TEKTROL
Technology Solutions

TEK-BAR 3800XA

Explosion-Proof Multivariable Transmitter

Instruction Manual

Document Number: IM-3800XA

www.tek-trol.com

Table of Contents

1 Safety Instructions

1.1 General information and notes for the reader

- 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 always fully legible.
- The operating company must strictly observe the applicable national regulations relating to the installation, function testing, repair and maintenance of electrical products.

1.2 Intended use.

The 3800XA Explosion Proof Multivariable Transmitter measure the mass flow of gases, vapours, and liquids in the process industry.
For information on measuring ranges and permissible overload, refer to the section "Specifications".

Using these products as intended includes compliance with the following points:

- Read and follow the instructions in this manual.
- The technical limit values must be complied with (refer to the section “Technical data").

1.3 Safety Precautions

Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator to do so. The specialist personnel must have read and understood the manual and comply with its instructions.
The operators must strictly observe the applicable national regulations with regards to installation, function tests, repairs, and maintenance of electrical products.

1.4 Product Liability and Warranty

The operator shall bear authority for the suitability of the device for the specific application. The manufacturer accepts no liability for the consequences of misuse by the operator. Wrong installation or operation of the devices (systems) will cause the warranty to be void. The respective "Standard Terms and Conditions", which forms the basis for the sales contract shall also apply.

1.5 Information Concerning the Documentation

To prevent any injury to the operator and damage to the device it is essential to read the information in this document and read the applicable national standard, and safety instruction.
These operating instructions contain all the information that is required in various stages, like product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

1.6 Compliance with Pressure Equipment Directive (2014/68/EU)

Devices with PS > 200
Devices with a permissible pressure of PS > 200 bar (20 MPa) have been tested for compliance by the notified body (0474) according to module H and can be used for liquids of group 1 (PED: 1G).
The rating plate contains the following designations: PED:1G.

Devices with PS ≤ 200
Devices with a permissible pressure PS ≤200 bar correspond to article 4 paragraph 3. They have not been subject to a conformity validation. These instruments were designed and manufactured according to SEP Sound Engineering Practices.

1.6.1 Warnings and Symbols Used

The following safety symbol marks are used in this operating instruction manual and instrument.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

NOTE

Indicates that operating the hardware or software in this manner may damage it or lead to system failure.

1.7 Packaging, Transportation and Storage

1.7.1 Packaging

The original package consists of

1. 3800XA Explosion Proof Multivariable Transmitter
2. Accessories (optional)
3. Documentation

1.8 Transportation

- After calibration, the instrument is packed in a carton (GB / T 13384-2008) to protect against destructions.
- When the transmitter is delivered, visually check them to make sure that no damage occurred during shipment.
- To avoid any damages, unpack the flowmeter only at the installation site.
- Avoid impact shocks, rain and water during transportation.
- Do not throw or drop the device.
- Use original packaging for transport and ensure that the packaging does not get crushed or damaged by sharp objects or other boxes.
- The flow tube is shipped with end covers to protect it from mechanical damage and normal unrestrained distortion. End covers should not be removed until just before installation.
- Keep shipping plugs in conduit connections until conduits are connected and sealed.

1.9 Storage

It is unnecessary to store equipment with some special treatments. The storage period is not limited, but the shelf life is consistent with the company's deadline.

- The device must be stored in dry and dust-free conditions. Always keep the device in its original package during storage / transport.
- Observe the permissible ambient conditions for transport and storage according to the chapter “Technical Data”.
- In principle, the devices may be stored for an unlimited period. However, the warranty conditions stipulated in the order confirmation of the supplier apply.

1.9.1 Nameplate

Product nameplate identification includes serial number, specification model, range, accuracy level, input voltage, output, factory date and other related information.

NOTE

Always asking for the instrument serial number when querying.

1.10 Safety instructions for electrical installation

Before switching on the device, make sure that your installation complies with the environmental conditions listed in the chapter “Technical Data” or on the data sheet.

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

1.11 Safety information for inspection and maintenance

WARNING

When the housing is open, EMC protection is impaired and there is no longer any protection against accidental contact. Switch off the power supply before opening the housing.

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)

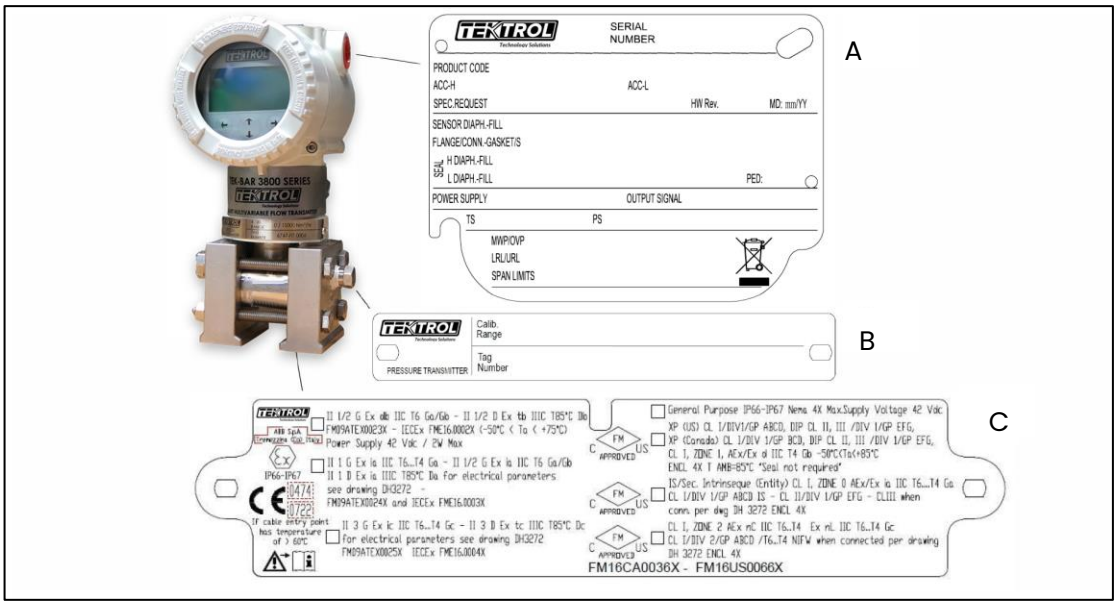


Fig 1. Product identification

2 Product Description

2.1 Introduction

Tek-Trol's advanced Tek-Bar 3800XA Explosion Proof Multivariable Transmitter consists of multisensory and microprocessor technologies that are capable of measuring three separate process variables at the same time and provide the option of calculating the following values:

- Mass flow for gases, steam, and liquids using dynamic compensation.
- Standard volume flow for gases using dynamic compensation.
- Heat flow for water and steam.
- Drum water level and level measurement with density compensation of liquids.

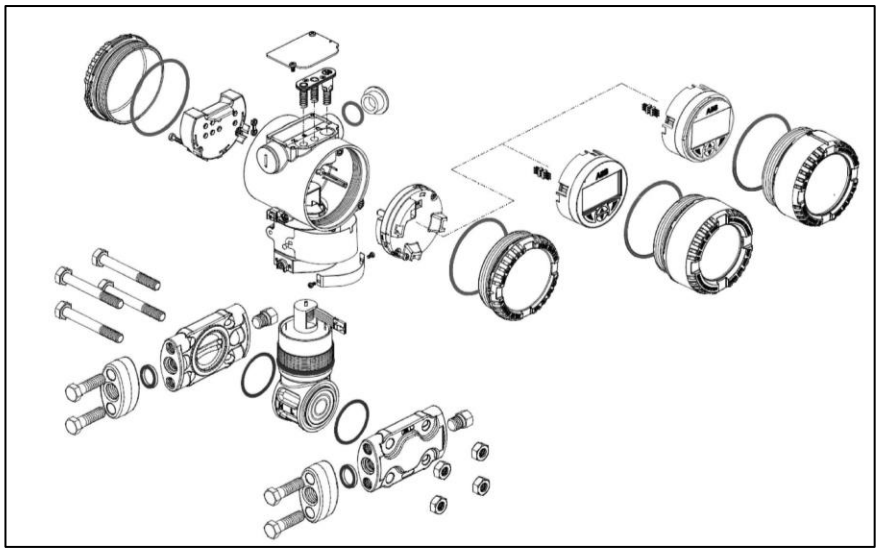
Tek- Bar 3800 XA Multivariable Transmitter is a best-in-class design solution to obtain measurement combinations of different process variables, including DP (Differential Pressure), SP (Static Pressure), PT (Process Temperature), which compensated mass or volume flow rate and totalized flow for gases, steam, and liquids. They are measured by two integrated sensors and an external standard Pt100 resistance thermometer.

2.2 Measuring Principle

The Tek-Bar 3800XA Explosion Proof Multivariable Transmitter measures differential pressure, static pressure (absolute or gauge), and process temperature. It also performs flow calculations, compensating for pressure or temperature and accounting for variables such as discharge coefficient, thermal expansion, Reynolds number, and compressibility factor.

The pressure transmitter includes flow calculations or superheated steam, saturated steam, gases, and liquids-so you only need one device for your system.The Multivariable Transmitter illustrate more economical solution than the designs that have been used for this type of measuring point up to now, in which three different transmitters for differential pressure, absolute pressure, and temperature report their values to a DCS, PLC, or flow computer.

2.3 Measuring range limits and span limits



The data sheets for the Series 3800XH/A multivariable transmitters contain all the information concerning the measuring range and measuring span of the individual. models, as well as the sensor code.

- URL: Upper Range Limit of a specific sensor. The highest measured value that can be measured by the transmitter.
- LRL: Lower Range Limit of a specific sensor. The lowest measured value that can be measured by the transmitter.
- URV: Upper Range Value The highest measured value to which the transmitter is calibrated.
- LRV: Lower Range Value. The lowest measured value to which the transmitter is calibrated.
- SPAN: Measuring span. The algebraic difference between the start of the measuring range and the end of the measuring range. The smallest span is the smallest value
- that can be selected without impairing the specified measuring accuracy.
- TURN DOWN : Span ratio The ration between the maximum span and
- RATIO: the calibrated span.

The measuring transmitter can be calibrated to any measuring range between LRL and URL with the following restrictions.

- LRL ≤ LRV ≤ (URL – CAL SPAN)
- CAL SPAN ≥ MIN SPAN
- URV ≤ URL

2.4 Specifications

Measuring Range	Differential pressure sensor: 1kPa 10 mbar 4 in H2O, -1kPa -10 mbar -4 in H2O, 0.05 kPa 0.5 mbar 0.2 in H2O Absolute pressure sensor: 600 kPa 6 bar 87 psi, 0 abs, 6 kPa 0.06 bar 0.87 psi
Accuracy	%FS
Span limits	± URL (TD = 0.5)
Relative humidity	up to 100 %. Condensation, icing: permitted
Output Signal	4 to 20 mA HART,Modbus RS285
Storage Temperature	-67 to 248°F (-55 to 120°C)
Temperature input	Process temperature range -200°C to 850°C (-328 to 1562 °F) with external resistance thermometer (Pt100) in four-wire circuit.
Damping	Between 0 to 60s.
Warm-up time	Ready for operation as per specifications in less than 10 s with minimum damping
Power supply	Operates on terminal voltage of 10.5 to 30 VDC
Electronic Housing Material	Pure Polyester Powder Coated Low Copper (<0.4%)-Aluminium
Fill Fluid	Silicone Oil DC200, Silicone Oil 704, NEOBEE® M-20 or CTFE (Chlorotrifluoroethylene)
Process Connections	1/4" -18 NPT (F),1/2"-14 NPT(F),M10 with operating pressure upto 100 bar,M12 with higher operating pressure of 410 bar
Insulation resistance	>100 M at 500V DC (between terminals and ground)
Cable entry	2, 1/2"-14 NPT or M20 × 1.5 threaded bores for cable glands, directly on housing.
Materials	Stainless steel 1.4435 (AISI 316L); Hastelloy C276®; Monel 400®; Monel 400®, gold-plated; Tantalum
Net Weight	8.3pounds (3.8kg) with Aluminium Housing
Mounting position	The transmitters can be installed in any position.
Approvals	ATEX/IEC, FM

2.5 Features

- Automatic static pressure and temperature compensation.
- Easy configuration & calibration
- Field-replaceable modules reduce downtime.
- Flexible configuration options
- Universal transmitter terminals save installation and start-up time.
- Large turn down ratio of up to 100:1
- Integrated counting function

2.6 Applications

- Steam and Natural Gas
- Compressed Air
- Nitrogen, Oxygen, Argon, Hydrogen Gases
- Boiler Control

- Power Plant

2.7 Hazardous atmospheres

With or without integral LCD display

INTRINSIC SAFETY Ex ia:
ATEX Europe (code E1) approval
II 1 G Ex ia IIC T6...T4 Ga, II 1/2 G Ex ia IIC T6...T4 Ga/Gb,
II 1 D Ex ia IIIC T85 °C Da, II 1/2 D Ex ia IIIC T85 °C Da; IP66, IP67.
IECEx (code E8) approval
Ex ia IIC T6...T4 Ga/Gb, Ex ia IIIC T85 °C Da; IP66, IP67.
NEPSI China (code EY)
Ex ia IIC T4/T5/T6 Ga, Ex ia IIC T4/T5/T6 Ga/Gb,
Ex iaD 20 T85/T100/T135, Ex iaD 20/21 T85/T100/T135.

EXPLOSION PROOF:
ATEX Europe (code E2) approval
II 1/2 G Ex db IIC T6 Ga/Gb Ta=−50 °C to +75 °C,
II 1/2 D Ex tb IIIC T85 °C Db Ta = −50 °C to +75 °C; IP66, IP67.
IECEx (code E9) approval
Ex db IIC T6 Ga/Gb Ta=−50 °C to +75 °C,
Ex tb IIIC T85 °C Db Ta = −50 °C to +75 °C; IP66, IP67.
NEPSI China (code EZ)
Ex d IIC T6 Gb, Ex tD A21 IP67 T85 °C.

INTRINSIC SAFETY Ex ic:
ATEX Europe (code E3) type examination
II 3 G Ex ic IIC T6...T4 Gc, II 3 D Ex tc IIIC T85 °C Dc;
IP66, IP67.
IECEx (code ER) type examination
Ex ic IIC T6...T4 Gc, Ex tc IIIC T85 °C Dc;
IP66, IP67.
NEPSI China (code ES) type examination
Ex ic IIC T4~T6 Gc, Ex nA IIC T4~T6 Gc, Ex tD A22 IP67 T85 °C.
FM Approvals US (code E6) and
FM Approvals Canada (code E4):

- Explosion proof (US): Class I, Zone 1 AEx d IIC T4 Gb
- Explosion proof (Canada): Class I, Zone 1 Ex d IIC T4 Gb
- Non incendive: Class I, Division 2, Groups A, B, C, D T6...T4
- Energy limited (US): Class I, Zone 2 AEx nC IIC T6...T4
- Energy limited (Canada): Class I, Zone 2 Ex nC IIC T6...T4
- Intrinsically safe: Class I, II, III, Division 1,

Groups A, B, C, D, E, F, G T6...T4
Class I, Zone 0 AEx ia IIC T6...T4 (US)
Class I, Zone 0 Ex ia IIC T6...T4 (Canada) Type 4X, IP66, IP67 for all above markings.
COMBINED FM Approvals US and Canada

- Intrinsically safe (code EA)

COMBINED ATEX, FM and IECEx Approvals (code EN)
NEPSI combined (code EP = EY + EZ), (code EQ = EY + EZ + ES)
Technical Regulations Customs Union EAC (Russia, Kazakhstan, Belarus), In metro (Brazil)
For ambient temperatures -40 ... 85°C (-40 ... 185°F) the information based on the temperature classes in the associated certificates, must be complied with. The temperature sensor circuit (Pt100) and the digital output (pulse / limit value output) must be connected in accordance with the requirements of the Ex-certificate.

WARNING

The housing contains aluminium, which can lead to a potential danger of ignition through impact or friction. For this reason, impact or friction must be avoided during installation and use.

3 Mounting

Before installing the transmitter, check whether the device design meets the requirements of the measuring point from a measurement technology and safety specifications point of view. This applies in respect of the:

- Measuring range
- Overload resistance
- Temperature
- Explosion protection
- Operating voltage

The suitability of the materials must be checked as regards their resistance to the media. This applies in respect of the:

- Gasket
- Process connection, separating diaphragm, etc.

In addition, the relevant directives, regulations, standards, and accident prevention regulations must be observed (e. g., VDE/VDI 3512, DIN 19210, VBG, Elex V, etc.).
Measurement accuracy is largely dependent on correct installation of the transmitter and, if applicable, the associated impulse line(s).
As far as possible, the measuring setup should be free from critical ambient conditions such as large variations in temperature, vibrations, or shocks.

NOTE

If unfavourable ambient conditions cannot be avoided for reasons relating to building structure, measurement technology, or other issues, the measurement quality may be affected. (See "Specifications" chapter).

If a remote seal with capillary tube is installed on the transmitter, the additional operating instructions for remote seals and the related data sheets must be observed.

3.1 IP rating

The housing of pressure transmitters of the 3800XA series satisfies the requirements of IP degree of protection IP 66 / IP 67 (NEMA 4X) in accordance with IEC 60529.
The first digit indicates the protection of the integrated electronics against penetration of foreign objects, including dust.
The digit "6" means that the housing is dust tight (i.e. dust cannot penetrate). The second digit indicates the protection of the integrated electronics against the penetration of water.
The digit "6" means that the housing is watertight and can even withstand a strong water jet under the specified conditions.
The digit "7" means that the housing is watertight and can be temporarily immersed at a specified pressure and for a specific time, without water penetrating.

3.2 Factory setting

The transmitter is factory configured according to the customer's order specifications.

NOTE

Under normal conditions no additional settings are required.

The typical configuration includes:

- Number of the measuring point tag
- Calibrated span
- Configuration of the flow or liquid level calculation
- Configuration of the LCD display

3.3 Venting / draining transmitters without diaphragm seals.

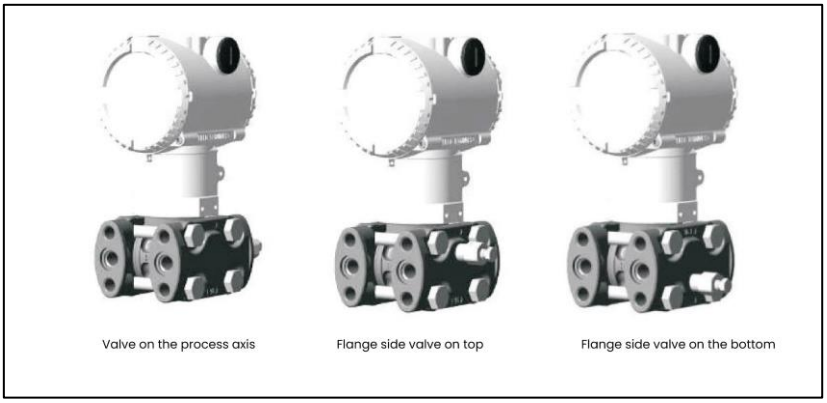


Fig.4 Venting / draining transmitters without diaphragm seals.

For transmitters without diaphragm sealers the following instructions on venting and draining must be complied with. It is important to attach the transmitter in such a

manner and to layout the process line in such a manner that gas bubbles in liquid measurements can be routed back into the process and not get into the measuring chambers.

The optional vent / drain valves on the transmitter are attached on the measuring cell flanges. Align the transmitter so that these vent / drain valves are arranged above the tap points for liquid measurement, so that gas can escape upward. For gas measurements align the transmitter so that the vent / drain valves are arranged below the tap points, so that air or condensate can drain.

WARNING

During the venting or draining process medium that is being discharged can escape and endanger personnel who are not working in the vicinity.
Consequently, when venting or draining, any escaping process medium must be collected.

3.4 Mounting positions

The transmitter can be attached directly on a valve manifold provided for flange installation.
Optionally a fastening bracket for wall or pipe installation (2" pipe) is available as an accessory.
For models 3800XH and 3800XH/A fastening brackets must always be used.
Ideally the transmitter must be mounted in such a manner that the separating diaphragms are standing vertical, to avoid later zero-point offsets.

NOTE

If the transmitters are mounted with an inclination that is not vertical, the filling fluid exerts hydrostatic pressure on the measuring diaphragm, which causes a zero-point offset. In this case the zero point can be adjusted via the zero-point button or with the command "Install position correction". See chapter "Configuration".

3.5 Mounting dimensions

3.5.1 Transmitter with barrel housing

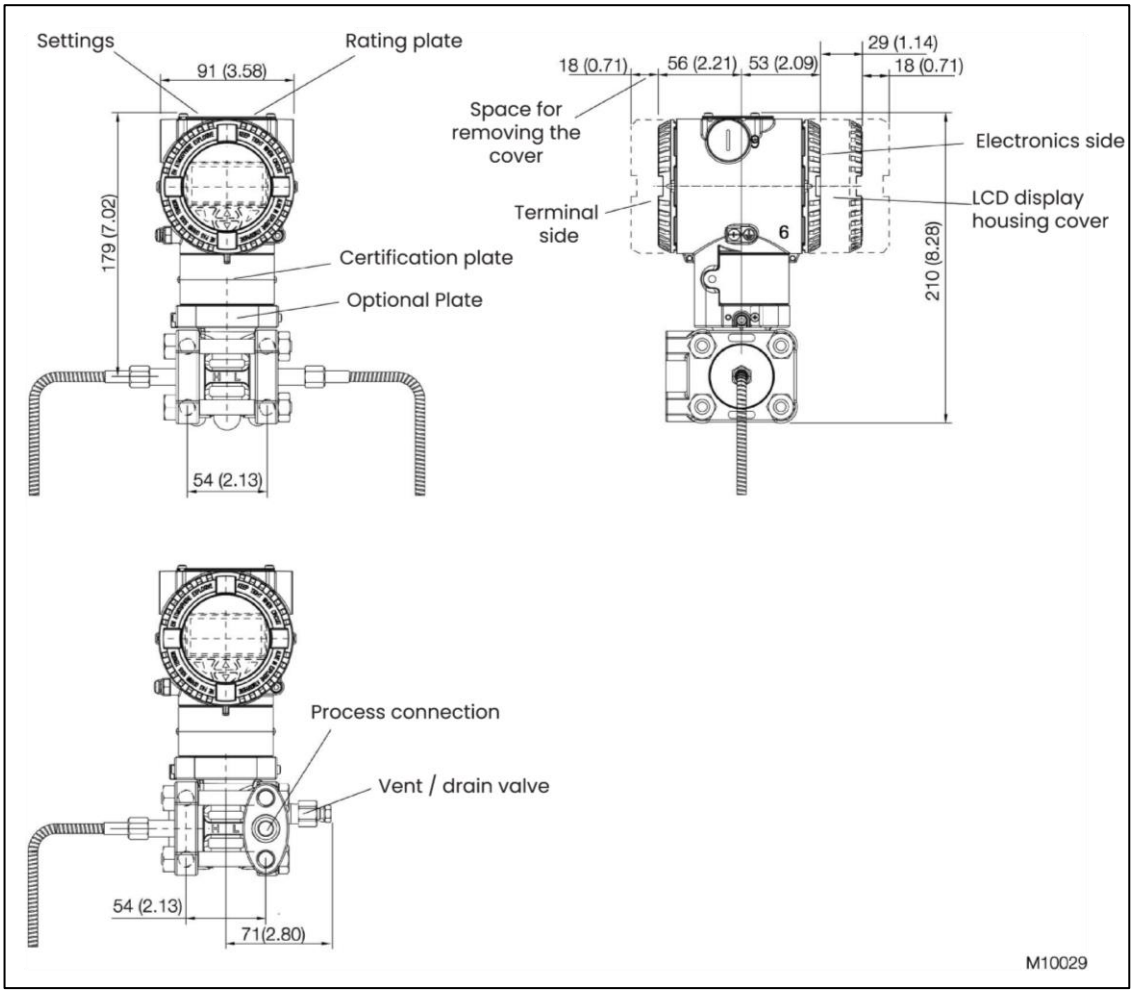


Fig.5 Barrel housing

In the case of models with just one remote seal, the threaded connection (1/4 – 18 NPT directly or 1/2 – 14 NPT using adapter) of the standard process flange, the gasket groove, and the gasket comply with IEC 61518.
The screw-on thread for attaching the adapter flange to the process flange is 7/16 - 20 UNF.

3.5.2 Transmitter with barrel housing and mounting bracket, for vertical and horizontal on 60 mm (2 in.) pipe

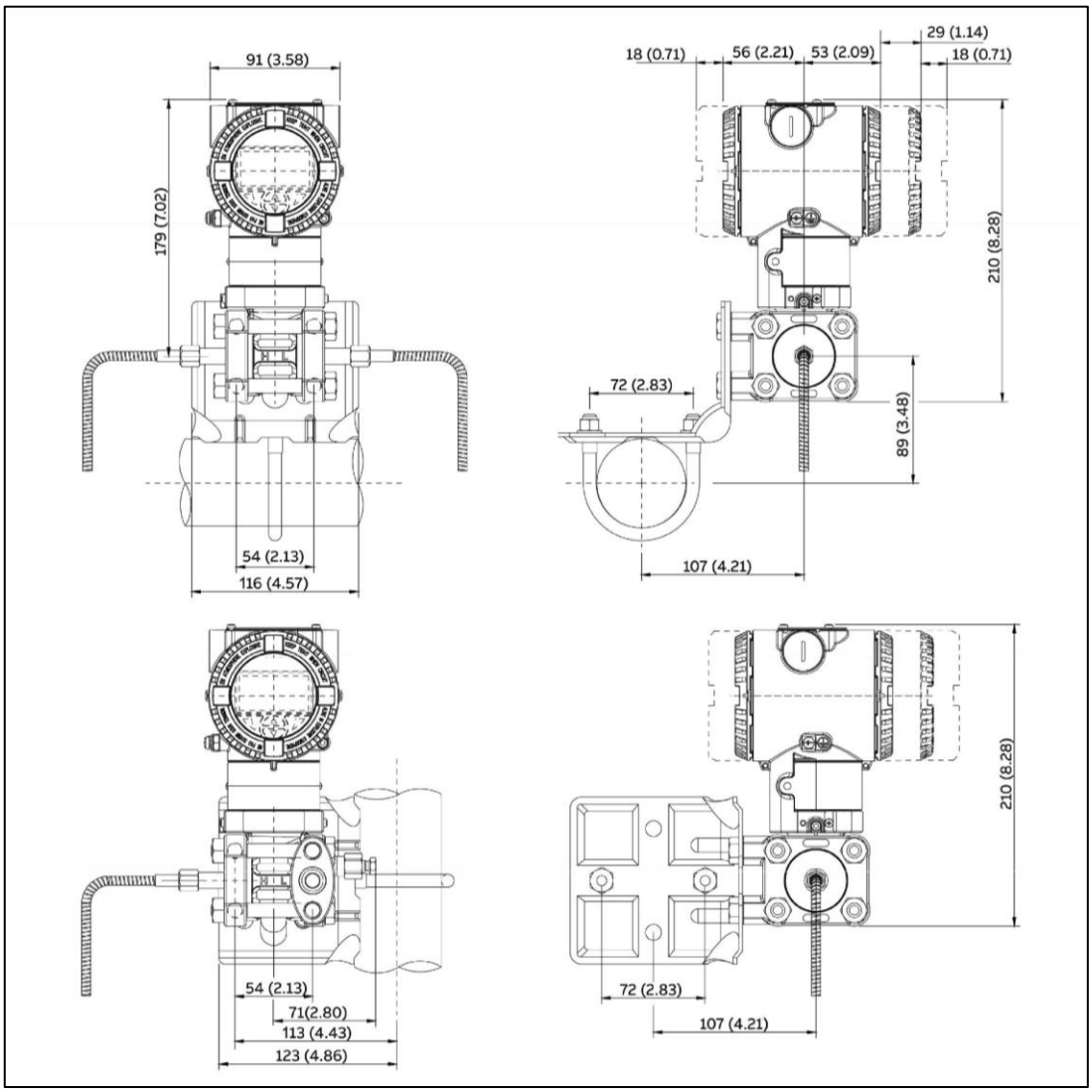


Fig.6 Pipe mounting - barrel housing

3.5.3 Transmitter with DIN housing and mounting bracket, for vertical or horizontal mounting on 60 mm (2 in.) pipe

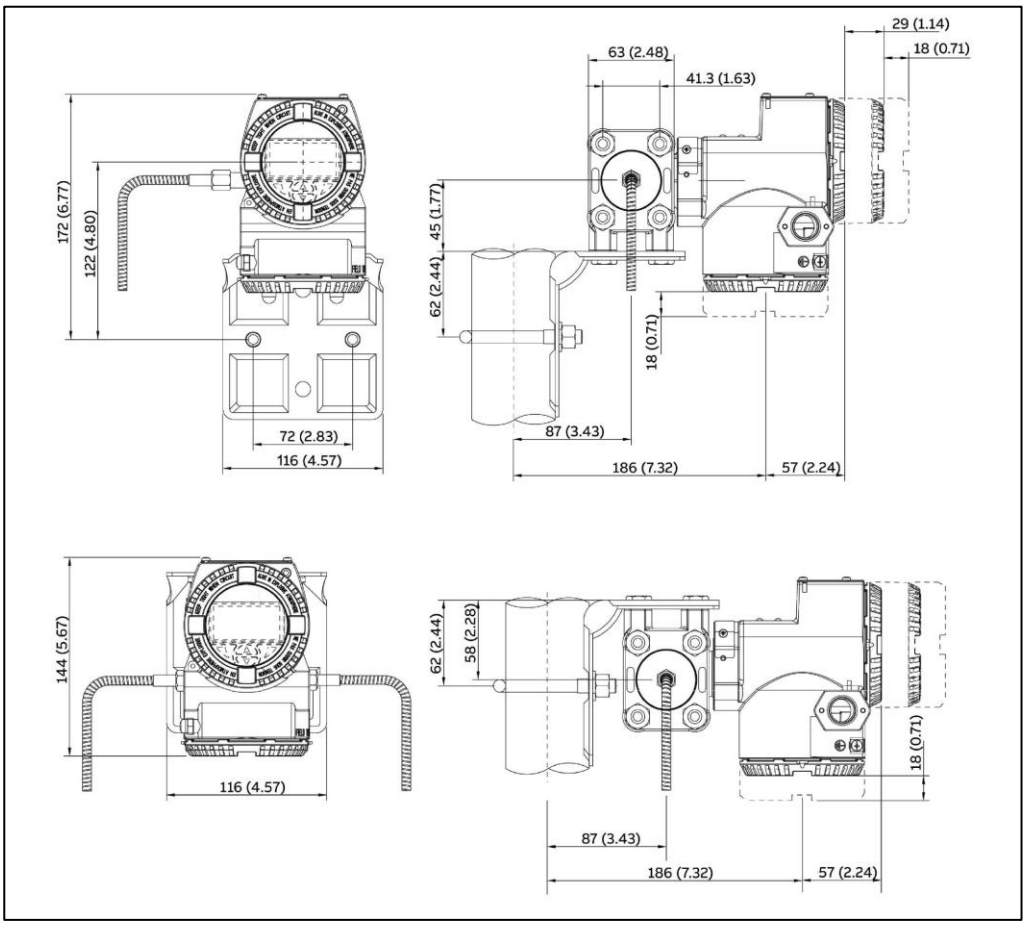


Fig. 7 Pipe mounting - DIN housing

3.5.4 Transmitter with barrel housing and flat bracket, for vertical or horizontal mounting on 60 mm (2 in.) pipe

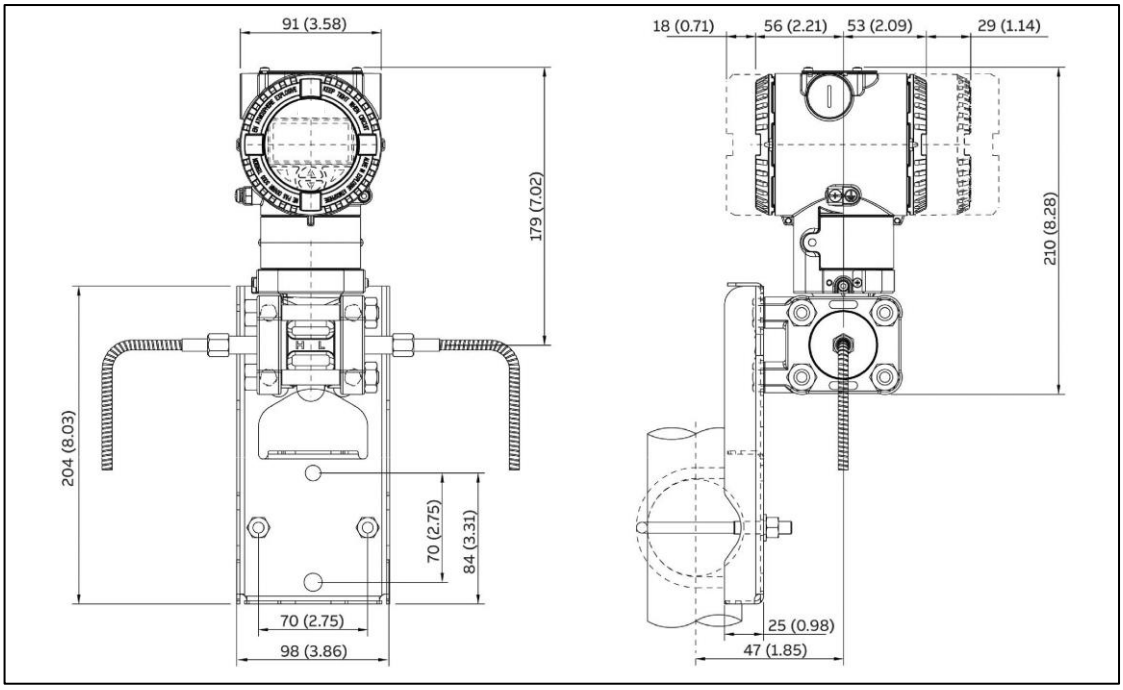


Fig. 8 Flat bracket for pipe mounting - barrel housing

3.6 Mounting dimensions

3.6.1 Transmitter with barrel housing – horizontal flanges

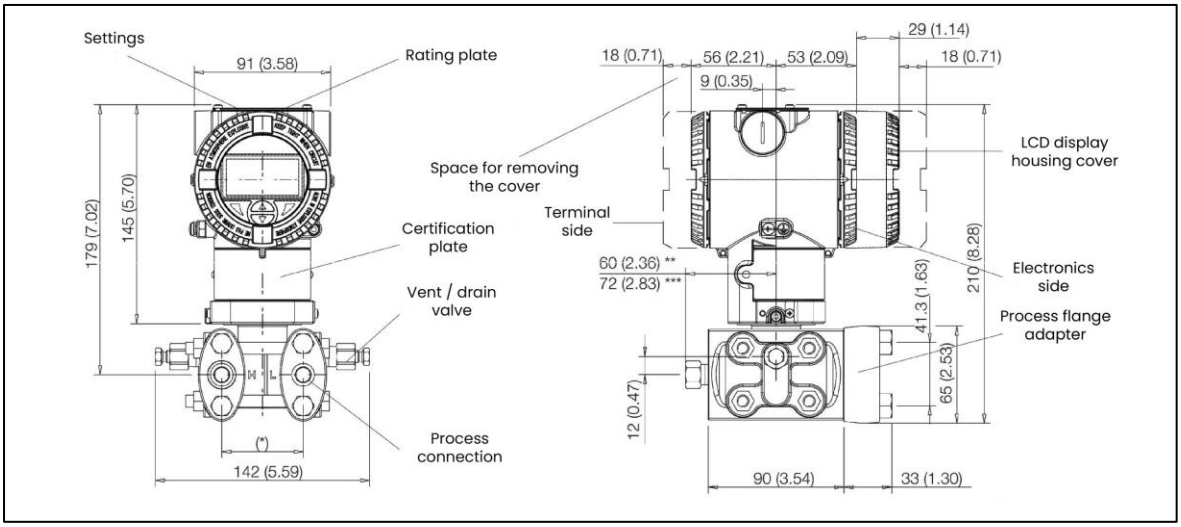


Fig. 9 Barrel housing - horizontal flanges

* 54 (2.13) mm (in.) via 1/4 - 18 NPT process flanges
51 (2.01), 54 (2.13), or 57 (2.24) mm (in) via 1/2 - 14 NPT adapter flanges.
Note: Process connection and seal groove satisfy IEC 161518. Thread for attaching adapter flanges or other components (e.g., manifold) on the process flange: 7/16 -20 UNF.
** With screw plug
*** With vent / drain valve

3.6.2 Transmitter with barrel housing – vertical flanges

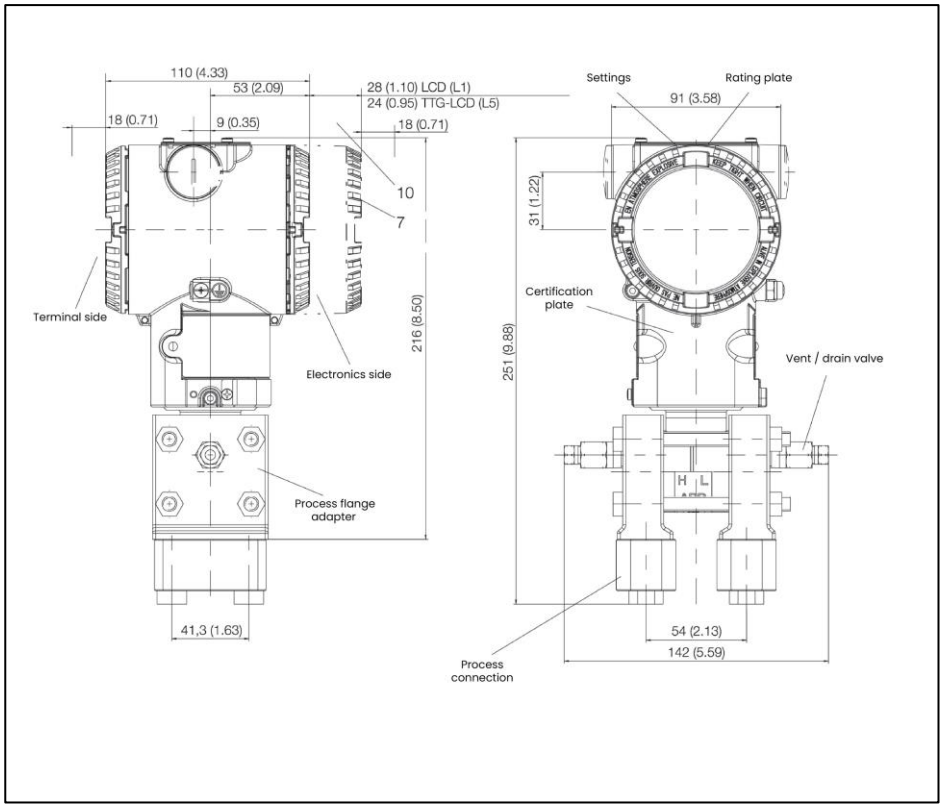


Fig. 10 Barrel housing - vertical flanges

3.6.3 Transmitter with mounting bracket, for vertical or horizontal mounting on 60 mm (2 in.) pipe

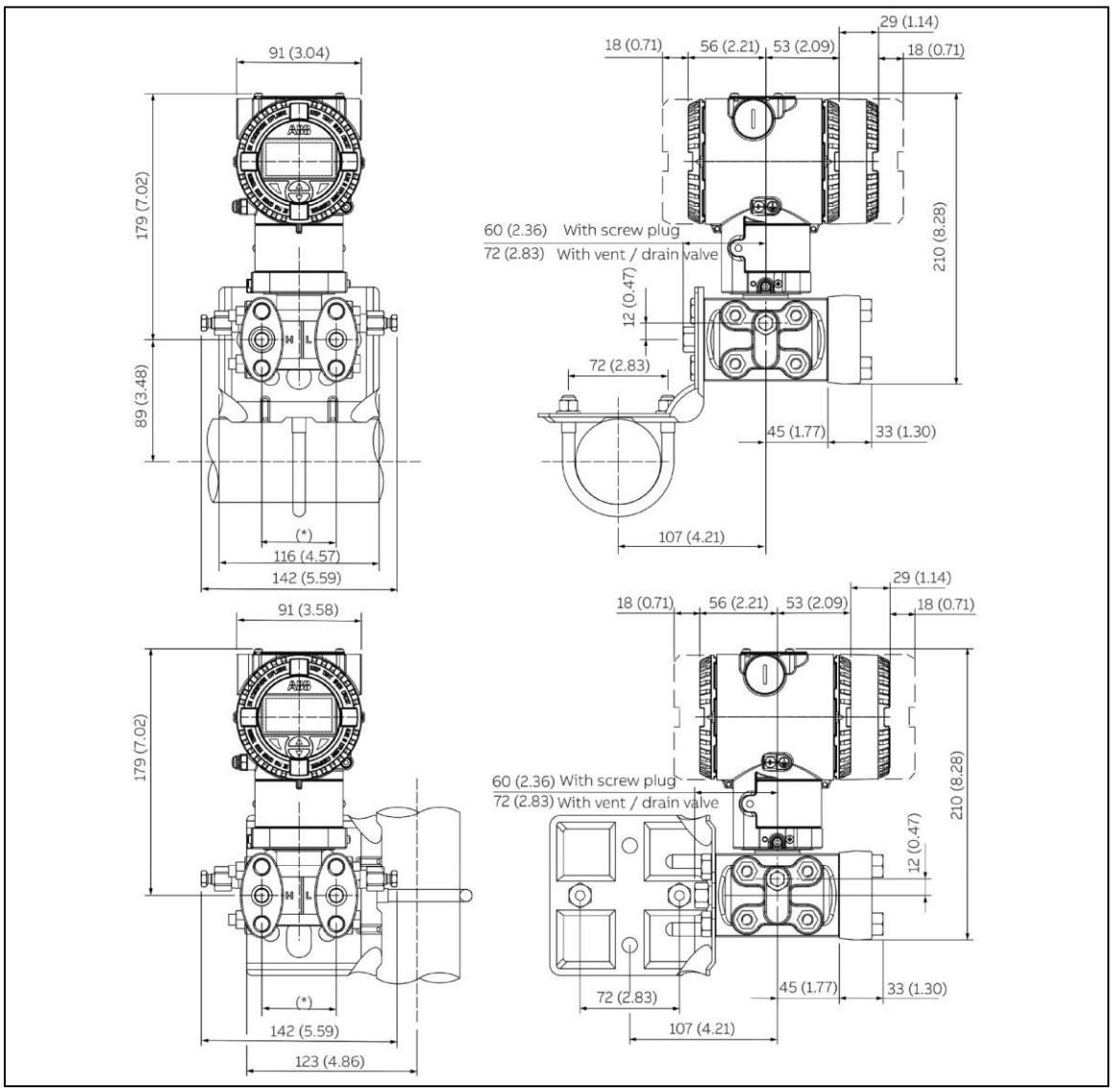


Fig. 11 Pipe mounting - barrel housing

* 54 (2.13) mm (in.) via 1/4 - 18 NPT process flanges
51 (2.01), 54 (2.13), or 57 (2.24) mm (in) via 1/2 - 14 NPT adapter flanges.
Note: Process connection and seal groove satisfy IEC 161518. Thread for attaching adapter flanges or other components (e.g., manifold) on the process flange: 7/16 -20 UNF.
** With screw plug
*** With vent / drain valve

3.6.4 Transmitter with DIN aluminium housing – horizontal flanges with mounting bracket for vertical or horizontal mounting on 60 mm (2 in.) pipe

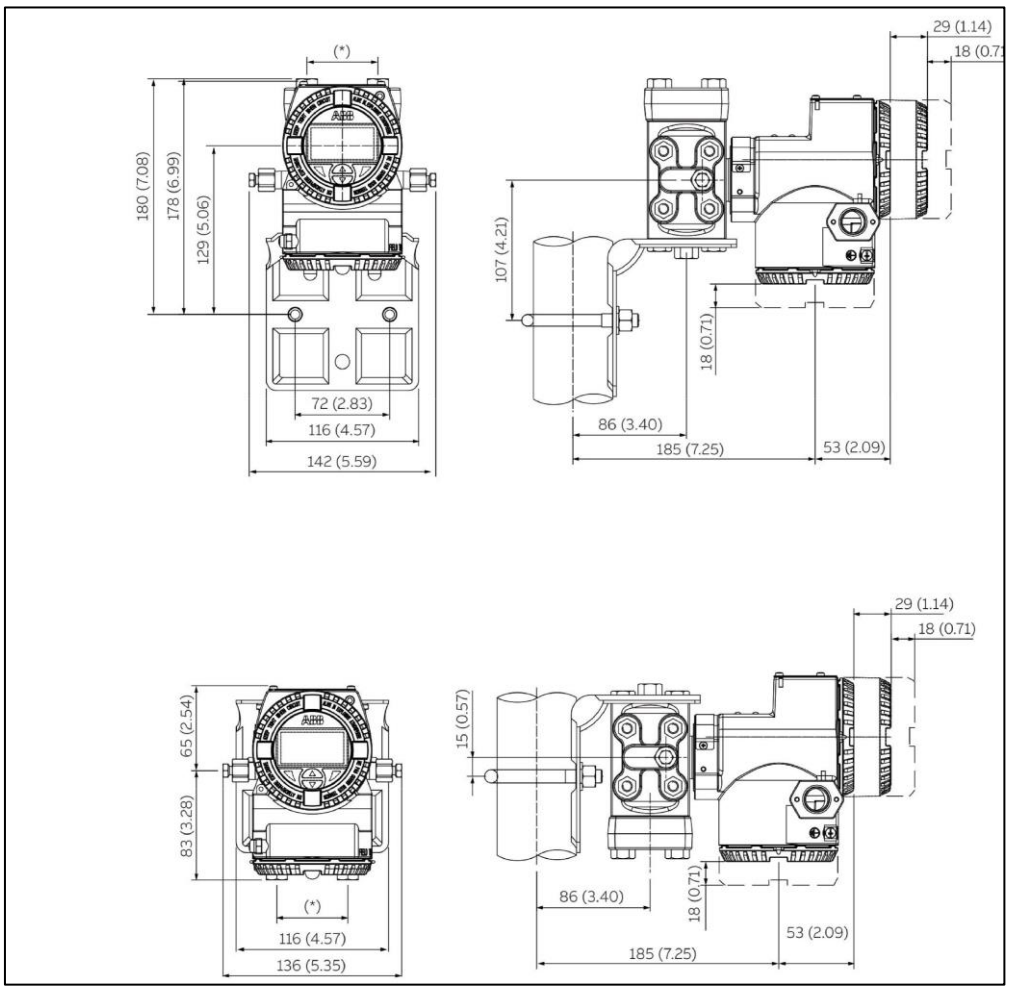


Fig. 12 Pipe mounting - DIN housing

* 54 (2.13) mm (in.) via 1/4 - 18 NPT process flanges
51 (2.01), 54 (2.13), or 57 (2.24) mm (in) via 1/2 - 14 NPT adapter flanges.
Note: Process connection and seal groove satisfy IEC 161518. Thread for attaching adapter flanges or other components (e.g., manifold) on the process flange: 7/16 -20 UNF.

3.6.5 Transmitter with flat bracket, for vertical or horizontal mounting on 60 mm (2 in.) pipe

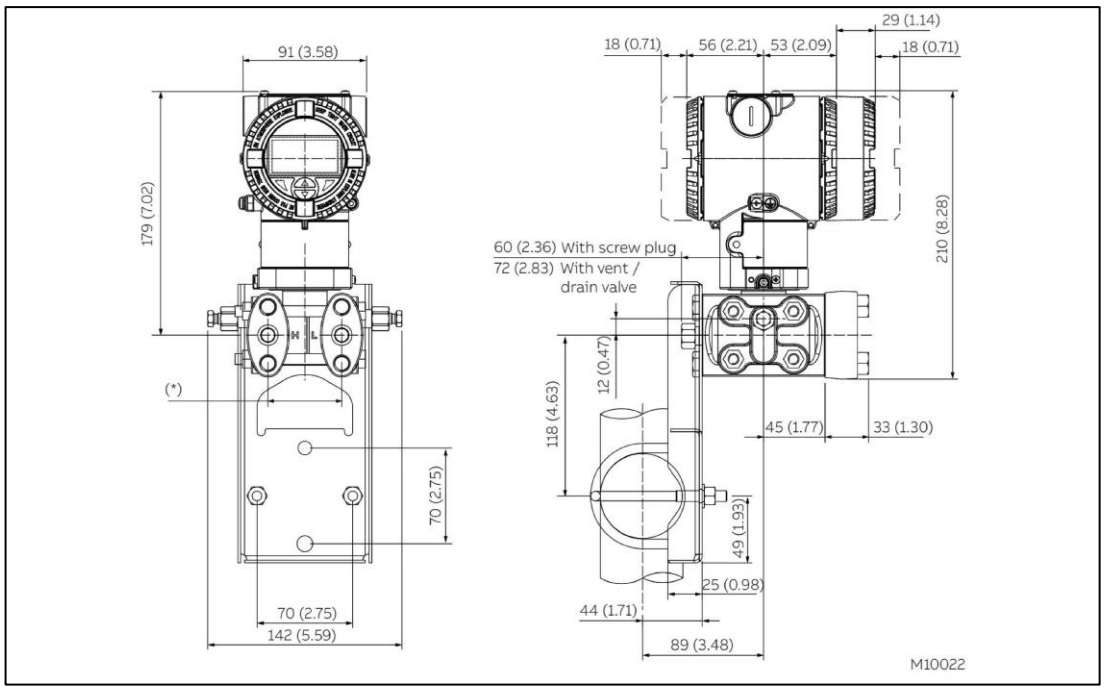


Fig. 13 Flat bracket for pipe mounting - barrel housing

* With screw plug

** With vent / drain valve

3.6.6 Installation via (optional) mounting brackets.

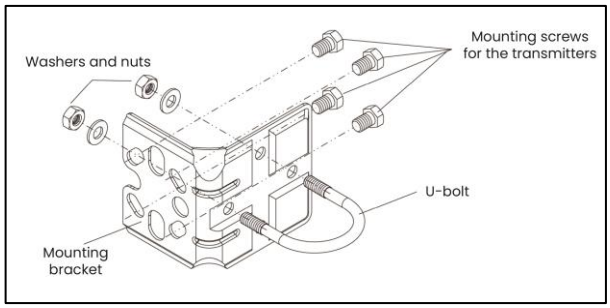


Fig. 14 Detail view

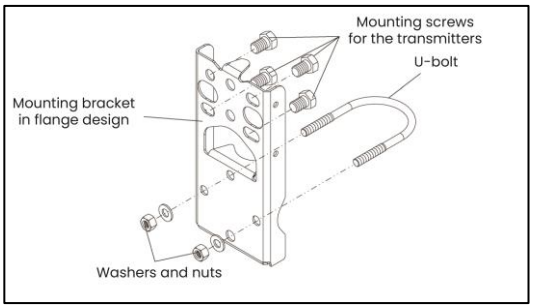
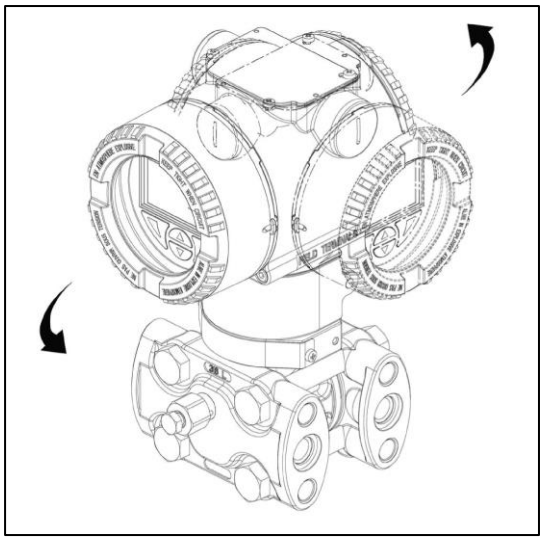


Fig. 15 Detail view

With the mounting brackets available the transmitter can be mounted in different positions.

3.7 Rotating the transmitter housing



To improve access to electrical connections and for better visibility of the optional LCD display in the field, the transmitter housing can be rotated through 360°. A stop prevents the housing from being turned too far.
In order to rotate the housing, the fixing screw must be loosened and unscrewed approx. one revolution (do not remove it). As soon as the desired position is reached, the fixing screw will be retightened.

Fig. 16 Rotating housing

3.8 Rotating the integral LCD display

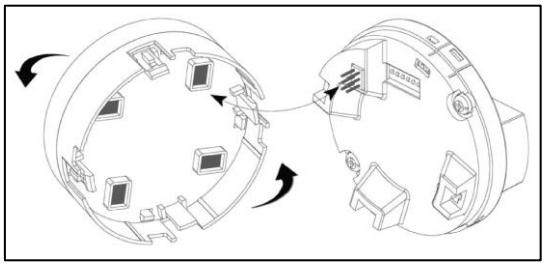


Fig. 17 Rotating the LCD display

If the device has an integral LCD display, this can be mounted in four different positions, each of which can be rotated through 90°.
To rotate the LCD display, open the windowed cover (ensuring compliance with special requirements for hazardous areas) and pull the LCD display out of the electronics module. Reposition the LCD display connector accordingly. Plug the LCD display back into the electronics module, checking that the 4 plastic fixing locks are securely in place.

3.9 Connecting impulse lines

In order for the impulse lines to be laid correctly, the following points must be observed:

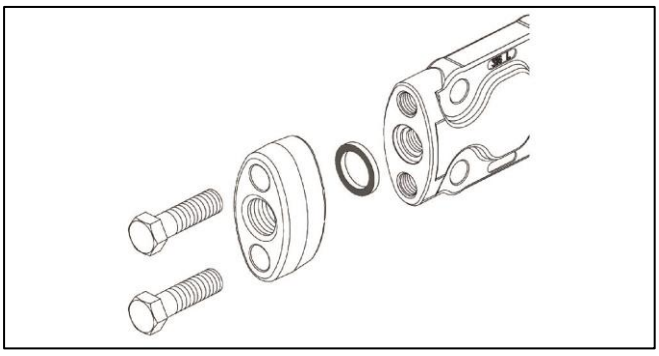
- The impulse lines must be as short as possible and have no sharp bends
- Lay the impulse lines so that no deposits can accumulate in them. Gradients should not be less than approx. 8 % (ascending or descending)
- The impulse lines should be blown through with compressed air or, better still, flushed through with the medium prior to connection
- With wet legs, the liquid in both lines must be at the same level.
- With vaporous measuring media, measures must be taken to prevent steam entering the measuring chambers of the measuring cell and causing overheating.

- It may be necessary to use condensate vessels or similar with small measuring spans and vaporous media.
- If you are using condensate vessels (steam measurement), you should ensure that the vessels are at the same elevation in the differential pressure piping.
- As far as possible, keep both impulse lines at the same temperature.
- Completely depressurize the impulse lines if the medium is a liquid.
- Lay the impulse lines so that gas bubbles (when measuring liquids) or condensate (when measuring gases) can flow back into the process line.
- Ensure that the impulse lines are connected correctly (connection of high-pressure and low-pressure sides to the measuring cell, seals, etc.)
- All connections must be secure and tight.
- Lay the impulse lines so that the medium cannot be blown out over the measuring cell.

WARNING

Install and seal process connections and all accessory elements (including valve blocks) before the charging the device with pressure. For applications with toxic or hazardous substances prior to venting or draining, take all precautionary measures that are recommended in the respective safety data sheet. Only tighten. the screws of the fastening accessories with a size 12 mm (15/32") inch hexagon socket wrench.

3.10 Process connections



On the flange of the 266 multivariable transmitter there are 1/4 – 18 NPT process connections with middle point spacings of 54 mm (2.13 in.). The process connections on the flange enable direct attachment of 3 element or element valve manifolds.

Fig. 18 Process Connections

Optionally flange adapters with 1/2 – 14 NPT connections are available. By turning one or both adapters, middle point spacing of 51 mm (2.01 in.), 54 mm (2.13 in.) or 57 mm (2.24 in.) is possible.

Mount the adapters as follows:

1. Correctly position the adapters with inserted O-ring.
2. Screw the adapters on the transmitter connection flange with the provided screws.
   Tighten the screws as follows: Preliminary tightening hand tight, preliminary tightening with 10 Nm, final tightening with 50 Nm.

3.11 Process connections

- Mount the temperature sensor in the downstream pipe of the primary element.
- Consider the downstream straight pipe requirements.
- If there is a significant difference between the temperature of the measuring medium and the ambient temperature, the measuring error caused by heat conduction must be minimized by insulating the installation location accordingly.
- Use class "A" sensors to maximize accuracy.
- The lengths of the protective tubes should be 15 ... 20 times the diameter of the protective tube for gas measurements and 3 ... 5 times the diameter of the protective tube for liquid measurements.
-

3.12 Mounting recommendation

The arrangement of the impulse lines depends on the respective measurement application.

3.12.1 Flow measurement of steam (condensable vapour) or clean liquids

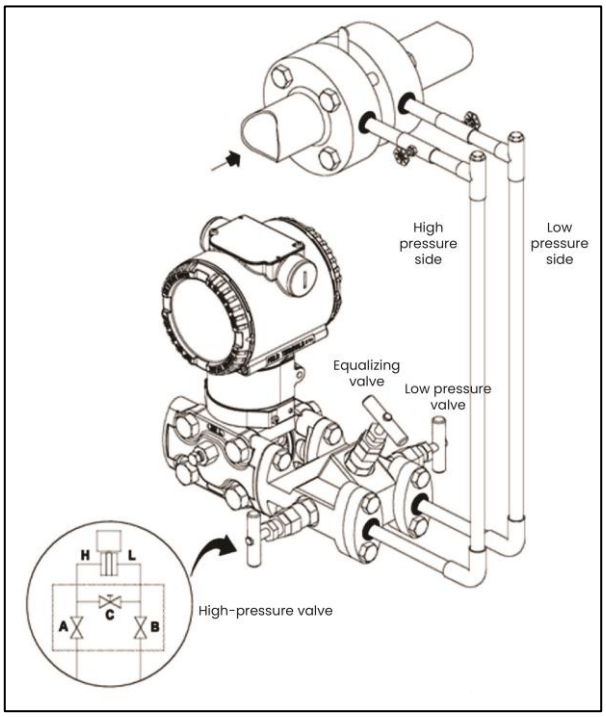


Fig. 19 Steam flow measurement

Place taps to the side of the process line.
For liquid measurements, mount the transmitter next to or underneath the taps, for steam measurements underneath the taps.
Mount the vent / drain valve pointing upward.
For steam applications, fill the vertical section of the impulse lines with a compatible fluid through the appropriate filling connections.
The height of the liquid column between process line and transmitter must be the same on the high-pressure side and the low-pressure side, so that an accurate

measurement is ensured. For implementation of this requirement, it can be practical for steam measurements, to use the impulse lines condensate tanks.
To commission the transmitter, operate the valves in the following sequence:

1. Open the equalizing valve (C)
2. Close the low-pressure valve (B) and high-pressure valve (A).
3. Open the primary shutoff valves.
4. Slowly open the high-pressure valve (A) so that the measuring medium can flow into the measuring cell on both sides.
5. Vent or drain the measuring cell and close the valves.
6. Open the low-pressure valve (B) and close the equalizing valve (C).

3.12.2 Flow measurement of gas or liquid with solids in suspension

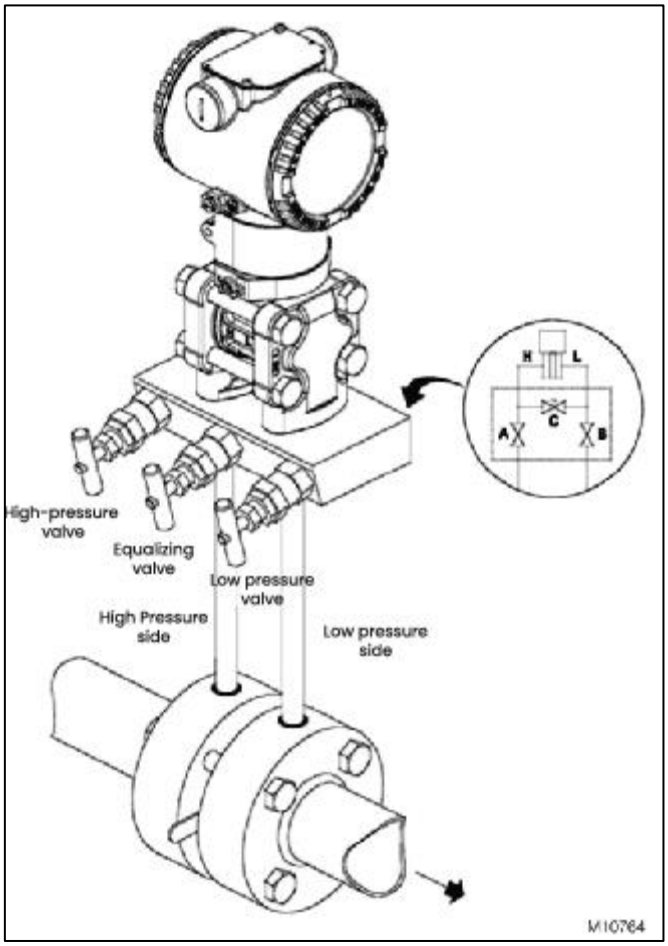


Fig. 20 Flow measurement of gases or liquids

Place taps above or to the side of the line. Mount the transmitter above the taps. To commission the transmitter, operate the valves in the following sequence:

1. Open the equalizing valve (C)
2. Close the low-pressure valve (B) and high-pressure valve (A).
3. Open the primary shutoff valves.
4. Slowly open the high-pressure valve (A) so that the measuring medium can flow into the measuring cell on both sides.
5. Vent or drain the measuring cell and close the valves.
6. Open the low-pressure valve (B) and close the equalizing valve (C).

3.12.3 Fill level measurement on closed tanks Non-condensing measuring medium (dry leg)

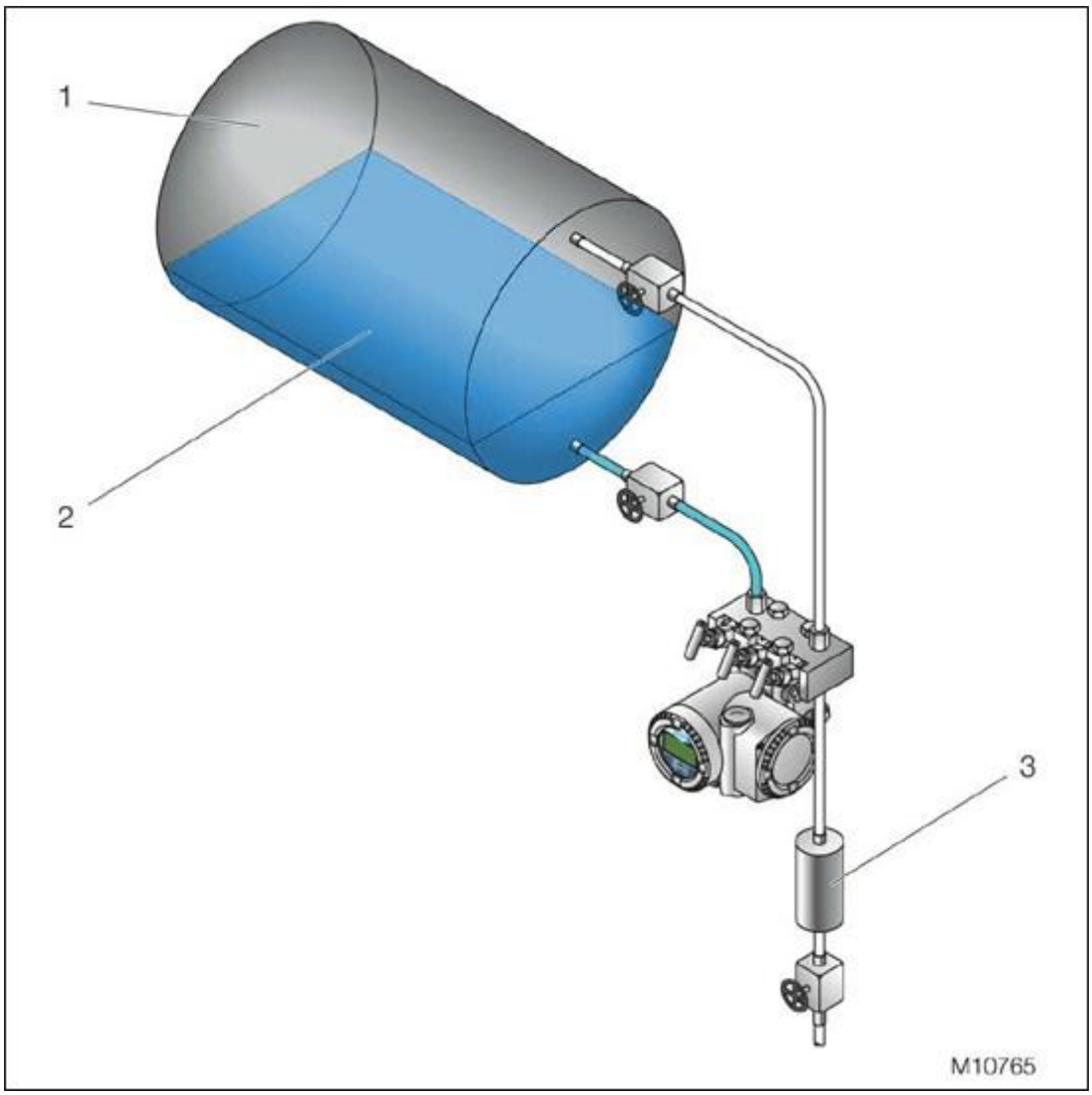


Fig. 21 Level measurement on closed tanks

Mount the transmitter at the same height or below the lowest level to be measured. Connect the high-pressure side "+" (H) of the transmitter to the bottom of the tank. Connect the low-pressure side "-" (L) of the transmitter to the top of the tank, above the maximum level.

3.12.4 Condensing measuring medium (wet leg)

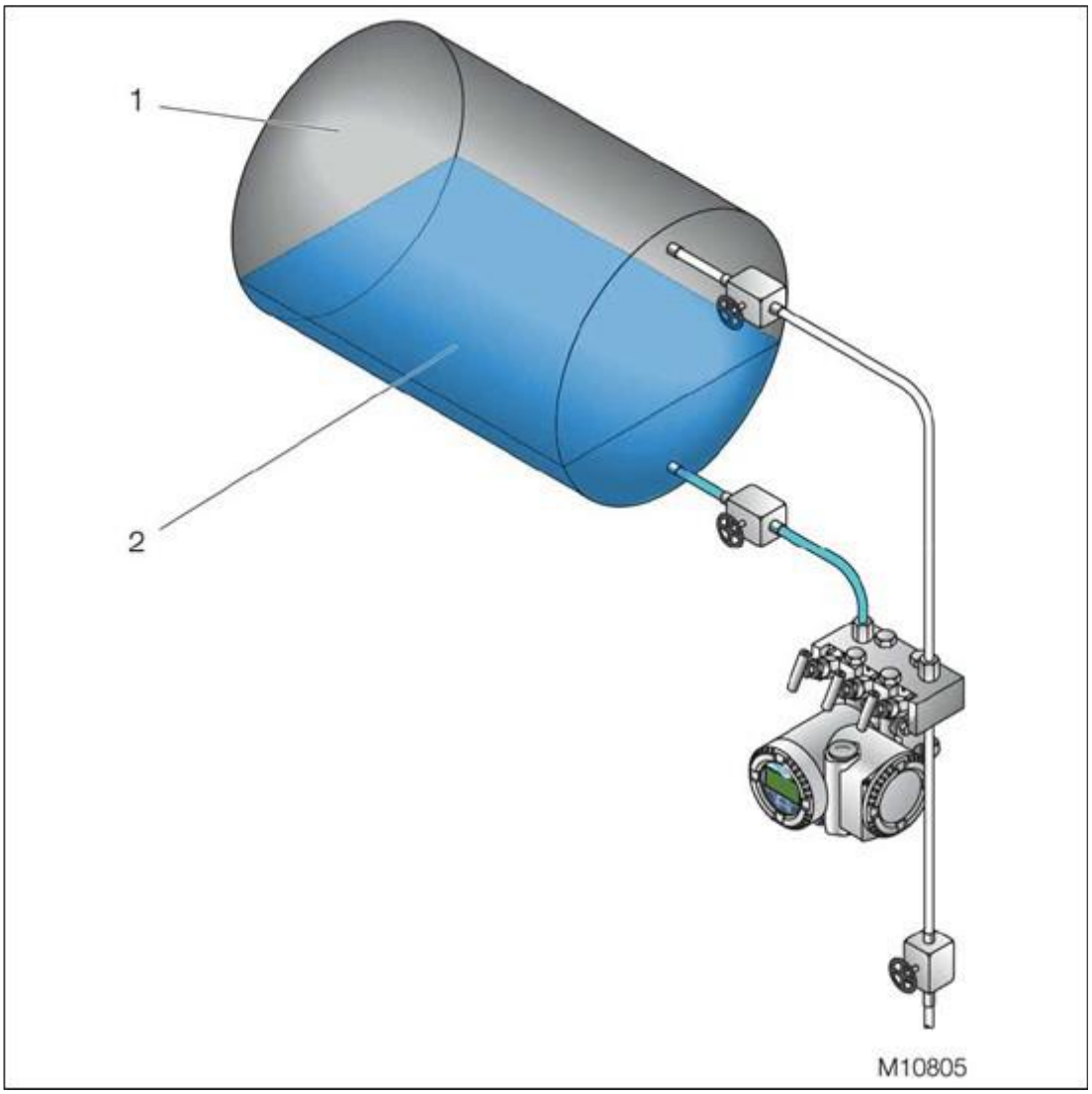


Fig. 22 Level measurement on closed tanks

Mount the transmitter at the same height or below the lowest level to be measured.
Connect the high-pressure side "+" (H) of the transmitter to the bottom of the tank.
Connect the low-pressure side "-" (L) of the transmitter to the top of the tank, above the maximum level.
Fill the vertical part of the impulse line of the low-pressure side with a compatible filling liquid via the appropriate filling connections.

3.12.5 Fill level measurement on open tanks with fruits

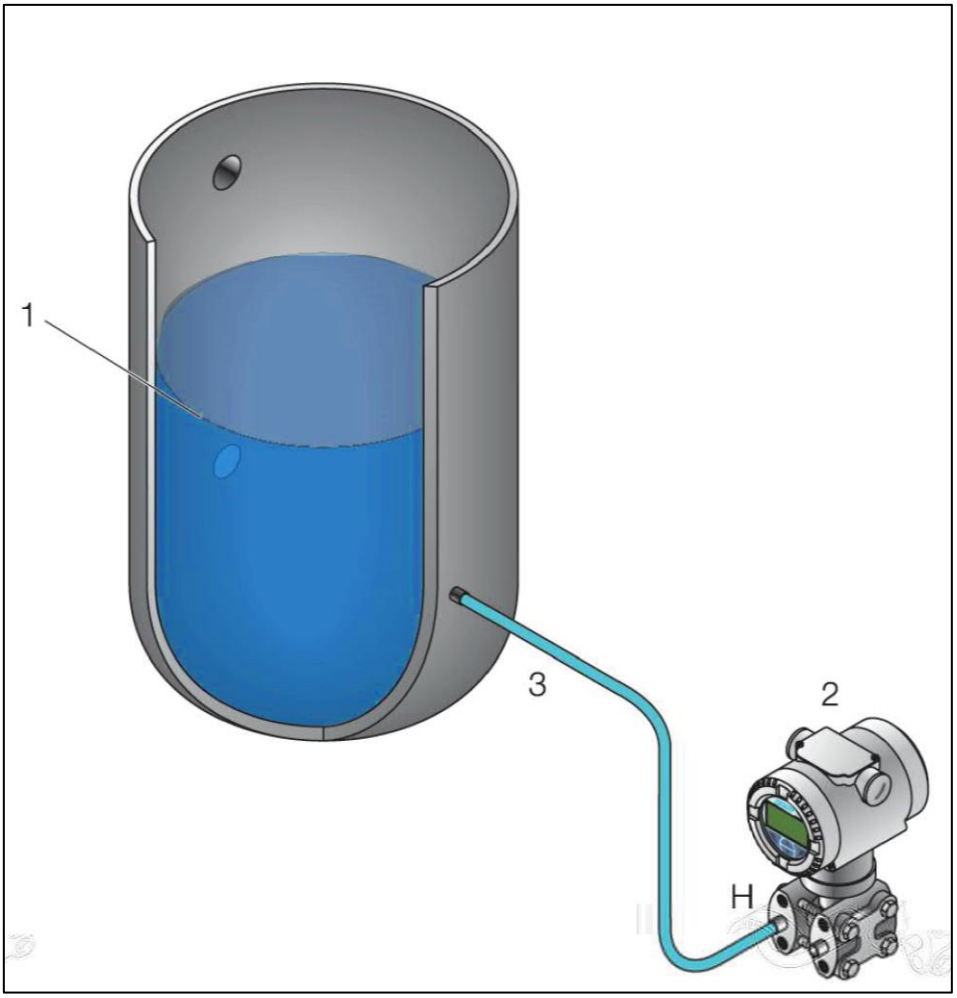


Fig. 23 Level measurement on open tanks

Mount the transmitter at the same height or below the lowest level to be measured.
Connect the high-pressure side "+" (H) of the transmitter to the bottom of the tank.
Leave the low-pressure side "–" (L) of the transmitter open to the atmosphere.

3.12.6 Fill level measurement on the steam boiler (drum water level)

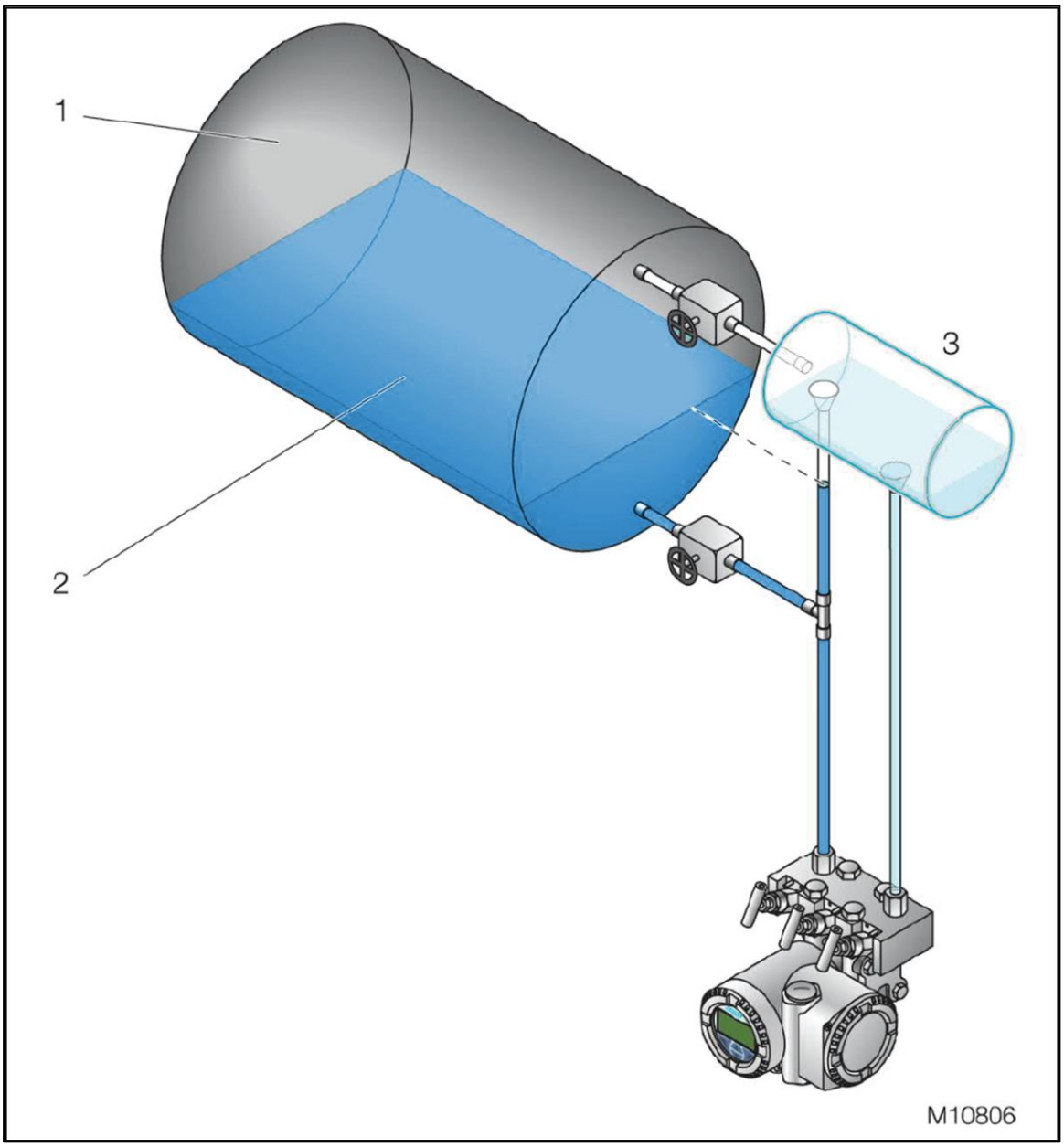


Fig. 24 Level measurement on the steam boiler

Mount the transmitter at the same height or below the lowest level to be measured. Connect the high-pressure side "+" (H) of the transmitter to the bottom of the tank. The low-pressure side "–" (L) of the transmitter up at the tank. Above the maximum level, connect using a condensate vessel.
Use the condensate tank to ensure that the impulse line of the low pressure side is always filled with liquid (condensate) at a constant height.

4 Electrical connections

The relevant directives must be complied with for the electrical installation!
Because the transmitter cannot be switched off, surge protection devices, lightning protection, or grid disconnect possibilities must be provided at the plant.

NOTE

An open cover does not provide contact protection. Touching conductive parts can damage electronic components (in some cases beyond repair) due to electrostatic discharge. Therefore, do not touch conductive components.

Check that the existing supply voltage corresponds to that indicated on the rating plate. The same lines are used for both the power supply and the output signal.
If an optional surge protector is provided and if the transmitter is used in a hazardous area, energy must only be supplied via a voltage source with galvanic isolation from the grid. Because the inherently safe power circuits of the transmitter are grounded, a sufficient equipotential bonding must be ensured for the entire supply line.

WARNING

If the type of protection specified on the certification plate does not agree with the requirements imposed on the implementation site, explosions or fires can be triggered. In this case the transmitter must NOT be connected electrically.

WARNING

The lines can carry dangerous touch voltages and cause electric shocks. An electric shock can be fatal or can cause serious injuries. Consequently, do not touch the conductors and connection terminals.

4.1 Cable connection

The electric connection is made using a 1/2-14 NPT or M20 x 1.5 cable entry. Basically, a metal cable gland should be provided for the Pt100 cable, since a shielded cable will be used. Connect the shielding within the metal cable gland! To ensure an 4X and IP 66-67 IP rating for the transmitter, the cable gland must be screwed into the housing (1/2" NPT female thread) using a suitable sealing compound.

NOTE

If cable glands are not used, the red transport screw plugs must be replaced with suitable screw plugs when the transmitter is installed. This is because the transport screw plugs are not certified as protected against explosion. This requirement is particularly relevant in hazardous areas.

NOTE

For the purpose of simulation, a 178 Ω resistor (206°C / 402.8°F) with 2 jumpers has been installed between the terminals for the Pt100 connection. This resistor (including the jumpers in the case of 4-wire connections) must be removed before connecting the Pt100. If a Pt100 is not connected, the resistor must not be moved.

NOTE

For category 3 transmitters for use in "Zone 2" a type of protection approved for this cable gland must be provided by the customer (see chapter "Ex-relevant technical data"). An appropriate thread M20 x 1.5 must be provided in the electronics housing for this purpose. for transmitters with "Ex d", Flameproof Enclosure" the housing cover must be arrested with the securing screw. The screw plug possible provided with the transmitter must be inserted on site with the sealant, Molykote DX. If a different sealant is used, the responsibility rests with the executing installer. At this point we expressly state that after several weeks the housing cover can only be unscrewed with an increased expenditure of force. This is not caused by the threads, but instead is due solely to the type of seal.

4.2 Connection of the analogue output (HART)

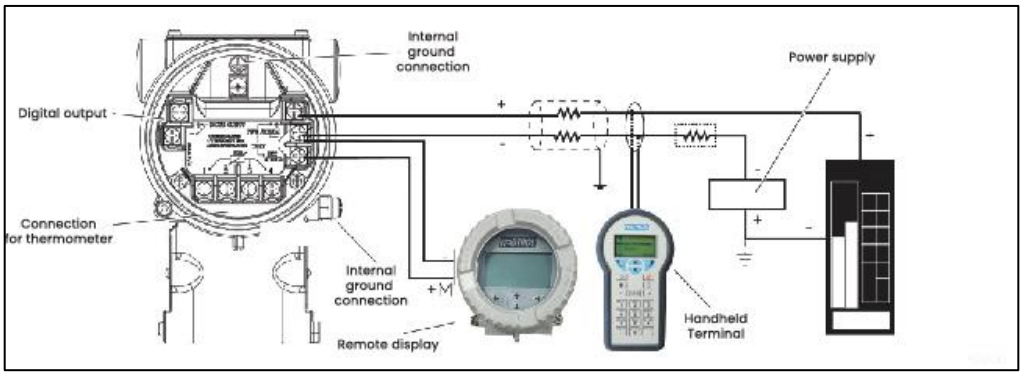


Fig. 25 Electrical connection

For connection of signal voltage / supply voltage twisted cable with a conductor cross section of 18 ... 22 AWG / 0.8 ... 0.35 mm2 to2 to max. 1500 m length must be used. For longer leads a greater cable cross section is required. For shielded cables the cable shielding must only be placed on one side (not on both sides). For the grounding on the transmitter the inner terminal marked with can also be used. The output signal (4 ... 20 mA) and the power supply are conducted via the same conductor pair. The transmitter always works with a supply voltage between 10.5 and 42 V DC.

For devices with "Ex ia" type of protection, "Intrinsic Safety" (FM, CSA, and SAA approval) the supply voltage must not exceed 30 V DC. In some countries the maximum supply voltage is limited to lower values. The permissible supply voltage is specified on the name plate on the top of the transmitter.

The possible line length depends on the total capacity and the total resistance and can be estimated based on the following formula.

$$L = \frac{65\ x\ 10^6}{R\ x\ C} - \frac{C_f + 10000}{C}$$

L = Line length in meters
R = Total resistance in Ohm
C = Line capacity
C_f = Maximum internal capacity in pF of the HART field devices in the circuit

Avoid cable installation, together with other power lines (with inductive load, etc.), as well as the vicinity to large electrical installations.
The HART handheld terminal can be connected to any connection point in the circuit if a resistance of at least 250 Ω is present in the circuit. If there is resistance less than 250 Ohm an additional resistor must be provided to enable communication. The handheld terminal is connected between the resistor and transmitter, not between the resistor and the power supply.

4.3 Digital output (pulse / limit output)

This digital output can be set as a pulse or limit output (transistor output) by making parameter changes using the software.
NPN transistor with open-collector output

Contact switching capacity	10 ... 30 V, maximum 120 mA DC
Low-level output voltage	0 ... 2 V
High-level output voltage	Maximum 30 V
Quiescent current	500 µA

4.4 Wiring

Proceed as follows to wire the transmitter:

- Unscrew the transport screw plug from one of the two cable entries located on both sides in the upper part of the transmitter housing.
- These cable entries have a 1/2-inch NPT or M20x1.5 female thread. Various adapters and bushings can be fitted to these threads to comply with plant wiring (conduit) standards.

WARNING

In an explosion-proof / flameproof installation in a hazardous area, the housing cover of the terminal compartment must not be removed when the voltage is connected, as an explosion may be caused by spark formation. Before removing the housing cover of the terminal compartment, disconnect the equipment from the supply voltage and take suitable measures to prevent reconnection.

- Remove the housing cover from the terminal compartment.
- Run the connection cable through the opening and connect the + wire to the + terminal and the - wire to the terminal.

- Run the temperature sensor cable (if there is one) through the second cable entry and connect it to the designated terminals.

NOTE

Do not connect the supply voltage across the test terminals. It could damage the test diode in the test connection.

- Plug and seal the cable entries. Make sure that when the installation has been completed, these openings are properly sealed to prevent the entry of rain and corrosive vapours and gases. In particular, for "Ex-d" (flameproof enclosure) installations, plug unused openings with a suited sealing plug that has been certified for explosion protection.
- If applicable, install the connection cable with a drip loop. Arrange the drip loop so the lower part is located below the cable entry and the transmitter housing.
- Replace the housing cover on the terminal compartment and tighten it by hand until the cover contacts the housing metal-to-metal. To prevent the housing cover from turning, in "Ex-d" type of protection (flameproof enclosure) installations, lock it by turning the locking screw / hex-head screw anti-clockwise with the 2 mm Allen key supplied with the device.

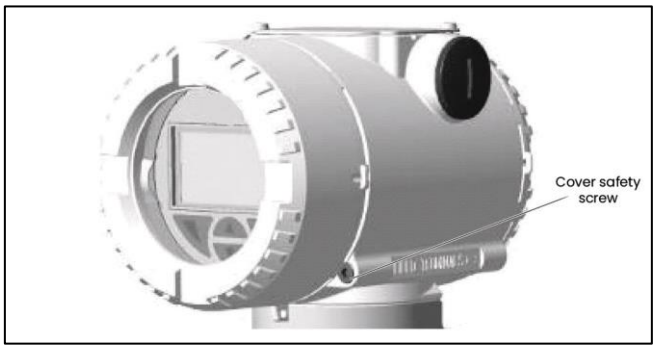


Fig. 26 Wiring

WARNING

If the cables, cable glands and stopper plugs used for the electrical connection do not satisfy the requirements for the type of protection (e.g., intrinsic safety, flameproof enclosure, etc.) and the necessary degree of protection for the housing (e.g. IP 6x in accordance with IEC EN 60529 or NEMA 4x), explosions or fires can be triggered.
For this reason, the red plastic transport caps must be replaced with cable glands or stopper plugs, that are approved for the required type of protection and the required degree of protection for the housing. See section “Ex-relevant technical data”.

4.5 Protective conductor connection / grounding

For the ground (PE) of the transmitter or the connection of a protective conductor, a connection is available on the exterior of the housing, and also in the terminal compartment. Both connections must be galvanically connected to one another. These connection points can be used if grounding or the connection of a protective conductor is prescribed by national regulations for the selected type of supply or the type of protection used.

Fig. 27 Grounding

5 Commissioning

5.1 General remarks

Once the pressure transmitter has been installed, it is put into operation by switching on the operating voltage. Prior to switching on the operating voltage check:

- Process connections
- Electrical connection
- Complete filling of the impulse line and measuring chamber of the measuring cell with the measuring medium.

The transmitter can then be put into operation. To do this, the valves must be actuated in the following order (in home position, all valves are closed):

1. Open the shut-off valves on the pressure tap connection (if present).
2. Open the pressure equalization valve of the valve block.
3. Open the shut-off valve of the high-pressure side (H) on the valve block.
4. Open the shut-off valve on the low-pressure side (L) on the valve manifold.
5. Close the pressure equalization valve.

Decommissioning is executed in the reverse sequence.
If, when using transmitters with type of protection "intrinsic safety", an ammeter is connected to the output circuit or a modem is connected in parallel while there is a risk of explosion, the sums of the capacitances and inductances of all circuits, including the transmitter (see EC-type examination certificate) must be equal to or less than the permissible capacitances and inductances of the intrinsically safe signal circuit (see EC-type-examination certificate for the power supply unit).
Only passive or explosion-proof test devices or display instruments may be connected.
If the output signal stabilizes only slowly, it is likely that a large damping time constant has been set on the transmitter.

5.2 Output signal

If the applied pressure is within the values indicated on the rating plate, the output current ranges between 4 and 20 mA. If the pressure applied falls outside the set

range, the output current will be between 3.5 mA and 4 mA if the range is under ranged or between 20 mA and 22 mA if the range is over range (depending on the respective configuration).
Standard setting for normal operation 3.8 mA / 20.5 mA

A current that is < 4 mA or > 20 mA may also indicate that the microprocessor has detected an internal error.
Standard setting for error detection 21.8 mA
In this case diagnosis of the error can be executed with the aid of different configuration tools.

NOTE

A brief interruption in the power supply results in initialization of the electronics (program restarts).

5.3 Zero-point correction following installation.

Once the transmitter has been installed, it is advisable to check the zero point and correct it if necessary.

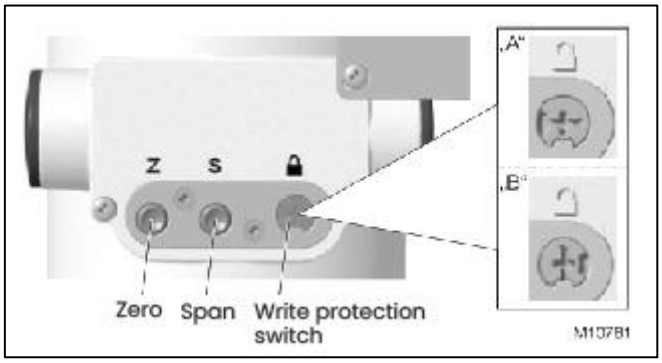


Fig. 28 operating buttons, write protection turn switch

5.3.1 Setting pre calibrated devices

(The lower range value has already been set to 0.) transmitters do not support this function if the "Level measurement" calculation function has been activated. In this case, the correction must be made using the optional LCD indicator, the handheld terminal, or the DTM.

NOTE

For this purpose, the DIP switch on the electronics board must be set to position 1.

A PV Bias / Offset correction can be performed via the local push buttons as follows:

- Separate the transmitter from the process and equalize the pressure in the two measuring chambers by adjusting the bypass valve in the manifold.
- Check the transmitter output signal If it is at 4 mA (or PV = 0), zero-point correction is not required.

If the output is not at zero, proceed as follows:

- Unscrew the screws attaching the name plate to the top of the transmitter housing.
- Rotate the name plate so that the push buttons can be accessed.
- Check that the write protection rotary switch is set to write enable.
- Press and hold down the zero button (Z) on the top of the transmitter for at least 3 seconds The output signal switches to 4 mA and the message "OPER DONE" appears on the LCD display (if there is one).
- If nothing happens, check the write protection rotary switch. It is probably set to write protection.
- For all other diagnosis notices, refer to the instructions.
- As soon as zero-point correction is complete, reconnect the transmitter to the process.
- Open the pressure equalization valve on the manifold.
- Open the shut-off valve of high-pressure side.
- Open the pressure equalization valve on the manifold.
- Open the shut-off valve on the low-pressure side.

5.3.2 Zero-point increase / suppression on predictable devices

(e.g., 4 ... 20 mA = -100 ... 100 mbar) This function is only supported by 266Jxx and 266Cxx transmitters if the calculation function has been disabled.

NOTE

For this purpose, the DIP switch on the electronics board must be set to position 0.

- Isolate the transmitter from the process and vent the transmitter measuring chamber(s) to atmosphere.
- Apply the lower range value pressure (4 mA). The pressure must be stable and applied with a high level of accuracy (< 0.05 %, observing the set damping value)
- Check the transmitter output signal If it is at 4 mA (or PV = 0), zero-point correction of the transmitter is not required. If the output is not at zero, proceed as follows:
- Unscrew the screws attaching the name plate to the top of the transmitter housing.
- Rotate the name plate so that the push buttons can be accessed.
- Check that the write protection rotary switch is set to write enable.

- Press and hold down the zero button (Z) on the top of the transmitter for at least 3 seconds The output signal switches to 4 mA and the message “OPER DONE” appears on the LCD display (if there is one)
- If nothing happens, check the write protection rotary switch. It is probably set to write protection.
- For all other diagnosis notices, refer to the instructions.
- As soon as zero-point correction is complete, reconnect the transmitter to the process
- Open the pressure equalization valve on the manifold.
- Open the shut-off valve of high-pressure side.
- Open the pressure equalization valve on the manifold.
- Open the shut-off valve on the low-pressure side.

NOTE

After the transmitter has been adjusted as described above, the zero bias / offset value is activated and stored in the memory of the transmitter. In this case calibration of the transmitter is can no longer be executed. Only if the PV bias / offset value is reset, will a sensor calibration be possible again.

6 Configuration

The transmitter is delivered preconfigured according to the information provided when placing the order. However, should a change to the configuration be necessary (because measuring point data has changed since the original plans were drawn up, for example), the following options are available:

- Local keypad for the LRV / URV setting (266Jxx only) and zero-point correction following installation.
- Menu-led configuration of the transmitter with the integrated LCD indicator
- Configuration using a handheld terminal.
- Configuration using a PC / laptop with graphical user interface (DTM)

How to use these tools to make the configuration settings is described in the corresponding related documentation.

6.1 Write protection.

The write protection prevents unauthorized users from overwriting the configuration data. With activated write protection the operating buttons "0% (Z)" and "100 % (S)" have no function.
A change of parameters with the integral LCD indicator, via a handheld terminal, or the user interface (DTM) are not possible either.
However, the configuration data can be read out via the graphic user interface (DTM) or a comparable communication tool. If needed the operating device can also be sealed with a lead seal.

Write protection can be activated as follows (see also the symbols on the plate).

1. Use a suitable screwdriver to press the switch all the way down.
2. Turn the switch 90° clockwise.

NOTE

To deactivate write protection, press the switch down slightly and then turn it counterclockwise 90°.

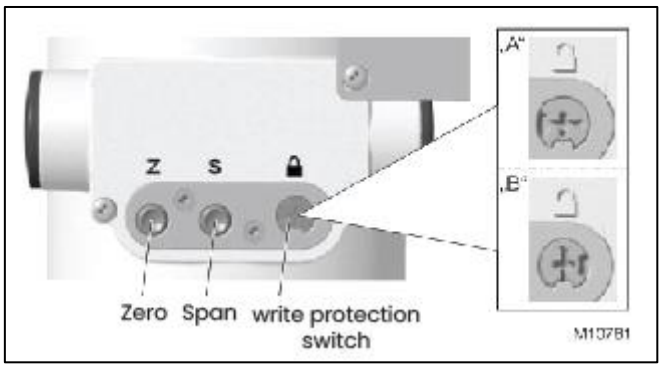


Fig. 29 operating buttons, write protection turn switch.

6.2 Hardware settings

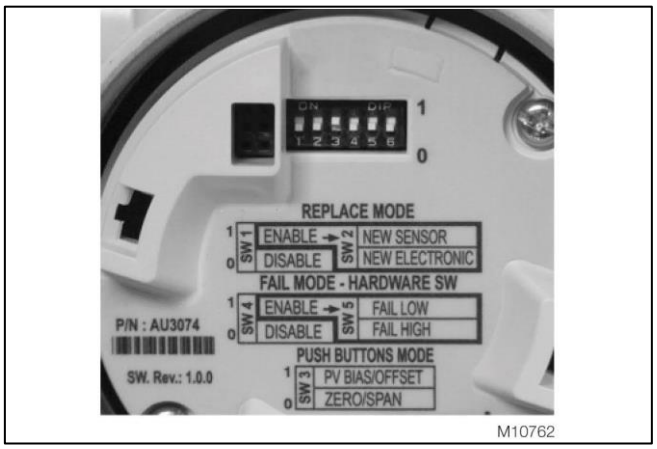


Fig. 30 DIP switches

There are six DIP switches on the secondary electronics. They are used to make settings if an LCD display is not present.

DIP switches 1 and 2 activate REPLACE MODE for the sensor and the secondary electronics (NEW SENSOR / NEW ELECTRONIC).

DIP switch 3 specifies the functions of the external pushbuttons (Z/S) PUSHBUTTON MODE). Zero corrections / span corrections or PV offset (bias) / PV offset (bias) reset.

DIP switches 4 and 5 are used to select the alarm current (high / low).

NOTE

Always disconnect the device from the power supply before making changes to DIP switches. The device must then be restarted in order for the new configurations to be loaded.

Replace mode (DIP switches 1 and 2)
In normal mode the DIP switches 1 and 2 are in position 0. If a replacement procedure is necessary, they will be activated.
When replacing the electronics or the sensor, disconnect the power supply and move DIP switch 1 to position 1. When replacing the secondary electronics, disconnect the power supply and move DIP switch 2 to position 0. The sensor can be replaced when DIP switch 2 is in position 1.

NOTE

We recommend resetting the corresponding DIP switch to position 0 after each replace operation.

Push buttons mode (DIP switch 3)
DIP switch 3 is factory-set to position 1. This means that the the zero pushbutton (Z) sets the PV offset (bias) value (bias = current digital measured value) to 0 and the span push button resets the PV offset (bias) value set to 0 with (Z). If this DIP switch is on position 0, the zero button (Z) and the span button (S) are used for setting the start of the measuring range (zero) and measuring voltage (span). For this the appropriate pressure for the values to be set must be specified.

NOTE

For 266Cxx transmitters, we recommend always leaving DIP switch 3 in position 1.

Fail mode (DIP switches 4 and 5)
Users wishing to modify the factory-set parameters for the alarm current (in the event of a transmitter failure) must set DIP switch 4 to position 1. Consequently, users must select whether the output is to change to the minimum or maximum output current.

DIP switch 5:

- The output is high in position 0 (> 20 mA to 22 mA; please specify exactly)
- The output is low in position 1 (< 4 mA to 3.7 mA; please specify exactly)

6.3 Factory setting

The transmitters calibrated in the factory to the measuring range specified by the customer. The calibrated measuring range and the measuring point tag are specified on an additional labelling plate. If nothing is specified by the customer in this regard, the transmitter will be delivered with a standard configuration, that contains the following parameters (among others).

Parameter	**Factory setting**
Measuring range start (LRV) (4 mA)	Zero
Measuring range end (URV) (20 mA)	Upper measuring range limit (URL)
Transmission function for the output	Mass flow for 3800XA Linear for 3800XA
Damping	1 second
Safety mode at transmitter failure (alarm)	High alarm (21.8 mA)
Presentation of the optional LCD display	Process value PV (1-place) and bar diagram of the output signal

Each of the parameters listed here can be easily set via the optional LCD display with operating menu, a HART handheld terminal, or a compatible software solution.

6.4 Configuration of the transmitter without integrated LCD display

NOTE

The configuration possibilities described below are only possible for the models 266Cxx with switched off rake function and for the 3800XA models.

The parameters “start of measuring range” and “Span” are set directly on the transmitter via the operating buttons. These operating buttons are arranged under the rating plate///.
To operate the device locally, unscrew the fastening screws of the rating plate, and swing the rating plate clockwise to the side.

NOTE

The use of magnetic screwdrivers results in damage of components. Do not use a magnetic screwdriver to operate the buttons.

The transmitter has been calibrated by the manufacturer based on the order information. The set measuring range start and measuring/// range end are specified on the identification plate.
The following always applies:

- The first pressure value (e.g., 0 mbar) is always assigned to the 4 mA signal (or 0%) and the second pressure value (e.g. 400 mbar) is always assigned to the 20 mA signal (or 100%).
- To make new settings on the transmitter "measuring range start" and measuring range end" are specified on the measuring cell as pressure. In this regard, measuring range limits must not be exceeded.

NOTE

A reducing station with adjustable pressure and reference display can be used as the pressure generator.

For the connection, ensure that liquid residues (for gaseous test materials) or air bubbles (for liquid test materials) are not in the impulse line; liquid residue can cause measurement errors in the test.
The possible measuring error for the pressure generator should be at least three times less than the desired measuring error for the transmitter.
It is required to set the damping to the value "zero".

6.4.1 Configuration of LRV and URV (4 "……."20mA range)

1. Measuring range start pressure (4 mA) - specified by the process or by a pressure generator. Pressure must be stable and must be applied with high accuracy < 0.05%. Press operating button "Z". The output current is set to 4 mA.
2. Charge the transmitter with the pressure that corresponds to the end of the measuring range, and wait
3. for approx. 30 seconds, until it has stabilized.
4. Press the operating button "S". The output current is set itself to 20 mA.
5. If required, reset the damping back to the original value.
6. Document the new values that have been set. The appropriate parameters will be saved 10 seconds after the last activation of the operating button "Z" or "S" in non-volatile memory.

NOTE

This configuration procedure only changes the 4 … 20 mA current signal; the process value shown on the digital display, or the user interface remain unchanged in this process. Possible differences can be avoided as described. After such a correction, the device configuration must be checked.

6.5 Configuration of the pressure transmitter menu controlled without integrated LCD display.

The LCD display is only used for visualization of the measured values and for configuration of the display and of the transmitter.
In addition, diagnostics messages are displayed.

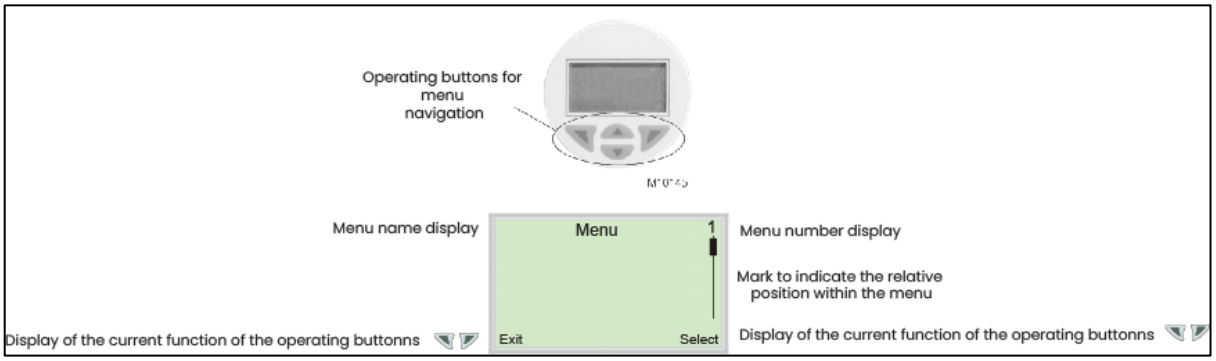


Fig. 31 LCD display

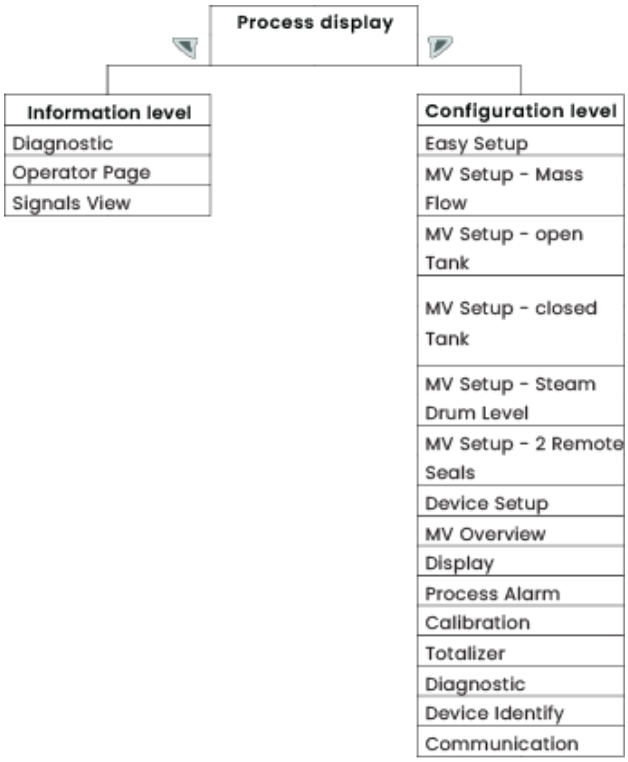
You can use the ▲ or ▼ operating buttons to browse through the menu or select a number or character within a parameter value.
Different functions can be assigned to the ◥ and ◤ operating buttons. The function that is currently assigned (5) is shown on the LCD display.

Operating button functions

◥	Meaning
Exit	Exit menu
Back	Go back one submenu
Cancel	Cancel 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

6.5.1 Menu levels



Process display	The process display shows the current process values.
Information level	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	The configuration level contains all the parameters required for device commissioning and configuration. The device configuration can be changed on this level.

Process display
The process display appears on the LCD display when the device is powered on. It shows information about the device and current process values. The way the current process values are shown can be adjusted on the configuration level, in the “Display “menu.

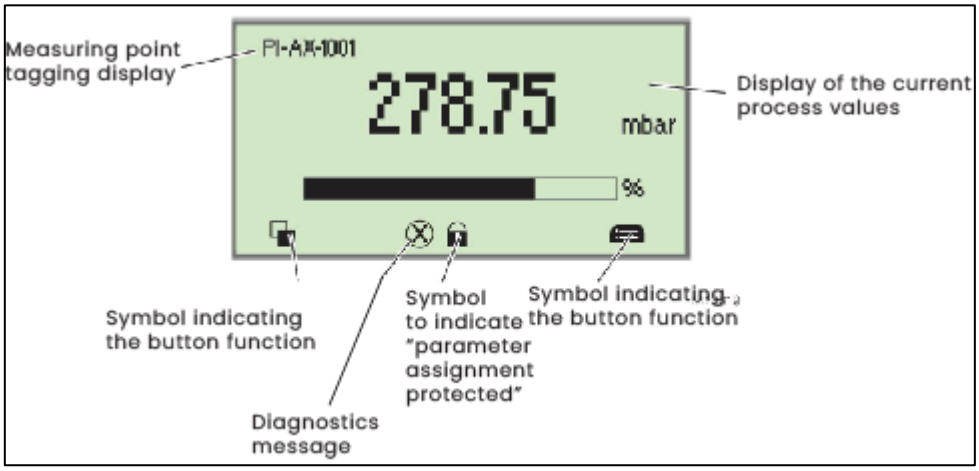


Fig. 32 Process display (example)

Description of symbols

Symbol	Description
	Call up information level.
	Call up configuration level.
	The device is protected against changes in the parametrization.

6.5.1 Activation of the operating menu

To access the operating menu, it must first be activated.

Standard LCD indicator (option L1)
For devices with standard LCD indicator, unscrew the housing cover with sight glass to obtain access to the display. When used in hazardous areas, always comply with the relevant directive before the housing is opened. Activate the operating button to call up the configuration level. Activate the operating button to call up the information level.

LCD indicator with TTG technology (option L5)
For devices with LCD indicators with TTG technology, activation can occur without opening the housing cover of the transmitter. The capacitive pickups that a person is taping with their finger on the glass over the appropriate operating button and triggers the appropriate command. When the transmitter is switched on, the operating interface automatically calibrates its sensitivity. Consequently to ensure trouble-free function of the operating interface with TTG function, the housing cover must be correctly screwed down when switching on the device.
If in the meantime the housing cover has been removed, to gain access to the electronics module, we recommend that you switch the energy supply off and then on again, as soon as the housing cover with the sight glass has been correctly screwed down.

Activation of the operating menu is executed as described:

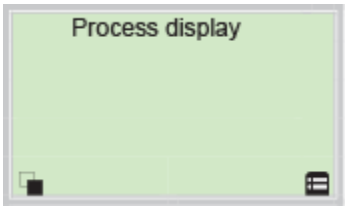
1. Press the upper, middle operating button and hold it until two symbols appear in the lower left and right in the display.

2. Within 1 second activate the operating button below the right symbol to call up the configuration level, or left activate the operating button to call up the information level.

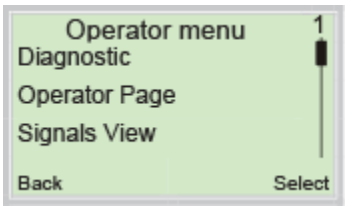
NOTE

If the contrast is out of adjustment to the extent that the display can no longer be read, the factory settings can be restored by simultaneous activation of the operating buttons and .

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. Use to go to the information level.



2. Use or select a submenu.
3. Confirm the selection with .

Menu	**Description**
... / Operator Menu	
Diagnostic	Display of the current alarms and messages.
Operator Page	Switches to the process display.
Signals View	Selects the "Signals View" submenu (only for service purposes).

If there is an error, a message consisting of a symbol and text (e.g. Electronics) appears at the bottom of the process display. 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.

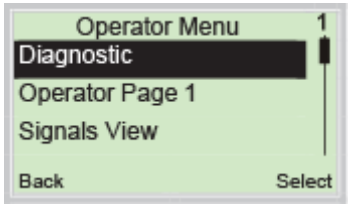
Symbol	Description
	Error / failure
	Function check
	Outside of the specification
	Maintenance required

The error messages are also divided into the following areas:

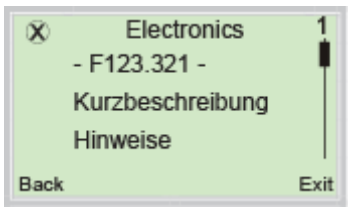
Area	Description
Process	Diagnostic messages that refer to the process and display impairments or states.
Sensor	Alarms that indicate problems with the measuring cell.
Electronics	Errors in the device electronics are displayed.
Configuration	Missing or faulty configuration of the transmitter is detected.

Calling up the error description
Additional details about the error that has occurred can be called up on the information level.

1. Use to go to the information level.



2. Use or select the submenu "Diagnostic".
3. Confirm the selection with .

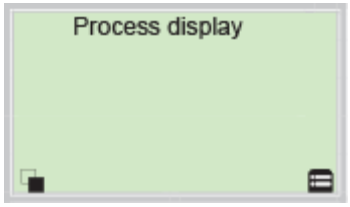


The first line shows the area in which the error has occurred. The second line shows the unique error number. The next lines show a brief description of the error and information on how to remedy it.

NOTE

For a detailed description of the errors and fault correction instructions, please refer to Chapter 12 "Error messages".

Switching to the configuration level (parameterization) The device parameters can be displayed and changed on the configuration level.

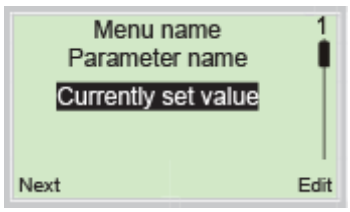


1. Change to the configuration level with .

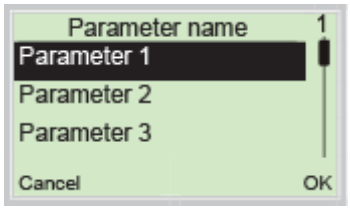
6.5.2 Selecting and changing parameters

Entry from table

When an entry is made from a table, a value is selected from a list of parameter values.



1. Select the parameters you want to set in the menu.
2. Use to call up the list of available parameter values. The parameter value that is currently set is highlighted.

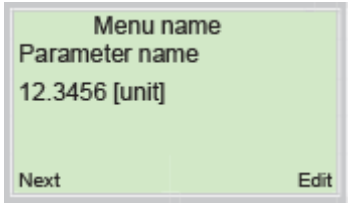


3. Use or to select the desired value.
4. Confirm the selection with .

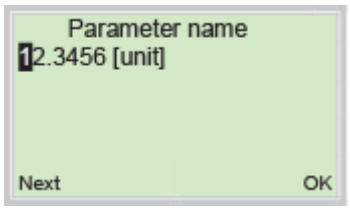
This concludes the procedure for selecting a parameter value.

Numerical entry

When a numerical entry is made, a value is set by entering the individual decimal positions.



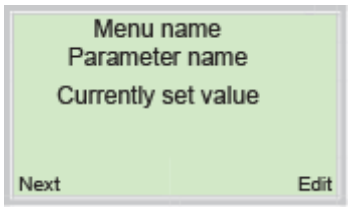
1. Select the parameters you want to set in the menu.
2. Use to call up the parameter for editing. The decimal place that is currently selected is highlighted



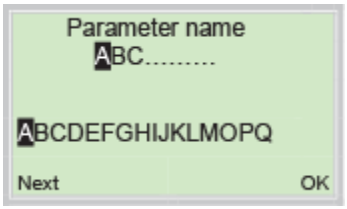
3. Use to select the next decimal place to change.
4. Use or to set the desired value.
5. Use to select the next decimal place.
6. If necessary select and set additional decimal places in accordance with steps 3 to 4.
7. Use to confirm the setting.

This concludes the procedure for changing a parameter value.

Alphanumeric entry
When an alphanumeric entry is made, a value is set by entering the individual characters.



1. Select the parameters you want to set in the menu.
2. Use to call up the parameter for editing. The currently selected character will be shown highlighted.



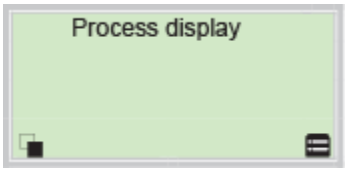
3. Use to select the character to be changed.
4. Use or select the desired character
5. Use to select the next character.
6. If necessary select and set additional characters in accordance with steps 3 to 4.
7. Confirm the setting with .

This concludes the procedure for changing a parameter value.

6.5.3 Easy Set-Up

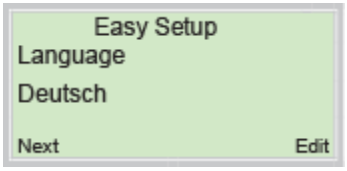
The device can be factory parameterized to customer specifications upon request. If no customer information is available, the device is delivered with factory settings.

The setting of the most current parameters is summarized in the "Easy Setup" menu.

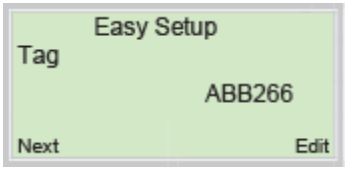


1. Press the operating key and keep it depressed until both symbols are shown left and right in the lower process display.
2. Change to the configuration level with .

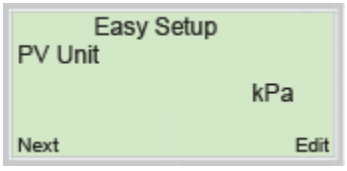
3. Use or to select “Easy Setup”.
4. Confirm the selection with .



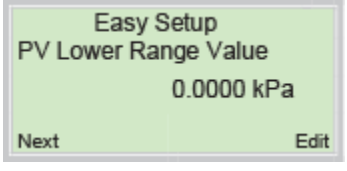
5. Use to call up edit mode.
6. Use or to select the desired language.
7. Confirm the selection with .
8. Go to the next menu item with .



9. Use to call up edit mode.
10. Enter the desired measurement point code
11. Confirm the selection with .
12. Go to the next menu item with .

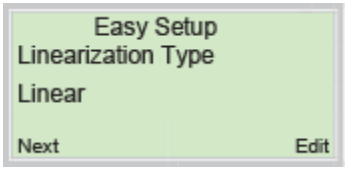


13. Use to call up edit mode.
14. Use or to select the desired unit.
15. Confirm the selection with .
16. Go to the next menu item with .

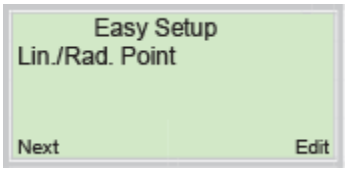


17. Use to call up edit mode.
18. Use or to set the start of the measurement range (LRV).
19. Confirm the selection with .
20. Go to the next menu item with .

21. Use to call up edit mode.
22. Use or to set the end of the measuring range (URV).
23. Confirm the selection with .
24. Go to the next menu item with .

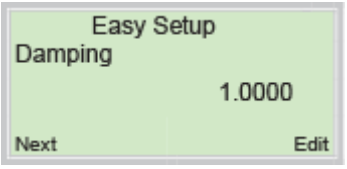


25. Use to call up edit mode.
26. Use or to select the desired transmission function.
27. Confirm the selection with .
28. Go to the next menu item with .

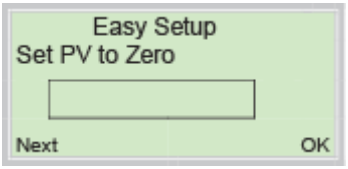


29. Use to call up edit mode.
30. Use or to select the desired Lin./Rad. transition.
31. Confirm the selection with .
32. Go to the next menu item with .

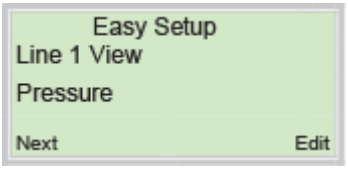
33. Use to call up edit mode.
34. Use or to select the desired low flow cut off.
35. Confirm the selection with .
36. Go to the next menu item with .



37. Use to call up edit mode.
38. Use or to select the desired damping.
39. Confirm the selection with .
40. Go to the next menu item with .



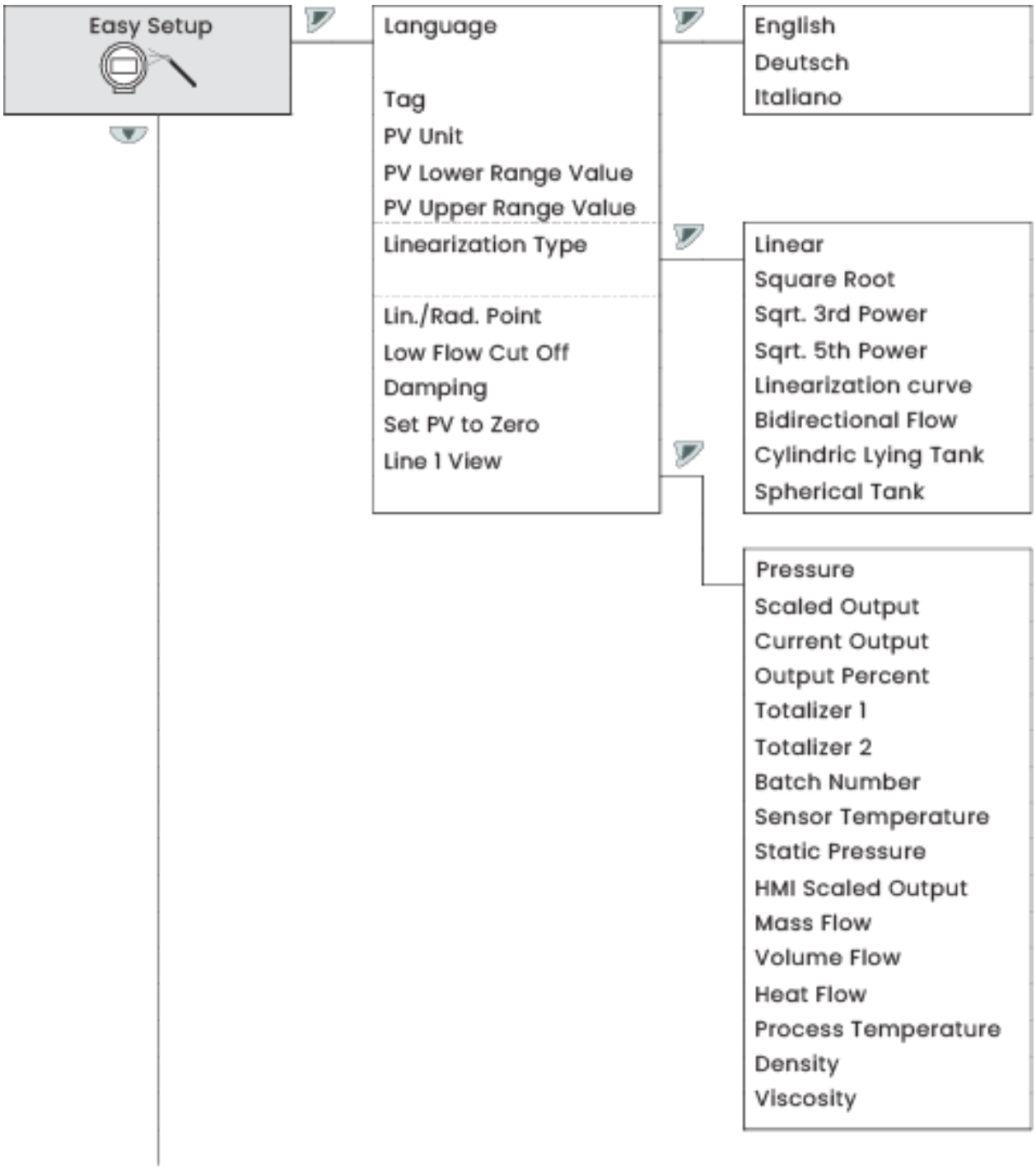
41. Use to call up edit mode.
42. Use to start automatic correction of the install position.
43. Go to the next menu item with .

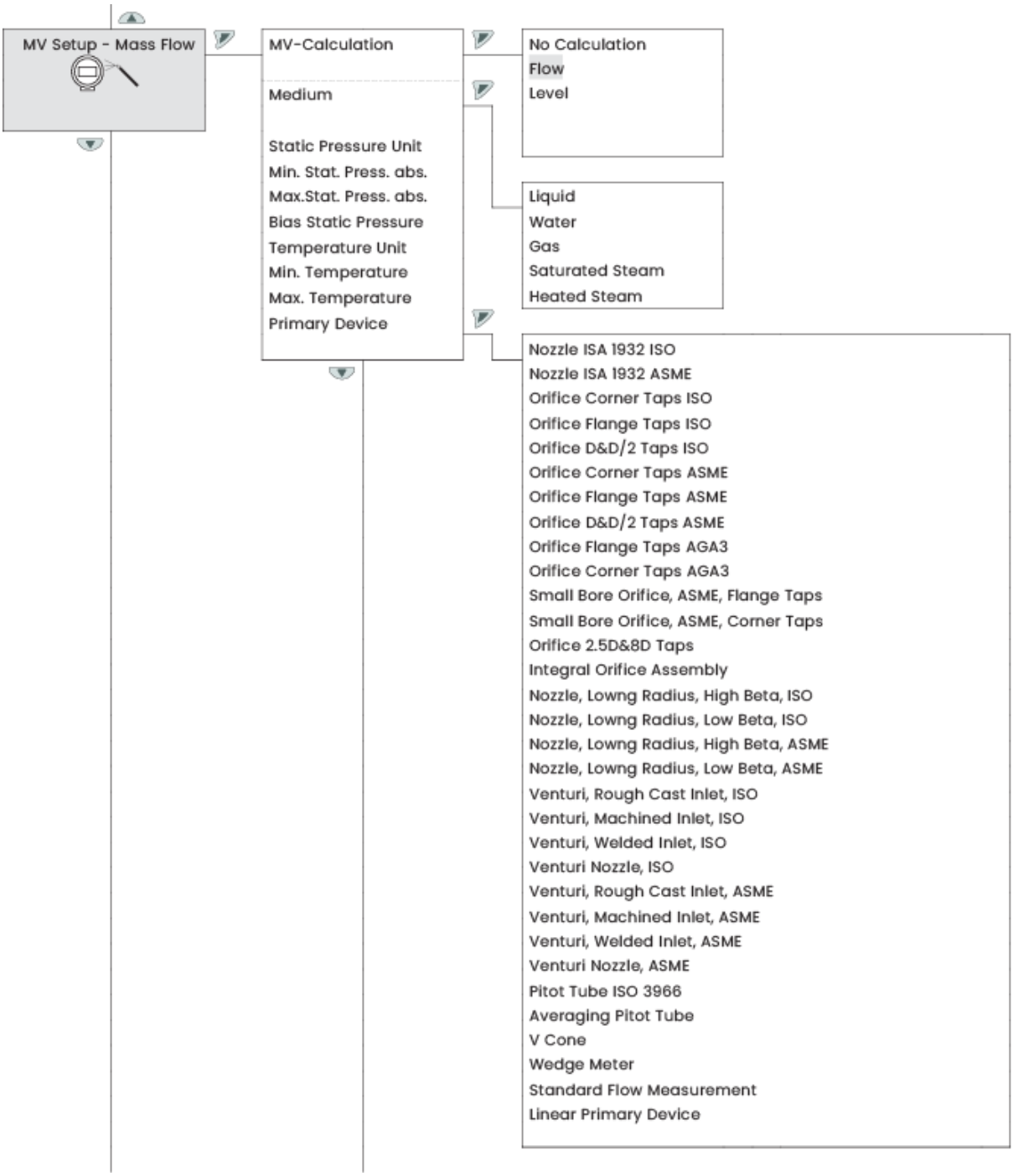


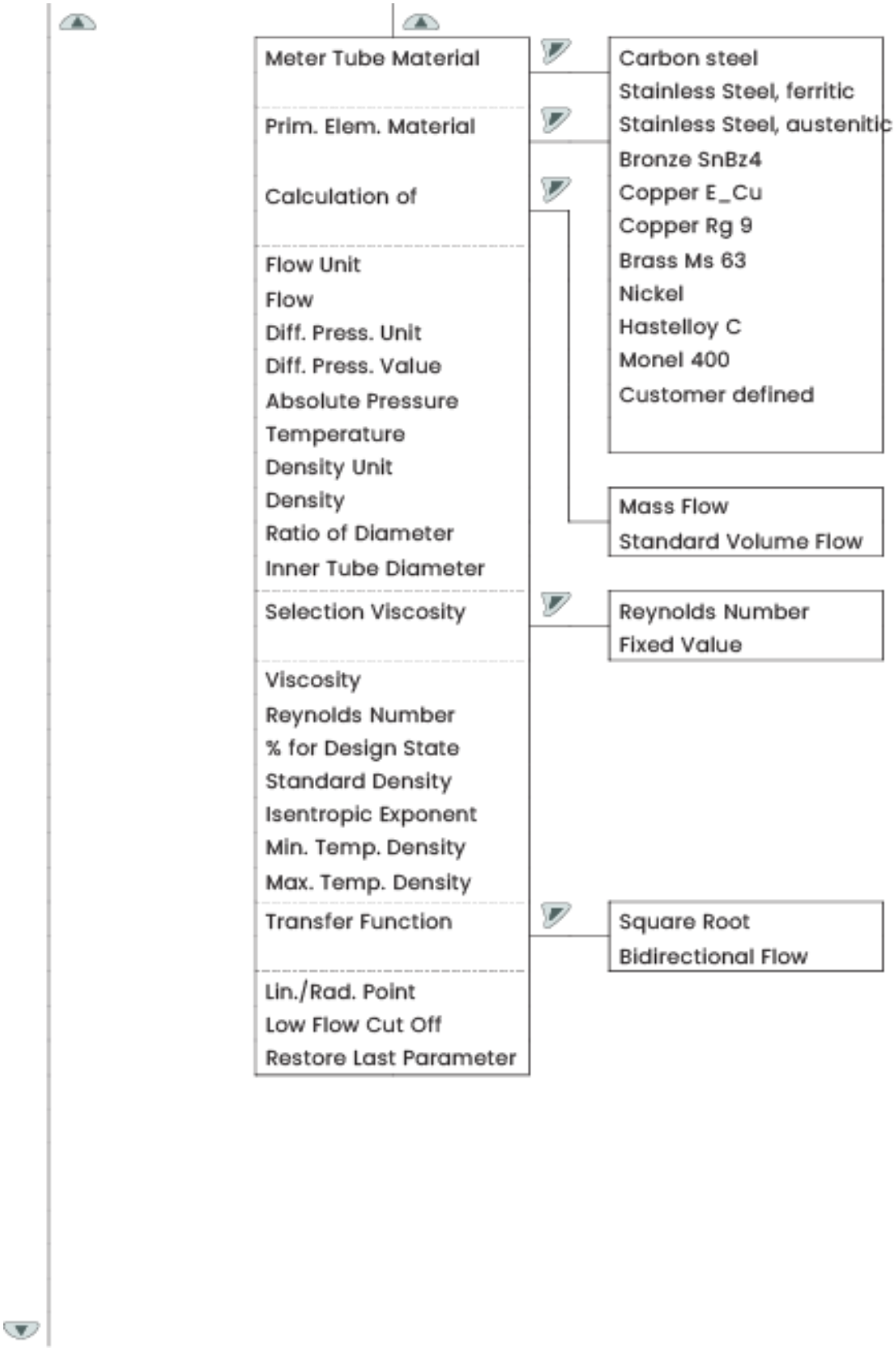
44. Use to call up edit mode.
45. Use or to select the desired value for display in the first line of the LCD display.
46. Confirm the selection with .

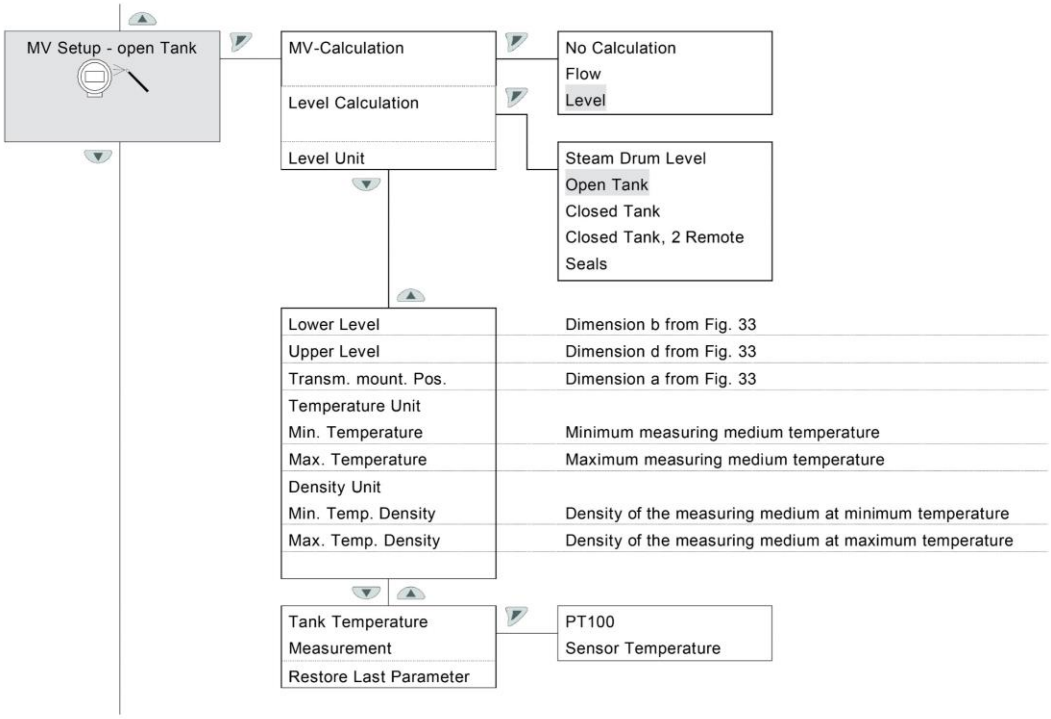
NOTE

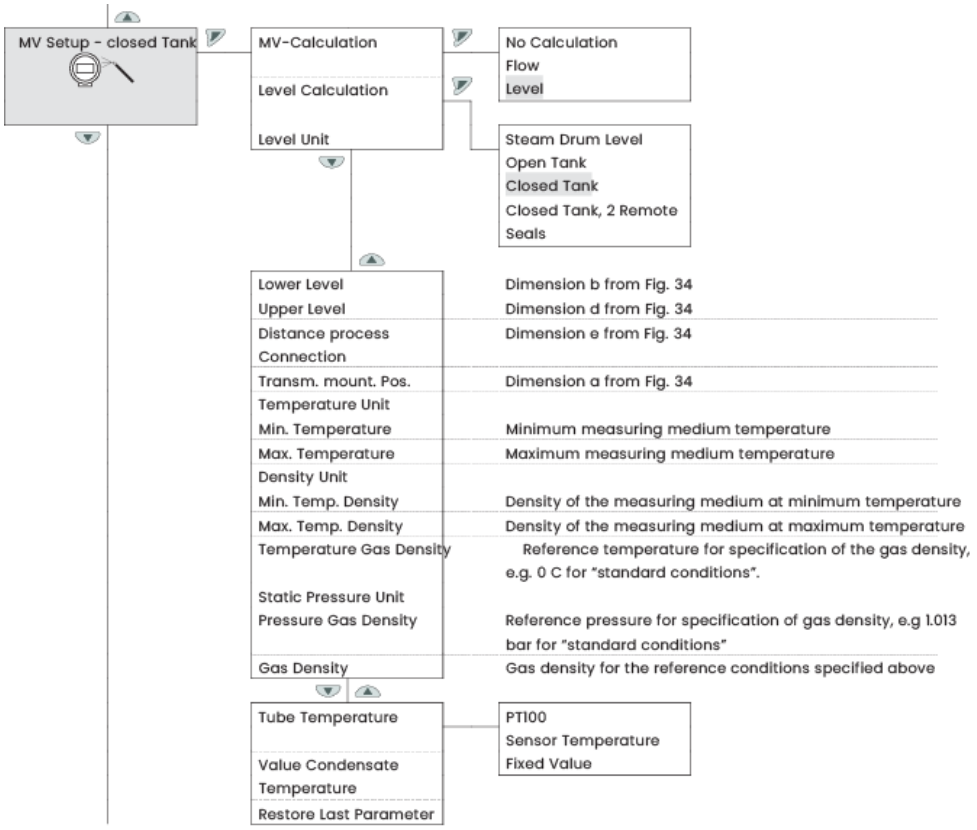
This overview of parameters shows all the menus and parameters available on the device. Depending on the version and configuration of the device, not all of the menus and parameters may be visible in it.


Easy Setup
Language
Tag
PV Unit
PV Lower Range Value
PV Upper Range Value
Linearization Type
Lin./Rad. Point
Low Flow Cut Off
Damping
Set PV to Zero
Line 1 View
English
Deutsch
Italiano
Linear
Square Root
Sqrt. 3rd Power
Sqrt. 5th Power
Linearization curve
Bidirectional Flow
Cylindric Lying Tank
Spherical Tank
Pressure
Scaled Output
Current Output
Output Percent
Totalizer 1
Totalizer 2
Batch Number
Sensor Temperature
Static Pressure
HMI Scaled Output
Mass Flow
Volume Flow
Heat Flow
Process Temperature
Density
Viscosity


MV Setup - Mass Flow
MV-Calculation
Medium
Static Pressure Unit
Min. Stat. Press. abs.
Max.Stat. Press. abs.
Bias Static Pressure
Temperature Unit
Min. Temperature
Max. Temperature
Primary Device
No Calculation
Flow
Level
Liquid
Water
Gas
Saturated Steam
Heated Steam
Nozzle ISA 1932 ISO
Nozzle ISA 1932 ASME
Orifice Corner Taps ISO
Orifice Flange Taps ISO
Orifice D&D/2 Taps ISO
Orifice Corner Taps ASME
Orifice Flange Taps ASME
Orifice D&D/2 Taps ASME
Orifice Flange Taps AGA3
Orifice Corner Taps AGA3
Small Bore Orifice, ASME, Flange Taps
Small Bore Orifice, ASME, Corner Taps
Orifice 2.5D&8D Taps
Integral Orifice Assembly
Nozzle, Lowng Radius, High Beta, ISO
Nozzle, Lowng Radius, Low Beta, ISO
Nozzle, Lowng Radius, High Beta, ASME
Nozzle, Lowng Radius, Low Beta, ASME
Venturi, Rough Cast Inlet, ISO
Venturi, Machined Inlet, ISO
Venturi, Welded Inlet, ISO
Venturi Nozzle, ISO
Venturi, Rough Cast Inlet, ASME
Venturi, Machined Inlet, ASME
Venturi, Welded Inlet, ASME
Venturi Nozzle, ASME
Pitot Tube ISO 3966
Averaging Pitot Tube
V Cone
Wedge Meter
Standard Flow Measurement
Linear Primary Device


Meter Tube Material
Prim. Elem. Material
Calculation of
Flow Unit
Flow
Diff. Press. Unit
Diff. Press. Value
Absolute Pressure
Temperature
Density Unit
Density
Ratio of Diameter
Inner Tube Diameter
Selection Viscosity
Viscosity
Reynolds Number
% for Design State
Standard Density
Isentropic Exponent
Min. Temp. Density
Max. Temp. Density
Transfer Function
Lin./Rad. Point
Low Flow Cut Off
Restore Last Parameter
Carbon steel
Stainless Steel, ferritic
Stainless Steel, austenitic
Bronze SnBz4
Copper E_Cu
Copper Rg 9
Brass Ms 63
Nickel
Hastelloy C
Monel 400
Customer defined
Mass Flow
Standard Volume Flow
Reynolds Number
Fixed Value
Square Root
Bidirectional Flow


MV Setup - open Tank
MV-Calculation
Level Calculation
Level Unit
No Calculation
Flow
Level
Steam Drum Level
Open Tank
Closed Tank
Closed Tank, 2 Remote Seals
Lower Level
Upper Level
Transm. mount. Pos.
Temperature Unit
Min. Temperature
Max. Temperature
Density Unit
Min. Temp. Density
Max. Temp. Density
Dimension b from Fig. 33
Dimension d from Fig. 33
Dimension a from Fig. 33
Minimum measuring medium temperature
Maximum measuring medium temperature
Density of the measuring medium at minimum temperature
Density of the measuring medium at maximum temperature
Tank Temperature Measurement
Restore Last Parameter
PT100
Sensor Temperature


MV Setup - closed Tank
MV-Calculation
Level Calculation
Level Unit
No Calculation
Flow
Level
Steam Drum Level
Open Tank
Closed Tank
Closed Tank, 2 Remote Seals
Lower Level
Upper Level
Distance process Connection
Transm. mount. Pos.
Temperature Unit
Min. Temperature
Max. Temperature
Density Unit
Min. Temp. Density
Max. Temp. Density
Temperature Gas Density
Static Pressure Unit
Pressure Gas Density
Gas Density
Dimension b from Fig. 34
Dimension d from Fig. 34
Dimension e from Fig. 34
Dimension a from Fig. 34
Minimum measuring medium temperature
Maximum measuring medium temperature
Density of the measuring medium at minimum temperature
Density of the measuring medium at maximum temperature
Reference temperature for specification of the gas density, e.g. 0 C for "standard conditions".
Reference pressure for specification of gas density, e.g 1.013 bar for "standard conditions"
Gas density for the reference conditions specified above
Tube Temperature
Value Condensate Temperature
Restore Last Parameter
PT100
Sensor Temperature
Fixed Value

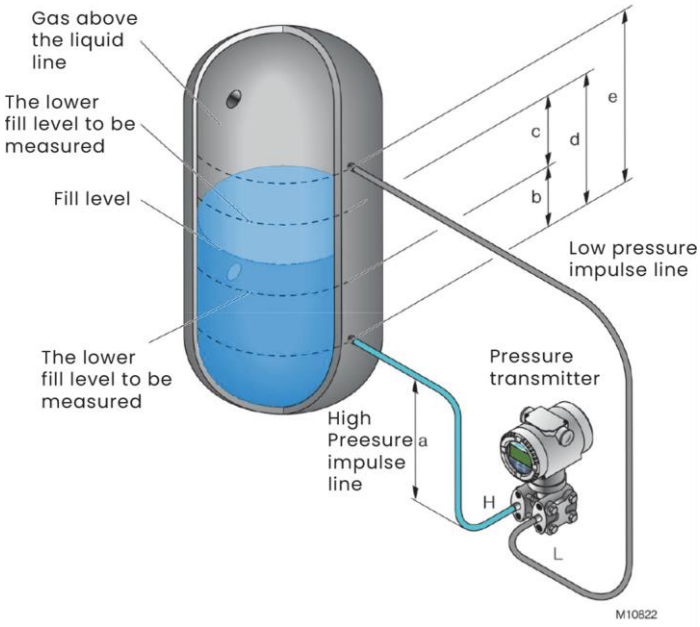


Fig. 33 Diagram - "Level measurement - open tank"

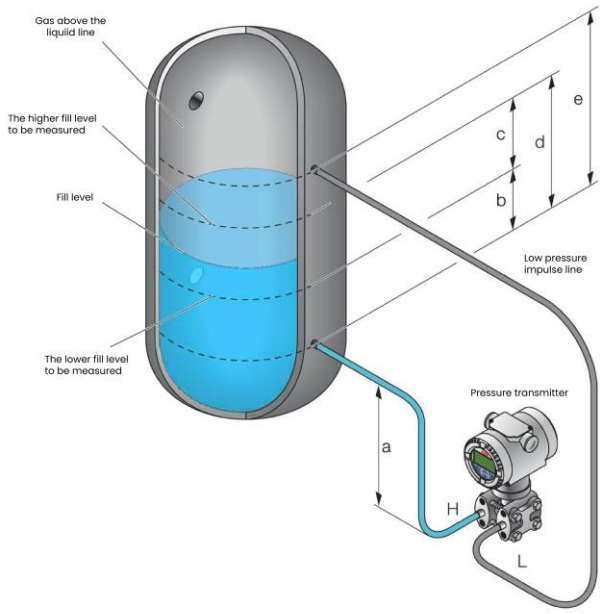
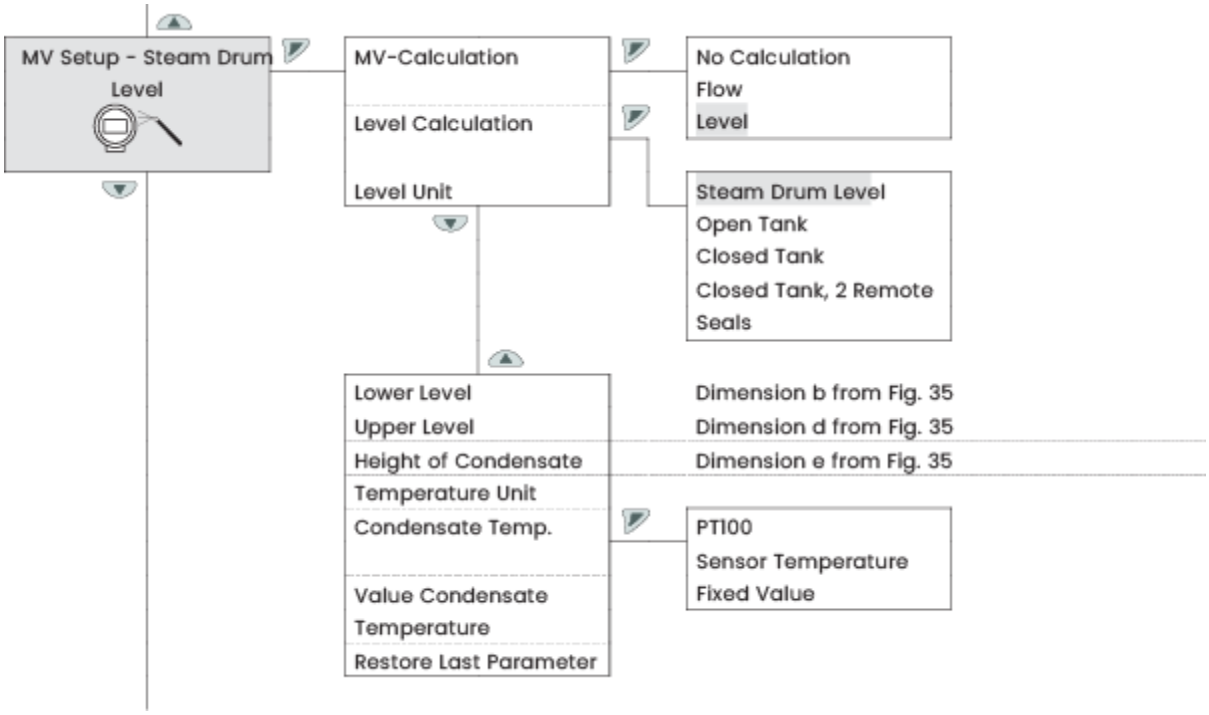


Fig. 34 Diagram - "Level measurement - closed tank"



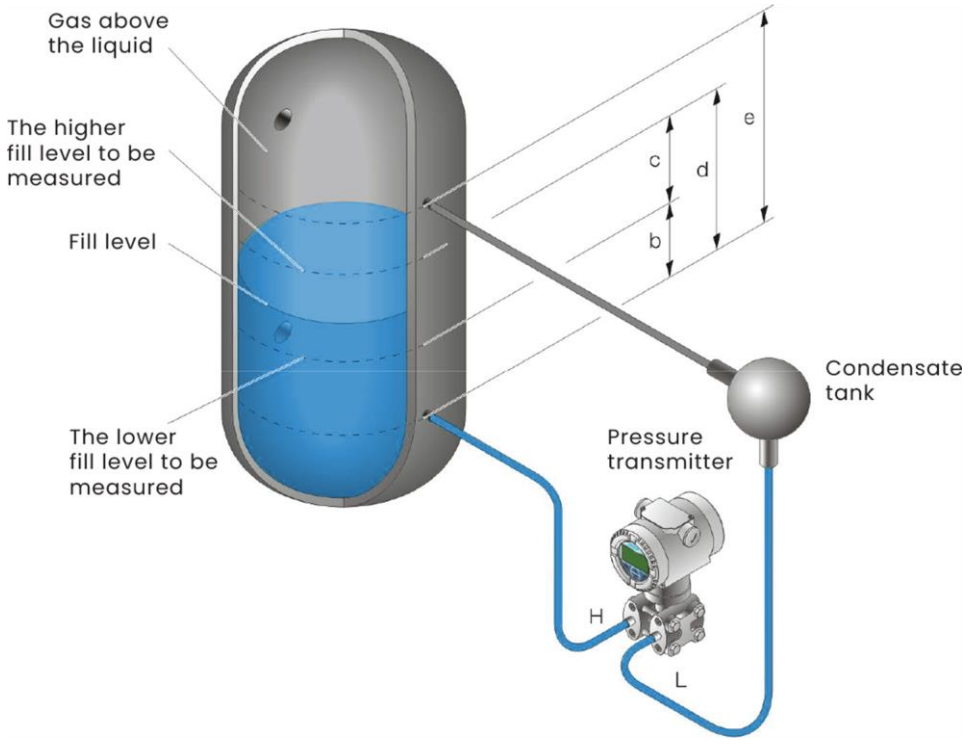
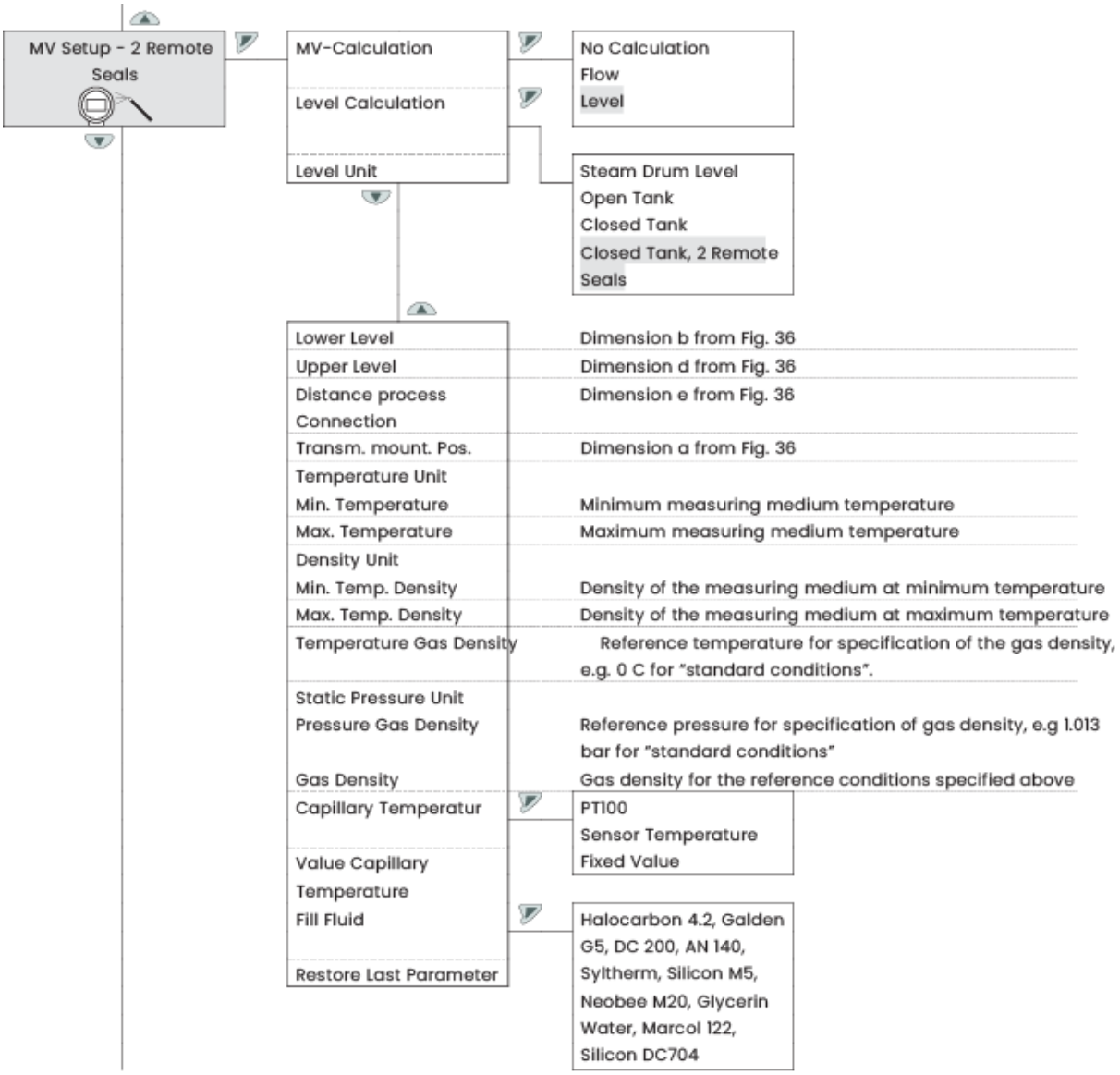


Fig. 35 Level measurement on the steam boilers (drum water level)



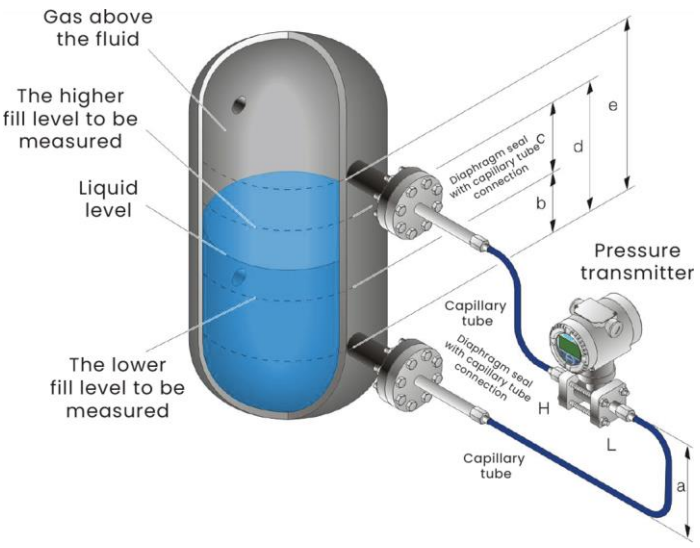
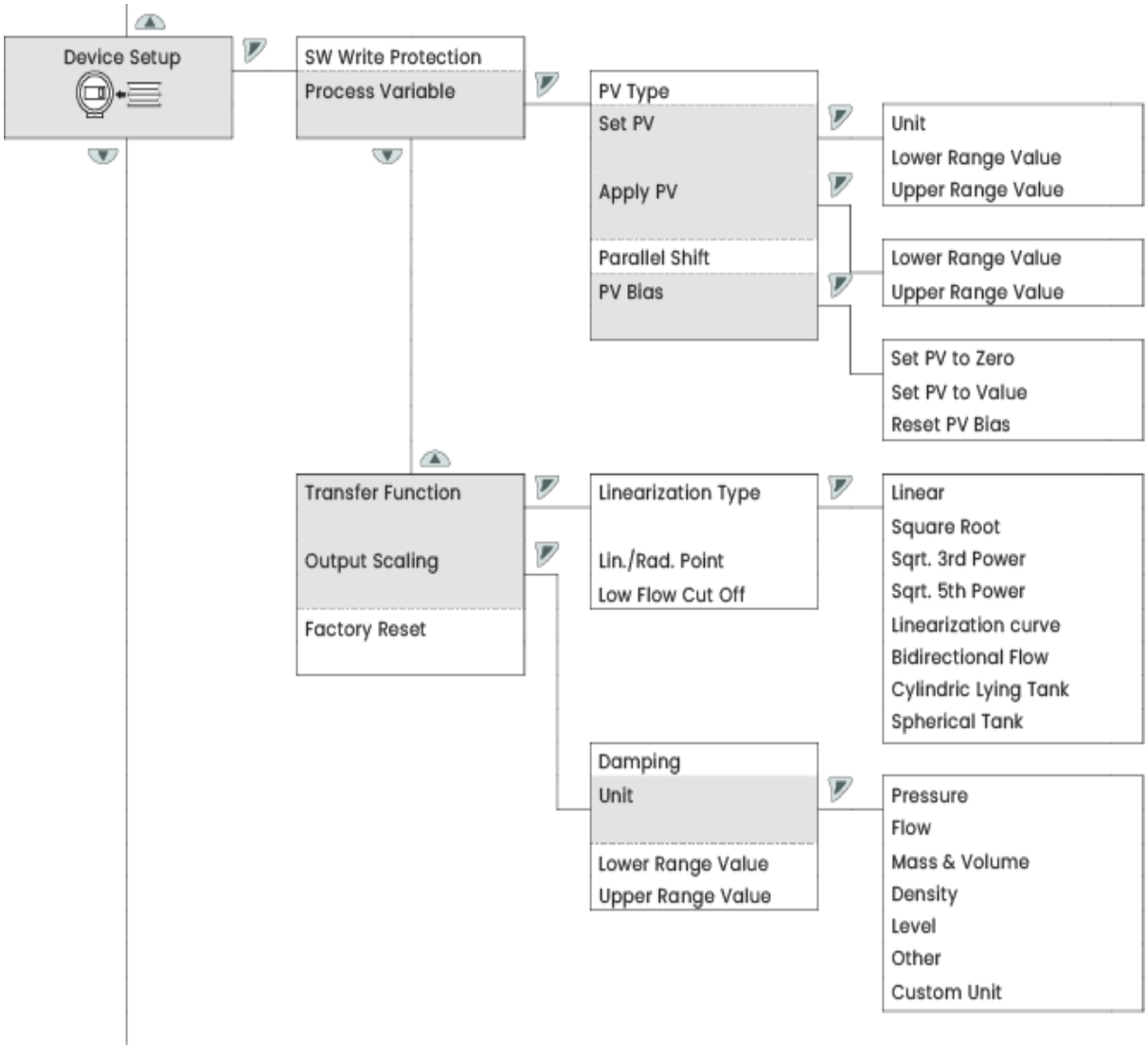
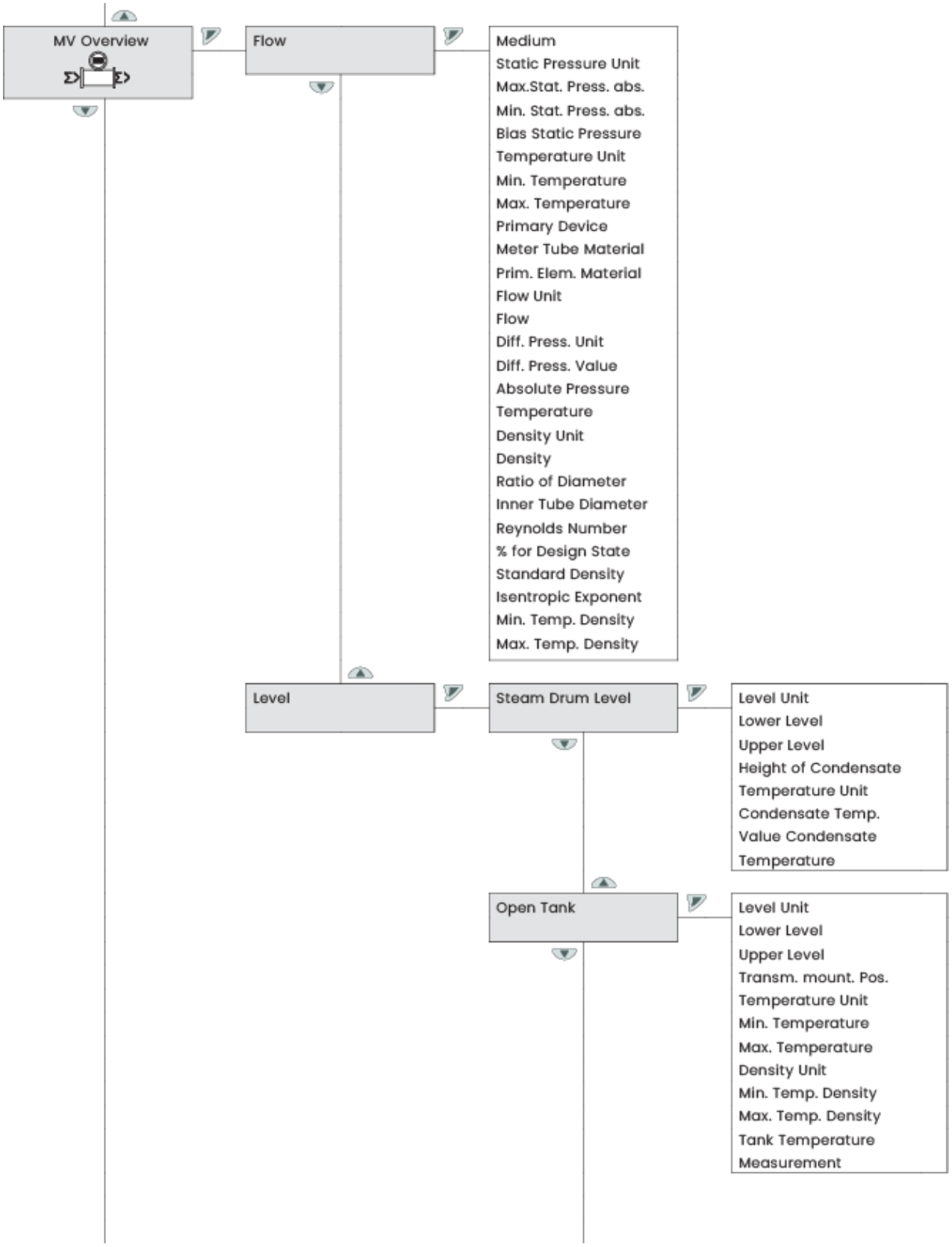
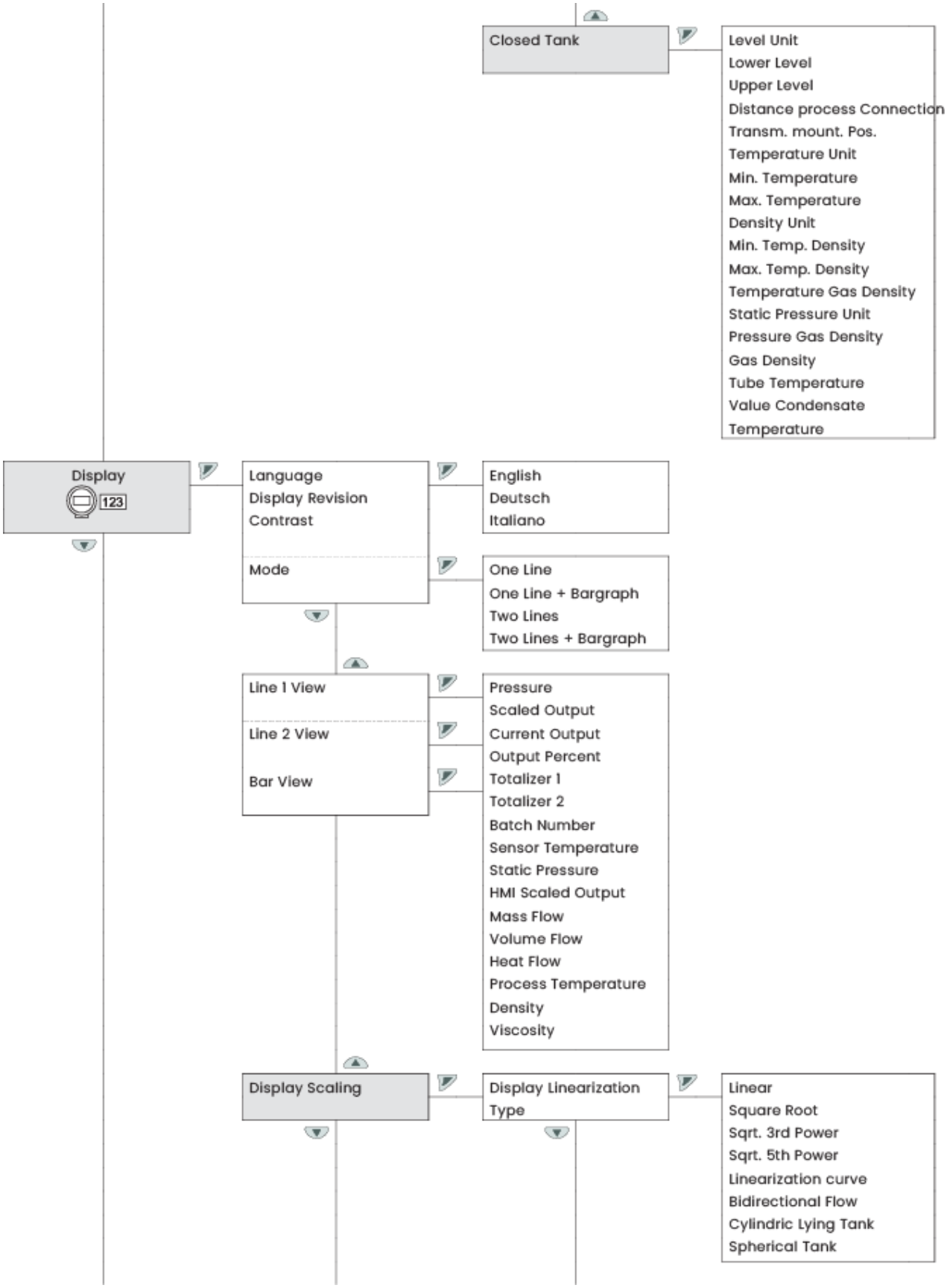
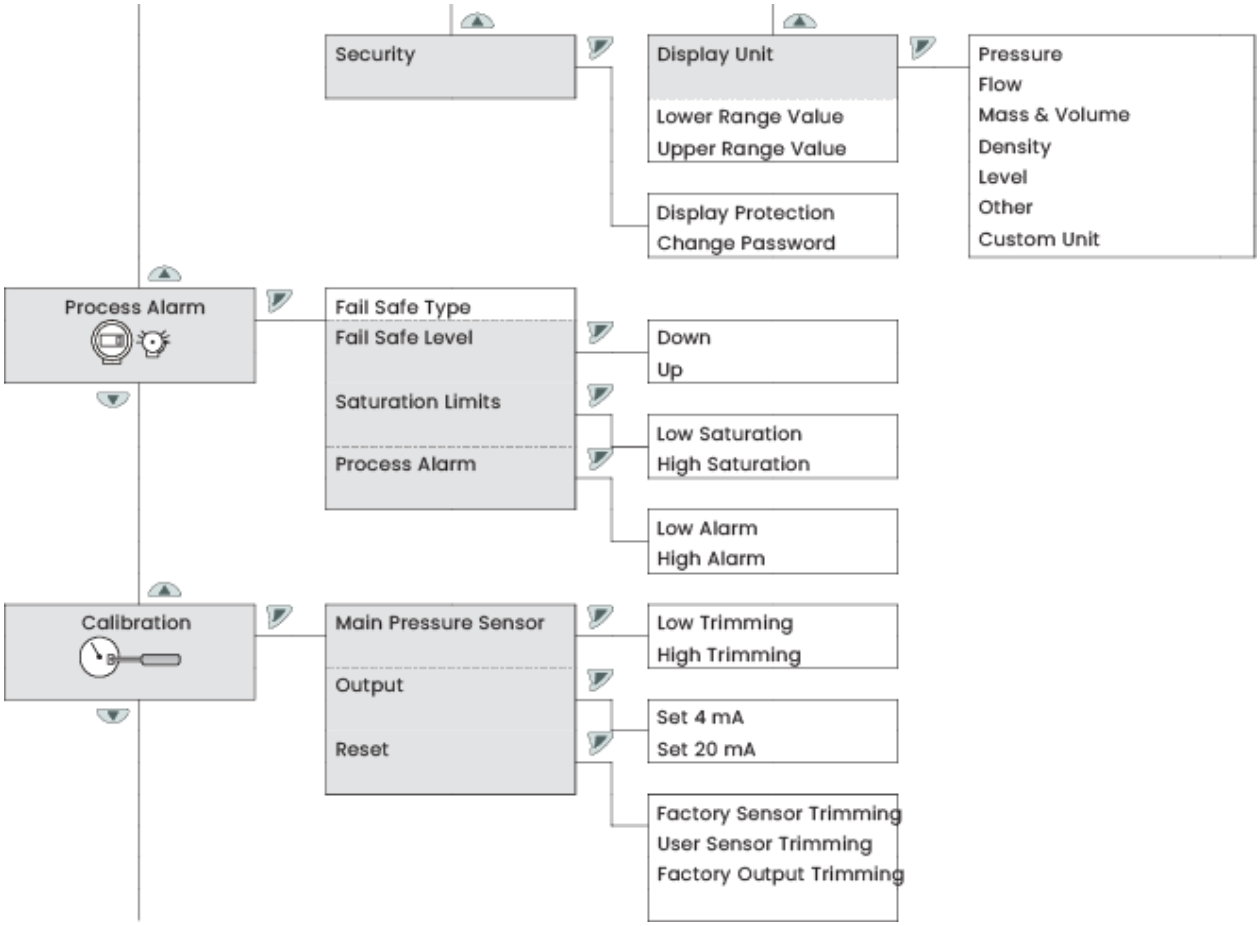


Fig. 36 Level measurement with closed tanks with two diaphragm seals

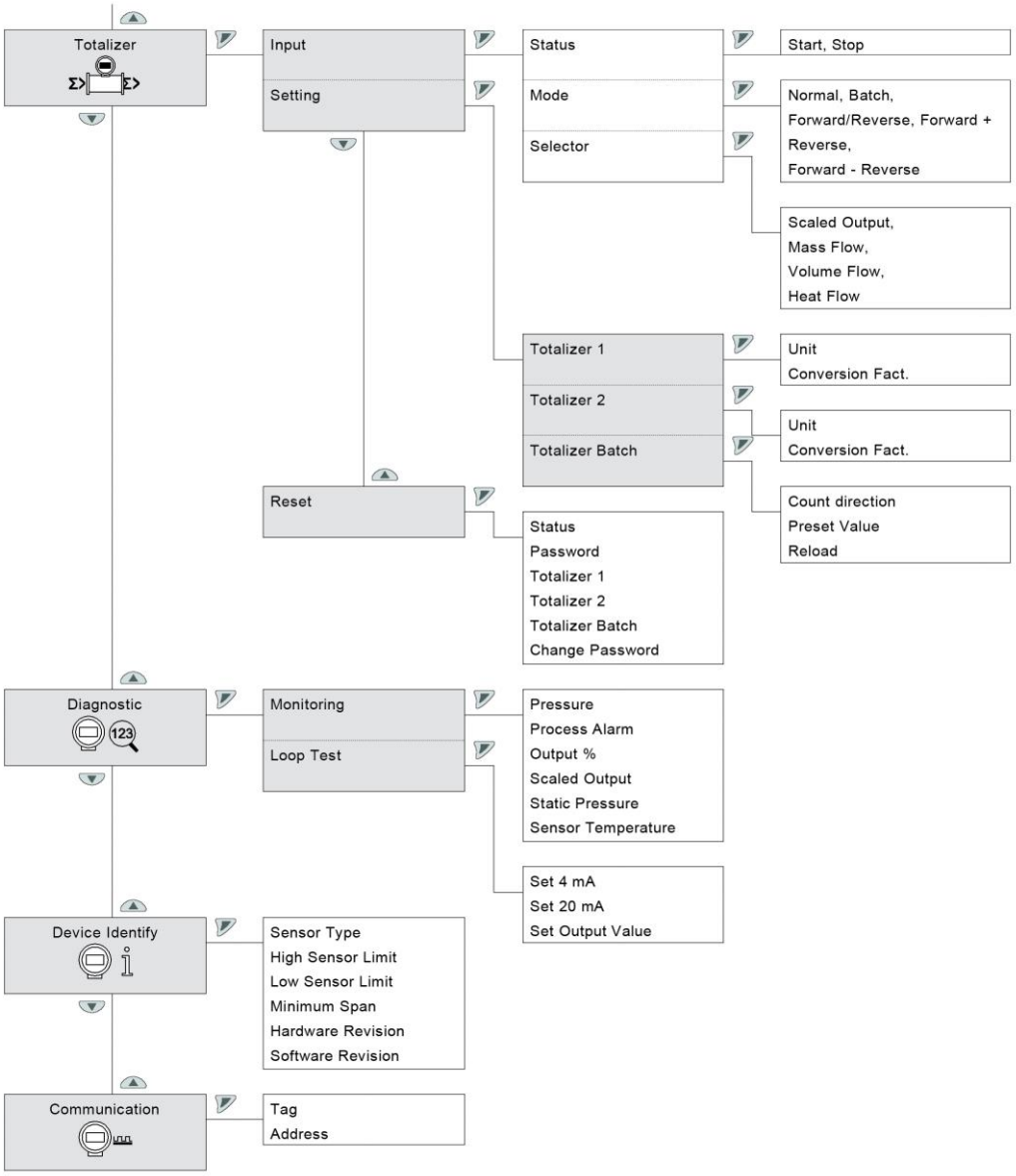

Device Setup
SW Write Protection
Process Variable
PV Type
Set PV
Apply PV
Parallel Shift
PV Bias
Unit
Lower Range Value
Upper Range Value
Lower Range Value
Upper Range Value
Set PV to Zero
Set PV to Value
Reset PV Bias
Transfer Function
Output Scaling
Factory Reset
Linearization Type
Lin./Rad. Point
Low Flow Cut Off
Linear
Square Root
Sqrt. 3rd Power
Sqrt. 5th Power
Linearization curve
Bidirectional Flow
Cylindric Lying Tank
Spherical Tank
Damping
Unit
Lower Range Value
Upper Range Value
Pressure
Flow
Mass & Volume
Density
Level
Other
Custom Unit


MV Overview
Flow
Medium
Static Pressure Unit
Max.Stat. Press. abs.
Min. Stat. Press. abs.
Bias Static Pressure
Temperature Unit
Min. Temperature
Max. Temperature
Primary Device
Meter Tube Material
Prim. Elem. Material
Flow Unit
Flow
Diff. Press. Unit
Diff. Press. Value
Absolute Pressure
Temperature
Density Unit
Density
Ratio of Diameter
Inner Tube Diameter
Reynolds Number
% for Design State
Standard Density
Isentropic Exponent
Min. Temp. Density
Max. Temp. Density
Level
Steam Drum Level
Level Unit
Lower Level
Upper Level
Height of Condensate
Temperature Unit
Condensate Temp.
Value Condensate
Temperature
Open Tank
Level Unit
Lower Level
Upper Level
Transm. mount. Pos.
Temperature Unit
Min. Temperature
Max. Temperature
Density Unit
Min. Temp. Density
Max. Temp. Density
Tank Temperature
Measurement


Closed Tank
Level Unit
Lower Level
Upper Level
Distance process Connection
Transm. mount. Pos.
Temperature Unit
Min. Temperature
Max. Temperature
Density Unit
Min. Temp. Density
Max. Temp. Density
Temperature Gas Density
Static Pressure Unit
Pressure Gas Density
Gas Density
Tube Temperature
Value Condensate
Temperature
Display
123
Language
Display Revision
Contrast
English
Deutsch
Italiano
Mode
One Line
One Line + Bargraph
Two Lines
Two Lines + Bargraph
Line 1 View
Line 2 View
Bar View
Pressure
Scaled Output
Current Output
Output Percent
Totalizer 1
Totalizer 2
Batch Number
Sensor Temperature
Static Pressure
HMI Scaled Output
Mass Flow
Volume Flow
Heat Flow
Process Temperature
Density
Viscosity
Display Scaling
Display Linearization
Type
Linear
Square Root
Sqrt. 3rd Power
Sqrt. 5th Power
Linearization curve
Bidirectional Flow
Cylindric Lying Tank
Spherical Tank



Notice regarding menu “Process Alarm”.
In this menu the behaviour of the analogue output current (current limits) for measuring range overshoots and alarm states can be configured. As long as the process value moves within the already set span, the output signal is between 4 and 20 mA. If the process value (PV) under ranges the lower range value (LRV), the signal will be set to the configurable lower current limit; if the process value exceeds the measuring range end URV), the signal will likewise be set to the configurable upper current limit.
If the diagnostic function of the transmitter detects an error, the signal will be set to high alarm or low alarm, depending on the user-defined setting.
The parameter “Fail Safe Level” (Fail Mode) can be adjusted via the DIP switches 4 and 5 of the electronics module. The precise value that the signal assumes can be set via the “Process Alarm” menu. In this process the limit for the low alarm current must be below the lower current limit and the limit for the high alarm current must be above the upper current limit.


Totalizer
Input
Setting
Status
Start, Stop
Mode
Normal, Batch,
Forward/Reverse, Forward +
Reverse,
Forward - Reverse
Selector
Scaled Output,
Mass Flow,
Volume Flow,
Heat Flow
Totalizer 1
Unit
Conversion Fact.
Totalizer 2
Unit
Conversion Fact.
Totalizer Batch
Count direction
Preset Value
Reload
Reset
Status
Password
Totalizer 1
Totalizer 2
Totalizer Batch
Change Password
Diagnostic
Monitoring
Loop Test
Pressure
Process Alarm
Output %
Scaled Output
Static Pressure
Sensor Temperature
Set 4 mA
Set 20 mA
Set Output Value
Device Identify
Sensor Type
High Sensor Limit
Low Sensor Limit
Minimum Span
Hardware Revision
Software Revision
Communication
Tag
Address

6.6 Configuration with PC / laptop or handheld terminal

The 3800XA multivariable transmitters can be configured with the aid of the following devices:

- Handheld terminals such as the 3800XA, or from a different manufacturer, with the prerequisite that the 266 EDD has been loaded and activated in the terminal.
- Tek-Trol Asset Vision Basic, a free-of-charge software configurator, that can be downloaded at www.tek-trol.com/downloads.
- Software for configuration of field devices, with the prerequisite that it is compatible with EDD or DTM.

A handheld terminal can be connected directly to a 4 ... 20 mA line if the connected power supply unit is equipped with an integrated communication resistor. If a communication resistor with a resistance of at least 250 Ω is not present, an additional resistor must be installed. Connect the handheld terminal between the resistor and the transmitter, not between the resistor and the power supply unit.

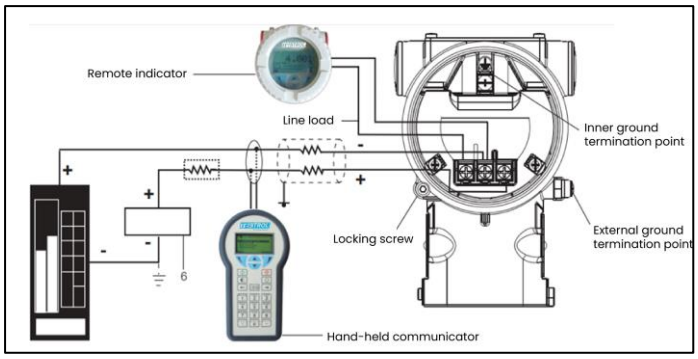


Fig. 37 Communication setup with handheld terminal

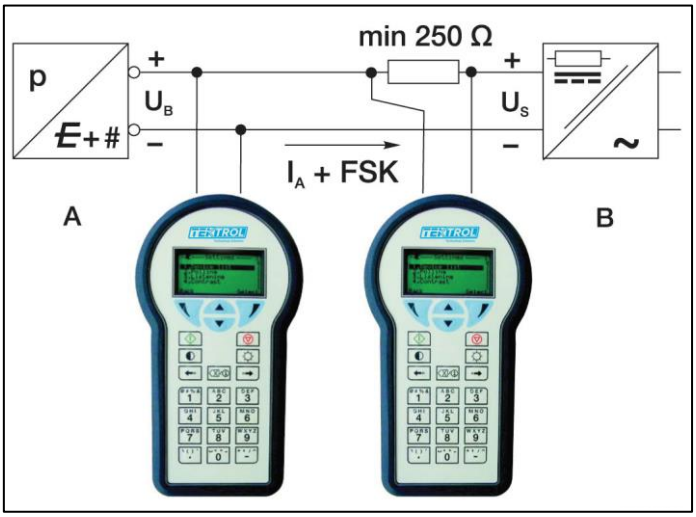


Fig. 38 Connection example with communication resistor in the connection lead

For additional information, see the "Handheld Terminal" operating instruction.
When using a graphic user interface (DTM) all configuration possibilities are available.

The procedure for program installation is described in the appropriate installation manual delivered with the software. The transmitter can be configured, read out and tested via the program. With the aid of the integrated database a configuration can also be executed in offline mode. Each configuration step is subject to a plausibility check. Each point of the program context-sensitive help can be called via "F1".
Immediately after receipt of the transmitter or after changing the configuration, we recommend that back up the existing configuration on a separate data medium under "Save in database".
Operating instructions for the program "Asset Vision Basic" are provided in the appropriate user manual.

6.7 Damping and transmission function

6.7.1 Damping

If the output signal of the pressure transmitter is conditionally irregular due to the process it can be electrically smoothed (damped).
The additional time constant can be set in increments of 0.0001 seconds to a value between 0 and 60 seconds. The damping has no influence whatsoever on the digitally displayed measured value in the physical unit. It only acts on the values that are derived from this, such as the analogue output current, the free process variable, the input signal for the controller, etc. The damping can be set locally via the LCD operating interface (HMI), via the "Asset Vision Basic" software, or via a handheld terminal.

6.7.2 Transmission function

In the evaluation of the output signal of the multivariable transmitters, you must bear in mind that these devices can work with different transmission functions.
For the 3800XA the following can be set:

- Linear for measurements of differential pressure or fill level
- Square root (x) for flow measurements in accordance with the differential pressure procedure with throttle elements such as orifices, nozzles, Venturi / swirl tubes
- and similar items
- Square root (x3) for flow measurements in open chutes with rectangular or trapezoidal measurement weir
- Square root (x5) for flow measurements in open chutes with V-measurement weir (triangular weir)
- Bidirectional for flow measurements with bidirectional characteristic curve
- With customer-specific linearization table.
- For cylindrical, horizontal tanks
- For spherical tanks

These transmission functions can also be set for the 3800XH/A models, if the rake function is switched off.
For 3800XA multivariable transmitters, set for mass flow measurement, the following functions are possible:

- Square root (x) for differential pressure flow measuring with throttle elements.

- Bidirectional for flow measurements with bidirectional characteristic curve

In addition, all characteristic curves are influenced by the pressure-dependent and temperature-dependent status correction.
For 3800XA multivariable transmitters set for level measurement, the following functions are possible:

- Linear
- With customer-specific linearization table
- For cylindrical, horizontal tanks
- For spherical tanks

Moreover, all characteristic curves are influenced by the temperature-dependent, for drum water level measurement, also pressure-dependent, density correction.
The output transmission functions can be activated via a configuration tool (integral digital LCD display, handheld terminal, or PC software such as "Asset Vision Basic").

Description of the transition function

Linear

When using this function, the relationship between the input value (measured value) in % of the calibrated measurement span and the output linear (i.e.: The input value of 0% corresponds to an output value of 0% = 4 mA, the input value of 100% corresponds to an output value of 100% = 20 mA). Additional settings are not possible here.

Square root

With this function the output (in % of the measuring span) is proportional to the square root in % of the set measuring span (i.e.: The device outputs an analogue output signal that behaves proportionally to the flow rate). It is possible to use the complete square root function.

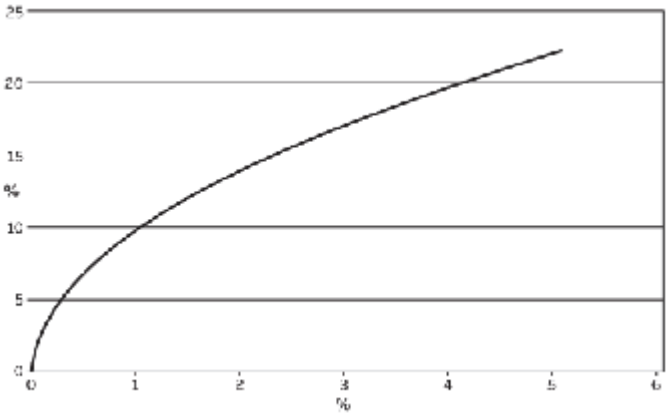


Fig. 38

To avoid the high gains occurring in the vicinity of the zero point, the transmitter works linear with a gradient of 1 to an input value of 0.5% of the set measuring span, and then continues linear to the activation point of the square root function, adjustable between 5% and 20% of the output. This function enables a more stable output signal

close to the zero point and avoids errors due to the high gain associated with the square root. The standard setting is 5% of the upper range value of the flow.

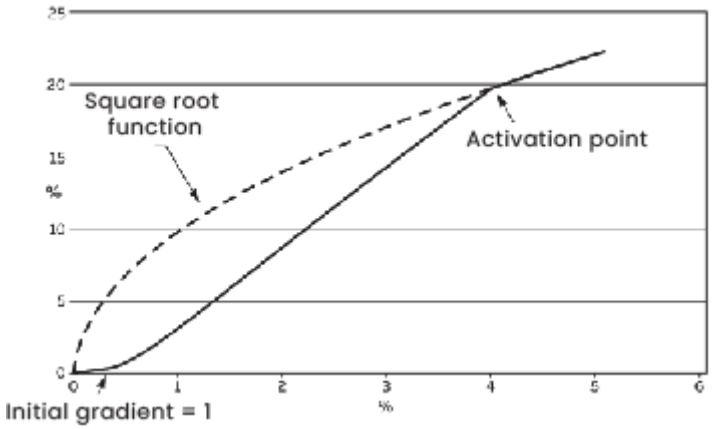


Fig. 39

For leak flow volume suppression for small input signals close to the zero point the transmitter output is set to zero until reaching an adjustable activation point between 0% and 20%. This function ensures the stability for flow measurements. The default setting is 6% of the upper range value of the flow.

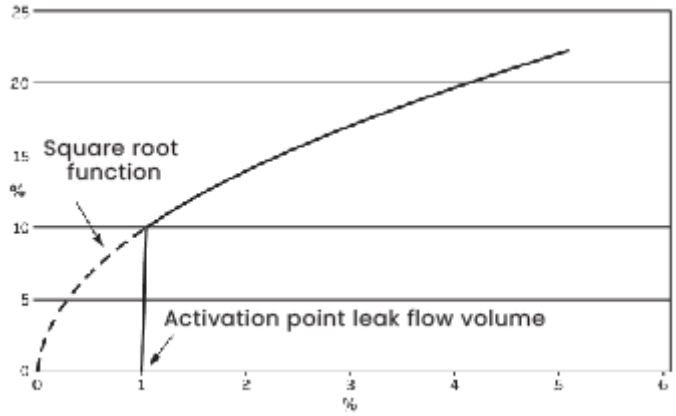


Fig. 41 Square root to the third power

The square root transmission function of x3 can be used for flow measurements in open chutes (see Fig. 42 and Fig. 43) with rectangular measuring weirs or trapezoidal measuring weirs, as well as Venturi flumes in accordance with ISO 1438. For these devices the relationship between flow and dammed up height h (differential pressure measured by the transmitter) is proportional to h3/2 or to the square root of h3. For other Venturi flumes or Parshall flumes this relationship is not right.
For this function the output (in % of the measuring span) is proportional to the square root to the third power of the input signal in % of the set measuring span. With the aid of the formulas cited, the device provides an output signal that is proportional to the flow rate.

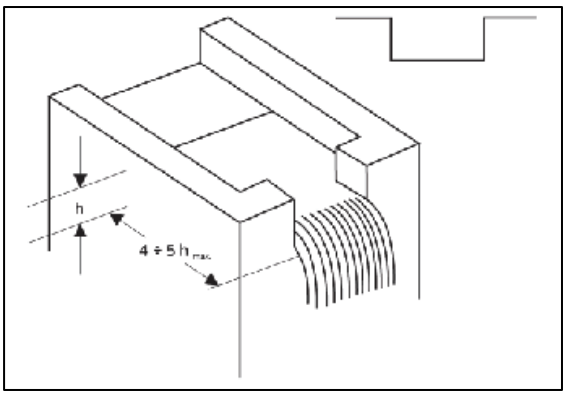


Fig. 42 Rectangular weir

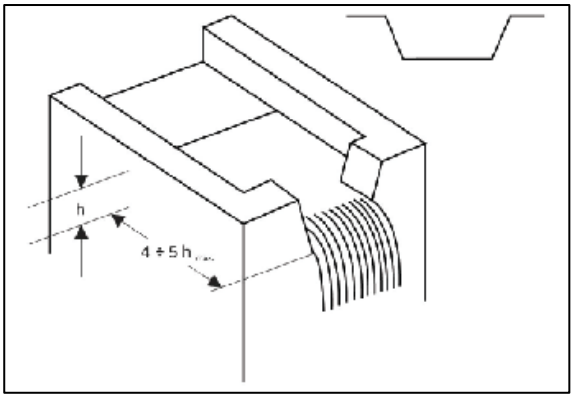


Fig. 44 V measuring weir

Square root to the fifth power

The square root transmission function of x5 can be used for flow measurements in open flumes of V measuring weirs (triangular weirs) in accordance with ISO 14398 (see Fig. 44); the relationship between flow and dammed up height h (differential pressure measured by the transmitter) is proportional to h5/2 or to the square root of h5. With this function the output in % of measuring span is proportional to the square root to the fifth power of the input signal in % of the set measuring span. The device delivers an output signal that behaves proportionally to the calculated flow rate.

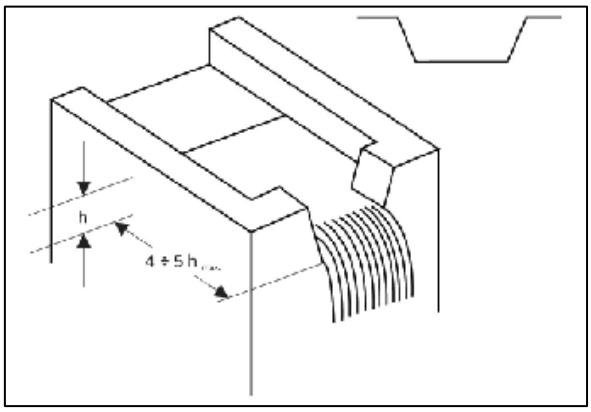


Fig. 43 Trapezoidal weir

Customer-specific linearization characteristic curve

The transmission function with a customer-specific linearization curve is normally used for volume measurement in tanks with unusual shapes. There is an assignment to a freely definable transmission characteristic curve with a maximum of 22 reference points. The first reference point is always the zero point, the last is the upper range value. These two reference points cannot be changed. In between a maximum of 20 points can be freely entered.

These max. 22 points are defined by extrapolating the tank fill data.

After they are determined, the 22 reference points are loaded into the device, via a HART handheld terminal or via an appropriate configuration program such as “Asset Vision Basic”.

Flow measurement with bidirectional characteristic curve

This method is used if the transmitter is connected to a bidirectional flow meter (e.g. a wedge meter - wedge-shaped narrowing). The main characteristics:

The bidirectional transmission function acts an the transmitter input (x) as a percentage value of the calibrated measuring span and is calculated with the following formula:

Output = 1/2 + 1/2 sign (x) · x ½

In this regard x and the output signal of the transmitter are scaled in the range from 0 to 1 for the calculation. The output has the following meaning:

- Output = 0 = analogue output signal 4 mA.
- Output = 1 = analogue output signal 20 mA.

This function can be used for bidirectional flow rates, for which the primary device is configured for this application.

Example of a bidirectional flow measurement with the following data:

- Max. negative flow: -100 t/h
- Max. positive flow: +100 t/h

The differential pressure generated by the primary element of the flow meter is 2500 mm H2O for the max. positive flow and 2500 mm H2O for the max. negative flow.

Thus, the transmitter must be configured as follows:

Set measuring span:	
4 mA	= LRV = -2500 mm H2O
20 mA	= URV = 2500 mm H2O
Transmission function	= Bidirectional

After the transmitter has been configured as described above, it supplies the following for:

Negative flow of 100 t/h:	Output signal = 4 mA
No flow:	Output signal = 12 mA
Positive flow of 100 t/h:	Output signal = 20 mA

Cylindrical horizontal tank

This function is used for the volume measurement in cylindrical horizontal tanks with straight ends. The transmitter calculates the volume and / or the mass from the measured fill level.

Spherical tank

This function is used for volume measurement in spherical tanks. The transmitter calculates the volume and / or the mass from the measured fill level

7 Error messages

7.1 Error states and alarms

Error code	Displayed message	Possible cause	Recommended measure	Transmitter reaction
C042.046	Default Value as Process Value	Substitute value for differential pressure active.	The calculation will be executed with the substitute value for differential pressure.	None
		The last valid value for differential pressure active.	The calculation will be executed with the last valid value for differential pressure.	
		The calculation will be executed with the substitute value for absolute pressure.	The calculation will be executed with the substitute value for absolute pressure.	
		Last valid value for absolute pressure active.	The calculation will be executed with the last valid value for absolute pressure.	
		The calculation will be executed with the substitute value for process temperature.	The calculation will be executed with the substitute value for process temperature.	
		Last valid value for process temperature active.	The calculation will be executed with the last valid value for process temperature.	
		Substitute value for line temperature active.	The calculation will be executed with the substitute value for line temperature.	
		Last valid value for line temperature active.	The calculation will be executed with the last valid value for line temperature.	
C056.047	Wrong Process Condition for Flow	Wrong direction for root calculation.	Check process connections for the flow measurement in one direction.	None
		Wrong aggregate status of the measuring medium.	Check the aggregate status of the measuring medium.	
C088.030	Input Simulation Active	The P-dP-value generated on the output is derived from the value simulated on the input.		None
		The static pressure value generated on the output is derived from the value simulated on the input.		
		The sensor temperature value generated on the output is derived from the value simulated on the input.		
C090.033	Loop Test	The analogue outputs and digital /analogue outputs for the primary variable are held at the desired value. The device is in fixed current mode (loop test).	Use HART configurator (DTM – handheld terminal) to switch the device back into the normal mode (loop test - end fixed output mode).	None

Error code	Displayed message	Possible cause	Recommended measure	Transmitter reaction
F098.034	Analog Output Saturated	The analogue output for the primary variable is on the other side of upper measuring limit and no longer presents the process value. The analogue output (4 … 20 mA) corresponds to the configured upper current limit.	Set current limit, or if possible, work range.	None
		The analogue output for the primary variable is on the other side of the lower current limit and no longer represents the process value. The analogue value (4 … 20 mA) corresponds to the lower current limit.		
F099.007	Process Temperature out of Limits	Wrong PT100 connection, line break or deviating process conditions.	Check the Pt100 connections and process conditions.	None
F100.005	Static Pressure Out of Limits	The static pressure of the process exceeds the limits of the measuring cell. An overshoot of the static pressure can reduce accuracy, mechanically damage the membrane, and make a calibration or replacement necessary. A wrong transmitter model may have been selected.	You must check whether the pressure transmitter is suitable for the process conditions. It is likely that a different transmitter type is required.	None
F102.004	P-dP Out of Limits	The measuring range has not been calculated correctly or the wrong transmitter model has been selected.	You must check whether the pressure transmitter is suitable for the process conditions. It is likely that a different transmitter type is required.	None
F104.032	Pressure Overrange	This effect may have been induced by other devices in the process (valves, etc.). A pressure range overshoot can result in reduced accuracy or mechanical damage of the diaphragm material and can make calibration or replacement necessary.	You must check whether the pressure transmitter is suitable for the process conditions. It is possible that a different transmitter type is required.	None
F106.035	Unreliable Output Current	The D/A converter is not correctly calibrated	Calibrate the output; if the error persists the electronics module must be replaced.	Analog alarm signal
		Device is not correctly calibrated.	Check device configuration.	
F108.040	Output Readback Failure	The output circuit may have been interrupted or not calibrated correctly.	Execute a calibration of the D/A converter. If the error persists, replace the electronics module.	Analog alarm signal

Error code	Displayed message	Possible cause	Recommended measure	Transmitter reaction
F109.003	Process Temperature Sensor Fail	A/D converter error of the temperature sensor.	Check the connection of the temperature electronics. Temperature electronics must be replaced if the problem persists.	Alarm current
		Wire break of wrong Pt100 connection.	Check the Pt100 connections and process conditions.	
		The reference voltage for the temperature measurement is not correct.	The PCB for the temperature measurement should be replaced.	
		The difference between the main channel and the reference measurement is outside of tolerance.		
F110.002	Sensor Temperature Fail	Error in the current circuit for scanning the temperature.	The measuring cell must be replaced.	Analog Alarm signal
F112.001	Static Pressure Sensor Fail	Error in the current circuit for scanning the static pressure.	The measuring cell must be replaced.	Analog Alarm signal
F114.000	P-dP Sensor Fail	Mechanical damage on the measuring cell. Measuring cell loses filling fluid, diaphragm is torn, sensor damaged.	The measuring cell must be replaced.	Analog Alarm signal
F116.023	Electronic Memory Failure	Electronic memory is damaged.	The electronics must be replaced.	Analog Alarm signal
F118.017	Sensor Memory Fail	Measuring cell memory damaged.	The measuring cell must be replaced.	Alarm current
F120.016	Sensor Invalid	The measuring cell signal is not updated correctly due to an electronics error, a measuring cell error or a poorly connected. measuring cell cable.	Check the cable connection and replace. measuring cell if the problem persists.	Analog Alarm signal
		The model / the version of the measuring cell is no longer compatible with the connected version of the electronics.	The measuring cell must be replaced.	
M014.037	Configuration Error	See the operating manual for possible cause of the error.	Use HART configurator (DTM – handheld terminal) to correct the configuration.	None
M016.039	PILD-Changed Op. Conditions	The process conditions have changed to such an extent that new settings are required for the PILD algorithm.	New training is required for this new process condition.	None

Error code	Displayed message	Possible cause	Recommended measure	Transmitter reaction
M018.038	PILD Output	Both impulse lines between the measuring cell and the process are either clogged or closed by valves.	Check valves and impulse line. If required, clean the impulse lines, and start PILD training.	None
		The impulse line between the pressure measuring cell and the process is either clogged on the high-pressure side or closed by valves.		
		The impulse line between the pressure measuring cell and the process is either clogged on the low-pressure side or closed by valves.		
		One of the impulse lines between the pressure measuring cell and the process is either clogged or closed by valves.		
M020.042	Replace Info	The electronics or the measuring cell have been replaced, but replacement mode has not been executed.	Execute replacement mode: Place switch SW 1 of the electronics in position 1 = activate replacement mode. With switch SW 2 select whether measuring cell or the electronics have been replaced. Switch device off and on. Return switch SW 1 of the electronics to position 0.	None
		The electronics or the measuring cell has been replaced and replacement mode for a new measuring cell must be executed.	Execute replacement mode: Only the data of the electronics can be copied into the measuring cell. Place switch SW 1 on (1) to activate replacement mode 1 – with switch SW2 select new measuring cell (1). Switch device off and on. Place switch SW 1 on (0) to deactivate replacement mode.	
		The electronics or the measuring cell has been replaced, replacement mode has been activated, but in the wrong direction (SW 2 = 0).	Change replacement direction (if possible). Switch SW 1 is already in position (1), replacement mode is activated. Switch SW 2 to position (1) for “new measuring cell”. Switch device off and on. Place switch SW 1 is position (0) to deactivate replacement mode.	

Error code	Displayed message	Possible cause	Recommended measure	Transmitter reaction
M022.041	Electronic Temperature Out of Limits	The electronics temperature under ranges the permissible lower limit value. Error in the current circuit for scanning the temperature.	The electronics should be replaced as soon as possible.	None
		The temperature of the electronics exceeds its upper limit value. Error in the current circuit for scanning the temperature.		
M024.036	Power Supply Warning	The energy supply of the device is close to the lower permissible limit.	Check the voltage on the connection terminal block and for values outside of the valid range check the external energy supply.	None
		The energy supply of the device is close to the permissible high limit.		
M026.024	NV Electronic Memory Burn Error	Writing to non-volatile memory was not successful.	The electronics module should be replaced as soon as possible.	None
M028.018	NV Sensor Memory Burn Error	Writing to non-volatile memory of the measuring cell was not successful.	The measuring cell should be replaced as soon as possible.	None
M030.020	Electronic Interface Error	Data exchange between measuring cell and electronics is faulty.	Switch transmitter off and back on again. Check whether error persists. If yes, replace electronics module as soon as possible.	None
S038.044	Binary Output max Frequency reached	The process works outside of the range.	The setting of the binary output must be compared with the process conditions.	None
S040.045	MV Input Value out of Range	Differential pressure input value outside of the range.	Check the value of the differential pressure.	None
		Static pressure input value outside of the range.	Check the value of the static pressure.	
		Temperature range outside of the range.	Check the value of the temperature.	
S044.043	MV Calculation out of Range	Flow is outside of the range.	Compare the settings of the multivariable configuration with the process conditions.	None
		The volume flow is outside of the range.		
		The heat flow is outside of the range.		
		The calculated fill height is outside of the range.		
		The volume is outside of the range.		
		The mass is outside of the range.		

Error code	Displayed message	Possible cause	Recommended measure	Transmitter reaction
S052.031	Max operating pressure Exceeded	The static pressure of the process increases the maximum permissible. operating pressure for the transmitter. Exceeding the maximum operating pressure can entail mechanical damage on the process connections (flanges, pipes, etc.) or cause dangerous situations.	You must check whether the pressure transmitter is suitable for the process conditions.	None
S054.006	Sensor Temperature Out of Limits	The temperature of the process environment influences the pressure transmitter. Excess temperatures can reduce accuracy, impair device components, and make a calibration or replacement necessary.	You must check whether the pressure transmitter is suitable for the process conditions. A different type of installation could be necessary, e.g. use of diaphragm seals.	None

8 Ex relevant specifications

8.1 Specific Conditions of Use (X)

1. For the Model 3800XA Multivariable the HART and the Digital Output circuits shall be treated as separate intrinsically safe circuits and the wiring used shall be Type A or Type B as defined in EN/IEC 60079-25.
2. When the manufacturer of the equipment has not identified the type of protection on the label, the user. shall, on installation, mark the label with the type of protection used. Once the type of protection has been marked it shall not be changed.
3. The material of the partition wall (sensing diaphragm) shall not be subject to environmental conditions which might adversely affect it.
4. The Model 3800XA main electronics enclosure option s = A or B contains aluminium and is considered to present a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact or friction.
5. For areas subject to explosive dust atmospheres the painted surface of the Model 3800XA may store electrostatic charge and become a source of ignition in applications with a low relative humidity <~30%relative humidity where the painted surface is relatively free of surface contamination such as dirt, dust, or oil. Guidance on protection against the risk of ignition due to electrostatic discharge can be found in IEC TS 60079-32-1. Cleaning of the painted surface shall only be done in accordance with the manufacturer's instructions.

8.2 Explosion protection requirements and IP rating (ATEX)

According to ATEX Directive (European Directive 2014/34/EU) and applicable European standards which assure compliance with essential safety requirements, i.e.,

- EN 60079-0 (General requirements)
- EN 60079-1 (Equipment protection by flameproof (enclosures) "d")
- EN 60079-11 (Equipment protection by intrinsic safety "i")

- EN 60079-15 (Electrical equipment for explosive gas atmospheres - Part 15: Construction, test and tagging of type of protection "n" electrical equipment)
- EN 60079-26 (Equipment with equipment protection level (EPL) - Ga)

The transmitters are certified for the following device groups, categories, and media in dangerous atmosphere, temperature classes, and types of protection. Simple sketches of example applications appear below.

NOTE

The temperature sensor circuit (Pt100) and the digital output (pulse / limit value output) must be connected in accordance with the requirements of the Ex-certificate. The sensor for measuring process temperature (Pt100) must be approved for use in hazardous areas.

8.3 Applications for "EX ia" transmitters categories 1 G and 1 D

ATEX II 1 G Ex ia IIC T4/T5/T6 and II 1 D Ex ia IIIC T85°C. FM approval FM09ATEX0024X
The meaning of the ATEX code is as follows:
II: Equipment group for hazardous areas above ground (not mines)
1: Category
G: Gas (dangerous media)
D: Dust (dangerous media)
T85°C: Maximum surface temperature of the transmitter housing at an ambient temperature Ta of up to 40 °C for dust (not for gas) with a dust layer up to 50 mm thick.
The rest of the tag relates to the type of protection according to the relevant EN standards:
Ex ia: Type of protection "Intrinsic Safety", level of protection "a"
IIC/IIIC: Explosion group gases
T4: Temperature class of the transmitter (corresponds to a maximum surface temperature of 135 ℃) with a Ta from -50 °C "..." 85℃
T5: Temperature class of the transmitter (corresponds to a maximum surface temperature of 100 °C) with a Ta from -50 °C "..." 40 °C
T6: Temperature class of the transmitter (corresponds to a maximum surface temperature of 85 °C) with a Ta from -50 °C "..." 40 °C.

8.3.1 Example applications

As shown in the figures below, the transmitter can be used in Zone 0 (gas) and Zone 20 (dust).
Application with gas
Zone 0
3800XA Tx category 1G Ex ia

NOTE

The transmitter must be connected to a power supply unit (associated device) with "Ex ia" certification.

Application with dust
Zone 20
266 Tx category 1D IP6x (Ex ia)

NOTE

Protection is afforded primarily by the IP degree of protection; the low level of power consumed from the power supply unit is also a contributing factor. The type of protection can be either [ia] or [ib].

WARNING

The housing contains aluminium, which can lead to a potential danger of ignition through impact or friction. For this reason, impact or friction must be avoided during installation and use.

8.4 Applications for "EX ia" transmitters categories 1/2 G and 1/2 D

ATEX II 1/2 G Ex ia IIC T4/T5/T6 and II 1/2 D Ex ia IIIC T85°C.
FM approval FM09ATEX0024X

NOTE

This ATEX category is determined by both the application and the intrinsic safety level of the transmitter power supply unit (associated apparatus) which can sometimes be [ib] instead of [ia]. The intrinsic safety level of a system is determined by the device with the lowest level of intrinsic safety.

The meaning of the ATEX code is as follows:
II: Equipment group for hazardous areas above ground (not mines)
1/2: Category - This means that the transmitter is suited for use in the partition for Category 1 (e.g., sensor in Category 1 / transmitter in Category 2) is suited – see example of application.
G: Gas (dangerous media)
D: Dust (dangerous media)
T85°C: Maximum surface temperature of transmitter housing with an ambient temperature Ta of -50°C to 40 °C for dust (not for gas) with a dust layer up to 50 mm thick.
T135°C: As above, but for dust with a Ta of 85 °C

The rest of the tag relates to the type of protection according to the relevant EN standards:
Ex ia: Type of protection "Intrinsic Safety", level of protection "a" IIC/IIIC: Explosion group gases
T4: Temperature class of the transmitter (corresponds to a maximum surface temperature of 135 °C) with a Ta from -50 °C to 85°C
T5: Temperature class of the transmitter (corresponds to a maximum surface temperature of 100 °C) with a Ta from -50 °C to 40 °C
T6: Temperature class of the transmitter (corresponds to a maximum surface temperature of 85 °C) with a Ta from -50 °C to 40 °C
About the example applications:
Only the "measuring cell" of this transmitter can be connected in Zone 0 (gas); while the remaining parts of the transmitter, i.e., its housing, can only be used in Zone 1 (gas) - see figure. The reason for this is that the measuring cell of the transmitter has internal partitioning elements in accordance with EN 60079-26 and EN 60079-1 which separate the power tap from the area of the process in which the atmosphere is always potentially explosive.

Where applications in areas with combustible dusts are concerned, the transmitter is suitable for "Zone 21" in accordance with EN 60079-0 and EN 60079-11 as shown in the corresponding section of the example applications.

8.4.1 Example applications

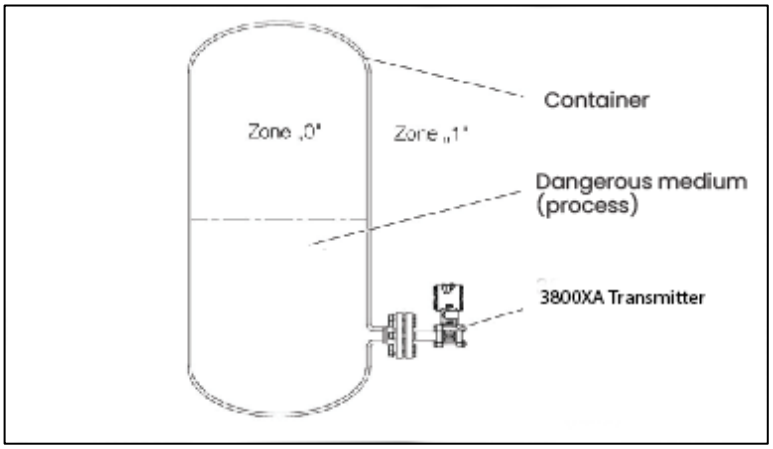


Fig. 45 Application with gas

NOTE

The transmitter can be connected to a power supply unit (associated device) with [ib] or [ia] type of protection.

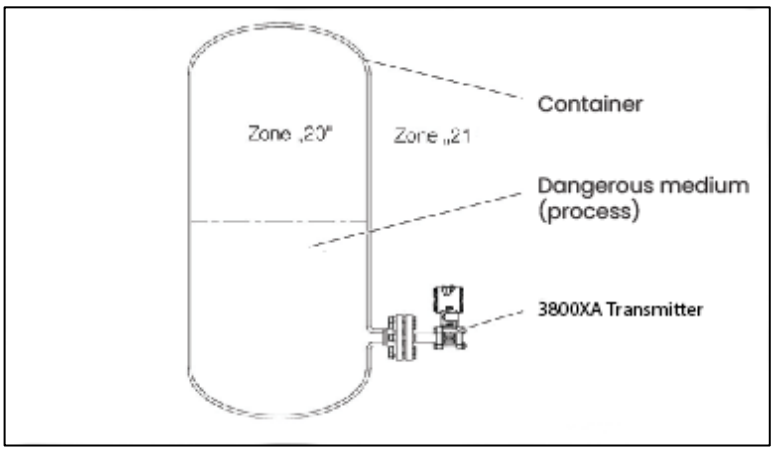


Fig. 46 Application with dust

NOTE

Protection is afforded primarily by the IP degree of protection; the low level of power consumed from the power supply unit is also a contributing factor. The type of protection can be either [ia] or [ib].

8.5 Applications for "EX d" transmitters categories 1/2 G and 1/2 D

ATEX II 1/2 G Ex db IIC T6 Ga/Gb Ta= -50 °C to +75 °C;
ATEX II 1/2 D Ex tb IIIC T85 °C Db Ta= -50°C to +75°C
FM approval FM09ATEX0023X
The meaning of the ATEX code is as follows:
II: Equipment group for hazardous areas above ground (not mines)
1/2: Category - This means that the transmitter is suited for use in the partition for Category 1 (e.g. sensor in Category 1 / transmitter in Category 2) is suited - see example of application.
G: Gas (dangerous media)
D: Dust (dangerous media)
T85°C: Maximum surface temperature of the transmitter housing at an ambient temperature Ta of up to 75 °C for dust (not for gas) with a dust layer up to 50 mm thick.
The rest of the tag relates to the type of protection according to the relevant EN standards:
Ex d: Flameproof (enclosure)
IIC/IIIC: Explosion group gases
T6: Temperature class of the transmitter (corresponds to 85 ℃ maximum) with an ambient temperature from -50 °C to +75 °C
About the example applications:
Only the "measuring cell" of this transmitter can be connected in Zone 0 (gas); while the remaining parts of the transmitter, i.e., its housing, can only be used in Zone 1 (gas) - see figure. The reason for this is that the measuring cell of the transmitter has internal partitioning elements in accordance with EN 60079-26 and EN 60079-1 which separate the power tap from the area of the process in which the atmosphere is

always potentially explosive. Where applications in areas with combustible dusts are concerned, the transmitter is suitable for "Zone 21" in accordance with EN 60079-1 as shown in the corresponding section of the example applications.

8.5.1 Example applications

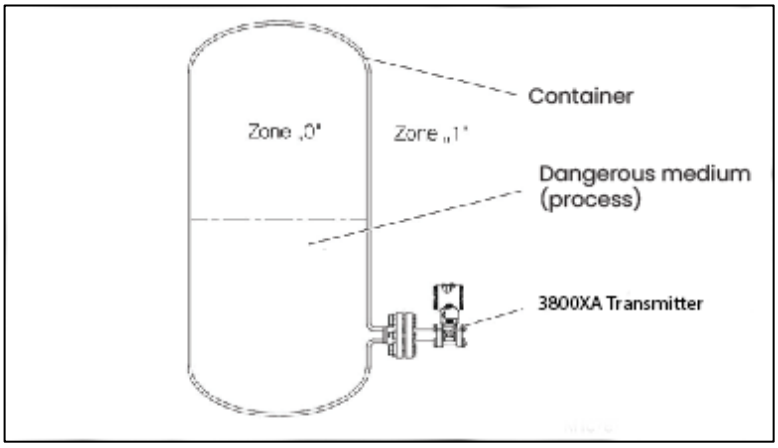


Fig. 47 Application with gas

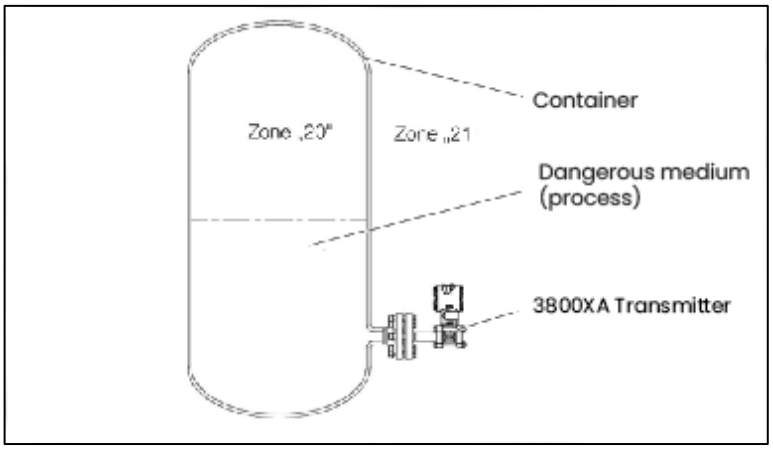


Fig. 48 Application with dust

NOTE

Protection is afforded primarily by the IP degree of protection; the low level of power consumed from the power supply unit is also a contributing factor. The type of protection can be either [ia] or [ib].

8.6 Applications for “EX ic” transmitters categories 3 G and 3 D

ATEX II 3 G Ex ic IIC T6 to T4 Gc and ATEX II 3 D Ex tc IIIC T85 °C Dc
Electrical data:
Ui = 42 V DC Ii < 25 mA Ci < 13 nF Li < 0.22 mH
FM Approval “Conformity Statement” - FM09ATEX0025X

NOTE

- This provides the technical basis for the ABB declaration of conformity.
- When installed, power must be supplied to this transmitter by a voltage limiting device which will prevent the upscale of the nominal voltage of 42 V DC.

The meaning of the ATEX code is as follows:
II: Equipment group for hazardous areas above ground (not mines)
3: Category
G: Gas (dangerous media)
D: Dust (dangerous media)
T85°C: Maximum surface temperature of the transmitter housing at an ambient temperature Ta of up to 40 °C for dust (not for gas) with a dust layer up to 50 mm thick.
The rest of the tag relates to the type of protection according to the relevant EN standards:
Ex ic: Type of protection "n", energy-limited equipment
IIC: Explosion group gases
T4: Temperature class of the transmitter (corresponds to a maximum surface temperature of 135 °C) with a Ta from -50 °C ... 85°C
T5: Temperature class of the transmitter (corresponds to a maximum surface temperature of 100 °C) with a Ta from -50 °C ... 40 °C.
T6: Temperature class of the transmitter (corresponds to a maximum surface temperature of 85 °C) with a Ta from -50 °C ... 40 °C.
This transmitter can be used in Zone 2 (gas) and Zone 22 (dust).

8.6.1 Example applications

Application with gas
Zone 2
3800 category 3G Ex ic

NOTE

The transmitter must be connected to a power supply unit with a maximum output voltage of 42 V DC. The current Ii of the transmitters is less than 25 mA.

Application with dust
Zone 22
3800 Tx category 3 D Ex tc

NOTE

Protection is afforded primarily by the IP degree of protection; the low level of power consumed from the power supply unit is also a contributing factor.

NOTE

Transmitter with combined approval Before the transmitter is installed, the selected type of protection must be indelibly marked on the explosion certification plate. The transmitter can then only be operated with this type of protection throughout its entire operating time. If two or more types of protection are indelibly marked on the explosion certification plate, the transmitter must not be used in areas categorized as hazardous. The selected type of protection may only be changed by the manufacturer further to repeat testing and assessment.

8.7 Applications for "EX ic" transmitters categories 3 G and 3 D

Ui = 30 V DC, Ci = 5 nF, Li = 10 µH					
Temperature class gas	**Temperature class dust**	**Ta min. [°C]**	**Ta max. [°C]**	**Imax [mA]**	**Power [W]**
T4	T135°C	-50	60	100	0.75
T4	T135°C	-50	60	160	1
T5	T100°C	-50	56	100	1.75
T6	T85°C	-50	44	50	0.4

8.8 Explosion protection requirements (north America)

According to Factory Mutual standards for the assurance of fundamental safety requirements

FM 3600: Electrical Equipment for use in Hazardous (Classified) Locations, General Requirements.

FM 3610: Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, and Class I, Zone 0 & 1 Hazardous (Classified) Locations.

FM 3611: Non incentive Electrical Equipment for Use in Class I and II, Division 2 and Class III Division 1 and 2 Hazardous (Classified) Locations.

FM 3615: Explosionproof Electrical Equipment.

FM 3810: Electrical and Electronic Test, Measuring and Process Control Equipment.

NEMA 250: Enclosure for Electrical Equipment (1000 Volts Maximum)

The transmitters in the 3800XA series have FM certification for the following "Class", "Divisions" and "Gas groups", "Hazardous classified locations", "Temperature class" and "Types of protection":

- Explosionproof (US) for Class I, Division 1, Groups A, B, C, and D, hazardous (classified) locations.

- Explosionproof (Canada) for Class I, Division 1, Groups B, C, and D, hazardous (classified) locations.
- Dust Ignition proof for Class II, III Division 1, Groups E, F, and G, hazardous (classified) locations.
- Suitable for Class II, III, Division 2, Groups F and G, hazardous (classified) locations.
- NonIncendive for Class I, Division 2, Groups A, B, C and D, in accordance with Nonincendive field wiring requirements for hazardous (classified) locations.
- Intrinsically Safe for use in Class I, II and III, Division 1, Groups A, B, C, D, E, F, and G in accordance with Entity requirements for hazardous (classified) locations.
- Temperature class T4 to T6 (dependent on the maximum input current and the maximum ambient temperature).
- Ambient Temperature range -40 ... 85 °C (dependent on the maximum input current and the maximum temperature class).
- Electrical Supply range Minimum 10.5 Volts, Maximum 42 Volts (dependent on the type of protection, maximum ambient temperature, maximum temperature class and communication protocol).
- Type 4X applications Indoors/Outdoors.

The corresponding control drawing shows how to install the transmitters correctly in the field. All connected devices must have FM approval.

9 Maintenance / Repair

WARNING

The device can be operated at high pressure and with aggressive media.
Any medium that squirts out can cause severe injuries.
Depressurize the pipeline/tank before opening the transmitter connection.

NOTE

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.

If pressure transmitters are used as intended under normal operating conditions, no maintenance is required. It suffices if the measuring range start and/or the spat are checked at specific intervals - depending on the operating. conditions. If deposits are expected to accumulate in the measuring cell, the measuring cell should be cleaned on a regular basis, in accordance with the operating conditions. Preferably the measuring cell should be cleaned in a workshop.

NOTE

For transmitters in safety-relevant applications in accordance with IEC 61508, verification in accordance with the paragraph “Acceptance test” in chapter “Functional safety in accordance with IEC 61508” is prescribed at fixed time intervals.

Repair and maintenance tasks must only be executed by employees of an authorized customer service organization. For replacement and repair of individual components use original parts.

WARNING

Transmitters with explosion protection must be either repaired by the manufacturer or approved by a certified expert after the repair. Comply with the relevant safety regulations and take the appropriate safety precautions before, during, and after repair work.

9.1 Dismounting

WARNING

Before removing or disassembling the device, check for hazardous process conditions such as pressure on the device, high temperatures, aggressive or toxic media, and so on. Carefully read the instructions in the sections “Safety", "Mounting", and “Electrical connections”, and perform the specified steps in reverse order.

9.2 Safeguard the housing cover for devices with “Ex d” type of protection

After tasks on the transmitter housing, for devices with “Ex d” type of protection strictly ensure that the housing cover is safeguarded again. To do this, a safety screw (hexagon socket screw) is provided on both facing sides of the electronics housing, at the bottom.

1. Screw the housing cover hand tight onto housing.
2. Turn the safety screw counterclockwise to secure the cover. The screw is unscrewed until the screw head arrests the housing cover.

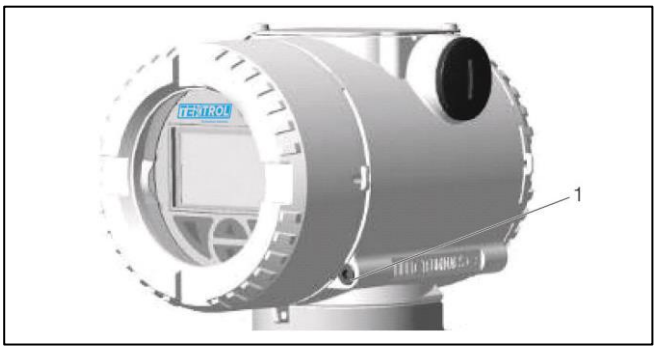


Fig. 49 Safeguard housing cover

9.3 Mounting / dismounting the button unit

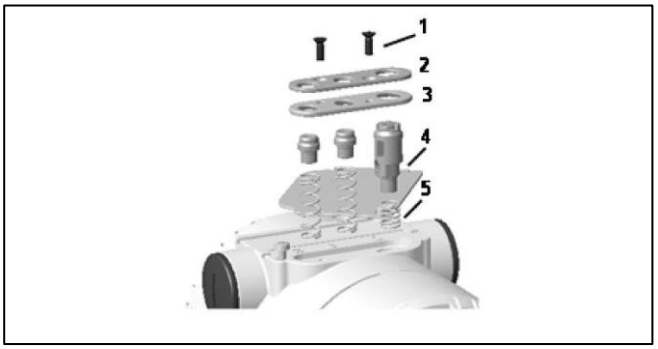


Fig. 50 Mounting / dismounting

1. Unscrew the fastening screws of the rating plate and swing the rating plate to the side to obtain access to the local operating elements.
2. Unscrew the fastening screws (1) of the button unit that hold the spring-loaded plastic part.
3. Remove the seal (3) that is located below the plastic cover of the button unit.
4. Now the three operating buttons (4) and the springs (5) can be taken out.

9.4 Mounting / dismounting the LCD display

1. On the side of the electronics module / LCD display, unscrew the housing cover.

NOTE

For devices with "Ex d" / "Flameproof Enclosure type of protection", comply with the instructions in the section "Securing the housing cover of devices with "Ex d" type of protection.

2. Fit on the LCD display. Depending on the install position of the multivariable transmitter, the LCD display can be fit on in four different positions. Consequently, it can be rotated by ± 90° or ± 180°.
3. Screw on the housing cover hand tight.

9.5 Measuring cell of the multivariable transmitter

Normally the measuring cell of the transmitter is essentially maintenance-free. Nevertheless, the following should be checked regularly:

- The sealing points of connected lines must be intact. There must not be any visible cracks on the process flanges.
- There must be no leaks at the connection points between sensor and flange and on the vent / drain valves.
- The screws on the process flanges must not show any corrosion.

If defects are detected in the inspection described above, the parts in question must be replaced with original spare parts. If information on spare parts is required, contact

an Tek-Trol office or refer to the spare parts list. If spare parts are used that are not original parts, the guarantee is invalidated.

9.6 Removing / installing the process flange

1. Unscrew the fastening screws of the process flanges in cross pattern (hexagon socket wrench AF 13 mm (0.51 inch).
2. Carefully take off the process flanges so that the separating diaphragms are not damaged.
3. Clean the separating diaphragms, and if necessary, the process flanges with a soft brush and a suitable cleaning agent.

NOTE

Components can be damaged through the use of the wrong cleaning tools.
Do not use any sharp-edged or pointed tools.

4. Insert new O-rings into the process flanges.
5. Fit the process flanges onto the measuring cell. The flange surfaces of both process flanges must be positioned in one plane and at right angles to the electronics housing (vertical process flanges are the exception).
6. Check the thread of the screws for the process flanges for ease of movement. To do this, screw on the nuts by hand to the screw head. If this is not possible, use new screws and nuts.
7. Lubricate the screw thread and the seat of the threaded union, e.g., with “Anti-Seize AS 040 P” (supplier: P.W. Wielding & Sohn GmbH & Co. KG, Münster, Germany).

NOTE

For the oil-free and grease-free version, after installation of the process flange, the measuring chambers must be cleaned again.

8. Installation of the process flanges
   - First tighten the screws / nuts of the process flanges with a torque wrench to a pre-tightening torque
   - of MJ = 2 Nm (0.2 kpm), working in a cross pattern.
   - Then tighten the screws / nuts of the process flanges with a pre-tightening torque of MJ = 10 Nm (1,0 kpm), working in a cross pattern.
   - Retighten all screws / nuts (in a cross pattern), this time with a total tightening angle of αA = 180°; in two steps, 90° for each step.
   - Some transmitters have size M10 screws. Tighten these screws with a total tightening angle of αA = 270°; in three steps, 90° each step.

9.6.1 Replacing the measuring cell

1. Disconnect the transmitter from the process via the valve manifold or the shut-off valves.
2. Open the vent valves to vent the measuring cell.
3. Disconnect the energy supply and the wiring supply to the transmitter.
4. Unscrew and remove the 4 fastening screws (1), with which the transmitter is bolted onto the fastening bracket or valve manifold.

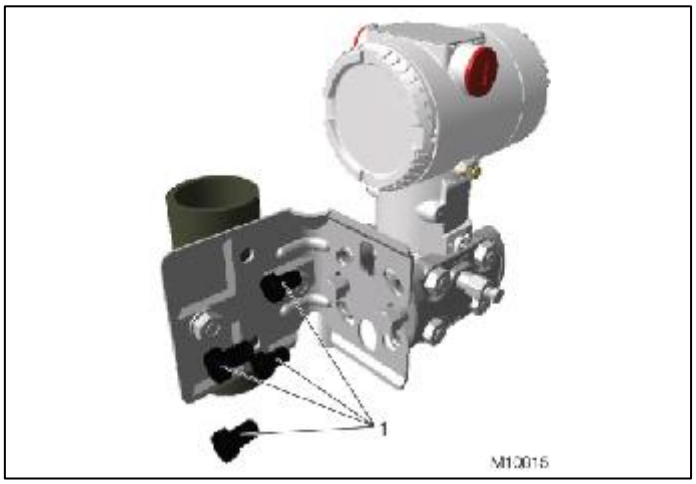


Fig. 51

5. Open the housing cover of the electronics side, unscrew both fastening screws (1) and pull out the electronics module.

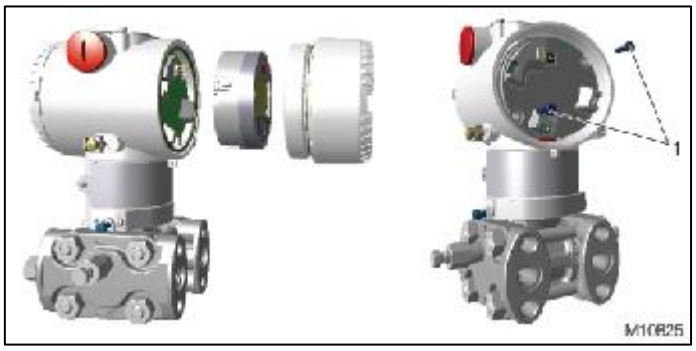


Fig. 52

6. The electronics module is connected via a ribbon cable with connector to the measuring cell; carefully unplug this connector from the electronics module.
7. Unscrew the electronics housing of the pressure transmitter. To do this, unscrew the fixing screws (2), so that the housing can be turned.
8. Turn the electronics housing counterclockwise until it can be taken off.

Fig. 53

9. Unscrew the fastening screws of the measuring cell and remove the process flanges.
10. After each dismounting, the O-rings (3) must be replaced.

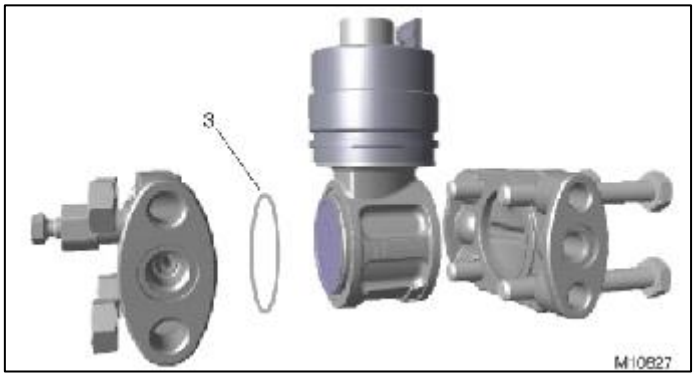


Fig. 54

11. Attach the flanges. To do this, executed the steps described above in the reverse sequence.

When the transmitter is reassembled, it can be reconfigured. The 3800XA transmitter is equipped with a self-adjustment function and thus applies the previous configuration data automatically.

12. Before the transmitter is switched on again, place the DIP switches 1 and 2 (4) in the upper position. Connect the transmitter to the energy supply and wait for 10 seconds; then return the DIP switches 1 and 2 (4) to the lower position.
13. Screw the transmitter onto its fastening bracket and onto the valve manifold. To correct a possible zero-point offset, we recommend that you execute the “PV-BIAS” function. See chapter “Correction of measuring range beginning / zero-point offset”.

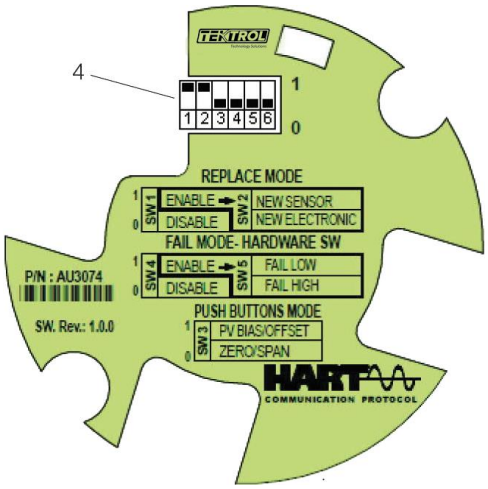

4
1
0
1 2 3 4 5 6
REPLACE MODE
SW 1
ENABLE
DISABLE
SW 2
NEW SENSOR
NEW ELECTRONIC
FAIL MODE- HARDWARE SW
SW 4
ENABLE
DISABLE
SW 5
FAIL LOW
FAIL HIGH
P/N : AU3074
SW. Rev.: 1.0.0
PUSH BUTTONS MODE
SW 3
PV BIAS/OFFSET
ZERO/SPAN
HART
COMMUNICATION PROTOCOL

Fig. 55

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Flow | Level | Temperature | Pressure | Valves | Analyzers | Accessories | TekValSys