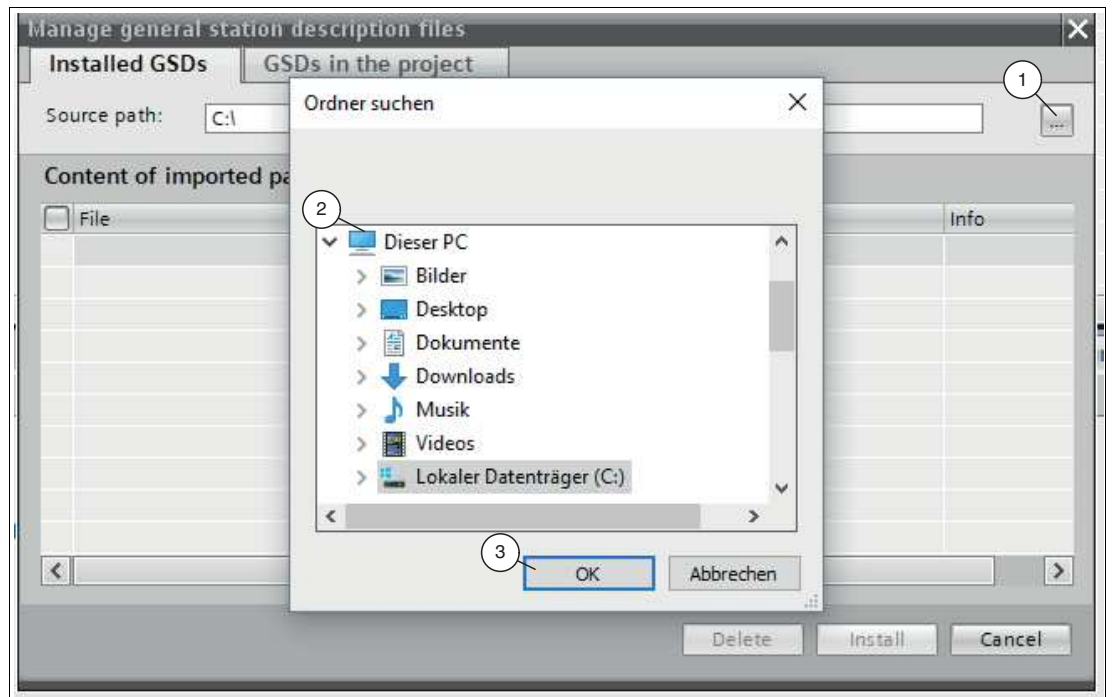↳ The *"Manage general station description files"* window opens.

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Figure 4.2   Searching for the GSDML file

3. Click the *"button with the three dots"* (1), which allows you to search for your GSDML file on the storage medium.

4. Select your GSDML file (2) and click *"OK"* (3) to confirm your selection.
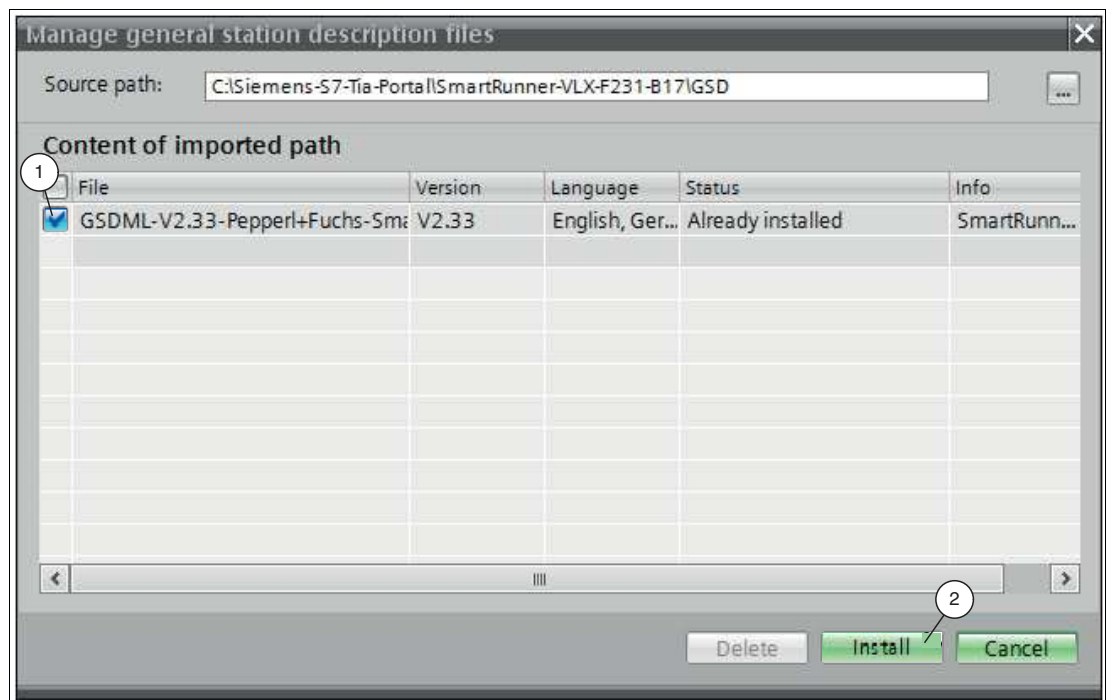
Figure 4.3   Installing the GSDML file

5. Select the GSDML file to install by checking the box (1) to the left of the filename.

6. Click the *"Install"* button (2). The installation process may take a few minutes.

↳ Once the file is installed successfully, the system issues a notification that the installation was successful. Close this window. The device data is added to the hardware catalog. Without a selection being made, the project view opens in the work area.

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Integrating a Device into the Project

1. On the left-hand side of the project navigation, double click on the *"Device and networks"* using the left mouse button. Network view is displayed in the work area.

Figure 4.4   Hardware catalog

2. Open the hardware catalog and browse through the tree structure until you see your device (1).

> **i** **Note**
>
> The figures are provided to aid basic understanding and may deviate from the actual design.
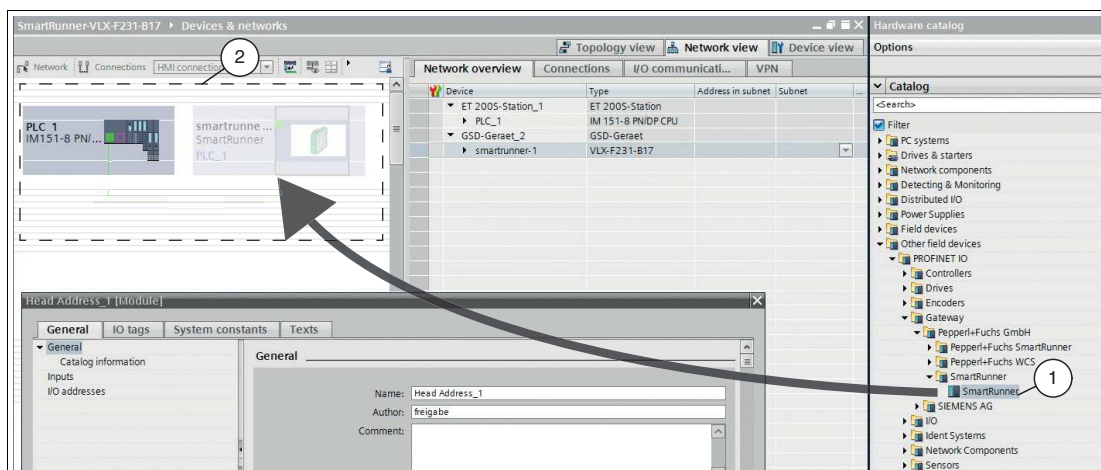

Figure 4.5   Integrating the device

3. Select your device (1) from the hardware catalog and drag it into the network view (2).

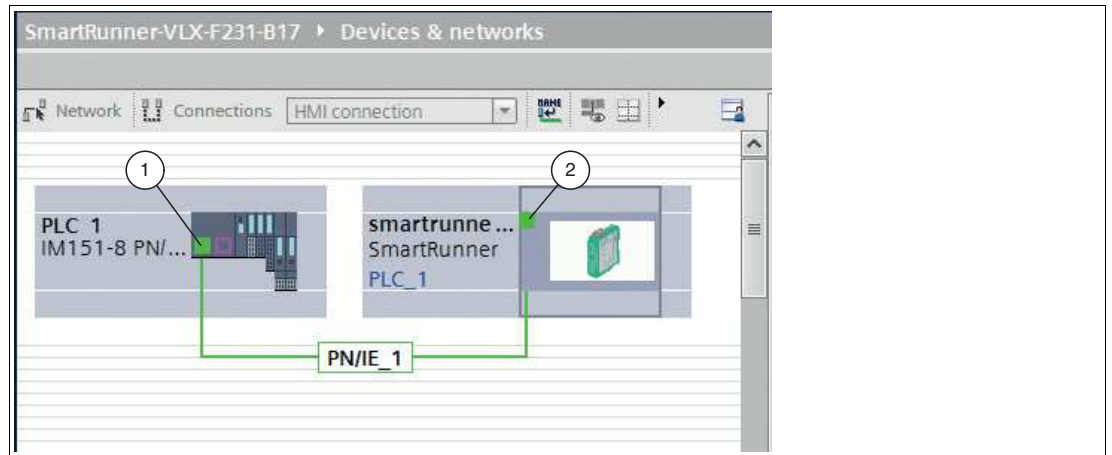↳ The device is displayed in the network view window (2).

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Figure 4.6   Connecting the device to the control panel

4. Connect the device to the control panel. To do this, move the mouse cursor over the PROFINET interface that is highlighted in green on the control panel (1). Click the left mouse button and drag the line shown to the PROFINET interface on the device (2). Once there, release the left mouse button again.

↳ The device is now connected to the control panel. A PROFINET subsystem is created.

Integrating Modules into the Project

You have the option to connect up to four sensors to the interface module. To do this, you must specify the number of modules and their properties in the control panel. The modules are available in the hardware catalog.
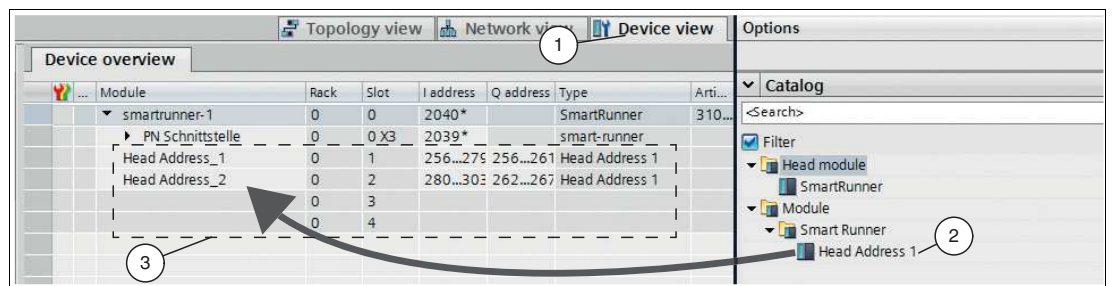
Figure 4.7   Integrating modules

1. Switch to the *"Device view"* tab (1) in the *"Device and networks"* window.

2. Open the hardware catalog. Select your module (2) from the hardware catalog and drag it into the device view (3).

↳ The modules will be automatically assigned an I and Q address range.

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4.5 "Utilize Data" Function Block

A function block is available to allow you to configure the interface module. The function block can be downloaded from our website: www.pepperl-fuchs.com. Simply enter the product name or item number in the product/keyword field and click the "Search" icon. Select your product from the list of search results. Click on the information you require in the product information list, e.g., Software. A list of all available downloads is displayed.

Figure 4.8   Function block

Note

Further information about the function block can be found in the configuration instructions on our website by using the product/keyword search function.

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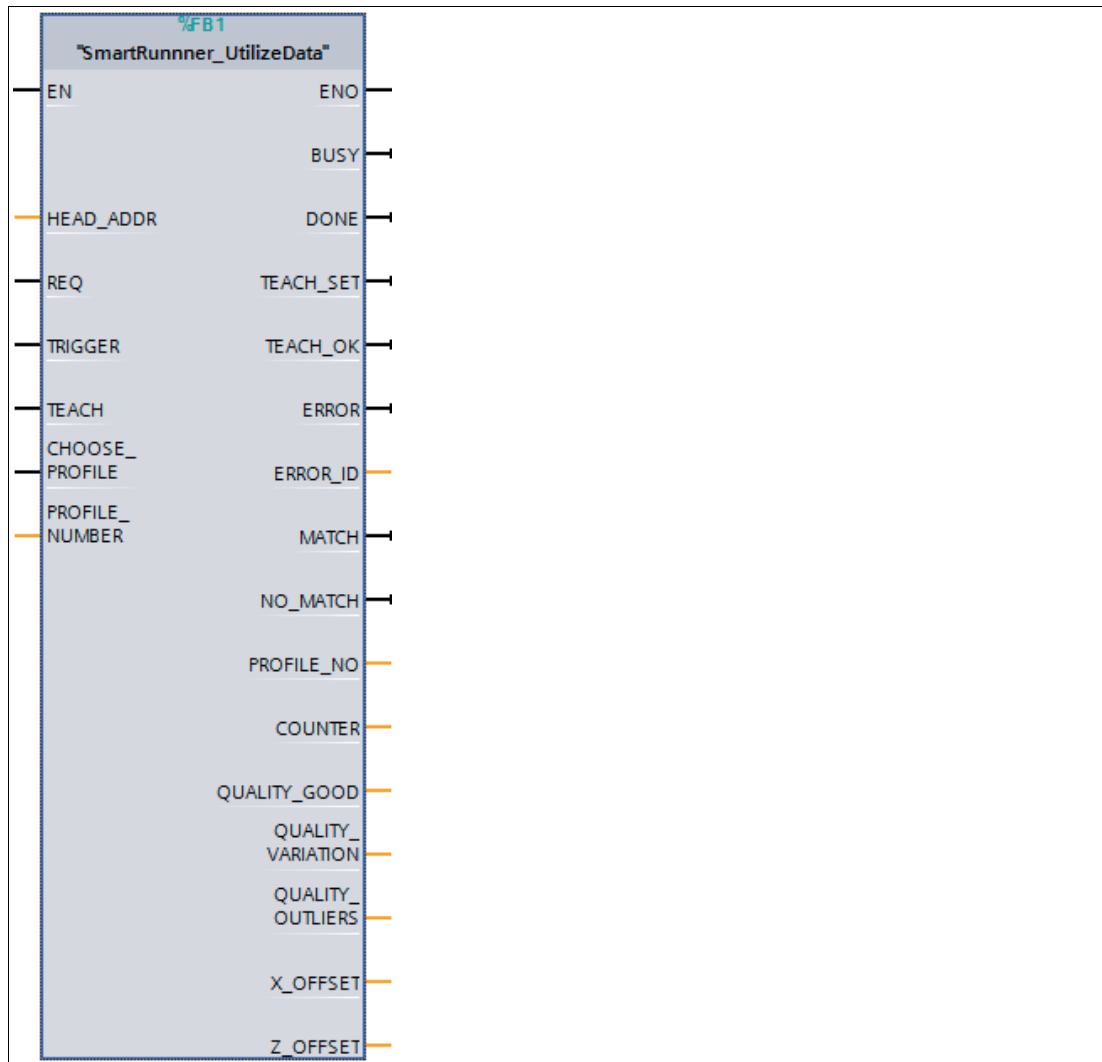## 4.6 Data Format for Modules

Output Parameters

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0 - Reserved	0	0	0	0	0	0	0	0
Byte 1 - Trigger	0	0	0	0	0	0	0	1
Byte 2 - Reserved	0	0	0	0	0	0	0	0
Byte 3 - Teach	0	0	0	0	0	0	0	1
Byte 4 - Reserved	0	0	0	0	0	0	0	0
Byte 5 - Choose profile[1]	0	0	x	x	x	x	x	x

1. for all VLM variants except VLM350-F280-2E2-1000

Legend

	1 ... 32	Profile number
x	0	Not defined
	> 32	Not defined

Trigger
After changing *Bit 0* from **0 to 1**, a **"Trigger"** is activated. This means that the sensor triggers an image capture process. In order to run an additional **"Trigger,"Bit 0** must be reset.

Teach
After changing *Bit 0* from **0 to 1**, a **"Teach-In"** is triggered. This means that the sensor initiates the teach-in process. A trigger must then be transmitted. In order to run the **"Teach"** process again, **Bit 0** must be reset.

Input Parameters

Note

The two protocols "Result Protocol" and "Teach Result Protocol" are connected. The two protocols cannot be run at the same time. Only one of the two protocols can be run at a time.

Result Protocol

Result data provides the measurement status and result as a response.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1 - Status	0	-	Addr 1	Addr 0	Event	WRN	No Match	ERR
Byte 2 - Result	0	R6	R5	R4	R3	R2	R1	R0
Byte 3 - Counter	0	C06	C05	C04	C03	C02	C01	C00
Byte 4 - Quality	0	Q06	Q05	Q04	Q03	Q02	Q01	Q00
Byte 5 - Quality	0	Q16	Q15	Q14	Q13	Q12	Q11	Q10
Byte 6 - Quality	0	Q26	Q25	Q24	Q23	Q22	Q21	Q20
Byte 7 - PosX	0	PosX13	PosX12	PosX11	PosX10	PosX09	PosX08	PosX07
Byte 8 - PosX	0	PosX06	PosX05	PosX04	PosX03	PosX02	PosX01	PosX00
Byte 9 - PosZ	0	PosZ13	PosZ12	PosZ11	PosZ10	PosZ09	PosZ08	PosZ07
Byte 10 - PosZ	0	PosZ06	PosZ05	PosZ04	PosZ03	PosZ02	PosZ01	PosZ00
Byte 11 - Checksum	0	xor	xor	xor	xor	xor	xor	xor
Byte 12	0	0	0	0	0	0	0	0

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Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 13	0	0	0	0	0	0	0	0
Byte 14	0	0	0	0	0	0	0	0
Byte 15	0	0	0	0	0	0	0	0
Byte 16	0	0	0	0	0	H2	H1	H0

Legend

Status	Addr	Device address
	Event	Event occurred (future) Currently read as 0
	WRN	Unused
	No Match	Profile does not match the saved profile
	ERR	System error or evaluation error
Result	R0 ... R6	Profile number 1 ... 32 0x00 = no object found
Quality	Q00 ... Q26	Quality of the current profile (0 = no profile found, 100 = perfect match) Quality: Quality Good Quality2: Quality Variation Quality3: Quality Outliers
Counter		Increments for each evaluation, is restarted at 0x3F
Position Data[1]	PosX13 ... PosX00	X-deviation of current profile from saved profile
	PosZ13 ... PosZ00	Z-deviation of current profile from saved profile
Handshake	H0	1: Software trigger is implemented by the interface module
	H1	1: Profile switching is implemented by the interface module
	H2	1: Software teach is implemented by the interface module

1. for all VLM variants except VLM350-F280-2E2-1000

Handshake between interface module and PLC (Byte 16)

The bits are set by the interface module when the interface module has implemented the commands from the PLC. The respective handshake bit is reset when the bit of the output parameter is zeroed.

Please note that in case of profile switching, byte 5 must be zeroed before a profile change.

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Teach Result Protocol

Teach Result Data returns the status and result of the teach-in process as a response.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 17 - Status	0	-	Addr 1	Addr 0	Event	WRN	0	ERR
Byte 18 - Result	0	0	0	0	0	0	0	0
Byte 19 - Counter	0	C06	C05	C04	C03	C02	C01	C00
Byte 20 - Quality A	0	QA6	QA5	QA4	QA3	QA2	QA1	QA0
Byte 21 - Quality B	0	QB6	QB5	QB4	QB3	QB2	QB1	QB0
Byte 22 - Quality C	0	QC6	QC5	QC4	QC3	QC2	QC1	QC0
Byte 23 - Quality D	0	QD6	QD5	QD4	QD3	QD2	QD1	QD0
Byte 24 - Checksum	0	xor	xor	xor	xor	xor	xor	xor

Legend

Status	**Addr**	**Device address**
	Event	Event has occurred - for future use, currently read as 0
	WRN	Unused
	ERR	System error or evaluation error
Result	R0	For extended protocol Always 0
Counter	C00 ... C06	Increments with each teach-in
Quality A		The quality of the current teach-in 0 = teach-in not possible 100 = perfect teach-in
Quality B-D		Unused

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