ABB MEASUREMENT & ANALYTICS | COMMISSIONING INSTRUCTION

# ProcessMaster FEP610, HygienicMaster FEH610

## Electromagnetic flowmeter

## Measurement made easy

ProcessMaster FEP610,
HygienicMaster FEH610

## Short product description

Electromagnetic flowmeter can measure the volume flowrate and the mass flowrate (based on a fixed density to be programmed).

Devices firmware version: 00.01.04

## Further information

Additional documentation on ProcessMaster FEP610, HygienicMaster FEH610 is available for download free of charge at www.abb.com/flow.

Alternatively simply scan this code:

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# Contents

# 1 Safety

## 1.1 General information and instructions

These instructions are an important part of the product and must be retained for future reference.
Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly. The specialist personnel must have read and understood the manual and must comply with its instructions.
For additional information or if specific problems occur that are not discussed in these instructions, contact the manufacturer.
The content of these instructions is neither part of nor an amendment to any previous or existing agreement, promise or legal relationship.
Modifications and repairs to the product may only be performed if expressly permitted by these instructions.
Information and symbols on the product must be observed. These may not be removed and must be fully legible at all times.
The operating company must strictly observe the applicable national regulations relating to the installation, function testing, repair and maintenance of electrical products.

## 1.2 Warnings

The warnings in these instructions are structured as follows:

**⚠ DANGER**

The signal word "DANGER" indicates an imminent danger. Failure to observe this information will result in death or severe injury.

**⚠ WARNING**

The signal word "WARNING" indicates an imminent danger. Failure to observe this information may result in death or severe injury.

**⚠ CAUTION**

The signal word "CAUTION" indicates an imminent danger. Failure to observe this information may result in minor or moderate injury.

**i NOTE**

The signal word "NOTE" indicates useful or important information about the product.
The signal word "NOTE" is not a signal word indicating a danger to personnel. The signal word "NOTE" can also refer to material damage.

## 1.3 Intended use

This device is intended for the following uses:
- To transmit fluid, pulpy or pasty measurement media with electrical conductivity.
- For volume flow measurement (under operating conditions).
- For mass flow measurement (based on a fixed density to be programmed).

The device has been designed for use exclusively within the technical limit values indicated on the identification plate and in the data sheets.

In terms of the measuring medium, observe following points:
- Wetted parts such as measuring electrodes, liner, grounding electrodes, grounding rings, protection flanges must not be damaged because of the chemical and physical characteristic of the measuring medium.
- Media with unknown properties or abrasive measuring media may only be used if regular and suitable tests can be performed to ensure the safe condition of the device.
- The information on the name plate must be observed.
- Prior to using corrosive and abrasive measurement media, the operator must check the level of resistance of all parts coming into contact with the measuring medium.
  ABB will gladly support you in selecting the materials, but cannot accept any liability in doing so.

## 1.4 Improper use

The following are considered to be instances of improper use of the device:
- For operating as a flexible adapter in piping, e.g. for compensating pipe offsets, pipe vibrations, pipe expansions, etc.
- For use as a climbing aid, e.g. for mounting purposes
- For use as a support for external loads, e.g. as a support for piping, etc.
- Material application, e.g. by painting over the name plate or welding/soldering on parts
- Material removal, e.g. by spot drilling the housing

# 2 Product identification

## 2.1 Name plate

### 2.1.1 Integral mount design

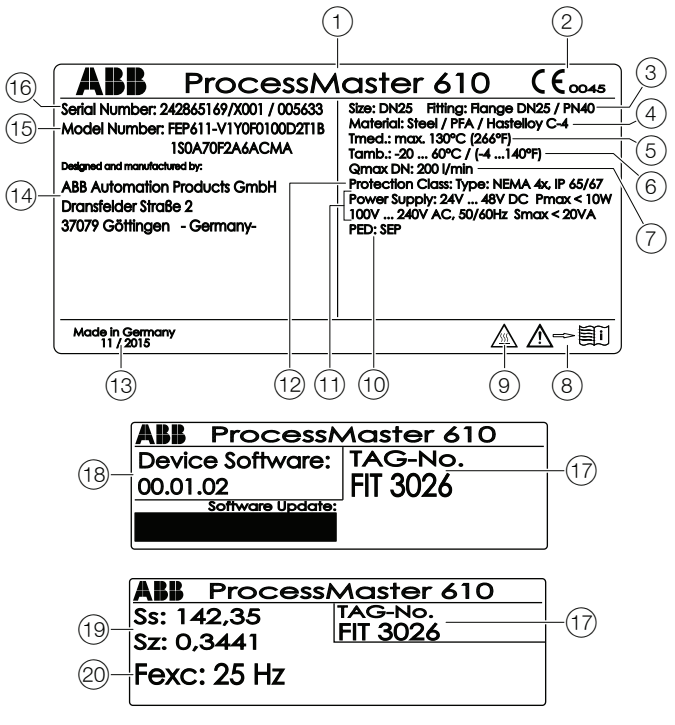



Fig. 1: Name plate integral mount design (example)
(1) Type designation (2) CE mark (3) Nominal diameter / Process connection / pressure rating (4) Flange material (5) Medium temperature range (6) Ambient temperature range (7) Calibration value $Q_{max}DN$ (8) "Follow operating instructions" symbol (9) "Hot surface" symbol (10) PED marking (11) Power supply (12) IP rating (13) Year of manufacture (month / year) (14) Manufacturer (15) Order code (16) Serial number (17) TAG number (18) Device Firmware version (19) Sensor calibration data (20) Excitation frequency

### Remote mount design

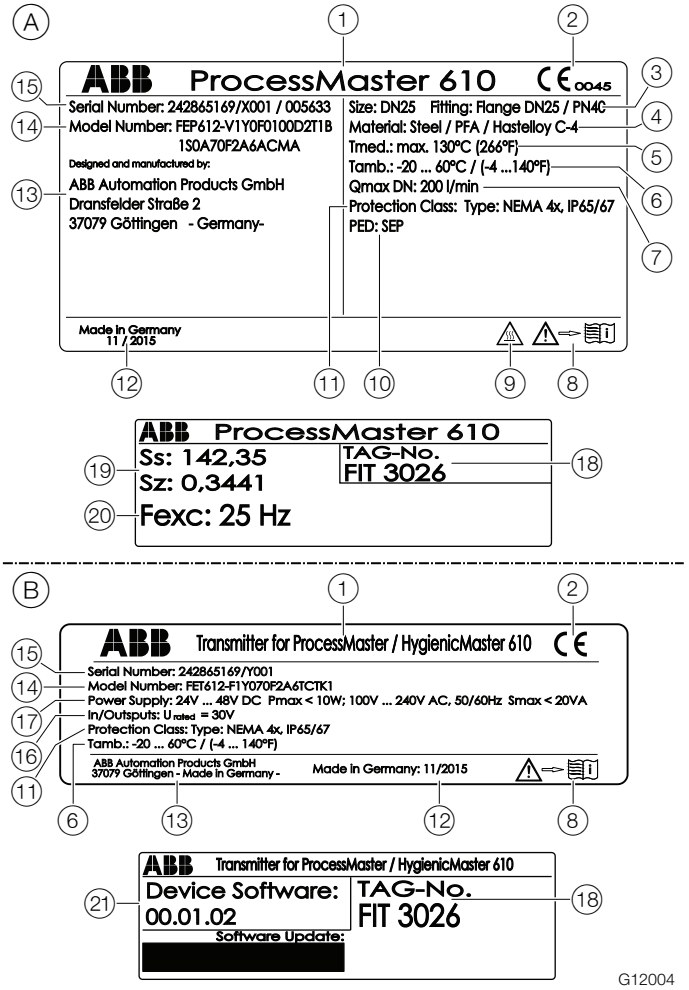



Fig. 2: Name plate remote mount design (example)
(A) Flowmeter sensor (B) Transmitter
(1) Type designation (2) CE mark
(3) Nominal diameter / Process connection / pressure rating
(4) Meter tube material (5) Medium temperature range
(6) Ambient temperature range (7) Calibration value $Q_{max}DN$
(8) "Follow operating instructions" symbol (9) "Hot surface" symbol
(10) PED marking (11) IP rating (12) Year of manufacture (month / year)
(13) Manufacturer (14) Order code (15) Serial number (16) Power supply (17) Maximum voltage at inputs and outputs (18) TAG number
(19) Sensor calibration data (20) Excitation frequency (21) Device Firmware version

The marking according to the Pressure Equipment Directive (PED) can be found on the name plate.

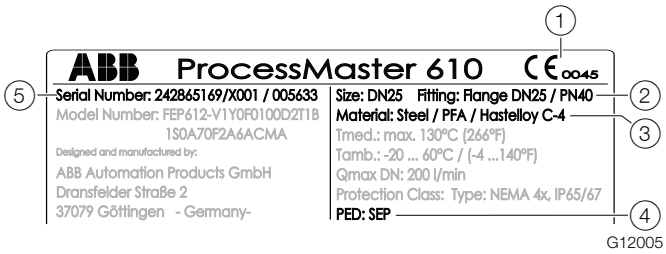



**Fig. 3: PED marking (example)**
**(1) CE mark (with number of labeled location) (2) Nominal size / nominal pressure rating (3) Material (wetted parts) (4) Fluid group resp. reason for the exception (5) Serial number of the flowmeter sensor**

The marking is applied depending to the nominal size (> DN 25 or ≤ DN 25) of the flowmeter (also refer to Pressure Equipment Directive 97/23/EC).

**Pressure equipment subject to PED**
Below the CE mark, the number of the designated authority to confirm that the device meets the requirements of Pressure Equipment Directive is specified.
The respective fluid group in accordance with the Pressure Equipment Directive is indicated under PED.
Example: Fluid group 1 = hazardous fluids, gaseous.

**Pressure equipment outside the applicable range of the PED**
Under PED, the reason for the exception in article 3, paragraph 3 of the Pressure Equipment Directive is specified.
The pressure equipment is classified in the SEP (= Sound Engineering Practice) "Good Engineering Practice" category.

## 2.2 Overview

### ProcessMaster FEP610

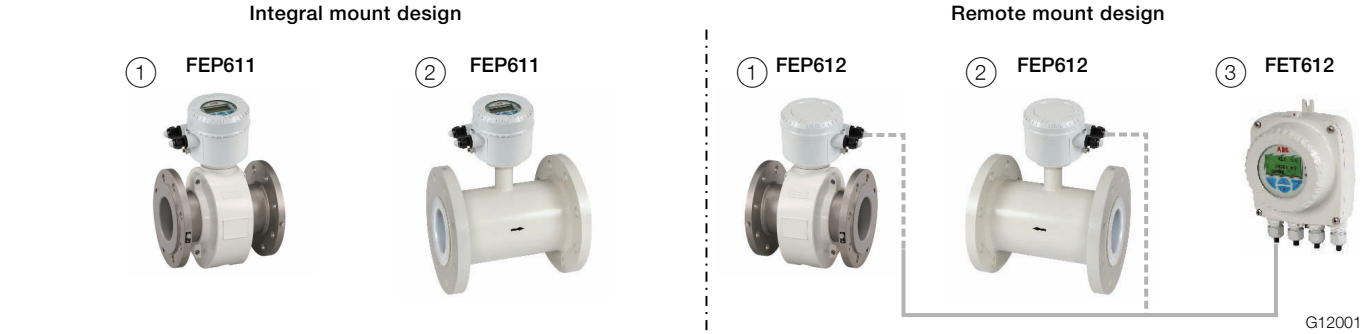



**Fig. 4**
**(1) Flowmeter sensor, Design Level A (DN 3 ... 2000) (2) Flowmeter sensor, Design Level B (DN 25 ... 600) (3) Remote transmitter**

### HygienicMaster FEH610


**Fig. 5**
**(1) Flowmeter sensor (2) Remote transmitter**

# 3 Transport and storage

## 3.1 Inspection

Check the devices immediately after unpacking for possible damage that may have occurred from improper transport.
Details of any damage that has occurred in transit must be recorded on the transport documents.
All claims for damages must be submitted to the shipper without delay and before installation.

## 3.2 Transport

**⚠ DANGER**

**Life-threatening danger due to suspended loads.**

In the case of suspended loads, a danger of the load falling exists.

Remaining under suspended loads is prohibited.

**⚠ WARNING**

**Risk of injury due to device slipping.**

The device's center of gravity may be higher than the harness suspension points.

- Make sure that the device does not slip or turn during transport.
- Support the device laterally during transport.

**i NOTE**

**Potential damage to device!**

The protection plates or protective caps installed on the process connections of devices lined with PTFE / PFA must not be removed until just before installation.

To prevent possible leakage, make sure that the liner on the flange is not cut or damaged

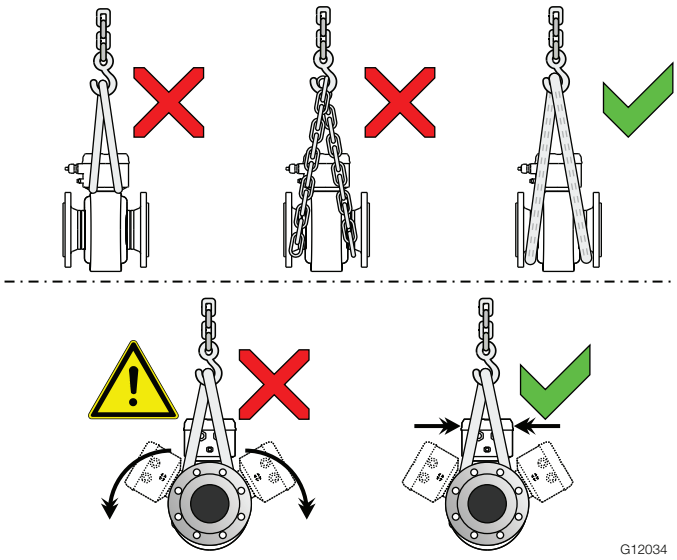



**Fig. 6: Transport instructions - ≤ DN 450**

**Flange devices ≤ DN 450**

- Carrying straps must be used to transport flange designs smaller than DN 450
- Wrap the straps around both process connections when lifting the device
- Chains should not be used, since these may damage the housing.

**Flange devices > DN 450**

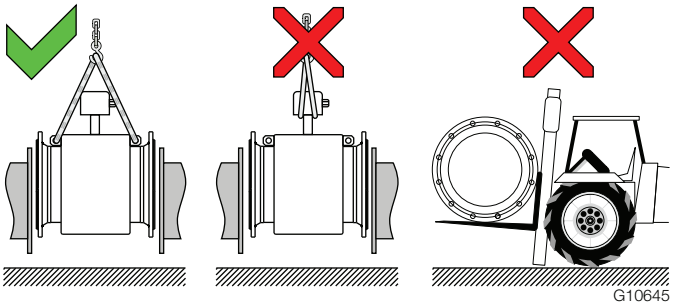



**Fig. 7: Transport instructions - > DN 450**

- Using a forklift to transport flange device can bend the housing
- Flange devices must not be lifted by the center of the housing when using a forklift for transport
- Flange devices must not be lifted by the terminal box or by the center of the housing
- Only the transport lugs fitted to the device can be used to lift the device and insert it into the piping

## 3.3 Storing the device

Bear the following points in mind when storing devices:

- Store the device in its original packaging in a dry and dust-free location.
- Observe the permitted ambient conditions for transport and storage.
- Avoid storing the device in direct sunlight.
- In principle, the devices may be stored for an unlimited period. However, the warranty conditions stipulated in the order confirmation of the supplier apply.

**Storage temperature range**

-30 ... 70 °C (-22 ... 158 °F)

The ambient conditions for the transport and storage of the device correspond to the ambient conditions for operation of the device.
Adhere to the device data sheet!

## 3.4 Returning devices

Please contact Customer Center Service acc. to page 2 for nearest service location.

# 4 Installation

## 4.1 Installation conditions

### 4.1.1 General information

The following points must be observed during installation:

- The flow direction must correspond to the marking, if present.
- The maximum torque for all flange screws must be complied with.
- Secure the flange bolts and nuts against pipe vibration.
- The devices must be installed without mechanical tension (torsion, bending).
- Install flange devices / wafer-type devices with plane parallel counterflanges and use appropriate gaskets only.
- Only gaskets made from a material that is compatible with the measuring medium and measuring medium temperature may be used.
- Gaskets must not extend into the flow area, since possible turbulence could influence the accuracy of the device.
- The piping may not exert any inadmissible forces or torques on the device.
- Make sure temperature limits are not exceeded operating the device.
- Vacuum shocks in the piping should be avoided to prevent damage to the liners (PTFE). Vacuum shocks can destroy the device.
- Do not remove the sealing plugs in the cable glands until you are ready to install the electrical cable.
- Make sure the gaskets for the housing cover are seated correctly. Carefully gasket the cover. Tighten the cover fittings.
- The transmitter with a remote mount design must be installed at a largely vibration-free location.
- Do not expose the transmitter and sensor to direct sunlight. Provide appropriate sun protection as necessary.
- When installing the transmitter in a control cabinet, make sure adequate cooling is provided.
- In case of a remote mounted transmitter make sure that the sensor and the transmitter have been assigned correctly. Compatible devices have the same end numbers on the name plate, e.g. flowmeter sensor X001 belongs to transmitter Y001 or flowmeter sensor X002 belongs to transmitter Y002.

### 4.1.2 Brackets and supports

**NOTE**

**Potential damage to device!**

Improper support for the device may result in deformed housing and damage to internal magnet coils.

Place the supports at the edge of the flowmeter sensor housing (see arrows in Fig. 8).

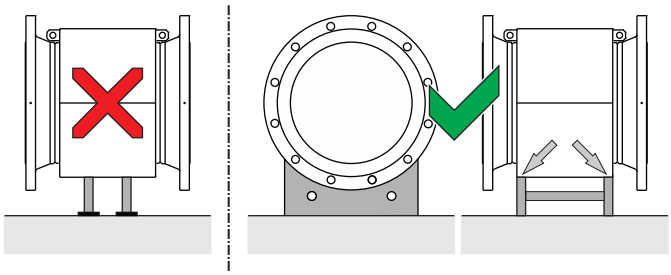


**Fig. 8: Support for meter sizes larger than DN 400**

Devices with meter sizes larger than DN 400 must be mounted with support on a sufficiently strong foundation.

### 4.1.3 Gaskets

The following points must be observed when installing gaskets:

- For achieve the best results, ensure the gaskets fit concentrically with the meter tube
- To ensure that the flow profile is not distorted, the gaskets must not protrude into the piping.
- The use of graphite with the flange or process connection gaskets is prohibited, because an electrically conductive coating may form on the inside of the meter tube.

**Devices with a hard rubber, soft rubber liner**

- Devices with a hard / soft rubber liner always require additional gaskets.
- ABB recommends using gaskets made from rubber or rubber-like sealing materials.
- When selecting the gaskets, ensure that the tightening torques specified in chapter "Torque information" on page 46 are not exceeded.

**Devices with a PTFE, PFA or ETFE liner**

- In principle, devices with a PTFE, PFA or ETFE liner do not require additional gaskets.

### 4.1.4 Devices with a wafer-type design

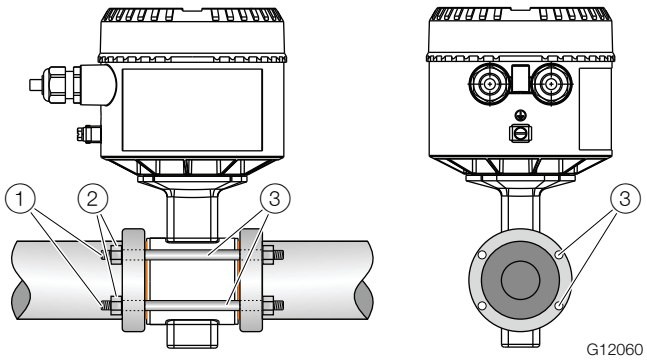



**Fig. 9: Installation set for wafer-type installation (example)**
**(1) Threaded rod (2) Nut with washer (3) Centering sleeves**

For devices with a wafer-type design, ABB offers an installation set as an accessory that comprises threaded rods, nuts, washers and centering sleeves for installation.

### 4.1.5 Flow direction

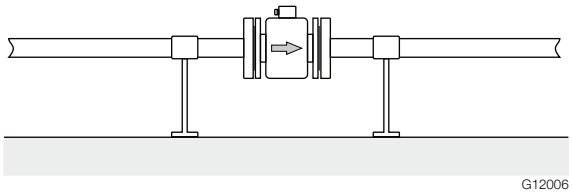



**Fig. 10: Flow direction**

The device measures the flowrate in both directions. Forward flow is the factory setting, as shown in Fig. 10.

### 4.1.6 Elektrode axis

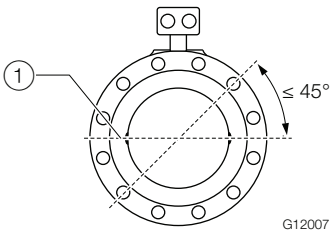



**Fig. 11: Orientation of the electrode axis**
**(1) Elektrode axis**

The electrode axis should be horizontal if at all possible or no more than 45° from horizontal.

### 4.1.7 Mounting position

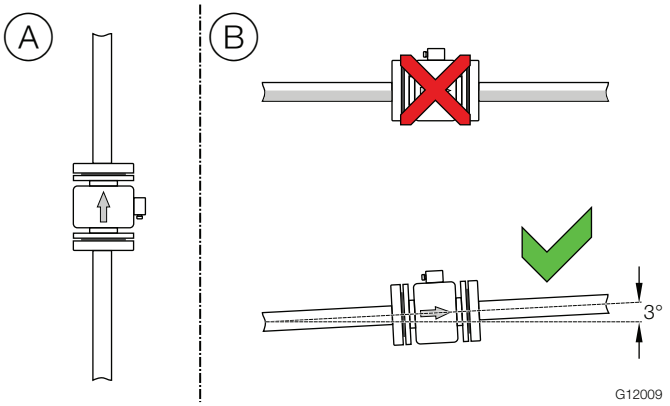


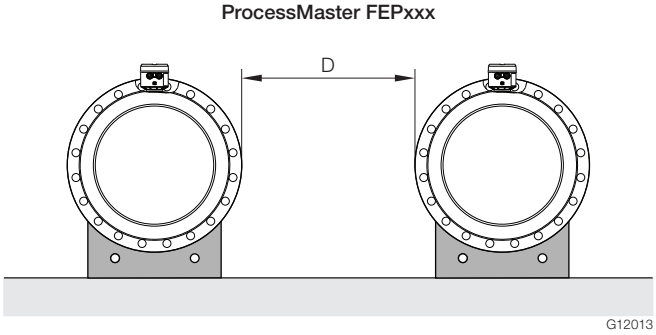

**Fig. 12: Mounting position**

(A) Vertical installation for measuring abrasive fluids, preferably with flow in upward direction.
(B) In case of horizontal installation, the Meter tube must always be completely full.
Provide for a slight incline of the connection for degassing.

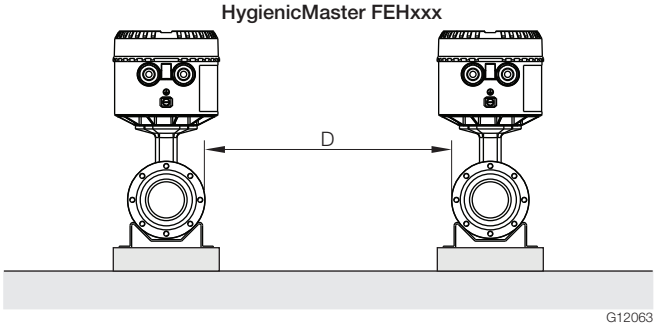
**NOTE**

Prefer vertical installation in hygienic applications!
With horizontal installation assure the sensor is self-drainable.

### 4.1.8 Minimum distance




Distance D: ≥ 1.0 m (3.3 ft ) for design level "A", ≥ 0.7 m (2.3 ft) for design level "B"




Distance D: ≥ 1.0 m (≥ 3.3 ft )

**Fig. 13: Minimum distance**

- In order to prevent the devices from interfering with each other, a minimum distance as shown in Fig. 13 must be maintained between the devices.
- The flowmeter sensor may not be operated in the vicinity of powerful electromagnetic fields, e.g., motors, pumps, transformers, etc. A minimum spacing of approx. 1 m (3.28 ft) should be maintained.
- For installation on or to steel parts (e.g. steel brackets), a minimum spacing of approx. 100 mm (3.94 inch) should be maintained (based on IEC801-2 and IECTC77B.

### 4.1.9 Inlet and outlet sections

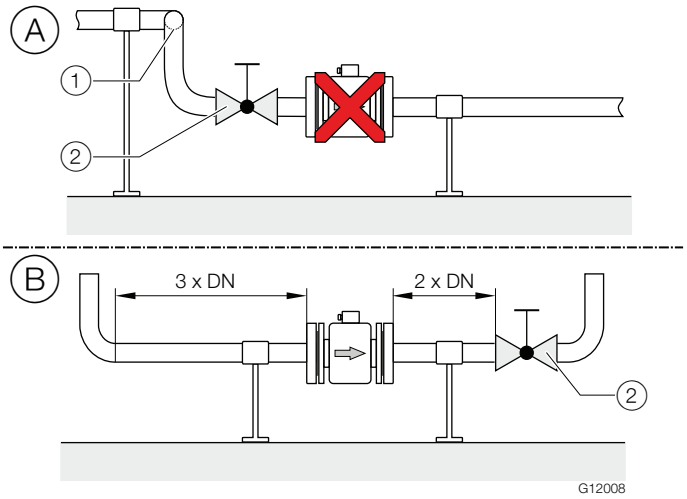



**Fig. 14: In- and outlet section, turn-off component**
**(1) Double elbow (2) Turn-off component**

The metering principle is independent of the flow profile as long as standing eddies do not extend into the metering section, such as may occur after double elbows, in the event of tangential inflow, or where half-open gate valves are located upstream of the flowmeter sensor.
In such cases, measures must be put in place to normalize the flow profile.

(A) Do not install fittings, manifolds, valves, etc., directly in front of the flowmeter sensor.

(B) Inlet and outlet section: Length of straight inlet and outlet section of the flowmeter sensor.
Experience has shown that, in most installations, inlet sections 3 x DN long and outlet sections 2 x DN long are sufficient (DN = nominal diameter of the flowmeter sensor).
For test stands, the reference conditions of 10 x DN inlet section and 5 x DN outlet section must be provided, in accordance with EN 29104 / ISO 9104.
Valves or other turn-off components should be installed in the outlet section.
Butterfly valves must be installed so that the valve plate does not extend into the flowmeter sensor.

### 4.1.10 Free inlet or outlet

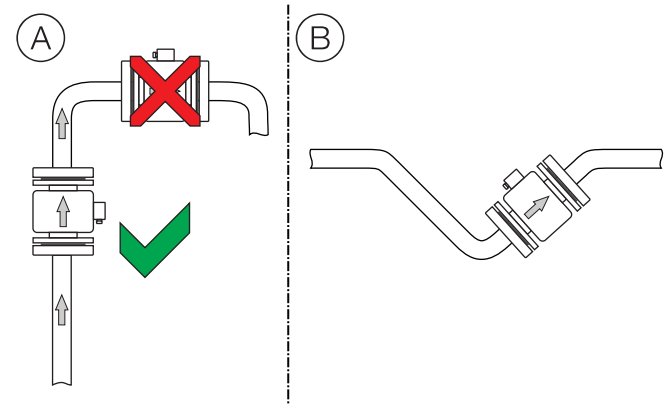



**Fig. 15: Free inlet or outlet**

(A) Do not install the flowmeter at the highest point or in the draining off side of the pipeline, flowmeter runs empty, air bubbles can form.
(B) Provide for a siphon fluid intake for free inlets or outlets so that the pipeline is always ful.

### 4.1.11 Strongly contaminated measuring media

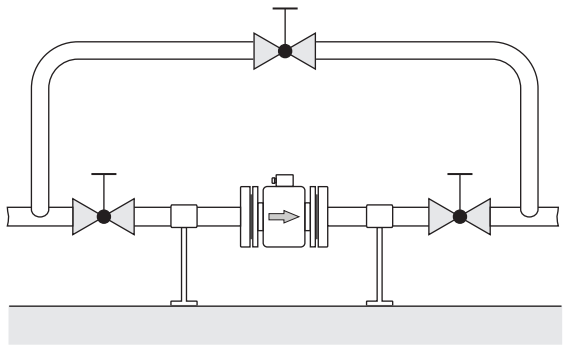


**Fig. 16: Bypass connection**

For strongly contaminated measuring media, a bypass connection according to the figure is recommended so that operation of the system can continue to run without interruption during the mechanical cleaning.

### 4.1.12 Installation in the vicinity of pumps

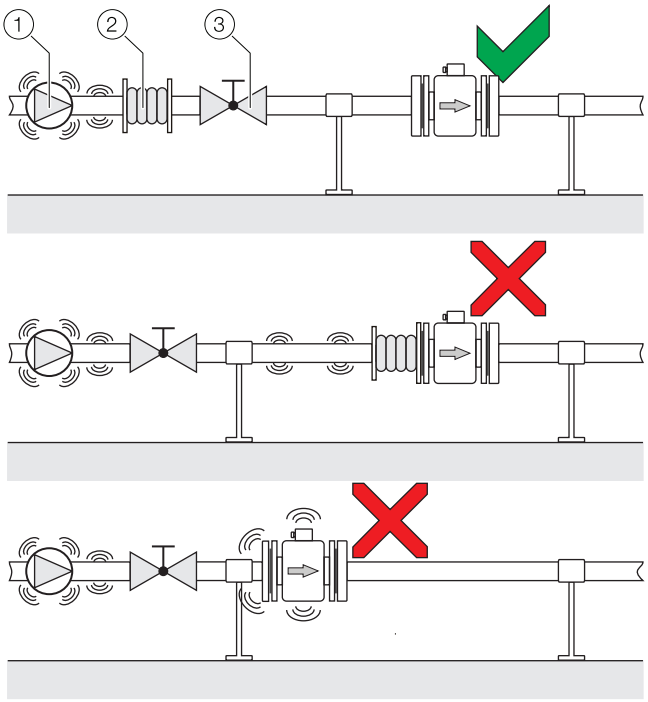



**Fig. 17: Vibration damping**
**(1) Pump (2) Damping device (3) Shut-off device**

Strong vibrations in the pipeline must be damped using flexible damping devices.
The damping devices must be installed beyond the supported flowmeter section and outside of the section between the shut-off devices.
Do not connect flexible damping devices directly to the flowmeter sensor.

### 4.1.13 Installation in pipelines with larger nominal diameters

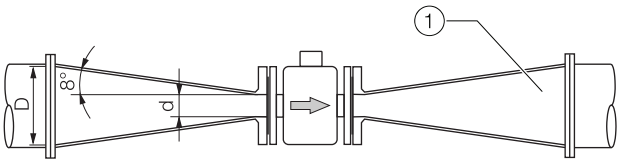



**Fig. 18: using reduction pieces**
**(1) Transition piece**

Determine the resulting pressure loss when using transition pieces:

1. Calculate the diameter ratio d/D.
2. Determine the flow velocity based on the flow range nomograph (Fig. 19).
3. Read the pressure drop on the Y-axis in Fig. 19.

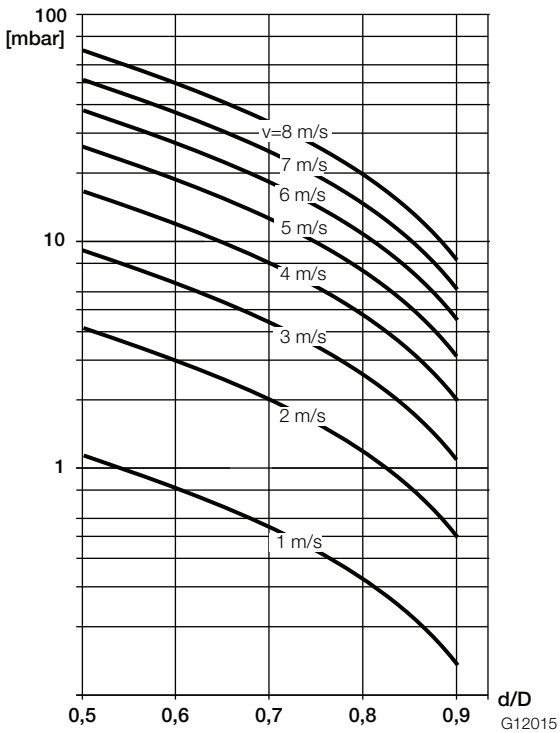



**Fig. 19: Nomograph for pressure drop calculations for flange transition piece with α/2 = 8°**

### 4.1.14 Installation in 3A-compliant installations

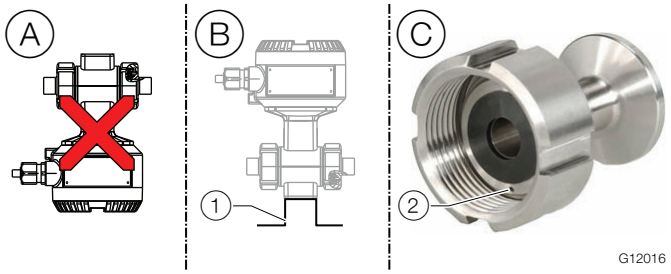



**Fig. 20: 3A-compliant installation**
**(1) Mounting bracket (2) Leakage hole**

Please observe the following points:

(A) Do not install the device horizontally with the terminal box or transmitter housing pointing downward.
(B) The "mounting bracket" option is not 3A-compliant.
(C) Please ensure that the leakage hole of the process connection is located at the deepest point of the installed device.
— Prefer vertical installation. With horizontal installation make sure the sensor is self-drainable
— Make sure the sensor terminal compartment cover and/or the transmitter housing cover is tightened properly to ensure there is no gap between the base of the housing and the cover.

Only devices with following process connections are 3A-compliant:

— Welded stubs
— Tri-Clamp

## 4.2 Installing the sensor

**NOTE**

**Potential damage to device!**

- The use of graphite with the flange or process connection gaskets is prohibited. This is because, in some instances, an electrically conductive coating may form on the inside of the meter tube.
- Vacuum shocks in the piping should be avoided to prevent damage to the liners (PTFE). Vacuum shocks can destroy the device.

The flowmeter sensor can be installed at any location in the piping while taking the installation conditions into account.

1. Remove protective plates, if present, to the right and left of the meter tube. To prevent possible leakage, make sure that the liner on the flange is not cut or damaged.
2. Position the flowmeter sensor coplanar and centered between the piping.
3. Install gaskets between the surfaces; see chapter "Gaskets" on page 8.

**NOTE**

For achieve the best results, ensure the gaskets fit concentrically with the meter tube

To ensure that the flow profile is not distorted, the gaskets must not protrude into the piping.

4. Use the appropriate screws for the holes in accordance with chapter "Torque information" on page 46.
5. Slightly grease the threaded nuts.
6. Tighten the nuts in a crosswise manner as shown in the figure. Observe the tightening torques in accordance with chapter "Torque information" on page 46!
   First tighten the nuts to approx. 50 % of the maximum torque, then to 80 %, and finally a third time to the maximum torque. Do not exceed the maximum torque.

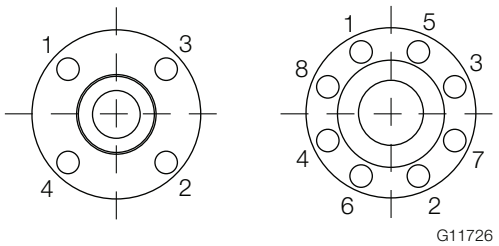



**Fig. 21: Tightening sequence for the flange screws**

## 4.3 Opening and closing the terminal box

**WARNING**

**Risk of injury due to live parts!**

When the housing is open, contact protection is not provided and EMC protection is limited.

Before opening the housing, switch off the power supply.

**NOTE**

**Impairment of the IP rating**

- Make sure that the cover of the power supply terminals is mounted correctly.
- Check the O-ring gasket for damage and replace it if necessary before closing the housing cover.
- Check that the O-ring gasket is properly seated when closing the housing cover.

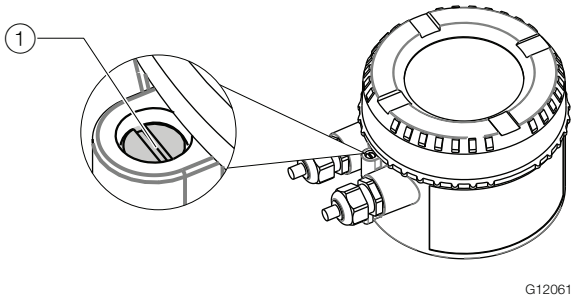



**Fig. 22: Cover safety device (example)**

To open the housing, release the cover safety device by screwing in the screw (1).

After closing the housing, lock the housing cover by unscrewing the screw (1).

### 4.3.1 Rotating the LCD indicator

Depending on the installation position, the LCD display can be rotated in 4 increments of 90° to enable horizontal readings. Refer to chapter "Opening and closing the terminal box" on page 13!

Rotating the LCD display: Perform steps Ⓐ … Ⓖ.

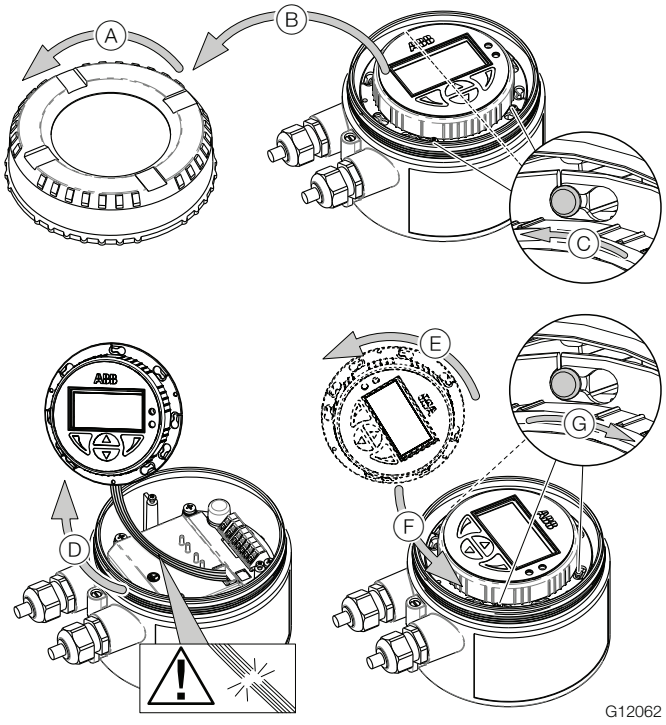



**Fig. 23: Rotating the LCD display (example)**

## 4.4 Grounding the flowmeter sensor

### 4.4.1 General information on ground connections

Observe the following items when grounding the device:

- For plastic pipes or pipes with insulating lining, the earth is provided by the grounding ring or grounding electrodes.
- When stray potentials are present, install a grounding ring upstream and downstream of the flowmeter sensor.
- For measurement-related reasons, the potentials in the station ground and in the pipeline should be identical.

**i NOTE**

If the flowmeter sensor is installed in plastic or earthenware pipelines, or in pipelines with an insulating lining, transient current may flow through the grounding electrode in special cases.

In the long term, this may destroy the sensor, since the grounding electrode will in turn degrade electrochemically. In these special cases, the connection to the earth must be performed using grounding rings. Install a grounding ring upstream and downstream of the device in this case.

### 4.4.2 Metal pipe with fixed flanges

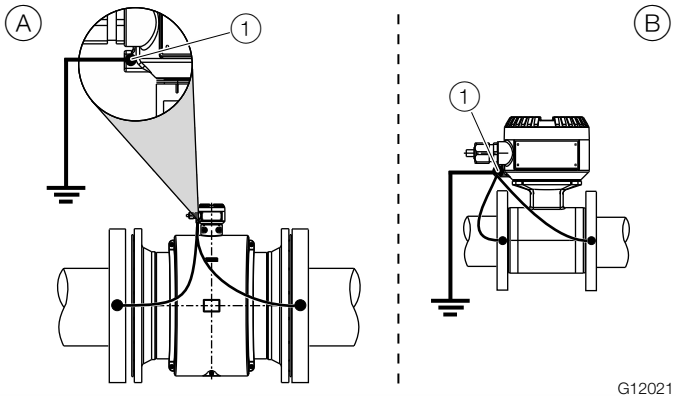



**Fig. 24: Metal pipe, without liner (example)**
**Ⓐ Flange design Ⓑ Wafer-type design**
**① Ground terminal**

Use a copper wire (at least 2.5 mm² (14 AWG)) to establish the ground connection between the sensor, the pipeline flanges and an appropriate grounding point.

### 4.4.3 Metal pipe with loose flanges

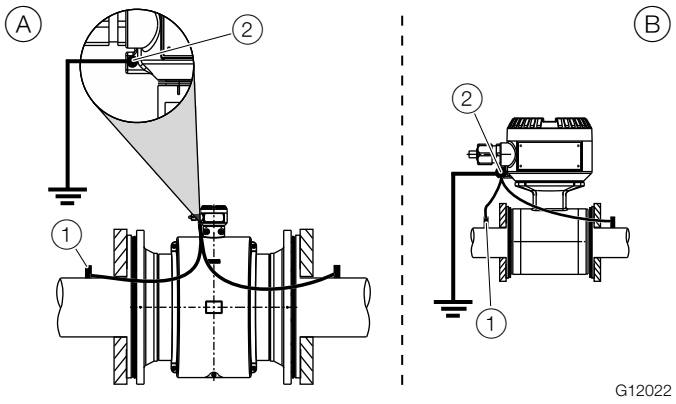



**Fig. 25: Metal pipe, without liner (example)**
**Ⓐ Flange design Ⓑ Wafer-type design**
**① Threaded nuts M6 ② Ground terminal**

1. Solder the threaded nuts M6 to the pipeline and connect the ground as shown in the illustration.
2. Use a copper wire (at least 2.5 mm² (14 AWG)) to establish the ground connection between the sensor and an appropriate grounding point.

### 4.4.4 Plastic pipes, non-metallic pipes or pipes with insulating liner

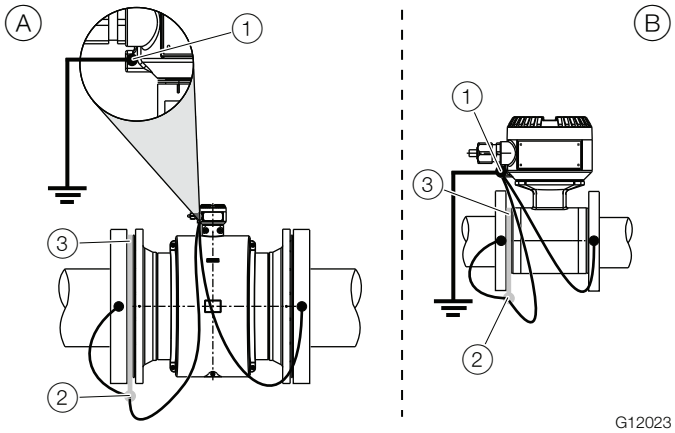



**Fig. 26: Plastic pipes, non-metallic pipes or pipes with insulating liner**

**(A) Flange design (B) Wafer-type design**

**(1) Earth connection (2) Terminal lug (3) Grounding ring**

For plastic pipes or pipes with insulating lining, the grounding for the measuring medium is provided by the grounding ring as shown in the figure below or via grounding electrodes that must be installed in the device (option). If grounding electrodes are used, the grounding ring is not necessary.

1. Install the flowmeter sensor with grounding ring in the pipeline.
2. Connect the terminal lug for the grounding ring and ground connection on the flowmeter sensor with the grounding strap.
3. Use a copper wire (min. 2.5 $mm^2$ (14 AWG)) to link the ground connection to a suitable grounding point.

### 4.4.5 Sensor type HygienicMaster

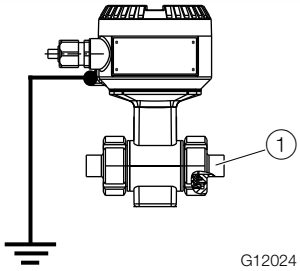



**Fig. 27**

**(1) Process connection adapter**

Ground the stainless steel model as shown in the figure. The measuring fluid is grounded via the process connection adapter and an additional ground is not required.

### 4.4.6 Grounding for devices with protective plates

The protective plates are used to protect the edges of the liner in the meter tube, e.g., for abrasive fluids. In addition, they function as a grounding ring.

— For plastic or pipes with insulating lining, electrically connect the protective plate in the same manner as a grounding ring.

### 4.4.7 Grounding with conductive PTFE grounding plate

For devices with a meter size between DN 10 … 250, grounding rings made of conductive PTFE are available. These are installed in a similar way to conventional grounding ring.

### 4.4.8 Installation and grounding in pipelines with cathodic corrosion protection

The installation of electromagnetic flowmeters in systems with cathodic corrosion protection must be made in compliance with the corresponding system conditions.

The following factors are especially important:

1. Pipelines inside electrically conductive or insulating.
2. Pipelines completely or for the most part with cathodic corrosion protection (CCP) or mixed systems with CCP areas and PE areas.

— When installing an electromagnetic flowmeter in pipes with insulating inner lining and free from foreign matter, it should be insulated with grounding rings on the upstream and downstream side. The corrosion protection potential is diverted. The grounding rings upstream and downstream of the electromagnetic flowmeter are connected to functional earth (Fig. 28 / Fig. 29).

— If the occurrence of external stray currents is to be expected in pipelines with internal insulation (e.g. in the case of long pipe sections in the vicinity of power supply units), an uninsulated pipe of approx. 1/4 x DN of length should be provided upstream and downstream of the flowmeter sensor in order to deviate these currents away from the measuring system (Fig. 30).

### Internally insulated pipelines with cathodic corrosion protection potential

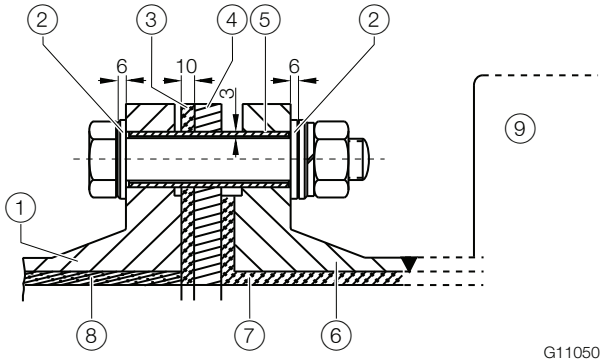



**Fig. 28: Bolt screw view**
**(1) Pipe flange (2) Insulating plate (3) Gasket / insulating ring (4) Grounding plate (5) Insulating pipe (6) Flange (7) Lining (8) Insulation (9) Flowmeter sensor**

Install grounding rings on each side of the flowmeter sensor. Insulate the grounding rings from the pipe flanges and connect them to the flowmeter sensor and to functional earth. Insulate the screw bolts for the flange connections when mounting. The insulation plates and the insulation pipe are not included in the delivery. They must be provided onsite by the customer.

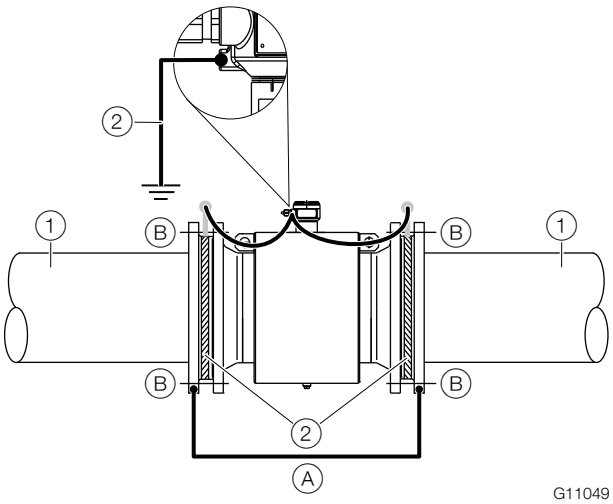



**Fig. 29: Flowmeter sensor with grounding plate and functional earth**
**(A) Connecting line for corrosion protection potential[1] (B) Insulated screw bolts without grounding rings**
**(1) Insulated pipe (2) Functional earth (3) Grounding plate**

1) ≥ 4 mm$^2$ Cu, not included in the delivery, to be provided onsite.

The corrosion protection potential must be diverted through a connecting line (A) away from the insulated flowmeter sensor.

### Mixed system pipeline with cathodic corrosion protection and functional earth potentials

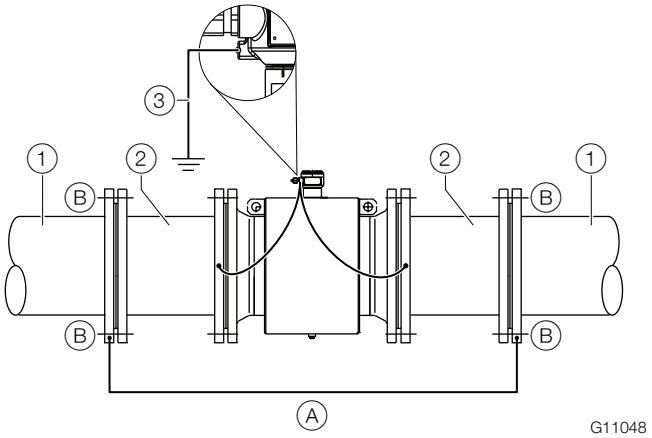



**Fig. 30: Flowmeter sensor with functional earth**
**(A) Connecting line for corrosion protection potential[1] (B) Insulated screw bolts without grounding rings**
**(1) Insulated pipe (2) Bare metal pipe (3) Functional earth**

1) ≥ 4 mm$^2$ Cu, not included in the delivery, to be provided onsite.

This mixed system has an insulated pipeline with corrosion protection potential and an uninsulated bar metal pipe (L = 1/4 x flowmeter sensor size) with functional earth potential upstream and downstream of the flowmeter sensor.
The Fig. 30 shows the preferred installation for cathodic corrosion protection systems.

## 4.5 Electrical connections

**⚠ WARNING**

**Risk of injury due to live parts.**

Improper work on the electrical connections can result in electric shock.

- Connect the device only with the power supply switched off.
- Observe the applicable standards and regulations for the electrical connection.

The electrical connection may only be established by authorized specialist personnel and in accordance with the connection diagrams.
The electrical connection information in the manual must be observed; otherwise, the type of electrical protection may be adversely affected.
Ground the measurement system according to requirements.

### 4.5.1 Connecting the power supply

**i NOTE**

- Observe the power supply limit values in accordance with the information on the name plate.
- Observe the voltage drop for large cable lengths and small conductor cross-sections. The voltage at the terminals of the device may not fall below the minimum value required in accordance with the information on the name plate.

The power supply is connected to terminal L (phase), N (neutral), or 1+, 2-, and PE, as stated on the name plate.
A circuit breaker with a maximum rated current of 16 A must be installed in the power supply line of the transmitter.
The wire cross-sectional area of the power supply cable and the circuit breaker used must comply with VDE 0100 and must be dimensioned in accordance with the current consumption of the flowmeter measuring system. The cables must comply with IEC 227 and/or IEC 245.
The circuit breaker should be located near the transmitter and marked as being associated with the device.
Connect the transmitter and sensor to functional earth.

### 4.5.2 Installing the connecting cables

Observe the following points when routing signal cables:

- A magnet coil cable (red and brown) is run parallel to the signal lines (violet and blue). As a result, only one cable is required between the flowmeter sensor and the transmitter. Do not run the cable over junction boxes or terminal strips.
- The signal cable carries a voltage signal of only a few millivolts and must, therefore, be routed over the shortest possible distance. The maximum allowable signal cable length is 50 m (164 ft).
- Avoid routing the cable in the vicinity of electrical equipment or switching elements that can create stray fields, switching pulses, and induction. If this is not possible, run the signal / magnet coil cable through a metal pipe and connect this to the station ground.
- All leads must be shielded and connected to the station ground potential.
- To shield against magnetic interspersion, the cable contains outer shielding. This is attached to the SE clamp.
- The supplied stranded steel wire is also connected to the SE clamp
- Do not damage the sheathing of the cable during installation.
- Ensure that a drip loop (water trap) is used when installing the connecting cables for the sensor.

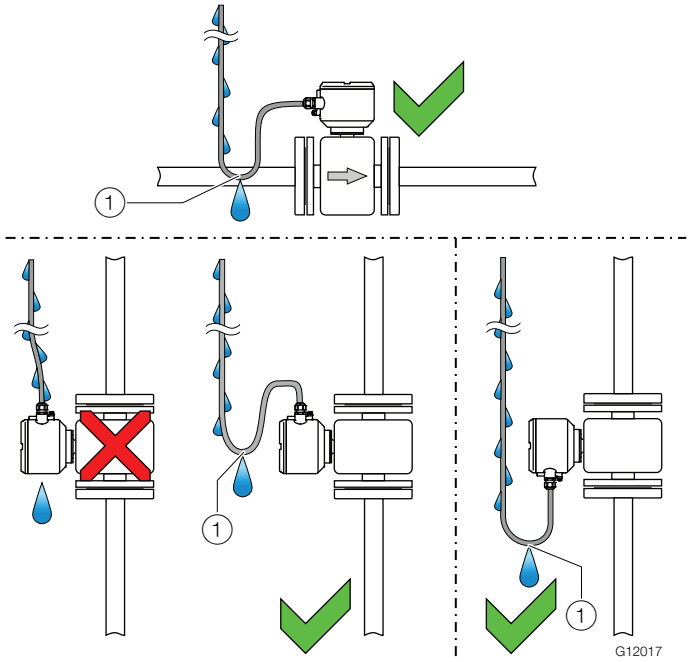



**Fig. 31: Laying of the connecting cable**
**(1) Drip loop**

### 4.5.3 Connection using a cable conduit

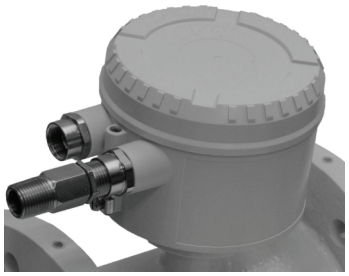



**Fig. 32: Installation set for cable conduit**

**NOTE**

**Condensate formation in terminal box**

If the flowmeter sensor is connected to cable conduits, there is a possibility that humidity may get into the terminal box because of condensate formation in the cable conduit.
Ensure that the cable entry points on the terminal box are sealed.

An installation set for sealing the cable conduit is available via order number 3KXF081300L0001.

### 4.5.4 Connection with IP rating IP 68

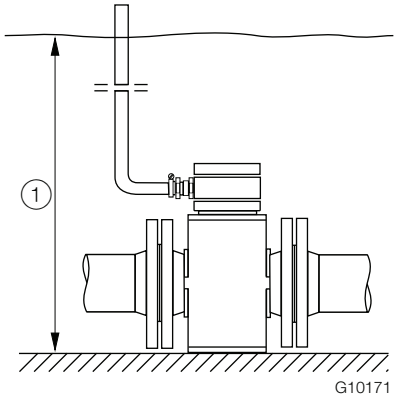



**Fig. 33**
**(1) Maximum flooding height 5 m (16.4 ft)**

For sensors with IP rating IP 68, the maximum flooding height is 5 m (16.4 ft). The supplied cable fulfills all submersion requirements.
The sensor is type-tested in accordance with EN 60529. Test conditions: 14 days at a flooding height of 5 m (16.4 ft).

**Connection**

**NOTE**

**Potential adverse effect on IP rating IP 68!**

The IP rating IP 68 of the sensor may be adversely affected as a result of damage to the signal cable.
The sheathing of the signal cable must not be damaged.

1. Use the supplied signal cable to connect the sensor and the transmitter.
2. Connect the signal cable in the terminal box of the sensor.
3. Route the cable from the terminal box to above the maximum flooding height of 5 m (16.4 ft).
4. Tighten the cable gland.
5. Carefully seal the terminal box. Make sure the gasket for the cover is seated properly.

**NOTE**

As an option, the sensor can be ordered with the signal cable already connected to the sensor and the terminal box already potted.

### Potting the terminal box

If the terminal box is to be potted subsequently on-site, a special two-component potting compound can be ordered separately (order no. D141B038U01). Potting is only possible if the sensor is installed horizontally. Observe the following instructions during work activity.

**⚠ WARNING**

**Health hazard!**

The two-component potting compound is toxic – observe all relevant safety measures!

Follow the Material Safety Data Sheet that are provided by the manufacturer prior to starting any preparations.

**Hazard warnings:**

- R20: Harmful by inhalation.
- R36 / 37 / 38: Irritating to eyes, respiratory system and skin.
- R42 / 43: May cause sensitization by inhalation and skin contact.

**Safety advice:**

- S23: Do not breathe gas/fumes/vapor/spray.
- S24: Avoid contact with skin.
- S37: Wear suitable gloves
- S63: In case of accident by inhalation: remove casualty to fresh air and keep at rest.

### Preparation

- Complete the installation before potting in order to avoid moisture penetration. Before starting, check all the connections for correct fitting and stability.
- Do not overfill the terminal box. Keep the potting compound away from the O-ring and the gasket / groove (see Fig. 34).
- Prevent the two-component potting compound from penetrating the cable conduit if an NPT 1/2" installation is used.

### Procedure

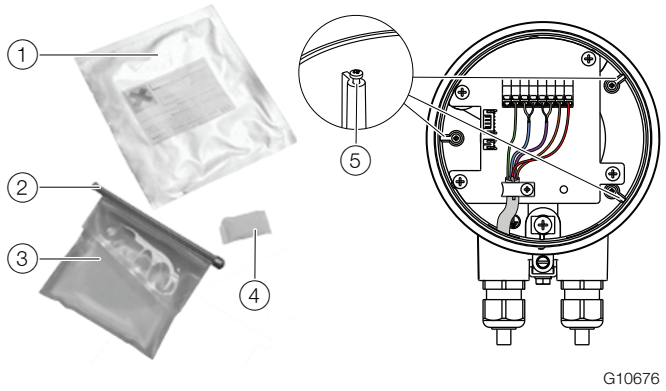



**Fig. 34**
**① Packing bag ② Connection clamp ③ Two-component potting compound ④ Drying bag ⑤ Maximum filling level**

1. Cut open the protective enclosure of the two-component potting compound (see packing).
2. Remove the connection clamp of the potting compound.
3. Knead both components thoroughly until a good mix is reached.
4. Cut open the bag at a corner. Perform work activity within 30 minutes.
5. Carefully fill the terminal box with the two-component potting compound until the connection cable is covered.
6. Wait a few hours before closing the cover in order to allow the compound to dry, and to release any possible gas.
7. Ensure that the packaging material and the drying bag are disposed of in an environmentally sound manner.

### 4.5.5 Electrical connection

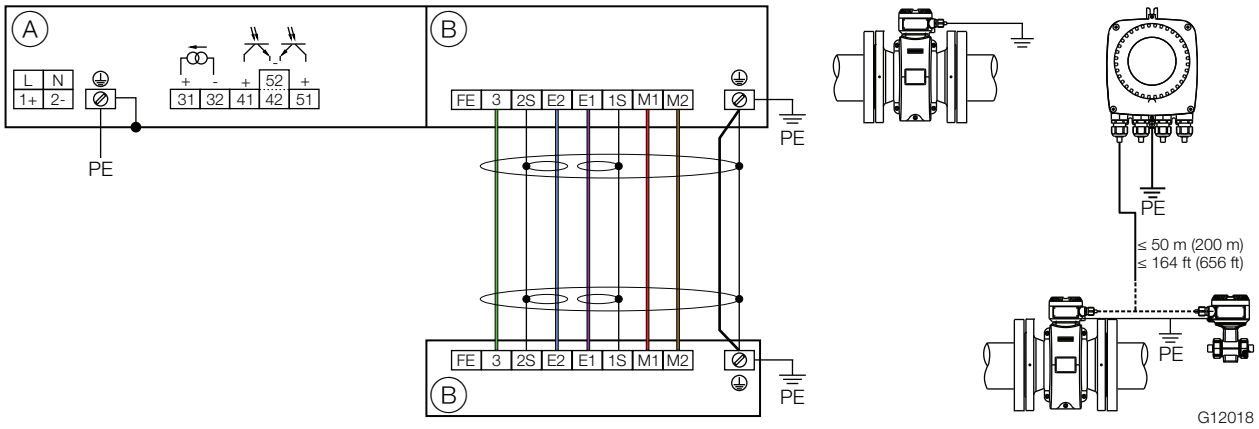



**Fig. 35: Electrical connections**
Ⓐ **Connections for power supply and outputs** Ⓑ **Connections for signal cable (remote mount design only)**

**i NOTE**

For detailed information about earthing the transmitter and the sensor, please refer to chapter "Grounding the flowmeter sensor" on page 14!

#### Connections for the power supply

| **AC power supply** | |
|---|---|
| **Terminal** | **Function / comments** |
| L | Phase |
| N | Neutral conductor |
| PE / ⏚ | Protective earth (PE) |

| **DC voltage supply** | |
|---|---|
| **Terminal** | **Function / comments** |
| 1+ | + |
| 2- | - |
| PE / ⏚ | Protective earth (PE) |

#### Connections for outputs

| **Terminal** | **Function / comments** |
|---|---|
| 31 / 32 | **Active current output**<br>The current output is "active" mode. The source to drive the 20 mA loop is in-built in the transmitter. |
| 41 / 42 | **Passive digital output DO1**<br>The output can be configured as a pulse output, frequency output or switch output on site. |
| 51 / 52 | **Passive digital output DO2**<br>The output can be configured as a pulse output, frequency output or switch output on site. |
| ⏚ | **Functional earth** |

#### Connections for the signal cable

Only for remote mount design.

| **Terminal** | **Function / comments** | **Color** |
|---|---|---|
| FE | Not connected | – |
| 3 | Measurement potential | green |
| 2S | Shield for E2 | – |
| E2 | Signal line | blue |
| E1 | Signal line | violet |
| 1S | Shield for E1 | – |
| M1 | Magnet coil | brown |
| M2 | Magnet coil | red |
| ⏚ | Shield | – |
| – | Not connected | orange / yellow |

### 4.5.6 Electrical data for inputs and outputs

**Power supply L / N, 1+ / 2-**

| AC power supply | |
|---|---|
| Terminals | L / N |
| Operating voltage | 100 … 240 V AC (-15 % / +10 %), 47 … 64 Hz |
| Power consumption | < 20 VA |
| Inrush current | 8.8 A |

| DC voltage supply | |
|---|---|
| Terminals | 1+ / 2- |
| Operating voltage | 24 ... 48V DC (-10 % / +10 %) |
| Ripple | < 5 % |
| Power consumption | < 10 W |
| Inrush current | 5.6 A |

**Current output 31 / 32**

Can be configured for outputting mass flow, volume flow.

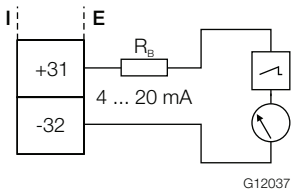



**Fig. 36: Connection example active current output 31 / 32 (I = internal, E = external, $R_B$ = load)**

| Current output | Active |
|---|---|
| Terminals | 31 / 32 |
| Output signal | 4 … 20 mA |
| Load $R_B$ | 0 Ω ≤ RB ≤ 650 Ω |

**Digital output 41 / 42, 51 / 52**

Can be configured as pulse, frequency or binary output.

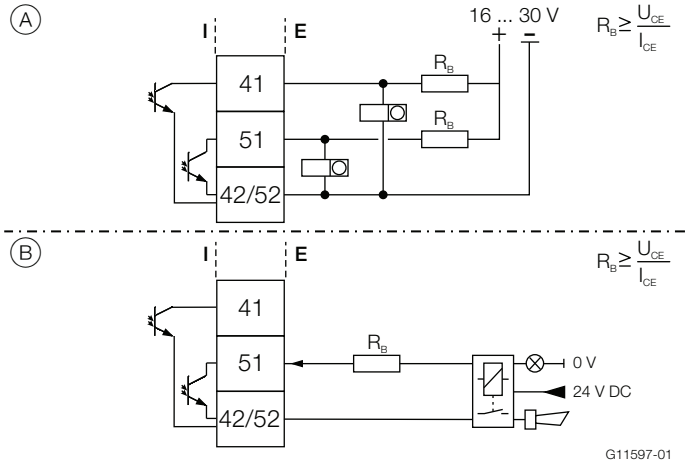



**Fig. 37: Connection example (I = internal, E = external, $R_B$ = load)**

**(A) Passive digital output 41 / 42, 51 / 52 as pulse or frequency output**

**(B) Passive digital output 51 / 52 as binary output**

**NOTE**

- Terminals 42 / 52 have the same ground potential. Digital outputs 41 / 42 and 51 / 52 are not electrically isolated from each other.
- If you are using a mechanical counter, we recommend setting a pulse width of ≥ 30 ms and a maximum frequency of fmax ≤ 3 kHz.

| Pulse / frequency output (passive) | |
|---|---|
| Terminals | 41 / 42, 51 / 52 |
| $U_{max}$ | 30 V DC |
| $I_{max}$ | 25 mA |
| $f_{max}$ | 10.5 kHz |
| Pulse width | 0.1 … 2000 ms |

| Binary output (passive) | |
|---|---|
| Terminals | 41 / 42, 51 / 52 |
| $U_{max}$ | 30 V DC |
| $I_{max}$ | 25 mA |
| Switching function | Can be configured using software as: System alarm, empty pipe alarm, max. / min. alarm, flow direction signaling, others |

### 4.5.7 Connection to integral mount design

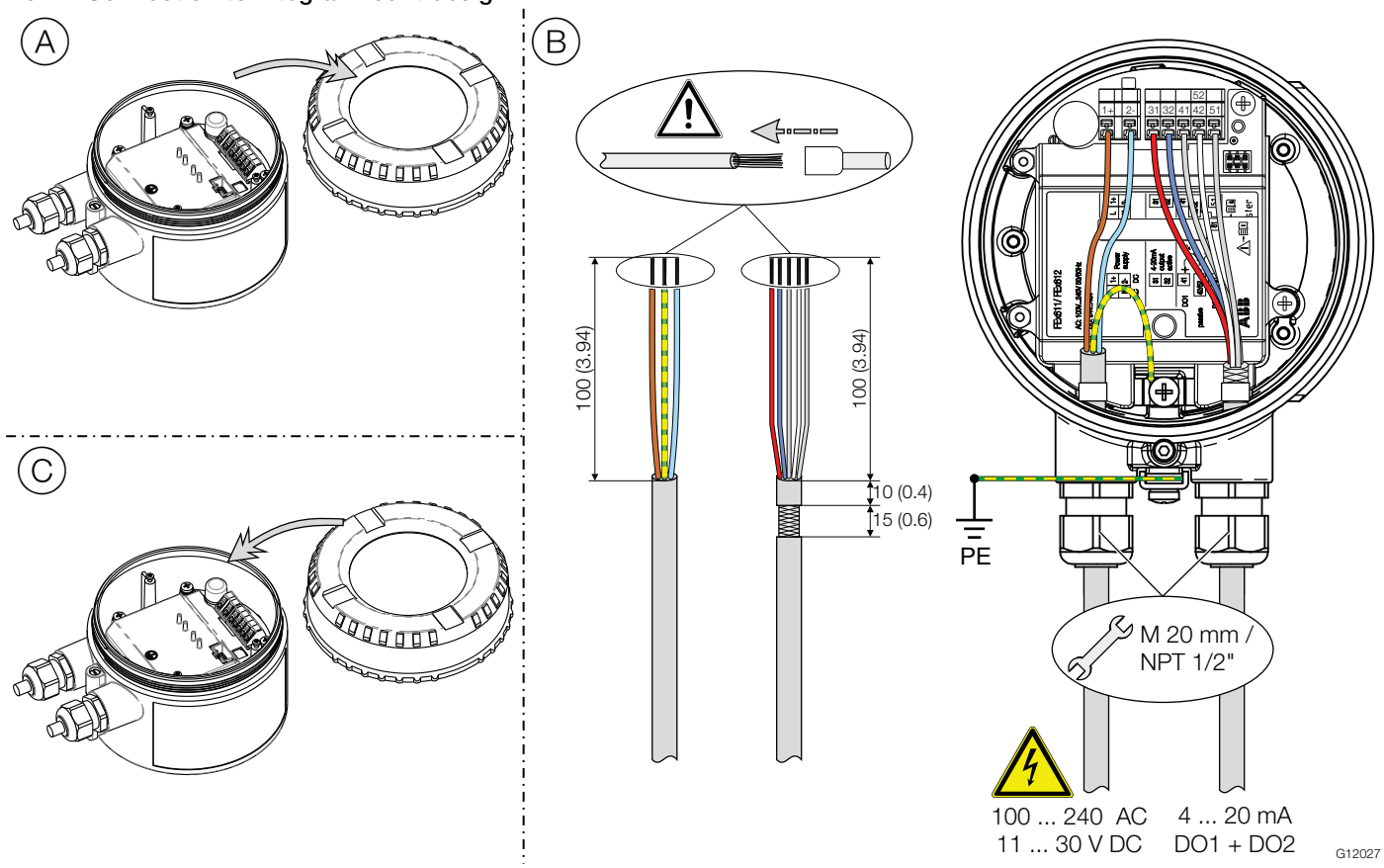



**Fig. 38: Connection on the device (example), dimensions in mm (inch)**
**PE = potential equalization**

**NOTE**

**If the O-ring gasket is seated incorrectly or damaged, this may have an adverse effect on the housing protection class.**

Follow the instructions in chapter "Opening and closing the terminal box" on page 13 to open and close the housing safely.

Connect compact design: Perform steps (A) ... (C).
In the process, observe the following instructions:

- Lead the cable for the power supply into the terminal box through the left cable entry.
- Lead the cables for the analog outputs and the digital outputs into the terminal box through the right cable entry.
- Connect the cables according to the electrical plan. Connect the cable shields to the designated grounding clamp in the terminal box.
- Connect the potential equalization (PE) on the ground terminal to the terminal box.
- Use wire end ferrules when connecting.

**NOTE**

- Observe the power supply limit values in accordance with the information on the name plate.
- Observe the voltage drop for large cable lengths and small conductor cross-sections. The voltage at the terminals of the device may not fall below the minimum value required in accordance with the information on the name plate.

The power supply is connected to terminal L (phase), N (neutral), or 1+, 2-, and PE, as stated on the name plate.
A circuit breaker with a maximum rated current of 16 A must be installed in the power supply line of the transmitter.
The wire cross-sectional area of the power supply cable and the circuit breaker used must comply with VDE 0100 and must be dimensioned in accordance with the current consumption of the flowmeter measuring system. The cables must comply with IEC 227 and/or IEC 245.
The circuit breaker should be located near the transmitter and marked as being associated with the device.
Connect the transmitter and sensor to functional earth.

### 4.5.8 Connection to remote mount design

**NOTE**

Use wire end sleeves.

— Wire end sleeves 0.75 mm² (AWG 19), for shielding (1S, 2S).

— Wire end sleeves 0.5 mm² (AWG 20), for all other wires.

The shields may not touch (signal short circuit).

#### Flowmeter sensor site

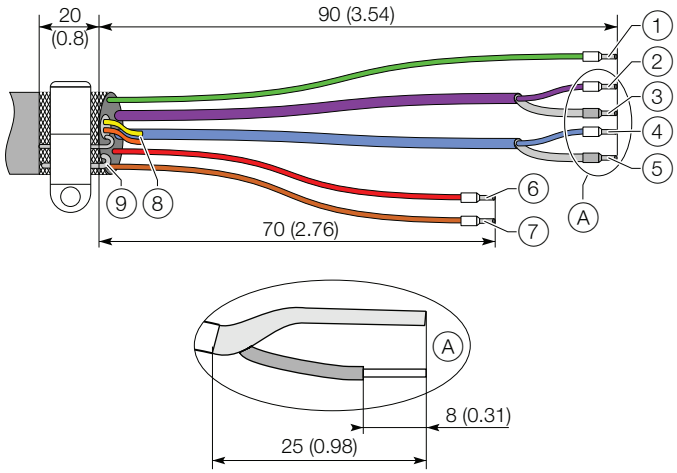



**Fig. 39: Signal Cable Part No. D173D031U01, Dimensions in mm (inch)**

| Pos. | | Terminal | Function / comments | Color |
|---|---|---|---|---|
| ① | | 3 | Measurement potential | green |
| ② | | E1 | Signal line | violet |
| ③ | | 1S | Shield for E1 | — |
| ④ | | E2 | Signal line | blue |
| ⑤ | | 2S | Shield for E2 | — |
| ⑥ | | M2 | Magnet coil | red |
| ⑦ | | M1 | Magnet coil | brown |
| ⑧ | | — | Not connected | yellow |
| | | — | Not connected | orange |
| ⑨ | | SE / ⏚ | Shield | — |

#### Transmitter side

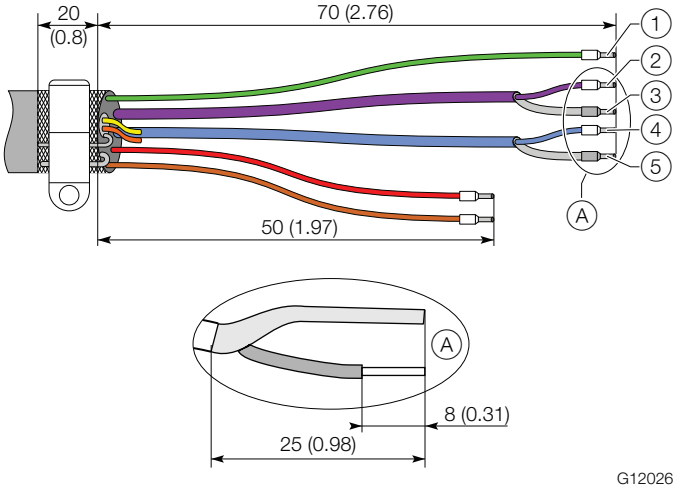



**Fig. 40: Signal Cable Part No. D173D031U01, Dimensions in mm (inch)**

| Pos. | Terminal | Function / comments | Color |
|---|---|---|---|
| ① | 3 | Measurement potential | green |
| ② | E1 | Signal line | violet |
| ③ | 1S | Shield for E1 | — |
| ④ | E2 | Signal line | blue |
| ⑤ | 2S | Shield for E2 | — |
| ⑥ | M2 | Magnet coil | red |
| ⑦ | M1 | Magnet coil | brown |
| ⑧ | — | Not connected | yellow |
| | — | Not connected | orange |
| ⑨ | SE / ⏚ | Shield | — |

**Transmitter**

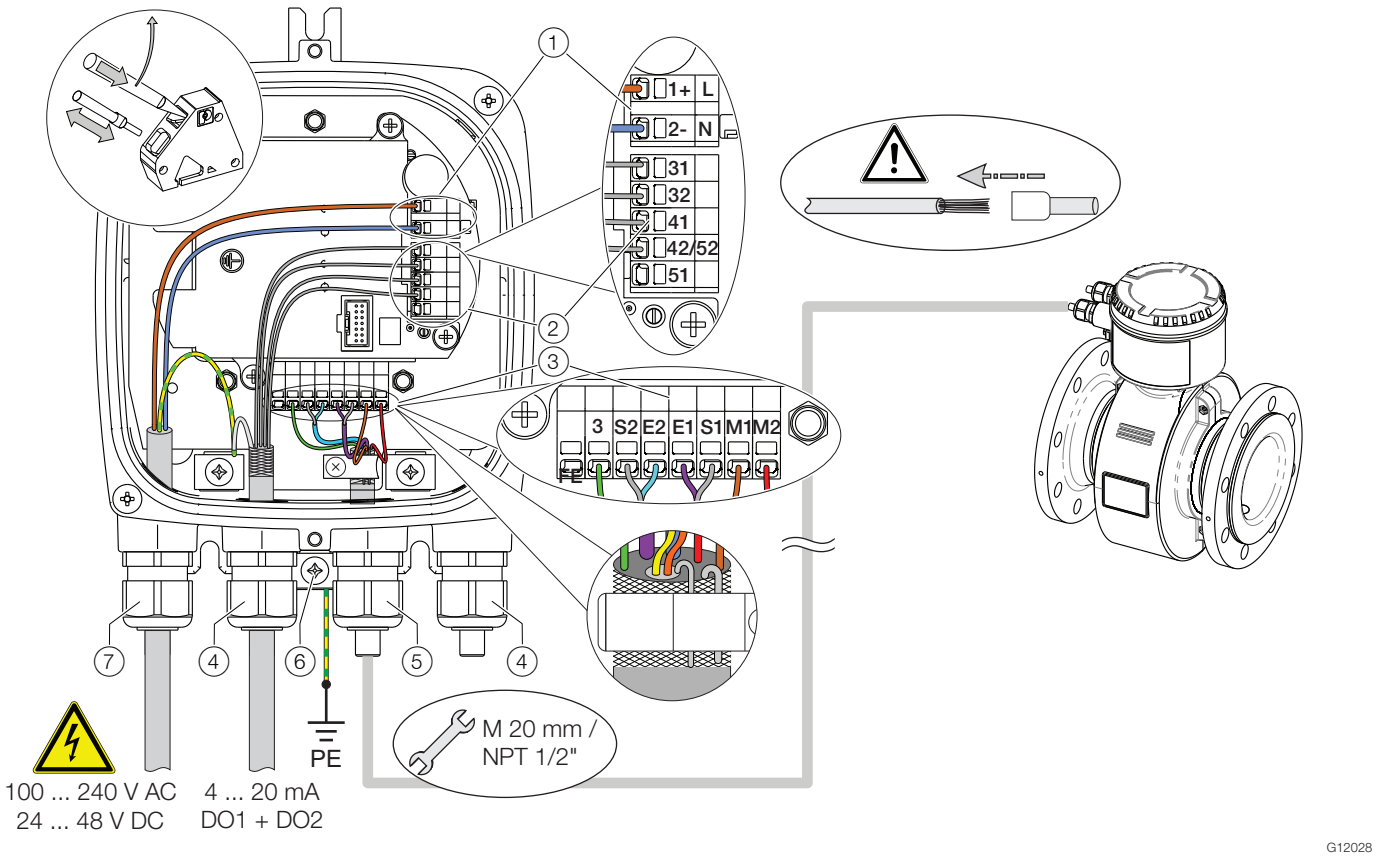



**Fig. 41: Connection to transmitter in remote mount design (example)**
(1) **Terminals for power supply** (3) **Terminal for signal cable** (3) **Terminals for inputs and outputs** (4) **Cable entry for inputs and outputs** (5) **Cable entry for signal cable** (6) **Terminal for potential equalization** (7) **Cable entry for power supply**

**NOTE**

**If the O-ring gasket is seated incorrectly or damaged, this may have an adverse effect on the housing protection class.**
Follow the instructions in chapter "Opening and closing the terminal box" on page 13 to open and close the housing safely.

Observe the following points when connecting to an electrical supply:
- Lead the cable for the power supply and the signal inputs and outputs into the housing as shown.
- Connect the cables in accordance with the electrical connection diagram. If present, connect the cable shielding to the earthing clamp provided.
- Use wire end ferrules when connecting.
- Close unused cable entries using suitable plugs.

**NOTE**

- Observe the power supply limit values in accordance with the information on the name plate.
- Observe the voltage drop for large cable lengths and small conductor cross-sections. The voltage at the terminals of the device may not fall below the minimum value required in accordance with the information on the name plate.

The power supply is connected to terminal L (phase), N (neutral), or 1+, 2-, and PE, as stated on the name plate.
A circuit breaker with a maximum rated current of 16 A must be installed in the power supply line of the transmitter.
The wire cross-sectional area of the power supply cable and the circuit breaker used must comply with VDE 0100 and must be dimensioned in accordance with the current consumption of the flowmeter measuring system. The cables must comply with IEC 227 and/or IEC 245.
The circuit breaker should be located near the transmitter and marked as being associated with the device.
Connect the transmitter and sensor to functional earth.

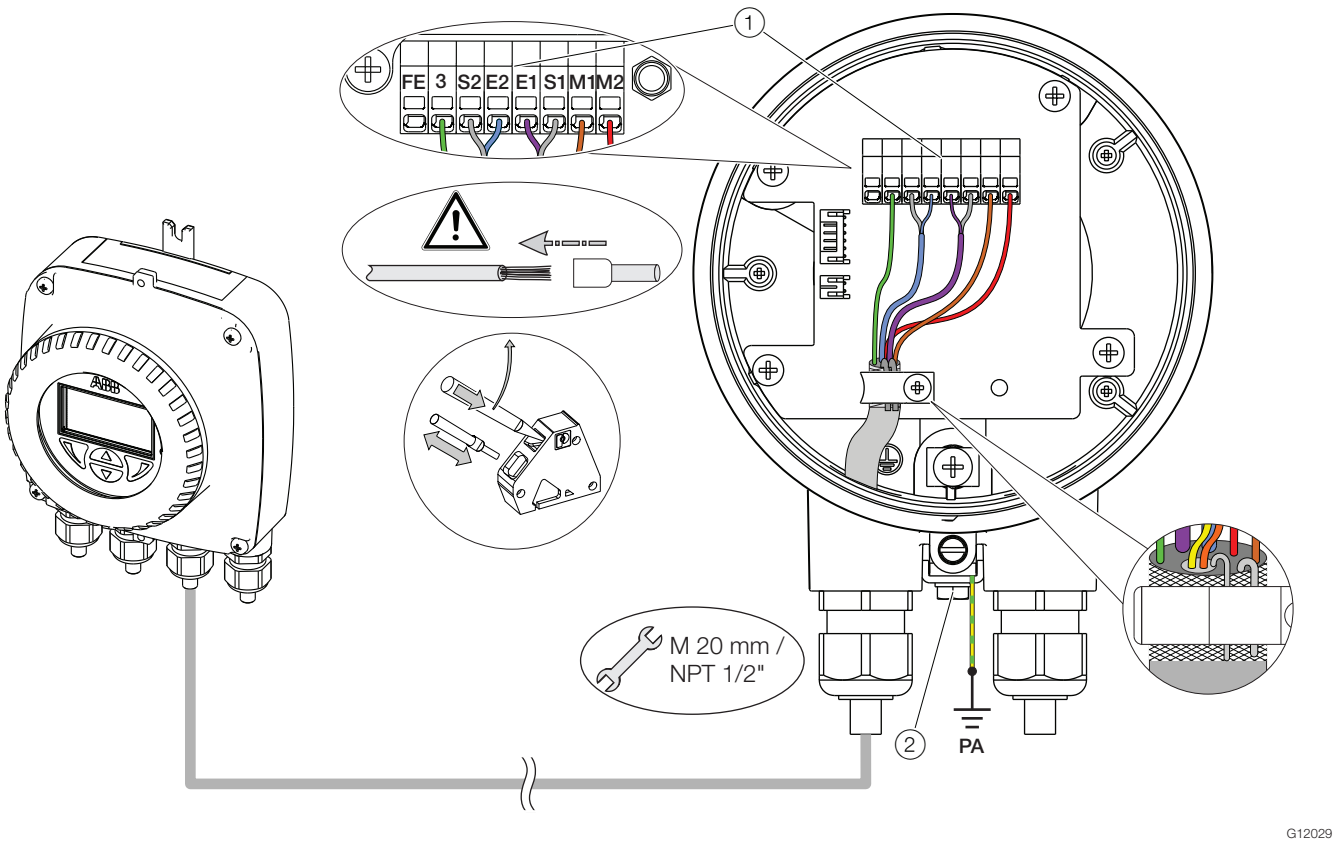



**Fig. 42: Connection to sensor in remote mount design (example)**
**(1) Terminals for signal cable (2) Terminal for potential equalization**

**NOTE**

**If the O-ring gasket is seated incorrectly or damaged, this may have an adverse effect on the housing protection class.**

Follow the instructions in chapter "Opening and closing the terminal box" on page 13 to open and close the housing safely.

Observe the following points:

- Lead the signal cable into the housing as shown.
- Connect the cables in accordance with the electrical connection diagram. If present, connect the cable shielding to the earthing clamp provided.
- Use wire end ferrules when connecting.
- Close unused cable entries using suitable plugs.

# 5 Commissioning

## 5.1 Safety instructions

**⚠ CAUTION**

**Risk of burns due to hot measuring media.**

The device surface temperature may exceed 70 °C (158 °F), depending on the measuring medium temperature!

Before starting work on the device, make sure that it has cooled sufficiently.

Aggressive or abrasive measuring medium may result in damage to the wetted parts of the flowmeter sensor. As a result, pressurized measuring medium may escape prematurely.

Due to wear on the flange seal or process connection gaskets (e.g., threaded pipe connections, Tri-Clamp, etc.), a pressurized measuring medium may escape.

When using internal flat gaskets, these can become embrittled through CIP/SIP processes.

If there is a chance that safe operation is no longer possible, take the device out of operation and secure it against unintended startup.

## 5.2 Write-protection switch, service LED and local operating interface

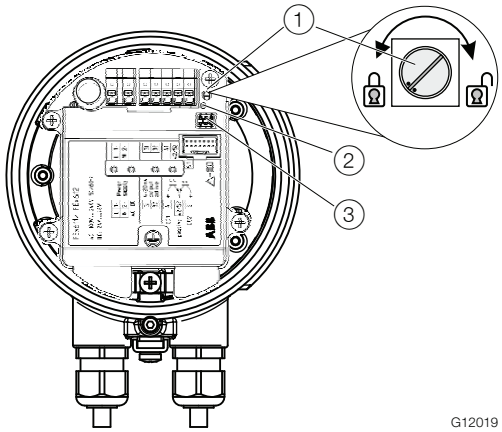



**Fig. 43**
**(1) Write protection switch (2) Service LED**
**(3) Local operatinginterface**

### Write protection switch

If write protection is active, the parameterization of the device cannot be changed via the local operating interface or the local display.

Turning the write protection switch clockwise deactivates the write protection while turning the switch counter-clockwise activates it.

### Service LED

The service LED, which indicates the operating condition of the device, is located in the sensor terminal box.

| Service LED | Description |
|---|---|
| Flashes rapidly (100 ms) | Starting sequence, device not yet ready for operation |
| Lit up continuously | Device operating, no critical error |
| Flashes slowly (1 second) | A critical error has occurred, see chapter "Error messages on the LCD display" on page 36 |

### Local operating interface

The sensor can also be parameterized without a local display via the local operating interface, see chapter "Parameterization via the local operating interface" on page 28.

### 5.3 Checks prior to commissioning

The following points must be checked before commissioning the device:

- The wiring must have been completed as described in the chapter "Electrical connections" on page 17.
- The correct grounding of the sensor.
- The ambient conditions must meet the requirements set out in the technical data.
- The power supply must meet the requirements set out on the identification plate.

**Remote Sensor - Checking for the correct sensor to transmitter assignment**

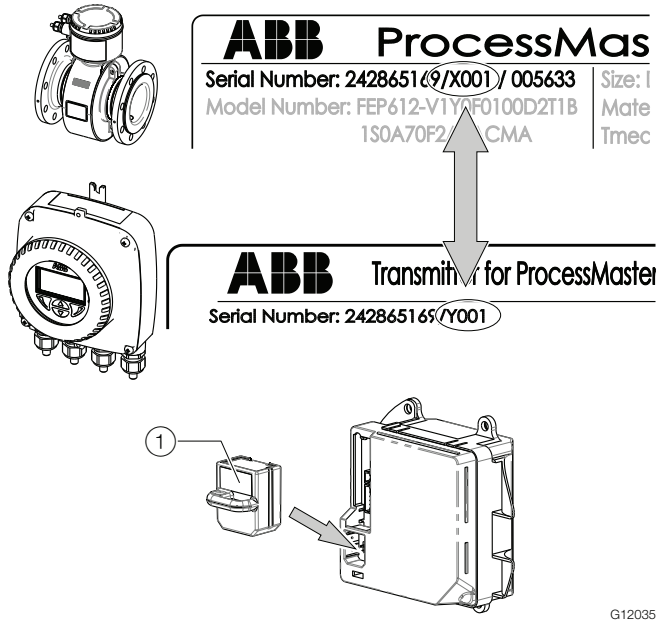



**Fig. 44: Sensor to transmitter assignment**
**(1) SensorMemory**

The SensorMemory is a pluggable data storage device located on the rear side of the transmitter cartridge.
The SensorMemory is labeled with an order number and an end number.
The end number is shown on the nameplate of the corresponding flowmeter sensor.
These numbers must be identical.

### 5.4 Parameterization of the device

The ProcessMaster FEP610, HygienicMaster FEH610 can be commissioned and operated via the integrated LCD indicator (option, see chapter "Parameterization via the "Easy Setup" menu function" on page 29).

Alternatively, the ProcessMaster FEP610, HygienicMaster FEH610 can also be commissioned and operated via ABB Asset Vision Basic (FEx61x DTM).

**Flowmeter without display operated through a hot pluggable display**

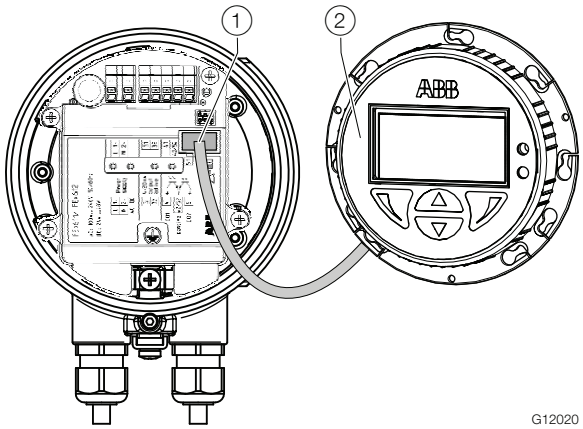



**Fig. 45: Optional LCD display**
**(1) Connector plug for LCD display (2) LCD display**

The “non display” version of the device can be parameterized using a display which is available as an accessory to the flowmeter.

### 5.4.1 Parameterization via the infrared service port adapter

Configuration via the infrared service port adapter on the device requires a PC / notebook and the FZA100 infrared service port adapter.

All parameters can also be set using the HART DTM available at www.abb.com / **flow** and the "ABB AssetVision" software.

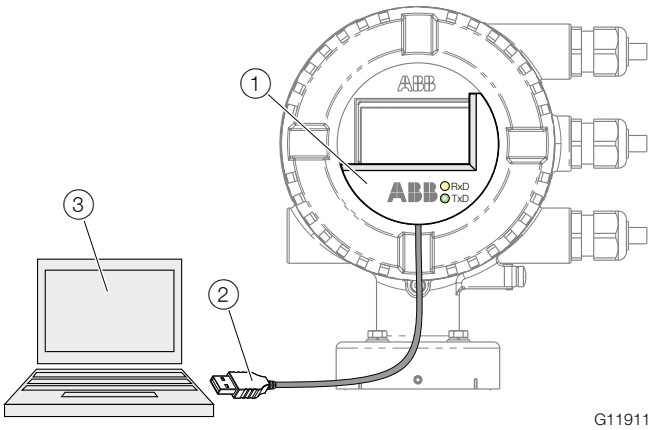



**Fig. 46: Infrared service port adapter on transmitter (example)**
**(1) Infrared service port adapter (2) USB interface cable**
**(3) PC / notebook running ABB AssetVision and HART DTM**

1. Position the infrared service port adapter on the front plate of the transmitter as shown
2. Insert USB interface cable into a free USB female connector on the PC / notebook.
3. Switch on the device power supply.
4. Start ABB AssetVision and perform the parameterization of the equipment.

Detailed information on operating the software is available in the relevant operating instructions and the DTM online help.

### 5.4.2 Parameterization via the local operating interface

A PC / notebook and the USB interface cable are required to configure the device via the device's local operating interface. In conjunction with the HART-DTM and the software "ABB AssetVision" available at www.abb.com/flow, all parameters can also be set without the need for a local display.

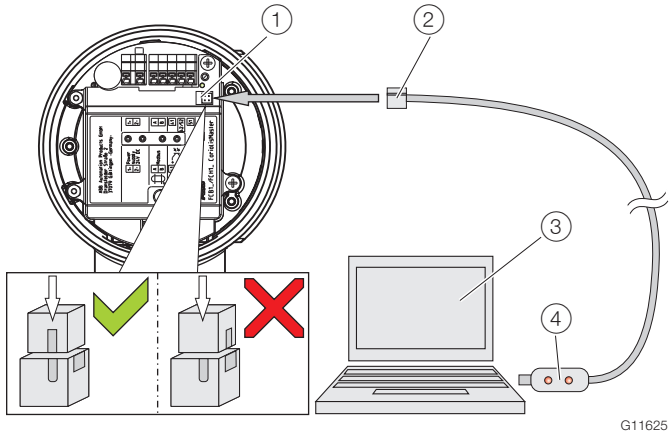



**Fig. 47: Connection to the local operating interface**
**(1) Local operating interface (2) Programming plug**
**(3) PC / notebook (4) USB interface cable**

1. Open device terminal box.
2. Connect programming plug to the local operating interface of the device.
3. Insert USB interface cable into a free USB female connector on the PC / notebook.
4. Switch on the device power supply.
5. Start ABB AssetVision and perform the parameterization of the equipment.

Detailed information on operating the software is available in the relevant operating instructions and the DTM online help.

### 5.5 Factory settings

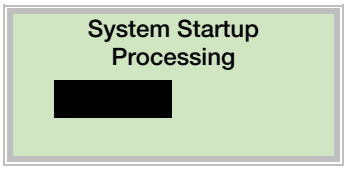
The device can be factory parameterized to customer specifications upon request. If no customer information is available, the device is delivered with factory settings.

| Parameter | Factory setting |
|---|---|
| Qv Max 1 | $Q_{max}$DN (see table in chapter "Measuring range table" on page 32) |
| Sensor Tag | None |
| TX Location TAG | None |
| Unit Volumeflow Qv | l/min |
| Unit Vol. Totalizer | l (liter) |
| Pulses per Unit | 1 |
| Pulse Width | 100 ms |
| Damping | 1 s |
| Digital output 41 / 42 | Impulse für Forward & Reverse |
| Digital output 51 / 52 | Flow Direction |
| Current output | 4-20mA FWD/REV |
| Curr.Out at Alarm | High Alarm, 21.8 mA |
| Current at flowrate > 20.5 mA | Off |
| Low Flow Cut Off | 1 % |
| EPD Alarm | Off |

### 5.6 Switching on the power supply

— Switch on the power supply.

The LCD display shows the following display during the startup process:

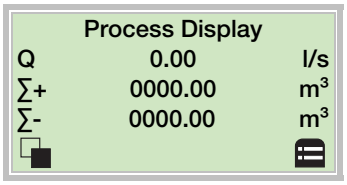



The process display is displayed after the startup process.

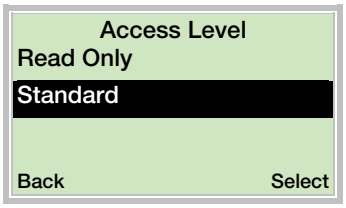
### 5.7 Parameterization via the "Easy Setup" menu function

Settings for the most common parameters are summarized in the "Easy Setup" menu. This menu provides the fastest way to configure the device.

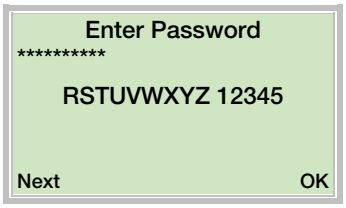
The following section describes parameterization via the "Easy Setup" menu function.



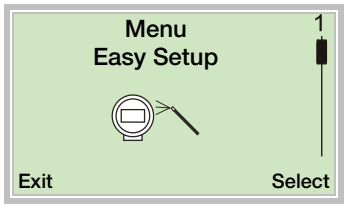

1. Use ◤ to switch to the configuration level.




2. Use ▲ / ▼ to select "Standard".
3. Confirm the selection with ◤.

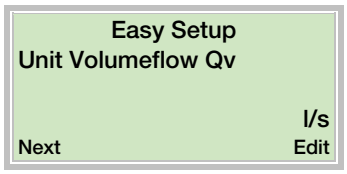



4. Use ◤ to confirm the password. A password is not available as factory default; you can continue without entering a password.

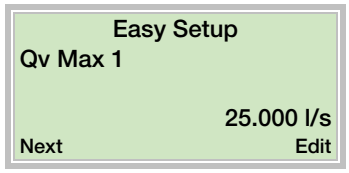



5. Use ▲ / ▼ to select "Easy Setup".
6. Confirm the selection with ◤.


7. Use ◤ to call up the edit mode.
8. Use ▲ / ▼ to select the desired language.
9. Confirm the selection with ◤.

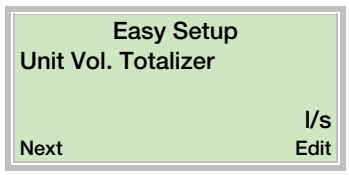



10. Use ◤ to call up the edit mode.
11. Use ▲ / ▼ to select the desired unit for the volume flow.
12. Confirm the selection with ◤.

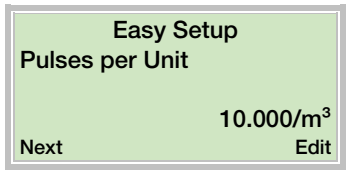



13. Use ◤ to call up the edit mode.
14. Use ▲ / ▼ to select the desired upper range value.
15. Confirm the selection with ◤.

The device is factory calibrated to the flow range end value $Q_{max}DN$, unless other customer information is available. The ideal flow range end values are approximately 2 ... 3 m/s (0.2 ... 0.3 x $Q_{max}DN$).
The possible flow range end values are shown in the table in chapter "Measuring range table" on page 32.

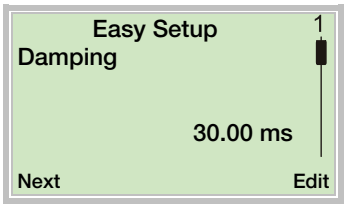



16. Use ◤ to call up the edit mode.
17. Use ▲ / ▼ to select the desired unit for the volume totalizer.
18. Confirm the selection with ◤.



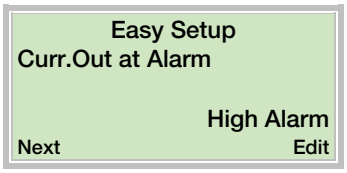

19. Use ◤ to call up the edit mode.
20. Use ▲ / ▼ to set the desired value.
21. Confirm the selection with ◤.


22. Use to call up the edit mode.
23. Use / to set the desired pulse width.
24. Confirm the selection with .

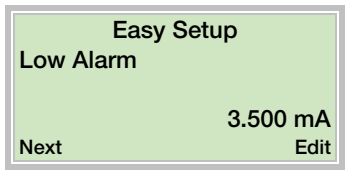



25. Use to call up the edit mode.
26. Use / to set the damping for the volume flow.
27. Confirm the selection with .

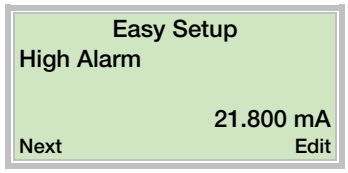

28. Use to call up the edit mode.
29. Use / to select the desired operating mode (Off, Logic, Pulse, Frequency) for the digital output.
30. Confirm the selection with .




31. Use to call up the edit mode.
32. Use / to select the desired alarm mode.
33. Confirm the selection with .




34. Use to call up the edit mode.
35. Use / to set the alarm current for "Low Alarm".
36. Confirm the selection with .



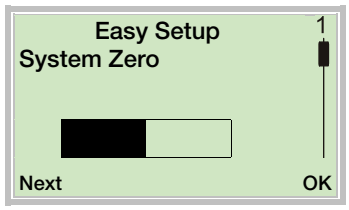

37. Use to call up the edit mode.
38. Use / to set the alarm current for "High Alarm".
39. Confirm the selection with .

**Zero point adjustment of the flowmeter**

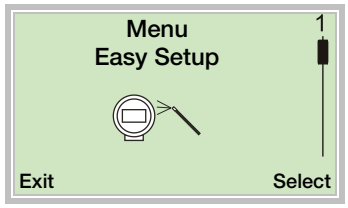
**i NOTE**

Prior to starting the zero point adjustment, make sure that:

— There is no flow through the sensor (close valves, shut-off devices etc.).
— The sensor is completely filled with the medium to be measured




— Use to start automatic balancing of the zero point for the system.




Once all parameter have been set, the main menu appears again. The most important parameters are now set.

40. Use to switch to the process display.

## 5.8 Measuring range table

The flow range end value can be set between 0.02 x $Q_{max}$DN and 2 x $Q_{max}$DN.

| Nominal diameter | | Minimum flow range end value | $Q_{max}$DN | Maximum flow range end value |
|---|---|---|---|---|
| DN | inch | 0.02 x $Q_{max}$DN (≈ 0.2 m/s) | 0 … ≈ 10 m/s | 2 x $Q_{max}$DN (≈ 20 m/s) |
| 3 | 1/10 | 0.08 l/min (0.02 US gal/min) | 4 l/min (1.06 US gal/min) | 8 l/min (2.11 US gal/min) |
| 4 | 5/32 | 0.16 l/min (0.04 US gal/min) | 8 l/min (2.11 US gal/min) | 16 l/min (4.23 US gal/min) |
| 6 | 1/4 | 0.4 l/min (0.11 US gal/min) | 20 l/min (5.28 US gal/min) | 40 l/min (10.57 US gal/min) |
| 8 | 5/16 | 0.6 l/min (0.16 US gal/min) | 30 l/min (7.93 US gal/min) | 60 l/min (15.85 US gal/min) |
| 10 | 3/8 | 0.9 l/min (0.24 US gal/min) | 45 l/min (11.9 US gal/min) | 90 l/min (23.78 US gal/min) |
| 15 | 1/2 | 2 l/min (0.53 US gal/min) | 100 l/min (26.4 US gal/min) | 200 l/min (52.8 US gal/min) |
| 20 | 3/4 | 3 l/min (0.79 US gal/min) | 150 l/min (39.6 US gal/min) | 300 l/min (79.3 US gal/min) |
| 25 | 1 | 4 l/min (1.06 US gal/min) | 200 l/min (52.8 US gal/min) | 400 l/min (106 US gal/min) |
| 32 | 1 1/4 | 8 l/min (2.11 US gal/min) | 400 l/min (106 US gal/min) | 800 l/min (211 US gal/min) |
| 40 | 1 1/2 | 12 l/min (3.17 US gal/min) | 600 l/min (159 US gal/min) | 1200 l/min (317 US gal/min) |
| 50 | 2 | 1.2 $m^3$/h (5.28 US gal/min) | 60 $m^3$/h (264 US gal/min) | 120 $m^3$/h (528 US gal/min) |
| 65 | 2 1/2 | 2.4 $m^3$/h (10.57 US gal/min) | 120 $m^3$/h (528 US gal/min) | 240 $m^3$/h (1057 US gal/min) |
| 80 | 3 | 3.6 $m^3$/h (15.9 US gal/min) | 180 $m^3$/h (793 US gal/min) | 360 $m^3$/h (1585 US gal/min) |
| 100 | 4 | 4.8 $m^3$/h (21.1 US gal/min) | 240 $m^3$/h (1057 US gal/min) | 480 $m^3$/h (2113 US gal/min) |
| 125 | 5 | 8.4 $m^3$/h (37 US gal/min) | 420 $m^3$/h (1849 US gal/min) | 840 $m^3$/h (3698 US gal/min) |
| 150 | 6 | 12 $m^3$/h (52.8 US gal/min) | 600 $m^3$/h (2642 US gal/min) | 1200 $m^3$/h (5283 US gal/min) |
| 200 | 8 | 21.6 $m^3$/h (95.1 US gal/min) | 1080 $m^3$/h (4755 US gal/min) | 2160 $m^3$/h (9510 US gal/min) |
| 250 | 10 | 36 $m^3$/h (159 US gal/min) | 1800 $m^3$/h (7925 US gal/min) | 3600 $m^3$/h (15850 US gal/min) |
| 300 | 12 | 48 $m^3$/h (211 US gal/min) | 2400 $m^3$/h (10567 US gal/min) | 4800 $m^3$/h (21134 US gal/min) |
| 350 | 14 | 66 $m^3$/h (291 US gal/min) | 3300 $m^3$/h (14529 US gal/min) | 6600 $m^3$/h (29059 US gal/min) |
| 400 | 16 | 90 $m^3$/h (396 US gal/min) | 4500 $m^3$/h (19813 US gal/min) | 9000 $m^3$/h (39626 US gal/min) |
| 450 | 18 | 120 $m^3$/h (528 US gal/min) | 6000 $m^3$/h (26417 US gal/min) | 12000 $m^3$/h (52834 US gal/min) |
| 500 | 20 | 132 $m^3$/h (581 US gal/min) | 6600 $m^3$/h (29059 US gal/min) | 13200 $m^3$/h (58117 US gal/min) |
| 600 | 24 | 192 $m^3$/h (845 US gal/min) | 9600 $m^3$/h (42268 US gal/min) | 19200 $m^3$/h (84535 US gal/min) |
| 700 | 28 | 264 $m^3$/h (1162 US gal/min) | 13200 $m^3$/h (58118 US gal/min) | 26400 $m^3$/h (116236 US gal/min) |
| 760 | 30 | 312 $m^3$/h (1374 US gal/min) | 15600 $m^3$/h (68685 US gal/min) | 31200 $m^3$/h (137369 US gal/min) |
| 800 | 32 | 360 $m^3$/h (1585 US gal/min) | 18000 $m^3$/h (79252 US gal/min) | 36000 $m^3$/h (158503 US gal/min) |
| 900 | 36 | 480 $m^3$/h (2113 US gal/min) | 24000 $m^3$/h (105669 US gal/min) | 48000 $m^3$/h (211337 US gal/min) |
| 1000 | 40 | 540 $m^3$/h (2378 US gal/min) | 27000 $m^3$/h (118877 US gal/min) | 54000 $m^3$/h (237754 US gal/min) |
| 1050 | 42 | 616 $m^3$/h (2712 US gal/min) | 30800 $m^3$/h (135608 US gal/min) | 61600 $m^3$/h (271217 US gal/min) |
| 1100 | 44 | 660 $m^3$/h (3038 US gal/min) | 33000 $m^3$/h (151899 US gal/min) | 66000 $m^3$/h (290589 US gal/min) |
| 1200 | 48 | 840 $m^3$/h (3698 US gal/min) | 42000 $m^3$/h (184920 US gal/min) | 84000 $m^3$/h (369841 US gal/min) |
| 1400 | 54 | 1080 $m^3$/h (4755 US gal/min) | 54000 $m^3$/h (237755 US gal/min) | 108000 $m^3$/h (475510 US gal/min) |
| 1500 | 60 | 1260 $m^3$/h (5548 US gal/min) | 63000 $m^3$/h (277381 US gal/min) | 126000 $m^3$/h (554761 US gal/min) |
| 1600 | 66 | 1440 $m^3$/h (6340 US gal/min) | 72000 $m^3$/h (317006 US gal/min) | 144000 $m^3$/h (634013 US gal/min) |
| 1800 | 72 | 1800 $m^3$/h (7925 US gal/min) | 90000 $m^3$/h (396258 US gal/min) | 180000 $m^3$/h (792516 US gal/min) |
| 2000 | 80 | 2280 $m^3$/h (10039 US gal/min) | 114000 $m^3$/h (501927 US gal/min) | 228000 $m^3$/h (1003853 US gal/min) |

# 6 Operation

## 6.1 Safety instructions

**⚠ CAUTION**

**Risk of burns due to hot measuring media.**

The device surface temperature may exceed 70 °C (158 °F), depending on the measuring medium temperature!

Before starting work on the device, make sure that it has cooled sufficiently.

Aggressive or abrasive measuring medium may result in damage to the wetted parts of the flowmeter sensor. As a result, pressurized measuring medium may escape prematurely.

Due to wear on the flange seal or process connection gaskets (e.g., threaded pipe connections, Tri-Clamp, etc.), a pressurized measuring medium may escape.

When using internal flat gaskets, these can become embrittled through CIP/SIP processes.

If there is a chance that safe operation is no longer possible, take the device out of operation and secure it against unintended startup.

## 6.2 Menu navigation

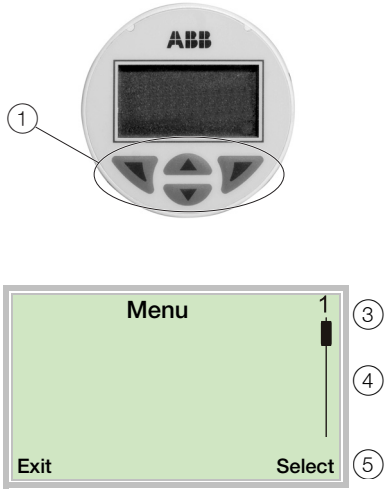



**Fig. 48: LCD display**

**(1) Operating buttons for menu navigation**
**(2) Menu name display (3) Menu number display**
**(4) Marker for indicating relative position within the menu**
**(5) Display showing the current functions of the ◥ and ◢ operating buttons**

The LCD indicator has capacitive operating buttons. These enable you to control the device through the closed housing cover.

**i NOTE**

The transmitter automatically calibrates the capacitive buttons on a regular basis. If the cover is opened during operation, the sensitivity of the buttons is firstly increased to enable operating errors to occur. The button sensitivity will return to normal during the next automatic calibration.

You can use the ▲ or ▼ operating buttons to browse through the menu or select a number or character within a parameter value.

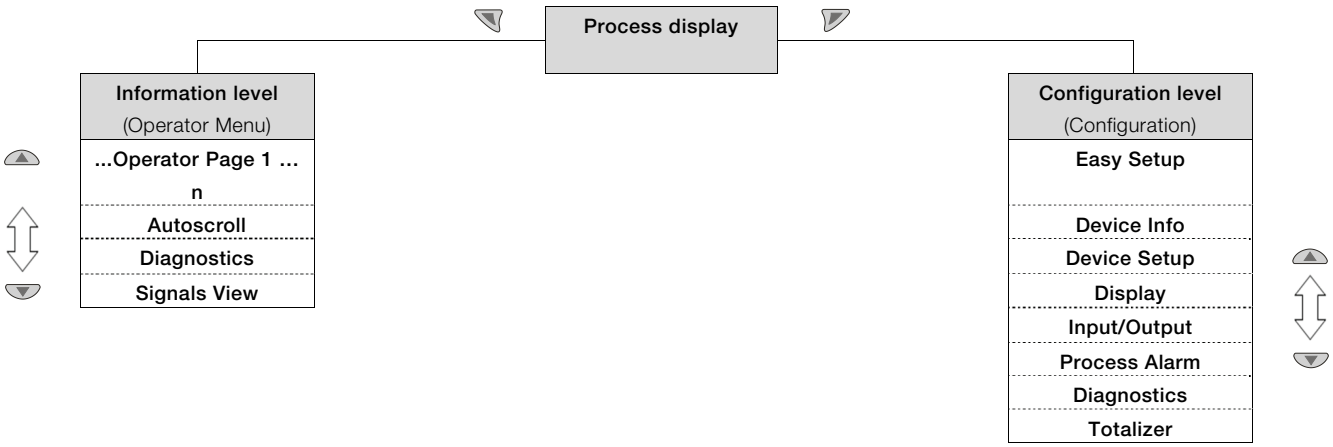
Different functions can be assigned to the ◥ and ◢ operating buttons. The function that is currently assigned to them is shown on the LCD display.

### Control button functions

| ◥ | **Meaning** |
|---|---|
| Exit | Exit menu |
| Back | Go back one submenu |
| Cancel | Cancel a parameter entry |
| Next | Select the next position for entering numerical and alphanumeric values |

| ◢ | **Meaning** |
|---|---|
| Select | Select submenu / parameter |
| Edit | Edit parameter |
| OK | Save parameter entered |

## 6.3 Menu levels




### Process display

The process display shows the current process values.
There are two menu levels under the process display.

### Information level (Operator Menu)

The information level contains the parameters and information that are relevant for the operator.
The device configuration cannot be changed on this level.

### Configuration level (Configuration)

The configuration level contains all the parameters required for device commissioning and configuration. The device configuration can be changed on this level. For detailed information on the parameters, see chapter Parameter descriptions in the operating instruction.

### 6.3.1 Process display

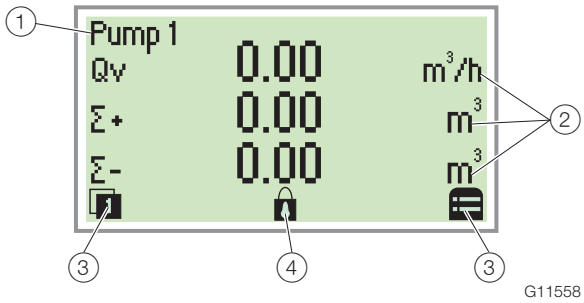


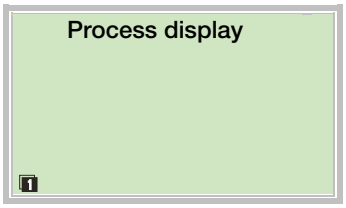

**Fig. 49: Process display (example)**
**(1) Measuring point tag (2) Current process values (3) "Button function" icon (4) "Parameterization protected" icon**

The process display appears on the LCD display when the device is switched on. It shows information about the device and current process values.
The way in which the current process values are shown can be adjusted on the configuration level.
The symbols at the bottom of the process display are used to indicate the functions of the operating buttons and , in addition to other information.

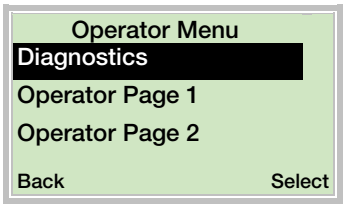
| Symbol | Description |
|---|---|
| / | Call up information level.<br>When Autoscroll mode is activated, the - icon appears here and the operator pages are automatically displayed one after the other. |
| | Call up configuration level. |
| | The device is protected against changes of the parameter settings. |

### 6.3.2 Switching to the information level (operator menu)

On the information level, the operator menu can be used to display diagnostic information and choose which operator pages to display.




1. Open the Operator Menu using .

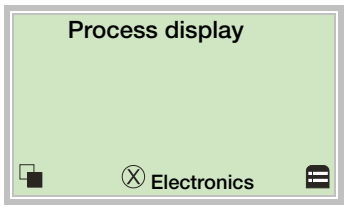



2. Select the desired submenu using / .
3. Confirm the selection with .

| Menu | Description |
|---|---|
| **... / Operator Menu** | |
| **Diagnostics** | Selection of sub-menu "**Diagnostics**"; see also chapter "Error messages on the LCD display" on page 36. |
| Operator Page 1 ... n | Selection of operator page to be displayed. |
| Autoscroll | When Autoscroll is activated, automatic switching of the operator pages is initiated on the process screen. |
| **Signals View** | Selection of submenu "**Signals View**" (only for service purposes). |

### 6.3.3 Error messages on the LCD display

In the event of an error, a message consisting of a symbol and text (e.g. Electronics) appears at the bottom of the process screen.
The text displayed provides information about the area in which the error has occurred.




The error messages are divided into four groups in accordance with the NAMUR classification scheme. The group assignment can only be changed using a DTM or EDD:

| Symbol | Description |
|---|---|
|  | Error / failure |
|  | Function check |
|  | Outside of the specification |
|  | Maintenance required |

The error messages are also divided into the following areas:

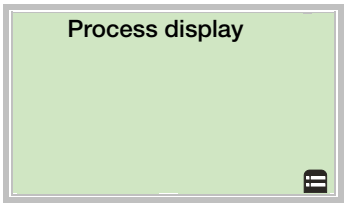
| Range | Description |
|---|---|
| Operation | Error / alarm due to the current operating conditions. |
| Sensor | Error / alarm of the flowmeter sensor. |
| Electronics | Error / alarm of the electronics. |
| Configuration | Error / alarm due to device configuration. |

**NOTE**

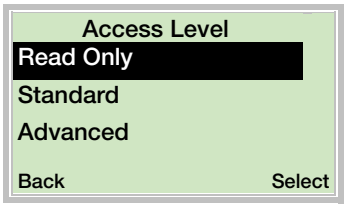
For a detailed description of errors and troubleshooting instructions, please see chapter "Diagnosis / error messages" in the operating instruction.

### 6.3.4 Switching to the configuration level (parameterization)

The device parameters can be displayed and changed on the configuration level.




1. Use ◤ to switch to the configuration level.



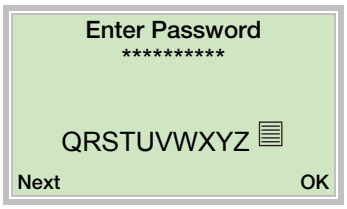

2. Select the desired level of access using ▲ / ▼.
3. Confirm the selection with ◤.

**NOTE**

There are three levels of access. A password can be defined for level "Standard".
There is no factory default password.

| Access Level | Description |
|---|---|
| Read Only | All parameters are locked. Parameters are read only and cannot be modified. |
| Standard | All the parameters can be altered. |
| Service | Only Customer Service has access to the Service menu. |

Once you have logged on to the corresponding access level, you can edit or reset the password. Reset (status "no password defined") by
selecting "▤" as a password.




4. Enter the corresponding password. No password is preset in the factory settings. Users can switch to the configuration level without entering a password.
   The selected access level remains active for 3 minutes. Within this time period you can toggle between the process display and the configuration level without re-entering the password.
5. Use ◤ to confirm the password.

The LCD display now indicates the first menu item on the configuration level.

6. Select a menu using ▲ / ▼.
7. Confirm the selection with ◤.

# 7 Maintenance

## 7.1 Safety instructions

**⚠ WARNING**

**Risk of injury due to live parts!**
When the housing is open, contact protection is not provided and EMC protection is limited.
Before opening the housing, switch off the power supply.

**⚠ CAUTION**

**Risk of burns due to hot measuring media.**
The device surface temperature may exceed 70 °C (158 °F), depending on the measuring medium temperature!
Before starting work on the device, make sure that it has cooled sufficiently.

**i NOTE**

**Damage to components!**
The electronic components of the printed circuit board can be damaged by static electricity (observe ESD guidelines).
Make sure that the static electricity in your body is discharged before touching electronic components.

Corrective maintenance work may only be performed by trained personnel.

— Before removing the device, depressurize it and any adjacent lines or containers.
— Check whether hazardous materials have been used as materials to be measured before opening the device. Residual amounts of hazardous material may still be present in the device and could escape when it is opened.

Within the scope of operator responsibility, check the following as part of a regular inspection:

— the pressure-carrying walls / lining of the pressure device
— the measurement-related function
— the leak tightness
— the wear (corrosion)

**i NOTE**

For detailed information on the maintenance of the device, consult the associated operating instructions (OI)!

# 8 Specifications

**NOTE**

The detailed device data sheet is available in the download area at www.abb.com/flow.

### 8.1 Permitted pipe vibration

In accordance with EN 60068-2-6.
Applicable to sensors in remote mount design and sensors in integral mount design.

— Maximum deflection: 0.15 mm (0.006 inch) in the 10 ... 58 Hz range
— Maximum acceleration: 2 g, in the 58 ... 150 Hz range

### 8.2 ProcessMaster - Temperature data

**Storage temperature range**
-30 ... 70 °C (-22 ... 158 °F)

The temperature range offered by the device is dependent on a number of different factors.
These factors include the measuring medium temperature $T_{medium}$, the ambient temperature $T_{amb.}$, the operating pressure $P_{medium}$, the liner material and the approvals for the explosion protection.

#### 8.2.1 Maximum permissible cleaning temperature

| CIP medium | Liner material | Cleaning temperature |
|---|---|---|
| Steam | PTFE, PFA | 150 °C (302 °F) |
| Cleaning fluid | PTFE, PFA | 140 °C (284 °F) |

— The specified cleaning temperature applies for a maximum ambient temperature of 25 °C (77 °F).
If the ambient temperature is > 25 °C (> 77 °F), the difference to the actual ambient temperature must be subtracted from the maximum cleaning temperature.
— The specified cleaning temperature may be applied for a maximum of 60 minutes.

### 8.2.2 Ambient temperature as a function of measuring medium temperature

**Integral mount design**

| Liner material | Flange material | Ambient temperature range ($T_{amb.}$) | | Measuring medium temperature range ($T_{medium}$) | |
|---|---|---|---|---|---|
| | | Minimum | Maximum | Minimum | Maximum |
| Hard rubber | Steel | -10 °C (14 °F) | 60 °C (140 °F) | -10 °C (14 °F) | 85 °C (185 °F)[2] |
| | | | | -5 °C (23 °F)[1] | 80 °C (176 °F)[1] |
| Hard rubber | Stainless steel | -15 °C (5 °F) | 60 °C (140 °F) | -15 °C (5 °F) | 85 °C (185 °F)[2] |
| | | | | -5 °C (23 °F)[1] | 80 °C (176 °F)[1] |
| Soft rubber | Steel | -10 °C (14 °F) | 60 °C (140 °F) | -10 °C (14 °F) | 60 °C (140 °F) |
| Soft rubber | Stainless steel | -15 °C (5 °F) | 60 °C (140 °F) | -15 °C (5 °F) | 60 °C (140 °F) |
| PTFE | Steel | -10 °C (14 °F) | 60 °C (140 °F) | -10 °C (14 °F) | 85 °C (185 °F) |
| | | -10 °C (14 °F) | 30 °C (86 °F) | -10 °C (14 °F) | 130 °C (266 °F) |
| PTFE | Stainless steel | -20 °C (-4 °F) | 60 °C (140 °F) | -25 °C (-13 °F) | 85 °C (185 °F) |
| | | -20 °C (-4 °F) | 30 °C (86 °F) | -25 °C (-13 °F) | 130 °C (266 °F) |
| PFA | Steel | -10 °C (14 °F) | 60 °C (140 °F) | -10 °C (14 °F) | 85 °C (185 °F) |
| | | -10 °C (14 °F) | 30 °C (86 °F) | -10 °C (14 °F) | 130 °C (266 °F) |
| PFA | Stainless steel | -20 °C (-4 °F) | 60 °C (140 °F) | -25 °C (-13 °F) | 85 °C (185 °F) |
| | | -20 °C (-4 °F) | 30 °C (86 °F) | -25 °C (-13 °F) | 130 °C (266 °F) |
| ETFE | Steel | -10 °C (14 °F) | 60 °C (140 °F) | -10 °C (14 °F) | 85 °C (185 °F) |
| | | -10 °C (14 °F) | 30 °C (86 °F) | -10 °C (14 °F) | 130 °C (266 °F) |
| ETFE | Stainless steel | -20 °C (-4 °F) | 60 °C (140 °F) | -25 °C (-13 °F) | 85 °C (185 °F) |
| | | -20 °C (-4 °F) | 30 °C (86 °F) | -25 °C (-13 °F) | 130 °C (266 °F) |

1) For China production site only.
2) The maximum measuring medium temperature is reduced to 80 °C (176 °F) for design level "B" sensors with a hard rubber liner.

**Remote mount design**

| Liner material | Flange material | Ambient temperature range ($T_{amb.}$) | | Measuring medium temperature range ($T_{medium}$) | |
|---|---|---|---|---|---|
| | | Minimum | Maximum | Minimum | Maximum |
| Hard rubber | Steel | -10 °C (14 °F) | 60 °C (140 °F) | -10 °C (14 °F) | 90 °C (194 °F)[2] |
| | | | | -5 °C (23 °F)[1] | 80 °C (176 °F)[1] |
| Hard rubber | Stainless steel | -15 °C (5 °F) | 60 °C (140 °F) | -15 °C (5 °F) | 90 °C (194 °F)[2] |
| | | | | -5 °C (23 °F)[1] | 80 °C (176 °F)[1] |
| Soft rubber | Steel | -10 °C (14°F) | 60 °C (140 °F) | -10 °C (14 °F) | 60 °C (140 °F) |
| Soft rubber | Stainless steel | -15 °C (5 °F) | 60 °C (140 °F) | -15 °C (5 °F) | 60 °C (140 °F) |
| PTFE | Steel | -10 °C (14°F) | 60 °C (140 °F) | -10 °C (14 °F) | 130 °C (266 °F) |
| PTFE | Stainless steel | -25 °C (-13 °F) | 60 °C (140 °F) | -25 °C (-13 °F) | 130 °C (266 °F) |
| PFA | Steel | -10 °C (14°F) | 60 °C (140 °F) | -10 °C (14 °F) | 130 °C (266 °F) |
| PFA | Stainless steel | -25 °C (-13 °F) | 60 °C (140 °F) | -25 °C (-13 °F) | 130 °C (266 °F) |
| ETFE | Steel | -10 °C (14°F) | 60 °C (140 °F) | -10 °C (14 °F) | 130 °C (266 °F) |
| ETFE | Stainless steel | -25 °C (-13 °F) | 60 °C (140 °F) | -25 °C (-13 °F) | 130 °C (266 °F) |

1) For China production site only.
2) The maximum measuring medium temperature is reduced to 80 °C (176 °F) for design level "B" sensors with a hard rubber liner.

## 8.3 ProcessMaster - Material loads for process connections

The limits for the permissible measuring medium temperature ($T_{medium}$) and permissible pressure ($P_{medium}$) are calculated on the basis of the lining and flange material used in the device (refer to the name plate on the device).

### Minimum permissible operating pressure

The following tables show the minimum permissible operating pressure ($P_{medium}$) depending on measuring medium temperature ($T_{medium}$) and the liner material.

### Design level "A" sensor

| Liner material | Nominal diameter | $P_{medium}$ [mbar abs] | $T_{medium}$ [1] |
|---|---|---|---|
| Hard rubber | DN 15 ... 2000<br>(1/2 ... 80") | 0 | < 85 °C (185 °F)<br>< 80 °C (176 °F)[2] |
| Soft rubber | DN 50 ... 2000<br>(2 ... 80") | 0 | < 60 °C (140 °F) |
| PTFE | DN 10 ... 600<br>(3/8 ... 24") | 270<br>400<br>500 | < 20 °C (68 °F)<br>< 100 °C (212 °F)<br>< 130 °C (266 °F) |
| PFA | DN 3 ... 200<br>(1/10 ... 8") | 0 | < 130 °C (266 °F) |
| ETFE | DN 25 ... 600<br>(1 ... 24") | 100 | < 130 °C (266 °F) |

### Design level "B" sensor

| Liner material | Nominal diameter | $P_{medium}$ [mbar abs] | $T_{medium}$ [1] |
|---|---|---|---|
| Hard rubber | DN 40 ... 600<br>(1 1/2 ... 24") | 600 | < 80 °C (176 °F) |
| PTFE | DN 25 ... 600<br>(1 ... 24") | 270<br>400<br>500 | < 20 °C (68 °F)<br>< 100 °C (212 °F)<br>< 130 °C (266 °F) |

1) For CIP/SIP cleaning, higher temperatures are permitted for limited time periods; refer to the chapter "Maximum permissible cleaning temperature" on page 38.
2) For China production site only.

Liner approvals on request; please contact ABB.

### Material load
### Flowmeter sensor design level "A"

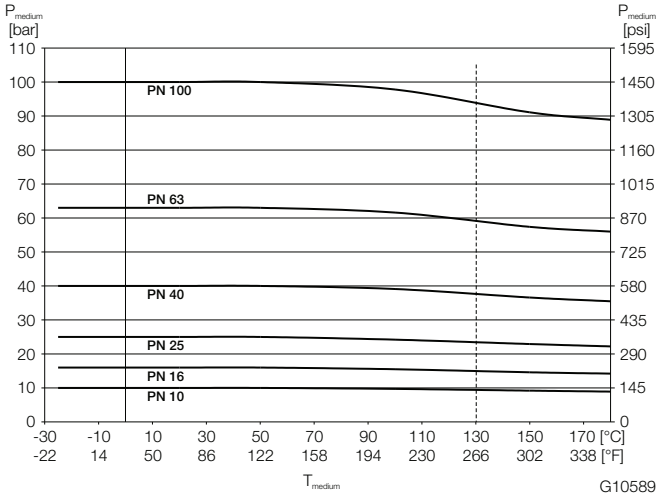



**Fig. 50: DIN flange stainless steel up to DN 600 (24")**

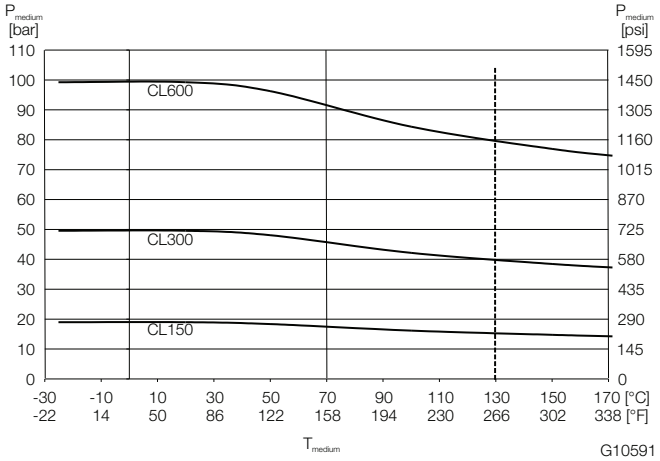



**Fig. 51: ASME flange, stainless steel, up to DN 400 (16") (CL150/300) up to DN 1000 (40") (CL150)**

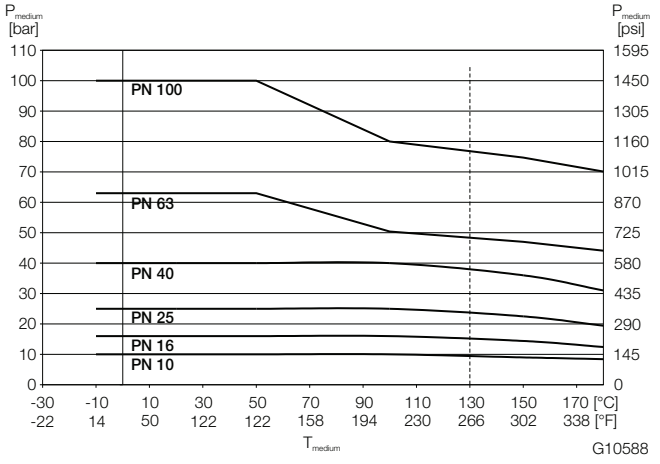



**Fig. 52: DIN flange, steel, up to DN 600 (24")**

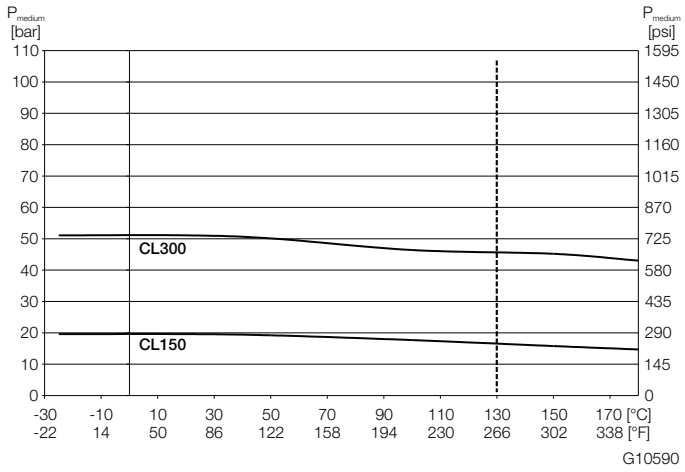



**Fig. 53: ASME flange, steel, up to DN 400 (16") (CL150/300); up to DN 1000 (40") (CL150)**

| JIS 10K-B2210 flange | | | | |
|---|---|---|---|---|
| **DN** | **Material** | **PN** | **$T_{medium}$** | **$P_{medium}$** |
| DN 32 ... 400 (1 1/4 ... 16") | Stainless steel | 10 | -25 ... 180 °C (-13 ... 356 °F) | 10 bar (145 psi) |
| DN 32 ... 400 (1 1/4 ... 16") | Steel | 10 | -10 ... 180 °C (14 ... 356 °F) | 10 bar (145 psi) |

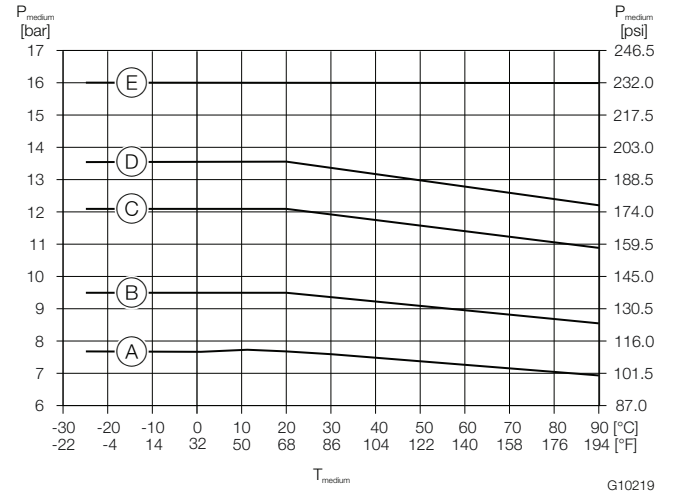



**Fig. 54: DIN flange, stainless steel, DN 700 (28") up to DN 1000 (40") (A) DN 1000, PN 10 (B) DN 700, DN800, DN900, PN 10 (C) DN 1000, PN 16 (D) DN 900, DN 800, PN 16 (E) DN 700, PN 16**

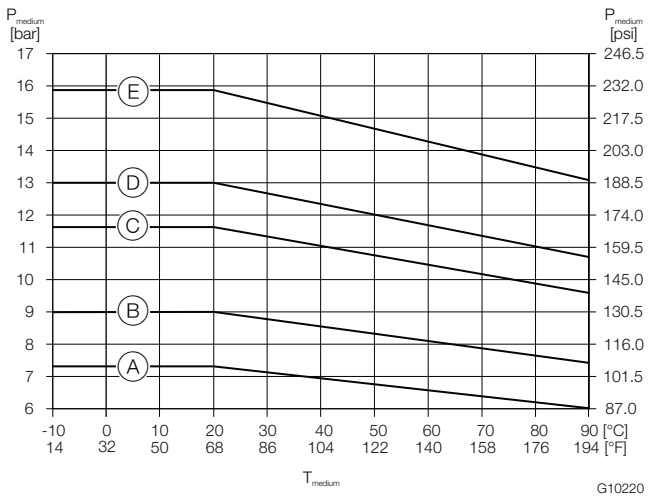



**Fig. 55: DIN flange, steel, DN 700 (28") up to DN 1000 (40") (A) DN 1000, PN 10 (B) DN 700, DN800, DN900, PN 10 (C) DN 1000, PN 16 (D) DN 900, DN 800, PN 16 (E) DN 700, PN 16**

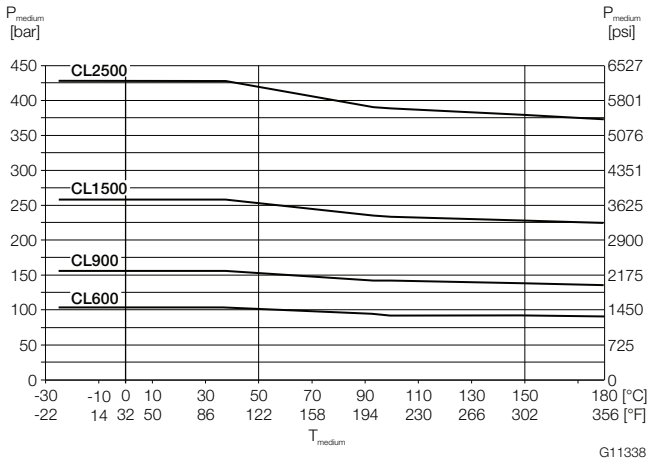



**Fig. 56: ASME flange, Steel, DN 25 ... 400 (1 ... 24“)**

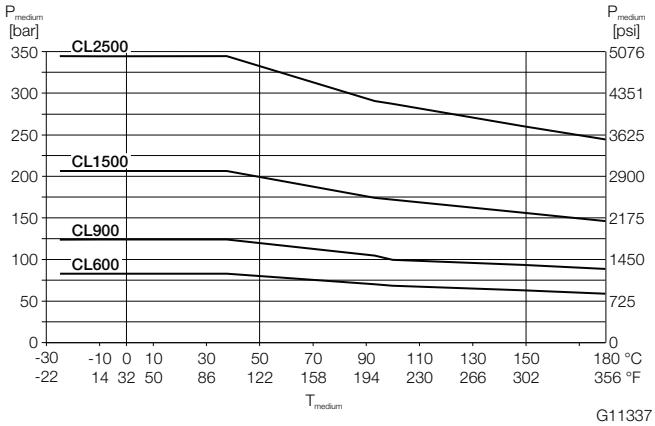



**Fig. 57: ASME flange, stainless steel, DN 25 ... 400 (1 ... 24“)**

**Flowmeter sensor design level “B”**

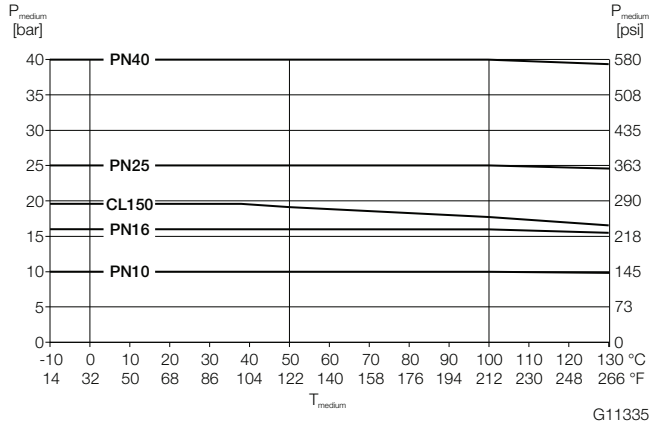



**Fig. 58: Cast iron housing, DN 25 ... 600 (1 ... 24“)**

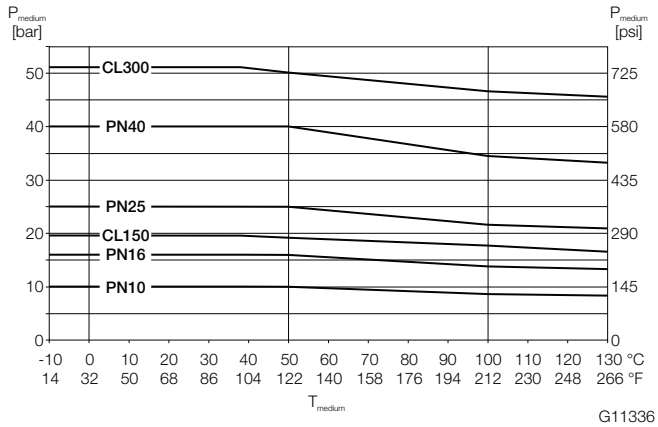



**Fig. 59: Welded steel housing, DN 25 ... 600 (1 ... 24“)**

## 8.4 HygienicMaster - Temperature data

The temperature range offered by the device is dependent on a number of different factors.

These factors include the measuring medium temperature $T_{medium}$, the ambient temperature $T_{amb.}$, the operating pressure $P_{medium}$, the liner material and the approvals for the explosion protection.

**Storage temperature range**

-30 ... 70 °C (-22 ... 158 °F)

### 8.4.1 Maximum permissible cleaning temperature

| CIP medium | Liner material | Cleaning temperature |
|---|---|---|
| Steam | PTFE, PFA | 150 °C (302 °F) |
| Cleaning fluid | PTFE, PFA | 140 °C (284 °F) |

— The specified cleaning temperature applies for a maximum ambient temperature of 25 °C (77 °F).
If the ambient temperature is > 25 °C (> 77 °F), the difference to the actual ambient temperature must be subtracted from the maximum cleaning temperature.
— The specified cleaning temperature may be applied for a maximum of 60 minutes.

**Maximum permissible temperature shock**

— Maximum temperature shock temperature difference in °C: Any
— Temperature gradient °C/min: Any

### 8.4.2 Ambient temperature as a function of measuring medium temperature

| Process connection | Ambient temperature range ($T_{amb.}$) | | Measuring medium temperature range ($T_{medium}$) | |
|---|---|---|---|---|
| | Minimum | Maximum | Minimum | Maximum[1] |
| Flange | -20 °C (-4 °F) | 60 °C (140 °F) | -25 °C (-13 °F) | 95 °C (203 °F) |
| | -20 °C (-4 °F) | 45 °C (113 °F) | -25 °C (-13 °F) | 130 °C (266 °F) |
| Variable process connections | -20 °C (-4 °F) | 60 °C (140 °F) | -25 °C (-13 °F) | 95 °C (203 °F) |
| | -20 °C (-4 °F) | 45 °C (113 °F) | -25 °C (-13 °F) | 130 °C (266 °F) |
| Flange | -20 °C (-4 °F) | 60 °C (140 °F) | -25 °C (-13 °F) | 95 °C (203 °F) |
| | -20 °C (-4 °F) | 45 °C (113 °F) | -25 °C (-13 °F) | 130 °C (266 °F) |
| Variable process connections | -20 °C (-4 °F) | 60 °C (140 °F) | -25 °C (-13 °F) | 95 °C (203 °F) |
| | -20 °C (-4 °F) | 45 °C (113 °F) | -25 °C (-13 °F) | 130 °C (266 °F) |

1) For CIP/SIP cleaning, higher temperatures are permitted for limited time periods; refer to chapter "Maximum permissible cleaning temperature" on page 42.

## 8.5 HygienicMaster - Material loads for process connections

The limits for the permissible measuring medium temperature ($T_{medium}$) and permissible pressure ($P_{medium}$) are calculated on the basis of the lining and flange material used in the device (refer to the name plate on the device).

### Minimum permissible operating pressure

The following tables show the minimum permissible operating pressure ($P_{medium}$) depending on measuring medium temperature ($T_{medium}$) and the liner material.

| Liner material | Nominal diameter | $P_{medium}$ [mbar abs] | $T_{medium}$[1] |
|---|---|---|---|
| PFA | DN 3 ... 100 (1/10 ... 4") | 0 | < 130 °C (266 °F) |

1) For CIP/SIP cleaning, higher temperatures are permitted for limited time periods; refer to the chapter "Maximum permissible cleaning temperature" on page 42.

Liner approvals on request; please contact ABB.

### Overview - Material load

| Process connection | DN | $P_{medium}$ max. | $T_{medium}$ |
|---|---|---|---|
| **Wafer type** | DN 3 ... 50 (1/10 ... 2“) | 40 bar (580 psi) | -25 ... 130 °C (-13 ... 266 °F) |
| | DN 65 ... 100 (2 1/2 ... 4“) | 16 bar (232 psi) | |
| **Welded spuds** DIN 2463, ISO 1127, DIN 11850 | DN 3 ... 40 (1/10 ... 1 1/2“) | 40 bar (580 psi) | -25 ... 130 °C (-13 ... 266 °F) |
| | DN 50, DN 80 (2“, 3“) | 16 bar (232 psi) | |
| | DN 65, DN 100 (2 1/2“, 4“) | 10 bar (145 psi) | |
| **Welded spuds** SMS 1145 | DN 25, DN 40 ... 100 (1“,1,5 ... 4“) | 6 bar (87 psi) | -25 ... 130 °C (-13 ... 266 °F) |
| **Threaded pipe connection** DIN 11851 | DN 3 ... 40 (1/10 ... 1 1/2“) | 40 bar (580 psi) | -25 ... 130 °C (-13 ... 266 °F) |
| | DN 50, DN 80 (2“, 3“) | 16 bar (232 psi) | |
| | DN 65, DN 100 (2 1/2“, 4“) | 10 bar (145 psi) | |
| **Tri-Clamp** DIN 32676 | DN 3 ... 50 (1/10 ... 2“) | 16 bar (232 psi) | -25 ... 130 °C (-13 ... 266 °F) |
| | DN 65 ... 100 (2 1/2 ... 4“) | 10 bar (145 psi) | |
| **Tri-Clamp** ASME BPE | DN 3 ... 80 (1/10 ... 3“) | 10 bar (145 psi) | -25 ... 121 °C (-13 ... 250 °F) |
| | DN 100 (4") | 8.6 bar (124.7 psi) | |
| **External thread** ISO 228, DIN 2999 | DN 3 ... 25 (1/10 ... 1“) | 16 bar (232 psi) | -25 ... 130 °C (-13 ... 266 °F) |
| **Welded spuds** OD tubing | DN 3 ... 50 (1/10 ... 2“) | 10 bar (145 psi) | -25 ... 130 °C (-13 ... 266 °F) |

## Flange devices

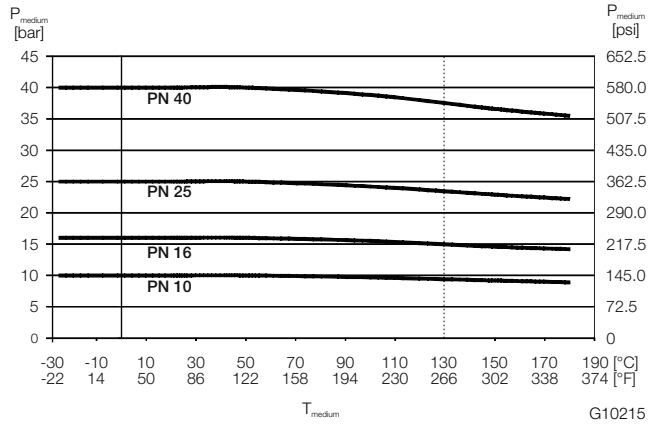



**Fig. 60: DIN flange stainless steel to DN 100 (4")**

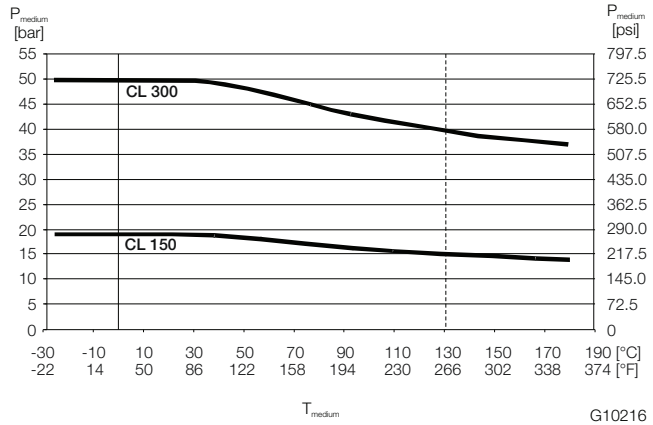



**Fig. 61: ASME flange, stainless steel, up to DN 100 (4") (CL 150 / CL 300)**

**JIS 10K-B2210 flange**

| DN | Material | PN | $T_{medium}$ | $P_{medium}$ |
|---|---|---|---|---|
| DN 25 ... 100 (1 ... 4") | Stainless steel | 10 | -25 ... 130 °C (-13 ... 266 °F) | 10 bar (145 psi) |

## Wafer type devices

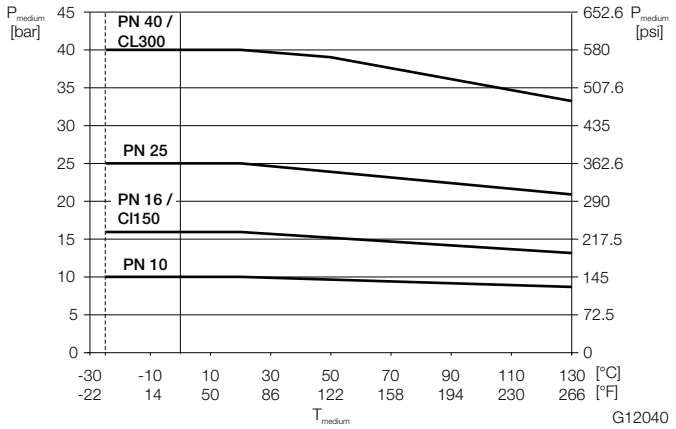



**Fig. 62: Wafer type design**

**JIS 10K-B2210 wafer type design**

| DN | Material | PN | $T_{medium}$ | $P_{medium}$ |
|---|---|---|---|---|
| DN 32 ... 100 (1 1/4 ... 4") | 1.4404 1.4435 1.4301 | 10 | -25 ... 130 °C (-13 ... 266 °F) | 10 bar (145 psi) |

## Trademarks

™ Hastelloy C is a trademark of Haynes International

# 9 Appendix

## 9.1 Return form

**Statement on the contamination of devices and components**

Repair and / or maintenance work will only be performed on devices and components if a statement form has been completed and submitted.
Otherwise, the device / component returned may be rejected. This statement form may only be completed and signed by authorized specialist personnel employed by the operator.

**Customer details:**

| | |
|---|---|
| Company: | |
| Address: | |
| Contact person: | Telephone: |
| Fax: | E-Mail: |

**Device details:**

| | |
|---|---|
| Typ: | Serial no.: |
| Reason for the return/description of the defect: | |

**Was this device used in conjunction with substances which pose a threat or risk to health?**

☐ Yes ☐ No

If yes, which type of contamination (please place an X next to the applicable items)?

| | | | | | |
|---|---|---|---|---|---|
| Biological | ☐ | Corrosive / irritating | ☐ | Combustible (highly / extremely combustible) | ☐ |
| Toxic | ☐ | Explosiv | ☐ | Other toxic substances | ☐ |
| Radioactive | ☐ | | | | |

Which substances have come into contact with the device?

1.
2.
3.

We hereby state that the devices / components shipped have been cleaned and are free from any dangerous or poisonous substances.

| | |
|---|---|
| Town/city, date | Signature and company stamp |

## 9.2 Declarations of conformity

**i NOTE**

All documentation, declarations of conformity, and certificates are available in ABB's download area.
www.abb.com/flow

## 9.3 Torque information

### 9.3.1 Torque information for sensors designLevel A

**NOTE**

The specified torques are valid only for greased threads and piping that is not subject to tensile stress.

**ProcessMaster in flange design and HygienicMaster in flange or wafer-type design**

| Nominal diameter [mm (inch)] | Nominal pressure rating | Maximum tightening torque [Nm] | | | | | |
|---|---|---|---|---|---|---|---|
| | | Hard / soft rubber | | PTFE, PFA, ETFE | | Ceramic carbide | |
| | | 2) | 3) | 2) | 3) | 2) | 3) |
| DN 3 ... 10 [1] | PN40 | – | – | 12.43 | 12.43 | – | – |
| (1/10 ... 3/8“[1]) | PN63/100 | – | – | 12.43 | 12.43 | – | – |
| | CL150 | – | – | 12.98 | 12.98 | – | – |
| | CL300 | – | – | 17.38 | 17.38 | – | – |
| | JIS 10K | – | – | 12.43 | 12.43 | – | – |
| DN 15 (1/2“) | PN40 | 6.74 | 4.29 | 14.68 | 14.68 | – | – |
| | PN63/100 | 13.19 | 11.2 | 22.75 | 22.75 | – | – |
| | CL150 | 3.65 | 3.65 | 12.98 | 12.98 | – | – |
| | CL300 | 4.94 | 3.86 | 17.38 | 17.38 | – | – |
| | CL600 | 9.73 | 9.73 | – | – | – | – |
| | JIS 10K | 2.84 | 1.37 | 14.68 | 14.68 | – | – |
| DN 20 (3/4“) | PN40 | 9.78 | 7.27 | 20.75 | 20.75 | – | – |
| | PN63/100 | 24.57 | 20.42 | 42.15 | 42.15 | – | – |
| | CL150 | 5.29 | 5.29 | 18.49 | 18.49 | – | – |
| | CL300 | 9.77 | 9.77 | 33.28 | 33.28 | – | – |
| | CL600 | 15.99 | 15.99 | – | – | – | – |
| | JIS 10K | 4.1 | 1.88 | 20.75 | 20.75 | – | – |
| DN 25 (1“) | PN40 | 13.32 | 8.6 | 13.32 | 8.6 | 13.32 | 8.6 |
| | PN63/100 | 32.09 | 31.42 | 53.85 | 53.85 | 53.85 | 53.85 |
| | CL150 | 5.04 | 2.84 | 23.98 | 23.98 | 23.98 | 23.98 |
| | CL300 | 17.31 | 16.42 | 65.98 | 38.91 | 65.98 | 38.91 |
| | CL600 | 22.11 | 22.11 | – | – | – | – |
| | JIS 10K | 8.46 | 5.56 | 26.94 | 26.94 | 26.94 | 26.94 |
| DN 32 (1 1/4“) | PN40 | 27.5 | 15.01 | 45.08 | 45.08 | 45.08 | 45.08 |
| | PN63/100 | 42.85 | 41.45 | 74.19 | 70.07 | 74.19 | 70.07 |
| | CL150 | 4.59 | 1.98 | 29.44 | 29.44 | 29.44 | 29.44 |
| | CL300 | 25.61 | 14.22 | 45.52 | 45.52 | 45.52 | 45.52 |
| | CL600 | 34.09 | 34.09 | – | – | – | – |
| | JIS 10K | 9.62 | 4.9 | 45.08 | 45.08 | 45.08 | 45.08 |
| DN 40 (1 1/2“) | PN40 | 30.44 | 23.71 | 56.06 | 56.06 | 56.06 | 56.06 |
| | PN63/100 | 62.04 | 51.45 | 97.08 | 97.08 | 97.08 | 97.08 |
| | CL150 | 5.82 | 2.88 | 36.12 | 36.12 | 36.12 | 36.12 |
| | CL300 | 33.3 | 18.41 | 73.99 | 73.99 | 73.99 | 73.99 |
| | CL600 | 23.08 | 23.08 | – | – | – | – |
| | JIS 10K | 12.49 | 6.85 | 56.06 | 56.06 | 56.06 | 56.06 |
| DN 50 (1 1/2“) | PN40 | 41.26 | 27.24 | 71.45 | 71.45 | 71.45 | 71.45 |
| | PN63 | 71.62 | 60.09 | 109.9 | 112.6 | 109.9 | 112.6 |
| | CL150 | 22.33 | 22.33 | 66.22 | 66.22 | 66.22 | 66.22 |
| | CL300 | 17.4 | 22.33 | 38.46 | 38.46 | 38.46 | 38.46 |
| | CL600 | 35.03 | 35.03 | – | – | – | – |
| | JIS 10K | 17.27 | 10.47 | 71.45 | 71.45 | 71.45 | 71.45 |

1) Connection flange DIN / EN1092-1 = DN 10 (3/8"), connection flange ASME = DN 15 (1/2").
2) Flange material: steel.
3) Flange material: stainless steel.

| Nominal diameter [mm (inch)] | Nominal pressure rating | Maximum tightening torque [Nm] | | | | | |
|---|---|---|---|---|---|---|---|
| | | Hard / soft rubber | | PTFE, PFA, ETFE | | Ceramic carbide | |
| | | 2) | 3) | 2) | 3) | 2) | 3) |
| DN 65 (2 1/2“) | PN16 | 14.94 | 8 | 37.02 | 39.1 | 37.02 | 39.1 |
| | PN40 | 30.88 | 21.11 | 43.03 | 44.62 | 43.03 | 44.62 |
| | PN63 | 57.89 | 51.5 | 81.66 | 75.72 | 81.66 | 75.72 |
| | CL150 | 30.96 | 30.96 | 89.93 | 89.93 | 89.93 | 89.93 |
| | CL300 | 38.38 | 27.04 | 61.21 | 61.21 | 61.21 | 61.21 |
| | CL600 | 53.91 | 53.91 | – | – | – | – |
| | JIS 10K | 14.94 | 8 | 37.02 | 39.1 | 37.02 | 39.1 |
| DN 80 (3“) | PN40 | 38.3 | 26.04 | 51.9 | 53.59 | 51.9 | 53.59 |
| | PN63 | 63.15 | 55.22 | 64.47 | 80.57 | 64.47 | 80.57 |
| | CL150 | 19.46 | 19.46 | 104.6 | 104.6 | 104.6 | 104.6 |
| | CL300 | 75.54 | 26.91 | 75.54 | 75.54 | 75.54 | 75.54 |
| | CL600 | 84.63 | 84.63 | – | – | – | – |
| | JIS 10K | 16.26 | 9.65 | 45.07 | 47.16 | 45.07 | 47.16 |
| DN 100 (4“) | PN16 | 20.7 | 12.22 | 49.68 | 78.19 | 49.68 | 78.19 |
| | PN40 | 67.77 | 47.12 | 78.24 | 78.19 | 78.24 | 78.19 |
| | PN63 | 107.4 | 95.79 | 148.5 | 119.2 | 148.5 | 119.2 |
| | CL150 | 17.41 | 7.82 | 76.2 | 76.2 | 76.2 | 76.2 |
| | CL300 | 74.9 | 102.6 | 102.6 | 102.6 | 102.6 | 102.6 |
| | CL600 | 147.1 | 147.1 | – | – | – | – |
| | JIS 10K | 20.7 | 12.22 | 49.68 | 78.19 | 49.68 | 78.19 |
| DN 125 (5“) | PN16 | 29.12 | 18.39 | 61.4 | 64.14 | 61.4 | 64.14 |
| | PN40 | 108.5 | 75.81 | 123.7 | 109.6 | 123.7 | 109.6 |
| | PN63 | 180.3 | 164.7 | 242.6 | 178.2 | 242.6 | 178.2 |
| | CL150 | 24.96 | 11.05 | 98.05 | 98.05 | 98.05 | 98.05 |
| | CL300 | 81.64 | 139.4 | 139.4 | 139.4 | 139.4 | 139.4 |
| | CL600 | 244.1 | 244.1 | – | – | – | – |
| DN 150 (6“) | PN16 | 46.99 | 23.7 | 81.23 | 85.08 | 81.23 | 85.08 |
| | PN40 | 143.5 | 100.5 | 162.5 | 133.5 | 162.5 | 133.5 |
| | PN63 | 288.7 | 269.3 | 371.3 | 243.4 | 371.3 | 243.4 |
| | CL150 | 30.67 | 13.65 | 111.4 | 111.4 | 111.4 | 111.4 |
| | CL300 | 101.4 | 58.4 | 123.6 | 123.6 | 123.6 | 123.6 |
| | CL600 | 218.4 | 218.4 | – | – | – | – |
| DN 200 (8“) | PN10 | 45.57 | 27.4 | 113 | 116.9 | 113 | 116.9 |
| | PN16 | 49.38 | 33.82 | 70.42 | 73 | 70.42 | 73 |
| | PN25 | 100.6 | 69.17 | 109.9 | 112.5 | 109.9 | 112.5 |
| | PN40 | 196.6 | 144.4 | 208.6 | 136.8 | 208.6 | 136.8 |
| | PN63 | 350.4 | 331.8 | 425.5 | 282.5 | 425.5 | 282.5 |
| | CL150 | 49.84 | 23.98 | 158.1 | 158.1 | 158.1 | 158.1 |
| | CL300 | 133.9 | 78.35 | 224.3 | 224.3 | 224.3 | 224.3 |
| | CL600 | 391.8 | 391.8 | – | – | – | – |
| DN 250 (10“) | PN10 | 23.54 | 27.31 | 86.06 | 89.17 | 86.06 | 89.17 |
| | PN16 | 88.48 | 61.71 | 99.42 | 103.1 | 99.42 | 103.1 |
| | PN25 | 137.4 | 117.6 | 166.5 | 133.9 | 166.5 | 133.9 |
| | PN40 | 359.6 | 275.9 | 279.9 | 241 | 279.9 | 241 |
| | CL150 | 55.18 | 27.31 | 146.1 | 148.3 | 146.1 | 148.3 |
| | CL300 | 202.7 | 113.2 | 246.4 | 246.4 | 246.4 | 246.4 |

2) Flange material: steel.
3) Flange material: stainless steel.

| Nominal diameter [mm (inch)] | Nominal pressure rating | Maximum tightening torque [Nm] | | | | | |
|---|---|---|---|---|---|---|---|
| | | Hard / soft rubber | | PTFE, PFA, ETFE | | Ceramic carbide | |
| | | 2) | 3) | 2) | 3) | 2) | 3) |
| DN 300 (12“) | PN10 | 58.79 | 38.45 | 91.29 | 94.65 | 91.29 | 94.65 |
| | PN16 | 122.4 | 85.64 | 113.9 | 114.8 | 113.9 | 114.8 |
| | PN25 | 180.6 | 130.2 | 151.1 | 106.9 | 151.1 | 106.9 |
| | PN40 | 233.4 | 237.4 | 254.6 | 252.7 | 254.6 | 252.7 |
| | CL150 | 90.13 | 50.37 | 203.5 | 198 | 203.5 | 198 |
| | CL300 | 333.3 | 216.4 | 421.7 | 259.1 | 421.7 | 259.1 |
| DN 350 (14“) | PN10 | 69.62 | 47.56 | 72.49 | 75.22 | 72.49 | 75.22 |
| | PN16 | 133.6 | 93.61 | 124.9 | 104.4 | 124.9 | 104.4 |
| | PN25 | 282.3 | 204.3 | 226.9 | 167.9 | 226.9 | 167.9 |
| | CL150 | 144.8 | 83.9 | 270.5 | 263 | 270.5 | 263 |
| | CL300 | 424.1 | 252.7 | 463.9 | 259.4 | 463.9 | 259.4 |
| DN 400 (16“) | PN10 | 108.2 | 75.61 | 120.1 | 113.9 | 120.1 | 113.9 |
| | PN16 | 189 | 137.2 | 191.4 | 153.8 | 191.4 | 153.8 |
| | PN25 | 399.4 | 366 | 404 | 246.7 | 404 | 246.7 |
| | CL150 | 177.6 | 100 | 229.3 | 222.8 | 229.3 | 222.8 |
| | CL300 | 539.5 | 318.8 | 635.8 | 328.1 | 635.8 | 328.1 |
| DN 450 (18“) | CL150 | 218.6 | 120.5 | 267.3 | 192.3 | 267.3 | 192.3 |
| | CL300 | 553.8 | 327.2 | 660.9 | 300 | 660.9 | 300 |
| DN 500 (20“) | PN10 | 141.6 | 101.4 | 153.9 | 103.5 | 153.9 | 103.5 |
| | PN16 | 319.7 | 245.4 | 312.1 | 224.8 | 312.1 | 224.8 |
| | PN25 | 481.9 | 350.5 | 477.1 | 286 | 477.1 | 286 |
| | CL150 | 212.5 | 116 | 237.3 | 230.4 | 237.3 | 230.4 |
| | CL300 | 686.3 | 411.8 | 786.8 | 363.1 | 786.8 | 363.1 |
| DN 600 (24“) | PN10 | 224.7 | 164.8 | 238.7 | 149.1 | 238.7 | 149.1 |
| | PN16 | 515.1 | 399.9 | 496.7 | 365.3 | 496.7 | 365.3 |
| | PN25 | 826.2 | 600.3 | 750.7 | 539.2 | 750.7 | 539.2 |
| | CL150 | 356.6 | 202.8 | 451.6 | 305.8 | 451.6 | 305.8 |
| | CL300 | 1188 | 719 | 1376 | 587.4 | 1376 | 587.4 |
| DN 700 (28“) | PN10 | 267.7 | 204.9 | On request | On request | 267.7 | 204.9 |
| | PN16 | 455.7 | 353.2 | On request | On request | 455.7 | 353.2 |
| | PN25 | 905.9 | 709.2 | On request | On request | 905.9 | 709.2 |
| | CL150 | 364.1 | 326.2 | 449.2 | 432.8 | 364.1 | 326.2 |
| | CL300 | 1241 | On request | On request | On request | 1241 | On request |
| DN 750 (30“) | CL150 | 423.8 | 380.9 | 493.3 | 442 | 423.8 | 380.9 |
| | CL300 | 1886 | On request | On request | On request | 1886 | On request |
| DN 800 (32“) | PN10 | 391.7 | 304.2 | On request | On request | 391.7 | 304.2 |
| | PN16 | 646.4 | 511.8 | On request | On request | 646.4 | 511.8 |
| | PN25 | 1358 | 1087 | On request | On request | 1358 | 1087 |
| | CL150 | 410.8 | 380.9 | 493.3 | 380.9 | 410.8 | 380.9 |
| | CL300 | 2187 | On request | On request | On request | 2187 | On request |
| DN 900 (36“) | PN10 | 387.7 | 296.3 | On request | On request | 387.7 | 296.3 |
| | PN16 | 680.8 | 537.3 | On request | On request | 680.8 | 537.3 |
| | PN25 | 1399 | 1119 | On request | On request | 1399 | 1119 |
| | CL150 | 336.2 | 394.6 | 511 | 458.5 | 336.2 | 394.6 |
| | CL300 | 1972 | On request | On request | On request | 1972 | On request |

2) Flange material: steel.
3) Flange material: stainless steel.

| Nominal diameter [mm (inch)] | Nominal pressure rating | Maximum tightening torque [Nm] | | | | | |
|---|---|---|---|---|---|---|---|
| | | Hard / soft rubber | | PTFE, PFA, ETFE | | Ceramic carbide | |
| | | 2) | 3) | 2) | 3) | 2) | 3) |
| DN 1000 (40“) | PN10 | 541.3 | 419.2 | On request | On request | 541.3 | 419.2 |
| | PN16 | 955.5 | 756.1 | On request | On request | 955.5 | 756.1 |
| | PN25 | 2006 | 1612 | On request | On request | 2006 | 1612 |
| | CL150 | 654.2 | 598.8 | 650.6 | 385.1 | 654.2 | 598.8 |
| | CL300 | 2181 | On request | On request | On request | 2181 | On request |
| DN 1100 (44“) | CL150 | 749.1 | 682.6 | 741.3 | 345.9 | – | – |
| | CL300 | 2607 | On request | On request | On request | – | – |
| DN 1200 (48“) | PN 6 | 363.5 | On request | – | – | – | – |
| | PN10 | 705.9 | On request | – | – | – | – |
| | PN16 | 1464 | On request | – | – | – | – |
| | CL150 | 815.3 | 731.6 | – | – | – | – |
| | CL300 | 3300 | On request | – | – | – | – |
| DN 1350 (54“) | CL150 | 1036 | 983.7 | – | – | – | – |
| | CL300 | 5624 | On request | – | – | – | – |
| DN 1400 (56“) | PN 6 | 515 | On request | – | – | – | – |
| | PN10 | 956.3 | On request | – | – | – | – |
| | PN16 | 1558 | On request | – | – | – | – |
| DN 1500 (60“) | CL150 | 1284 | 1166 | – | – | – | – |
| | CL300 | 6139 | On request | – | – | – | – |
| DN 1600 (64“) | PN 6 | 570.7 | On request | – | – | – | – |
| | PN10 | 1215 | On request | – | – | – | – |
| | PN16 | 2171 | On request | – | – | – | – |
| DN 1800 (72“) | PN 6 | 708.2 | On request | – | – | – | – |
| | PN10 | 1492 | On request | – | – | – | – |
| | PN16 | 2398 | On request | – | – | – | – |
| DN 2000 (80“) | PN 6 | 857.9 | On request | – | – | – | – |
| | PN10 | 1840 | On request | – | – | – | – |
| | PN16 | 2860 | On request | – | – | – | – |

2) Flange material: steel.
3) Flange material: stainless steel.

### 9.3.2 Torque information for sensors Design Level B

**NOTE**

The specified torques are valid only for greased threads and piping that is not subject to tensile stress.

| Nominal diameter | Nominal pressure | Hard / Soft rubber | | PTFE | |
|---|---|---|---|---|---|
| [mm (inch)] | rating | 2) [Nm] | 3) [Nm] | 2) [Nm] | 3) [Nm] |
| DN 25 (1“) | PN40 | — | — | 13.32 | 8.6 |
| | CL150 | — | — | 23.98 | 23.98 |
| | CL300 | — | — | 65.98 | 38.91 |
| | JIS 10K | — | — | 26.94 | 26.94 |
| DN 32 (1 1/4“) | PN40 | — | — | 45.08 | 45.08 |
| | CL150 | — | — | 29.44 | 29.44 |
| | CL300 | — | — | 45.52 | 45.52 |
| | JIS 10K | — | — | 45.08 | 45.08 |
| DN 40 (1 1/2“) | PN40 | — | — | 56.06 | 56.06 |
| | CL150 | — | — | 36.12 | 36.12 |
| | CL300 | — | — | 73.99 | 73.99 |
| | JIS 10K | — | — | 56.06 | 56.06 |
| DN 50 (1 1/2“) | PN40 | — | — | 71.45 | 71.45 |
| | CL150 | — | — | 66.22 | 66.22 |
| | CL300 | — | — | 38.46 | 38.46 |
| | JIS 10K | — | — | 71.45 | 71.45 |
| DN 65 (2 1/2“) | PN16 | — | — | 37.02 | 39.1 |
| | PN40 | — | — | 43.03 | 44.62 |
| | CL150 | — | — | 89.93 | 89.93 |
| | CL300 | — | — | 61.21 | 61.21 |
| | JIS 10K | — | — | 37.02 | 39.1 |
| DN 80 (3“) | PN40 | — | — | 51.9 | 53.59 |
| | CL150 | — | — | 104.6 | 104.6 |
| | CL300 | — | — | 75.54 | 75.54 |
| | JIS 10K | — | — | 45.07 | 47.16 |
| DN 100 (4“) | PN16 | — | — | 49.68 | 78.19 |
| | PN40 | — | — | 78.24 | 78.19 |
| | CL150 | — | — | 76.2 | 76.2 |
| | CL300 | — | — | 102.6 | 102.6 |
| | JIS 10K | — | — | 49.68 | 78.19 |
| DN 125 (5“) | PN16 | — | — | 61.4 | 64.14 |
| | PN40 | — | — | 123.7 | 109.6 |
| | CL150 | — | — | 98.05 | 98.05 |
| | CL300 | — | — | 139.4 | 139.4 |
| DN 150 (6“) | PN16 | — | — | 81.23 | 85.08 |
| | PN40 | — | — | 162.5 | 133.5 |
| | CL300 | — | — | 111.4 | 111.4 |
| DN 200 (8“) | PN10 | — | — | 123.6 | 123.6 |
| | PN16 | — | — | 113 | 116.9 |
| | PN25 | — | — | 70.42 | 73 |
| | PN40 | — | — | 109.9 | 112.5 |
| | CL150 | — | — | 208.6 | 136.8 |
| | CL300 | — | — | 158.1 | 158.1 |

2) Flange material: steel.
3) Flange material: stainless steel.

| Nominal diameter [mm (inch)] | Nominal pressure rating | Hard / Soft rubber | | PTFE | |
|---|---|---|---|---|---|
| | | 2) [Nm] | 3) [Nm] | 2) [Nm] | 3) [Nm] |
| DN 250 (10“) | PN10 | — | — | 86.06 | 89.17 |
| | PN16 | — | — | 99.42 | 103.1 |
| | PN25 | — | — | 166.5 | 133.9 |
| | PN40 | — | — | 279.9 | 241 |
| | CL150 | — | — | 146.1 | 148.3 |
| | CL300 | — | — | 246.4 | 246.4 |
| DN 300 (12“) | PN10 | — | — | 91.29 | 94.65 |
| | PN16 | — | — | 113.9 | 114.8 |
| | PN25 | — | — | 151.1 | 106.9 |
| | PN40 | — | — | 254.6 | 252.7 |
| | CL150 | — | — | 203.5 | 198 |
| | CL300 | — | — | 421.7 | 259.1 |
| DN 350 (14“) | PN10 | — | — | 72.49 | 75.22 |
| | PN16 | — | — | 124.9 | 104.4 |
| | PN25 | — | — | 226.9 | 167.9 |
| | CL150 | — | — | 270.5 | 263 |
| | CL300 | — | — | 463.9 | 259.4 |
| DN 400 (16“) | PN10 | — | — | 120.1 | 113.9 |
| | PN16 | — | — | 191.4 | 153.8 |
| | PN25 | — | — | 404 | 246.7 |
| | CL150 | — | — | 229.3 | 222.8 |
| | CL300 | — | — | 635.8 | 328.1 |
| DN 450 (18“) | CL150 | — | — | 267.3 | 192.3 |
| | CL300 | — | — | 660.9 | 300 |
| DN 500 (20“) | PN10 | — | — | 153.9 | 103.5 |
| | PN16 | — | — | 312.1 | 224.8 |
| | PN25 | — | — | 477.1 | 286 |
| | CL150 | — | — | 237.3 | 230.4 |
| | CL300 | — | — | 786.8 | 363.1 |
| DN 600 (24“) | PN10 | — | — | 238.7 | 149.1 |
| | PN16 | — | — | 496.7 | 365.3 |
| | PN25 | — | — | 750.7 | 539.2 |
| | CL150 | — | — | 451.6 | 305.8 |
| | CL300 | — | — | 1376 | 587.4 |

2) Flange material: steel.
3) Flange material: stainless steel.

## Torque information for HygienicMaster with variable process connections

| Nominal diameter | | Max. tightening torque |
|---|---|---|
| [mm] | [inch] | [Nm] |
| DN 3 ... 10 | 3/8“ | 8 |
| DN 15 | 1/2“ | 10 |
| DN 20 | 3/4“ | 21 |
| DN 25 | 1 | 31 |
| DN 32 | 1 1/4“ | 60 |
| DN 40 | 1 1/2“ | 80 |
| DN 50 | 2 | 5 |
| DN 65 | 2 1/2“ | 5 |
| DN 80 | 3 | 15 |
| DN 100 | 4 | 14 |

## 9.4 Overview parameter settings (factory default settings)

| Parameter | Possible parameter settings | Factory default settings |
|---|---|---|
| Sensor Tag | Alphanumeric, max. 20 characters | None |
| Sensor Location Tag | Alphanumeric, max. 20 characters | None |
| Qv Max 1 | Depending on nominal diameter of the flowmeter sensor. | Set to $Q_{max}$DN according to chapter "Measuring range table" on page 32. |
| Unit Volumeflow Qv | l/s; l/min; l/h; ml/s; ml/min; m3/s; m3/min; m3/h; m3/d; hl/h; g/s; g/min; g/h; kg/s; kg/min; kg/h; kg/d; t/min; t/h; t/d | l/min |
| Unit Vol. Totalizer | m3; l; ml; hl; g; kg; t | Liter (l) |
| Pulses per Unit | 1 ... 10000 | 1 |
| Pulse Width | 0,1 ... 2000 ms | 100 ms |
| Damping | 0,02 ... 60 s | 1 |
| Operating mode digital output 41 / 42 | Off, binary output, pulse output, frequency output | Digital output 41 / 42 as pulse output for forward flow and reverse flow. |
| Operating mode digital output 51 / 52 | Off, binary output, pulse output (follows digital output 41 / 42, 90° or 180° phase shift) | Digital output 51 / 52 as binary output for flow direction. |
| Curr.Out 31 / 32 | 4-20mA FWD/REV, 4-20mA FWD, 4-12-20 mA | 4-20mA FWD/REV |
| Curr.Out at Alarm | High Alarm 21 ... 23 mA oder Low Alarm 3.5 ... 3.6 mA | High Alarm, 21.8 mA |
| Current at flow > 103 % (I=20,5 mA) | Off (Current output remains at 20.5 mA), High Alarm, Low Alarm. | Off |
| Low flow cut-off | 0 ... 10 % | 1 % |
| Empty conduit detector | On / Off | Off |

# Notes

# Notes

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