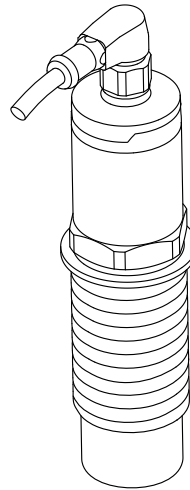
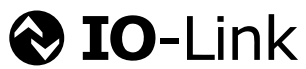


Operating Instructions

Nivector FTI26

Capacitance

Point level switch for powdered and fine-grained solids





A0023555

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1 About this document

1.1 Document function

These Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

1.2 Symbols

1.2.1 Safety symbols

DANGER

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

WARNING

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



CAUTION

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







NOTICE



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

1.3 Electrical symbols

Symbol	Meaning
	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.

1.4 Symbols for certain types of information

Symbol	Meaning
	Preferred Procedures, processes or actions that are preferred.
	Allowed Procedures, processes or actions that are permitted.
	Forbidden Procedures, processes or actions that are forbidden.
	Tip Indicates additional information.
	Reference to page
	Series of steps

Symbol	Meaning
	Result of a step
	Visual inspection

1.5 Symbols for graphics

Symbol	Meaning
1, 2, 3 ...	Item numbers
A, B, C, ...	Views

1.6 Documentation

 For an overview of the scope of the associated Technical Documentation, refer to the following:

- *W@M Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from nameplate
- *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2D matrix code (QR code) on the nameplate

1.7 Standard documentation

- TI01384F → Nivector FTI26, IO-Link
- BA01830F → Nivector FTI26 without IO-Link
- BA01832F → Nivector FTI26, IO-Link
- KA01408F → Nivector FTI26

1.8 Supplementary documentation

- TI00426F/00 → Weld-in adapter, process adapter and flanges (overview)
- SD01622P/00 → Weld-in adapter (installation instructions)
- SD00356F/00 → Valve plug (installation instructions)
- SD02242F/00 → Protector (installation instructions)

1.9 Certificates

Depending on the option selected in the "Approval" order code, Safety Instructions are supplied with the device, e. g. XA. This documentation is an integral part of the Operating Instructions. The nameplate indicates the Safety Instructions (XA) that are relevant to the device.

Safety instructions

- XA01734F/00 → ATEX; IECEx
- XA01821F/00 → CSA Ex
- XA01943F/00 → EAC Ex

1.10 Registered trademarks

IO-Link

is a registered trademark of the IO-Link company group.

2 Basic safety instructions

2.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:

- ▶ Trained, qualified specialists must have a relevant qualification for this specific function and task.
- ▶ Are authorized by the plant owner/operator.
- ▶ Are familiar with federal/national regulations.
- ▶ Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
- ▶ Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:

- ▶ Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
- ▶ Follow the instructions in this manual.

2.2 Designated use

The measuring device described in these instructions may be used only as a point level switch for powdery and fine-grained bulk solids. Incorrect use may pose a hazard. To ensure that the measuring device remains in perfect condition during the operating time:

- Measuring devices must be used only for media to which the process-wetted materials have an adequate level of resistance.
- The relevant limit values must not be violated, see TI01384F/00/EN.

2.2.1 Incorrect use

The manufacturer is not liable for damage caused by improper or non-designated use.

Residual risks

Due to heat transfer from the process, the temperature of the electronics housing and the assemblies contained therein may rise to 80 °C (176 °F) during operation.

CAUTION

Hot surfaces

Danger of burns from contact with surfaces!

- ▶ In the event of elevated fluid temperatures, ensure protection against contact to prevent burns.

2.3 Workplace safety

For work on and with the device:

- ▶ Wear the required personal protective equipment according to federal/national regulations.

2.4 Operational safety

CAUTION

Risk of injury!

- ▶ The operator is responsible for the trouble-free operation of the device.
- ▶ Operate the device only if it is in proper technical condition, free from errors and faults.
- ▶ The device must be operated with a 500 mA fine-wire fuse (slow-blow) which is suitable for DC current in accordance with IEC 60127-2.

Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers:

- ▶ If, despite this, modifications are required, consult with Endress+Hauser.

Repair

To ensure continued operational safety and reliability:

- ▶ Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe federal/national regulations pertaining to the repair of an electrical device.
- ▶ Use original spare parts and accessories from Endress+Hauser only.

2.5 Product safety

This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate.

It meets general safety standards and legal requirements. It also complies with the EC directives listed in the device-specific EC Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.

2.6 IT security

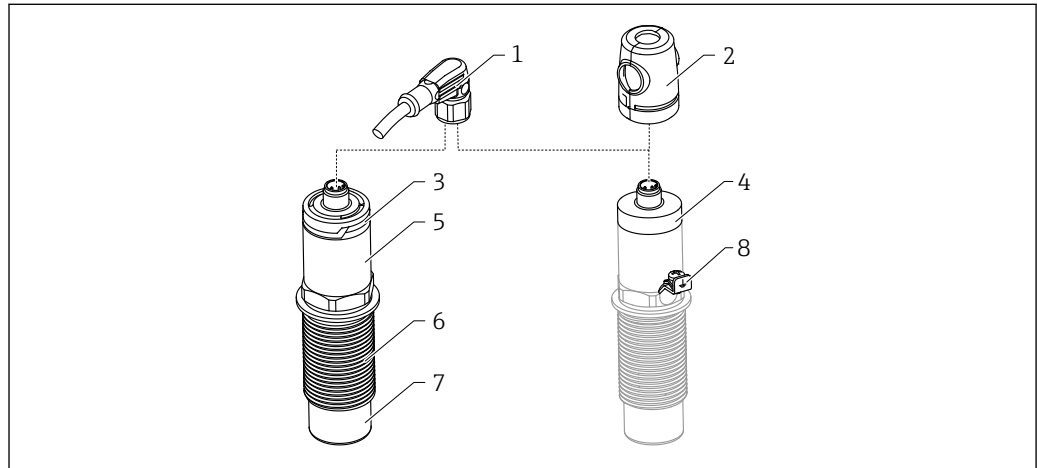
Our warranty is valid only if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the settings.

IT security measures, which provide additional protection for the device and associated data transfer, must be implemented by the operators themselves in line with their security standards.

3 Product description

Capacitance point level switch for powdery and fine-grained bulk solids; use preferably in bulk solids vessels, e.g. silos

3.1 Product structure



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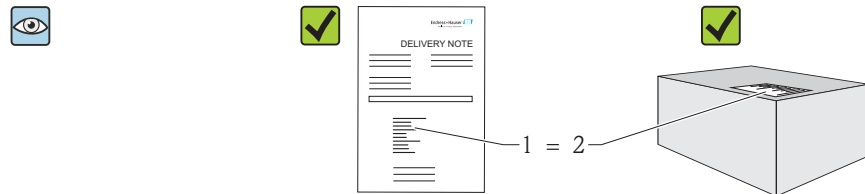
1 Product structure of Nivector FTI26 IO-Link, connection and housing covers optional

- 1 M12 plug
- 2 Ex protection cover → 51
- 3 Plastic housing cover with LED, IP65/67
- 4 Metal housing cover, IP66/68/69
- 5 Housing
- 6 Process connection G 1"
- 7 Sensor
- 8 Ground terminal (hazardous area)

Additional and optional accessories available to order, from → 49.

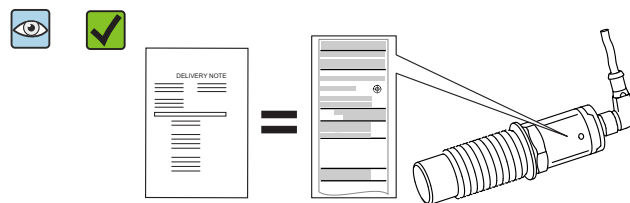
4 Incoming acceptance and product identification

4.1 Incoming acceptance



Is the order code on the delivery note (1) identical to the order code on the product sticker (2)?

Are the goods undamaged?



Do the data on the nameplates correspond to the order specifications on the delivery note?

i If one of these conditions is not satisfied, contact your Sales Center.

4.2 Product identification

The measuring device can be identified in the following ways:

- Nameplate data
- Order code with breakdown of the device features on the delivery note
- Enter serial number from nameplates in *W@M Device Viewer* (www.endress.com/deviceviewer): All information on the measuring device is displayed

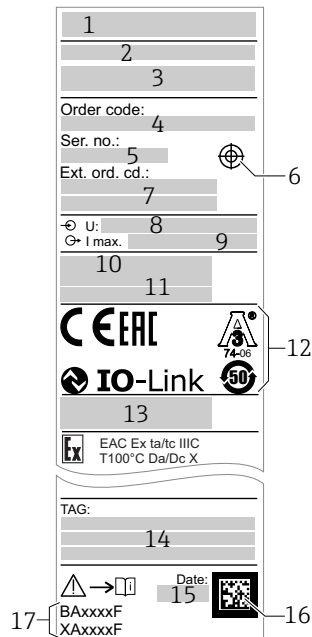
The serial number on the nameplate can also be used to obtain an overview of the technical documentation supplied with the device in *W@M Device Viewer* (www.endress.com/deviceviewer)

4.2.1 Manufacturer address

Endress+Hauser SE+Co. KG
Hauptstraße 1
79689 Maulburg, Germany

Address of the manufacturing plant: See nameplate.

4.2.2 Nameplate



- 1: Company logo
- 2: Device name
- 3: Manufacturer address
- 4: Order code
- 5: Serial number
- 6: Marking for test magnet
- 7: Extended order code
- 8: Supply voltage
- 9: Signal output
- 10: Process and ambient temperature
- 11: Process pressure
- 12: Certificate symbols, communication (optional)
- 13: Degree of protection: e.g. IP, NEMA
- 14: Measuring point identification (optional)
- 15: Date of manufacture (year, month)
- 16: Data matrix code with E+H serial number
- 17: Document number of Operating Instructions (BA), Safety Regulations (XA)

A0036631

i The test magnet is included in the scope of delivery. It can be canceled optionally.
 → 51

4.3 Storage and transport

4.3.1 Storage conditions

- Permitted storage temperature: -25 to +85 °C (-13 to +185 °F)
- Use original packaging.

4.3.2 Transport

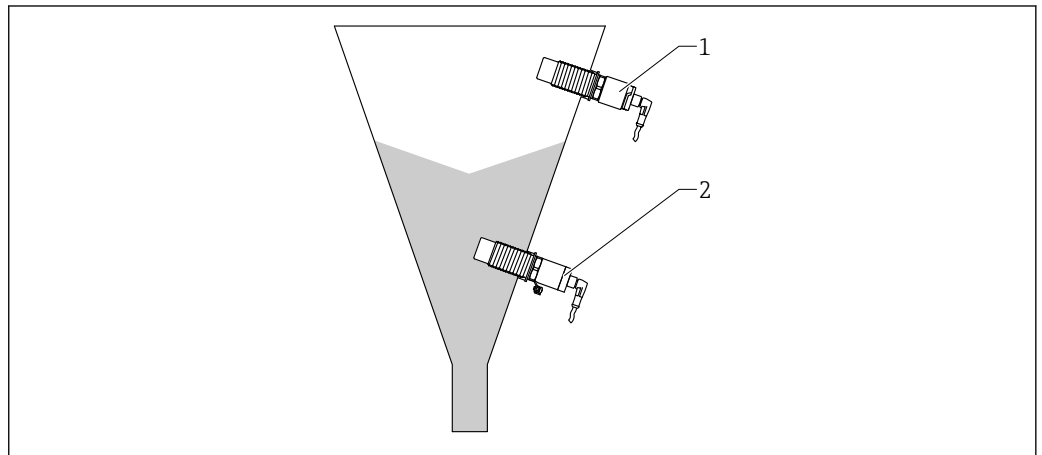
Transport the device to the measuring point in the original packaging.

5 Installation

5.1 Installation conditions

Lateral mounting in bulk solids vessel, e.g. silo

A miniature contactor, a solenoid valve or a programmable logic controller (PLC) can be connected directly to the point level switch.



A0035880

2 Application examples

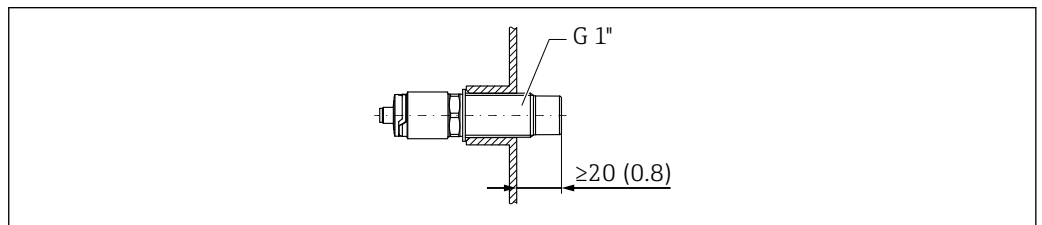
- 1 Overfill prevention or upper level detection (MAX)
- 2 Dry-running protection or lower level detection (MIN)

5.2 Mounting the measuring device

5.2.1 Required tools

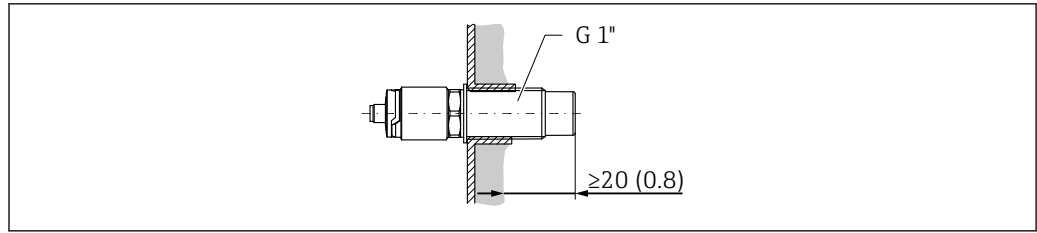
- Open-ended wrench AF32
 - When screwing in, turn by the hex bolt only.
 - Torque: 5 to 12 Nm (3.7 to 8.9 lbf ft)
- Sensor surface ≥ 20 mm (0.79 in) projecting into silo (when installing with weld-in adapter 20 mm (0.79 in))
- Silo wall thickness < 35 mm (1.38 in) or welding socket G 1" < 50 mm (1.97 in)

5.2.2 Installation examples



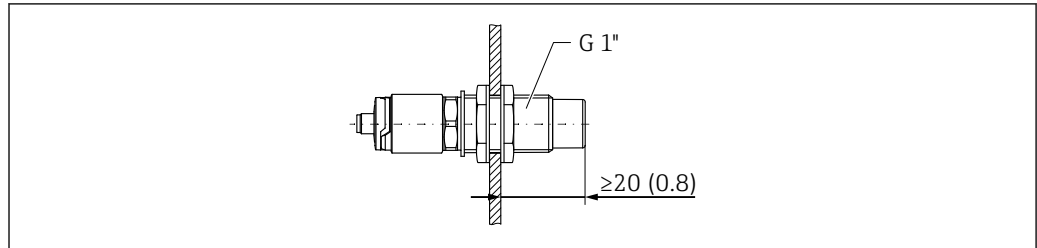
A0035881

3 Standard installation with external G 1" threaded adapter



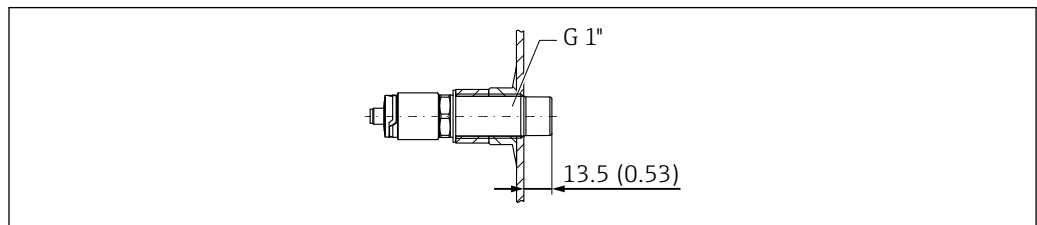
A0036360

4 Where buildup occurs on the silo wall with internal G 1" threaded adapter



A0036359

5 Bore hole in silo wall with lock nuts, can be ordered as an accessory → 49



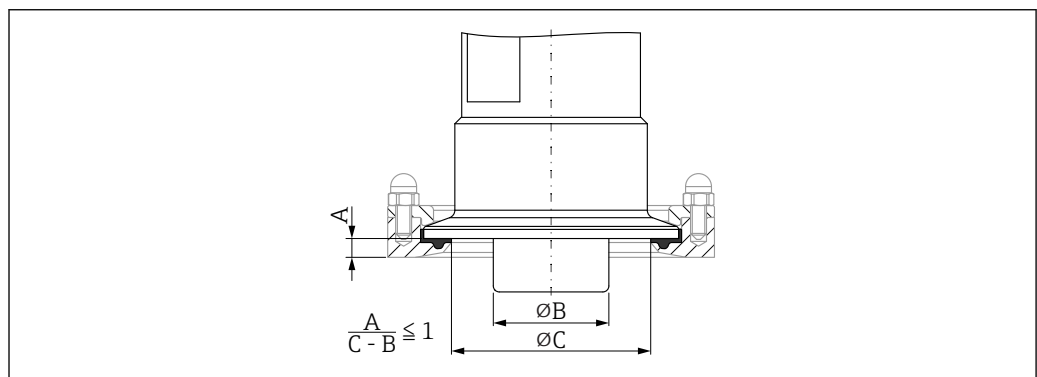
A0036362

6 Installation with weld-in adapter, can be ordered as an accessory → 49

NOTICE

Installation in a conventional T-section or in a metallic tank nozzle reduces the measuring performance of the sensor.

- Install Tri-Clamp version, e. g. NA Connect adapter for hygiene-compliant connection. This minimizes dead legs and increases cleanability.



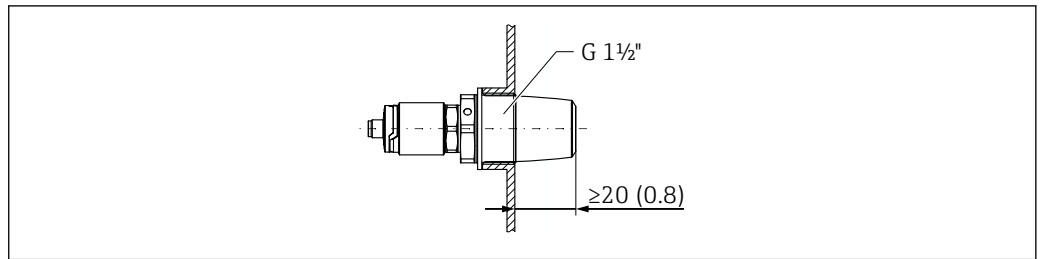
A0036363

7 Installation with Tri-Clamp, which can be ordered as an accessory, → 49 and with NA Connect adapter provided by customer

- A Distance between Tri-Clamp and NA Connect adapter
- B Diameter of Nivector
- C Diameter of NA Connect adapter

Installation with protector

- Protection of point level switch against damage by particularly abrasive or coarse product
- Outflow protection in silo for functional testing when silo is full



A0036361

8 Installation with protector, can be ordered as an accessory → 49

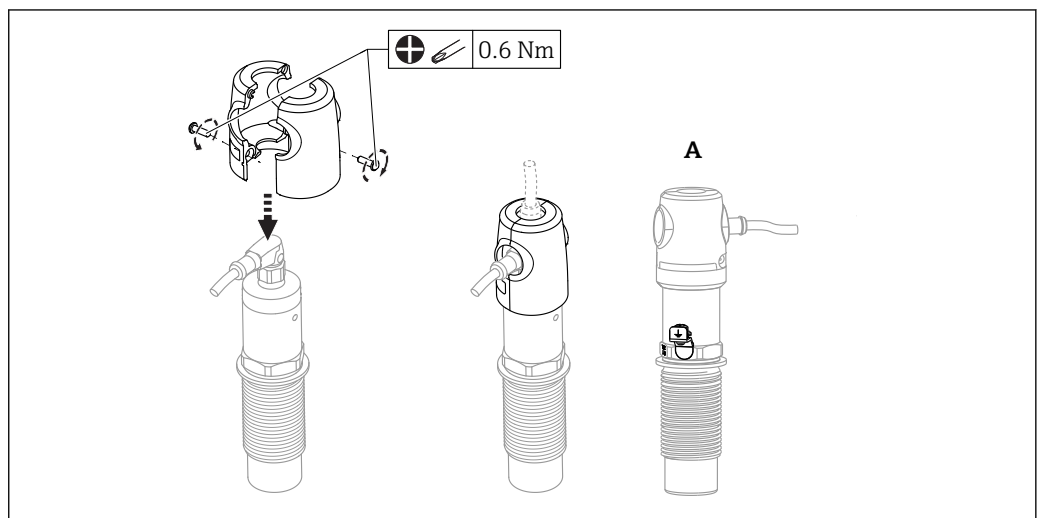
i Take account of metallic or non-metallic vessels in accordance with EMC guidelines, see Technical Information TI01384F.

5.2.3 Protection cover for hazardous areas

⚠ WARNING

Damage to the device from impact.

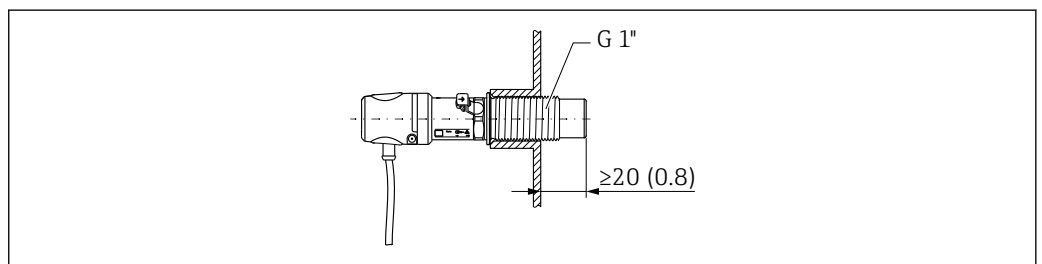
- The protection cover must be fitted before the device is put into operation.



A0035999

A View with ground terminal

Can also be ordered as an accessory → 49



A0036433

9 Installation with protection cover, included in scope of delivery for hazardous areas or can be ordered as an accessory → 49

5.3 Post-installation check

<input type="checkbox"/>	Is the device undamaged (visual inspection)?
<input type="checkbox"/>	Is the device adequately protected from wet conditions and direct sunlight?
<input type="checkbox"/>	Is the device properly secured?
<input type="checkbox"/>	Use in hazardous areas: Is the protection cover installed?

6 Electrical connection

6.1 Connection conditions

The measuring device has two modes of operation:

- **Maximum point level detection (MAX):** e.g. for overflow prevention
The device keeps the electrical switch closed as long as the sensor is not yet covered by medium or the measured value is within the process window.
- **Minimum point level detection (MIN):** e.g. Dry running protection
The device keeps the electrical switch closed as long as the sensor is covered by medium or the measured value is outside the process window.

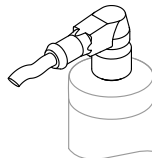
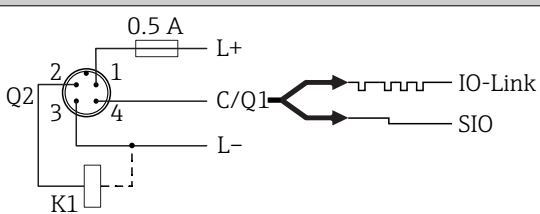
Choosing the MAX or MIN mode of operation ensures that the device switches in a safety-oriented manner even in an alarm condition, e.g. if the power supply line is disconnected. The electronic switch opens if the point level is reached, if a fault occurs or if the power fails (quiescent current principle).


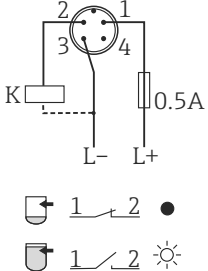
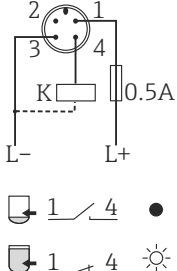


- i** ▪ **IO-Link:** Communication on C/Q1; switch mode on Q2.
- **SIO mode:** If there is no communication, the device switches to the SIO mode = standard IO mode.


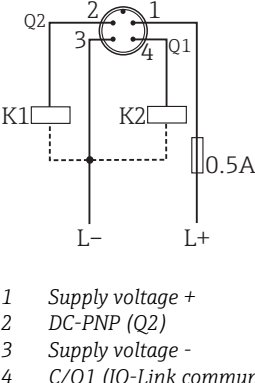
The factory-set functions for the MAX and MIN modes can be changed via IO-Link.

6.2 Connecting the measuring device

- Supply voltage 12 to 30 V DC
- In accordance with IEC/EN61010 a suitable circuit breaker must be provided for the measuring device.
- Voltage source: Non-hazardous contact voltage or Class 2 circuit (North America).
- The device must be operated with a 500 mA fine-wire fuse (slow-blow) which is suitable for DC current in accordance with IEC 60127-2.
- Depending on the analysis of the switch outputs, the measuring device works in the MAX or MIN modes.

Electrical connection	IO-Link with one switch output
M12 plug 	 1 Supply voltage + 2 DC-PNP (Q2) 3 Supply voltage - 4 C/Q1 (IO-Link communication or SIO mode)

Electrical connection	Operating mode (SIO mode with factory setting)	
	MAX	MIN
M12 plug 		
Symbols Description  Yellow LED (ye) lit  Yellow LED (ye) not lit K External load		

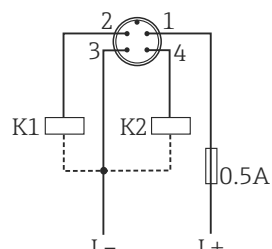
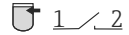
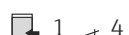


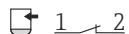



Electrical connection	Both switch outputs active simultaneously ^{1) 2)}
M12 plug 	 <p> ¹⁾ Following customer adjustment ²⁾ Current consumption with two outputs connected: < 25 mA </p>









6.2.1 Function monitoring

With two-channel evaluation, functional monitoring of the sensor is also possible in addition to level monitoring.

With two-channel evaluation, functional monitoring of the sensor is also possible in addition to level monitoring provided that no other monitoring option has been configured via IO-Link.

When both outputs are connected, the MIN and MAX outputs assume opposite states (XOR) when the device is operating fault-free. In the event of an alarm condition or a cable break, both outputs are de-energized.

Connection for function monitoring using XOR operation	Yellow LED (ye)	Red LED (rd)
	Sensor covered  	 
	Sensor free  	 

Connection for function monitoring using XOR operation		Yellow LED (ye)	Red LED (rd)
	Fault		
			
Symbols	Description		
	LED lit		
	LED not lit		
	Fault or warning		
K1/K2	External load		

6.2.2 Post-connection check

<input type="checkbox"/>	Is the device or cable undamaged (visual check)?
<input type="checkbox"/>	Do the cables comply with the requirements?
<input type="checkbox"/>	Do the mounted cables have adequate strain relief?
<input type="checkbox"/>	Are the cable glands mounted and firmly tightened?
<input type="checkbox"/>	Does the supply voltage match the specifications on the nameplate?
<input type="checkbox"/>	If supply voltage is present, is the green LED lit? With IO-Link communication: is the green LED flashing?

7 Operation options

7.1 Structure and function of the operating menu

7.1.1 IO-Link

IO-Link information

IO-Link is a point-to-point connection for communication between the device and an IO-Link master. The device features an IO-Link communication interface type 2 with a second IO function on pin 4. This requires an IO-Link-compatible assembly (IO-Link master) for operation. The IO-Link communication interface enables direct access to the process and diagnostic data. It also provides the option of configuring the device while in operation.

Physical layer, the device supports the following features:

- IO-Link specification: version 1.1
- IO-Link Smart Sensor Profile 2nd Edition
- SIO mode: yes
- Speed: COM2; 38.4 kBaud
- Minimum cycle time: 6 msec.
- Process data width: 16 bit
- IO-Link data storage: yes
- Block configuration: no

IO-Link download

<http://www.endress.com/download>

- Select "Software" as the media type.
- Select "Device Driver" as the software type.
Select IO-Link (IODD).
- In the "Text Search" field enter the device name.



<https://ioddfinder.io-link.com/>

Search by

- Manufacturer
- Article number
- Product type

7.1.2 Structure of the operating menu

The menu structure has been implemented according to VDMA 24574-1 and complemented by Endress+Hauser-specific menu items.

 For an overview of the operating menu, see →  36

8 System integration

8.1 Process data

The measuring device has two switch outputs. Both outputs are transmitted as process data via IO-Link.


- In the SIO mode, switch output 1 is switched at pin 4 of the M12 plug. In the IO-Link communication mode, this pin is reserved exclusively for communication.
- In addition, switch output 2 is always switched at pin 2 of the M12 plug.
- The process data of the point level switch are transmitted cyclically in 16-bit chunks.

Bit	0 (LSB)	1	...	12	13 (MSB)	14	15
Measuring device	Coverage [0 to 400 %], resolution 1 %					OU1	OU2

Bit 14 reflects the status of switch output 1 and bit 15 the status of switch output 2. Here, the logical state "1" at the specific switch output corresponds to "closed" or $24 V_{DC}$.

The remaining 14 bits contain the coverage value [0 to 400 %].

Bit	Process value	Value range
14	OU1	0 = open 1 = closed
15	OU2	0 = open 1 = closed
0 to 13	Percentage coverage	Integer

 In addition, the coverage value can be read via ISDU (hex) 0x0028 – acyclic service.

8.2 Reading out and writing device data (ISDU – Indexed Service Data Unit)

Device data are always exchanged acyclically and at the request of the IO-Link master. Using the device data, the following parameter values or device statuses can be read out:

8.2.1 Endress+Hauser-specific device data

Designation	ISDU (dec)	ISDU (hex)	Size (byte)	Data type	Access	Default value	Value range	Offset/gain	Data storage	Range limits
Identification										
Extended order code	259	0x0103	60	String	r					
Parameters - Application										
Active switch settings	64	0x0040	1	UInt8	r/w	Standard	0 ~ Standard 1 ~ User	0/0	No	0 to 1
Active media settings	79	0x004F	1	UInt8	r/w	1 Medium	0 ~ 1 Medium 1 ~ 2 Media	0/0	No	0 to 1
Parameters if "Active switch settings = User" and "Active media settings = 1 Medium"										

Designation	ISDU (dec)	ISDU (hex)	Size (byte)	Data type	Access	Default value	Value range	Offset/gain	Data storage	Range limits
Reset user switch settings	65	0x0041	1	UInt8	r/w	False	0 ~ False 1 ~ Switch settings free 2 ~ Switch settings covered Out1 and Out2	0/0	No	0 to 2
Empty adjustment	90	0x005A	1	UInt8	w		1			
Free value	268	0x010C	2	Int16	r/w	¹⁾		0/0	Yes	0 to 400
Full adjustment, Output 1 and Output 2	78	0x004E	1	UInt8	w		1			
Covered value Output 1 and 2	274	0x0112	2	Int16	r/w	¹⁾		0/0	Yes	0 to 400
Switch point value Output 1 and 2 (SP1/FH1 and SP2/FH2)	73	0x0049	2	Int16	r/w	¹⁾		0/0	Yes	0 to 400
Switchback point value Output 1 and 2 (rP1/FL1 and rP2/FL2)	74	0x004A	2	Int16	r/w	¹⁾		0/0	Yes	0 to 400
Switching delay time Output 1 and 2 (dS1 and dS2)	66	0x0042	2	UInt16	r/w	0.5s		0/0.1	Yes	0.3 to 60
Switchback delay time Output 1 and 2 (dR1 and dR2)	67	0x0043	2	UInt16	r/w	1.0s		0/0.1	Yes	0.3 to 60
Output mode Output 1	85	0x0055	1	UInt8	r/w	HNO	0 ~ HNO ²⁾ 1 ~ HNC ²⁾ 2 ~ FNO ²⁾ 3 ~ FNC ²⁾		Yes	0 to 3
Output mode Output 2	86	0x0056	1	UInt8	r/w	HNC	0 ~ HNO ²⁾ 1 ~ HNC ²⁾ 2 ~ FNO ²⁾ 3 ~ FNC ²⁾		Yes	0 to 3
Parameters if “Active switch settings = User” and “Active media settings = 2 Medium”										
Reset user switch settings	77	0x004D	1	UInt8	r/w	False	0 ~ False 1 ~ Switch settings free 3 ~ Switch settings covered Out1 4 ~ Switch settings covered Out2	0/0	No	0-4
Empty adjustment	90	0x005A	1	UInt8	w		1			
Free value	268	0x010C	2	Int16	r/w	¹⁾		0/0	Yes	0 to 400
Full adjustment, Output 1	87	0x0057	1	UInt8	w		1			
Covered value Output 1	269	0x010D	2	Int16	r/w	¹⁾		0/0	Yes	0 to 400
Switch point value Output 1 (SP1/FH1)	71	0x0047	2	Int16	r/w	¹⁾		0/0	Yes	0 to 400
Switchback point value Output 1 (rP1/FL1)	72	0x0048	2	Int16	r/w	¹⁾		0/0	Yes	0 to 400

Designation	ISDU (dec)	ISDU (hex)	Size (byte)	Data type	Access	Default value	Value range	Offset/gain	Data storage	Range limits
Switching delay time Output 1 (dS1)	81	0x0051	2	Uint16	r/w	0.5s		0/0.1	Yes	0.3 to 60
Switchback delay time Output 1 (dR1)	82	0x0052	2	Uint16	r/w	1.0s		0/0.1	Yes	0.3 to 60
Output mode Output 1	85	0x0055	1	Uint8	r/w	HNO	0 ~ HNO ²⁾ 1 ~ HNC ²⁾ 2 ~ FNO ²⁾ 3 ~ FNC ²⁾	0...	Yes	0 to 3
Full adjustment, Output 2	88	0x0058	1	Uint8	w		1			
Covered value Output 2	273	0x0111	2	Int16	r/w	¹⁾		0/0	Yes	0 to 400
Switch point value Output 2 (SP2/FH2)	75	0x004B	2	Uint16	r/w	¹⁾		0/0	Yes	0 to 400
Switchback point value Output 2 (rP2/FL2)	76	0x004C	2	Int16	r/w	¹⁾		0/0	Yes	0 to 400
Switching delay time Output 2 (dS2)	83	0x0053	2	Int16	r/w	0.5s		0/0.1	Yes	0.3 to 60
Switchback delay time Output 2 (dR2)	84	0x0054	2	Uint16	r/w	1.0s		0/0.1	Yes	0.3 to 60
Output mode Output 2	86	0x0056	1	Uint8	r/w	HNC	0 ~ HNO ²⁾ 1 ~ HNC ²⁾ 2 ~ FNO ²⁾ 3 ~ FNC ²⁾		Yes	0 to 3
Parameters - System										
Operating hours	96	0x0060	4	Uint32	r			0 / 0.016667	No	0 to 2 ³²
uC-Temperature	91	0x005B	1	Int8	r			°C: 0 / 1 °F: 32 / 1.8 K: 273.15 / 1	No	-128 to 127
Unit changeover (UNI) – uC-Temperature	80	0x0050	1	Uint8	r/w	°C	0 ~ °C 1 ~ °F 2 ~ K	0/0	Yes	0 to 2
Minimum uC-Temperature	92	0x005C	2	Int16	r	127		°C: 0 / 1 °F: 32 / 1.8 K: 273.15 / 1	No	-128 to 127
Maximum uC-Temperature	93	0x005D	2	Int16	r	-128		°C: 0 / 1 °F: 32 / 1.8 K: 273.15 / 1	No	-128 to 127
Reset uC-Temperature	94	0x005E	1	Uint8	w		1			
Reset to factory settings (RES)	275	0x0113	1	Uint8	w		1			
Diagnosis										
Simulation switch Output 1 (OU1)	89	0x0059	1	Uint8	r/w	Off	0 ~ Off 1 ~ High 2 ~ Low	0/0	No	0 to 2
Simulation switch Output 2 (OU2)	68	0x0044	1	Uint8	r/w	Off	0 ~ Off 1 ~ High 2 ~ Low	0/0	No	0 to 2

Designation	ISDU (dec)	ISDU (hex)	Size (byte)	Data type	Access	Default value	Value range	Offset/gain	Data storage	Range limits
Device search	69	0x0045	1	UInt8	r/w	Off	0 ~ Off 1 ~ On	0/0	No	0 to 1
Sensor check	70	0x0046	1	UInt8	w		1	0/0	No	

- 1) As-delivered state depends on the options ordered.
- 2) For an explanation of the abbreviations, see the parameter description.

8.2.2 IO-Link-specific device data

Designation	ISDU (dec)	ISDU (hex)	Size (byte)	Data type	Access	Default value	Data storage
Serial number	21	0x0015	max. 16	String	ro		
Firmware version	23	0x0017	max. 64	String	ro		
ProductID	19	0x0013	max. 64	String	ro	FTI26	
ProductName	18	0x0012	max. 64	String	ro	Nivector	
ProductText	20	0x0014	max. 64	String	ro	Capacitance point level switch	
VendorName	16	0x0010	max. 64	String	ro	Endress+Hauser	
VendorText	17	0x0011	max. 64	String	ro	People for Process Automation	
Hardware Revision	22	0x0016	max. 64	String	ro		
Application Specific Tag	24	0x0018	32	String	r/w		
Actual Diagnostics (STA)	260	0x0104	4	String	ro		No
Last Diagnostic (LST)	261	0x0105	4	String	ro		No

8.3 System commands

Designation	ISDU (dec)	ISDU (hex)	Value range	Access
Device Access Locks. Data Storage Lock	12	0x000C	2 ~ Data storage <ul style="list-style-type: none"> ▪ 0 ~ False ▪ 2 ~ True 	r/w

9 Commissioning

If an existing configuration is changed, measuring operation continues! The new or modified entries are only accepted once the setting has been made.



WARNING

Risk of injury and damage to property due to uncontrolled activation of processes!

- ▶ Make sure that downstream processes are not started unintentionally.

9.1 Function check

Before commissioning your measuring point, ensure that the post-installation and post-connection checks have been performed:


- "Post-installation check" checklist →  14
- "Post-connection check" checklist →  16

9.2 Commissioning with an operating menu

IO-Link communication

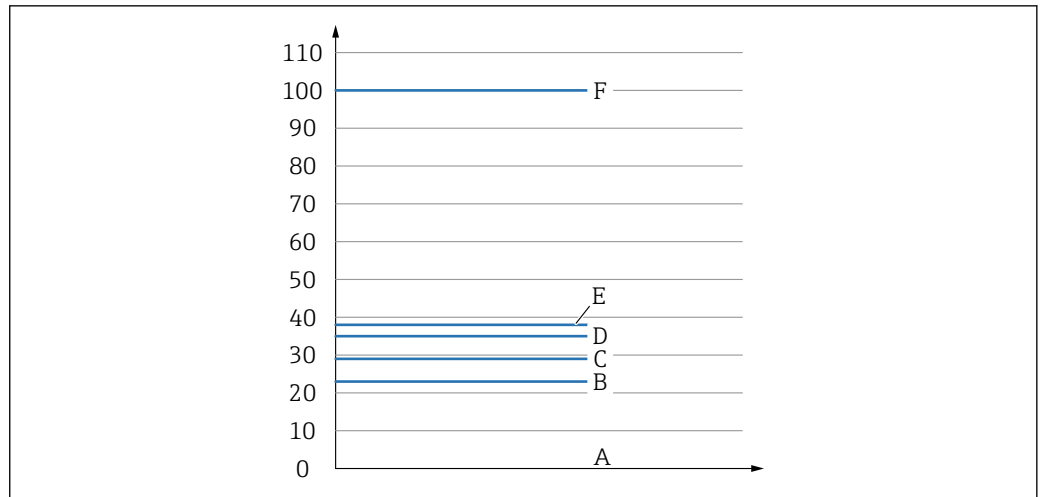
- The device is preconfigured at the factory in such a way that it can be used for the majority of applications without the need for an adjustment. The electrical switch point of the device is factory-set to product with a particle size $\varnothing < 10$ mm and a relative dielectric constant $\epsilon_r \geq 1.6$. Depending on the option ordered, the device is configured for the type of installation with a protector or without a protector with lock nuts (installation is intended in a metal tank in each case). A customer-specific adjustment (empty and full adjustment) is recommended for other types of installation (e.g. installation in plastic tanks, weld-in adapters).

Factory setting: output 1 and output 2 are configured for XOR operation. The option selected in the **Active switch settings** parameter is set to Standard and the **Active media settings** parameter is for 1 medium.

- For switch-sensitive applications, the measurement performance can be improved by a customer-specific adjustment. An adjustment is recommended for:
 - sensitive media (< 1.6 DC)
 - different type of installation
 - In processes with large variations in temperature, the temperature dependence of the medium must be taken into account. A new empty and full calibration can compensate for these variations.
-  Each change must be confirmed with Enter to ensure that the value is accepted.
- Switching errors are suppressed by adjusting the settings (Switch point value/Switchback point value parameters).

9.3 Hysteresis function, level detection

The following graphic is an example and illustrates the factory adjustment with its switching thresholds.



A0036906

- A Air ~ DC 1 (0 %)
- B Empty adjustment, Output 1/2 empty
- C Switchback point value (Coverage), Output 1/2 (rP1/rP2) DC 1.6
- D Switch point value (Coverage), Output 1/2 (SP1/SP2) DC 1.6
- E Full adjustment, Output 1/2 full ~ DC 1.6
- F ~ DC 5 (100 %)



The values for B, C, D and E are determined by the factory adjustment. These values depend on the product configuration.

9.3.1 Medium adjustment

Empty adjustment

If the installation position in the process changes, an empty adjustment is recommended.

1. Navigate to the menu level Parameters -> Application
 - ↳ Setting: **Active switch settings = User**
2. In the event of lateral installation, the device is completely free.
3. Accept the measured value shown for the free value.
 - ↳ Setting: **Empty adjustment**
The automatically generated switch limits can be adjusted accordingly.

Full adjustment

Full adjustment is used to set the switching threshold to a specific medium.

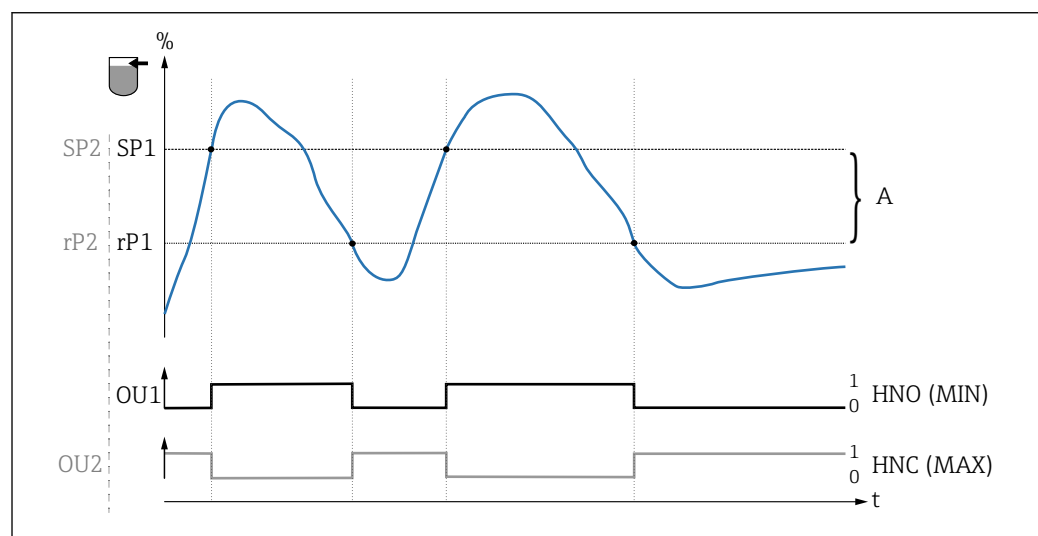
1. Navigate to the menu level Parameters -> Application
 - ↳ Setting: **Active switch settings = User**
2. In the event of lateral installation, the device is completely covered with medium.
3. Configure the behavior of the switch output.
 - ↳ Setting: **Output 1/2 (OU1/2) = Hysteresis normally open (MIN) (HNO) or Hysteresis normally closed (MAX) (HNC)**
4. Accept the measured value shown for the switch output in question.
 - ↳ Setting: **Full adjustment, Output 1 and Output 2**
The automatically generated switch limits can be adjusted accordingly.

9.3.2 Dry adjustment

This adjustment is suitable if the medium values are known.

1. Navigate to the menu level Parameters -> Application
 - ↳ Setting: **Active switch settings = User**
2. Configure the behavior of the switch output.
 - ↳ Setting: **Output 1/2 (OU1/2) = Hysteresis normally open (MIN) (HNO) or Hysteresis normally closed (MAX) (HNC)**
3. Enter the measured values for the switch point and switchback point. The set value for the switch point "SP1"/"SP2" must be greater than the switchback point "rP1" /"rP2".
 - ↳ Setting: **Switch point value, Output 1/2 (SP1/2 or FH1/2) and Switchback point value, Output 1/2 (rP1/2 or FL1/2)**

i A minimum hysteresis of 7% is recommended.



10 Adjustment (default)

0	0-signal, output open
1	1-signal, output closed
A	Hysteresis (difference between the value of the switch point SP1/SP2 and the value of the switchback point rP1/rP2)
%	Coverage of sensor
HNO	Normally open contact (MIN)
HNC	Normally closed contact (MAX)
SP1	Switch point 1 / SP2: Switch point 2
rP1	Switchback point 1 / rP2: Switchback point 2

- i** Recommended assignment of switch outputs:
- MAX mode for overflow prevention (HNC)
 - MIN mode for dry running protection (HNO)

9.4 Window function, media detection/differentiation

Unlike the hysteresis, media are detected only if they are within the defined window. Depending on the medium, a switch output can be used here.

 Media differentiation cannot be guaranteed for media with similar dielectric constants.

9.4.1 Medium adjustment

Empty adjustment

If the installation position in the process changes, an empty adjustment is recommended.

1. Navigate to the menu level Parameters -> Application
 - ↳ Setting: **Active switch settings = User**
2. In the event of lateral installation, the device is completely free.
3. Accept the measured value shown for the free value.
 - ↳ Setting: **Empty adjustment**
The automatically generated switch limits can be adjusted accordingly.

Full adjustment

Full adjustment is used to set the switching threshold to a specific medium.

1. Navigate to the menu level Parameters -> Application
 - ↳ Setting: **Active switch settings = User**
2. In the event of lateral installation, the device is completely covered with medium.
3. Configure the behavior of the switch output.
 - ↳ Setting: **Output 1/2 (OU1/2) = Window normally open (MIN)(FNO) or Window normally closed (MAX)(FNC)**
4. Accept the measured value shown for the switch output in question.
 - ↳ Setting: **Full adjustment, Output 1 and Output 2**
The automatically generated switch limits can be adjusted accordingly.

9.4.2 Dry adjustment

This adjustment is suitable if the measured values of the medium are known.

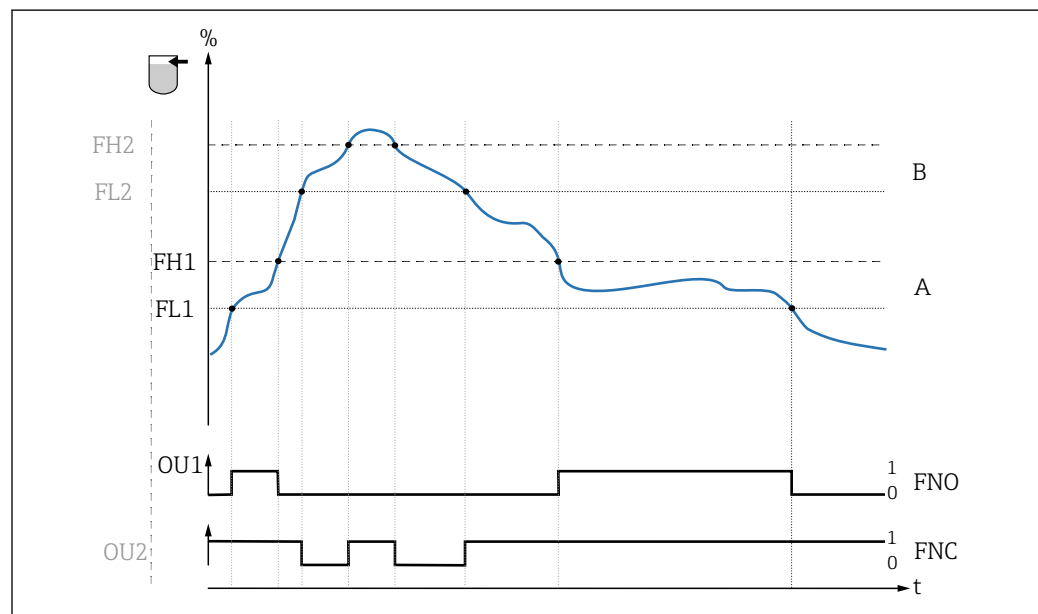
 For reliable detection of the medium, the process window must be sufficiently large.

1. Navigate to the Application menu level
 - ↳ Setting: **Active switch settings = User**
2. Configure the behavior of the switch output.
 - ↳ Setting: **Output 1/2 (OU1/2) = Window normally open (MIN)(FNO) or Window normally closed (MAX)(FNC)**
3. Define the window around the calibrated value for the switch point/switchback point of the output (percentage coverage). The set value for the switch point "FH1"/"FH2" must be greater than the switchback point "FL1" /"FL2".
 - ↳ Setting: **Switch point value, Output 1/2 (SP1/2 or FH1/2) and Switchback point value, Output 1/2 (rP1/2 or FL1/2)**

9.5 Application example

Differentiation between flour and sugar using the example of full adjustment in the process.

1. Navigate to the Application menu level
 - ↳ Setting: **Active switch settings = User**
2. Accept the measured value shown for the free value
 - ↳ Setting: **Empty adjustment** The automatically generated switch limits can be adjusted accordingly.
3. Assign switch function to the switch outputs:
 - ↳ Switch output active if medium detected → setting: **Output mode Out1 = Window normally open (MIN) (FNO)**
Switch output active if medium not detected → setting: **Output mode Out2 = Window normally closed (MAX) (FNC)**
4. Medium 1: Sensor is covered by sugar.
 - ↳ Setting: **Full adjustment, Output 1**
5. Medium 2: Sensor is covered by flour.
 - ↳ Setting: **Full adjustment, Output 2**

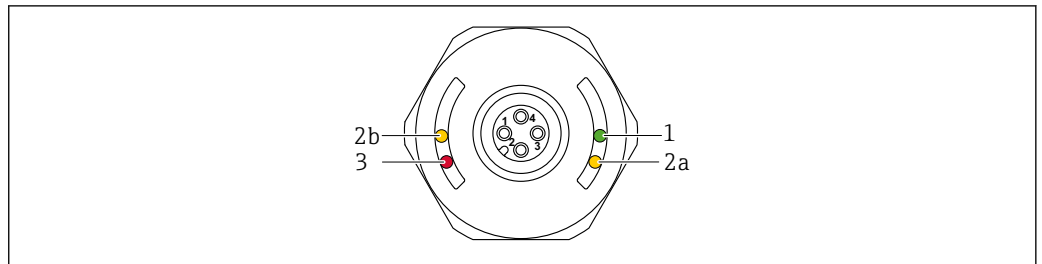


A0034568

11 Medium detection/Process window


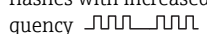
0	0-signal, output open
1	1-signal, output closed
%	Coverage of sensor
A	Medium 1, process window 1
B	Medium 2, process window 2
FNO	NO contact
FNC	NC contact 1
FH1	/ FH2 Upper value process window
FL1	/ FL2 Lower value process window

9.6 Light signals (LEDs)



A0035982

12 Housing cover with M12 plug, plastic

Position	LEDs	Description of function
1	Green LED (gn)	<p>Lit: Measuring device is operational</p> <p>IO-Link communication</p> <ul style="list-style-type: none"> lit: SIO mode flashing: Active communication, flash frequency  flashes with increased luminosity: Device search (device identification), flash frequency 
2	Yellow LED (ye)	<p>M12 plug: LED 2a switch status/switch output 2 ¹⁾ With IO-Link communication in accordance with customer calibration: Sensor is covered by medium 1.</p> <p>LED 2b switch status/switch output 1 Sensor is covered by medium. With IO-Link communication in accordance with customer calibration: Sensor is covered by medium 2.</p>
3	Red LED (rd)	<p>Warning/Maintenance required flashing: Error remediable, e. g. invalid calibration</p> <p>Fault/device failure lit: Error not remediable, e. g. Electronics error Diagnostics and troubleshooting → 31</p>

1) Only enabled if both switch outputs are active and if different thresholds were configured for the two switch outputs.

i There is no external signaling via LEDs on the metal housing cover (IP69). A connecting cable with an M12 plug and LED display can be ordered as an accessory if necessary. This cable has no red LED. See "Accessories".

9.7 Function of LEDs

i Any configuration of the switch outputs is possible.

The following table shows the behavior of the LEDs in the SIO mode:

	Operating mode	MAX		MIN		Warning	Fault
		free	covered	free	covered		
1							
2						—	

LED indicator	LED colors	Symbols/description
1 M12 plug on plastic housing cover	gn green	● not lit
2 M12 plug including LEDs	ye yellow	☀ lit
	rd red	⚡ flashing
		⚡ fault/warning
		— no signaling

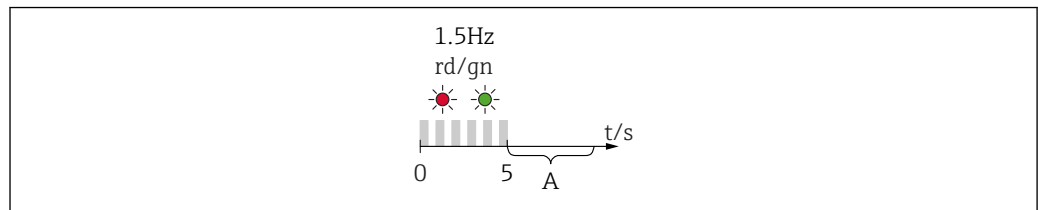
9.8 Operation with test magnet

9.8.1 Full adjustment

Prerequisite: Sensor is covered by the medium

1. Hold the test magnet against the marking on the housing.
2. Apply operating voltage to the device.
3. The green and red LEDs flash at a frequency of 1.5Hz.
4. The LEDs stop flashing after 5s.
5. Remove test magnet.
 - ↳ The full adjustment is performed and the switching thresholds are set accordingly.

i The test magnet must be removed in the timeframe between 5 seconds and 10 seconds. A full adjustment is not performed if the magnet is removed outside this timeframe.



A0036912

A Remove the magnet now for full adjustment.

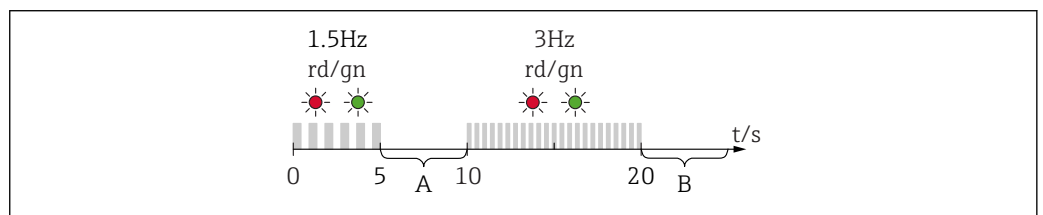
9.8.2 Empty adjustment

Prerequisite: Sensor is free

1. Hold the test magnet against the marking on the housing

2. Apply operating voltage to the device
3. The green and red LEDs flash at a frequency of 1.5Hz
4. The LEDs stop flashing after 5s
5. At 10s, the green and red LEDs start flashing at a frequency of 3Hz
6. The LEDs stop flashing after 20s
7. Remove test magnet.
 - ↳ The empty adjustment is performed and the switching thresholds are set accordingly.

i The test magnet must be removed in the timeframe between 20 seconds and 25 seconds. An empty adjustment is not performed if the magnet is removed outside this timeframe.

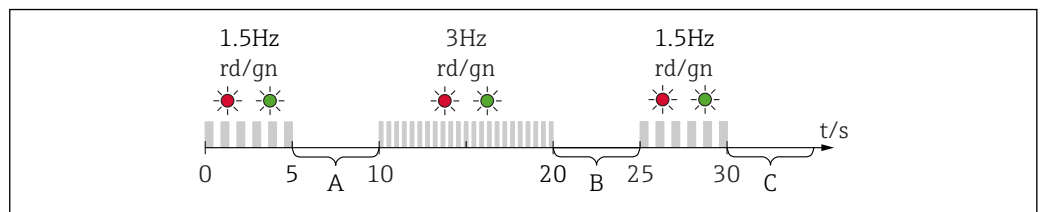


- A Remove the magnet now for full adjustment.
 B Remove the magnet now for empty adjustment.

9.8.3 Resetting to factory settings

If the test magnet is held against the marking for ≥ 30 seconds, the switching thresholds are reset to the factory setting. Pay attention to the time or flashing frequencies!

i If a medium-specific switching threshold is active, this is signaled by a flashing green LED indicator during the first 5 seconds of the operating voltage being applied.



- A Remove the magnet now for full adjustment.
 B Remove the magnet now for empty adjustment.
 C Remove the magnet now to reset to factory settings.

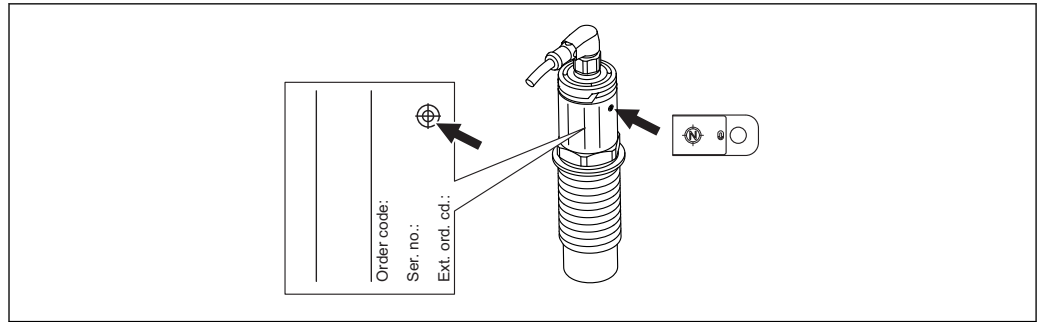
9.8.4 Function test

Carry out a function test while the device is in operation.

- ▶ Hold the test magnet against the marking on the housing for at least 2 seconds.
 - ↳ This inverts the current switch status, and the yellow LED changes state. When the magnet is removed, the switch status valid at that time is adopted.

If the test magnet is held against the marking for ≥ 30 seconds, the red LED will flash: The device returns automatically to the current switch status.

i The test magnet is included in the scope of delivery. It can be canceled optionally.



A0035882

13 Position for test magnet on housing nameplate

10 Diagnostics and troubleshooting

10.1 Firmware history

Date	Firmware	IODD	BA version
07.2018	01.00.00	01.00.00	BA01830F_0218
01.2019	02.00.zz	02.00.zz	BA01830F_0319

10.2 Troubleshooting

If an electronic/sensor defect is present, the device changes to the error mode and displays the diagnostic event F270. The status of the process data is rendered invalid. The switch output(s) is/are opened.

General errors

Error	Possible cause	Solution
Device does not respond	Supply voltage does not match that specified on the nameplate.	Apply correct voltage.
	Supply voltage has incorrect polarity.	Reverse polarity of supply voltage.
	Connecting cables are not in contact with the terminals.	Check for electrical contact between cables and correct.
No communication	<ul style="list-style-type: none"> ▪ Communication cable not connected. ▪ Communication cable incorrectly attached to device. ▪ Communication cable incorrectly attached to the IO-Link master. 	Check wiring and cables.
	Overload or short-circuit in load circuit Q2.	<ul style="list-style-type: none"> ▪ Remove overload or short-circuit. ▪ Restart the device.
No transmission of process data	There is an error in the device.	Correct errors that are displayed as a diagnostic event → 34.

10.3 Diagnostic information via LED indicator

LED indicator on housing cover

Malfunction	Possible cause	Corrective action
Green LED not lit	No power supply	Check plug, cable and power supply.
Red LED flashing	Overload or short-circuit in load circuit	<ul style="list-style-type: none"> ▪ Clear the short-circuit. ▪ Reduce maximum load current to below 200 mA if 1 switch output is active. ▪ Maximum load current = 105 mA per output if both switch outputs are active. ▪ If communication was active, restart the device.
	Ambient temperature outside of specification	Operate measuring device in specified temperature range.
	Calibration error	Reset calibration and perform calibration again.
	Test magnet held against marking for too long	Repeat function test.
	Device incorrectly connected	Remove plug and check connection.

Malfunction	Possible cause	Corrective action
	Simulation active	Deactivate simulation.
Red LED lit	Internal sensor error	Replace device.

LED indicator on M12 plug, can be ordered as an accessory


Malfunction	Possible cause	Corrective action
Green LED not lit	No power supply	Check plug, cable and power supply.
Yellow LED both lit / not lit	Internal sensor error Short-circuit in load circuit	<ul style="list-style-type: none"> ▪ Check cable. ▪ Replace device.

10.4 Diagnostic events

10.4.1 Diagnostic message

Faults that are detected by the device's self-monitoring system are displayed as a diagnostic message via IO-Link.

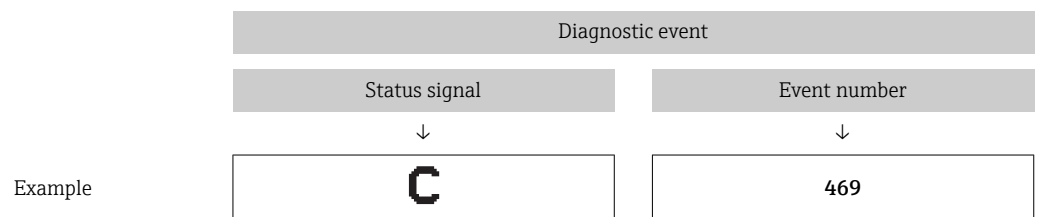
Status signals

The table →  34 lists the messages that may occur. The Actual Diagnostic (STA) parameter displays the message with the highest priority. The device has four different status information codes according to NE107:



F	"Failure" A device error has occurred. The measured value is no longer valid.
M	"Maintenance required" Maintenance is required. The measured value is still valid.
C	"Function check" The device is in the service mode (e.g. during a simulation).
S	"Out of specification" The device is being operated: <ul style="list-style-type: none"> ▪ Outside its technical specifications (e.g. during warmup or cleaning process) ▪ Outside the parameter configuration undertaken by the user (e.g. level outside of configured span)

Diagnostics event and event text

The fault can be identified by means of the diagnostic event.



If two or more diagnostic events are pending simultaneously, only the message with the highest priority is shown.

 The last diagnostic message is displayed - see Last Diagnostic (LST) in the **Diagnosis** submenu →  39.

10.4.2 Overview of diagnostic events


Status signal/ diagnostic event	Diagnostic behavior	EventCode	Event text	Cause	Corrective measure
F270	Fault	0x5000	Defect in electronics/ sensor	Electronics/sensor defective	Replace device
S804	Warning	0x1801	Load current > 200 mA per output	Load current > 200 mA	Increase load resistance at switch output
			Overload at switch output 1 or output 2	Overload at switch output 1 or switch output 2	<ul style="list-style-type: none"> ▪ Check output circuit ▪ Replace device
M290	Warning	0x1816	Device wiring faulty	Device wiring is faulty	Remove plug and check wiring
C485	Warning	0x8C01	Simulation active	When the simulation of a switch output or current output is active, the device displays a warning.	Switch off simulation.
C182	Message	0x1807	Invalid calibration	Switch point/switchback point are too close together or interchanged.	<ul style="list-style-type: none"> ▪ Check probe coverage ▪ New adjustment recommen- ded and check switching behavior ▪ Perform configuration again.
C103	Message	0x1813	Sensor check failed	Sensor check failed	<ul style="list-style-type: none"> ▪ Repeat cleaning ▪ Replace device
-	Message	0x1814	Sensor check passed	Sensor check	-
-	Information	0x1815	Timeout Reedcontact	Timeout reed contact	Remove test magnet
S825	Warning	0x1812	Ambient temperature outside of specification	Ambient temperature outside of specification	Operate device in the specified temperature range

10.5 Behavior of the device in the event of a fault

The device displays warnings and faults via I/O-Link. All the device warnings and faults are for information purposes only and do not have a safety function. The errors diagnosed by the device are displayed via IO-Link in accordance with NE107. In accordance with the diagnostic message, the device behaves as per a warning or fault condition. It is necessary to distinguish between the following types of errors here:

- **Warning:**
 - The device continues measuring if this type of error occurs. The output signal is not affected (exception: simulation is active).
 - The switch output remains in the state defined by the switch points.
- **Fault:**
 - The device does **not** continue measuring if this type of error occurs. The output signal assumes its fault state (switch outputs de-energized).
 - The fault state is displayed via IO-Link.
 - The switch output changes to the "open" state.

10.6 Resetting to factory settings (reset)

See Reset to factory settings (RES) parameter description →  48.

11 Maintenance

No special maintenance work is required.

11.1 Cleaning

The sensor must be cleaned if necessary. Cleaning can also be performed while installed. Care must be taken to ensure that no damage occurs to the sensor in the process.

12 Repair

12.1 General information

Repair is not envisaged for this measuring device.

12.2 Spare parts

No spare parts are provided for this measuring device.

12.3 Return

The requirements for safe device return can vary depending on the device type and national legislation.

1. Refer to the website for more information:
<http://www.endress.com/support/return-material>
2. Return the device if repairs or a factory calibration are required, or if the wrong device was ordered or delivered.





































12.4 Disposal




If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to Endress+Hauser for disposal under the applicable conditions.

13 Overview of the operating menu

Navigation

IO-Link	Level 1	Level 2	Details
Identification	Extended Ordercode		→  38
	Application Specific Tag		→  38
Diagnosis	Actual Diagnostics		→  39
	Last Diagnostic		→  39
	Simulation switch Output 1 (OU1)		→  39
	Simulation switch Output 2 (OU2)		→  39
	Device search		→  40
	Sensor check		→  40
Parameter	Application	Active switch settings	→  41
		Active media settings	→  41
		Reset user switch settings	→  41
		Empty adjustment	→  42
		Free value	→  42
		Full adjustment, Output 1	→  42
		Covered value Output 1	→  43
		Switch point value Output 1 (SP1/FH1)	→  43
		Switchback point value Output 1 (rP1/FL1)	
		Switching delay time, Output 1 (dS1)	→  43
		Switchback delay time, Output 1 (dR1)	→  45
		Output mode Output 1	→  46
		Full adjustment, Output 2	
		Covered value Output 2	→  43
		Switch point value Output 2 (SP2/FH2)	→  43
		Switchback point value Output 2 (rP2/FL2)	→  43
		Switching delay time, Output 2 (dS2)	→  45
		Switchback delay time, Output 2 (dR2)	→  45
		Output mode 2	→  46
	System	Operating hours	→  47
		µC temperature	→  47
		Unit changeover - µC-Temperature	→  47
		Minimum µC-Temperature	→  48
	Maximum µC-Temperature	→  48	
	Reset µC-Temperature	→  48	
	Reset to factory settings	→  48	
	Device Access Locks.Data Storage Lock	→  49	
Observation	Coverage		→  49
	Switch State Output 1		→  49
	Switch State Output 2		→  49

 This operating menu corresponds to the settings "**Active switch settings = User**" and "**Active media settings = 2 Media**". The settings for Output 1 and Output 2 are combined for the setting "**Active media settings = 1 Medium**".

14 Description of device parameters

14.1 Identification

Extended ordercode

Navigation	Identification → Extended ordercode
Description	Used to replace the device. Displays the extended order code (max. 60 alphanumeric characters).
Factory setting	As per order specifications

Application Specific Tag

Navigation	Identification → Application Specific Tag
Description	Used for unique identification of device in the field. Enter device tag (max. 32 alphanumeric characters).
Factory setting	As per order specifications

14.2 Diagnosis

Actual Diagnostics (STA)

Navigation Diagnosis → Actual Diagnostics (STA)

Description Displays the current device status.

Last Diagnostic (LST)

Navigation Diagnosis → Last Diagnostic (LST)

Description Displays the latest device status (error or warning) that was rectified during operation.

Simulation Switch Output 1 (OU1)

Navigation Diagnosis → Simulation Switch Output 1 (OU1)

Description The simulation affects the process data only. It does not affect the physical switch output. If a simulation is active, a warning to this effect is displayed so that it is obvious to the user that the device is in simulation mode. A warning is communicated via IO-Link (C485 - simulation active). The simulation must be ended actively via the menu. If the device is disconnected from the power supply during the simulation and power is then resupplied, simulation mode is not resumed, and instead the device continues operation in measuring mode.

Options ■ OFF
 ■ OU1 = HIGH
 ■ OU1 = LOW

Simulation Switch Output 2 (OU2)

Navigation Diagnosis → Simulation Switch Output 2 (OU2)


Description The simulation affects the process data and the physical switch output. If a simulation is active, a warning to this effect is displayed via IO-Link so that it is obvious to the user that the device is in simulation mode (C485 - simulation active). The simulation must be ended actively via the menu. If the device is disconnected from the power supply during the simulation and power is then resupplied, simulation mode is not resumed, and instead the device continues operation in measuring mode.

Options ■ OFF
 ■ OU2 = HIGH
 ■ OU2 = LOW

Device search

Navigation	Diagnosis → Device search
Description	This parameter is used to uniquely identify the device during installation. The green LED is lit (= operational) on the device and starts to flash with increased luminosity, flash frequency $\square\square\square\square\square\square\square\square$.
Note	There is no external signaling via LEDs on the metal housing cover (IP69).
Options	<ul style="list-style-type: none"> ▪ OFF ▪ ON
Factory setting	OFF

Sensor check

Navigation	Diagnosis → Sensor check
Description	<p>This parameter is used to test if the measuring point is functioning correctly. The sensor must not be covered and must be free of residue. The device compares the current measured values with the measured values from the factory calibration.</p> <p> The device must be removed before the sensor check since the free value is influenced by the type of installation.</p>
Options	<p>Check: Following the test, one of the following messages is displayed:</p> <ul style="list-style-type: none"> ▪ Message (0x1814) for sensor check passed ▪ Message C103 (0x1813) for sensor check failed

14.3 Parameter

14.3.1 Application

Active switch settings

Navigation	Application → Active switch settings
Description	Choice between standard or customer-specific, user-definable switch points
Switch-on value	Last setting selected prior to switching off device.
Options	<ul style="list-style-type: none"> ■ Standard ■ User
Factory setting	Standard

Active media settings

Navigation	Application → Active media settings
Description	Use this function to select the configuration of the switch outputs for 1 medium or 2 media. If the setting Active switch settings = Standard is active, both switch outputs are configured for 1 medium, i.e. the switching thresholds for switch output 1 and 2 are identical. If the setting Active switch settings = User is active, the customer can choose between 1 medium and 2 media. If Active media settings = 2 media , the two switch outputs can be configured for two different media.
Switch-on value	Last setting selected prior to switching off device.
Options	<ul style="list-style-type: none"> ■ 1 medium ■ 2 media
Factory setting	1 medium

Reset user switch settings

Navigation	Application → Reset user switch settings
Note	This parameter is visible only if the User option is selected in the Active switch settings parameter.
Description	After the option has been selected, the state along with the associated value is reset to the factory setting.

Options	<ul style="list-style-type: none"> ▪ False ▪ Switch settings free ▪ Switch settings covered Out1 and Out2 (if Active media settings = 1 medium) ▪ Switch settings covered Out1 (if Active media settings = 2 media) ▪ Switch settings covered Out2 (if Active media settings = 2 media)
----------------	--

Factory setting	False
------------------------	-------

Empty adjustment

Navigation	Application → Empty adjustment
-------------------	--------------------------------



This parameter is only visible if the option User is set in the parameter "**Active switch settings**".

Description	Empty adjustment with uncovered sensor. With the applied measuring signal, the free value is set according to the present process and a suitable switching threshold is generated, both for switching output 1 and 2.
--------------------	---

Full adjustment, Output 1 Full adjustment, Output 2

Navigation	Application → Full adjustment, Output 1 Application → Full adjustment, Output 2
-------------------	--

Description	<p>Full adjustment with covered sensor.</p> <p>With the present measuring signal, the covered value is set according to the current process and a suitable switching threshold is generated, both for switch output 1 and for switch output 2.</p> <p>Example → 22</p>
--------------------	---

Free value

Navigation	Application → Free value
-------------------	--------------------------

Description	Free value corresponding to the current process. The free value simulates the installation position.
--------------------	--

Switch-on value	Last setting selected prior to switching off device.
------------------------	--

Options	No selection. The user is free to edit the values.
----------------	--

Input range	0 to 400
--------------------	----------

Factory setting	The factory settings correspond to the switch settings for a medium with DC value 1.6 (delivered with Protector) or DC value 2.0.
------------------------	---

Covered value Output 1 and 2

Navigation	Application → Covered value Output 1 and 2
Description	Covered value corresponding to the current process. If the setting "Active media settings = 2 media" is active, different covered values can be entered for Output 1 and Output 2.
Switch-on value	Last setting selected prior to switching off device.
Options	No selection. The user is free to edit the values.
Input range	0 to 400
Factory setting	The factory settings correspond to the switch settings for a medium with DC value 1.6 (delivered with Protector) or DC value 2.0. Depending on the installation.

**Switch point value (Coverage), Output 1/2 (SP1/SP2)
Switchback point value (Coverage), Output 1/2 (rP1/rP2)**

Navigation	Application → Switch point value, Output 1/2 (SP1/SP2) Application → Switchback point value, Output 1/2 (rP1/rP2)
Note	The switching sensitivity of the sensor is set using the SP1/rP1 or SP2/rP2 parameters. Since the parameter settings depend on one another, the parameters are described all together. <ul style="list-style-type: none"> ■ SP1 = switch point 1 ■ SP2 = switch point 2 ■ rP1 = switchback point 1 ■ rP2 = switchback point 2

Description

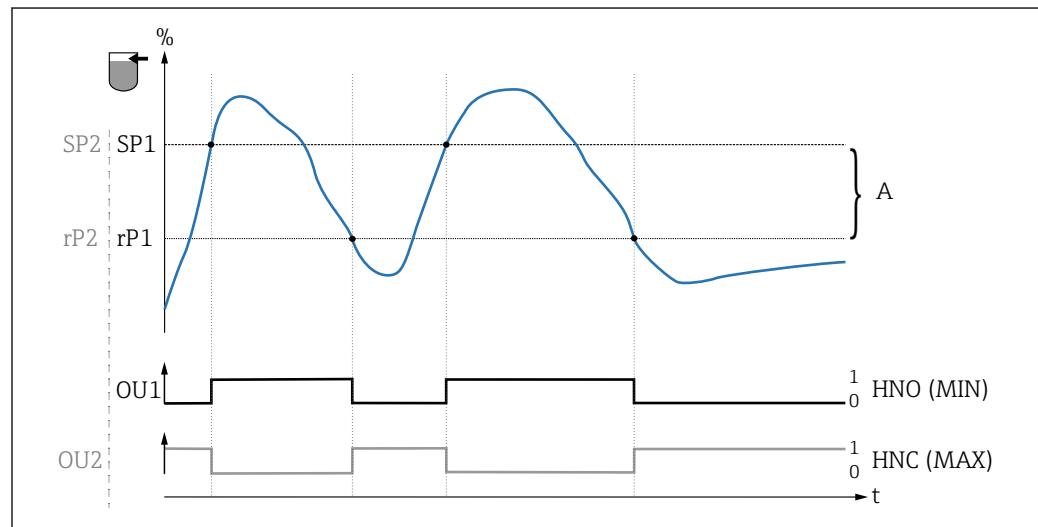
The switching sensitivity of the sensor can be configured using the switch point and switchback point. The switching sensitivity can be adapted to the medium (depending on the DC value (dielectric constant) or conductivity of medium).

- Sensor switches if there is slight coverage = very sensitive.
- Sensor switches if there is heavy buildup = not sensitive.

The set value for the switch point SP1/SP2 must be greater than the switchback point rP1/rP2!

A diagnostic message is displayed if a switch point SP1/SP2 is entered that is \leq switchback point rP1/rP2.

When the set switchback point rP1/rP2 is reached, an electrical signal change takes place again at the switch output (OU1/OU2). The difference between the value of the switch point SP1/SP2 and the value of the switchback point rP1/rP2 is known as the hysteresis.



A0034529

14 Adjustment (default)

0 0-signal, output open

1 1-signal, output closed

A Hysteresis (difference between the value of the switch point SP1/SP2 and the value of the switchback point rP1/rP2)

% Coverage of sensor

HNO Normally open contact (MIN)

HNC Normally closed contact (MAX)

SP1 Switch point 1 / SP2: Switch point 2

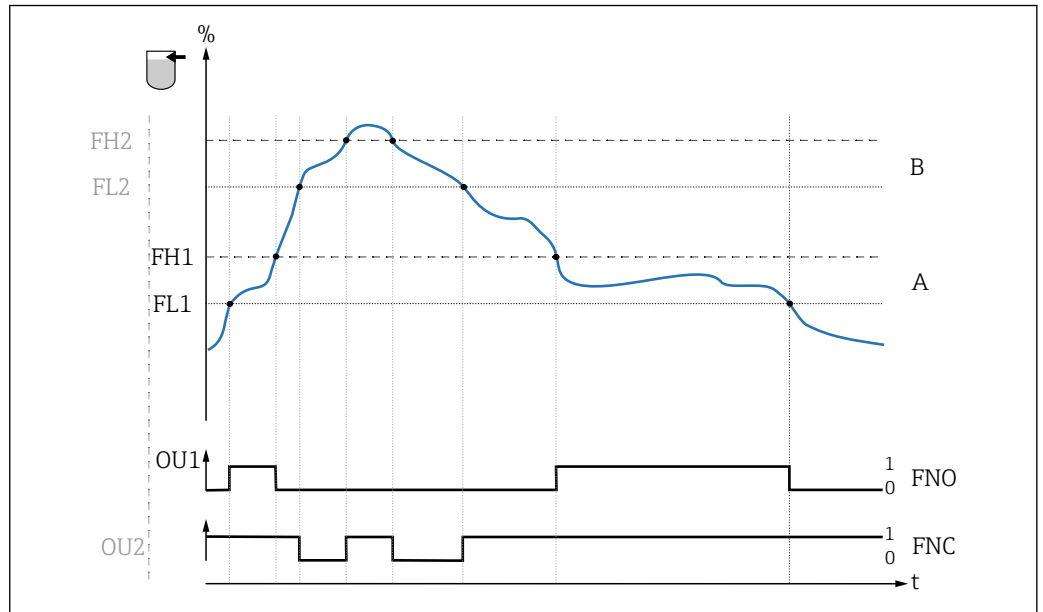
rP1 Switchback point 1 / rP2: Switchback point 2

Examples of set values in parameters

Medium	Coverage of sensor (as %)	Sensitivity (SP/rP) in %
Jasmine rice (DC 5)	100	80/41
Sand (DC 3.1)	75	60/31
Building plaster (DC 2)	45	36/19
Expanded glass (DC 1.3)	16	12/5



These values apply to installation with locknuts in a metal tank.



15 Medium detection/Process window

- 0 0-signal, output open
- 1 1-signal, output closed
- % Coverage of sensor
- A Medium 1, process window 1
- B Medium 2, process window 2
- FNO NO contact
- FNC NC contact 1
- FH1 / FH2 Upper value process window
- FL1 / FL2 Lower value process window

Note The various points for the switching delay can be adjusted to ensure that rapid switching back and forth at the switch limits is suppressed.

Switch-on value Last value selected prior to switching off.

Options No selection. The user is free to edit the values.

Input range 0 to 400

Factory setting The factory settings correspond to the switch settings for a medium with DC 1.6 (delivered with Protector) or DC 2.0.

Switching delay time, Output 1/2 (dS1/dS2)
Switchback delay time, Output 1/2 (dR1/dR2)

Navigation Application → Switch output → Switching delay time, Output 1/2 (dS1/dS2)
 Application → Switch output → Switchback delay time, Output 1/2 (dR1/dR2)

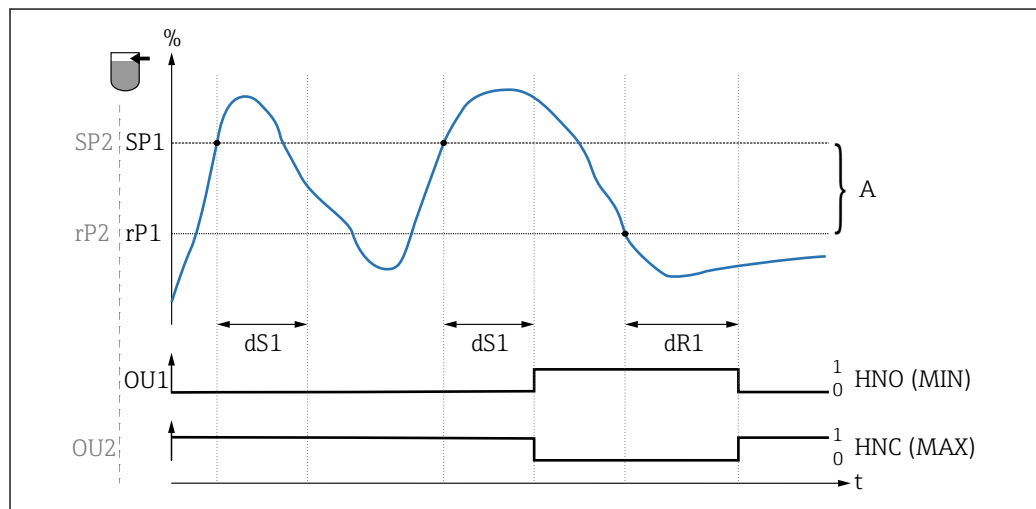
Note The switching delay time/switchback delay time functions are implemented using the "dS1"/"dS2" and "dR1"/"dR2" parameters. Since the parameter settings depend on one another, the parameters are described all together.

- dS1 = switching delay time, output 1
- dS2 = switching delay time, output 2
- dR1 = switchback delay time, output 1
- dR2 = switchback delay time, output 2

Description

To prevent rapid switching back and forth when values are close to the switch point "SP1"/"SP2" or switchback point "rP1"/"rP2", a delay in the range of 0.3 to 60 seconds, to one decimal place, can be set for individual points.

If the measured value leaves the switching range during the delay time, the delay time starts again from scratch.



A0034590

0 0-signal, output open in the quiescent state

1 1-signal, output closed in the quiescent state

A Hysteresis (difference between the value of the switch point "SP1" and the value of the switchback point "rP1")

HNO Normally open contact (MIN)

HNC Normally closed contact (MAX)

% Coverage of sensor

SP1 Switch point 1 / SP2: Switch point 2

rP1 Switchback point 1 / rP2: Switchback point 2

dS1 Set time for which the specific switch point must be reached continuously without interruption until an electrical signal change takes place.

dR1 Set time for which the specific switchback point must be reached continuously without interruption until an electrical signal change takes place.

Switch on value Last value selected prior to switching off.

Options No selection. The user is free to edit the values.

Input range 3 to 600

Factory setting 0.5 s (Switching delay time dS1/dS2)
1.0 s (Switchback delay time dR1/dR2)

Output mode Output 1/2

Navigation Application → Output mode Output 1/2

Description	<ul style="list-style-type: none"> ■ Hysteresis: Determining whether sensor is free or covered. Setting is medium-specific in each case. <ul style="list-style-type: none"> ■ SP1/rP1 = medium 1 ■ SP2/rP2 = medium 2 ■ Window: Determining medium. Setting is medium-specific in each case. <ul style="list-style-type: none"> ■ FH1/FL1 = medium 1 ■ FH2/FL2 = medium 2
Switch on value	Last function selected prior to switching off.
Options	<ul style="list-style-type: none"> ■ Hysteresis normally open (MIN) (HNO) ■ Hysteresis normally closed (MAX) (HNC) ■ Window normally open (MIN) (FNO) ■ Window normally closed (MAX) (FNC)
Factory setting	Output 1 (OU1): HNO Output 2 (OU2): HNC

14.3.2 System

Operating hours

Navigation	System → Operating hours
Description	This parameter counts the operating hours in minutes during the period in which operating voltage is present.

μC-Temperature

Navigation	System → μC temperature
Description	This parameter displays the current μC-temperature on the electronics.

Unit changeover (UNI) - μC-Temperature

Navigation	System → Unit changeover (UNI) - μC-Temperature
Description	This parameter is used to select the electronics temperature unit. Once a new electronics temperature unit has been selected, the new unit is calculated and displayed.
Switch on value	Last unit selected prior to switching off.
Options	<ul style="list-style-type: none"> ■ °C ■ °F ■ K
Factory setting	°C

Minimum μ C-Temperature

Navigation System → Minimum μ C temperature

Description This parameter is used as the minimum peak indicator and makes it possible to call up retroactively the lowest electronics temperature measured.
If the value of the peak indicator is overwritten, the value is automatically set to the temperature currently measured.

Maximum μ C temperature

Navigation System → Maximum μ C temperature

Description This parameter is used as the maximum peak indicator and makes it possible to call up retroactively the highest electronics temperature measured.
If the value of the peak indicator is overwritten, the value is automatically set to the temperature currently measured.


Reset μ C-Temperature

Navigation System → Reset μ C-Temperature

Description The minimum/maximum indicators can be reset (min = 127, max = -128) so one-off temperature peaks can be «cleared».

Reset to factory settings (RES)

Navigation System → Reset to factory settings (RES)

Description  **WARNING**
"Reset to factory settings" causes an immediate reset to the factory settings of the order configuration (as-delivered state).
If the factory settings have been changed, downstream processes might be affected following a reset (the behavior of the switch output or current output might be changed).
► Make sure that downstream processes are not started unintentionally.

The reset is not subject to additional locking, such as in the form of device locking. The reset also depends on the device status.
Any customer-specific configuration carried out at the factory is not affected by a reset (customer-specific configuration remains).

Note The last error is not reset in a reset.

Device Access Locks.Data Storage Lock ¹⁾ Activation/deactivation of DataStorage

- 1) The "Device Access Locks.Data Storage Lock" parameter is an IO-Link standard parameter. The name of the parameter may exist in the configured language in the IO-Link operating tool used. The display depends on the operating tool in question.

Navigation

System → Device Access Locks.Data Storage Lock

Description

The device supports DataStorage. If a device is being replaced, this allows the configuration of the old device to be written to the new device. If, when a device is being replaced, the original configuration of the new device is to be retained, the **Device Access Locks.Data Storage Lock** parameter can be used to prevent the parameters from being overwritten. If this parameter is set to "true", the new device does not adopt the data stored in the master's DataStorage.

Options

- false
- true

14.4 Observation

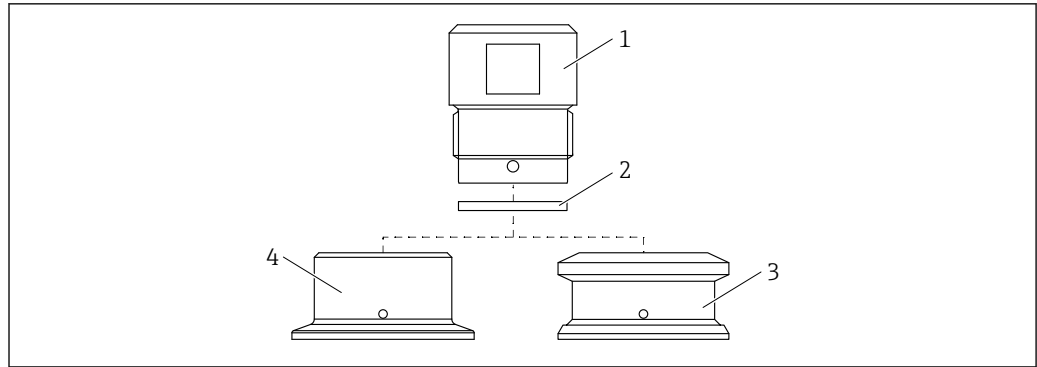
The process data are transmitted acyclically.

15 Accessories

- Accessories can be ordered with the device (optional) or separately.
- The adapters are also available with inspection certificate 3.1 EN10204. For more information on process adapters and weld-in adapters, please refer to the supplementary documentation .

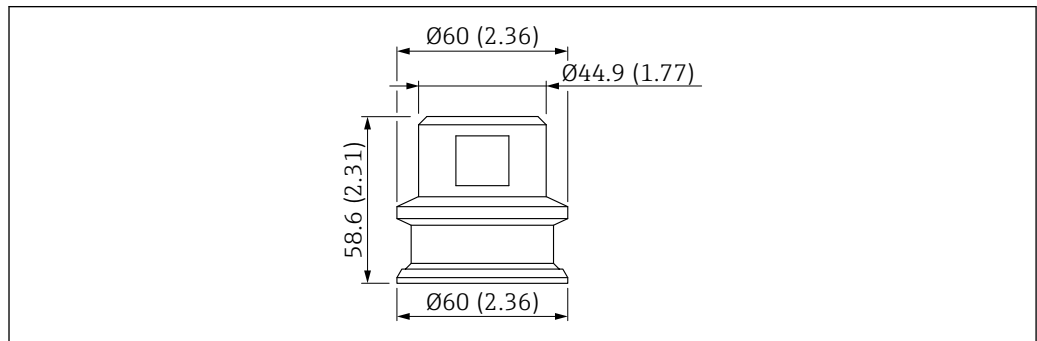
15.1 Adapter

- For hygiene sector and hazardous areas
- Material: 316L (1.4404), seal: VMQ
- Weight
 - Weld-in adapter with threaded sleeve: 466 g (16.44 oz)
 - Tri-Clamp 2" with threaded sleeve: 503 g (17.74 oz)
- Order number
 - Weld-in adapter G 1", threaded sleeve, molded seal: 71444432
 - Process adapter G 1" Tri-Clamp 2" , threaded sleeve, molded seal: 71444431



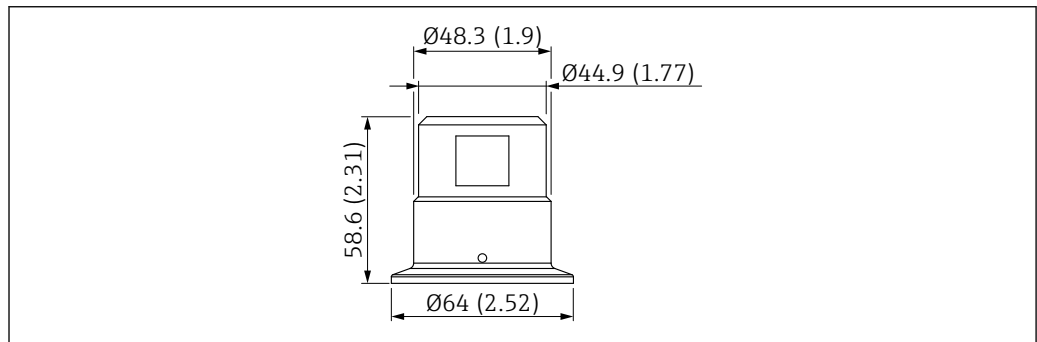
A0040366

- 1 Threaded sleeve
- 2 Molded seal
- 3 Weld-in adapter G 1", order code 620, option PK
- 4 Process adapter G 1" Tri-Clamp 2", order code 620, option RK



A0040367

16 Weld-in adapter G 1" with threaded sleeve. Unit of measurement mm (in)



A0036229

17 Process adapter G 1" Tri-Clamp 2" with threaded sleeve. Unit of measurement mm (in)

15.2 Protector G 1½", R 1½", NPT 1½"

G 1½"

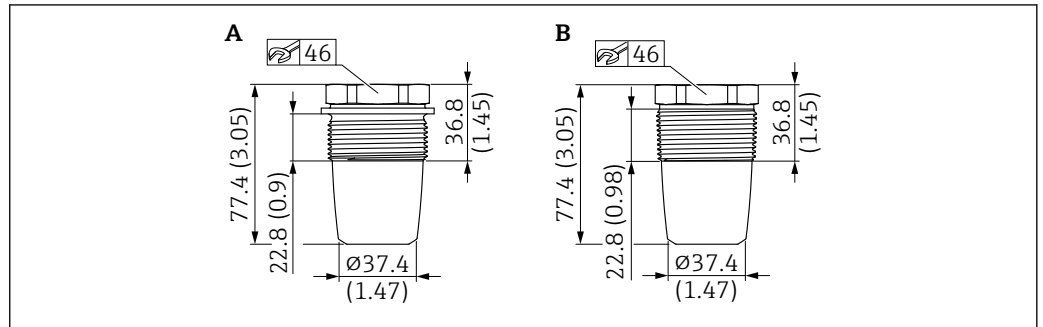
- Material: PBT-GF
- Weight: 74 g (2.610 oz.)
- Order number: 71395785

R 1½"

- Material: PBT-GF
- Weight: 71 g (2.504 oz.)
- Order number: 71395862

NPT 1½"

- Material: PBT-GF
- Weight: 71 g (2.504 oz.)
- Order number: 71416936



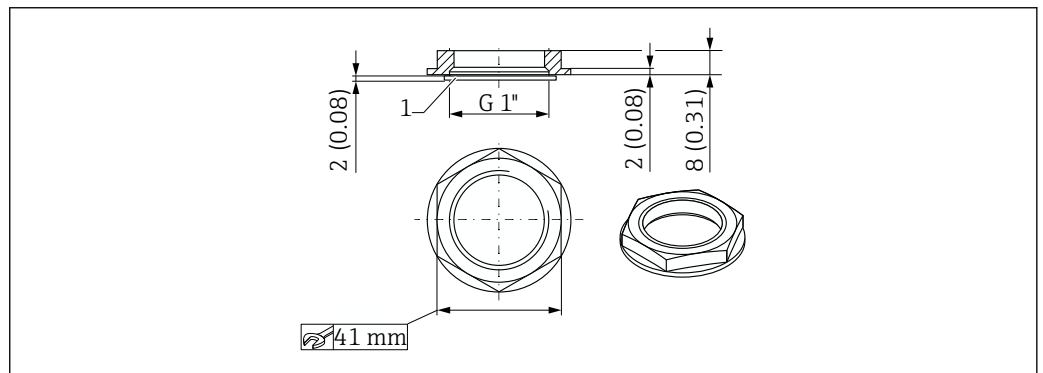
A0035938

A G 1½", order code 620, option PA

B R 1½", order code 620, option PB; NPT 1½", order code 620, option PC

15.3 Lock nut

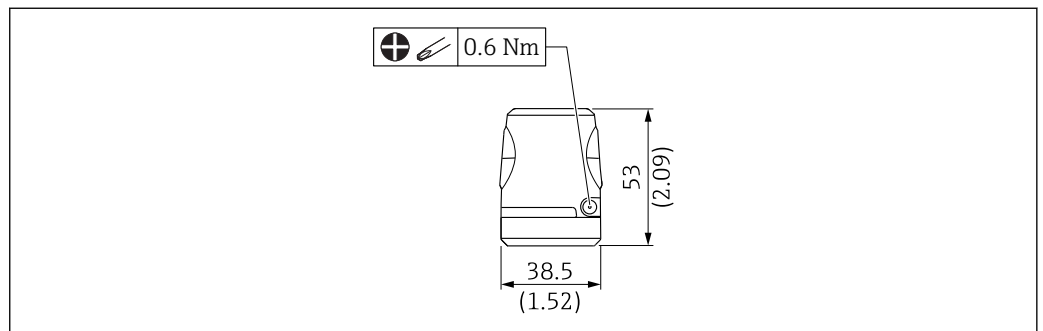
- Material: PA
- Order number: 71395801



A0036041

15.4 Protection cover

- Material: PC
- Order number: 71395803

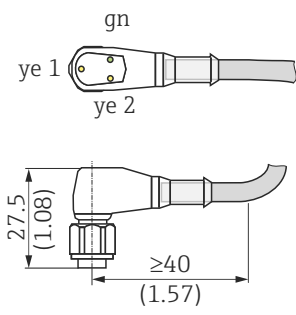
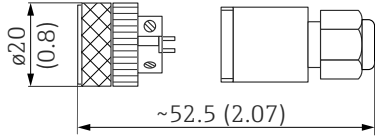


A0036434

15.5 Test magnet

Order number: 71267011

15.6 Plug-in jack, connection adapter

Identifier	Order number	Option ¹⁾
<p>Cable, plug-in jack Engineering unit mm (in)</p>  <p>Example: M12 with LED</p>	<p>M12 IP69 with LED</p> <ul style="list-style-type: none"> ▪ Elbowed 90°, terminated at one end ▪ 5 m (16 ft) PVC cable (orange) ▪ Body: PVC (transparent) ▪ Slotted nut 316L 	<p>52018763</p> <p>RX</p>
	<p>M12 IP69 without LED</p> <ul style="list-style-type: none"> ▪ Elbowed 90°, terminated at one end ▪ 5 m (16 ft) PVC cable (orange) ▪ Body: PVC (orange) ▪ Slotted nut 316L (1.4435) 	<p>52024216</p> <p>RW</p>
	<p>M12 IP67 without LED</p> <ul style="list-style-type: none"> ▪ Elbowed 90° ▪ 5 m (16 ft) PVC cable (gray) ▪ Slotted nut Cu Sn/Ni ▪ Body: PUR (blue) 	<p>52010285</p> <p>RZ</p>
	<p>M12 IP67 without LED</p> <ul style="list-style-type: none"> ▪ Straight, self-terminated connection to M12 plug ▪ Slotted nut Cu Sn/Ni ▪ Body: PBT 	<p>52006263</p> <p>R1</p>
<p>Wire colors for M12 plug: 1 = BN (brown), 2 = WT (white), 3 = BU (blue), 4 = BK (black)</p>		

1) See order code 620 in Product Configurator

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