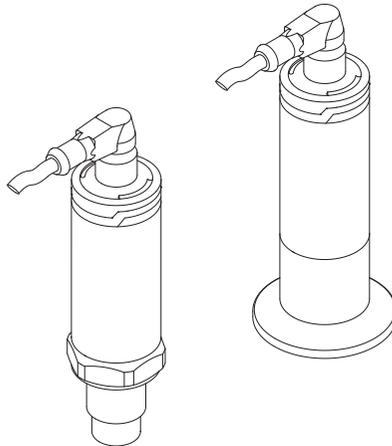


# Brief Operating Instructions

## Liquipoint FTW33

### IO-Link

Conductive and capacitance point level measurement

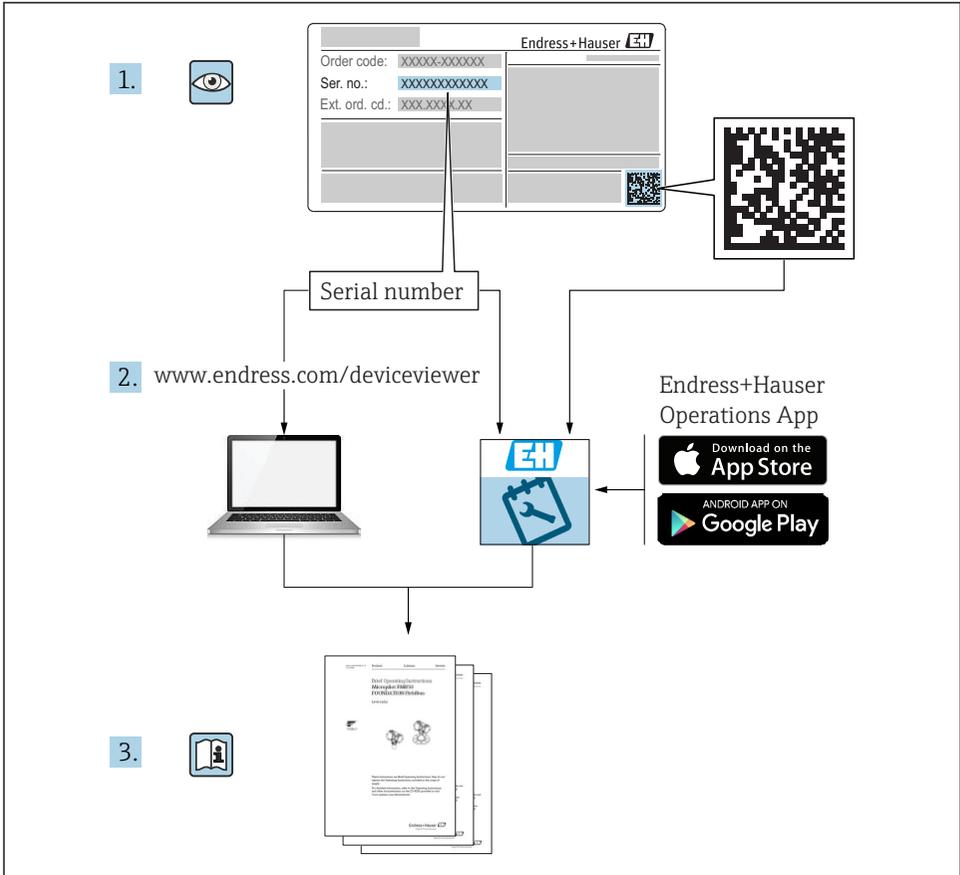


These Instructions are Brief Operating Instructions; they are not a substitute for the Operating Instructions pertaining to the device.

Detailed information about the device can be found in the Operating Instructions and the other documentation:

Available for all device versions via:

- Internet: [www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)
- Smart phone/tablet: *Endress+Hauser Operations App*



A0023555

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# 1 About this document

## 1.1 Document function

The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

## 1.2 Symbols used

### 1.2.1 Safety symbols

#### CAUTION

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

#### DANGER

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

#### NOTICE

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

#### WARNING

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

### 1.2.2 Tool symbols



Open-ended wrench

### 1.2.3 Symbols for certain types of information and graphics



#### Permitted

Procedures, processes or actions that are permitted



#### Preferred

Procedures, processes or actions that are preferred



#### Forbidden

Procedures, processes or actions that are forbidden



#### Tip

Indicates additional information



Notice or individual step to be observed

**1., 2., 3.**

Series of steps



Result of a step

**1, 2, 3, ...**

Item numbers

**A, B, C, ...**

Views



### **Hazardous area**

Indicates the hazardous area



### **Safe area (non-hazardous area)**

Indicates the non-hazardous area



### **Safety instructions**

Observe the safety instructions contained in the associated Operating Instructions

## **1.3 Documentation**

The following documentation types are available in the Downloads of the Endress+Hauser website ([www.endress.com/downloads](http://www.endress.com/downloads)):



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

- *W@M Device Viewer* ([www.endress.com/deviceviewer](http://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

### **1.3.1 Technical Information (TI)**

#### **Planning aid**

The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

### **1.3.2 Operating Instructions (BA)**

#### **Your reference guide**

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.

### 1.3.3 Safety Instructions (XA)

Depending on the approval, the following Safety Instructions (XA) are supplied with the device. They are an integral part of the Operating Instructions.



The nameplate indicates the Safety Instructions (XA) that are relevant to the device.

## 1.4 Registered trademarks

### IO-Link®

Is a registered trademark. It may only be used in conjunction with products and services by members of the IO-Link Community or by non-members who hold an appropriate license. For more detailed information on the use of IO-Link, please refer to the rules of the IO-Link Community at: [www.io.link.com](http://www.io.link.com).

## 2 Basic safety instructions

### 2.1 Requirements for the personnel

The personnel must fulfill the following requirements for its tasks:

- ▶ 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.

### 2.2 Designated use

#### Application and media

The device described in these instructions may only be used as a point level switch for liquids and foams.

To ensure that the measuring device remains in proper condition for the operating time:

- ▶ Use the device only for media to which the process-wetted materials are sufficiently resistant.
- ▶ Observe the limit values in "Technical data".

#### Incorrect use

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

Verification for borderline cases:

- ▶ For special fluids and media used for cleaning, the manufacturer is happy to provide assistance in verifying the corrosion resistance of fluid-wetted materials, but disclaims any warranty or liability.

### **Residual risks**

Due to heat transfer from the process as well as power dissipation within the electronics, the temperature of the electronics housing and the assemblies contained therein may rise to 80 °C (176 °F) during operation. When in operation, the sensor may reach a temperature close to the medium temperature.

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.

For welding work on the piping:

- ▶ Do not ground the welding unit via the device.

If working on and with the device with wet hands:

- ▶ Due to the increased risk of electric shock, gloves must be worn.

## **2.4 Operational safety**

Risk of injury.

- ▶ Operate the device in proper technical condition and fail-safe condition only.
- ▶ The operator is responsible for interference-free operation of the device.

### **Conversions 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 the manufacturer.

### **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 repair of an electrical device.
- ▶ Use original spare parts and accessories from the manufacturer only.

### **Hazardous area**

To eliminate a danger for persons or for the facility when the device is used in the hazardous area (e.g. explosion protection, pressure vessel safety):

- ▶ Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area.
- ▶ Observe the specifications in the separate supplementary documentation that is an integral part of these Instructions.

## 2.5 Product safety

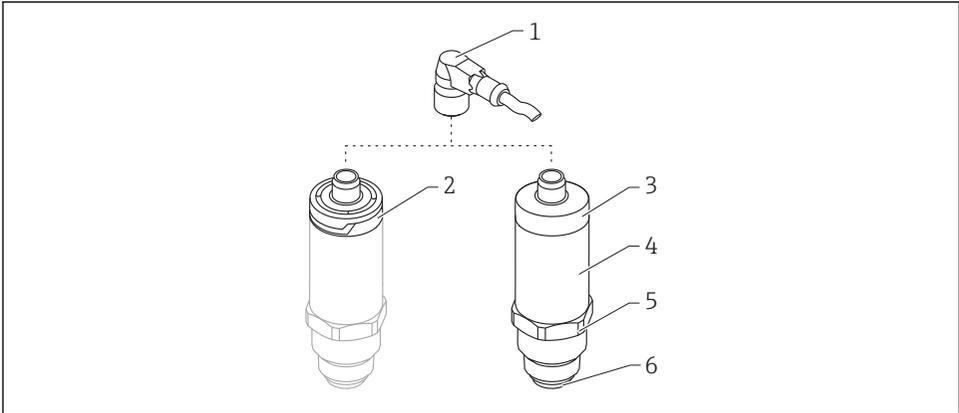
This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate.

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.

## 3 Product description

Compact point level switch for liquids and pastes; to be used preferably in pipes and in storage, mixing and process vessels with or without an agitator for flush-mounted installation.

### 3.1 Product design



A0036957

#### 1 Product design

- 1 M12 plug
- 2 Plastic housing cover IP65/67
- 3 Metal housing cover IP66/68/69
- 4 Housing
- 5 Process connection
- 6 Sensor

## 4 Incoming acceptance and product identification

### 4.1 Incoming acceptance

Check the following during incoming acceptance:

- Are the order codes on the delivery note and the product sticker identical?
  - Are the goods undamaged?
  - Do the nameplate data match the ordering information on the delivery note?
  - If required (see nameplate): Are the safety instructions (XA) provided?
-  If one of these conditions is not met, please contact the manufacturer's sales office.

### 4.2 Product identification

The following options are available for the identification of the measuring device:

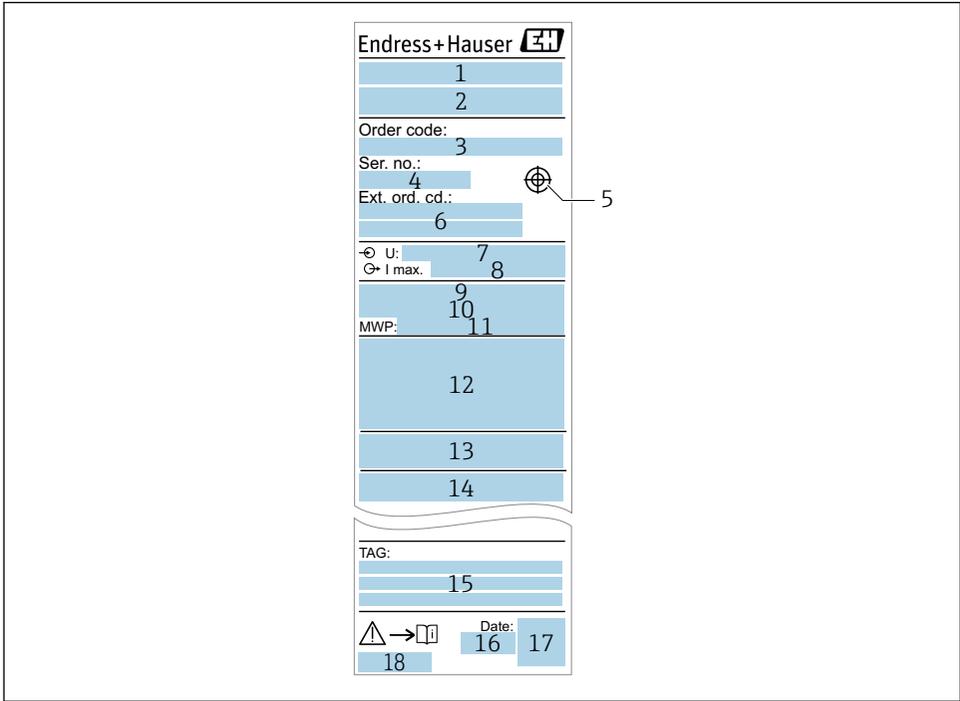
- Nameplate specifications
- Extended order code with breakdown of the device features on the delivery note
- ▶ Enter the serial number from the nameplates into *W@M Device Viewer* ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer))
  - ↳ All the information about the measuring device and the scope of the associated Technical Documentation are displayed.
- ▶ Enter the serial number from the nameplate into the *Endress+Hauser Operations App* or use the *Endress+Hauser Operations App* to scan the 2-D matrix code (QR Code) provided on the nameplate
  - ↳ All the information about the measuring device and the scope of the associated Technical Documentation are displayed.

### 4.3 Manufacturer address

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

Address of the manufacturing plant: See nameplate.

## 4.4 Nameplate



A0036915

- 1 Device name
- 2 Manufacturer address
- 3 Order code
- 4 Serial number
- 5 Marking for test magnet
- 6 Extended order code
- 7 Supply voltage
- 8 Signal output
- 9 Process temperature
- 10 Ambient temperature range
- 11 Process pressure
- 12 Certificate symbols, communication mode (optional)
- 13 Degree of protection: e. g. IP, NEMA
- 14 Certificate and approval relevant data
- 15 Measuring point identification (optional)
- 16 Manufacturing date: year-month
- 17 2-D matrix code (QR code)
- 18 Document number of Operating Instructions

## 4.5 Storage, Transport

### 4.5.1 Storage conditions

- Permitted storage temperature:  $-40$  to  $+85$  °C ( $-40$  to  $+185$  °F)
- Use original packaging.

### 4.5.2 Transporting the product to the measuring point

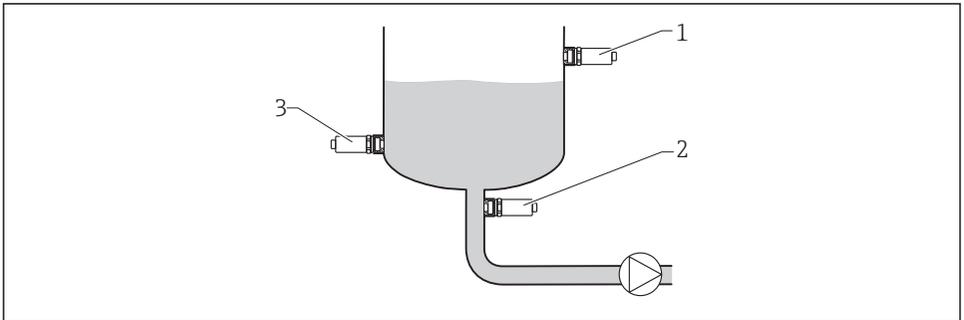
Transport the device to the measuring point in the original packaging.

## 5 Installation

### 5.1 Installation conditions

#### 5.1.1 Mounting location

Installation is possible in any position in a vessel, pipe or tank.

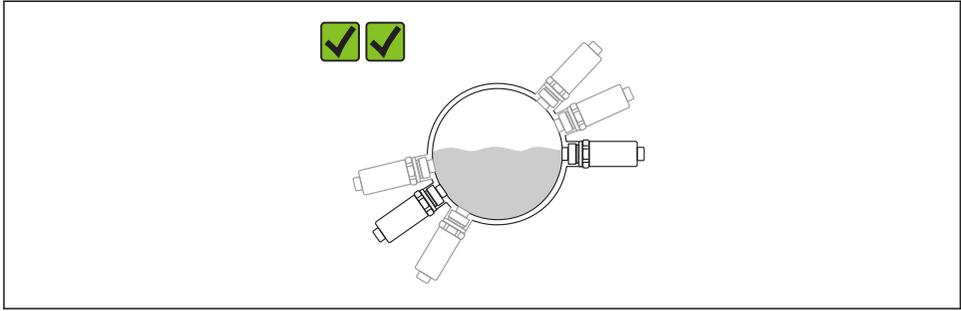


A0036961

#### 2 Installation examples

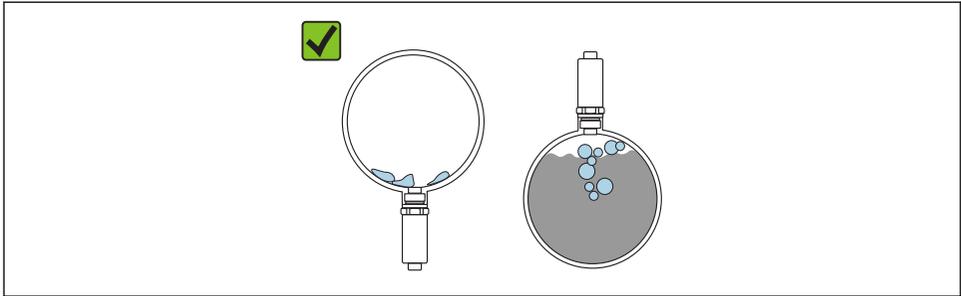
- 1 Overfill prevention or upper level detection (maximum safety)
- 2 Dry running protection for pump (minimum safety)
- 3 Lower level detection (minimum safety)

### 5.1.2 Installation in pipes



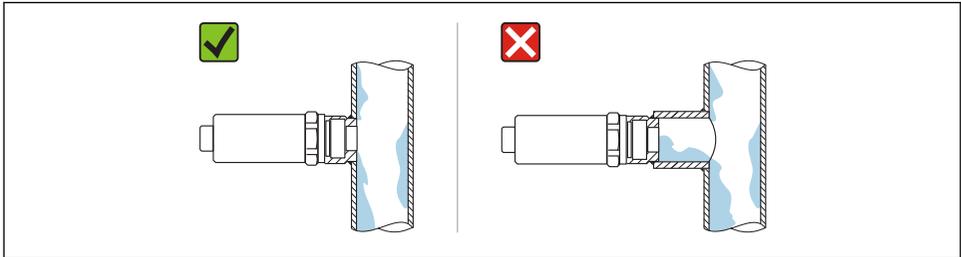
A0021052

3 Mounting position in horizontal pipes



A0038773

4 The measurement can be impaired if the sensor is partially covered or if air bubbles occur at the sensor.



A0025915

5 Flush-mounted installation

### 5.1.3 Special mounting instructions

- Protect housing against impact.
- Moisture must not penetrate the housing when mounting the device, establishing the electrical connection and during operation.
- In the IP69 version, only remove the protection cap from the M12 plug shortly before establishing the electrical connection.

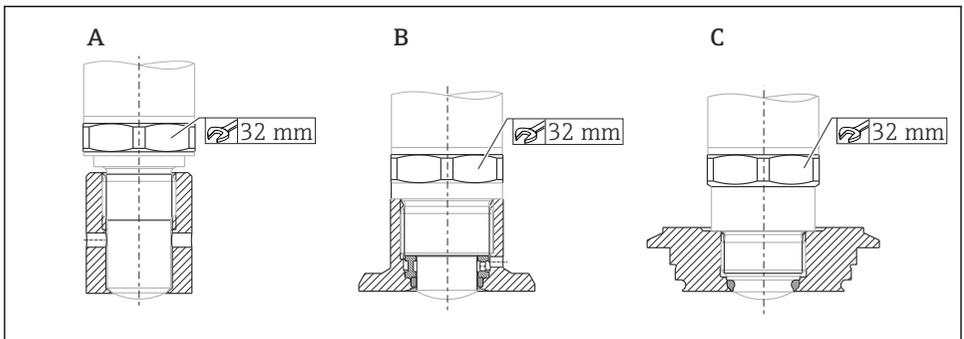
## 5.2 Installing the device

### 5.2.1 Required tools

Open-ended wrench or, for measuring points that are difficult to access, a hexagon tubular socket wrench 32 mm <sup>1)</sup>

- When screwing in, turn by the hex bolt only.
- Torque: 15 to 30 Nm (11 to 22 lbf ft).

### 5.2.2 Installation



A0021389

- A Thread G 1/2"  
 B Thread G 3/4"/G 1"  
 C Thread M24 × 1.5

## 5.3 Post-installation check

- Is the device undamaged (visual inspection)?
- Does the device comply with the measuring point specifications?
  - Process temperature
  - Process pressure
  - Ambient temperature range
  - Measuring range
- Are the measuring point identification and labeling correct (visual inspection)?

1) Can be ordered as an optional accessory

- Is the device adequately protected against precipitation and direct sunlight?
- Is the device adequately protected against impact?
- Are all mounting and safety screws securely tightened?
- Is the device properly secured?

## 6 Electrical connection

### 6.1 Connection conditions

The measuring device has two modes of operation:

- **Maximum point level detection (MAX):** e. g. for overfill prevention  
The device keeps the electrical switch closed as long as the sensor is not yet covered by liquid or the measured value is within the process window.
- **Minimum point level detection (MIN):** e. g. to protect pumps from dry running.  
The device keeps the electrical switch closed as long as the sensor is covered by liquid or the measured value is outside the process window.

Choosing the "MAX"/"MIN" mode of operation ensures that the device switches in a safe manner even in the event of 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).



- IO-Link: Communication on pin 4; switch mode on pin 2.
- SIO mode: If there is no communication, the device switches to the SIO mode = standard IO mode.

The functions configured in the factory for the MAX and MIN modes can be changed via IO-Link:

HNO/HNC hysteresis

### 6.2 Supply voltage

#### SIO mode

10 to 30 VDC

#### IO-Link mode

18 to 30 VDC

IO-Link communication is guaranteed only if the supply voltage is at least 18 V.

### 6.3 Connecting the device



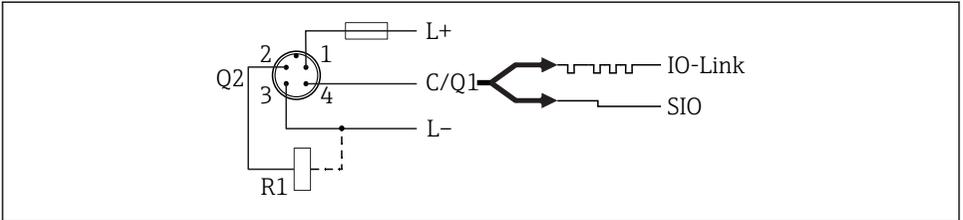
#### **Risk of injury from the uncontrolled activation of processes!**

- ▶ Switch off the supply voltage before connecting the device.
- ▶ Make sure that downstream processes are not started unintentionally.

**⚠ WARNING**

**Electrical safety is compromised by an incorrect connection!**

- ▶ In accordance with IEC/EN61010 a separate circuit breaker must be provided for the device.
- ▶ Voltage source: Non-hazardous contact voltage or Class 2 circuit (North America).
- ▶ The device must be operated with a fine-wire fuse 500 mA (slow-blow).
- ▶ Protective circuits against reverse polarity are integrated.



A0037916

- Pin 1 Supply voltage +
- Pin 2 2nd switch output
- Pin 3 Supply voltage -
- Pin 4 IO-Link communication or 1st switch output (SIO mode)

**6.3.1 SIO mode (without IO-Link communication)**

Minimum safety		
Terminal assignment	MIN output	LED yellow (ye) 1
	+ — 4	
	+ — 4	

Maximum safety		
Terminal assignment	MAX output	LED yellow (ye) 2

### Function monitoring

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. This means that function monitoring is possible in addition to level monitoring. The behavior of the switch outputs can be configured via IO-Link.

Connection for function monitoring using XOR operation					
Terminal assignment	MAX output	LED yellow (ye) 2	MIN output	LED yellow (ye) 1	LED red (rd)

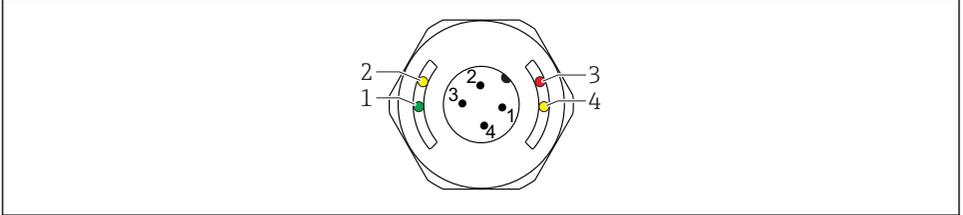
### 6.4 Post-connection check

- Are the device and cable undamaged (visual inspection)?
- Does the supply voltage match the specifications on the nameplate?
- If supply voltage is present, is the green LED lit?
- With IO-Link communication: is the green LED flashing?

## 7 Operation options

### 7.1 Local operation

#### 7.1.1 Operational display (LEDs)



A0038425

#### 6 LEDs in the housing cover

- 1 Status/Communication
- 2 Switch status/switch output 2
- 3 Warning/Maintenance required
- 4 Switch status/switch output 1

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

### 7.2 Operation via test magnet

The test magnet is included in the scope of delivery.

A switch output function test can be carried out directly at the machine by means of a test magnet.

### 7.3 Operation via IO-Link operating menu

#### 7.3.1 IO-Link information

IO-Link is a point-to-point connection for communication between the device and an IO-Link master. This requires an IO-Link compatible module (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 devices 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: TBD
- Process data width: 16 bit

- IO-Link data storage: Yes
- Block configuration: Yes
- Device operational: The device is operational 4 s after the supply voltage has been applied

### 7.3.2 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.

## 8 System integration

See Operating Instructions.

## 9 Commissioning

### 9.1 Function check

Prior to commissioning, make sure that the post-installation and post-connection checks have been performed.

See:

- "Post-installation check" checklist
- "Post-connection check" checklist

## 9.2 Commissioning the local display

### 9.2.1 Light signals (LEDs)

Position of LEDs in housing cover

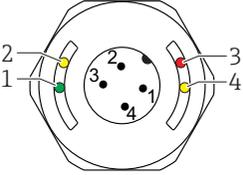
Position	LED color	Description of function
1	green (gn)	Status/Communication <ul style="list-style-type: none"> <li>■ lit: SIO mode</li> <li>■ flashing: Active communication, flash frequency </li> <li>■ flashes with increased luminosity: Device search (device identification), flash frequency </li> </ul>
2	yellow (ye)2	Switch status/switch output 2 lit: If the sensor is covered by medium
3	red (rd)	Warning/Maintenance required flashing: Error remediable, e. g. invalid calibration Fault/device failure lit: see Diagnostics and troubleshooting
4	yellow (ye)1	Switch status/switch output 1 lit: If the sensor is covered by medium

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

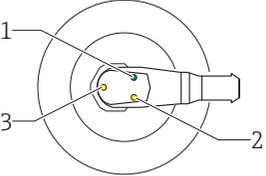
### 9.2.2 Function of LEDs

Any configuration of the switch outputs is possible. The following table shows the behavior of the LEDs in the SIO mode:

*LEDs on housing cover with M12 plug, IO-Link*

Operating modes	MAX		MIN		Warning	Fault
	free	covered	free	covered		
 <small>A0039425</small>						
1: green (gn)						
2: yellow (ye) 2						
3: red (rd)						
4: yellow (ye) 1						

*LEDs on M12 plug (signals status of switch outputs)*

Operating modes	MAX		MIN	
	free	covered	free	covered
				
1: green (gn)				
2: yellow (ye)2				
3: yellow (ye)1				

### 9.3 Commissioning with an operating menu

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

Parameter changes are not accepted until after the parameters have been downloaded.

If using block configuration, parameter changes are accepted only after the parameters have been downloaded.

### **⚠ WARNING**

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

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

#### **IO-Link communication**

- Commissioning with factory settings: The device is configured for use with water-based media. The device can be commissioned directly when used with water-based media. Factory setting: Output 1 and output 2 are configured for XOR operation.
  - Commissioning with customer-specific settings: The device can be configured differently to the factory settings via IO-Link. Select User in the **Active switchpoints** parameter.
- i**
- Each change must be confirmed with Enter to ensure that the value is accepted.
  - Incorrect switching is suppressed by adjusting the settings in the switching delay/switchback delay (Switching delay time/Switchback delay time parameters).

## 10 Switch output function test

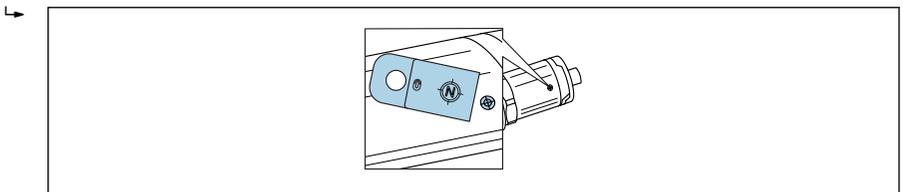
### **⚠ WARNING**

#### **Risk of injury!**

- ▶ Ensure that no uncontrolled processes are activated in the system.

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

1. Hold the test magnet against the marking for approx. 2 seconds



A0036907

 7 Position for test magnet on housing

Status inverted; indicated by yellow LED

2. Remove test magnet
  - ↳ Original status is adopted once again
3. Test magnet is held against the marking for longer than 30 seconds
  - ↳ Red LED flashing; original status is adopted once again

# 11 Diagnostics and troubleshooting

## 11.1 Troubleshooting

If an electronic/sensor defect is present, the device changes to 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 the value indicated on the nameplate.	Apply correct voltage.
	The polarity of the supply voltage is wrong.	Correct the polarity.
	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"> <li>■ Communication cable not connected.</li> <li>■ Communication cable incorrectly attached to device.</li> <li>■ Communication cable incorrectly attached to the IO-Link master.</li> </ul>	Check wiring and cables.
No transmission of process data	There is an error in the device.	Correct errors that are displayed as a diagnostic event.

## 11.2 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"> <li>■ Clear the short-circuit.</li> <li>■ Reduce maximum load current to below 200 mA if one switch output is active.</li> <li>■ Maximum load current = 105 mA per output if both switch outputs are active.</li> </ul>
	Ambient temperature outside of specification	Operate measuring device in specified temperature range.
	Test magnet held against marking for too long	Repeat function test.
Red LED lit	Internal sensor error	Replace device.

## 11.3 Diagnostic events

### 11.3.1 Diagnostic message

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

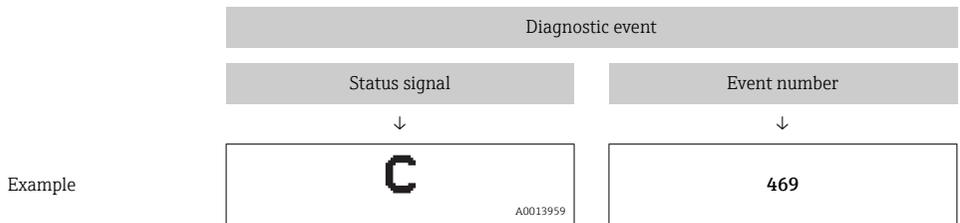
#### Status signals

The overview of diagnostic events 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:

<b>F</b> A0013956	<b>"Failure"</b> A device error has occurred. The measured value is no longer valid.
<b>M</b> A0013957	<b>"Maintenance required"</b> Maintenance is required. The measured value is still valid.
<b>C</b> A0013959	<b>"Function check"</b> The device is in the service mode (e. g. during a simulation).
<b>S</b> A0013958	<b>"Out of specification"</b> The device is being operated: <ul style="list-style-type: none"> <li>▪ Outside its technical specifications (e. g. during warm-up or cleaning process)</li> <li>▪ Outside the parameter configuration undertaken by the user (e. g. level outside of configured span)</li> </ul>

#### 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.

### 11.3.2 Overview of diagnostic events

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

1) EventCode as per IO-Link standard 1.1

## 11.4 Behavior of the device in the event of a fault

The device displays warnings and faults via IO-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. Depending on the diagnostic message, the device behaves as per a warning or fault condition. A distinction must be made between the following types of error 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.

## 11.5 Resetting to factory settings (reset)

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### Reset to factory settings (RES)

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#### Navigation

Parameter → System → Reset to factory settings (RES)

#### Description



**Confirming the "Standard Command" with "Reset to factory settings" causes an immediate reset to the factory settings of the order configuration.**

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).

The following parameters are **not** reset when a reset is performed:

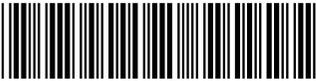
- Minimum  $\mu\text{C}$ -temperature
- Maximum  $\mu\text{C}$ -temperature
- Last Diagnostic (LST)
- Operating hours

#### Note

The last error is not reset in a reset.







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