

# Technical Information

## Liquitrend QMW43

Conductive and capacitive measurement

Continuous measurement of conductivity and thickness of buildup



### Application

Developed and built for use in the food and beverages industry.

Meets international hygiene requirements.

### Your benefits

- Can be used irrespective of the conductivity of liquid media or pastes
- Flush mount installation, pipes remain piggable
- Easy installation thanks to compact design - even in tight conditions or where access is restricted
- Flexible thanks to two continuous signals, a current output and a frequency output, and digital communication via IO-Link
- Configuration via IO-Link always possible, also if using analog versions (current and frequency outputs)
- Wide range of process connections for installation in new or existing systems
- Robust stainless steel housing, optionally available with IP69 protection

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## About this document

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### Symbols

#### Safety symbols



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



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



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



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

#### 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, ...

Item numbers

A, B, C, ...

Views



Reference to documentation

## Function and system design

### Measuring principle

A low, galvanically isolated AC voltage is applied at the electrodes in contact with the process. If liquid media or pastes come into contact with the electrode, a measurable current flows. In this way, the device determines the conductivity and the dielectric constant ( $\epsilon_r$ ) of the medium.

The thickness of the buildup is calculated from the ratio between the measuring signals of the two electrodes.

## Input

### Measured process variable

Electrical conductivity, dielectric constant ( $\epsilon_r$ ) of the medium

### Calculated process variable

Thickness of buildup

### Measuring range

#### Conductivity

0  $\mu\text{S}/\text{cm}$  to 100  $\text{mS}/\text{cm}$

Minimum permitted span: 3 000  $\mu\text{S}/\text{cm}$  can be ordered; 1 000  $\mu\text{S}/\text{cm}$  can be configured at the device via the IO-Link interface

#### Thickness of buildup

0 to 10 mm

## Output

### Output signal

The following options can be selected in the Product Configurator, order code for "Output":

#### Preconfigured assignment of the outputs:

- Option B
  - OU1: frequency (buildup)
  - OU2: frequency (conductivity)
- Option C
  - OU1: frequency (buildup)
  - OU2: 4 to 20 mA (conductivity)

Select the HT option if the device is to be adjusted to non-conductive media and the measuring range is to be preconfigured.

#### Variable assignment of the outputs with the conductivity and thickness of buildup parameters:

- Option 7
  - OU1: IO-Link
  - OU2: 4 to 20 mA (off, conductivity or buildup depending on the order, select the HT option)
- Option 8
  - OU1: IO-Link
  - OU2: frequency (off or conductivity depending on the order, select the HT option)

### Signal on alarm

The behavior of the output in the event of a failure is regulated in accordance with NAMUR NE43.

#### Frequency

$f < 260 \text{ Hz}$

#### Current

$I < 3.6 \text{ mA}$  (as per NAMUR NE43)

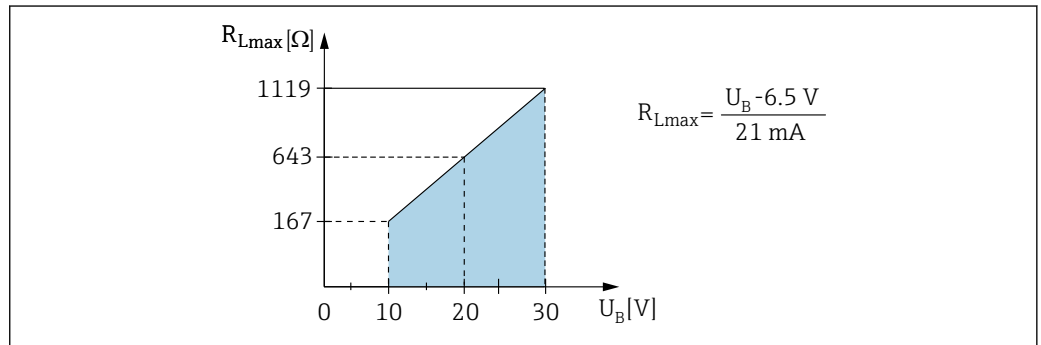
- Failure current is output and "S803" displayed (output: MIN alarm current)
- Periodic checking to establish if it is possible to quit fault state

### Signal range

- Frequency, lower range value: 300 Hz
- Frequency, end: 3 000 Hz
- Signal range: 270 to 3 100 Hz
- Current: 3.8 to 20.5 mA

**Load****Load for 4 to 20 mA output**

Depends on the supply voltage  $U_B$  of the power supply unit: do not exceed the maximum load resistance  $R_L$  (including supply line resistance) as otherwise it will not be possible to set the corresponding current.



A0041303

1 Load for 4 to 20 mA output

**Power supply****Device plugs**

M12 plug: IEC 60947-5-2

**Supply voltage****Without digital communication**

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.

**Power consumption**

< 1.4 W

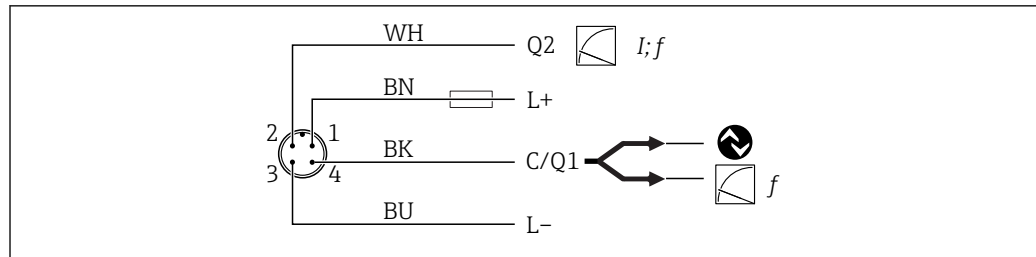
**Electrical connection****Connecting the device****⚠ WARNING****Risk of injury from the uncontrolled activation of processes!**

- ▶ 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 suitable 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.



A0041101

#### 2 Connection

- Pin 1 Supply voltage +  
 Pin 2 Current output 4 to 20 mA or frequency 300 to 3 000 Hz  
 Pin 3 Supply voltage -  
 Pin 4 IO-Link communication or frequency 300 to 3 000 Hz

#### 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?

#### Overvoltage protection

Overvoltage category II

#### Reverse polarity protection

Integrated; no damage in the event of reverse polarity or short-circuit

#### Short-circuit protection

The device is protected against overload and short-circuiting.

Intelligent monitoring:

Check for overload in intervals of ~ 1.5 s; normal operation is resumed once the overload/short-circuit is fixed.

## Performance characteristics

#### Reference operating conditions

- Ambient temperature: constant 20 °C (68 °F) ±5 °C (9 °F)
- Medium: water, conductivity approx. 200 µS/cm
- Medium temperature: 20 °C (68 °F) ±5 °C (9 °F)
  - Conductivity: fully covered, sensor covered by 20 mm of medium
  - Coverage: up to max. 6 mm

#### Maximum measured error under reference conditions

**Conductivity**  
 ≤ 5 %


#### Typical measured error

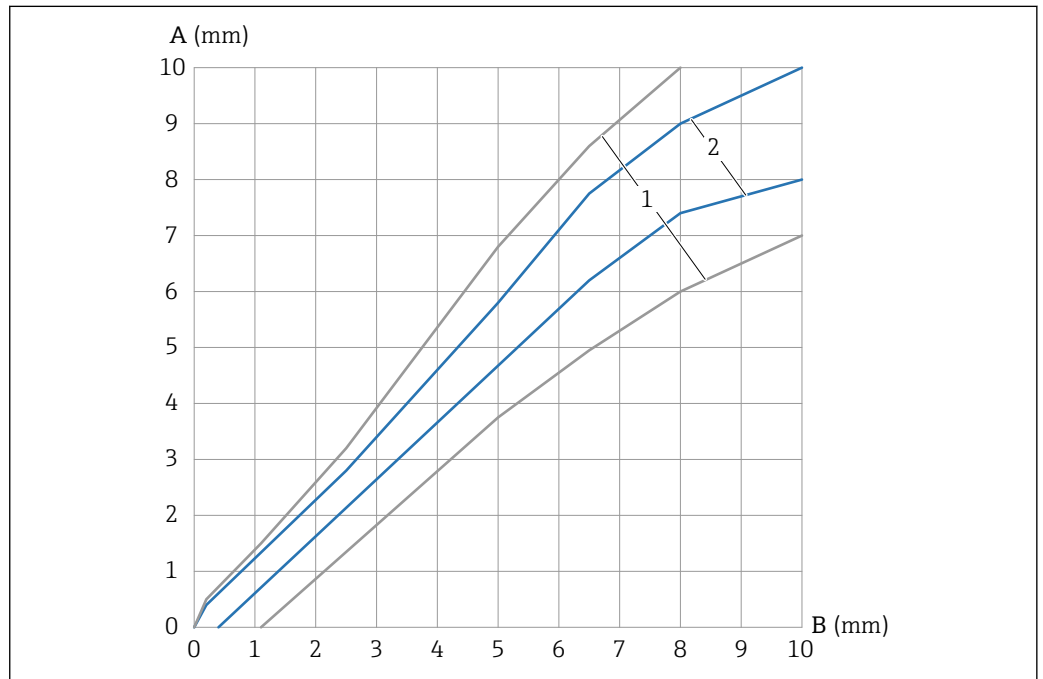
**Conductivity**  
 0 to 2 mS/cm: ≤ 5 % of reading ± 0.2 µS/cm  
 2 to 20 mS/cm: ≤ 7 % of reading  
 20 to 50 mS/cm: ≤ 10 % of reading  
 50 to 100 mS/cm: ≤ 15 % of reading

The sensor must be covered by at least 20 mm of medium.


The data indicated are typical measured errors. In individual cases, the effects of factors such as polarization can result in different values.

**Buildup**

 The typical measured error is between the limits indicated.



A0041586

 3 *Buildup measured error*

A *Buildup measured value*

B *Actual buildup*

1 *0 to 100 mS/cm*

2 *0.01 to 20 mS/cm*

**Non-repeatability**

**Conductivity**

0 to 2 mS/cm:  $\leq 0.5\%$  of reading  $\pm 0.2 \mu\text{S/cm}$

2 to 20 mS/cm:  $\leq 0.75\%$  of reading

20 to 50 mS/cm:  $\leq 1.5\%$  of reading

50 to 100 mS/cm:  $\leq 2.5\%$  of reading

**Buildup**

$\leq 0.25 \text{ mm}$

**Switch-on time**

$< 2 \text{ s}$

**Response time**

**Configurable damping**

0.1 to 60 s

T63: as per set damping. Output has behavior of PT<sub>1</sub> element.

**Dead time**

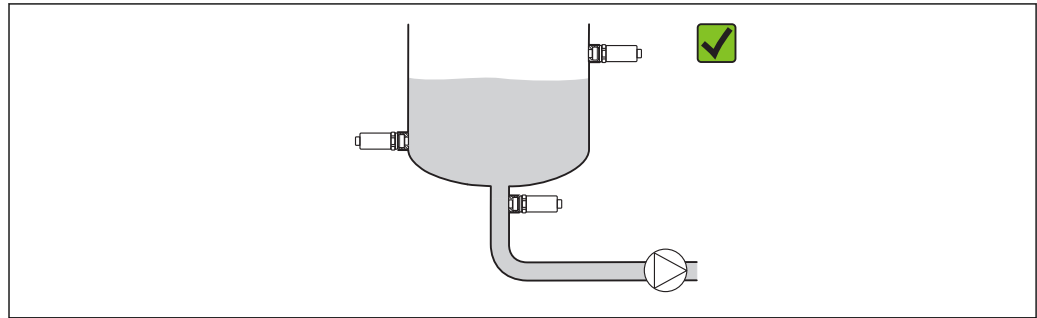
250 ms

**Installation**

**Mounting location**

Installation in vessel, pipe or tank.

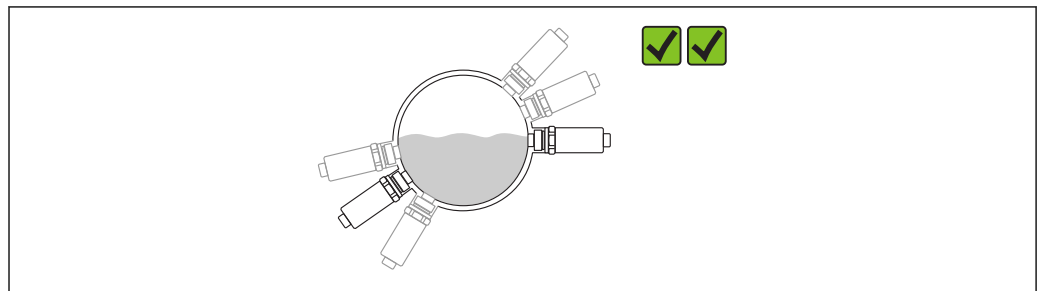
Vessel or tank



A0040922

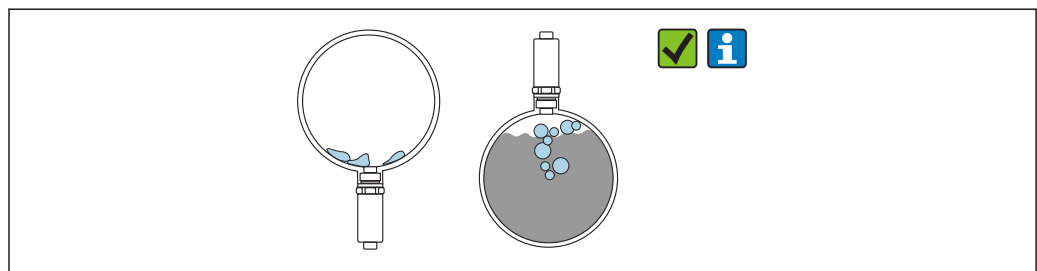
4 Installation examples

Pipes



A0021052

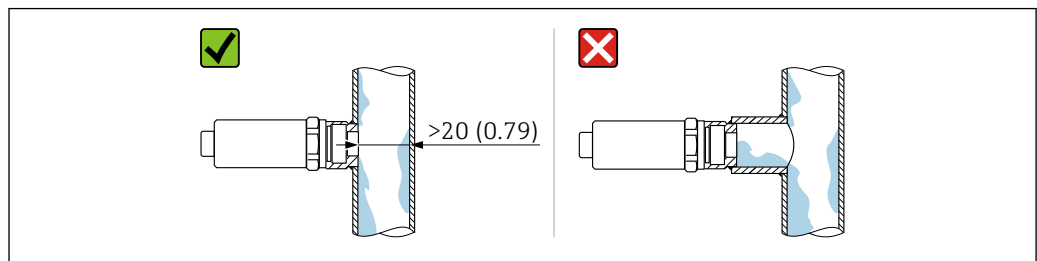
5 Horizontal orientation → preferred orientation



A0038773

6 Vertical orientation → formation of buildup or bubbles on the sensor must be taken into account

**i** The possibility of buildup or bubbles forming on the sensor when installed vertically must be taken into account. If the sensor is partially covered, or if encrustations or air bubbles have formed on the sensor, this will be reflected in the measured value.



A0041584

7 Flush-mounted orientation. Unit of measurement mm (in)

Length of connecting cable


- Max. 25 Ω/core, total capacity < 100 nF
- IO-Link communication: < 10 nF

Special mounting instructions

- When installing the plug, do not allow moisture to enter the plug or socket area
- Protect housing against impact



## Environment

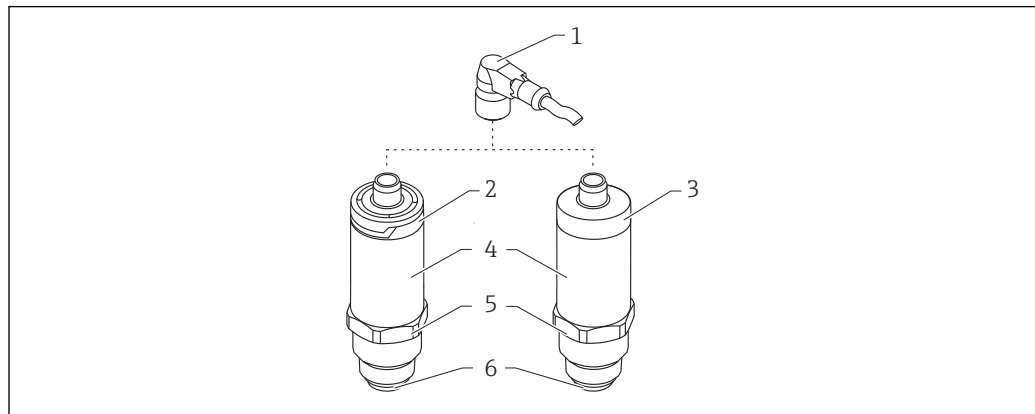
<b>Ambient temperature range</b>	At the housing: -40 to +70 °C (-40 to +158 °F)
<b>Storage temperature</b>	-40 to +85 °C (-40 to +185 °F)
<b>Humidity</b>	Operation up to 100 %. Do not connect in a condensing atmosphere.
<b>Operating altitude</b>	Up to 2 000 m (6 600 ft) above sea level
<b>Pollution degree</b>	Pollution degree 4
<b>Climate class</b>	DIN EN 60068-2-38/IEC 68-2-38: Test Z/AD
<b>Degree of protection</b>	<ul style="list-style-type: none"> <li>■ IP65/67 NEMA type 4X enclosure (plastic housing cover)</li> <li>■ IP66/68/69 NEMA type 4X/6P enclosure (metal housing cover)</li> </ul>
<b>Vibration resistance</b>	As per test Fh, EN 60068-2-64:2008: $a(\text{RMS}) = 50 \text{ m/s}^2$ , $f = 5 \text{ to } 2\,000 \text{ Hz}$ , $t = 3 \text{ axes} \times 2 \text{ h}$
<b>Shock resistance</b>	As per test Ea, prEN 60068-2-27:2007: $a = 300 \text{ m/s}^2 = 30 \text{ g}$ , $3 \text{ axes} \times 2 \text{ directions} \times 3 \text{ shocks} \times 18 \text{ ms}$
<b>Cleaning</b>	Resistant to typical cleaning agents from the outside, in accordance with Ecolab test.
<b>Electromagnetic compatibility</b>	<p>Electromagnetic compatibility in accordance with all the relevant requirements of the EN 61326 series.</p> <p> Details: Declaration of Conformity</p> <p>Only the requirements of IEC/EN 61131-9 are met if IO-Link communication is used.</p> <p>If the device is installed in plastic structures, its function may be influenced by strong electromagnetic fields. Emission requirements for class A equipment are met (only for use in "industrial environments").</p>

## Process

<b>Process temperature range</b>	-20 to +100 °C (-4 to +212 °F) <ul style="list-style-type: none"> <li>■ For 1 h: +150 °C (+302 °F)</li> <li>■ M24 process adapter with EPDM process seal for 1 h: +130 °C (+266 °F)</li> </ul>
<b>Process pressure range</b>	-1 to +25 bar (-14.5 to +362.5 psi)

## Mechanical construction

### Design

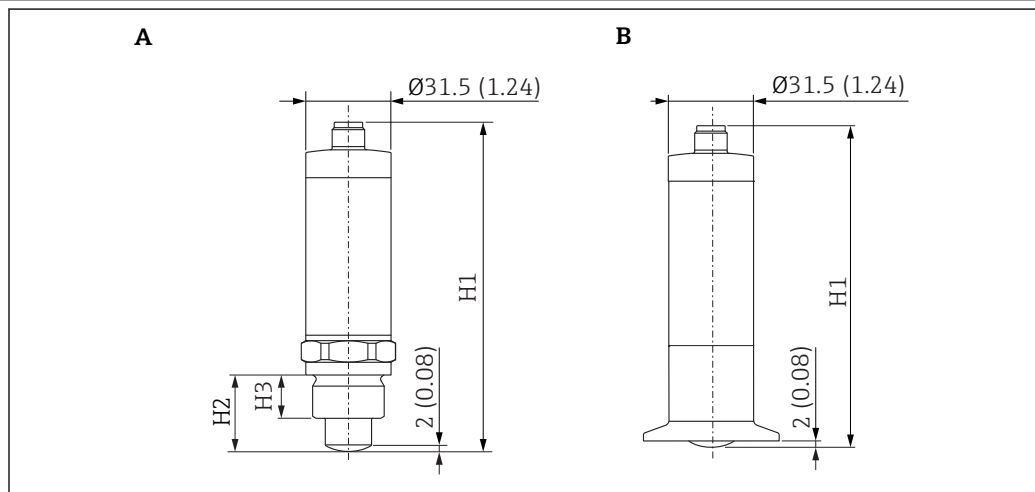


A0036957

#### 8 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

### Dimensions



A0040941

Unit of measurement mm (in)

- A Device with threaded connection
- B Device with clamp/DIN11851 process connection

### Process connections

A: Device with threaded connection; product structure: order code for "Process connection", options W5J, WSJ, X2J; material: 316L, dimensions in: mm (in)

A	G 3/4", W5J	G 1", WSJ	M24 1.5, X2J
H1	122 (4.8)	124 (4.88)	122 (4.8)
H2	28 (1.1)	32 (1.26)	19 (0.75)
H3	16 (0.63)	19 (0.75)	13 (0.51)

B: Device with clamp/DIN11851 process connection; product structure: order code for "Process connection", options 3CJ, 3EJ, 1AJ, 1CJ; material: 316L; dimensions in: mm (in)

B	Tri-Clamp ISO2852		DIN11851	
	DN25-38 (1...1-1/2"), 3CJ	DN40-51 (2"), 3EJ	DN25 PN40, 1AJ	DN25 PN40, 1CJ
H1	117 (4.61)	117 (4.61)	117 (4.61)	117 (4.61)

**Weight** Approx.300 g (10.58 oz)

**Materials**

**Sensor:**  
316L (1.4404), PEEK  
(The material PEEK meets the requirements of EU 1935/2004, 10/2011, 2023/2006 and FDA 21 CFR 177.1380)

**Process connection:**  
316L (1.4404/1.4435)

**M12 connector:**  
Housing cover (depending on the design):

- PPSU
- 316L (1.4404/1.4435)

**Design ring:**  
PBT/PC

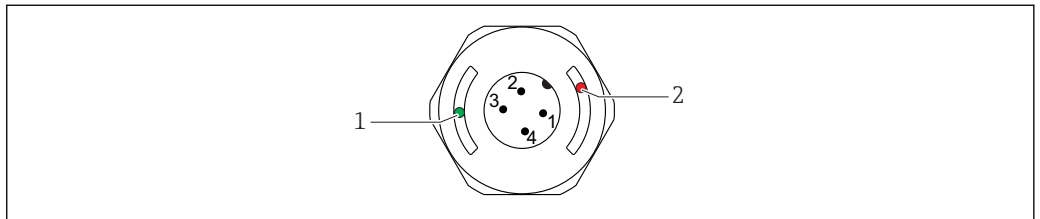
**Housing:**  
316L (1.4404/1.4435)

**Nameplate:**  
Lasered onto housing

**Surface roughness** Wetted sensor surface:  $R_a \leq 0.76 \mu\text{m}$  (30  $\mu\text{in}$ )

## Human interface

**Operational display (LEDs)**



A0041157

9 Position of LEDs in housing cover

- 1 Green (GN), communication status
- 2 Red (RD), warning/maintenance required

There is no external signaling via LEDs on the metal housing cover (IP69).

**Operating concept for devices with IO-Link**

**Operator-oriented menu structure for user-specific tasks**

**Quick and safe commissioning**

Guided menus for applications

**Reliable operation**

Operation in the following languages:  
Via IO-Link: English

**Efficient diagnostic behavior increases measurement availability**


- Remedial measures
- Simulation options

**System integration****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 during operation.

The device supports the following characteristics of the physical layer:

- 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 ms
- Process data width: 32 bit
- IO-Link data storage: Yes
- Block configuration: Yes

 Regardless of the customer-specific default settings selected, the device always has the option of communicating or being configured via IO-Link.

**IO-Link download**

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

- Select "Device Driver" from the list displayed
- In the Type search field, select "IO Device Description (IODD)"
- In the Product Code search field, select the product root
- Click "Search" button → Select result → Download

Optional: In the Text Search search field, enter the device name.

**Certificates and approvals**

 Currently available certificates and approvals can be called up via the product configurator.

**CE mark**

The measuring system meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

**RCM-Tick marking**

The supplied product or measuring system meets the ACMA (Australian Communications and Media Authority) requirements for network integrity, interoperability, performance characteristics as well as health and safety regulations. Here, especially the regulatory arrangements for electromagnetic compatibility are met. The products are labelled with the RCM- Tick marking on the name plate.



A0029561

**Sanitary compatibility**

The device has been developed for use in hygienic processes. The materials in contact with the process meet FDA requirements as well as the 3-A Sanitary Standard No. 74-xx. Endress+Hauser confirms this by affixing the 3-A symbol to the device. As an option, a certificate of conformity according to EC/1935/2004 can be ordered.

The following certificate copies can be ordered with the device (optional):

3-A



EHEDG



- If cleaning in place (CIP) is required, process adapters that comply with 3-A requirements are available. If installed horizontally, ensure that the leakage hole is pointing down. This allows leaks to be detected as quickly as possible.
- To avoid the risk of contamination, install the device according to the EHEDG design principles outlined in document 8 "Hygienic Equipment Design Criteria".
- Suitable connections and seals must be used in order to guarantee a hygienic design according to the latest design version.  
Hygienic design according to 3-A specifications and the EHEDG "Position Paper".
- For information on 3-A and EHEDG-approved weld-in adapters, see Technical Information TI00426F.
- Gap-free connections can be cleaned of all residue using sterilization in place (SIP) and cleaning in place (CIP), which are industry-standard cleaning methods. Attention must be paid to the pressure and temperature specifications of the sensor and process connections for CIP and SIP processes.

#### CRN approval

Versions with a CRN approval (Canadian Registration Number) are listed in the corresponding registration documents. CRN-approved devices are marked with a registration number.

Any restrictions regarding the maximum process pressure values are listed on the CRN certificate.

#### Test reports

The following documents can be ordered with the device (optional):

- Certificate of conformity EC 1935/2004
- Acceptance test certificate as per EN 10204-3.1
- Test report of surface roughness ISO4287/Ra

#### Pressure equipment with allowable pressure ≤ 200 bar (2 900 psi)

Pressure instruments with a flange and threaded boss that do not have a pressurized housing do not fall within the scope of the Pressure Equipment Directive, irrespective of the maximum allowable pressure.

##### Reasons:

According to Article 2, point 5 of EU Directive 2014/68/EU, pressure accessories are defined as "devices with an operational function and having pressure-bearing housings".

If a pressure instrument does not have a pressure-bearing housing (no identifiable pressure chamber of its own), there is no pressure accessory present within the meaning of the Directive.

#### Additional certification

CSA C/US General Purpose

#### RoHS

The measuring system complies with the substance restrictions of the Restriction on Hazardous Substances Directive 2011/65/EU (RoHS 2).

## Ordering information

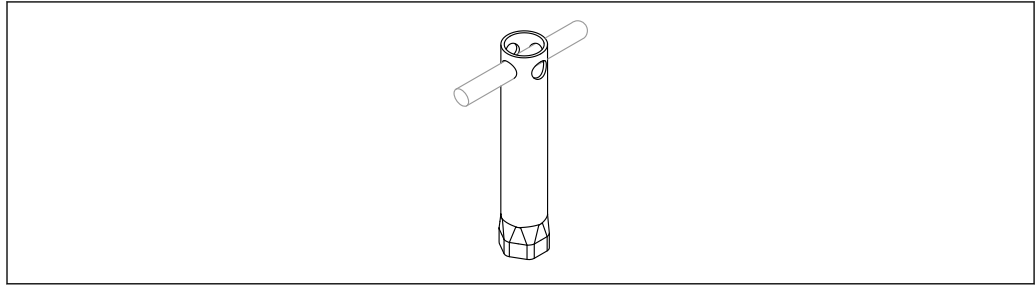
Detailed ordering information is available from your nearest sales organization  
[www.addresses.endress.com](http://www.addresses.endress.com).

## Accessories



Accessories can be ordered with the device (optional) or separately.

### Hexagon tubular socket wrench 32 mm



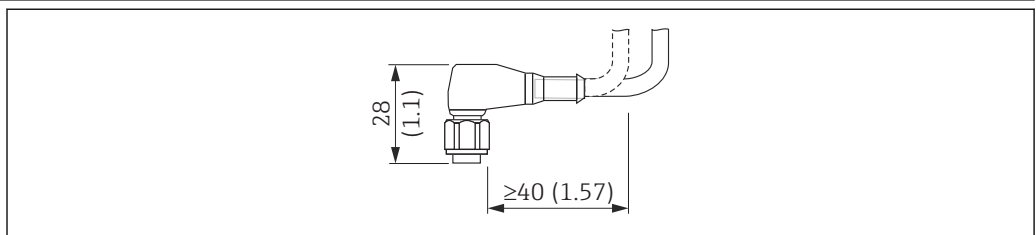
A0038864

10 Hexagon tubular socket wrench

Order number: 52010156

**i** To mount the device in locations that are difficult to access.

### Plug-in jack, elbowed 90°



A0024477

11 Example of plug-in jack M12. Unit of measurement mm (in)

#### Plug-in jack M12 IP69

- Terminated connector
- 5 m (16 ft) PVC cable (orange)
- Body: PVC (orange)
- Slotted nut 316L (1.4435)
- Order number: 52024216

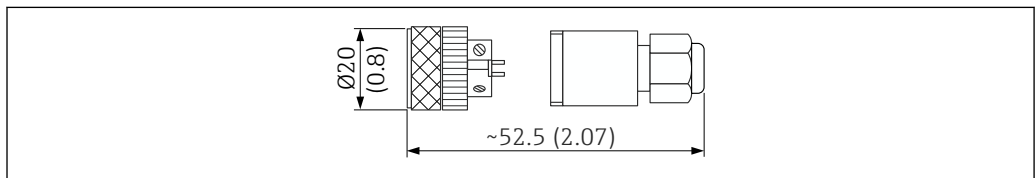
#### Plug-in jack M12 IP67

- Terminated connector
- 5 m (16 ft) PVC cable (gray)
- Body: PUR (blue)
- Slotted nut Cu Sn/Ni
- Order number: 52010285

#### **i** Core colors for M12 plug:

- 1 = BN (brown)
- 2 = WH (white)
- 3 = BU (blue)
- 4 = BK (black)

### Plug-in jack, straight



A0022293

12 Dimensions of self-terminated connection. Unit of measurement mm (in)

#### Plug-in jack M12 IP67

- Straight
- Self-terminated connection to M12 connector
- Body: PBT
- Slotted nut Cu Sn/Ni
- Order number: 52006263

**Process adapter M24 thread**

**Material**

For all versions:

- Adapter  
316L (1.4435)
- Seal  
EPDM

**Process adapter M24 PN25**

Available versions:

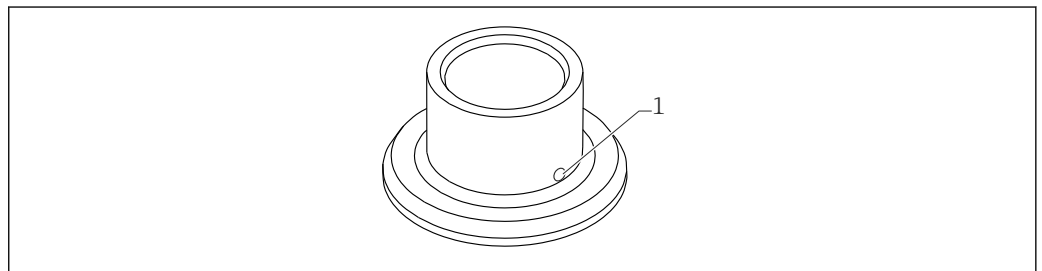
- DIN11851 DN50 with slotted nut
- SMS 1 ½"

**Process adapter M24 PN40**

Available versions:

- Varivent F
- Varivent N

**Weld-in adapter**



A0023557

13 Sample drawing of weld-in adapter

1 Leakage hole

**G ¾"**

Available versions:

- ø 50 mm (1.97 in) - Installation on vessel
- ø 29 mm (1.14 in) - Installation in pipe

**G 1"**

Available versions:

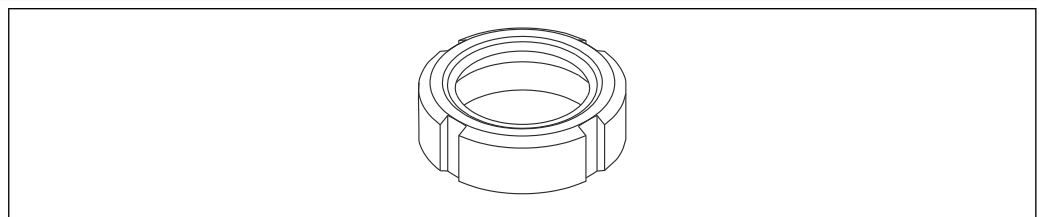
- ø 53 mm (2.09 in) - Installation on vessel
- ø 60 mm (2.36 in) - Installation on pipe

**M24**

Available versions:

- ø 65 mm (2.56 in) - Installation on vessel

**Grooved union nut DIN11851**



A0023556

14 Sample drawing of grooved union nut

**Material**

For all versions:


304 (1.4307)

**For milk pipe DIN11851**

Available versions:

- DN25 - F26
- DN40 - F40
- DN50 - F50

## Supplementary documentation

 The certificates, approvals and other documentation currently available can be accessed as follows:  
Endress+Hauser website: [www.endress.com](http://www.endress.com) → Downloads.

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### Special Documentation

- TI00426F: Adapter and flanges (overview)
- SD01622P: Weld-in adapter (installation instructions)

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### Supplementary device-dependent documentation

#### Document type: Operating Instructions (BA)

Installation and initial commissioning – contains all functions in the operating menu that are required for a typical measuring task. Functions beyond this scope are not included.  
BA01925F

#### Document type: Brief Operating Instructions (KA)

Quick guide to the first measured value – includes all essential information from the incoming acceptance to the electrical connection.  
KA01448F

## Registered trademarks

 **IO-Link**

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



71461870

[www.addresses.endress.com](http://www.addresses.endress.com)

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