

Nivo®Guide 3100

Two-wire 4 ... 20 mA/HART

Rod and cable probe

TDR sensor for continuous level measurement of bulk solids



Quick setup guide



Document ID: 61268



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find further information in the corresponding, comprehensive operating instructions as well as in the Safety Manual for instruments with SIL qualification.

Operating instructions NivoGuide 3100 - 4 ... 20 mA/HART - Two-wire - Rod and cable probe: Document-ID 58879

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1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 3100 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

1.6 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

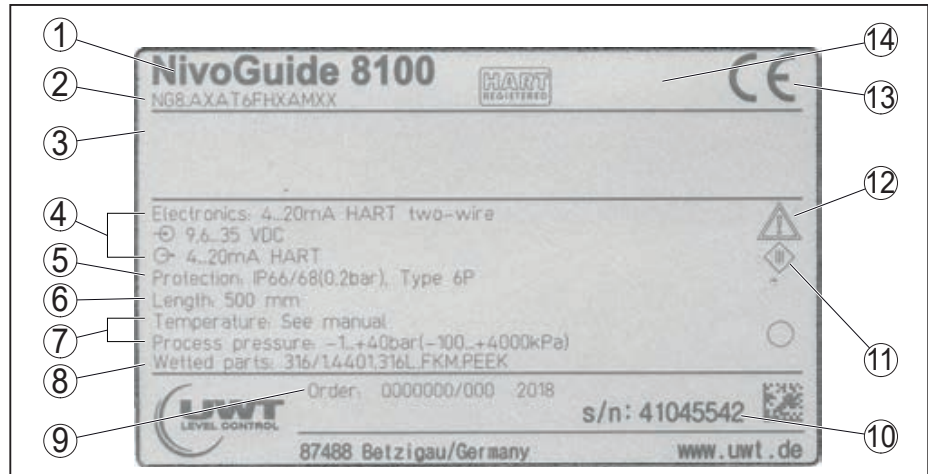


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals (option)
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 ID numbers, instrument documentation
- 13 CE identification
- 14 Approval directives (optional)

3 Mounting

Protection against moisture

3.1 General instructions for use of the instrument

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "*Connecting to power supply*")
- Tighten the cable gland or plug connector
- When mounting horizontally, turn the housing so that the cable gland or plug connector point downward
- Lead the connection cable downward in front of the cable entry or plug connector.

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

Make sure that the degree of contamination specified in chapter "*Technical data*" meets the existing ambient conditions.

Installation position

3.2 Mounting instructions

Mount NivoGuide 3100 in such a way that the distance to vessel installations or to the vessel wall is at least 300 mm (12 in). In non-metallic vessels, the distance to the vessel wall should be at least 500 mm (19.7 in).

During operation, the probe must not touch any installations or the vessel wall. If necessary, fasten the probe end.

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead band) is stated in chapter "*Technical data*" of the operating instructions.

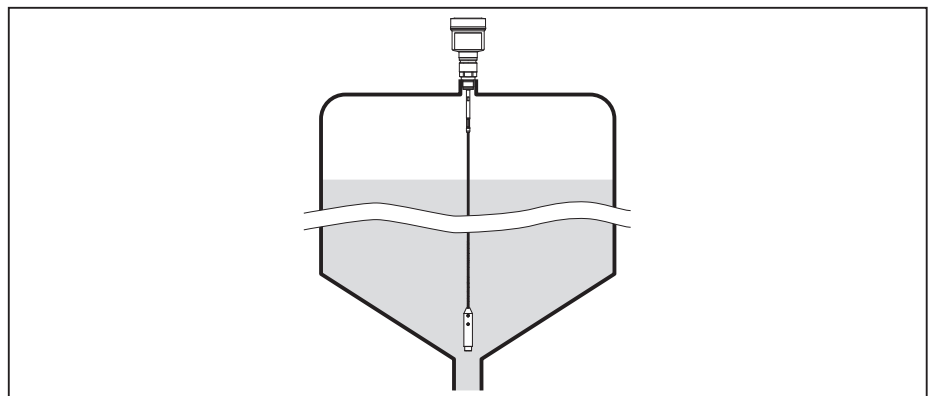


Fig. 2: Vessel with conical bottom

Type of vessel

Plastic vessel/Glass vessel

The guided microwave principle requires a metallic surface on the process fitting. Therefore, in plastic vessels, etc., use an instru-

ment version with flange (from DN 50) or place a metal sheet ($\varnothing > 200$ mm/8 in) beneath the process fitting when screwing it in. Make sure that the plate has direct contact with the process fitting. When using the probes without metal vessel wall, e.g. in plastic vessels, the measured value can be influenced by strong electromagnetic fields (emitted interference according to EN 61326: class A). Use a probe in coax version for applications in liquids.

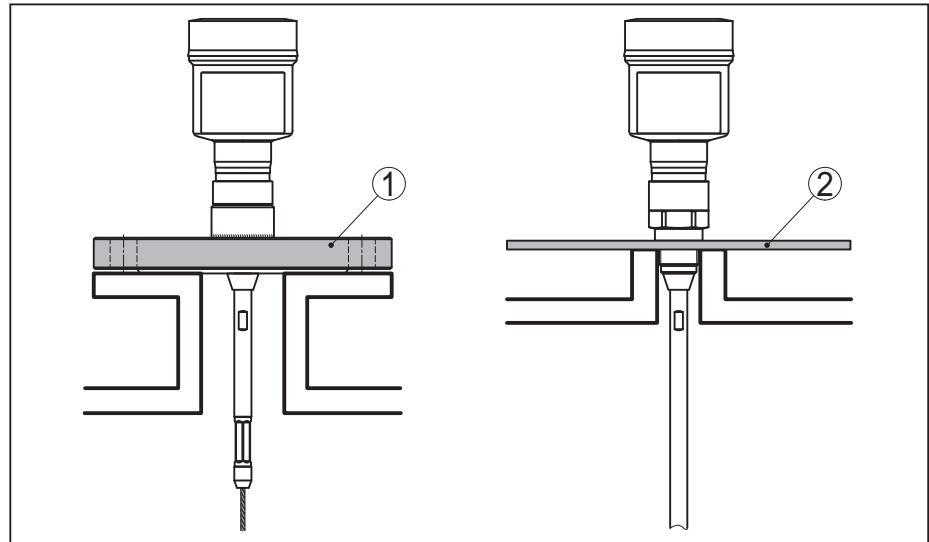


Fig. 3: Mounting in non-metallic vessel

- 1 Flange
- 2 Metal sheet

Concrete vessel

When mounting in thick concrete ceilings, NivoGuide 3100 should be mounted front flush to the lower edge. In concrete silos, the distance to the wall should be at least 500 mm (20 in).

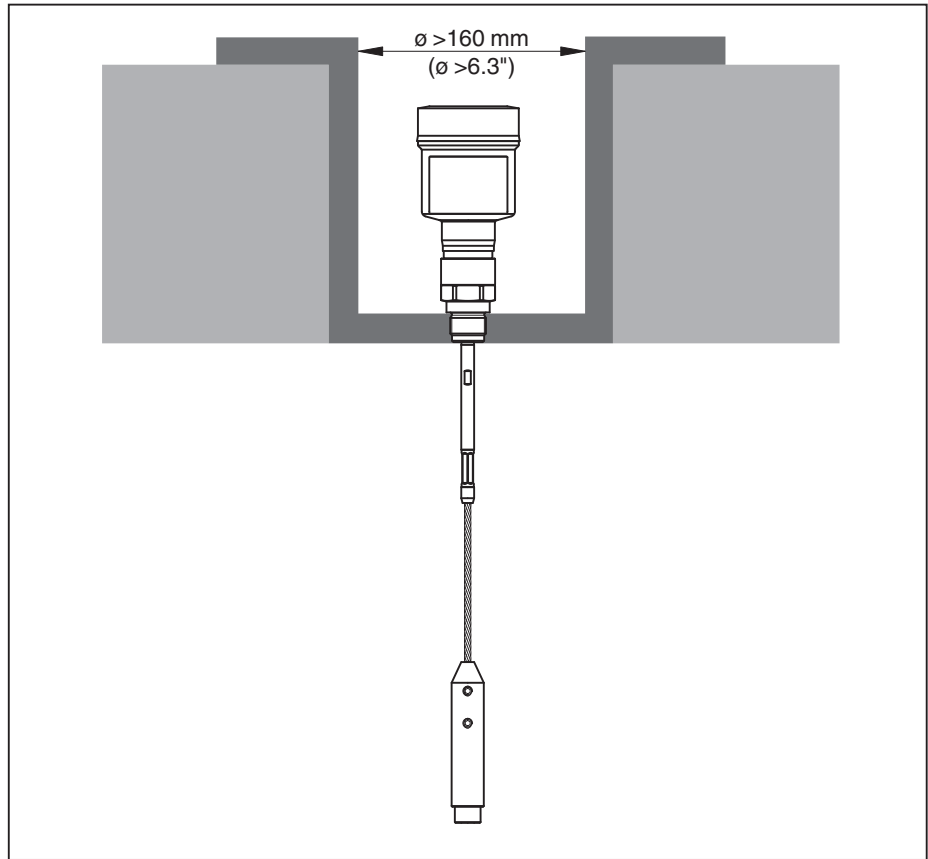


Fig. 4: Mounting in concrete silo

Mounting socket

If possible, avoid sockets. Mount the sensor flush with the vessel top. If this is not possible, use short sockets with small diameter.

Higher sockets or sockets with a bigger diameter can generally be used. They can, however, increase the upper blocking distance (dead band). Check if this is relevant for your measurement.

In such cases, always carry out a false signal suppression after mounting. You can find further information under "Setup procedure".

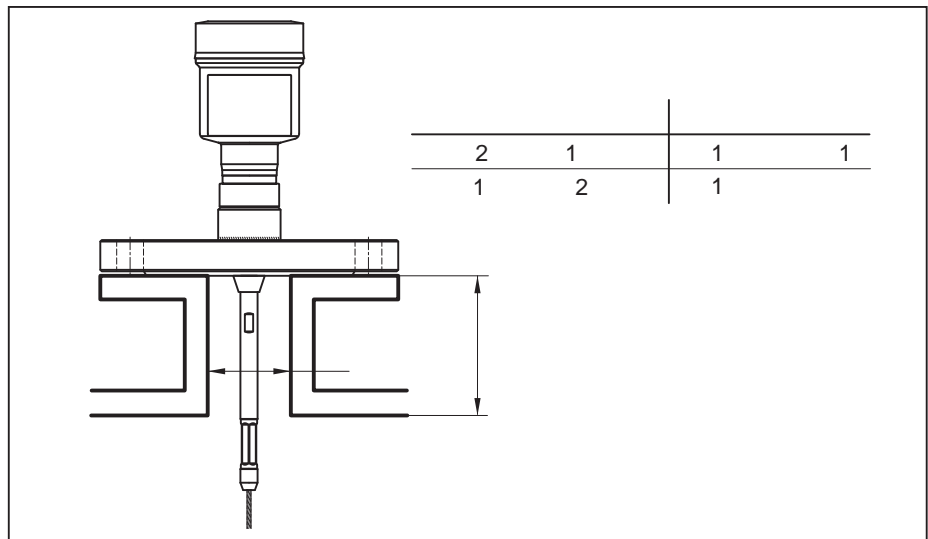


Fig. 5: Mounting socket

When welding the socket, make sure that the socket is flush with the vessel top.

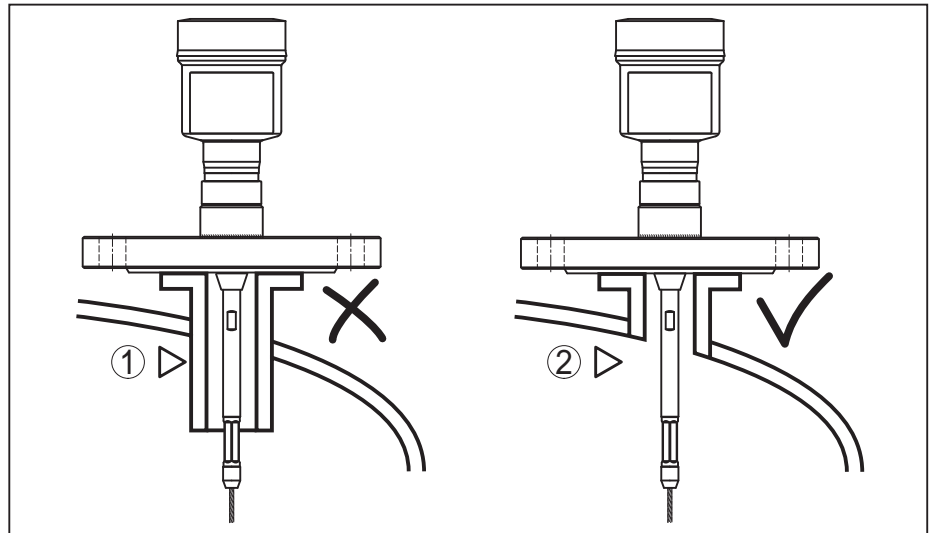


Fig. 6: Socket must be installed flush

- 1 Unfavourable mounting*
- 2 Socket flush - optimum mounting*

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

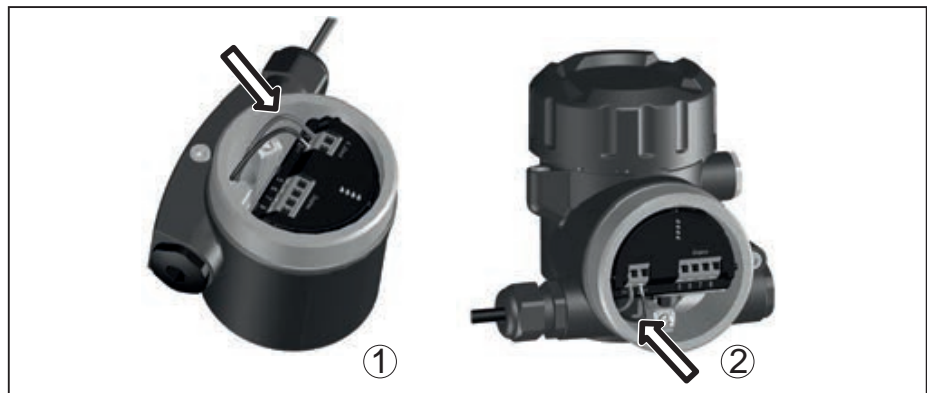


Fig. 7: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "*Technical data - Electromechanical data*".

7. Check the hold of the wires in the terminals by lightly pulling on them

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

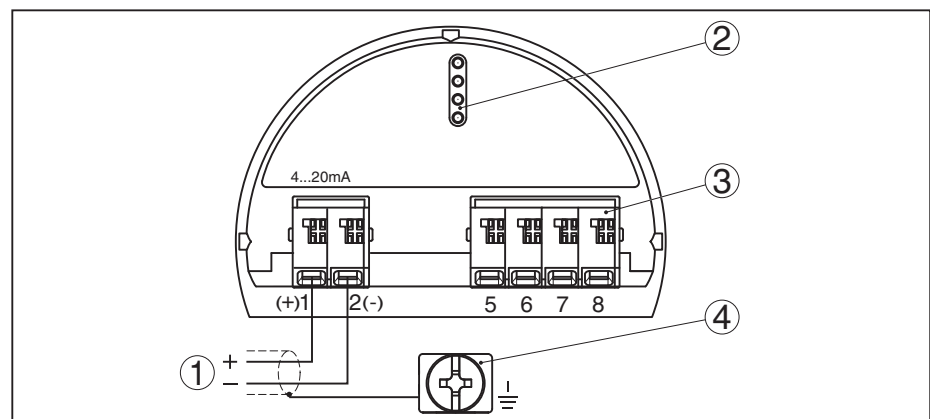


Fig. 8: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

Connection compartment

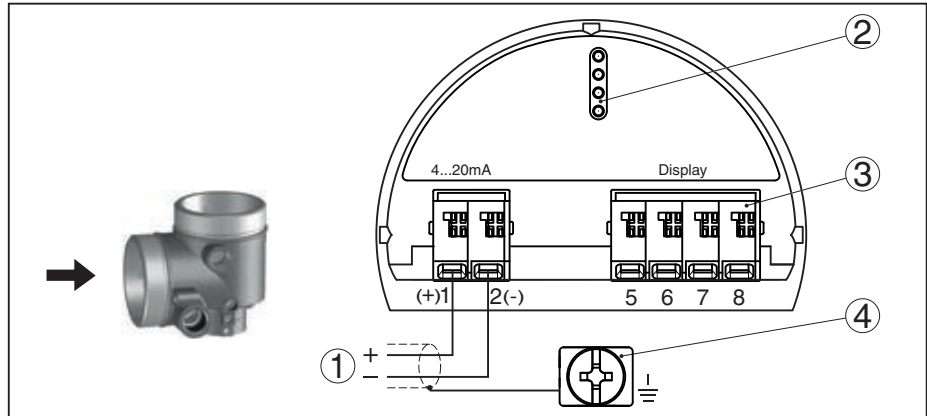


Fig. 9: Connection compartment - double chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 10: Installing the display and adjustment module in the electronics compartment of the single chamber housing

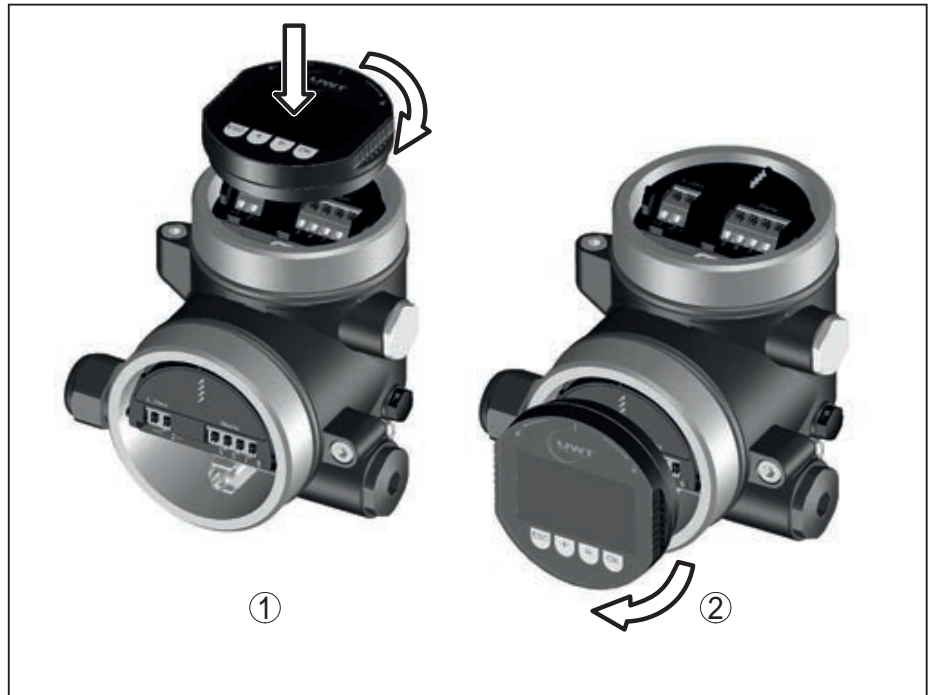


Fig. 11: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment - Quick setup

Quick setup

To quickly and easily adapt the sensor to the application, select the menu item "Quick setup" in the start graphic on the display and adjustment module.



You can find "Extended adjustment" in the detailed operating instructions.

General information

Measurement loop name

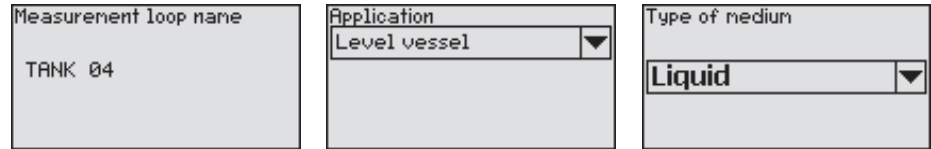
In the first menu item you can assign a suitable measurement loop name. You can enter a name with max. 19 characters.

Type of medium

In the next menu item you can see which type of medium the instrument is suitable for. If your instrument is only suitable for a certain medium, this menu item is not visible.

Application

In this menu item, you can select the application. You can choose between level measurement and interface measurement. You can also choose between measurement in a vessel or in a bypass or standpipe.



Level measurement

Medium - dielectric constant

In this menu item, you can define the type of medium (product).

Max. adjustment

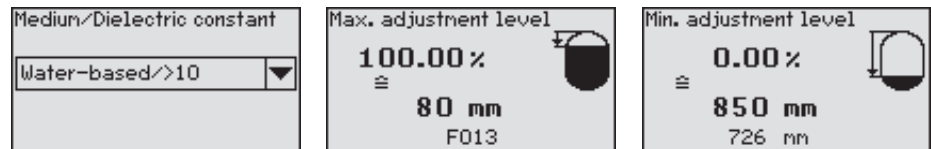
In this menu item, you can enter the max. adjustment for the level.

Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead band.

Min. adjustment

In this menu item, you can enter the min. adjustment for the level.

Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers to the sensor reference plane (seal surface of the process fitting).

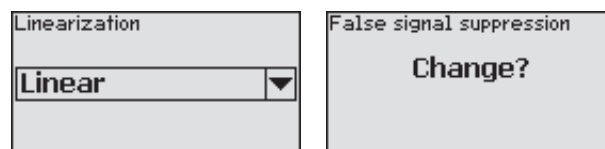


Linearisation

Linearisation

A linearisation is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. a horizontal cylindrical or spherical tank, when the indication or output of the volume is required. Corresponding linearisation curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume.

The linearization applies for the measured value indication and the current output. By activating the suitable curve, the percentage vessel volume is displayed correctly.



6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein - for example regarding the process conditions or the voltage supply.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; 0.2 bar

Cable entry

- | | |
|-------------|----------------------------------------------------------------------------------------|
| – M20 x 1.5 | 1 x cable gland M20 x 1.5 (cable: \varnothing 6 ... 12 mm), 1 x blind plug M20 x 1.5 |
| – ½ NPT | 1 x blind plug NPT, 1 x closing cap (red) ½ NPT |

Wire cross-section (spring-loaded terminals)

- | | |
|---------------------------------|---------------------------------------------|
| – Massive wire, stranded wire | 0.2 ... 2.5 mm ² (AWG 24 ... 14) |
| – Stranded wire with end sleeve | 0.2 ... 1.5 mm ² (AWG 24 ... 16) |

Voltage supply

Operating voltage U_B

- | | |
|---------------------|-----------------|
| – Non-Ex instrument | 9.6 ... 35 V DC |
| – Ex-ia instrument | 9.6 ... 30 V DC |

Operating voltage U_B with lighting switched on

- | | |
|---------------------|----------------|
| – Non-Ex instrument | 16 ... 35 V DC |
| – Ex-ia instrument | 16 ... 30 V DC |

Reverse voltage protection Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- | | |
|--------------------------------------------|-------------------------------------------|
| – for $9.6 \text{ V} < U_B < 14 \text{ V}$ | $\leq 0.7 V_{\text{eff}}$ (16 ... 400 Hz) |
| – for $18 \text{ V} < U_B < 36 \text{ V}$ | $\leq 1.0 V_{\text{eff}}$ (16 ... 400 Hz) |

Load resistor

- | | |
|------------------------------------------------------------|---------------------------------------------------------------|
| – Calculation | $(U_B - U_{\text{min}})/0.022 \text{ A}$ |
| – Example - Non-Ex instrument with $U_B = 24 \text{ V DC}$ | $(24 \text{ V} - 9.6 \text{ V})/0.022 \text{ A} = 655 \Omega$ |

Printing date:

All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.

Subject to change without prior notice

Technical support

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