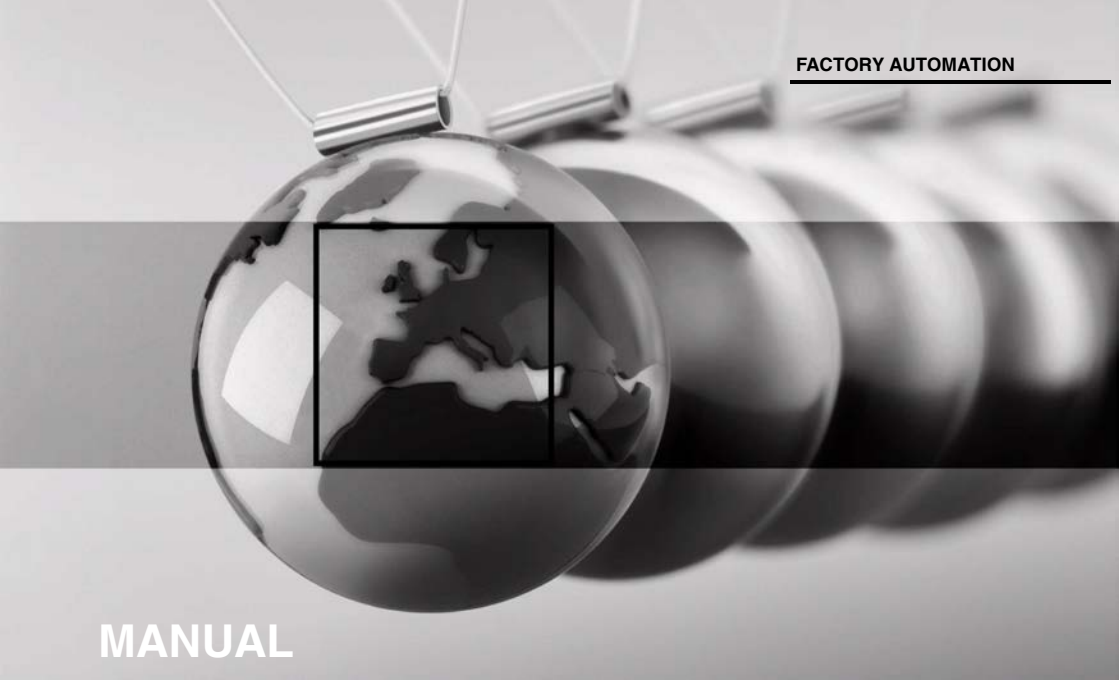

MANUAL

Distance Measurement Devices

VDM100/G2

PROFIBUS

EtherNet/IP

SSI

INTERBUS

PEPPERL+FUCHS

SENSING YOUR NEEDS

With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

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1 Introduction

1.1 Introduction

Congratulations

You have chosen a device manufactured by Pepperl+Fuchs. Pepperl+Fuchs develops, produces and distributes electronic sensors and interface modules for the market of automation technology on a worldwide scale.

Bevor Sie dieses Gerät montieren und in Betrieb nehmen, lesen Sie diese Betriebsanleitung bitte sorgfältig durch. Die in dieser Betriebsanleitung enthaltenen Anleitungen und Hinweise dienen dazu, Sie schrittweise durch die Montage und Inbetriebnahme zu führen und so einen störungsfreien Gebrauch dieses Produktes sicher zu stellen. Dies ist zu Ihrem Nutzen, da Sie dadurch:

Read these instructions carefully before you install this device and put it into operation. Instructions and hints included in this manual lead you step by step through the installation and commissioning and provide a trouble-free use of this product. This is for your benefit, since this helps you to:

- ensures the safe operation of the device
- exploit the full functionality of the device
- avoid operating errors and related disturbances
- avoid costs due to disruptions and repair work
- increase the effectiveness and efficiency of your system.

Keep these instructions for reference for later work on the equipment.

Please check after opening the package, that the device isn't damaged and the completeness of the delivered goods.

Symbols used

The following symbols are used in this manual:

Note!

This symbol draws your attention to important information.

Handling instructions

You will find handling instructions beside this symbol

Contact

If you have any questions about the device, its functions, or accessories, please contact us at:

Pepperl+Fuchs GmbH
Lilienthalstraße 200
68307 Mannheim
Telephone: +49 621 776-4411
Fax: +49 621 776-274411
E-Mail: fa-info@pepperl-fuchs.com

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2 Declaration of Conformity

All products were developed and manufactured under observance of the applicable European standards and guidelines.

Note!

A Declaration of Conformity can be requested from the manufacturer.

The product manufacturer, Pepperl+Fuchs GmbH, 68307 Mannheim, has a certified quality assurance system that conforms to ISO 9001.

ISO**9001**

3 Safety

3.1 Symbols relevant to safety

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 devices and any connected facilities or systems, or result in their complete failure.

3.2 General Safety Information

The following basic instructions must be observed at all times:

- The device must not be commissioned until the manual has been read and understood
- The power supply to produce the supply voltage must have a safe electrical isolation by means of double insulation and a safety transformer according to DIN VDE 0551 (corresponds to IEC 742)
- The device must not be used outside of its specification without suitable protective measures
- Modifying the device is not permitted
- Do not point the devices in direct sunlight and do not take measurements in sunlight
- Do not remove the warnings or rating plates

Installation and commissioning of all devices must be performed only by personnel specially trained for that purpose.

Protection of operating personnel and the system is not ensured if the product is not used in accordance with its intended use.

The laws and guidelines applicable for the use or the intended purpose must be observed. Devices are approved only for proper usage in accordance with intended use. Ignoring these instructions will void any warranty and absolve the manufacturer from any liability.

Use only recommended original accessories.

If you are unable to resolve faults, switch the device off. Make sure that the device cannot be switched back on accidentally. If the device needs to be repaired, return it to Pepperl+Fuchs. If you open or modify the device yourself, not only are you endangering yourself and others but you will void any warranty and absolve the manufacturer from any liability.

Dispose of unusable devices in accordance with the applicable national statutory regulations.

For instance, you can take the sensor to a designated collection point for electronic waste.

Danger!

In applications involving stock feeders and moving carriages, care must be taken to ensure that the applicable safety regulations are observed at all times.

Failure to do so may result in serious or fatal injury!

3.3 Laser Class 2 Safety Information

Class 2 Laser Product

Standards

IEC 60825-1:2007 certified. Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

Warning!

Visible and invisible class 2 laser light

Caution: visible and invisible laser light. Do not look into the beam!

The laser light can be an irritant, especially in a dark environment. Do not point lasers at people!

Maintenance and repairs must be carried out by authorized service personnel only!

Install the device so that the warning is clearly visible and readable.

Caution: Using controls or adjustments, or performing procedures other than those specified herein may result in harmful laser beam exposure.

Only use recommended original accessories.

The operating company bears responsibility for observing locally applicable safety regulations.

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Installation and commissioning of all devices must be performed by a trained professional only.

User modification and or repair are dangerous and will void the warranty and exclude the manufacturer from any liability. If serious faults occur, stop using the device. Secure the device against inadvertent operation. In the event of repairs, return the device to your local Pepperl+Fuchs representative or sales office.

3.4 Intended Use

The VDM100 Series distance measurement devices are used for the accurate positioning of stock feeders, moving carriages, cranes, and handling machines, as well as length measurements in the wood processing industry, with concrete saws, and in elevator construction.

Make sure that the devices are used only for their intended purpose.

4 Product Description

4.1 VDM100 Distance Measurement Devices

The exact positioning of stock feeders, moving carriages, cranes, and handling machines, as well as performing length measurements in the woodworking industry, with concrete saws and in elevator construction, requires distance measurement devices that are capable of returning measured values at a high measurement rate over large distances with millimeter precision.

Distance measurement devices are used where distances were previously determined using angle coders or electromechanical measuring instruments. These mechanical measurement sensors are heavily dependent—in terms of their properties—on ambient conditions, such as temperature, and are subject to aging and constant wear.

In contrast, photoelectric distance measurement devices work virtually wear-free and are easier to install using an integrated laser pointer.

Additional benefits offered by these devices are short assembly and commissioning times and the high degree of reliability of a photoelectric measuring system, as well as ease of replacement.

The VDM Series covers three standard distance ranges: 50 m, 150 m, and 300 m.

The available interfaces are:

- SSI (Synchronous Serial Interface)/RS422
- EtherNet/IP
- PROFIBUS DP
- INTERBUS

The VDM100 Series photoelectric distance measurement devices meet laser class 1 (EN 60825) safety requirements in measurement mode (without laser pointer). Due to the low amount of laser light emitted, operating personnel are neither injured nor harmed.

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New VDM100/G2 generation properties

In general, all second-generation (G2) VDM100 devices have an improved HMI menu structure and display. The SSI and PROFIBUS devices in particular are equipped with new properties. All new-generation devices with SSI interfaces support the RS422 command interface (SSI/RS422 switchable). A modular GSD file is used on G2 devices with a PROFIBUS interface.

Note that all VDM100/G2 devices are fully downward compatible with the corresponding predecessor devices. VDM100 Series predecessor devices can easily be replaced by VDM100/G2 devices without the need for changes to the application.

4.2 Operating Principle

The devices work according to the principle of pulse ranging technology (PRT). As part of this principle, the time between sending an invisible light pulse and receiving the reflected pulse is measured in the device. Due to the constancy of the speed of light, this time is a distance measurement.

The light source and light receiver are located in the device. A reflector is required for measuring the distance, and must be installed opposite the device. By virtue of its technical features, pulse ranging technology (PRT) is particularly well-suited to high-precision distance measurement over large distances compared to other methods of distance measurement.

In comparison to other distance measurement processes, time-of-flight measurement is largely independent of the measuring environment, and can therefore be used to a high degree of accuracy in harsh everyday industrial conditions.

Note!

Influence of Ambient Conditions

The speed of light depends on the air temperature and barometric pressure.

The influence of the air temperature amounts to 1 ppm/K.

The influence of barometric pressure amounts to -0.3 ppm/hPa.

These faults must be taken into consideration by the user in the case of longer distances.

In the VDM operating range (-10 °C ... +50 °C), this error amounts to 6 mm at a distance of 100 m.

4.3 Indicators and Operating Controls

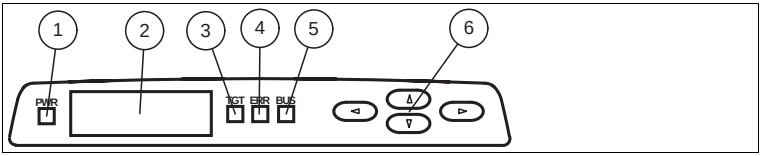

Figure 4.1 Displays and controls

No.	Designation	Color	Description
1	POWER LED	Green	Lights up when supplied with operating voltage
2	Display		Lights up when the device has detected a reflector see chapter 6.3
3	TARGET LED	Green	Lights up when there is an error; flashes in the event of a warning
4	ERROR LED	Red	Lights up when there is active communication at the bus interface
5	BUS LED	Green	See chapter 6.4
6	Operating buttons		See chapter 7.2

Table 4.1 Indicators and operating controls

4.4 Interfaces and Connections

The following connections are found on all devices:

Power Supply and 2 Inputs/Outputs

There is a 4-pin M12 connector to connect the power supply, as well as two inputs/outputs, on the back of the housing. The following diagram shows the pin assignment:

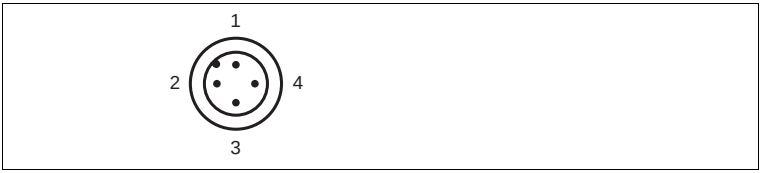

Figure 4.2 Power supply and two Inputs/Outputs connection layout

1 24 V power supply

2 Input / Output 2

3 Ground (GND)

4 Input / Output 1

Service

The 8-pin M12 connector on the rear of the housing is for service purposes.

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Interfaces:

Different connection types can be found on the back of the housing depending on what interface is used. The following diagrams show the pin assignments:

Interface type: SSI (Synchronous Serial Interface)/RS422

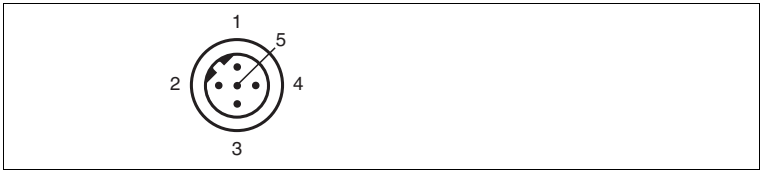

Figure 4.3 SSI connection layout

1 D+
2 D-
3 CLK+
4 CLK-
5 Shield

The connector housing is located on the shield.

Interface type: EIP (EtherNet/IP)

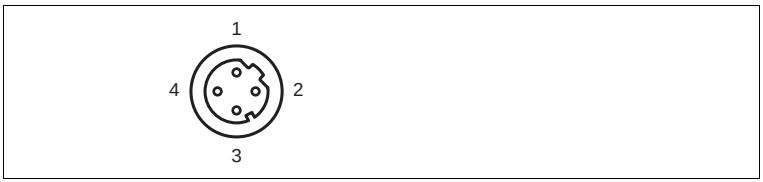

Figure 4.4 Ethernet connection layout

1 TD+
2 RD+
3 TD-
4 RD-

The connector housing is located on the shield.

Interface type: PROFIBUS (P)

Figure 4.5 Profibus Bus In connection layout

1 n.c.
2 Rx/Tx-N
3 n.c.
4 Rx/Tx-P
5 Shield

The connector housing is located on the shield.

Figure 4.6 Profibus Bus Out and Termination connection layout

1 VP
2 Rx/Tx-N
3 DGND
4 Rx/Tx-P
5 Shield

The connector housing is located on the shield.

Interface type: INTERBUS (IBS)

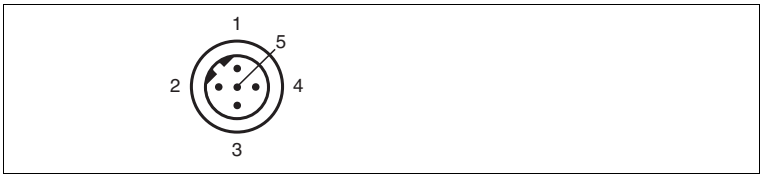

Figure 4.7 Interbus Remote Bus In connection layout

1 DO1
2 /DO1
3 DI1
4 /DI1
5 DGND

The connector housing is located on the shield.

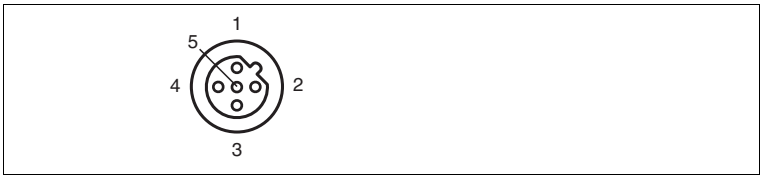

Figure 4.8 Interbus Remote Bus Out connection layout

1 DO2
2 /DO2
3 DI2
4 /DI2
5 GND

4.5 Scope of Delivery

The scope of delivery includes:

- VDM100
- Quick start guide
- Functional grounding (preassembled)
- Protective cover

4.6 Accessories

The following products are available as accessories:

No.	Designation	Illustration	Description
1	OMH-VDM100-01		Mounting bracket with deviation mirror
2	OMH-LS610-01		Mounting bracket
3	OMH-LS610-02		Direct mounting set (4 M4 threaded inserts)
5	Functional grounding LS610		Functional grounding
6	Protective cover LS610		M12 sealing caps
7	ICZ-TR-V15B		PROFIBUS terminal resistor
8	VDM01 reflector		Plastic reflector 500 mm x 500 mm
9	VDM02 reflector In conjunction with VDM01 reflector only		Plastic reflector 500 mm x 250 mm

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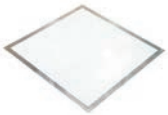
No.	Designation	Illustration	Description
10	Reflector 250 mm x 250 mm		Foil reflector 250 mm x 250 mm on metal panel
11	Reflector 500 mm x 500 mm		Foil reflector 500 mm x 500 mm on metal panel
12	Reflector 1000 mm x 1000 mm		Foil reflector 1000 mm x 1000 mm on metal panel
13	V15SB-G		Single-ended male cordset, M12 x 1, B-coding, 5-pin for bus cable
14	V15B-G		Single-ended female cordset, M12 x 1, B-coding, 5-pin for bus cable
15	V1-G		Single-ended female cordset, M12 x 1, 4-pin for power supply

Table 4.2 Accessories

5 Installation

5.1 Storage and Transport

Package the device for storage and transport such that it is protected from impact and moisture. The original packaging provides optimum protection. Also take note of the permitted ambient conditions.

Note!

If the temperature is subject to major fluctuations during transport, the device must be allowed to acclimatize for around two hours prior to installation and use. During this acclimatization period, avoid subjecting the device to condensation at all costs, as this could have an effect on internal parts and cause damage.

5.2 Unpacking

Check the product for damage while unpacking. In the event of damage to the product, inform the post office or parcel service and notify the supplier.

Retain the original packaging in case the device must be stored or shipped again at a later date.

Should you have any questions, please direct them to Pepperl+Fuchs.

5.3 Mounting

Caution!

Do not point the sensor into the sun.

Protect the sensor against direct and prolonged sunlight.

Prevent condensation from forming by ensuring that the sensor is not subjected to any major temperature fluctuations.

Do not subject the sensor to any influences caused by aggressive chemicals.

Keep the glass on the device and the reflector clean.

Use soft cloths and standard glass cleaner to clean the device.

When using existing adjustment and mounting facilities, M4 inserts can be pressed into the housing feet see chapter 4.6.

The accessory OMH-LS610-01, a mounting aid for wall installation, enables mounting and adjustment to be performed quickly.

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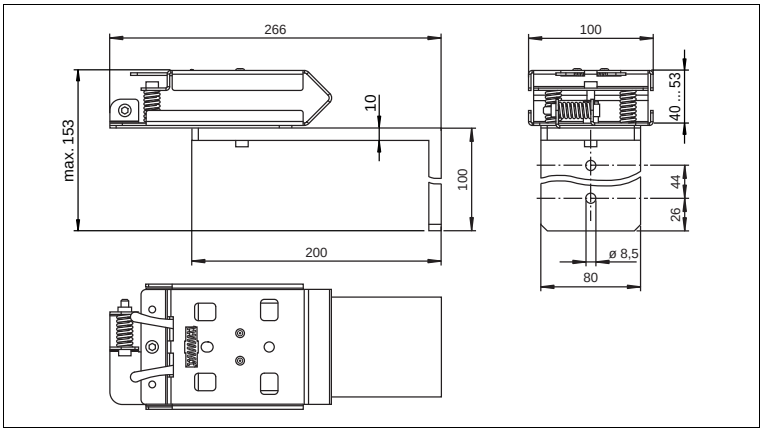

Figure 5.1 Mounting aid OMH-LS610-01 for wall installation

The mounting aid (OMH-LS610-01) comprises a mounting bracket and a preassembled adjustment device (x and y direction).

Layout of the Mounting Aid

1. Position the adjustment device in the required beam direction (±90° rotation).
2. Secure the adjustment device using the two M4 screws and the central M6 screw on the mounting bracket.
3. When adjustment is complete, securely tighten the central M6 screw.
4. Press the two front latches on the adjustment device together.
5. Set the distance measurement device with the retaining feet into the recesses on the adjustment device.
6. Press the two front latches on the adjustment device together again.

   ↳ The distance measurement device is now mounted.

Note!

Make sure that the retaining feet are fully engaged. In this case, the two latches are pressed outward as far as they will go. If necessary, press the distance measurement device centrally from top to bottom by applying slight force.

5.4 Notes for Parallel Operation of VDM Series Devices and Data Light Barriers

Where VDM Series devices and data light barriers are used simultaneously in an optical axis, the following instructions must be observed to ensure that the data transmission process is not influenced by the VDM.

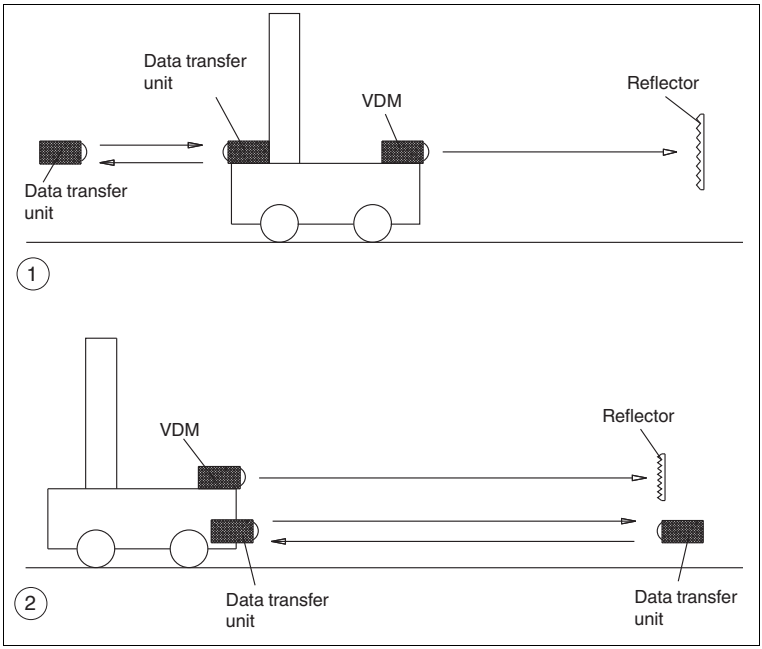

Figure 5.2 Arranging the devices

1. We recommend an arrangement as shown in Figure (1). Data transfer and distance measurement take place on two different sides of the vehicle. Make sure that the data light barrier on the left of the picture does not receive scattered light from the VDM reflector. This is not a problem in most cases because the vehicle covers the scattered light, which is why this device arrangement is preferred.
2. Arranging the data transfer and distance measurement on one side of the vehicle as in Figure (2) must be avoided. Insufficient lateral clearance can influence the data transfer. Since the foil reflector can reflect the sharply bundled laser beam under a fairly large scattering angle, some of the reflected light can get into the receiving lens of the data light barrier.

   For this reason, we recommend that a plastic reflector with low scatter be used as the reflector in this arrangement.

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The lateral distance required between the data light barriers and the distance measuring device is based on the range.

Distance	Lateral distance
30 m	0.5 m
60 m	0.8 m
90 m	1.0 m
120 m	1.2 m
240 m	2.4 m
300 m	3.2 m

Table 5.1 Clearance-to-distance relationship

For an arrangement of data light barriers and distance measuring device as per Figure (2), it must be ensured that the VDM light bundle does not fall directly on the opposite data light barrier. A minimum distance is not necessary during parallel operation with an LS80 Series data light barrier.

5.5 Reflector selection

	Reflector 250 mm x 250 mm	Reflector 500 mm x 500 mm	Reflector 1000 mm x 1000 mm	Reflector VDM01 (500 mm x 500 mm)	Reflector VDM02 (500 mm x 250 mm)
VDM100-50	Yes	Yes	Yes	Yes	Yes
VDM100-150	No	Yes, if VDM is stable	Yes	Yes	Yes
VDM100-300	No	No	No	Yes	Yes

Table 5.2 Reflector selection

Use the VDM02 reflector only in conjunction with the VDM01 reflector. The VDM02 reflector can be used as an attachment to the VDM01. It is used only for the purpose of capturing the measuring spot if it drifts due to unevenness or vibrations.

5.6 Reflector Arrangement

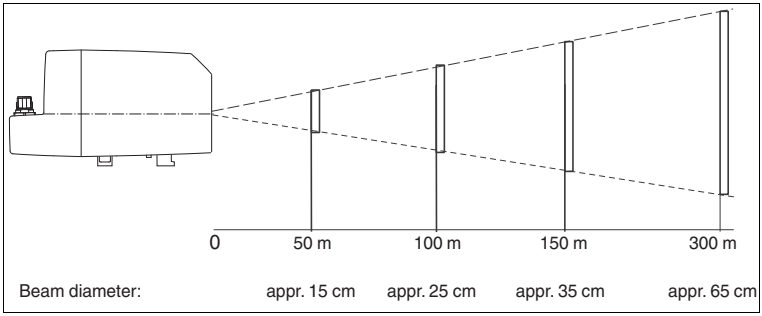

Figure 5.3 General reflector arrangement (side view of VDM)

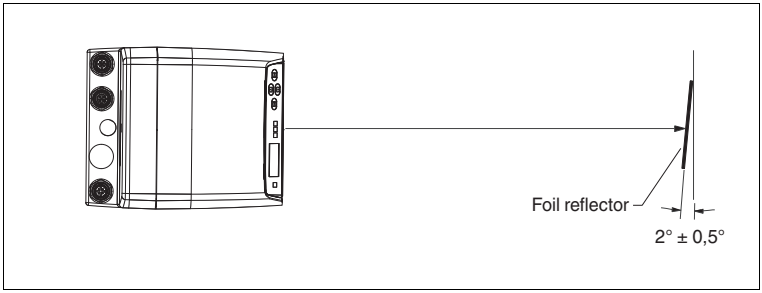

Figure 5.4 Foil reflector arrangement

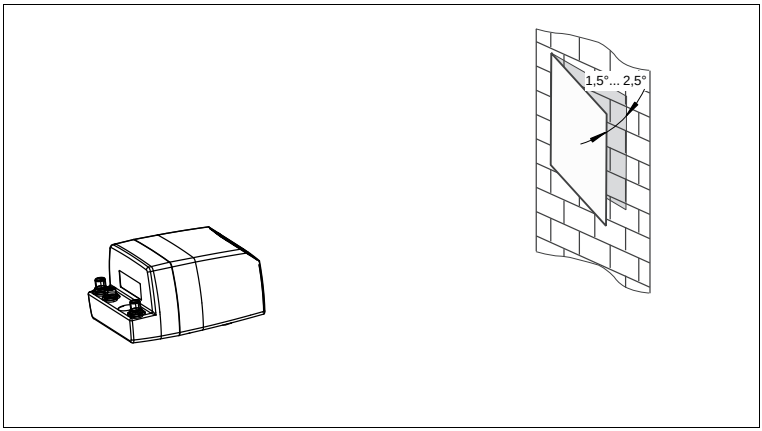

Figure 5.5 3D view of the orientation of sensor alignment and the required reflector inclination

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6 Commissioning

1. Connect the distance measurement device to the power supply.

   ↳ The device starts an initialization phase of a maximum of 10 seconds.
2. The red error LED (ERR) goes out and the green target LED (TGT) lights up when the device has been positioned correctly on the reflector and valid measured values are determined. If the LEDs do not do this, please note the messages that appear on the display (see chapter 9.1).

   ↳ The device is ready for operation.
3. Allow a warm-up phase of 30 minutes for the distance measurement device.

   ↳ The distance measurement device has achieved optimal measurement accuracy after this 30-minute warm-up phase. The device has been tested and calibrated before delivery. It can be put into operation immediately.

6.1 Device Connection

Put protective covers on unused M12 connectors.

↳ The IP65 protection class is achieved. The protective covers can be ordered as accessories.

The device conforms to protection class III. This means that the power has to be supplied as a low protective voltage (PELV).

The grounding of the cable shields on the metallic flush-type connectors is not protective grounding in the sense of personal protection, but is rather a functional grounding (please refer to the "Grounding/Shielding" chapter).

The VDM100 power supply uses a direct current of 18 V – 30 VDC. The VDM100 has two I/O ports, which can be configured individually as input or output (see chapter 7.3.2). For an input connection, an electrical level $U_e < 6$ V is low, and a level $U_e > 16$ V is high. A connection configured as output, at a maximum load of 200 mA, has a level $U_a < 1$ V with electrical low, and a level of $U_a = U_B - 1$ V for a high, in which u_B designates the supply voltage applied to the device. Both I/Os can be configured both as high-active and low-active. The maximum cable length is 30 m.

The pin assignment is as follows:

VDM100-SSI:

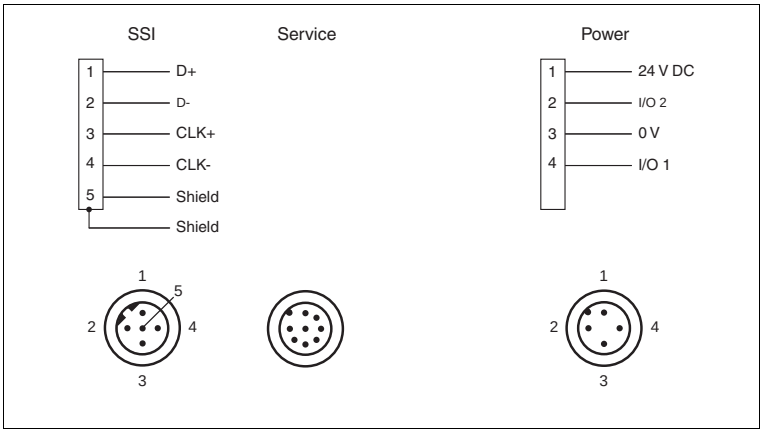

Figure 6.1 SSI interface pin assignment and RS422 interface

Note!

Terminator

If there is no terminator connected on the interface card, you must connect a 100 Ω terminator (0.25 W) between Data+ and Data- on the control computer. A double-sided screen mounting is recommended.

VDM100-EIP:

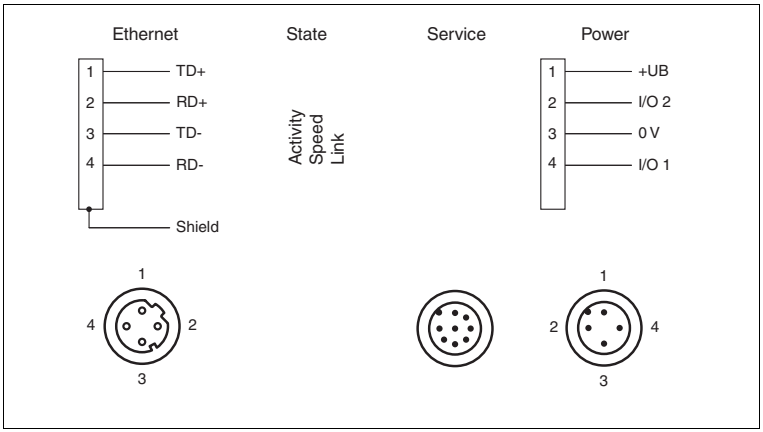

Figure 6.2 EtherNet/IP interface pin assignment

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VDM100-P:

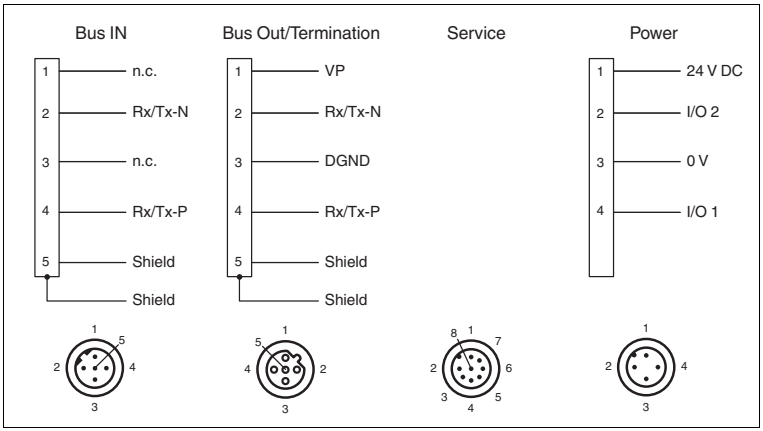

Figure 6.3 PROFIBUS-DP interface pin assignment

Note!

Terminator

The last PROFIBUS subscriber must be completed with a terminator. For this purpose, the PROFIBUS terminal resistor (see chapter 4.6) is to be screwed to the terminal resistor connector. Fit the cable screen on both sides.

VDM100-IBS:

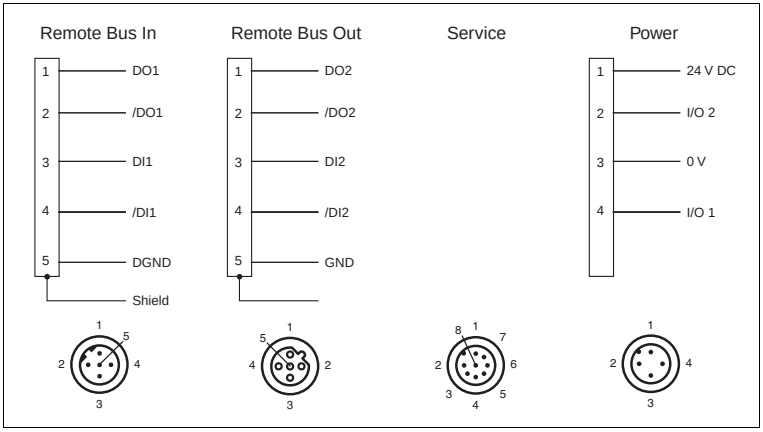

Figure 6.4 INTERBUS interface pin assignment

6.2 Grounding/Shielding

Functional grounding of the cable shields is recommended, since the housings do not have grounding. If the shields must be grounded because of EMC, basically section 3.3.3 of the PROFIBUS PNO guideline and the "Conformance test and certification V2.0" of the INTERBUS club must be followed.

Shield Grounding

For shield grounding, use the preassembled insertion prong, which is screwed onto the bus connector.

Functional grounding can be ordered as an accessory. (See the "Accessories" chapter)

Figure 6.5 Preassembled insertion prong

Warning!

Do not open the primary mounting nut for the receptacle connector.

If you do, the connector assembly may be damaged and the housing may leak.

INTERBUS Interface:

The cable shield must be attached on both sides. The input (REMOTE BUS IN) is completely isolated from the operating voltage and the output (REMOTE BUS OUT). The output shield should be placed on PE.

If the IN and OUT shields are connected, they must be placed on PE. At the same time, 10 mm² equipotential bonding must be used parallel to the shield.

6.3 Adjustment

An alignment laser pointer, which is visible from a long distance, is located on the front of the device as an alignment aid. You can optimally align the distance measurement device with the reflector using the alignment laser pointer.

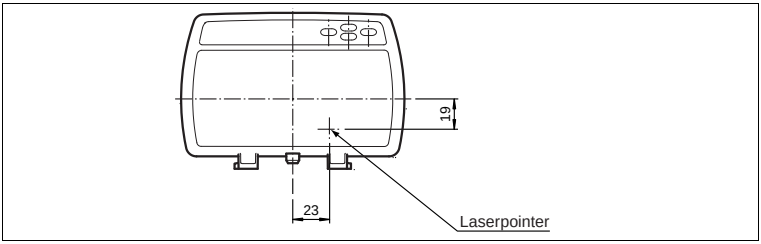

Figure 6.6 Alignment aid

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6.3.1 Alignment

Alignment Instructions

When making an adjustment, ensure that the laser pointer is offset to the measuring lens. The adjustment applies to both reflector types (foil and plastic).

Perform the adjustment at maximum distance. At larger distances, perform the adjustment with the reflector at a distance of not less than 40 m.

The measurement beam to the laser pointer is offset 23 mm horizontally and 19 mm vertically (→ see Figure 6.7 on page 27).

Checking the Alignment

1. The factory default setting for the laser pointer in the menu is "Auto".

   ↳ If the sensor does not detect a target, the laser pointer flashes at a frequency of approx. 1 Hz.

2. Align the sensor if necessary.

   ↳ As soon as the distance measurement device has detected a target, the laser pointer flashes for an additional two minutes before deactivating automatically.

The beam position in dynamic mode can be checked by performing a test drive with the laser pointer switched on.

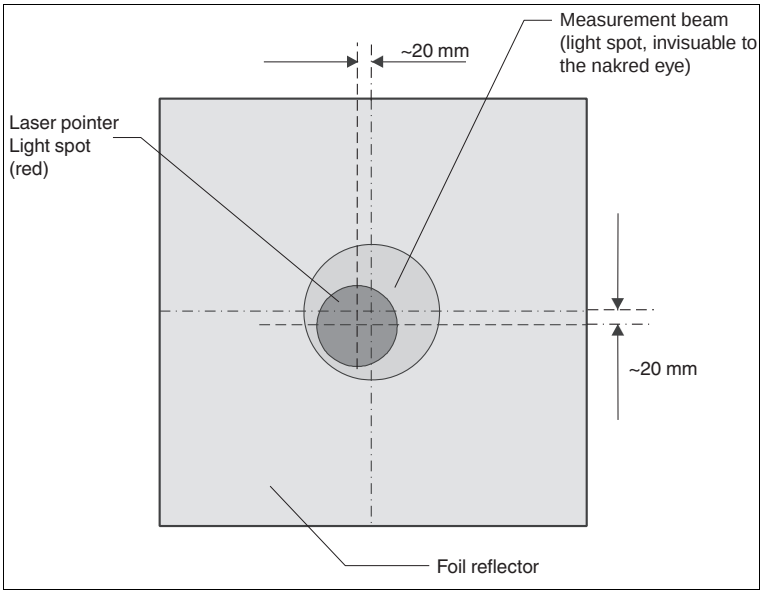
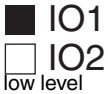


Figure 6.7 Alignment instructions

6.4 Display

The display shows the following values for all variants:

- Current distance measured value in meters
- Current communication mode (e.g., 12 ms)
- Electrical level of both I/O pins I/O1 and I/O2



An empty square means: input or output with low level

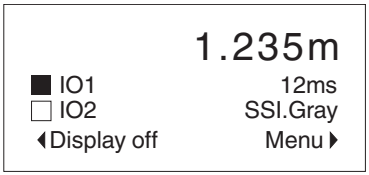
- A filled square means: input or output with high level

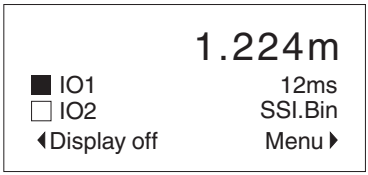
A user aid appears in the lower line of the display. The assignment of the arrow keys (left/right) is shown.

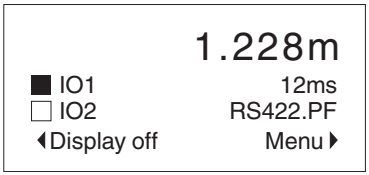
SSI/RS422 operating status indicator.

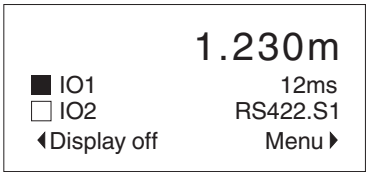
- You can select from the following protocols:
  - SSI Gray coded
  - SSI binary coded
  - RS422 Pepperl+Fuchs protocol
  - RS422 S1 protocol
  - RS422 S2 protocol
  - RS422 S3 protocol

The set protocol is shown in the display



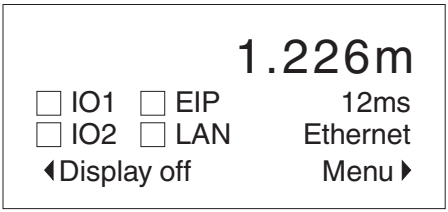






EtherNet/IP operating status indicator

The Ethernet logo is shown in the display. Two additional values continue to be displayed as "software LEDs".



The software LEDs are based on the specifications of the EtherNet/IP standard and mean the following:

- **EIP** signals the status of the EtherNet/IP communication (comparable with the module status indicator defined in the EtherNet/IP standard).
- **LAN** signals the status of the EtherNet/IP network connection (comparable with the network status indicator defined in the EtherNet/IP standard).

Software LED "EIP"

Status square	Interpretation LED	Description
The software LEDs simulate a two-color LED with the following statuses:		
Off	Off	The EtherNet/IP stack is switched off
Alternately crossed/filled	Red/green flashing	The EtherNet/IP stack performs an initialization or a self-test
Alternately empty/filled	Green flashing	The EtherNet/IP stack is in operation. It is working correctly
Filled permanently	Green lit up	The EtherNet/IP stack has not yet been configured by the controller. It is in standby
Alternately empty/crossed	Red flashing	A recoverable, simple error has occurred
Permanently crossed	Red lit up	A non-recoverable, serious error has occurred

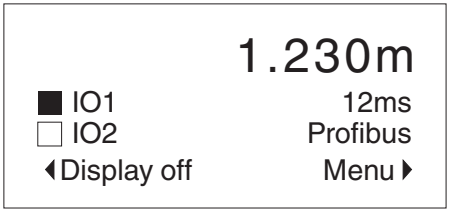
Software LED "LAN"

Status square	Interpretation LED	Description
The software LEDs simulate a two-color LED with the following statuses:		
Permanently empty	Off	The LAN interface is switched off or has no IP address
Alternately crossed/filled	Red/green flashing	The LAN interface performs an initialization or self-test
Alternately empty/filled	Green flashing	An IP address is configured. However, there is no CIP connection active (CIP = Common Industrial Protocol)
Filled permanently	Green lit up	There is at least one CIP connection active
Alternately empty/crossed	Red flashing	A CIP connection timeout with exclusive access
Permanently crossed	Red lit up	The IP address assigned to the bus interface is already in use

Note the EIP status (Info) description in the Interfaces see chapter 7.3.4 chapter.

PROFIBUS operating status indicator

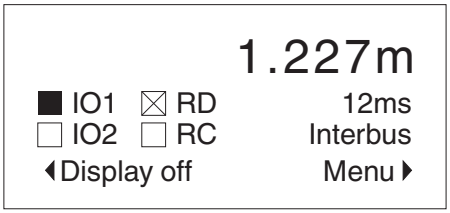
The PROFIBUS logo is shown in the display.



INTERBUS operating status indicator

The INTERBUS logo is shown in the display. Two additional values continue to be displayed as "software LEDs".
The software LEDs comply with the specifications of the Interbus standard and mean the following:

- **RD (Remote Bus Disabled)** active when the square has a cross in it and inactive when it is empty
- **RC (Remote Bus Check)** indicates, by means of a simulated green LED, whether the (incoming) remote bus has been connected correctly:
  - Active when the square is filled
  - Inactive when the square is empty



7 Settings

7.1 Menu Structure

The following menu is available for setting operating states

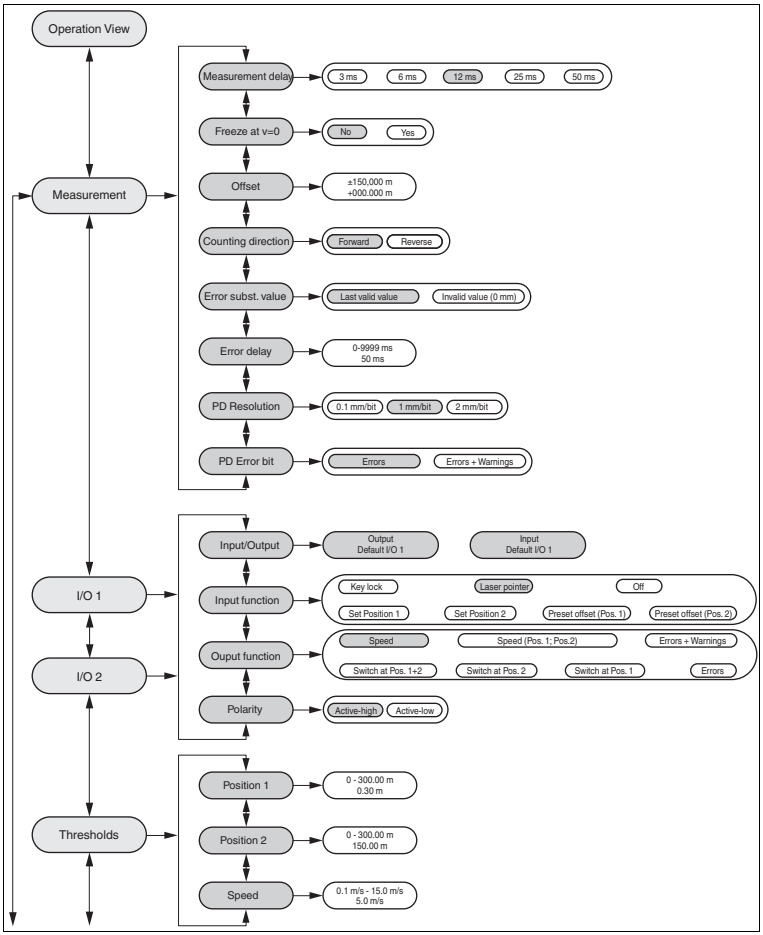


Figure 7.1 Menu structure

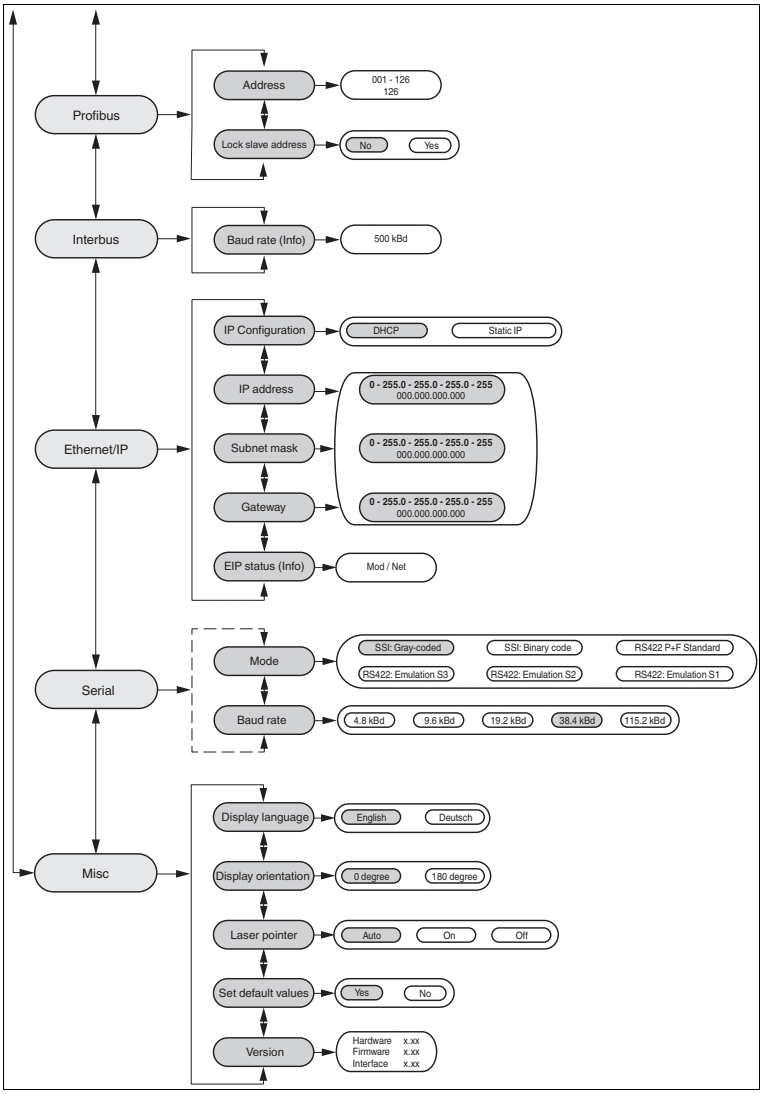


Figure 7.2 Menu structure

7.2 Operation

The display on the front of the distance measurement device shows the distance and other parameters.

In normal mode (menu not active), an operating status indicator displays the distance and the physical states of the two IO pins. An open square stands for "low" level; a solid square stands for "high" level.

There are four buttons in addition to this display. These four buttons can be used to navigate within the menu structure. You can change the parameters or enter values using these buttons.

Meaning of Buttons

	Skipping to submenus, confirming entry values This button has a similar function to the ENTER button on the computer keyboard.
	Jumping out of submenus, undoing an entry This button has a similar function to the ESC button on a computer keyboard.
	Scrolling up within a menu level
	Scrolling down within a menu level

Activating the  button takes the user to the main menu level. These are all the fields that can be found under the "MENU" field under the "Menu Structure" chapter.

By pressing the  and  buttons, the corresponding menu item (e.g., threshold values) can be selected.

Pressing the  button again takes you to the submenu level. Additional items can be selected here according to the menu structure.

Preset values are displayed in each submenu. You can change these values.

When entering numerical values, the device constantly verifies that the value entered is valid. A corresponding message is issued if unacceptable values are entered. This value cannot be saved.

The distance measurement device does not display negative distance values. In this case, the error bit is set and the output remains at zero.

When all of the settings have been made, you can use the  button to return to the operating status indicator. If no other button in the menu levels is pressed for ten minutes, the display automatically reverts to "Operation Mode".

7.3 Description of Menu Items

7.3.1 Measurement Menu Item

The "Measurement "submenu contains various parameters that have an impact on recording and issuing the distance measured value.

Measured Value Age

This setting is used to determine the measured value age of the sensor's output measured values. A measured value age of 50 ms, 25 ms, 12 ms, 6 ms, and 3 ms can be set. A higher measured value age increases the measurement accuracy; a lower measured value age improves the response time. The factory default setting is 12 ms.

Freezing at v=0

The "Freezing at v= 0" function hides the noise of the output distance value when the sensor is at a standstill. The measurement remains active. However, changes to the distance value are output only when they exceed an internal threshold value. The factory default setting is "no".

Offset

This value moves the zero point of the measurement. Doing so enables multiple devices with different positions to be set to identical distances. This does not change the absolute range. The measured value output is calculated from the sum of the absolute measured value and the signed offset. The resulting measured value is used when testing the distance limits. The factory default setting is 0 m.

Valid Settings for the Offset

VDM100-50	-50.000 m ... +50.000 m
VDM100-150	-150.000 m ... +150.000 m
VDM100-300	-300.000 m ... +300.000 m

Note!

- If the resulting measured value is negative, an error is displayed by the device. If this is the case, increase the offset.
- The offset is used when the function reserve is activated.

Counting Direction

The Counting direction setting can be used to invert the measurement's counting direction. The device displays 0 mm at maximum distance. As the distances become smaller, the output value increases. The output measured value is calculated from the difference between the range limit (50 m for VDM100-50, 150 m for VDM100-150, or 300 m for VDM100-300) and the real measured value. The factory default setting is "forward".

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Error Substitute Value

This option defines which distance value is output by the device in the event of an error. You can choose between the substitute value 0 mm and the last valid measured value. If the device is unable to determine a valid measured value for the 'last measured value' setting, the value 999.999 m is output. The factory default setting is "last measured value".

Error Delay

This setting defines a time delay for outputting an error. The delay is between an error occurring and indicating the buses via the error flag, as well as a suitably configured switching output (see chapter 7.3.2 section "Output Function -> Errors + Warnings"). The error delay is specified in milliseconds. The factory default setting is "50 ms".

PD Resolution

This parameter defines the resolution of the output distance value in the process data (PD) (see chapter 10.2). The "2 mm/bit", "1 mm/bit", and "0.1 mm/bit" settings can be selected. The factory default setting is "1 mm/bit".

PD Error Bit

This parameter defines the behavior of the collective error bit in the process data see chapter 10.2. The collective error bit can be set either for errors only or for errors and warnings. If the collective error bit is set, the error substitute value is output. The factory default setting is the "Error" option.

7.3.2 I/O 1 and I/O 2 Menu Item

The device has two I/O pins. The "I/O 1" and "I/O 2" submenu items can be used to configure the two I/O pins separately of each other as input or output. The "output" operating mode with the "speed" function and the "high active" polarity is selected as the factory default setting for "I/O 1". The factory default setting for "I/O 2" is the "input" operating mode with the "laser pointer" function and the "high active" polarity.

Input/Output

This menu item allows the respective I/O pin to be configured as input or as output. The I/O function and polarity settings are based on this pre-selection.

Input function

If an I/O pin is configured as an input, you can use this menu item to activate one of the following functions:

- **Laser pointer:** With this function, an active input switches the laser pointer on as an alignment aid.
    - This input function is evaluated only if the laser pointer works in "Auto" operating mode. Otherwise the laser pointer, regardless of the status of the input, is permanently active or inactive (see chapter 7.3.5).
- **Off:** With this setting, no functionality is assigned to the input. Changes to the status of the input pin will be ignored.
- **Set position 1:** With a rising edge on the input pin, this function accepts the current distance measured value as the "Position 1" threshold value.
- **Set position 2:** With a rising edge on the input pin, this function accepts the current distance measured value as "Position 2".
- **Preset offset (pos. 1):** The "Preset Offset (Pos. 1)" function adapts the offset in the device during activation. As a result, the distance value displayed by the sensor corresponds to the distance value stored in the "Position 1" threshold value. Any previous offset will be overwritten. Activation occurs with "high active" polarity caused by a rising edge and "low active" polarity caused by a falling edge.
- **Preset offset (pos. 2):** The "Preset Offset (Pos. 2)" function adapts the offset in the device during activation. As a result, the distance value displayed by the sensor corresponds to the distance value stored in the "Position 2" threshold value. Any previous offset will be overwritten. Activation occurs with "high active" polarity caused by a rising edge and "low active" polarity caused by a falling edge.
- **Key lock:** With this function, changes to the parameters can be locked using the HMI. A small lock icon appears in the display in the corresponding submenus. The navigation buttons can still be used to scroll though the menu for reading. Regardless of the polarity set for the input pin, the logical status of the input pin is always evaluated as high-active for the 'Key lock' function, i.e., the entry block is activated at the input with an electrical high.

Output function

If an I/O pin is configured as an output, you can use this menu item to activate one of the following functions:

- **Speed:** If this output function is selected, the output is switched to active if the speed determined by the device exceeds the value defined in the "Threshold values" submenu (see chapter 7.3.3).
- **Speed (pos. 1; pos. 2):** With this setting, the output becomes active when the current speed exceeds the trip value defined in the "Threshold values" submenu (see chapter 7.3.3), while the device is outside the distance limits entered via position 1 and position 2.
- **Errors + warnings:** With this setting, the output becomes active when the device shows an error or warning on the display
- **Errors:** With this setting, the output becomes active when the device shows an error on the display.
- **Switch at pos. 1:** With this setting, the output becomes active when the distance measured value output is greater than the "Position 1" value defined in the "Threshold values" submenu.

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- **Switch at pos. 2:** With this setting, the output becomes active when the distance measured value output is greater than the "Position 1" value defined in the "Threshold values" submenu.
- **Switch at pos. 1+2:** With this setting, the output becomes active when the (output) distance measured value is between the "Position 1" and "Position 2" values defined in the "Threshold values" submenu.

Polarity

This menu defines implementation between the electrical status of the I/O ports and the logical evaluation.

For example: If an input is parameterized as low-active, it will be interpreted as inactive at electrical level 'high' (U_e > 16 V). An electrical level 'low' (U_e < 6 V) is interpreted as active.

7.3.3 Thresholds Menu Item

Position 1

This menu item is used to define the position value for "Position 1." This value is evaluated by the functions for controlling the switching outputs. The factory default setting is "0.3 m".

Position 2

This menu item is used to define the position value for "Position 2." This value is evaluated by the functions for controlling the switching outputs. The factory default setting is "50 m".

Speed

This menu item is used to define a limit value for the speed. This value is evaluated by the functions for controlling the switching outputs. The factory default setting is "5 m/s".

7.3.4 Interfaces Menu Item

PROFIBUS

This menu item is used to define the settings for the PROFIBUS interface. You have the option to set the slave address and the lock slave address. The factory default setting is "slave address = 126" and "Lock slave address = no".

INTERBUS

This menu item is used to define the settings for the INTERBUS interface. You have the option to read the baud rate. The baud rate is fixed at "500 kBd".

EtherNet/IP

This menu item is used to define the settings for the EtherNet/IP interface. You have the option to set the IP configuration, IP address, subnet mask, gateway. The factory default setting is "IP configuration = DHCP".

Serial

This menu item can be used to define the settings for the serial interface. Mode (SSI Gray coded, SSI binary coded, RS422) and baud rate for the RS422 communication can be set. The factory default setting is "Gray-coded SSI data output."

7.3.5 Miscellaneous Menu Item

Display Language

This menu item is used to select the menu language. German and English are the currently available settings. The factory default setting is "English".

Display Orientation

This menu item will change the orientation of the display. The setting options are 0° and 180° for overhead mounting. The function of the buttons is rotated by 180°. The factory default setting is "0°".

Laser Pointer

This menu item can be used to switch the laser pointer to automatic mode (Auto), always active (On), or always off (Off). In automatic mode, the laser pointer is activated automatically (flashing frequency of 1 Hz) if the sensor does not detect a target. It is deactivated again as soon as a target has been detected within two minutes. The factory default setting is "Auto".

Factory Default Setting

You can use this menu item to reset all of the device's settings to the factory default settings.

Version

This menu item allows the hardware version, the firmware version, and the interface version to be interrogated.

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8 Maintenance and Repair

8.1 Maintenance

Observe the applicable national regulations when maintaining the sensor. Essentially, the sensor is maintenance free. Nonetheless, check the technical safety of the sensor system at regular intervals by looking for damage to the housing. Check the sensor for dirt every now and then. To clean the sensor, wipe it at regular intervals with a dry or damp soft cloth. This will ensure it continues to function properly. The housing is made of plastic. For this reason, do not use acetone or detergents containing solvents.

8.2 Repairs

If it appears that safe operation of the system is no longer possible, the system must be taken out of operation and steps taken to prevent it being used inadvertently. If the device needs to be repaired, return it to Pepperl+Fuchs. If you open or modify the device yourself, not only are you endangering yourself and others but you will void any warranty and absolve the manufacturer from any liability.

9 Troubleshooting

9.1 Troubleshooting

Interference

- The sensor must be firmly mounted. It must not vibrate.
- The sensor must not be installed behind a cover.
- The sensor should be installed so it is protected from rain.

Note!

When carrying out the insulation measurement, be aware that suppressor diodes have been installed for electromagnetic compatibility.

Display messages—information

The red error LED lights up, the error indication will appear alternately to the operating status indicator

Message	Description
Initializing—please wait ...	Initializing the device
Accept changes—please wait ...	Saved changed parameters
IP address conflict	EIP: Current IP address has been issued twice
No valid IP configuration	EIP: invalid IP address, no DHCP server etc.

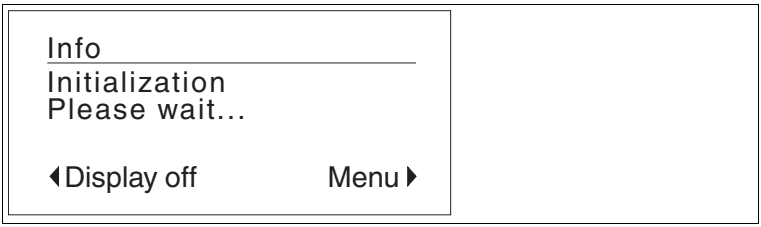

Figure 9.1 Display message information - For example the message "Initialization"

Display messages—pre-failure message

The red error LED lights up, the error indication will appear alternately to the operating status indicator

Message	Description
Laser weak	Laser power fading—failure pending
Faulty internal communication	Malfunctions detected in internal communication—failure pending

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Display messages—error

The red error LED lights up, the error indication will appear alternately to the operating status indicator

Message	Description
No target detected	No target (reflector) found
Invalid measured values	Invalid measured values—sensor/reflector may be dirty
Target outside the measuring range	Sensor measuring range exited
Negative distance value	Negative distance value—correct "Offset" setting

Figure 9.2 Display message error - For example the message "No target detected"

Display messages—device faulty

The red error LED lights up; the error indication appears static.

There is no way to correct the error yourself. Return the device with a description of the error code to Pepperl+Fuchs GmbH.

Message	Description
Error code: xxx	Device faulty

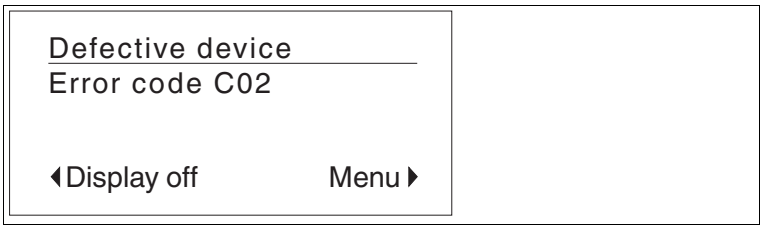

Figure 9.3 Display message "Defective device"

10 Appendix

10.1 Technical Data

General data

Measurement range	**VDM100-300:** 0.3 m ... 300 m **VDM100-150:** 0.3 m ... 150 m **VDM100-50:** 0.3 m ... 50 m
Reference object	**VDM100-300:** VDM01 reflector **VDM100-150:** Foil reflector 500 mm x 500 mm **VDM100-50:** Foil reflector 500 mm x 500 mm
Light source	Laser diode
Laser nominal ratings	
Note	VISIBLE AND INVISIBLE LASER LIGHT. Do not look into the beam
Laser class	Measuring laser: 1 Alignment laser: 2
Wavelength	Measuring laser: 905 nm Alignment laser: 660 nm
Beam divergence	Measuring laser: 2 mrad Alignment laser: 1 mrad
Pulse length	Measuring laser: 4 ns
Repeat rate	Measuring laser: 20 kHz
Maximum optical power output	Alignment laser: 0.6 mW
Max. pulse energy	Measuring laser: 12 ms
Measuring method	Pulse ranging technology (PRT)
Maximum travel speed	15 m/s
Alignment aid	Laser class 2 laser pointer
Service life	> 100000 h
Diameter of the light spot	**VDM100-300:** < 70 cm at 300 m **VDM100-150:** < 35 cm at 150 m **VDM100-50:** < 15 cm at 50 m
Extraneous light limit	> 100000 Lux
Resolution	0.1 mm, adjustable
Temperature influence	0.03 mm/K

Functional safety data

$MTTF_d$	120 a
Life time (T_M)	20 a
Diagnostic coverage (DC)	0%

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Indicators/controls

Function indicator	4 LEDs
Operating controls	Operating panel (4 foil buttons) to set parameters
Parameterizing display	Illuminated display for measured value display and parameterization

Electrical data

Operating voltage	18 VDC ... 30 VDC
No-load current	250 mA (18 V) ... 150 mA (30 V)
Protection class	III (rated voltage 50 V)
Time delay before availability	< 10 s

Input/output

Input/output type	Two PNP inputs/outputs, independently configurable, short-circuit proof, protected against polarity reversal

Input

Switching threshold	low: U_e < 6 V, high: U_e > 16 V

Output

Switching threshold	low: U_a < 1 V, high: U_a > Ub - 1 V
Switching current	200 mA per output

Measurement accuracy

Measured value output	1 ms
Average measured value age	3 ms, 6 ms, 12 ms, 25 ms, 50 ms, adjustable
Offset	max. 2 mm (between two devices)
Absolute accuracy	± 2.5 mm (> 3 m); ± 3.5 mm (0.3 m ... 3 m)
Repeatability	< 0.5 mm

Conformity with standards and directives

Directive conformity	EMC guideline 2004/108/EG
Conformity with standards	
Product standard	EN 60947-5-2:2007
Laser class	IEC 60825-1:2007

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Approvals and certificates

UL approval	cULus-listed

Ambient conditions

Ambient temperature	-10 °C ... 50 °C (263 K ... 323 K) Version/146: -30 °C ... 50 °C (243 K ... 323 K)
Storage temperature	-20 °C ... 70 °C (253 K ... 343 K) Version/146: -30 °C ... 70 °C (243 K ... 343 K)
Relative humidity	95%, no condensation

Mechanical data

Housing length	170 mm
Housing width	140 mm
Housing height	100 mm
Protection class	IP65
Material	
Housing	ABS/PC
Optical face	PMMA, hard-coated
Weight	Approx. 700 g

Note!

Information at 23 °C air temperature, 977 hPa and minimum duty cycle 30 min. In version/146 and -30 °C, the minimum duty cycle is 90 min.

10.1.1 SSI/RS422 Interface

SSI

Interface	
Transfer rate	4000/s pulse frequency: 100 kHz ... 1 MHz

Table 10.1 SSI technical data interface

RS422

Interface	
Transfer rate	4.8 kBit/s ... 115.2 kBit/s

Table 10.2 RS422 technical data

10.1.2 EtherNet/IP interface

Interface	
Transfer rate	1000/s @ 100 Mbit/s

Table 10.3 EtherNet/IP interface technical data

10.1.3 PROFIBUS DP Interface

Interface	
Transfer rate	9.6 kBit/s ... 12 Mbit/s, adjustable

Table 10.4 PROFIBUS DP interface technical data

10.1.4 INTERBUS Interface

Interface	
Transfer rate	500 kBit/s

Table 10.5 INTERBUS interface technical data

10.2 Description of Interfaces

10.2.1 General

Process Data: Format

The data is transmitted serially at all interfaces. A distance value, as well as any error information (status flags) and the status of the I/O pins, are always output as process data. Depending on the interface, the process data composition is defined as either fixed (e.g., SSI) or configurable (e.g., PROFIBUS). For details, please refer to the description of the individual interfaces.

Process Data: Distance Value

The distance value is transmitted as binary data. The number of bytes used and the byte order (Little Endian, Big Endian) are configured according to the interface.

The resolution of the distance value transmitted in the process data can be configured via the "PD resolution" parameter (see chapter 7.3.1). When configuring this resolution, the value of the LSB can be set to 0.1 mm, 1 mm, or 2 mm. The "1 mm/bit" resolution is the default selection.

In the event of an error (depending on the "error substitute value" parameter setting), the last valid measured value or the value zero is output. If the "last measured value" setting does not have a valid measured value, the largest value that can be displayed in the process data (e.g., `0xFFFFFFFF`) is output.

Process Data: Error Byte

With many bus interfaces (e.g., PROFIBUS, INTERBUS), an (optional) error byte can be output in the process data. This error byte is composed of individual error bits that reflect the status of the sensor. The assignment of the bits can be found in the table below. A more detailed description of the error statuses is provided in the "Error Messages" section in the "Troubleshooting" chapter.

Bit	Meaning
0	Collective error (depending on the "PD error bit" setting)
1	Error: "No target detected"
2	Error: "Invalid measured values"
3	Error: "Measured value outside the measuring range"
4	Reserved (always 0)
5	Error: "Distance value negative"
6	Error: "Device faulty"
7	Warning: "Pre-fault output"

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Note!

Collective Error Flag

The collective error flag is set if the process data does not contain any valid measured values. The additional flags in the error byte do not necessarily cover all of the device's error statuses if this is the case. Therefore, only the collective error flag may be set (e.g., during the initialization phase).

Process Data: I/O Status Byte

The optional I/O status byte is used to evaluate the current level of the IO pins (I/O1 and I/O2). The 0 value stands for the electrical level LOW, and the 1 value for the electrical level HIGH (information on the switching thresholds see chapter 10.1).

Bit	Meaning
0	Level I/O 1 (0 — low, 1 — high)
1	Level I/O 2 (0 — low, 1 — high)
2 – 7	Reserved (always 0)

10.2.2 SSI

Illustration shows the data transfer pulse diagram. Monoflop time tm is 20 µs, and delay time tv is a maximum of 100 ns. The pulse must be at least 100 kHz (max. duration T = 10 µs).

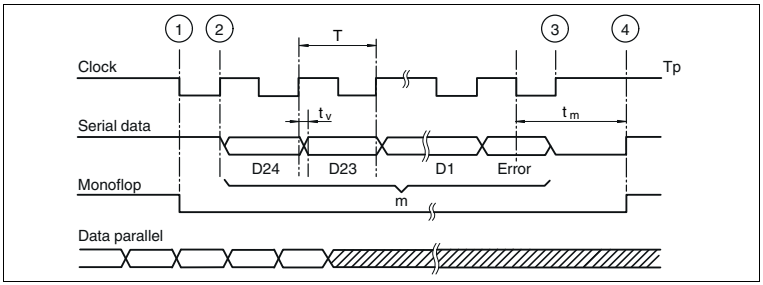

Figure 10.1 Pulse diagram for data transfer

Data Telegram:

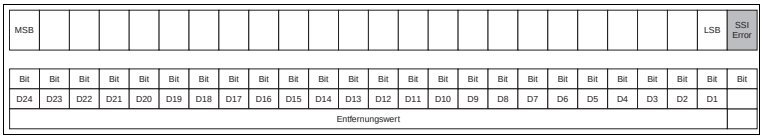

Figure 10.2 SSI data telegram

24 data bits are transmitted in the Gray code, and 1 error bit. **The error bit is transmitted uncoded.** The code for the distance value is selected from the menu.

Binary Code:

Bit D0	Error bit: 0 = no error, 1 = error (see "PD error bit")
Bit D24 ... D1	Distance value, binary-coded with variable resolution (see "PD resolution")

Gray code:

Bit D0	Error bit: 0 = no error, 1 = error (see "PD error bit")
Bit D24 ... D1	Distance value, Gray-coded with variable resolution (see "PD resolution")

10.2.3 RS422

The serial interface and the SSI interface use the same physical interface. From the menu, you can select the Pepperl+Fuchs standard protocol as well as three additional protocols. If you make changes to the basic settings, make a note of them, because all settings will be lost when reverting to the factory default settings.

Structure:

All commands and responses start with the ASCII code STX (0x02, start of text) and end with the ASCII code ETX (0x03, end of text).

`<STX> Command Type Command option <ETX>`

The command and the option byte must first be converted to ASCII code.

Examples

Command	Command	ASCII code		Response command	Response ASCII code
Laser pointer on	<STX>01<ETX>	02 30 31 03		<STX>81 96<ETX>	02 38 31 39 36 03
Read release number	<STX>06<ETX>	02 30 36 03		<STX>86 01 09 C7<ETX>	02 38 36 30 31 30 39 43 37 03
Start measurement (value = 123456 = 0x0001E240)	<STX>08<ETX>	02 30 38 03		Binary: <STX>88 00 01 E2 40 F3<ETX>	02 38 38 30 30 30 31 45 32 34 30 46 33 03
				Decimal: <STX>88 00 12 34 56 FA<ETX>	02 38 38 30 30 31 32 33 34 35 36 46 41 03
Set offset value = -10.999 mm	<STX>11-0010999<ETX>	02 31 31 2D 30 30 31 30 39 39 39 03		<STX>91-0010999<ETX>	02 39 31 2D 30 30 31 30 39 39 39 03

Commands in an incorrect format will not receive a response. Commands from 0x01 to 0x0F without a leading zero will be accepted.

Invalid commands or commands with invalid parameters will receive a response with an error message: `<STX>ERROR 75<ETX> -`
`02 45 52 52 4F 52 37 35 03`

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Commands

Command	ID [hex]	Command	Response
Laser pointer on	01	<STX>01<ETX>	<STX>81 96<ETX>
Laser pointer off	02	<STX>02<ETX>	<STX>82 95<ETX>
Laser pointer automatic mode	03	<STX>03<ETX>	<STX>83 94<ETX>
Read out status	04	<STX>04<ETX>	<STX>84 xx<ETX> xx means D7 — Q1 status D D6 — Q2 status D5 — distance < 0 D4 — invalid measured value D3 — distance outside the range D2 — maintenance required D1 — target lost D0 — general error
Read out temperature	05	<STX>05<ETX>	<STX>85 tt<ETX> tt = temperature
Read out release number	06	<STX>06<ETX>	<STX>86 hh ll<ETX> hh = main number ll = sub-number
Load factory default setting	07	<STX>07<ETX>	<STX>87<ETX>
Start measurement	08	<STX>08<ETX>	<STX>88vvv<ETX> vvv = measured value
Stop measurement	09	<STX>09<ETX>	<STX>89<ETX>
Read out configuration	0A	<STX>0A<ETX>	<STX>8A param_ID1 param_value1 <CRLF> param_ID2 param_value2 <CRLF> ... param_IDn param_valuen <CRLF> <ETX>

Parameters

Parameters sent via the serial interface overwrite the value already in the device.

The parameters being sent have the following format: `<STX>param_ID param_wert<ETX>`.

The response is structured as follows: `<STX>param_ID+0x80 param_wert CS<ETX>`.

Measurement

Parameters	ID [hex]	Value	Command
Resolution	10	v = 0: 0.1 mm **v = 1: 1 mm** v = 2: 2 mm	<STX>10v<ETX>
Offset	11	v = -range ... +range 0 [mm]	<STX>11v<ETX>
Counting direction	12	**v = 0: forward** v = 1: backward	<STX>12v<ETX>
Measured value age	13	v = 0: 50 ms v = 1: 25 ms **v = 2: 12 ms** v = 3: 6 ms V = 4: 3 ms	<STX>13v<ETX>
Set output format	14	**v = 0: binary (uint_32)** v = 1: decimal v = 2: VDM mode (4 bytes) v = 3: quick mode	<STX>14v<ETX>
Set output mode	15	**v = 0: continuously** v = 1: individually	<STX>15v<ETX>
	16	**v = 0: off** v = 1: on	<STX>16v<ETX>
Error substitute value	17	v = 0: 0 **v = 1: last valid measured value**	<STX>17v<ETX>
Error delay	18	v = 0 ... 9999 **50 ms**	<STX>18v<ETX> v = decimal

A detailed description of the parameters can be found in the respective chapters for the menu items see chapter 7.3.1

Input/Output 1 (I/O1)

Parameters	ID [hex]	Value	Command
Input or output selection	20	v = 0: input **v = 1: output**	<STX>20v<ETX>
Output function	21	v = 0: error + warnings v = 1: invalid measurement v = 2 switch at pos.1 v = 3: switch at pos.2 v = 4: switch at pos.1+2 **v = 5: speed** v = 6: speed pos.1;pos.2	<STX>21v<ETX>
Polarity	22	**v = 0: low active** v = 1: high active	<STX>22v<ETX>
Input function	23	v = 0: set position 1 v = 1: set position 2 v = 2 :key lock v = 3: laser pointer **v = 4: off** v = 5: preset offset (pos.1) v = 6: preset offset (pos.2)	<STX>23v<ETX>
Polarity	24	v = 0: low active **v = 1: high active**	<STX>24v<ETX>

A detailed description of the parameters can be found in the respective chapters for the menu items see chapter 7.3.2

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Input/Output 1 (I/O2)

Parameters	ID [hex]	Value	Command
Input or output selection	28	**v = 0: input** v = 1: output	<STX>28v<ETX>
Output function	29	v = 0: error + warnings v = 1: invalid measurement v = 2 switch at pos.1 v = 3: switch at pos.2 v = 4: switch at pos.1+2 **v = 5: speed** v = 6: speed pos.1;pos.2	<STX>29v<ETX>
Polarity	2A	**v = 0: low active** v = 1: high active	<STX>2Av<ETX>
Input function	2B	v = 0: set position 1 v = 1: set position 2 v = 2 :key lock **v = 3: laser pointer** v = 4: off v = 5: preset offset (pos.1) v = 6: preset offset (pos.2)	<STX>2Bv<ETX>
Polarity	2C	v = 0: low active **v = 1: high active**	<STX>2Cv<ETX>

A detailed description of the parameters can be found in the respective chapters for the menu items see chapter 7.3.2

Thresholds

Parameters	ID [hex]	Value	Command
Position 1	30	v = 0 ... 2 * range **300 [mm]**	<STX>30v<ETX> v = decimal
Position 2	31	v = 0 ... 2 * range **150000 [mm]**	<STX>31v<ETX> v = decimal
Speed	32	v = 1 ... 150 **50 [0.1 m/s]**	<STX>32v<ETX> v = decimal

A detailed description of the parameters can be found in the respective chapters for the menu items see chapter 7.3.3

Miscellaneous

Parameters	ID [hex]	Value	Command
Activate checksum	40	**v = 0: off** v = 1: on	<STX>40v<ETX>
SSI/RS422 interface Set protocol	41	**v = 0: protocol Pepperl+Fuchs standard** v = 1: protocol S1 (STX_ETX) v = 2: protocol S2 (CRLF) v = 3: protocol S3 (CP0) v = 0: reserved	<STX>41v<ETX> Response: <STX>C1v<ETX> then according to the respective protocol
Set all necessary parameters	50	any parameter 1 parameter 1 value 2 parameter 2 value ... n parameter n value	<STX>50 1 number 1 value 2 number 2 value ... n number n value <ETX>

A detailed description of the parameters can be found in the respective chapters for the menu items see chapter 7.3.4

Special protocol S1, S2, and S3

The following are deviations from the standard protocol

- The two LASER_ON and LASER_OFF commands are not available. There is no way to switch off the laser pointer. If the "LASER_OFF" command is sent, the "Measured value = zero" response will be returned
- The default SSI Gray25 setting is not available. The setting is fixed at gray 24 +1.
- RSSI value is not available. The value is fixed at 0 dB.
- Preset activation is not implemented
- The service status differs from the Pepperl+Fuchs standard

Factory default setting (Set_factory_defaults)

Output mode	Separately
Output format	Binary
Error delay	200 ms
Offset	0 m
SSI resolution	0.1 mm
Position 1	1995 mm
Position 2	2995 mm
I/O1	Output
	Output high active
	Input high active
	Output function = pos. 1
	Input function cannot be selected
I/O2	Output
	Output low active
	Input low active
	Output function = fault indication
	Input function cannot be selected

10.2.4 EtherNet/IP

The Ethernet connection is established using an industrial M12 connector (D coding).

Link Status

The rearward status LEDs show the link status of the Ethernet connection:

- Speed (green): indicates static 10 Mbit (LED off)/100 Mbit (LED on)
- Link (yellow): shows the correct connection to the switch or the controller
- Activity (green): flashes to indicate that there is data traffic

The distance measurement device is controlled by Auto-MDIX. The transmission and receiving channels are automatically given the correct assignment; therefore, a crossover cable is not required.

IP Setup

The distance measurement device is supplied in DHCP mode. A valid IP address can be assigned by:

- A controller with DHCP via EtherNet/IP.
- A DHCP server. This is only temporary until the device is turned off.
- Input of IP, network screen, and gateway on the device, as well as a change of mode from DHCP to static IP. The new IP address becomes effective only after the device has been switched off and then on again.

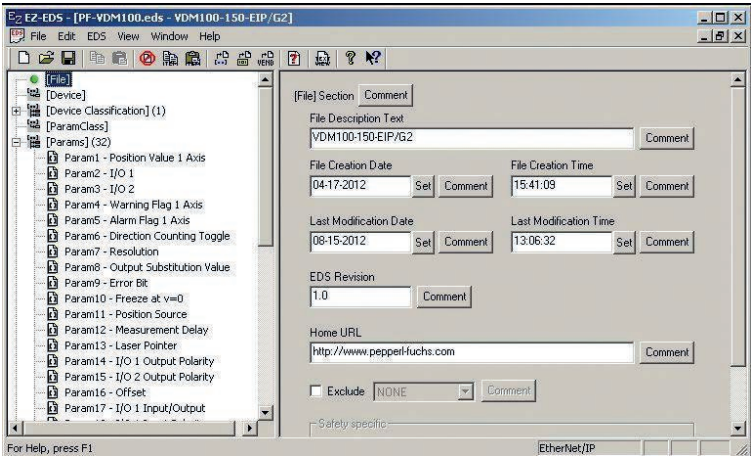
No communication can be established if a device without a valid IP address is integrated into a system without DHCP capability. The distance measurement device shows the missing IP address on the display and via the error LED. Invalid IP addresses, as well as invalid network screens, cannot be entered, or will be rejected by internal control routines.

EDS File

The VDM100-EIP/G2 is implemented as an encoder device (device type 0x22) to ODVA specification (volume 1: Common Industrial Protocol Specification, Chapter 6: Device Profiles, Part 2). It offers a total of 27 parameters or parameter groups designed to parameterize the measured value, I/Os, limit values, and other device features. All of the parameters can be changed at the HMI for test purposes—as long as the device is not integrated into the EIP data exchange facility. The HMI settings are stored permanently. Upon integration into the bus, all parameters are changed to the values set in the project. As long as the bus is active, these parameters cannot be changed.

The VDM100-related EDS file enables the operator to use the controller for parameterization purposes. When imported into the "RSLOGIX5000" software, the EDS file enables both the data format and all parameters to be set. Parameters that are not changed in the project will be set to their default value.

The user can ignore the EDS file and select the assembly setup as required. In this case, the parameter length can be either 0 or 36. If 0 is entered, no parameters are transferred. The device operates using the values selected at the HMI.



Note!

No Parameter Restrictions in Rslogix5000

Parameters (specification of minimum and maximum values by the EDS file) are not restricted in RSLOGIX5000. Having no restrictions means that incorrect parameters can be entered, which results in the VDM100 rejecting the parameterization. In turn, the device will not operate.

Project Planning with RSLogix5000

The VDM100 offers two setups (instance assemblies), as well as setting all parameters for both instances:

Instance 1 = 4 input bytes (distance)

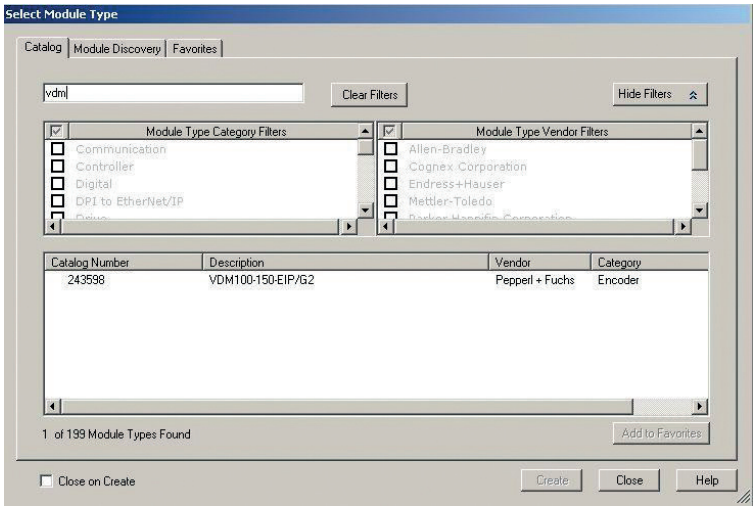
- 4 bytes distance (Little Endian — LSB first)

Instance 2 = 5 input bytes (distance and status byte)

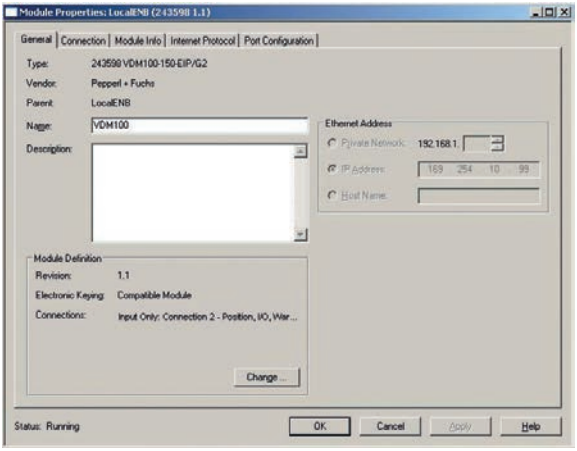
- 4 bytes distance (Little Endian — LSB first)
- Status byte with
  - State 0 = collective error (target loss, limit has been exceeded, device fault)
  - State 6 = logic level of the I/O2 pin
  - State 7 = logic level of the I/O1 pin

Project planning with the EDS file

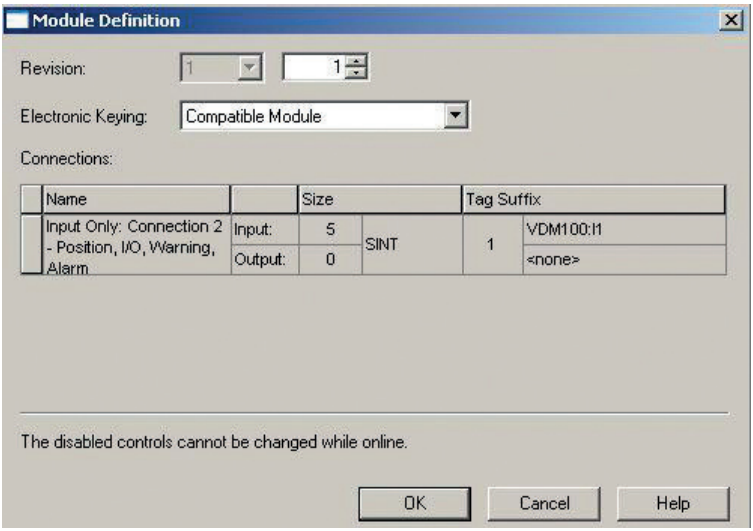
Import the EDS file "PF-VDM100.eds" in the project planning program into the device library using EDS_Hardware_Installation_Tool. Once the file is imported, the device is available with both possible instances and all factory default parameters under "VDM100".



Set the device in Module_Properties to the required instance and the required IP address.



The input assemblies can be changed to "Change..." in the Module Definition.



The current RSLogix version 20 cannot display the input data formats as double integers when using the EDS. However, these formats can be displayed in the Generic_Ethernet_Module.

Name	Value	Force Mask	Style	Data Type
VDM100:C	{...}	{...}		_0039:243598_F1792DDB:C:0
VDM100:C.Resolution	1		Decimal	SINT
VDM100:C.Output_Substitution_Value	0		Decimal	BOOL
VDM100:C.Direction_Counting_Toggle	0		Decimal	BOOL
VDM100:C.Error_Bit	0		Decimal	BOOL
VDM100:C.Freeze_at_v_0	0		Decimal	BOOL
VDM100:C.Position_Source	0		Decimal	BOOL
VDM100:C.Measurement_Delay	2		Decimal	SINT
VDM100:C.Laser_Pointer	0		Decimal	SINT
VDM100:C.I_O_1_Output_Polarity	0		Decimal	BOOL
VDM100:C.I_O_2_Output_Polarity	0		Decimal	BOOL
VDM100:C.Offset	0		Decimal	DINT
VDM100:C.I_O_1_Input_Output	1		Decimal	BOOL
VDM100:C.I_O_1_Input_Polarity	1		Decimal	BOOL
VDM100:C.I_O_1_Input_Function	4		Decimal	SINT
VDM100:C.I_O_1_Output_Function	5		Decimal	SINT
VDM100:C.I_O_2_Input_Output	0		Decimal	BOOL
VDM100:C.I_O_2_Input_Polarity	1		Decimal	BOOL
VDM100:C.I_O_2_Input_Function	3		Decimal	SINT
VDM100:C.I_O_2_Output_Function	5		Decimal	SINT
VDM100:C.Display_Language	0		Decimal	BOOL
VDM100:C.Display_Orientation	0		Decimal	BOOL
VDM100:C.Position_1	300		Decimal	DINT
VDM100:C.Position_2	150000		Decimal	DINT
VDM100:C.Speed	100		Decimal	INT
VDM100:C.Error_Delay	500		Decimal	INT

You can change the default parameters in Controller_Tags as required.

Note!

The RSLogix5000 software rejects any incorrect entries.

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Manual parameterization

You can manually select the setups by retrieving the VDM100 as Generic_Ethernet_Module from the module list.

In addition, you can set parameters by setting configuration assembly instance 106 to 36 bytes. Zero length is to be set if parameterization is not required.

Note!

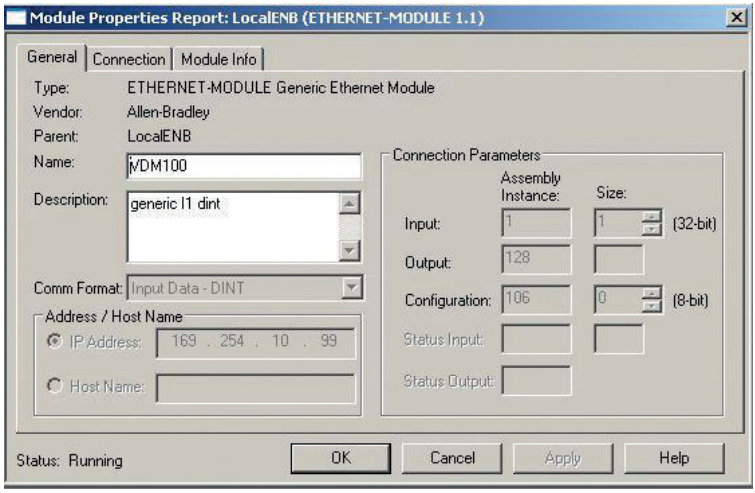
When selecting the parameter string, all parameters must be set to valid values, otherwise the VDM100 will reject the parameter string.

Manual parameterization -> Set Instance_1

Instance 1 = 4 input bytes (distance)

- 4 bytes distance (Little Endian — LSB first)

You can use D_INT as the data format so that the measured value can be read directly as a number.



Setting the system IO parameterization in "Module Properties" without any parameters.

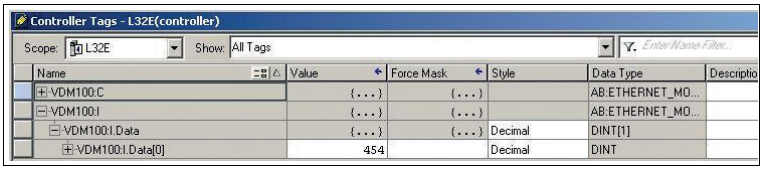


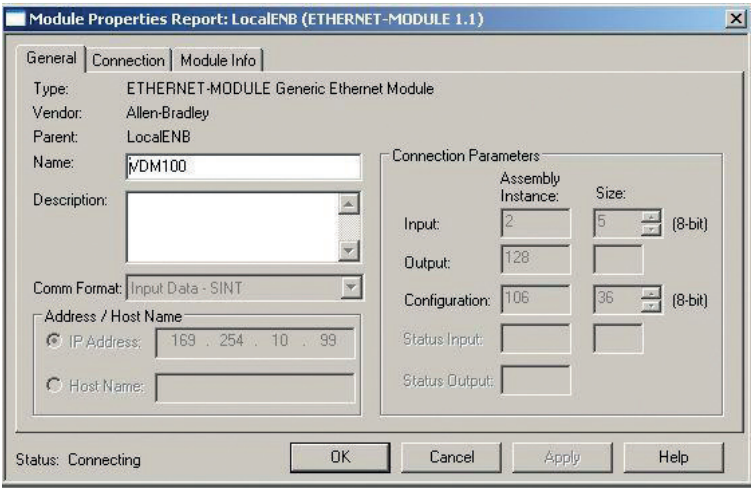
Figure 10.3 Instance_1 data structure (input 1 D_INT)

Manual parameterization -> Set Instance_2

Instance 2 = 5 input bytes (distance and status byte)

- 4 bytes distance (Little Endian — LSB first)
- Status byte with
  - State 0 = collective error (target loss, limit has been exceeded, device fault)
  - State 6 = logic level of the I/O2 pin
  - State 7 = logic level of the I/O1 pin

= 5 bytes of data + 36 bytes of parameters



Setting the system IO parameterization in "Module Properties".

Note!

It is not possible to use double_integer for the data share here.

VDM100:C	{...}	{...}		_0039:243598_F179...	Parameters
VDM100:I1	{...}	{...}		_0039:243598_4E8F...	
VDM100:I1.ConnectionFaulted	0		Decimal	BOOL	
VDM100:I1.Data	{...}	{...}	Decimal	SINT[5]	
VDM100:I1.Data[0]	-105		Decimal	SINT	lowest byte distance
VDM100:I1.Data[1]	1		Decimal	SINT	midd low
VDM100:I1.Data[2]	0		Decimal	SINT	midd high
VDM100:I1.Data[3]	0		Decimal	SINT	high byte distance
VDM100:I1.Data[4]	64		Decimal	SINT	errors&I/O
VDM100:I1.Data[4].0	0		Decimal	BOOL	error (target lost, etc.)
VDM100:I1.Data[4].1	0		Decimal	BOOL	errors&I/O
VDM100:I1.Data[4].2	0		Decimal	BOOL	errors&I/O
VDM100:I1.Data[4].3	0		Decimal	BOOL	errors&I/O
VDM100:I1.Data[4].4	0		Decimal	BOOL	errors&I/O
VDM100:I1.Data[4].5	0		Decimal	BOOL	errors&I/O
VDM100:I1.Data[4].6	1		Decimal	BOOL	Input 2
VDM100:I1.Data[4].7	0		Decimal	BOOL	Input 1

Figure 10.4 Instance_2 data structure (input 5 bytes)

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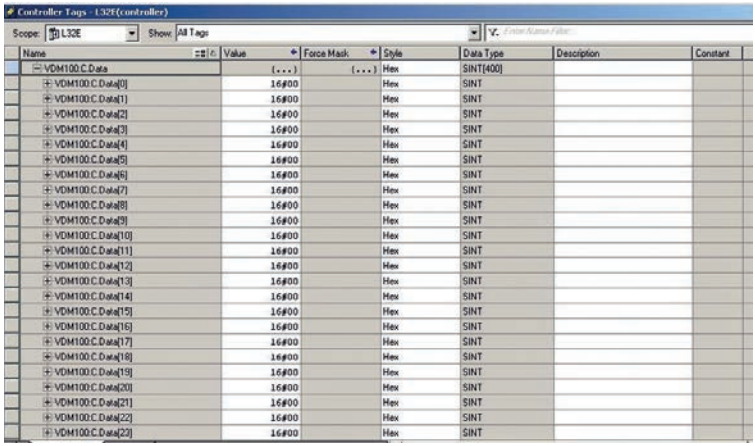
Manual parameterization -> setting the parameters

When setting the parameters, the parameter limits must be very carefully followed.



The labels for the parameters in the "Name" column, as well as the superior values, appear only when retrieved using the EDS file.

10.2.5 PROFIBUS DP

GSD file VDM100/G1

The PROFIBUS interface for the VDM100/G2 is compatible with the PROFIBUS interface for the VDM100/G1. The VDM100/G2 can be operated with the GSD file of the VDM100/G1, and provides identical process data. 5 bytes are transmitted in binary form:

- 3 bytes distance value (low, middle, high)
- 1 byte error status
- 1 byte I/O status

Byte 0								Byte 1								Byte 2								Byte 3								Byte 4							
Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Distance low								Distance middle								Distance high								Error								I/O status							

Note!

GSD File

It is recommended to use the modular GSD file of the VDM100/G2 for new projects.

GSD file VDM100/G2

The VDM100/G2 PROFIBUS interface has a modular GSD file, in which the available setting options can be selected from a list of modules. This modular design has several advantages over the static GSD of the VDM100/G1:

- It is possible to select from various process data modules. Therefore, the process data being transmitted and its arrangement in the PLC memory can be influenced.
- It is possible to select from various parameter modules according to the menu structure. This structuring of the device parameters means that the user must define only the parameters relevant to his application.

Information regarding the GSD File (PROFIBUS DP)

Process data modules

The modular GSD of the VDM100/G2 currently offers a selection of four process data modules (PD1, PD2, PD3, PD4). They differ only in the composition and arrangement of the data. To commission the PROFIBUS sensor, select exactly one process data module.

Each process data module features module-specific parameters that can be used to configure all parameters, which can be set via the HMI "Measurement" menu item. For the "Offset" parameter, you can specify whether the PROFIBUS value is to be transferred to the device, or whether the value stored in the device is to be retained. The latter is always appropriate if the offset was measured for a specific device or is set using the "Preset Offset" function.

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"[PD1] Measurement: 4-byte Position" module

Module PD1 delivers only one distance value as a prefix-less 32-bit integer with the Big Endian byte order (data type DWORD in Step7). Only three bytes (low, middle, and high distance) are required to display the VDM100 distance values—the fourth byte (padding distance) is only populated.

Byte 0								Byte 1								Byte 2								Byte 3							
Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Distance padding								Distance high								Distance middle								Distance low							

With this process data module, the error byte is not transferred with the normal process data. But it can be interrogated using the advanced diagnostics (see below).

Modules="[PD2] measurement: 4-byte position +1-byte IO status"

Module PD2 provides one distance value as a prefix-less 32-bit integer with the Big Endian byte order (data type DWORD in Step7), as well as the I/O status byte (data type BYTE). Only three bytes (low, middle, and high distance) are required to display the VDM100 distance values—byte 4 (padding distance) is only populated.

Byte 0								Byte 1								Byte 2								Byte 3								Byte 4							
Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Distance padding								Distance high								Distance middle								Distance low								I/O status							

With this process data module, the error byte is not transferred with the normal process data. But it can be queried using the advanced diagnostics.

Modules= "[PD3] measurement: 5-byte VDM100"

Module PD3 provides process data in VDM100/G1 format. This data is made up of the 3-byte distance value (Little Endian), the error byte, and the I/O status byte.

Byte 0								Byte 1								Byte 2								Byte 3								Byte 4							
Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Distance low								Distance middle								Distance high								Error								I/O status							

The error byte can be queried using the advanced diagnostics function.

Note!

The PD3 process data module is particularly suitable for integrating the modular GSD of the VDM100/G2 into a project that was created for the VDM100/G1, since the mapping of the process data does not need to be adapted in the PLC memory.

Modules="[PD4] measurement: 4-byte EDM120"

Module PD4 provides process data in the EDM120 format. It is made up of the 3-byte distance value and the error byte (Little Endian byte order):

Byte 0								Byte 1								Byte 2								Byte 3							
Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Distance low								Distance middle								Distance high								Error							

Figure 10.5 4 Byte EDM120 compatible data telegram

The error byte can be queried using the advanced diagnostics function.

Note!

The PD4 process data module is particularly suitable for integrating a VDM100/G2 into a project that has been created for the EDM120, since the mapping of the process data does not need to be adapted in the PLC memory.

Parameter modules

All settings not related to measurements can be made via parameter modules. These modules are subdivided in accordance with the HMI menu structure (see chapter 7.1) and allow access to the corresponding settings via module-specific parameters. In contrast to the process data modules referred to above, the parameter modules do not require memory capacity for input data or output data (process data).

For unselected parameter modules, the user-specific "unused modules" parameter can be used in the GSD to define whether the parameters belonging to these modules remain unchanged in the device ("Do not change parameters" setting), or whether they are to be set to the factory default settings ("Set parameters to default" setting). The factory default setting in the GSD is "Do not change parameters."

Modules="[IO1] I/O 1"

This module allows parameterization of the "I/O 1" pin. Mode, function, and polarity can be configured in the same way as the settings in the HMI menu (see chapter 7.1).

Modules="[IO2] I/O 2"

This module allows parameterization of the "I/O 2" pin. Mode, function, and polarity can be configured in the same way as the settings in the HMI menu (see chapter 7.1).

Modules="[TSH] threshold values"

This module allows the "speed", "position 1", and "position 2" threshold values to be set in the same way as the settings in the HMI menu (see chapter 7.1). For the "position 1" and "position 2" threshold values, it is possible to specify in each case whether the PROFIBUS threshold value is to be transferred to the device, or whether the value stored in the device is to be retained. The latter is always appropriate if a threshold value was measured for a specific device or is updated using the "Preset position 1" or "Preset position 2" function.

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Modules="[MSC] Miscellaneous"

This module allows the parameterization of display options and laser pointer mode, and setting the factory default settings for all device parameters in the same way as the settings in the HMI menu (see chapter 7.1).

Note!

If loading the factory default settings is activated, all parameters will be reset to their default setting in the device. All values configured via the GSD will be ignored.

Advanced diagnostics

The PROFIBUS interface of the VDM100/G2 supports—in addition to the obligatory 6-byte standard diagnostics for the PROFIBUS devices (see DIN 19245-3)—the transfer of additional device-specific diagnostic data. The diagnostic data has the following structure:

Byte	Description
0	Standard diagnostics: station status 1
1	Standard diagnostics: station status 2
2	Standard diagnostics: station status 3
3	Standard diagnostics: DP master address
4	Standard diagnostics: slave ident number (low)
5	Standard diagnostics: slave ident number (high)
6	Block length advanced diagnostics (VDM100/G2: 3-byte)
7	VDM100/G2: error byte
8	VDM100/G2: PROFIBUS status byte

The error byte provides status information for measuring the VDM100 (see chapter 10.2.1)

The PROFIBUS status byte provides additional information about the status of the PROFIBUS interface:

Byte	Description
0	Error GSD: incompatible version
1	Error GSD: invalid module parameterization Cause: no process data module or double parameter module
2	Error GSD: invalid parameter Cause: a parameter value is outside the permitted value range
3	Reserved (0)
4	Reserved (0)
5	Reserved (0)
6	Warning: PROFIBUS ASIC fault detected (reset performed)
7	Warning: fault detected in internal communication

PROFIBUS communication cannot start in the event of an error. The error must be corrected in the project planning phase. The warnings indicate potential faults in PROFIBUS communication. The cause of these faults can be either sensor defects or problems with the system hardware (power supply, electromagnetic interference).

Within the GSD, the user-specific "advanced diagnostics" parameter can be used to configure how frequently the device-specific diagnostics data will be updated. During each update, the controller interrupts the process data exchange to retrieve the diagnostics information from the device.

The following settings can be selected:

Deactivated	The advanced diagnostics is deactivated—no device-specific diagnostics data is transferred
Update at PB startup only	The device-specific diagnostics data is updated only when PROFIBUS communication starts. No update takes place while process data is transferred ("Data exchange" status)
Update in the event of errors	If an error occurs, the device-specific diagnostic data is updated regardless of the operating status of PROFIBUS communication
Update in the event of errors and warnings	If an error or warning occurs, the device-specific diagnostics data is updated regardless of the operating status of PROFIBUS communication

Note!

Depending on the controller parameterization, updating the diagnostics data can put the controller into an error status. Therefore, the factory default setting for the "Advanced diagnostics" parameter is "deactivated."

10.2.6 INTERBUS

The INTERBUS features automatic successor detection. The successor is detected if it indicates an active bus when the power is turned on. If the successor does not become active until a later point, it will not be detected automatically. In this case, the controller must trigger the remote bus to be reset.

Process Data

The format of the process data output via the Interbus can be configured from the HMI menu. The data can be output in a form that is compatible with either the VDM100/G1 (factory default setting) or the EDM120. In each case, it comprises the distance value (3 bytes) and the error byte—but differs in terms of the byte order (VDM100: Big Endian, EDM120: Little Endian).

Byte 0								Byte 1								Byte 2								Byte 3							
Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Error								Distance high								Distance middle								Distance low							

Figure 10.6 4 Byte VDM100/G1 compatible data telegram

Byte 0								Byte 1								Byte 2								Byte 3							
Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Distance low								Distance middle								Distance high								Error							

Figure 10.7 4 Byte EDM120 compatible data telegram

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