# ROCK CREEK WRRF PRIMARY CLARIFIER NO. 4 TREATMENT EXPANSION

CLEAN WATER SERVICES

APRIL 2025

# SECTION 17405

PRESSURE/VACUUM MEASUREMENT: DIRECT

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  - GENERAL TERMS AND CONDITIONS OF SALE



**OPTIMAL CONTROL SYSTEMS, INC.**
2324 Three Lakes Road SE
Albany, OR 97322
Phone: (541) 967-9323
Fax: (541) 967-9485
Project No. 0523-23SSE

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## EQUIPMENT SUPPLIER'S CERTIFICATE OF PROPER INSTALLATION

OWNER Clean Water Services

PROJECT Rock Creek WWRF Primary Clarifier No. 4 Treatment Expansion

CONTRACT NO. 7012

EQUIPMENT SPECIFICATION SECTION 17405

EQUIPMENT DESCRIPTION Pressure Transmitter

___Hoyt Day_____, Authorized representative of
(Print Name)

Endress+Hauser
(Print Manufacturer's Name)

hereby CERTIFY that Endress+Hauser Pressure Transmitter, Model No.
(print equipment name and model with serial no.)

Cerabar PMP71B, Part No. PMP71B-CABAFJH6AA3PFA1VXJA1+AAF1I7, Serial No.

W3027015198, Tag No. 350PIT1203

installed for the subject project has (have) been installed in a satisfactory manner, has (have) been tested and adjusted, and is (are) ready for final acceptance testing and operation on :

Date: 2024.12.5

Time: 11:00

CERTIFIED BY: Hoyt Day
(Signature of Manufacturer's Representative)

Date: 2024.12.5


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## EQUIPMENT SUPPLIER'S CERTIFICATE OF PROPER INSTALLATION

OWNER Clean Water Services

PROJECT Rock Creek WWRF Primary Clarifier No. 4 Treatment Expansion

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EQUIPMENT SPECIFICATION SECTION 17405

EQUIPMENT DESCRIPTION Pressure Transmitter

_____ Hoyt Day_____, Authorized representative of
(Print Name)

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(Print Manufacturer's Name)

hereby CERTIFY that Endress+Hauser Pressure Transmitter, Model No.
(print equipment name and model with serial no.)

Cerabar PMP71B, Part No. PMP71B-CABAFJH6AA3PFA1VXJA1+AAF1I7, Serial No.

W3027115198, Tag No. 350PIT1105

installed for the subject project has (have) been installed in a satisfactory manner, has (have) been tested and adjusted, and is (are) ready for final acceptance testing and operation on :

Date: 2024.12.5

Time: 11:00

CERTIFIED BY: Hoyt Day
(Signature of Manufacturer's Representative)

Date: 2024.12.5


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## EQUIPMENT SUPPLIER'S CERTIFICATE OF PROPER INSTALLATION

OWNER Clean Water Services

PROJECT Rock Creek WWRF Primary Clarifier No. 4 Treatment Expansion

CONTRACT NO. 7012

EQUIPMENT SPECIFICATION SECTION 17405

EQUIPMENT DESCRIPTION Pressure Transmitter

Hoyt Day, Authorized representative of
(Print Name)

Endress+Hauser
(Print Manufacturer's Name)

hereby CERTIFY that Endress+Hauser Pressure Transmitter, Model No.
(print equipment name and model with serial no.)

Cerabar PMP71B, Part No. PMP71B-CABAFJH6AA3PFA1VXJA1+AAF1I7, Serial No.

W3027215198, Tag No. 350PIT1106

installed for the subject project has (have) been installed in a satisfactory manner, has (have) been tested and adjusted, and is (are) ready for final acceptance testing and operation on :

Date: 2024.12.5

Time: 11:00

CERTIFIED BY: Hoyt Day
(Signature of Manufacturer's Representative)

Date: 2024.12.5


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# CWS INSTRUMENT CALIBRATION SHEET

| | |
|---|---|
| Project Name: Rock Creek WWRF Primary Clarifier No. 4 Treatment Expansion | Owner Project No.: 7012 |
| Project Owner: Clean Water Services | Regulatory Agency Project No.: |
| Project No.:0523-23SSE | Date:2024.12.5 |
| Control Loop No.: RC350PIT1203 | |
| Instrument Tag No.: 350PIT1203 | Transmitter/gauge span: 0-100 PSI |
| Manufacturer: Enderss+Hauser | |
| Model No.: Cerebar PMP71B | |
| Serial No.: W3027015198 | |

## TRANSMITTERS AND INDICATORS

| | Increasing Input | | | Decreasing Input | | |
|---|---|---|---|---|---|---|
| % of Span | Input PSI | Output mA | Error (% of span) | Input PSI | Output mA | Error |
| 0% | 0 | 4 | Simulated | 0 | 4 | Simulated |
| 25% | 25 | 8 | Simulated | 25 | 8 | Simulated |
| 50% | 50 | 12 | Simulated | 50 | 12 | Simulated |
| 75% | 75 | 16 | Simulated | 75 | 16 | Simulated |
| 100% | 100 | 20 | Simulated | 100 | 20 | Simulated |
| Other (if applicable) | | | | | | |
| Other (if applicable) | | | | | | |
| | | | | | | |

Maximum allowable error (per Contract Documents) 0.075%

Remarks: Simulated in SmartBlue App

## CALIBRATION EQUIPMENT UTILIZED

| Device Type | MFR/Model No. | Accuracy | Nist Traceability? |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

Certified by: Hoyt Day Date Certified:2024.12.5

# CWS INSTRUMENT CALIBRATION SHEET

| | |
|---|---|
| Project Name: Rock Creek WWRF Primary Clarifier No. 4 Treatment Expansion | Owner Project No.: 7012 |
| Project Owner: Clean Water Services | Regulatory Agency Project No.: |
| Project No.:0523-23SSE | Date:2024.12.5 |
| Control Loop No.: RC350PIT1105 | |
| Instrument Tag No.: 350PIT1105 | Transmitter/gauge span: 0-60 PSI |
| Manufacturer: Enderss+Hauser | |
| Model No.: Cerebar PMP71B | |
| Serial No.: W3027115198 | |

## TRANSMITTERS AND INDICATORS

| | Increasing Input | | | Decreasing Input | | |
|---|---|---|---|---|---|---|
| % of Span | Input PSI | Output mA | Error (% of span) | Input PSI | Output mA | Error |
| 0% | 0 | 4 | Simulated | 0 | 4 | Simulated |
| 25% | 15 | 8 | Simulated | 15 | 8 | Simulated |
| 50% | 30 | 12 | Simulated | 30 | 12 | Simulated |
| 75% | 45 | 16 | Simulated | 45 | 16 | Simulated |
| 100% | 60 | 20 | Simulated | 60 | 20 | Simulated |
| Other (if applicable) | | | | | | |
| Other (if applicable) | | | | | | |
| | | | | | | |

Maximum allowable error (per Contract Documents) 0.075%

Remarks: Simulated in SmartBlue App

## CALIBRATION EQUIPMENT UTILIZED

| Device Type | MFR/Model No. | Accuracy | Nist Traceability? |
|---|---|---|---|
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Certified by: Hoyt Day Date Certified:2024.12.5

# CWS INSTRUMENT CALIBRATION SHEET

| | |
|---|---|
| Project Name: Rock Creek WWRF Primary Clarifier No. 4 Treatment Expansion | Owner Project No.: 7012 |
| Project Owner: Clean Water Services | Regulatory Agency Project No.: |
| Project No.:0523-23SSE | Date:2024.12.5 |
| Control Loop No.: RC350PIT1106 | |
| Instrument Tag No.: 350PIT1106 | Transmitter/gauge span: 0-60 PSI |
| Manufacturer: Enderss+Hauser | |
| Model No.: Cerebar PMP71B | |
| Serial No.: W3027215198 | |

## TRANSMITTERS AND INDICATORS

| | Increasing Input | | | Decreasing Input | | |
|---|---|---|---|---|---|---|
| % of Span | Input PSI | Output mA | Error (% of span) | Input PSI | Output mA | Error |
| 0% | 0 | 4 | Simulated | 0 | 4 | Simulated |
| 25% | 15 | 8 | Simulated | 15 | 8 | Simulated |
| 50% | 30 | 12 | Simulated | 30 | 12 | Simulated |
| 75% | 45 | 16 | Simulated | 45 | 16 | Simulated |
| 100% | 60 | 20 | Simulated | 60 | 20 | Simulated |
| Other (if applicable) | | | | | | |
| Other (if applicable) | | | | | | |
| | | | | | | |

Maximum allowable error (per Contract Documents) 0.075%

Remarks: Simulated in SmartBlue App

## CALIBRATION EQUIPMENT UTILIZED

| Device Type | MFR/Model No. | Accuracy | Nist Traceability? |
|---|---|---|---|
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Certified by: Hoyt Day Date Certified:2024.12.5

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| EQUIPMENT INFORMATION SHEET | | Page 1 |
|---|---|---|
| **EQUIP. DESCRIPTION -**<br>Pressure Transmitter | **DATE INSTALLED** | **DATE STARTED** |
| **EQUIP. TAG -**<br>350PIT1203 | **EST. COST**<br>$1,596 | **EST. LIFE** |
| **EQUIP. LOCATION -**<br>Primary Scum Pump 3 | **SPECIFICATION #**<br>17405 | |
| **MFR -**<br>Endress+Hauser | | **PHONE NUMBERS**<br>888-363-7377 |
| **ADDRESS**<br>2350 Endress Place, Greenwood, IN 46143 | | |
| **VENDOR**<br>Field Instruments & Controls, Inc. | | 360-896-9910 |
| 7509 S 5th St., Suite 112, Ridgefield, WA 98642 | | |

| MAINTENANCE REQUIREMENTS | LUBE CODE | | W | M | Q | S | A | HOURS |
|---|---|---|---|---|---|---|---|---|
| Clean the instrument exterior using a soft, damp cloth and mild soap. | | | Dependent on operating conditions. | | | | | |
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| CODE | LUBRICANT TYPE | MANUFACTURER | CODE | LUBRICANT TYPE | MANUFACTURER |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |


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| EQUIPMENT INFORMATION SHEET | | | Page 2 | | | |
|---|---|---|---|---|---|---|
| **RECOMMENDED SPARE PARTS** | | | **ELECTRICAL NAMEPLATE DATA** | | | |
| **PART NO.** | **PART NAME** | **QUANTITY** | **EQUIP.** Pressure Transmitter | | | |
| | | | **Manufacturer:** Endress+Hauser | | | |
| | | | **SERIAL NO.** W3027015198 | | **ID NO.** 350PIT1203 | |
| | | | **MODEL NO.** Cerabar PMP71B | | **FRAME NO.** | |
| | | | **HP** | **VOLT.** 10.5-30VDC | **AMP.** 4-20mA | **HZ** |
| | | | **Phase** | **RPM** | **Service Factor** | **DUTY** |
| | | | **CODE** | **Insulation** | **Design** | **TYPE** |
| | | | **NEMA** 4X/6P | **Enclosure** | **Misc.** | **RATING** IP66/68 |
| | | | **MECHANICAL NAMEPLATE DATA** | | | |
| | | | **EQUIP.** Pressure Transmitter | | | |
| | | | **Manufacturer:** Endress+Hauser | | | |
| | | | **SERIAL NO.** W3027015198 | | **ID NO.** 350PIT1203 | |
| | | | **MODEL NO.** Cerabar PMP71B | | **MOUNTING POS** | |
| | | | **HP** | **RPM** | **CAP** | **SIZE** |
| | | | **TDH** | **IMP.SZ** | **BELT NO.** | **Output Tor.** |
| | | | **PSI** 0-150 | **NEMA** 4X/6P | **GEAR RATIO** | |


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| EQUIPMENT INFORMATION SHEET | | Page 3 |
|---|---|---|
| **EQUIP. DESCRIPTION -**<br>Pressure Transmitter | **DATE INSTALLED** | **DATE STARTED** |
| **EQUIP. TAG -**<br>350PIT1105 | **EST. COST**<br>$1,596 | **EST. LIFE** |
| **EQUIP. LOCATION -**<br>Primary Sludge Pump 5 | **SPECIFICATION #**<br>17405 | |
| **MFR -**<br>Endress+Hauser | | **PHONE NUMBERS**<br>888-363-7377 |
| **ADDRESS**<br>2350 Endress Place, Greenwood, IN 46143 | | |
| **VENDOR**<br>Field Instruments & Controls, Inc. | | 360-896-9910 |
| 7509 S 5th St., Suite 112, Ridgefield, WA 98642 | | |

| MAINTENANCE REQUIREMENTS | LUBE CODE | | W | M | Q | S | A | HOURS |
|---|---|---|---|---|---|---|---|---|
| Clean the instrument exterior using a soft, damp cloth and mild soap. | | | Dependent on operating conditions. | | | | | |
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| CODE | LUBRICANT TYPE | MANUFACTURER | CODE | LUBRICANT TYPE | MANUFACTURER |
|---|---|---|---|---|---|
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| 2 | | | | | |
| 3 | | | | | |


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| EQUIPMENT INFORMATION SHEET | | | Page 4 | | | |
|---|---|---|---|---|---|---|
| **RECOMMENDED SPARE PARTS** | | | **ELECTRICAL NAMEPLATE DATA** | | | |
| **PART NO.** | **PART NAME** | **QUANTITY** | **EQUIP.** Pressure Transmitter | | | |
| | | | **Manufacturer:** Endress+Hauser | | | |
| | | | **SERIAL NO.** W3027115198 | | **ID NO.** 350PIT1105 | |
| | | | **MODEL NO.** Cerabar PMP71B | | **FRAME NO.** | |
| | | | **HP** | **VOLT.** 10.5-30VDC | **AMP.** 4-20mA | **HZ** |
| | | | **Phase** | **RPM** | **Service Factor** | **DUTY** |
| | | | **CODE** | **Insulation** | **Design** | **TYPE** |
| | | | **NEMA** 4X/6P | **Enclosure** | **Misc.** | **RATING** IP66/68 |
| | | | **MECHANICAL NAMEPLATE DATA** | | | |
| | | | **EQUIP.** Pressure Transmitter | | | |
| | | | **Manufacturer:** Endress+Hauser | | | |
| | | | **SERIAL NO.** W3027115198 | | **ID NO.** 350PIT1105 | |
| | | | **MODEL NO.** Cerabar PMP71B | | **MOUNTING POS** | |
| | | | **HP** | **RPM** | **CAP** | **SIZE** |
| | | | **TDH** | **IMP.SZ** | **BELT NO.** | **Output Tor.** |
| | | | **PSI** 0-150 | **NEMA** 4X/6P | **GEAR RATIO** | |


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| EQUIPMENT INFORMATION SHEET | | Page 5 |
|---|---|---|
| **EQUIP. DESCRIPTION -**<br>Pressure Transmitter | **DATE INSTALLED** | **DATE STARTED** |
| **EQUIP. TAG -**<br>350PIT1106 | **EST. COST**<br>$1,596 | **EST. LIFE** |
| **EQUIP. LOCATION -**<br>Primary Sludge Pump 6 | **SPECIFICATION #**<br>17405 | |
| **MFR -**<br>Endress+Hauser | | **PHONE NUMBERS**<br>888-363-7377 |
| **ADDRESS**<br>2350 Endress Place, Greenwood, IN 46143 | | |
| **VENDOR**<br>Field Instruments & Controls, Inc. | | 360-896-9910 |
| 7509 S 5th St., Suite 112, Ridgefield, WA 98642 | | |

| MAINTENANCE REQUIREMENTS | LUBE CODE | | W | M | Q | S | A | HOURS |
|---|---|---|---|---|---|---|---|---|
| Clean the instrument exterior using a soft, damp cloth and mild soap. | | | Dependent on operating conditions. | | | | | |
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| CODE | LUBRICANT TYPE | MANUFACTURER | CODE | LUBRICANT TYPE | MANUFACTURER |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |


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| EQUIPMENT INFORMATION SHEET | | | Page 6 |
|---|---|---|---|

| RECOMMENDED SPARE PARTS | | |
|---|---|---|
| PART NO. | PART NAME | QUANTITY |
| | | |
| | | |
| | |

# Bill of Materials

**Project:** Rock Creek WRRF Primary Clarifier No. 4 Treament Expansion
**Specification Section(s):** Section 17405 – Pressure/Vacuum Measurement: Direct
**Date:** April 2025

| Item No. | Qty. | Tag(s) | Description | Manufacturer | Part Number | Serial Number |
|---|---|---|---|---|---|---|
| 001 | 1 | 350PIT1203 | Cerabar PMP71B Pressure Transmitter | Endress+Hauser | PMP71B-CABAFJH6AA 3PFA1VXJA1+AAF1I7 | W3027015198 |
| 002 | 1 | 350PIT1105 | Cerabar PMP71B Pressure Transmitter | Endress+Hauser | PMP71B-CABAFJH6AA 3PFA1VXJA1+AAF1I7 | W3027115198 |
| 003 | 1 | 350PIT1106 | Cerabar PMP71B Pressure Transmitter | Endress+Hauser | PMP71B-CABAFJH6AA 3PFA1VXJA1+AAF1I7 | W3027215198 |
| 004 | | | | | | |
| 005 | | | | | | |
| 006 | | | | | | |
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# Configuration summary

| Mat. no. | Description<br>Order code | Quantity | Unit |
|---|---|---|---|
| 71409451 | Cerabar PMP71B<br>PMP71B-CABAFJH6AA3PFA1VXJA1+AAF1I7 | 1 | ST |

| | | | |
|---|---|---|---|
| 010 | Approval: | CA | CSA C/US General Purpose |
| 020 | Output: | BA | 2-wire 4-20mA HART |
| 030 | Display; Operation: | F | Graphic display with touch control + Bluetooth |
| 040 | Housing; Material: | J | Dual compartment; Alu, coated |
| 050 | Electrical Connection: | H | Thread NPT1/2, IP66/68 NEMA Type 4X/6P |
| 055 | Pressure Type: | 6 | Gauge |
| 060 | Application: | A | Standard |
| 065 | Diaphragm Seal Type: | A | W/o |
| 075 | Sensor Range: | 3P | 10bar/1MPa/150psi |
| 090 | Calibration; Unit: | F | Sensor range; psi |
| 105 | Process Connection, Sealing Surface: | A1 | Thread ASME B1.20.1, NPT |
| 110 | Process Connection: | VXJ | MNPT1/2 FNPT1/4, 316L |
| 170 | Membrane Material; Application: | A | 316L; standard |
| 180 | Fill Fluid: | 1 | Silicone oil |
| 500 | >Operation Language Display: | AA | English |
| 550 | >Calibration: | F1 | Factory calibration certificate, 5-point |
| 570 | >>Service: | I7 | Product documentation on paper |

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# Note / Hinweis

Endress+Hauser
People for Process Automation

EN Important for devices with Bluetooth®
The serial number of the device is used as initial password for the wireless connection via SmartBlue (app operation). Please use the following:

1. User name: admin
2. Password: W3027015198 (device serial number)

It is recommended to change the password after the first login.

DE Wichtig für Geräte mit Bluetooth®
Die Geräteseriennummer dient als Initialpasswort für den Verbindungsaufbau mittels SmartBlue (App-Bedienung). Bitte folgende Eingabewerte verwenden:

1. Benutzername: admin
2. Passwort: W3027015198 (Geräteseriennummer)

Es wird empfohlen, das Initialpasswort nach dem ersten Login zu ändern.

71335502W3027015198

# Note / Hinweis

Endress+Hauser
People for Process Automation

EN Important for devices with Bluetooth®
The serial number of the device is used as initial password for the wireless connection via SmartBlue (app operation). Please use the following:

1. User name: admin
2. Password: W3027115198 (device serial number)

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DE Wichtig für Geräte mit Bluetooth®
Die Geräteseriennummer dient als Initialpasswort für den Verbindungsaufbau mittels SmartBlue (App-Bedienung). Bitte folgende Eingabewerte verwenden:

1. Benutzername: admin
2. Passwort: W3027115198 (Geräteseriennummer)

Es wird empfohlen, das Initialpasswort nach dem ersten Login zu ändern.

71335502W3027115198

# Note / Hinweis

Endress+Hauser
People for Process Automation

EN Important for devices with Bluetooth®
The serial number of the device is used as initial password for the wireless connection via SmartBlue (app operation). Please use the following:

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1. Benutzername: admin
2. Passwort: W3027215198 (Geräteseriennummer)

Es wird empfohlen, das Initialpasswort nach dem ersten Login zu ändern.

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# Calibration Certificate

Certificate number: W3027015198-20240318

Endress+Hauser
People for Process Automation

## Factory Calibration - Pressure

### Order information

| | |
|---|---|
| Customer name | OPTIMAL CONTROL SYSTEMS INC |
| Customer purchase order | 24-0184 |
| Sales order number / Item | 3004185544/0010 |
| Internal order number / Item | 3021278590000010 |

### Device information

| | |
|---|---|
| Description | Cerabar PMP71B |
| TAG | 350PIT1203 |
| Serial number | W3027015198 |
| Order code | PMP71B-5RN69/0 |
| Extended order code | PMP71B-CABAFJH6AA3PFA1VXJA1+AAF1I7Z1 |

### Additional information

| | |
|---|---|
| Device condition | New |
| Adjustment | No |
| Sensor range | -15...150 psi rel |
| Adjusted measuring range | 0...150 psi rel |
| Maximum permissible error | ± 0.05 % of upper range limit (URL) |
| Calibrated output | 4-20 mA HART |
| Software version | 01.00.01 |
| Output mode | linear |

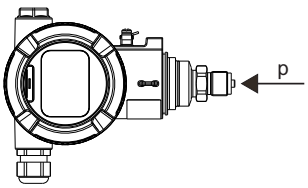
### Procedure

| | |
|---|---|
| Test specification | 160000559 / 160000554, Comparison of unit under test (UUT) with standard |
| Calibration rig | 15104 / 15106 |

### Measuring condition

| | |
|---|---|
| Ambient temperature | 21.8 °C ±1 °C |
| Ambient pressure | 990.3 mbar ±0.2 mbar |
| Ambient humidity | 21.9 % rel. ±10 % rel. |

Calibration orientation




### Execution

Greenwood, 18. Mar 2024, 414408

This document was generated electronically and is valid without signature.

**Endress+Hauser SE+Co.**
2340 Endress Place
Greenwood. In. 46143-9772
USA
www.endress.com

# Calibration Certificate

Certificate number: W3027015198-20240318

Endress+Hauser
People for Process Automation

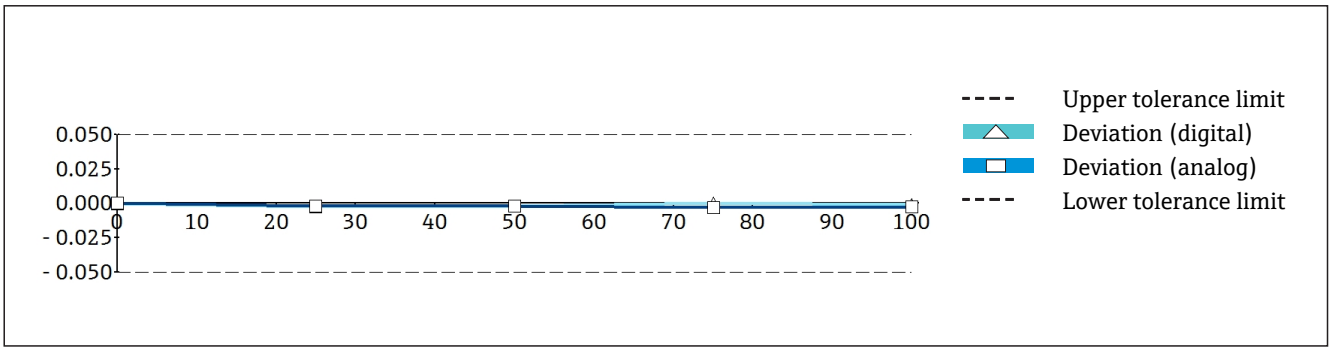
## Factory Calibration - Pressure

### Calibration results

Successfully passed.

### Deviation

% of upper range limit (URL)




| Nominal calibration point [%] | Reference pressure [psi] | UUT output (digital) [psi] | Measurement error (digital) [% of URL] | Measurement error (digital) [psi] | Reference pressure (Iout calc.) [mA] | UUT output (analog) [mA] | Measurement error (analog) [% of URL] |
|---|---|---|---|---|---|---|---|
| 0 | 0.00071 | 0.00006 | -0.00045 | -0.00065 | 4.00008 | 4.00008 | 0.00001 |
| 25 | 37.4965 | 37.4931 | -0.00233 | -0.00340 | 7.99963 | 7.99933 | -0.00189 |
| 50 | 74.9996 | 74.9971 | -0.00171 | -0.00250 | 12.0000 | 11.9996 | -0.00215 |
| 75 | 112.498 | 112.499 | 0.00007 | 0.00100 | 15.9998 | 15.9994 | -0.00277 |
| 100.0 | 149.990 | 149.989 | -0.00087 | -0.00100 | 19.9990 | 19.9986 | -0.00222 |

### Standards used

| Asset | Manufacturer | Type | Certificate | Due date |
|---|---|---|---|---|
| MY57508522 | Keysight | 34410A | 20230747 | 11/30/2024 |
| 136516 | Paroscientific | 1000-15A | 20220706 | 07/31/2024 |
| 70285 | Fluke | Fluke 7250i | 20240114 | 02/28/2025 |
| 011.0620.0802.034 | Lufft | OPUS 20 THIP Typ 8120.11 | 5004/D-K-15202-01-00/2020-6 | 07/31/2024 |

Hereby we confirm that all measuring equipment used to assure the quality of the products has been calibrated and is traceable to national (e.g. PTB, NIST) or international standards. The calibration was performed in compliance with an ISO 9001 quality management system. The observance of recalibration interval is under the responsibility of the user.

# Calibration Certificate

Certificate number: W3027115198-20240318

Endress+Hauser
People for Process Automation

## Factory Calibration - Pressure

### Order information

| | |
|---|---|
| Customer name | OPTIMAL CONTROL SYSTEMS INC |
| Customer purchase order | 24-0184 |
| Sales order number / Item | 3004185544/0010 |
| Internal order number / Item | 3021278590000010 |

### Device information

| | |
|---|---|
| Description | Cerabar PMP71B |
| TAG | 350PIT1105 |
| Serial number | W3027115198 |
| Order code | PMP71B-5RN69/0 |
| Extended order code | PMP71B-CABAFJH6AA3PFA1VXJA1+AAF1I7Z1 |

### Additional information

| | |
|---|---|
| Device condition | New |
| Adjustment | No |
| Sensor range | -15...150 psi rel |
| Adjusted measuring range | 0...150 psi rel |
| Maximum permissible error | ± 0.05 % of upper range limit (URL) |
| Calibrated output | 4-20 mA HART |
| Software version | 01.00.01 |
| Output mode | linear |

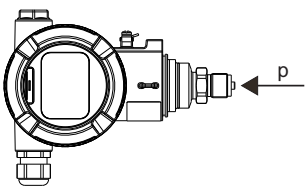
### Procedure

| | |
|---|---|
| Test specification | 160000559 / 160000554, Comparison of unit under test (UUT) with standard |
| Calibration rig | 15104 / 15106 |

### Measuring condition

| | |
|---|---|
| Ambient temperature | 21.8 °C ±1 °C |
| Ambient pressure | 990.3 mbar ±0.2 mbar |
| Ambient humidity | 21.9 % rel. ±10 % rel. |

Calibration orientation




### Execution

Greenwood, 18. Mar 2024, 414408

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Greenwood. In. 46143-9772
USA
www.endress.com

# Calibration Certificate

Certificate number: W3027115198-20240318

Endress+Hauser
People for Process Automation

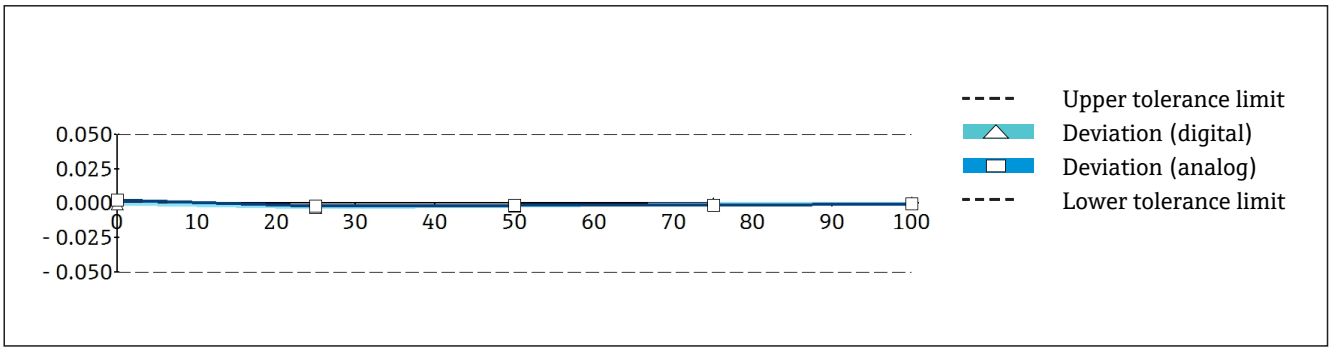
## Factory Calibration - Pressure

### Calibration results

Successfully passed.

### Deviation

% of upper range limit (URL)




| Nominal calibration point [%] | Reference pressure [psi] | UUT output (digital) [psi] | Measurement error (digital) [% of URL] | Measurement error (digital) [psi] | Reference pressure (Iout calc.) [mA] | UUT output (analog) [mA] | Measurement error (analog) [% of URL] |
|---|---|---|---|---|---|---|---|
| 0 | 0.00089 | 0.00044 | -0.00031 | -0.00045 | 4.00009 | 4.00051 | 0.00268 |
| 25 | 37.4965 | 37.4921 | -0.00302 | -0.00440 | 7.99963 | 7.99935 | -0.00180 |
| 50 | 74.9996 | 74.9968 | -0.00192 | -0.00280 | 12.0000 | 11.9997 | -0.00163 |
| 75 | 112.498 | 112.498 | -0.00017 | 0.00000 | 15.9998 | 15.9996 | -0.00141 |
| 100.0 | 149.990 | 149.990 | 0.00017 | 0.00000 | 19.9989 | 19.9989 | -0.00031 |

### Standards used

| Asset | Manufacturer | Type | Certificate | Due date |
|---|---|---|---|---|
| MY57508522 | Keysight | 34410A | 20230747 | 11/30/2024 |
| 136516 | Paroscientific | 1000-15A | 20220706 | 07/31/2024 |
| 70285 | Fluke | Fluke 7250i | 20240114 | 02/28/2025 |
| 011.0620.0802.034 | Lufft | OPUS 20 THIP Typ 8120.11 | 5004/D-K-15202-01-00/2020-6 | 07/31/2024 |

Hereby we confirm that all measuring equipment used to assure the quality of the products has been calibrated and is traceable to national (e.g. PTB, NIST) or international standards. The calibration was performed in compliance with an ISO 9001 quality management system. The observance of recalibration interval is under the responsibility of the user.

# Calibration Certificate

Certificate number: W3027215198-20240318

Endress+Hauser
People for Process Automation

## Factory Calibration - Pressure

### Order information

| | |
|---|---|
| Customer name | OPTIMAL CONTROL SYSTEMS INC |
| Customer purchase order | 24-0184 |
| Sales order number / Item | 3004185544/0010 |
| Internal order number / Item | 3021278590000010 |

### Device information

| | |
|---|---|
| Description | Cerabar PMP71B |
| TAG | 350PIT1106 |
| Serial number | W3027215198 |
| Order code | PMP71B-5RN69/0 |
| Extended order code | PMP71B-CABAFJH6AA3PFA1VXJA1+AAF1I7Z1 |

### Additional information

| | |
|---|---|
| Device condition | New |
| Adjustment | No |
| Sensor range | -15...150 psi rel |
| Adjusted measuring range | 0...150 psi rel |
| Maximum permissible error | ± 0.05 % of upper range limit (URL) |
| Calibrated output | 4-20 mA HART |
| Software version | 01.00.01 |
| Output mode | linear |

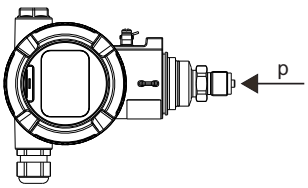
### Procedure

| | |
|---|---|
| Test specification | 160000559 / 160000554, Comparison of unit under test (UUT) with standard |
| Calibration rig | 15104 / 15106 |

### Measuring condition

| | |
|---|---|
| Ambient temperature | 22.0 °C ±1 °C |
| Ambient pressure | 989.7 mbar ±0.2 mbar |
| Ambient humidity | 21.2 % rel. ±10 % rel. |

Calibration orientation

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USA
www.endress.com

# Calibration Certificate

Certificate number: W3027215198-20240318

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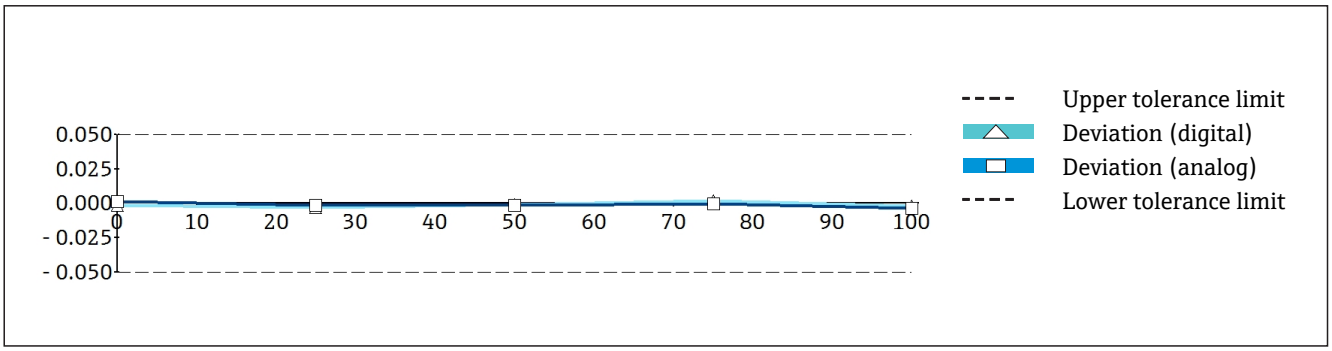
## Factory Calibration - Pressure

### Calibration results

Successfully passed.

### Deviation

% of upper range limit (URL)




| Nominal calibration point [%] | Reference pressure [psi] | UUT output (digital) [psi] | Measurement error (digital) [% of URL] | Measurement error (digital) [psi] | Reference pressure (Iout calc.) [mA] | UUT output (analog) [mA] | Measurement error (analog) [% of URL] |
|---|---|---|---|---|---|---|---|
| -0 | -0.00117 | -0.00293 | -0.00121 | -0.00176 | 3.99988 | 4.00005 | 0.00114 |
| 25 | 37.4982 | 37.4940 | -0.00290 | -0.00420 | 7.99980 | 7.99957 | -0.00150 |
| 50 | 75.0071 | 75.0063 | -0.00057 | -0.00080 | 12.0008 | 12.0006 | -0.00120 |
| 75 | 112.490 | 112.493 | 0.00218 | 0.00300 | 15.9989 | 15.9988 | -0.00053 |
| 100.0 | 149.990 | 149.987 | -0.00170 | -0.00300 | 19.9989 | 19.9984 | -0.00331 |

### Standards used

| Asset | Manufacturer | Type | Certificate | Due date |
|---|---|---|---|---|
| MY57508522 | Keysight | 34410A | 20230747 | 11/30/2024 |
| 136516 | Paroscientific | 1000-15A | 20220706 | 07/31/2024 |
| 70285 | Fluke | Fluke 7250i | 20240114 | 02/28/2025 |
| 011.0620.0802.034 | Lufft | OPUS 20 THIP Typ 8120.11 | 5004/D-K-15202-01-00/2020-6 | 07/31/2024 |

Hereby we confirm that all measuring equipment used to assure the quality of the products has been calibrated and is traceable to national (e.g. PTB, NIST) or international standards. The calibration was performed in compliance with an ISO 9001 quality management system. The observance of recalibration interval is under the responsibility of the user.

TI01509P/00/EN/07.24-00
71647844
2024-03-26



# Technical Information
# **Cerabar PMP71B**

Process pressure and level measurement in liquids or gases

## Digital pressure transmitter with metal process membrane

### Applications

- Pressure measuring ranges: up to 700 bar (10 500 psi)
- Process temperatures: up to 400 °C (752 °F) with diaphragm seal
- Accuracy: up to ±0.025%

### Advantages

The new Cerabar generation introduces a robust pressure transmitter that combines numerous benefits: Easiest local or remote operation, allows condition-based maintenance and offers smart safety in processes. The firmware is designed to ensure extremely easy handling. Intuitive and clear wizard navigation guides the user through the commissioning and verification of the device. The Bluetooth connectivity provides safe and remote operation. The large display with backlight guarantees excellent readability. The Heartbeat Technology software package offers an on-demand verification and monitoring function to detect undesired anomalies. These undesired anomalies include dynamic pressure shocks or changes in the supply voltage, for example.

Endress+Hauser
People for Process Automation

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# About this document

## Symbols

### 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.

### Electrical symbols

*Ground connection:* ⏚

Terminal for connection to the grounding system.

### Symbols for certain types of information

*Permitted:* ✓

Procedures, processes or actions that are permitted.

*Forbidden:* ✗

Procedures, processes or actions that are forbidden.

*Additional information:* ℹ

*Reference to documentation:* 📖

*Reference to page:* 📄

*Series of steps:* 1., 2., 3.

*Result of an individual step:* ↳

### Symbols in graphics

*Item numbers: 1, 2, 3 ...*

*Series of steps:* 1., 2., 3.

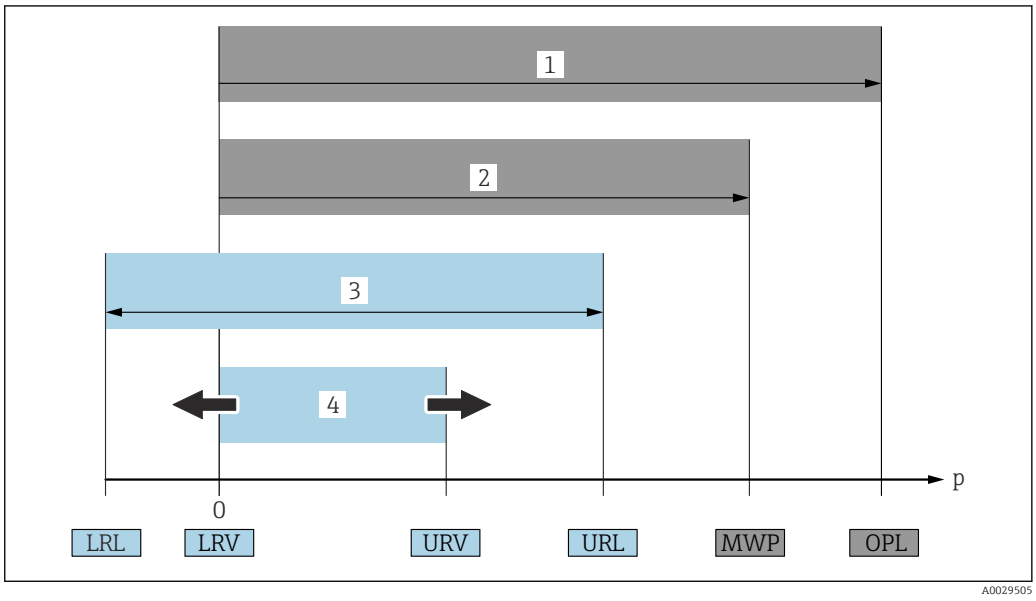
*Views: A, B, C, ...*

### Symbols on the device

*Safety instructions:* ⚠ → 📖

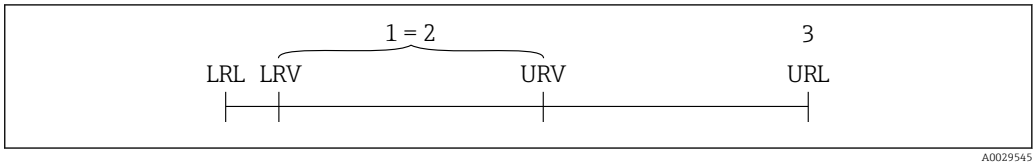
Observe the safety instructions contained in the associated Operating Instructions.

## List of abbreviations




1 *OPL: The OPL (overpressure limit = measuring cell overload limit) for the device depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Pay attention to the pressure/temperature dependency.*
2 *The MWP (maximum working pressure) for the measuring cells depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Pay attention to the pressure/temperature dependency. The MWP may be applied at the device for an unlimited period of time. The MWP can be found on the nameplate.*
3 *The maximum measuring range corresponds to the span between the LRL and URL. This measuring range is equivalent to the maximum calibratable/adjustable span.*
4 *The calibrated/adjusted span corresponds to the span between the LRV and URV. Factory setting: 0 to URL. Other calibrated spans can be ordered as customized spans.*
*p Pressure*
*LRL Lower range limit*
*URL Upper range limit*
*LRV Lower range value*
*URV Upper range value*
*TD Turn down. Example - see the following section.*

## Turn down calculation




1 *Calibrated/adjusted span*
2 *Zero point-based span*
3 *Upper range limit*

Example:
- Measuring cell: 10 bar (150 psi)
- Upper range limit (URL) = 10 bar (150 psi)
- Calibrated/adjusted span: 0 to 5 bar (0 to 75 psi)
- Lower range value (LRV) = 0 bar (0 psi)
- Upper range value (URV) = 5 bar (75 psi)

$$TD = \frac{URL}{|URV - LRV|}$$

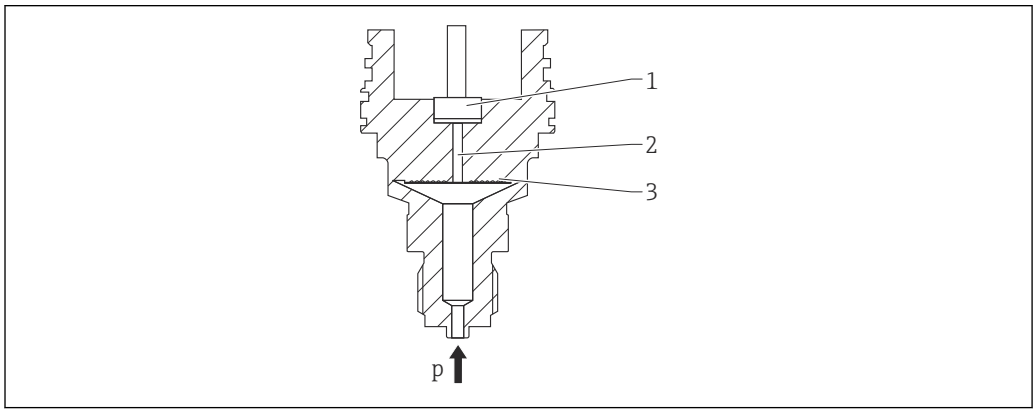
In this example, the TD is therefore 2:1. This measuring span is based on the zero point.

# Function and system design

## Measuring principle

### Metallic membrane

*Standard device (without diaphragm seal)*



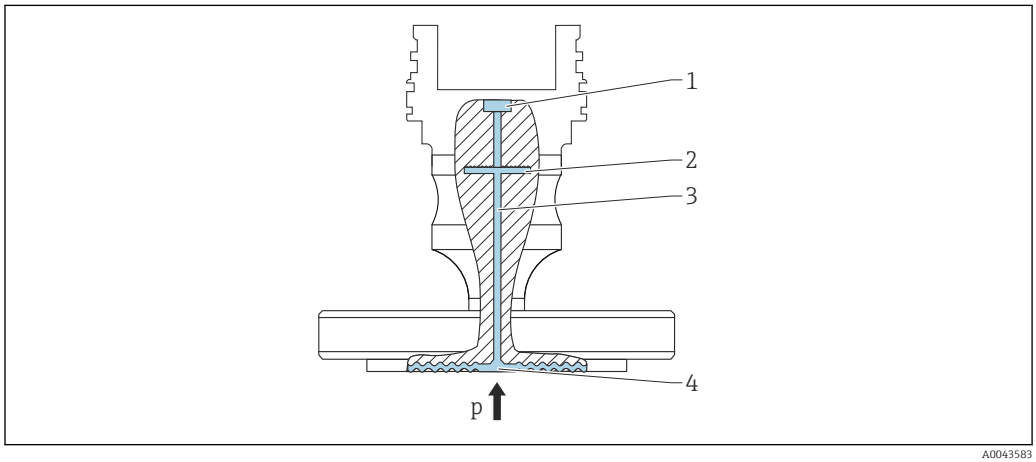

A0043089

*1 Measuring element*
*2 Channel with fill fluid*
*3 Metallic membrane*
*p Pressure*

The pressure deflects the metallic membrane of the measuring cell. A fill fluid transfers the pressure to a Wheatstone bridge (semiconductor technology). The pressure-dependent change in the bridge output voltage is measured and evaluated.

**Advantages:**
- Can be used for high pressures
- High long-term stability
- High overload resistance
- Secondary containment for enhanced integrity
- Significantly reduced thermal effect e.g. compared to diaphragm seal systems with capillaries

*Device with diaphragm seal*




A0043583

*1 Measuring element*
*2 Internal membrane*
*3 Channel with fill fluid*
*4 Metallic membrane*
*p Pressure*

The pressure acts on the membrane of the diaphragm seal and is transferred to the internal membrane by a fill fluid. The internal membrane is deflected. A fill fluid transfers the pressure to the

measuring element on which a resistance bridge is located. The pressure-dependent change in the bridge output voltage is measured and evaluated.

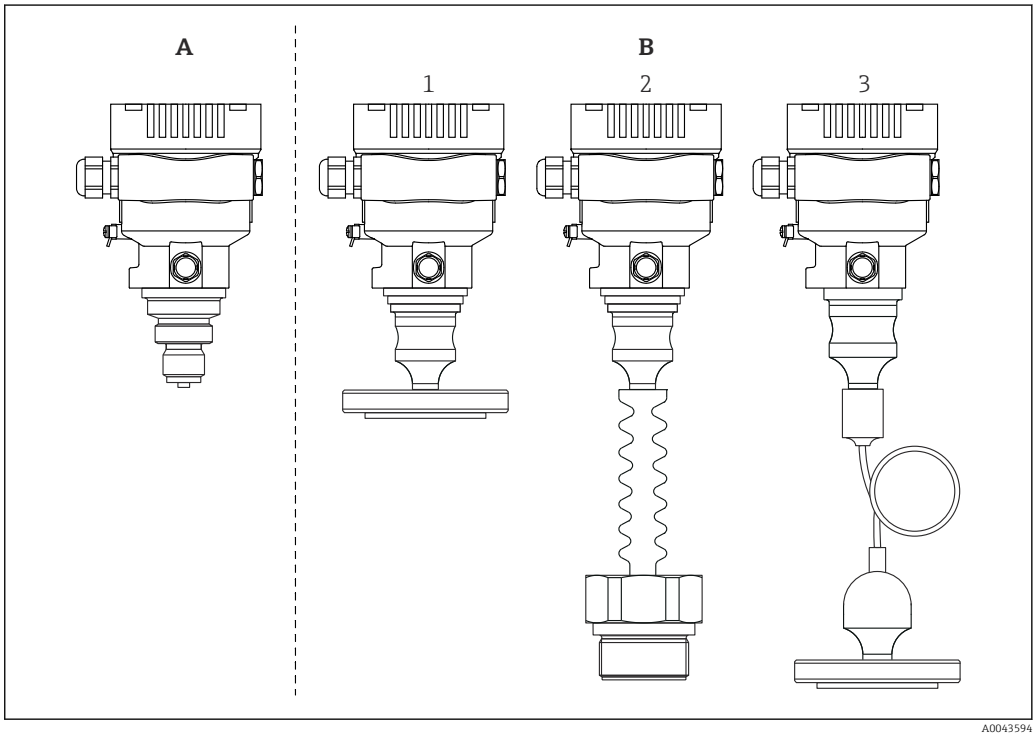
**Advantages:**
- Depending on the version, can be used for pressures up to 400 bar (6 000 psi) and for extreme process temperatures
- High long-term stability
- High overload resistance
- Standard device (without diaphragm seal): secondary containment for enhanced integrity

*Applications for diaphragm seals*

Diaphragm seal systems are used if the process and the device need to be separated. Diaphragm seal systems offer clear advantages in the following instances:
- In the case of extreme process temperatures - through the use of temperature isolators or capillaries
- In the case of strong vibrations - decouple the process from the device by using a capillary
- In the case of aggressive or corrosive media - through the use of high-durability membrane materials
- In the case of media that crystallize or contain solids - through the choice of suitable coatings
- In the case of heterogeneous and fibrous process media
- If extreme measuring point cleaning is necessary, or in the event of very damp mounting locations
- For mounting locations that are difficult to access

## Measuring system

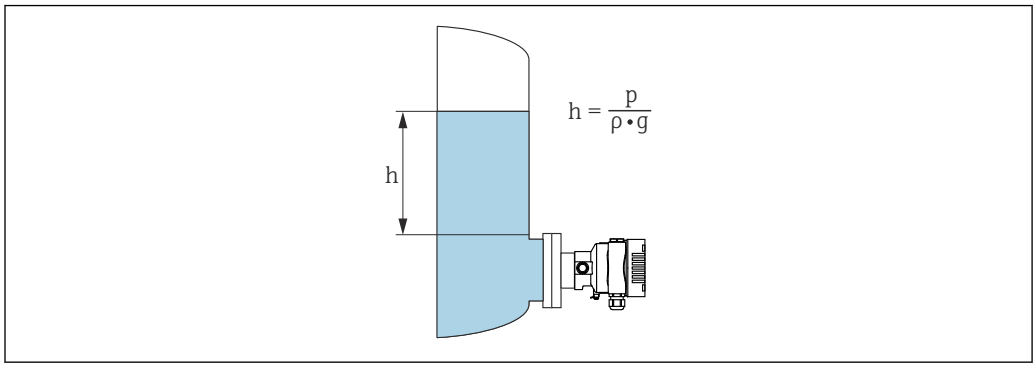
### Device versions




*A Standard device (without diaphragm seal)*
*B Device with diaphragm seal*
*1 Compact diaphragm seal type*
*2 Diaphragm seal type with temperature isolator*
*3 Diaphragm seal type with capillary*

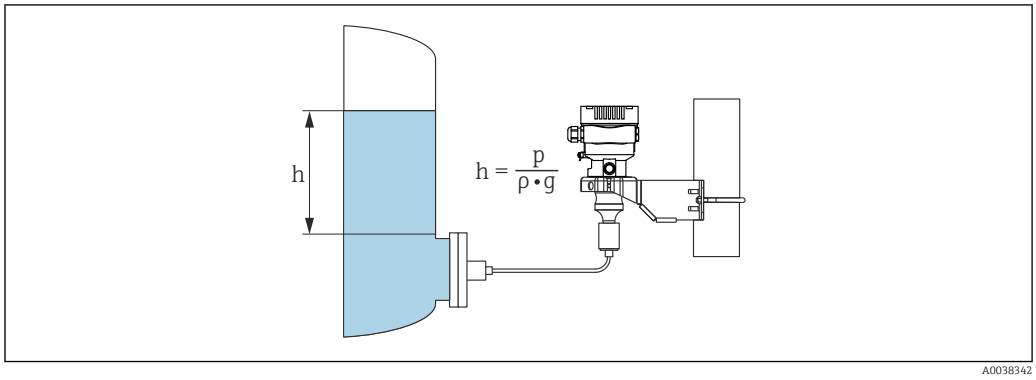
**Level measurement (level, volume and mass)**

*Standard device (without diaphragm seal)*




*h* *Height (level)*
*p* *Pressure*
*ρ* *Density of the medium*
*g* *Gravitational acceleration*

*Device with diaphragm seal*




1 *Sample illustration: diaphragm seal with capillary*

*h* *Height (level)*
*p* *Pressure*
*ρ* *Density of the medium*
*g* *Gravitational acceleration*

*Advantages:*

- Volume and mass measurements in any vessel shape with a freely programmable characteristic curve
- Has a wide range of uses, e.g.
  - For foam formation
  - In vessels with agitators or screen fittings
  - For liquid gases

**Communication and data processing**

- 4 to 20 mA with HART communication protocol
- Bluetooth (optional)
- PROFINET with Ethernet-APL: 10BASE-T1L communication protocol

**Dependability for devices with HART, Bluetooth, PROFINET with Ethernet-APL**

**IT security**

Endress+Hauser can only provide a warranty 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 device settings. IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

**Device-specific IT security**

The device offers specific functions to support protective measures by the operator. These functions can be configured by the user and guarantee greater in-operation safety if used correctly. An overview of the most important functions is provided in the following section:

- Write protection via hardware write protection switch
- Access code to change user role (applies to operation via the display, Bluetooth or FieldCare, DeviceCare and asset management tools (e.g. AMS, PDM and Web server)

| Function/interface | Factory setting | Recommendation |
|---|---|---|
| Access code<br>(also applies to Web server login or FieldCare connection) | Not enabled<br>(0000) | Assign a customized access code during commissioning. |
| Web server | Enabled | On an individual basis following risk assessment. |
| Service interface (CDI) | Enabled | On an individual basis following risk assessment. |
| Write protection via hardware write protection switch | Not enabled | On an individual basis following risk assessment. |

*Protecting access via a password*

Different passwords are available to protect write access to the parameters of the device.

Protect write access to the parameters of the device via the local display, Web browser or operating tool (e.g. FieldCare, DeviceCare). Access authorization is clearly regulated through the use of a user-specific access code.

*User-specific access code*

Write access to the parameters of the device via the local display, Web browser or operating tool (e.g. FieldCare, DeviceCare) can be protected using the editable, user-specific access code.

*General notes on the use of passwords*

- During commissioning, change the access code used when the device was delivered
- When defining and managing the access code, comply with the general rules for the generation of a secure password
- The user is responsible for managing the access code and for using the code with due care

*Access via Web server*

Thanks to the integrated Web server, the device can be operated and configured using a Web browser and via PROFINET with Ethernet-APL. In addition to the measured values, status information on the device is displayed and can be used to monitor device health. Furthermore the device data can be managed and the network parameters can be configured.

Access to the network is required for the PROFINET with Ethernet-APL connection.

*Supported functions*
Data exchange between the operating unit (such as a notebook, for example,) and measuring device:
- Export parameter settings (PDF file, create documentation of the measuring point configuration)
- Export the Heartbeat Technology verification report (PDF file, only available with the "Heartbeat Verification" application package)
- Download driver (GSDML) for system integration

The Web server is enabled when the device is delivered. The Web server can be disabled via the **Web server functionality** parameter if necessary (e.g. after commissioning).

The device and status information can be hidden on the login page. This prevents unauthorized access to the information.

Detailed information on the device parameters:
"Description of Device Parameters" document

# Input

**Measured variable**

**Measured process variables**

- Absolute pressure
- Gauge pressure

**Measuring range**

Depending on the device configuration, the maximum working pressure (MWP) and the overpressure limit (OPL) can deviate from the values in the tables.

*Absolute pressure*

| Measuring cell | Maximum measuring range [1] | | Smallest calibratable span (preset at factory) [2] [3] | |
|---|---|---|---|---|
| | lower (LRL) | upper (URL) | | |
| | [$bar_{abs}$ ($psi_{abs}$)] | [$bar_{abs}$ ($psi_{abs}$)] | [bar (psi)] | Platinum |
| 400 mbar (6 psi) | 0 | +0.4 (+6) | 0.005 (0.075) [4] | 80 mbar (1.2 psi) |
| 1 bar (15 psi) | 0 | +1 (+15) | 0.01 (0.15) [5] | 200 mbar (3 psi) |
| 2 bar (30 psi) | 0 | +2 (+30) | 0.02 (0.3) [5] | 400 mbar (6 psi) |
| 4 bar (60 psi) | 0 | +4 (+60) | 0.04 (0.6) [5] | 800 mbar (12 psi) |
| 10 bar (150 psi) | 0 | +10 (+150) | 0.1 (1.5) [5] | 2 bar (30 psi) |
| 40 bar (600 psi) | 0 | +40 (+600) | 0.4 (6) [5] | 8 bar (120 psi) |
| 100 bar (1 500 psi) | 0 | +100 (+1500) | 1.0 (15) [5] | 20 bar (300 psi) |
| 400 bar (6 000 psi) | 0 | +400 (+6000) | 4.0 (60) [5] | 80 bar (1 200 psi) |
| 700 bar (10 500 psi) [6] | 0 | +700 (+10500) | 7.0 (105) [5] | 140 bar (2 100 psi) |

1) Device with diaphragm seal: Within the measuring range, the minimum upper range value of 80 $mbar_{abs}$ (1.16 $psi_{abs}$) must be observed.
2) Turn down > 100:1 on request or can be configured at the device
3) The maximum TD is 5:1 in the case of platinum.
4) Largest factory-configurable turn down: 80:1
5) Largest factory-configurable turn down: 100:1
6) Only for standard device (without diaphragm seal). On request for device with diaphragm seal.

*Absolute pressure*

| Measuring cell | MWP | OPL | Vacuum resistance [1] | Burst pressure [2] |
|---|---|---|---|---|
| | [$bar_{abs}$ ($psi_{abs}$)] | [$bar_{abs}$ ($psi_{abs}$)] | [$bar_{abs}$ ($psi_{abs}$)] | [bar (psi)] |
| 400 mbar (6 psi) | 4 (60) | 6 (90) | ▪ Silicone oil: 0.01 (0.15)<br>▪ Inert oil: 0.04 (0.6) | 100 (1450) |
| 1 bar (15 psi) | 6.7 (100) | 10 (150) | | 100 (1450) |
| 2 bar (30 psi) | 13.3 (200) | 20 (300) | | 100 (1450) |
| 4 bar (60 psi) | 18.7 (280.5) | 28 (420) | | 100 (1450) |
| 10 bar (150 psi) | 26.7 (400.5) | 40 (600) | | 100 (1450) |
| 40 bar (600 psi) | 100 (1500) | 160 (2400) | | 250 (3625) |
| 100 bar (1 500 psi) | 100 (1500) | 400 (6000) [3] | | 1000 (14500) |
| 400 bar (6 000 psi) | 400 (6000) | 600 (9000) | | 2000 (29000) |
| 700 bar (10 500 psi) [4] | 700 (10500) | 1050 (15750) | | 2800 (40600) |

1) The vacuum resistance applies for the measuring cell under reference operating conditions. A ceramic membrane is recommended for applications in the limit range. Device with diaphragm seal: Observe the pressure and temperature application limits of the selected fill fluid.
2) The information applies to the standard device (without a diaphragm seal).
3) OPL optional 160 bar (2 400 psi) in low-temperature version.
4) Only for standard device (without diaphragm seal). On request for device with diaphragm seal.

*Gauge pressure*

| Measuring cell | Maximum measuring range | | Smallest calibratable span (preset at factory) [1) 2)] | |
|---|---|---|---|---|
| | lower (LRL) | upper (URL) | | |
| | [bar (psi)] | [bar (psi)] | [bar (psi)] | Platinum |
| 400 mbar (6 psi) | −0.4 (−6) | +0.4 (+6) | 0.005 (0.075) | 80 mbar (1.2 psi) |
| 1 bar (15 psi) | −1 (−15) | +1 (+15) | 0.01 (0.15) | 200 mbar (3 psi) |
| 2 bar (30 psi) | −1 (−15) | +2 (+30) | 0.02 (0.3) | 400 mbar (6 psi) |
| 4 bar (60 psi) | −1 (−15) | +4 (+60) | 0.04 (0.6) | 800 mbar (12 psi) |
| 10 bar (150 psi) | −1 (−15) | +10 (+150) | 0.1 (1.5) | 2 bar (30 psi) |
| 40 bar (600 psi) | −1 (−15) | +40 (+600) | 0.4 (6) | 8 bar (120 psi) |
| 100 bar (1 500 psi) | −1 (−15) | +100 (+1500) | 1.0 (15) | 20 bar (300 psi) |
| 400 bar (6 000 psi) | −1 (−15) | +400 (+6000) | 4.0 (60) | 80 bar (1 200 psi) |
| 700 bar (10 500 psi) [3)] | −1 (−15) | +700 (+10500) | 7.0 (105) | 140 bar (2 100 psi) |

1) Turn down > 100:1 on request or can be configured at the device
2) The maximum TD is 5:1 in the case of platinum.
3) Only for standard device (without diaphragm seal). On request for device with diaphragm seal.

*Gauge pressure*

| Measuring cell | MWP | OPL | Vacuum resistance [1)] | Burst pressure [2)] |
|---|---|---|---|---|
| | [bar (psi)] | [bar (psi)] | [$bar_{abs}$ ($psi_{abs}$)] | [bar (psi)] |
| 400 mbar (6 psi) | 4 (60) | 6 (90) | ▪ Silicone oil: 0.01 (0.15)<br>▪ Inert oil: 0.04 (0.6) | 100 (1450) |
| 1 bar (15 psi) | 6.7 (100) | 10 (150) | | 100 (1450) |
| 2 bar (30 psi) | 13.3 (200) | 20 (300) | | 100 (1450) |
| 4 bar (60 psi) | 18.7 (280.5) | 28 (420) | | 100 (1450) |
| 10 bar (150 psi) | 26.7 (400.5) | 40 (600) | | 100 (1450) |
| 40 bar (600 psi) | 100 (1500) | 160 (2400) | | 250 (3625) |
| 100 bar (1 500 psi) | 100 (1500) | 400 (6000) [3)] | | 1000 (14500) |
| 400 bar (6 000 psi) | 400 (6000) | 600 (9000) | | 2000 (29000) |
| 700 bar (10 500 psi) [4)] | 700 (10500) | 1050 (15750) | | 2800 (40600) |

1) The vacuum resistance applies for the measuring cell under reference operating conditions. A ceramic membrane is recommended for applications in the limit range. Device with diaphragm seal: Observe the pressure and temperature application limits of the selected fill fluid.
2) The information applies to the standard device (without a diaphragm seal).
3) OPL optional 160 bar (2 400 psi) in low-temperature version.
4) Only for standard device (without diaphragm seal). On request for device with diaphragm seal.

# Output

**Output signal**

**Current output**

4 to 20 mA with superimposed digital communication protocol HART, 2-wire

The current output offers a choice of three different operating modes:
- 4.0 to 20.5 mA
- NAMUR NE 43: 3.8 to 20.5 mA (factory setting)
- US mode: 3.9 to 20.8 mA

**PROFINET with Ethernet-APL**

10BASE-T1L, 2-wire 10 Mbit

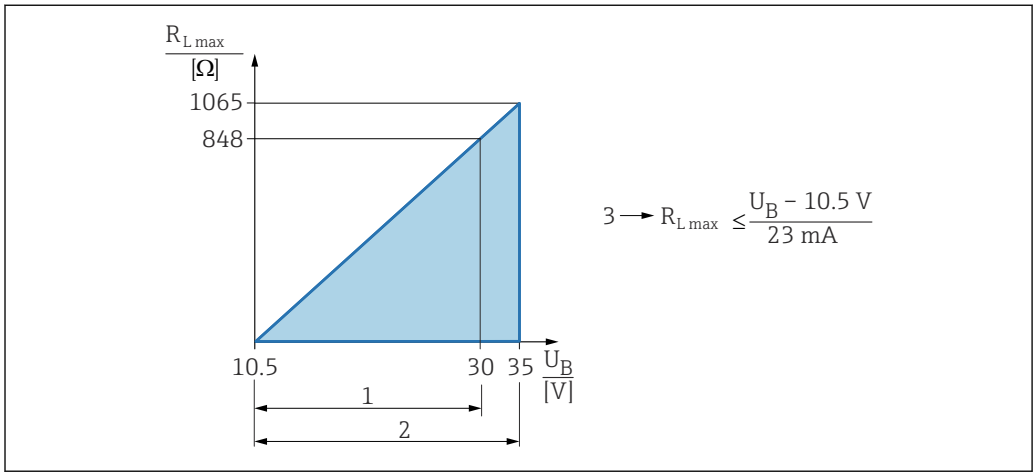
**Signal on alarm**

Signal on alarm in accordance with NAMUR recommendation NE 43.

- 4 to 20 mA HART:
  Options:
  - Max alarm: can be set from 21.5 to 23 mA
  - Min. alarm: < 3.6 mA (factory setting)
- PROFINET with Ethernet-APL:
  - According to "Application layer protocol for decentralized periphery", Version 2.4
  - Diagnostics according to PROFINET PA Profile 4.02

**Load**

**4 to 20 mA HART**




*1 Power supply 10.5 to 30 VDC Ex i*
*2 Power supply 10.5 to 35 VDC, for other types of protection and non-certified device versions*
*3 $R_{Lmax}$ maximum load resistance*
*$U_B$ Supply voltage*

Operation via handheld terminal or PC with operating program: take minimum communication resistance of 250 Ω into consideration.

**Damping**

A damping affects all outputs (output signal, display). Damping can be enabled as follows:
- Via the onsite display, Bluetooth, handheld terminal or PC with operating program, continuous from 0 to 999 seconds
- Factory setting: 1 s

**Ex connection data**

See the separate technical documentation (Safety Instructions (XA)) on www.endress.com/download.

**Linearization**

The device's linearization function allows the user to convert the measured value to any units of height or volume. User-defined linearization tables of up to 32 value pairs can be entered if necessary.

**Protocol-specific data**

### HART

- Manufacturer ID: 17 (0x11{hex})
- Device type ID: 0x112A
- Device revision: 1
- HART specification: 7
- DD revision: 1
- Device description files (DTM, DD) information and files at:
  - www.endress.com
  - www.fieldcommgroup.org
- HART load: min. 250 Ohm

*HART device variables (preset at the factory)*

The following measured values are assigned to the device variables at the factory:

| Device variable | Measured value |
|---|---|
| Primary variable (PV) [1] | Pressure [2] |
| Secondary variable (SV) | Sensor temperature |
| Tertiary variable (TV) | Electronics temperature |
| Quaternary variable (QV) | Sensor pressure [3] |

1) The PV is always applied to the current output.
2) The pressure is the calculated signal after damping and position adjustment.
3) The Sensor pressure is the raw signal of the measuring cell before damping and position adjustment.

*Choice of HART device variables*

- **Pressure** option (after position adjustment and damping)
- Scaled variable
- Sensor temperature
- Sensor pressure
  Sensor Pressure is the raw signal from sensor before damping and position adjustment.
- Electronics temperature
- Terminal current
  The terminal current is the read-back current on terminal block.
- Terminal voltage 1
  Visibility depends on order options or device settings
- **Noise of pressure signal** option and **Median of pressure signal** option
  Visible if Heartbeat Technology ordered
- Percent of range
- Loop current
  The loop current is the output current set by the applied pressure.

*Supported functions*

- Burst mode
- Additional transmitter status
- Device locking

### PROFINET with Ethernet-APL

| | |
|---|---|
| **Protocol** | Application layer protocol for decentral device periphery and distributed automation, Version 2.4 |
| **Communication type** | Ethernet Advanced Physical Layer 10BASE-T1L |
| **Conformance Class** | Conformance Class B |
| **Netload Class** | Netload Class II |
| **Baud rates** | Automatic 10 Mbit/s with full-duplex detection |
| **Cycle times** | From 32 ms |
| **Polarity** | Auto-polarity for automatic correction of crossed TxD and RxD pairs |

| | |
|---|---|
| **Media Redundancy Protocol (MRP)** | Yes |
| **System redundancy support** | System redundancy S2 (2 AR with 1 NAP) |
| **Device profile** | Application interface identifier 0xB310<br>Generic device |
| **Manufacturer ID** | 0x11 |
| **Device type ID** | A22A |
| **Device description files (GSD, FDI, DTM, DD)** | Information and files available at:<br>▪ www.endress.com<br>On the product page for the device: Documents/Software → Device drivers<br>▪ www.profibus.org |
| **Supported connections** | ▪ 2 x AR (IO Controller AR)<br>▪ 1 x AR (IO-Supervisor Device AR connection allowed)<br>▪ 1 x Input CR (Communication Relation)<br>▪ 1 x Output CR (Communication Relation)<br>▪ 1 x Alarm CR (Communication Relation) |
| **Configuration options for device** | ▪ Manufacturer-specific software (FieldCare, DeviceCare)<br>▪ Web browser<br>▪ Device master file (GSD), can be read out via the integrated Web server of the device<br>▪ DIP switch for setting the service IP address |
| **Configuration of the device name** | ▪ DCP protocol<br>▪ Process Device Manager (PDM)<br>▪ Integrated Web server |
| **Supported functions** | ▪ Identification & maintenance<br>Simple device identification via:<br>▪ Control system<br>▪ Nameplate<br>▪ Measured value status<br>The process variables are communicated with a measured value status<br>▪ Blinking feature via the local display for simple device identification and assignment<br>▪ Device operation via operating tools (e.g., FieldCare, DeviceCare, SIMATIC PDM) |
| **System integration** | For information on system integration, see Operating Instructions<br>▪ Cyclic data transmission<br>▪ Overview and description of the modules<br>▪ Status coding<br>▪ Startup configuration<br>▪ Factory setting |

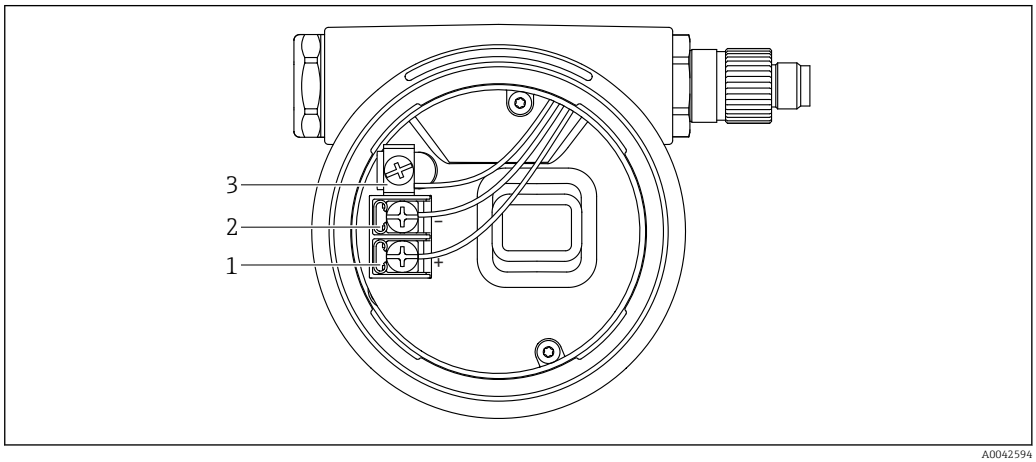
**Wireless HART data**

- Minimum starting voltage: 10.5 V
- Start-up current: 3.6 mA
- Start-up time: <5 s
- Minimum operating voltage: 10.5 V
- Multidrop current: 4 mA

# Power supply

## Terminal assignment

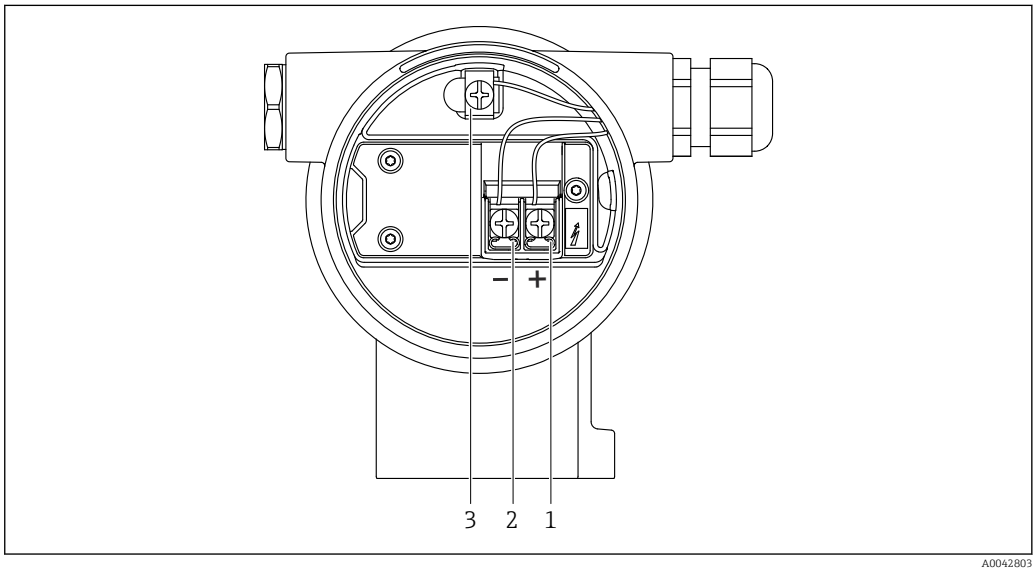
### Single compartment housing




2 *Connection terminals and ground terminal in the connection compartment*

1 *Positive terminal*
2 *Negative terminal*
3 *Internal ground terminal*

### Dual compartment housing




3 *Connection terminals and ground terminal in the connection compartment*

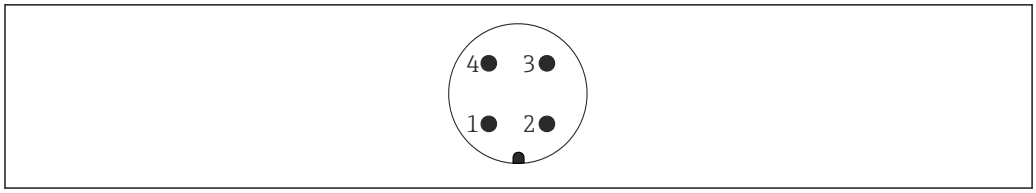
1 *Positive terminal*
2 *Negative terminal*
3 *Internal ground terminal*

## Available device plugs

In the case of devices with a plug, it is not necessary to open the housing for connection purposes.

Use the enclosed seals to prevent the penetration of moisture into the device.

**Devices with M12 plug**




4 *View of the plug-in connection on the device*

| Pin | HART |
|---|---|
| 1 | Signal + |
| 2 | Not assigned |
| 3 | Signal – |
| 4 | Ground |

| Pin | PROFINET with Ethernet-APL |
|---|---|
| 1 | APL signal – |
| 2 | APL signal + |
| 3 | Shielding |
| 4 | Not assigned |

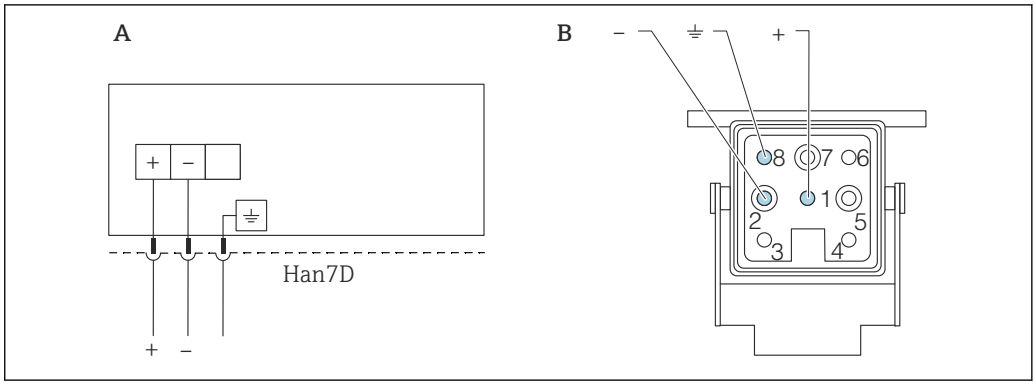
Endress+Hauser offers the following accessories for devices with an M12 plug:

Plug-in jack M 12x1, straight
- Material:
  Body: PBT; union nut: nickel-plated die-cast zinc; seal: NBR
- Degree of protection (fully locked): IP67
- Order number: 52006263

Plug-in jack M 12x1, elbowed (not for PROFINET with Ethernet-APL)
- Material:
  Body: PBT; union nut: nickel-plated die-cast zinc; seal: NBR
- Degree of protection (fully locked): IP67
- Order number: 71114212

Cable 4x0.34 $mm^2$ (20 AWG) with M12 plug-in jack, elbowed, screw plug, length 5 m (16 ft)
- Material: body: TPU; union nut: nickel-plated die-cast zinc; cable: PVC
- Degree of protection (fully locked): IP67/68
- Order number: 52010285
- Cable colors
  - 1 = BN = brown
  - 2 = WT = white
  - 3 = BU = blue
  - 4 = BK = black

### Devices with a Harting plug Han7D




*A Electrical connection for devices with Harting plug Han7D*
*B View of the plug-in connection on the device*
*- Brown*
*⏚ Green/yellow*
*+ Blue*

Material: CuZn, gold-plated contacts of the plug-in jack and plug

## Supply voltage

- Analog/HART: Ex d, Ex e, non-Ex: supply voltage: 10.5 to 35 $V_{DC}$
- Analog/HART: Ex i: supply voltage: 10.5 to 30 $V_{DC}$
- HART: Nominal current: 4 to 20 mA HART
- PROFINET over Ethernet-APL: APL performance class A (9.6 to 15 $V_{DC}$ 540 mW)

Analog/HART: The power unit must be safety-approved (e.g. PELV, SELV, Class 2) and must comply with the relevant protocol specifications. For 4 to 20 mA, the same requirements apply as for HART.

PROFINET with Ethernet-APL: The APL field switch must be safety-approved (e.g. PELV, SELV, Class 2) and must comply with the relevant protocol specifications.

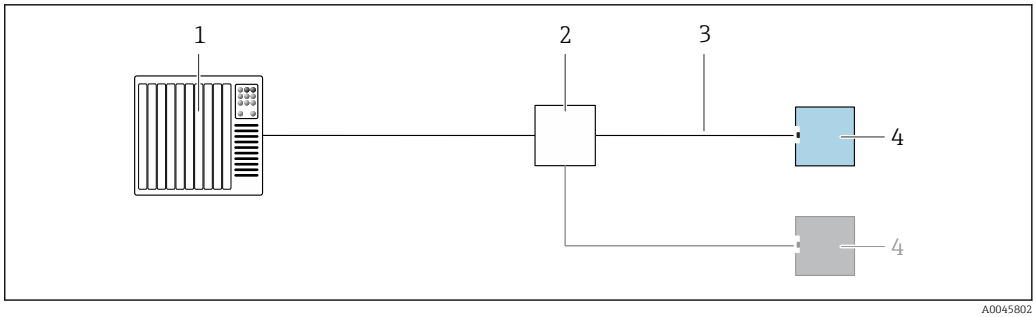
A suitable circuit breaker should be provided for the device in accordance with IEC/EN 61010.

Depending on the supply voltage when the device is switched on
- the background lighting is switched off (supply voltage <15 V)
- the Bluetooth function (order option) is also switched off (supply voltage <12 V)

## Electrical connection

### Connection examples

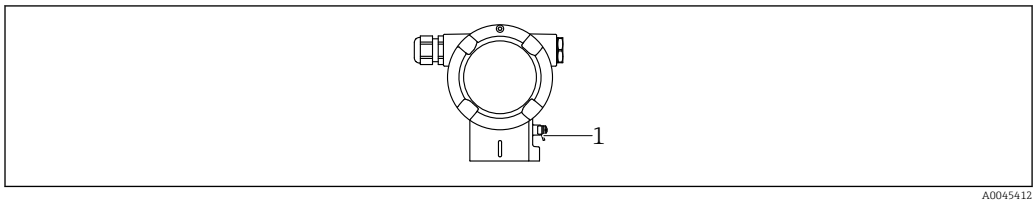
*PROFINET with Ethernet-APL*




*5 Connection example for PROFINET with Ethernet-APL*

*1 Automation system*
*2 APL field switch*
*3 Observe cable specifications*
*4 Transmitter*

## Potential equalization

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*1 Ground terminal for connecting the potential matching line*

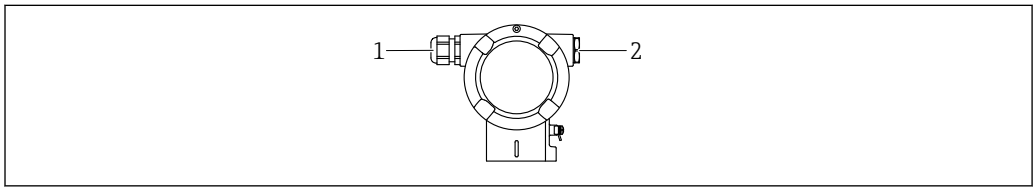
If necessary, the potential matching line can be connected to the outer ground terminal of the device before the device is connected.

For optimum electromagnetic compatibility:
- Keep the potential matching line as short as possible
- Maintain a cross-section of at least 2.5 mm² (14 AWG)

## Terminals

- Supply voltage and internal ground terminal: 0.5 to 2.5 mm² (20 to 14 AWG)
- External ground terminal: 0.5 to 4 mm² (20 to 12 AWG)

## Cable entries

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*1 Cable entry*
*2 Dummy plug*

The type of cable entry depends on the device version ordered.

Always route connecting cables downwards so that moisture cannot penetrate the connection compartment.

If necessary, create a drip loop or use a weather protection cover.

## Cable specification

- The cable outer diameter depends on the cable entry used
- Cable outer diameter
  - Plastic: Ø5 to 10 mm (0.2 to 0.38 in)
  - Nickel-plated brass: Ø7 to 10.5 mm (0.28 to 0.41 in)
  - Stainless steel: Ø7 to 12 mm (0.28 to 0.47 in)

### PROFINET with Ethernet-APL

The reference cable type for APL segments is fieldbus cable type A, MAU type 1 and 3 (specified in IEC 61158-2). This cable meets the requirements for intrinsically safe applications according to IEC TS 60079-47 and can also be used in non-intrinsically safe applications.

| | |
|---|---|
| **Cable type** | A |
| **Cable capacitance** | 45 to 200 nF/km |
| **Loop resistance** | 15 to 150 Ω/km |
| **Cable inductance** | 0.4 to 1 mH/km |

Further details are provided in the Ethernet-APL Engineering Guideline (https://www.ethernet-apl.org).

## Overvoltage protection

### Devices without optional overvoltage protection

Equipment from Endress+Hauser fulfills the requirements of the product standard IEC / DIN EN 61326-1 (Table 2 Industrial Environment).

Depending on the type of port (DC power supply, input/output port) different testing levels according to IEC / DIN EN 61326-1 against transient overvoltages (Surge) are applied (IEC / DIN EN 61000-4-5 Surge):
Test level on DC power ports and input / output ports is 1000 V line to earth

**Devices with optional overvoltage protection**

- Spark-over voltage: min. 400 V DC
- Tested according to IEC / DIN EN 60079-14 sub chapter 12.3 (IEC / DIN EN 60060-1 chapter 7)
- Nominal discharge current: 10 kA

**Overvoltage category**

Overvoltage category II

# Performance characteristics

**Response time**

- HART: acyclic: min. 330 ms, typically 590 ms (depends on commands and number of preambles)
- HART: cyclic (burst): min. 160 ms, typically 350 ms (depends on commands and number of preambles)
- PROFINET with Ethernet-APL: cyclic: min. 32 ms

**Reference operating conditions**

- As per IEC 62828-2
- Ambient temperature $T_A$ = constant, in the range of +22 to +28 °C (+72 to +82 °F)
- Humidity φ = constant, in the range of: 5 to 80 % rF ± 5 %
- Ambient pressure $p_A$ = constant, in the range of: 860 to 1060 mbar (12.47 to 15.37 psi)
- Position of the measuring cell: horizontal ±1°
- Input of LOW SENSOR TRIM and HIGH SENSOR TRIM for lower range value and upper range value
- Membrane material: AISI 316L (1.4435), Alloy C (Alloy C only for standard device (without diaphragm seal)
- Fill fluid:
  - Silicone oil (standard)
  - Silicone oil, FDA (diaphragm seal)
- Supply voltage: 24 V DC ±3 V DC
- Load with HART: 250 Ω
- Turn down (TD) = URL/ | URV - LRV |
- Zero based span

**Total performance**

The performance characteristics refer to the accuracy of the device. The factors influencing accuracy can be divided into two groups

- Total performance of device
- Installation factors

All performance characteristics are in conformance with ≥ ± 3 sigma.

The total performance of the device comprises the reference accuracy and the ambient temperature effect and is calculated using the following formula:

Total performance = $\pm \sqrt{( (E1)^2 + (E2)^2)}$

E1 = Reference accuracy

E2 = Ambient temperature effect

Influence of diaphragm seal (calculation performed with Applicator "Sizing Diaphragm Seal")

Calculation of E2:

Ambient temperature effect per ±28 °C (50 °F)

(corresponds to the range from −3 to +53 °C (+27 to +127 °F))

$E2 = E2_M + E2_E$

$E2_M$ = Main temperature error

$E2_E$ = Electronics error

- The values apply to membranes made of 316L (1.4435)
- The values refer to the calibrated span.

### Calculation of the total performance with the Endress+Hauser Applicator

Detailed inaccuracies, e.g. for other temperature ranges, can be calculated with the Applicator "Sizing Pressure Performance".

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### Calculation of the diaphragm seal error with the Endress+Hauser Applicator

Diaphragm seal errors are not taken into consideration. They are calculated separately in the Applicator "Sizing Diaphragm Seal".

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**Reference accuracy [E1]**

The reference accuracy comprises the non-linearity according to the limit point method, pressure hysteresis and non-repeatability in accordance with [IEC62828-1 / IEC 61298-2]. Reference accuracy for standard up to TD 100:1, for platinum up to TD 5:1.

*Standard device (without diaphragm seal)*

| Measuring cell | Standard | Platinum [1] |
|---|---|---|
| 400 mbar (6 psi) | TD 1:1 = ±0.05 %<br>TD > 1:1 = ±0.05 % · TD | TD 1:1 = ±0.025 %<br>TD > 1:1 to TD 5:1 = ±0.04 % |
| 1 bar (15 psi) | TD 1:1 to 2.5:1 = ±0.05 %<br>TD > 2.5:1 = ±0.02 % · TD | TD 1:1 = ±0.025 %<br>TD > 1:1 to TD 5:1 = ±0.03 % |
| 2 bar (30 psi) | TD 1:1 to 5:1 = ±0.05 %<br>TD > 5:1 = ±0.01 % · TD | TD 1:1 = ±0.025 %<br>TD > 1:1 to TD 5:1 = ±0.03 % |
| 4 bar (60 psi)<br>10 bar (150 psi)<br>40 bar (600 psi) | TD 1:1 to 10:1 = ±0.05 %<br>TD > 10:1 = ±0.005 % · TD | TD 1:1 = ±0.025 %<br>TD > 1:1 to TD 5:1 = ±0.03 % |
| 100 bar (1 500 psi) | TD 1:1 to 10:1 = ±0.05 %<br>TD > 10:1 = ±0.005 % · TD | TD 1:1 = ±0.035 %<br>TD > 1:1 to TD 5:1 = ±0.04 % |
| 400 bar (6 000 psi)<br>700 bar (10 500 psi) | TD 1:1 to 5:1 = ±0.1 %<br>TD > 5:1 = ±0.02 % · TD | TD 1:1 = ±0.065 %<br>TD > 1:1 to TD 5:1 = ±0.09 % |

1) Platinum not for flush mount process connections G ½, NPT ¾ and M20.

*Devices with diaphragm seal*

| Measuring cell | Standard | Platinum |
|---|---|---|
| 400 mbar (6 psi) | TD 1:1 = ±0.15 %<br>TD > 1:1 = ±0.15 % · TD | not available |
| 1 bar (15 psi) | TD 1:1 to 2.5:1 = ±0.075 %<br>TD > 2.5:1 = ±0.03 % · TD | not available |
| 2 bar (30 psi) | TD 1:1 to 5:1 = ±0.075 %<br>TD > 5:1 = ±0.015 % · TD | not available |
| 4 bar (60 psi)<br>10 bar (150 psi)<br>40 bar (600 psi)<br>100 bar (1 500 psi) | TD 1:1 to 10:1 = ±0.075 %<br>TD > 10:1 = ±0.0075 % · TD | not available |
| 400 bar (6 000 psi) | TD 1:1 to 5:1 = ±0.15 %<br>TD > 5:1 = ±0.03 % · TD | not available |

*Measuring uncertainty for small absolute pressure measuring ranges*

The smallest extended uncertainty of measurement that can delivered by our standards in the 0.001 to 35 mbar (0.0000145 to 0.5075 psi) range is 0.1 % of the reading + 0.004 mbar (0.000058 psi).

**Temperature effect [E2]**

*$E2_M$ - Main temperature error*

The output changes due to the effect of the ambient temperature [IEC 62828-1 / IEC 61298-3] with respect to the reference temperature [IEC 62828-1]. The values specify the maximum error due to min./max. ambient or process temperature conditions.

400 mbar (6 psi), 1 bar (15 psi), 2 bar (30 psi) and 4 bar (60 psi) measuring cell
Standard and platinum: ± (0.04 % · TD + 0.08 %)

10 bar (150 psi) and 40 bar (600 psi) measuring cell
Standard and platinum: ± (0.03 % · TD + 0.03 %)

100 bar (1 500 psi), 400 bar (6 000 psi) and 700 bar (10 500 psi) measuring cell
Standard and platinum: ± (0.015 % · TD + 0.06 %)

*$E2_E$ - Electronics error*

- 4 to 20 mA: 0.05 %
- Digital output HART: 0 %
- Digital output PROFINET: 0 %

**Resolution**

Current output: <1 µA

**Total error**

The total error of the device comprises the total performance and the long-term stability effect and is calculated using the following formula:

Total error = total performance + long-term stability

**Calculation of the total error with the Endress+Hauser Applicator**

Detailed inaccuracies, e.g. for other temperature ranges, can be calculated with the Applicator "Sizing Pressure Performance".

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**Calculation of the diaphragm seal error with the Endress+Hauser Applicator**

Diaphragm seal errors are not taken into consideration. They are calculated separately in the Applicator "Sizing Diaphragm Seal".

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**Long-term stability**

The specifications refer to the upper range limit (URL).

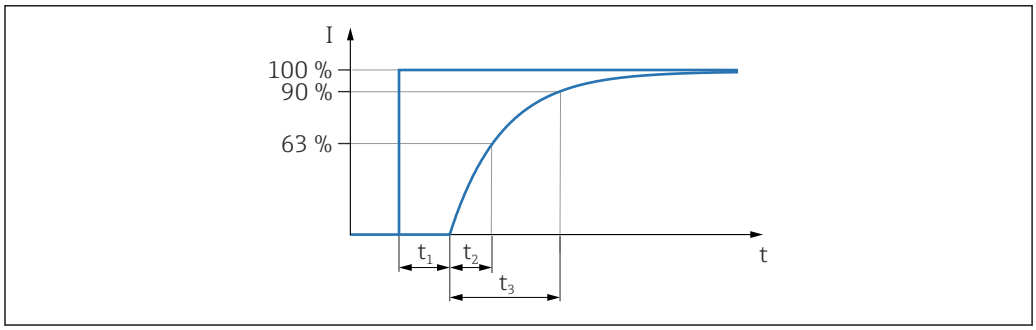
400 mbar (6 psi), 1 bar (15 psi) and 2 bar (30 psi) measuring cells
- 1 year: ± 0.08 %
- 5 years: ± 0.12 %
- 10 years: ± 0.13 %
- 15 years: ± 0.14 %

All other measuring cells
- 1 year: ± 0.05 %
- 5 years: ± 0.07 %
- 10 years: ± 0.10 %
- 15 years: ± 0.11 %

**Response time T63 and T90**

**Dead time, time constant**

Representation of dead time and time constant as per IEC62828-1:

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Step response time = dead time ($t_1$) + time constant T90 ($t_3$) according to IEC62828-1

**Dynamic behavior, current output (HART electronics)**

*400 mbar (6 psi) standard measuring device (without diaphragm seal)*

- Dead time ($t_1$): maximum 45 ms
- Time constant T63 ($t_2$): maximum 85 ms
- Time constant T90 ($t_3$): maximum 200 ms

*≥ 1 bar (15 psi) standard measuring device (without diaphragm seal)*

- Dead time ($t_1$): maximum 45 ms
- Time constant T63 ($t_2$): maximum 45 ms
- Time constant T90 ($t_3$): maximum 85 ms

*Devices with diaphragm seal*

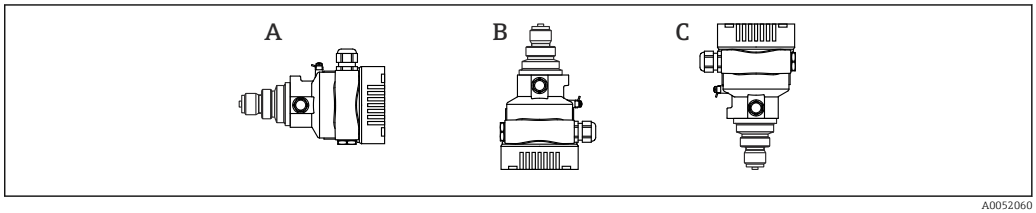
Values like standard device (without diaphragm seal) plus influence of diaphragm seal. Calculation with Applicator Sizing Diaphragm Seal.

The "Thermal range expander" diaphragm seal can be used for extreme applications with high process temperatures and low ambient temperatures. The range of application is expanded by the use of two different fill fluids (fill fluid in the primary chamber for high process temperature and fill fluid in the secondary chamber for ambient temperature).

Ordering information: Product Configurator, order code for "Application package", option "Thermal Range Expander"

**Installation factors**

**Devices without a diaphragm seal**

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The value is doubled for devices with inert oil.

- A: Membrane axis horizontal: calibration position, no measurement error
- Process connections G ½, ½ MNPT, JIS G ½, JIS R ½, M20x1.5
  - B: Membrane pointing upwards: measurement error ≤ +4 mbar (+0.06 psi)
  - C: Membrane pointing downwards: measurement error ≤ −4 mbar (−0.06 psi)
- Process connections G 1 A, G 1 ½, G 2, 1 ½ MNPT, 2 MNPT, M44x1.25, EN/DIN, ASME and JIS flanges
  - B: Membrane pointing upwards: measurement error ≤ +10 mbar (+0.15 psi)
  - C: Membrane pointing downwards: measurement error ≤ −10 mbar (−0.15 psi)

A position-dependent zero point shift can be corrected on the device.

**Devices with diaphragm seals**

Take into account the additional influence of the hydrostatic pressure of the diaphragm seal oil.

**Warm-up time (according to IEC62828-4)**

≤5 s

# Mounting

**Orientation**

- A position-dependent zero point shift (when the vessel is empty the measured value does not display zero) can be corrected
- Diaphragm seals also shift the zero point, depending on the installation position
- The use of shutoff devices and/or water pocket pipes is recommended for mounting
- The orientation depends on the measuring application

**Installation instructions**

- The standard devices (without diaphragm seals) are mounted according to the same guidelines as pressure gauges (DIN EN837-2)
- To ensure optimal readability of the local display, adjust the housing and local display
- Endress+Hauser offers a mounting bracket to mount the device on pipes or walls
- Use flushing rings for flanges, flange seals and pancake seals if buildup or clogging can be expected at the membrane
  - The flushing ring is clamped between the process connection and the flange, flange seal or pancake seal
  - Material buildup in front of the membrane is flushed away, and the pressure chamber is vented, via the two lateral flushing holes
- When measuring in media containing solids (e.g. dirty liquids), installing separators and drain valves is useful for capturing and removing sediment
- Using a valve manifold allows for easy commissioning, installation and maintenance without interrupting the process
- When mounting the device, establishing the electrical connection and during operation: prevent the penetration of moisture into the housing
- Point the cable and plug downwards as much as possible to prevent moisture from entering (e.g. rainwater or condensation)

**Installation instructions for devices with diaphragm seals**

**General information**

A diaphragm seal together with the transmitter form a closed, calibrated system, which has been filled through openings in the diaphragm seal and in the transmitter's measurement system. These openings are sealed and must not be opened.

In the case of devices with diaphragm seals and capillaries, the zero point shift caused by the hydrostatic pressure of the filling liquid column in the capillaries must be taken into account when selecting the measuring cell. Perform zero adjustment if necessary. If a measuring cell with a small measuring range is selected, a position adjustment can cause the measuring cell to go over range (position adjustment due to zero point offset, caused by the orientation of the fill fluid liquid column).

For devices with a capillary, use a suitable bracket (mounting bracket) for mounting.

When mounting, sufficient strain relief must be provided for the capillary to prevent the capillary from bending (capillary bending radius ≥ 100 mm (3.94 in)).

Mount the capillary so that it is vibration-free (in order to avoid additional pressure fluctuations).

Do not mount capillaries in the vicinity of heating or cooling lines and protect them against direct sunlight.

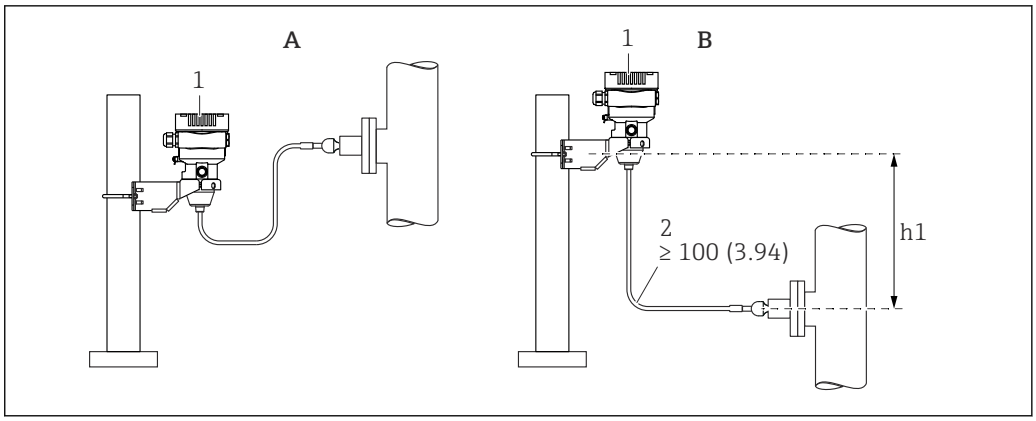
More detailed installation instructions are provided in the Applicator "Sizing Diaphragm Seal".

**Vacuum applications**

In vacuum applications, ideally use pressure transmitters with a ceramic membrane (oil-free).

In vacuum applications, mount the pressure transmitter below the diaphragm seal. This prevents additional vacuum loading of the diaphragm seal caused by the presence of fill fluid in the capillary.

If the pressure transmitter is mounted above the diaphragm seal, do not exceed the maximum height difference h1. The height difference h1 is shown in the Applicator "Sizing Diaphragm Seal".




*A Recommended installation in a vacuum application*
*B Installation above the diaphragm seal*
*h1 Height difference*
*1 Device*
*2 Bending radius ≥ 100 mm (3.94 in). Ensure strain relief to prevent the capillary from bending.*

The maximum height difference depends on the density of the fill fluid and the lowest absolute pressure that can ever occur at the diaphragm seal (empty vessel).

## Sensor selection and arrangement

### Mounting the device

*Pressure measurement in gases*

Mount the device with the shutoff device above the tapping point so that any condensate can flow into the process.

*Pressure measurement in steam*

Observe the maximum permitted ambient temperature of the transmitter!

Mounting:
- Ideally, mount the device with the O-shaped siphon below the tapping point
  The device may also be mounted above the tapping point
- Fill the siphon with liquid before commissioning

Advantages of using siphons:
- Protects the measuring device from hot, pressurized media due to the formation and collection of condensate
- Attenuation of water hammer
- The defined water column only causes minimal (negligible) measured errors and minimal (negligible) thermal effects on the device

For technical data (e.g. materials, dimensions or order numbers), see the accessory document SD01553P.

*Pressure measurement in liquids*

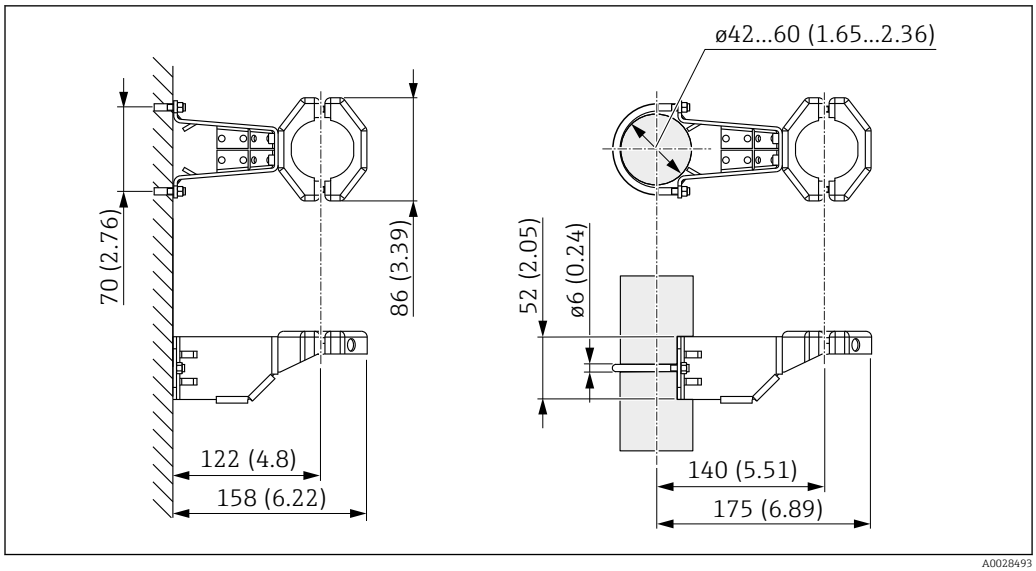
Mount the device with the shutoff device below or at the same level as the tapping point.

*Level measurement*

- Always mount the device below the lowest measuring point
- Do not install the device at the following positions:
  - In the filling curtain
  - In the tank outlet
  - In the suction area of a pump
  - At a point in the tank which could be affected by pressure pulses from the agitator
- Mount the device downstream from a shutoff device: the calibration and function check can be carried out more easily

*Mounting bracket for device or separate housing*

The device or the separate housing can be mounted on walls or pipes (for pipes with a diameter of 1 ¼" to 2") using the mounting bracket.




*Unit of measurement mm (in)*

Ordering information:
- Can be ordered via the Product Configurator
- Can be ordered as a separate accessory, part number 71102216

The mounting bracket is included in the delivery if you order the device with a separate housing.

## Special mounting instructions

### Wall and pipe mounting with a manifold (optional)

If the device is mounted on a shutoff device (e.g. manifold or shutoff valve), then use the bracket provided for this purpose. This makes it easier to disassemble the device.

For technical data, see the SD01553P accessory document.

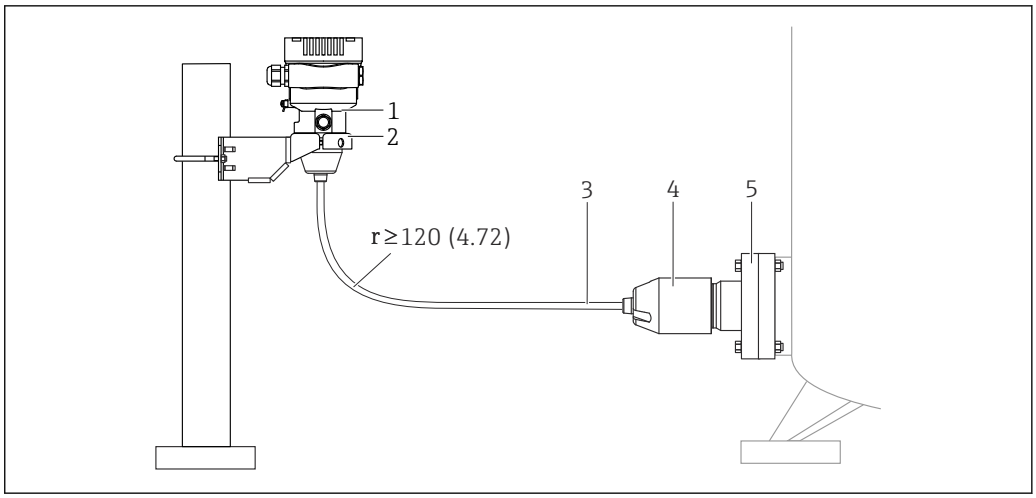
### Sensor, remote (separate housing)

The housing of the device (including electronic insert) is mounted away from the measuring point.

This version thus facilitates trouble-free measurement
- Under particularly difficult measuring conditions (at installation locations that are cramped or difficult to access)
- If the measuring point is exposed to vibrations

Cable versions:
- PE: 2 m (6.6 ft), 5 m (16 ft) and 10 m (33 ft)
- FEP: 5 m (16 ft).

The sensor is supplied with the process connection and cable fitted. The housing (including electronic insert) and a mounting bracket are enclosed as separate units. The cable is provided with a socket at both ends. These sockets are simply connected to the housing (including electronic insert) and the sensor.

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*1 Sensor, remote (including electronic insert)*
*2 Mounting bracket provided, suitable for wall mounting or pipe mounting*
*3 Cable, both ends are fitted with a socket*
*4 Process connection adapter*
*5 Process connection with sensor*

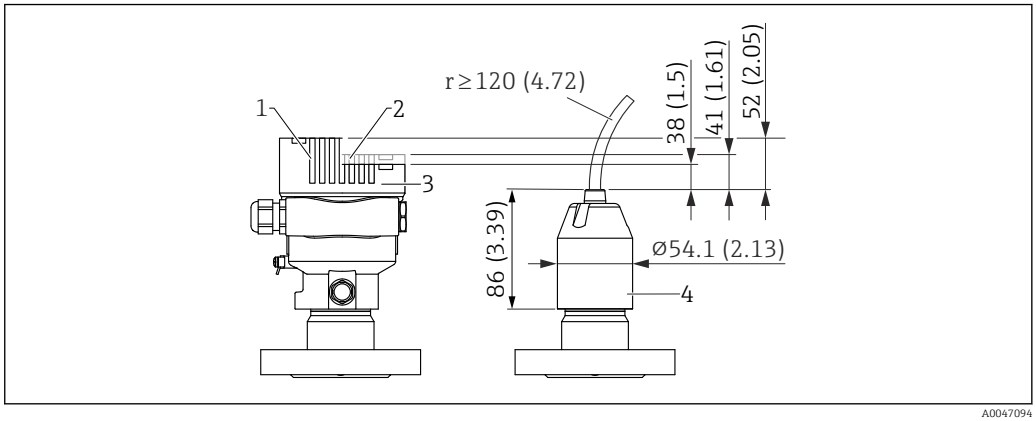
Ordering information:
- Sensor, remote (including electronic insert), and mounting bracket can be ordered via the Product Configurator
- Mounting bracket can also be ordered as a separate accessory, part number 71102216

Technical data for cable:
- Minimum bending radius: 120 mm (4.72 in)
- Cable extraction force: max. 450 N (101.16 lbf)
- Resistance to UV light

Use in hazardous area:
- Intrinsically safe installations (Ex ia/IS)
- FM/CSA IS: for Div.1 installation only

*Reduction of the installation height*

If this version is used, the mounting height of the process connection is reduced compared to the dimensions of the standard version.

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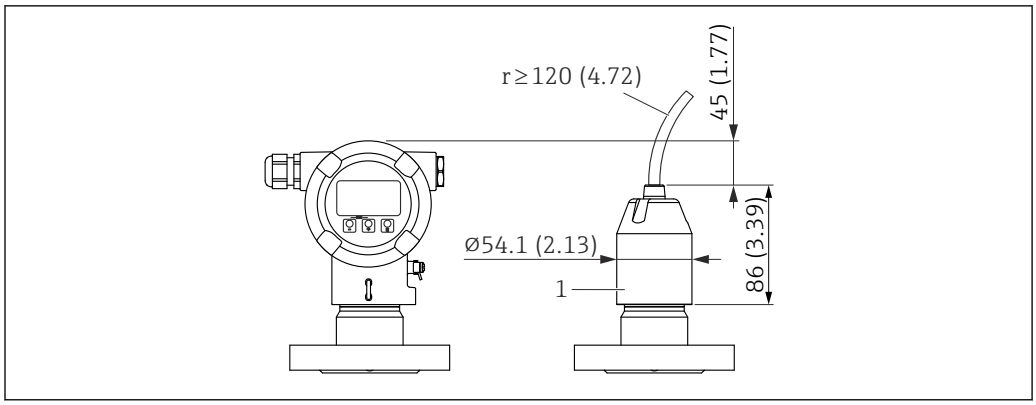
*1 Device with display, cover with sight glass made of glass (devices for Ex d, dust Ex)*
*2 Device with display, cover with plastic sight glass*
*3 Device without display, cover without sight glass*
*4 Process connection adapter*




*1 Process connection adapter*

# Environment

**Ambient temperature range**

The following values apply up to a process temperature of +85 °C (+185 °F). At higher process temperatures, the permitted ambient temperature is reduced.

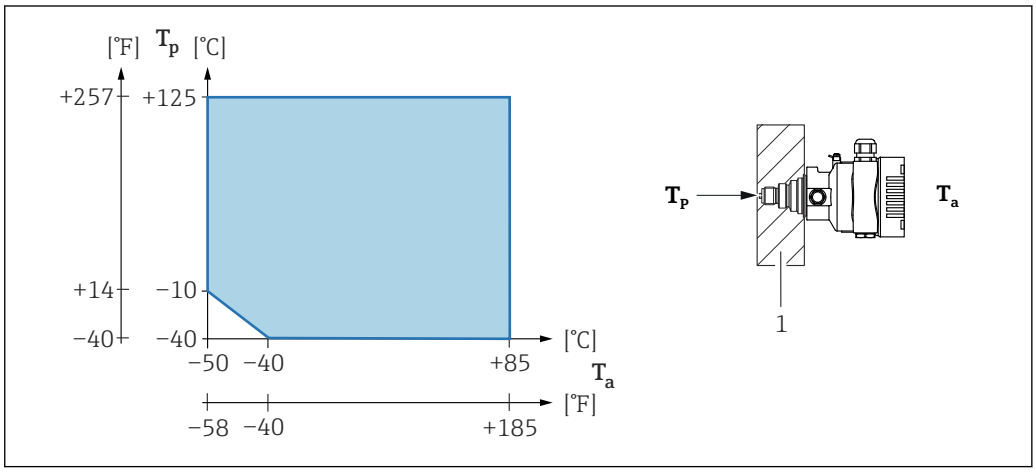
- Without segment display or graphic display:
  - Standard: −40 to +85 °C (−40 to +185 °F)
  - Optionally available: −50 to +85 °C (−58 to +185 °F) with restricted operating life and performance
  - Optionally available: −60 to +85 °C (−76 to +185 °F) with restricted operating life and performance; below −50 °C (−58 °F): devices can be permanently damaged
- With segment display or graphic display: −40 to +85 °C (−40 to +185 °F) with limitations in optical properties such as display speed and contrast. Can be used without limitations up to −20 to +60 °C (−4 to +140 °F)
  Segment display: up to −50 to +85 °C (−58 to +185 °F) with restricted operating life and performance
- Devices with PVC-coated capillary armor: −25 to +80 °C (−13 to +176 °F)
- Separate housing: −20 to +60 °C (−4 to +140 °F)

Applications with very high temperatures: use diaphragm seals with a temperature isolator or capillaries. Use a mounting bracket!

If vibrations additionally occur in the application: use a device with a capillary. Diaphragm seal with temperature isolator: use a mounting bracket!

### Ambient temperature $T_a$ depending on the process temperature $T_p$

The process connection must be fully insulated for ambient temperatures below −40 °C (−40 °F).




*1 Insulation material*

### Hazardous area

- For devices for use in hazardous areas, see the Safety Instructions, Installation Drawing or Control Drawing
- Devices that have the most common explosion protection certificates (e.g. ATEX/ IEC Ex, etc.) can be used in explosive atmospheres up to an ambient temperature of −60 °C (−76 °F) (optionally available). The functionality of the explosion protection Ex ia is guaranteed for ambient temperatures to −50 °C (−58 °F) (optionally available).
  At temperatures ≤ −50 °C (−58 °F), explosion protection is guaranteed by the housing in the case of flameproof enclosure (Ex d) type of protection. The functionality of the transmitter cannot be fully guaranteed. The Ex ia capability can no longer be guaranteed.

**Storage temperature**

- Without LCD display:
  - Standard: −40 to +90 °C (−40 to +194 °F)
  - Optionally available: −50 to +90 °C (−58 to +194 °F) with restricted operating life and performance
  - Optionally available: −60 to +90 °C (−76 to +194 °F) with restricted operating life and performance; below −50 °C (−58 °F): Ex d devices can be permanently damaged
- With LCD display: −40 to +85 °C (−40 to +185 °F)
- Separate housing: −40 to +60 °C (−40 to +140 °F)

With M12 plug, elbowed: −25 to +85 °C (−13 to +185 °F)

Devices with PVC-coated capillary armor: −25 to +90 °C (−13 to +194 °F)

**Operating altitude**

Up to 5 000 m (16 404 ft) above sea level.

**Climate class**

Class 4K4H (air temperature: −20 to +55 °C (−4 to +131 °F), relative humidity: 4 to 100 %) satisfied as per DIN EN 60721-3-4.

Condensation is possible.

**Atmosphere**

**Operation in very corrosive environment**

For corrosive environments (e.g. maritime environment / coastal areas), Endress+Hauser recommends the use of a PVC-coated capillary armor or a PTFE capillary armor for capillaries and the stainless steel housing. The transmitter can be additionally protected by a special coating (**T**echnical **S**pecial **P**roduct (TSP)).

**Degree of protection**

Test as per IEC 60529 and NEMA 250-2014

**Housing and process connection**

IP66/68, TYPE 4X/6P

(IP68: (1.83 m$H_2O$ for 24 h))

**Cable entries**

- Gland M20, plastic, IP66/68 TYPE 4X/6P
- Gland M20, brass nickel plated, IP66/68 TYPE 4X/6P
- Gland M20, 316L, IP66/68 TYPE 4X/6P
- Thread M20, IP66/68 TYPE 4X/6P
- Thread G1/2, IP66/68 TYPE 4X/6P
  If the G1/2 thread is selected, the device is delivered with an M20 thread as standard and a G1/2 adapter is included with the delivery, along with the corresponding documentation
- Thread NPT1/2, IP66/68 TYPE 4X/6P
- Dummy plug transport protection: IP22, TYPE 2
- Plug HAN7D, 90 deg. IP65 NEMA Type 4X
- Plug M12
  When housing is closed and connecting cable is plugged in: IP66/67 NEMA Type 4X
  When housing is open or connecting cable is not plugged in: IP20, NEMA Type 1

**NOTICE**

**Plug M12 and plug HAN7D: incorrect mounting can invalidate the IP protection class!**

- ▶ The degree of protection only applies if the connecting cable used is plugged in and screwed tight.
- ▶ The degree of protection only applies if the connecting cable used is specified according to IP67 NEMA Type 4X.
- ▶ The IP protection classes are only maintained if the dummy cap is used or the cable is connected.

**Process connection and process adapter when using the separate housing**

*FEP cable*

- IP69 (on sensor side)
- IP66 TYPE 4/6P
- IP68 (1.83 m$H_2O$ for 24 h) TYPE 4/6P

*PE cable*

- IP69 (on sensor side)
- IP66 TYPE 4/6P
- IP68 (1.83 $mH_2O$ for 24 h) TYPE 4/6P

**Vibration resistance**

### Single compartment housing

| Mechanical construction | Sinusoidal oscillation IEC62828-1/IEC61298-3 | Shock |
|---|---|---|
| Device | 10 Hz to 60 Hz: ±0.35 mm (0.0138 in)<br>60 Hz to 1000 Hz: 5 g | 30 g |
| Device with "Compact" or "Temperature isolator" diaphragm seal type [1] | 10 Hz to 60 Hz: ±0.15 mm (0.0059 in)<br>60 Hz to 1000 Hz: 2 g | 30 g |

1) For applications with very high temperatures, either a device with a temperature isolator or with a capillary can be used. If vibrations also occur in the application, Endress+Hauser recommends using a device with a capillary. If a device with a temperature isolator or capillary is used, it must be mounted with a mounting bracket.

### Aluminum dual compartment housing

| Mechanical construction | Sinusoidal oscillation IEC62828-1/IEC61298-3 | Shock |
|---|---|---|
| Device | 10 Hz to 60 Hz: ±0.15 mm (0.0059 in)<br>60 Hz to 1000 Hz: 2 g | 30 g |
| Device with "Compact" or "Temperature isolator" diaphragm seal type [1] | 10 Hz to 60 Hz: ±0.15 mm (0.0059 in)<br>60 Hz to 1000 Hz: 2 g | 30 g |

1) For applications with very high temperatures, either a device with a temperature isolator or with a capillary can be used. If vibrations also occur in the application, Endress+Hauser recommends using a device with a capillary. If a device with a temperature isolator or capillary is used, it must be mounted with a mounting bracket.

### Stainless steel dual compartment housing

| Mechanical construction | Sinusoidal oscillation IEC62828-1/IEC61298-3 | Shock |
|---|---|---|
| Device | 10 Hz to 60 Hz: ±0.15 mm (0.0059 in)<br>60 Hz to 1000 Hz: 2 g | 15 g |
| Device with "Compact" or "Temperature isolator" diaphragm seal type [1] | 10 Hz to 150 Hz: 0.2 g | 15 g |

1) For applications with very high temperatures, either a device with a temperature isolator or with a capillary can be used. If vibrations also occur in the application, Endress+Hauser recommends using a device with a capillary. If a device with a temperature isolator or capillary is used, it must be mounted with a mounting bracket.

**Electromagnetic compatibility (EMC)**

- Electromagnetic compatibility as per EN 61326 series and NAMUR recommendation EMC (NE21)
- With regard to the safety function (SIL), the requirements of EN 61326-3-x are satisfied
- Maximum deviation with interference influence: < 0.5% of span with full measuring range (TD 1:1)

For more details refer to the EU Declaration of Conformity.

# Process

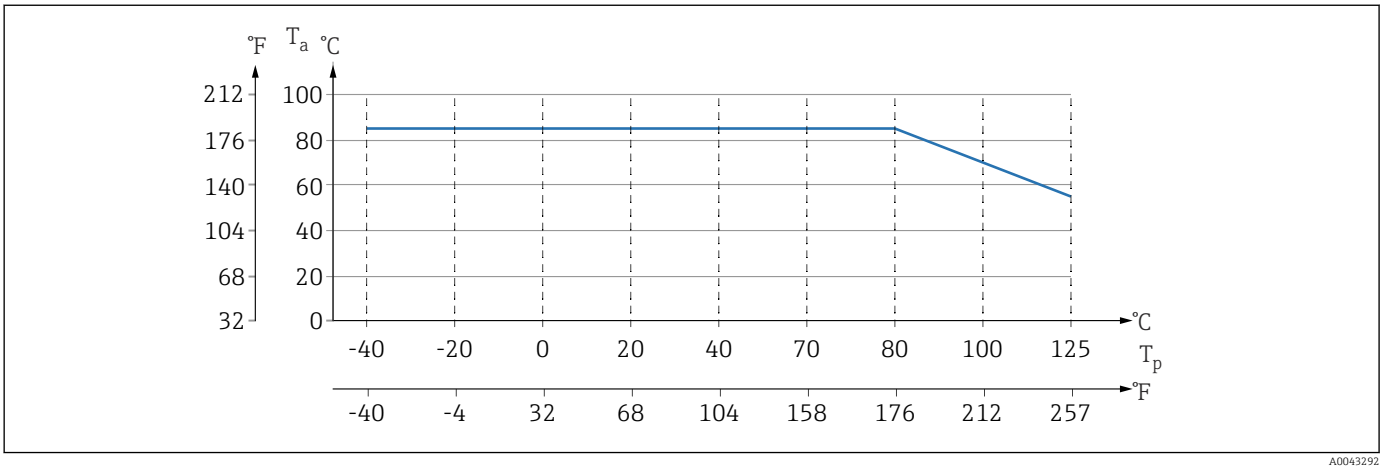
## Process temperature range

### Standard device (without diaphragm seal)

**NOTICE**

**The permitted process temperature depends on the process connection, process seal, ambient temperature and the type of approval.**

- ▶ All the temperature data in this document must be taken into consideration when selecting the device.




6 *Values apply for vertical mounting without insulation.*

$T_p$ *Process temperature*
$T_a$ *Ambient temperature*

### Diaphragm seal fill fluid

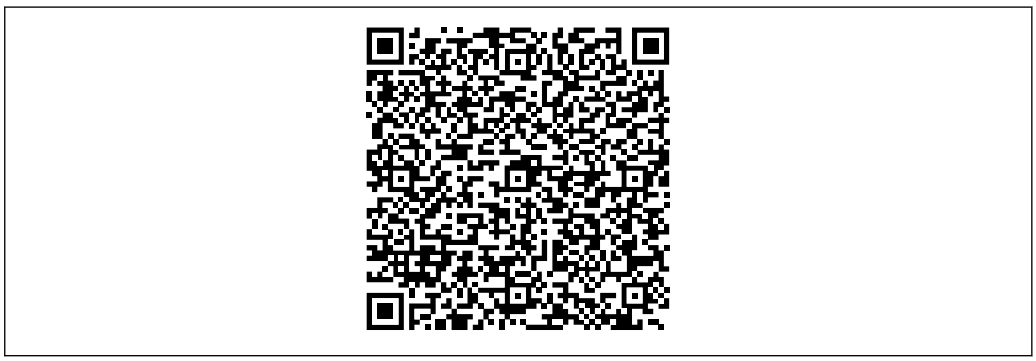
| Fill fluid | $P_{abs}$ = 0.05 bar (0.725 psi) [1] | $P_{abs}$ ≥1 bar (14.5 psi) [2] |
|---|---|---|
| Silicone oil | −40 to +180 °C (−40 to +356 °F) | −40 to +250 °C (−40 to +482 °F) |
| High-temperature oil | −20 to +200 °C (−4 to +392 °F) | −20 to +400 °C (−4 to +752 °F) [3] [4] [5] |
| Low-temperature oil | −70 to +120 °C (−94 to +248 °F) | −70 to +180 °C (−94 to +356 °F) |
| Vegetable oil | −10 to +160 °C (+14 to +320 °F) | −10 to +220 °C (+14 to +428 °F) |
| Inert oil | −40 to +100 °C (−40 to +212 °F) | −40 to +175 °C (−40 to +347 °F) [6] [7] |

1) Permitted temperature range at $p_{abs}$ = 0.05 bar (0.725 psi) (observe temperature limits of the device and the system!)
2) Permitted temperature range at $p_{abs}$ ≥1 bar (14.5 psi) (observe temperature limits of the device and the system!)
3) 325 °C (617 °F) at ≥1 bar (14.5 psi) absolute pressure
4) 350 °C (662 °F) at ≥1 bar (14.5 psi) absolute pressure (max. 200 hours)
5) 400 °C (752 °F) at ≥1 bar (14.5 psi) absolute pressure (max. 10 hours)
6) 150 °C (302 °F) at ≥1 bar (14.5 psi) absolute pressure
7) 175 °C (347 °F) at ≥1 bar (14.5 psi) absolute pressure (max. 200 hours)

| Fill fluid | Density [1] kg/m³ |
|---|---|
| Silicone oil | 970 |
| High-temperature oil | 995 |
| Low-temperature oil | 940 |
| Vegetable oil | 920 |
| Inert oil | 1900 |

1) Density of the diaphragm seal fill fluid at 20 °C (68 °F).

The calculation of the operating temperature range of a diaphragm seal system depends on the fill fluid, capillary length and capillary internal diameter, process temperature and oil volume of the diaphragm seal. Detailed calculations, e.g. for temperature ranges, negative pressure and temperature ranges, are done separately in the Applicator "Sizing Diaphragm Seal".



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### Oxygen applications (gaseous)

Oxygen and other gases can react explosively to oils, grease and plastics. The following precautions must be taken:
- All components of the system, such as devices, must be cleaned in accordance with national requirements.
- Depending on the materials used, a certain maximum temperature and a maximum pressure must not be exceeded for oxygen applications.

The cleaning of the device (not accessories) is provided as an optional service.

- $p_{max}$: Depends on the lowest-rated element, with regard to pressure, of the selected components: Over pressure limit (OPL) of the measuring cell, process connection (1.5 x PN) or fill fluid (80 bar (1 200 psi))
- $T_{max}$: 60 °C (140 °F)

### Standard device (without diaphragm seal)

- Process connections with internal membrane: −40 to +125 °C (−40 to +257 °F) ; 150 °C (302 °F) for max. one hour)
- Process connections with flush membrane:
  - Thread (ISO228, ASME, metric DIN13) and flanges (EN, ASME, JIS): −40 to +100 °C (−40 to +212 °F)
  - Exceptions with seal supplied (M20 x 1.5, G1/2 DIN3852): −20 to +85 °C (−4 to +185 °F)

### Devices with diaphragm seal

- Depends on diaphragm seal and fill fluid: −70 °C (−94 °F) up to +400 °C (+752 °F)
- A4 screws of process connection, threaded separator: $T_{min}$ −60 °C (−76 °F)
- Observe the maximum gauge pressure and maximum temperature

### Diaphragm seal with tantalum membrane

−70 to +300 °C (−94 to +572 °F)

### Devices with PTFE-coated diaphragm seal membrane

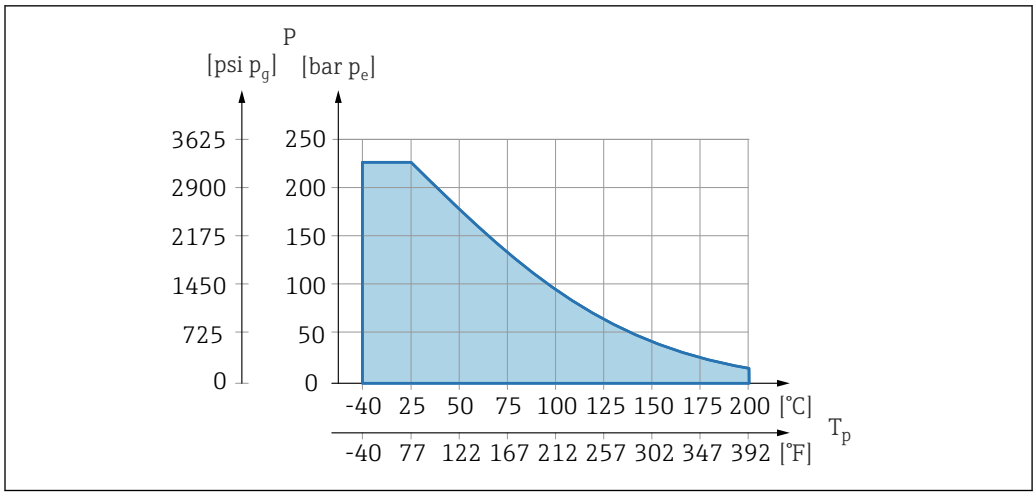
The anti-stick coating has very good anti-friction properties and protects the membrane against abrasive media.

NOTICE

**Destruction of the device due to incorrect use of PTFE coating!**

▶ The PTFE coating used is designed to protect the unit against abrasion. It does not provide protection against corrosive media.

Area of application of the 0.25 mm (0.01 in) PTFE foil on AISI 316L (1.4404/1.4435) membrane, see the following graphic:

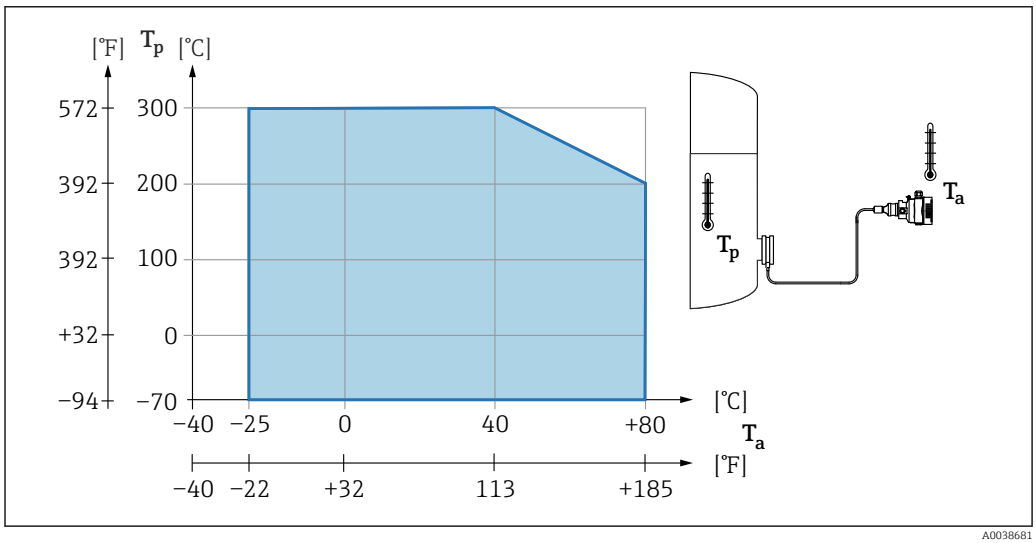



For vacuum applications: $p_{abs} \leq 1$ bar (14.5 psi) to 0.05 bar (0.725 psi) to max.+150 °C (302 °F).
If a PTFE coating has been selected, a conventional membrane is always delivered.

**Diaphragm seal capillary armor**

Process temperature depending on the ambient temperature.

- 316L: No restrictions
- PTFE: No restrictions
- PVC: See the following diagram



**Process pressure range**

**Pressure specifications**

**⚠ WARNING**

**The maximum pressure for the device depends on the lowest-rated component with regard to pressure (components are: process connection, optional mounted parts or accessories).**

- Only operate the device within the specified limits for the components!
- MWP (maximum working pressure): The MWP is specified on the nameplate. This value refers to a reference temperature of +20 °C (+68 °F) and may be applied to the device for an unlimited time. Note temperature dependence of MWP. For flanges, refer to the following standards for the permitted pressure values at higher temperatures: EN 1092-1 (with regard to their stability/ temperature property, the materials 1.4435 and 1.4404 are grouped together under EN 1092-1; the chemical composition of the two materials can be identical.), ASME B 16.5a, JIS B 2220 (the latest version of the standard applies in each case). MWP data that deviate from this are provided in the relevant sections of the Technical Information.
- The overpressure limit is the maximum pressure a device may be subjected to during a test. It is greater than the maximum working pressure by a certain factor. This value refers to a reference temperature of +20 °C (+68 °F).
- The Pressure Equipment Directive (2014/68/EU) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the device.
- In the case of measuring cell range and process connection combinations where the overpressure limit (OPL) of the process connection is smaller than the nominal value of the measuring cell, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If the entire measuring cell range must be used, select a process connection with a higher OPL value (1.5 x PN; MWP = PN).
- Oxygen applications: do not exceed values for $P_{max}$ and $T_{max}$.

**Burst pressure**

As of the specified burst pressure, the complete destruction of the pressure-bearing parts and/or a device leak must be expected. It is therefore imperative to avoid such operating conditions by carefully planning and sizing your facility.

**Ultrapure gas applications**

Endress+Hauser also offers devices for special applications, such as for ultrapure gas, that are cleaned of oil and grease. No special restrictions regarding the process conditions apply to these devices.

**Hydrogen applications**

A **gold-coated** metallic membrane offers universal protection against hydrogen diffusion, both in gas applications and in applications with water-based solutions.

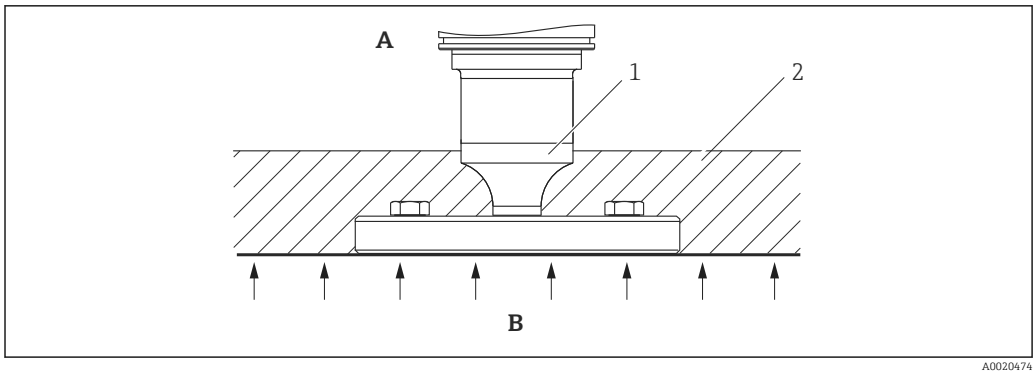
**Steam applications and saturated steam applications**

For steam and saturated steam applications: Use a device with a metallic membrane or provide a water pocket pipe for temperature decoupling when installing.

**Thermal insulation**

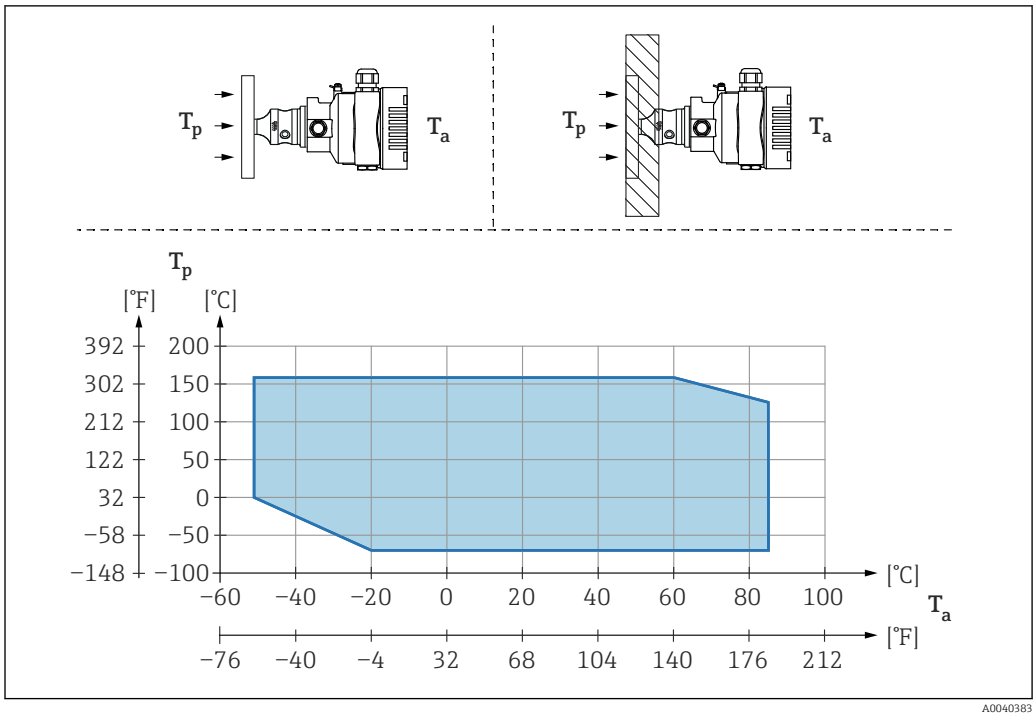
**Thermal insulation with diaphragm seal directly mounted**

The device may only be insulated up to a certain height. The maximum permitted insulation height is indicated on the device and applies to an insulation material with a heat conductivity ≤ 0.04 W/(m x K) and to the maximum permitted ambient and process temperature. The data were determined under the most critical application "quiescent air". Maximum permitted insulation height, indicated here on a device with a flange:




*A* *Ambient temperature*
*B* *Process temperature*
*1* *Maximum permitted insulation height*
*2* *Insulation material*

### Mounting with a "Compact" diaphragm seal type




$T_a$ *Ambient temperature at transmitter*
$T_p$ *Maximum process temperature*

| $T_a$ | $T_p$ |
|---|---|
| +85 °C (+185 °F) | −70 to +120 °C (−94 to +248 °F) |
| +60 °C (+140 °F) | −70 to +160 °C (−94 to +320 °F) |
| −20 °C (−4 °F) | −70 to +160 °C (−94 to +320 °F) |
| −50 °C (−58 °F) | 0 to +160 °C (+32 to +320 °F) |

### Thermal insulation when mounting with a "Temperature isolator" diaphragm seal type

Use of temperature isolators in the event of constant extreme medium temperatures which cause the maximum permissible electronics temperature of +85 °C (+185 °F) to be exceeded. Diaphragm seal systems with temperature isolators can be used up to a maximum temperature of +400 °C (+752 °F) depending on the fill fluid used. To minimize the influence of rising heat, mount the device horizontally or with the housing pointing downwards. The additional installation height brings about

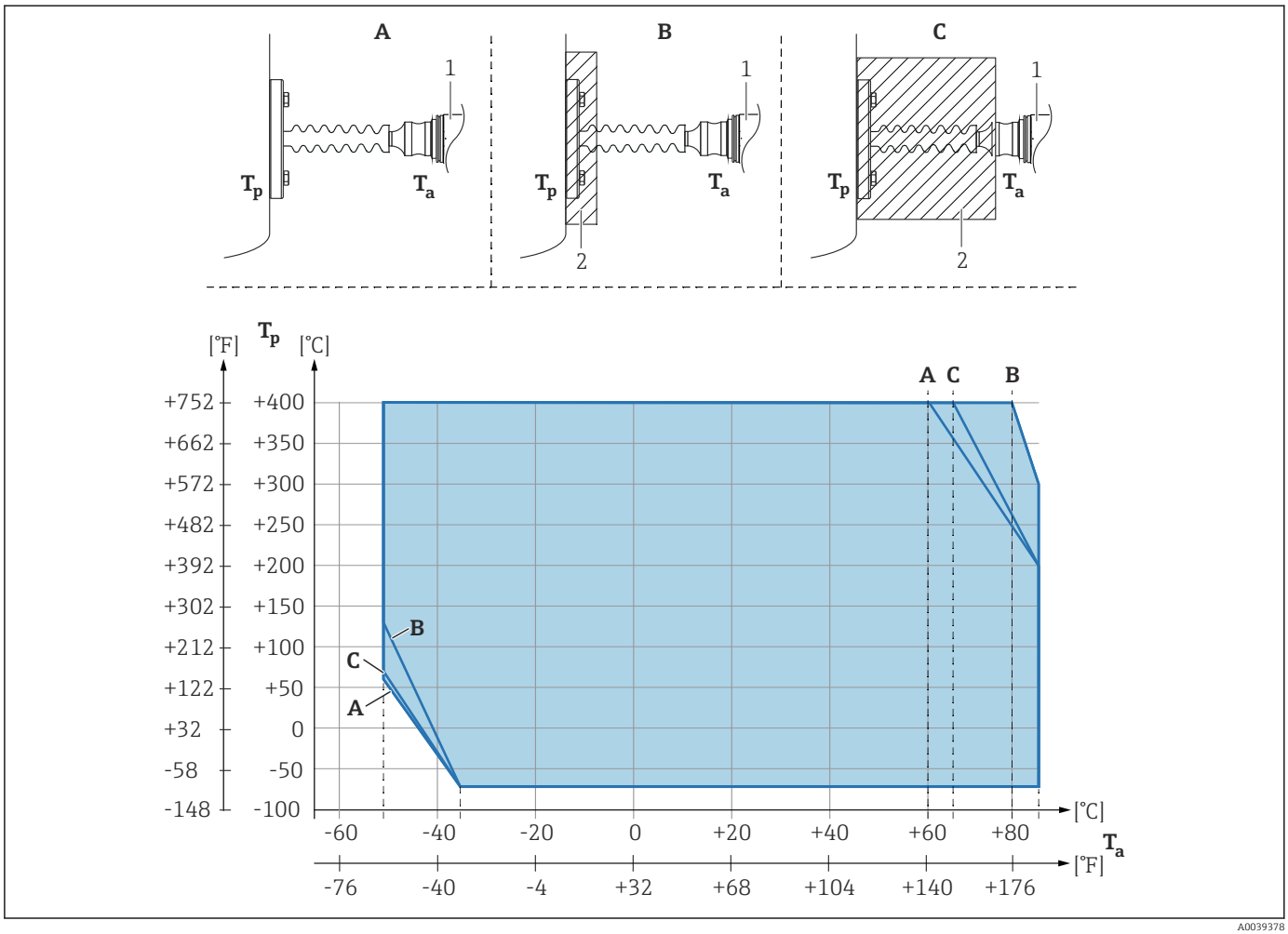
a zero point shift due to the hydrostatic column in the temperature isolator. This zero point shift can be corrected on the device.

The maximum ambient temperature $T_a$ at the transmitter depends on the maximum process temperature $T_p$.

The maximum process temperature depends on the fill fluid used.

The "Thermal Range Expander" diaphragm seal can be used for extreme applications with high process temperatures and low ambient temperatures. The range of application is expanded by the use of two different fill fluids (fill fluid in the primary chamber for high process temperature and fill fluid in the secondary chamber for ambient temperature).

Ordering information: Product Configurator, order code for "Application package", option "Thermal Range Expander"




*A No insulation*
*B Insulation 30 mm (1.18 in)*
*C Maximum insulation*
*1 Transmitter*
*2 Insulation material*

| Item | $T_a$ [1] | $T_p$ [2] |
|---|---|---|
| **A** | 60 °C (140 °F) | 400 °C (752 °F) [3] |
| | 85 °C (185 °F) | 200 °C (392 °F) |
| | −50 °C (−58 °F) | 60 °C (140 °F) |
| | −35 °C (−31 °F) | −70 °C (−94 °F) |
| **B** | 80 °C (176 °F) | 400 °C (752 °F) [3] |
| | 85 °C (185 °F) | 300 °C (572 °F) |

| Item | $T_a$ [1] | $T_p$ [2] |
|---|---|---|
| | −50 °C (−58 °F) | 130 °C (266 °F) |
| | −35 °C (−31 °F) | −70 °C (−94 °F) |
| C | 67 °C (153 °F) | 400 °C (752 °F) [3] |
| | 85 °C (185 °F) | 200 °C (392 °F) |
| | −50 °C (−58 °F) | 70 °C (158 °F) |
| | −35 °C (−31 °F) | −70 °C (−94 °F) |

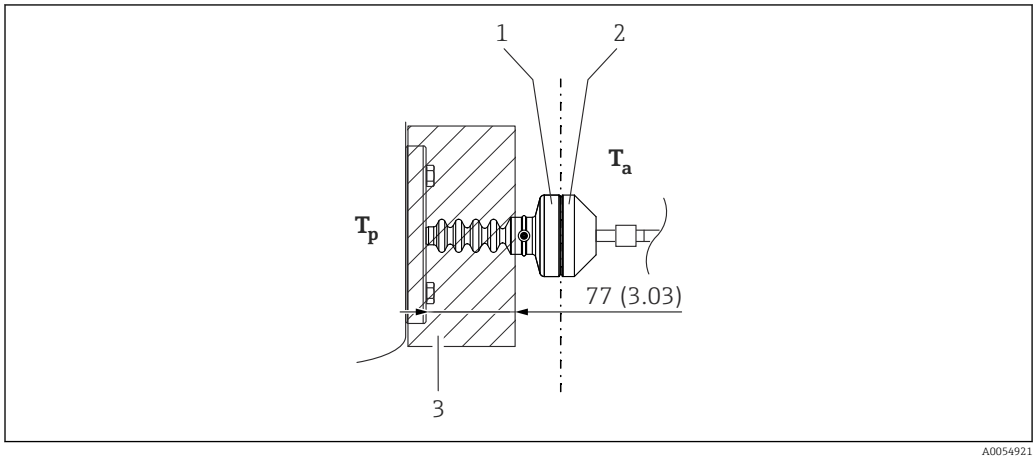
1) Maximum ambient temperature at transmitter
2) Maximum process temperature
3) Process temperature: max. +400 °C (+752 °F), depending on the fill fluid used

*Thermal Range Expander*

The "Thermal Range Expander" diaphragm seal can be used for extreme applications with high process temperatures and low ambient temperatures. The range of application is expanded by the use of two different fill fluids (fill fluid in the primary chamber for high process temperature and fill fluid in the secondary chamber for ambient temperature).

The device may only be insulated up to a certain height. The maximum permitted insulation height applies to an insulation material with a thermal conductivity ≤ 0.04 W/(m x K) and to the maximum permitted ambient temperature and process temperature. The data were determined under the application "quiescent air".

Ordering information: Product Configurator, order code for "Application package", option "Thermal Range Expander"




*1 Primary chamber*
*2 Secondary chamber*
*3 Insulation material*

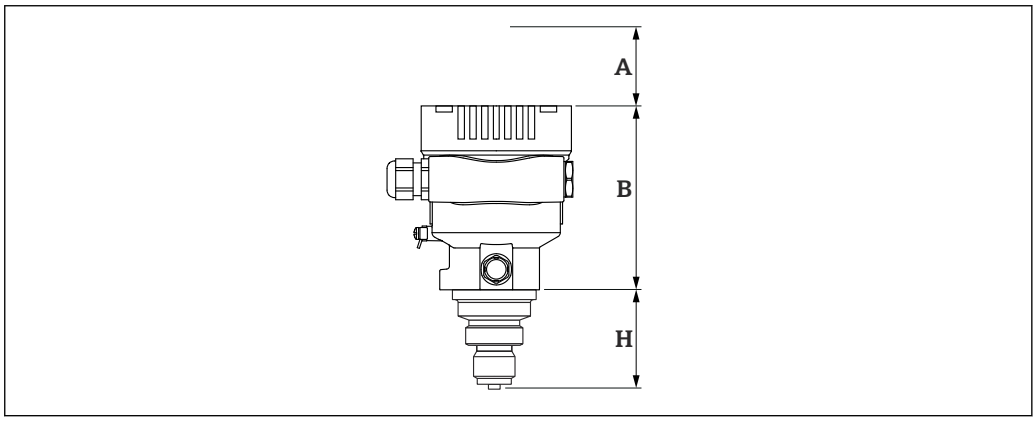
Without insulation, the ambient temperature decreases by 5 K.

# Mechanical construction

## Design, dimensions

### Height of standard device (without diaphragm seal)

The device height is calculated from
- the height of the housing
- the height of the individual process connection

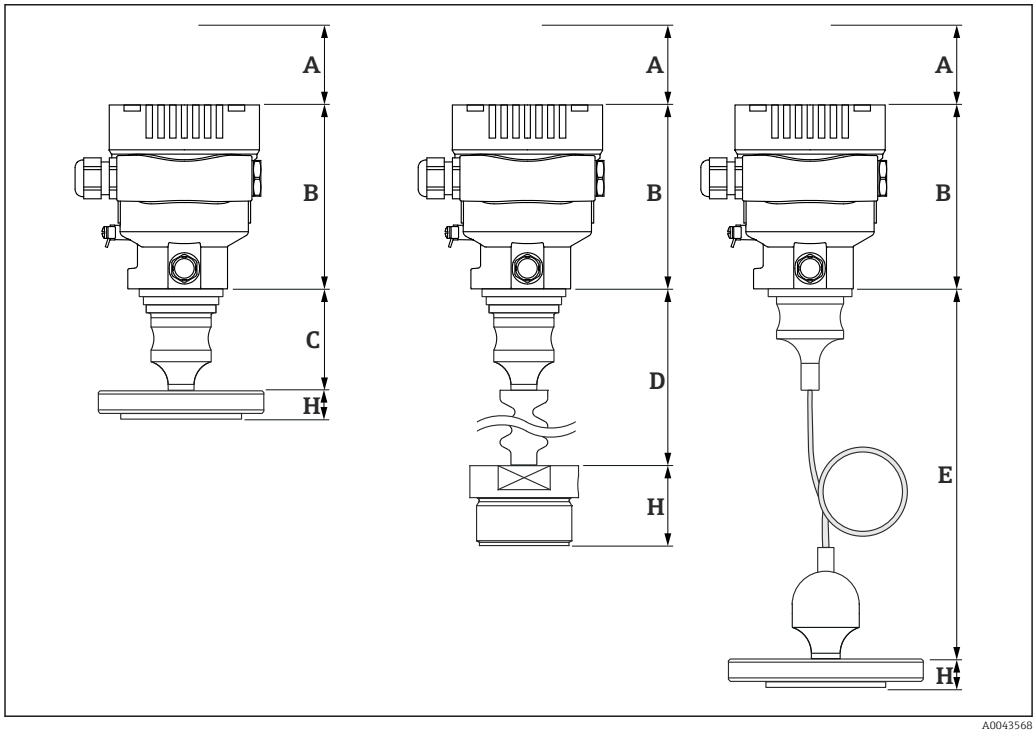



A0043567

*A Installation clearance*
*B Height of the housing*
*H Height of the process connection*

**Device height, diaphragm seal**

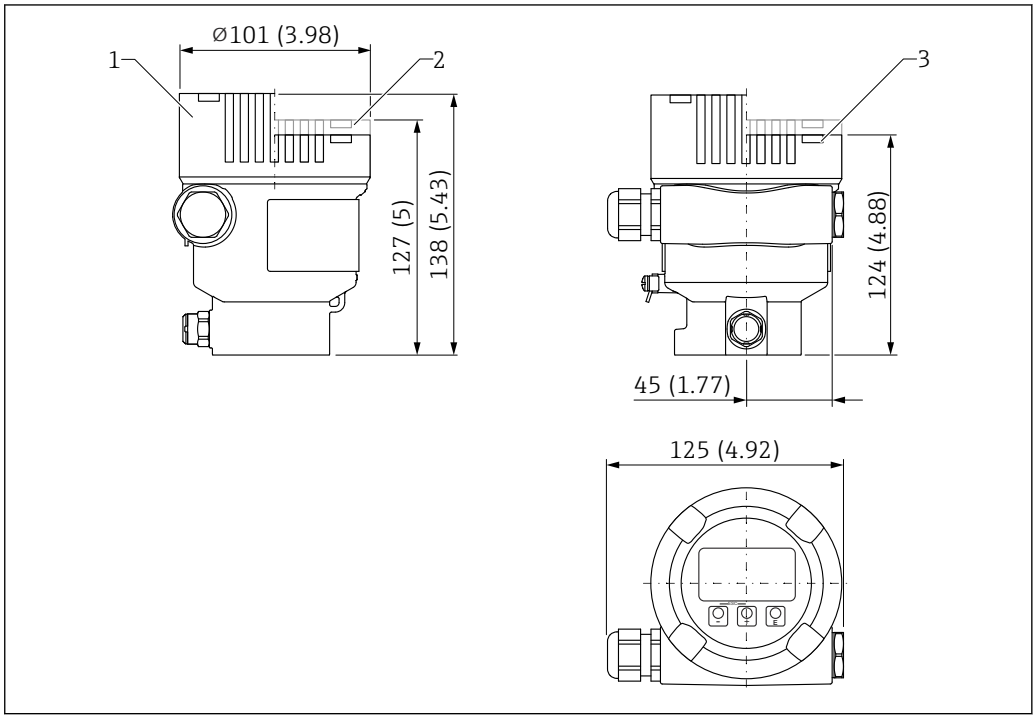
The device height is calculated from
- the height of the housing
- the height of optional mounted parts such as temperature isolators or capillaries
- the height of the individual process connection




*A Installation clearance*
*B Height of the housing*
*C Height of the mounted parts, here with the "Compact" diaphragm seal type for example*
*D Height of the mounted parts, here with the "Temperature isolator" diaphragm seal type for example*
*E Height of the mounted parts, here with the "Capillary" diaphragm seal type for example*
*H Height of the process connection*

## Dimensions

### Single compartment housing

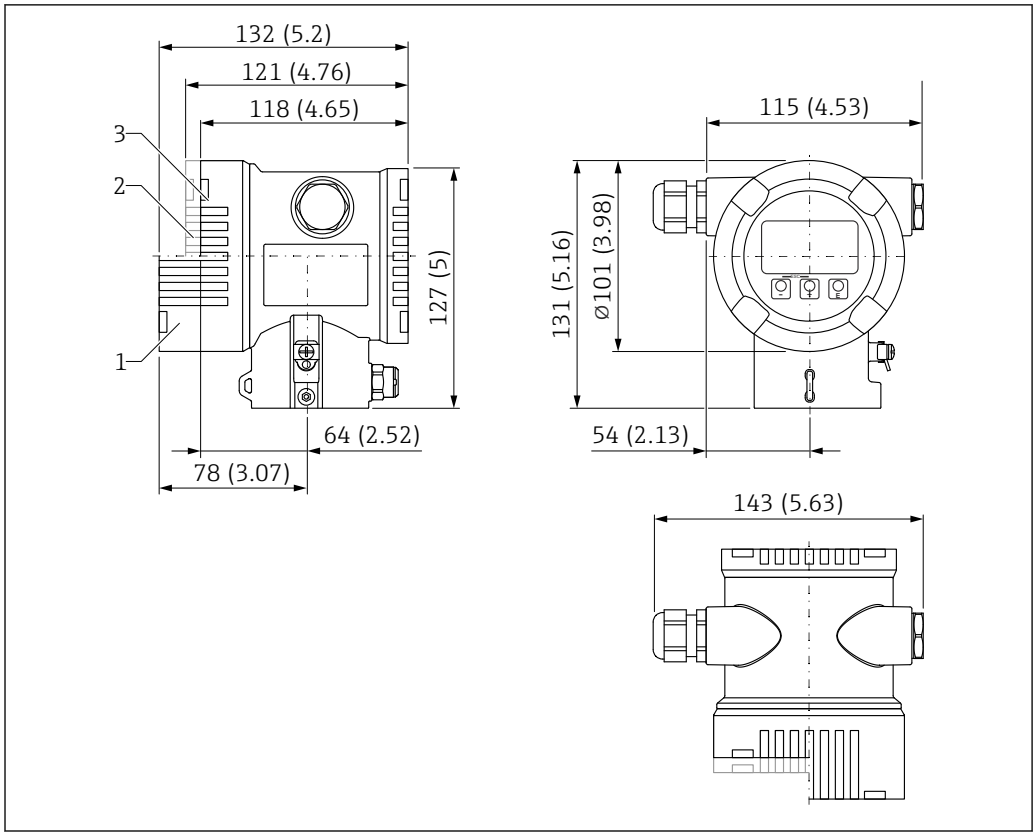



*Unit of measurement mm (in)*

1 *Device with display, cover with sight glass made of glass (devices for Ex d/XP, dust Ex): 138 mm (5.43 in)*
2 *Device with display, cover with plastic sight glass: 127 mm (5 in)*
3 *Device without display, cover without sight glass: 124 mm (4.88 in)*

Cover optionally with ANSI Safety Red (color RAL3002) coating.

**Dual compartment housing**

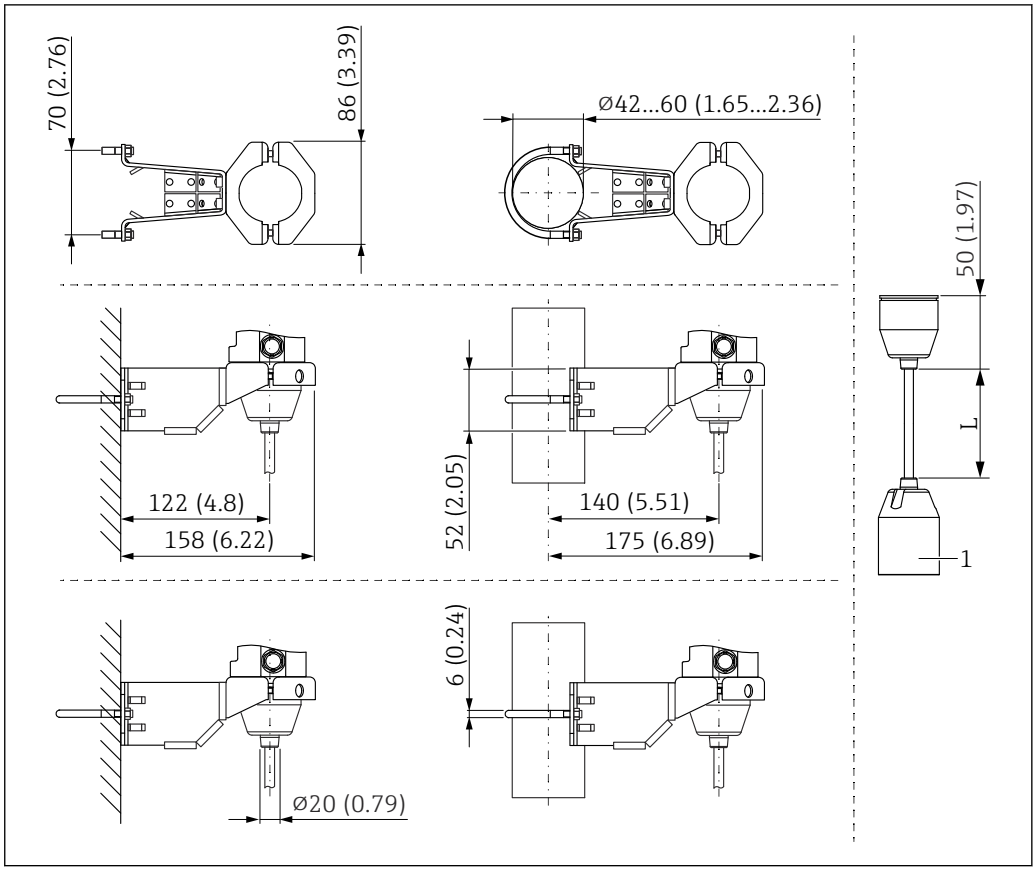



*Unit of measurement mm (in)*

*1 Device with display, cover with sight glass made of glass (devices for Ex d/XP, dust Ex): 132 mm (5.2 in)*
*2 Device with display, cover with plastic sight glass: 121 mm (4.76 in)*
*3 Device without display, cover without sight glass: 118 mm (4.65 in)*

Cover optionally with ANSI Safety Red (color RAL3002) coating.

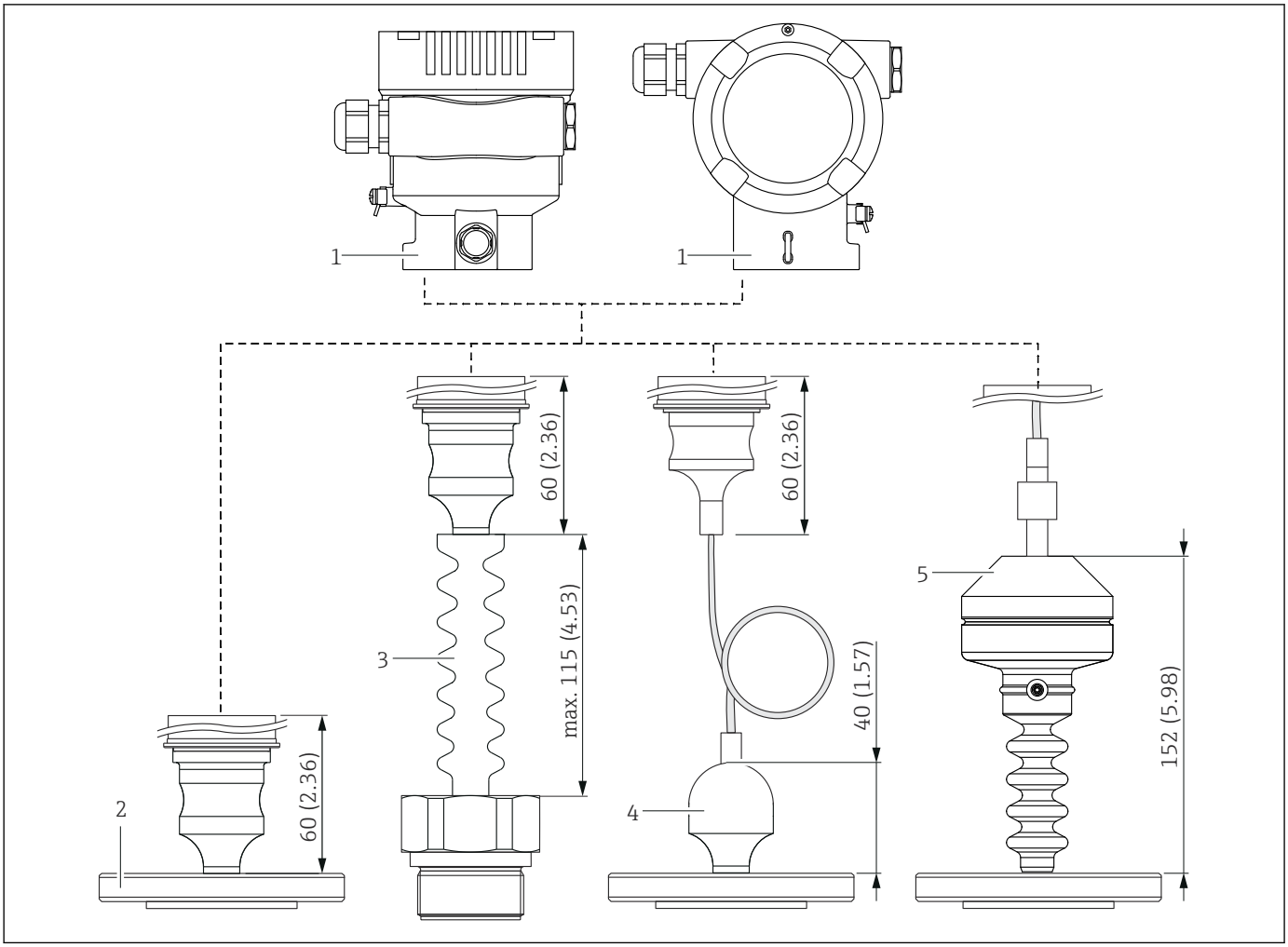
**Sensor, remote (separate housing)**




*Unit of measurement mm (in)*

*1 86 mm (3.39 in)*
*L Length of cable versions*

### Mounted parts, diaphragm seal




1 *Housing*
2 *Diaphragm seal, e.g. flange diaphragm seal here*
3 *Diaphragm seal with temperature isolator*
4 *Process connections with capillary lines are 40 mm (1.57 in) higher than process connections without capillary lines*
5 *Thermal Range Expander*

### OPL and MWP

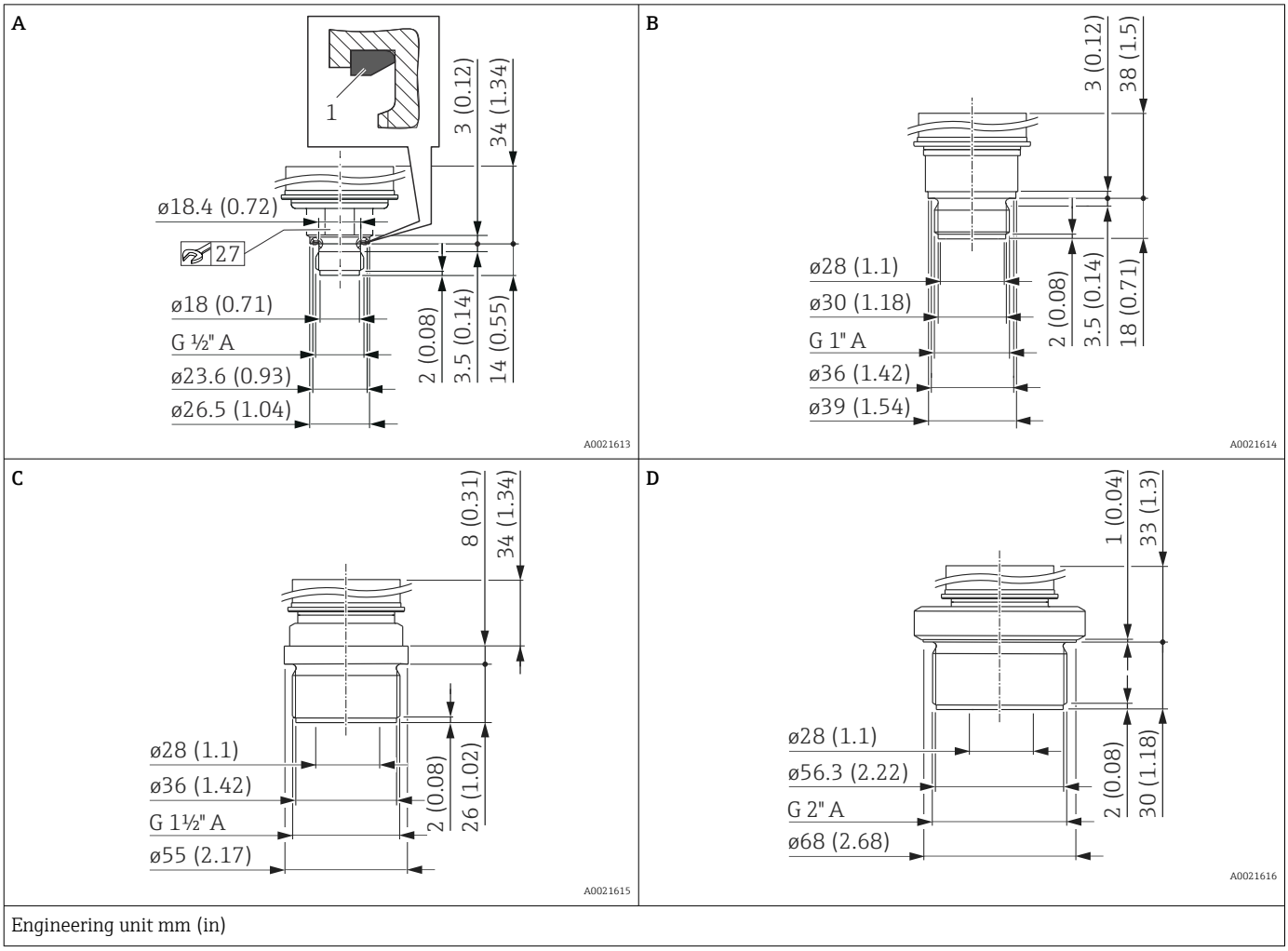
The maximum overpressure limit (OPL) and the maximum working pressure (MWP) of the sensor can deviate from the maximum OPL and MWP of the process connection.

For the maximum OPL and MWP, see the technical documentation of the process connection.

### Explanation of terms

- DN or NPS or A = alphanumeric identifier of the flange size
- PN or Class or K = alphanumeric pressure rating of a component

**Thread ISO 228 G, flush membrane, standard (without diaphragm seal)**

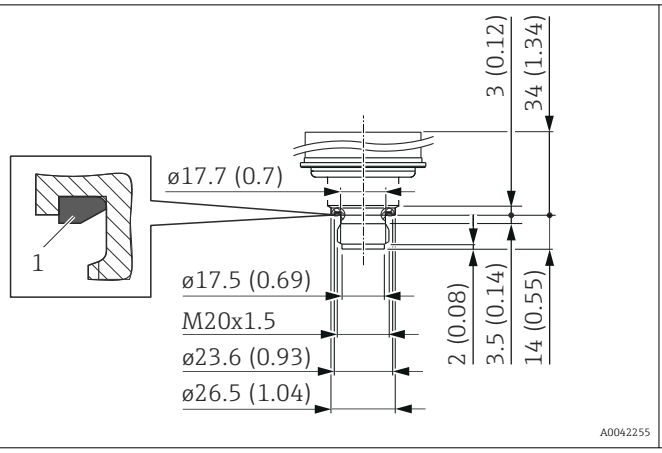



Engineering unit mm (in)

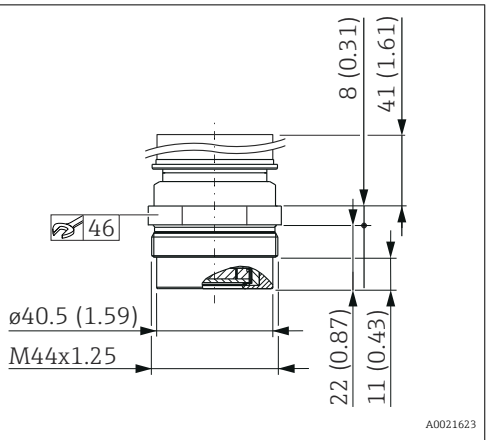
| Item | Designation | Material | Weight |
|---|---|---|---|
| | | | kg (lb) |
| A | Thread ISO 228 G ½" A, DIN 3852<br>FKM form seal (item 1) pre-installed | AISI 316L | 0.4 (0.88) |
| A | Thread ISO 228 G ½" A, DIN 3852<br>FKM form seal (item 1) pre-installed | Alloy C276 (2.4819) | 0.4 (0.88) |
| B | Thread ISO 228 G 1" A | AISI 316L | 0.7 (1.54) |
| B | Thread ISO 228 G 1" A | Alloy C276 (2.4819) | 0.7 (1.54) |
| C | Thread ISO 228 G 1 ½" A | AISI 316L | 1.1 (2.43) |
| C | Thread ISO 228 G 1 ½" A | Alloy C276 (2.4819) | 1.1 (2.43) |
| D | Thread ISO 228 G 2" A | AISI 316L | 1.5 (3.31) |
| D | Thread ISO 228 G 2" A | Alloy C276 (2.4819) | 1.5 (3.31) |

**Thread DIN, flush membrane, standard (no diaphragm seal)**

A



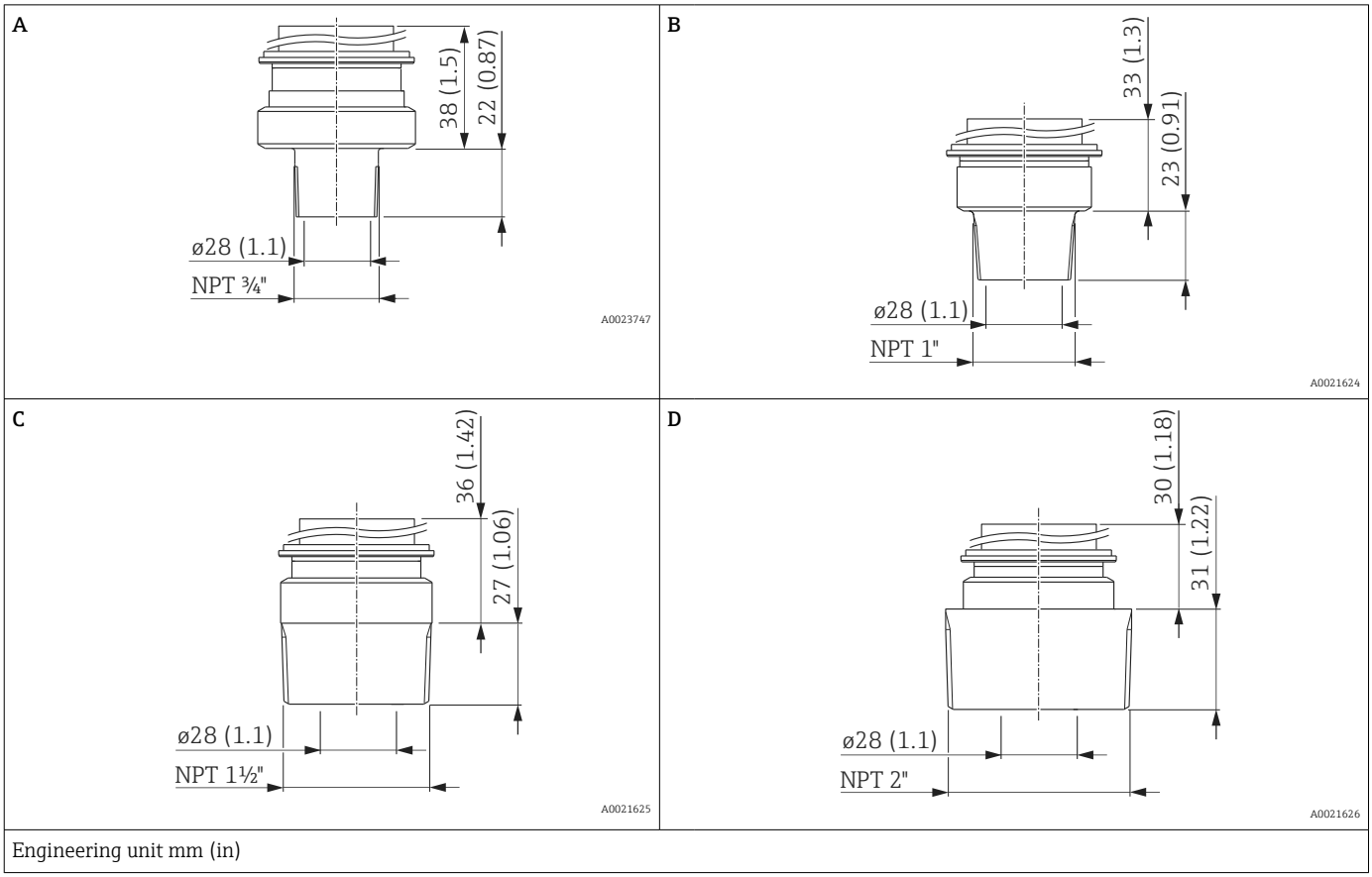

B




Engineering unit mm (in)

| Item | Designation | Material | Weight |
|---|---|---|---|
| | | | kg (lb) |
| A | Thread DIN 16288 M20<br>FKM 80 flat seal (item 1) pre-installed | AISI 316L | 0.4 (0.88) |
| A | Thread DIN 16288 M20<br>FKM 80 flat seal (item 1) pre-installed | Alloy C276 (2.4819) | 0.4 (0.88) |
| B | Thread DIN 13 M44 x 1.25 | AISI 316L | 1.1 (2.43) |

**Thread ASME, flush membrane, standard (without diaphragm seal)**

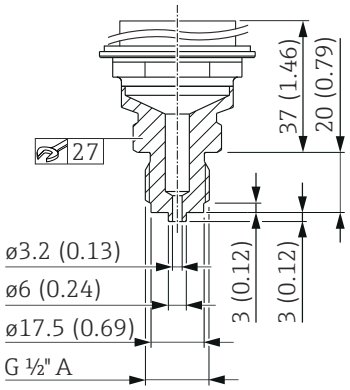



Engineering unit mm (in)

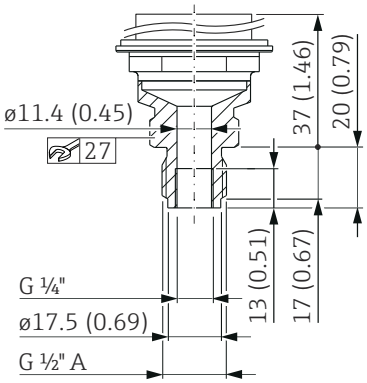
| Item | Designation | Material | Weight |
|---|---|---|---|
| | | | kg (lb) |
| A | Thread ASME ¾" MNPT | AISI 316L | 0.6 (1.32) |
| B | Thread ASME 1" MNPT | AISI 316L | 0.7 (1.54) |
| B | Thread ASME 1" MNPT | Alloy C276 (2.4819) | 0.7 (1.54) |
| C | Thread ASME 1 ½" MNPT | AISI 316L | 1 (2.21) |
| C | Thread ASME 1 ½" MNPT | Alloy C276 (2.4819) | 1 (2.21) |
| D | Thread ASME 2" MNPT | AISI 316L | 1.3 (2.87) |
| D | Thread ASME 2" MNPT | Alloy C276 (2.4819) | 1.3 (2.87) |

**Thread ISO 228 G, internal membrane, standard (without diaphragm seal)**

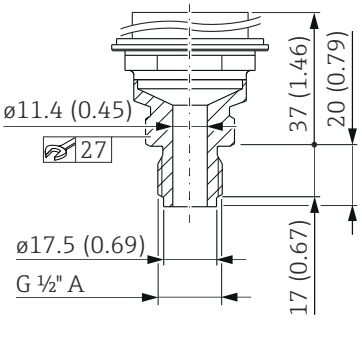
A




B




C

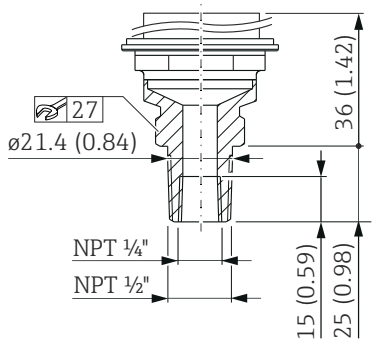



Engineering unit mm (in)

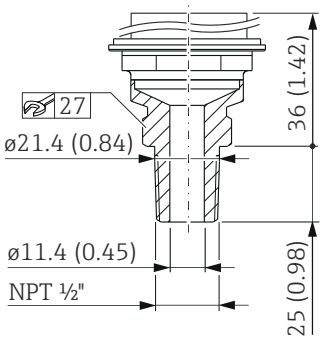
| Item | Designation | Material | Weight |
|---|---|---|---|
| | | | kg (lb) |
| A | Thread ISO 228 G ½" A EN837<br>Bore 11.4 mm (0.45 in) = 400 bar (6 000 psi)<br>Bore 3.2 mm (0.13 in) = 700 bar (10 500 psi) | AISI 316L | 0.63 (1.39) |
| | | Alloy C276 (2.4819) | 0.63 (1.39) |
| B | Thread ISO 228 G ½" A,<br>G ¼" (female) bore 11.4 mm (0.45 in) = 400 bar (6 000 psi) | AISI 316L | 0.63 (1.39) |
| | | Alloy C276 (2.4819) | 0.63 (1.39) |
| C | Thread ISO 228 G ½" A,<br>Bore 11.4 mm (0.45 in) = 400 bar (6 000 psi) | AISI 316L | 0.63 (1.39) |
| | | Alloy C276 (2.4819) | 0.63 (1.39) |

**Thread ASME B1.20.1, internal membrane, standard (without diaphragm seal)**

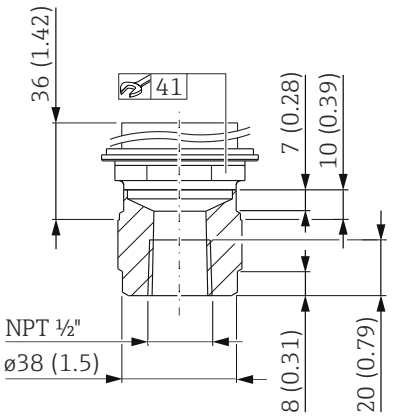
A




B




C

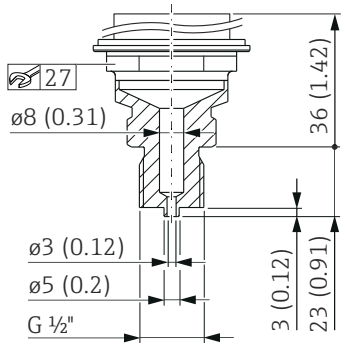



Engineering unit mm (in)

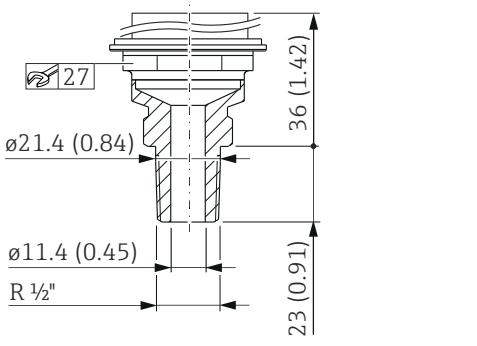
| Item | Designation | Material | Weight |
|---|---|---|---|
| | | | kg (lb) |
| A | Thread ASME ½" MNPT, ¼" FNPT | AISI 316L | 0.63 (1.39) |
| A | Thread ASME ½" MNPT, ¼" FNPT | Alloy C276 (2.4819) | 0.63 (1.39) |
| B | Thread ASME ½" MNPT,<br>Bore 11.4 mm (0.45 in) = 400 bar (6 000 psi)<br>Bore 3.2 mm (0.13 in) = 700 bar (10 500 psi) | AISI 316L | 0.63 (1.39) |
| B | Thread ASME ½" MNPT,<br>Bore 11.4 mm (0.45 in) = 400 bar (6 000 psi)<br>Bore 3.2 mm (0.13 in) = 700 bar (10 500 psi) | Alloy C276 (2.4819) | 0.63 (1.39) |
| C | Thread ASME ½" FNPT | AISI 316L | 0.7 (1.54) |
| C | Thread ASME ½" FNPT | Alloy C276 (2.4819) | 0.7 (1.54) |

### Thread JIS, internal membrane, standard (without diaphragm seal)

A




B

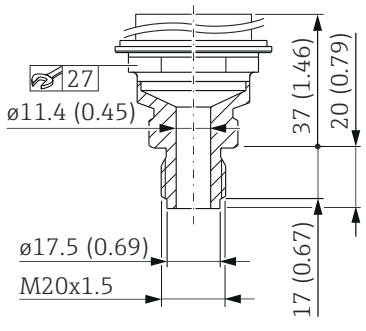



Engineering unit mm (in)

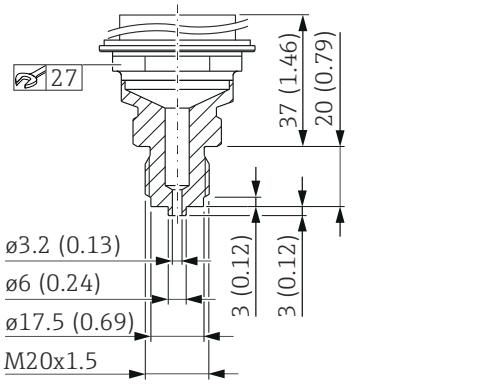
| Item | Designation | Material | Weight |
|---|---|---|---|
| | | | kg (lb) |
| A | JIS B0202 G ½" (male) | AISI 316L | 0.6 (1.32) |
| B | JIS B0203 R ½" (male) | AISI 316L | 0.6 (1.32) |

### Thread DIN 13, internal membrane, standard (without diaphragm seal)

A




B

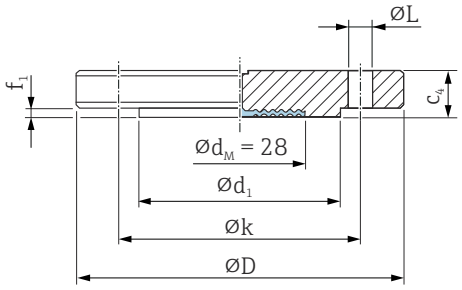



Engineering unit mm (in)

| Item | Designation | Material | Weight |
|---|---|---|---|
| | | | kg (lb) |
| A | DIN 13 M20 x 1.5 11.4 mm (0.45 in) | AISI 316L | 0.6 (1.32) |
| A | DIN 13 M20 x 1.5 11.4 mm (0.45 in) | Alloy C276 (2.4819) | 0.6 (1.32) |
| B | DIN 13 M20 x 1.5, EN837 3 mm (0.12 in) | AISI 316L | 0.6 (1.32) |
| B | DIN 13 M20 x 1.5, EN837 3 mm (0.12 in) | Alloy C276 (2.4819) | 0.6 (1.32) |

### Flange EN1092-1, flush mount membrane, standard (without diaphragm seal)

Connection dimensions according to EN1092-1.




A0045473

*ØD Diameter of flange*
*$c_4$ Thickness*
*$Ød_1$ Raised face*
*$f_1$ Raised face*
*Øk Pitch diameter*
*ØL Diameter of hole*
*$Ød_M$ Max. diameter of membrane*

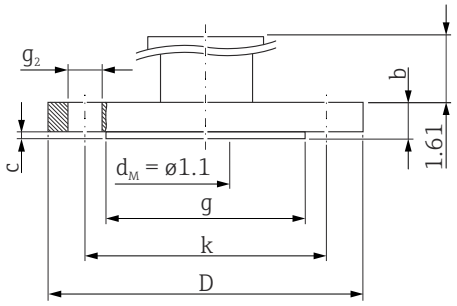
Engineering unit mm

| Flange [1) 2)] | | | | | | | Boltholes | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| DN | PN | Form | ØD | $c_4$ | $Ød_1$ | $f_1$ | Number | ØL | Øk | |
| | | | mm | mm | mm | mm | | mm | mm | kg (lb) |
| DN 25 | PN 10-40 | B1 | 115 | 18 | 68 | 2 | 4 | 14 | 85 | 1.38 (3.04) |
| DN 32 | PN 10-40 | B1 | 140 | 18 | 78 | 2 | 4 | 18 | 100 | 2.03 (4.48) |
| DN 40 | PN 10-40 | B1 | 150 | 18 | 88 | 3 | 4 | 18 | 110 | 2.35 (5.18) |
| DN 50 | PN 10-40 | B1 | 165 | 20 | 102 | 3 | 4 | 18 | 125 | 3.2 (7.06) |
| DN 80 | PN 10-40 | B1 | 200 | 24 | 138 | 3 | 8 | 18 | 160 | 5.54 (12.22) |

1) Material: AISI 316L
2) The raised face of the flange is made from the same material as the membrane.

**Flange ASME, flush membrane, standard (without diaphragm seal)**

Connection dimensions in accordance with ASME B 16.5, raised face RF




A0022645

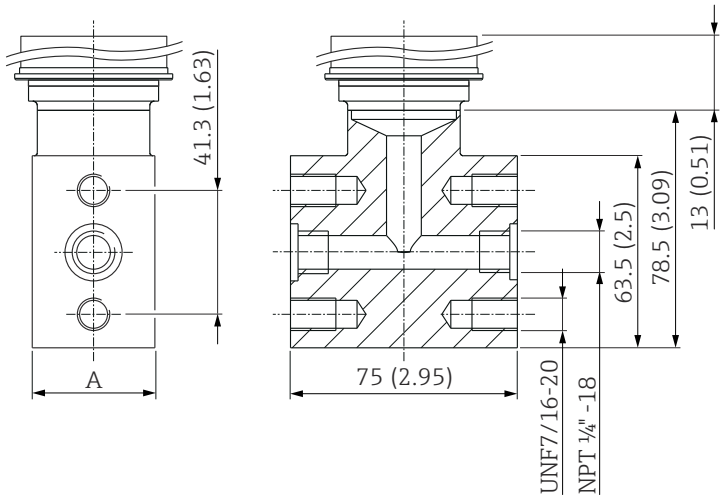
*D* *Diameter of flange*
*b* *Thickness*
*g* *Raised face*
*c* *Thickness of raised face*
*k* *Pitch diameter*
$g_2$ *Diameter of hole*
$d_M$ *Max. diameter of the membrane*

Engineering unit in.

| Flange [1] | | | | | | Boltholes | | | Weight |
|---|---|---|---|---|---|---|---|---|---|
| NPS | Class | D | b | g | c | Quantity | $g_2$ | k | |
| in | | in | in | in | in | | in | in | kg (lb) |
| 1 | 150 | 4.25 | 0.61 | 2.44 | 0.08 | 4 | 0.62 | 3.13 | 1.1 (2.43) |
| 1 | 300 | 4.88 | 0.69 | 2.7 | 0.06 | 4 | 0.75 | 3.5 | 1.3 (2.87) |
| 1 ½ | 150 | 5 | 0.69 | 2.88 | 0.08 | 4 | 0.62 | 3.88 | 1.5 (3.31) |
| 1 ½ | 300 | 6.12 | 0.81 | 2.88 | 0.08 | 4 | 0.88 | 4.5 | 2.6 (5.73) |
| 2 | 150 | 6 | 0.75 | 3.62 | 0.08 | 4 | 0.75 | 4.75 | 2.4 (5.29) |
| 2 | 300 | 6.5 | 0.88 | 3.62 | 0.08 | 8 | 0.75 | 5 | 3.2 (7.06) |
| 3 | 150 | 7.5 | 0.94 | 5 | 0.08 | 4 | 0.75 | 6 | 4.9 (10.8) |
| 3 | 300 | 8.25 | 1.12 | 5 | 0.08 | 8 | 0.88 | 6.62 | 6.7 (14.77) |
| 4 | 150 | 9 | 0.94 | 6.19 | 0.08 | 8 | 0.75 | 7.5 | 7.1 (15.66) |
| 4 | 300 | 10 | 1.25 | 6.19 | 0.08 | 8 | 0.88 | 7.88 | 11.6 (25.88) |

1) Material: AISI 316/316L; combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)

**Oval flange**

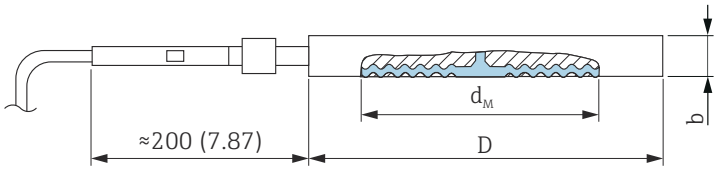



*A Sensor <40 bar (600 psi): 40 mm (1.57 in); sensor ≥40 bar (600 psi): 45 mm (1.77 in)*

Engineering unit mm (in)

| Material | Designation | Weight |
|---|---|---|
| | | kg (lb) |
| AISI 316L (1.4404) | Oval flange adapter 1/4-18 NPT<br>as per IEC 61518<br>Mounting: 7/16-20 UNF | 1.9 (4.19) |

**Pancake seal with flush membrane**




*D Diameter*
*$d_M$ Max. diameter of the membrane*
*b Thickness*

Engineering unit mm (in)

| Material [1] | DN | PN [2] | D mm | b mm | Weight kg (lb) |
|---|---|---|---|---|---|
| AISI 316L | DN 50 | PN 16-400 | 102 | 20 - 22 | 1.3 (2.87) |
| | DN 80 | PN 16-400 | 138 | 20 - 22 | 2.3 (5.07) |
| | DN 100 | PN 16-400 | 162 | 20 - 22 | 3.1 (6.84) |

1) Supplied with conventional membrane if a PTFE membrane coating is ordered.
2) The specified nominal pressure applies for the diaphragm seal. The maximum pressure for the device depends on the lowest-rated element, with regard to pressure, of the selected component.

| Material | NPS | Class [1] | D in | b in | Weight kg (lb) |
|---|---|---|---|---|---|
| AISI 316L | 2 | 150-2500 | 3.62 | 0.79 - 0.87 | 1.3 (2.87) |
| | 3 | 150-2500 | 5.00 | 0.79 - 0.87 | 2.3 (5.07) |
| | 4 | 150-2500 | 6.22 | 0.79 - 0.87 | 3.1 (6.84) |

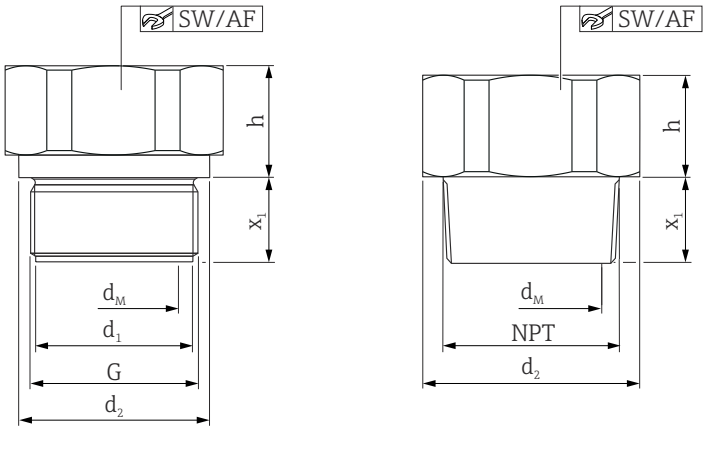
1) The specified nominal pressure applies for the diaphragm seal. The maximum pressure for the device depends on the lowest-rated element, with regard to pressure, of the selected component.

*Maximum diameter of membrane Ø$d_M$*

| DN | PN | Ø$d_M$ (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 316L TempC | 316L | Alloy C276 | Tantalum | Monel (Alloy 400) | PTFE |
| 50 | 16-400 | 61 | - | 62 | 60 | 59 | 52 |
| 80 | 16-400 | 89 | - | 90 | 92 | 89 | 80 |
| 100 | 16-400 | - | 89 | 90 | 92 | 89 | - |

| NPS | Class | Ø$d_M$ (in) | | | | | |
|---|---|---|---|---|---|---|---|
| in | | 316L TempC | 316L | Alloy C276 | Tantalum | Monel (Alloy 400) | PTFE |
| 2 | 150-2500 | 2.40 | - | 2.32 | 2.36 | 2.32 | 2.05 |
| 3 | 150-2500 | 3.50 | - | 3.54 | 3.62 | 3.50 | 3.14 |
| 4 | 150-2500 | - | 3.14 | 3.50 | 3.62 | 3.50 | - |

### Thread ISO228, thread ASME, flush membrane, diaphragm seal, TempC




*$d_1$ Diameter*
*$d_2$ Diameter*
*G Thread*
*$x_1$ Screw-in length*
*SW/AF Across flats*
*$d_M$ Max. diameter of membrane*
*h Height*

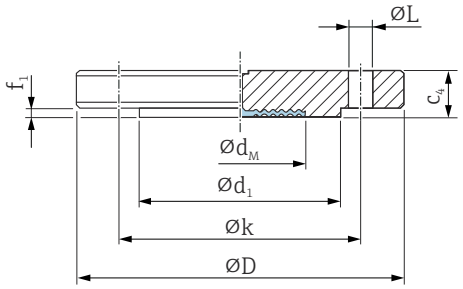
Engineering unit mm (in). Left: thread ISO228, right: thread ASME
Schematic diagram, the design may differ.

| Thread | | | | | | | Diaphragm seal | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Material | G | PN | $d_1$ | $d_2$ | $x_1$ | SW/AF | $d_M$ | h | Weight | |
| | | | [mm] | [mm] | [mm] | | [mm] | [mm] | [kg (lb)] | |
| AISI 316L | G 1" A | 400 | 30 | 39 | 21 | 41 | 28 | 19 | 0.35 (0.77) | |
| Alloy C276 | | | | | | | | | 0.38 (0.84) | |
| AISI 316L | G 1 ½" A | 400 | – | 55 | 30 | 46 | 41 | 20 | 0.73 (1.61) | |
| Alloy C276 | | | | | | | | | 0.79 (1.74) | |
| AISI 316L | G 2" | 400 | – | 68 | 30 | 60 | 48 | 20 | 1.20 (2.65) | |
| Alloy C276 | | | | | | | | | 1.30 (2.87) | |

| Thread | | | | | | | Diaphragm seal | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Material | MNPT | PN | $d_1$ | $d_2$ | $x_1$ | SW/AF | $d_M$ | h | Weight | |
| | | | [mm] | [mm] | [mm] | | [mm] | [mm] | [kg (lb)] | |
| AISI 316L | 1" MNPT | 400 | – | 45 | 23 | 41 | 28 | 16 | 0.38 (0.84) | |
| Alloy C276 | | | | | | | | | 0.41 (0.90) | |
| AISI 316L | 1 ½" MNPT | 400 | – | 60 | 30 | 46 | 41 | 20 | 0.70 (1.54) | |
| Alloy C276 | | | | | | | | | 0.76 (1.68) | |
| AISI 316L | 2" MNPT | 400 | – | 60 | 34 | 46 | 48 | 21 | 1.10 (2.43) | |
| Alloy C276 | | | | | | | | | 1.19 (2.62) | |

**Flange EN1092-1, flush membrane, diaphragm seal**

Connection dimensions according to EN1092-1.




A0045226

*ØD Diameter of flange*
*$c_4$ Thickness*
*Ød$_1$ Raised face*
*$f_1$ Raised face*
*Øk Pitch diameter*
*ØL Diameter of hole*
*Ød$_M$ Max. diameter of membrane*

Engineering unit mm

| Flange [1) 2) 3) 4)] | | | | | | | Boltholes | | | Diaphragm seal |
|---|---|---|---|---|---|---|---|---|---|---|
| DN | PN | Form | ØD | $c_4$ | Ød$_1$ | $f_1$ | Number | ØL | Øk | Weight |
| | | | mm | mm | mm | mm | | mm | mm | kg (lb) |
| DN 25 | PN 10-40 | B1 | 115 | 18 | 68 | 2 | 4 | 14 | 85 | 1.38 (3.04) |
| DN 25 | PN 63-160 | B2 | 140 | 24 | 68 | 2 | 4 | 18 | 100 | 2.54 (5.60) |
| DN 25 | PN 250 | B2 | 150 | 28 | 68 | 2 | 4 | 22 | 105 | 3.7 (8.16) |
| DN 25 | PN 400 | B2 | 180 | 38 | 68 | 2 | 4 | 26 | 130 | 6.65 (14.66) |
| DN 32 | PN 10-40 | B1 | 140 | 18 | 78 | 2 | 4 | 18 | 100 | 2.03 (4.48) |
| DN 40 | PN 10-40 | B1 | 150 | 18 | 88 | 3 | 4 | 18 | 110 | 2.35 (5.18) |
| DN 50 | PN 10-40 | B1 | 165 | 20 | 102 | 3 | 4 | 18 | 125 | 3.2 (7.06) |
| DN 50 | PN 63 | B2 | 180 | 26 | 102 | 3 | 4 | 22 | 135 | 4.52 (9.97) |
| DN 50 | PN 100-160 | B2 | 195 | 30 | 102 | 3 | 4 | 26 | 145 | 6.07 (13.38) |
| DN 80 | PN 10-40 | B1 | 200 | 24 | 138 | 3 | 8 | 18 | 160 | 5.54 (12.22) |
| DN 80 | PN 100 | B2 | 230 | 32 | 138 | 3 | 8 | 26 | 180 | 8.85 (19.51) |
| DN 100 | PN 10-16 | B1 | 220 | 20 | 158 | 3 | 8 | 18 | 180 | 5.65 (12.46) |
| DN 100 | PN 25-40 | B1 | 235 | 24 | 162 | 3 | 8 | 22 | 190 | 7.6 (16.76) |
| DN 100 | PN 100 | B2 | 265 | 36 | 162 | 3 | 8 | 30 | 210 | 13.3 (29.33) |

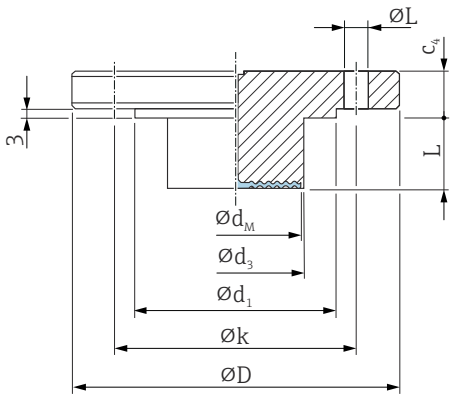
1) Material: AISI 316L
2) The roughness of the surface in contact with the medium including the raised face of the flanges (all standards) made of Alloy C276, Monel, tantalum, gold > 316L or PTFE is $R_a$< 0.8 µm (31.5 µin). Lower surface roughness on request.
3) The flange raised face is made from the same material as the membrane.
4) Supplied with conventional membrane if a PTFE membrane coating is ordered.

*Maximum diameter of membrane $Ød_M$*

| DN | PN | $Ød_M$ (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 316L TempC | 316L | Alloy C276 | Tantalum | Monel (Alloy 400) | PTFE |
| DN 25 | PN 10-40 | 28 | - | 33 | 33 | 33 | 28 |
| DN 25 | PN 63-160 | - | 28 | 28 | 28 | 28 | - |
| DN 25 | PN 250 | - | 28 | 28 | 28 | 28 | - |
| DN 25 | PN 400 | - | 28 | 28 | 28 | 28 | - |
| DN 32 | PN 10-40 | - | 34 | 42 | 42 | 34 | - |
| DN 40 | PN 10-40 | - | 38 | 48 | 51 | 42 | - |
| DN 50 | PN 10-40 | 61 | - | 57 | 60 | 59 | 52 |
| DN 50 | PN 63 | - | 52 | 62 | 60 | 59 | - |
| DN 50 | PN 100-160 | - | 52 | 62 | 60 | 59 | - |
| DN 80 | PN 10-40 | 89 | - | 89 | 92 | 89 | 80 |
| DN 80 | PN 100 | - | 80 | 90 | 92 | 90 | - |
| DN 100 | PN 10-16 | - | 80 | 90 | 92 | 89 | - |
| DN 100 | PN 25-40 | - | 80 | 90 | 92 | 89 | - |
| DN 100 | PN 100 | - | 80 | 90 | 92 | 89 | - |

**Barrel, flange, EN1092-1, flush membrane, diaphragm seal**

Connection dimensions in accordance with EN 1092-1.




A0045227

*ØD Diameter of flange*
*$c_4$ Thickness*
*Ød$_1$ Raised face*
*Øk Pitch diameter*
*ØL$_2$ Diameter of hole*
*Ød$_M$ Max. diameter of membrane*
*Ød$_3$ Barrel diameter*
*L Barrel length*

Engineering unit mm

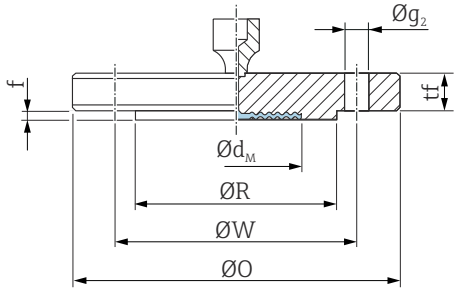
| Flange [1) 2)] | | | | | | Boltholes | | | Diaphragm seal |
|---|---|---|---|---|---|---|---|---|---|
| DN | PN | Form | ØD | $c_4$ | Ød$_1$ | Number | ØL | Øk | Ød$_M$ [3)] |
| | | | mm | mm | mm | | mm | mm | mm |
| DN 50 | PN 10-40 | B1 | 165 | 20 | 102 | 4 | 18 | 125 | 48 |
| DN 80 | PN 10-40 | B1 | 200 | 24 | 138 | 8 | 18 | 160 | 73 |

1) Material: AISI 316L
2) In the case of membranes made of Alloy C276, the flange raised face and the barrel are made of 316L
3) Maximum membrane diameter

| Casing | | | | |
|---|---|---|---|---|
| DN | PN | L | Ød$_3$ | Weight |
| | | mm | mm | kg (lb) |
| DN 50 | PN 10-40 | 50 / 100 / 150 / 200 | 48.3 | 3.44 (7.59) / 3.8 (8.4) / 4.1 (9.04) / 4.4 (9.7) |
| DN 80 | PN 10-40 | 50 /100 / 150 / 200 | 76 | 6.2 (13.7) / 6.7 (14.8) / 7.27 (16.03) / 7.8 (17.2) |

**Flange ASME B16.5, flush membrane, diaphragm seal**

Connection dimensions in accordance with ASME B 16.5, raised face RF




A0045230

*ØO Diameter of flange*
*tf Thickness*
*ØR Raised face*
*f Raised face*
*ØW Pitch diameter*
*Øg$_2$ Diameter of hole*
*Ød$_M$ Max. membrane diameter*

Engineering unit in

| Flange [1) 2) 3)] | | | | | | Boltholes | | | Diaphragm seal |
|---|---|---|---|---|---|---|---|---|---|
| NPS | Class | ØO | tf | ØR | f | Quantity | Øg$_2$ | ØW | Weight |
| in | | in | in | in | in | | in | in | kg (lb) |
| 1 | 150 | 4.25 | 0.50 | 2 | 0.06 | 4 | 5/8 | 3.12 | 1.2 (2.65) |
| 1 | 300 | 4.88 | 0.62 | 2 | 0.06 | 4 | 3/4 | 3.5 | 1.5 (3.31) |
| 1 | 400/600 | 4.88 | 0.69 | 2 | 0.25 | 4 | 3/4 | 3.5 | 1.7 (3.75) |
| 1 | 900/1500 | 5.88 | 1.12 | 2 | 0.25 | 4 | 1 | 4 | 3.7 (8.16) |
| 1 | 2500 | 6.25 | 1.38 | 2 | 0.25 | 4 | 1 | 4.25 | 5.1 (11.25) |
| 1 ½ | 150 | 5 | 0.62 | 2.88 | 0.06 | 4 | 5/8 | 3.88 | 1.6 (3.53) |
| 1 ½ | 300 | 6.12 | 0.75 | 2.88 | 0.06 | 4 | 7/8 | 4.5 | 2.7 (5.95) |
| 2 | 150 | 6 | 0.69 | 3.62 | 0.06 | 4 | 3/4 | 4.75 | 2.5 (5.51) |
| 2 | 300 | 6.5 | 0.81 | 3.62 | 0.06 | 8 | 3/4 | 5 | 3.4 (7.5) |
| 2 | 400/600 | 6.5 | 1 | 3.62 | 0.25 | 8 | 3/4 | 5 | 4.3 (9.48) |
| 2 | 900/1500 | 8.5 | 1.5 | 3.62 | 0.25 | 8 | 1 | 6.5 | 10.3 (22.71) |
| 2 | 2500 | 9.25 | 2 | 3.62 | 0.25 | 8 | 1 1/8 | 6.75 | 15.8 (34.84) |
| 3 | 150 | 7.5 | 0.88 | 5 | 0.06 | 4 | 3/4 | 6 | 5.1 (11.25) |
| 3 | 300 | 8.25 | 1.06 | 5 | 0.06 | 8 | 7/8 | 6.62 | 7.0 (15.44) |
| 3 | 400/600 | 6.5 | 1.25 | 5 | 0.25 | 8 | 7/8 | 6.62 | 8.6 (18.96) |
| 3 | 900 | 9.5 | 1.5 | 5 | 0.25 | 8 | 1 | 7.5 | 13.3 (29.33) |
| 4 | 150 | 9 | 0.88 | 6.19 | 0.06 | 8 | 3/4 | 7.5 | 7.2 (15.88) |
| 4 | 300 | 10 | 1.19 | 6.19 | 0.06 | 8 | 7/8 | 7.88 | 11.7 (25.8) |

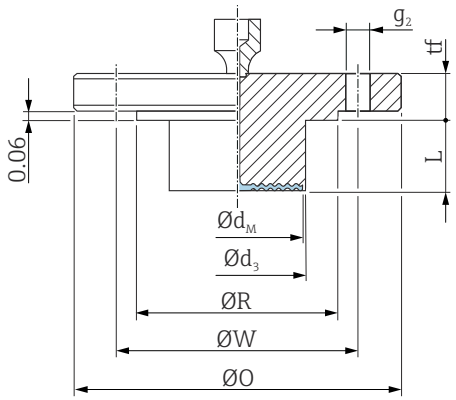
1) Material AISI 316/316L: Combination of AISI 316 for necessary pressure resistance and AISI 316L for necessary chemical resistance (dual rated)
2) The roughness of the surface in contact with the medium including the raised face of the flanges (all standards) made of Alloy C276, Monel, tantalum, gold or PTFE is $R_a$< 0.8 µm (31.5 µin). Lower surface roughness on request.
3) The flange raised face is made from the same material as the membrane.

*Maximum diameter of membrane $Ød_M$*

| NPS | Class | $Ød_M$ (in) | | | | |
|---|---|---|---|---|---|---|
| | | 316L TempC | 316L | Alloy C276 | Tantalum | Monel (Alloy 400) |
| 1 | 150 | 1.10 | - | 1.30 | 1.34 | 1.30 |
| 1 | 300 | 1.10 | - | 1.30 | 1.34 | 1.30 |
| 1 | 400/600 | - | 1.10 | 1.30 | 1.34 | 1.30 |
| 1 | 900/1500 | - | 1.10 | 1.10 | 1.02 | 1.10 |
| 1 | 2500 | - | 1.10 | 1.30 | 1.34 | 1.30 |
| 1 ½ | 150 | - | 1.50 | 1.89 | 2.01 | 1.89 |
| 1 ½ | 300 | - | 1.50 | 1.89 | 2.01 | 1.89 |
| 2 | 150 | 2.40 | - | 2.44 | 2.44 | 2.44 |
| 2 | 300 | 2.40 | - | 2.44 | 2.44 | 2.44 |
| 2 | 400/600 | - | 2.05 | 2.44 | 2.44 | 2.44 |
| 2 | 900/1500 | - | 2.05 | 2.44 | 2.44 | 2.44 |
| 2 | 2500 | - | 2.05 | 2.44 | 2.44 | 2.44 |
| 3 | 150 | 3.50 | - | 3.62 | 3.62 | 3.62 |
| 3 | 300 | 3.50 | - | 3.62 | 3.62 | 3.62 |
| 3 | 400/600 | - | 3.15 | 3.62 | 3.62 | 3.62 |
| 3 | 900 | - | 3.15 | 3.62 | 3.62 | 3.62 |
| 4 | 150 | - | 3.15 | 3.62 | 3.62 | 3.62 |
| 4 | 300 | - | 3.15 | 3.62 | 3.62 | 3.62 |

**Barrel, flange ASME B16.5, flush membrane, diaphragm seal**

Connection dimensions in accordance with ASME B 16.5, raised face RF




A0045232

*ØO Diameter of flange*
*tf Thickness*
*ØR Raised face*
*ØW Pitch diameter*
*Ø$g_2$ Diameter of hole*
*Ød$_M$ Max. diameter of the membrane*
*Ød$_3$ Barrel diameter*
*L Barrel length*

Engineering unit in

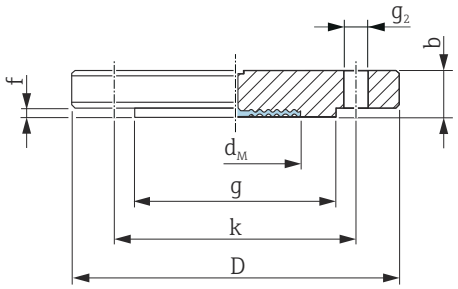
| **Flange** [1) 2) 3)] | | | | | **Boltholes** | | | **Diaphragm seal** |
|---|---|---|---|---|---|---|---|---|
| **NPS** | **Class** | **ØO** | **tf** | **ØR** | **Quantity** | **Ø$g_2$** | **ØW** | **Ød$_M$** [4)] |
| **in** | | **in** | **in** | **in** | | **in** | **in** | **in** |
| 2 | 150 | 6 | 0.69 | 3.62 | 4 | 3/4 | 4.75 | 1.9 |
| 3 | 150 | 7.5 | 0.88 | 5 | 4 | 3/4 | 6 | 2.87 |
| 4 | 150 | 9 | 0.88 | 6.19 | 8 | 3/4 | 7.5 | 3.5 |

1) Material: AISI 316/316L. Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)
2) In the case of membranes made of Alloy C276, the flange raised face is made of 316L.
3) Supplied with a conventional membrane if a PTFE membrane coating is ordered.
4) Maximum membrane diameter

| **Barrel** | | | | |
|---|---|---|---|---|
| **NPS** | **Class** | **L** | **$d_3$** | **Weight** |
| **in** | | **in (mm)** | **in (mm)** | **kg (lb)** |
| 2 | 150 | 2 (50.8) / 4 (101.6) / 6 (152.4) / 8 (203.2) | 1.9 (48.3) | 3.84 (8.47)/ 4.16 (9.17)/ 4.47 (9.86)/ 4.77 (10.52) |
| 3 | 150 | 2 (50.8) / 4 (101.6) / 6 (152.4) / 8 (203.2) | 2.99 (76) | 6.0 (13.2) / 6.6 (14.5) / 7.1 (15.7) / 7.8 (17.2) |
| 4 | 150 | 2 (50.8) / 4 (101.6) / 6 (152.4) / 8 (203.2) | 3.7 (94) | 8.6 (19) / 9.9 (21.8) / 11.2 (24.7) / 12.4 (27.3) |

**Flange JIS, flush membrane, diaphragm seal**

Connection dimensions in accordance with JIS B 2220 BL, raised face RF.




A0021680

*D Diameter of flange*
*b Thickness*
*g Raised face*
*f Thickness of raised face*
*k Pitch diameter*
*$g_2$ Diameter of hole*

Engineering unit mm

| Flange [1) 2) 3)] | | | | | | Boltholes | | | Diaphragm seal |
|---|---|---|---|---|---|---|---|---|---|
| A [4)] | K [5)] | D | b | g | f | Number | $g_2$ | k | Weight |
| | | mm | mm | mm | mm | | mm | mm | kg (lb) |
| 25 A | 10 K | 125 | 14 | 67 | 1 | 4 | 19 | 90 | 1.5 (3.31) |
| 40 A | 10 K | 140 | 16 | 81 | 2 | 4 | 19 | 105 | 2.0 (4.41) |
| 50 A | 10 K | 155 | 16 | 96 | 2 | 4 | 19 | 120 | 2.3 (5.07) |
| 80 A | 10 K | 185 | 18 | 127 | 2 | 8 | 19 | 150 | 3.3 (7.28) |
| 100 A | 10 K | 210 | 18 | 151 | 2 | 8 | 19 | 175 | 4.4 (9.7) |

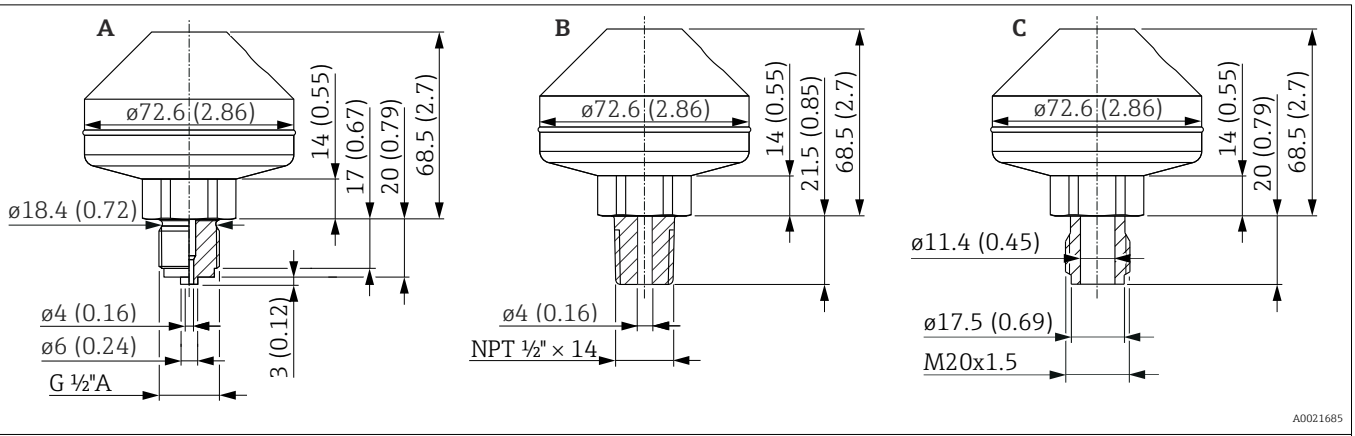
1) Material: AISI 316L
2) The roughness of the surface in contact with the medium, including the raised face of the flanges (all standards) made of Alloy C276, Monel, tantalum, gold or PTFE, is $R_a$< 0.8 µm (31.5 µin). Lower surface roughness on request.
3) The flange raised face is made from the same material as the membrane.
4) Alphanumeric designation of the flange size.
5) Alphanumeric pressure rating of a component.

*Maximum diameter of membrane Ø$d_M$*

| A [1)] | K [2)] | Ø$d_M$ (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 316L TempC | 316L | Alloy C276 | Tantalum | Monel (Alloy 400) | PTFE |
| 25 A | 10 K | - | 28 | - | - | - | - |
| 40 A | 10 K | - | 38 | - | - | - | - |
| 50 A | 10 K | - | 52 | 62 | 60 | 59 | - |
| 80 A | 10 K | - | 80 | - | - | - | - |
| 100 A | 10 K | - | 80 | - | - | - | - |

1) Alphanumeric designation of the flange size.
2) Alphanumeric pressure rating of a component.

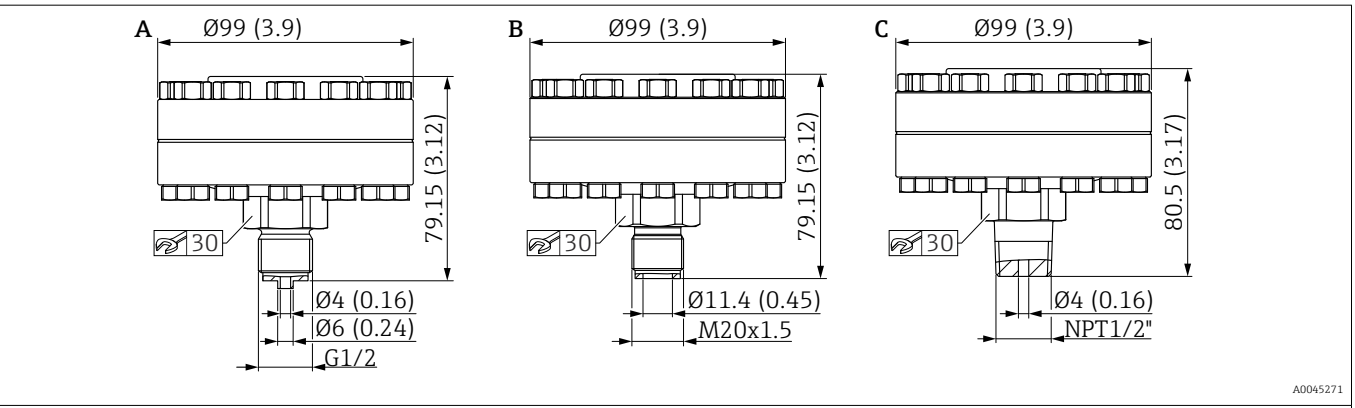
**Separator, thread, ISO228, ASME, DIN, welded, diaphragm seal, TempC**




Engineering unit mm (in)

| Item | Designation | Material | Measuring range | PN | Weight |
|---|---|---|---|---|---|
| | | | bar (psi) | | kg (lb) |
| A | Welded, ISO228 G ½ A EN837 | AISI 316L | ≤ 160 (2320) | PN 160 | 1.43 (3.15) |
| B | Welded, ANSI MNPT ½ | | | | |
| C | Welded, thread DIN 13 M20x1.5 | | | | |

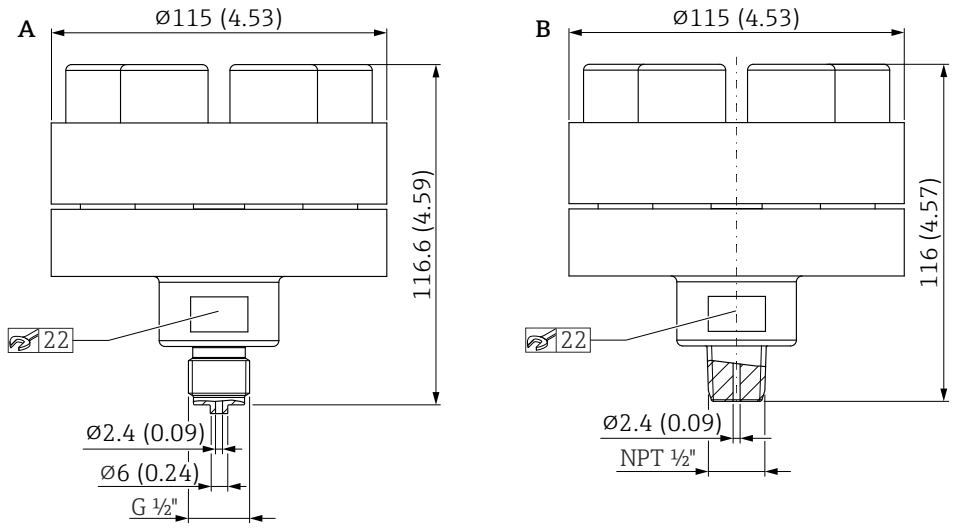
**Separator ISO228, ASME, DIN13, threaded, diaphragm seal, membrane material 316L, TempC**




Engineering unit mm (in)

| Item | Designation | Material | Measuring range | PN | Weight |
|---|---|---|---|---|---|
| | | | bar (psi) | | kg (lb) |
| A | Threaded, ISO228 G½ EN837 with metal seal (silver-plated)<br>−60 to +400 °C (−76 to +752 °F) | AISI 316L,<br>Screws made of A4 | ≤ 100 (1450) | PN 100 | 2.35 kg (5.18 lb) |
| B | Threaded, DIN13 M20x1.5 with metal seal (silver-plated)<br>−60 to +400 °C (−76 to +752 °F) | | | | 2.30 kg (5.07 lb) |
| C | Threaded, ASME MNPT ½ with metal seal (silver-plated)<br>−60 to +400 °C (−76 to +752 °F) | | | | 2.35 kg (5.18 lb) |

**Separator ISO228, ASME, threaded, diaphragm seal**




Engineering unit mm (in)

| Item | Designation | Material | Measuring range | PN [1] | Weight |
|---|---|---|---|---|---|
| | | | bar (psi) | | kg (lb) |
| A | Threaded, ISO228 G ½ A EN837, with integrated seal lip<br>−60 to +400 °C (−76 to +752 °F) | AISI 316L,<br>Screws made of A4 | > 40 (580) | PN 400 | 4.75 (10.47) |
| B | Threaded, ASME MNPT ½, with integrated seal lip<br>−60 to +400 °C (−76 to +752 °F) | | | | |

1) This separator is assembled prior to delivery and must not be disassembled!

## Weight

### Housing

Weight including electronics and display.

- Single compartment housing: 1.1 kg (2.43 lb)
- Dual compartment housing
  - Aluminum: 1.4 kg (3.09 lb)
  - Stainless steel: 3.3 kg (7.28 lb)

### Sensor, remote (separate housing)

- Housing: see the Housing section
- Housing adapter: 0.55 kg (1.21 lb)
- Process connection adapter: 0.36 kg (0.79 lb))
- Cable:
  - PE cable, 2 meters: 0.18 kg (0.40 lb)
  - PE cable, 5 meters: 0.35 kg (0.77 lb)
  - PE cable, 10 meters: 0.64 kg (1.41 lb)
  - FEP cable, 5 meters: 0.62 kg (1.37 lb)
- Mounting bracket: 0.46 kg (1.01 lb)

### Temperature isolator

- Temperature isolator, short: 0.19 kg (0.42 lb)
- Temperature isolator, long: 0.34 kg (0.75 lb)

### Capillary

- 316L (standard capillary armor):
  0.16 kg/m (0.35 lb/m) + 0.2 kg (0.44 lb)
  (Weight per capillary in m)
- PVC-coated capillary armor on 316 L:
  0.21 kg/m (0.46 lb/m) + 0.2 kg (0.44 lb)
  (Weight per capillary in m)
- PTFE-coated capillary armor on 316L:
  0.29 kg/m (0.64 lb/m) + 0.2 kg (0.44 lb)
  (Weight per capillary in m)

### Process connections

Weight, see the specific process connection.

Ex d version: 0.63 kg (1.39 lb)

### Accessories

Mounting bracket: 0.5 kg (1.10 lb)

## Materials in contact with process

### Membrane material

- 316L (1.4435)
- 316L (1.4435), TempC
  TempC membrane stands for "Temperature Compensatory Membrane"
  This membrane reduces the process and environmental influences for diaphragm seals compared to conventional systems
- Alloy C276
  The flange raised face is made from the same material as the membrane
  In the case of devices with a barrel, the flange raised face is made of 316L
  - 316L in the case of EN 1092-1 flanges
  - F316/316L in the case of ASME flanges
- Tantalum
  The flange raised face is made from the same material as the membrane
  In the case of devices with a barrel, the flange raised face is made of 316L
  - 316L in the case of EN 1092-1 flanges
  - F316/316L in the case of ASME flanges
- Monel (Alloy 400)
  The flange raised face is made from the same material as the membrane
  In the case of devices with a barrel, the flange raised face is made of 316L
  - 316L in the case of EN 1092-1 flanges
  - F316/316L in the case of ASME flanges

### Membrane coating

- PTFE, 0.25 mm (0.01 in)
  PTFE is standard only with conventional membranes
- Standard device (without diaphragm seal): gold, 25 µm
- Device with diaphragm seal: gold, 25 µm
  The gold-plated TempC membrane does not offer any corrosion protection!
  Gold is standard only for TempC membranes

### Process connections

See the specific process connection.

### Accessories

For technical data (e.g. materials, dimensions or order numbers), see the accessory document SD01553P.

## Materials not in contact with process

### Single compartment housing, aluminum, coated

- Housing: aluminum EN AC 43400
- Housing coating, cover: polyester
- EN AC-43400 aluminum cover with Lexan 943A PC sight glass
  EN AC-443400 aluminum cover with borosilicate sight glass; dust-Ex for Ex d/XP
- Dummy cover: aluminum EN AC 43400

- Cover sealing materials: HNBR
- Cover sealing materials: FVMQ (in low temperature version only)
- Potential equalization: 316L
- Seal under potential equalization: EPDM
- Plug: PBT-GF30-FR or aluminum
- Plug sealing material: EPDM
- Nameplate: plastic foil
- TAG plate: plastic foil, stainless steel or provided by the customer

The cable entry (material: Stainless steel, nickel-plated brass, plastic) can be ordered via the "Electrical connection" product structure.

**Dual compartment housing, aluminum, coated**

- Housing: aluminum EN AC 43400
- Housing coating, cover: polyester
- EN AC-43400 aluminum cover with Lexan 943A PC sight glass
  EN AC-443400 aluminum cover with borosilicate sight glass; dust-Ex for Ex d/XP
- Dummy cover: aluminum EN AC 43400
- Cover sealing materials: HNBR
- Cover sealing materials: FVMQ (in low temperature version only)
- Potential equalization: 316L
- Seal under potential equalization: EPDM
- Plug: PBT-GF30-FR or aluminum
- Plug sealing material: EPDM
- Nameplate: plastic foil
- TAG plate: plastic foil, stainless steel or provided by the customer

The cable entry (material: Stainless steel, nickel-plated brass, plastic) can be ordered via the "Electrical connection" product structure.

**Dual compartment housing; 316L**

- Housing: stainless steel AISI 316L (1.4409)
  Stainless steel (ASTM A351 : CF3M (cast equivalent to AISI 316L material)/DIN EN 10213 : 1.4409)
- Dummy cover: stainless steel AISI 316L (1.4409)
- Cover: stainless steel AISI 316L (1.4409) with borosilicate sight glass
- Cover sealing materials: HNBR
- Cover sealing materials: FVMQ (in low temperature version only)
- Potential equalization: 316L
- Seal under potential equalization: EPDM
- Plug: stainless steel
- Plug sealing material: EPDM
- Nameplate: stainless steel
- TAG plate: plastic foil, stainless steel or provided by the customer

The cable entry (material: Stainless steel, nickel-plated brass, plastic) can be ordered via the "Electrical connection" product structure.

**Electrical connection**

**Coupling M20, plastic**
- Material: PA
- Seal on cable gland: EPDM
- Dummy plug: plastic

**Coupling M20, nickel-plated brass**
- Material: nickel-plated brass
- Seal on cable gland: EPDM
- Dummy plug: plastic

**Coupling M20, 316L**
- Material: 316L
- Seal on cable gland: EPDM
- Dummy plug: plastic

**M20 coupling, 316 L, hygiene**
- Material: 316L
- Seal on cable gland: EPDM

**M20 thread**
The device is supplied with M20 thread as standard.
Transport plug: LD-PE

**Thread G ½**
The device is supplied with an M20 thread as standard and an adapter to G½ including documentation is included.
- Adapter made of PA66-GF or aluminum or 316L (depends on housing version ordered)
- Transport plug: LD-PE

**NPT ½ thread**
The device is supplied with an NPT½ thread as standard (aluminum housing, 316L housing) or with an M20 thread and an adapter to NPT½ including documentation (plastic housing, hygienic housing).
- Adapter made of PA66-GF or 316L (depends on housing version ordered)
- Transport plug: LD-PE

**Thread NPT ¾**
The device is supplied with thread NPT ¾ as standard
Transport plug: LD-PE

**M20 coupling, blue plastic**
- Material: PA, blue
- Seal on cable gland: EPDM
- Dummy plug: plastic

**M12 plug**
- Material: nickel-plated CuZn or 316L (depends on housing version ordered)
- Transport cap: LD-PE

**HAN7D plug**
Material: aluminum, die-cast zinc, steel

**Valve plug ISO44000 M16**
- Material: PA6
- Transport plug: LD-PE

**Separate housing**

- Mounting bracket
  - Bracket: AISI 316L (1.4404)
  - Screw and nuts: A4-70
  - Half-shells: AISI 316L (1.4404)
- Seal for cable from separate housing: EPDM
- Gland for cable of separate housing: AISI 316L (1.4404)
- PE cable for separate housing: abrasion-proof cable with strain-relief Dynema members; shielded using aluminum-coated foil; insulated with polyethylene (PE-LD), black; copper wires, twisted, UV-resistant
- FEP cable for separate housing: abrasion-proof cable; shielded using galvanized steel wire netting; insulated with fluorinated ethylene propylene (FEP), black; copper cores, twisted, UV-resistant
- Process connection adapter for separate housing: AISI 316L (1.4404)

**Fill fluid**

- Silicone oil
- Silicone oil, FDA 21 CFR 175.105
- Synthetic oil, FDA
- Vegetable oil, FDA 21 CFR 172.856
- High-temperature oil
- Low-temperature oil
- Inert oil (not suitable for temperatures below −20 °C (−4 °F))

**Connecting parts**

- Connection between housing and process connection: AISI 316L (1.4404)
- Measuring cell body: AISI 316L (1.4404)
- Connection between measuring cell body and capillary: AISI 316L (1.4404)
- Heat shrink tube (only available for capillary with PTFE capillary armor or PVC-coated capillary armor): polyolefin

**Armor for capillary**

*AISI 316L*

- Capillary: AISI 316 Ti (1.4571)
- Protective hose for capillary: AISI 316L (1.4404)

*PVC-coated*

- Capillary: AISI 316 Ti (1.4571)
- Protective hose for capillary: AISI 316L (1.4404)
- Coating: PVC
- Heat shrink tube at capillary junction: polyolefin

*PTFE-armored*

- Capillary: AISI 316 Ti (1.4571)
- Protective hose for capillary: AISI 316L (1.4404)
- Armor: PTFE
- Single-ear clamp: 1.4301

**Accessories**

For technical data (e.g. materials, dimensions or order numbers), see the accessory document SD01553P.

# Display and user interface

## Operating concept

**Operator-oriented menu structure for user-specific tasks**
- User navigation
- Diagnostics
- Application
- System

**Fast and safe commissioning**
- Interactive wizard with graphical user interface for guided commissioning in FieldCare, DeviceCare or DTM, AMS and PDM-based third-party tools or SmartBlue
- Menu guidance with short explanations of the individual parameter functions
- Standardized operation at the device and in the operating tools
- PROFINET with Ethernet-APL: access to the device via Web server

**Integrated HistoROM data memory**
- Adoption of data configuration when electronics modules are replaced
- Up to 100 event messages recorded in the device

**Efficient diagnostic behavior increases measurement availability**
- Remedial measures are integrated in plain text
- Diverse simulation options

**Bluetooth module (optionally integrated in local display)**
- Quick and easy setup with SmartBlue app or PC with DeviceCare, version 1.07.00 and higher, or FieldXpert SMT70
- No additional tools or adapters required
- Encrypted single point-to-point data transmission (tested by Fraunhofer Institute) and password-protected communication via *Bluetooth*® wireless technology

## Languages

The operating language of the local display (optional) can be selected via the Product Configurator.

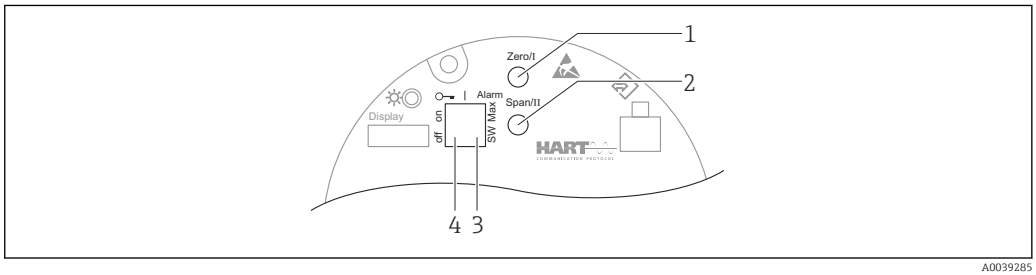
If no particular operating language has been selected, the local display is delivered from the factory with English.

The operating language can be changed subsequently via the **Language** parameter.

## Local operation

**Operating keys and DIP switches on the electronic insert**

*HART*

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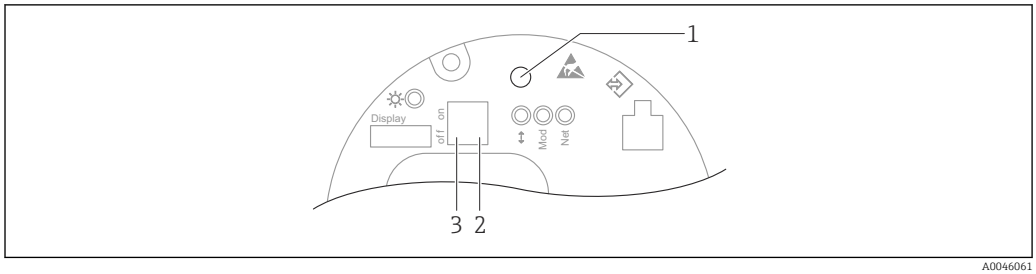
*1 Operating key for lower range value (Zero)*
*2 Operating key for upper range value (Span)*
*3 DIP switch for alarm current*
*4 DIP switch for locking and unlocking the device*

The setting of the DIP switches has priority over the settings made via other operation methods (e.g. FieldCare/DeviceCare).

*PROFINET with Ethernet-APL*




A0046061

*1 Operating key for position adjustment (zero point correction) and device reset*
*2 DIP switch for setting the service IP address*
*3 DIP switch for locking and unlocking the device*

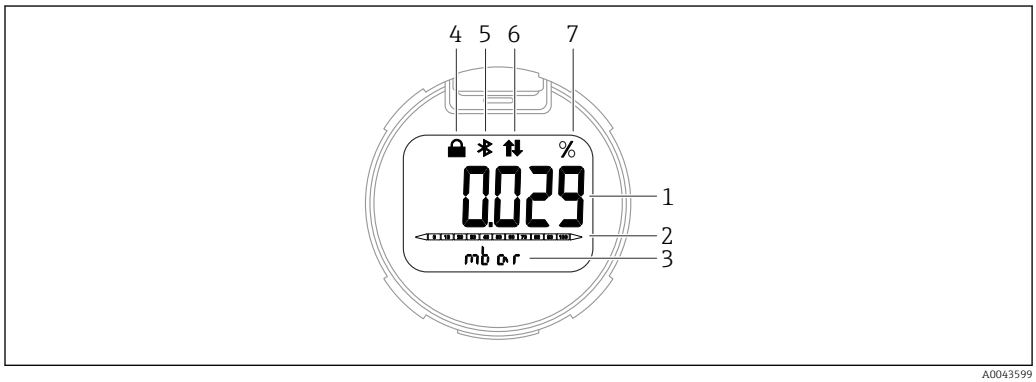
The setting of the DIP switches has priority over the settings made via other operation methods (e.g. FieldCare/DeviceCare).

## Local display

### Device display (optional)

Functions:
- Display of measured values and fault and notice messages
- Background lighting, which switches from green to red in the event of an error
- The device display can be removed for easier operation

The device displays are available with the additional option of Bluetooth® wireless technology.

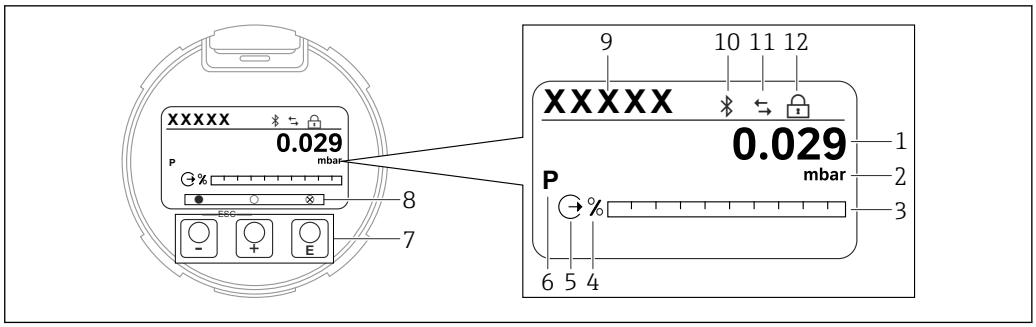



A0043599

*7 Segment display*

*1 Measured value (up to 5 digits)*
*2 Bar graph proportional to the current output (not for PROFINET with Ethernet-APL)*
*3 Unit of measured value*
*4 Locked (symbol appears when the device is locked)*
*5 Bluetooth (symbol flashes if Bluetooth connection is active) (only HART and PROFINET with Ethernet-APL)*
*6 HART communication (symbol is displayed if HART communication is active) , or communication via PROFINET is active (only HART and PROFINET with Ethernet-APL)*
*7 Measured value output in %*

The following graphics are examples. The display depends on the display settings.

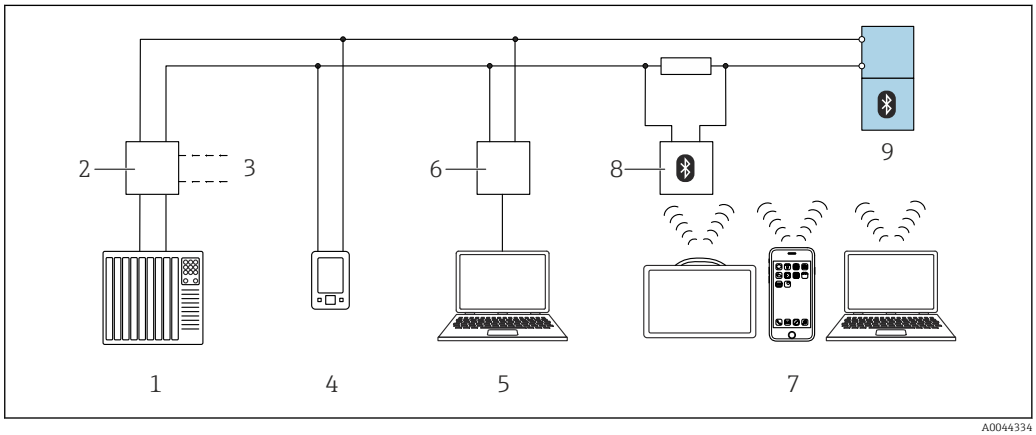



*8 Graphic display with optical operating keys.*

1 *Measured value (up to 12 digits)*
2 *Unit of measured value*
3 *Bar graph proportional to the current output (not for PROFINET with Ethernet-APL)*
4 *Bar graph unit*
5 *Symbol for current output*
6 *Symbol for displayed measured value (e.g. p = pressure)*
7 *Optical operating keys*
8 *Symbols for key feedback. Different display symbols are possible: circle (not filled in) = key pressed briefly; circle (filled in) = key pressed for longer; circle (with X) = no operation possible due to Bluetooth connection*
9 *Device Tag*
10 *Bluetooth (symbol flashes if Bluetooth connection is active)*
11 *HART communication (symbol is displayed if HART communication is active) , or communication via PROFINET is active*
12 *Locked (symbol appears when the device is locked)*

## Remote operation

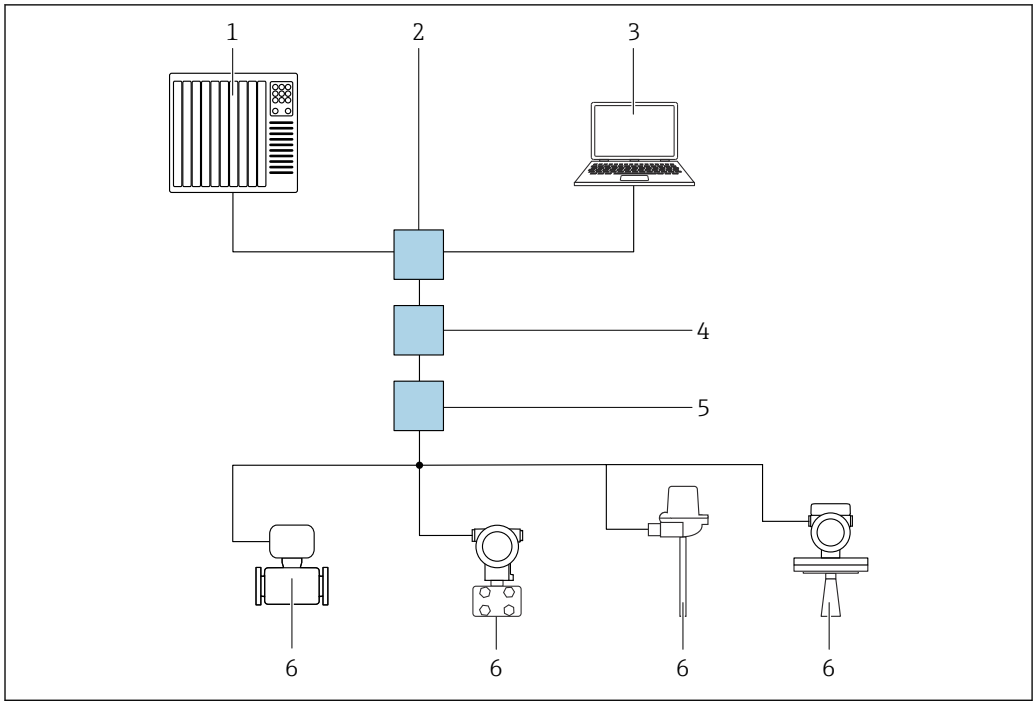
### Via HART protocol or Bluetooth




*9 Options for remote operation via HART protocol*

1 *PLC (programmable logic controller)*
2 *Transmitter power supply unit, e.g. RN221N (with communication resistor)*
3 *Connection for Commubox FXA195 and AMS Trex™ device communicator*
4 *AMS Trex™ device communicator*
5 *Computer with operating tool (e.g. DeviceCare/FieldCare , AMS Device View, SIMATIC PDM)*
6 *Commubox FXA195 (USB)*
7 *Field Xpert SMT70/SMT77, smartphone or computer with operating tool (e.g. DeviceCare/FieldCare, AMS Device View, SIMATIC PDM)*
8 *Bluetooth modem with connecting cable (e.g. VIATOR)*
9 *Transmitter*

### Via PROFINET with Ethernet-APL network




10 *Options for remote operation via PROFINET with Ethernet-APL network: star topology*

1 *Automation system, e.g. Simatic S7 (Siemens)*
2 *Ethernet switch*
3 *Computer with Web browser (e.g., Microsoft Edge) for accessing the integrated device Web server or computer with operating tool (e.g., FieldCare, DeviceCare, SIMATIC PDM) with iDTM Profinet Communication*
4 *APL power switch (optional)*
5 *APL field switch*
6 *APL field device*

Call up the website via the computer in the network. The IP address of the device must be known.

The IP address can be assigned to the device in a variety of ways:
- Dynamic Configuration Protocol (DCP), factory setting
  The automation system (e.g. Siemens S7) automatically assigns the IP address to the device
- Software addressing
  The IP address is entered via the IP address parameter
- DIP switch for service
  The device then has the fixed IP address 192.168.1.212
  The IP address is only adopted following a restart.
  The IP address can now be used to establish the connection to the network

The default setting is that the device uses the Dynamic Configuration Protocol (DCP). The automation system (e.g. Siemens S7) automatically assigns the IP of the device.

### Via Web browser (for devices with PROFINET)

*Function scope*

Thanks to the integrated Web server the device can be operated and configured via a Web browser. The structure of the operating menu is the same as for the local display. In addition to the measured values, device status information is also displayed and allows users to monitor the status of the device. Furthermore the device data can be managed and the network parameters can be configured.

### Via service interface (CDI)

With the Commubox FXA291, a CDI connection is established with the device interface and a Windows PC/notebook with a USB port.

**Operation via Bluetooth® wireless technology (optional)**

Requirement
- Device with Bluetooth display
- Smartphone or tablet with Endress+Hauser SmartBlue app or PC with DeviceCare from version 1.07.00 or FieldXpert SMT70

The connection has a range of up to 25 m (82 ft). The range can vary depending on environmental conditions such as attachments, walls or ceilings.

The operating keys on the display are locked as soon as the device is connected via Bluetooth.

**System integration**

**HART**

Version 7

**PROFINET with Ethernet-APL**

PROFINET Profile 4.02

**Supported operating tools**

Smartphone or tablet with Endress+Hauser SmartBlue (app), DeviceCare, version 1.07.00 and higher, FieldCare, DTM, AMS and PDM.

PC with Web server via fieldbus protocol.

**HistoROM**

When replacing the electronic insert, the stored data is transferred by reconnecting the HistoROM. The device does not work without HistoROM.

The device serial number is saved in the HistoROM. The electronics serial number is saved in the electronics.

# Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

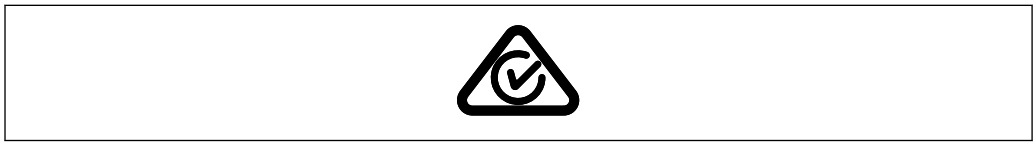
1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

**CE mark**

The device meets the legal requirements of the relevant EC directives. Endress+Hauser confirms that the device has been successfully tested by applying 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 bear the RCM-Tick marking on the nameplate.



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**Ex approvals**

- ATEX
- CSA
- NEPSI
- UKCA
- INMETRO
- KC
- EAC
- JPN
- Combinations of different approvals also

All the data related to explosion protection is provided in separate Ex documentation which is also available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas.

Additional approvals in preparation.

**Explosion-protected smartphones and tablets**

If used in hazardous areas, mobile end devices with an Ex approval must be used.

**Corrosion test**

Standards and test methods:
- 316L: ASTM A262 Practice E and ISO 3651-2 Method A
- Alloy C22 and Alloy C276: ASTM G28 Practice A and ISO 3651-2 Method C
- 22Cr duplex, 25Cr duplex: ASTM G48 Practice A or ISO 17781 and ISO 3651-2 Method C

The corrosion test is confirmed for all wetted and pressure-bearing parts.

A 3.1 material certificate must be ordered as confirmation of the test.

**EAC conformity**

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

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

**Drinking water approval**

NSF/ANSI 61 drinking water approval

**Overfill protection (in preparation)**

The device is tested in accordance with the approval guidelines for overfill protection units (ZG-ÜS:2012-07) as overfill protection as per Section 63 of the German Water Resources Act (WHG).

**Functional safety SIL/ IEC 61508 Declaration of Conformity (optional)**

The devices with a 4-20 mA output signal have been developed according to the IEC 61508 standard. These devices can be used to monitor the process level and pressure up to SIL 3. For a detailed description of the safety functions, settings and functional safety data, see the "Functional Safety Manual".

**Marine approval**

- ABS (American Bureau of Shipping)
- LR (Lloyd's Register)
- BV (Bureau Veritas)
- DNV GL (Det Norske Veritas / German Lloyd)

**Radio approval**

Displays with Bluetooth LE have radio licenses according to CE and FCC. The relevant certification information and labels are provided on display.

**CRN approval**

A CRN approval (Canadian Registration Number) is available for some device versions. These devices are fitted with a separate plate bearing the following registration numbers:
- Devices without a diaphragm seal: CRN 0F22502.5C
- Devices with a diaphragm seal: CRN 0F24854.5C

In order to obtain a CRN-approved device, a CRN-approved process connection must be ordered along with the option "CRN" in the order code for "Additional approvals".

**Test reports**

**Test, certificate, declarations**

- Inspection certificate 3.1, EN10204 (material certificate, wetted metallic parts)
  The selection of this feature for coated process membranes/process connections refers to the metallic base material
- NACE MR0175 / ISO 15156 (wetted metallic parts), declaration
- NACE MR0103 / ISO 17945 (wetted metallic parts), declaration
- AD 2000 (wetted, metallic parts), declaration, excluding membrane
- ASME B31.3 process piping, declaration
- ASME B31.1 power piping, declaration
- Ambient temperature of transmitter (−50 to +85 °C (−58 to +185 °F)); sensor see specification
- Ambient temperature of transmitter (−54 to +85 °C (−65 to +185 °F)); sensor see specification
- Pressure test, internal procedure, test report
- Helium leak test, internal procedure, test report
- PMI test, internal procedure (wetted metallic parts), test report
- Standard device (without a diaphragm seal): penetrant testing ISO23277-1 (PT), wetted/ pressurized metallic parts, test report
- Standard device (without a diaphragm seal): penetrant testing ASME VIII-1 (PT), wetted/ pressurized metallic parts, test report
- Welding documentation, wetted/pressurized seams, declaration

Test reports, declarations and inspection certificates are available in electronic format in the Device Viewer: enter the serial number from the nameplate (www.endress.com/deviceviewer).

Applicable for the order codes "Calibration" and "Test, certificate" .

**Product documentation on paper**

Test reports, declarations and inspection certificates in hard copy can optionally be ordered with the order option "Product documentation on paper". These documents are supplied with the ordered product.

**Calibration**

5-point calibration certificate

10-point calibration certificate, traceable to ISO/IEC 17025

**Manufacturer declarations**

Various manufacturer declarations can be downloaded from the Endress+Hauser website. Other manufacturer declarations can be ordered via the Endress+Hauser sales office.

*Downloading the Declaration of Conformity*

www.endress.com → Download

**Pressure Equipment Directive 2014/68/EU (PED)**

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

Pressure equipment (maximum working pressure PS ≤ 200 bar (2 900 psi)) can be classified as pressure accessories according to the Pressure Equipment Directive 2014/68/EU. If the maximum working pressure is ≤ 200 bar (2 900 psi) and the pressurized volume of the pressure equipment is ≤ 0.1 l, the pressure equipment is subject to the Pressure Equipment Directive (see Pressure Equipment

Directive 2014/68/EU, Article 4, point 3). The Pressure Equipment Directive only requires that the pressure equipment shall be designed and manufactured in accordance with the "sound engineering practice of a Member State".

*Reasons:*

- Pressure Equipment Directive (PED) 2014/68/EU Article 4, point 3
- Pressure equipment directive 2014/68/EU, Commission's Working Group "Pressure", Guideline A-05 + A-06

*Note:*

A partial examination shall be performed for pressure instruments that are part of a safety instrumented system for the protection of a pipe or vessel from exceeding allowable limits (safety accessory in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).

**Pressure equipment with allowable pressure > 200 bar (2 900 psi)**

Pressure equipment designated for application in every process fluid having a pressurized volume of <0.1 l and a max. allowable pressure PS > 200 bar (2 900 psi) must satisfy the essential safety requirements set out in Annex I of the Pressure Equipment Directive 2014/68/EU. According to Article 13 pressure equipment shall be classified by category in accordance with Annex II. Taking into account the low volume specified above, the pressure instruments can be categorized as category I pressure equipment. These devices must then bear the CE marking.

*Reasons:*

- Pressure Equipment Directive 2014/68/EU, Article 13, Annex II
- Pressure equipment directive 2014/68/EU, Commission's Working Group "Pressure", Guideline A-05

*Note:*

A partial examination shall be performed for pressure instruments that are part of a safety instrumented system for the protection of a pipe or vessel from exceeding allowable limits (safety accessory in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).

*The following also applies:*

- Devices with thread and internal membrane PN > 200 and oval flange adapter PN > 200:
  Suitable for stable gases in group 1, category I, module A
- Devices with separators PN > 200 ≥ 1.5" / PN 40:
  Suitable for stable gases in group 1, category I, module A
- Devices with thread PN > 200:
  Suitable for stable gases in group 1, category I, module A

**Oxygen application**

Verified cleaned, suitable for O2 service (wetted parts)

**China RoHS symbol**

The device is visibly identified according to SJ/T 11363-2006 (China-RoHS).

**RoHS**

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

**Certification PROFINET with Ethernet-APL**

**PROFINET with Ethernet-APL interface**

The device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V. / PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:

- Certified according to:
  - Test specification for PROFINET devices
  - PROFINET Security Level – Netload Class
- The device can also be operated with certified devices of other manufacturers (interoperability)

**Additional certification**

**Classification of process seal between electrical systems and (flammable or combustible) process liquids in accordance with UL 122701 (formerly ANSI/ISA 12.27.01)**

Endress+Hauser devices are designed according to UL 122701 (formerly ANSI/ISA 12.27.01) which means that users do not need and can save on external secondary process seals in the pipe as

required in the process seal sections of ANSI/NFPA 70 (NEC) and CSA 22.1 (CEC). These devices comply with North American installation practice and allow very safe and cost-effective installation for pressurized applications with hazardous fluids. The devices are assigned "single seal" as follows:

CSA C/US IS, XP, NI:

400 bar (6 000 psi)

Further information can be found in the control drawings of the relevant devices.

### Metrological approval

If you select the "China" order option, the device is delivered with a Chinese nameplate according to the Chinese Quality Act.

### MID parts certificate

MID parts certificate for custody transfer, optionally available.

For details, refer to document SD02854P.

# Ordering information

**Ordering information**

Detailed ordering information is available from the nearest sales organization www.addresses.endress.com or in the Product Configurator under www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.

The **Configuration** button opens the Product Configurator.

**Product Configurator - the tool for individual product configuration**
- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to the measuring point, such as the measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

**Scope of delivery**

The scope of delivery comprises:
- Device
- Optional accessories

Accompanying documentation:
- Brief Operating Instructions
- Final inspection report
- Additional Safety Instructions for devices with approvals (e.g. ATEX, IECEx, NEPSI, etc.)
- Optional: factory calibration form, test certificates

The Operating Instructions are available on the Internet at:

www.endress.com → Download

**Service**

The following services, among others, can be selected using the Product Configurator.

- Cleaned of oil+grease (wetted)
- Verified cleaned, suitable for O2 applic. (wetted)
- PWIS-free (paint-wetting impairment substances)
  (The plastic protective cover is excluded from the PWIS cleaning)
- ANSI Safety Red coating, coated housing cover
- Set HART burst mode PV
- Set max. alarm current
- Bluetooth communication is disabled on delivery
- Product documentation on paper
  As an option, test reports, declarations and material test certificates can be ordered as a paper printout using the feature **Service**, format**Product documentation on paper**. The required documents can be selected under the feature **Test, certificate, declaration** and are then included with the device on delivery.

**Measuring point (tag)**

- Order code: marking
- Option: Z1, tagging (TAG), see additional specification
- Location of tag identifier: to be selected in the additional specifications
  - Tag plate, stainless steel
  - Self-adhesive paper label
  - Supplied plate
  - RFID TAG
  - RFID TAG + tag plate stainless steel
  - RFID TAG + self-adhesive paper label
  - RFID TAG + supplied label/plate
- Definition of tag name: to be defined in the additional specifications
  3 lines, each containing up to maximum 18 characters
  The specified tag name appears on the selected label and/or the RFID TAG
- Identification on electronic nameplate (ENP): 32 digits

**Test reports, declarations and inspection certificates**

All test reports, declarations and inspection certificates are provided electronically in the *Device Viewer*:
Enter the serial number from the nameplate (www.endress.com/deviceviewer)

**Product documentation on paper**
Test reports, declarations and inspection certificates in hard copy can optionally be ordered with feature 570 "Service", Version I7 "Product documentation on paper". The documents are then provided with the device upon delivery.

# Application packages

## Heartbeat Technology

### Availability

Available in all device versions.

Heartbeat Verification + Monitoring, optional.

### Heartbeat Diagnostics

- Continuous self-monitoring of the device
- Diagnostic messages output to
  - the local display
  - an asset management system (e.g. FieldCare or DeviceCare)
  - an automation system (e.g. PLC)
  - Web server

### Heartbeat Verification

- Monitoring of the installed device without interrupting the process, including a verification report
- Clear measuring point assessment (pass/fail) with high total test coverage as part of the manufacturer's specification
- Can be used to document normative requirements
- From firmware 01.01.xx: Meets the requirements for metrological traceability in accordance with ISO 9001 (ISO9001:2015 Section 7.1.5.2). The verification report can be generated via Bluetooth and HART *1).

### Heartbeat Monitoring

- Statistical Sensor Diagnostics: statistical analysis and evaluation of the pressure signal, including signal noise, to detect process anomalies (e.g. blocked impulse lines)
- Loop Diagnostics: detection of elevated measuring circuit resistance values or declining power supply
- Process window: user-definable pressure and temperature limits to detect dynamic pressure surges or faulty trace heating systems or insulation
- Continuously supplies additional monitoring data to an external condition monitoring system for the purpose of predictive maintenance or process monitoring

### Detailed description

See Special Documentation for SD Heartbeat Technology.

# Accessories

## Device-specific accessories

### Mechanical accessories

- Mounting bracket for housing
- Mounting bracket for block & bleed valves
- Block&Bleed valves:
  - Block&Bleed valves can be ordered as **enclosed** accessories (seal for mounting is enclosed)
  - Block&Bleed valves can be ordered as **mounted** accessories (mounted manifolds are supplied with a documented leak test)
  - Certificates (e.g. 3.1 material certificate and NACE) and tests (e.g. PMI and pressure test) that are ordered with the device apply for the transmitter and the manifold
  - During the operating life of the valves, it may be necessary to re-tighten the pack
- Water pocket pipes (PZW)
- Flushing rings
- Weather protection covers

For technical data (e.g. materials, dimensions or order numbers), see the accessory document SD01553P.

### Plug connectors

- Plug connector M12 90 deg, IP67 5m cable, union nut, Cu Sn/Ni
- Plug connector M12, IP67 union nut, Cu Sn/Ni
- Plug connector M12, 90 deg IP67 union nut, Cu Sn/Ni

The IP protection classes are only maintained if the dummy cap is used or the cable is connected.

### Weld-in accessory

For details, refer to TI00426F/00/EN "Weld-in adapters, process adapters and flanges".

## Device Viewer

All the spare parts for the device, along with the order code, are listed in the *Device Viewer* (www.endress.com/deviceviewer).

# Documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

**Standard documentation**

- Technical Information: planning guide
  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
- Brief Operating Instructions: takes you quickly to the 1st measured value
  The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning
- Operating Instructions: reference manual
  The Operating Instructions contain all the information that is required in the 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

**Supplementary device-dependent documentation**

Additional documents are supplied depending on the device version ordered: Always comply strictly with the instructions in the supplementary documentation. The supplementary documentation is an integral part of the device documentation.

**Field of Activities**

Document FA00004P

Pressure measurement, powerful devices for process pressure, differential pressure, level and flow

**Special Documentation**

Document SD01553P

Mechanical accessories for pressure equipment

The documentation provides an overview of available manifolds, oval flange adapters, pressure gauge valves, shutoff valves, water pocket pipes, condensate pots, cable shortening kits, test adapters, flushing rings, Block&Bleed valves and protective roofs.

# Registered trademarks

**HART®**
Registered trademark of the FieldComm Group, Austin, Texas, USA

**PROFINET®**
Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

**Bluetooth®**
The Bluetooth® wordmark and logos are registered trademarks of Bluetooth SIG, Inc. and any use of these trademarks by Endress+Hauser is licensed. Other trademarks and trade names are those of their respective owners.

www.addresses.endress.com

Endress+Hauser

People for Process Automation

TI00426F/00/EN/24.23
71628664
2023-09-07



# Technical Information
# **Weld-in adapter, Process adapter and Flanges**

Level, Pressure, Temperature

**Application**

The adapters and the flanges are used to connect level, pressure or temperature sensors to a vessel or a pipe.

**Your benefits**

- High-quality, corrosion resistant materials for use in aggressive media
- Versions without crevices and dead space of the weld-in adapters and the process adapters according to international hygiene regulations
- A variety of seals for application in diverse processes

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# General information

**NOTICE**

**Maximum pressure and temperature may be limited by the sensor installed in the adapter.**

- Maximum design pressure and temperature stated is for the adapter only and not for the sensor being installed in the adapter. Consult sensor supplier for sensor pressure-temperature ratings.

**Pressure equipment directive PED 2014/68/EU**

The herein listed adapters are not subject to the pressure equipment directive independent of the maximum allowable amount of pressure, because they have no pressurised volume.

**Suitable for hygienic processes**

**3-A and EHEDG**

The listed connections in this documentation are EHEDG and 3-A approved.

Suitable for hygienic application, see also documentation "Hygienic Certificates", SD02503F.

**Material conformity**

The data concerning suitability for hygienic processes are listed under the relevant device version.
The weld-in adapters are manufactured according to the material specifications of the latest standards. Special versions of weld-in adapters, e.g. older material charges, must be requested and ordered via TSP workflow.

**Seals:**
Conform materials according to FDA 21 CFR (Code of Federal Regulations)

PART 177 - Indirect Food Additives: Polymers
- Part 177.1550: Perfluorocarbon resins (PTFE)
- Part 177.2600: Rubber articles intended for repeated use (EPDM, Silicone (VMQ), Viton (FKM))

Conform to regulation (EC) No. 1935/2004 on materials and articles intended to come into contact with food (European)

- BfR (Federal Institute for Risk Assessment) Recommendation XV. Commodities based on Silicones: Silicone (VMQ)
- BfR (Federal Institute for Risk Assessment) Recommendation XXI. Commodities based on Natural and Synthetic Rubber: EPDM, Viton (FKM)
- PTFE conform to regulation (EC) No. 10/2011

**Metals:**
Metals meet at least the voluntary Standard des Council of Europe des Council of Europe - EDQM-Guide "metals and alloys used in food contact materials and articles 2013 (1st edition)".

**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.
Adapters with CRN approval can be found on the Endress+Hauser website: www.endress.com → Downloads

**Ordering information**

Product Configurator: www.endress.com
**Product Configurator - the tool for individual product configuration**
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

## Symbols

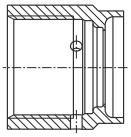
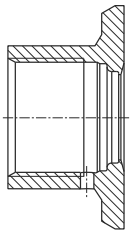
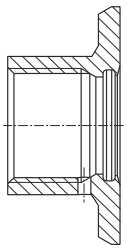
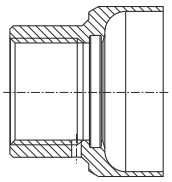
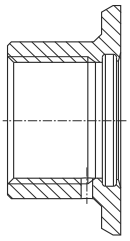
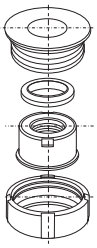
### Safety symbols

| Symbol | Meaning |
|---|---|
| A0011189-EN | **DANGER!**<br>This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in seriousor fatal injury. |
| A0011190-EN | **WARNING!**<br>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in seriousor fatal injury. |
| A0011191-EN | **CAUTION!**<br>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minoror medium injury. |
| A0011192-EN | **NOTICE!**<br>This symbol contains information on procedures and other facts which do not result in personalinjury. |

### Symbols for certain types of information

| Symbol | Bedeutung |
|---|---|
| A0011193 | Indicates additional information. |
| A0039080 | Please recycle a part of an device or the device itself if allowed. |
| 1. , 2. , 3. ... | Series of steps |

# Weld-in adapter - overview Level

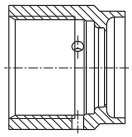
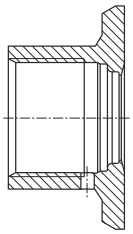
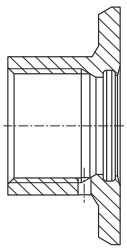
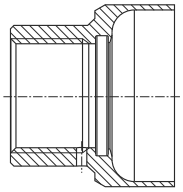
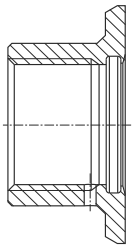
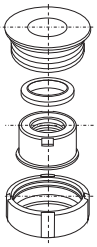
| **[Part 1]**<br><br>**Weld-in adapter - overview Level** |  <br>A0008246 |  <br>A0008251 |  <br>A0008256 |  <br>A0011924 |  <br>A0008248 |  <br>A0008253 |
|---|---|---|---|---|---|---|
| | **G ¾, d=29 for pipe-mounting** | **G ¾, d=50 for vessel-mounting** | **G ¾, d=55 with flange** | **G 1, d=53 without flange** | **G 1, d=60 with flange** | **G 1 adjustable** |
| Material | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) |
| Roughness µm (µin) process side | ≤ 1,5 (59.1) | ≤ 0,8 (31.5) | ≤ 0,8 (31.5) | ≤ 0,8 (31.5) | ≤ 0,8 (31.5) | ≤ 0,8 (31.5) |
| Order number weld-in adapter | 71258357 | 71258355 | 52001052 | 71258358 | 52001051 | 52001221 |
| Order number weld-in adapter with inspection certificate[1)] | 52028295 | 52018765 | 52011897 | 71093129 | 52011896 | 52011898 |
| Order number for seal replacement (5 pieces) | Silicone O-ring 52021717[2)] | Silicone O-ring 52021717[2)] | Silicone O-ring 52014473[2)] | Silicone O-ring 52014472[2)] | Silicone O-ring 52014472[2)] | Silicone profile gasket 52014424[3)] |
| Order number welding dummy[4)] | 71174959 | 71174959 | 71168889 | 71166879 | 71166879 | 71181945 |
| Order number blind plug[4)] | 71167850 | 71167850 | 71177193 | 71580894 | 71580894 | 71166366 |
| Order number blind plug with inspection certificate[1) 4)] | – | – | 71190074 | 71167291 | 71167291 | 71196853 |

1) Inspection certificate EN10204-3.1 material; AD2000: The material 316L (in contact with process) corresponds to AD2000 – W0/W2/W10.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

3) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

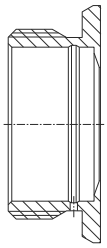
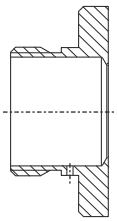
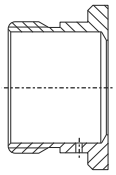
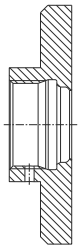
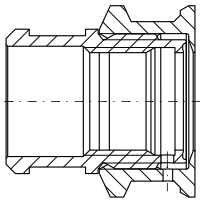
4) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

| [continue part 1]<br><br>Weld-in adapter - overview Level |  <br>A0008246 |  <br>A0008251 |  <br>A0008256 |  <br>A0011924 |  <br>A0008248 |  <br>A0008253 |
|---|---|---|---|---|---|---|
| | **G ¾, d=29 for pipe-mounting** | **G ¾, d=50 for vessel-mounting** | **G ¾, d=55 with flange** | **G 1, d=53 without flange** | **G 1, d=60 with flange** | **G 1 adjustable** |
| **Measuring device**<br>**Liquicap** | **Suitable for process connection** option[1] | | | | | |
| FMI51 | – | GQJ | – | GWJ | GWJ | – |
| FMI52 | – | – | – | GWJ | GWJ | – |
| FTI51 | – | GQJ | – | GWJ | GWJ | – |
| FTI52 | – | – | – | GWJ | GWJ | – |
| **Liquipoint** | | | | | | |
| FTW23, FTW33 | W5J | W5J | – | WSJ | WSJ | – |
| **Liquitrend** | | | | | | |
| QMW43 | W5J | W5J | – | WSJ | WSJ | – |
| **Rod probe** | | | | | | |
| 11371 | 4 | 4 | 4 | – | – | – |
| **Liquiphant** | | | | | | |
| FTL33, FTL31 | W5J | W5J | – | WSJ | WSJ | WSJ |
| FTL50, FTL50H | – | – | GQ2 | GW2 | GW2 | GW2 |
| FTL51, FTL51H | – | – | – | GW2 | GW2 | GW2 |
| FTL41, FTL51B, FTL63 | – | – | W5J[2] | WSJ | WSJ | WSJ |
| FTL51B | – | – | W5J[2] | WSJ | WSJ | WSJ |
| FTL80 | – | – | WCJ | WSJ | WSJ | WSJ |
| FTL81 | – | – | – | WSJ | WSJ | WSJ |
| **Liquipoint** | **Adapter as an accessory enclosed** option[3] | | | | | |
| FTW23, FTW33 | PC/PD | PA/PB | – | PG/PH | PE/PF | – |
| **Liquitrend** | | | | | | |
| QMW43 | PC/PD | PA/PB | – | PG/PH | PE/PF | – |
| **Liquiphant** | | | | | | |
| FTL31, FTL33 | PC/PD | PA/PB | – | PG/PH | PE/PF | – |
| FTL41, FTL51B, FTL63 | – | – | PO/PP | PG/PH | PE/PF | PI/PJ |

1) The option can be selected in the Product Configurator via the order feature "Process Connection".

2) The option can be selected in the Product Configurator only available for the compact version via the order code "Type of probe", option 1 "compact version".

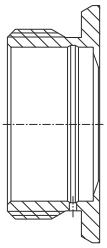
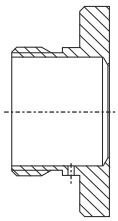
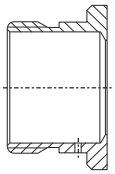
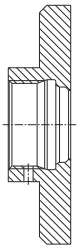
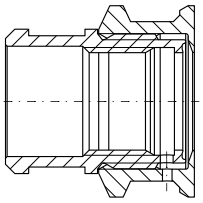
3) The option can be selected in the Product Configurator via the order feature "Accessory Enclosed".

| **[Part 2]**<br><br>**Weld-in adapter-overview Level** |  <br>A0008252 |  <br>A0008245 |  <br>A0017639 |  <br>A0008552 | <br>A0008254 |  <br>A0045641 |
|---|---|---|---|---|---|---|
| | **RD52** | **UNI D85** | **UNI D65** | **M24 D65** | **DRD DN50 65 mm (2.56 in) (weld-in flange)** | **G 1¼" with thread adapter G 1"** |
| Material | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435)<br>304 (1.4301) | 316L (1.4404) |
| Roughness µm (µin) process side | ≤ 0,8 (31.5) | ≤ 0,76 (29.9) | ≤ 0,76 (29.9) | ≤ 0,76 (29.9) | ≤ 0,76 (29.9) | ≤ 0,76 (29.9) |
| Order number weld-in adapter | 52001047 | 52006262 | 214880-0002 | 71041381 | 52002041/<br>916743-0000 | – |
| Order number weld-in adapter with inspection certificate[1)] | 52006909 | 52010173 | 52010174 | 71041383 | 52011899/ – | 71444432 |
| Order number for seal replacement (5 pieces)[2)] | Silicone profile gasket 52014424 | Silicone profile gasket 52023572 | Silicone profile gasket 52023572 | EPDM O-ring 52024267 | PTFE flat seal 52024228 | Silicone profile gasket 71075662 |
| Order number welding dummy | 71181945[3)] | 71114210 | 71114210 | – | 71114209 | – |
| Order number blind plug[3)] | 71166366 | 71580894 | 71580894 | 71171418 | 71181450 | – |
| Slotted nut | 52021715 | 52021715 | 52021715 | – | – | – |

1) Inspection certificate EN10204-3.1 material; AD2000: The material 316L (in contact with process) corresponds to AD2000 – W0/W2/W10.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

3) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

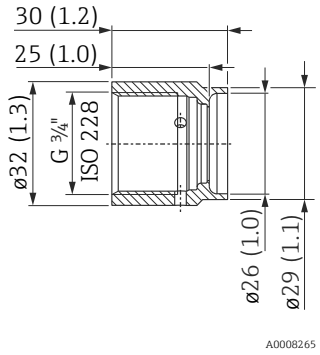
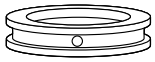
| [continue part 2]<br><br>Weld-in adapter - overview Level |  <br>A0008252 |  <br>A0008245 |  <br>A0017639 |  <br>A0008552 | <br>A0008254 |  <br>A0045641 |
|---|---|---|---|---|---|---|
| | **RD52** | **UNI D85** | **UNI D65** | **M24 D65** | **DRD DN50 65 mm (2.56 in) (weld-in flange)** | **G 1¼" with thread adapter G 1"** |
| **Measuring device**<br>**Liquicap** | **Suitable for process connection** option[1] | | | | | |
| FMI5x | – | UPJ | UPJ | – | – | – |
| FTI5x | – | UPJ | UPJ | – | – | – |
| **Liquipoint** | | | | | | |
| FTW23, FTW33 | – | – | – | X2J | – | – |
| **Liquitrend** | | | | | | |
| QMW43 | – | – | – | X2J | – | – |
| **Liquiphant** | | | | | | |
| FTL33 | 5ZJ | – | – | X2J | – | – |
| FTL63 | 5ZJ | – | – | – | – | – |
| FTL5xH | EE2 | – | – | – | PE2 | – |
| **Nivector** | | | | | | |
| FTI26 | - | – | – | - | – | WDJ |
| **Levelflex** | | | | | | |
| FMP41C | – | UPK/UQK | UPK/UQK | – | – | – |
| FMP43 | – | – | – | U1J | – | – |
| FMP53 | – | – | – | U1J | – | – |
| **Liquipoint** | **Adapter as an accessory enclosed** option[2] | | | | | |
| FTW23, FTW33 | – | – | – | PM/PN | – | – |
| **Liquitrend** | | | | | | |
| QMW43 | – | – | – | PM/PN | – | – |
| **Liquiphant** | | | | | | |
| FTL33 | PO/PQ | – | – | PM/PN | – | – |
| FTL63 | PR/PS | – | – | – | – | – |
| **Nivector** | | | | | | |
| FTI26 | – | – | – | – | – | PK |

1) The option can be selected in the Product Configurator via the order feature "Process Connection".

2) The option can be selected in the Product Configurator via the order feature "Accessory Enclosed".

# Weld-in adapter and accessories - Level

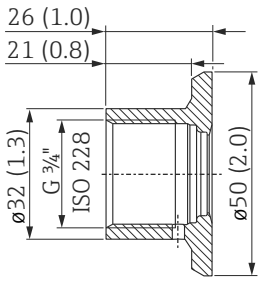
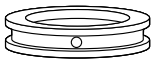
**G ¾, d=29 for pipe-mounting**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0008265<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 1.5 µm (59.1 µin)<br><br>Approved by CRN: 0F18434.5C | 71258357<br>52028295 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71174959[1)] |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 3.2 µm (126 µin) | 71167850[1)] |
| **Seals and pressure ring** | | **Order number** |
| <br>A0021901 | **Standard seal** | |
| | Silicone O-ring, ø 14.9 x 2.7 mm (0.59 x 0.11 in)<br>Material: VMQ 70<br>Conform according to FDA, 3-A<br><br>For this version a simple replacement of the seal is possible. | 52021717[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | ø 15.08 x 2.62 mm (0.59 x 0.10 in)<br>Material: EPDM<br>Conform according to FDA, USP Class VI, EC1935, 3-A<br><br>Approved by EHEDG | 71529759[2)]<br>(5 pieces) |
| | ø 15.08 x 2.62 mm (0.59 x 0.10 in)<br>Material: FKM<br>Conform according to FDA, USP Class VI, EC1935, 3-A<br><br>Approved by EHEDG | 71167890[1)]<br>(5 pieces) |
| | ø14.9 x 2.7 mm (0.59 x 0.11 in)<br>Material: Silicone VMQ 80<br>Conform according to FDA, USP Class VI, 3-A | 71086117<br>(3 pieces) |
|  <br>A0021902 | **Pressure ring**<br>Material: 316L (1.4435)<br>▪ The seal with pressure ring enables easy exchange of defective sealing rings. | 52027421 |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

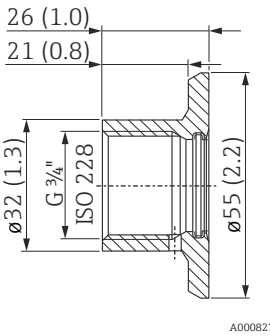
### G ¾, d=50 for vessel-mounting

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0008810<br>Pressure and temperature range of the adapter of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin)<br><br>Approved by CRN: 0F18434.5C | 71258355<br>52018765 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71174959[1)] |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 3.2 µm (126 µin) | 71167850[1)] |
| **Seals and pressure ring** | | **Order number** |
| <br>A0021901 | **Standard seal** | |
| | Silicone O-ring, ø 14.9 x 2.7 mm (0.59 x 0.11 in)<br>Material: VMQ 70<br>Conform according to FDA, 3-A<br><br>For this version a simple replacement of the seal is possible. | 52021717[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | ø 15.08 x 2.62 mm (0.59 x 0.10 in)<br>Material: EPDM<br>Conform according to FDA, USP Class VI, EC1935, 3-A<br><br>Approved by EHEDG | 71529759[2)]<br>(5 pieces) |
| | ø 15.08 x 2.62 mm (0.59 x 0.10 in)<br>Material: FKM<br>Conform according to FDA, USP Class VI, EC1935, 3-A<br><br>Approved by EHEDG | 71167890[1)]<br>(5 pieces) |
| | ø 14.9 x 2.7 mm (0.59 x 0.11 in)<br>Material: Silicone VMQ 80<br>Conform according to FDA, USP Class VI, 3-A | 71086117<br>(3 pieces) |
|  <br>A0021902 | **Pressure ring**<br>Material: 316L (1.4435)<br><br>The seal with pressure ring enables easy exchange of defective sealing rings. | 52027421 |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

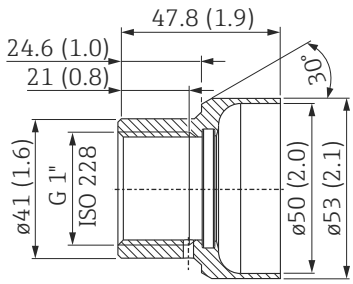
### G ¾, d=55 with flange for flush-mounted installation

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0008274<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin) | 52001052<br>52011897 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71168889[1)] |
| | Blind plug for closing weld-in adapter<br>▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71177193[1)]<br>71190074[1)] |
| **Seals, ø 21.89 x 2.62 mm (0.86 x 0.10 in)** | | **Order number** |
| <br>A0021901 | **Standard seal** | |
| | Silicone O-ring<br>Material: VMQ 70<br>Conform according to FDA, 3-A, EC1935, GB4806 | 52014473[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A, EC1935, GB4806<br><br>Approved by EHEDG | 71140670[2)]<br>(3 pieces) |
| | Material: FFKM Kalrez 6221<br>Conform according to FDA, USP Class VI, 3-A | 71167883[1)] |
| | Material: FKM | 71172153[1)]<br>(5 pieces) |
| | Material: FKM-FEP coated<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 71167747 |
| | Material: Silicone VMQ 3-80<br>Conform according to FDA, USP Class VI, 3-A, EC1935, GB4806 | 71086100<br>(3 pieces) |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

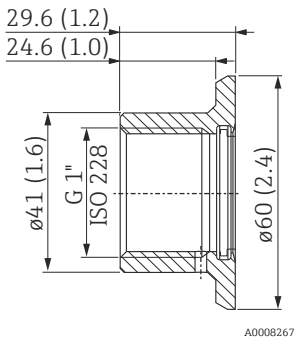
### G 1, d=53 without flange for pipe-mounting

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0011927<br><br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin)<br><br>Approved by CRN: 0F18434.5C | 71258358<br>71093129 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71166879[1)] |
| | Blind plug for closing weld-in adapter<br>▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71580894<br>71167291[1)] |
| **Seals, ø 28.17 x 3.53 mm (1.11 x 0.14 in)** | | **Order number** |
| <br>A0021901 | **Standard seal** | |
| | Silicone O-ring<br>Material: VMQ 70<br>Conform according to FDA, 3-A, EC1935, GB4806 | 52014472[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A, EC1935<br><br>Approved by EHEDG | 71140668[2)]<br>(3 pieces) |
| | Material: FKM 75<br>Conform according to FDA, USP Class VI, EC1935 | 71182264[1)]<br>(5 pieces) |
| | Material: FFKM Kalrez 4079 | 71166292[1)] |
| | Material: Silicone VMQ 3-80<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 71086102<br>(3 pieces) |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

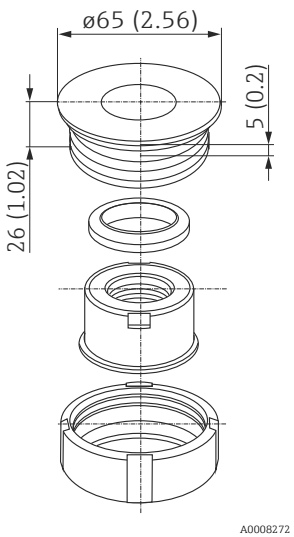
### G 1, d=60 with flange for flush-mounted installation with sealing surface

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  A0008267<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin)<br>Approved by CRN: 0F18434.5C | 52001051<br>52011896 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71166879[1)] |
| | Blind plug for closing weld-in adapter<br>▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71580894<br>71167291[1)] |
| **Seals, ø 28.17 x 3.53 mm (1.11 x 0.14 in)** | | **Order number** |
| A0021901 | **Standard seal** | |
| | Silicone O-ring<br>Material: VMQ 70<br>Conform according to FDA, 3-A, EC1935, GB4806 | 52014472[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A, EC1935<br>Approved by EHEDG | 71140668[2)]<br>(3 pieces) |
| | Material: FKM 75<br>Conform according to FDA, USP Class VI, EC1935 | 71182264[1)]<br>(5 pieces) |
| | Material: FFKM Kalrez 4079 | 71166292[1)] |
| | Material: Silicone VMQ 3-80<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 71086102<br>(3 pieces) |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

### G 1 sensor can be positioned

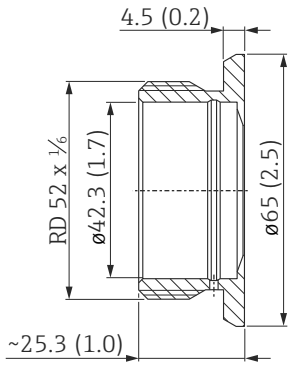
| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0008272<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin)<br><br>Approved by CRN: 0F18434.5C | 52001221<br>52011898 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71181945[1)] |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71166366[1)] |

| Seals, ø 29 x 36 x 3.7 mm (1.14 x 1.42 x 0.15 in) | | Order number |
|---|---|---|
| <br>A0021901 | **Standard seal** | |
| | Silicone profile gasket<br>Material: VMQ 60<br>Conform according to FDA, EC1935 | 52014424[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | Material: EPDM-70 | 71168375[1)]<br>(5 pieces) |
| | Material: VMQ 60<br>Conform according FDA, USP Class VI, 3-A, EC1935 | 71075662<br>(5 pieces) |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

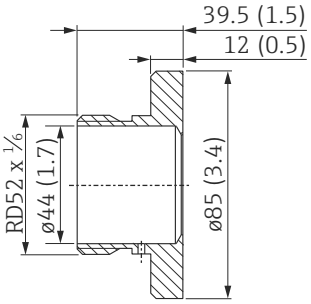
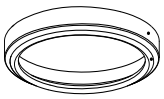
**RD 52 sensor can be positioned**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  A0008271<br><br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin) | 52001047<br>52006909 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71181945[1)] |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71166366[1)] |
| **Seals, ø 29 x 36 x 3.7 mm (1.14 x 1.42 x 0.15 in)** | | **Order number** |
| A0021901 | **Standard seal** | |
| | Silicone profile gasket<br>Material: VMQ 60<br>Conform according to FDA, EC1935<br><br>For this version a simple replacement of the seal is possible. | 52014424[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | Material: EPDM-70 | 71168375[1)]<br>(5 pieces) |
| | Material: VMQ 60<br>Conform according FDA, USP Class VI, 3-A, EC1935 | 71075662<br>(5 pieces) |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

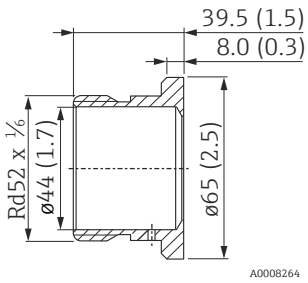
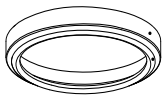
2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

## UNI D85

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  A0009985<br>Pressure and temperature range of the adapter<br>▪ max. 16 bar (232 psi) / max. 150 °C (302 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin)<br><br>Approved by CRN: 0F18434.5C | 52006262<br>52010173 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71114210 |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71580894 |
| **Seals, back ring** | | **Order number** |
| A0021901 | **Standard seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Silicone profile gasket<br>Material: Silicone 60 Shore A<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 52023572[1)]<br>(5 pieces) |
| | **Alternative seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Profile gasket<br>Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A | 71100719<br>(5 pieces) |
|  A0042001 | **O-ring with back ring** | |
| | With inspection certificate EN10204-3.1 material<br>Back ring:<br>Dimensions: ø 38.2 x 43.6 x 5.6 mm (1.5 x 1.72 x 0.22 in)<br>Material: AISI 316L (1.4404)<br><br>O-ring:<br>Dimensions: ø 36 x 2.5 mm (1.42 x 0.1 in)<br>Material: EPDM-70 Shore A<br>Conform according to FDA, USP, Class VI, 3-A<br><br>Approved by EHEDG | 71431380 |

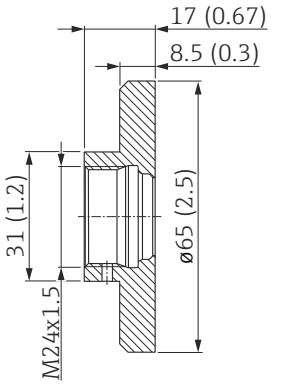
1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

**UNI D65**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  A0008264<br>Pressure and temperature range of the adapter<br>▪ max. 16 bar (232 psi) / max. 150 °C (302 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin)<br><br>Approved by CRN: 0F18434.5C | 214880-0002<br>52010174 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71114210 |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71580894 |
| **Seals, back ring** | | **Order number** |
| A0021901 | **Standard seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Silicone profile gasket<br>Material: Silicone 60 Shore A<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 52023572[1)]<br>(5 pieces) |
| | **Alternative seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Profile gasket<br>Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A | 71100719<br>(5 pieces) |
|  A0042001 | **O-ring with back ring** | |
| | With inspection certificate EN10204-3.1 material<br>Back ring:<br>Dimensions: ø 38.2 x 43.6 x 5.6 mm (1.5 x 1.72 x 0.22 in)<br>Material: AISI 316L (1.4404)<br><br>O-ring:<br>Dimensions: ø 36 x 2.5 mm (1.42 x 0.1 in)<br>Material: EPDM-70 Shore A<br>Conform according to FDA, USP, Class VI, 3-A<br><br>Approved by EHEDG | 71431380 |

1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

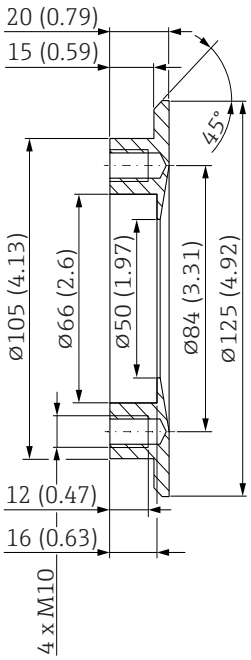
**M24 D65**

| Dimensions (mm) | Version | Order number |
|---|---|---|
|  <br>A0008551<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin)<br><br>Approved by CRN: 0F18434.5C | 71041381<br>71041383 |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71171418[1)] |
| **Seal ø 15.54 x 2.62 mm (0.61 x 0.1 in)** | | **Order number** |
| | **Standard seal** | |
| <br>A0021901 | O-ring<br>Material: EPDM-70<br>Conform according FDA, USP Class VI, 3-A, EC1935, GB4806<br><br>Approved by EHEDG | 52024267[2)]<br>(5 pieces) |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

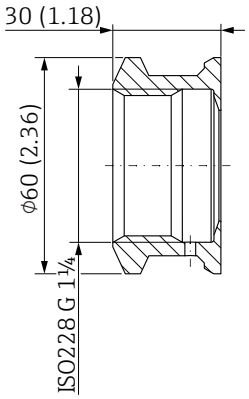
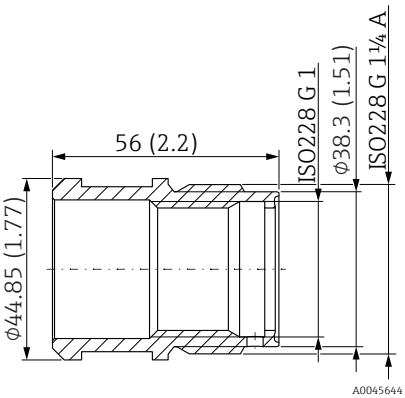
**DRD DN50 (65 mm (2.56 in)) for flush-mounted installation of devices with DRD-flange**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 52002041<br>52011899 |
| | Material: AISI 304 (1.4301)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin) | 916743-0000 |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71181450[1)] |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71114209 |
| **Seal ø 50 x 65 x 1 mm (1.97 x 2.56 x 0.04 in)** | | **Order number** |
| | **Standard seal** | |
| | Flat seal<br>Material: PTFE<br>Conform according to FDA, EC1935 | 52024228[2)]<br>(5 pieces) |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

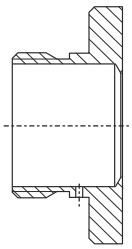
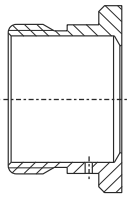
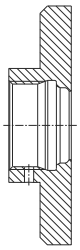
2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

### G 1¼ with thread adapter G 1

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>*Weld-in adapter G 1¼*<br>  <br>*Threaded sleeve*<br><br>Pressure and temperature range<br>▪ max. 6 bar (87 psi) / -20 °C … +80 °C (-4 °F … +176 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | -<br>71444432 |
| **Seal, ø 29 x 36 x 3.7 mm (1.14 x 1.42 x 0.15 in)** | | **Order number** |
| | **Standard seal** | |
| | Silicone profile gasket<br>Material: VMQ 60<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 71075662[1)]<br>(5 pieces) |
| | **Alternative seal** | |
| | Silicone profile gasket<br>Material: VMQ 60<br>Conform according to FDA, EC1935 | 52014424<br>(5 pieces) |

1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

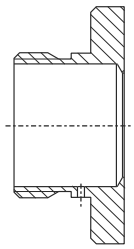
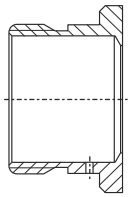
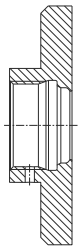
# Weld-in adapter - overview Pressure

| [Part 1]<br><br>**Weld-in adapter - overview Pressure** |  <br>A0008245 |  <br>A0017639 | <br>A0008254 |  <br>A0008552 |
|---|---|---|---|---|
| | **UNI D85** | **UNI D65** | **DRD DN50 (65 mm) (weld-in flange)** | **M24 D65** |
| Material | 316L (1.4435) | 316L (1.4435) | 316L (1.4435)<br>304 (1.4301) | 316L (1.4435) |
| Roughness µm (µin) process side | ≤ 0,76 (29.9) | ≤ 0,76 (29.9) | ≤ 0,76 (29.9) | ≤ 0,76 (29.9) |
| Order number<br>weld-in adapter | 52006262 | 214880-0002 | 52002041/916743-0000 | 71041381 |
| Order number<br>weld-in adapter with inspection certificate[1)] | 52010173 | 52010174 | 52011899/ – | 71041383 |
| Order number<br>for seal replacement (5 pieces)[2)] | Silicone<br>profile gasket<br>52023572 | Silicone<br>profile gasket<br>52023572 | PTFE<br>flat seal<br>52024228 | EPDM<br>O-ring<br>52024267 |
| Order number<br>Welding dummy | 71114210 | 71114210 | 71114209 | – |
| Order number blind plug[3)] | 71181340 | 71181340 | 71181450 | 71171418 |

1) AD2000: The material 316L (in contact with process) corresponds to AD2000 – W0/W2/W10.

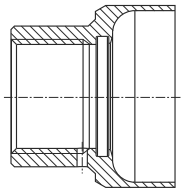
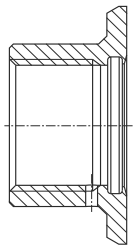
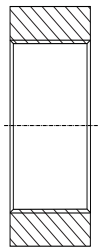
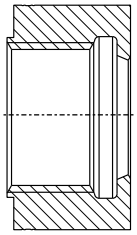
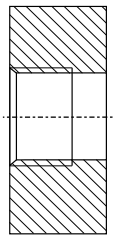
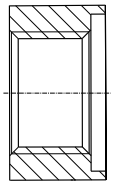
2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

3) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

| [continue part 1]<br><br>**Weld-in adapter - overview Pressure** |  <br>A0008245 |  <br>A0017639 | <br>A0008254 |  <br>A0008552 |
|---|---|---|---|---|
| | **UNI D85** | **UNI D65** | **DRD DN50 (65 mm) (weld-in flange)** | **M24 D65** |
| **Measuring device**<br>**Cerabar** | **Suitable for process connection** option[1] | | | |
| PMP23 | 52J | 52J | – | X2J/X3J |
| **Ceraphant** | | | | |
| PTP33B | – | – | – | X2J/X3J |
| **Cerabar M** | | | | |
| PMC51 | UNJ/UPJ | UNJ/UPJ | TIJ | – |
| PMP51 | – | – | TIJ | – |
| PMP55 | UPJ | UPJ | TIJ | – |
| **Deltapilot M** | | | | |
| FMB50 | UNJ/UPJ | UNJ/UPJ | TIJ | – |
| **Deltapilot S** | | | | |
| FMB70 | 00/01 | 00/01 | TK | – |
| **Deltabar S** | | | | |
| FMD78 | 00/UT | 00/UT | TK | – |
| **Deltabar** | | | | |
| FMD71 | UNJ/UPJ | UNJ/UPJ | TIJ | – |
| FMD72 | – | – | TIJ | – |
| **Measuring device**<br>**Ceraphant** | **Adapter as an accessory enclosed** option[2] | | | |
| PTP33B | QP/QR | QL/QM | – | PM/PN |
| **Cerabar** | | | | |
| PMP23 | QP/QR | QL/QM | – | PM/PN |
| **Cerabar M** | | | | |
| PMC51 | Q2/Q3 | QT/QU | QP/QR | – |
| PMP51 | – | – | QP/QR | – |
| PMP55 | – | – | QP/QR | – |
| **Deltapilot M** | | | | |
| FMB50 | Q2/Q3 | QT/QU | QP/QR | – |

1) The option can be selected in the Product Configurator via the order feature “Process Connection”.

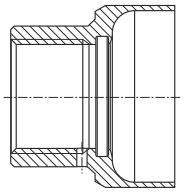
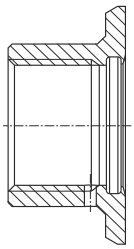
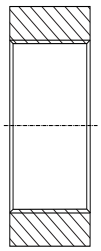
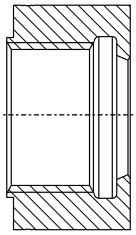
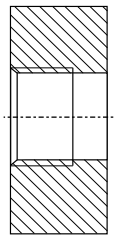
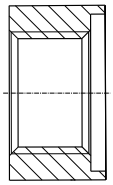
2) The option can be selected in the Product Configurator via the order feature “Accessory Enclosed”.

| **[Part 2]**<br><br>**Weld-in adapter overview Pressure** |  <br>A0011924 |  <br>A0008248 |  <br>A0008247 |  <br>A0008249 |  <br>A0008250 |  <br>A0037352 |
|---|---|---|---|---|---|---|
| | **G 1, d=53 without flange** | **G 1, d=60 with flange** | **G 1½ flush-mounted** | **G 1 flush-mounted (sealing taper)** | **G ½ flush-mounted** | **G ½ DIN3852** |
| Material | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4404) | 316L (1.4435) | 316L (1.4404) |
| Roughness µm (µin) process side | ≤ 0,8 (31.5) | ≤ 0,8 (31.5) | ≤ 0,8 (31.5) | ≤ 0,8 (31.5) | ≤ 0,8 (31.5) | ≤ 0,8 (31.5) |
| Order number weld-in adapter | 71258358 | 52001051 | 52024469 | 52005087 | 52002643 | 71389241 |
| Order number weld-in adapter with inspection certificate[1)] | 71093129 | 52011896 | 52024470 | 52010171 | 52010172 | 71389243 |
| Order number for seal replacement (5 pieces)[2)] | Silicone O-ring 52014472 | Silicone O-ring 52014472 | – | – | – | – |
| Order number Welding dummy | 71166879 | 71166879 | 52024471 | 52005272 | 52005082 | 52005082 |
| Order number blind plug | 71580894 | 71580894 | – | 71171731 | – | – |
| Order number blind plug with inspection certificate[3)] | 71167291 | 71167291 | – | – | – | – |

1) AD2000: The material 316L (in contact with process) corresponds to AD2000 – W0/W2/W10.

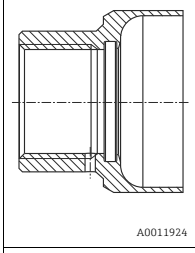
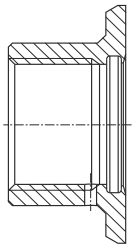
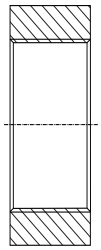
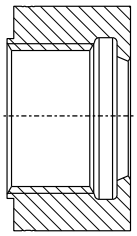
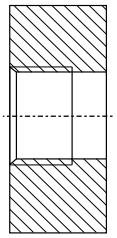
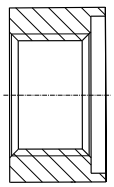
2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

3) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

| [continue part 2]<br><br>weld-in adapter<br>overview Pressure |  <br>A0011924 |  <br>A0008248 |  <br>A0008247 |  <br>A0008249 |  <br>A0008250 |  <br>A0037352 |
|---|---|---|---|---|---|---|
| | **G 1, d=53<br>without flange** | **G 1, d=60<br>with flange** | **G 1½<br>flush-mounted** | **G 1<br>flush-mounted<br>(sealing taper)** | **G ½<br>flush-mounted** | **G ½<br>DIN3852** |
| **Measuring device**<br>**Ceraphant** | **Suitable for process connection**<br>option[1] | | | | | |
| PTP31 | – | – | – | – | AG | – |
| PTP35 | BB | BB | – | BA | – | – |
| PTP31B | – | – | – | – | WUJ | WJJ |
| PTP33B | WSJ | WSJ | – | WQJ | – | – |
| **Cerabar** | | | | | | |
| PMP11 | – | – | – | – | – | WJJ |
| PMP135 | N | N | – | M | – | – |
| PMP21 | – | – | – | – | WUJ | WJJ |
| PMP23 | WSJ | WSJ | – | WQJ | – | – |
| PMP51B | – | – | WNJ | – | – | WJJ |
| PMP71B | – | – | WNJ | – | – | WJJ |
| PMC51B | – | – | WNJ | – | – | – |
| PMC71B | – | – | WNJ | – | – | – |
| **Cerabar M** | | | | | | |
| PMC51 | – | – | GVJ | – | – | – |
| PMP51 | – | GZJ | GVJ | GXJ | G0J/GCJ | GRJ/GRC |
| PMP55 | – | – | GVJ[2] | – | – | – |
| **Cerabar S** | | | | | | |
| PMC71 | – | – | 1G/1H/1J | – | – | – |
| PMP71 | – | – | 1G/1H | – | – | 1A/1B |
| PMP75 | – | – | 1G/1H | – | – | – |
| **Deltapilot M** | | | | | | |
| FMB50 | – | – | GGJ/GGC | – | – | – |
| FMB51 | – | – | GGJ/GGC | – | – | – |
| FMB52 | – | – | GGJ/GGC | – | – | – |
| **Deltapilot S** | | | | | | |
| FMB70 | – | – | 1G/1H | – | – | – |
| **Deltabar S** | | | | | | |
| FMD78 | – | – | 1G/1H | – | – | – |
| **Deltabar** | | | | | | |
| FMD71 | – | – | GVJ | – | – | – |
| FMD72 | – | – | GVJ | – | – | – |

1) The option can be selected in the Product Configurator via the order feature “Process Connection”.

2) Flush mounting is not possible with this combination.

| **[continue part 2]**<br><br>**weld-in adapter overview Pressure** |  <br>A0011924 |  <br>A0008248 |  <br>A0008247 |  <br>A0008249 |  <br>A0008250 |  <br>A0037352 |
|---|---|---|---|---|---|---|
| | **G 1, d=53 without flange** | **G 1, d=60 with flange** | **G 1½ flush-mounted** | **G 1 flush-mounted (sealing taper)** | **G ½ flush-mounted** | **G ½ DIN3852** |
| **Measuring device**<br>**Ceraphant** | **Adapter as an accessory enclosed** option[1] | | | | | |
| PTP31B | – | – | – | – | QA/QB | – |
| PTP33B | – | QJ/QK | – | QE/QF[2] | – | – |
| **Cerabar** | | | | | | |
| PMP21 | – | – | – | – | QA/QB | QM/QN |
| PMP23 | - | QJ/QK | – | QE/QF[2] | – | – |
| PMC51 | – | – | QJ/QK | – | – | – |
| PMP51 | – | – | QJ/QK | QE/QF[2] | QA/QB | QM/QN |
| PMP55 | – | – | QJ/QK[3] | – | – | – |
| PMP51B | – | – | QJ | – | – | – |
| PMP71B | – | – | QJ | – | – | – |
| PMC51B | – | – | QJ | – | – | – |
| PMC71B | – | – | QJ | – | – | – |
| **Deltapilot M** | | | | | | |
| FMB50 | – | – | QJ/QK | – | – | – |
| FMB51 | – | – | QJ/QK | – | – | – |
| FMB52 | – | – | QJ/QK | – | – | – |

1) The option can be selected in the Product Configurator via the order feature “Accessory Enclosed”.

2) Only suitable for one-time screwing in (observe the following note "Untight connection")

3) Flush mounting is not possible with this combination.

**NOTICE**

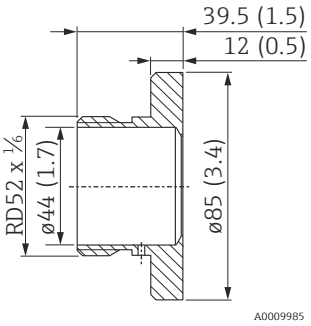
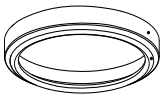
**Untight connection**

Repeated screwing in of the process connection can cause damage to the weld-in adapter. The connection becomes untight.

- Use sealing G 1 flush-mounted only for one-time screwing in.

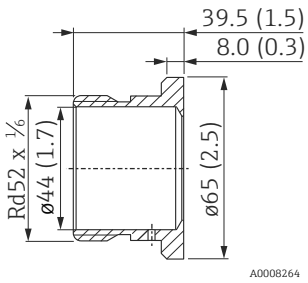
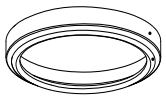
# Weld-in adapter and accessories - Pressure

**UNI D85**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  A0009985<br>Pressure and temperature range of the adapter<br>▪ max. 16 bar (232 psi) / max. 150 °C (302 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin)<br><br>Approved by CRN: 0F18434.5C | 52006262<br>52010173 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71114210 |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71580894 |
| **Seals, back ring** | | **Order number** |
| A0021901 | **Standard seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Silicone profile gasket<br>Material: Silicone 60 Shore A<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 52023572[1]<br>(5 pieces) |
| | **Alternative seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Profile gasket<br>Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A | 71100719<br>(5 pieces) |
|  A0042001 | **O-ring with back ring** | |
| | With inspection certificate EN10204-3.1 material<br>Back ring:<br>Dimensions: ø 38.2 x 43.6 x 5.6 mm (1.5 x 1.72 x 0.22 in)<br>Material: AISI 316L (1.4404)<br><br>O-ring:<br>Dimensions: ø 36 x 2.5 mm (1.42 x 0.1 in)<br>Material: EPDM-70 Shore A<br>Conform according to FDA, USP, Class VI, 3-A<br><br>Approved by EHEDG | 71431380 |

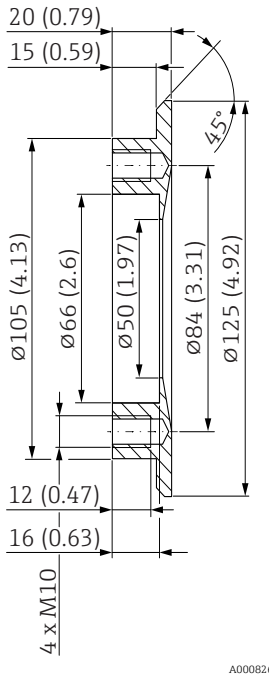
1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

**UNI D65**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  A0008264<br>Pressure and temperature range of the adapter<br>▪ max. 16 bar (232 psi) / max. 150 °C (302 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin)<br><br>Approved by CRN: 0F18434.5C | 214880-0002<br>52010174 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71114210 |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71580894 |
| **Seals, back ring** | | **Order number** |
| A0021901 | **Standard seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Silicone profile gasket<br>Material: Silicone 60 Shore A<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 52023572[1)]<br>(5 pieces) |
| | **Alternative seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Profile gasket<br>Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A | 71100719<br>(5 pieces) |
|  A0042001 | **O-ring with back ring** | |
| | With inspection certificate EN10204-3.1 material<br>Back ring:<br>Dimensions: ø 38.2 x 43.6 x 5.6 mm (1.5 x 1.72 x 0.22 in)<br>Material: AISI 316L (1.4404)<br><br>O-ring:<br>Dimensions: ø 36 x 2.5 mm (1.42 x 0.1 in)<br>Material: EPDM-70 Shore A<br>Conform according to FDA, USP, Class VI, 3-A<br><br>Approved by EHEDG | 71431380 |

1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

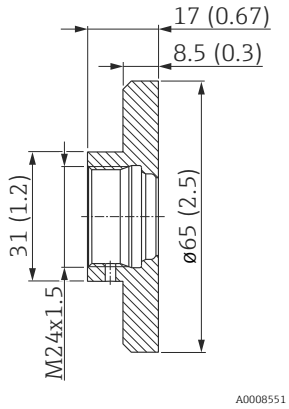
**DRD DN50 (65 mm (2.56 in)) for flush-mounted installation of devices with DRD-Flange**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 52002041<br>52011899 |
| | Material: AISI 304 (1.4301)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin) | 916743-0000 |
| | Pressure welding dummy for welding the weld-in adapter<br>Material: Brass | 71114209 |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71181450[1] |
| **Seal, ø 50 x 65 x 1 mm (1.97 x 2.56 x 0.04 in)** | | **Order number** |
| | **Standard seal** | |
| | Flat seal<br>Material: PTFE<br>Conform according to FDA, EC1935 | 52024228[2]<br>(5 pieces) |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

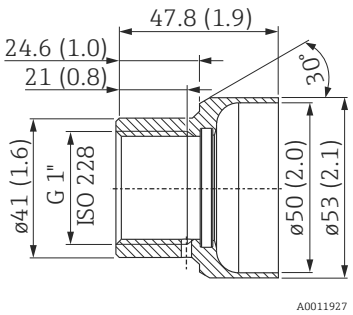
**M24 D65**

| Dimensions (mm) | Version | Order number |
|---|---|---|
|  <br>A0008551<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin)<br><br>Approved by CRN: 0F18434.5C | 71041381<br>71041383 |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71171418[1)] |
| **Seal ø 15.54 x 2,62 mm (0.61 x 0.1 in)** | | **Order number** |
| <br>A0021901 | **Standard seal** | |
| | O-Ring<br>Material: EPDM-70<br>Conform according FDA, USP Class VI, 3-A, EC1935, GB4806<br><br>Approved by EHEDG | 52024267[2)]<br>(5 pieces) |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

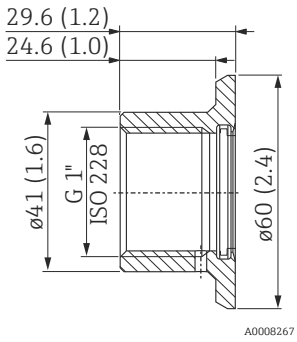
### G 1, d=53 without flange for pipe-mounting

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0011927<br><br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br><br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin)<br><br>Approved by CRN: 0F18434.5C | 71258358<br>71093129 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71166879[1)] |
| | Blind plug for closing weld-in adapter<br>▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br><br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71580894<br>71167291[1)] |
| **Seals, ø 28.17 x 3.53 mm (1.11 x 0.14 in)** | | **Order number** |
| <br>A0021901 | **Standard seal** | |
| | Silicone O-ring<br>Material: VMQ 70<br>Conform according to FDA, 3-A, EC1935, GB4806 | 52014472[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A, EC1935<br><br>Approved by EHEDG | 71140668[2)]<br>(3 pieces) |
| | Material: FKM 75<br>Conform according to FDA, USP Class VI, EC1935 | 71182264[1)]<br>(5 pieces) |
| | Material: FFKM Kalrez 4079 | 71166292[1)] |
| | Material: Silicone VMQ 3-80<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 71086102<br>(3 pieces) |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

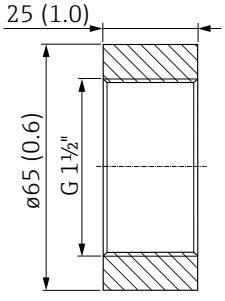
### G 1, d=60 with flange for flush-mounted installation with sealing surface

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  A0008267<br><br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin)<br><br>Approved by CRN: 0F18434.5C | 52001051<br>52011896 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71166879[1)] |
| | Blind plug for closing weld-in adapter<br>▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71580894<br>71167291[1)] |
| **Seals, ø 28.17 x 3.53 mm (1.11 x 0.14 in)** | | **Order number** |
| A0021901 | **Standard seal** | |
| | Silicone O-ring<br>Material: VMQ 70<br>Conform according to FDA, 3-A, EC1935, GB4806 | 52014472[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A, EC1935<br><br>Approved by EHEDG | 71140668[2)]<br>(3 pieces) |
| | Material: FKM 75<br>Conform according to FDA, USP Class VI, EC1935 | 71182264[1)]<br>(5 pieces) |
| | Material: FFKM Kalrez 4079 | 71166292[1)] |
| | Material: Silicone VMQ 3-80<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 71086102<br>(3 pieces) |

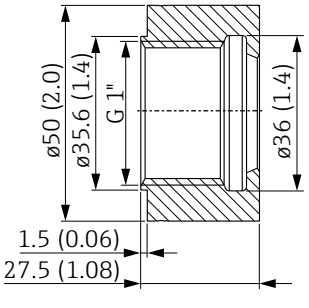
1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

### G 1½ flush-mounted

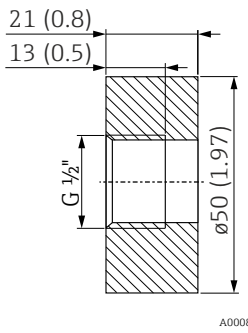
| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  A0008266 | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin) | 52024469<br>52024470 |
| | Pressure welding dummy for welding the weld-in adapter<br>Material: Brass | 52024471 |

### G 1 flush-mounted with metallic sealing taper

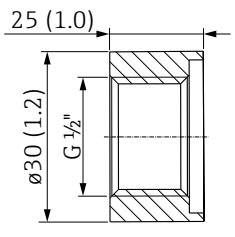
| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0008268<br>**NOTICE**<br>**Untight connection**<br>Repeated screwing in of the process connection can cause damage to the weld-in adapter. The connection becomes untight.<br>▸ Use sealing G 1 flush with front only for one-time screwing in. | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4404)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin)<br><br>Approved by CRN: 0F18434.5C | 52005087<br>52010171 |
| | Pressure welding dummy for welding the weld-in adapter<br>Material: Brass | 52005272 |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71171731[1)] |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

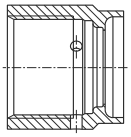
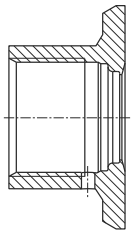
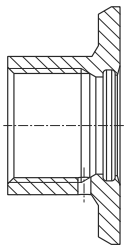
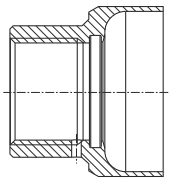
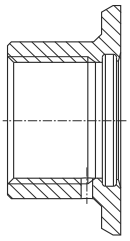
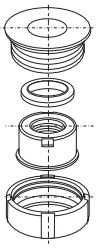
### G ½ flush-mounted

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0008269<br>Pressure resistance:<br>max. 100 bar (1500 psi) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin) | 52002643<br>52010172 |
| | Pressure welding dummy for welding the weld-in adapter<br>Material: Brass | 52005082 |

### G ½ DIN3852

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0037351<br>Pressure resistance:<br>max. 100 bar (1500 psi) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4404)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin) | 71389241<br>71389243 |
| | Pressure welding dummy for welding the weld-in adapter<br>Material: Brass | 52005082 |

# Weld-in adapter - overview Temperature

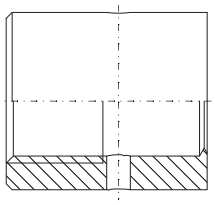
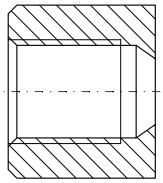
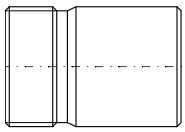
| [Part 1]<br><br>**Weld-in adapter - overview Temperature** |  <br>A0008246 |  <br>A0008251 |  <br>A0008256 |  <br>A0011924 |  <br>A0008248 |  <br>A0008253 |
|---|---|---|---|---|---|---|
| | **G ¾, d=29 for pipe-mounting** | **G ¾, d=50 for vessel-mounting** | **G ¾, d=55 with flange** | **G 1, d=53 without flange** | **G 1, d=60 with flange** | **G 1 adjustable** |
| Material | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) |
| Roughness µm (µin) process side | ≤ 1,5 (59.1) | ≤ 0,8 (31.5) | ≤ 0,8 (31.5) | ≤ 0,8 (31.5) | ≤ 0,8 (31.5) | ≤ 0,8 (31.5) |
| Order number weld-in adapter | 71258357 | 71258355 | 52001052 | 71258358 | 52001051 | 52001221 |
| Order number weld-in adapter with inspection certificate[1)] | 52028295 | 52018765 | 52011897 | 71093129 | 52011896 | 52011898 |
| Order number for seal replacement (5 pieces) | Silicone O-ring 52021717[2)] | Silicone O-ring 52021717[2)] | Silicone O-ring 52014473[2)] | Silicone O-ring 52014472[2)] | Silicone O-ring 52014472[2)] | Silicone profile gasket 52014424[3)] |
| Order number welding dummy | 71174959 | 71174959 | 71168889 | 71166879 | 71166879 | 71181945 |
| Order number blind plug | 71167850 | 71167850 | 71177193 | 71580894 | 71580894 | 71166366 |
| Order number blind plug with inspection certificate[1)] | – | – | 71190074 | 71167291 | 71167291 | 71196853 |
| **Measuring device**<br>**Compact thermometer** | **Suitable for process connection** option[4)] | | | | | |
| TMR35 | AC | AC | AB | AD | AD | AD |
| TM311 | J1 | J1 | J2 | J3 | J3 | J3 |
| **Hygienic thermometer** | | | | | | |
| TM371 | J1 | J1 | J2 | J3 | J3 | J3 |
| TM372 | J1 | J1 | J2 | J3 | J3 | J3 |
| TM411 | J1 | J1 | J2 | J3 | J3 | J3 |
| **Thermowell** | | | | | | |
| TT411 | J1 | J1 | J2 | J3 | J3 | J3 |

1) Inspection certificate EN10204-3.1 material; AD2000: The material 316L (in contact with process) corresponds to AD2000 – W0/W2/W10.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

3) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

4) The option can be selected in the Product Configurator via the corresponding order feature.

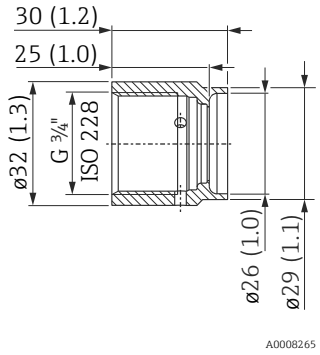
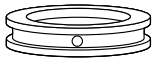
| [Part 2]<br><br>**Weld-in adapter - overview Temperature** |  <br>A0045815 |  <br>A0045834 |  <br>A0045836 |
|---|---|---|---|
| | **Welding boss with sealing taper for G ½** | **Welding boss with sealing taper for M12x1.5** | **G 1¼ for Ingold process connection** |
| Material | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) |
| Order number weld-in adapter | 71424800 | 71405560 | 71531585 |
| Order number for seal replacement (5 pieces)[1] | – | – | Silicone o-ring 60018911 |
| Order number blind plug | 60022519 | 60021194 | – |
| **Measuring device**<br>**Compact thermometer** | **Suitable for process connection** option[2] | | |
| TMR31 | – | – | – |
| TMR35 | MB | – | – |
| TM311 | H2 | H1 | – |
| **Hygienic thermometer** | | | |
| TM371 | H2 | H1 | M1/M3 |
| TM372 | – | – | – |
| TM401 | H2 | H1 | – |
| TM411 | H2 | H1 | M1/M3 |
| **Thermowell** | | | |
| TT411 | H2 | H1 | M1/M3 |
| **Temperature switch** | | | |
| TTR31 | – | – | – |
| TTR35 | MB | – | – |
| **Flow switch** | | | |
| DTT31 | – | – | – |
| DTT35 | MB | – | – |

1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

2) The option can be selected in the Product Configurator via the corresponding order feature.

# Weld-in adapter and accessories - Temperature

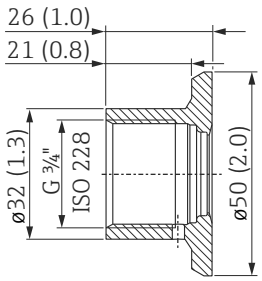
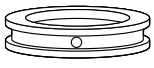
**G ¾, d=29 for pipe-mounting**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0008265<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 1.5 µm (59.1 µin)<br><br>Approved by CRN: 0F18434.5C | 71258357<br>52028295 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71174959[1)] |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 3.2 µm (126 µin) | 71167850[1)] |
| **Seals and pressure ring** | | **Order number** |
| <br>A0021901 | **Standard seal** | |
| | Silicone O-ring, ø 14.9 x 2.7 mm (0.59 x 0.11 in)<br>Material: VMQ 70<br>Conform according to FDA, 3-A<br><br>For this version a simple replacement of the seal is possible. | 52021717[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | ø 15.08 x 2.62 mm (0.59 x 0.10 in)<br>Material: EPDM<br>Conform according to FDA, USP Class VI, EC1935, 3-A<br><br>Approved by EHEDG | 71529759[2)]<br>(5 pieces) |
| | ø 15.08 x 2.62 mm (0.59 x 0.10 in)<br>Material: FKM<br>Conform according to FDA, USP Class VI, EC1935, 3-A<br><br>Approved by EHEDG | 71167890[1)]<br>(5 pieces) |
| | ø14.9 x 2.7 mm (0.59 x 0.11 in)<br>Material: Silicone VMQ 80<br>Conform according to FDA, USP Class VI, 3-A | 71086117<br>(3 pieces) |
|  <br>A0021902 | **Pressure ring**<br>Material: 316L (1.4435)<br>▪ The seal with pressure ring enables easy exchange of defective sealing rings. | 52027421 |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

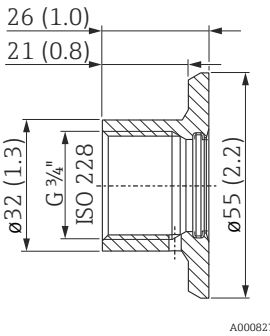
### G ¾, d=50 for vessel-mounting

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0008810<br>Pressure and temperature range of the adapter of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin)<br><br>Approved by CRN: 0F18434.5C | 71258355<br>52018765 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71174959[1)] |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 3.2 µm (126 µin) | 71167850[1)] |
| **Seals and pressure ring** | | **Order number** |
| <br>A0021901 | **Standard seal** | |
| | Silicone O-ring, ø 14.9 x 2.7 mm (0.59 x 0.11 in)<br>Material: VMQ 70<br>Conform according to FDA, 3-A<br><br>For this version a simple replacement of the seal is possible. | 52021717[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | ø 15.08 x 2.62 mm (0.59 x 0.10 in)<br>Material: EPDM<br>Conform according to FDA, USP Class VI, EC1935, 3-A<br><br>Approved by EHEDG | 71529759[2)]<br>(5 pieces) |
| | ø 15.08 x 2.62 mm (0.59 x 0.10 in)<br>Material: FKM<br>Conform according to FDA, USP Class VI, EC1935, 3-A<br><br>Approved by EHEDG | 71167890[1)]<br>(5 pieces) |
| | ø 14.9 x 2.7 mm (0.59 x 0.11 in)<br>Material: Silicone VMQ 80<br>Conform according to FDA, USP Class VI, 3-A | 71086117<br>(3 pieces) |
|  <br>A0021902 | **Pressure ring**<br>Material: 316L (1.4435)<br><br>The seal with pressure ring enables easy exchange of defective sealing rings. | 52027421 |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

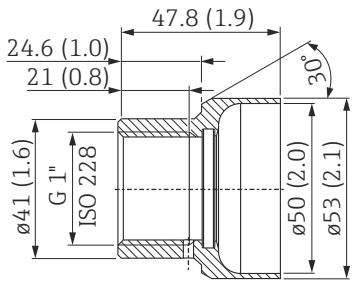
### G ¾, d=55 with flange for flush-mounted installation

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0008274<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin) | 52001052<br>52011897 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71168889[1)] |
| | Blind plug for closing weld-in adapter<br>▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71177193[1)]<br>71190074[1)] |
| **Seals, ø 21.89 x 2.62 mm (0.86 x 0.10 in)** | | **Order number** |
| <br>A0021901 | **Standard seal** | |
| | Silicone O-ring<br>Material: VMQ 70<br>Conform according to FDA, 3-A, EC1935, GB4806 | 52014473[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A, EC1935, GB4806<br><br>Approved by EHEDG | 71140670[2)]<br>(3 pieces) |
| | Material: FFKM Kalrez 6221<br>Conform according to FDA, USP Class VI, 3-A | 71167883[1)] |
| | Material: FKM | 71172153[1)]<br>(5 pieces) |
| | Material: FKM-FEP coated<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 71167747 |
| | Material: Silicone VMQ 3-80<br>Conform according to FDA, USP Class VI, 3-A, EC1935, GB4806 | 71086100<br>(3 pieces) |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

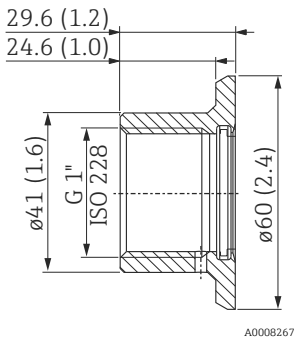
### G 1, d=53 without flange for pipe-mounting

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0011927<br><br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin)<br><br>Approved by CRN: 0F18434.5C | 71258358<br>71093129 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71166879[1)] |
| | Blind plug for closing weld-in adapter<br>▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71580894<br>71167291[1)] |
| **Seals, ø 28.17 x 3.53 mm (1.11 x 0.14 in)** | | **Order number** |
| <br>A0021901 | **Standard seal** | |
| | Silicone O-ring<br>Material: VMQ 70<br>Conform according to FDA, 3-A, EC1935, GB4806 | 52014472[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A, EC1935<br><br>Approved by EHEDG | 71140668[2)]<br>(3 pieces) |
| | Material: FKM 75<br>Conform according to FDA, USP Class VI, EC1935 | 71182264[1)]<br>(5 pieces) |
| | Material: FFKM Kalrez 4079 | 71166292[1)] |
| | Material: Silicone VMQ 3-80<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 71086102<br>(3 pieces) |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

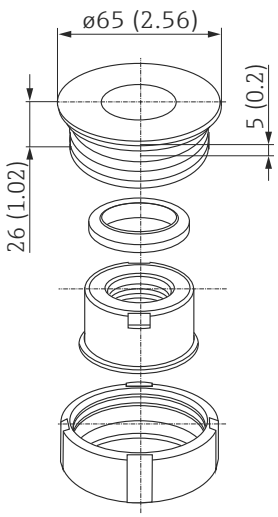
### G 1, d=60 with flange for flush-mounted installation with sealing surface

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  A0008267<br><br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin)<br><br>Approved by CRN: 0F18434.5C | 52001051<br>52011896 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71166879[1)] |
| | Blind plug for closing weld-in adapter<br>▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71580894<br>71167291[1)] |
| **Seals, ø 28.17 x 3.53 mm (1.11 x 0.14 in)** | | **Order number** |
| A0021901 | **Standard seal** | |
| | Silicone O-ring<br>Material: VMQ 70<br>Conform according to FDA, 3-A, EC1935, GB4806 | 52014472[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A, EC1935<br><br>Approved by EHEDG | 71140668[2)]<br>(3 pieces) |
| | Material: FKM 75<br>Conform according to FDA, USP Class VI, EC1935 | 71182264[1)]<br>(5 pieces) |
| | Material: FFKM Kalrez 4079 | 71166292[1)] |
| | Material: Silicone VMQ 3-80<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 71086102<br>(3 pieces) |

1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal, 1 x EPDM seal (EHEDG).

### G 1 sensor can be positioned

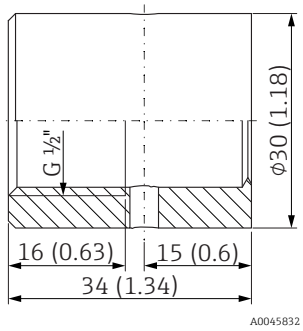
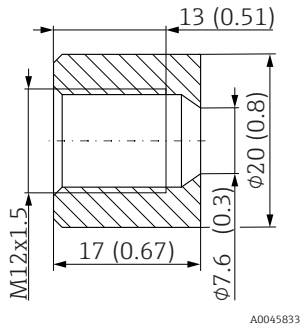
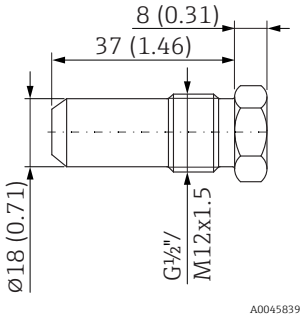
| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0008272<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.8 µm (31.5 µin)<br><br>Approved by CRN: 0F18434.5C | 52001221<br>52011898 |
| | Welding dummy for welding the weld-in adapter<br>Material: Brass | 71181945[1)] |
| | Blind plug for closing weld-in adapter<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71166366[1)] |

| Seals, ø 29 x 36 x 3.7 mm (1.14 x 1.42 x 0.15 in) | | Order number |
|---|---|---|
| <br>A0021901 | **Standard seal** | |
| | Silicone profile gasket<br>Material: VMQ 60<br>Conform according to FDA, EC1935 | 52014424[2)]<br>(5 pieces) |
| | **Alternative seals** | |
| | Material: EPDM-70 | 71168375[1)]<br>(5 pieces) |
| | Material: VMQ 60<br>Conform according FDA, USP Class VI, 3-A, EC1935 | 71075662<br>(5 pieces) |

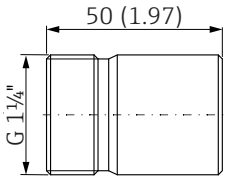
1) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

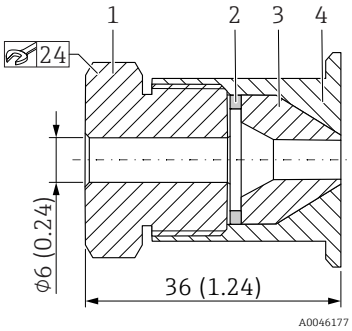
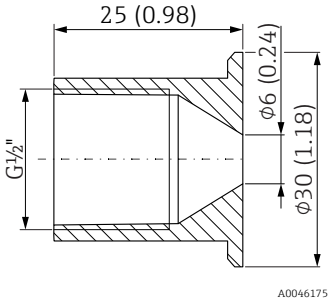
**Welding boss with sealing taper for thread G ½ or M12x1.5**

| Dimensions in mm (in) | Version | Order number |
|---|---|---|
|  <br>  <br>Process pressure<br>▪ max. 16 bar (232 psi) | Welding boss for thread G ½- or M12x1.5<br>Metal-sealing; conical<br><br>Material of wetted parts AISI 316L (1.4435) | 71424800 (G ½)<br><br>71405560 (M12x1.5) |
|  | Dummy plug for G ½ or M12x1.5 conical metal-sealing welding boss<br><br>Material: AISI 316L (1.4435) | 60022519 (G ½)<br><br>In preparation (M12x1.5) |

### Weld-in adapter for Ingold process connection

| Dimensions in mm (in) | Version | Order number |
|---|---|---|
|  | G 1¼ x 50 mm (1.97 in)<br><br>Material of wetted parts: AISI 316L (1.4435) | 71531585 |
| **Seal** | | **Order number** |
| | **O-ring sealing kit** | |
| | Silicone O-ring<br>In accordance with FDA<br><br>Maximum temperature: 230 °C (446 °F) | 60018911 |

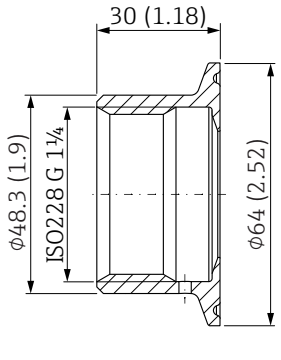
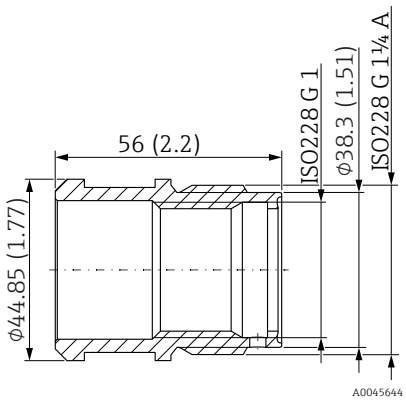
### Welding boss with sealing taper with/without pressure screw

| Dimensions in mm (in) | Version | Bestellnummer |
|---|---|---|
|  <br>*1 Pressure screw, 303/304*<br>*2 Washer, 303/304*<br>*3 Sealing taper, PEEK*<br>*4 Collar welding boss, 316L*<br><br>Process pressure<br>▪ max. 10 bar (145 psi) | Collar welding boss movable with sealing taper, washer and pressure screw G ½<br><br>Material of parts in contact with the process AISI 316L, PEEK | In preparation (with pressure screw) |
|  <br>Process pressure<br>▪ max. 10 bar (145 psi) | Collar welding boss<br><br>Material of parts in contact with the process AISI 316L | 51004752 (without pressure screw) |

# Hygiene process adapter Nivector FTI26

Pay attention to the temperature and pressure specifications for the seals and clips used at the customer site!

**Process adapter G 1¼ Tri-Clamp 2" with threaded sleeve**

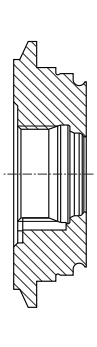
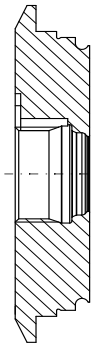
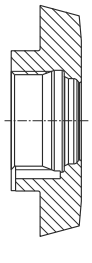
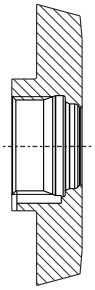
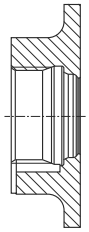
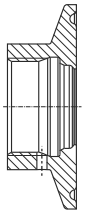
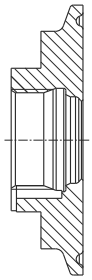
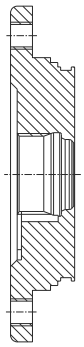
| Dimensions in mm (in) | Version | Order number |
|---|---|---|
|  *Process adapter G 1¼* | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4404)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | –<br>71444431 |
| | ▪ Measuring device: Nivector FTI26<br>▪ Suitable for Process connection[1)]<br>Option: WDJ<br>▪ Adapter as an accessory enclosed[1]<br>Option: RK | |
|  *Threaded sleeve*<br><br>Pressure and temperature range<br>▪ max. 6 bar (87 psi) / -20 °C … +80 °C (-4 °F … +176 °F) | | |

| Seal, ø 29 x 36 x 3.7 mm (1.14 x 1.42 x 0.15 in) | | Order number |
|---|---|---|
| | **Standard seal** | |
| | Silicone profile gasket<br>Material: VMQ 60<br>Conform according to FDA, USP Class VI, 3-A, EC1935<br>Approved by EHEDG | 71075662[2)]<br>(5 pieces) |
| | **Alternative seal** | |
| | Silicone profile gasket<br>Material: VMQ 60<br>Conform according to FDA, EC1935<br>Approved by EHEDG | 52014424<br>(5 pieces) |

1) The option can be selected in the Product Configurator via the corresponding order feature.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

# Process adapter M24 - overview Level and Pressure

| **Process adapter M24** |  A0023286 |  A0023419 |  A0023547 |  A0023418 |  A0023420 |  A0023423 |  A0023426 |  A0023422 |
|---|---|---|---|---|---|---|---|---|
| | **Varivent F DN32 PN40** | **Varivent N DN50 PN40** | **DIN11851 DN40** | **DIN11851 DN50** | **SMS 1½** | **Clamp 1½** | **Clamp 2** | **APV-Inline** |
| Material | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) |
| Roughness µm (µin) process side | ≤ 0.76 (29.9) | ≤ 0.76 (29.9) | ≤ 0.76 (29.9) | ≤ 0.76 (29.9) | ≤ 0.76 (29.9) | ≤ 0.76 (29.9) | ≤ 0.76 (29.9) | ≤ 0.76 (29.9) |
| Order number process adapter | 52023996 | 52023997 | 52023999 | 52023998 | 52026997 | 52023994 | 52023995 | 52024000 |
| Order number process adapter with inspection certificate[1)] | 52024003 | 52024004 | 52024006 | 52024005 | 52026999 | 52024001 | 52024002 | 52024007 |
| Order number for seal replacement (5 pieces)[2)] | EPDM 52024267 | EPDM 52024267 | EPDM 52024267 | EPDM 52024267 | EPDM 52024267 | EPDM 52024267 | EPDM 52024267 | EPDM 52024267 |
| Slottet nut | – | – | 71258361 | 71258361 | – | – | – | – |
| **Measuring device** / **Liquipoint** | **Suitable for process connection** option[3)] | | | | | | | |
| FTW23, FTW33 | X2J | X2J | X2J | X2J | X2J | X2J | X2J | X2J |
| **Liquitrend** | | | | | | | | |
| QMW43 | X2J | X2J | X2J | X2J | X2J | X2J | X2J | X2J |
| **Liquiphant** | | | | | | | | |
| FTL33 | X2J | X2J | X2J | X2J | X2J | X2J | X2J | X2J |
| **Ceraphant** | | | | | | | | |
| PTP33B | X2J/X3J | X2J/X3J | X2J/X3J | X2J/X3J | X2J/X3J | X2J/X3J | X2J/X3J | X2J/X3J |
| **Cerabar** | | | | | | | | |
| PMP23 | X2J/X3J | X2J/X3J | X2J/X3J | X2J/X3J | X2J/X3J | X2J/X3J | X2J/X3J | X2J/X3J |
| **Micropilot** | | | | | | | | |
| FMR62 | U2J | U2J | U2J | U2J | U2J | U2J | U2J | U2J |
| FMR63B | X2J | X2J | X2J | X2J | X2J | X2J | – | – |
| **Liquipoint** | **Adapter as an accessory enclosed** option [4)] | | | | | | | |
| FTW23 | RC/RD | RA/RB | – | RE/RF | RG/RH | RI/RJ | RK/RL | – |
| FTW33 | RC/RD | RA/RB | – | RE/RF | RG/RH | – | – | – |
| **Liquiphant** | | | | | | | | |
| FTL33 | RC/RD | RA/RB | – | RE/RF | RG/RH | – | – | – |
| **Micropilot** | | | | | | | | |
| FMR62, FMR63B | RC/RD | RA/RB | RE/RF | RG/RH | RI/RJ | RK/RL | – | – |

1) Inspection certificate EN10204-3.1 material; AD2000: The material 316L (in contact with process) corresponds to AD2000 – W0/W2/W10.

2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

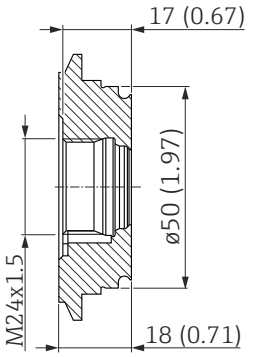
3) The option can be selected in the Product Configurator via the order feature "Process Connection".

4) The option can be selected in the Product Configurator via the order feature "Accessory Enclosed".

# Process connection M24 - Level and Pressure

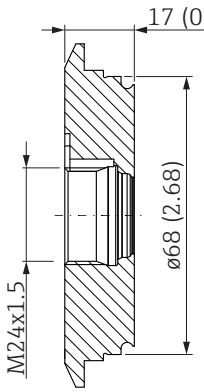
Pay attention to the temperature and pressure specifications for the seals and clips used at the customer site!

## Varivent F DN32 PN40

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin)<br><br>Approved by CRN: 0F18434.5C | 52023996<br>52024003 |
| **Seal ø 15.54 x 2.62 mm (0.61 x 0.1 in)** | | **Order number** |
| | **Standard seal** | |
| | O-ring<br>Material: EPDM-70<br>Conform according FDA, USP Class VI, 3-A, EC1935, GB4806<br><br>Approved by EHEDG | 52024267[1]<br>(5 pieces) |

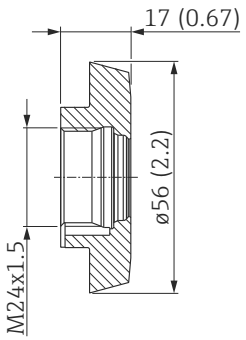
1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

**Varivent N DN50 PN40**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0023276<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin)<br><br>Approved by CRN: 0F18434.5C | 52023997<br>52024004 |
| **Seal ø 15.54 x 2.62 mm (0.61 x 0.1 in)** | | **Order number** |
| | **Standard seal** | |
| <br>A0021901 | O-ring<br>Material: EPDM-70<br>Conform according FDA, USP Class VI, 3-A, EC1935, GB4806<br><br>Approved by EHEDG | 52024267[1)]<br>(5 pieces) |

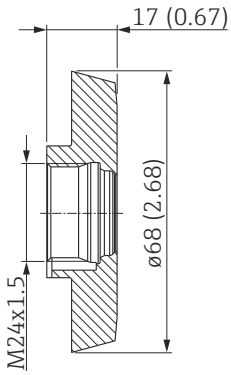
1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

**DIN11851 DN40**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0023548<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin)<br><br>Approved by CRN: 0F18434.5C | 52023999<br>52024006 |
| **Seal ø 15.54 x 2.62 mm (0.61 x 0.1 in)** | | **Order number** |
| | **Standard seal** | |
| <br>A0021901 | O-ring<br>Material: EPDM-70<br>Conform according FDA, USP Class VI, 3-A, EC1935, GB4806<br><br>Approved by EHEDG | 52024267[1)]<br>(5 pieces) |

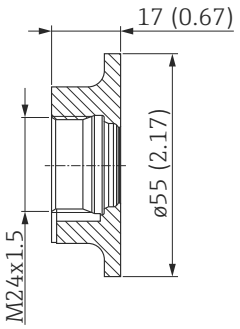
1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

**DIN11851 DN50**

| Dimensions in mm (in) | Version | Order number |
|---|---|---|
|  <br>A0023273<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin)<br><br>Approved by CRN: 0F18434.5C | 52023998<br>52024005 |
| **Seal ø 15.54 x 2.62 mm (0.61 x 0.1 in)** | | **Order number** |
| <br>A0021901 | **Standard seal** | |
| | O-Ring<br>Material: EPDM-70<br>Conform according FDA, USP Class VI, 3-A, EC1935, GB4806<br><br>Approved by EHEDG | 52024267[1)]<br>(5 pieces) |

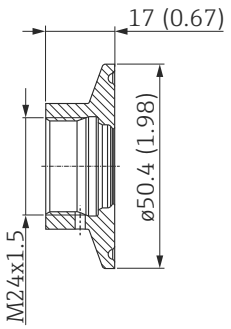
1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

**SMS 1½**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0023278<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin)<br>Approved by CRN: 0F18434.5C | 52026997<br>52026999 |
| **Seal ø 15.54 x 2.62 mm (0.61 x 0.1 in)** | | **Order number** |
| <br>A0021901 | **Standard seal** | |
| | O-ring<br>Material: EPDM-70<br>Conform according FDA, USP Class VI, 3-A, EC1935, GB4806<br>Approved by EHEDG | 52024267[1)]<br>(5 pieces) |

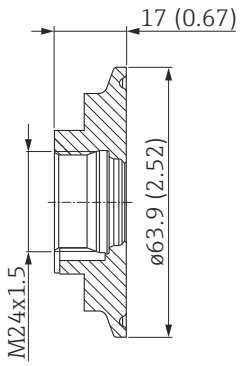
1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

**Clamp 1½ (DIN32676, ISO28552)**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0023284<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin)<br><br>Approved by CRN: 0F18434.5C | 52023994<br>52024001 |
| **Seal ø 15.54 x 2.62 mm (0.61 x 0.1 in)** | | **Order number** |
| <br>A0021901 | **Standard seal** | |
| | O-Ring<br>Material: EPDM-70<br>Conform according FDA, USP Class VI, 3-A, EC1935, GB4806<br><br>Approved by EHEDG | 52024267[1)]<br>(5 pieces) |

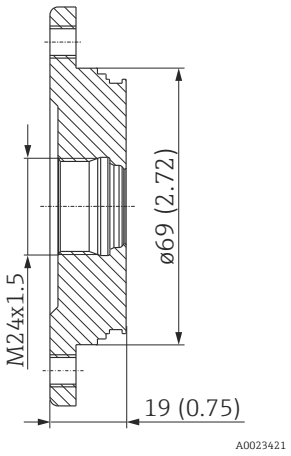
1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

### Clamp 2 (DIN32676, ISO28552)

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin)<br><br>Approved by CRN: 0F18434.5C | 52023995<br>52024002 |
| **Seal ø 15.54 x 2.62 mm (0.61 x 0.1 in)** | | **Order number** |
| | **Standard seal** | |
| | O-Ring<br>Material: EPDM-70<br>Conform according FDA, USP Class VI, 3-A, EC1935, GB4806<br><br>Approved by EHEDG | 52024267[1)]<br>(5 pieces) |

1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

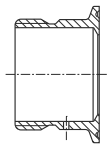
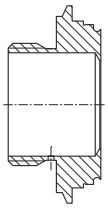
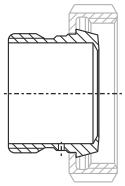
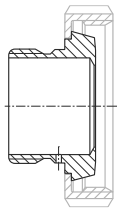
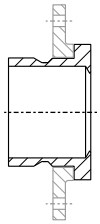
## APV-Inline

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0023421<br>Pressure and temperature range of the adapter<br>▪ max. 25 bar (362 psi) / max. 150 °C (302 °F)<br>▪ max. 40 bar (580 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 52024000<br>52024007 |
| **Seal ø 15.54 x 2.62 mm (0.61 x 0.1 in)** | | **Order number** |
| | **Standard seal** | |
| <br>A0021901 | O-ring<br>Material: EPDM-70<br>Conform according FDA, USP Class VI, 3-A, EC1935, GB4806<br><br>Approved by EHEDG | 52024267[1)]<br>(5 pieces) |

1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

# Process adapter UNI - overview Pressure

The following adapters can be used to create a connection between the customer's process connection and the Endress+Hauser instrument with a universal adapter.

| **Process adapter UNI overview Pressure** |  A0023532 |  A0023530 |  A0023413 |  A0023417 |  A0021898 |
|---|---|---|---|---|---|
| | **Clamp 2** | **Varivent N** | **DIN11851 DN40** | **DIN11851 DN50** | **DRD DN50** |
| Material | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) | 316L (1.4435) |
| Roughness µm (µin) process side | ≤ 0.76 (29.9) | ≤ 0.76 (29.9) | ≤ 0.76 (29.9) | ≤ 0.76 (29.9) | ≤ 0,76 (29.9) |
| Order number process adapter | 71114176 | 71114177 | 71114172 | 71114173 | 71114174 |
| Order number process adapter with inspection certificate[1)] | 71114207 | 71114208 | 71114178 | 71114205 | 71114206 |
| Order number for seal replacement (5 pieces)[2)] | Silicone profile gasket 52023572 | Silicone profile gasket 52023572 | Silicone profile gasket 52023572 | Silicone profile gasket 52023572 | Silicone profile gasket 52023572 |
| Scope of delivery | – | – | Slotted nut | Slotted nut | DRD-flange |
| **Measuring device** / **Cerabar** | **Suitable for process connection** option[3)] | | | | |
| PMP23 | 52J | 52J | 52J | 52J | 52J |
| PMC51 | UNJ/UPJ | UNJ/UPJ | UNJ/UPJ | UNJ/UPJ | UNJ/UPJ |
| PMP55 | UPJ | UPJ | UPJ | UPJ | – |
| **Deltapilot** | | | | | |
| FMB50 | UNJ/UPJ | UNJ/UPJ | UNJ/UPJ | UNJ/UPJ | UNJ/UPJ |
| FMB70 | 00/01 | 00/01 | 00/01 | 00/01 | 00/01 |
| **Deltabar** | | | | | |
| FMD71 | UNJ/UPJ | UNJ/UPJ | UNJ/UPJ | UNJ/UPJ | UNJ/UPJ |
| FMD78 | 00 | 00 | 00 | 00 | 00 |
| **Cerabar** | **Adapter as an accessory enclosed** option[4)] | | | | |
| PMC51 | RD / R4 | RF/R6 | RA/R1 | RB/R2 | RC/R3 |
| **Deltapilot** | | | | | |
| FMB50 | RD/R4 | RF/R6 | RA/R1 | RB/R2 | RC/R3 |

1) Inspection certificate EN10204-3.1 material; AD2000: The material 316L (in contact with process) corresponds to AD2000 – W0/W2/W10.

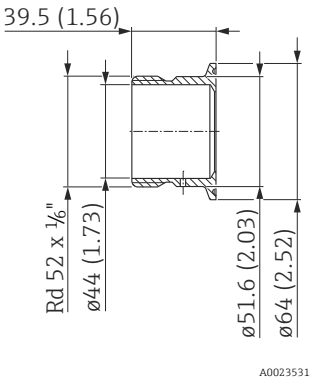
2) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

3) The option can be selected in the Product Configurator via the order feature "Process Connection".

4) The option can be selected in the Product Configurator via the order feature "Accessory Enclosed".

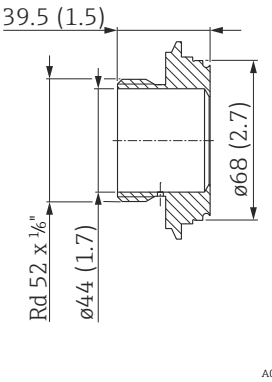
# Process adapter UNI - Pressure

**Clamp 2**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0023531<br><br>Pressure- and temperature range<br>▪ max. 10 bar (150 psi) / max. 100 °C (212 °F) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br><br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71114176<br>71114207 |
| **Seals, back ring** | | **Order number** |
| <br>A0021901 | **Standard seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Silicone profile gasket<br>Material: SI-60<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 52023572[1)]<br>(5 pieces) |
| | **Alternative seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Profile gasket<br>Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A | 71100719<br>(5 pieces) |
| <br>A0042001 | **O-ring with back ring** | |
| | With inspection certificate EN10204-3.1 material<br>Back ring:<br>Dimensions: ø 38.2 x 43.6 x 5.6 mm (1.5 x 1.72 x 0.22 in)<br>Material: AISI 316L (1.4404)<br><br>O-ring:<br>Dimensions: ø 36 x 2.5 mm (1.42 x 0.1 in)<br>Material: EPDM-70 Shore A<br>Conform according to FDA, USP, Class VI, 3-A<br><br>Approved by EHEDG | 71431380 |

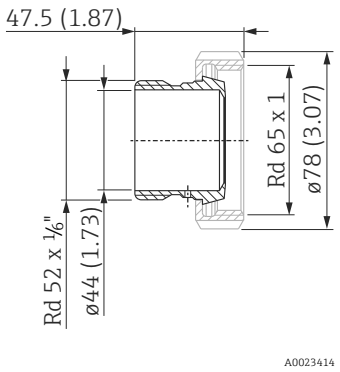
1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

**Varivent N**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0023526<br><br>Pressure- and temperature range<br>▪ max. 10 bar (150 psi) / max. 100 °C (212 °F) (max. 135 °C (275 °F) for 30 minutes) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br><br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71114177<br>71114208 |
| **Seals, back ring** | | **Order number** |
| <br>A0021901 | **Standard seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Silicone profile gasket<br>Material: SI-60<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 52023572[1)]<br>(5 pieces) |
| | **Alternative seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Profile gasket<br>Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A | 71100719<br>(5 pieces) |
| <br>A0042001 | **O-ring with back ring** | |
| | With inspection certificate EN10204-3.1 material<br>Back ring:<br>Dimensions: ø 38.2 x 43.6 x 5.6 mm (1.5 x 1.72 x 0.22 in)<br>Material: AISI 316L (1.4404)<br><br>O-ring:<br>Dimensions: ø 36 x 2.5 mm (1.42 x 0.1 in)<br>Material: EPDM-70 Shore A<br>Conform according to FDA, USP, Class VI, 3-A<br><br>Approved by EHEDG | 71431380 |

1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

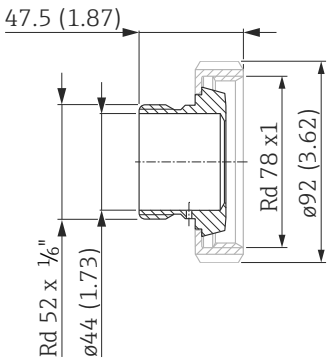
**DIN11851 DN40**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>Pressure- and temperature range<br>▪ max. 10 bar (150 psi) / max. 100 °C (212 °F) (max. 135 °C (275 °F) for 30 minutes) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71114172<br>71114178 |
| | Material slotted nut:<br>Endress+Hauser supplies these slotted nuts in stainless steel AISI 304 (DIN/EN material number 1.4301) or in AISI 304L (DIN/EN material number 1.4307). | |

| Seals, back ring | | Order number |
|---|---|---|
| | **Standard seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Silicone profile gasket<br>Material: SI-60<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 52023572[1)]<br>(5 pieces) |
| | **Alternative seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Profile gasket<br>Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A | 71100719<br>(5 pieces) |
| | **O-ring with back ring** | |
| | With inspection certificate EN10204-3.1 material<br>Back ring:<br>Dimensions: ø 38.2 x 43.6 x 5.6 mm (1.5 x 1.72 x 0.22 in)<br>Material: AISI 316L (1.4404)<br><br>O-ring:<br>Dimensions: ø 36 x 2.5 mm (1.42 x 0.1 in)<br>Material: EPDM-70 Shore A<br>Conform according to FDA, USP, Class VI, 3-A<br><br>Approved by EHEDG | 71431380 |

1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

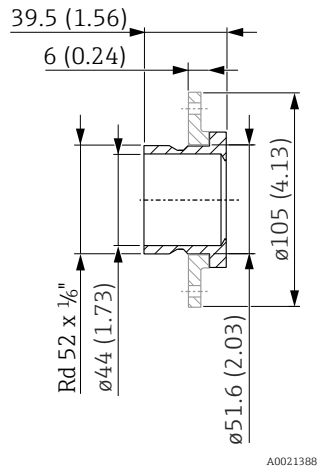
**DIN11851 DN50**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>A0023416<br><br>Pressure- and temperature range<br>▪ max. 10 bar (150 psi) / max. 100 °C (212 °F) (max. 135 °C (275 °F) for 30 minutes) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br><br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71114173<br>71114205 |
| | Material slotted nut:<br>Endress+Hauser supplies these slotted nuts in stainless steel AISI 304 (DIN/EN material number 1.4301) or in AISI 304L (DIN/EN material number 1.4307). | |

| Seals, back ring | | Order number |
|---|---|---|
| <br>A0021901 | **Standard seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Silicone profile gasket<br>Material: SI-60<br>Conform according to FDA, USP Class VI, 3-A, EC1935 | 52023572[1]<br>(5 pieces) |
| | **Alternative seal ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | |
| | Profile gasket<br>Material: EPDM-70<br>Conform according to FDA, USP Class VI, 3-A | 71100719<br>(5 pieces) |
| <br>A0042001 | **O-ring with back ring** | |
| | With inspection certificate EN10204-3.1 material<br>Back ring:<br>Dimensions: ø 38.2 x 43.6 x 5.6 mm (1.5 x 1.72 x 0.22 in)<br>Material: AISI 316L (1.4404)<br><br>O-ring:<br>Dimensions: ø 36 x 2.5 mm (1.42 x 0.1 in)<br>Material: EPDM-70 Shore A<br>Conform according to FDA, USP, Class VI, 3-A<br><br>Approved by EHEDG | 71431380 |

1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

**DRD DN50**

| Dimensions mm (in) | Version | Order number |
|---|---|---|
|  <br>Pressure- and temperature range<br>▪ max. 10 bar (150 psi) / max. 100 °C (212 °F) (max. 135 °C (275 °F) for 30 minutes) | ▪ Without inspection certificate<br>▪ With inspection certificate EN10204-3.1 material<br>Material: AISI 316L (1.4435)<br>Roughness (process side): Ra ≤ 0.76 µm (29.9 µin) | 71114174<br>71114206 |
| | Material DRD flange:<br>Endress+Hauser supplies these slotted nuts in stainless steel AISI 304 (DIN/EN material number 1.4301). | |
| **Seals ø 34 x 41.5 x 6.4 mm (1.34 x 1.63 x 0.25 in)** | | **Order number** |
| | **Standard seal** | |
| | Silicone profile gasket<br>Material: SI-60<br>Conform according to FDA, USP Class VI, EC1935 | 52023572[1)]<br>(5 pieces) |
| | **Alternative seal** | |
| | Profile gasket<br>Material: EPDM-70<br>Conform according to FDA, USP Class VI | 71100719<br>(5 pieces) |

1) Already included in the scope of delivery of the weld-in adapter: 1 x standard seal.

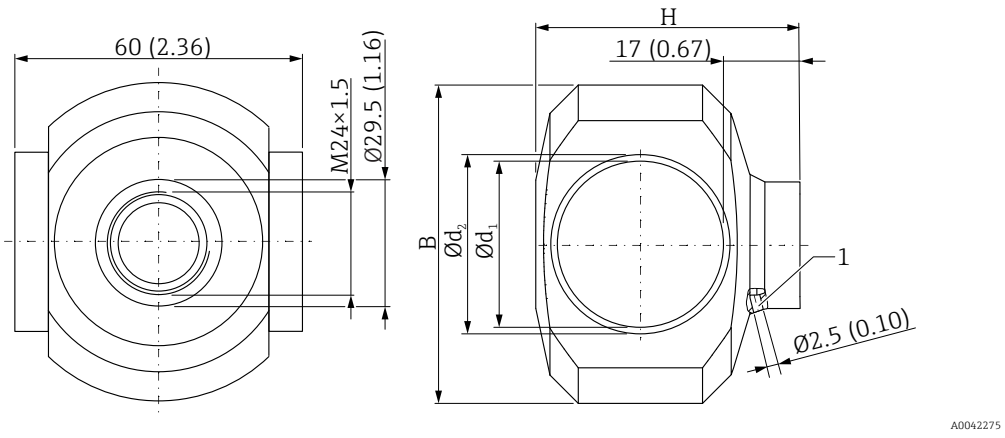
# Flush mount pipe connection M24×1.5 - Level and Pressure

**General**

- Material: AISI 316L (1.4404)
- Roughness: Ra wetted (inside) 0.76 µm (29.9 µin)/Ra outside: 1.6 µm (62.99 µin)
- Process temperature range: −40 … +85 °C (−40 … +185 °F)
  For a maximum 30 min: +85 … +150 °C (+185 … +302 °F), e.g. SIP cleaning

**Pipe connection, weldable**

**Dimensions mm (in)**




*1 Leakage hole*

| Nominal diameter | DN25 | DN32 | DN40 | DN50 |
|---|---|---|---|---|
| Order number | 71477801 | 71477803 | 71477807 | 71477808 |
| B | 67-mm (2.64 in) | 70 mm (2.56 in) | 73 mm (2.87 in) | 81 mm (3.19 in) |
| H | 48 mm (1.89 in) | 54 mm (2.13 in) | 60 mm (2.36 in) | 72 mm (2.83 in) |
| Ø $d_1$ | 26 mm (1.02 in) | 32 mm (1.26 in) | 38 mm (1.50 in) | 50 mm (2.00 in) |
| Ø $d_2$ | 29 mm (1.14 in) | 35 mm (1.34 in) | 41 mm (1.61 in) | 53 mm (2.09 in) |
| MWP for gases in fluid group 2[1) 2)] | 26 bar (377 psi) | 26 bar (377 psi) | 20 bar (290 psi) | 20 bar (290 psi) |
| MWP for gases in fluid group 1[1) 2)] | 26 bar (377 psi) | 26 bar (377 psi) | 26 bar (377 psi) | 26 bar (377 psi) |
| | | | | |
| **Measuring devices** | **Pipe connection as an accessory enclosed** option[3)] | | | |
| **Liquipoint** | | | | |
| FTW23, FTW33 | QS | QU | QW | QY |
| **Liquitrend** | | | | |
| QMW43 | QS | QU | QW | QY |
| **Ceraphant** | | | | |
| PTP33B | QS | QU | QW | QY |
| **Cerabar** | | | | |
| PMP23 | QS | QU | QW | QY |

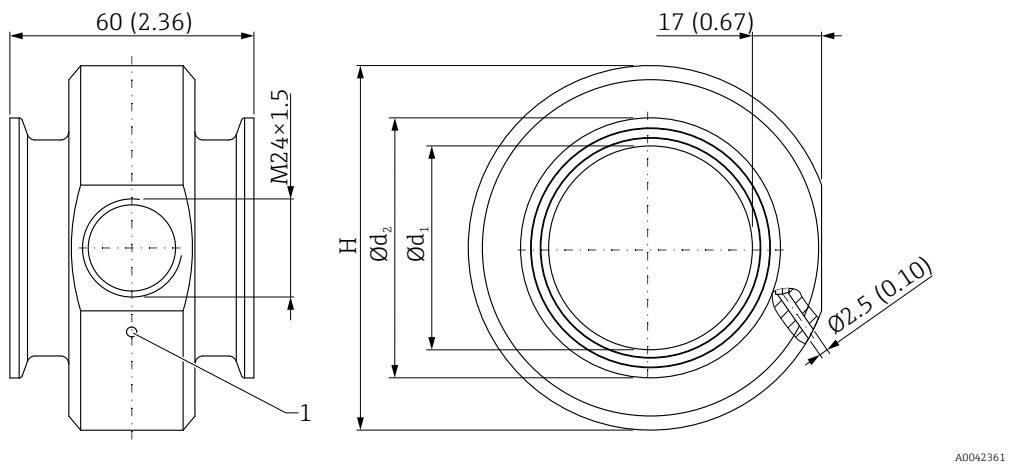
1) The maximum process pressure depends on the temperature.

2) Specifications according to PED, Rev. 01, Pipe adapter, classified according to PED (EU) 2014/68, Article 4, paragraph 3.

3) The option can be selected in the Product Configurator via the order feature "Accessory Enclosed".

## Pipe connection, clamp connection

**Dimensions mm (in)**




*1 Leakage hole*

| Nominal diameter | DN25 | DN32 | DN40 | DN50 |
|---|---|---|---|---|
| Order number | 71477812 | 71477813 | 71477816 | 71477817 |
| H | 68 mm (2.68 in) | 73 mm (2.87 in) | 78,5 mm (3.09 in) | 90 mm (3.54 in) |
| Ø $d_1$ | 26 mm (1.02 in) | 32 mm (1.26 in) | 38 mm (1.50 in) | 50 mm (2.00 in) |
| Ø $d_2$ | 50 mm (2.00 in) | 50 mm (2.00 in) | 50 mm (2.00 in) | 64 mm (2.50 in) |
| MWP for gases in fluid group 2[1) 2)] | 26 bar (377 psi) | 26 bar (377 psi) | 20 bar (290 psi) | 20 bar (290 psi) |
| MWP for gases in fluid group 1[1) 2)] | 26 bar (377 psi) | 26 bar (377 psi) | 26 bar (377 psi) | 26 bar (377 psi) |
| | | | | |
| **Measuring devices** | **Pipe connection as an accessory enclosed** option[3)] | | | |
| **Liquipoint** | | | | |
| FTW23, FTW33 | QT | QV | QX | QZ |
| **Liquitrend** | | | | |
| QMW43 | QT | QV | QX | QZ |
| **Ceraphant** | | | | |
| PTP33B | QT | QV | QX | QZ |
| **Cerabar** | | | | |
| PMP23 | QT | QV | QX | QZ |

1) The maximum process pressure depends on the temperature

2) Specifications according to PED, Rev. 01, Pipe adapter, classified according to PED (EU) 2014/68, Article 4, paragraph 3

3) The option can be selected in the Product Configurator via the order feature "Accessory Enclosed".

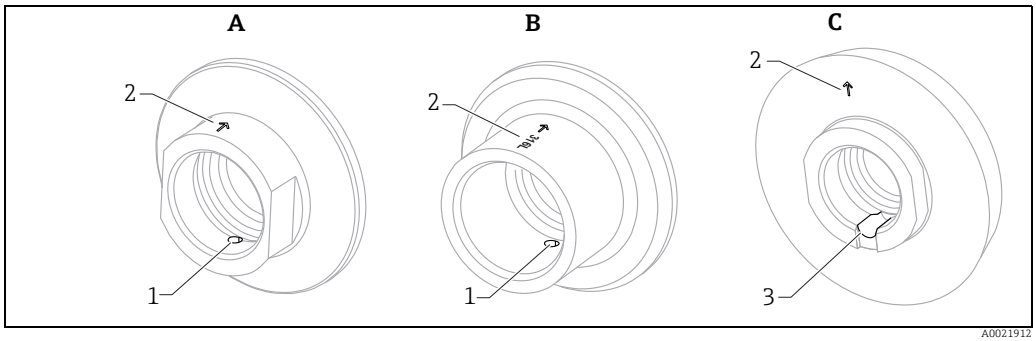
# Mounting and welding hints

Absolute care must be taken when welding stainless steel. The applied work pieces and tools must be rust-free. Also, no normal steel parts may be present in the vicinity.

During the welding, the adapter should be protected against deformations by the welding dummy or by other means of cooling according to usual welding practice (e.g. water cooling). With a suitable seal the welding dummy can also be used to flush-plug the process when starting-up the plant. Before doing so, make sure that the material of the dummy fits the process.

**Weld-in adapter with leakage hole or leakage port**

If installed horizontally and weld-in adapters with a leakage hole or leakage port are used, ensure that the leakage hole or the leakage port is pointing down. This allows leaks to be detected as quickly as possible.




*A Process adapter with leakage hole*
*B Weld-in adapter with leakage hole*
*C Process adapter with leakage port*
*1 Leakage hole*
*2 Mark, e.g. material and/or arrow, 180° across from hole*
*3 Leakage port*

**Notes for pressure measuring devices**

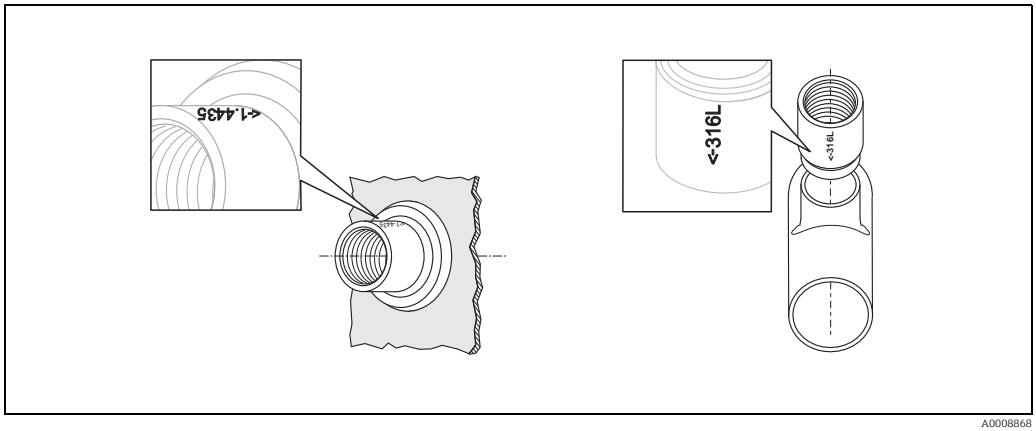
Before mounting a weld-in adapter for a pressure measuring device, please note the following:

- The maximum pressure resistance of a sensor is limited. Therefore, the welding must be performed very carefully if a weld-in adapter is applied for screwing-in a pressure measuring cell.
- In order to avoid deformations of the weld-in adapter during the welding it is essential to use the correct welding dummy for heat dissipation. Otherwise the tightness and pressure resistance can not be guaranteed after screwing in the sensor. The welding dummy prevents deformation of the weld-in adapter, which could cause leaks after the mounting of the sensor.

**Preparation**

- Drill a hole at the required position into the wall of the vessel or pipe
  Hole diameter: The outer diameter of the welding adapter (max. tolerance: +0.2 mm (0.01 in))

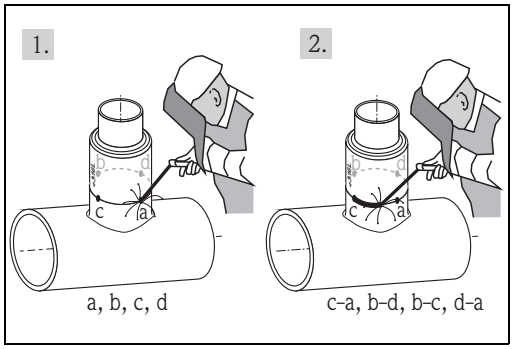
- Slide the weld-in adapter with welding dummy into the hole and align it in a way as to ensure that the sensor will be positioned correctly. See the chapter "Install measuring device" from → ä 65.



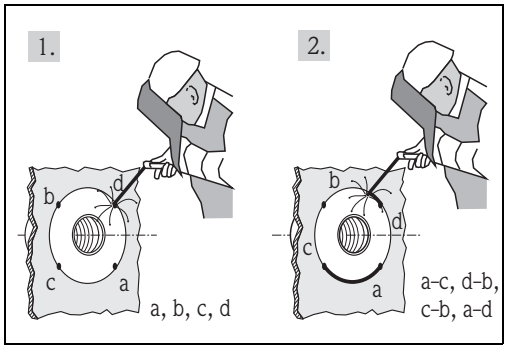
**Welding procedure**

It is recommended to partition the welding seam into several segments (according to common welding practice).

- Pin the weld-in adapter with four or six welding spots to the vessel or tube (see the figures).
- Weld the segments between the spots in order to avoid deformations and leakages. After welding a segment always weld the opposite segment.
- After welding two segments stop the welding procedure until the workpiece is cooled down.
- Let the weld-in adapter cool down after the welding and remove the welding dummy.




*Welding of pipes*




*Welding of vessels*

To obtain the desired surface roughness, the range of the welding seam must be polished.

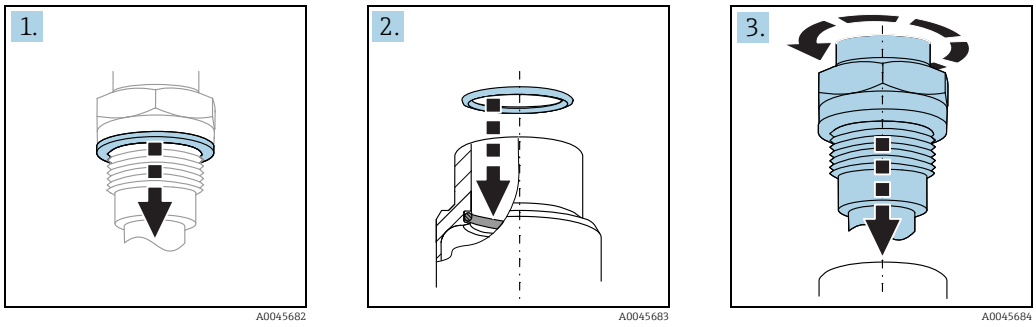
**Before mounting**

**Note for Liquiphant**

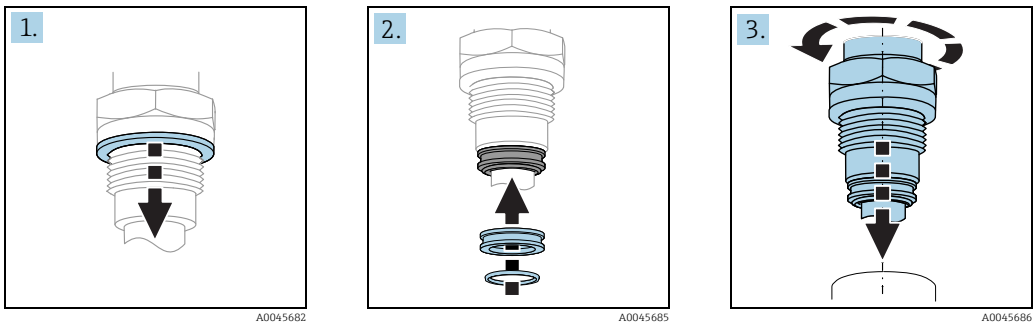
Some devices are supplied with a flat gasket on the adapter.

- Remove the flat gasket
- Use supplied o-ring or pressure ring with o-ring

**Scope of delivery: O-ring for G ¾ d=55, G 1 d=53, G 1 d=60**




**Scope of delivery: Pressure ring with o-ring für G ¾ d=50, G ¾ d=29**



## Install measuring device

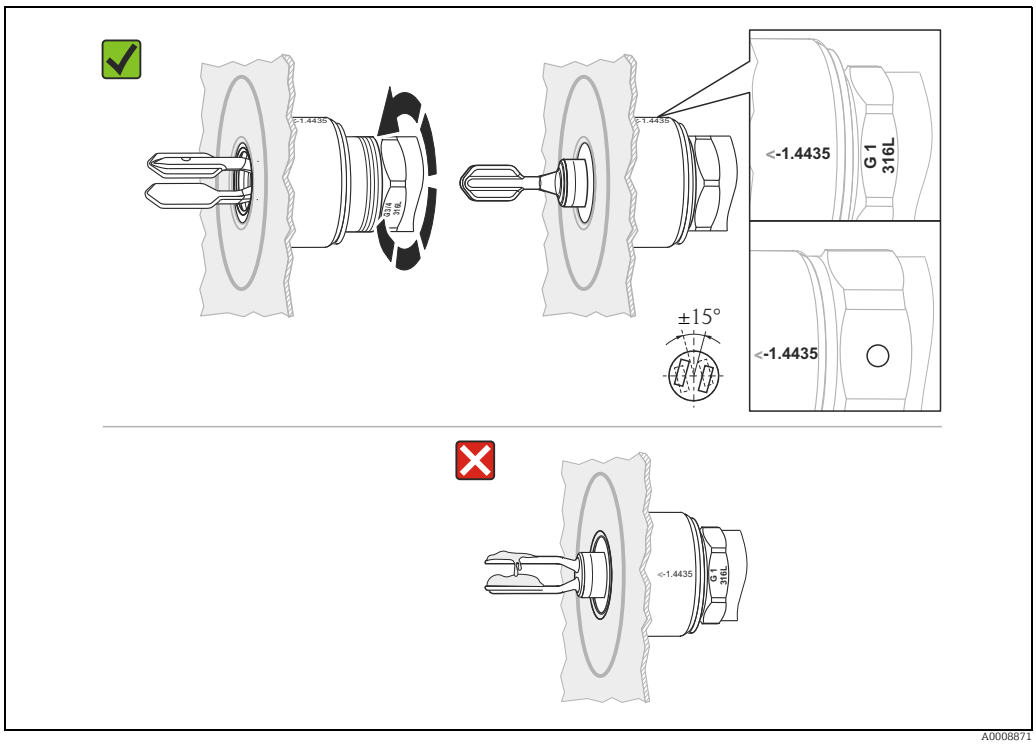
### Notes for level measuring device (e.g. Liquiphant)

#### Consider marking

The marking indicates the position of the tuning fork. The marking appears either as a material specification (e.g. 316L) or a thread designation (e.g. G ½) in the following locations: On the process- or weld-in adapter or on the name plate of the measuring device.

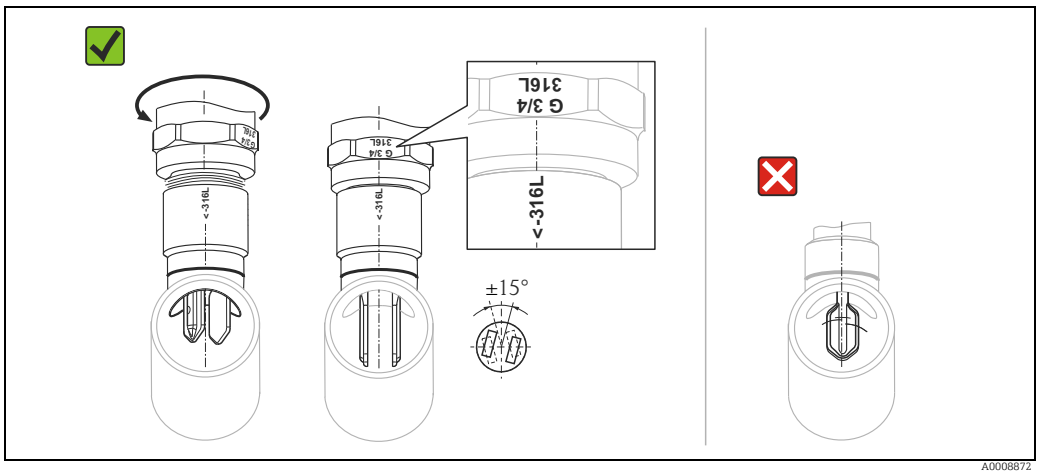
If installed horizontally in vessels

- the marking is face up
- ensure that the leakage hole is pointing down. This allows leaks to be detected as quickly as possible, see chapter "Weld-in adapter with leakage hole/leakage port" → ä 63.




*Orientation in the vessel*

When mounted into pipes, the fork must be aligned in the direction of the flow according to the mark.




*Orientation in the pipe*

**Notes for pressure sensor**

- Before mounting, all sealing surfaces at the weld-in adapter must be cleaned.
- Remove the protective cap from the pressure sensor.

Do not touch or damage the process isolating diaphragm!

- Screw the pressure sensor firmly at the hexagonal nut. The threaded connection must be fastened fingertight. It is recommended to secure the threaded connection with a torque of 60 Nm (±20 Nm) to protect it against vibrations and other influences.

**Pressure resistance**

The material of the weld-in adapter and the quality of the welding are crucial for pressure resistance. The complete length of the thread has to be used in order to ensure maximum pressure resistance.

# Flange - overview

**Specifications**

The material of the flanges delivered is AISI 316L with the material number 1.4404 or 1.4435. With regard to their stability-temperature property, the materials 1.4404 and 1.4435 are grouped in DIN EN 1092-1 table 18 under 13E0 and in JIS B2220 table 5 under 023b. The ASME flanges are dual rated flanges (316/316L) and grouped in table 2-2.2 according to ASME B16.5.

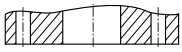
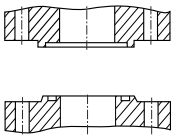
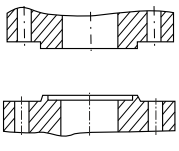
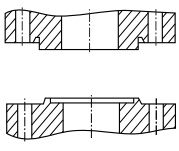
Values in inches are converted to values in millimeters using the factor 2.54.
The mm values are rounded off to the nearest 0 or 5 in the ASME standard.

**Versions**

| EN flanges | ASME flanges | JIS flanges |
|---|---|---|
| European Standards | America Society of Mechanical Engineers | Japanese Industrial Standard |
| DIN EN 1092-1 | ASME B16.5 | B2220 |

**Flange Norm DIN EN 1092-1**

Endress+Hauser usually delivers only flanges with flat face. This type of flange has hardly changed. Thus, a comparison is done only for this sealing surfaces. Due to the change of the designation of the sealing surface mistakes may occur occasionally. The roughness (Rz) of the old raised face form C and the new one B1 have an overlapping between 40 to 50 µm. In this roughness window both standards are fulfilled.
Therefore, at Endress+Hauser the flanges are specified according to both flange standards. This double marking makes it clear that both standards are met.

| Flange | Sealing surface | DIN EN 1092-1 | | |
|---|---|---|---|---|
| | | Form | Rz (µm) | Ra (µm) |
| without raised face |  | A | 12.5 - 50 | 3.2 - 12.5 |
| with raised face | | B1[1)]<br>B2[2)] | 12.5 - 50<br>3.2 - 12.5 | 3.2 - 12.5<br>0.8 - 3.2 |
| tongue<br>groove |  | C<br>D | 3.2 - 12.5 | 0.8 - 3.2 |
| projection<br>recess |  | E<br>F | 12.5 - 50 | 3.2 - 12.5 |
| projection<br>recess |  | H<br>G | 3.2 - 12.5 | 3.2 - 12.5 |

1) typically of PN2.5 bis PN40

2) typically of PN63

**Height of raised face**

Unit of measurement in mm (in)

| Standard | Flange | Height of raised face f | Tolerance |
|---|---|---|---|
| DIN EN 1092-1 | ≤ DN 32 | 2 (0.08) | 0<br>−1 (−0.04) |
| | > DN 32 up to DN 250 | 3 (0.12) | 0<br>−2 (−0.08) |
| | > DN 250 up to DN 500 | 4 (0.16) | 0<br>−3 (−0.12) |
| | > DN 500 | 5 (0.19) | 0<br>−4 (−0.16) |
| ASME B16.5 | ≤ Class 300 | 1.6 (0.06) | ±0.75 (±0.03) |
| | ≥ Class 600 | 6.4 (0.25) | ±0.5 (±0.02) |
| JIS B2220 | < DN 20 | 1.5 (0.06)<br>0 | – |
| | > DN 20 up to DN 50 | 2 (0.08)<br>0 | |
| | > DN 50 | 3 (0.12)<br>0 | |

# Mechanical Construction

## EN flanges (DIN EN 1092-1)

A0029176

*(Raised face B1)*

*L Diameter of holes*
*d Raised face diameter*
*K Diameter of hole circle*
*D Flange diameter*
*b Total flange thickness*
*f Raised face height (general 2 mm (0.08 in))*

## PN16

In following tables, the unit of measurement are indicated in mm (in) unless otherwise noted.

| DN | D | b | K | d | L | approx. kg (lbs) |
|---|---|---|---|---|---|---|
| 25 | 115 (4.53) | 18 (0.71) | 85 (3.35) | 68 (2.68) | 4x∅14 (0.55) | 1.50 (3.31) |
| 32 | 140 (5.51) | 18 (0.71) | 100 (3.94) | 78 (3.07) | 4x∅18 (0.71) | 2.00 (4.41) |
| 40 | 150 (5.91) | 18 (0.71) | 110 (4.33) | 88 (3.46) | 4x∅18 (0.71) | 2.50 (5.51) |
| 50 | 165 (6.50) | 18 (0.71) | 125 (4.92) | 102 (4.02) | 4x∅18 (0.71) | 2.90 (6.39) |
| 65 | 185 (7.28) | 18 (0.71) | 145 (5.71) | 122 (4.80) | 8x∅18 (0.71) | 3.50 (7.72) |
| 80 | 200 (7.87) | 20 (0.79) | 160 (6.30) | 138 (5.43) | 8x∅18 (0.71) | 4.50 (9.92) |
| 100 | 220 (8.66) | 20 (0.79) | 180 (7.09) | 158 (6.22) | 8x∅18 (0.71) | 5.50 (12.13) |
| 125 | 250 (9.84) | 22 (0.87) | 210 (8.27) | 188 (7.40) | 8x∅18 (0.71) | 8.00 (17.64) |
| 150 | 285 (11.2) | 22 (0.87) | 240 (9.45) | 212 (8.35) | 8x∅22 (0.87) | 10.5 (23.15) |
| 200 | 340 (13.4) | 24 (0.94) | 295 (11.6) | 268 (10.6) | 12x∅22 (0.87) | 16.5 (36.38) |
| 250 | 405 (15.9) | 26 (1.02) | 355 (14.0) | 320 (12.6) | 12x∅26 (1.02) | 25.0 (55.13) |
| 300 | 460 (18.1) | 28 (1.10) | 410 (16.1) | 378 (14.9) | 12x∅26 (1.02) | 35.0 (77.18) |

## PN25

| DN | D | b | K | d | L | approx. kg (lbs) |
|---|---|---|---|---|---|---|
| 25 | 115 (4.53) | 18 (0.71) | 85 (3.35) | 68 (2.68) | 4x∅14 (0.55) | 1.50 (3.31) |
| 32 | 140 (5.51) | 18 (0.71) | 100 (3.94) | 78 (3.07) | 4x∅18 (0.71) | 2.00 (4.41) |
| 40 | 150 (5.91) | 18 (0.71) | 110 (4.33) | 88 (3.46) | 4x∅18 (0.71) | 2.50 (5.51) |
| 50 | 165 (6.50) | 20 (0.79) | 125 (4.92) | 102 (4.02) | 4x∅18 (0.71) | 3.00 (6.62) |
| 65 | 185 (7.28) | 22 (0.87) | 145 (5.71) | 122 (4.80) | 8x∅18 (0.71) | 4.50 (9.92) |
| 80 | 200 (7.87) | 24 (0.94) | 160 (6.30) | 138 (5.43) | 8x∅18 (0.71) | 5.50 (12.13) |
| 100 | 235 (9.25) | 24 (0.94) | 190 (7.48) | 162 (6.38) | 8x∅22 (0.87) | 7.50 (16.54) |
| 125 | 270 (10.6) | 26 (1.02) | 220 (8.66) | 188 (7.40) | 8x∅26 (1.02) | 11.0 (24.26) |
| 150 | 300 (11.8) | 28 (1.10) | 250 (9.84) | 218 (8.58) | 8x∅26 (1.02) | 14.5 (31.97) |
| 200 | 360 (14.2) | 30 (1.18) | 310 (12.2) | 278 (10.9) | 12x∅26 (1.02) | 22.5 (49.61) |
| 250 | 425 (16.7) | 32 (1.26) | 370 (14.6) | 335 (13.2) | 12x∅30 (1.18) | 33.5 (73.9) |
| 300 | 485 (19.1) | 34 (1.34) | 430 (16.9) | 395 (15.6) | 16x∅30 (1.18) | 46.5 (102.5) |

**PN40**

| DN | D | b | K | d | L | approx. kg (lbs) |
|---|---|---|---|---|---|---|
| 25 | 115 (4.53) | 18 (0.71) | 85 (3.35) | 68 (2.68) | 4x∅14 (0.55) | 1.50 (3.31) |
| 32 | 140 (5.51) | 18 (0.71) | 100 (3.94) | 78 (3.07) | 4x∅18 (0.71) | 2.00 (4.41) |
| 40 | 150 (5.91) | 18 (0.71) | 110 (4.33) | 88 (3.46) | 4x∅18 (0.71) | 2.50 (5.51) |
| 50 | 165 (6.50) | 20 (0.79) | 125 (4.92) | 102 (4.02) | 4x∅18 (0.71) | 3.00 (6.62) |
| 65 | 185 (7.28) | 22 (0.87) | 145 (5.71) | 122 (4.80) | 8x∅18 (0.71) | 4.50 (9.92) |
| 80 | 200 (7.87) | 24 (0.94) | 160 (6.30) | 138 (5.43) | 8x∅18 (0.71) | 5.50 (12.13) |
| 100 | 235 (9.25) | 24 (0.94) | 190 (7.48) | 162 (6.38) | 8x∅22 (0.87) | 7.50 (16.54) |
| 125 | 270 (10.6) | 26 (1.02) | 220 (8.66) | 188 (7.40) | 8x∅26 (1.02) | 11.0 (24.26) |
| 150 | 300 (11.8) | 28 (1.10) | 250 (9.84) | 218 (8.58) | 8x∅26 (1.02) | 14.5 (31.97) |
| 200 | 375 (14.8) | 36 (1.42) | 320 (12.6) | 285 (11.2) | 12x∅30 (1.18) | 29.0 (63.95) |
| 250 | 450 (17.7) | 38 (1.50) | 385 (15.2) | 345 (13.6) | 12x∅33 (1.30) | 44.5 (98.12) |
| 300 | 515 (20.3) | 42 (1.65) | 450 (17.7) | 410 (16.1) | 16x∅33 (1.30) | 64.0 (141.1) |

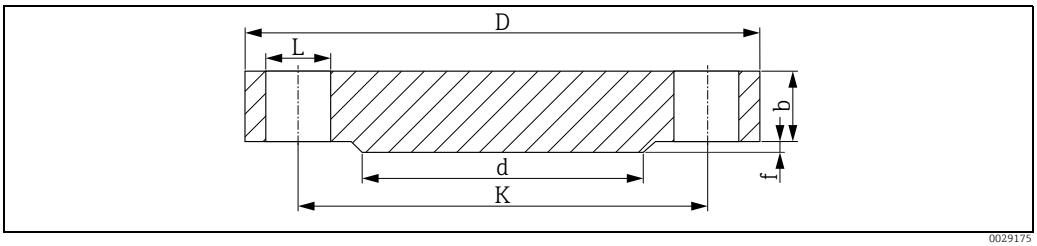
**PN63**

| DN | D | b | K | d | L | approx. kg (lbs) |
|---|---|---|---|---|---|---|
| 25 | 140 (5.51) | 24 (0.94) | 100 (3.94) | 68 (2.68) | 4x∅18 (0.71) | 2.50 (5.51) |
| 32 | 155 (6.10) | 24 (0.94) | 110 (4.33) | 78 (3.07) | 4x∅22 (0.87) | 3.50 (7.72) |
| 40 | 170 (6.69) | 26 (1.02) | 125 (4.92) | 88 (3.46) | 4x∅22 (0.87) | 4.50 (9.92) |
| 50 | 180 (7.09) | 26 (1.02) | 135 (5.31) | 102 (4.02) | 4x∅22 (0.87) | 5.00 (11.03) |
| 65 | 205 (8.07) | 26 (1.02) | 160 (6.30) | 122 (4.80) | 8x∅22 (0.87) | 6.00 (13.23) |
| 80 | 215 (8.46) | 28 (1.10) | 170 (6.69) | 138 (5.43) | 8x∅22 (0.87) | 7.50 (16.54) |
| 100 | 250 (9.84) | 30 (1.18) | 200 (7.87) | 162 (6.38) | 8x∅26 (1.02) | 10.5 (23.15) |
| 125 | 295 (11.6) | 34 (1.34) | 240 (9.45) | 188 (7.40) | 8x∅30 (1.18) | 16.5 (36.38) |
| 150 | 345 (13.6) | 36 (1.42) | 280 (11.0) | 218 (8.58) | 8x∅33 (1.30) | 24.5 (54.02) |
| 200 | 415 (16.3) | 42 (1.65) | 345 (13.6) | 285 (11.2) | 12x∅36 (1.42) | 40.5 (89.3) |
| 250 | 470 (18.5) | 46 (1.81) | 400 (15.7) | 345 (13.6) | 12x∅36 (1.42) | 58.0 (127.9) |
| 300 | 530 (20.9) | 52 (2.05) | 460 (18.1) | 410 (16.1) | 16x∅36 (1.42) | 83.5 (184.1) |

**PN100**

| DN | D | b | K | d | L | approx. kg (lbs) |
|---|---|---|---|---|---|---|
| 25 | 140 (5.51) | 24 (0.94) | 100 (3.94) | 68 (2.68) | 4x∅18 (0.71) | 2.50 (5.51) |
| 32 | 155 (6.10) | 24 (0.94) | 110 (4.33) | 78 (3.07) | 4x∅22 (0.87) | 3.50 (7.72) |
| 40 | 170 (6.69) | 26 (1.02) | 125 (4.92) | 88 (3.46) | 4x∅22 (0.87) | 4.50 (9.92) |
| 50 | 195 (7.68) | 28 (1.10) | 145 (5.71) | 102 (4.02) | 4x∅26 (1.02) | 6.00 (13.23) |
| 65 | 220 (8.66) | 30 (1.18) | 170 (6.69) | 122 (4.80) | 8x∅26 (1.02) | 8.00 (17.64) |
| 80 | 230 (9.06) | 32 (1.26) | 180 (7.09) | 138 (5.43) | 8x∅26 (1.02) | 9.50 (20.95) |
| 100 | 265 (10.4) | 36 (1.42) | 210 (8.27) | 162 (6.38) | 8x∅30 (1.18) | 14.0 (30.87) |
| 125 | 315 (12.4) | 40 (1.57) | 250 (9.84) | 188 (7.40) | 8x∅33 (1.30) | 22.5 (49.61) |
| 150 | 355 (14.0) | 44 (1.73) | 290 (11.4) | 218 (8.58) | 12x∅33 (1.30) | 30.5 (67.25) |
| 200 | 430 (16.9) | 52 (2.05) | 360 (14.2) | 285 (11.2) | 12x∅36 (1.42) | 54.5 (120.2) |
| 250 | 505 (19.9) | 60 (2.36) | 430 (16.9) | 345 (13.6) | 12x∅39 (1.54) | 87.5 (192.9) |
| 300 | 585 (23.0) | 68 (2.68) | 500 (19.7) | 410 (16.1) | 16x∅42 (1.65) | 131.5 (289.9) |

### ASME-Flange (ASME B16.5)




*(Raised face RF)*

*L Diameter of holes*
*d Raised face diameter*
*K Diameter of hole circle*
*D Flange diameter*
*b Total flange thickness*
*f Raised face height Class 150/300: 1.6 mm (0.06 in) or from Class 600: 6.4 mm (0.25 in)*

Note!
Surface finish of the gasket faces Ra ≤ 3.2 to 6.3 µm (126 to 248 µin).

### Class 150

In following tables, the unit of measurement are indicated in mm (in) unless otherwise noted.

| NPS (Nominal pipe size) | D | b | K | d | L | approx. kg (lbs) |
|---|---|---|---|---|---|---|
| 1" | 108.0 (4.25) | 14.2 (0.56) | 79.2 (3.12) | 50.8 (2.00) | 4x∅15.7 (0.62) | 0.86 (1.9) |
| 1¼" | 117.3 (4.62) | 15.7 (0.62) | 88.9 (3.50) | 63.5 (2.50) | 4x∅15.7 (0.62) | 1.17 (2.58) |
| 1½" | 127.0 (5.00) | 17.5 (0.69) | 98.6 (3.88) | 73.2 (2.88) | 4x∅15.7 (0.62) | 1.53 (3.37) |
| 2" | 152.4 (6.00) | 19.1 (0.75) | 120.7 (4.75) | 91.9 (3.62) | 4x∅19.1 (0.75) | 2.42 (5.34) |
| 2½" | 177.8 (7.00) | 22.4 (0.88) | 139.7 (5.50) | 104.6 (4.12) | 4x∅19.1 (0.75) | 3.94 (8.69) |
| 3" | 190.5 (7.50) | 23.9 (0.94) | 152.4 (6.00) | 127.0 (5.00) | 4x∅19.1 (0.75) | 4.93 (10.87) |
| 3½" | 215.9 (8.50) | 23.9 (0.94) | 177.8 (7.00) | 139.7 (5.50) | 8x∅19.1 (0.75) | 6.17 (13.60) |
| 4" | 228.6 (9.00) | 23.9 (0.94) | 190.5 (7.50) | 157.2 (6.19) | 8x∅19.1 (0.75) | 7.00 (15.44) |
| 5" | 254.0 (10.0) | 23.9 (0.94) | 215.9 (8.50) | 185.7 (7.31) | 8x∅22.4 (0.88) | 8.63 (19.03) |
| 6" | 279.4 (11.0) | 25.4 (1.00) | 241.3 (9.50) | 215.9 (8.50) | 8x∅22.4 (0.88) | 11.3 (24.92) |
| 8" | 342.9 (13.5) | 28.4 (1.12) | 298.5 (11.8) | 269.7 (10.6) | 8x∅22.4 (0.88) | 19.6 (43.22) |
| 10" | 406.4 (16.0) | 30.2 (1.19) | 362.0 (14.3) | 323.8 (12.7) | 12x∅25.4 (1.00) | 28.8 (63.50) |

Class 300

| NPS (Nominal pipe size) | D | b | K | d | L | approx. kg (lbs) |
|---|---|---|---|---|---|---|
| 1" | 124.0 (4.88) | 17.5 (0.69) | 88.9 (3.50) | 50.8 (2.00) | 4x∅19.1 (0.75) | 1.39 (3.06) |
| 1¼" | 133.4 (5.25) | 19.1 (0.75) | 98.6 (3.88) | 63.5 (2.50) | 4x∅19.1 (0.75) | 1.79 (3.95) |
| 1½" | 155.4 (6.12) | 20.6 (0.81) | 114.3 (4.50) | 73.2 (2.88) | 4x∅22.4 (0.88) | 2.66 (5.87) |
| 2" | 165.1 (6.50) | 22.4 (0.88) | 127.0 (5.00) | 91.9 (3.62) | 8x∅19.1 (0.75) | 3.18 (7.01) |
| 2½" | 190.5 (7.50) | 25.4 (1.00) | 149.4 (5.88) | 104.6 (4.12) | 8x∅22.4 (0.88) | 4.85 (10.69) |
| 3" | 209.5 (8.25) | 28.4 (1.12) | 168.1 (6.62) | 127.0 (5.00) | 8x∅22.4 (0.88) | 6.81 (15.02) |
| 3½" | 228.6 (9.00) | 30.2 (1.19) | 184.2 (7.25) | 139.7 (5.50) | 8x∅22.4 (0.88) | 8.71 (19.21) |
| 4" | 254.0 (10.0) | 31.8 (1.25) | 200.2 (7.88) | 157.2 (6.19) | 8x∅22.4 (0.88) | 11.5 (25.36) |
| 5" | 279.4 (11.0) | 35.1 (1.38) | 235.0 (9.25) | 185.7 (7.31) | 8x∅22.4 (0.88) | 15.6 (34.4) |
| 6" | 317.5 (12.5) | 36.6 (1.44) | 269.7 (10.6) | 215.9 (8.50) | 12x∅22.4 (0.88) | 20.9 (46.08) |
| 8" | 381.0 (15.0) | 41.1 (1.62) | 330.2 (13.0) | 269.7 (10.6) | 12x∅25.4 (1.00) | 34.3 (75.63) |
| 10" | 444.5 (17.5) | 47.8 (1.88) | 387.4 (15.3) | 323.8 (12.7) | 16x∅28.4 (1.12) | 53.3 (117.5) |

Class 600

| NPS (Nominal pipe size) | D | b | K | d | L | approx. kg (lbs) |
|---|---|---|---|---|---|---|
| 1" | 124.0 (4.88) | 17.5 (0.69) | 88.9 (3.50) | 50.8 (2.00) | 4x∅19.1 (0.75) | 1.60 (3.53) |
| 1¼" | 133.4 (5.25) | 20.6 (0.81) | 98.6 (3.88) | 63.5 (2.50) | 4x∅19.1 (0.75) | 2.23 (4.92) |
| 1½" | 155.4 (6.12) | 22.4 (0.88) | 114.3 (4.50) | 73.2 (2.88) | 4x∅22.4 (0.88) | 3.25 (7.17) |
| 2" | 165.1 (6.50) | 25.4 (1.00) | 127.0 (5.00) | 91.9 (3.62) | 8x∅19.1 (0.75) | 4.15 (9.15) |
| 2½" | 190.5 (7.50) | 28.4 (1.12) | 149.4 (5.88) | 104.6 (4.12) | 8x∅22.4 (0.88) | 6.13 (13.52) |
| 3" | 209.5 (8.25) | 31.8 (1.25) | 168.1 (6.62) | 127.0 (5.00) | 8x∅22.4 (0.88) | 8.44 (18.61) |
| 3½" | 228.6 (9.00) | 35.1 (1.38) | 184.2 (7.25) | 139.7 (5.50) | 8x∅25.4 (1.00) | 11.0 (24.26) |
| 4" | 273.1 (10.8) | 38.1 (1.50) | 215.9 (8.50) | 157.2 (6.19) | 8x∅25.4 (1.00) | 17.3 (38.15) |
| 5" | 330.2 (13.0) | 44.5 (1.75) | 266.7 (10.5) | 185.7 (7.31) | 8x∅28.4 (1.12) | 29.4 (64.83) |
| 6" | 355.6 (14.0) | 47.8 (1.88) | 292.1 (11.5) | 215.9 (8.50) | 12x∅28.4 (1.12) | 36.1 (79.6) |
| 8" | 419.1 (16.5) | 55.6 (2.19) | 349.3 (13.8) | 269.7 (10.6) | 12x∅31.8 (1.25) | 58.9 (129.9) |
| 10" | 508.0 (20.0) | 63.5 (2.50) | 431.8 (17.0) | 323.8 (12.7) | 16x∅35.1 (1.38) | 97.5 (214.9) |

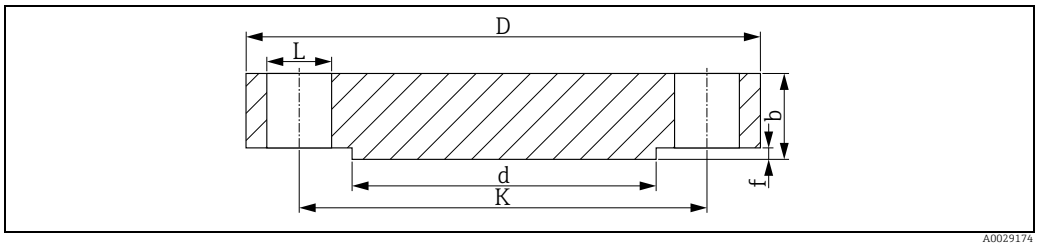
### Class 900

| NPS (Nominal pipe size) | D | b | K | d | L | approx. kg (lbs) |
|---|---|---|---|---|---|---|
| 1" | 149.4 (5.88) | 28.4 (1.12) | 101.6 (4.00) | 50.8 (2.00) | 4x∅25.4 (1.00) | 3.57 (7.87) |
| 1¼" | 158.8 (6.25) | 28.4 (1.12) | 111.3 (4.38) | 63.5 (2.50) | 4x∅25.4 (1.00) | 4.14 (9.13) |
| 1½" | 177.8 (7.00) | 31.8 (1.25) | 124.0 (4.88) | 73.2 (2.88) | 4x∅28.4 (1.12) | 5.75 (12.68) |
| 2" | 215.9 (8.50) | 38.1 (1.50) | 165.1 (6.50) | 91.9 (3.62) | 8x∅25.4 (1.00) | 10.1 (22.27) |
| 2½" | 244.4 (9.62) | 41.1 (1.62) | 190.5 (7.50) | 104.6 (4.12) | 8x∅28.4 (1.12) | 14.0 (30.87) |
| 3" | 241.3 (9.50) | 38.1 (1.50) | 190.5 (7.50) | 127.0 (5.00) | 8x∅25.4 (1.00) | 13.1 (28.89) |
| 4" | 292.1 (11.50) | 44.5 (1.75) | 235.0 (9.25) | 157.2 (6.19) | 8x∅31.8 (1.25) | 26.9 (59.31) |
| 5" | 349.3 (13.8) | 50.8 (2.00) | 279.4 (11.0) | 185.7 (7.31) | 8x∅35.1 (1.38) | 36.5 (80.48) |
| 6" | 381.0 (15.00) | 55.6 (2.19) | 317.5 (12.5) | 215.9 (8.50) | 12x∅31.8 (1.25) | 47.4 (104.5) |
| 8" | 469.9 (18.50) | 63.5 (2.50) | 393.7 (15.5) | 269.7 (10.6) | 12x∅38.1 (1.50) | 82.5 (181.9) |
| 10" | 546.1 (21.50) | 69.9 (2.75) | 469.9 (18.5) | 323.8 (12.7) | 16x∅38.1 (1.50) | 122 (269.0) |

### Class 1500

| NPS (Nominal pipe size) | D | b | K | d | L | approx. kg (lbs) |
|---|---|---|---|---|---|---|
| 1" | 149.4 (5.88) | 28.4 (1.12) | 101.6 (4.00) | 50.8 (2.00) | 4x∅25.4 (1.00) | 3.57 (7.87) |
| 1¼" | 158.8 (6.25) | 28.4 (1.12) | 111.3 (4.38) | 63.5 (2.50) | 4x∅25.4 (1.00) | 4.14 (9.13) |
| 1½" | 177.8 (7.00) | 31.8 (1.25) | 124.0 (4.88) | 73.2 (2.88) | 4x∅28.4 (1.12) | 5.75 (12.68) |
| 2" | 215.9 (8.50) | 38.1 (1.50) | 165.1 (6.50) | 91.9 (3.62) | 8x∅25.4 (1.00) | 10.1 (22.27) |
| 2½" | 244.4 (9.62) | 41.1 (1.62) | 190.5 (7.50) | 104.6 (4.12) | 8x∅28.4 (1.12) | 14.0 (30.87) |
| 3" | 266.7 (10.50) | 47.8 (1.88) | 203.2 (8.00) | 127.0 (5.00) | 8x∅31.8 (1.25) | 19.1 (42.12) |
| 4" | 311.2 (12.3) | 53.8 (2.12) | 241.3 (9.50) | 157.2 (6.19) | 8x∅35.1 (1.38) | 29.9 (65.93) |
| 5" | 374.7 (14.8) | 73.2 (2.88) | 292.1 (11.5) | 185.7 (7.31) | 8x∅41.1 (1.62) | 58.4 (128.8) |
| 6" | 393.7 (15.50) | 82.6 (3.25) | 317.5 (12.5) | 215.9 (8.50) | 12x∅38.1 (1.50) | 71.8 (158.3) |
| 8" | 482.6 (19.00) | 91.9 (3.62) | 393.7 (15.5) | 269.7 (10.6) | 12x∅44.5 (1.75) | 122 (269.0) |
| 10" | 584.2 (23.00) | 108.0 (4.25) | 482.6 (19.0) | 323.8 (12.7) | 12x∅50.8 (2.00) | 210 (463.0) |

### JIS flanges (B 2220)




*(Raised face RF)*

*L Diameter of holes*
*d Raised face diameter*
*K Diameter of hole circle*
*D Flange diameter*
*b Total flange thickness*
*f Raised face height (general 2 mm (0.08 in))*

Note!
Surface finish of the gasket faces Ra ≤ 3.2 to 6.3 µm (126 to 248 µin).

### 10 K

In following tables, the unit of measurement are indicated in mm (in) unless otherwise noted.

| DN | D | b | K | d | L |
|---|---|---|---|---|---|
| 25 | 125 (4.92) | 14 (0.55) | 90 (3.54) | 67 (2.64) | 4x∅19 (0.75) |
| 32 | 135 (5.31) | 16 (0.63) | 100 (3.94) | 76 (2.99) | 4x∅19 (0.75) |
| 40 | 140 (5.51) | 16 (0.63) | 105 (4.13) | 81 (3.19) | 4x∅19 (0.75) |
| 50 | 155 (6.10) | 16 (0.63) | 120 (4.72) | 96 (3.78) | 4x∅19 (0.75) |
| 65 | 175 (6.89) | 18 (0.71) | 140 (5.51) | 116 (4.57) | 4x∅19 (0.75) |
| 80 | 185 (7.28) | 18 (0.71) | 150 (5.91) | 126 (4.96) | 8x∅19 (0.75) |
| 100 | 210 (8.27) | 18 (0.71) | 175 (6.89) | 151 (5.94) | 8x∅19 (0.75) |
| 125 | 250 (9.84) | 20 (0.79) | 210 (8.27) | 182 (7.17) | 8x∅23 (0.91) |
| 150 | 280 (11.0) | 22 (0.87) | 240 (9.45) | 212 (8.35) | 8x∅23 (0.91) |
| 200 | 330 (13.0) | 22 (0.87) | 290 (11.4) | 262 (10.3) | 12x∅23 (0.91) |
| 250 | 400 (15.7) | 24 (0.94) | 355 (14.0) | 324 (12.8) | 12x∅25 (0.98) |
| 300 | 445 (17.5) | 24 (0.94) | 400 (15.7) | 368 (14.5) | 16x∅25 (0.98) |

### 20 K

| DN | D | b | K | d | L |
|---|---|---|---|---|---|
| 25 | 125 (4.92) | 16 (0.63) | 90 (3.54) | 67 (2.64) | 4x∅19 (0.75) |
| 32 | 135 (5.31) | 18 (0.71) | 100 (3.94) | 76 (2.99) | 4x∅19 (0.75) |
| 40 | 140 (5.51) | 18 (0.71) | 105 (4.13) | 81 (3.19) | 4x∅19 (0.75) |
| 50 | 155 (6.10) | 18 (0.71) | 120 (4.72) | 96 (3.78) | 8x∅19 (0.75) |
| 65 | 175 (6.89) | 20 (0.79) | 140 (5.51) | 116 (4.57) | 8x∅19 (0.75) |
| 80 | 200 (7.87) | 22 (0.87) | 160 (6.30) | 132 (5.20) | 8x∅23 (0.91) |
| 100 | 225 (8.86) | 24 (0.94) | 185 (7.28) | 160 (6.30) | 8x∅23 (0.91) |
| 125 | 270 (10.6) | 26 (1.02) | 225 (8.86) | 195 (7.68) | 8x∅25 (0.98) |
| 150 | 305 (12.0) | 28 (1.10) | 260 (10.2) | 230 (9.06) | 12x∅25 (0.98) |
| 200 | 350 (13.8) | 30 (1.18) | 305 (12.0) | 275 (10.8) | 12x∅25 (0.98) |
| 250 | 430 (16.9) | 34 (1.34) | 380 (15.0) | 345 (13.6) | 12x∅27 (1.06) |
| 300 | 480 (18.9) | 36 (1.42) | 430 (16.9) | 395 (15.6) | 16x∅27 (1.06) |

**63 K**

| DN | D | b | K | d | L |
|---|---|---|---|---|---|
| 25 | 140 (5.51) | 27 (1.06) | 100 (3.94) | 70 (2.76) | 4x∅23 (0.91) |
| 32 | 150 (5.91) | 30 (1.18) | 110 (4.33) | 80 (3.15) | 4x∅23 (0.91) |
| 40 | 175 (6.89) | 32 (1.26) | 130 (5.12) | 90 (3.54) | 4x∅25 (0.98) |
| 50 | 185 (7.28) | 34 (1.34) | 145 (5.71) | 105 (4.13) | 8x∅23 (0.91) |
| 65 | 220 (8.66) | 38 (1.50) | 175 (6.89) | 130 (5.12) | 8x∅25 (0.98) |
| 80 | 230 (9.06) | 40 (1.57) | 185 (7.28) | 140 (5.51) | 8x∅25 (0.98) |
| 100 | 270 (10.6) | 44 (1.73) | 220 (8.66) | 165 (6.50) | 8x∅27 (1.06) |
| 125 | 325 (12.8) | 50 (1.97) | 265 (10.4) | 200 (7.87) | 8x∅33 (1.30) |
| 150 | 365 (14.4) | 54 (2.13) | 305 (12.0) | 240 (9.45) | 12x∅33 (1.30) |
| 200 | 425 (16.7) | 60 (2.36) | 360 (14.2) | 290 (11.4) | 12x∅33 (1.30) |
| 250 | 500 (19.7) | 68 (2.68) | 430 (16.9) | 355 (14.0) | 12x∅39 (1.54) |
| 300 | 560 (22.0) | 77 (3.03) | 485 (19.1) | 410 (16.1) | 16x∅39 (1.54) |

# Pressure-temperature dependencies

**EN flanges**[1)]

| Temperature range | Nominal pressure bar (psi) | | | | |
|---|---|---|---|---|---|
| | PN16 | PN25 | PN40 | PN63 | PN100 |
| –10 °C … +50 °C (+14 °F … +122 °F) | 16.0 (232) | 25.0 (362) | 40.0 (580) | 63.0 (913) | 100.0 (1450) |
| 50 °C (122 °F) | 15.5 (225) | 24.3 (352) | 38.9 (564) | 61.3 (889) | 97.3 (1411) |
| 100 °C (212 °F) | 15.1 (219) | 23.6 (342) | 37.9 (550) | 59.7 (866) | 94.7 (1373) |
| 150 °C (302 °F) | 13.7 (199) | 21.5 (312) | 34.4 (499) | 54.3 (787) | 86.1 (1248) |
| 200 °C (392 °F) | 12.7 (184) | 19.8 (287) | 31.8 (461) | 50.1 (726) | 79.5 (1153) |
| 250 °C (482 °F) | 11.9 (173) | 18.6 (270) | 29.9 (434) | 47.1 (683) | 74.7 (1083) |
| 300 °C (572 °F) | 11.0 (159) | 17.2 (249) | 27.6 (400) | 43.5 (631) | 69.0 (1000) |
| 350 °C (662 °F) | 10.5 (152) | 16.5 (239) | 26.4 (383) | 41.7 (605) | 66.1 (958) |
| 400 °C (752 °F) | 10.2 (148) | 16.0 (232) | 25.7 (373) | 40.1 (580) | 64.2 (931) |

**ASME flanges**[1)]

| Temperature range | Nominal pressure bar (psi) | | | | |
|---|---|---|---|---|---|
| | Class 150 | Class 300 | Class 600 | Class 900 | Class 1500 |
| –29 °C … +38 °C (–20 °F … +100 °F) | 19.0 (275) | 49.6 (719) | 99.3 (1440) | 148.9 (2159) | 248.2 (3599) |
| 50 °C (122 °F) | 18.4 (267) | 48.1 (697) | 96.2 (1395) | 144.3 (2092) | 240.6 (3489) |
| 100 °C (212 °F) | 16.2 (235) | 42.2 (612) | 84.4 (1224) | 126.6 (1836) | 211.0 (3059) |
| 150 °C (302 °F) | 14.8 (215) | 38.5 (558) | 77.0 (1116) | 115.5 (1675) | 192.5 (2791) |
| 200 °C (392 °F) | 13.7 (199) | 35.7 (518) | 71.3 (1034) | 107.0 (1551) | 178.3 (2588) |
| 250 °C (482 °F) | 12.1 (175) | 33.4 (484) | 66.8 (969) | 100.1 (1451) | 166.9 (2420) |
| 300 °C (572 °F) | 10.2 (148) | 31.6 (458) | 63.2 (916) | 94.9 (1376) | 158.1 (2292) |
| 325 °C (617 °F) | 9.3 (135) | 30.9 (448) | 61.8 (896) | 92.7 (1344) | 154.4 (2239) |
| 350 °C (662 °F) | 8.4 (122) | 30.3 (439) | 60.7 (880) | 91.0 (1319) | 151.6 (2189) |
| 375 °C (707 °F) | 7.4 (107) | 29.9 (434) | 59.8 (867) | 89.6 (1299) | 149.4 (2166) |
| 400 °C (752 °F) | 6.5 (94) | 29.4 (426) | 58.9 (854) | 88.3 (1280) | 147.2 (2134) |

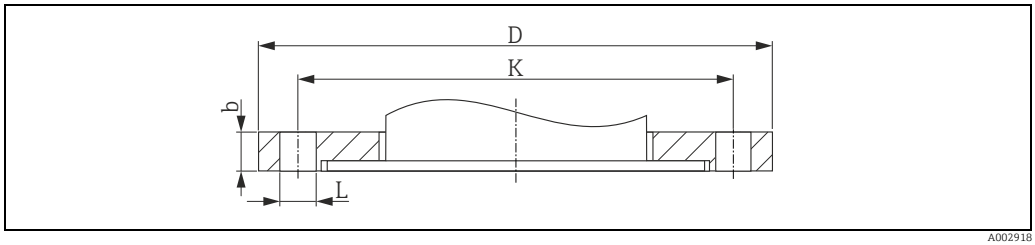
**JIS flanges**[1)]

| Temperature range | Nominal pressure bar (psi) | | | |
|---|---|---|---|---|
| | 10 K | 20 K | | |
| | for all flanges | to DN 125 | from DN 150 up to DN 250 | DN 300 |
| up to 120 °C (248 °F) | 14 (203.0) | 34 (493.0) | 20 (290.0) | 20 (290.0) |
| 220 °C (428 °F) | 12 (174.0) | 31 (449.5) | 20 (290.0) | – |
| 300 °C (572 °F) | 10 (145.0) | 29 (420.5) | 19 (275.5) | – |
| 350 °C (662 °F) | – | 26 (377.0) | 17 (246.5) | – |
| 400 °C (752 °F) | – | 23 (333.5) | 17 (246.5) | – |
| 425 °C (797 °F) | – | 20 (290.0) | 17 (246.5) | – |

1) With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are grouped in DIN EN 1092-1 table 18 under 13E0 and in JIS B2220 table 5 under 023b. The ASME flanges are dual rated flanges (316/316L) and grouped in table 2-2.2 according to ASME B16.5.

# Slip-on flange FAU80

The sensors (FDU91F, FDU80F, FDU81F) can be flush mounted using a FAU80 slip-on flange. Flanges in polypropylene (PP) should only used with pressures up to 1.5 $bar_{abs}$ (22 psi) flanges in 316L also above.




*Details to dimension "Mechanical Construction" → ä 69*

## FAU80 Version slip-on flange

### Order information

| 010 | | Process Connection |
|---|---|---|
| | AA | 3" 150 lbs FF, flange ANSI B16.5 |
| | AH | 4" 150 lbs FF, flange ANSI B16.5 |
| | CA | DN 80 PN16 A, flange EN1092-1 |
| | CH | DN 100 PN16 A, flange EN1092-1 ( |
| | KA | 10K 80A FF, flange JIS B2220 |
| | KH | 10K 100A FF, flange JIS B2220 |
| | YY | Special version, to be specified |

| 020 | | Flange Material |
|---|---|---|
| | J | 316L |
| | P | PPs, max. 1.5 bar abs |
| | Y | Special version, to be specified |

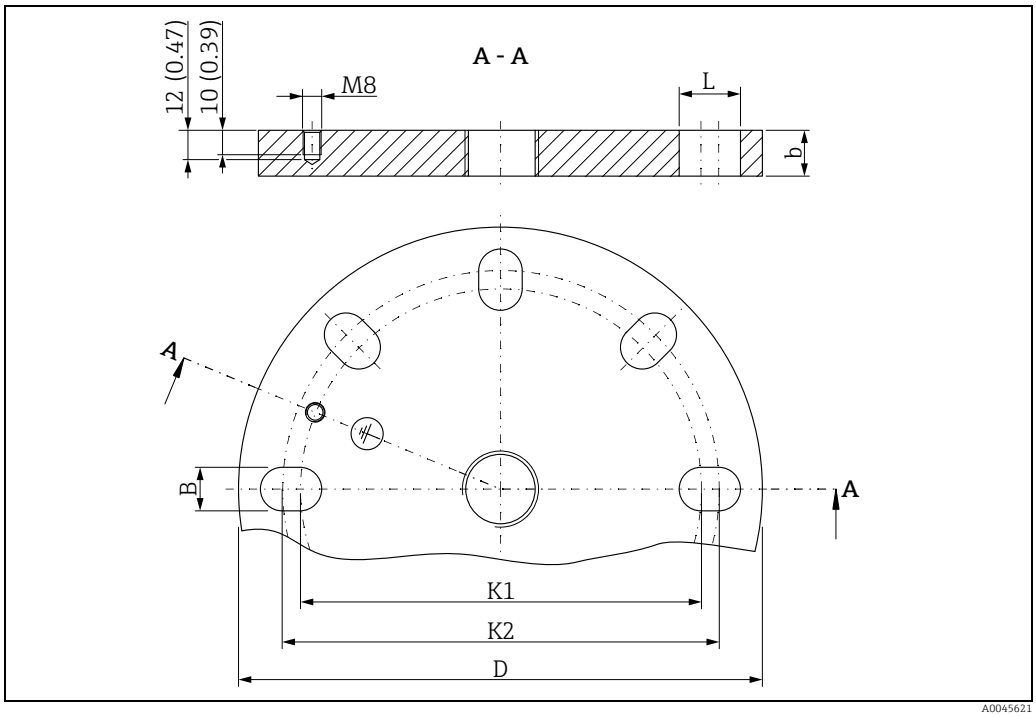
The versions entered make up the order code:

| | 010 | 020 |
|---|---|---|
| FAU80 - | | |

# Screw in flange FAX50

The screw in flange is an universal flange. On the basis of dimensions min./max. it can be used for all three standards (DIN - ASME - JIS).

**FAX50 universal flange DIN-ASME-JIS**




*L Diameter of holes*
*K1, K2 Diameter of hole circle*
*D Flange diameter*
*b Total flange thickness*
*B Slotted hole (width)*

Thread M8, 10 mm + 2 mm (0.39 in + 0.08 in) deep, centered between 2 holes
Is made on all flanges, incl. UNI flanges, out of steel or 316L.

**G ¾, NPT ¾**

In following tables, the unit of measurement are indicated in mm (in) unless otherwise noted.

| DN | D | b | L | K1 | K2 | approx. kg (lbs) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | PP | PVDF | 316L |
| 50 | 165 (6.50) | 20 (0.79) | 4xØ19 (0.75) | 120 (4.72) | 125 (4.92) | – | – | 3.11 (6.86) |
| 80 | 200 (7.87) | | 8xØ19 (0.75) | 150 (5.91) | 160 (6.30) | – | – | 4.37 (9.64) |
| 100 | 228.6 (9.0) | | 8xØ19 (0.75) | 175 (6.89) | 190.5 (7.5) | – | – | 5.79 (12.77) |

### G 1, NPT 1

| DN | D | b | L | K1 | K2 | approx. kg (lbs) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | PP | PVDF | 316L |
| 80 | 200 (7.87) | 20 (0.79) | 8xØ19 (0.75) | 150 (5.91) | 160 (6.30) | 0.50 (1.10) | 0.97 (2.14) | 4.34 (9.57) |
| 100 | 228.6 (9.0) | | 8xØ19 (0.75) | 175 (6.89) | 190.5 (7.5) | 0.66 (1.46) | 1.29 (2.84) | 5.75 (12.68) |
| 150 | 285 (11.2) | | 8xØ23 (0.91) | 240 (9.45) | 241.3 (9.5) | 1.09 (2.40) | 2.12 (4.67) | 9.44 (20.82) |
| 200 [1)] | 340 (13.4) | | 12xØ23 (0.91) | 290 (11.4) | 295 (11.6) | 1.53 (3.37) | – | – |
| 250 | 406.4 (16.0) | | 12xØ26 (1.02) | 355 (14.0) | 362 (14.3) | 2.20 (4.85) | – | – |

1) Only for DIN und JIS!

#### Exception G 1

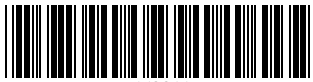
| NPS (Nominal pipe size) | D | b | L | K1 | K2 | approx. kg (lbs) | | |
|---|---|---|---|---|---|---|---|---|
| ASME | | | | | | PP | PVDF | 316L |
| 8" | 342.9 (13.5) | 20 (0.79) | 8xØ22.5 (0.89) | 298.5 (11.8) | 298.5 (11.8) | 1.61 (3.55) | – | – |

### G 1½, NPT 1½

| DN | D | b | L | K1 | K2 | approx. kg (lbs) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | PP | PVDF | 316L |
| 50 | 165 (6.50) | 20 (0.79) | 4xØ19 (0.75) | 120 (4.72) | 125 (4.92) | 0.34 (0.75) | 0.67 (1.48) | 2.97 (6.55) |
| 80 | 200 (7.87) | | 8xØ19 (0.75) | 150 (5.91) | 160 (6.30) | 0.49 (1.08) | 0.95 (2.09) | 4.24 (9.35) |
| 100 | 228.6 (9.0) | | 8xØ19 (0.75) | 175 (6.89) | 190.5 (7.5) | 0.65 (1.43) | 1.27 (2.80) | 5.65 (12.46) |
| 150 | 285 (11.2) | | 8xØ23 (0.91) | 240 (9.45) | 241.3 (9.5) | 1.08 (2.38) | 2.09 (4.61) | 9.34 (20.59) |

### G 2, NPT 2

| DN | D | b | L | K1 | K2 | approx. kg (lbs) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | PP | PVDF | 316L |
| 50 | 165 (6.50) | 20 (0.79) | 4xØ19 (0.75) | 120 (4.72) | 125 (4.92) | 0.33 (0.73) | 0.63 (1.39) | 2.83 (6.24) |
| 80 | 200 (7.87) | | 8xØ19 (0.75) | 150 (5.91) | 160 (6.30) | 0.47 (1.04) | 0.92 (2.03) | 4.10 (9.04) |
| 100 | 228.6 (9.0) | | 8xØ19 (0.75) | 175 (6.89) | 190.5 (7.5) | 0.64 (1.41) | 1.24 (2.73) | 5.51 (12.15) |
| 150 | 285 (11.2) | | 8xØ23 (0.91) | 240 (9.45) | 241.3 (9.5) | 1.06 (2.34) | 2.06 (4.54) | 9.20 (20.29) |

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Endress+Hauser

People for Process Automation

KA01465P/00/EN/04.22-00
71582830
2022-08-31



# Brief Operating Instructions
# **Cerabar PMP71B**

Process pressure measurement
HART

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
- Smart phone/tablet: *Endress+Hauser Operations App*

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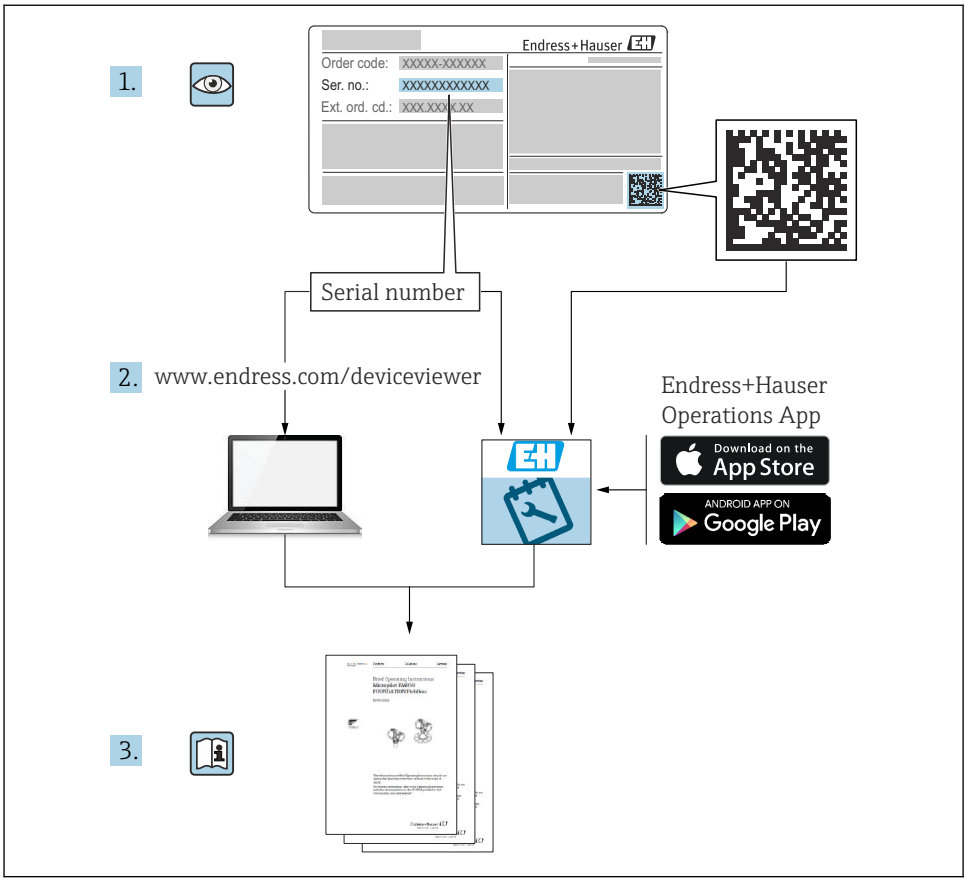
# 1 Associated documentation

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# 2 About this document

## 2.1 Document function

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

## 2.2 Symbols

### 2.2.1 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.

### 2.2.2 Electrical symbols

**Ground connection:** ⏚

Terminal for connection to the grounding system.

### 2.2.3 Symbols for certain types of information

**Permitted:** ✓

Procedures, processes or actions that are permitted.

**Forbidden:** ✗

Procedures, processes or actions that are forbidden.

**Additional information:** ℹ

**Reference to documentation:** 📖

**Reference to page:** 📄

**Series of steps:** 1., 2., 3.

**Result of an individual step:** ↳

### 2.2.4 Symbols in graphics

**Item numbers: 1, 2, 3 ...**

**Series of steps:** 1., 2., 3.

**Views: A, B, C, ...**

### 2.2.5 Symbols on the device

**Safety instructions:** ⚠ → 📖

Observe the safety instructions contained in the associated Operating Instructions.

### 2.2.6 Communication symbols

## 2.3 Registered trademarks

**HART®**
Registered trademark of the FieldComm Group, Austin, Texas, USA

**Bluetooth®**
The Bluetooth® wordmark and logos are registered trademarks of Bluetooth SIG, Inc. and any use of these trademarks by Endress+Hauser is licensed. Other trademarks and trade names are those of their respective owners.

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**Android®**
Android, Google Play and the Google Play logo are trademarks of Google Inc.

# 3 Basic safety instructions

## 3.1 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 beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
- Follow instructions and comply with conditions

The operating personnel must fulfill the following requirements:
- Being instructed and authorized according to the requirements of the task by the facility's owner-operator
- Following the instructions in these Operating Instructions

## 3.2 Intended use

The Cerabar is a pressure transmitter for measuring level and pressure.

### 3.2.1 Incorrect use

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

Verification for borderline cases:
- For special fluids and fluids for cleaning, Endress+Hauser is glad to provide assistance in verifying the corrosion resistance of fluid-wetted materials, but does not accept any warranty or liability.

## 3.3 Workplace safety

When working on and with the device:
- Wear the required personal protective equipment according to federal/national regulations.
- Switch off the supply voltage before connecting the device.

## 3.4 Operational safety

Risk of injury!
- Operate the device only if it is in proper technical condition, free from errors and faults.
- The operator is responsible for the interference-free operation of the device.

### 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.

### Hazardous area

To eliminate the risk of danger to persons or the facility when the device is used in the approval-related area (e.g. explosion protection, pressure equipment safety):
- Check the nameplate to verify if the device ordered can be put to its intended use in the approval-related area.
- Observe the specifications in the separate supplementary documentation that is an integral part of these Instructions.

## 3.5 Product safety

This 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.

## 3.6 Functional Safety SIL (optional)

The Functional Safety Manual must be strictly observed for devices that are used in functional safety applications.

## 3.7 IT security

Endress+Hauser can only provide a warranty 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 device settings. IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

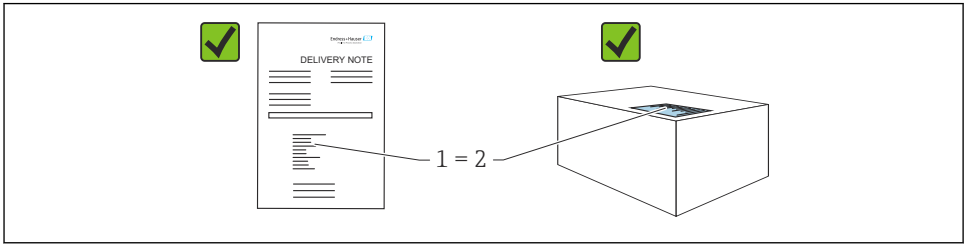
## 3.8 Device-specific IT security

The device offers specific functions to support protective measures by the operator. These functions can be configured by the user and guarantee greater in-operation safety if used correctly. An overview of the most important functions is provided in the following section:

- Write protection via hardware write protection switch
- Access code to change the user role (applies for operation via display, Bluetooth, or FieldCare, DeviceCare, Asset Management Tools ( e.g. AMS, PDM)

# 4 Incoming acceptance and product identification

## 4.1 Incoming acceptance




A0016870

- 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 nameplate correspond to the order specifications and the delivery note?
- Is the documentation available?
- If required (see nameplate): are the Safety Instructions (XA) provided?

If you can answer "no" to any of these questions, please contact Endress+Hauser.

## 4.2 Storage and transport

### 4.2.1 Storage conditions

- Use the original packaging
- Store the device in clean and dry conditions and protect from damage caused by shocks

**Storage temperature range**

See Technical Information.

### 4.2.2 Transporting the product to the measuring point

**⚠ WARNING**

**Incorrect transport!**

Housing and membrane may become damaged, and there is a risk of injury!

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

**⚠ WARNING**

**Incorrect transport!**

Capillaries may become damaged, and there is a risk of injury!

► Do not use capillaries as a carrying aid for the diaphragm seals.

# 5 Mounting

## 5.1 Mounting requirements

### 5.1.1 General instructions

- Do not clean or touch the membrane with hard and/or pointed objects.
- Do not remove the protection on the membrane until just before installation.

Always firmly tighten the housing cover and the cable entries.

1. Counter-tighten the cable entries.
2. Tighten the coupling nut.

### 5.1.2 Installation instructions

- The standard devices (without diaphragm seals) are mounted according to the same guidelines as pressure gauges (DIN EN837-2)
- To ensure optimal readability of the local display, adjust the housing and local display
- Endress+Hauser offers a mounting bracket to mount the device on pipes or walls

- Use flushing rings for flanges, flange seals and pancake seals if buildup or clogging can be expected at the membrane
  - The flushing ring is clamped between the process connection and the flange, flange seal or pancake seal
  - Material buildup in front of the membrane is flushed away, and the pressure chamber is vented, via the two lateral flushing holes
- When measuring in media containing solids (e.g. dirty liquids), installing separators and drain valves is useful for capturing and removing sediment
- Using a valve manifold allows for easy commissioning, installation and maintenance without interrupting the process
- When mounting the device, establishing the electrical connection and during operation: prevent the penetration of moisture into the housing
- Point the cable and plug downwards as much as possible to prevent moisture from entering (e.g. rainwater or condensation)

### 5.1.3 Installation instructions for thread

- Device with G 1 ½" thread:
  Place the flat seal on the sealing surface of the process connection
  Avoid additional strain on the membrane: do not seal the thread with hemp or similar materials
- Device with NPT thread:
  - Wrap Teflon tape around the thread to seal it
  - Tighten the device at the hexagon bolt only; do not turn it by the housing
  - When screwing in, do not overtighten the thread; tighten the NPT thread to the required depth according to the standard
- For the following process connections, a tightening torque of max. 40 Nm (29.50 lbf ft) is specified:
  - Thread ISO228 G ½" with flush membrane
  - Thread DIN13 M20 x 1.5 with flush membrane
  - NPT 3/4" with flush membrane

### 5.1.4 Installation instructions for devices with diaphragm seals

NOTICE

**Improper handling!**

Damage to the device!

- ▶ The diaphragm seal and pressure transmitter form a closed, calibrated system which has been filled with diaphragm seal fill fluid. Never open any of the holes for fill fluid.
- ▶ Ensure strain relief to prevent the capillary from bending (bending radius ≥ 100 mm (3.94 in)).
- ▶ Do not use capillaries as a carrying aid for the diaphragm seals.
- ▶ Observe the application limits of the fill fluid.

**General information**

In the case of devices with diaphragm seals and capillaries, the zero point shift caused by the hydrostatic pressure of the filling liquid column in the capillaries must be taken into account when selecting the measuring cell. If a measuring cell with a small measuring range is selected, a position adjustment can cause the measuring cell to go over range (position

adjustment due to zero point offset, caused by the orientation of the fill fluid liquid column). Perform zero adjustment if necessary.

For devices with a capillary, use a suitable bracket (mounting bracket) for mounting.

When mounting, sufficient strain relief must be provided for the capillary to prevent the capillary from bending (capillary bending radius ≥ 100 mm (3.94 in)).

Mount the capillary so that it is vibration-free (in order to avoid additional pressure fluctuations).

Do not mount capillaries in the vicinity of heating or cooling lines and protect them against direct sunlight.

More detailed installation instructions are provided in the Applicator "Sizing Diaphragm Seal".

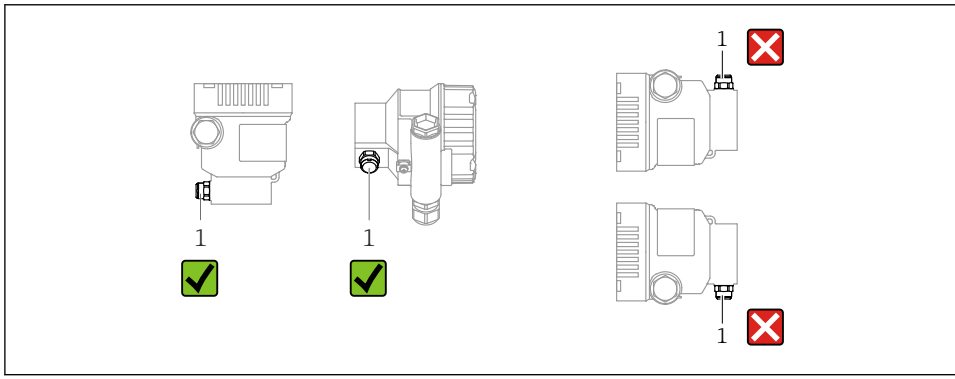
### 5.1.5 Orientation

NOTICE

**Damage to the device!**

If a heated device is cooled during a cleaning process (e.g. by cold water), a vacuum develops for a short time. As a result of this, moisture can enter the measuring cell via the pressure compensation element (1).

► Mount the device as follows.




A0038723

- Keep the pressure compensation element (1) free from contamination
- A position-dependent zero point shift (when the vessel is empty the measured value does not display zero) can be corrected
- Diaphragm seals also shift the zero point, depending on the installation position
- The use of shutoff devices and/or water pocket pipes is recommended for mounting
- The orientation depends on the measuring application

## 5.2 Mounting the device

### 5.2.1 Pressure measurement in gases

Mount the device with the shutoff device above the tapping point so that any condensate can flow into the process.

### 5.2.2 Pressure measurement in vapors

A water pocket pipe reduces the temperature to almost the ambient temperature. The defined water column only causes minimal (negligible) measured errors and minimal (negligible) thermal effects on the device.

Observe the maximum permitted ambient temperature of the transmitter!

- Ideally, mount the device with the O-shaped water pocket pipe below the tapping point
  The device may also be mounted above the tapping point
- Fill the water pocket pipe with liquid before commissioning

### 5.2.3 Pressure measurement in liquids

Mount the device with the shutoff device below or at the same level as the tapping point.

### 5.2.4 Level measurement

- Always mount the device below the lowest measuring point
- Do not install the device at the following positions:
  - In the filling curtain
  - In the tank outlet
  - In the suction area of a pump
  - At a point in the tank which could be affected by pressure pulses from the agitator
- Mount the device downstream from a shutoff device: the calibration and function check can be carried out more easily

### 5.2.5 Closing the housing cover

NOTICE

**Thread and housing cover damaged from dirt and fouling!**

- ▶ Remove fouling (e.g. sand.) on the thread of the cover and housing.
- ▶ If you continue to encounter resistance when closing the cover, check the thread again for fouling.

**Housing thread**

The thread of the electronics and connection compartment is coated with lubricant varnish.

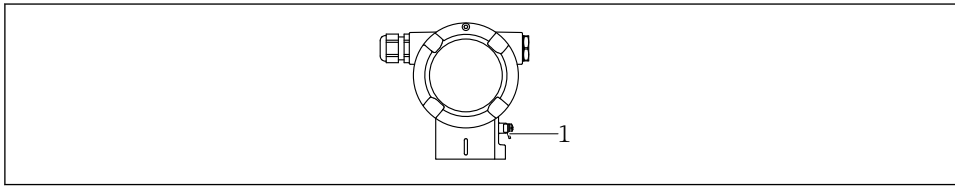
☒ Avoid additional lubrication.

# 6 Electrical connection

## 6.1 Connecting requirements

### 6.1.1 Potential equalization

The protective ground on the device must not be connected. If necessary, the potential matching line can be connected to the outer ground terminal of the device before the device is connected.




A0045412

*1 Ground terminal for connecting the potential matching line*

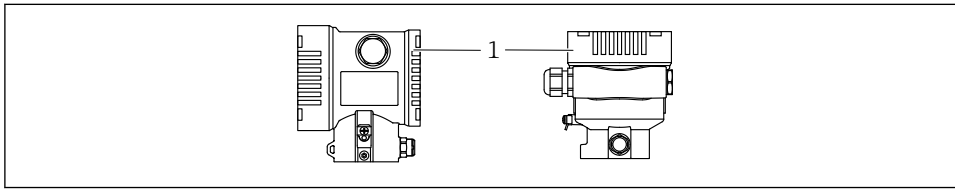
**WARNING**

**Explosion Hazard!**

- Please refer to the separate documentation on applications in hazardous areas for the safety instructions.

For optimum electromagnetic compatibility:
- Keep the potential matching line as short as possible
- Maintain a cross-section of at least 2.5 $mm^2$ (14 AWG)

## 6.2 Connecting the device




A0043806

*1 Connection compartment cover*

**Housing thread**

The thread of the electronics and connection compartment is coated with lubricant varnish.

Avoid additional lubrication.

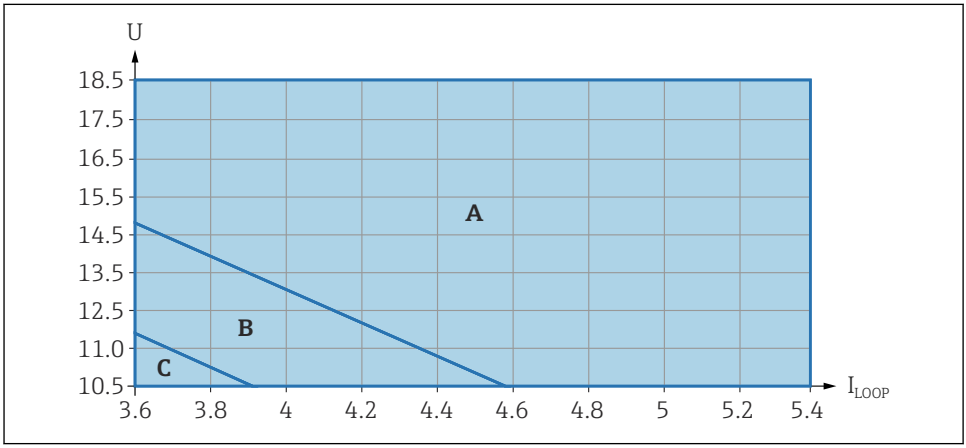
### 6.2.1 Supply voltage

- Ex d, Ex e, non-Ex: supply voltage: 10.5 to 35 $V_{DC}$
- Ex i: supply voltage: 10.5 to 30 $V_{DC}$
- Nominal current: 4 to 20 mA HART

The power unit must be tested to ensure it meets safety requirements (e.g., PELV, SELV, Class 2) and must comply with the relevant protocol specifications. The requirements for 4 to 20 mA are the same as those for HART.

Depending on the supply voltage and the current consumption, background lighting is switched on or off. For the dependency, see the diagram:

Depending on the supply voltage and the current consumption, Bluetooth can optionally be switched on or off. For the dependency, see the diagram:




*A Display lighting switched on, Bluetooth can be switched on optionally*
*B Display lighting switched off and Bluetooth can be switched on optionally*
*C Display lighting switched off and Bluetooth not active*

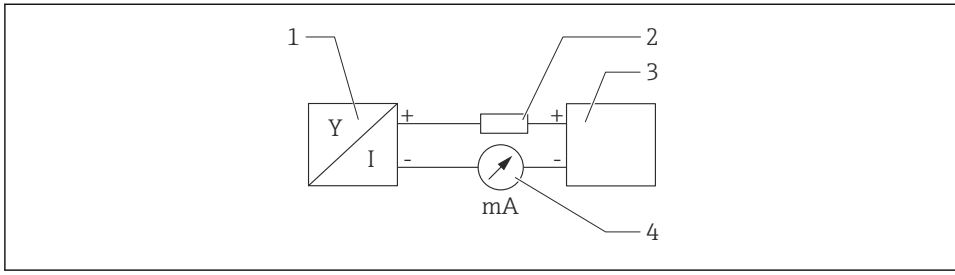
### 6.2.2 Terminals

- Supply voltage and internal ground terminal: 0.5 to 2.5 $mm^2$ (20 to 14 AWG)
- External ground terminal: 0.5 to 4 $mm^2$ (20 to 12 AWG)

### 6.2.3 Cable specification

- Protective ground or grounding of the cable shield: rated cross-section > 1 $mm^2$ (17 AWG) Rated cross-section of 0.5 $mm^2$ (20 AWG) to 2.5 $mm^2$ (13 AWG)
- Cable outer diameter: Ø5 to 12 mm (0.2 to 0.47 in) depends on the cable gland used (see Technical Information)

### 6.2.4 4-20 mA HART




*1 Block diagram of HART connection*

*1 Device with HART communication*
*2 HART communication resistor*
*3 Power supply*
*4 Multimeter*

The HART communication resistor of 250 Ω in the signal line is always necessary in the case of a low-impedance power supply.

**Take the voltage drop into consideration:**
Maximum 6 V with a communication resistor of 250 Ω

### 6.2.5 Overvoltage protection

**Devices without optional overvoltage protection**

Equipment from Endress+Hauser fulfills the requirements of the product standard IEC / DIN EN 61326-1 (Table 2 Industrial Environment).

Depending on the type of port (DC power supply, input/output port) different testing levels according to IEC / DIN EN 61326-1 against transient overvoltages (Surge) are applied (IEC / DIN EN 61000-4-5 Surge):
Test level on DC power ports and input / output ports is 1000 V line to earth

**Devices with optional overvoltage protection**

- Spark-over voltage: min. 400 V DC
- Tested according to IEC / DIN EN 60079-14 sub chapter 12.3 (IEC / DIN EN 60060-1 chapter 7)
- Nominal discharge current: 10 kA

**Overvoltage category**

Overvoltage category II

### 6.2.6 Wiring

**WARNING**

**Supply voltage might be connected!**

Risk of electric shock and/or explosion!

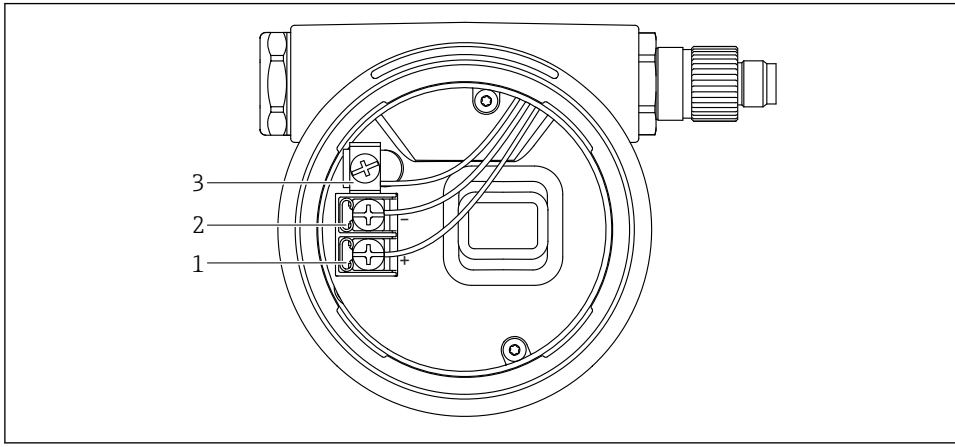
- If the device is used in hazardous areas, comply with national standards and the specifications in the Safety Instructions (XAs). Use the specified cable gland.
- The supply voltage must match the specifications on the nameplate.
- Switch off the supply voltage before connecting the device.
- If necessary, the potential matching line can be connected to the outer ground terminal of the transmitter before the device is connected.
- A suitable circuit breaker should be provided for the device in accordance with IEC/EN 61010.
- The cables must be adequately insulated, with due consideration given to the supply voltage and the overvoltage category.
- The connecting cables must offer adequate temperature stability, with due consideration given to the ambient temperature.
- Only operate the device with the covers closed.

Connect the device in the following order:

1. Release the cover lock (if provided).
2. Unscrew the cover.
3. Guide the cables into the cable glands or cable entries.
4. Connect the cable.
5. Tighten the cable glands or cable entries so that they are leak-tight. Counter-tighten the housing entry. Use a suitable tool with width across flats AF24/25 8 Nm (5.9 lbf ft) for the M20 cable gland.
6. Screw the cover securely back onto the connection compartment.
7. If fitted: tighten the screw of the cover lock using the Allen key 0.7 Nm (0.52 lbf ft) ±0.2 Nm (0.15 lbf ft).

### 6.2.7 Terminal assignment

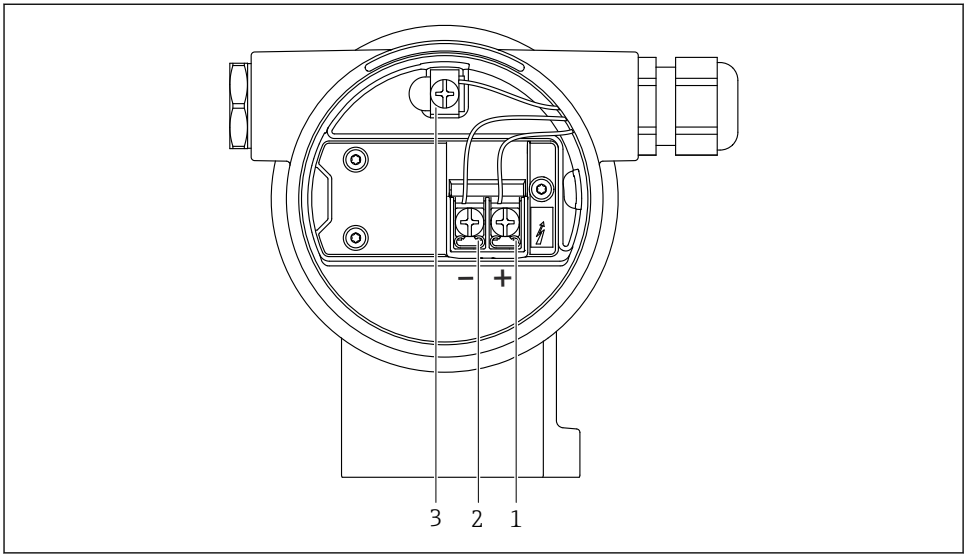
#### Single compartment housing




*2 Connection terminals and ground terminal in the connection compartment*

*1 Positive terminal*
*2 Negative terminal*
*3 Internal ground terminal*

### Dual compartment housing

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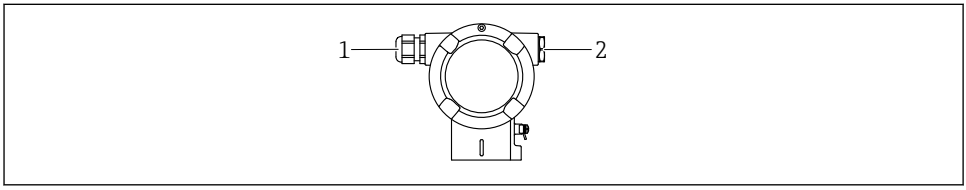
*3 Connection terminals and ground terminal in the connection compartment*

*1 Positive terminal*
*2 Negative terminal*
*3 Internal ground terminal*

## 6.2.8 Cable entries




A0045414

*1 Cable entry*
*2 Dummy plug*

The type of cable entry depends on the device version ordered.

Always route connecting cables downwards so that moisture cannot penetrate the connection compartment.

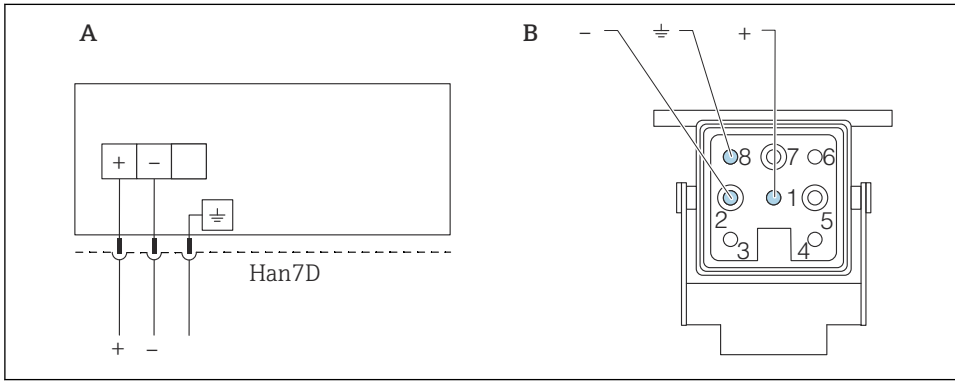
If necessary, create a drip loop or use a weather protection cover.

### 6.2.9 Available device plugs

In the case of devices with a plug, it is not necessary to open the housing for connection purposes.

Use the enclosed seals to prevent the penetration of moisture into the device.

**Devices with a Harting plug Han7D**




A0041011

*A Electrical connection for devices with Harting plug Han7D*
*B View of the plug-in connection on the device*
*- Brown*
*⏚ Green/yellow*
*+ Blue*

## 6.3 Ensuring the degree of protection

### 6.3.1 Cable entries

- Gland M20, plastic, IP66/68 TYPE 4X/6P
- Gland M20, brass nickel plated, IP66/68 TYPE 4X/6P
- Gland M20, 316L, IP66/68 TYPE 4X/6P
- Thread M20, IP66/68 TYPE 4X/6P
- Thread G1/2, IP66/68 TYPE 4X/6P
  If the G1/2 thread is selected, the device is delivered with an M20 thread as standard and a G1/2 adapter is included with the delivery, along with the corresponding documentation
- Thread NPT1/2, IP66/68 TYPE 4X/6P
- Dummy plug transport protection: IP22, TYPE 2
- HAN7D plug, 90 degrees, IP65 NEMA Type 4X
- M12 plug
  When housing is closed and connecting cable is plugged in: IP66/67, NEMA Type 4X
  When housing is open or connecting cable is not plugged in: IP20, NEMA Type 1

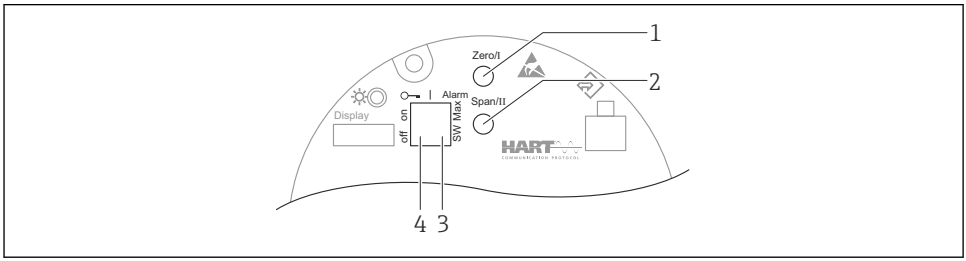
**NOTICE**

**M12 plug and HAN7D plug: incorrect mounting can invalidate the IP protection class!**

- The degree of protection only applies if the connecting cable used is plugged in and screwed tight.
- The degree of protection only applies if the connecting cable used is specified according to IP67, NEMA Type 4X.
- The IP protection classes are only maintained if the dummy cap is used or the cable is connected.

# 7 Operation options

## 7.1 Operating keys and DIP switches on the electronic insert




A0039285

1 *Operating key for lower range value (Zero)*
2 *Operating key for upper range value (Span)*
3 *DIP switch for alarm current*
4 *DIP switch for locking and unlocking the device*

The setting of the DIP switches has priority over the settings made via other operation methods (e.g. FieldCare/DeviceCare).

## 7.2 Access to the operating menu via the local display

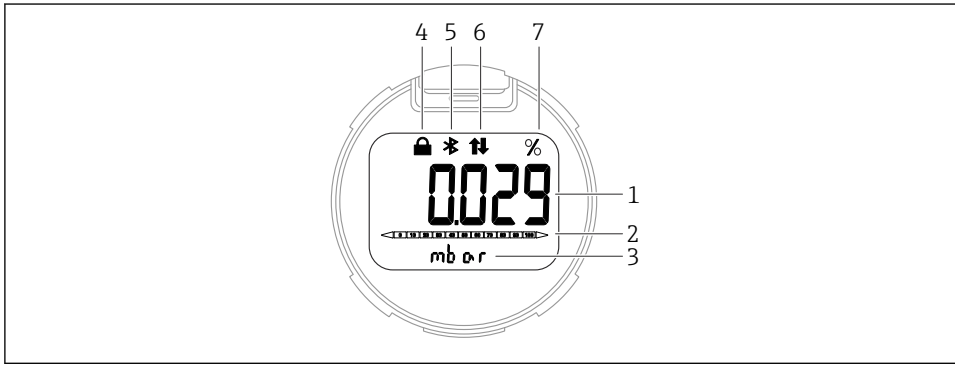
### 7.2.1 Device display (optional)

Functions:
- Display of measured values and fault and notice messages
- Background lighting, which switches from green to red in the event of an error
- The device display can be removed for easier operation

The device displays are available with the additional option of Bluetooth® wireless technology.

Depending on the supply voltage and the current consumption, background lighting is switched on or off.

Depending on the supply voltage and the current consumption, Bluetooth can optionally be switched on or off.

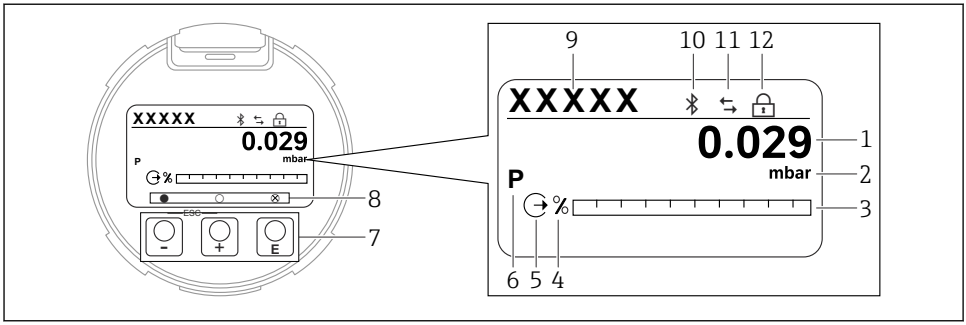



A0043599

4 *Segment display*

1 *Measured value*
2 *Bar graph proportional to the current output*
3 *Unit of measured value*
4 *Locked (symbol appears when the device is locked)*
5 *Bluetooth (symbol flashes if Bluetooth connection is active)*
6 *HART communication (symbol is displayed if HART communication is active)*
7 *Measured value output in %*

The following graphics are examples. The display depends on the display settings.




*5 Graphic display with optical operating keys.*

1 *Measured value*
2 *Unit of measured value*
3 *Bar graph proportional to the current output*
4 *Bar graph unit*
5 *Symbol for current output*
6 *Symbol for displayed measured value (e.g. p = pressure)*
7 *Optical operating keys*
8 *Symbols for key feedback. Different display symbols are possible: circle (not filled in) = key pressed briefly; circle (filled in) = key pressed for longer; circle (with X) = no operation possible due to Bluetooth connection*
9 *Device Tag*
10 *Bluetooth (symbol flashes if Bluetooth connection is active)*
11 *HART communication (symbol is displayed if HART communication is active)*
12 *Locked (symbol appears when the device is locked)*

- ⊞ key
  - Navigate down in the picklist
  - Edit the numerical values or characters within a function
- ⊟ key
  - Navigate up in the picklist
  - Edit the numerical values or characters within a function
- Ⓔ key
  - Confirm entry
  - Jump to the next item
  - Select a menu item and activate edit mode
  - Unlock/lock the display operation
  - Press and hold the Ⓔ key to display a short description of the selected parameter (if available)
- ⊞ key and ⊟ key (ESC function)
  - Exit the edit mode for a parameter without saving the changed value
  - Menu at a selection level: pressing the keys simultaneously takes the user back up a level in the menu
  - Press and hold the keys simultaneously to return to the upper level

# 8 Commissioning

## 8.1 Preliminaries

The measuring range and the unit in which the measured value is transmitted correspond to the data on the nameplate.

**⚠ WARNING**

**The settings of the current output are relevant for safety!**
This situation can result in product overflow.
- ▶ The setting of the current output depends on the setting in the **Assign PV** parameter.
- ▶ After changing the **Assign PV** parameter, check the settings for the range (LRV and URV) and reconfigure them if necessary.

**⚠ WARNING**

**Process pressure above or below permitted maximum/minimum!**
Risk of injury if parts burst! Warnings are displayed if the pressure is too high.
- ▶ If a pressure smaller than the minimum permitted pressure or greater than the maximum permitted pressure is present at the device, a message is output.
- ▶ Only use the device within the measuring range limits!

### 8.1.1 As-delivered state

If no customized settings were ordered:

- **Assign PV** parameter **Pressure** option
- Calibration values defined by defined measuring cell nominal value
- The alarm current is set to min. (3.6 mA), (only if no other option was selected when ordering)
- DIP switch to Off position
- If Bluetooth is ordered, then Bluetooth is switched on

## 8.2 Function check

Perform a function check before putting the measuring point into operation:

- "Post-installation check" checklist (see the "Installation" section)
- "Post-connection check" checklist (see the "Electrical connection" section)

## 8.3 Switching on the device

All configuration tools offer a commissioning wizard that helps the user to configure the most important configuration parameters (**Guidance** menu **Commissioning** wizard).

## 8.4 Setting the operating language

### 8.4.1 Local display

#### Setting the operating language

To set the operating language, the display first needs to be unlocked:

1. Press the E key for at least 2 s.
   ↳ A dialog box appears.
2. Unlock the display operation.
3. Select the **Language** parameter in the main menu.
4. Press the E key.
5. Select the desired language with the + or − key.
6. Press the E key.

Display operation locks automatically:
- after 1 min on the main page if no key has been pressed
- after 10 min within the operating menu if no key has been pressed

#### Display operation - locking or unlocking

The E key must be pressed for at least 2 seconds in order to lock or unlock the optical keys. Display operation can be locked or unlocked in the dialog that appears.

Display operation locks automatically (except in the SIL wizard):
- After 1 minute on the main page if no key has been pressed
- After 10 minutes within the operating menu if no key has been pressed

### 8.4.2 Operating tool

See the description of the operating tool.

## 8.5 Configuring the measuring device

### 8.5.1 Commissioning with keys on the electronic insert

The following functions are possible via the keys on the electronic insert:
- Position adjustment (zero point correction)
  The orientation of the device may cause a pressure shift
  This pressure shift can be corrected by a position adjustment
- Setting the lower range value and upper range value
  The pressure applied must be within the nominal pressure limits of the sensor (see the specifications on the nameplate)
- Resetting the device

#### Carrying out position adjustment

1. Device installed in desired position and no pressure applied.

2. Press the "Zero" and "Span" keys simultaneously for at least 3 s.
3. When the LED lights up briefly, the pressure present has been accepted for position adjustment.

**Setting the lower range value (pressure or scaled variable)**

1. The desired pressure for the lower range value is present at the device.
2. Press the "Zero" key for at least 3 s.
3. When the LED lights up briefly, the pressure present has been accepted for the lower range value.

**Setting the upper range value (pressure or scaled variable)**

1. The desired pressure for the upper range value is present at the device.
2. Press the "Span" key for at least 3 s.
3. When the LED lights up briefly, the pressure present has been accepted for the upper range value.
4. Does the LED on the electronic insert not light up?
   ↳ Applied pressure has not been accepted for upper range value.
   Wet calibration is not possible if the **Scaled variable** option has been selected in the **Assign PV** parameter and the **Table** option has been selected in the **Scaled variable transfer function** parameter.

**Checking the settings (pressure or scaled variable)**

1. Press the "Zero" key briefly in order to display the lower range value.
2. Press the "Span" key briefly in order to display the upper range value.
3. Press the "Zero" and "Span" keys simultaneously in order to display the calibration offset.

**Resetting the device**

► Press and hold the "Zero" and "Span" keys simultaneously for at least 12 s.

### 8.5.2 Commissioning with the commissioning wizard

In FieldCare, DeviceCare [1)], SmartBlue and on the display, the **Commissioning** wizard is available to guide the user through the initial commissioning steps. Commissioning is also possible via AMS or PDM.

1. Connect the device with FieldCare or DeviceCare.
2. Open the device in FieldCare or DeviceCare.
   ↳ The dashboard (homepage) of the device is displayed:
3. In the **Guidance** menu, click the **Commissioning** wizard to open the wizard.

1) DeviceCare is available for download at www.software-products.endress.com. You must register in the Endress +Hauser software portal to download the product.

4. Enter the appropriate value in each parameter or select the appropriate option. These values are written directly to the device.
5. Click "Next" to go to the next page.
6. Once all the pages have been completed, click "End" to close the **Commissioning** wizard.

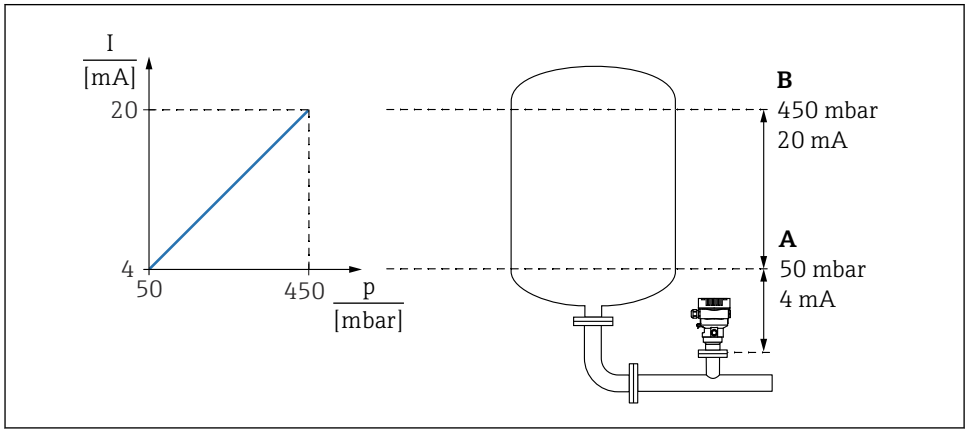
If the **Commissioning** wizard is cancelled before all the necessary parameters have been configured, the device may be in an undefined state. In such situations, it is advisable to reset the device to the factory default settings.

### Example: Outputting of the pressure value at the current output

Pressure and temperature units are converted automatically. Other units are not converted.

In the following example, the pressure value should be measured in a tank and output on the current output. The maximum pressure of 450 mbar (6.75 psi) corresponds to the 20 mA current. The 4 mA current corresponds to a pressure of 50 mbar (0.75 psi).

Prerequisites:
- Measured variable in direct proportion to the pressure
- Due to the orientation of the device, there may be pressure shifts in the measured value (when the vessel is empty or partly filled, the measured value is not zero)
  Perform a position adjustment if necessary
- In the **Assign PV** parameter, the **Pressure** option must be selected (factory setting)
  Display: In the **Guidance** menu **Commissioning** wizard, keep pressing the ⊞ key until you reach the **Assign PV** parameter. Press the Ⓔ key to confirm, select the **Pressure** option and press Ⓔ to confirm.




A0039009

*A Lower range value output*
*B Upper range value output*

Adjustment:

1. Enter the pressure value for the 4 mA current via the **Lower range value output** parameter (50 mbar (0.75 psi)).
2. Enter the pressure value for the 20 mA current via the **Upper range value output** parameter (450 mbar (6.75 psi))

Result: The measuring range is set to 4 to 20 mA.

### 8.5.3 Commissioning without the commissioning wizard

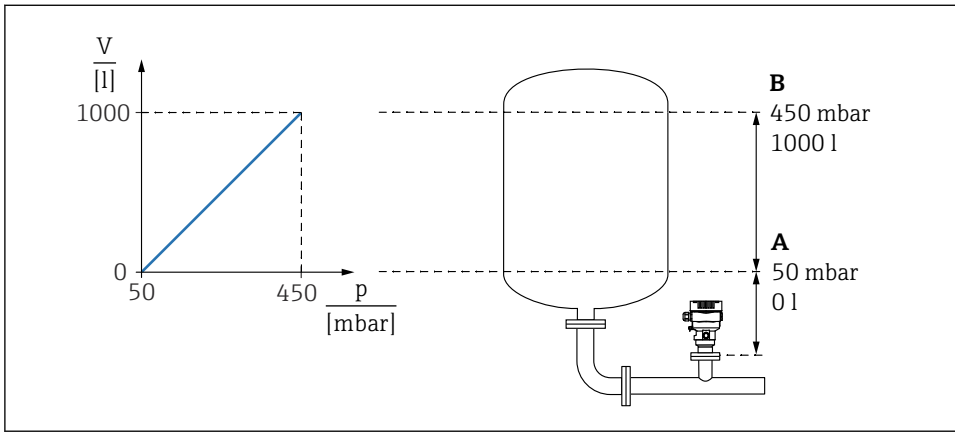
**Example: Commissioning a volume measurement in the tank**

Pressure and temperature units are converted automatically. Other units are not converted.

In the following example, the volume in a tank should be measured in liters. The maximum volume of 1 000 l (264 gal) corresponds to a pressure of 450 mbar (6.75 psi).

The minimum volume of 0 liters corresponds to a pressure of 50 mbar (0.75 psi).

Prerequisites:
- Measured variable in direct proportion to the pressure
- Due to the orientation of the device, there may be pressure shifts in the measured value (when the vessel is empty or partly filled, the measured value is not zero)
  Perform position adjustment if necessary




*A "Pressure value 1" parameter and "Scaled variable value 1" parameter*
*B "Pressure value 2" parameter and "Scaled variable value 2" parameter*

The pressure present is displayed in the operating tool on the same settings page in the "Pressure" field.

1. Enter the pressure value for the lower calibration point via the **Pressure value 1** parameter: 50 mbar (0.75 psi)
   ↳ Menu path: Application → Sensor → Scaled variable → Pressure value 1
2. Enter the volume value for the lower calibration point via the **Scaled variable value 1** parameter: 0 l (0 gal)
   ↳ Menu path: Application → Sensor → Scaled variable → Scaled variable value 1
3. Enter the pressure value for the upper calibration point via the **Pressure value 2** parameter: 450 mbar (6.75 psi)
   ↳ Menu path: Application → Sensor → Scaled variable → Pressure value 2
4. Enter the volume value for the upper calibration point via the **Scaled variable value 2** parameter: 1 000 l (264 gal)
   ↳ Menu path: Application → Sensor → Scaled variable → Scaled variable value 2

Result: The measuring range is set for 0 to 1 000 l (0 to 264 gal). Only the **Scaled variable value 1** parameter and **Scaled variable value 2** parameter are set with this setting. This setting has no effect on the current output.

www.addresses.endress.com

Endress+Hauser

People for Process Automation

BA02012P/00/EN/06.24-00
71647854
2024-03-26

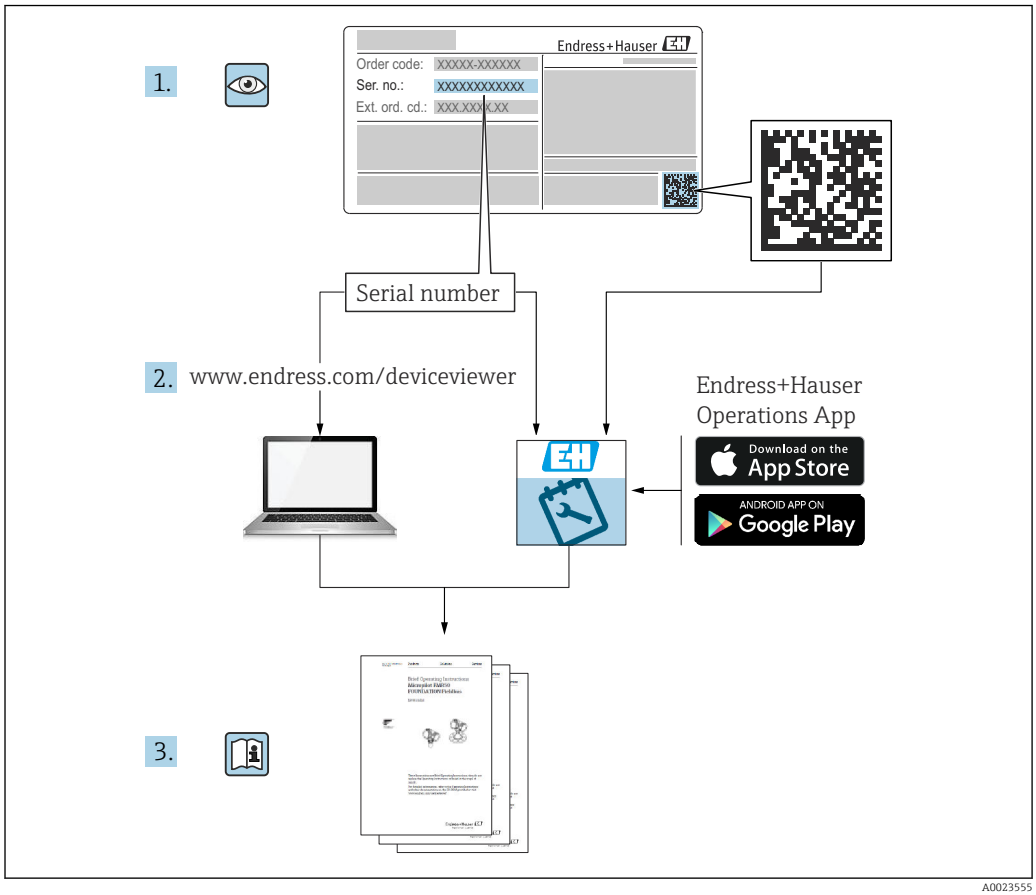
Valid as of version
01.00.zz (Device firmware)



# Operating Instructions
# **Cerabar PMP71B**

Process pressure measurement
HART

Endress+Hauser
People for Process Automation




- Make sure the document is stored in a safe place such that it is always available when working on or with the device
- Avoid danger to individuals or the facility: read the "Basic safety instructions" section carefully, as well as all other safety instructions in the document that are specific to working procedures

The manufacturer reserves the right to modify technical data without prior notice. The Endress+Hauser sales organization will supply you with current information and updates to these instructions.

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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.

### 1.2.2 Electrical symbols

**Ground connection:** ⏚

Terminal for connection to the grounding system.

### 1.2.3 Symbols for certain types of information

**Permitted:** ✓

Procedures, processes or actions that are permitted.

**Forbidden:** ✗

Procedures, processes or actions that are forbidden.

**Additional information:**

**Reference to documentation:**

**Reference to page:**

**Series of steps:** 1., 2., 3.

**Result of an individual step:**

### 1.2.4 Symbols in graphics

**Item numbers: 1, 2, 3 ...**

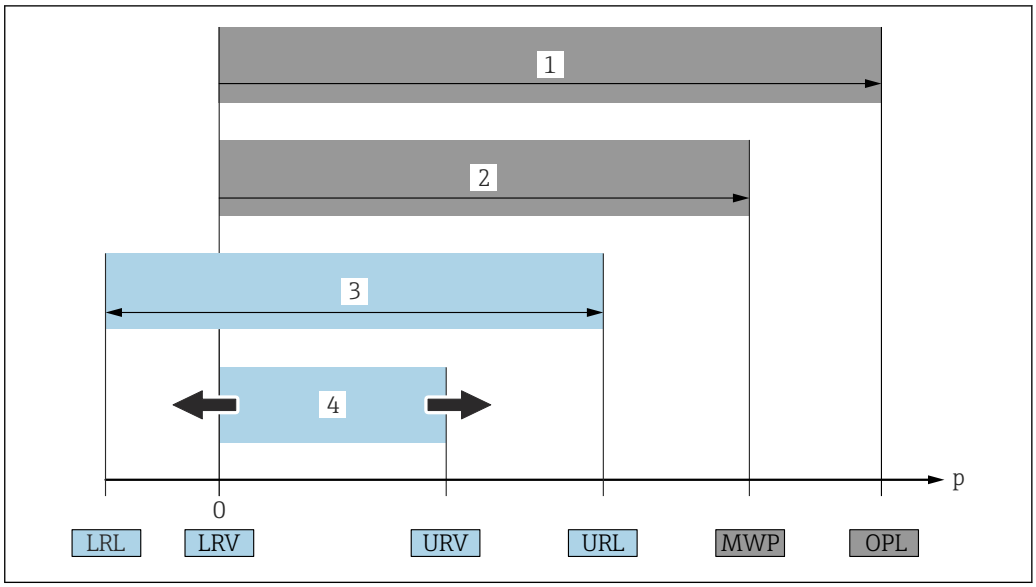
**Series of steps:** 1., 2., 3.

**Views: A, B, C, ...**

### 1.2.5 Symbols on the device

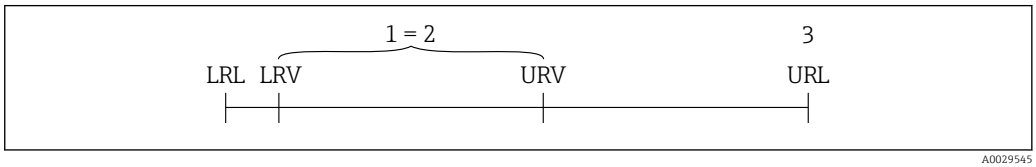
**Safety instructions:** → 
Observe the safety instructions contained in the associated Operating Instructions.

## 1.3 List of abbreviations




*1 OPL: The OPL (overpressure limit = measuring cell overload limit) for the device depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Pay attention to the pressure/temperature dependency.*
*2 The MWP (maximum working pressure) for the measuring cells depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Pay attention to the pressure/temperature dependency. The MWP may be applied at the device for an unlimited period of time. The MWP can be found on the nameplate.*
*3 The maximum measuring range corresponds to the span between the LRL and URL. This measuring range is equivalent to the maximum calibratable/adjustable span.*
*4 The calibrated/adjusted span corresponds to the span between the LRV and URV. Factory setting: 0 to URL. Other calibrated spans can be ordered as customized spans.*
*p Pressure*
*LRL Lower range limit*
*URL Upper range limit*
*LRV Lower range value*
*URV Upper range value*
*TD Turn down. Example - see the following section.*

## 1.4 Turn down calculation




*1 Calibrated/adjusted span*
*2 Zero point-based span*
*3 Upper range limit*

Example:
- Measuring cell: 10 bar (150 psi)
- Upper range limit (URL) = 10 bar (150 psi)
- Calibrated/adjusted span: 0 to 5 bar (0 to 75 psi)
- Lower range value (LRV) = 0 bar (0 psi)
- Upper range value (URV) = 5 bar (75 psi)

$$TD = \frac{URL}{|URV - LRV|}$$

In this example, the TD is therefore 2:1. This measuring span is based on the zero point.

## 1.5 Documentation

All available documents can be downloaded using:
- the serial number of the device (see cover page for description) or
- the data matrix code of the device (see cover page for description) or
- the "Downloads" area of the website www.endress.com

### 1.5.1 Supplementary device-dependent documentation

Additional documents are supplied depending on the device version ordered: Always comply strictly with the instructions in the supplementary documentation. The supplementary documentation is an integral part of the device documentation.

## 1.6 Registered trademarks

**HART®**
Registered trademark of the FieldComm Group, Austin, Texas, USA

**Bluetooth®**
The Bluetooth® wordmark and logos are registered trademarks of Bluetooth SIG, Inc. and any use of these trademarks by Endress+Hauser is licensed. Other trademarks and trade names are those of their respective owners.

**Apple®**
Apple, the Apple logo, iPhone, and iPod touch are trademarks of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc.

**Android®**
Android, Google Play and the Google Play logo are trademarks of Google Inc.

# 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 beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
- Follow instructions and comply with conditions

The operating personnel must fulfill the following requirements:
- Being instructed and authorized according to the requirements of the task by the facility's owner-operator
- Following the instructions in these Operating Instructions

## 2.2 Intended use

The Cerabar is a pressure transmitter for measuring level and pressure.

### 2.2.1 Incorrect use

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

Verification for borderline cases:
- For special fluids and fluids for cleaning, Endress+Hauser is glad to provide assistance in verifying the corrosion resistance of fluid-wetted materials, but does not accept any warranty or liability.

## 2.3 Workplace safety

When working on and with the device:
- Wear the required personal protective equipment according to federal/national regulations.
- Switch off the supply voltage before connecting the device.

## 2.4 Operational safety

Risk of injury!
- Operate the device only if it is in proper technical condition, free from errors and faults.
- The operator is responsible for the interference-free operation of the device.

**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.

**Hazardous area**

To eliminate the risk of danger to persons or the facility when the device is used in the approval-related area (e.g. explosion protection, pressure equipment safety):
- ▶ Check the nameplate to verify if the device ordered can be put to its intended use in the approval-related area.
- ▶ Observe the specifications in the separate supplementary documentation that is an integral part of these Instructions.

## 2.5 Product safety

This 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 Functional Safety SIL (optional)

The Functional Safety Manual must be strictly observed for devices that are used in functional safety applications.

## 2.7 IT security

Endress+Hauser can only provide a warranty 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 device settings. IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

## 2.8 Device-specific IT security

The device offers specific functions to support protective measures by the operator. These functions can be configured by the user and guarantee greater in-operation safety if used correctly. An overview of the most important functions is provided in the following section:

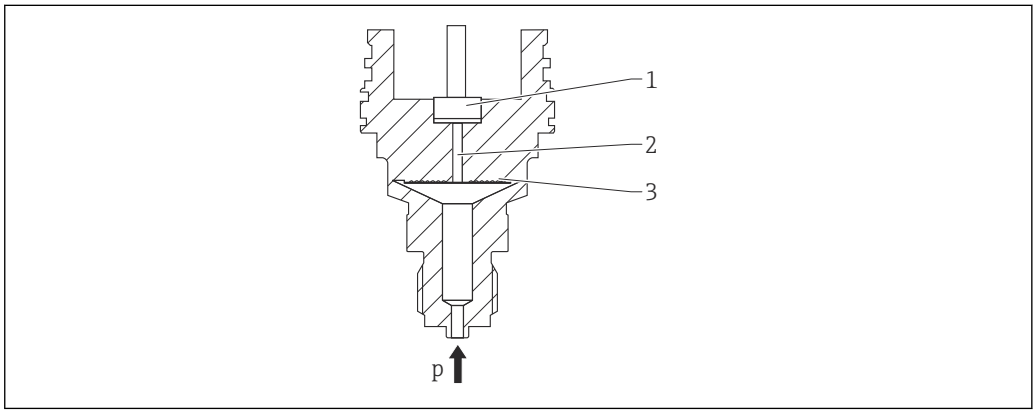
- Write protection via hardware write protection switch
- Access code to change user role (applies to operation via the display, Bluetooth or FieldCare, DeviceCare and asset management tools (e.g. AMS, PDM)

# 3 Product description

## 3.1 Product design

### 3.1.1 Metallic membrane

**Standard device (without diaphragm seal)**

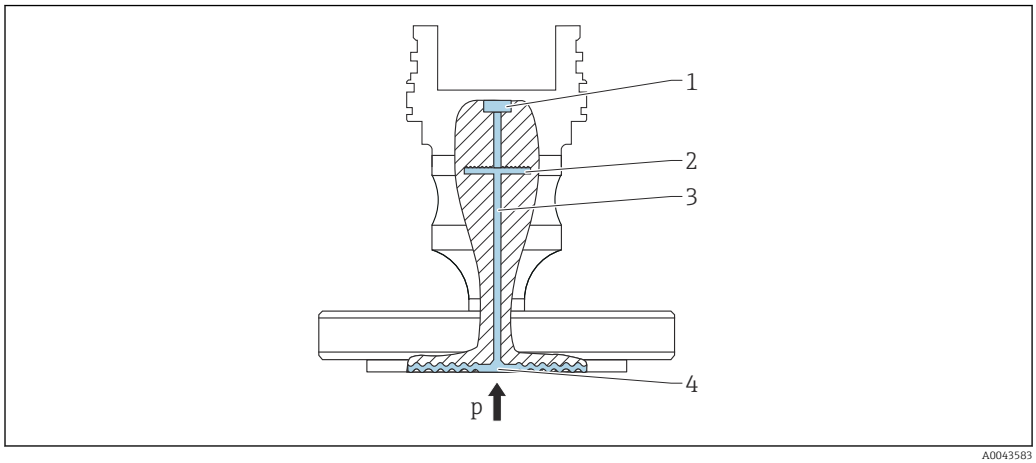



*1 Measuring element*
*2 Channel with fill fluid*
*3 Metallic membrane*
*p Pressure*

The pressure deflects the metallic membrane of the measuring cell. A fill fluid transfers the pressure to a Wheatstone bridge (semiconductor technology). The pressure-dependent change in the bridge output voltage is measured and evaluated.

**Advantages:**
- Can be used for high pressures
- High long-term stability
- High overload resistance
- Secondary containment for enhanced integrity
- Significantly reduced thermal effect e.g. compared to diaphragm seal systems with capillaries

### Device with diaphragm seal




*1 Measuring element*
*2 Internal membrane*
*3 Channel with fill fluid*
*4 Metallic membrane*
*p Pressure*

The pressure acts on the membrane of the diaphragm seal and is transferred to the internal membrane by a fill fluid. The internal membrane is deflected. A fill fluid transfers the pressure to the measuring element on which a resistance bridge is located. The pressure-dependent change in the bridge output voltage is measured and evaluated.

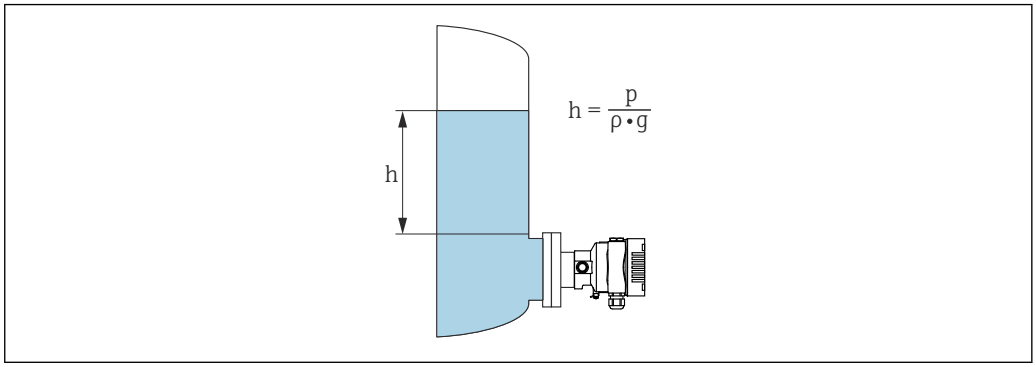
**Advantages:**
- Depending on the version, can be used for pressures up to 400 bar (6 000 psi) and for extreme process temperatures
- High long-term stability
- High overload resistance
- Standard device (without diaphragm seal): secondary containment for enhanced integrity

*Applications for diaphragm seals*

Diaphragm seal systems are used if the process and the device need to be separated. Diaphragm seal systems offer clear advantages in the following instances:
- In the case of extreme process temperatures - through the use of temperature isolators or capillaries
- In the case of strong vibrations - decouple the process from the device by using a capillary
- In the case of aggressive or corrosive media - through the use of high-durability membrane materials
- In the case of media that crystallize or contain solids - through the choice of suitable coatings
- In the case of heterogeneous and fibrous process media
- If extreme measuring point cleaning is necessary, or in the event of very damp mounting locations
- For mounting locations that are difficult to access

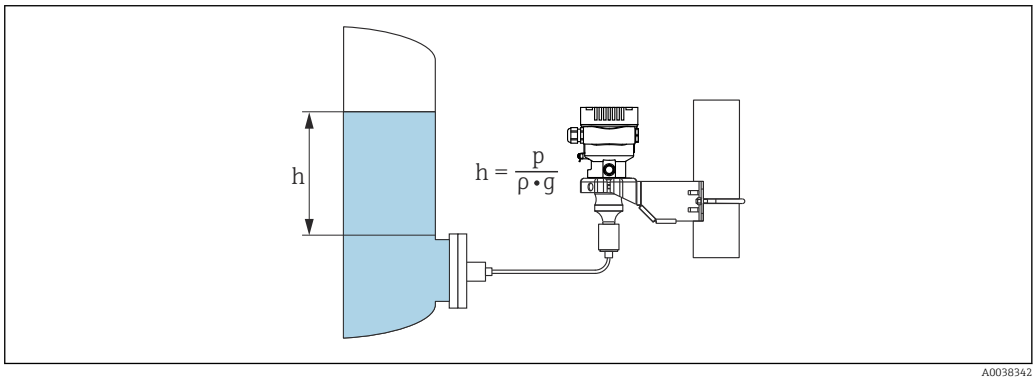
### 3.1.2 Level measurement (level, volume and mass)

**Standard device (without diaphragm seal)**




*h* *Height (level)*
*p* *Pressure*
*ρ* *Density of the medium*
*g* *Gravitational acceleration*

**Device with diaphragm seal**




*1 Sample illustration: diaphragm seal with capillary*

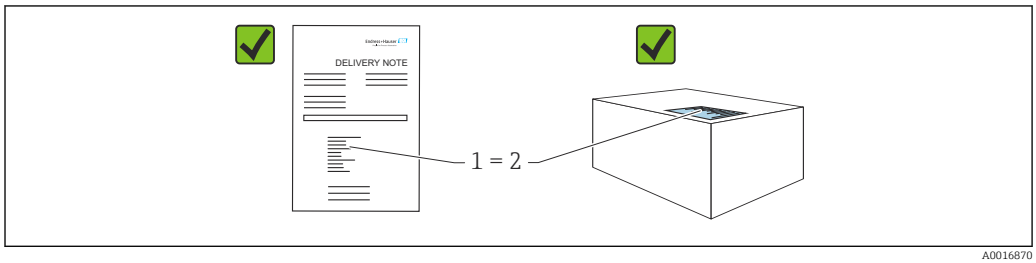
*h* *Height (level)*
*p* *Pressure*
*ρ* *Density of the medium*
*g* *Gravitational acceleration*

**Advantages:**

- Volume and mass measurements in any vessel shape with a freely programmable characteristic curve
- Has a wide range of uses, e.g.
  - For foam formation
  - In vessels with agitators or screen fittings
  - For liquid gases

# 4 Incoming acceptance and product identification

## 4.1 Incoming acceptance

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- 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 nameplate correspond to the order specifications and the delivery note?
- Is the documentation available?
- If required (see nameplate): are the Safety Instructions (XA) provided?

If you can answer "no" to any of these questions, please contact Endress+Hauser.

### 4.1.1 Scope of delivery

The scope of delivery comprises:
- Device
- Optional accessories

Accompanying documentation:
- Brief Operating Instructions
- Final inspection report
- Additional Safety Instructions for devices with approvals (e.g. ATEX, IECEx, NEPSI, etc.)
- Optional: factory calibration form, test certificates

The Operating Instructions are available on the Internet at:

www.endress.com → Download

## 4.2 Product identification

The following options are available for identification of the device:
- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter the serial numbers from the nameplates in *Device Viewer* (www.endress.com/deviceviewer): all the information about the device is displayed.

### 4.2.1 Manufacturer address

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

Place of manufacture: See nameplate.

### 4.2.2 Nameplate

Different nameplates are used depending on the device version.

The nameplates contain the following information:
- Manufacturer name and device name
- Address of the certificate holder and country of manufacture
- Order code and serial number
- Technical data
- Approval-specific information

Compare the data on the nameplate with your order.

## 4.3 Storage and transport

### 4.3.1 Storage conditions

- Use the original packaging
- Store the device in clean and dry conditions and protect from damage caused by shocks

**Storage temperature range**

See Technical Information.

### 4.3.2 Transporting the product to the measuring point

**⚠ WARNING**

**Incorrect transport!**

Housing and membrane may become damaged, and there is a risk of injury!

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

**⚠ WARNING**

**Incorrect transport!**

Capillaries may become damaged, and there is a risk of injury!

► Do not use capillaries as a carrying aid for the diaphragm seals.

# 5 Mounting

## 5.1 Mounting requirements

### 5.1.1 General instructions

- Do not clean or touch the membrane with hard and/or pointed objects.
- Do not remove the protection on the membrane until just before installation.

Always firmly tighten the housing cover and the cable entries.

1. Counter-tighten the cable entries.
2. Tighten the coupling nut.

### 5.1.2 Installation instructions

- The standard devices (without diaphragm seals) are mounted according to the same guidelines as pressure gauges (DIN EN837-2)
- To ensure optimal readability of the local display, adjust the housing and local display
- Endress+Hauser offers a mounting bracket to mount the device on pipes or walls
- Use flushing rings for flanges, flange seals and pancake seals if buildup or clogging can be expected at the membrane
  - The flushing ring is clamped between the process connection and the flange, flange seal or pancake seal
  - Material buildup in front of the membrane is flushed away, and the pressure chamber is vented, via the two lateral flushing holes
- When measuring in media containing solids (e.g. dirty liquids), installing separators and drain valves is useful for capturing and removing sediment
- Using a valve manifold allows for easy commissioning, installation and maintenance without interrupting the process
- When mounting the device, establishing the electrical connection and during operation: prevent the penetration of moisture into the housing
- Point the cable and plug downwards as much as possible to prevent moisture from entering (e.g. rainwater or condensation)

### 5.1.3 Installation instructions for thread

- Device with G 1 ½" thread:
  Place the flat seal on the sealing surface of the process connection
  Avoid additional strain on the membrane: do not seal the thread with hemp or similar materials
- Device with NPT thread:
  - Wrap Teflon tape around the thread to seal it
  - Tighten the device at the hexagon bolt only; do not turn it by the housing
  - When screwing in, do not overtighten the thread; tighten the NPT thread to the required depth according to the standard
- For the following process connections, a tightening torque of max. 40 Nm (29.50 lbf ft) is specified:
  - Thread ISO228 G ½" with flush membrane
  - Thread DIN13 M20 x 1.5 with flush membrane
  - NPT 3/4" with flush membrane

### 5.1.4 Installation instructions for devices with diaphragm seals

NOTICE

**Improper handling!**

Damage to the device!

- The diaphragm seal and pressure transmitter form a closed, calibrated system which has been filled with diaphragm seal fill fluid. Never open any of the holes for fill fluid.
- Ensure strain relief to prevent the capillary from bending (bending radius ≥ 100 mm (3.94 in)).
- Do not use capillaries as a carrying aid for the diaphragm seals.
- Observe the application limits of the fill fluid.

#### General information

In the case of devices with diaphragm seals and capillaries, the zero point shift caused by the hydrostatic pressure of the filling liquid column in the capillaries must be taken into account when selecting the measuring cell. If a measuring cell with a small measuring range is selected, a position adjustment can cause the measuring cell to go over range (position adjustment due to zero point offset, caused by the orientation of the fill fluid liquid column). Perform zero adjustment if necessary.

For devices with a capillary, use a suitable bracket (mounting bracket) for mounting.

When mounting, sufficient strain relief must be provided for the capillary to prevent the capillary from bending (capillary bending radius ≥ 100 mm (3.94 in)).

Mount the capillary so that it is vibration-free (in order to avoid additional pressure fluctuations).

Do not mount capillaries in the vicinity of heating or cooling lines and protect them against direct sunlight.

More detailed installation instructions are provided in the Applicator "Sizing Diaphragm Seal".

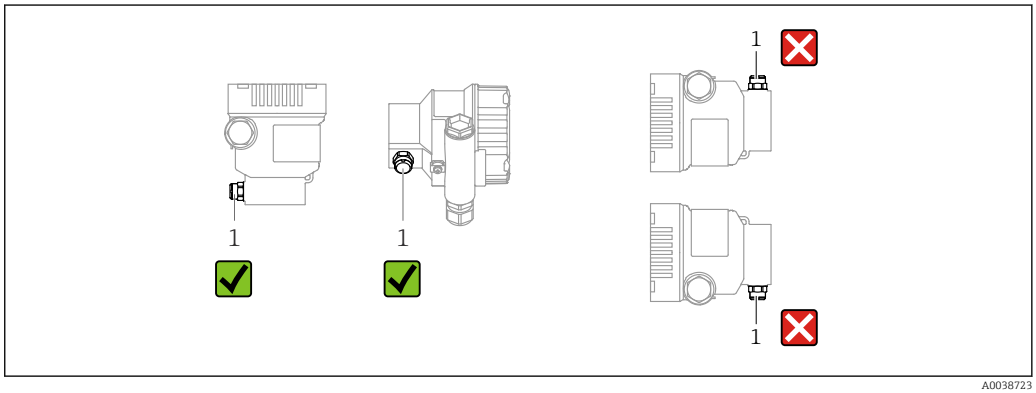
### 5.1.5 Orientation

NOTICE

**Damage to the device!**

If a heated device is cooled during a cleaning process (e.g. by cold water), a vacuum develops for a short time. As a result of this, moisture can enter the measuring cell via the pressure compensation element (1).

- Mount the device as follows.

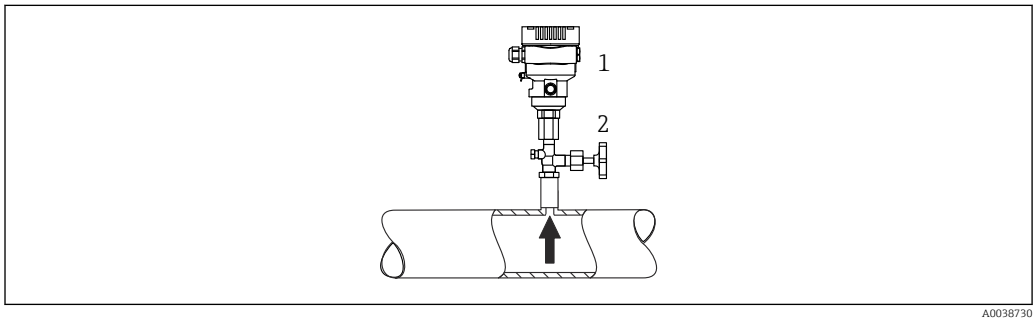



A0038723

- Keep the pressure compensation element (1) free from contamination
- A position-dependent zero point shift (when the vessel is empty the measured value does not display zero) can be corrected
- Diaphragm seals also shift the zero point, depending on the installation position
- The use of shutoff devices and/or water pocket pipes is recommended for mounting
- The orientation depends on the measuring application

## 5.2 Mounting the device

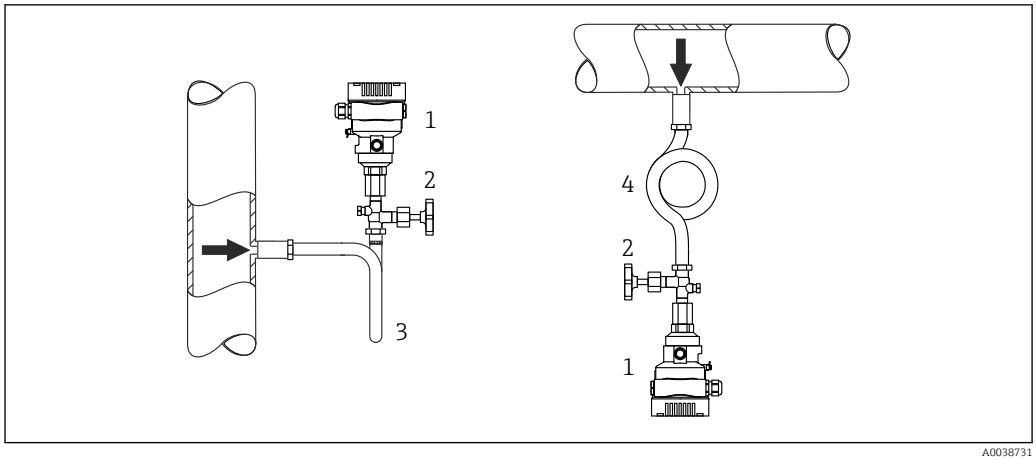
### 5.2.1 Pressure measurement in gases




*1 Device*
*2 Shutoff device*

Mount the device with the shutoff device above the tapping point so that any condensate can flow into the process.

### 5.2.2 Pressure measurement in steam




*1 Device*
*2 Shutoff device*
*3 U-shaped siphon*
*4 O-shaped siphon*

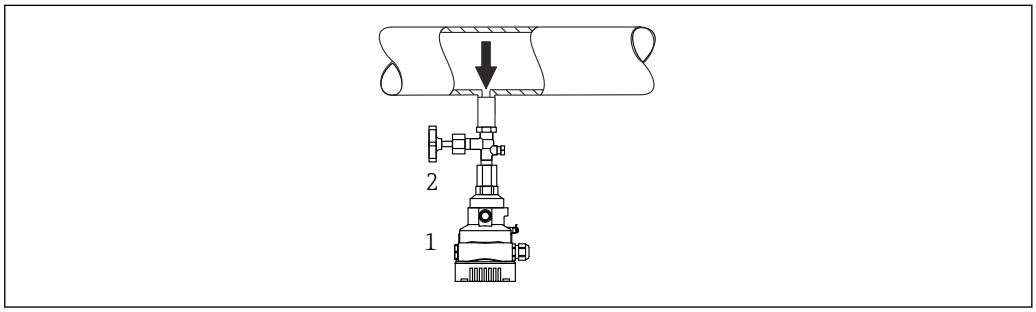
Observe the maximum permitted ambient temperature of the transmitter!

Mounting:
- Ideally, mount the device with the O-shaped siphon below the tapping point
  The device may also be mounted above the tapping point
- Fill the siphon with liquid before commissioning

Advantages of using siphons:
- Protects the measuring device from hot, pressurized media due to the formation and collection of condensate
- Attenuation of water hammer
- The defined water column only causes minimal (negligible) measured errors and minimal (negligible) thermal effects on the device

For technical data (e.g. materials, dimensions or order numbers), see the accessory document SD01553P.

### 5.2.3 Pressure measurement in liquids

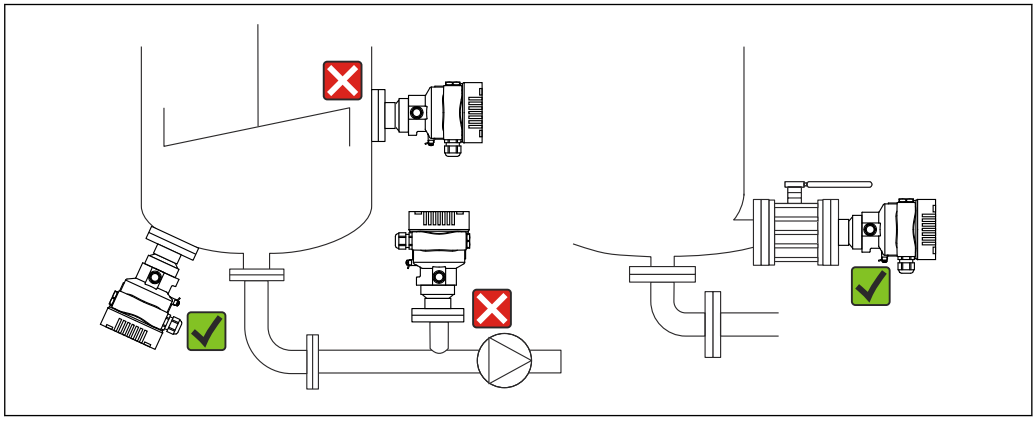



A0038732

*1 Device*
*2 Shutoff device*

Mount the device with the shutoff device below or at the same level as the tapping point.

### 5.2.4 Level measurement



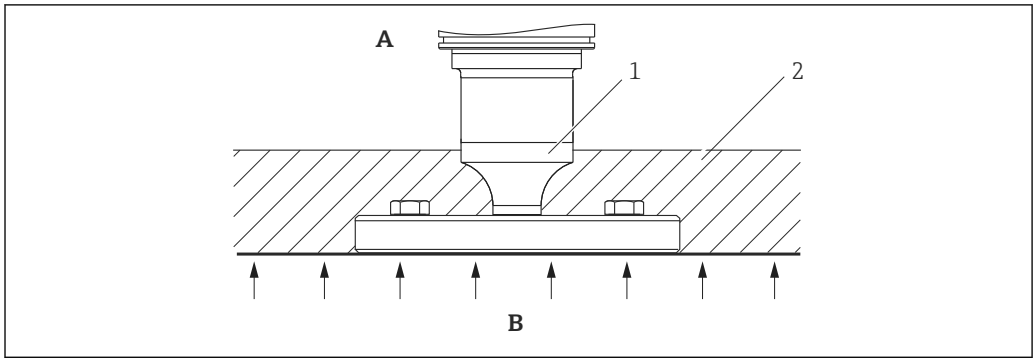
A0038733

- Always mount the device below the lowest measuring point
- Do not install the device at the following positions:
  - In the filling curtain
  - In the tank outlet
  - In the suction area of a pump
  - At a point in the tank which could be affected by pressure pulses from the agitator
- Mount the device downstream from a shutoff device: the calibration and function check can be carried out more easily

### 5.2.5 Thermal insulation with diaphragm seal directly mounted

The device may only be insulated up to a certain height. The maximum permitted insulation height is indicated on the device and applies to an insulation material with a heat conductivity ≤ 0.04 W/(m x K) and to the maximum permitted ambient and process

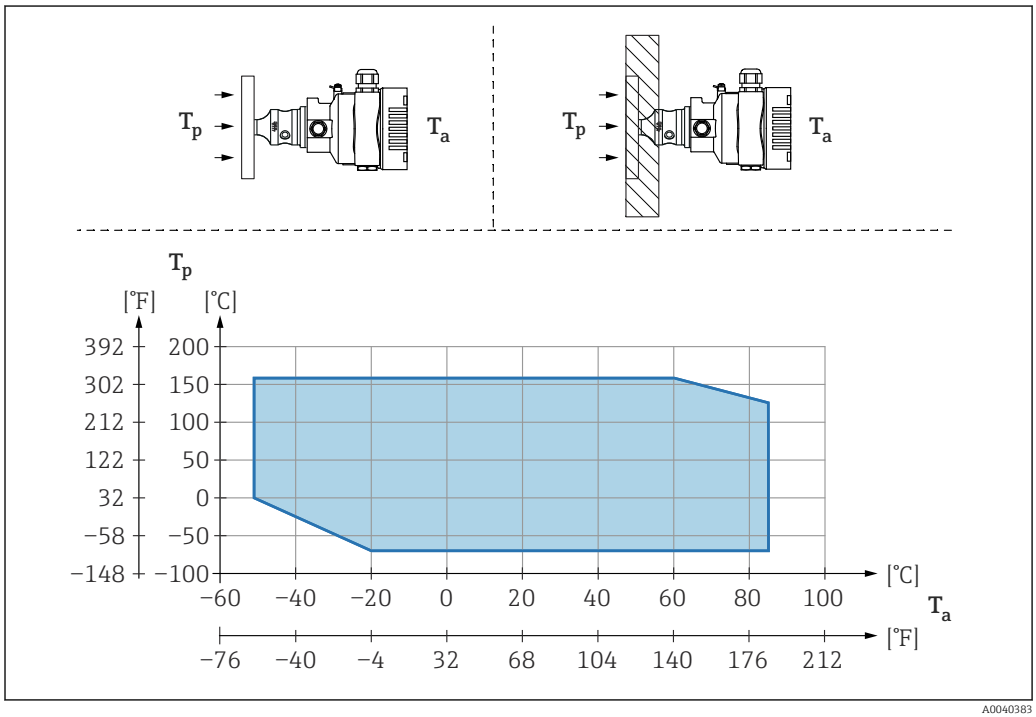
temperature. The data were determined under the most critical application "quiescent air". Maximum permitted insulation height, indicated here on a device with a flange:




A0020474

*A Ambient temperature*
*B Process temperature*
*1 Maximum permitted insulation height*
*2 Insulation material*

## 5.2.6 Mounting with a "Compact" diaphragm seal type




A0040383

*$T_a$ Ambient temperature at transmitter*
*$T_p$ Maximum process temperature*

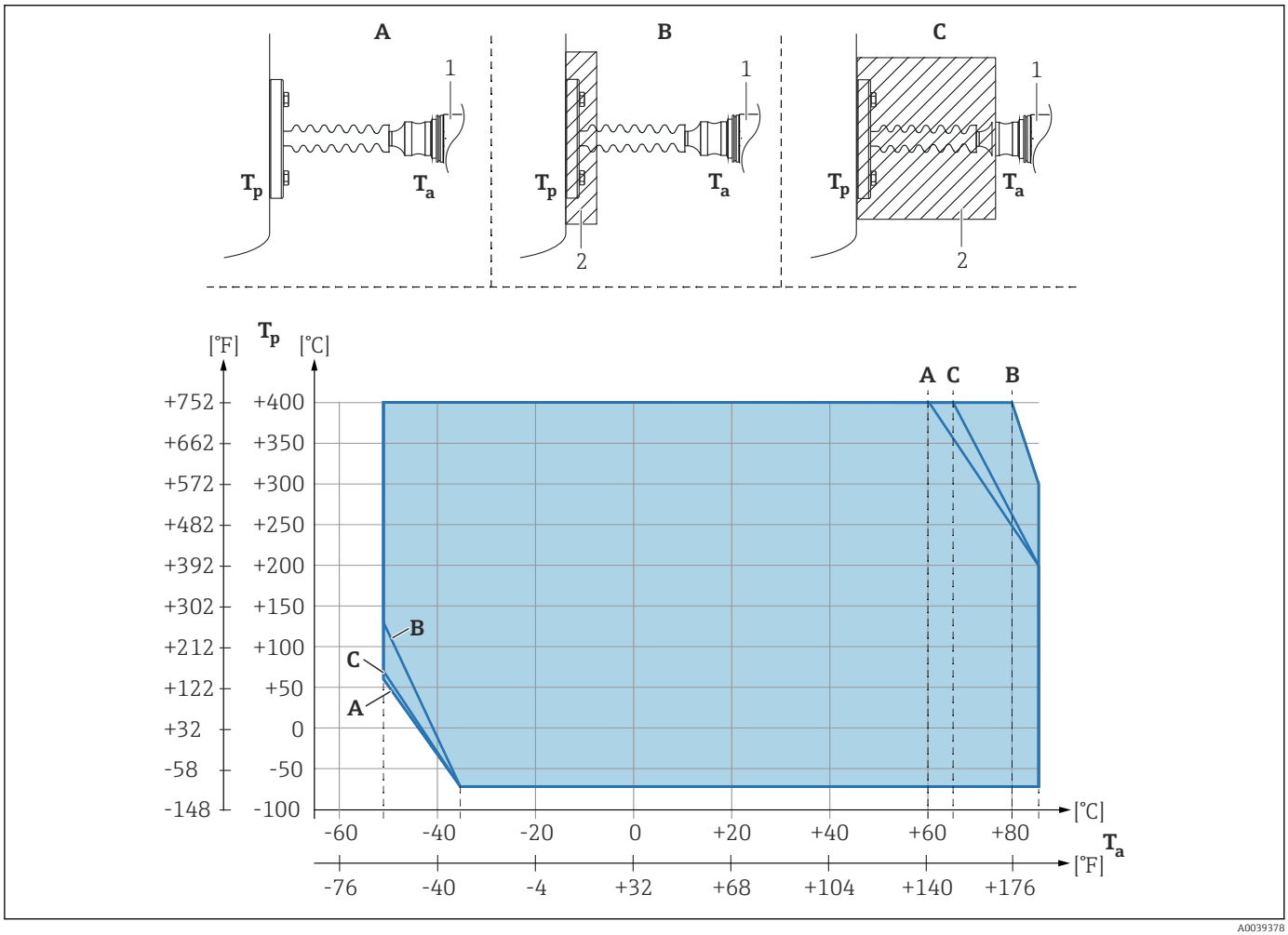
| $T_a$ | $T_p$ |
|---|---|
| +85 °C (+185 °F) | −70 to +120 °C (−94 to +248 °F) |
| +60 °C (+140 °F) | −70 to +160 °C (−94 to +320 °F) |
| −20 °C (−4 °F) | −70 to +160 °C (−94 to +320 °F) |
| −50 °C (−58 °F) | 0 to +160 °C (+32 to +320 °F) |

### 5.2.7 Thermal insulation when mounting with a "Temperature isolator" diaphragm seal type

Use of temperature isolators in the event of constant extreme medium temperatures which cause the maximum permissible electronics temperature of +85 °C (+185 °F) to be exceeded. Diaphragm seal systems with temperature isolators can be used up to a maximum temperature of +400 °C (+752 °F) depending on the fill fluid used. For details, see the Technical Information. To minimize the influence of rising heat, mount the device horizontally or with the housing pointing downwards. The additional installation height brings about a zero point shift due to the hydrostatic column in the temperature isolator. This zero point shift can be corrected on the device.

The maximum ambient temperature $T_a$ at the transmitter depends on the maximum process temperature $T_p$.

The maximum process temperature depends on the fill fluid used.




A0039378

*A No insulation*
*B Insulation 30 mm (1.18 in)*
*C Maximum insulation*
*1 Transmitter*
*2 Insulation material*

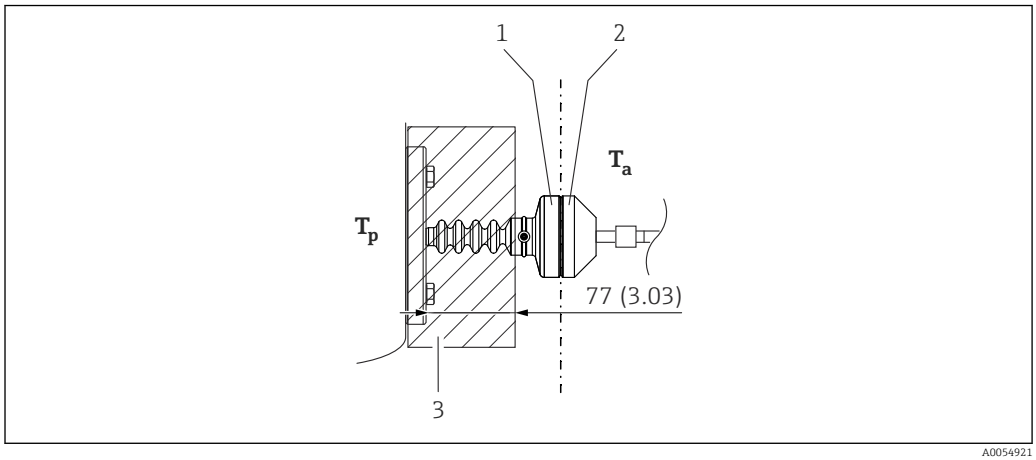
| Item | $T_a$ [1] | $T_p$ [2] |
|---|---|---|
| A | 60 °C (140 °F) | 400 °C (752 °F) [3] |
| | 85 °C (185 °F) | 200 °C (392 °F) |
| | −50 °C (−58 °F) | 60 °C (140 °F) |

| Item | $T_a$ [1] | $T_p$ [2] |
|---|---|---|
| | −35 °C (−31 °F) | −70 °C (−94 °F) |
| B | 80 °C (176 °F) | 400 °C (752 °F) [3] |
| | 85 °C (185 °F) | 300 °C (572 °F) |
| | −50 °C (−58 °F) | 130 °C (266 °F) |
| | −35 °C (−31 °F) | −70 °C (−94 °F) |
| C | 67 °C (153 °F) | 400 °C (752 °F) [3] |
| | 85 °C (185 °F) | 200 °C (392 °F) |
| | −50 °C (−58 °F) | 70 °C (158 °F) |
| | −35 °C (−31 °F) | −70 °C (−94 °F) |

1) Maximum ambient temperature at transmitter
2) Maximum process temperature
3) Process temperature: max. +400 °C (+752 °F), depending on the fill fluid used

### Thermal Range Expander

The device may only be insulated up to a certain height. The maximum permitted insulation height applies to an insulation material with a thermal conductivity ≤ 0.04 W/(m x K) and to the maximum permitted ambient temperature and process temperature. The data were determined under the application "quiescent air".




*1 Primary chamber*
*2 Secondary chamber*
*3 Insulation material*

Without insulation, the ambient temperature decreases by 5 K.

## 5.2.8 Oxygen applications (gaseous)

Oxygen and other gases can react explosively to oils, grease and plastics. The following precautions must be taken:
- All components of the system, such as devices, must be cleaned in accordance with national requirements.
- Depending on the materials used, a certain maximum temperature and a maximum pressure must not be exceeded for oxygen applications.

The cleaning of the device (not accessories) is provided as an optional service.

- $p_{max}$: Depends on the lowest-rated element, with regard to pressure, of the selected components: Over pressure limit (OPL) of the measuring cell, process connection (1.5 x PN) or fill fluid (80 bar (1 200 psi))
- $T_{max}$: 60 °C (140 °F)

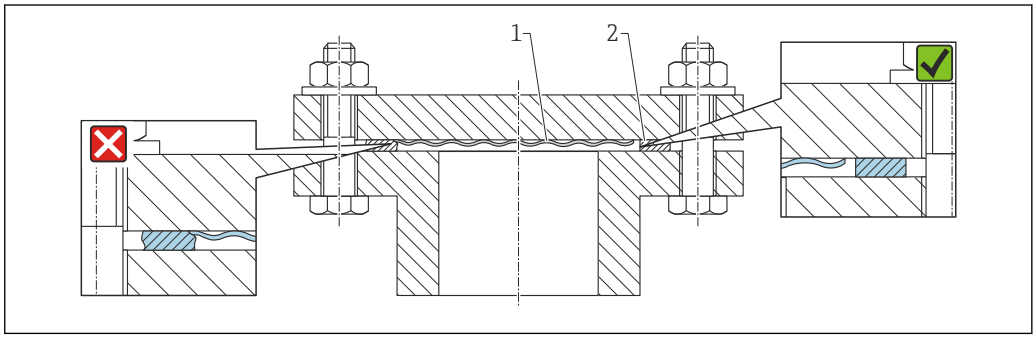
### 5.2.9 Seal for flange mounting

NOTICE

**Seal pressing against the membrane!**

Incorrect measurement results!

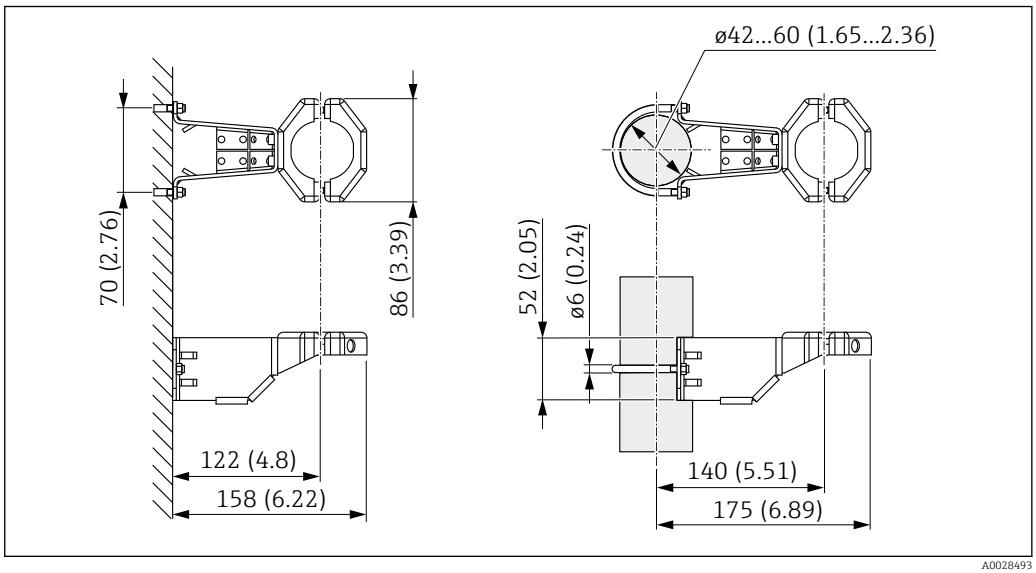
▶ Ensure that the seal is not touching the membrane.




*1 Membrane*
*2 Seal*

### 5.2.10 Mounting bracket for device or separate housing

The device or the separate housing can be mounted on walls or pipes (for pipes with a diameter of 1 ¼" to 2") using the mounting bracket.



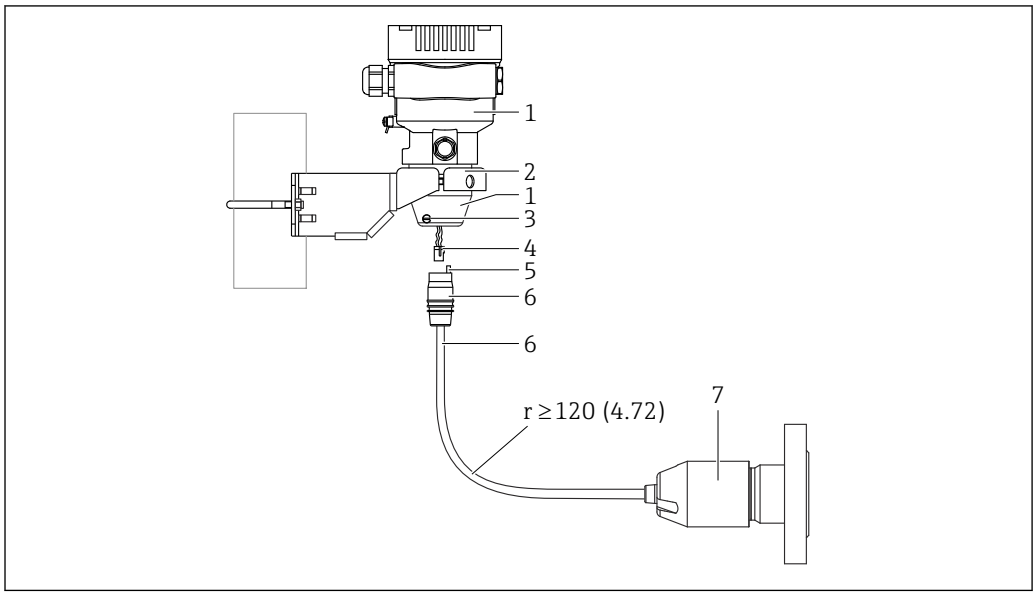

*Unit of measurement mm (in)*

Ordering information:
- Can be ordered via the Product Configurator
- Can be ordered as a separate accessory, part number 71102216

The mounting bracket is included in the delivery if you order the device with a separate housing.

When mounting on a pipe, tighten the nuts on the bracket uniformly with a torque of at least 5 Nm (3.69 lbf ft).

## 5.2.11 Assembling and mounting the separate housing

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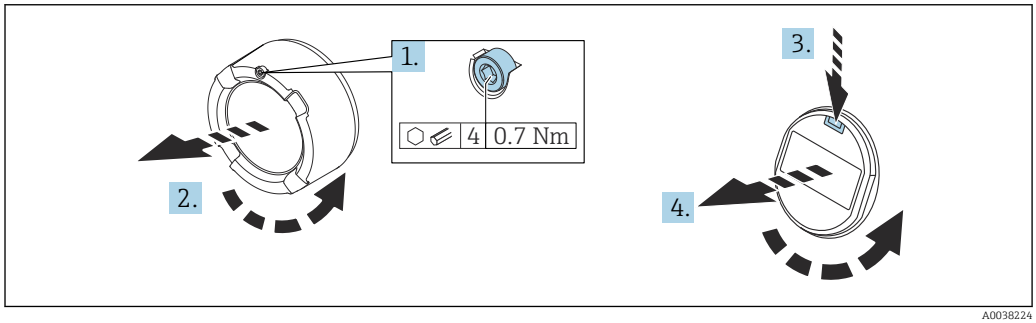
*Unit of measurement mm (in)*

1 *Housing mounted with housing adapter, included*
2 *Mounting bracket provided, suitable for pipe and wall mounting (for pipe diameters from 1 ¼" to 2")*
3 *Locking screw*
4 *Plug*
5 *Pressure compensation*
6 *Cable with connection jack*
7 *In the separate housing version, the measuring cell is delivered with the process connection and cable already mounted.*

### Assembly and mounting

1. Insert the connector (item 4) into the corresponding connection jack of the cable (item 6).
2. Insert the cable with the socket (item 6) into the housing adapter (item 1) to the end stop.
3. Tighten the locking screw (item 3).
4. Mount the housing on a wall or pipe with the mounting bracket (item 2). When mounting on a pipe, tighten the nuts on the bracket uniformly with a torque of at least 5 Nm (3.69 lbf ft). Mount the cable with a bending radius (r) ≥ 120 mm (4.72 in).

## 5.2.12 Turning the display module




A0038224

**⚠ WARNING**

**Supply voltage switched on!**
Risk of electric shock and/or explosion!
- ▶ Switch off the supply voltage before opening the device.

**⚠ CAUTION**

**Dual-compartment housing: When opening the terminal compartment cover, fingers can get trapped between the cover and the pressure compensation filter.**
- ▶ Open the cover slowly.

1. If fitted: release the screw of the cover lock for the electronics compartment cover using the Allen key.
2. Unscrew the electronics compartment cover from the transmitter housing and check the cover seal.
3. Press the release mechanism and remove the display module.
4. Turn the display module to the desired position: maximum 4 × 90 ° in each direction. Fit the display module on the electronics compartment in the desired position until it clicks into place. Screw the electronics compartment cover back onto the transmitter housing. If provided: tighten the screw of the cover lock using the Allen key 0.7 Nm (0.52 lbf ft) ±0.2 Nm (0.15 lbf ft).

### 5.2.13 Closing the housing covers

**NOTICE**

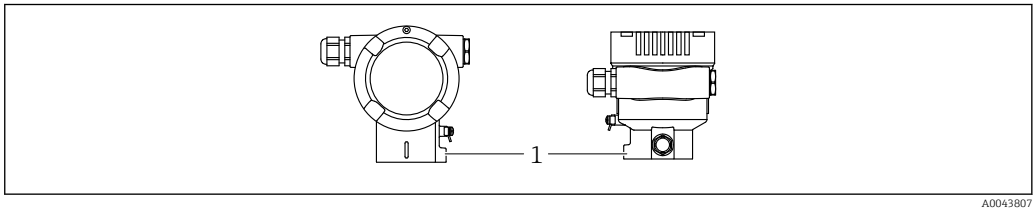
**Thread and housing cover damaged from dirt and fouling!**
- ▶ Remove dirt (e.g. sand.) on the thread of the cover and housing.
- ▶ If you continue to encounter resistance when closing the cover, check the thread again for fouling.

**Housing thread**
The threads of the electronics and connection compartment can be coated with an anti-friction coating.
The following applies for all housing materials:
**☒ Do not lubricate the housing threads.**

### 5.2.14 Turning the housing

The housing can be rotated up to 380° by loosening the locking screw.

**Your benefits**
- Easy mounting due to optimum alignment of housing
- Easily accessible device operation
- Optimum readability of the onsite display (optional)




*1 Locking screw*

NOTICE

**The housing cannot be unscrewed fully.**

- ▶ Loosen the external locking screw by a maximum of 1.5 turns. If the screw is unscrewed too much or completely (beyond the screw anchor point), small parts (counter disk) can become loose and fall out.
- ▶ Tighten the securing screw (hex socket 4 mm (0.16 in)) with maximum 3.5 Nm (2.58 lbf ft) ± 0.3 Nm (0.22 lbf ft).

## 5.3 Post-mounting check

❑ Is the device undamaged (visual inspection)?

❑Are the measuring point identification and labeling correct (visual inspection)?

❑ Is the device protected against precipitation and direct sunlight?

❑ Are the securing screws and cover lock tightened securely?

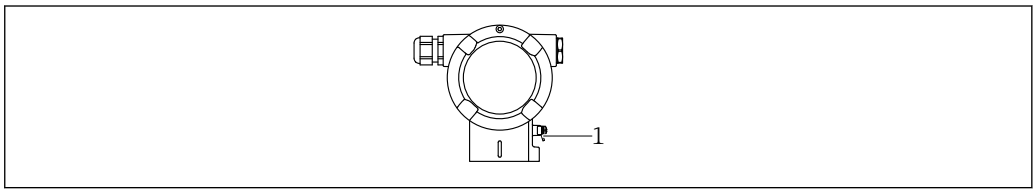
❑ Does the measuring device meet the measuring point specifications?
For example:
- Process temperature
- Process pressure
- Ambient temperature
- Measuring range

# 6 Electrical connection

## 6.1 Connecting requirements

### 6.1.1 Potential equalization

The protective ground on the device must not be connected. If necessary, the potential matching line can be connected to the outer ground terminal of the device before the device is connected.




*1 Ground terminal for connecting the potential matching line*

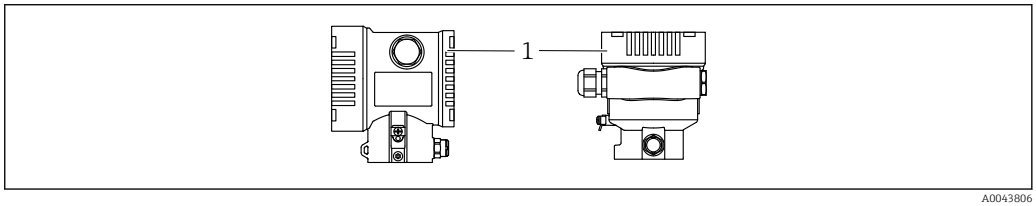
**⚠ WARNING**

**Explosion Hazard!**

- ▶ Please refer to the separate documentation on applications in hazardous areas for the safety instructions.

For optimum electromagnetic compatibility:
- Keep the potential matching line as short as possible
- Maintain a cross-section of at least 2.5 mm² (14 AWG)

## 6.2 Connecting the device




*1 Connection compartment cover*

**Housing thread**

The threads of the electronics and connection compartment can be coated with an anti-friction coating.

The following applies for all housing materials:

**☒ Do not lubricate the housing threads.**

### 6.2.1 Supply voltage

- Ex d, Ex e, non-Ex: supply voltage: 10.5 to 35 $V_{DC}$
- Ex i: supply voltage: 10.5 to 30 $V_{DC}$
- Nominal current: 4 to 20 mA HART

The power unit must be safety-approved (e.g. PELV, SELV, Class 2) and must comply with the relevant protocol specifications. For 4 to 20 mA, the same requirements apply as for HART.

Depending on the supply voltage when the device is switched on
- the background lighting is switched off (supply voltage <15 V)
- the Bluetooth function (order option) is also switched off (supply voltage <12 V)

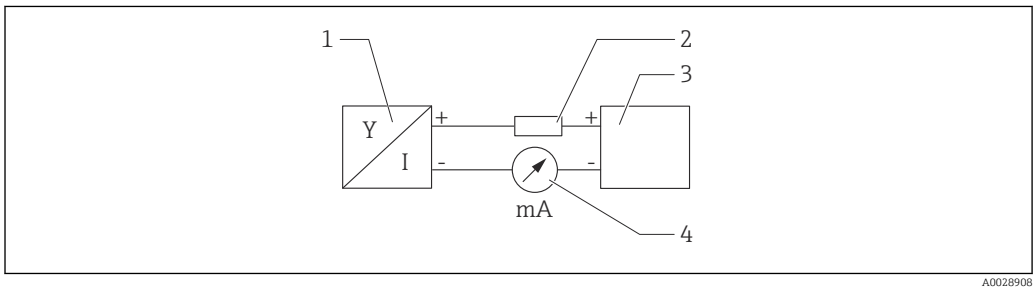
### 6.2.2 Terminals

- Supply voltage and internal ground terminal: 0.5 to 2.5 mm$^2$ (20 to 14 AWG)
- External ground terminal: 0.5 to 4 mm$^2$ (20 to 12 AWG)

### 6.2.3 Cable specification

- Protective ground or grounding of the cable shield: rated cross-section > 1 mm$^2$ (17 AWG)
  Rated cross-section of 0.5 mm$^2$ (20 AWG) to 2.5 mm$^2$ (13 AWG)
- Cable outer diameter: Ø5 to 12 mm (0.2 to 0.47 in) depends on the cable gland used (see Technical Information)

### 6.2.4 4-20 mA HART




*2 Block diagram of HART connection*

*1 Device with HART communication*
*2 HART communication resistor*
*3 Power supply*
*4 multimeter*

The HART communication resistor of 250 Ω in the signal line is always necessary in the case of a low-impedance power supply.

**Take the voltage drop into consideration:**
Maximum 6 V for a communication resistor of 250 Ω

### 6.2.5 Overvoltage protection

**Devices without optional overvoltage protection**

Equipment from Endress+Hauser fulfills the requirements of the product standard IEC / DIN EN 61326-1 (Table 2 Industrial Environment).

Depending on the type of port (DC power supply, input/output port) different testing levels according to IEC / DIN EN 61326-1 against transient overvoltages (Surge) are applied (IEC / DIN EN 61000-4-5 Surge):
Test level on DC power ports and input / output ports is 1000 V line to earth

**Devices with optional overvoltage protection**

- Spark-over voltage: min. 400 V DC
- Tested according to IEC / DIN EN 60079-14 sub chapter 12.3 (IEC / DIN EN 60060-1 chapter 7)
- Nominal discharge current: 10 kA

**Overvoltage category**

Overvoltage category II

### 6.2.6 Wiring

**⚠ WARNING**

**Supply voltage might be connected!**
Risk of electric shock and/or explosion!

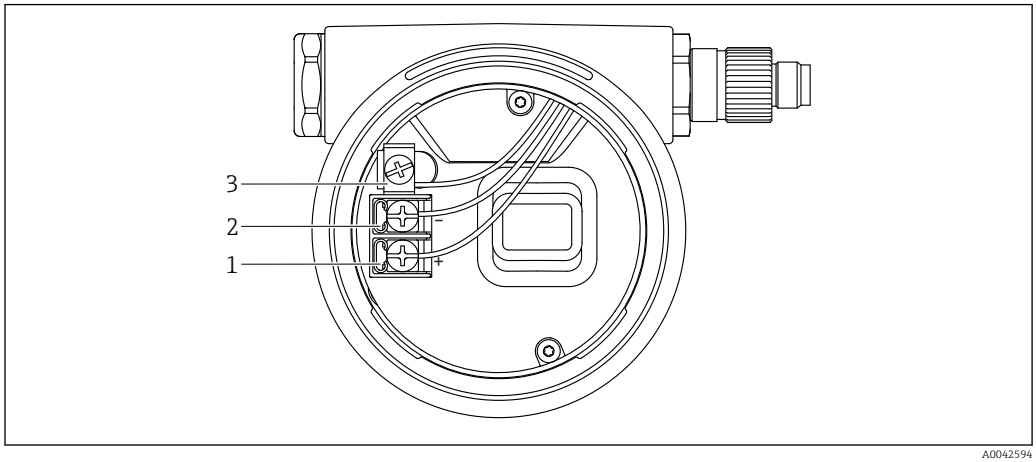
- If the device is used in hazardous areas, comply with national standards and the specifications in the Safety Instructions (XAs). Use the specified cable gland.
- The supply voltage must match the specifications on the nameplate.
- Switch off the supply voltage before connecting the device.
- If necessary, the potential matching line can be connected to the outer ground terminal of the transmitter before the device is connected.
- A suitable circuit breaker should be provided for the device in accordance with IEC/EN 61010.
- The cables must be adequately insulated, with due consideration given to the supply voltage and the overvoltage category.
- The connecting cables must offer adequate temperature stability, with due consideration given to the ambient temperature.
- Only operate the device with the covers closed.
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are integrated.

Connect the device in the following order:

1. Release the cover lock (if provided).
2. Unscrew the cover.
3. Guide the cables into the cable glands or cable entries.
4. Connect the cables.
5. Tighten the cable glands or cable entries so that they are leak-tight. Counter-tighten the housing entry. Use a suitable tool with width across flats AF24/25
   8 Nm (5.9 lbf ft) for the M20 cable gland.
6. Screw the cover securely back onto the connection compartment.
7. If fitted: tighten the screw of the cover lock using the Allen key 0.7 Nm (0.52 lbf ft) ±0.2 Nm (0.15 lbf ft).

### 6.2.7 Terminal assignment

#### Single compartment housing

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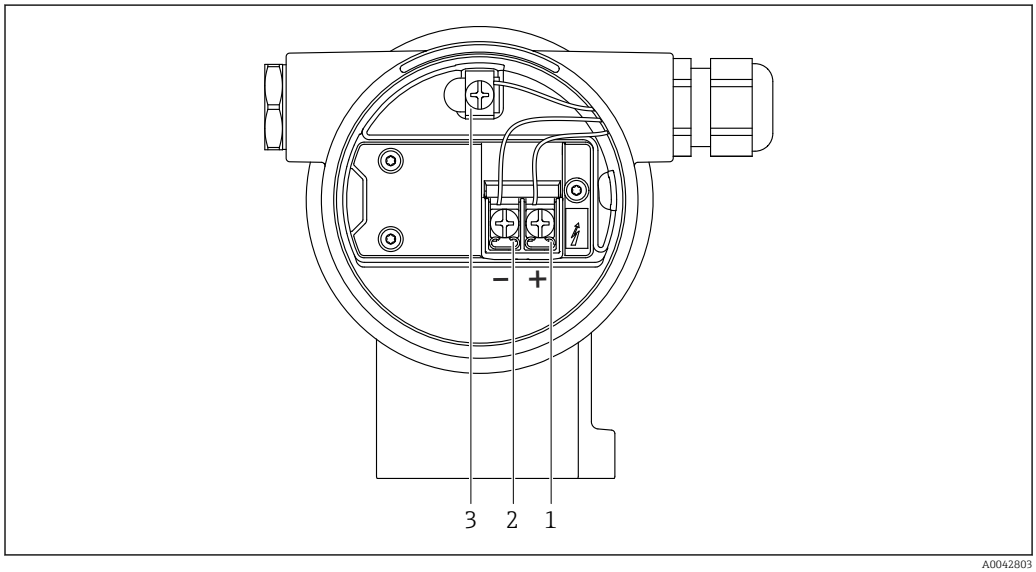
*3 Connection terminals and ground terminal in the connection compartment*

*1 Positive terminal*
*2 Negative terminal*
*3 Internal ground terminal*

#### Dual compartment housing

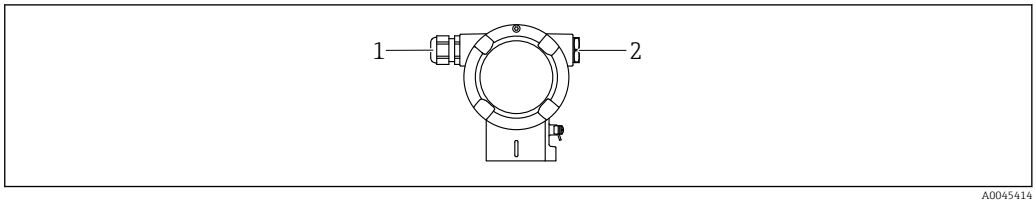



A0042803

*4 Connection terminals and ground terminal in the connection compartment*

*1 Positive terminal*
*2 Negative terminal*
*3 Internal ground terminal*

## 6.2.8 Cable entries




*1 Cable entry*
*2 Dummy plug*

The type of cable entry depends on the device version ordered.

Always route connecting cables downwards so that moisture cannot penetrate the connection compartment.

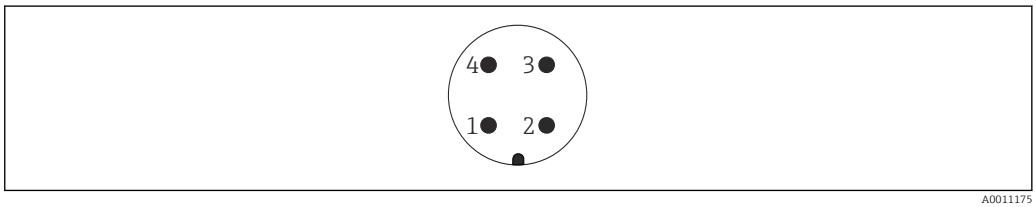
If necessary, create a drip loop or use a weather protection cover.

## 6.2.9 Available device plugs

In the case of devices with a plug, it is not necessary to open the housing for connection purposes.

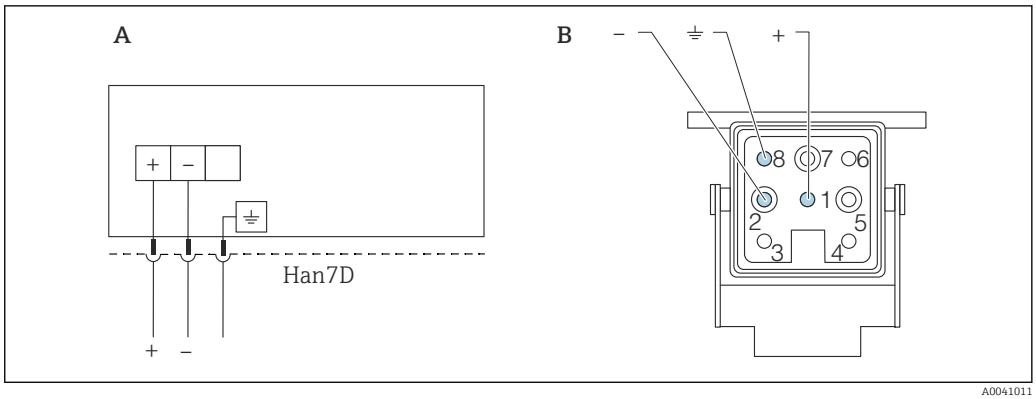
Use the enclosed seals to prevent the penetration of moisture into the device.

### Devices with M12 plug




*1 Signal +*
*2 Not assigned*
*3 Signal –*
*4 Ground*

### Devices with a Harting plug Han7D




*A Electrical connection for devices with Harting plug Han7D*
*B View of the plug-in connection on the device*
*- Brown*
*⏚ Green/yellow*
*+ Blue*

## 6.3 Ensuring the degree of protection

### 6.3.1 Cable entries

- Gland M20, plastic, IP66/68 TYPE 4X/6P
- Gland M20, brass nickel plated, IP66/68 TYPE 4X/6P
- Gland M20, 316L, IP66/68 TYPE 4X/6P
- Thread M20, IP66/68 TYPE 4X/6P
- Thread G1/2, IP66/68 TYPE 4X/6P
  If the G1/2 thread is selected, the device is delivered with an M20 thread as standard and a G1/2 adapter is included with the delivery, along with the corresponding documentation
- Thread NPT1/2, IP66/68 TYPE 4X/6P
- Dummy plug transport protection: IP22, TYPE 2
- HAN7D plug, 90 degrees, IP65 NEMA Type 4X
- M12 plug
  When housing is closed and connecting cable is plugged in: IP66/67, NEMA Type 4X
  When housing is open or connecting cable is not plugged in: IP20, NEMA Type 1

NOTICE

**M12 plug and HAN7D plug: incorrect mounting can invalidate the IP protection class!**

- ▶ The degree of protection only applies if the connecting cable used is plugged in and screwed tight.
- ▶ The degree of protection only applies if the connecting cable used is specified according to IP67, NEMA Type 4X.
- ▶ The IP protection classes are only maintained if the dummy cap is used or the cable is connected.

## 6.4 Post-connection check

After wiring the device, perform the following checks:

❑ Is the potential matching line connected?

❑ Is the terminal assignment correct?

❑ Are the cable glands and dummy plugs leak-tight?

❑ Are the fieldbus connectors properly secured?

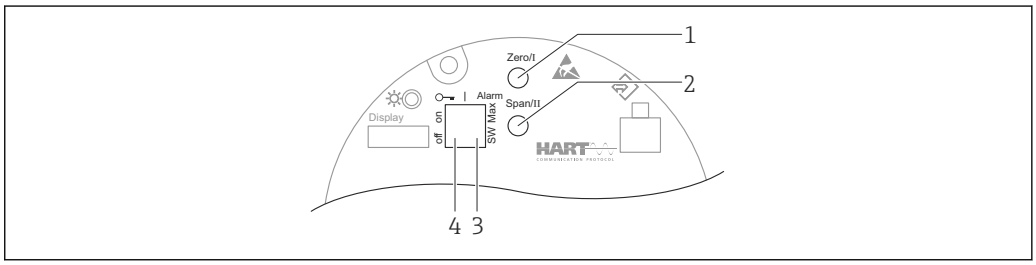
❑ Are the covers screwed down correctly?

# 7 Operation options

## 7.1 Overview of operation options

- Operation via operating keys and DIP switches on the electronic insert
- Operation via optical operating keys on the device display (optional)
- Operation via Bluetooth® wireless technology (with optional Bluetooth device display) with Smartblue app or FieldXpert, DeviceCare
- Operation via operating tool (Endress+Hauser FieldCare/DeviceCare or AMS, PDM, etc.)
- Operation via handheld, Fieldcare, DeviceCare, AMS and PDM

## 7.2 Operating keys and DIP switches on the electronic insert

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*1 Operating key for lower range value (Zero)*
*2 Operating key for upper range value (Span)*
*3 DIP switch for alarm current*
*4 DIP switch for locking and unlocking the device*

The setting of the DIP switches has priority over the settings made via other operation methods (e.g. FieldCare/DeviceCare).

## 7.3 Structure and function of the operating menu

The differences between the structure of the operating menus of the local display and the Endress+Hauser FieldCare or DeviceCare operating tools can be summarized as follows:

The local display is suitable for configuring simple applications.

More elaborate applications can be configured with the Endress+Hauser FieldCare or DeviceCare operating tools as well as Bluetooth and the SmartBlue App and the device display.

"Wizards" help the user to commission the various applications. The user is guided through the individual configuration steps.

### 7.3.1 User roles and related access authorization

The two user roles, **Operator** and **Maintenance** (order configuration), have different write access to the parameters if a device-specific access code has been defined. This access code protects the device configuration from unauthorized access.

If an incorrect access code is entered, the user retains the **Operator** option user role.

## 7.4 Access to the operating menu via the local display

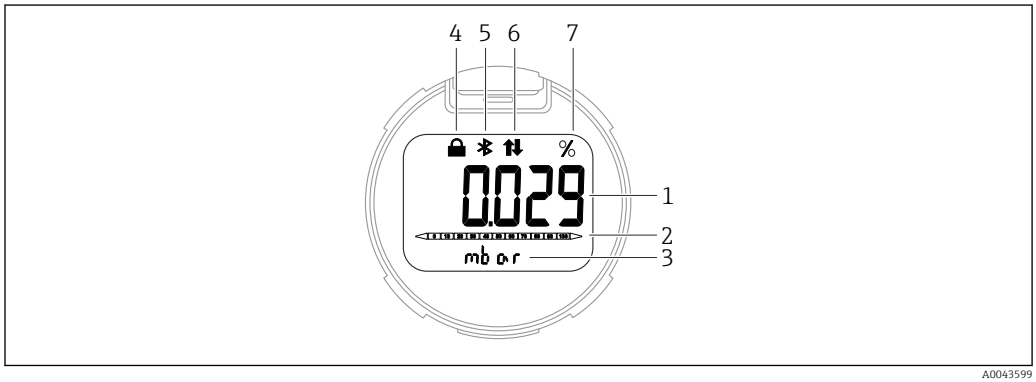
### 7.4.1 Device display (optional)

Functions:
- Display of measured values and fault and notice messages
- Background lighting, which switches from green to red in the event of an error
- The device display can be removed for easier operation

The device displays are available with the additional option of Bluetooth® wireless technology.

Depending on the supply voltage and the current consumption, background lighting is switched on or off.

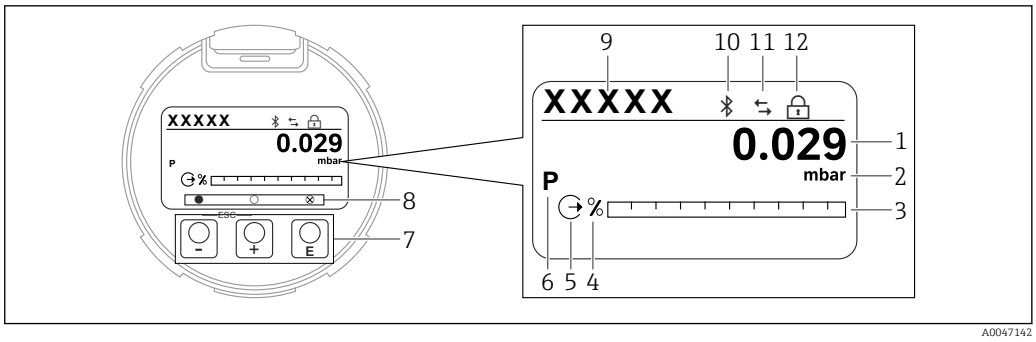
Depending on the supply voltage and the current consumption, Bluetooth can optionally be switched on or off.




*5 Segment display*

*1 Measured value (up to 5 digits)*
*2 Bar graph proportional to the current output*
*3 Unit of measured value*
*4 Locked (symbol appears when the device is locked)*
*5 Bluetooth (symbol flashes if Bluetooth connection is active)*
*6 HART communication (symbol is displayed if HART communication is active)*
*7 Measured value output in %*

The following graphics are examples. The display depends on the display settings.




6 *Graphic display with optical operating keys.*

1 *Measured value (up to 12 digits)*
2 *Unit of measured value*
3 *Bar graph proportional to the current output*
4 *Bar graph unit*
5 *Symbol for current output*
6 *Symbol for displayed measured value (e.g. p = pressure)*
7 *Optical operating keys*
8 *Symbols for key feedback. Different display symbols are possible: circle (not filled in) = key pressed briefly; circle (filled in) = key pressed for longer; circle (with X) = no operation possible due to Bluetooth connection*
9 *Device Tag*
10 *Bluetooth (symbol flashes if Bluetooth connection is active)*
11 *HART communication (symbol is displayed if HART communication is active)*
12 *Locked (symbol appears when the device is locked)*

- ⊞ operating key
  - Navigate down in the picklist
  - Edit the numerical values or characters within a function
- ⊟ operating key
  - Navigate up in the picklist
  - Edit the numerical values or characters within a function
- Ⓔ operating key
  - Confirm entry
  - Jump to the next item
  - Select a menu item and activate edit mode
  - Unlock/lock the display operation
  - Press and hold the Ⓔ key to display a short description of the selected parameter (if available)
- ⊞ key and ⊟ key (ESC function)
  - Exit the edit mode for a parameter without saving the changed value
  - Menu at a selection level: pressing the keys simultaneously takes the user back up a level in the menu
  - Press and hold the keys simultaneously to return to the upper level

### 7.4.2 Operation via Bluetooth® wireless technology (optional)

Requirement
- Device with Bluetooth display
- Smartphone or tablet with Endress+Hauser SmartBlue app or PC with DeviceCare from version 1.07.00 or FieldXpert SMT70

The connection has a range of up to 25 m (82 ft). The range can vary depending on environmental conditions such as attachments, walls or ceilings.

The operating keys on the display are locked as soon as the device is connected via Bluetooth.

### SmartBlue app

1. Scan the QR code or enter "SmartBlue" in the search field of the App Store or Google Play.
   ↳

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2. Start the SmartBlue app.
3. Select device from livelist displayed.
4. Login:
   ↳ Enter the user name: admin
   Password: serial number of the device.
5. Change the password after logging in for the first time!

*Prerequisites*

**System requirements**
The SmartBlue app is available to download for smartphones or tablets. For information on the compatibility of the SmartBlue App with mobile end devices, see "App Store (Apple)" or "Google Play Store".

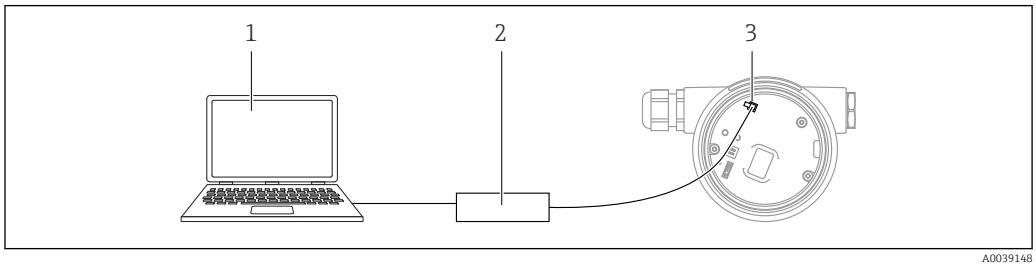
**Initial password**
The serial number of the device serves as the initial password when the connection is established for the first time.

## 7.5 Access to the operating menu via the operating tool

The structure of the operating menu in the operating tools is the same as for operation via the local display. The range of functions is different however.

### 7.5.1 Connecting the operating tool

**Service interface**



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*1 Computer with FieldCare/DeviceCare operating tool*
*2 Commubox FXA291*
*3 Service interface (CDI) of the device (= Endress+Hauser Common Data Interface)*

At least 22 mA is required to update (flash) the device firmware.

### 7.5.2 FieldCare

**Range of functions**

FDT-based plant asset management tool from Endress+Hauser. FieldCare can configure all intelligent field devices in a system and helps you manage them. By using the status information, FieldCare is also a simple but effective way of checking their status and condition.

Access is via:
- CDI service interface
- HART communication

Typical functions:
- Transmitter parameter configuration
- Loading and saving of device data (upload/download)
- Documentation of the measuring point
- Visualization of the measured value memory (line recorder) and event logbook

For additional information about FieldCare, see Operating Instructions BA00027S and BA00059S.

### 7.5.3 DeviceCare

**Range of functions**

Tool for connecting and configuring Endress+Hauser field devices

Together with the device type managers (DTMs), DeviceCare presents a convenient, comprehensive solution.

For details, see Innovation Brochure IN01047S.

## 7.6 HistoROM

When replacing the electronic insert, the stored data is transferred by reconnecting the HistoROM. The device does not work without HistoROM.

The device serial number is saved in the HistoROM. The electronics serial number is saved in the electronics.

# 8 System integration

## 8.1 Overview of device description files

- Manufacturer ID: 17 (0x0011)
- Device type ID: 0x112A
- HART specification: 7.6
- DD files, information and files can be found at:
  - www.endress.com
  - www.fieldcommgroup.org

## 8.2 Measured variables via HART protocol

The following measured values are assigned to the device variables at the factory:

| Device variable | Measured value |
|---|---|
| Primary variable (PV) [1] | Pressure [2] |
| Secondary variable (SV) | Sensor temperature |
| Tertiary variable (TV) | Electronics temperature |
| Quaternary variable (QV) | Sensor pressure [3] |

1) The PV is always applied to the current output.
2) The pressure is the calculated signal after damping and position adjustment.
3) The Sensor pressure is the raw signal of the measuring cell before damping and position adjustment.

The assignment of the measured values to the device variables can be changed in the following submenu:
Application → HART output → HART output

In a HART Multidrop loop, only one device may use the analog current value for signal transmission. For all other devices in the **"Loop current mode" parameter**, select the **Disable** option.

### 8.2.1 Device variables and measured values

The following codes are assigned to the device variables at the factory:

| Device variable | Device variable code |
|---|---|
| Pressure | 0 |
| Scaled variable | 1 |
| Sensor temperature | 2 |
| Sensor pressure | 3 |
| Electronics temperature | 4 |
| Terminal current | 5 |
| Terminal voltage | 6 |
| Median of pressure signal | 7 |
| Noise of pressure signal | 8 |
| Percent of range | 244 |

| Device variable | Device variable code |
|---|---|
| Loop current | 245 |
| Not used | 250 |

The device variables can be queried by a HART® master using HART® command 9 or 33.

### 8.2.2 System units

The following table describes the supported pressure measuring units.

| Index number | Description | Hart unit code |
|---|---|---|
| 0 | mbar | 8 |
| 1 | bar | 7 |
| 2 | Pa | 11 |
| 3 | kPa | 12 |
| 4 | MPa | 237 |
| 5 | psi | 6 |
| 6 | torr | 13 |
| 7 | atm | 14 |
| 8 | mmH2O | 4 |
| 9 | mmH2O (4°C) | 239 |
| 10 | mH2O | 240 |
| 11 | mH2O (4°C) | 240 |
| 10 | ftH2O | 3 |
| 11 | inH2O | 1 |
| 12 | inH2O (4°C) | 238 |
| 13 | mmHg | 5 |
| 14 | inHg | 2 |
| 15 | gf/cm² | 9 |
| 16 | kgf/cm² | 10 |

# 9 Commissioning

## 9.1 Preliminaries

The measuring range and the unit in which the measured value is transmitted correspond to the data on the nameplate.

**⚠ WARNING**

**The settings of the current output are relevant for safety!**
This situation can result in product overflow.
- ▶ The setting of the current output depends on the setting in the **Assign PV** parameter.
- ▶ After changing the **Assign PV** parameter, check the settings for the range (LRV and URV) and reconfigure them if necessary.

**⚠ WARNING**

**Process pressure above or below permitted maximum/minimum!**
Risk of injury if parts burst! Warnings are displayed if the pressure is too high.
- ▶ If a pressure smaller than the minimum permitted pressure or greater than the maximum permitted pressure is present at the device, a message is output.
- ▶ Only use the device within the measuring range limits!

### 9.1.1 As-delivered state

If no customized settings were ordered:

- **Assign PV** parameter **Pressure** option
- Calibration values defined by defined measuring cell nominal value
- The alarm current is set to min. (3.6 mA), (only if no other option was selected when ordering)
- DIP switch to Off position
- If Bluetooth is ordered, then Bluetooth is switched on

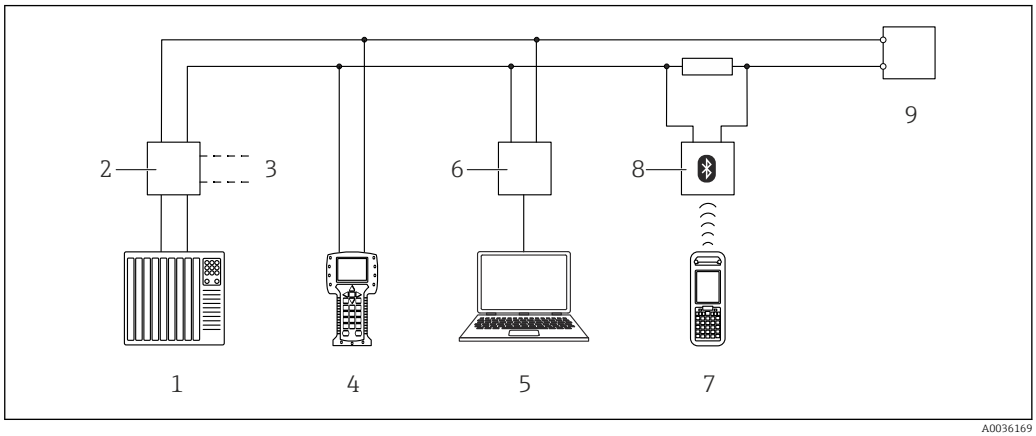
## 9.2 Function check

Perform a function check before putting the measuring point into operation:

- "Post-installation check" checklist (see the "Installation" section)
- "Post-connection check" checklist (see the "Electrical connection" section)

## 9.3 Establishing a connection via FieldCare and DeviceCare

### 9.3.1 Via HART protocol

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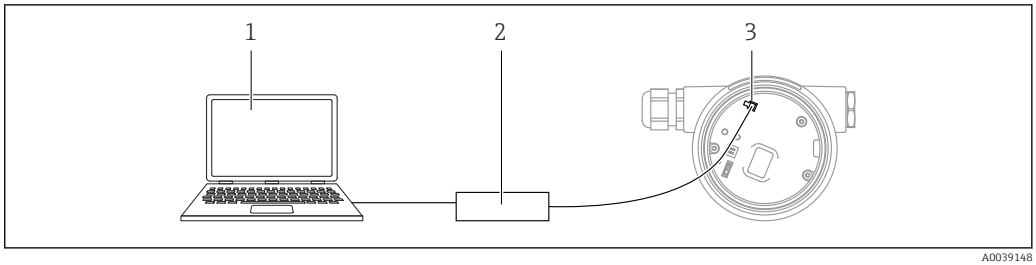
7 *Options for remote operation via HART protocol*

1 *PLC (programmable logic controller)*
2 *Transmitter power supply unit, e.g. RN221N (with communication resistor)*
3 *Connection for Commubox FXA195 and Field Communicator 375, 475*
4 *Field Communicator 475*
5 *Computer with operating tool (e.g. FieldCare/DeviceCare, AMS Device Manager, SIMATIC PDM)*
6 *Commubox FXA195 (USB)*
7 *Field Xpert SFX350/SFX370*
8 *VIATOR Bluetooth modem with connecting cable*
9 *Device*

### 9.3.2 FieldCare/DeviceCare via service interface (CDI)




A0039148

1 *Computer with FieldCare/DeviceCare operating tool*
2 *Commubox FXA291*
3 *Service interface (CDI) of the device (= Endress+Hauser Common Data Interface)*

At least 22 mA is required to update (flash) the device firmware.

## 9.4 Configuring the device address via software

See the **HART address** parameter.

Menu path: Application → HART output → Configuration → HART address

## 9.5 Setting the operating language

### 9.5.1 Local display

**Setting the operating language**

To set the operating language, the display first needs to be unlocked:

1. Press the E key for at least 2 s.
   ↳ A dialog box appears.
2. Unlock the display operation.
3. Select the **Language** parameter in the main menu.
4. Press the E key.
5. Select the desired language with the + or − key.
6. Press the E key.

Display operation locks automatically:
- after 1 min on the main page if no key has been pressed
- after 10 min within the operating menu if no key has been pressed

**Display operation - locking or unlocking**

The E key must be pressed for at least 2 seconds in order to lock or unlock the optical keys. Display operation can be locked or unlocked in the dialog that appears.

Display operation locks automatically (except in the SIL wizard):
- After 1 minute on the main page if no key has been pressed
- After 10 minutes within the operating menu if no key has been pressed

### 9.5.2 Operating tool

See the description of the operating tool.

## 9.6 Configuring the device

### 9.6.1 Commissioning with keys on the electronic insert

The following functions are possible via the keys on the electronic insert:
- Position adjustment (zero point correction)
  The orientation of the device may cause a pressure shift
  This pressure shift can be corrected by a position adjustment
- Setting the lower range value and upper range value
  The pressure applied must be within the nominal pressure limits of the sensor (see the specifications on the nameplate)
- Resetting the device

**Carrying out position adjustment**

1. Device installed in desired position and no pressure applied.
2. Press the "Zero" and "Span" keys simultaneously for at least 3 s.
3. When the LED lights up briefly, the pressure present has been accepted for position adjustment.

**Setting the lower range value (pressure or scaled variable)**

1. The desired pressure for the lower range value is present at the device.

2. Press the "Zero" key for at least 3 s.
3. When the LED lights up briefly, the pressure present has been accepted for the lower range value.

### Setting the upper range value (pressure or scaled variable)

1. The desired pressure for the upper range value is present at the device.
2. Press the "Span" key for at least 3 s.
3. When the LED lights up briefly, the pressure present has been accepted for the upper range value.
4. Does the LED on the electronic insert not light up?
   ↳ Applied pressure for upper range value has not been accepted.
   Wet calibration is not possible if the **Scaled variable** option has been selected in the **Assign PV** parameter and the **Table** option has been selected in the **Scaled variable transfer function** parameter.

### Checking the settings (pressure or scaled variable)

1. Press the "Zero" key briefly (approx. 1 second) in order to display the lower range value.
2. Press the "Span" key briefly (approx. 1 second) in order to display the upper range value.
3. Briefly press the "Zero" and "Span" keys simultaneously (approx. 1 second) in order to display the position offset.

### Resetting the device

- Press and hold the "Zero" and "Span" keys simultaneously for at least 12 seconds.

### 9.6.2 Commissioning with the Commissioning wizard

In FieldCare, DeviceCare [1], SmartBlue and on the display, the **Commissioning** wizard is available to guide the user through the initial commissioning steps. Commissioning is also possible via AMS or PDM.

1. Connect the device with FieldCare or DeviceCare.
2. Open the device in FieldCare or DeviceCare.
   ↳ The dashboard (homepage) of the device is displayed:
3. In the **Guidance** menu, click the **Commissioning** wizard to open the wizard.
4. Enter the appropriate value in each parameter or select the appropriate option. These values are written directly to the device.
5. Click "Next" to go to the next page.
6. Once all the pages have been completed, click "End" to close the **Commissioning** wizard.

If the **Commissioning** wizard is cancelled before all the necessary parameters have been configured, the device may be in an undefined state. In such situations, it is advisable to reset the device to the factory default settings.

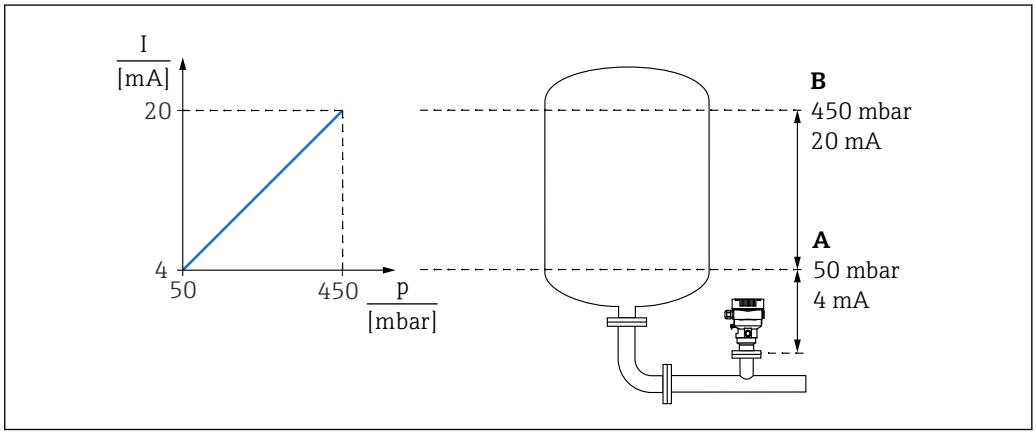
1) DeviceCare is available for download at www.software-products.endress.com. You must register in the Endress+Hauser software portal to download the product.

**Example: Outputting of the pressure value at the current output**

Pressure and temperature units are converted automatically. Other units are not converted.

In the following example, the pressure value should be measured in a tank and output on the current output. The maximum pressure of 450 mbar (6.75 psi) corresponds to the 20 mA current. The 4 mA current corresponds to a pressure of 50 mbar (0.75 psi).

Prerequisites:
- Measured variable in direct proportion to the pressure
- Due to the orientation of the device, there may be pressure shifts in the measured value (when the vessel is empty or partly filled, the measured value is not zero)
  Perform a position adjustment if necessary
- In the **Assign PV** parameter, the **Pressure** option must be selected (factory setting)
  Display: In the **Guidance** menu **Commissioning** wizard, keep pressing the ⊞ key until you reach the **Assign PV** parameter. Press the Ⓔ key to confirm, select the **Pressure** option and press Ⓔ to confirm.




*A Lower range value output*
*B Upper range value output*

Adjustment:

1. Enter the pressure value for the 4 mA current via the **Lower range value output** parameter (50 mbar (0.75 psi)).
2. Enter the pressure value for the 20 mA current via the **Upper range value output** parameter (450 mbar (6.75 psi))

Result: The measuring range is set to 4 to 20 mA.

## 9.6.3 Commissioning without the commissioning wizard

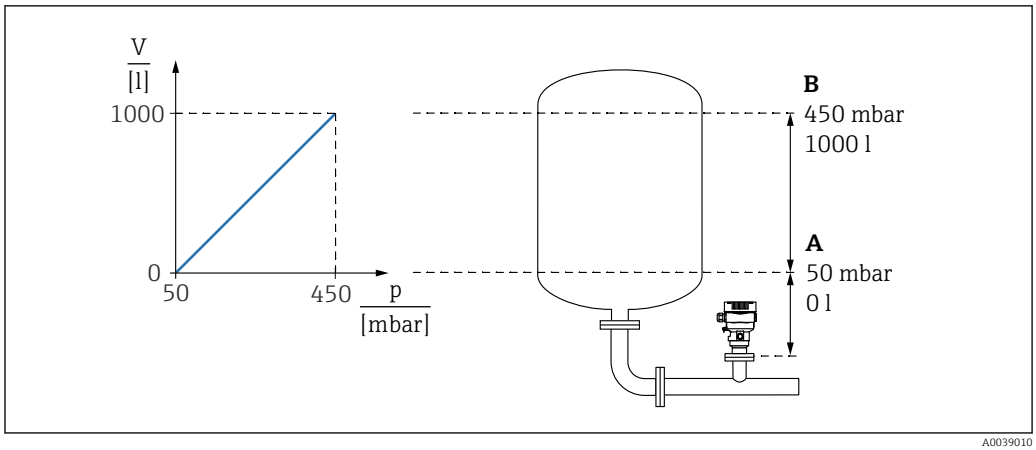
**Example: Commissioning a volume measurement in the tank**

Pressure and temperature units are converted automatically. Other units are not converted.

In the following example, the volume in a tank should be measured in liters. The maximum volume of 1 000 l (264 gal) corresponds to a pressure of 450 mbar (6.75 psi).

The minimum volume of 0 liters corresponds to a pressure of 50 mbar (0.75 psi).

Prerequisites:
- Measured variable in direct proportion to the pressure
- Due to the orientation of the device, there may be pressure shifts in the measured value (when the vessel is empty or partly filled, the measured value is not zero)
  Perform position adjustment if necessary




*A "Pressure value 1" parameter and "Scaled variable value 1" parameter*
*B "Pressure value 2" parameter and "Scaled variable value 2" parameter*

The pressure present is displayed in the operating tool on the same settings page in the "Pressure" field.

1. Enter the pressure value for the lower calibration point via the **Pressure value 1** parameter: 50 mbar (0.75 psi)
   ↳ Menu path: Application → Sensor → Scaled variable → Pressure value 1
2. Enter the volume value for the lower calibration point via the **Scaled variable value 1** parameter: 0 l (0 gal)
   ↳ Menu path: Application → Sensor → Scaled variable → Scaled variable value 1
3. Enter the pressure value for the upper calibration point via the **Pressure value 2** parameter: 450 mbar (6.75 psi)
   ↳ Menu path: Application → Sensor → Scaled variable → Pressure value 2
4. Enter the volume value for the upper calibration point via the **Scaled variable value 2** parameter: 1 000 l (264 gal)
   ↳ Menu path: Application → Sensor → Scaled variable → Scaled variable value 2

Result: The measuring range is set for 0 to 1 000 l (0 to 264 gal). Only the **Scaled variable value 1** parameter and **Scaled variable value 2** parameter are set with this setting. This setting has no effect on the current output.

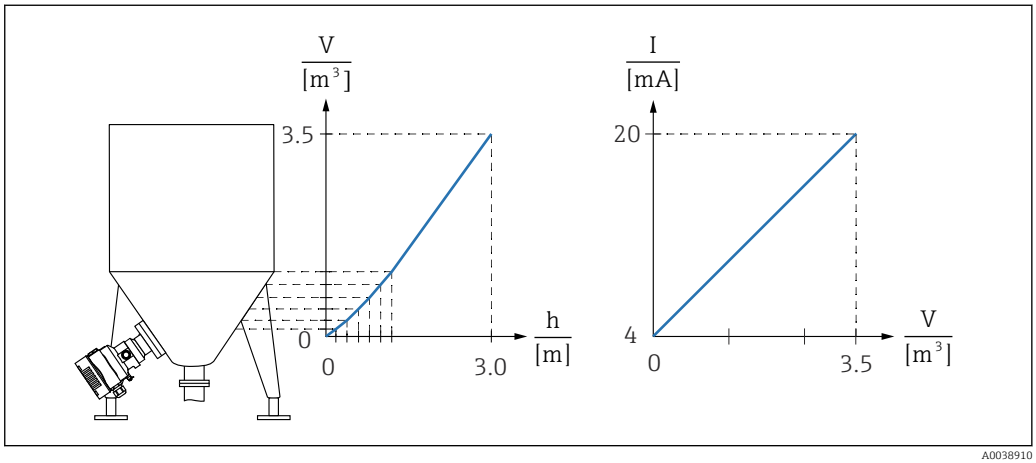
### 9.6.4 Linearization

In the following example, the volume in a tank with a conical outlet should be measured in $m^3$.

Prerequisites:
- Points for linearization table are known.
- Level calibration is performed.
- Linearization characteristic must continually increase or decrease.

**⚠ WARNING**

**The settings of the current output are relevant for safety!**
This situation can result in product overflow.
- ▶ The setting of the current output depends on the setting in the **Assign PV** parameter.
- ▶ After changing the **Assign PV** parameter, check the settings for the range (LRV and URV) and reconfigure them if necessary.




1. In the **Assign PV** parameter, the **Scaled variable** option must be configured.
   ↳ Menu path: Application → HART output → HART output → Assign PV
2. In the **Scaled variable unit** parameter, set the desired unit.
   ↳ Menu path: Application → Sensor → Scaled variable → Scaled variable unit
3. The linearization table can be opened via the **Go to linearization table** parameter **Table** option.
   ↳ Menu path: Application → Sensor → Scaled variable → Scaled variable transfer function
4. Enter the desired table values.
5. The table is activated once all the points in the table have been entered.
6. Activate the table using the **Activate table** parameter.

Result:

The measured value after linearization is displayed.

- Error message F435 "Linearization" and the alarm current appear as long as the table is being entered and until the table is activated.
- The 0% value (= 4 mA) is defined by the smallest point in the table.
  The 100% value (= 20 mA) is defined by the largest point in the table.
- The assignment of the volume/mass values to the current values can be changed with the **Lower range value output** parameter and **Upper range value output** parameter

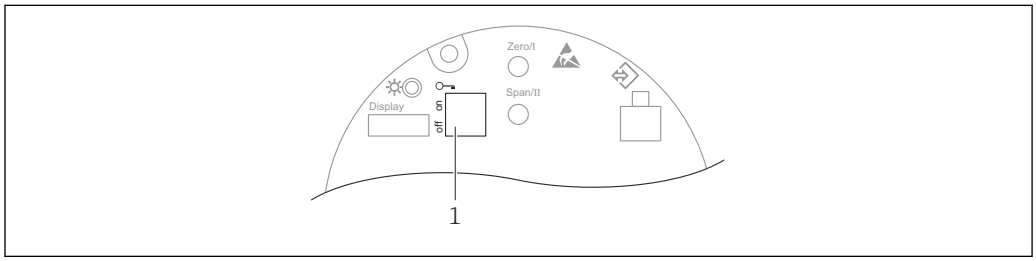
## 9.7 "Simulation" submenu

With the **Simulation** submenu, the pressure, current and diagnostic events can be simulated.

Menu path: Diagnostics → Simulation

## 9.8 Protecting settings from unauthorized access

### 9.8.1 Hardware locking or unlocking




A0043441

*1 DIP switch for locking and unlocking the device*

DIP switch 1 on the electronic insert is used to lock or unlock operation.

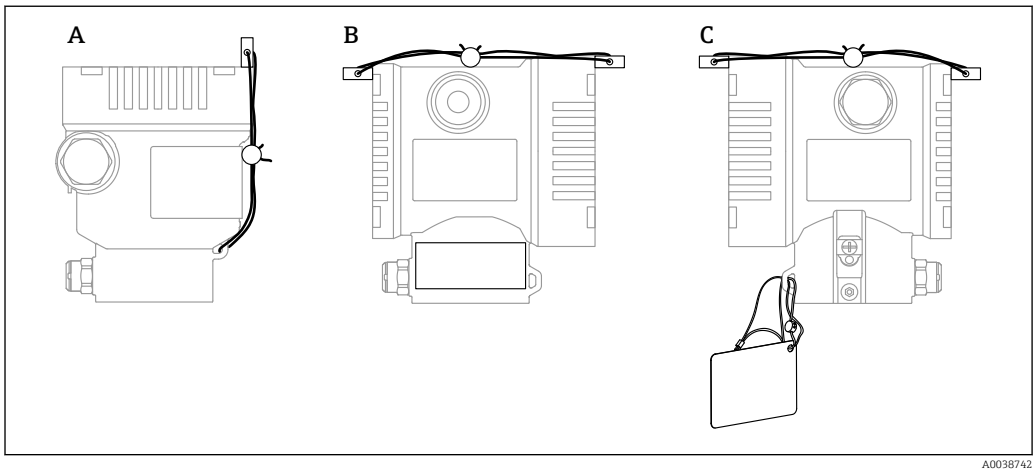
If operation is locked via the DIP switch, you can only unlock operation again via the DIP switch.

If operation is locked via the operating menu, you can only unlock operation again via the operating menu.

If operation is locked via the DIP switch, the key symbol appears on the local display.

#### Sealing the device

The housing cover is designed to be sealed for use in custody transfer.




A0038742

*A Single compartment housing*
*B Dual compartment housing*

### 9.8.2 Display operation - locking or unlocking

The E key must be pressed for at least 2 seconds in order to lock or unlock the optical keys. Display operation can be locked or unlocked in the dialog that appears.

Display operation locks automatically (except in the SIL wizard):
- After 1 minute on the main page if no key has been pressed
- After 10 minutes within the operating menu if no key has been pressed

### 9.8.3 Software locking or unlocking

If operation is locked by means of the DIP switch, you can only unlock operation again by means of the DIP switch.

#### Locking via password in display / FieldCare / DeviceCare / SmartBlue

Access to the device configuration can be locked by assigning a password. The user role is set to **Maintenance** option when the device is delivered to the customer. The device can be fully configured with the **Maintenance** option user role. Afterwards, access to the configuration can be locked by assigning a password. The lock sets the **Maintenance** option to the **Operator** option. The configuration can be accessed by entering the password.

The password is defined under:

**System** menu **User management** submenu

The user role can be changed from **Maintenance** option to **Operator** option under:

System → User management

#### Disabling the lock via the display / FieldCare / DeviceCare / SmartBlue

Once the password is entered, you can enable the configuration of the device as an **Operator** option by entering the password. The user role then changes to **Maintenance** option.

The password can be deleted if necessary in the **User management** submenu: System → User management

# 10 Operation

## 10.1 Reading off the device locking status

Displaying active write protection:
- In the **Locking status** parameter
  Menu path of local display: at the top operating level
  Menu path of operating tool: System → Device management
- In the operating tool (FieldCare/DeviceCare) in the DTM header

## 10.2 Reading off measured values

All the measured values can be read off using the **Measured values** submenu.

**Navigation**
"Application" menu → Measured values

## 10.3 Adapting the device to process conditions

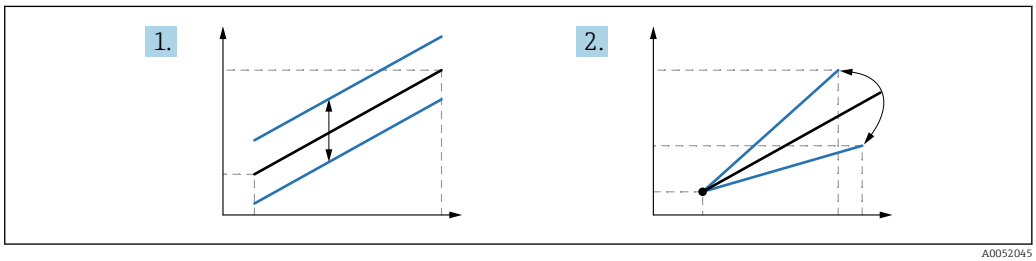
The following are available for this purpose:
- Basic settings using the **Guidance** menu
- Advanced settings using the **Diagnostics** menu, **Application** menu and **System** menu

### 10.3.1 Sensor calibration [2)]

In the course of their life cycle, pressure sensors **can** deviate, or drift, [3)] from the original pressure characteristic curve. This deviation depends on the operating conditions and can be corrected in the **Sensor calibration** submenu.

Set the value of the zero point shift to 0.00 before the Sensor calibration. Application → Sensor → Sensor calibration → Zero adjustment offset

1. Apply the lower pressure value (value measured with pressure reference) to the device. Enter this pressure value in the **Lower sensor trim** parameter. Application → Sensor → Sensor calibration → Lower sensor trim
   ↳ The value entered causes a parallel shift of the pressure characteristic in relation to the current Sensor calibration.
2. Apply the upper pressure value (value measured with pressure reference) to the device. Enter this pressure value in the **Upper sensor trim** parameter. Application → Sensor → Sensor calibration → Upper sensor trim
   ↳ The value entered causes a change in the slope of the current Sensor calibration.




The accuracy of the pressure reference determines the accuracy of the device. The pressure reference must be more accurate than the device.

2) Not possible with display.
3) Deviations caused by physical factors are also known as "Sensor drift".

# 11 Diagnosis and troubleshooting

## 11.1 General troubleshooting

### 11.1.1 General errors

**Device not responding**
- Possible cause: Supply voltage does not match the specification on the nameplate
  Remedial action: Apply the correct voltage
- Possible cause: The polarity of the supply voltage is wrong
  Remedial action: Correct the polarity
- Possible cause: The cables do not contact the terminals properly
  Remedial action: Check the electrical contact between cables and correct if necessary
- Possible cause: Load resistance too high
  Remedial action: Increase the supply voltage to reach the minimum terminal voltage

**No values visible on the display**
- Possible cause: Graphic display is set too bright or too dark
  Remedial action: Increase or decrease the contrast with the **Contrast display** parameter
  Navigation path: System → Display → Contrast display
- Possible cause: The plug of the display cable is not connected correctly
  Remedial action: Connect the plug correctly
- Possible cause: Display is defective
  Remedial action: Replace the display

**No background lighting on the graphic display**
Possible cause: The electric current and voltage are not correct.
Remedial action: Increase the supply voltage and restart the device.

**"Communication error" is indicated on the display when the device is started or the display is connected**
- Possible cause: Electromagnetic interference influence
  Remedial action: Check grounding of the device
- Possible cause: Defective cable connection or display plug
  Remedial action: Replace the display

**HART communication not working**
- Possible cause: Communication resistor missing or incorrectly installed
  Remedial action: Install the communication resistor (250 Ω) correctly
- Possible cause: Commubox is connected incorrectly
  Remedial action: Connect Commubox correctly

**Communication via CDI interface not working**
Possible cause: Wrong setting of the COM port on the computer
Remedial action: Check the setting of the COM port on the computer and correct it if necessary

### 11.1.2 Error - SmartBlue operation

Operation via SmartBlue is only possible on devices that have a display with Bluetooth (optionally available).

**Device is not visible in the live list**
- Possible cause: Supply voltage too low
  Remedial action: Increase the supply voltage.
- Possible cause: No Bluetooth connection available
  Remedial action: Enable Bluetooth in the field device via display or software tool and/or in the smartphone/tablet
- Possible cause: Bluetooth signal outside range
  Remedial action: Reduce distance between field device and smartphone/tablet
  The connection has a range of up to 25 m (82 ft)
- Possible cause: Geopositioning is not enabled on Android devices or is not permitted for the SmartBlue app.
  Remedial action: Enable/permit the geopositioning service on Android device for the SmartBlue app.

**Device appears in the live list but a connection cannot be established**
- Possible cause: The device is already connected with another smartphone/tablet via Bluetooth.
  Only one point-to-point connection is permitted
  Remedial action: Disconnect the smartphone/tablet from the device
- Possible cause: Incorrect user name and password
  Remedial action: The standard user name is "admin" and the password is the device serial number indicated on the device nameplate (only if the password was not changed by the user beforehand)
  If the password has been forgotten: → 🖹 64

**Connection via SmartBlue not possible**
- Possible cause: Incorrect password entered
  Remedial action: Enter the correct password, paying attention to lower/upper case
- Possible cause: Forgotten password
  Remedial action: → 🖹 64

**No communication with device via SmartBlue**
- Possible cause: Supply voltage too low
  Remedial action: Increase the supply voltage.
- Possible cause: No Bluetooth connection available
  Remedial action: Enable the Bluetooth function on the smartphone, tablet and device
- Possible cause: The device is already connected with another smartphone/tablet
  Remedial action: Disconnect the device from the other smartphone/tablet
- Ambient conditions (e.g. walls/tanks) disturbing the Bluetooth connection
  Remedial action: Establish direct line-of-sight connection
- Display does not have Bluetooth

**Device cannot be operated via SmartBlue**
- Possible cause: Incorrect password entered
  Remedial action: Enter the correct password, paying attention to lower/upper case
- Possible cause: Forgotten password
  Remedial action: → 🖹 64
- Possible cause: **Operator** option has no authorization.
  Remedial action: Change to the **Maintenance** option.

### 11.1.3 Additional tests

If no clear cause of the error can be identified or the source of the problem can be both the device and the application, the following additional tests can be performed:

1. Check the digital pressure value (display, HART, .. ).
2. Check that the device concerned is functioning correctly. Replace the device if the digital value does not correspond to the expected pressure value.
3. Switch on the simulation and check the current output. Replace the main electronics if the current output does not correspond to the simulated value.

### 11.1.4 Response of current output to errors

The response of the current output to errors is defined by the **Failure behavior current output** parameter.

**Parameter overview with brief description**

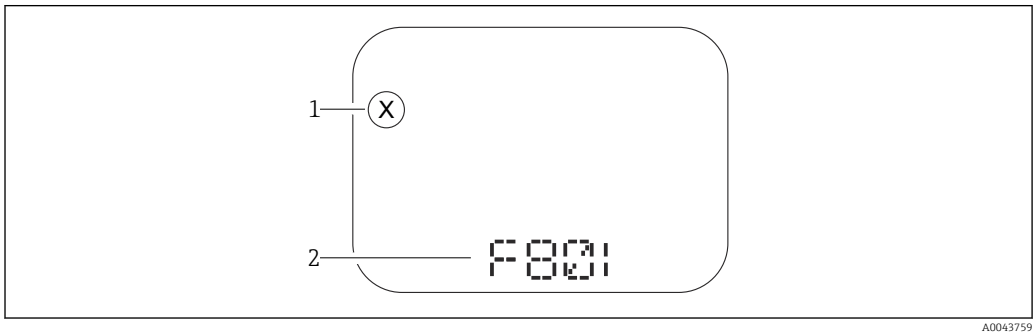
| Parameter | Description | Selection / User entry |
|---|---|---|
| Failure behavior current output | Defines which current the output assumes in the case of an error.<br>Min: < 3.6 mA<br>Max: >21.5 mA<br>Note: The hardware DIP Switch for alarm current has priority over software setting. | ▪ Min.<br>▪ Max. |
| Failure current | Enter current output value in alarm condition. | 21.5 to 23 mA |

## 11.2 Diagnostic information on local display

### 11.2.1 Diagnostic message

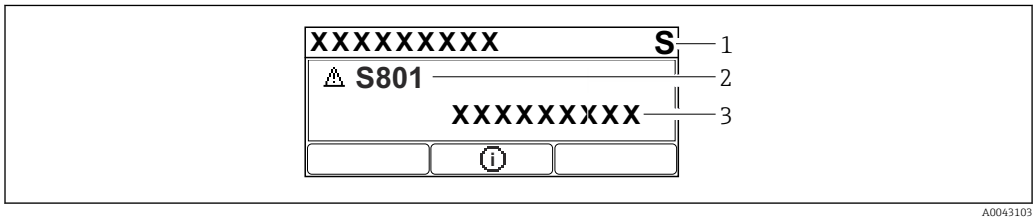
#### Measured value display and diagnostic message in alarm condition

Faults detected by the device's self-monitoring system are displayed as a diagnostic message in alternation with the unit.




*1 Status signal*
*2 Status symbol with diagnostic event*

Faults detected by the device's self-monitoring system are displayed as a diagnostic message in alternation with the measured value display.




*1 Status signal*
*2 Status symbol with diagnostic event*
*3 Event text*

#### Status signals

*F*

**"Failure (F)" option**
A device error has occurred. The measured value is no longer valid.

*C*

**"Function check (C)" option**
The device is in the service mode (e.g. during a simulation).

*S*

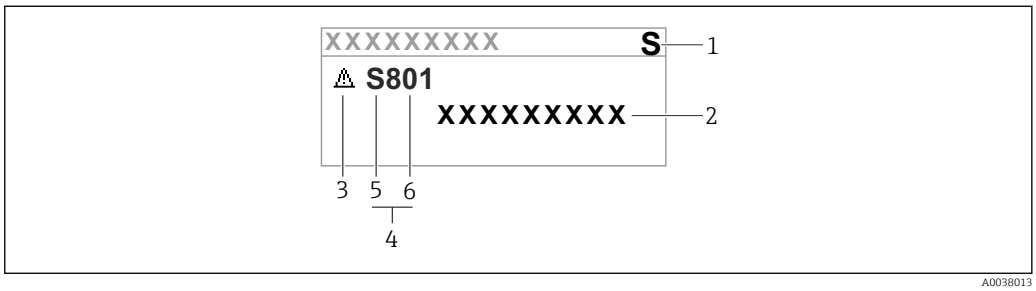
**"Out of specification (S)" option**
The device is being operated:
- Outside of its technical specifications (e.g. during startup or a cleaning)
- Outside of the configuration performed by the user (e.g. level outside configured span)

*M*

**"Maintenance required (M)" option**
Maintenance required. The measured value remains valid.

### Diagnostic event and event text

The fault can be identified by means of the diagnostic event. The event text helps you by providing information about the fault. In addition, the corresponding status symbol is displayed in front of the diagnostic event.




*1 Status signal*
*2 Event text*
*3 Status symbol*
*4 Diagnostic event*
*5 Status signal*
*6 Event number*

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

### "Active diagnostics" parameter

*Key* ⊞

Opens the message about the remedial measures.

*Key* ⊟

Acknowledge warnings.

*Key* Ⓔ

Back to operating menu.

## 11.3 Diagnostic event in the operating tool

If a diagnostic event has occurred in the device, the status signal appears in the top left status area of the operating tool together with the corresponding symbol for the event level according to NAMUR NE 107:

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)

Click the status signal to see the detailed status signal.

The diagnostic events and remedial measures can be printed out in the **Diagnostic list** submenu.

## 11.4 Adapting the diagnostic information

The event level can be configured:

Menu path: Diagnostics → Diagnostic settings → Configuration

## 11.5 Queued diagnostic messages

The display alternates between the queued diagnostic messages and the measured value.

Queued diagnostic messages can also be displayed in the **Active diagnostics** parameter.

Menu path: Diagnostics → Active diagnostics

## 11.6 Diagnostic list

All of the diagnostic messages currently pending can be displayed in the **Diagnostic list** submenu.

**Navigation path**
Diagnostics → Diagnostic list

### 11.6.1 List of diagnostic events

| Diagnostic number | Short text | Remedy instructions | Status signal [from the factory] | Diagnostic behavior [from the factory] |
|---|---|---|---|---|
| **Diagnostic of sensor** | | | | |
| 062 | Sensor connection faulty | Check sensor connection | F | Alarm |
| 081 | Sensor initialization faulty | 1. Restart device<br>2. Contact service | F | Alarm |
| 100 | Sensor error | 1. Restart the device<br>2. Contact Endress+Hauser Service | F | Alarm |
| 101 | Sensor temperature | 1. Check process temperature<br>2. Check ambient temperature | F | Alarm |
| 102 | Sensor incompatible error | 1. Restart device<br>2. Contact service | F | Alarm |
| **Diagnostic of electronic** | | | | |
| 203 | HART Device Malfunction | Check device specific diagnosis. | S | Warning |
| 204 | HART Electronic Defect | Check device specific diagnosis. | F | Alarm |
| 242 | Firmware incompatible | 1. Check software<br>2. Flash or change main electronic module | F | Alarm |
| 252 | Module incompatible | 1. Check if correct electronic module is plugged<br>2. Replace electronic module | F | Alarm |
| 263 | Incompatibility detected | Check electronic module type | M | Warning |
| 270 | Main electronics defective | Replace main electronics | F | Alarm |
| 272 | Main electronics faulty | 1. Restart device<br>2. Contact service | F | Alarm |
| 273 | Main electronics defective | Replace main electronics | F | Alarm |
| 282 | Data storage inconsistent | Restart device | F | Alarm |
| 283 | Memory content inconsistent | 1. Restart device<br>2. Contact service | F | Alarm |
| 287 | Memory content inconsistent | 1. Restart device<br>2. Contact service | M | Warning |
| 388 | Electronics and HistoROM defective | 1. Restart device<br>2. Replace electronics and HistoROM<br>3. Contact service | F | Alarm |
| **Diagnostic of configuration** | | | | |
| 410 | Data transfer failed | 1. Retry data transfer<br>2. Check connection | F | Alarm |
| 412 | Processing download | Download active, please wait | C | Warning |
| 420 | HART Device Configuration Locked | Check device locking configuration. | S | Warning |
| 421 | HART Loop Current fixed | Check Multi-drop mode or current simulation. | S | Warning |
| 431 | Trim required | Carry out trim | C | Warning |
| 435 | Linearization faulty | Check data points and min span | F | Alarm |

| Diagnostic number | Short text | Remedy instructions | Status signal [from the factory] | Diagnostic behavior [from the factory] |
|---|---|---|---|---|
| 437 | Configuration incompatible | 1. Update firmware<br>2. Execute factory reset | F | Alarm |
| 438 | Dataset different | 1. Check dataset file<br>2. Check device parameterization<br>3. Download new device parameterization | M | Warning |
| 441 | Current output 1 saturated | 1. Check process<br>2. Check current output settings | S | Warning |
| 484 | Failure mode simulation active | Deactivate simulation | C | Alarm |
| 485 | Process variable simulation active | Deactivate simulation | C | Warning |
| 491 | Current output simulation active | Deactivate simulation | C | Warning |
| 495 | Diagnostic event simulation active | Deactivate simulation | S | Warning |
| 500 | Process alert pressure | 1. Check process pressure<br>2. Check configuration of process alert | S | Warning [1)] |
| 501 | Process alert scaled variable | 1. Check process conditions<br>2. Check scaled variable configuration | S | Warning [1)] |
| 502 | Process alert temperature | 1. Check process temperature<br>2. Check configuration of process alert | S | Warning [1)] |
| 503 | Zero adjustment | 1. Check measuring range<br>2. Check position adjustment | M | Warning |
| **Diagnostic of process** | | | | |
| 801 | Supply voltage too low | Increase supply voltage | F | Alarm |
| 802 | Supply voltage too high | Decrease supply voltage | S | Warning |
| 805 | Loop current faulty | 1. Check wiring<br>2. Replace electronics | F | Alarm |
| 806 | Loop diagnostics | 1. Check supply voltage<br>2. Check wiring and terminals | M | Warning [1)] |
| 807 | No Baseline due to insuf. volt. at 20 mA | Increase supply voltage | M | Warning |
| 822 | Sensor temperature out of range | 1. Check process temperature<br>2. Check ambient temperature | S | Warning [1)] |
| 825 | Electronics temperature | 1. Check ambient temperature<br>2. Check process temperature | S | Warning |
| 841 | Operating range | 1. Check the process pressure<br>2. Check the sensor range | S | Warning [1)] |
| 846 | HART Non-Primary Variable Out of Limit | Check device specific diagnosis. | S | Warning |
| 847 | HART Primary Variable Out of Limit | Check device specific diagnosis. | S | Warning |
| 848 | HART Device Variable Alert | Check device specific diagnosis. | S | Warning |
| 900 | High signal noise detected | 1. Check impulse line<br>2. Check valve position<br>3. Check process | M | Warning [1)] |

| Diagnostic number | Short text | Remedy instructions | Status signal [from the factory] | Diagnostic behavior [from the factory] |
|---|---|---|---|---|
| 901 | Low signal noise detected | 1. Check impulse line<br>2. Check valve position<br>3. Check process | M | Warning [1] |
| 902 | Min signal noise detected | 1. Check impulse line<br>2. Check valve position<br>3. Check process | M | Warning [1] |
| 906 | Out of range signal detected | 1. Process Information. No action<br>2. Rebuild baseline<br>3. Adapt signal range thresholds | S | Warning [1] |

1) Diagnostic behavior can be changed.

## 11.7 Event logbook

### 11.7.1 Event history

The **Event list** submenu provides a chronological overview of the event messages that have occurred [4].

**Navigation path**
Diagnostics → Event logbook

A maximum of 100 event messages can be displayed in chronological order.

The event history includes entries for:
- Diagnostic events
- Information events

In addition to the operating time when the event occurred, each event is also assigned a symbol that indicates whether the event has occurred or is finished:
- Diagnostic event
  - ⊕: Occurrence of the event
  - ⊖: End of the event
- Information event
  ⊕: Occurrence of the event

### 11.7.2 Filtering the event logbook

Filters can be used to determine which category of event messages is displayed in the **Event list** submenu.

**Navigation path**
Diagnostics → Event logbook

### 11.7.3 Overview of information events

| Info number | Info name |
|---|---|
| I1000 | --------(Device ok) |
| I1079 | Sensor changed |
| I1089 | Power on |
| I1090 | Configuration reset |

4) If operating via FieldCare, the event list can be displayed with the "Event List/HistoROM" function in FieldCare.

| Info number | Info name |
|---|---|
| I1091 | Configuration changed |
| I11074 | Device verification active |
| I1110 | Write protection switch changed |
| I11104 | Loop diagnostics |
| I11284 | DIP MIN setting to HW active |
| I11285 | DIP SW setting active |
| I11341 | SSD baseline created |
| I1151 | History reset |
| I1154 | Reset terminal voltage min/max |
| I1155 | Reset electronics temperature |
| I1157 | Memory error event list |
| I1256 | Display: access status changed |
| I1264 | Safety sequence aborted |
| I1335 | Firmware changed |
| I1397 | Fieldbus: access status changed |
| I1398 | CDI: access status changed |
| I1440 | Main electronic module changed |
| I1444 | Device verification passed |
| I1445 | Device verification failed |
| I1461 | Sensor verification failed |
| I1512 | Download started |
| I1513 | Download finished |
| I1514 | Upload started |
| I1515 | Upload finished |
| I1551 | Assignment error fixed |
| I1552 | Failed: Main electronic verification |
| I1554 | Safety sequence started |
| I1555 | Safety sequence confirmed |
| I1556 | Safety mode off |
| I1956 | Reset |

### 11.7.4 Overview of information events

| Info number | Info name |
|---|---|
| I1000 | --------(Device ok) |
| I1079 | Sensor changed |
| I1089 | Power on |
| I1090 | Configuration reset |
| I1091 | Configuration changed |
| I11074 | Device verification active |
| I1110 | Write protection switch changed |
| I11104 | Loop diagnostics |
| I11284 | DIP MIN setting to HW active |

| Info number | Info name |
|---|---|
| I11285 | DIP SW setting active |
| I11341 | SSD baseline created |
| I1151 | History reset |
| I1154 | Reset terminal voltage min/max |
| I1155 | Reset electronics temperature |
| I1157 | Memory error event list |
| I1256 | Display: access status changed |
| I1264 | Safety sequence aborted |
| I1335 | Firmware changed |
| I1397 | Fieldbus: access status changed |
| I1398 | CDI: access status changed |
| I1440 | Main electronic module changed |
| I1444 | Device verification passed |
| I1445 | Device verification failed |
| I1461 | Sensor verification failed |
| I1512 | Download started |
| I1513 | Download finished |
| I1514 | Upload started |
| I1515 | Upload finished |
| I1551 | Assignment error fixed |
| I1552 | Failed: Main electronic verification |
| I1554 | Safety sequence started |
| I1555 | Safety sequence confirmed |
| I1556 | Safety mode off |
| I1956 | Reset |

## 11.8 Device reset

### 11.8.1 Resetting the device using the operating tool

Reset the device configuration - either entirely or in part - to a defined state

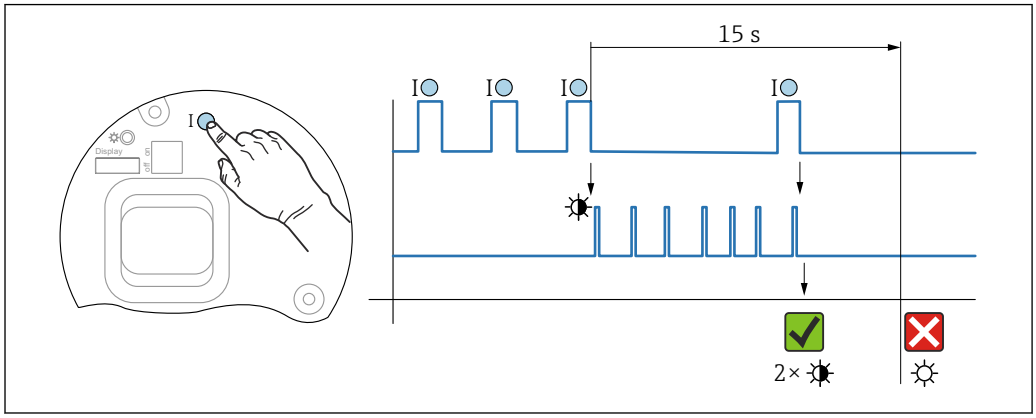
Navigation: System → Device management → Reset device

**Reset device** parameter

For details see the "Description of device parameters" documentation.

### 11.8.2 Resetting the device via electronic insert keys

#### Resetting Bluetooth password and user role (SW 1/1/2000 and higher)



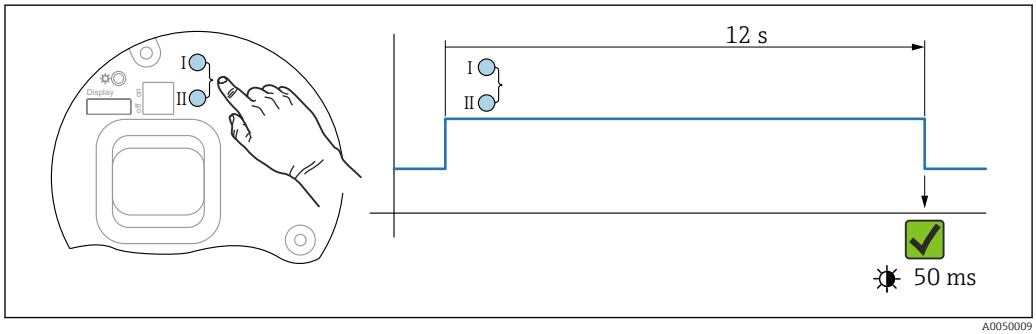

8 *Sequence for resetting the password*

#### Delete/reset the password

1. Press operating key I three times.
   ↳ The reset password function is started, the LED flashes.
2. Within 15 s, press operating key I once.
   ↳ The password is reset, and the LED flashes briefly.

If operating key I is not pressed within 15 s, the action is canceled and the LED goes out.

#### Resetting the device to the factory setting




9 *Operating keys on the electronic insert*

#### Resetting the device to the factory setting

- Simultaneously press the I and II operating keys for at least 12 s.
  ↳ Device data are reset to the factory setting, the LED flashes briefly.

## 11.9 Device information

All the device information is contained in the **Information** submenu.

Menu path: System → Information

For details see the "Description of device parameters" document.

## 11.10 Firmware history

The firmware version can explicitly be ordered via the product structure. This makes it possible to ensure the compatibility of the firmware version with an existing or planned system integration.

### 11.10.1 Version 01.00.zz

Original software

### 11.10.2 Version 01.01.zz

- Heartbeat Technology extended functionality
- HART condensed status

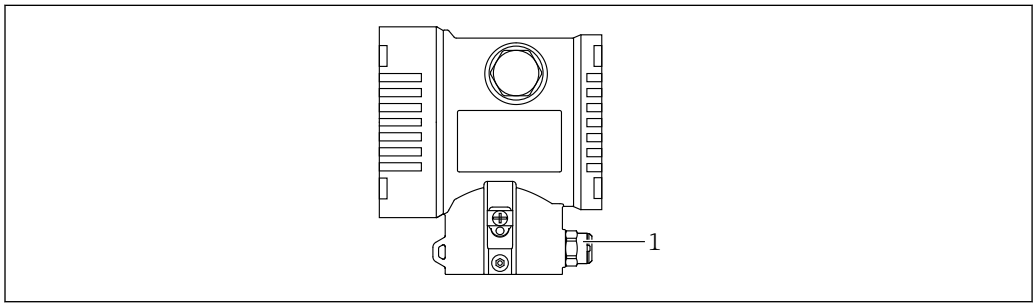
# 12 Maintenance

## 12.1 Maintenance work

This chapter describes the maintenance of physical device components.

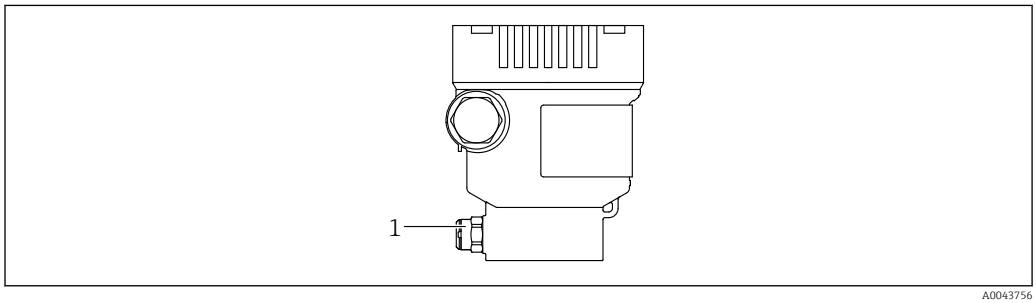
### 12.1.1 Pressure compensation filter

Keep the pressure compensation filter (1) free from contamination.




A0038667

*1 Pressure compensation filter*




A0043756

*1 Pressure compensation filter*

### 12.1.2 Flushing rings

The use of flushing rings allows the membrane to be cleaned without removing the device from the process.

For more information: contact the Endress+Hauser sales office.

### 12.1.3 Exterior cleaning

**Notes on cleaning**

- The cleaning agents used should not corrode the surfaces and the seals
- Mechanical damage to the membrane, e.g. due to sharp objects, must be avoided
- Observe the degree of protection of the device

# 13 Repair

## 13.1 General information

### 13.1.1 Repair concept

Under the Endress+Hauser repair concept, devices have a modular design and repairs are carried out by Endress+Hauser Service or by properly trained customers.

Spare parts are grouped into logical kits with the associated replacement instructions.

For more information on service and spare parts contact Endress+Hauser Service.

### 13.1.2 Repair of Ex-certified devices

**⚠ WARNING**

**Incorrect repair can compromise electrical safety!**
Explosion Hazard!

- ▶ Repairs to Ex-certified devices must be carried out by Endress+Hauser Service or by specialist personnel according to national regulations.
- ▶ Relevant standards and national regulations on hazardous areas, safety instructions and certificates must be observed.
- ▶ Use only original Endress+Hauser spare parts.
- ▶ Please note the device designation on the nameplate. Only identical parts may be used as replacements.
- ▶ Carry out repairs according to the instructions.
- ▶ Only the Endress+Hauser service team is permitted to modify a certified device and convert it to another certified version.

## 13.2 Spare parts

- Some replaceable device components are identified by a spare part nameplate. This contains information about the spare part.
- All the spare parts for the measuring device, along with the order code, are listed in the *Device Viewer* (www.endress.com/deviceviewer) and can be ordered. If available, users can also download the associated Installation Instructions.

Device serial number:
- Located on the device and spare part nameplate.
- Can be read out via the device software.

## 13.3 Replacement

**⚠ CAUTION**

**Data upload/download is not permitted if the device is used for safety-related applications.**

- ▶ After an entire device or an electronics module has been replaced, the parameters can be downloaded to the device again via the communication interface. For this, the data must have been uploaded to the PC beforehand using the "FieldCare/DeviceCare" software.

### 13.3.1 HistoROM

It is not necessary to perform a new device calibration after replacing the display or transmitter electronics. The parameters are saved in the HistoROM.

After replacing the transmitter electronics, remove the HistoROM and insert it into the new replacement part.

## 13.4 Return

The device must be returned in the event of a factory calibration, or if the wrong device has been ordered or delivered.

As an ISO-certified company and also due to legal regulations, Endress+Hauser is obliged to follow certain procedures when handling any returned products that have been in contact with medium. To ensure swift, safe and professional device returns, please read the return procedures and conditions on the Endress+Hauser website http://www.endress.com/support/return-material.

- Select country.
  - The website of the responsible sales office opens with all the relevant information relating to returns.

1. If the desired country is not listed:
   Click on the "Choose your location" link.
   - An overview of Endress+Hauser sales offices and representatives opens.
2. Contact the Endress+Hauser sales organization responsible for your area.

## 13.5 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 the manufacturer for disposal under the applicable conditions.

# 14 Accessories

## 14.1 Device-specific accessories

### 14.1.1 Mechanical accessories

- Mounting bracket for housing
- Mounting bracket for block & bleed valves
- Block&Bleed valves:
  - Block&Bleed valves can be ordered as **enclosed** accessories (seal for mounting is enclosed)
  - Block&Bleed valves can be ordered as **mounted** accessories (mounted manifolds are supplied with a documented leak test)
  - Certificates (e.g. 3.1 material certificate and NACE) and tests (e.g. PMI and pressure test) that are ordered with the device apply for the transmitter and the manifold
  - During the operating life of the valves, it may be necessary to re-tighten the pack
- Water pocket pipes (PZW)
- Flushing rings
- Weather protection covers

For technical data (e.g. materials, dimensions or order numbers), see the accessory document SD01553P.

### 14.1.2 Plug connectors

- Plug connector M12 90 deg, IP67 5m cable, union nut, Cu Sn/Ni
- Plug connector M12, IP67 union nut, Cu Sn/Ni
- Plug connector M12, 90 deg IP67 union nut, Cu Sn/Ni

The IP protection classes are only maintained if the dummy cap is used or the cable is connected.

### 14.1.3 Weld-in accessory

For details, refer to TI00426F/00/EN "Weld-in adapters, process adapters and flanges".

## 14.2 Device Viewer

All the spare parts for the device, along with the order code, are listed in the *Device Viewer* (www.endress.com/deviceviewer).

# 15 Technical data

## 15.1 Output

Output signal

**Current output**

4 to 20 mA with superimposed digital communication protocol HART, 2-wire

The current output offers a choice of three different operating modes:
- 4.0 to 20.5 mA
- NAMUR NE 43: 3.8 to 20.5 mA (factory setting)
- US mode: 3.9 to 20.8 mA

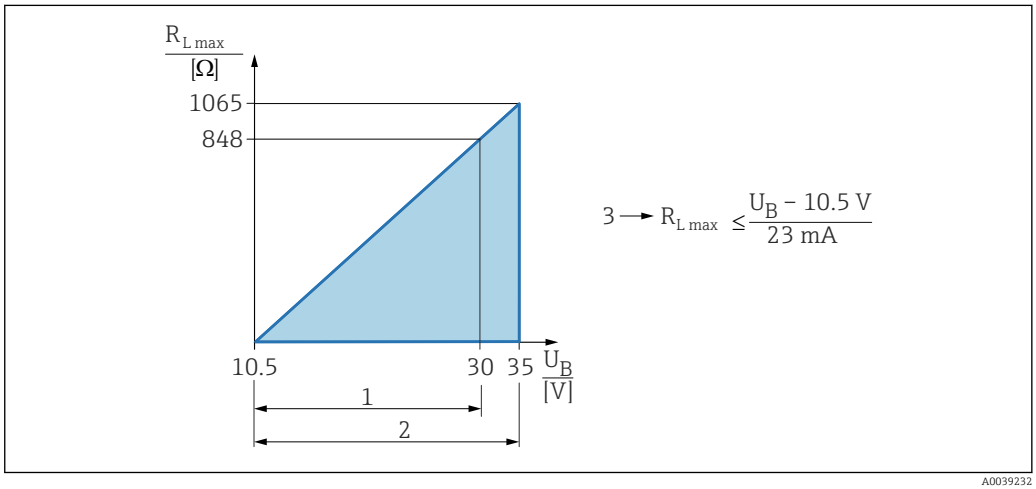
Signal on alarm

Signal on alarm in accordance with NAMUR recommendation NE 43.

4 to 20 mA HART:
Options:
- Max alarm: can be set from 21.5 to 23 mA
- Min. alarm: < 3.6 mA (factory setting)

Load

**4 to 20 mA HART**




*1 Power supply 10.5 to 30 VDC Ex i*
*2 Power supply 10.5 to 35 VDC, for other types of protection and non-certified device versions*
*3 $R_{Lmax}$ maximum load resistance*
*$U_B$ Supply voltage*

Operation via handheld terminal or PC with operating program: take minimum communication resistance of 250 Ω into consideration.

Damping

A damping affects all outputs (output signal, display). Damping can be enabled as follows:
- Via the onsite display, Bluetooth, handheld terminal or PC with operating program, continuous from 0 to 999 seconds
- Factory setting: 1 s

Ex connection data

See the separate technical documentation (Safety Instructions (XA)) on www.endress.com/download.

Linearization

The device's linearization function allows the user to convert the measured value to any units of height or volume. User-defined linearization tables of up to 32 value pairs can be entered if necessary.

Protocol-specific data

**HART**

- Manufacturer ID: 17 (0x11{hex})
- Device type ID: 0x112A
- Device revision: 1
- HART specification: 7
- DD revision: 1
- Device description files (DTM, DD) information and files at:
  - www.endress.com
  - www.fieldcommgroup.org
- HART load: min. 250 Ohm

*HART device variables (preset at the factory)*

The following measured values are assigned to the device variables at the factory:

| Device variable | Measured value |
|---|---|
| Primary variable (PV) [1] | Pressure [2] |
| Secondary variable (SV) | Sensor temperature |
| Tertiary variable (TV) | Electronics temperature |
| Quaternary variable (QV) | Sensor pressure [3] |

1) The PV is always applied to the current output.
2) The pressure is the calculated signal after damping and position adjustment.
3) The Sensor pressure is the raw signal of the measuring cell before damping and position adjustment.

The assignment of the measured values to the device variables can be changed in the following submenu:
Application → HART output → HART output

In a HART Multidrop loop, only one device may use the analog current value for signal transmission. For all other devices in the **"Loop current mode" parameter**, select the **Disable** option.

*Choice of HART device variables*

- **Pressure** option (after position adjustment and damping)
- Scaled variable
- Sensor temperature
- Sensor pressure
  Sensor Pressure is the raw signal from sensor before damping and position adjustment.
- Electronics temperature
- Terminal current
  The terminal current is the read-back current on terminal block.
- Terminal voltage 1
  Visibility depends on order options or device settings
- **Noise of pressure signal** option and **Median of pressure signal** option
  Visible if Heartbeat Technology ordered
- Percent of range
- Loop current
  The loop current is the output current set by the applied pressure.

*Supported functions*

- Burst mode
- Additional transmitter status
- Device locking

Wireless HART data

- Minimum starting voltage: 10.5 V
- Start-up current: 3.6 mA
- Start-up time: <5 s
- Minimum operating voltage: 10.5 V
- Multidrop current: 4 mA

## 15.2 Environment

Ambient temperature range

The following values apply up to a process temperature of +85 °C (+185 °F). At higher process temperatures, the permitted ambient temperature is reduced.

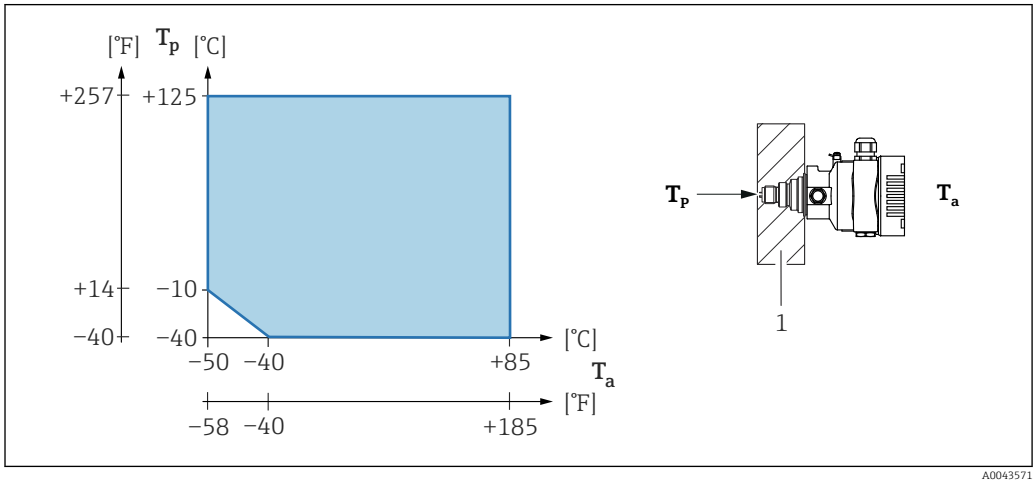
- Without segment display or graphic display:
  - Standard: −40 to +85 °C (−40 to +185 °F)
  - Optionally available: −50 to +85 °C (−58 to +185 °F) with restricted operating life and performance
  - Optionally available: −60 to +85 °C (−76 to +185 °F) with restricted operating life and performance; below −50 °C (−58 °F): devices can be permanently damaged
- With segment display or graphic display: −40 to +85 °C (−40 to +185 °F) with limitations in optical properties such as display speed and contrast. Can be used without limitations up to −20 to +60 °C (−4 to +140 °F)
  Segment display: up to −50 to +85 °C (−58 to +185 °F) with restricted operating life and performance
- Devices with PVC-coated capillary armor: −25 to +80 °C (−13 to +176 °F)
- Separate housing: −20 to +60 °C (−4 to +140 °F)

Applications with very high temperatures: use diaphragm seals with a temperature isolator or capillaries. Use a mounting bracket!

If vibrations additionally occur in the application: use a device with a capillary. Diaphragm seal with temperature isolator: use a mounting bracket!

### Ambient temperature $T_a$ depending on the process temperature $T_p$

The process connection must be fully insulated for ambient temperatures below −40 °C (−40 °F).




*1 Insulation material*

### Hazardous area

- For devices for use in hazardous areas, see the Safety Instructions, Installation Drawing or Control Drawing
- Devices that have the most common explosion protection certificates (e.g. ATEX/ IEC Ex, etc.) can be used in explosive atmospheres up to an ambient temperature of −60 °C (−76 °F) (optionally available). The functionality of the explosion protection Ex ia is guaranteed for ambient temperatures to −50 °C (−58 °F) (optionally available).
  At temperatures ≤ −50 °C (−58 °F), explosion protection is guaranteed by the housing in the case of flameproof enclosure (Ex d) type of protection. The functionality of the transmitter cannot be fully guaranteed. The Ex ia capability can no longer be guaranteed.

Storage temperature

- Without LCD display:
  - Standard: −40 to +90 °C (−40 to +194 °F)
  - Optionally available: −50 to +90 °C (−58 to +194 °F) with restricted operating life and performance
  - Optionally available: −60 to +90 °C (−76 to +194 °F) with restricted operating life and performance; below −50 °C (−58 °F): Ex d devices can be permanently damaged
- With LCD display: −40 to +85 °C (−40 to +185 °F)
- Separate housing: −40 to +60 °C (−40 to +140 °F)

With M12 plug, elbowed: −25 to +85 °C (−13 to +185 °F)

Devices with PVC-coated capillary armor: −25 to +90 °C (−13 to +194 °F)

Operating altitude

Up to 5 000 m (16 404 ft) above sea level.

Climate class

Class 4K4H (air temperature: −20 to +55 °C (−4 to +131 °F), relative humidity: 4 to 100 %) satisfied as per DIN EN 60721-3-4.

Condensation is possible.

Atmosphere

**Operation in very corrosive environment**

For corrosive environments (e.g. maritime environment / coastal areas), Endress+Hauser recommends the use of a PVC-coated capillary armor or a PTFE capillary armor for capillaries and the stainless steel housing. The transmitter can be additionally protected by a special coating (**T**echnical **S**pecial **P**roduct (TSP)).

Degree of protection

Test as per IEC 60529 and NEMA 250-2014

**Housing and process connection**

IP66/68, TYPE 4X/6P

(IP68: (1.83 m$H_2O$ for 24 h))

**Cable entries**

- Gland M20, plastic, IP66/68 TYPE 4X/6P
- Gland M20, brass nickel plated, IP66/68 TYPE 4X/6P
- Gland M20, 316L, IP66/68 TYPE 4X/6P
- Thread M20, IP66/68 TYPE 4X/6P
- Thread G1/2, IP66/68 TYPE 4X/6P
  If the G1/2 thread is selected, the device is delivered with an M20 thread as standard and a G1/2 adapter is included with the delivery, along with the corresponding documentation
- Thread NPT1/2, IP66/68 TYPE 4X/6P
- Dummy plug transport protection: IP22, TYPE 2
- Plug HAN7D, 90 deg. IP65 NEMA Type 4X
- Plug M12
  When housing is closed and connecting cable is plugged in: IP66/67 NEMA Type 4X
  When housing is open or connecting cable is not plugged in: IP20, NEMA Type 1

NOTICE

**Plug M12 and plug HAN7D: incorrect mounting can invalidate the IP protection class!**

- The degree of protection only applies if the connecting cable used is plugged in and screwed tight.
- The degree of protection only applies if the connecting cable used is specified according to IP67 NEMA Type 4X.
- The IP protection classes are only maintained if the dummy cap is used or the cable is connected.

### Process connection and process adapter when using the separate housing

*FEP cable*

- IP69 (on sensor side)
- IP66 TYPE 4/6P
- IP68 (1.83 $mH_2O$ for 24 h) TYPE 4/6P

*PE cable*

- IP69 (on sensor side)
- IP66 TYPE 4/6P
- IP68 (1.83 $mH_2O$ for 24 h) TYPE 4/6P

## Vibration resistance

### Single compartment housing

| Mechanical construction | Sinusoidal oscillation IEC62828-1/IEC61298-3 | Shock |
|---|---|---|
| Device | 10 Hz to 60 Hz: ±0.35 mm (0.0138 in)<br>60 Hz to 1000 Hz: 5 g | 30 g |
| Device with "Compact" or "Temperature isolator" diaphragm seal type [1)] | 10 Hz to 60 Hz: ±0.15 mm (0.0059 in)<br>60 Hz to 1000 Hz: 2 g | 30 g |

1) For applications with very high temperatures, either a device with a temperature isolator or with a capillary can be used. If vibrations also occur in the application, Endress+Hauser recommends using a device with a capillary. If a device with a temperature isolator or capillary is used, it must be mounted with a mounting bracket.

### Aluminum dual compartment housing

| Mechanical construction | Sinusoidal oscillation IEC62828-1/IEC61298-3 | Shock |
|---|---|---|
| Device | 10 Hz to 60 Hz: ±0.15 mm (0.0059 in)<br>60 Hz to 1000 Hz: 2 g | 30 g |
| Device with "Compact" or "Temperature isolator" diaphragm seal type [1)] | 10 Hz to 60 Hz: ±0.15 mm (0.0059 in)<br>60 Hz to 1000 Hz: 2 g | 30 g |

1) For applications with very high temperatures, either a device with a temperature isolator or with a capillary can be used. If vibrations also occur in the application, Endress+Hauser recommends using a device with a capillary. If a device with a temperature isolator or capillary is used, it must be mounted with a mounting bracket.

### Stainless steel dual compartment housing

| Mechanical construction | Sinusoidal oscillation IEC62828-1/IEC61298-3 | Shock |
|---|---|---|
| Device | 10 Hz to 60 Hz: ±0.15 mm (0.0059 in)<br>60 Hz to 1000 Hz: 2 g | 15 g |
| Device with "Compact" or "Temperature isolator" diaphragm seal type [1)] | 10 Hz to 150 Hz: 0.2 g | 15 g |

1) For applications with very high temperatures, either a device with a temperature isolator or with a capillary can be used. If vibrations also occur in the application, Endress+Hauser recommends using a

device with a capillary. If a device with a temperature isolator or capillary is used, it must be mounted with a mounting bracket.

Electromagnetic compatibility (EMC)

- Electromagnetic compatibility as per EN 61326 series and NAMUR recommendation EMC (NE21)
- With regard to the safety function (SIL), the requirements of EN 61326-3-x are satisfied
- Maximum deviation with interference influence: < 0.5% of span with full measuring range (TD 1:1)

For more details refer to the EU Declaration of Conformity.

## 15.3 Process

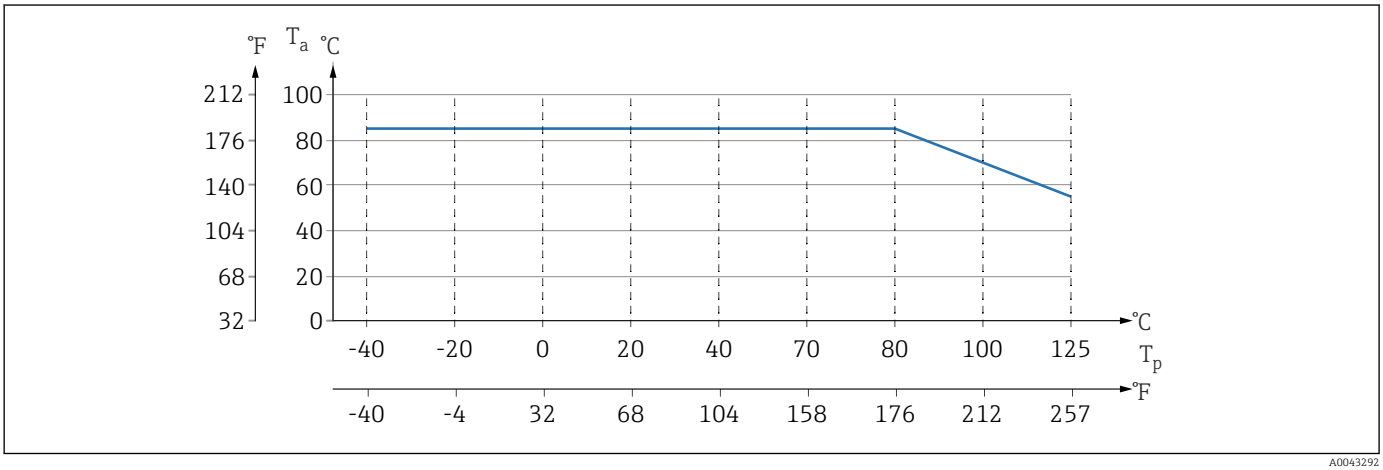
Process temperature range

**Standard device (without diaphragm seal)**

**NOTICE**

**The permitted process temperature depends on the process connection, process seal, ambient temperature and the type of approval.**

▶ All the temperature data in this document must be taken into consideration when selecting the device.




10 *Values apply for vertical mounting without insulation.*

$T_p$ *Process temperature*
$T_a$ *Ambient temperature*

### Diaphragm seal fill fluid

| Fill fluid | $P_{abs}$ = 0.05 bar (0.725 psi) [1] | $P_{abs}$ ≥1 bar (14.5 psi) [2] |
|---|---|---|
| Silicone oil | −40 to +180 °C (−40 to +356 °F) | −40 to +250 °C (−40 to +482 °F) |
| High-temperature oil | −20 to +200 °C (−4 to +392 °F) | −20 to +400 °C (−4 to +752 °F) [3] [4] [5] |
| Low-temperature oil | −70 to +120 °C (−94 to +248 °F) | −70 to +180 °C (−94 to +356 °F) |
| Vegetable oil | −10 to +160 °C (+14 to +320 °F) | −10 to +220 °C (+14 to +428 °F) |
| Inert oil | −40 to +100 °C (−40 to +212 °F) | −40 to +175 °C (−40 to +347 °F) [6] [7] |

1) Permitted temperature range at $p_{abs}$ = 0.05 bar (0.725 psi) (observe temperature limits of the device and the system!)
2) Permitted temperature range at $p_{abs}$ ≥1 bar (14.5 psi) (observe temperature limits of the device and the system!)
3) 325 °C (617 °F) at ≥1 bar (14.5 psi) absolute pressure
4) 350 °C (662 °F) at ≥1 bar (14.5 psi) absolute pressure (max. 200 hours)
5) 400 °C (752 °F) at ≥1 bar (14.5 psi) absolute pressure (max. 10 hours)
6) 150 °C (302 °F) at ≥1 bar (14.5 psi) absolute pressure
7) 175 °C (347 °F) at ≥1 bar (14.5 psi) absolute pressure (max. 200 hours)

| Fill fluid | Density [1] kg/m³ |
|---|---|
| Silicone oil | 970 |
| High-temperature oil | 995 |
| Low-temperature oil | 940 |

| Fill fluid | Density [1] kg/m³ |
|---|---|
| Vegetable oil | 920 |
| Inert oil | 1900 |

1) Density of the diaphragm seal fill fluid at 20 °C (68 °F).

The calculation of the operating temperature range of a diaphragm seal system depends on the fill fluid, capillary length and capillary internal diameter, process temperature and oil volume of the diaphragm seal. Detailed calculations, e.g. for temperature ranges, negative pressure and temperature ranges, are done separately in the Applicator "Sizing Diaphragm Seal".

A0038925

### Oxygen applications (gaseous)

Oxygen and other gases can react explosively to oils, grease and plastics. The following precautions must be taken:
- All components of the system, such as devices, must be cleaned in accordance with national requirements.
- Depending on the materials used, a certain maximum temperature and a maximum pressure must not be exceeded for oxygen applications.

The cleaning of the device (not accessories) is provided as an optional service.

- $p_{max}$: Depends on the lowest-rated element, with regard to pressure, of the selected components: Over pressure limit (OPL) of the measuring cell, process connection (1.5 x PN) or fill fluid (80 bar (1 200 psi))
- $T_{max}$: 60 °C (140 °F)

### Standard device (without diaphragm seal)

- Process connections with internal membrane: −40 to +125 °C (−40 to +257 °F) ; 150 °C (302 °F) for max. one hour)
- Process connections with flush membrane:
  - Thread (ISO228, ASME, metric DIN13) and flanges (EN, ASME, JIS): −40 to +100 °C (−40 to +212 °F)
  - Exceptions with seal supplied (M20 x 1.5, G1/2 DIN3852): −20 to +85 °C (−4 to +185 °F)

### Devices with diaphragm seal

- Depends on diaphragm seal and fill fluid: −70 °C (−94 °F) up to +400 °C (+752 °F)
- A4 screws of process connection, threaded separator: $T_{min}$ −60 °C (−76 °F)
- Observe the maximum gauge pressure and maximum temperature

### Diaphragm seal with tantalum membrane

−70 to +300 °C (−94 to +572 °F)

### Devices with PTFE-coated diaphragm seal membrane

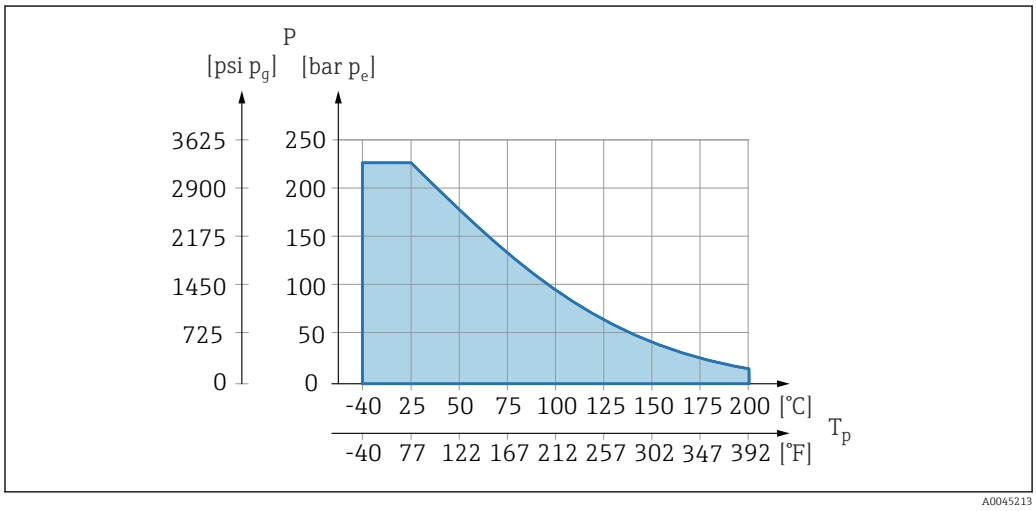
The anti-stick coating has very good anti-friction properties and protects the membrane against abrasive media.

NOTICE

**Destruction of the device due to incorrect use of PTFE coating!**

- The PTFE coating used is designed to protect the unit against abrasion. It does not provide protection against corrosive media.

Area of application of the 0.25 mm (0.01 in) PTFE foil on AISI 316L (1.4404/1.4435) membrane, see the following graphic:



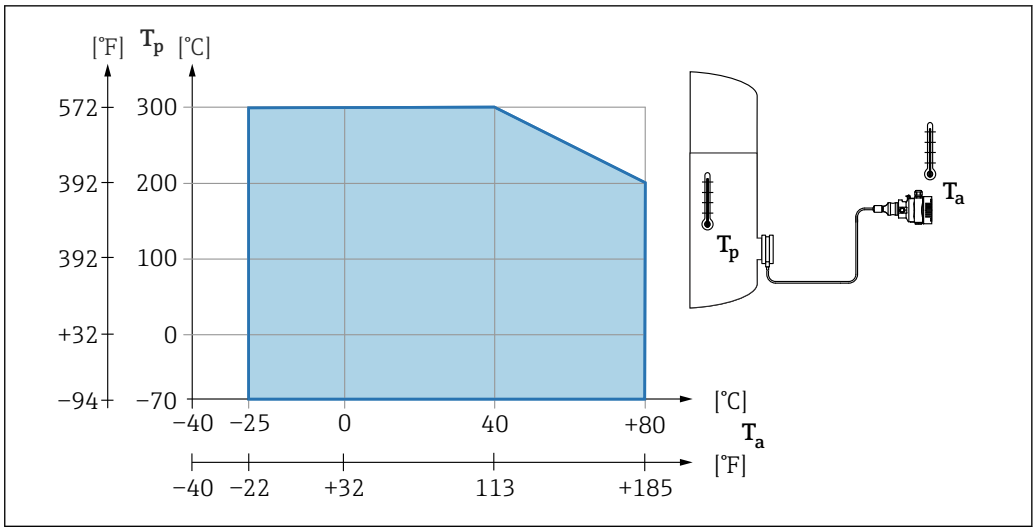

For vacuum applications: $p_{abs} \leq 1$ bar (14.5 psi) to 0.05 bar (0.725 psi) to max. +150 °C (302 °F).

If a PTFE coating has been selected, a conventional membrane is always delivered.

### Diaphragm seal capillary armor

Process temperature depending on the ambient temperature.

- 316L: No restrictions
- PTFE: No restrictions
- PVC: See the following diagram




Process pressure range

**Pressure specifications**

**⚠ WARNING**

**The maximum pressure for the device depends on the lowest-rated component with regard to pressure (components are: process connection, optional mounted parts or accessories).**

- Only operate the device within the specified limits for the components!
- MWP (maximum working pressure): The MWP is specified on the nameplate. This value refers to a reference temperature of +20 °C (+68 °F) and may be applied to the device for an unlimited time. Note temperature dependence of MWP. For flanges, refer to the following standards for the permitted pressure values at higher temperatures: EN 1092-1 (with regard to their stability/temperature property, the materials 1.4435 and 1.4404 are grouped together under EN 1092-1; the chemical composition of the two materials can be identical.), ASME B 16.5a, JIS B 2220 (the latest version of the standard applies in each case). MWP data that deviate from this are provided in the relevant sections of the Technical Information.
- The overpressure limit is the maximum pressure a device may be subjected to during a test. It is greater than the maximum working pressure by a certain factor. This value refers to a reference temperature of +20 °C (+68 °F).
- The Pressure Equipment Directive (2014/68/EU) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the device.
- In the case of measuring cell range and process connection combinations where the overpressure limit (OPL) of the process connection is smaller than the nominal value of the measuring cell, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If the entire measuring cell range must be used, select a process connection with a higher OPL value (1.5 x PN; MWP = PN).
- Oxygen applications: do not exceed values for $P_{max}$ and $T_{max}$.

**Burst pressure**

As of the specified burst pressure, the complete destruction of the pressure-bearing parts and/or a device leak must be expected. It is therefore imperative to avoid such operating conditions by carefully planning and sizing your facility.

Ultrapure gas applications

Endress+Hauser also offers devices for special applications, such as for ultrapure gas, that are cleaned of oil and grease. No special restrictions regarding the process conditions apply to these devices.

Hydrogen applications

A **gold-coated** metallic membrane offers universal protection against hydrogen diffusion, both in gas applications and in applications with water-based solutions.

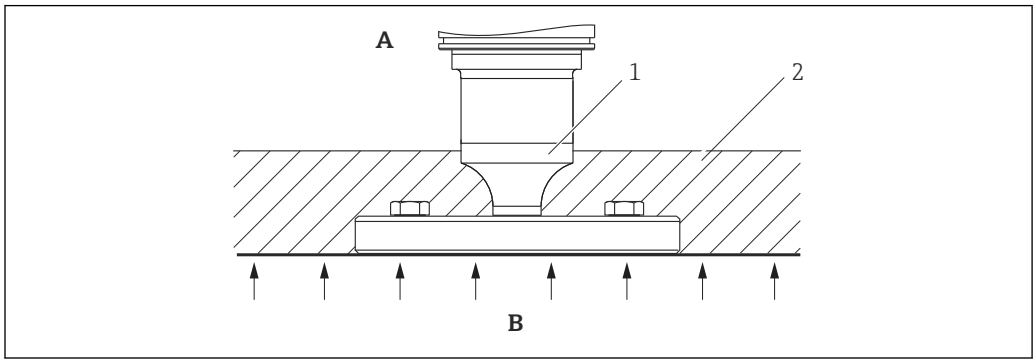
Steam applications and saturated steam applications

For steam and saturated steam applications: Use a device with a metallic membrane or provide a water pocket pipe for temperature decoupling when installing.

Thermal insulation

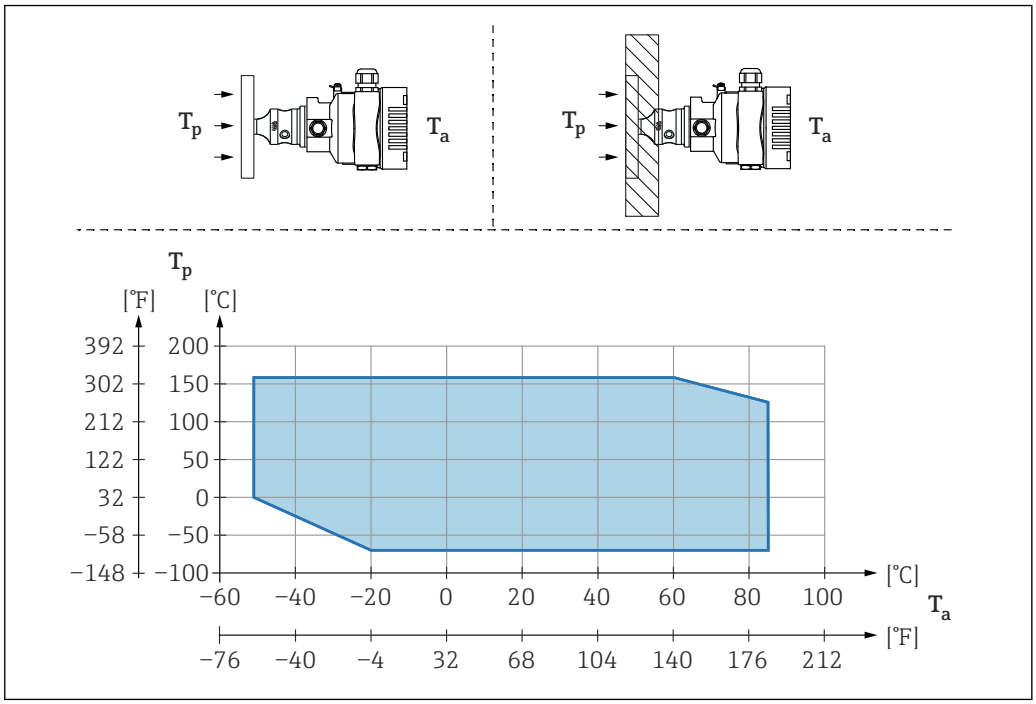
**Thermal insulation with diaphragm seal directly mounted**

The device may only be insulated up to a certain height. The maximum permitted insulation height is indicated on the device and applies to an insulation material with a heat conductivity ≤ 0.04 W/(m x K) and to the maximum permitted ambient and process temperature. The data were determined under the most critical application "quiescent air". Maximum permitted insulation height, indicated here on a device with a flange:




*A Ambient temperature*
*B Process temperature*
*1 Maximum permitted insulation height*
*2 Insulation material*

### Mounting with a "Compact" diaphragm seal type




$T_a$ *Ambient temperature at transmitter*
$T_p$ *Maximum process temperature*

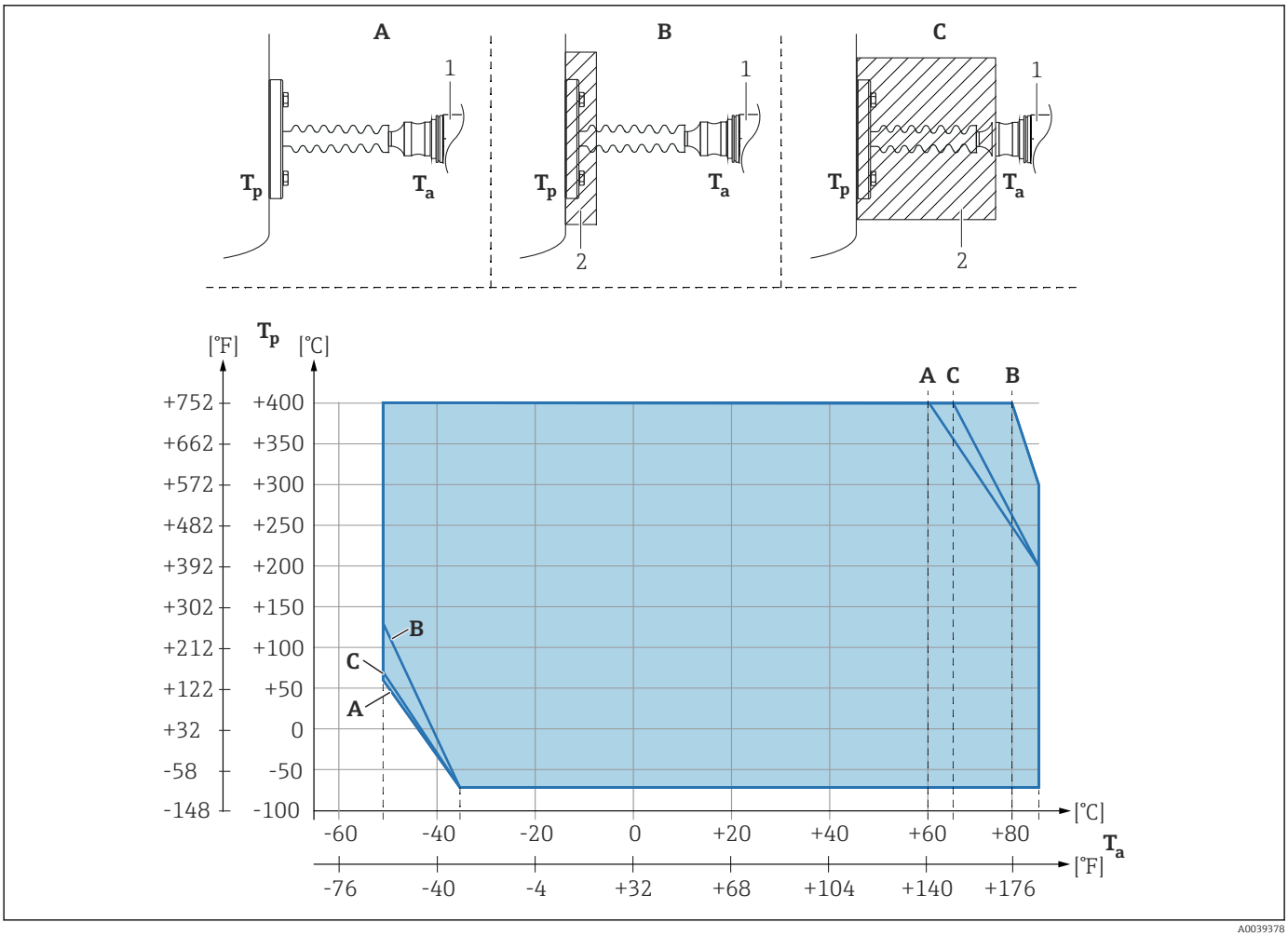
| $T_a$ | $T_p$ |
|---|---|
| +85 °C (+185 °F) | −70 to +120 °C (−94 to +248 °F) |
| +60 °C (+140 °F) | −70 to +160 °C (−94 to +320 °F) |
| −20 °C (−4 °F) | −70 to +160 °C (−94 to +320 °F) |
| −50 °C (−58 °F) | 0 to +160 °C (+32 to +320 °F) |

### Thermal insulation when mounting with a "Temperature isolator" diaphragm seal type

Use of temperature isolators in the event of constant extreme medium temperatures which cause the maximum permissible electronics temperature of +85 °C (+185 °F) to be exceeded. Diaphragm seal systems with temperature isolators can be used up to a maximum temperature of +400 °C (+752 °F) depending on the fill fluid used. For details, see the Technical Information. To minimize the influence of rising heat, mount the device horizontally or with the housing pointing downwards. The additional installation height brings about a zero point shift due to the hydrostatic column in the temperature isolator. This zero point shift can be corrected on the device.

The maximum ambient temperature $T_a$ at the transmitter depends on the maximum process temperature $T_p$.

The maximum process temperature depends on the fill fluid used.



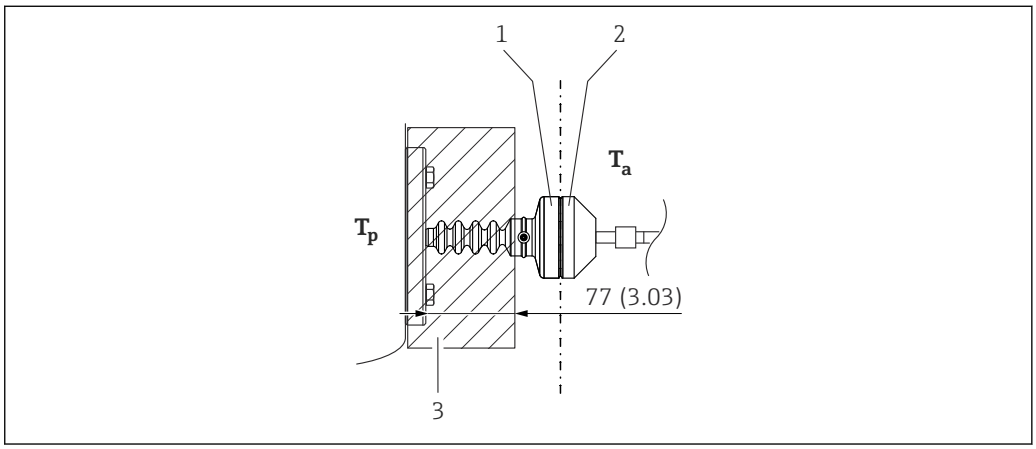

*A No insulation*
*B Insulation 30 mm (1.18 in)*
*C Maximum insulation*
*1 Transmitter*
*2 Insulation material*

| Item | $T_a$ [1] | $T_p$ [2] |
|---|---|---|
| **A** | 60 °C (140 °F) | 400 °C (752 °F) [3] |
| | 85 °C (185 °F) | 200 °C (392 °F) |
| | −50 °C (−58 °F) | 60 °C (140 °F) |
| | −35 °C (−31 °F) | −70 °C (−94 °F) |
| **B** | 80 °C (176 °F) | 400 °C (752 °F) [3] |
| | 85 °C (185 °F) | 300 °C (572 °F) |
| | −50 °C (−58 °F) | 130 °C (266 °F) |
| | −35 °C (−31 °F) | −70 °C (−94 °F) |
| **C** | 67 °C (153 °F) | 400 °C (752 °F) [3] |
| | 85 °C (185 °F) | 200 °C (392 °F) |
| | −50 °C (−58 °F) | 70 °C (158 °F) |
| | −35 °C (−31 °F) | −70 °C (−94 °F) |

1) Maximum ambient temperature at transmitter
2) Maximum process temperature
3) Process temperature: max. +400 °C (+752 °F), depending on the fill fluid used

*Thermal Range Expander*

The device may only be insulated up to a certain height. The maximum permitted insulation height applies to an insulation material with a thermal conductivity ≤ 0.04 W/(m x K) and to the maximum permitted ambient temperature and process temperature. The data were determined under the application "quiescent air".




*1 Primary chamber*
*2 Secondary chamber*
*3 Insulation material*

Without insulation, the ambient temperature decreases by 5 K.

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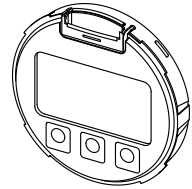
SD02530P/00/EN/08.23-00
71618148
2023-06-30



# Special Documentation
# VU113 Graphical display with keys and Bluetooth
# VU112 Graphical display with keys

Remote operation via Bluetooth® wireless technology



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# 1 Declaration of conformity

Endress+Hauser
People for Process Automation

CE

## EU Declaration of Conformity

(de) EU-Konformitätserklärung
(fr) Déclaration de conformité UE
(bg) ЕС Декларация за съвместимост
(es) Declaración CE de conformidad
(cs) EU prohlášení o shodě
(da) EF-overensstemmelseserklæring
(et) ELi vastavusdeklaratsioon
(el) Δήλωση συμμόρφωσης ΕΕ
(hr) EU Izjava o sukladnosti
(it) Dichiarazione di Conformità UE
(lt) ES atitikties deklaracija
(lv) ES atbilstības deklarācija
(hu) EU-megfelelőségi nyilatkozat
(nl) EG-conformiteitsverklaring
(pl) Deklaracja zgodności UE
(pt) Declaração de conformidade da CE
(ro) Declarație de conformitate UE
(sk) Vyhlásenie o zhode EÚ
(sl) EU izjava o skladnosti
(fi) EU-vaatimustenmukaisuusvakuutus
(sv) EU-försäkran om överensstämmelse

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

declares as manufacturer under sole responsibility, that the product

(de) erklärt als Hersteller in alleiniger Verantwortung, dass das Produkt
(fr) déclare en tant que fabricant, sous sa seule responsabilité, que le produit
(bg) декларира като производител с изключителна отговорност, че продуктът
(es) declara, en calidad de fabricante y asumiendo en exclusiva la responsabilidad, que el producto
(cs) jakožto výrobce, prohlašuje na svou vlastní zodpovědnost, že výrobek
(da) erklærer som producent under eneansvar, at produktet
(et) kinnitab tootjana oma ainuvastutusel, et toode
(el) δηλώνει ως κατασκευαστής με αποκλειστική της ευθύνη, ότι το προϊόν
(hr) izjavljuje kao proizvođač s isključivom odgovornošću da je proizvod
(it) dichiara, sotto la propria esclusiva responsabilità in quanto fabbricante, che il prodotto
(lt) kaip gamintojas prisiimdamas atsakomybę patvirtina, kad gaminys
(lv) kā ražotājs un uzņemoties visu atbildību paziņo, ka izstrādājums
(hu) mint gyártó kizárólagos felelősségе mellett kijelenti, hogy a termék
(nl) verklaart als fabrikant onder volledige verantwoordelijkheid, dat het product
(pl) jako producent oświadcza, na swoją wyłączną odpowiedzialność, że wyrób
(pt) declara como fabricante sob responsabilidade exclusiva, que o produto
(ro) în calitate de producător, declară pe proprie răspundere că produsul
(sk) vyhlasuje ako výrobca na vlastnú zodpovednosť, že výrobok
(sl) kot proizvajalec z izključno odgovornostjo izjavlja, da je izdelek
(fi) ilmoittaa valmistajana yksinomaisella vastuullaan, että tuote
(sv) förkunnar som tillverkare med ensamansvar, att produkten

**Graphic display touch control + Bluetooth VU113**

EC_00777_03.21

A0047192

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CE

conforms to following European Directives:

| | |
|---|---|
| (de) | den folgenden Europäischen Richtlinien entspricht: |
| (fr) | est conforme aux directives européennes suivantes : |
| (bg) | отговаря на следните европейски директиви: |
| (es) | se ajusta a las siguientes directivas europeas: |
| (cs) | vyhovuje následujícím evropským směrnicím: |
| (da) | er i overensstemmelse med følgende direktiver: |
| (et) | vastab järgmistele Euroopa direktiividele: |
| (el) | συμμορφώνεται με τις ακόλουθες Ευρωπαϊκές Οδηγίες: |
| (hr) | u skladu sa sljedećim europskim direktivama: |
| (it) | è conforme alle seguenti direttive europee: |
| (lt) | atitinka toliau nurodytas Europos Sąjungos direktyvas: |
| (lv) | atbilst tālāk norādīto Eiropas direktīvu prasībām: |
| (hu) | megfelel az alábbi európai irányelveknek: |
| (nl) | voldoet aan de volgende Europese richtlijnen: |
| (pl) | jest zgodny z następującymi dyrektywami europejskimi: |
| (pt) | está em conformidade com as seguintes diretrizes europeias: |
| (ro) | este în conformitate cu următoarele directive europene: |
| (sk) | je v súlade s týmito európskymi smernicami: |
| (sl) | skladen z naslednjimi evropskimi direktivami: |
| (fi) | täyttää seuraavat eurooppalaiset direktiivit: |
| (sv) | överensstämmer med följande europeiska direktiv: |

| | | |
|---|---|---|
| RED | 2014/53/EU | (L153/62) |
| RoHS | 2011/65/EU | (L174/88) |

EC_00777_03.21

A0047193

Endress+Hauser
People for Process Automation

CE

## Applied harmonized standards or normative documents:

(de) Angewandte harmonisierte Normen oder normative Dokumente:
(fr) Normes harmonisées ou documents normatifs appliqués :
(bg) Приложени хармонизирани стандарти или нормативни документи:
(es) Normas armonizadas o documentos normativos aplicados:
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(et) Kohaldatud harmoneeritud standardid või normdokumendid:
(el) Εφαρμοσμένα εναρμονισμένα πρότυπα ή κανονιστικά έγγραφα:
(hr) Primijenjeni usklađeni standardi ili normativni dokumenti:
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(lt) Taikytini suderintieji standartai ar norminiai dokumentai:
(lv) Piemērotie saskaņotie standarti vai normatīvie dokumenti:
(hu) Alkalmazott harmonizált szabványok vagy normatív dokumentumok:
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(sl) Uporabljeni harmonizirani standardi ali normativni dokumenti:
(fi) Sovelletut yhdenmukaistetut standardit tai ohjeelliset asiakirjat:
(sv) Tillämpade harmoniserade standarder eller normativa dokument:

| | | | |
|---|---|---|---|
| EN 61010-1 | (2017) | EN 300328 V2.2.2 | (2019) |
| EN 61326-1 | (2013) | EN 301489-1 V2.2.3 | (2019) |
| EN 61326-2-3 | (2013) | EN 301489-17 V3.3.4 | (2020) |
| EN 61326-2-5 | (2013) | | |
| EN 63311 | (2008) | | |
| EN IEC 63000 | (2018) | | |

i.V. Dr. Arno Götz
Department Manager Product Safety

Maulburg, 12.10.2021
Endress+Hauser SE+Co. KG

EC_00777_03.21

A0047194

# 2 About this document

## 2.1 Symbols

Tip
Indicates additional information.

## 2.2 Documentation

### 2.2.1 Intended use

Remote operation of devices via Bluetooth® wireless technology

**Products:**
- Cerabar PMC71B, PMP71B
- Deltabar PMD75B, PMD78B
- Liquiphant FTL51B, FTL62, FTL63, FTL64
- Micropilot FMR60B, FMR62B, FMR63B, FMR66B, FMR67B

Firmware version: 01.00.zz or higher

Device version: 1

**Incorrect use**

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

Under different operating conditions than those described here, protection may be compromised and the correct functioning of the device cannot be guaranteed.

## 2.3 Registered trademarks

**Bluetooth®**
The *Bluetooth*® word mark and logos are registered trademarks owned by the Bluetooth SIG, Inc. and any use of such marks by Endress+Hauser is under license. Other trademarks and trade names are those of their respective owners.

**Apple®**
Apple, the Apple logo, iPhone, and iPod touch are trademarks of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc.

**Android®**
Android, Google Play and the Google Play logo are trademarks of Google Inc.

# 3 Radio approvals

Valid for VU113 graphical display with keys and Bluetooth

## 3.1 Europe

This device meets the requirements of the Radio Equipment Directive RED 2014/53/EU. The standards specified in the declaration of conformity were used for this purpose.

## 3.2 Canada and United States

### 3.2.1 English

This device complies with Part 15 of the FCC Rules and with Industry Canada licence-exempt RSS standard(s).

Operation is subject to the following two conditions:
- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications made to this equipment not expressly approved by Endress+Hauser SE+Co. KG may void the FCC authorization to operate this equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### 3.2.2 Français

Le présent appareil est conforme aux CNR d'industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes :
- L'appareil ne doit pas produire de brouillage, et
- L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

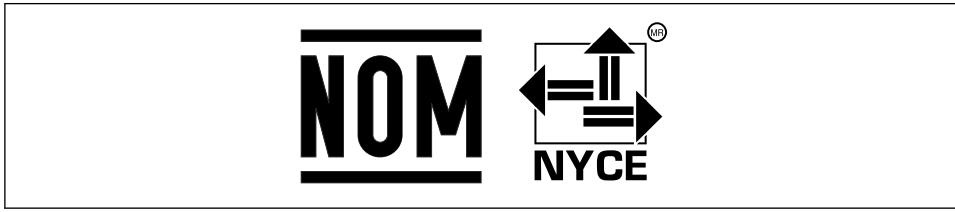
Les changements ou modifications apportés à cet appareil non expressément approuvés par Endress+Hauser SE+Co. KG peuvent annuler l'autorisation FCC d'utiliser cet appareil.

## 3.3 Mexico

**IFETEL notice**

La operación de este equipo está sujeta a las siguientes dos condiciones:

- (1) es posible que este equipo o dispositivo no cause interferencia perjudicial
- (2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada

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## 3.4 Japan

Japanese Radio Law and Japanese Telecommunications Business Law Compliance.

This device is granted pursuant to the Japanese Radio Law (電波法) and the Japanese Telecommunications Business Law (電気通信事業法).

This device should not be modified (otherwise the granted designation number will become invalid).

## 3.5 Taiwan

根據 NCC 低功率電波輻射性電機管理辦法規定：

第十二條經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

廠牌 Endress+Hauser

產品型號 VU113

產地德國

製造商 Endress+Hauser SE+Co.KG

## 3.6 Thailand

A0042673

## 3.7 Singapore

Complies with
IDMA Standards
DA108204

A0042672

## 3.8 Malaysia

MCMC
HIDF18000085

A0042675

## 3.9 Indonesia

Cert. ID: 90241/SDPPI/2023

PLG ID: 4962

A0044414

## 3.10 Brazil

A0039064

00732-21-07318

Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados

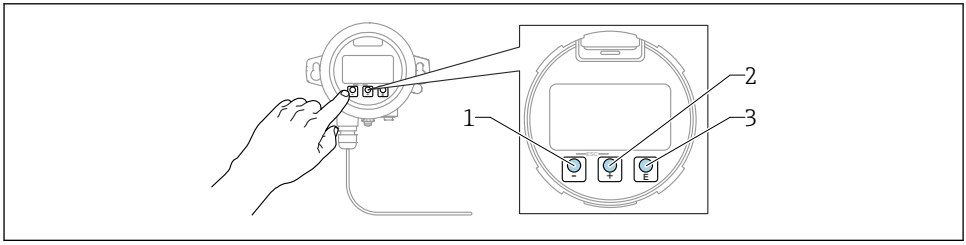
## 3.11 Other countries

Other national approvals are available on request.

# 4 Operation options

## 4.1 Local operation

The device can be operated onsite with three optical keys. Operation is possible through the cover glass.

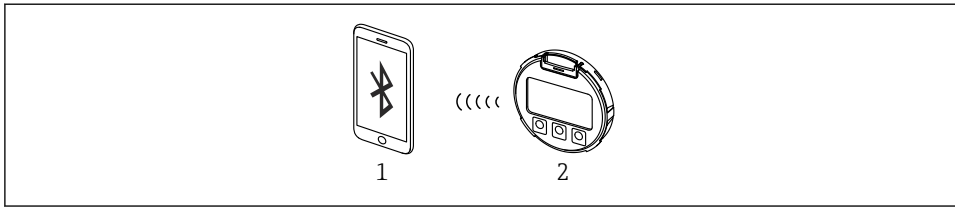



A0044639

*1 Minus key*
*2 Plus key*
*3 Enter key*

## 4.2 Access via Bluetooth® wireless technology

Bluetooth is optional, and is not an integral feature of the display (see the product structure for the specific device).

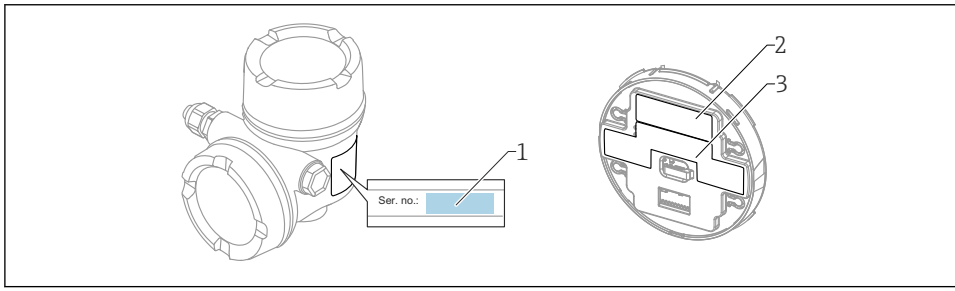



*1 Remote operation via Bluetooth® wireless technology*

*1 Smartphone or tablet with SmartBlue (app)*
*2 Display with optional Bluetooth function*

### 4.2.1 Preparation

The serial number of the device serves as the initial password when the connection is established for the first time. The serial number can be found on the nameplate of the device.




*1 Serial number on the nameplate of the device (sample illustration)*
*2 Serial number on the nameplate of the display (on rear) with information on Bluetooth certificates*
*3 Information on Bluetooth for VU113*

## 4.3 Technical data

- Maximum free-field range 50 m (165 ft) for Bluetooth option
- Operation radius with intervisibility 10 m (33 ft) around the device for Bluetooth option
- Supply voltage: 3.2 $V_{DC}$ with max. 3.4 $V_{DC}$ and min. 3.1 $V_{DC}$
- Power consumption: max. 17 mW
- Current consumption: 5 mA
- Pollution degree: 2

- Temperature range: –40 to +85 °C (–40 to +185 °F)
- Suitable for wet environments, integrated in measuring devices
- Relative humidity: operation up to 100 % in the measuring devices
  Do not open in a condensing environment!

**⚠ WARNING**

**Pay attention to restrictions for operation in explosive atmospheres.**

► Observe the Safety Datasheet for the device.

### 4.3.1 Operating altitude

As per IEC 61010-1 Ed.3:

- Up to 3 000 m (9 800 ft) above sea level
- Can be extended to 5 000 m (16 400 ft) above sea level if overvoltage protection (OVP) is used, for details see the TI of the device

# 5 Commissioning with Bluetooth

## 5.1 Requirements

**Device requirements**

Commissioning via SmartBlue is only possible if the VU113 (graphical display with Bluetooth®) is installed.

**System requirements**

SmartBlue is available as a download from the Google Play Store for Android devices and from the iTunes Store for iOS devices

- iOS devices: iPhone 5S or higher from iOS11; iPad 5th Generation or higher from iOS11; iPod Touch 6th Generation or higher from iOS11
- Devices with Android: from Android 6.0 and *Bluetooth*® 4.0

**Initial password**

- The serial number of the device (on the nameplate) serves as the initial password when the connection is established for the first time.
- If the main electronics module of the device is a spare part, the initial password is the ID number of the Bluetooth display.
  The ID number is located on the rear of the display beside the Bluetooth logo.

**Please note the following:**

If the Bluetooth display is removed from one device and installed in another device.

- All the log-in data are only saved in the Bluetooth display and not in the device
- The password changed by the user is also saved in the Bluetooth display
- The Bluetooth and/or background lighting function can depend on the supply voltage to the device. For details on the supply voltage range, **see the Operating Instructions for the entire device.**

## 5.2 SmartBlue app

1. Scan the QR code or enter "SmartBlue" in the search field of the App Store.
   ↳

*2 Download link*

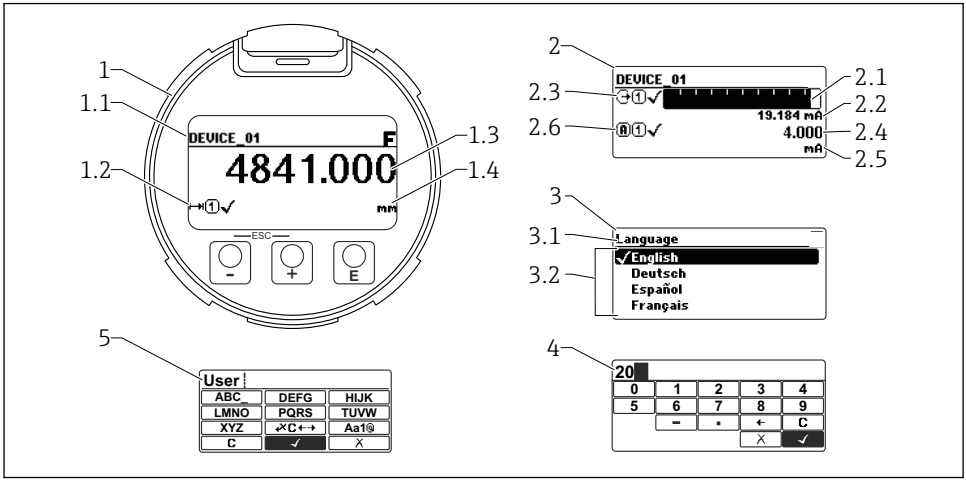
2. Start SmartBlue.
3. Select device from livelist displayed.
4. Enter the login data:
   ↳ User name: admin
   Password: Serial number of the device or ID number of the Bluetooth display
5. Tap the icons for more information.

After logging in for the first time, change the password!

# 6 Onsite commissioning

The optical keys can be used through the glass or directly on the graphical display for onsite commissioning. For details on the operating menu, please refer to the Operating Instructions of the specific device.

## 6.1 Display



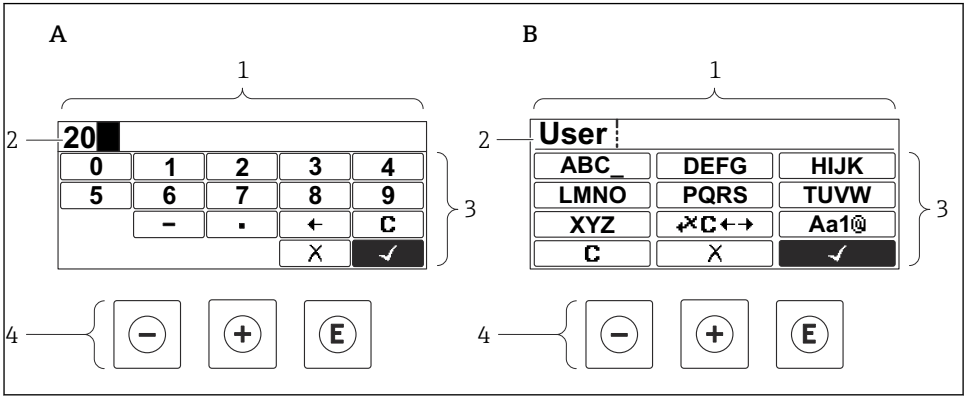

A0044661

*1 Measured value display (1 value max. size)*
*1.1 Header containing tag and error symbol (if an error is active)*
*1.2 Measured value symbols*
*1.3 Measured value*
*1.4 Unit*
*2 Measured value display (bar graph + 1 value)*
*2.1 Bar graph for measured value 1*
*2.2 Measured value 1 (including unit)*
*2.3 Measured value symbol for measured value 1*
*2.4 Measured value 2*
*2.5 Unit for measured value 2*
*2.6 Measured value symbol for measured value 2*
*3 Parameter display (here: parameter with picklist)*
*3.1 Header containing parameter name and error symbol (if an error is active)*
*3.2 Picklist; ☑ indicates the current parameter value*
*4 Input matrix for numbers*
*5 Input matrix for alphanumeric and special characters*

## 6.2 Operating elements

- **⊖ Minus key**
  - *In menu, submenu*
    Moves the bar up in a picklist
  - *In text and numeric editor*
    In the input mask, moves the bar to the left (backwards)
- **⊕ Plus key**
  - *In menu, submenu*
    Moves the bar down in a picklist
  - *In text and numeric editor*
    In the input mask, moves the selection bar to the right (forwards)
- **E Enter key**
  - *Unlocking the display*
    Long key press (>2 s)
    Unlock by selecting "Keylock Off" with +/- and pressing Enter to confirm
  - *On measured value display*
    Pressing the key briefly opens the operating menu
    Pressing the key for 2 s opens the context menu (guide and keylock).
  - *In menu, submenu*
    Pressing the key briefly opens the selected menu, submenu or parameter
    Pressing the key for 2 s on a parameter opens the help text for the parameter function, if available.
  - *In text and numeric editor*
    Pressing the key briefly opens the selected group, performs the selected action
    Pressing the key for 2 s on a parameter confirms the editable parameter value.
- **⊖+⊕ Escape key combination (press keys simultaneously)**
  - *In menu, submenu*
    Pressing the key briefly exits the current menu level and takes you to the next higher level; if help text is open, closes the help text for the parameter
    Pressing the key for 2 s returns you to the measured value display ("home position").
  - *In text and numeric editor*
    Closes the text or numeric editor without applying changes

## 6.3 Entering numbers and text




*A Numeric editor*
*B Text editor*
*1 Editing view*
*2 Display area of the entered values*
*3 Input screen*
*4 Operating elements*

### 6.3.1 Input mask of numeric editor

- 0 ... 9
  For selecting numbers from 0 to 9
- .
  Inserts decimal separator at the input position
- –
  Inserts minus sign at the input position
- ✓
  Confirms the selection
- ←
  Moves the input position one position to the left
- ✗
  Exits the input without applying the changes
- C
  Clears all entered characters

### 6.3.2 Input mask of text editor

ABC_ ... XYZ
Selection of letters from A to Z

# 7 Troubleshooting

## 7.1 Errors in local operation

| Error | Possible cause | Remedy |
|---|---|---|
| Key not responding | Cover glass dirty | Remove dirt.<br>If necessary, then wait 3 min until the keys respond to operation again. |
| | Condensate on cover glass | Wipe dry with a clean cloth.<br>If necessary, then wait 3 min until the keys respond to operation again. |
| | Sunlight on the display | Sunlight can affect the function of the optical sensors. Provide shade and try again |
| | Bluetooth operation active | Simultaneous operation onsite and via Bluetooth is not possible. You can determine whether or not Bluetooth is active by the flashing Bluetooth symbol or the crossed-out key symbols. |
| Key not responding when operating with gloves | Glove reflection may be too low to detect operation (black gloves). | Remove gloves or replace with other glove material |
| Key not responding after replacement of housing cover | The keys are adapted to the viewing window materials. A change of material will cause malfunctions. | Contact Endress+Hauser Service. |
| Key not responding or is too sensitive after opening the housing cover | Display crooked in housing | Open again and ensure the display is mounted correctly and properly engaged in the catches |
| Key not responding after housing cover cleaning | The cleaning changes the reflection properties of the device cover | The function readjusts, operation should be possible again after approximately 3 min. |
| Wrong key response during rain | Raindrops can be incorrectly interpreted as user input. | Locking the display prevents incorrect response. Locking is activated automatically if the device is not operated for longer, or can be activated manually (see "Operation" section) |

## 7.2 Error - SmartBlue operation

| Error | Possible cause | Remedy |
|---|---|---|
| Login via SmartBlue not possible | No Bluetooth connection | Enable Bluetooth function on smartphone or tablet |
| | | Bluetooth function of sensor disabled, perform recovery sequence |
| | HistoROM missing | Attach HistoROM |

| Error | Possible cause | Remedy |
|---|---|---|
| | The device is already connected with another smartphone/tablet | Only **one** point-to-point connection is established between a sensor and a smartphone or tablet |
| | Device is being put into operation for the first time | Enter initial password (device serial number) and change. Pay attention to lower/upper case when entering the serial number. |
| Device is visible in the live list but cannot be accessed via SmartBlue | Android end device | Is the location function permitted for the app, was it approved the first time? |
| | | GPS or positioning function must be activated for certain Android versions in conjunction with Bluetooth |
| | | Activate GPS - close the app fully and restart - enable the positioning function for the app |
| Device is visible in the live list but cannot be accessed via SmartBlue | Apple end device | Log in as standard<br>Enter user name "admin"<br>Enter initial password (device serial number), paying attention to lower/upper case |
| Device cannot be operated via SmartBlue | Incorrect password entered | Enter correct password |
| | Password forgotten | Contact Endress+Hauser Service. |
| | The sensor temperature is too high | If the ambient temperature results in an elevated sensor temperature of >60 °C (140 °F), Bluetooth communication may be disabled.<br>Shield the device, isolate it and cool it down if necessary. |
| TAG in SmartBlue and HART do not match | System-related | The device ID (TAG) is transferred to the live list via Bluetooth® to facilitate device identification. The tag is abbreviated in the middle since the HART tag can be up to 32 characters long but Bluetooth® can only use 29 characters as the device name. |

# 8 History

### Firmware history

- **01.00.00**
  - Initial software for VU without optical keys
  - Valid from: 31 August 2019
- 01.02.30
  - Initial software for VU with optical keys
  - Valid from: 1 November 2020

# 9 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 the manufacturer for disposal under the applicable conditions.

www.addresses.endress.com

Endress+Hauser

People for Process Automation

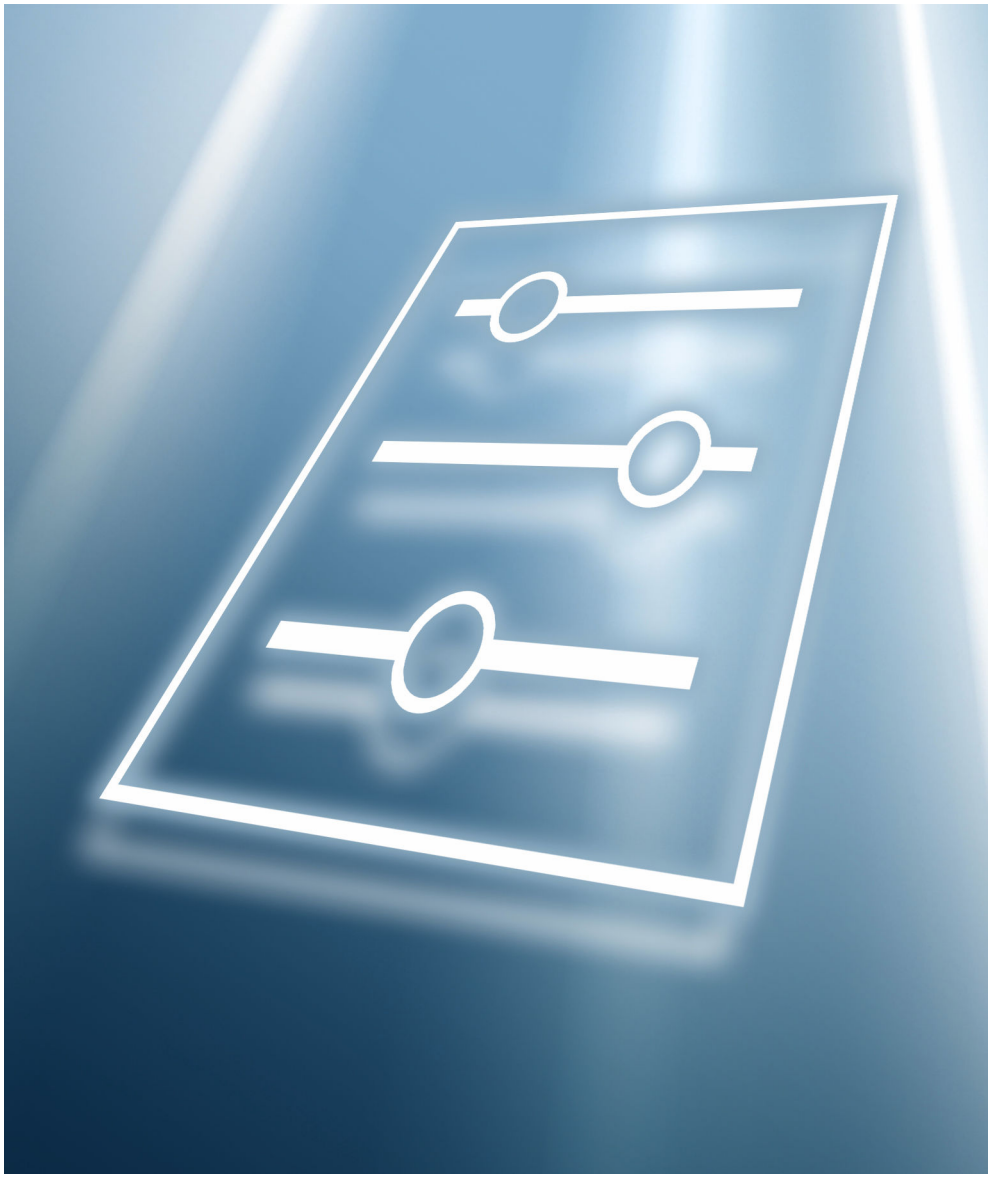
GP01163P/00/EN/01.21
71521419
2021-03-30

01.00.zz (Device firmware)



# Description of Device Parameters
# **Cerabar PMP71B**

Process pressure measurement
HART



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# 1 About this document

## 1.1 Document function

The document is part of the Operating Instructions and serves as a reference for parameters. The document provides a detailed explanation of each individual parameter.

Performance of tasks that require detailed knowledge of the functioning of the device:
- Commissioning measurements under difficult conditions
- Optimal adaptation of the measurement to difficult conditions
- Detailed configuration of the communication interface
- Error diagnostics in difficult cases

## 1.2 Target audience

The document is aimed at specialists who work with the device over the entire life cycle and perform specific configurations.

## 1.3 Using this document

### 1.3.1 Information on the document structure

This document lists the submenus and their parameters that are available when the **"Maintenance" option** user role is activated.

For the operating concept of the operating menus, see the Operating Instructions.

### 1.3.2 Structure of a parameter description

The individual parts of a parameter description are described in the following section:

- Navigation: Navigation path to the parameter via the local display
- Prerequisite: The parameter is only available under these specific conditions
- Description: Description of the parameter function
- Selection: List of the individual options for the parameter
- User entry: Input range for the parameter
- User interface: Display value/data of the parameter
- Factory setting: Default setting on leaving the factory
- Additional information:
  - On individual options
  - On display values/data
  - On the input range
  - On the factory setting
  - On the parameter function

## 1.4 Symbols used

### 1.4.1 Symbols for certain types of information

**Additional information:**

**Reference to documentation:**

**Operation via local display:**

**Operation via operating tool:**

**Write-protected parameter:**

## 1.5 Documentation

### 1.5.1 Standard documentation

**Operating Instructions**

The Operating Instructions are available on the Internet at: www.endress.com → Download

### 1.5.2 Supplementary device-dependent documentation

**Special Documentation**

The Special Documentation is available on the Internet at: www.endress.com → Download

# 2 Overview of the operating menu


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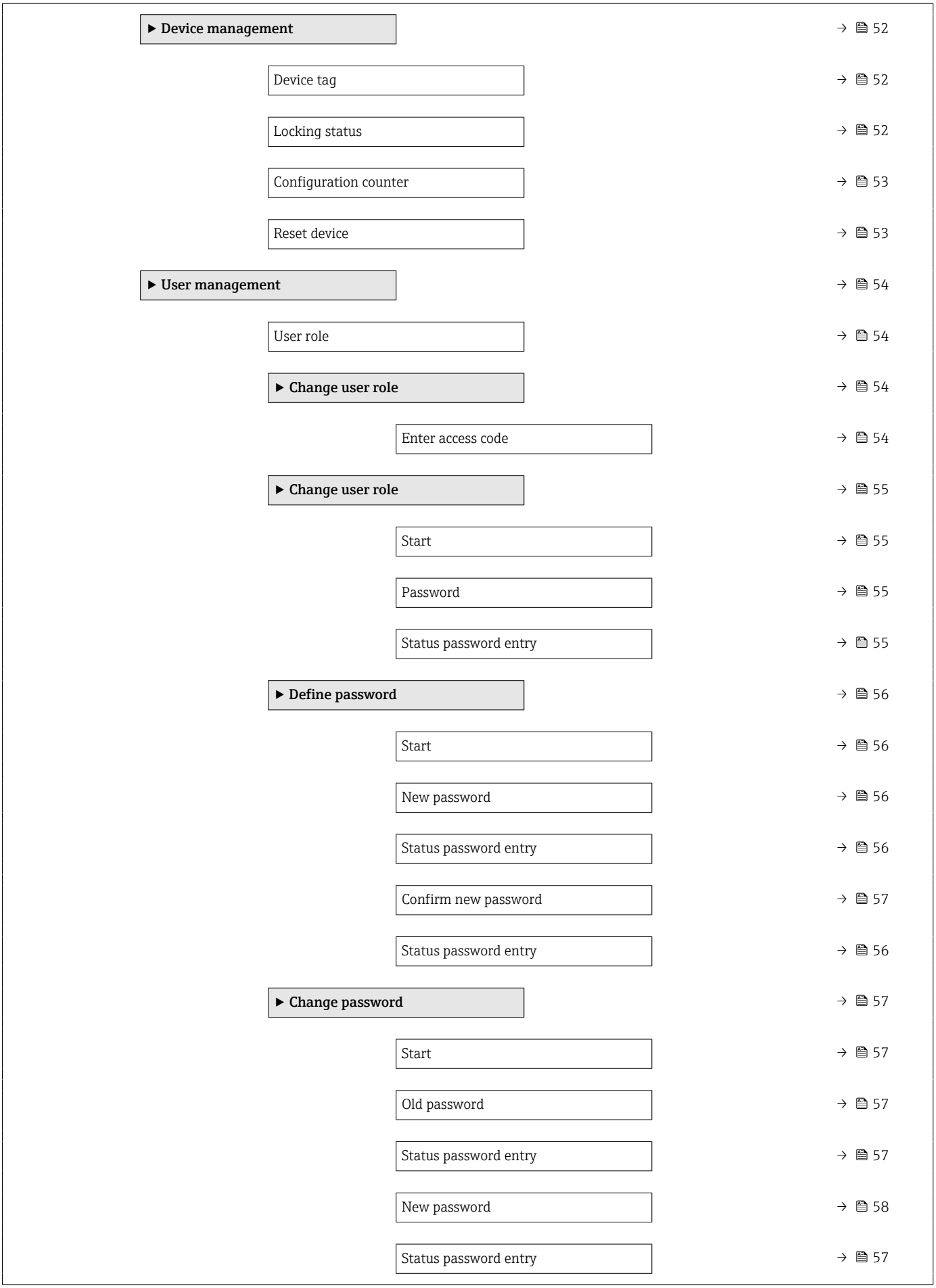
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# 3 Description of device parameters

In the following section, the parameters are listed according to the menu structure of the local display.

The operating menu is dynamic and adapts the choice of parameters to the selected options.

The parameter description of the operating tool is contained in the operating tool.

*Navigation* System → Display

## Language

**Navigation** System → Display → Language

**Prerequisite** A local display is provided.

**Description** Use this function to select the configured language on the local display.

**Selection**
- English
- Deutsch
- Français
- Español
- Italiano
- Nederlands
- Portuguesa
- Polski
- русский язык (Russian)
- Svenska
- Türkçe
- 中文 (Chinese)
- 日本語 (Japanese)
- 한국어 (Korean)
- Bahasa Indonesia
- tiếng Việt (Vietnamese)
- čeština (Czech)

**Factory setting** English (alternatively, the ordered language is preset in the device)

## Access status display

**Navigation** System → Display → Access stat.disp

**Prerequisite** A local display is provided.

**Description** Displays the access authorization to the parameters via the local display.

**User interface**
- Operator
- Maintenance

**Additional information**

*Description*

If the 🔒-symbol appears in front of a parameter, the parameter cannot be modified via the local display with the current access authorization.

Access authorization can be modified via the **Enter access code** parameter.

For the **Enter access code** parameter: See the "Disabling write protection via the access code" section of the Operating Instructions for the device.

If additional write protection is active, this restricts the current access authorization even further.

*User interface*

Detailed information on access authorization is provided in the "User roles and associated access authorization" and "Operating concept" sections of the Operations Instructions for the device.

# 3.1 "Guidance" menu

*Navigation* Guidance

## 3.1.1 "Commissioning" wizard

*Navigation* Guidance → Commissioning

**Device tag**

**Navigation** Guidance → Commissioning → Device tag

**Description** Enter a unique name for the measuring point to identify the device quickly within the plant.

**User entry** Character string comprising numbers, letters and special characters (#32)

**Assign PV**

**Navigation** Guidance → Commissioning → Assign PV

**Description** Use this function to select a measured variable (HART device variable) for the primary dynamic variable (PV).

**Selection**
- Pressure
- Scaled variable

**Assign SV**

**Navigation** Guidance → Commissioning → Assign SV

**Description** Use this function to select a measured variable (HART device variable) for the secondary dynamic variable (SV).

**Selection**
- Pressure
- Scaled variable
- Sensor temperature
- Sensor pressure
- Electronics temperature
- Terminal current *
- Terminal voltage 1 *
- Median of pressure signal *

* Visibility depends on order options or device settings

- Noise of pressure signal *
- Percent of range
- Loop current
- Not used

**Additional information** *Selection*

- **Sensor pressure** option
  Sensor Pressure is the raw signal from sensor before damping and position adjustment.
- **Terminal current** option
  The terminal current is the read-back current on terminal block.
- **Loop current** option
  The loop current is the output current set by the applied pressure.

## Damping

**Navigation** Guidance → Commissioning → Damping

**Description** Enter damping constant.
The damping constant affects the speed at which the measured value reacts to pressure changes.

**User entry** 0 to 999.0 s

## Pressure unit

**Navigation** Guidance → Commissioning → Pressure unit

**Description** Use this function to select the unit for the pipe pressure.

**Selection**

| *SI units* | *US units* | *Other units* |
|---|---|---|
| ▪ MPa | psi | ▪ inH2O |
| ▪ kPa | | ▪ inH2O (4°C) |
| ▪ Pa | | ▪ mmH2O |
| ▪ bar | | ▪ mmH2O (4°C) |
| ▪ mbar a | | ▪ mH2O |
| ▪ torr | | ▪ mH2O (4°C) |
| ▪ atm | | ▪ ftH2O |
| ▪ kgf/cm² | | ▪ inHg |
| ▪ gf/cm² | | ▪ mmHg |

## Temperature unit

**Navigation** Guidance → Commissioning → Temperature unit

**Description** Use this function to select the unit for the temperature.

* Visibility depends on order options or device settings

**Selection**

*SI units*
- °C
- K

*US units*
°F

**Factory setting**

Country-specific:
- °C
- °F

**Additional information**

*Selection*

## Zero adjustment

**Navigation**

Guidance → Commissioning → Zero adjustment

**Description**

Due to the mounting position of the measuring instrument, a pressure shift may occur. The pressure shift can be corrected with the zero adjustment.

**Selection**

- No
- Confirm

## Pressure

**Navigation**

Guidance → Commissioning → Pressure

## Output current transfer function

**Navigation**

Guidance → Commissioning → Curr. trans.func

**Description**

'Linear'
The linear pressure signal is used for the current output. The flow must be calculated in the evaluation unit.

'Square root - differential pressure only'
The root flow signal is used for the current output. The 'Flow (square root)' current signal is indicated on the on-site display with a root symbol.

**Selection**

- Linear
- Square root *

**Additional information**

*Selection*

**"Square root" option**
Is used when a linear output porportional to the flow is required. The flow calcualtion is done internally in the transmitter.

* Visibility depends on order options or device settings

## Scaled variable unit

**Navigation** Guidance → Commissioning → SV unit

**Description** Use 'Free text', first selection, if the desired unit is not available in the selection list. It is possible to define a customer specific unit with another parameter.

**Selection**

*SI units*
- %
- mm
- cm
- m
- l
- hl
- $m^3$
- g
- kg
- t
- g/s
- kg/s
- kg/min
- kg/h
- t/min
- t/h
- t/d
- $m^3$/s
- $m^3$/min
- $m^3$/h
- $m^3$/d
- l/s
- l/min
- l/h
- $Nm^3$/h
- Nl/h
- $Sm^3$/s
- $Sm^3$/min
- $Sm^3$/h
- $Sm^3$/d
- $Nm^3$/s
- g/$cm^3$
- kg/$m^3$

*US units*
- ft
- in
- $ft^3$
- gal (us)
- bbl (us;oil)
- oz
- lb
- STon
- lb/s
- lb/min
- lb/h
- STon/min
- STon/h
- STon/d
- $ft^3$/s
- $ft^3$/min
- $ft^3$/h
- $ft^3$/d
- gal/s (us)
- gal/min (us)
- gal/h (us)
- gal/d (us)
- bbl/s (us;oil)
- bbl/min (us;oil)
- bbl/h (us;oil)
- bbl/d (us;oil)
- $Sft^3$/min
- $Sft^3$/h
- $Sft^3$/d

*Imperial units*
- gal (imp)
- gal/s (imp)
- gal/min (imp)
- gal/h (imp)

*Custom-specific units*
Free text

## Free text

**Navigation** Guidance → Commissioning → Free text

**User entry** Character string comprising numbers, letters and special characters (#32)

## Scaled variable transfer function

**Navigation** Guidance → Commissioning → Scal. v. trans.

**Description**

'Linear'
The linear pressure signal is used for the current output. The flow must be calculated in the evaluation unit. Deviating from the bar graph (current output), the digital value on the display shows continues to be the eradicated value.

'Square root'
The root flow signal is used for the current output. The 'Flow (square root)' current signal is indicated on the on-site display with a root symbol.

'Table'
The output ist defined according to the scaled variable / pressure table entered.

**Selection**

- Linear
- Square root *
- Table

**Additional information**

*Selection*

**"Square root" option**
Is used when a linear output porportional to the flow is required. The flow calcualtion is done internally in the transmitter.

## Table not available

**Navigation** Guidance → Commissioning → Table not avail.

**User interface** Character string comprising numbers, letters and special characters (#2)

## Pressure value 1

**Navigation** Guidance → Commissioning → P. value 1

**Description** Enter pressure for the first scaling point. 'Scaled variable value 1' will be allocated to this pressure.

**User entry** Signed floating-point number

* Visibility depends on order options or device settings

### Scaled variable value 1

**Navigation** Guidance → Commissioning → Sc. var.value 1

**Description** Enter value for the first scaling point. This value is allocated to 'Pressure value 1'.

**User entry** Signed floating-point number

### Pressure value 2

**Navigation** Guidance → Commissioning → P. value 2

**Description** Enter pressure for the second scaling point. 'Scaled variable value 2' will be allocated to this pressure.

**User entry** Signed floating-point number

### Scaled variable value 2

**Navigation** Guidance → Commissioning → Sc. var.value 2

**Description** Enter value for the second scaling point. This value is allocated to 'Pressure value 2'.

**User entry** Signed floating-point number

### Lower range value output

**Navigation** Guidance → Commissioning → Low.range outp

**Description** Depending of which variable has been selected as PV, define the related lower and upper range values.
Assignment PV value to 4 mA and 20 mA.

**User entry** Signed floating-point number

### Pressure

**Navigation** Guidance → Commissioning → Pressure

### Upper range value output

**Navigation** Guidance → Commissioning → Upp.range outp

**Description** Depending of which variable has been selected as PV, define the related lower and upper range values.
Assignment PV value to 4 mA and 20 mA.

**User entry** Signed floating-point number

### Scaled variable

**Navigation** Guidance → Commissioning → Scaled variable

**User interface** Signed floating-point number

### Current range output

**Navigation** Guidance → Commissioning → Cur.range outp

**Description** Define the current range used to transmit the measured or calculated value.
In brackets are indicated the “low saturation value” and the “high saturation value”.
If Measured value <= “low saturation”, the output current is set to “low saturation”.
If Measured value >= “high saturation”, the output current is set to “”high saturation”.

Note:
Currents below 3.6 mA or above 21.5 mA can be used to signal an alarm.

**Selection**
- 4...20 mA (4... 20.5 mA)
- 4...20 mA NE (3.8...20.5 mA)
- 4...20 mA US (3.9...20.8 mA)

### Failure behavior current output

**Navigation** Guidance → Commissioning → Fail.behav.out

**Description** Defines which current the output assumes in the case of an error.
Min: < 3.6 mA
Max: >21.5 mA

**Selection**
- Min.
- Max.

### 3.1.2 "SIL confirmation" wizard

*Navigation* Guidance → SIL confirmation

**Proof test via Bluetooth allowed?**

**Navigation** Guidance → SIL confirmation → Bluetooth

**Description**
After completition of the SIL activation/deactivation wizard, the device will be write protected via software lock.

To use the proof test wizard (optional) where alarm currents are simulated, the device does not have to be unlocked.

It must be defined, if the proof test wizard via Bluetooth is allowed.

**Selection**
- No
- Yes

**Enter SIL locking code**

**Navigation** Guidance → SIL confirmation → SIL locking code

**Description**
Enter the locking code to start the SIL/WHG locking sequence.

**User entry**
0 to 65 535

**Additional information**
**Locking codes**
- WHG: 7450
- SIL: 7452
- SIL and WHG: 7454

**SIL status**

**Navigation** Guidance → SIL confirmation → SIL status

**User interface**
- Not active
- SIL sequence active
- Active
- Failed
- Finished

## Character test string

**Navigation** Guidance → SIL confirmation → Char.test string

**Description** Check the shown character string for correct representations of the characters and digits.

**User interface** Character string comprising numbers, letters and special characters (#14)

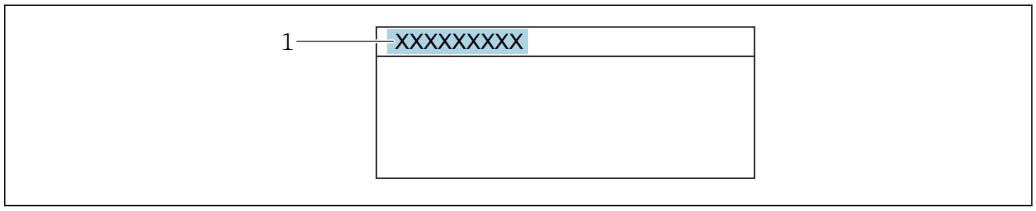
## Device tag

**Navigation** Guidance → SIL confirmation → Device tag

**Description** Displays a unique name for the measuring point so it can be identified quickly within the plant. The name is displayed in the header.

**User interface** Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).

**Additional information** *User interface*




*1 Position of the header text on the display*

The number of characters displayed depends on the characters used.

## Device name

**Navigation** Guidance → SIL confirmation → Device name

**Description** Displays the name of the transmitter. It can also be found on the nameplate of the transmitter.

**User interface** Max. 32 characters such as letters or numbers.

## Serial number

**Navigation** Guidance → SIL confirmation → Serial number

**Description** Displays the serial number of the measuring device.

The number can be found on the nameplate of the sensor and transmitter.

**User interface** Max. 11-digit character string comprising letters and numbers.

**Additional information** *Description*

**Uses of the serial number**
- To identify the measuring device quickly, e.g. when contacting Endress+Hauser.
- To obtain specific information on the measuring device using the Device Viewer: www.endress.com/deviceviewer

## CRC device configuration

**Navigation** Guidance → SIL confirmation → CRC device conf.

**Description** CRC device configuration based on current settings of safety relevant parameters. The CRC device configuration is unique and can be used to detect changes in safety relevant parameter settings.

**User interface** 0 to 65 535

## Stored CRC device configuration

**Navigation** Guidance → SIL confirmation → Stored CRC conf.

**Description** Stored CRC after the last SIL lock. Factory delivery is 65535 means that the device has not yet been SIL locked.

**User interface** 0 to 65 535

## Timestamp stored CRC device config.

**Navigation** Guidance → SIL confirmation → TS stored CRC

**Description** Gives the time stamp when the CRC was last stored following completion of the SIL-Mode Wizard.

**User interface** Character string comprising numbers, letters and special characters (#20)

### Operating time

**Navigation** Guidance → SIL confirmation → Operating time

**Description** Indicates how long the device has been in operation.

**Additional information** Maximum time: 9 999 d (≈ 27 years)

### Configuration counter

**Navigation** Guidance → SIL confirmation → Config. counter

**Description** Displays the counter for changes to the device parameters.

Additional information:
- If the value for a static parameter is changed when optimizing or configuring the parameter, the counter is incremented by 1. This is to enable tracking different parameter versions.
- When multiple parameters are changed simultaneously, e.g. when loading parameters into the device from an external source such as FieldCare, the counter may display a higher value. The counter cannot be reset, nor is it reset to a default value on performing a device reset.
- Once the counter has reached the value 65535, it restarts at 0.

**User interface** 0 to 65 535

### Zero adjustment offset

**Navigation** Guidance → SIL confirmation → Zero adj. offset

**Description** Assigned value of zero adjustment due to mounting position.

**User interface** Character string comprising numbers, letters and special characters (#20)

### HP/LP swap

**Navigation** Guidance → SIL confirmation → HP/LP swap

**Description** Assigned setting high pressure / low pressure.

**User interface**
- No
- Yes

### Damping

**Navigation** Guidance → SIL confirmation → Damping

**Description** Assigned damping value.

**User interface** Character string comprising numbers, letters and special characters (#20)

### Sensor pressure range behavior

**Navigation** Guidance → SIL confirmation → P-range behavior

**Description** Assigned event behavior in case of over/under pressure outside of measuring range.

**User interface**
- Alarm
- Warning
- Remark
- Special

### Output current transfer function

**Navigation** Guidance → SIL confirmation → Curr. trans.func

**Description** Assigned transfer function for current output.

**User interface**
- Linear
- Square root

### Low cutoff

**Navigation** Guidance → SIL confirmation → Low cutoff

**User interface** Character string comprising numbers, letters and special characters (#20)

### Failure behavior current output

**Navigation** Guidance → SIL confirmation → Fail.behav.out

**Description** Assigned value of current output in case of an error.

**User interface**
- Min.
- Max.

### Current range output

**Navigation** Guidance → SIL confirmation → Cur.range outp

**Description** Assigned current range used to transmit the measured value.

**User interface**
- 4...20 mA (4... 20.5 mA)
- 4...20 mA NE (3.8...20.5 mA)
- 4...20 mA US (3.9...20.8 mA)
- Customer specific

### Measuring mode current output

**Navigation** Guidance → SIL confirmation → Meas.mode outp

**Description** Assigned setting of curve form of current output.

**User interface**
- Standard
- Inverse
- Bi-directional

### Lower range value output

**Navigation** Guidance → SIL confirmation → Low.range outp

**Description** Assigned value 4 mA.

**User interface** Character string comprising numbers, letters and special characters (#20)

### Upper range value output

**Navigation** Guidance → SIL confirmation → Upp.range outp

**Description** Assigned value 20 mA.

**User interface** Character string comprising numbers, letters and special characters (#20)

### Assign PV

**Navigation** Guidance → SIL confirmation → Assign PV

**Description** Identifies the process variable linked with the primary variable. Primary variable is used in HART as current output.

**User interface**
- Pressure
- Scaled variable

### Enter SIL locking code

**Navigation** Guidance → SIL confirmation → SIL locking code

**Description** Enter the locking code to start the SIL/WHG locking sequence.

**User entry** 0 to 65 535

**Additional information** **Locking codes**
- WHG: 7450
- SIL: 7452
- SIL and WHG: 7454

### Code incorrect

**Navigation** Guidance → SIL confirmation → Code incorrect

**Description** Abort SIL confirmation sequence or reenter SIL locking code.

**Selection**
- Reenter code
- Abort sequence

### Locking status

**Navigation** Guidance → SIL confirmation → Locking status

**Description** Displays the active write protection.

**User interface**
- Hardware locked
- SIL locked
- Temporarily locked

**Additional information**

*User interface*

If two or more types of write protection are active, the write protection with the highest priority is shown on the local display. In the operating tool all active types of write protection are displayed.

Detailed information on access authorization is provided in the "User roles and associated access authorization" and "Operating concept" sections of the Operations Instructions for the device.

*Selection*

*Function scope of the "Locking status" parameter*

| Options | Description |
|---|---|
| None | The access status displayed in the **Access status display** parameter (→ 15) applies. Only appears on local display. |
| Hardware locked | The DIP switch for hardware locking is activated on the main electronics module. This prevents write access to the parameters (e.g. via the local display or operating tool). |
| Temporarily locked | Write access to the parameters is temporarily locked due to device-internal processing (e.g. data upload/download, reset). Once the internal processing has been completed, the parameters can be changed once again. |

### 3.1.3 "Deactivate SIL" wizard

*Navigation* Guidance → Deactivate SIL

**Enter SIL unlocking code**

**Navigation** Guidance → Deactivate SIL → SIL unlock. code

**Description** The SIL locking/unlocking code can be found in the corresponding safety manual.

**User entry** 0 to 65 535

**Code incorrect**

**Navigation** Guidance → Deactivate SIL → Code incorrect

**Description** Abort SIL confirmation sequence or reenter SIL locking code.

**Selection**
- Reenter code
- Abort sequence

## Locking status

**Navigation** Guidance → Deactivate SIL → Locking status

**Description** Displays the active write protection.

**User interface**
- Hardware locked
- SIL locked
- Temporarily locked

**Additional information**

*User interface*

If two or more types of write protection are active, the write protection with the highest priority is shown on the local display. In the operating tool all active types of write protection are displayed.

Detailed information on access authorization is provided in the "User roles and associated access authorization" and "Operating concept" sections of the Operations Instructions for the device.

*Selection*

*Function scope of the "Locking status" parameter*

| Options | Description |
|---|---|
| None | The access status displayed in the **Access status display** parameter (→ 15) applies. Only appears on local display. |
| Hardware locked | The DIP switch for hardware locking is activated on the main electronics module. This prevents write access to the parameters (e.g. via the local display or operating tool). |
| Temporarily locked | Write access to the parameters is temporarily locked due to device-internal processing (e.g. data upload/download, reset). Once the internal processing has been completed, the parameters can be changed once again. |

## 3.2 "Diagnostics" menu

*Navigation* Diagnostics

### 3.2.1 "Active diagnostics" submenu

*Navigation* Diagnostics → Active diagnos.

**Active diagnostics**

**Navigation** Diagnostics → Active diagnos. → Active diagnos.

**Prerequisite** A diagnostic event has occurred.

**Description** Displays the current diagnostic message. If two or more messages occur simultaneously, the message with the highest priority is shown on the display.

**User interface** Symbol for diagnostic behavior, diagnostic code and short message.

**Additional information** *User interface*

Additional pending diagnostic messages can be viewed in the **Diagnostic list** submenu.

*Example*

For the display format:
⊗F271 Main electronic failure

**Timestamp**

**Navigation** Diagnostics → Active diagnos. → Timestamp

**Description** Displays the operating time when the current diagnostic message occurred.

**User interface** Days (d), hours (h), minutes (m) and seconds (s)

**Additional information** *User interface*

The diagnostic message can be viewed via the **Actual diagnostics** parameter (→ 33).

*Example*

For the display format:
24d12h13m00s

## Previous diagnostics

**Navigation** Diagnostics → Active diagnos. → Prev.diagnostics

**Prerequisite** Two diagnostic events have already occurred.

**Description** Displays the diagnostic message that occurred before the current message.

**User interface** Symbol for diagnostic behavior, diagnostic code and short message.

**Additional information** *User interface*

Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the E key.

*Example*

For the display format:
⊗F271 Main electronic failure

## Timestamp

**Navigation** Diagnostics → Active diagnos. → Timestamp

**Description** Displays the operating time when the last diagnostic message before the current message occurred.

**User interface** Days (d), hours (h), minutes (m) and seconds (s)

**Additional information** *User interface*

The diagnostic message can be viewed via the **Previous diagnostics** parameter (→ 34).

*Example*

For the display format:
24d12h13m00s

## Operating time from restart

**Navigation** Diagnostics → Active diagnos. → Time fr. restart

**Description** Shows the time the device has been in operation since the last device restart.

**User interface** Days (d), hours (h), minutes (m), seconds (s)

**Operating time**

**Navigation** Diagnostics → Active diagnos. → Operating time

**Description** Indicates how long the device has been in operation.

**Additional information** Maximum time: 9 999 d (≈ 27 years)

### 3.2.2 "Minimum/maximum values" submenu

*Navigation* Diagnostics → Min/max val.

**Pressure min**

**Navigation** Diagnostics → Min/max val. → Pressure min

**User interface** Signed floating-point number

**Pressure max**

**Navigation** Diagnostics → Min/max val. → Pressure max

**User interface** Signed floating-point number

**Counter limit underruns sensor Pmin**

**Navigation** Diagnostics → Min/max val. → Counter P < Pmin

**User interface** 0 to 65 535

**Counter limit overruns sensor Pmax**

**Navigation** Diagnostics → Min/max val. → Counter P > Pmax

**User interface** 0 to 65 535

### Counter underruns of user limit Pmin

**Navigation** Diagnostics → Min/max val. → Counter < P user

**User interface** 0 to 65 535

### Counter overruns of user limit Pmax

**Navigation** Diagnostics → Min/max val. → Counter > P user

**User interface** 0 to 65 535

### Reset user defined counters P and T

**Navigation** Diagnostics → Min/max val. → Reset count. P T

**Selection**
- Cancel
- Confirm

### Minimum sensor temperature

**Navigation** Diagnostics → Min/max val. → Min. sensor temp

**User interface** −273.15 to 9 726.85 °C

### Maximum sensor temperature

**Navigation** Diagnostics → Min/max val. → Max. Sensor temp

**User interface** −273.15 to 9 726.85 °C

### Counter limit overruns sensor Tmax

**Navigation** Diagnostics → Min/max val. → Counter T > Tmax

**User interface** 0 to 65 535

### Counter limit underruns sensor Tmin

**Navigation** Diagnostics → Min/max val. → Counter T < Tmin

**User interface** 0 to 65 535

### Counter underruns of user limit Tmin

**Navigation** Diagnostics → Min/max val. → Counter < T user

**User interface** 0 to 65 535

### Counter overruns of user limit Tmax

**Navigation** Diagnostics → Min/max val. → Counter > T user

**User interface** 0 to 65 535

### Minimum terminal voltage

**Navigation** Diagnostics → Min/max val. → Min.term.volt.

**User interface** 0.0 to 50.0 V

### Maximum terminal voltage

**Navigation** Diagnostics → Min/max val. → Max.term.voltage

**User interface** 0.0 to 50.0 V

### Minimum electronics temperature

**Navigation** Diagnostics → Min/max val. → Min.electr.temp.

**User interface** Signed floating-point number

**Maximum electronics temperature**

**Navigation** Diagnostics → Min/max val. → Max.electr.temp.

**User interface** Signed floating-point number

### 3.2.3 "Simulation" submenu

*Navigation* Diagnostics → Simulation

**Simulation**

**Navigation** Diagnostics → Simulation → Simulation

**Selection**
- Off
- Pressure
- Current output
- Diagnostic event simulation

**Value pressure simulation**

**Navigation** Diagnostics → Simulation → Value pressure

**User entry** Signed floating-point number

**Value current output**

**Navigation** Diagnostics → Simulation → Val. curr.outp

**Description** Defines the value of the simulated output current.

**User entry** 3.59 to 23 mA

**Diagnostic event category**

**Navigation** Diagnostics → Simulation → Event category

**Description** Use this function to select the category of the diagnostic events that are displayed for the simulation in the **Diagnostic event simulation** parameter (→ 39).

**Selection**
- Sensor
- Electronics
- Configuration
- Process

**Diagnostic event simulation**

**Navigation** Diagnostics → Simulation → Diag. event sim.

**Description** Use this function to select a diagnostic event for the simulation process that is activated.

**Selection**
- Off
- Diagnostic event picklist (depends on the category selected)

**Additional information** *Description*

For the simulation, you can choose from the diagnostic events of the category selected in the **Diagnostic event category** parameter (→ 38).

### 3.2.4 "Heartbeat Technology" submenu

*Navigation* Diagnostics → HBT

#### "Heartbeat Verification" submenu

*Navigation* Diagnostics → HBT → HBT Verification

**Start verification**

**Navigation** Diagnostics → HBT → HBT Verification → Start verificat.

**Description** Start verification.

To carry out a complete verification, select the selection parameters individually. Once the external measured values have been recorded, verification is started using the **Start** option.

**Selection**

or

- Cancel
- Start

**Additional information**

### Operating time (Verification)

**Navigation** Diagnostics → HBT → HBT Verification → Operating time

**Description** Indicates how long the device has been in operation.

**User interface** Days (d), hours (h), minutes (m), seconds (s)

### Verification result

**Navigation** Diagnostics → HBT → HBT Verification → Verific. result

**User interface**
- Not done
- Passed
- Not done
- Failed

### Status

**Navigation** Diagnostics → HBT → HBT Verification → Status

**Description** Displays the current status of the verification.

**User interface**
- Done
- Busy
- Failed
- Not done

## "Loop diagnostics" submenu

*Navigation* Diagnostics → HBT → Loop diagn.

### Rebuild baseline

**Navigation** Diagnostics → HBT → Loop diagn. → Reb. baseline

**Description** Notice
The current output is simulated.
Bridge the PLC or take other appropriate measures to prevent an erroneous triggering of alarm messages or changes in the control loop behavior.

The baseline should be rebuilt if planned changes have been made in the loop.

**Selection**
- No
- Yes

## Tolerated deviation +/-

**Navigation** Diagnostics → HBT → Loop diagn. → Toler. deviation

**Description**
A value should be chosen to ensure that normal voltage deviations do not lead to unwanted messages.

Default
1.5 V DC

**User entry** 0.5 to 3.0 V

## 806 Alarm delay

**Navigation** Diagnostics → HBT → Loop diagn. → 806 Alarm delay

**User entry** 0 to 60 s

## Baseline status

**Navigation** Diagnostics → HBT → Loop diagn. → Baseline status

**Description**
'Failed'
Means, baseline is not available or creation not possible.

'Passed'
Baseline is available.

**User interface**
- Failed
- Success

## Loop diagnostics

**Navigation** Diagnostics → HBT → Loop diagn. → Loop diagn.

**Selection**
- Disable
- Enable

### Terminal voltage 1

**Navigation** Diagnostics → HBT → Loop diagn. → Terminal volt. 1

**Description** Shows the current terminal voltage that is applied at the output.

**User interface** 0.0 to 50.0 V

### Clamping voltage lower threshold

**Navigation** Diagnostics → HBT → Loop diagn. → Lower threshold

**User interface** 0.0 to 50.0 V

### Clamping voltage upper threshold

**Navigation** Diagnostics → HBT → Loop diagn. → Upper threshold

**User interface** 0.0 to 50.0 V

## "Statistical Sensor Diagnostics" submenu

*Navigation* Diagnostics → HBT → SSD

### SSD: Statistical Sensor Diagnostics

**Navigation** Diagnostics → HBT → SSD → Stat. Sens. Diag

**Description** Enable or disable SSD.

After selecting 'Disable', no statistical sensor diagnosis takes place. No diagnostic messages are output.

**Selection**
- Disable
- Enable

### System status

**Navigation** Diagnostics → HBT → SSD → System status

**User interface**
- Idle
- No sufficient signal noise
- Stable
- Not stable
- Verify System Dynamics

### Signal status

**Navigation** Diagnostics → HBT → SSD → Signal status

**User interface**
- Idle
- Building Baseline
- Verifying Baseline
- Verifying baseline failed
- Monitoring
- Out of range
- Monitoring inactive

### Signal noise status

**Navigation** Diagnostics → HBT → SSD → Noise status

**User interface**
- Idle
- Building Baseline
- Verifying Baseline
- Verifying baseline failed
- Monitoring
- Out of range
- Monitoring inactive

### Counter Baseline creation SSD

**Navigation** Diagnostics → HBT → SSD → Counter Baseline

**Description** Specifies how often the baseline has been rebuilt.

**User interface** Positive integer

## 3.3 "Application" menu

*Navigation* Application

### 3.3.1 "Measured values" submenu

*Navigation* Application → Measured values

**Terminal voltage 1**

**Navigation** Application → Measured values → Terminal volt. 1

**Description** Shows the current terminal voltage that is applied at the output.

**User interface** 0.0 to 50.0 V

**Terminal current**

**Navigation** Application → Measured values → Terminal curr.

**Description** Shows the current value of the current output which is currently measured.

**User interface** 0 to 30 mA

**Electronics temperature**

**Navigation** Application → Measured values → Electronics temp

**User interface** Signed floating-point number

**Pressure**

**Navigation** Application → Measured values → Pressure

**Scaled variable**

**Navigation** Application → Measured values → Scaled variable

**User interface** Signed floating-point number

**Sensor temperature**

**Navigation** Application → Measured values → Sensor temp.

**User interface** −273.15 to 9 726.85 °C

### 3.3.2 "Sensor" submenu

*Navigation* Application → Sensor

**"Sensor calibration" submenu**

*Navigation* Application → Sensor → Sensor cal.

**Zero adjustment**

**Navigation** Application → Sensor → Sensor cal. → Zero adjustment

**Description** Due to the mounting position of the measuring instrument, a pressure shift may occur. The pressure shift can be corrected with the zero adjustment.

**Selection**
- No
- Confirm

## Calibration offset

**Navigation** Application → Sensor → Sensor cal. → Calibr offset

**Prerequisite** Absolute pressure sensor

**User entry** Signed floating-point number

## Zero adjustment offset

**Navigation** Application → Sensor → Sensor cal. → Zero adj. offset

**User entry** Signed floating-point number

## Sensor Trim Reset

**Navigation** Application → Sensor → Sensor cal. → Sen. Trim Reset

**Selection**
- No
- Confirm

## Lower sensor trim

**Navigation** Application → Sensor → Sensor cal. → LowerSensor trim

**User entry** Signed floating-point number

## Upper sensor trim

**Navigation** Application → Sensor → Sensor cal. → UpperSensor trim

**User entry** Signed floating-point number

**"Sensor configuration" submenu**

*Navigation* Application → Sensor → Sensor conf.

## Output current transfer function

**Navigation** Application → Sensor → Sensor conf. → Curr. trans.func

**Description**

'Linear'
The linear pressure signal is used for the current output. The flow must be calculated in the evaluation unit.

'Square root - differential pressure only'
The root flow signal is used for the current output. The 'Flow (square root)' current signal is indicated on the on-site display with a root symbol.

**Selection**

- Linear
- Square root *

**Additional information** *Selection*

**"Square root" option**
Is used when a linear output porportional to the flow is required. The flow calcualtion is done internally in the transmitter.

## Damping

**Navigation** Application → Sensor → Sensor conf. → Damping

**Description**

Enter damping constant.
The damping constant affects the speed at which the measured value reacts to pressure changes.

**User entry**

0 to 999.0 s

* Visibility depends on order options or device settings

### "Wet calibration" submenu

*Navigation* Application → Sensor → Wet calibration

*"Zero" wizard*

*Navigation* Application → Sensor → Wet calibration → Zero

**Zero**

**Navigation** Application → Sensor → Wet calibration → Zero → Zero

**Selection**
- No
- Confirm

**Pressure**

**Navigation** Application → Sensor → Wet calibration → Zero → Pressure

**Pressure value 1**

**Navigation** Application → Sensor → Wet calibration → Zero → P. value 1

**Description** Enter pressure for the first scaling point. 'Scaled variable value 1' will be allocated to this pressure.

**User entry** Signed floating-point number

**Lower range value output**

**Navigation** Application → Sensor → Wet calibration → Zero → Low.range outp

**Description** Depending of which variable has been selected as PV, define the related lower and upper range values.
Assignment PV value to 4 mA and 20 mA.

**User entry** Signed floating-point number

*"Span" wizard*

*Navigation* Application → Sensor → Wet calibration → Span

## Span

**Navigation** Application → Sensor → Wet calibration → Span → Span

**Selection**
- No
- Confirm

## Pressure

**Navigation** Application → Sensor → Wet calibration → Span → Pressure

## Pressure value 2

**Navigation** Application → Sensor → Wet calibration → Span → P. value 2

**Description** Enter pressure for the second scaling point. 'Scaled variable value 2' will be allocated to this pressure.

**User entry** Signed floating-point number

## Upper range value output

**Navigation** Application → Sensor → Wet calibration → Span → Upp.range outp

**Description** Depending of which variable has been selected as PV, define the related lower and upper range values.
Assignment PV value to 4 mA and 20 mA.

**User entry** Signed floating-point number

### 3.3.3 "HART output" submenu

*Navigation* Application → HART output

**"Configuration" submenu**

*Navigation* Application → HART output → Configuration

**HART address**

**Navigation** Application → HART output → Configuration → HART address

**Description** Define the HART address of the device.

**User entry** 0 to 63

**Additional information**
- The measured value can only be transmitted via the current value if the address is set to "0". The current is fixed at 4.0 mA for all other addresses (Multidrop mode).
- Only addresses in the range 0 to 15 are permitted for a system according to HART 5.0.
- All addresses in the range 0 to 63 are permitted for a system with HART 6.0 and higher.

**HART short tag**

**Navigation** Application → HART output → Configuration → HART short tag

**Description** Defines the short tag for the measuring point.

Maximum length: 8 characters
Allowed characters: A-Z, 0-9, certain special characters

**User entry** Max. 8 characters: A to Z, 0 to 9 and certain special characters (e.g. punctuation marks, @, %).

**Device tag**

**Navigation** Application → HART output → Configuration → Device tag

**Description** Enter a unique name for the measuring point to identify the device quickly within the plant.

**User entry** Character string comprising numbers, letters and special characters (#32)

## No. of preambles

**Navigation** Application → HART output → Configuration → No. of preambles

**Description** Defines the number of preambles in the HART telegram.

**User entry** 5 to 20

## Loop current mode

**Navigation** Application → HART output → Configuration → Loop curr mode

**Description** If Loop current mode is disabled, Multi-drop communication mode is activated. Multi-drop is a HART digital communication mode where multiple devices may share the same pair of wires for power and communications.
In this mode the output current is fixed.

**Selection**
- Disable
- Enable

## 3.4 "System" menu

*Navigation* System

### 3.4.1 "Device management" submenu

*Navigation* System → Device manag.

**Device tag**

**Navigation** System → Device manag. → Device tag

**Description** Enter a unique name for the measuring point to identify the device quickly within the plant.

**User entry** Character string comprising numbers, letters and special characters (#32)

**Locking status**

**Navigation** System → Device manag. → Locking status

**Description** Displays the active write protection.

**User interface**
- Hardware locked
- SIL locked
- Temporarily locked

**Additional information** *User interface*

If two or more types of write protection are active, the write protection with the highest priority is shown on the local display. In the operating tool all active types of write protection are displayed.

Detailed information on access authorization is provided in the "User roles and associated access authorization" and "Operating concept" sections of the Operations Instructions for the device.

*Selection*

*Function scope of the "Locking status" parameter*

| Options | Description |
|---|---|
| None | The access status displayed in the **Access status display** parameter (→ 15) applies. Only appears on local display. |
| Hardware locked | The DIP switch for hardware locking is activated on the main electronics module. This prevents write access to the parameters (e.g. via the local display or operating tool). |
| Temporarily locked | Write access to the parameters is temporarily locked due to device-internal processing (e.g. data upload/download, reset). Once the internal processing has been completed, the parameters can be changed once again. |

## Configuration counter

**Navigation** System → Device manag. → Config. counter

**Description** Displays the counter for changes to the device parameters.

Additional information:
- If the value for a static parameter is changed when optimizing or configuring the parameter, the counter is incremented by 1. This is to enable tracking different parameter versions.
- When multiple parameters are changed simultaneously, e.g. when loading parameters into the device from an external source such as FieldCare, the counter may display a higher value. The counter cannot be reset, nor is it reset to a default value on performing a device reset.
- Once the counter has reached the value 65535, it restarts at 0.

**User interface** 0 to 65 535

## Reset device

**Navigation** System → Device manag. → Reset device

**Description** Use this function to choose whether to reset the device configuration - either entirely or in part - to a defined state.

**Selection**
- Cancel
- To factory defaults *
- To delivery settings *
- Restart device

**Additional information** *Selection*

| Options | Description |
|---|---|
| Cancel | No action is executed and the user exits the parameter. |
| To factory defaults | Every parameter is reset to its factory setting. |
| To delivery settings | Every parameter for which a customer-specific default setting was ordered is reset to this customer-specific value. All other parameters are reset to the factory setting.<br>This option is not visible if no customer-specific settings have been ordered. |
| Restart device | The restart resets every parameter whose data are in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged. |

* Visibility depends on order options or device settings

### 3.4.2 "User management" submenu

*Navigation* System → User manag.

**User role**

**Navigation** System → User manag. → User role

**Description** Displays the access authorization to the parameters via the operating tool.

**User interface**
- Operator
- Maintenance
- Expert

**Additional information** *Description*

Access authorization can be modified via the **Enter access code** parameter.

If additional write protection is active, this restricts the current access authorization even further.

*User interface*

Detailed information on access authorization is provided in the "User roles and associated access authorization" and "Operating concept" sections of the Operations Instructions for the device.

**"Change user role" wizard**

*Navigation* System → User manag. → Change user role

**Enter access code**

**Navigation** System → User manag. → Change user role → Ent. access code

**Description** Use this function to enter the user-specific release code to remove parameter write protection in the operating tool.

**User entry** 0 to 9 999

### "Change user role" wizard

*Navigation* System → User manag. → Change user role

### Start

**Navigation** System → User manag. → Change user role → Start

**User interface** Character string comprising numbers, letters and special characters (#14)

### Password

**Navigation** System → User manag. → Change user role → Password

**Description** Enter the password for the 'Maintenance' user role to get access to the functionality of this role.

**User entry** Character string comprising numbers, letters and special characters (#16)

### Status password entry

**Navigation** System → User manag. → Change user role → Status pw entry

**Description** Use this function to display the status of the password verification.

**User interface**
- --------
- Wrong password
- Password rule violated
- Password accepted
- Permission denied
- Confirm PW mismatch
- Reset password accepted
- Invalid user role
- Wrong sequence of entry

### "Define password" wizard

*Navigation* System → User manag. → Define password

### Start

**Navigation** System → User manag. → Define password → Start

**User interface** Character string comprising numbers, letters and special characters (#14)

### New password

**Navigation** System → User manag. → Define password → New password

**Description** If the factory setting is not changed, the device works without write-protection, using userrole 'Maintenance'. The configuration data of the device can always be modified.
Once the password has been defined, write-protected devices can only be set to maintenance mode if a correct password is entered in the parameter 'Password'.
A new password is valid, after it has been confirmed within the parameter 'Confirm new password'.
Any new password must consist of at least 4 and a maximum of 16 characters and can contain letters and numbers.

**User entry** Character string comprising numbers, letters and special characters (#16)

### Status password entry

**Navigation** System → User manag. → Define password → Status pw entry

**Description** Use this function to display the status of the password verification.

**User interface**
- --------
- Wrong password
- Password rule violated
- Password accepted
- Permission denied
- Confirm PW mismatch
- Reset password accepted
- Invalid user role
- Wrong sequence of entry

### Confirm new password

**Navigation** System → User manag. → Define password → Conf. new passw.

**Description** Enter the new password again to confirm.

**User entry** Character string comprising numbers, letters and special characters (#16)

**"Change password" wizard**

*Navigation* System → User manag. → Change password

### Start

**Navigation** System → User manag. → Change password → Start

**User interface** Character string comprising numbers, letters and special characters (#14)

### Old password

**Navigation** System → User manag. → Change password → Old password

**Description** Enter the current password, to subsequently change the existing password.

**User entry** Character string comprising numbers, letters and special characters (#16)

### Status password entry

**Navigation** System → User manag. → Change password → Status pw entry

**Description** Use this function to display the status of the password verification.

**User interface**
- --------
- Wrong password
- Password rule violated
- Password accepted
- Permission denied
- Confirm PW mismatch
- Reset password accepted
- Invalid user role
- Wrong sequence of entry

### New password

**Navigation** System → User manag. → Change password → New password

**Description** If the factory setting is not changed, the device works without write-protection, using userrole 'Maintenance'. The configuration data of the device can always be modified.
Once the password has been defined, write-protected devices can only be set to maintenance mode if a correct password is entered in the parameter 'Password'.
A new password is valid, after it has been confirmed within the parameter 'Confirm new password'.
Any new password must consist of at least 4 and a maximum of 16 characters and can contain letters and numbers.

**User entry** Character string comprising numbers, letters and special characters (#16)

### Confirm new password

**Navigation** System → User manag. → Change password → Conf. new passw.

**Description** Enter the new password again to confirm.

**User entry** Character string comprising numbers, letters and special characters (#16)

**"Delete password" wizard**

*Navigation* System → User manag. → Delete password

### Start

**Navigation** System → User manag. → Delete password → Start

**User interface** Character string comprising numbers, letters and special characters (#14)

### Old password

**Navigation** System → User manag. → Delete password → Old password

**Description** Enter the current password, to subsequently change the existing password.

**User entry** Character string comprising numbers, letters and special characters (#16)

### Status password entry

**Navigation** System → User manag. → Delete password → Status pw entry

**Description** Use this function to display the status of the password verification.

**User interface**
- --------
- Wrong password
- Password rule violated
- Password accepted
- Permission denied
- Confirm PW mismatch
- Reset password accepted
- Invalid user role
- Wrong sequence of entry

**"Reset password" wizard**

*Navigation* System → User manag. → Reset password

### Start

**Navigation** System → User manag. → Reset password → Start

**User interface** Character string comprising numbers, letters and special characters (#14)

### Reset password

**Navigation** System → User manag. → Reset password → Reset password

**Description** Enter a code to reset the current password.
CAUTION: Use this function only if the current password is lost. Contact your Endress +Hauser Sales Center.

**User entry** Character string comprising numbers, letters and special characters (#16)

### Status password entry

**Navigation** System → User manag. → Reset password → Status pw entry

**Description** Use this function to display the status of the password verification.

**User interface**

- --------
- Wrong password
- Password rule violated
- Password accepted
- Permission denied
- Confirm PW mismatch
- Reset password accepted
- Invalid user role
- Wrong sequence of entry

### "Logout" wizard

*Navigation* System → User manag. → Logout

## Start

**Navigation** System → User manag. → Logout → Start

**User interface** Character string comprising numbers, letters and special characters (#14)

## User role

**Navigation** System → User manag. → Logout → User role

**Description** Displays the access authorization to the parameters via the operating tool.

**User interface**

- Operator
- Maintenance
- Expert

**Additional information** *Description*

Access authorization can be modified via the **Enter access code** parameter.

If additional write protection is active, this restricts the current access authorization even further.

*User interface*

Detailed information on access authorization is provided in the "User roles and associated access authorization" and "Operating concept" sections of the Operations Instructions for the device.

### 3.4.3 "Bluetooth configuration" submenu

*Navigation* System → Bluetooth conf.

**Bluetooth activation**

**Navigation** System → Bluetooth conf. → Bluetooth active

**Selection**
- Disable
- Enable

### 3.4.4 "Display" submenu

*Navigation* System → Display

**Language**

**Navigation** System → Display → Language

**Prerequisite** A local display is provided.

**Description** Use this function to select the configured language on the local display.

**Selection**
- English
- Deutsch
- Français
- Español
- Italiano
- Nederlands
- Portuguesa
- Polski
- русский язык (Russian)
- Svenska
- Türkçe
- 中文 (Chinese)
- 日本語 (Japanese)
- 한국어 (Korean)
- Bahasa Indonesia
- tiếng Việt (Vietnamese)
- čeština (Czech)

**Factory setting** English (alternatively, the ordered language is preset in the device)

## Format display

**Navigation** System → Display → Format display

**Prerequisite** A local display is provided.

**Description** Use this function to select how the measured value is shown on the local display.

**Selection**
- 1 value, max. size
- 1 bargraph + 1 value
- 2 values

**Additional information**

*Description*

The display format (size, bar graph etc.) and number of measured values displayed simultaneously (1 to 4) can be configured. This setting only applies to normal operation.

- The **Value 1 display** parameter (→ 62) to **Value 4 display** parameter (→ 64) are used to specify which measured values are shown on the local display and in what order.
- If more measured values are specified than the display mode selected permits, then the values alternate on the device display. The display time until the next change is configured via the **Display interval** parameter.

## Value 1 display

**Navigation** System → Display → Value 1 display

**Prerequisite** A local display is provided.

**Description** Use this function to select one of the measured values shown on the local display.

**Selection**
- Pressure
- Scaled variable
- Current output
- Sensor temperature
- Percent of range

**Additional information**

*Description*

If several measured values are displayed at once, the measured value selected here will be the first value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter (→ 62) is used to specify how many measured values are displayed simultaneously and how.

*Dependency*

The unit of the displayed measured value is taken from the **System units** submenu.

## Value 2 display

**Navigation** System → Display → Value 2 display

**Prerequisite** A local display is provided.

**Description** Use this function to select one of the measured values shown on the local display.

**Selection**
- None
- Pressure
- Scaled variable
- Current output
- Sensor temperature
- Percent of range

**Additional information**

*Description*

If several measured values are displayed at once, the measured value selected here will be the second value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter (→ 62) is used to specify how many measured values are displayed simultaneously and how.

*Dependency*

The unit of the displayed measured value is taken from the **System units** submenu.

## Value 3 display

**Navigation** System → Display → Value 3 display

**Prerequisite** A local display is provided.

**Description** Use this function to select one of the measured values shown on the local display.

**Selection**
- None
- Pressure
- Scaled variable
- Current output
- Sensor temperature
- Percent of range

**Additional information**

*Description*

If several measured values are displayed at once, the measured value selected here will be the third value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter (→ 62) is used to specify how many measured values are displayed simultaneously and how.

*Selection*

The unit of the displayed measured value is taken from the **System units** submenu.

## Value 4 display

**Navigation** System → Display → Value 4 display

**Prerequisite** A local display is provided.

**Description** Use this function to select one of the measured values shown on the local display.

**Selection**
- None
- Pressure
- Scaled variable
- Current output
- Sensor temperature
- Percent of range

**Additional information**

*Description*

If several measured values are displayed at once, the measured value selected here will be the fourth value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter (→ 62) is used to specify how many measured values are displayed simultaneously and how.

*Selection*

The unit of the displayed measured value is taken from the **System units** submenu.

## Contrast display

**Navigation** System → Display → Contrast display

**Description** Adjust local display contrast setting to ambient conditions (e.g. lighting or reading angle).

**User entry** 20 to 80 %

**Factory setting** Depends on the display

**Additional information**

Set the contrast via the push-buttons:
- Weaker: Press the ⊖ and E buttons simultaneously
- Stronger: Press the ⊕ and E buttons simultaneously

### 3.4.5 "Software configuration" submenu

*Navigation* System → Softw. config.

**CRC device configuration**

**Navigation** System → Softw. config. → CRC device conf.

**Description** CRC device configuration based on current settings of safety relevant parameters. The CRC device configuration is unique and can be used to detect changes in safety relevant parameter settings.

**User interface** 0 to 65 535

**Stored CRC device configuration**

**Navigation** System → Softw. config. → Stored CRC conf.

**Description** Stored CRC after the last SIL lock. Factory delivery is 65535 means that the device has not yet been SIL locked.

**User interface** 0 to 65 535

**Timestamp stored CRC device config.**

**Navigation** System → Softw. config. → TS stored CRC

**Description** Gives the time stamp when the CRC was last stored following completion of the SIL-Mode Wizard.

**User interface** Character string comprising numbers, letters and special characters (#20)

**Activate SW option**

**Navigation** System → Softw. config. → Activate SW opt.

**Description** Use this function to enter an activation code to enable an additional, ordered software option.

**User entry** Max. 10-digit string of numbers.

**Factory setting** Depends on the software option ordered

**Additional information**

*Description*

If a measuring device was ordered with an additional software option, the activation code is programmed in the device at the factory.

*User entry*

To activate a software option subsequently, please contact your Endress+Hauser sales organization.

**NOTE!**

**The activation code is linked to the serial number of the measuring device and varies according to the device and software option.**

If an incorrect or invalid code is entered, this results in the loss of software options that have already been activated.

▸ Before you enter a new activation code, make a note of the current activation code from the parameter protocol.

▸ Enter the new activation code provided by Endress+Hauser when the new software option was ordered.

▸ If the code entered is incorrect or invalid, enter the old activation code from the parameter protocol.

▸ Have the Endress+Hauser sales organization check the new activation code remembering to specify the serial number or ask for the code again.

*Example for a software option*

Order code for "Application package", option **EA** "Extended HistoROM"

## 3.4.6 "Information" submenu

*Navigation* System → Information

**Device name**

**Navigation** System → Information → Device name

**Description** Displays the name of the transmitter. It can also be found on the nameplate of the transmitter.

**User interface** Max. 32 characters such as letters or numbers.

**Manufacturer**

**Navigation** System → Information → Manufacturer

**User interface** Character string comprising numbers, letters and special characters (#32)

## Serial number

**Navigation** System → Information → Serial number

**Description** Displays the serial number of the measuring device.

The number can be found on the nameplate of the sensor and transmitter.

**User interface** Max. 11-digit character string comprising letters and numbers.

**Additional information** *Description*

**Uses of the serial number**
- To identify the measuring device quickly, e.g. when contacting Endress+Hauser.
- To obtain specific information on the measuring device using the Device Viewer: www.endress.com/deviceviewer

## Order code

**Navigation** System → Information → Order code

**Description** Shows the device order code.

**User interface** Character string composed of letters, numbers and certain punctuation marks (e.g. /).

**Factory setting** –

**Additional information** *Description*

The order code is generated from the extended order code through a process of reversible transformation. The extended order code indicates the attributes for all the device features in the product structure. The device features are not directly readable from the order code.

**Uses of the order code**
- To order an identical spare device.
- To identify the device quickly and easily, e.g. when contacting Endress+Hauser.

## Firmware version

**Navigation** System → Information → Firmware version

**Description** Displays the device firmware version that is installed.

**User interface** Character string in the format xx.yy.zz

**Additional information** *User interface*

The Firmware version is also located:
- On the title page of the Operating instructions
- On the transmitter nameplate

### Hardware version

**Navigation** System → Information → Hardware version

**Description** Displays the hardware revision of the module.

**User interface** Max. 16 characters, such as letters, numbers or special characters (e.g. @, %, /)

### XML build number

**Navigation** System → Information → XML build no.

**User interface** Positive integer

### Checksum

**Navigation** System → Information → Checksum

**User interface** Positive integer

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People for Process Automation

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People for Process Automation

# ENDRESS+HAUSER, INC. GENERAL TERMS AND CONDITIONS OF SALE

1. **Acceptance.** The Buyer's purchase order ("Order") constitutes an offer by Buyer to purchase Goods and/or Services in accordance with these Terms and Conditions. The Order shall be deemed to be accepted when Seller issues written acceptance of the Order at which point and on which date the Agreement shall come into existence. Any quotation given by the Seller shall not constitute an offer. It is only valid for a period of 30 days from the date of issue unless the Seller agrees in writing to extend that period.
2. **Buyer's Assent.** Shipment by Seller and acceptance by Buyer of, or payment for all or any part of the Goods (as defined below) and/or Services (as defined below) covered by the Order shall constitute Buyer's assent to all of the Terms herein. Prior to acceptance of Goods and Services by Buyer, Seller may withdraw or modify its conditional acceptance of the Order.
3. **Complete Agreement.** The Agreement along with these Terms (collectively referred to herein as the "Agreement") constitutes the entire agreement between the parties and supersedes all prior agreements with respect to the Goods and Services whether such agreements were written or oral. These Terms apply to the Agreement to the exclusion of any other terms that Buyer seeks to impose or incorporate, or which are implied by trade, custom, practice or course of dealing. These Terms are also available online at www.us.endress.com. Seller may amend these Terms at any time at its discretion. These Terms shall apply to the supply of both Goods and Services except where application to one or the other is specified. Special terms may apply in respect of software support services and/or other specific services if agreed between the parties.
4. **Modification.** No modification, amendment, extension, renewal, rescission, discharge, abandonment, waiver or other change or alteration shall be valid, enforceable or binding on Seller unless agreed to in writing by Seller. Seller shall not be bound by any additional or different terms, whether printed or otherwise, in the Order or any other communication from Buyer to Seller unless specifically agreed to by Seller in writing. Prior courses of dealing, usage of the trade, and verbal agreements not reduced to writing and signed by Seller, to the extent that they modify, add to, or detract from the Agreement, shall not be binding on the Seller. Seller may, at its option, treat any attempted modification, termination or repudiation by Buyer to which Seller does not assent as a breach of the entire Agreement and claim all proper damages.
5. **Termination.** If all or part of the Agreement is terminated by agreement of the parties, and if there is no contrary written agreement between Seller and Buyer, Buyer shall pay termination charges in the amount equal to the greater of (I) ten (10) percent of the net sales price or (II) (a) the price provided in the Order for all Goods assembled and Services performed prior to the agreement by Seller to terminate, plus (b) the actual expenditures made and liabilities incurred by Seller in connection with any portion of the Goods and Services not yet completed (as evidenced in writing), plus (c) reasonable estimated profit on the not yet completed portion of the Goods and Services.
6. **Price, Payment Terms, and Security Interest.** The price for Goods shall be the price set out in the Order confirmation. The price of the Goods is exclusive of all costs and charges of packaging, insurance, and transport of the Goods. The charges for Services shall be on a time and materials basis and shall be calculated in accordance with Seller's standard daily fee rates and service rate schedule, which is available upon request. The price for Goods and Services are collectively hereinafter also referred to as the "Prices". Seller's Prices may be subject to change and are subject to Seller's standard annual price increases. Seller will notify Buyer of any Price increase.

Unless provided otherwise on the face of this Agreement, Buyer shall pay the purchase price for the Goods and Services in full within 30 days from date of shipment. Buyer shall pay all amounts due under this Agreement in full without any set-off, counterclaim, deduction, or withholding except as required by law. Seller may, without limiting its other rights or remedies, set off any amount owing to it by Buyer against any amount payable by Seller to Buyer. All invoices not paid when due will thereafter be subject to a monthly service charge of one and a half percent (1½%) of the unpaid balance. If, in Seller's opinion, there is a material, adverse change in Buyer's financial condition or if Buyer has not, within the agreed time, fully paid for Goods shipped and Services performed under this or any other agreement with Seller, Seller reserves the right to revoke Buyer's credit, to require shipment of Goods C.O.D., and/or suspend performance on this and/or other agreements and/or future shipments. Buyer hereby grants Seller a purchase money security interest in the Goods until the full purchase price is paid, and Buyers appoints Seller as its attorney-in-fact for the purpose of filing any documents necessary or desirable to perfect such security interest in any applicable jurisdiction.
7. **Services**. In the event services are also provided to Buyer by Seller (including, but not limited to the licensing of software), Seller will provide services ("Services") to Buyer in accordance with the Buyer's service specifications and these Terms. However, Seller shall not be obligated to perform Services as a result of malfunctions of the Goods caused by: (a) the deliberate or negligent acts of persons other than the Seller; (b) inadequate facilities of Buyer; (c) systems or equipment outside Seller's control (such as those provided by vendors of utilities), and (d) modifications to the Goods made by a party other than the Seller. Seller shall have the right to make any changes to the Services that are necessary to comply with any applicable law or safety requirement, or which do not materially affect the nature or quality of the Services, and the Seller shall notify the Buyer in any such event.

Buyer shall provide Seller with reasonable access to its premises as necessary for Seller to perform the Services. At all times Seller's personnel will comply with Buyer's safety and security precautions, procedures, and guidelines. Seller will immediately inform Buyer of any injury or accident occurring on Buyer's premises involving Seller's personnel. Seller will provide Services in a manner as to minimize interference with Buyer's operations. Buyer shall cooperate with the Seller in all matters relating to the Services and provide the Seller with such information and materials as the Seller may reasonably require to supply the Services, and ensure that such information is accurate in all material respects. Seller shall have the right to rely on information and materials provided by Buyer and

Seller shall not be liable for Services performed, provided that such Services are provided in accordance with Buyer's specifications. Buyer shall obtain and maintain all necessary licenses, permissions and consents which may be required for the Services to be performed prior to the date on which the Services are to start, and keep and maintain all materials, equipment, documents and other property of the Seller ("Seller Materials") at the Buyer's premises in safe custody at its own risk, and in good condition until returned to the Supplier, and not dispose of or use the Seller Materials other than in accordance with the Seller's written instructions or authorization.

8. **Delivery/Shipment.** Seller shall deliver the Goods to the location as set out in the Order Confirmation (Delivery Location) and in accordance with the INCOTERM referred to in the Order Confirmation (in the absence of written agreement to the contrary) and shall be deemed complete pursuant to the agreed upon delivery terms. If no terms are specified, the delivery terms shall be EXW (Incoterms 2010) Shipping Point. Buyer shall pay all shipping, packing and handling costs and shall bear the risk of loss after Seller completes delivery of the Goods to the carrier. Buyer shall have five (5) days after any full or partial delivery to notify Seller if Buyer's count of delivered Goods does not comport with Seller's count as identified in the itemized packing list accompanying the shipment.

9. **Sales or Use Taxes.** In compliance with various state sales tax statutes and regulations, Seller will add sales tax to the sale of a taxable order unless Buyer provides documentation that is complete, legally acceptable in form, and valid in accordance with applicable laws and regulations of the state that has jurisdiction over the sales transaction. The jurisdiction state shall be the state into which the delivery of tangible personal property or digital property was transported, where the performance of services occurred, or the state from which there was a foreign export of tangible personal property or digital property, which is issued by Buyer and accepted by Seller, *unless* Buyer provides Seller legally acceptable proof of a direct pay permit and/or a tax exempt certificate, as applicable, owned by Buyer and issued by the state which has jurisdiction over the transaction. Buyer shall be held liable to Seller for monies due for sales tax if a subsequent tax audit determines that Buyer provided incomplete or invalid documentation, unless Buyer provides additional documentation to correct any deficiencies in the original documentation in accordance with applicable state laws and regulations and audit requirements.

10. **Time of Delivery.** Shipment and Service schedules are approximate and are based on conditions existing at the time of execution of the Agreement. Seller shall attempt to effect delivery or performance of Services in good faith by the date specified on the Order. Buyer agrees that Seller shall not be responsible or liable for any damages, including but not limited to, special or consequential damages, arising from any shipment of nonconforming Goods, or any delay in delivery of Goods or performance of Services, or any failure to deliver Goods in quantities and at times specified. In such cases, Seller reserves the right to terminate the Agreement or to reschedule delivery within a reasonable time, and Buyer agrees that such termination or rescheduling shall not be considered a breach of the Agreement. In no event shall Seller be liable for incidental or consequential damages resulting from failure to meet requested delivery schedules. Goods and Services shall be deemed accepted when received by Buyer or upon completion of Services, respectively. Buyer's revocation of acceptance, if any, must be made in writing within fifteen (15) business days after receipt of the Goods or completion of the Services. The writing must specify Buyer's reason for revocation of acceptance. The terms of this section do not limit or affect Buyer's rights or Seller's warranty obligations specified hereunder.

11. **Returns.** Except for the return of nonconforming and defective Goods, all returns of Goods shall be made in strict compliance with Seller's Return Policy as may be in effect from time to time, a written copy of which is available to Buyer upon request.

12. **Storage Fees.** If Buyer requests deferral of shipment, or fails to provide information, material or documentation required by this Agreement and as a result Goods are placed in storage, storage fees will commence immediately following the scheduled ship date unless extended in writing. The Buyer will be charged a storage fee equal to Seller's actual cost to store the Goods. These charges will be invoiced to Buyer separately from the actual shipment and shall be paid in full by Buyer within thirty (30) days of date of invoice.

13. **Specifications.** Goods and Services shall be deemed to be in conformity herewith if they conform to the specifications provided by Buyer. In the event ambiguities, discrepancies, or express conflicts exist between the specifications and any other item purporting to describe or define the Goods or Services, including but not limited to drawings, photographs, models or other documentation, the specifications shall control unless otherwise agreed to in writing by Seller. Buyer agrees that Seller shall have no responsibility to identify or notify Buyer of any such ambiguity, discrepancy, or conflict. Seller reserves the right to amend the specification of the Goods if required by any applicable statutory or regulatory requirements.

14. **Nonconforming Goods.** Seller reserves the right to cure any shipment of nonconforming Goods. At the option of Seller, Buyer's remedies for nonconforming Goods shall be limited to the repair or replacement of the nonconforming Goods, and if repair or replacement is not possible, return of the nonconforming Goods and repayment of any portion of the purchase price paid.

15. **Seller's Express Warranty.** Seller warrants the Goods to meet the specifications provided in the Order and to be free from defects in materials and workmanship under normal use and service for a period of one year from time of shipment. Seller further warrants that for a period of one year from time of completion of Services, Services will conform to the specifications set forth in the Order and that Seller will perform Services in a professional and workmanlike manner in accordance with all applicable laws and regulations. Buyer agrees that it has the sole responsibility for the proper selection application, installation, use and instructions (concerning use, application, periodic maintenance, and cautions of the Goods) to ultimate users of the Goods and Services. Buyer agrees that the warranty provided herein shall not apply to any Goods or Services which: (1) have been repaired or altered outside of Seller's factory in any way so as, in Seller's judgment, to affect such Goods' or Services' reliability; (2) have been subject to misuse, negligence, or accident; (3) have been operated other than in accordance with the printed instructions prepared by Seller and provided by Seller with the Goods or Services; or (4) have been subject to abnormal wear of wetted parts caused by Buyer's application of the

Goods. Furthermore, Buyer acknowledges that repairs performed by Buyer or others are not warranted by Seller, and that third party equipment shall be subject to the warranties provided therewith.

16. **Seller's Exclusive Obligations under Warranty.** Seller shall re-perform, at Seller's sole cost and expense, any Services which do not comply with the applicable warranties specified hereof. At Seller's option, Seller may repair, replace, or refund the purchase price of Goods. Goods shall be returned to Seller no later than one month after the expiration of the applicable warranty period and in the manner set forth in this clause and in a manner in which Seller's examination shall disclose to Seller's satisfaction that Goods are defective as specified in the warranty clause hereof. All allegedly defective Goods shall be returned to the Seller at Buyer's expense and risk. All such defective or nonconforming Goods shall be returned to Seller at Greenwood, Indiana, freight prepaid, unless otherwise agreed by the parties in writing, and shall be accompanied or preceded by a particularized statement of the claimed defect. Under such circumstances, freight charges to and from Seller and risk of loss shall be borne by Buyer. Seller shall bear the cost of repair or replacement and the risk of loss while the Goods are in Seller's possession at Seller's plant. If Goods are returned without being preceded or accompanied by a written statement of the claimed defect, Seller shall hold the Goods pending receipt of Buyer's statement of defect, provided that, prior to such receipt, risk of loss of the Goods shall remain with the Buyer.

17. **Limitation of Remedies**. SELLER'S OPTION TO REPAIR, REPLACE OR REFUND THE PURCHASE PRICE FOR GOODS OR RE-PERFORM SERVICES IS BUYER'S EXCLUSIVE REMEDY AGAINST SELLER WHETHER SUCH REMEDY ARISES OUT OF BUYER'S CLAIM FOR BREACH OF WARRANTY, BREACH OF CONTRACT OR ANY OTHER CLAIM WITH RESPECT TO THE GOODS AND SERVICES AND SELLER SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES. THE PARTIES AGREE THAT CONSEQUENTIAL DAMAGES FOR PURPOSES OF THIS AGREEMENT REPRESENT ANY DAMAGES OTHER THAN THE COST TO REPAIR, REPLACE OR REFUND THE PURCHASE PRICE OF THE GOODS WITH RESPECT TO WHICH THE LOSS OCCURRED.

18. **Seller's Disclaimer of Implied Warranties.** SELLER'S EXPRESS WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, AND SELLER HEREBY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. BUYER AGREES THAT MODELS OR SAMPLES SHOWN TO BUYER, IF ANY, WERE USED MERELY TO ILLUSTRATE THE GOODS AND NOT TO REPRESENT, PROMISE, OR GUARANTEE THAT ANY GOODS DELIVERED HEREUNDER WOULD CONFORM TO SUCH MODELS OR SAMPLES. SELLER'S AGENTS HAVE NO AUTHORITY TO GIVE WARRANTIES BEYOND THOSE PROVIDED IN THIS LIMITED EXPRESS WARRANTY.

19. **Indemnification.** Buyer agrees to indemnify and hold harmless Seller against all damages, costs, expenses and attorney's fees arising from claims of infringement of patents, designs, copyrights or trademarks with respect to all Goods manufactured or assembled either in whole or in part to Buyer's specifications. Buyer agrees that such infringement shall be deemed a breach of the Agreement. Seller further reserves the right to terminate the Agreement for Goods which, in the opinion of Seller, infringe upon any patent, design, copyright or trademark in their manufacture, sale and/or use, and Buyer agrees that such termination shall not be considered a breach by Seller of the Agreement. Buyer further agrees that Seller shall not be liable under this provision if the Goods or Services are altered or modified in any manner after Seller delivers such Goods to the carrier for delivery to Buyer or completes performance of any Services.

20. **Import and Export Compliance.** Buyer is solely responsible for compliance with all applicable import and export control laws, in any jurisdiction, relating to the Goods and Services. Buyer shall undertake all necessary actions to comply with such laws, including, but not limited to, processing of all necessary customs procedures, payment of import/export duties and import/export taxes, completion and maintenance of documentation and provision of accurate information to all customs authorities. Buyer shall indemnify and hold harmless Seller against all damages, costs, expenses and attorney's fees arising from or alleged to arise from any violation, alleged violation, or failure to comply with, the terms of this provision by Buyer or any person for whom Buyer may be responsible.

21. **Buyer Default.** Seller shall have the unrestricted right, upon written notice to Buyer, to declare a default ("Buyer Default") hereunder and to terminate this Agreement if any of the following events occur: 1) Buyer's failure to comply with any of the provisions, terms and conditions of this Agreement, including without limitation, Buyer's failure to timely pay for any Goods or Services delivered to Buyer; 2) Seller's ability to perform of any of its obligations in respect of Services is prevented or delayed by any act or omission by Buyer or failure by Buyer to perform any relevant obligation, after a reasonable opportunity to cure such Buyer's failure to perform or act or omission; 3) Dissolution, insolvency, appointment of a receiver, assignment for the benefit of creditors or the commencement of any proceeding under any bankruptcy or insolvency laws by or against the Buyer; or 4) Seller's determination, in its sole discretion, that Buyer's financial condition is such as to endanger Buyer's performance hereunder.

22. **Remedies Upon Buyer's Default.** Upon Buyer's Default and Seller's written notice thereof to Buyer, every obligation of Seller hereunder shall immediately terminate and Seller shall have all rights and remedies existing at law or in equity, including but not limited to those provided by the Uniform Commercial Code as adopted in Indiana, and Buyer shall reimburse Seller on written demand for any costs or losses sustained or incurred by Seller arising directly or indirectly from the Buyer Default. Seller shall also have the right to suspend performance of any Services until Buyer remedies such Buyer Default, and to rely on the Buyer Default to relieve it from the performance of any of its obligations to the extent the Buyer Default prevents or delays Seller's performance of any of its obligations.

23. **Reservation of Rights.** Buyer agrees that Seller's forbearance, delay or failure to exercise any right or remedy hereunder shall not constitute a waiver of such right or remedy and that Seller's exercise or partial exercise of any right or remedy shall not preclude further exercise of such right or remedy or any other right or remedy.
24. **Costs of Enforcement.** Buyer agrees to pay Seller's reasonable expenses, including reasonable attorney's fees and costs, incurred in enforcing the terms herein.
25. **Choice of Law and Venue.** The Agreement shall be governed by the laws of the State of Indiana, excluding its provisions on conflicts of law. Exclusive venue of any dispute or action arising out of this Agreement will lie in any state or federal court of competent jurisdiction in Johnson County, Indiana.
26. **Severability of Clauses.** Buyer agrees that the invalidity or unenforceability of any of the clauses or terms herein shall not affect the validity or enforceability of any other clauses or terms hereof. Sections 15-20, 28 and 30, and any other clause as the context implies, shall survive the termination or expiration of this Agreement.
27. **Alternative Dispute Resolution.** If a dispute arises between the parties, the parties agree to use the following alternative dispute resolution ("ADR") procedure prior to either Party pursuing other available remedies:
1) A meeting shall be held promptly between the parties, attended by individuals with decision-making authority regarding the dispute, to attempt in good faith to negotiate a resolution of the dispute.
2) If, within thirty (30) days after such meeting, the parties have not succeeded in negotiating a resolution of the dispute, they will jointly appoint a mutually acceptable neutral person not affiliated with either of the parties to act as a mediator. If the parties are unable to agree on the neutral person within twenty (20) days, they shall seek assistance in such regard from the American Arbitration Association ("AAA"). The fees of the neutral person and all other common fees and expenses shall be shared equally by the parties.
3) The mediation may proceed in accordance with AAA's Model Procedure for Mediation of Business Disputes. The parties shall pursue mediation in good faith and in a timely manner. In the event the mediation does not result in resolution of the dispute within sixty (60) days, then, upon seven (7) days' written notice to the other party either party may suggest another form of ADR, *e.g.*, arbitration, a mini-trial or a summary jury trial, or may pursue other available remedies.
28. **Confidentiality.** The parties agree to treat the Order, this Agreement, and any contract formed upon its acceptance as confidential and shall not disclose the existence or substance hereof to any third party. If in connection with the provision of goods or services hereunder a party (each one a "Recipient" as applicable to this provision) becomes aware of or receives any confidential information of the other party (each one a "Discloser" as applicable to this provision), Recipient agrees not to disclose such information to any third party or to make use of such information, except to the extent necessary to perform hereunder or as required by law. Upon Discloser's request, Recipient shall promptly return to Discloser all Confidential Information in tangible form. The parties agree that any disclosure or use of the other party's Confidential Information, except as otherwise authorized herein or by Discloser in writing, would be wrongful and cause immediate and irreparable injury to Discloser. Recipient agrees to immediately notify Discloser of any unauthorized disclosure or use of any Discloser's Confidential Information of which Recipient becomes aware. This clause shall survive termination of this Agreement.
29. **Independent Contractors.** In performing its obligations to Buyer, hereunder, Seller is acting as an independent contractor and neither party is an agent or representative of the other. Neither party is authorized to make any representations or assume or create any obligations on behalf of the other.
30. **Limitation of Liability.** NOTWITHSTANDING THE OTHER PROVISIONS OF THIS AGREEMENT TO THE CONTRARY, THE AGGREGATE LIABILITY OF EACH PARTY TO THE OTHER PARTY FOR ANY AND ALL CLAIMS AND LIABILITIES ARISING OUT OF OR RELATING TO THIS AGREEMENT OR TO THE BUYER'S OR SELLER'S RIGHTS AND OBLIGATIONS HEREUNDER, WHETHER BASED ON A THEORY OF CONTRACT, TORT, STRICT LIABILITY, OR OTHERWISE, SHALL NOT EXCEED THE PRICE OF THE GOODS OR SERVICES. IN NO EVENT SHALL SELLER'S LIABILITY TO BUYER EXTEND TO INCLUDE INCIDENTAL, INDIRECT, CONSEQUENTIAL OR PUNITIVE DAMAGES. THE TERM "CONSEQUENTIAL DAMAGES" SHALL INCLUDE BUT NOT BE LIMITED TO, LOSS OF ANTICIPATED PROFITS, REVENUE OR USE AND COSTS INCURRED. THIS CLAUSE SHALL SURVIVE TERMINATION OF THIS AGREEMENT.
31. **Compliance with Governing Laws and Regulations.** The Parties acknowledge and agree that all business activities shall be conducted ethically, with integrity, and in full compliance with both the letter and the spirit of the laws and regulations applicable to those activities. This commitment applies without limitation to the award of contracts/subcontracts on an impartial/competitive basis, personal business conduct, internal control systems, the offering/giving/receiving of gifts or anything of value, and correct documentation and registration of financial accounts. Neither Buyer nor its employees are authorized to operate on Seller's behalf in an illegal manner or in contrast with Seller's business-conduct policies and vice-versa. Should a Party ever receive, directly or indirectly from any of the other Party's representatives or agents, a request that the Party believes is contrary to the provisions of this clause, that Party shall immediately notify the other Party's general counsel.
Without limiting the generality of the foregoing or the effect of any other provision of this Agreement, and to the extent either Party performs any work or obtains or sells any of the products in relation to this Agreement in or from a foreign country:
a. Each Party represents and warrants that it is familiar with the Foreign Corrupt Practices Act, as amended, ("the FCPA"). Each Party further represents that, in particular, it is familiar with the prohibitions of the FCPA against offering, paying or giving anything of value, either directly or indirectly, to foreign officials (including employees of state-owned or controlled enterprises), candidates or

political parties for the purpose of securing any improper advantage for a company, including assisting a company in obtaining or retaining business.

b. Each Party agrees that it shall not make any offer, payment, promise to pay, gift, or promise to give monies or anything of value; nor authorize any such offer, payment, promise to pay, gift, or promise to give by anyone acting for or on behalf of itself or the other Party; to any government official, any political party or official thereof, any candidate for political office, any official of a public international organization, or any other person that is contrary to the provisions of the FCPA, as amended.

c. Each Party agrees that it shall not make any offer, payment, promise to pay, gift, or promise to give monies or anything of value; nor authorize any such offer, payment, promise to pay, gift, or promise to give by anyone acting for or on behalf of itself or the other Party; to any employee of a private company in order to improperly induce that employee to provide any competitive advantage to either Party in selling products or services or in otherwise doing business with that company.

d. Each Party agrees to maintain records for 5 years and present them for auditing upon demand by the other Party if there is any suspicion that a violation of this provision 33 may have occurred.

e. Both Parties represent that neither it nor any of its directors, officers, or employees is a government official, including without limitation an official or employee of any government, an official of a political party, or a candidate for political office, or a director, officer, employee, or "affiliate" (as defined in regulations under the U.S. Securities Exchange Act of 1934) of a government instrumentality. Both Parties understand that for purposes of this agreement, a "government official" may include an employee or official of a commercial entity or a university or institute of higher learning in which a government body has an ownership interest or exerts control over the activities of such entity, as well as officials and employees of public international organizations.

Each Party acknowledges that the representations and warranties provided in this clause are material to this Agreement. These representations shall be deemed to be continuing in effect throughout the term of the Agreement. Both Parties shall promptly advise each other of any change in circumstances which may affect the continuing validity of their representations. Either Party may terminate this Agreement at any time, without any liability or obligations to the other Party, if that Party believes, in good faith, that the other Party has violated any provisions of this clause. Any action by either Party which would or might constitute a violation of the FCPA, as amended, or a request for such action from or by a representative of either Party shall result in immediate termination of this Agreement without further liability or obligation of the other Party.

32. **Force Majeure.** The Seller will not be responsible or liable in any way for delay or failure to effect delivery of Goods and Services pursuant to its obligations under this Agreement in which effectuation is hindered or prevented by conditions reasonably beyond its control, acts of God, fire, flood, other weather conditions, war, embargo, explosions, riots, laws, rules, regulations, or orders of any governmental authority.

33. **Assignment.** This Agreement may not be assigned by either Party to any third party without the prior written consent of the other Party hereto; provided, however, that a Party may assign its rights and obligations hereunder by written notice to the other Party to (a) any Affiliate or (b) a successor or transferee (whether by merger, consolidation, purchase or otherwise) of either (i) all or substantially all of the assets of the assignor, or (ii) all or substantially all of the assets of the business to which it pertains; and provided such party is not a competitor of the non-assignor. Any purported assignment in violation of the preceding shall be void. Any permitted assignee shall assume all obligations of its assignor under this Agreement. No assignment shall relieve a Party of responsibility for the performance of any obligation which accrued prior to the effective date of such assignment.

34. **Intellectual Property.** All Intellectual Property Rights in or arising out of or in connection with this Agreement and/or the Services shall be owned by Seller.

35. **General Definitions.**

a) Agreement: means the receipt and acceptance by Seller of the Order along with these Standard Sales and Service Terms and Conditions, Sellers' invoices, delivery forms, or other Seller documents related to the Order.

b) Goods: means any and all goods purchased by Buyer from Seller in connection with this Agreement and as specified in the Order.

c) Intellectual Property Rights: means patents, inventions, copyright and related rights, trademarks, trade names, business and domain names, goodwill, designs, database rights, processes, know-how, trade secrets, computer technical expertise, general product and process expertise, software and other intellectual property independently developed, owned, and/or controlled by Seller and any improvements thereto which are used, improved, modified, or further developed by Seller during its performance under this Agreement, in each case whether registered or unregistered and including all applications and rights to apply for and be granted, renewals or extensions of, and right to claim priority from, such rights and all similar or equivalent rights or forms of protection which subsist or will subsist now or in the future in any part of the world, shall be and remain the property of Seller.

d) Services: means any and all services, including any deliverables, purchased by Buyer from Seller in connection with this Agreement and as specified in the Order.

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