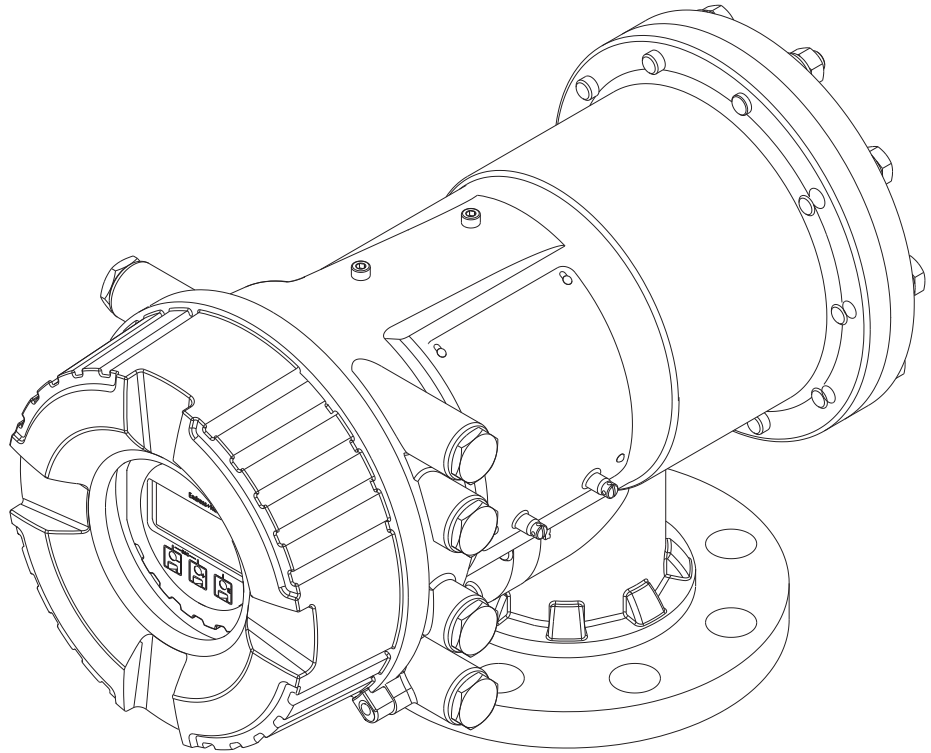
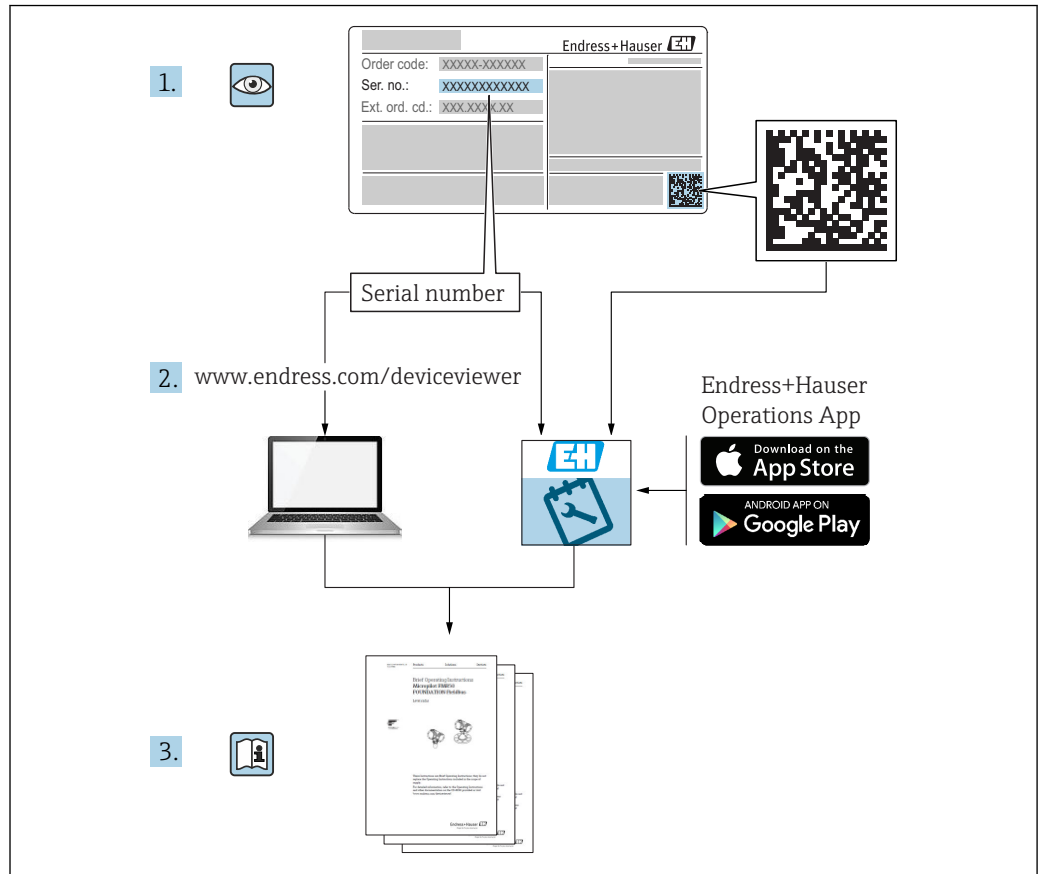


Operating Instructions

Proservo NMS83

Tank Gauging





A0023555

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1 About this document

1.1 Document function







These Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

1.2 Symbols




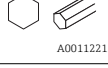

1.2.1 Safety symbols

| Symbol | Meaning |
|---|--|
|  | DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury. |
|  | WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury. |
|  | CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury. |
|  | NOTE! This symbol contains information on procedures and other facts which do not result in personal injury. |













1.2.2 Electrical symbols

| Symbol | Meaning |
|---|--|
|  | Direct current |
|  | Alternating current |
|  | Direct current and alternating current |
|  | Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system. |
|  | Protective ground connection A terminal which must be connected to ground prior to establishing any other connections. |
|  | Equipotential connection A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice. |

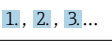
1.2.3 Tool symbols



| Symbol | Meaning |
|---|------------------------|
|  A0013442 | Torx screwdriver |
|  A0011220 | Flat blade screwdriver |
|  A0011219 | Cross-head screwdriver |
|  A0011221 | Allen key |
|  A0011222 | Hexagon wrench |

1.2.4 Symbols for certain types of information



| Symbol | Meaning |
|---|--|
|  | Permitted Procedures, processes or actions that are permitted. |
|  | Preferred Procedures, processes or actions that are preferred. |
|  | Forbidden Procedures, processes or actions that are forbidden. |
|  | Tip Indicates additional information. |
|  | Reference to documentation |
|  | Reference to page |
|  | Reference to graphic |
|  | Notice or individual step to be observed |
|  | Series of steps |
|  | Result of a step |
|  | Help in the event of a problem |
|  | Visual inspection |

1.2.5 Symbols in graphics


| Symbol | Meaning |
|---|-----------------|
| 1, 2, 3 ... | Item numbers |
|  | Series of steps |
| A, B, C, ... | Views |
| A-A, B-B, C-C, ... | Sections |

| Symbol | Meaning |
|---|--|
|  | Hazardous area Indicates a hazardous area. |
|  | Safe area (non-hazardous area) Indicates the non-hazardous area. |

1.2.6 Symbols at the device

| Symbol | Meaning |
|---|---|
|  | Safety instructions Observe the safety instructions contained in the associated Operating Instructions. |
|  | Temperature resistance of the connection cables Specifies the minimum value of the temperature resistance of the connection cables. |

1.3 Documentation

 For an overview of the scope of the associated Technical Documentation, refer to the following:

- The *W@M Device Viewer* : Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

1.3.1 Technical Information (TI)

The Technical Information contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

| Device | Technical Information |
|----------------|-----------------------|
| Proservo NMS83 | TI01250G |

1.3.2 Brief Operating Instructions (KA)

The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

| Device | Brief Operating Instructions |
|----------------|------------------------------|
| Proservo NMS83 | KA01206G |

1.3.3 Operating Instructions (BA)

The Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

It also contains a detailed explanation of each individual parameter in the operating menu (except the **Expert** menu). The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.

| Device | Operating Instructions |
|----------------|------------------------|
| Proservo NMS83 | BA01462G |

1.3.4 Description of Device Parameters (GP)

The Description of Device Parameters provides a detailed explanation of each individual parameter in the 2nd part of the operating menu: the **Expert** menu. It contains all the device parameters and allows direct access to the parameters by entering a specific code. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.

| Device | Description of Device Parameters |
|----------------|----------------------------------|
| Proservo NMS83 | GP01080G |

1.3.5 Safety instructions (XA)

| Ordering feature 010 "Approval" | Meaning | XA |
|---------------------------------|---|----------|
| BC | ATEX II 1/2G Ex db [ia Ga] IIC T6 Ga/Gb | XA01495G |
| FD | FM C/US XP-AIS CLI Div.1 Gr.BCD T6 AEx db [ia Ga] IIC T6 Ga/Gb | XA01496G |
| GC | EAC Ga/Gb Ex db [ia Ga] IIC T6...T1 X | XA01711G |
| IC | IEC Ex db [ia Ga] IIC T6 Ga/Gb | XA01495G |
| KC ¹⁾ | KC Ex d[ia] IIC T6 Ga/Gb | XA01495G |
| MC | INMETRO Ex d[ia] IIC T6 Ga/Gb | XA01705G |
| NC | NEPSI Ex d[ia] IIC T6 Ga/Gb | XA01704G |
| TC | TIIS Ex d[ia] IIC T4 Ga/Gb | XA01600G |

1) KC approval is covered with IEC Ex approval.

1.4 Registered trademarks

FieldCare®

Registered trademark of the Endress+Hauser Process Solutions AG, Reinach, Switzerland

MODBUS®

Registered trademark of the MODBUS-IDA, Hopkinton, MA, USA

2 Basic safety instructions

2.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:

- ▶ Trained, qualified specialists must have a relevant qualification for this specific function and task.
- ▶ Are authorized by the plant owner/operator.
- ▶ Are familiar with federal/national regulations.
- ▶ Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
- ▶ Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:

- ▶ Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
- ▶ Follow the instructions in this manual.

2.2 Designated use

Application and measured materials

Depending on the version ordered, the measuring device can also measure potentially explosive, flammable, poisonous and oxidizing media.

Measuring devices for use in hazardous areas, in hygienic applications or in applications where there is an increased risk due to process pressure, are labeled accordingly on the nameplate.

To ensure that the measuring device remains in proper condition for the operation time:

- ▶ Only use the measuring device in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
- ▶ Check the nameplate to verify if the device ordered can be put to its intended use in the approval-related area (e.g. explosion protection, pressure vessel safety).
- ▶ Use the measuring device only for media against which the process-wetted materials are adequately resistant.
- ▶ If the measuring device is not operated at atmospheric temperature, compliance with the relevant basic conditions specified in the associated device documentation is absolutely essential.
- ▶ Protect the measuring device permanently against corrosion from environmental influences.
- ▶ Observe the limit values in the "Technical Information".

The manufacturer is not liable for damage caused by improper or non-designated use.

Residual risk

During operation the sensor may assume a temperature near the temperature of the measured material.

Danger of burns due to heated surfaces!

- ▶ For high process temperatures: Install protection against contact in order to prevent burns.

2.3 Workplace safety

For work on and with the device:

- ▶ Wear the required personal protective equipment according to federal/national regulations.

2.4 Operational safety

Risk of injury.

- ▶ Operate the device in proper technical condition and fail-safe condition only.
- ▶ The operator is responsible for interference-free operation of the device.

Conversions to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers.

- ▶ If, despite this, modifications are required, consult with the manufacturer.

Repair

To ensure continued operational safety and reliability,

- ▶ Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe federal/national regulations pertaining to repair of an electrical device.
- ▶ Use original spare parts and accessories from the manufacturer only.

Hazardous area

To eliminate a danger for persons or for the facility when the device is used in the hazardous area (e.g. explosion protection, pressure vessel safety):

- ▶ Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area.
- ▶ Observe the specifications in the separate supplementary documentation that is an integral part of these Instructions.

2.5 Product safety

This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. It meets general safety standards and legal requirements.

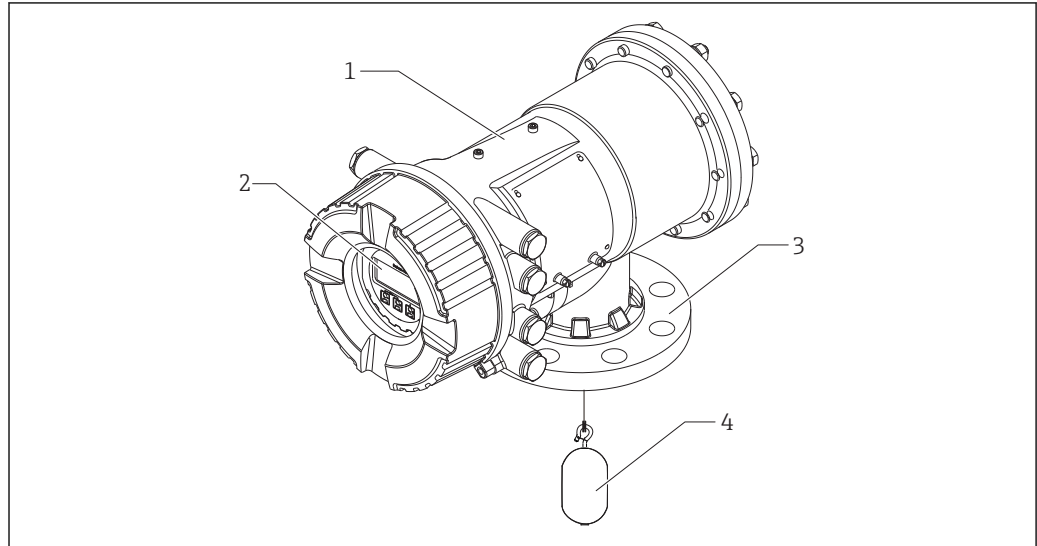
2.5.1 CE mark

The measuring system meets the legal requirements of the applicable EC guidelines. These are listed in the corresponding EC Declaration of Conformity together with the standards applied.

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

3 Product description

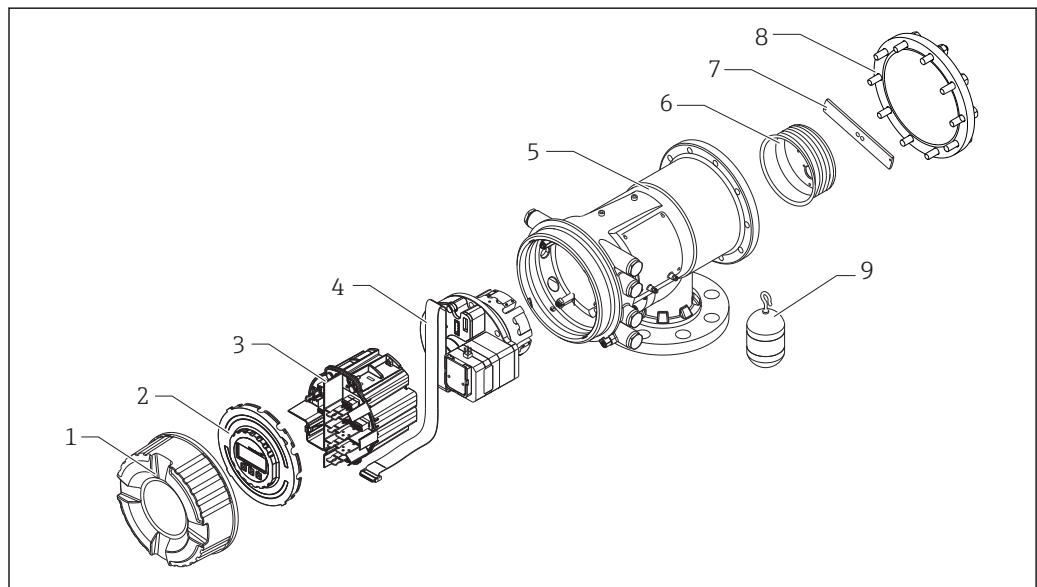
3.1 Product design



A0028699

1 Design of Proservo NMS83

- 1 Housing
- 2 Display and operating module (can be operated without opening the cover)
- 3 Process connection (Flange)
- 4 Displacer



A0028873

2 Configuration of NMS83

- 1 Front cover
- 2 Display
- 3 Modules
- 4 Sensor unit
- 5 Housing
- 6 Wire drum
- 7 Bracket
- 8 Housing cover
- 9 Displacer

4 Incoming acceptance and product identification

4.1 Incoming acceptance

Upon receipt of the goods check the following:

- Are the order codes on the delivery note and the product sticker identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- If required (see nameplate): Are the Safety Instructions (XA) enclosed?



If one of these conditions is not satisfied, contact your Endress+Hauser Sales Center.

4.2 Product identification

The following options are available for identification of the measuring device:

- Nameplate specifications
- Extended order code with breakdown of the device features on the delivery note
- Enter serial numbers from nameplates in *W@M Device Viewer* (www.endress.com/deviceviewer): All information about the measuring device is displayed.
- Enter the serial number from the nameplates into the *Endress+Hauser Operations App* or scan the 2-D matrix code (QR code) on the nameplate with the *Endress+Hauser Operations App*: all the information for the measuring device is displayed.

For an overview of the scope of the associated Technical Documentation, refer to the following:

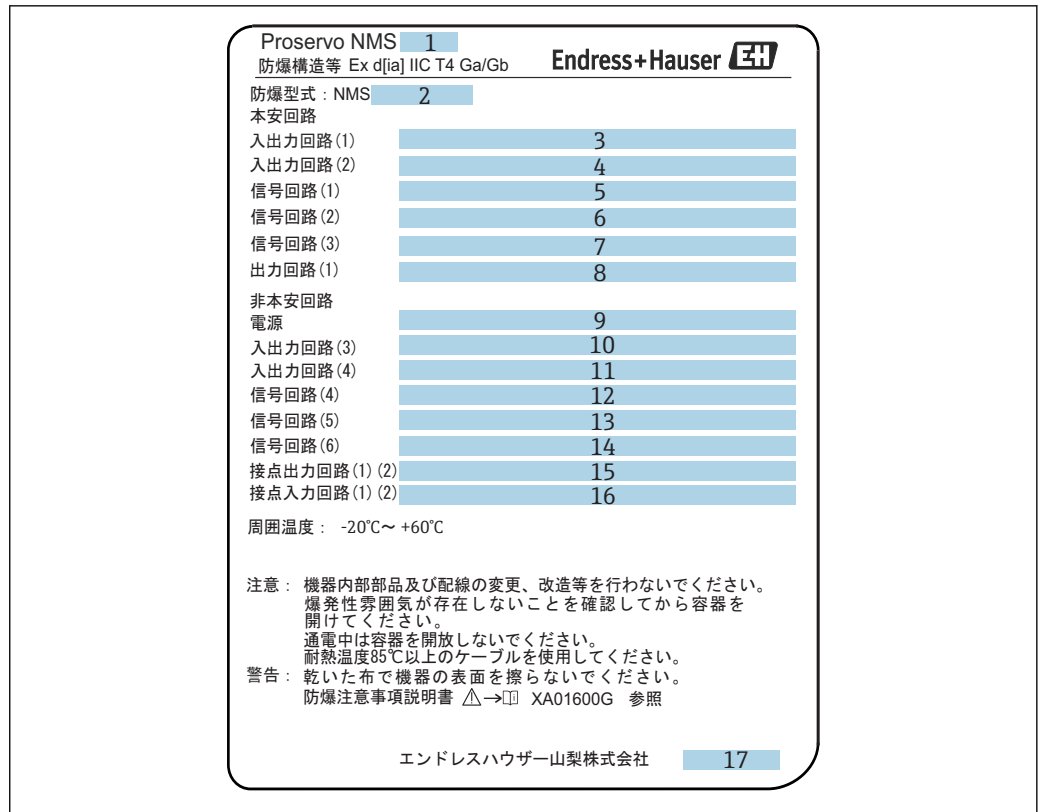
- The *W@M Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

4.2.1 Nameplate

A0027791

3 Nameplate

- 1 Manufacturer address
- 2 Device name
- 3 Order code
- 4 Serial number
- 5 Extended order code
- 6 Supply voltage
- 7 Maximum process pressure
- 8 Maximum process temperature
- 9 Permitted ambient temperature (T_a)
- 10 Temperature resistance of cable
- 11 Thread for cable entry
- 12 Material in contact with process
- 13 Device ID
- 14 Firmware version
- 15 Device revision
- 16 Metrology certification numbers
- 17 Customized parametrization data
- 18 Ambient temperature range
- 19 CE mark / C-tick mark
- 20 Additional information on the device version
- 21 Ingress protection
- 22 Certificate symbol
- 23 Data concerning the Ex approval
- 24 General certificate of approval
- 25 Associated Safety Instructions (XA)
- 26 Manufacturing date
- 27 RoHS mark
- 28 QR code for the Endress+Hauser Operations App



A0032435

4 Nameplate Proservo NMS8x for TIIS

- 1 Product type
- 2 Ex type
- 3 Input/Output circuit (1)
- 4 Input/Output circuit (2)
- 5 Signal circuit (1)
- 6 Signal circuit (2)
- 7 Signal circuit (3)
- 8 Output circuit (1)
- 9 Power supply
- 10 Input/output circuit (3)
- 11 Input/output circuit (4)
- 12 Signal circuit (4)
- 13 Signal circuit (5)
- 14 Signal circuit (6)
- 15 Contact output circuit (1) (2)
- 16 Contact input circuit (1) (2)
- 17 Drawing number

4.2.2 Manufacturer address

Endress+Hauser SE+Co. KG
 Hauptstraße 1
 79689 Maulburg, Germany

Address of the manufacturing plant: See nameplate.

4.3 Storage and transport

4.3.1 Storage conditions

- Storage temperature: -50 to +80 °C (-58 to +176 °F)
- Store the device in its original packaging.

4.3.2 Transport

NOTICE**Risk of injury**

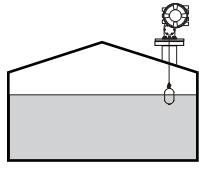
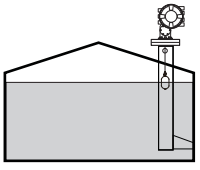
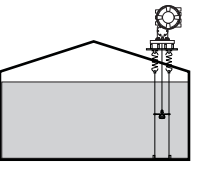

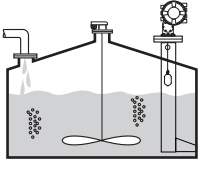
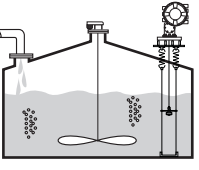
- ▶ Transport the measuring device to the measuring point in its original packaging.
- ▶ Take into account the mass center of the device in order to avoid unintended tilting.
- ▶ Comply with the safety instructions, transport conditions for devices over 18kg (39.6lbs) (IEC61010).


5 Installation

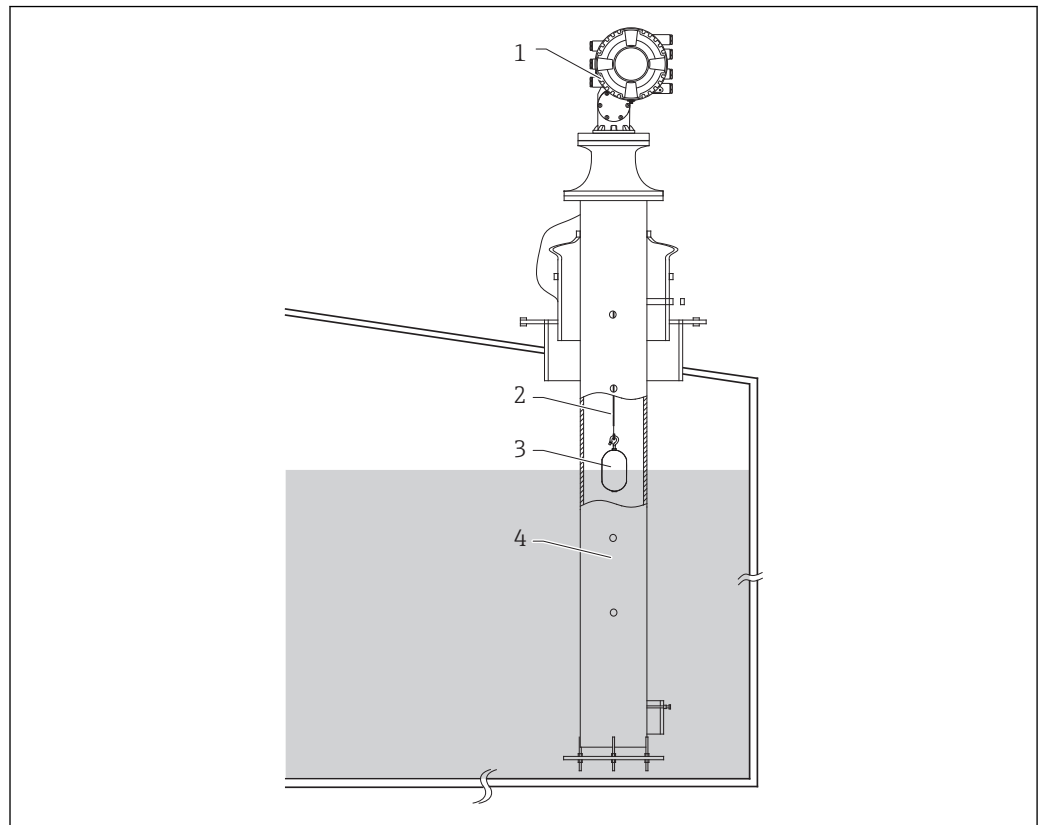
5.1 Requirements

5.1.1 Type of tanks

Depending on the type of tank and application, different installation procedures are recommended for NMS8x.

| Type of tanks | Without guide system | With stilling well | With guide wires |
|--|--|--|--|
| Fixed roof tank |  A0032437 |  A0032438 |  A0032439 |
| Tank with agitator or heavy turbulence |  |  A0032440 |  A0032441 |

-  A stilling well is required in a floating roof tank and a covered floating roof tank.
- Guide wires cannot be installed in a floating roof tank. When the measuring wire is exposed to free space, it may break due to an external shock.
- Installing guide wires is not allowed in pressurized tanks because the wires would prevent closing the valve for replacing the wire, wire drum, or displacer. NMS8x installation position is important for applications without the guide wire system in order to prevent the measuring wire from being broken (refer to Operating Instructions for details).

Typical tank installation

A0026904

5 Typical tank installation 1

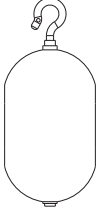
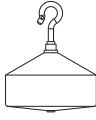
- 1 NMS8x
- 2 Measuring wire
- 3 Displacer
- 4 Stilling well

5.1.2 Displacer selection guide

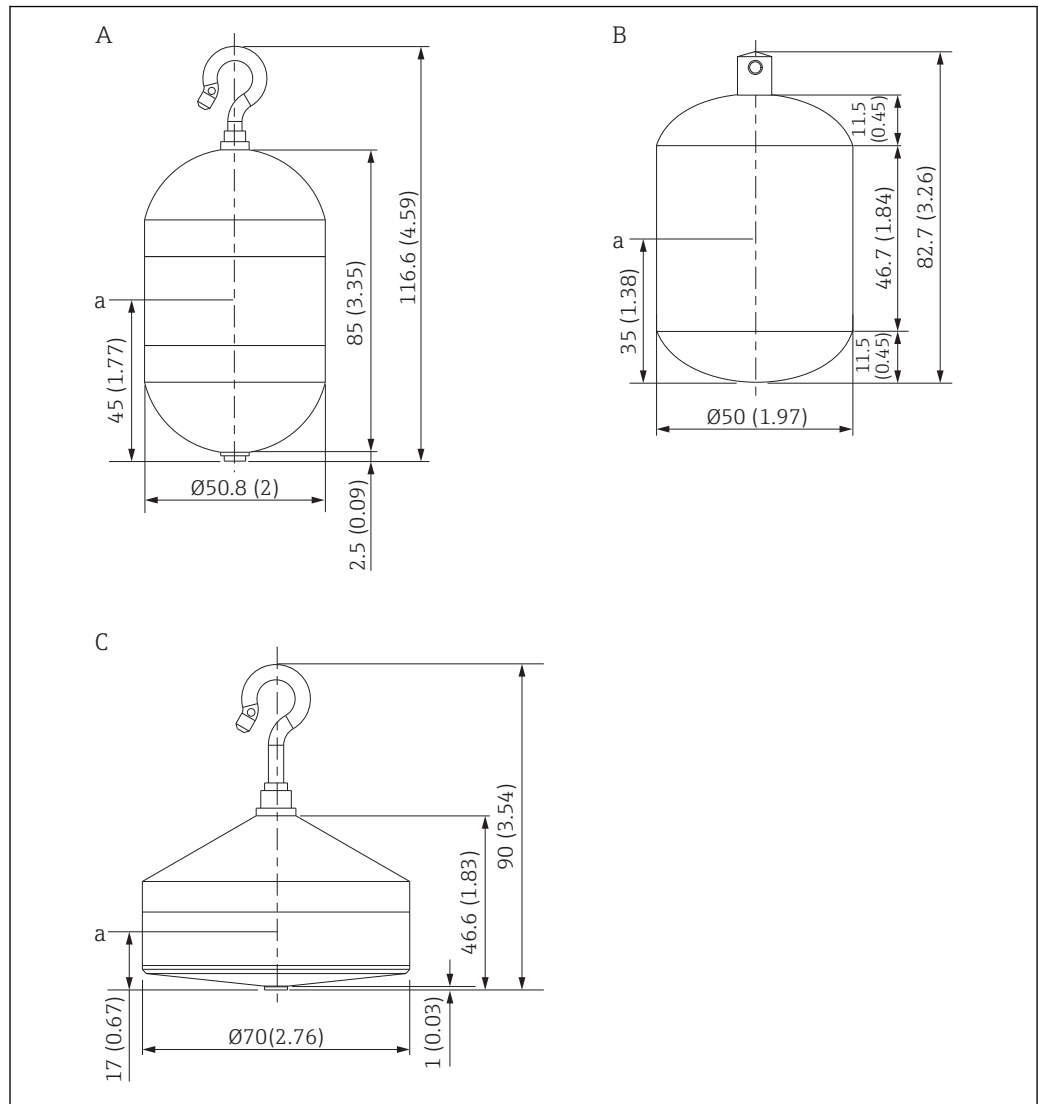
A wide variety of displacers are available to suit different application. Proper displacer selection ensures optimal performance and longevity. The following guidelines will assist you in selecting the most suitable displacer for your application.

Displacer types

The following NMS8x displacers are available.

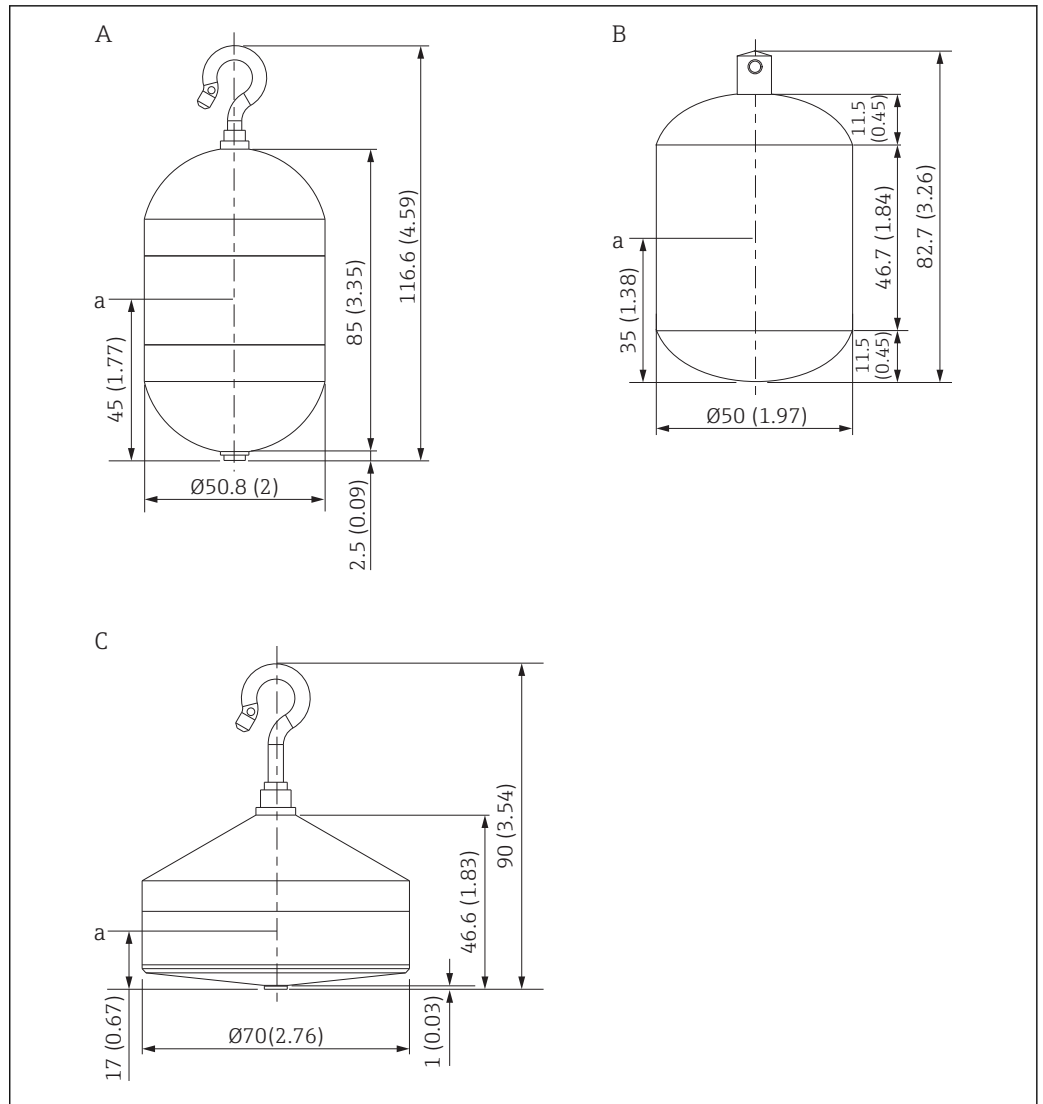
| 50 mm (1.97 in) | 70 mm (2.76 in) |
|--|--|
| 316L/PTFE | 316L |
|  <p style="text-align: right; font-size: small;">A0032429</p> |  <p style="text-align: right; font-size: small;">A0032430</p> |

Displacer dimensions



A0029581

- A $\text{Ø}50$ mm (1.97 in) 316L cylindrical displacer
- B $\text{Ø}50$ mm (1.97 in) PTFE cylindrical displacer
- C $\text{Ø}70$ mm (2.76 in) 316L conical displacer
- a Immersion point



A0029581

A $\varnothing 50$ mm (1.97 in) 316L cylindrical displacer
 B $\varnothing 50$ mm (1.97 in) PTFE cylindrical displacer
 C $\varnothing 70$ mm (2.76 in) 316L conical displacer
 a Immersion point


| Item | $\varnothing 50$ mm (1.97 in) 316L cylindrical displacer | $\varnothing 50$ mm (1.97 in) PTFE cylindrical displacer | $\varnothing 70$ mm (2.76 in) 316L conical displacer |
|---------------------|--|--|--|
| Weight (g) | 253 | 250 | 245 |
| Volume (ml) | 143 | 118 | 124 |
| Balance volume (ml) | 70.7 | 59 | 52.8 |

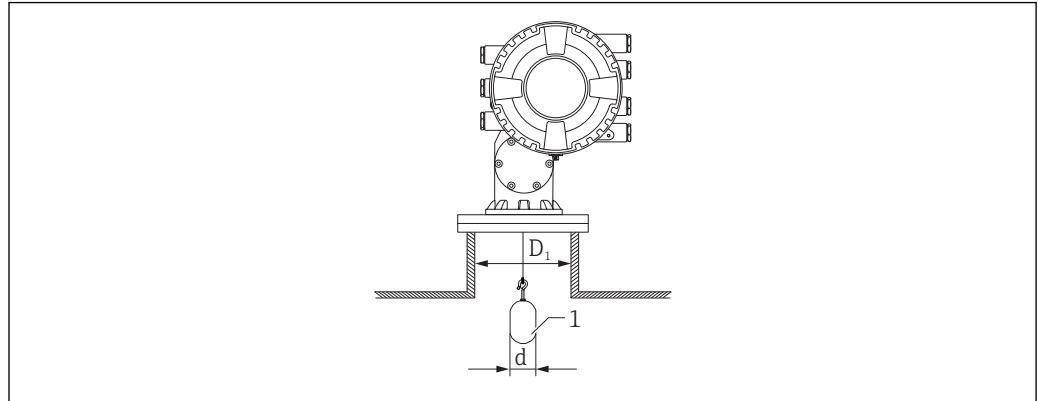
i The weight, volume, and balance volume are individually determined by each displacer and also might vary depending on the values stated above.

Recommended displacer by application


| Application | Product level | Interface level | Density |
|-----------------------------------|----------------------|----------------------|----------------------|
| Viscous liquid | 50 mm (1.97 in) PTFE | Not Recommended | Not Recommended |
| Not viscous liquid (e.g. alcohol) | 50 mm (1.97 in) 316L | 50 mm (1.97 in) 316L | 50 mm (1.97 in) 316L |

5.1.3 Mounting without a guide system

NMS8x is mounted on a nozzle of the tank roof without a guide system. Sufficient clearance inside the nozzle is necessary to allow the displacer to move without hitting the inner walls (for details of D, →  23).



A0026908

 6 No guide system

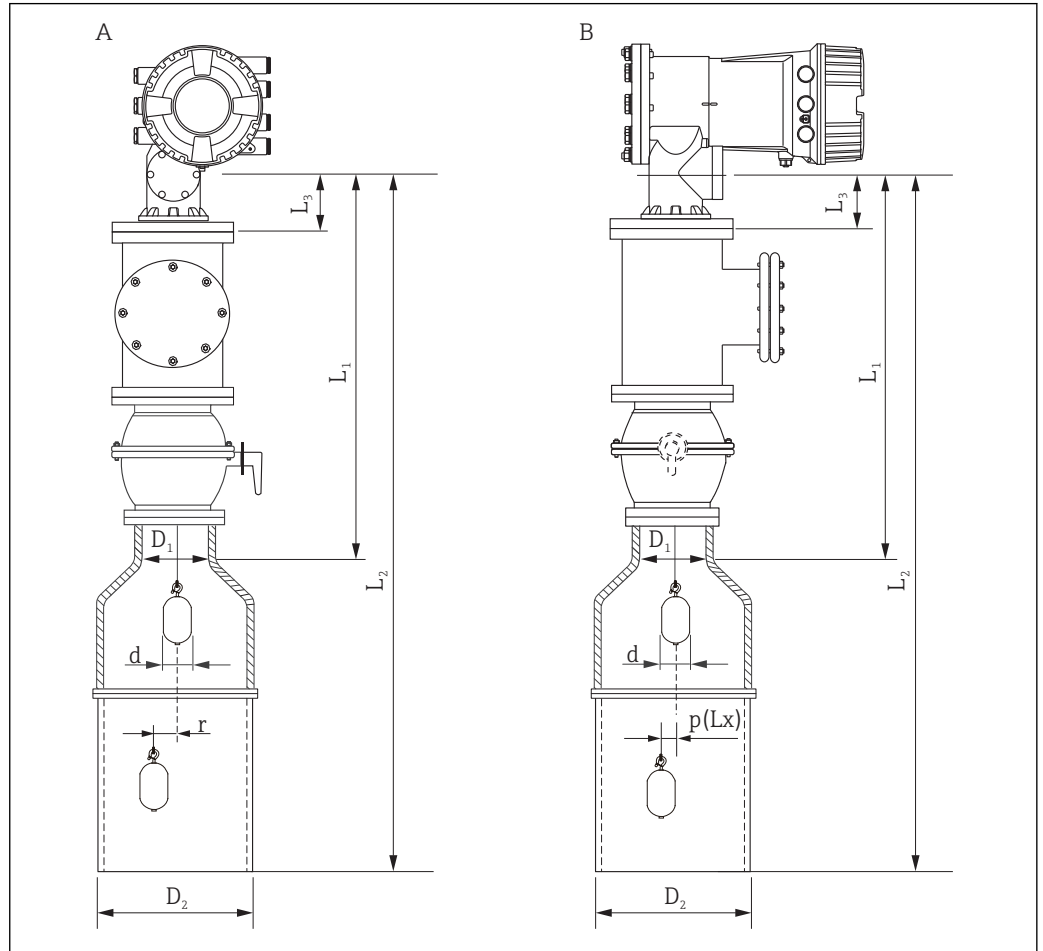
D_1 Inner diameter of the tank nozzle

d Diameter of the displacer

1 Displacer

5.1.4 Mounting with a stilling well

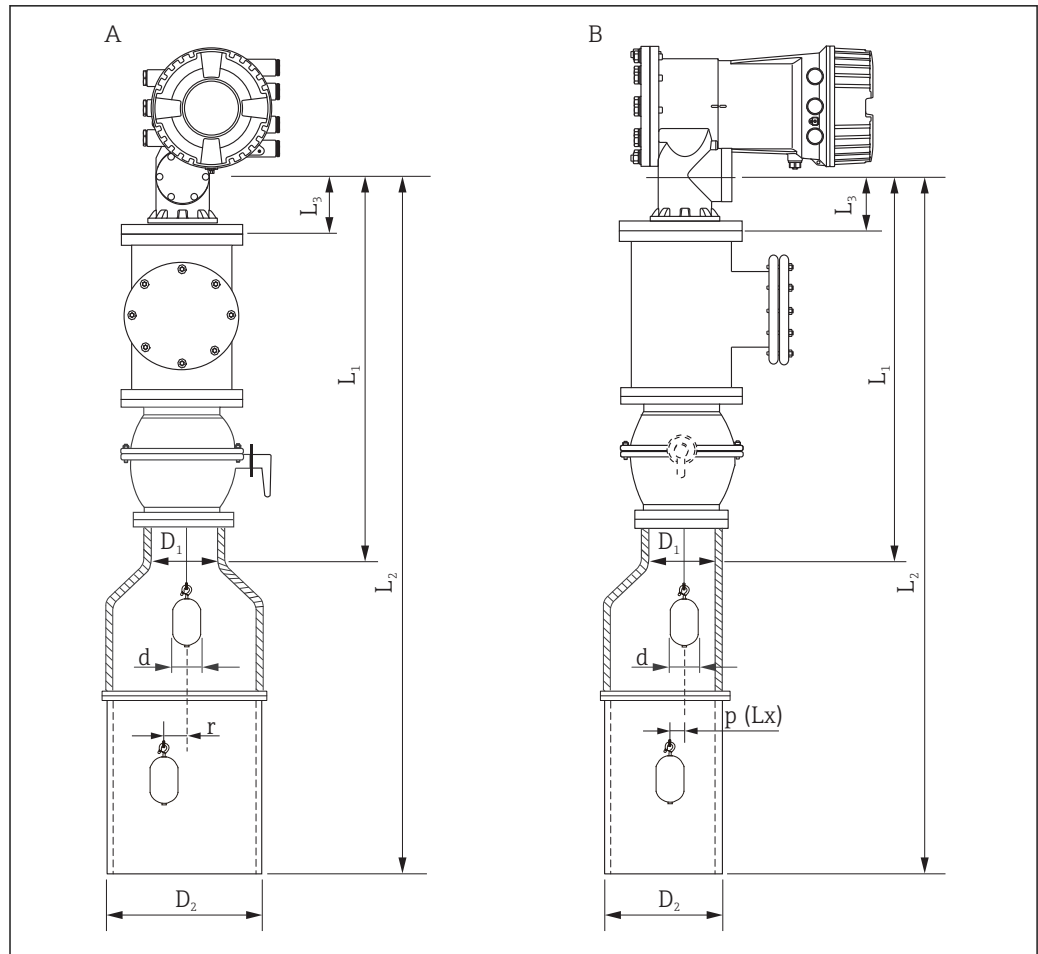
The stilling well diameter that is required to protect the measuring wire without disturbing its operation varies depending on the tank height. The stilling well could either be of constant diameter, or narrower at its upper part and wider at its lower part. The following figure shows two examples of the latter case, namely a concentric stilling well and an asymmetric stilling well.



A0029574

7 Mounting with concentric stilling well

- A Front view
- B Side view
- L_1 Length from the center of the calibration window to the upper part of the stilling well
- L_2 Length from the center of the calibration window to the bottom of the stilling well
- L_3 Length from the center of the calibration window to the bottom of the flange
- D_1 Diameter of upper part of stilling well
- D_2 Diameter of stilling well
- d Diameter of displacer
- p Longitudinal wire position from the center of the flange
- (Lx)
- r Radial direction offset



A0026909

8 Mounting with asymmetric stilling well

A Front view

B Side view

L_1 Length from the center of the calibration window to the upper part of the stilling well

L_2 Length from the center of the calibration window to the bottom of the stilling well

L_3 Length from the center of the calibration window to the bottom of the flange

D_1 Diameter of upper part of stilling well

D_2 Diameter of stilling well

d Diameter of displacer

p Longitudinal wire position from the center of the flange

(Lx)

r Radial direction offset

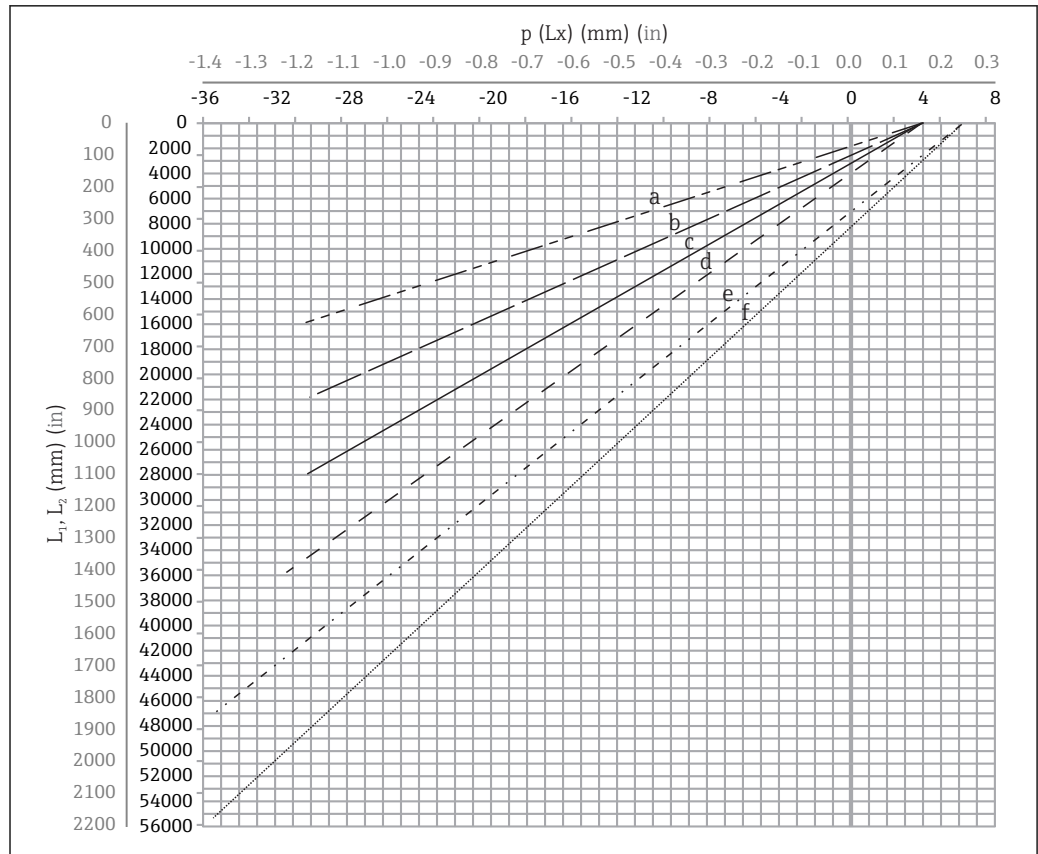
- i** L_3 : length from center of the calibration window to the bottom of the flange (77 mm (3.03 in) + flange thickness).
For JIS 10K 150A RF, the flange thickness is 22 mm (0.87 in).
- When using an asymmetric stilling well, take into account the lateral shift of the displacer and follow the NMS8x mounting direction as shown in the figure.
- To calculate the required stilling well diameters, the formula below should be used. The following tables contain the necessary parameters in order to calculate the dimensions of the stilling well. Be sure to have appropriate dimensions of the stilling well according to each dimension in the table.
- The radial direction offset (r) is required for only the 47 m (154.20 ft) and 55 m (180.45 ft) wire drum. For all other drums, the offset is 0 mm/in.

| Feature: 110 | Description (Measuring range; Wire; Diameter) | NMS80 | NMS81 | NMS83 | r |
|--------------|---|-------|-------------------------------------|-------|----------------|
| G1 | 47 m (154.20 ft); 316L; 0.15 mm (0.00591 in) | | <input checked="" type="checkbox"/> | | 6 mm (0.24 in) |
| H1 | 55 m (180.45 ft); 316L 0.15 mm (0.00591 in) | | <input checked="" type="checkbox"/> | | 6 mm (0.24 in) |

| Feature: 120 | Description (Displacer material; Type) | NMS80 | NMS81 | NMS83 | d |
|--------------|--|-------------------------------------|-------------------------------------|-------------------------------------|------------------|
| 1AA | 316L; 30 mm (1.18 in) cylindrical | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | 30 mm (1.18 in) |
| 1AC | 316L; 50 mm (1.97 in) cylindrical | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | 50 mm (1.97 in) |
| 1BE | 316L; 70 mm (2.76 in) conical | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | 70 mm (2.76 in) |
| 1BJ | 316L; 110 mm (4.33 in) conical | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | 110 mm (4.33 in) |
| 2AA | PTFE; 30 mm (1.18 in) cylindrical | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | 30 mm (1.18 in) |
| 2AC | PTFE; 50 mm (1.97 in) cylindrical | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | 50 mm (1.97 in) |
| 3AC | AlloyC276; 50 mm (1.97 in) cylindrical | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | 50 mm (1.97 in) |
| 4AC | 316L polished; 50 mm (1.97 in) cylindrical | | | <input checked="" type="checkbox"/> | 50 mm (1.97 in) |
| 4AE | 316L polished; 70 mm (2.76 in) conical | | | <input checked="" type="checkbox"/> | 70 mm (2.76 in) |
| 5AC | PTFE; 50 mm (1.97 in) cylindrical, hygienic white | | | <input checked="" type="checkbox"/> | 50 mm (1.97 in) |

| Parameter | Description |
|-----------|---|
| d | Diameter of displacer |
| p(Lx) | Longitudinal wire position from the center of the flange The value can be determined by using following graph. |
| r | Radial direction offset |
| s | Safety factor recommended: 5 mm (0.197 in) |

The following graph shows the lateral shift of the displacer depending on the measured distance for the different wire drums.



A0027997

9 Lateral shift of displacer according to measurement range

- a 16 m (A3) (NMS80/NMS81/NMS83)
- b 22 m (C2) (NMS80/NMS81/NMS83)
- c 28 m (D1) (NMS80/NMS81)
- d 36 m (F1) (NMS80/NMS81)
- e 47 m (G1) (NMS81)
- f 55 m (H1) (NMS81)

Upper diameter of stilling well

The dimension of D_1 has to be the largest value of the dimensions D_{1a} , D_{1b} , D_{1c} , and D_{1d} according to the following formula.

| D ₁ Dimension (Example) | D _{1x} Dimension | | Description | Formula |
|------------------------------------|---------------------------|-----------|---|-------------------------------------|
| | Example | Parameter | | |
| >68.1 mm (2.68 in) | 68.1 mm (2.68 in) | D_{1a} | D_1 dimension when the displacer is at the center of the calibration window | $= 2 \times (p(0) + d/2 + s)$ |
| | 65.6 mm (2.58 in) | D_{1b} | D_1 dimension when the displacer is at the upper part of the stilling well | $= 2 \times (p(L_1) + d/2 + s)$ |

| D ₁ Dimension (Example) | D _{1x} Dimension | | Description | Formula |
|---------------------------------------|---------------------------|-----------------|--|---------------------------------|
| | Example | Parameter | | |
| | 50.9 mm (2.00 in) | D _{1c} | D ₁ dimension when the displacer is at the bottom of the stilling well | $= 2 \times (p (L_2) + s)$ |
| | | D _{1d} | D ₁ dimension when the radial direction offset is considered. This calculation is used only with the 47 m (154.20 ft) wire drum (G1 in Feature110) and 55 m (180.45 ft) (H1 in feature 110) | $= 2 \times (d/2 + r + s)$ |

i Example: L₁ = 1 000 mm, L₂ = 20 000 mm, d = 50 mm, s = 5.0, 28 m drum

Lower diameter of stilling well

The dimension of D₂ has to be the larger value of the dimensions D₁ and D_{2b} .
See the table below.

Concentric pipe

| D ₂ Dimension (Example) | D _{2x} Dimension | | Description | Formula |
|---------------------------------------|---------------------------|-----------------|---|---------------------------------------|
| | Example | Parameter | | |
| >100.9 mm (3.97 in) | 68.1 mm (2.68 in) | D ₁ | Calculated D ₁ value | |
| | 100.9 mm (3.97 in) | D _{2b} | D ₂ dimension when the displacer is in L ₂ length | $= 2 \times (p (L_2) + d/2 + s)$ |

i Example: L₂ = 20 000 mm, d = 50 mm, s = 5.0, 28 m drum

Asymmetric pipe

| D ₂ Dimension (Example) | D _{2x} Dimension | | Description | Formula |
|---------------------------------------|---------------------------|-----------------|---|----------------------------------|
| | Example | Parameter | | |
| >84.5 mm (3.33 in) | 68.1 mm (2.68 in) | D ₁ | Calculated D ₁ value | |
| | 84.5 mm (3.33 in) | D _{2b} | D ₂ dimension that the displacer can pass through (nth groove) | $= p (L_2) + d/2 + s + D_1/2$ |

i Example: L₂ = 20 000 mm, d = 50 mm, s = 5.0, 28 m drum

Recommendations for NMS8x mounting with a stilling well

i Follow the recommendations for mounting NMS8x with a stilling well.

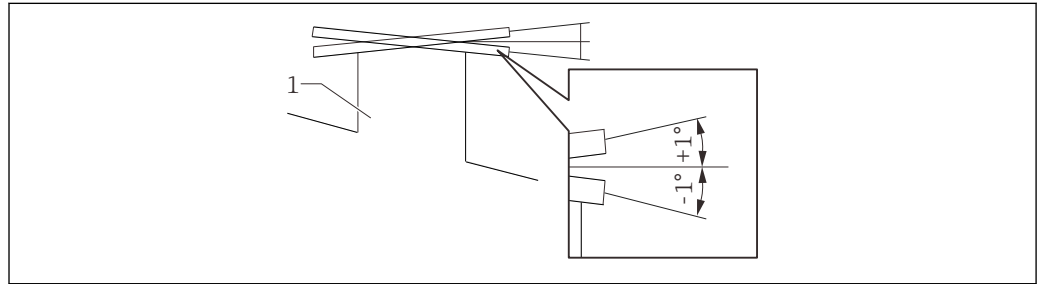
- Keep the pipe connection welds smooth.
- When drilling holes into the pipe, keep the interior surface of the holes clear of metal chips and burrs.
- Keep the pipe as vertical as possible. Check using a plumb bob.
- Install the asymmetric pipe under the valve and align the centers of the NMS8x and the valve.
- Set the center of the lower part of the asymmetric pipe in the direction of the lateral motion.
- Observe the recommendations as per API MPMS chapter 3.1B.
- Confirm grounding between NMS8x and the tank nozzle.

5.1.5 Alignment of NMS8x

Flange

Confirm that the size of the nozzle and the flange is matched prior to mounting NMS8x on the tank. The flange size and the rating of NMS8x vary depending on the customer's specifications.


- i
 - Check the flange size of NMS8x.
 - Mount the flange on the top of the tank. The deviation of the flange from the horizontal plane should not exceed ± 1 degree.
 - When mounting NMS8x on a long nozzle, make sure that the displacer does not touch the inner wall of the nozzle.

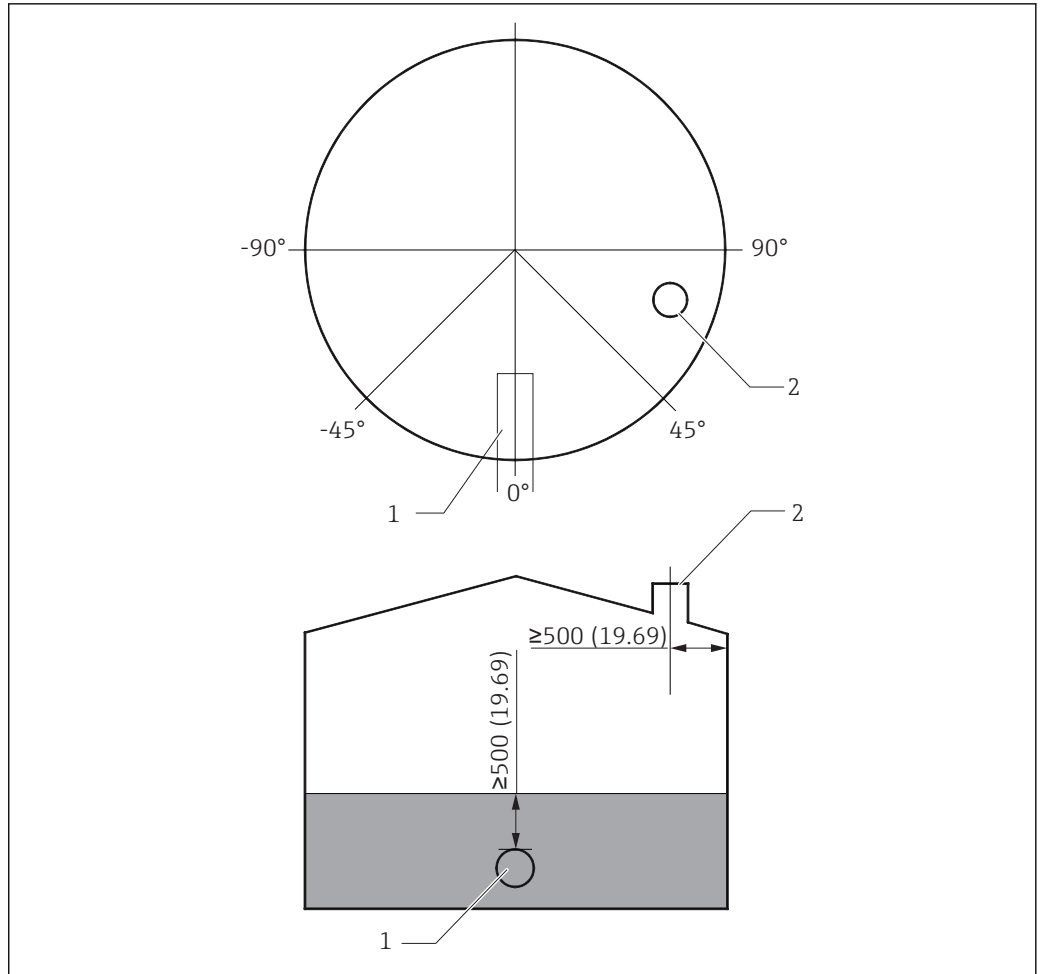


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 10 Allowable inclination of mounting flange

1 Nozzle

- i
 - When NMS8x is installed without a guide system, follow the recommendations below:
 - Confirm the mounting nozzle is in the sector between 45 and 90 degrees (or -45 and -90 degrees) away from the inlet pipe of the tank. This prevents heavy swinging of the displacer caused by waves or turbulence from the inlet liquid.
 - Confirm the mounting nozzle is 500 mm (19.69 in) or more away from the tank wall.
 - Confirm the minimum measuring level is at 500 mm (19.69 in) or more above the top of the inlet pipe by setting the low stop (for details of low stop setting, →  89). This protects the displacer from direct flow of the inlet liquid.
 - If a stilling well cannot be mounted in the tank due to the shape or condition of the tank, attaching a guide system is recommended. Consult E+H services for further information.



11 Recommended position for mounting NMS8x and minimum measuring level; dimensions mm (in)

- 1 Inlet pipe
- 2 Tank nozzle

- i
 - Before pouring liquid into the tank, confirm that liquid flowing through the inlet of the pipe will not contact the displacer directly.
 - When discharging liquid out of the tank, ensure that the displacer will not get caught in the liquid current and sucked into the outlet pipe.

5.1.6 Electrostatic charge

When liquid measured by NMS8x has a conductivity of 1 uS/m or less, it is quasi-nonconductive. In this case, using a stilling well or guide wire is recommended. This releases the electrostatic charge on the liquid surface.

5.2 Mounting of the device

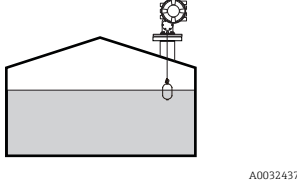
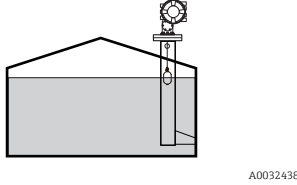
When NMS8x is delivered, the displacer is always shipped separately and there are two methods to install displacer as follows.

- Installation for displacer shipped separately method
- Installation through the calibration window

5.2.1 Available installations

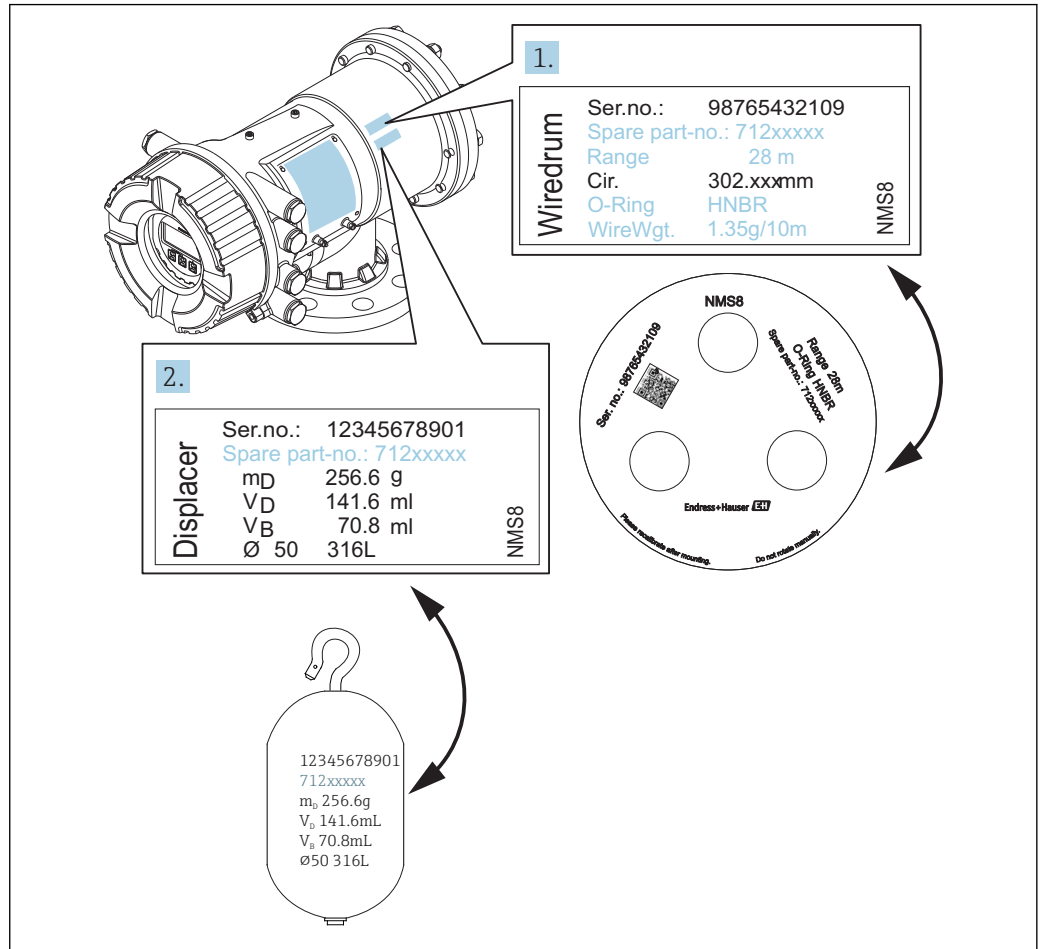
The following installation procedures are available for NMS8x.

- Mounting without guide system
- Mounting with stilling well

| Mounting options | Free-space mounting | With stilling well |
|-----------------------|---|---|
| Type of tanks |  |  |
| Type of installations | <ul style="list-style-type: none"> ▪ Displacer shipped separately ▪ Displacer installation through calibration window | <ul style="list-style-type: none"> ▪ Displacer shipped separately ▪ Displacer installation through calibration window |

5.2.2 Verification of displacer and wire drum

Prior to installation of NMS8x, confirm that the serial numbers of displacer and the wire drum match with those printed to the label attached on the housing.

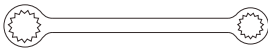


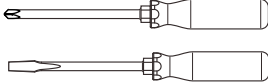
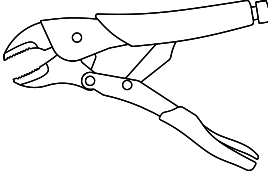


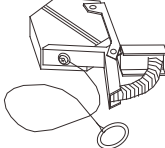


12 Verification of displacer and wire drum

A0029470

5.2.3 Tools to be required for installation

The following tools are required when installing NMS8x.

| Tools | Figures | Notes |
|---|---|---|
| Box end wrench |  | Use the following size <ul style="list-style-type: none"> ■ 24 mm (0.94 in) ■ 26 mm (1 in) ■ 30 mm (1.2 in) ■ 32 mm (1.3 in) |
| Crescent wrench |  | Use the size of 350 mm (13.78 in) |
| Allen key |  | Use the size of 3 mm (0.12 in) or 5 mm (0.17 in) |
| Screw driver <ul style="list-style-type: none"> ■ Cross-head screwdriver ■ Flat-blade screwdriver |  | |
| Wire cutters or terminal pliers |  | |
| Crimp terminal |  | A: Signal and power supply: 0.2 to 2.5 mm ² (24 to 13 AWG) <ul style="list-style-type: none"> ■ Ground terminal in the terminal compartment: max. 2.5 mm² (13 AWG) ■ Ground terminal at the housing: max. 4 mm² (11 AWG) |
| Water pump pliers |  | |
| Density calibration test weight |  | This tool is used especially for density measurement application (optional). |

5.2.4 Installation for displacer shipped separately method

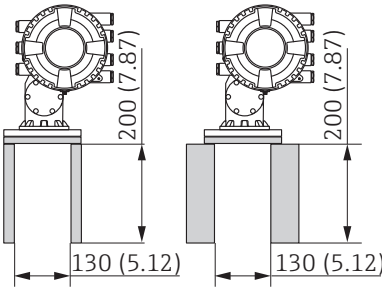
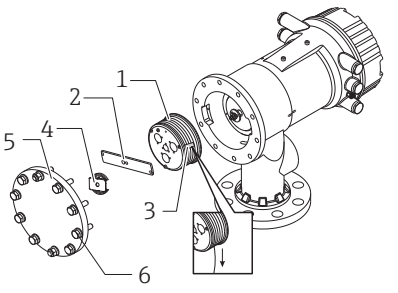
It is necessary to remove the wire drum from NMS8x, remove the tape on the wire drum, mount the wire drum in the drum housing, and install the displacer on the measuring wire.

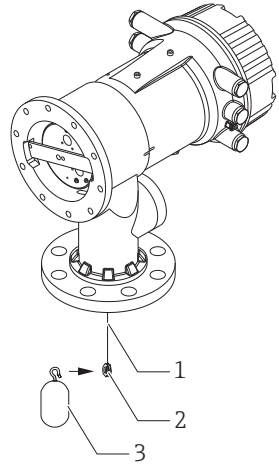
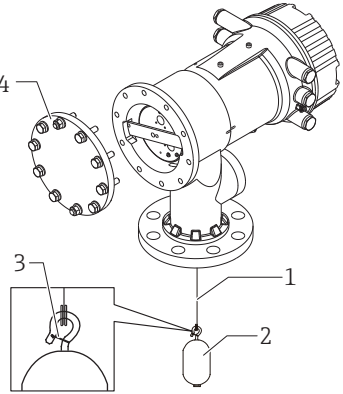
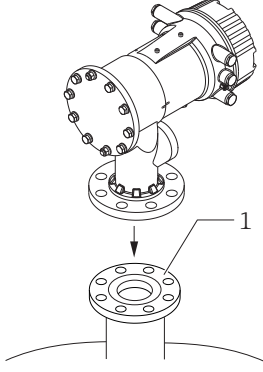
Use blocks or a pedestal to secure NMS8x and provide an environment where electrical power can be supplied to NMS8x.

i The following procedure uses NMS81 figures for an example.

i Displacer is shipped separately according to the following specifications.

- 47 m (154.2 ft) measuring range
- 55 m (180.5 ft) measuring range
- 110 mm (4.33 in) measuring range
- 8 in flange
- Cleaned from oil+grease option

| Procedures | Figures |
|--|---|
| <ol style="list-style-type: none"> 1. Secure NMS8x on the blocks or pedestal. 2. Confirm that there is enough space under NMS8x. <p>i Be careful not to drop NMS8x.</p> |  <p style="text-align: right; font-size: small;">A0032442</p> <p style="text-align: center;">Dimensions mm (in)</p> |
| <ol style="list-style-type: none"> 3. Remove screws and M6 bolts [6] (M10 bolts for stainless steel housing). 4. Remove the wire drum cover [5], wire drum stopper [4], and the bracket [2]. 5. Remove the wire drum [1] from the drum housing. 6. Remove the tape [3] on the wire drum. 7. Unwind the measuring wire approximately 250 mm (9.84 in) so that the wire ring is positioned under the flange. 8. Mount the wire drum on NMS8x. 9. Mount the bracket. <p>i</p> <ul style="list-style-type: none"> ■ Take special care to not hit the wire drum against the housing due to strong magnet force. ■ Handle the measuring wire with care. It may kink. ■ Be sure that the wire is wound correctly in the grooves. |  <p style="text-align: right; font-size: small;">A0028876</p> |

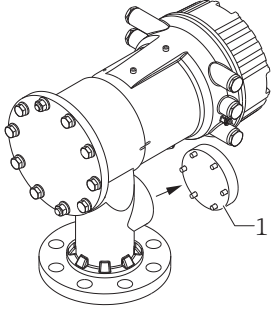
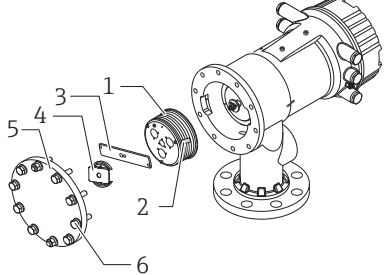
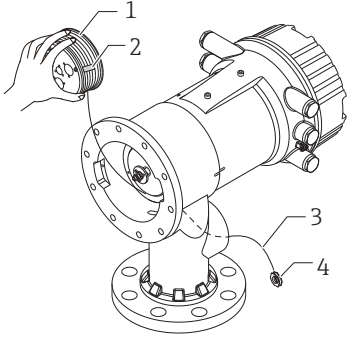
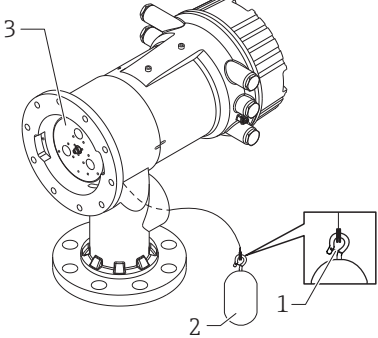
| Procedures | Figures |
|---|--|
| <p>10. Hook the displacer [3] on the ring [2].</p> <p>i</p> <ul style="list-style-type: none"> ▪ Be sure that the wire is wound correctly in the grooves. ▪ If not, remove the displacer and the wire drum, and repeat step 7. |  <p style="text-align: right;">A0029116</p> |
| <p>11. Turn on the power of NMS8x.</p> <p>12. Perform sensor calibration</p> <p>13. Secure the displacer [2] to the measuring wire [1] using the securing wire [3].</p> <p>14. Perform reference calibration.</p> <p>15. Turn off the power.</p> <p>16. Mount the wire drum cover [4].</p> <p>i</p> <ul style="list-style-type: none"> ▪ For sensor calibration, → 82 ▪ For reference calibration, → 84. |  <p style="text-align: right;">A0027017</p> |
| <p>17. Mount NMS8x on the tank nozzle [1].</p> <p>18. Confirm that the displacer does not touch the inner wall of the nozzle.</p> <p>19. Turn on the power.</p> <p>20. Perform drum calibration.</p> <p>i For drum calibration, → 85</p> |  <p style="text-align: right;">A0028877</p> |

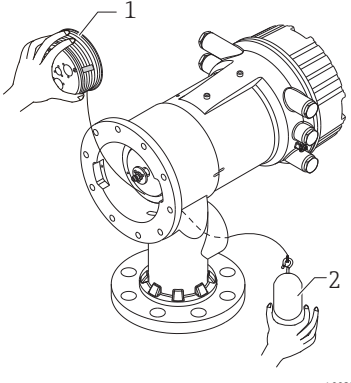
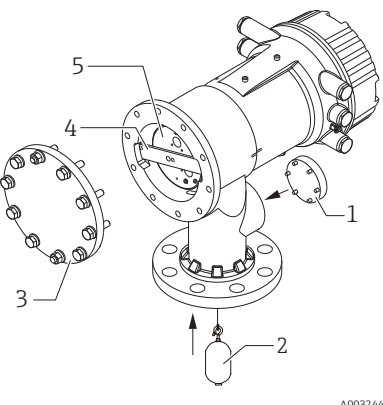
5.2.5 Installation through the calibration window

In the case of a 50 mm (1.97 in) diameter displacer, the displacer can be installed through the calibration window.

i It is only possible to install the following displacers through the calibration window:
50 mm SUS, 50 mm alloy C, 50 mm PTFE

i The following procedure uses NMS81 figures for an example.


| Procedures | Figures |
|---|--|
| <ol style="list-style-type: none"> 1. Remove the calibration window cover [1]. |  <p style="text-align: right;">A0032443</p> |
| <ol style="list-style-type: none"> 2. Remove M6 bolts and screws [6] (M10 bolts for stainless steel housing). 3. Remove the cover [5], wire drum stopper [4], and the bracket [3]. 4. Remove the wire drum [1] from the drum housing. 5. Remove the tape [2] that is securing the wire. <p>i Handle the measuring wire with care. It may kink.</p> |  <p style="text-align: right;">A0029118</p> |
| <ol style="list-style-type: none"> 6. Holding the wire drum [1] with one hand, unwind the measuring wire [3] approximately 500 mm (19.69 in). 7. Secure the wire [3] temporarily with the tape [2]. 8. Insert the wire ring [4] into the drum housing. 9. Pull the wire ring out through the calibration window. <p>i</p> <ul style="list-style-type: none"> Take special care to not hit the wire drum against the housing due to strong magnet force. Handle the measuring wire with care. |  <p style="text-align: right;">A0028879</p> |
| <ol style="list-style-type: none"> 10. Insert the wire drum [3] temporarily into the drum housing. 11. Hook the displacer [2] on the wire ring. 12. Secure the displacer to the measuring wire using the securing wire [1]. <p>i Handle the measuring wire with care. It may kink.</p> |  <p style="text-align: right;">A0027984</p> |

| Procedures | Figures |
|---|--|
| <p>13. Remove the wire drum from the drum housing and unwind the measuring wire down approximately 500 mm (19.69 in).</p> <p>14. Hold the wire drum [1] up and place the displacer [2] into the calibration window.</p> <p>15. Hold the displacer at the center of the calibration window.</p> <p>16. Hold the other hand (wire drum) up to add tension to the measuring wire in order not to drop the displacer rapidly.</p> |  <p>A0027986</p> |
| <p>17. Let go of the displacer [2].</p> <p>18. Remove the tape from the wire drum [5].</p> <p>19. Insert the wire drum into the drum housing.</p> <p>20. Mount the bracket [4].</p> <p>i Be sure that the wire is wrapped correctly in grooves.</p> <p>21. Turn on the power of NMS8x and move the displacer up using the Move displacer wizard → 80 until the wire ring can be seen in the calibration window.</p> <p>i</p> <ul style="list-style-type: none"> ▪ Confirm that there are no kinks or other defects in the measuring wire. ▪ Confirm that the displacer does not touch the inner wall of the nozzle. <p>22. Perform sensor calibration.</p> <p>i For sensor calibration, → 82</p> <p>23. Perform reference calibration.</p> <p>i For reference calibration, → 84.</p> <p>24. Mount the drum housing cover [5] and the calibration window cover [1].</p> <p>25. Perform drum calibration.</p> <p>i For drum calibration, → 85</p> |  <p>A0032444</p> |

5.3 Post-installation check

| | |
|---|--|
| ○ | Is the device undamaged (visual inspection)? |
| ○ | <p>Does the device conform to the measuring point specifications?</p> <p>For example:</p> <ul style="list-style-type: none"> ▪ Process temperature ▪ Process pressure (refer to the chapter on "Material load curves" of the "Technical Information" document) ▪ Ambient temperature range ▪ Measuring range |

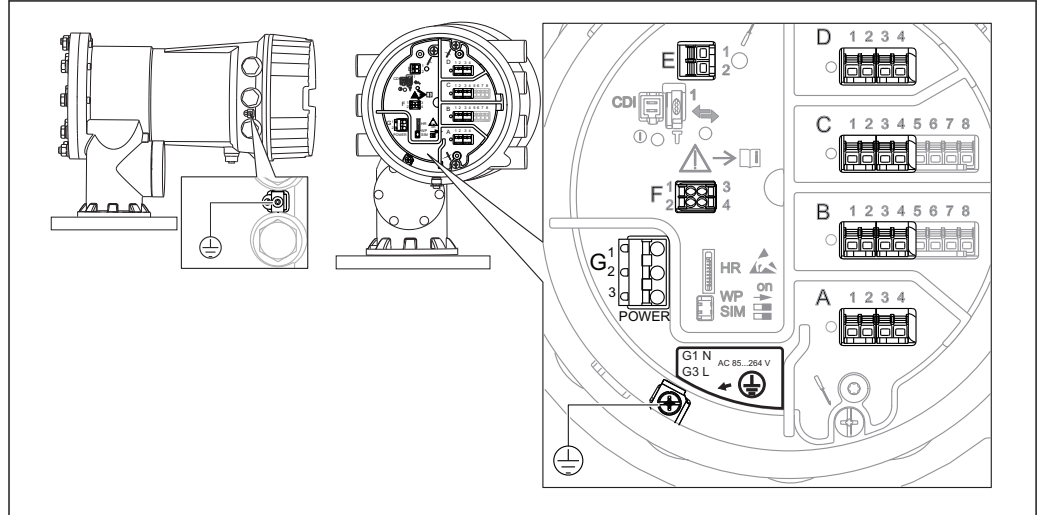
| | |
|-----------------------|--|
| <input type="radio"/> | Are the measuring point identification and labeling correct (visual inspection)? |
| <input type="radio"/> | Is the device adequately protected from precipitation and direct sunlight? |

 **Connection check for wire ring of displacer**

To keep it clean, the NMS83 displacer does not have any washers or nuts. When using the NMS83 in a hazardous area, make sure that the wire ring is connected to the wire hook of the displacer without any foreign matter interfering in order to prevent static electricity.

6 Electrical connection

6.1 Terminal assignment

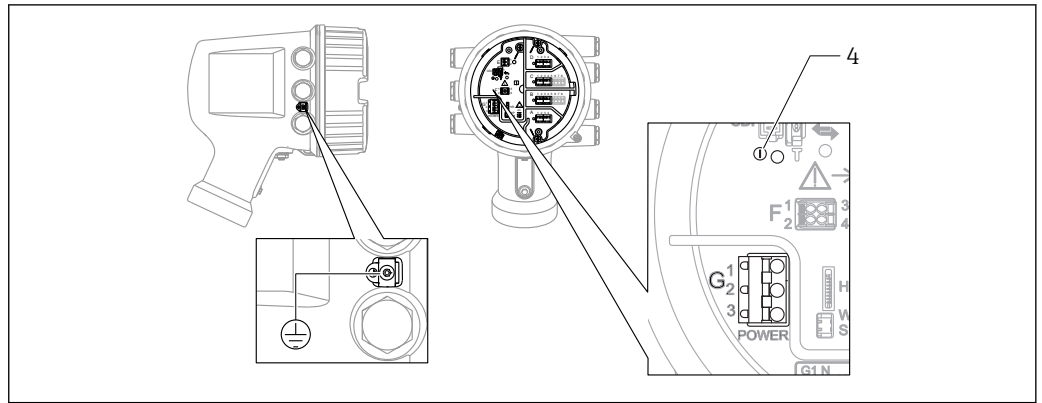


13 Terminal compartment (typical example) and ground terminals

| Terminal area | Module |
|------------------------------------|---|
| A/B/C/D (slots for I/O modules) | <p>Up to four I/O modules, depending on the order code</p> <ul style="list-style-type: none"> Modules with four terminals can be in any of these slots. Modules with eight terminals can be in slot B or C. <p> The exact assignment of the modules to the slots is dependent on the device version → 41.</p> |
| E | <p>HART Ex i/IS interface</p> <ul style="list-style-type: none"> E1: H+ E2: H- |
| F | <p>Remote display</p> <ul style="list-style-type: none"> F1: V_{CC} (connect to terminal 81 of the remote display) F2: Signal B (connect to terminal 84 of the remote display) F3: Signal A (connect to terminal 83 of the remote display) F4: Gnd (connect to terminal 82 of the remote display) |
| G | <p>Power consumption: 28.8 VA ¹⁾</p> <p>Power supply: 85 to 264 V_{AC}</p> <ul style="list-style-type: none"> G1: N G2: not connected G3: L |
| | <p>Protective ground connection (M4 screw)</p> <p>A0018339</p> |

1) Maximum power varies depending on the configuration of the modules. As the value of 28.8 VA shows maximum apparent power, select the applicable cables accordingly. The actual consumed effective power is 12 w.

6.1.1 Power supply



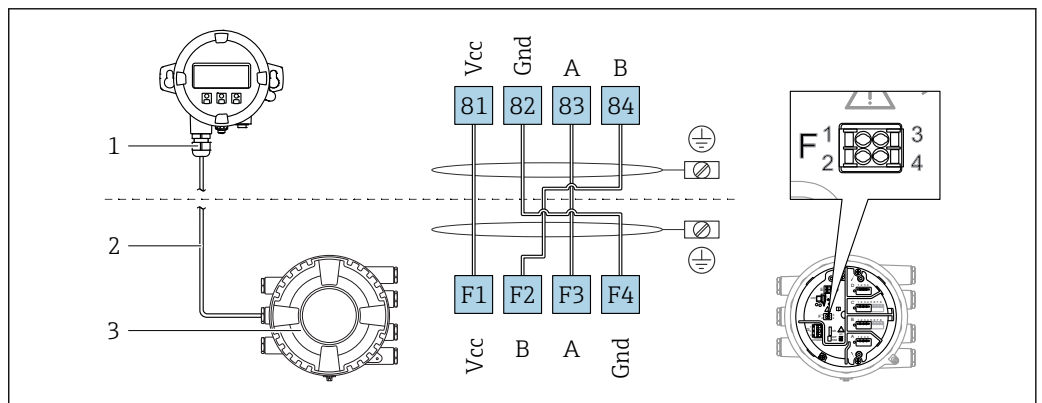
- G1 N
- G2 not connected
- G3 L
- 4 Green LED: indicates power supply

Supply voltage

85 to 264 V_{AC}, 50/60 Hz, 28.8 VA ¹⁾

i The supply voltage is also indicated on the nameplate.

6.1.2 Remote display and operating module DKX001



14 Connection of the remote display and operating module DKX001 to the Tank Gauging device (NMR8x, NMS8x or NRF8x)

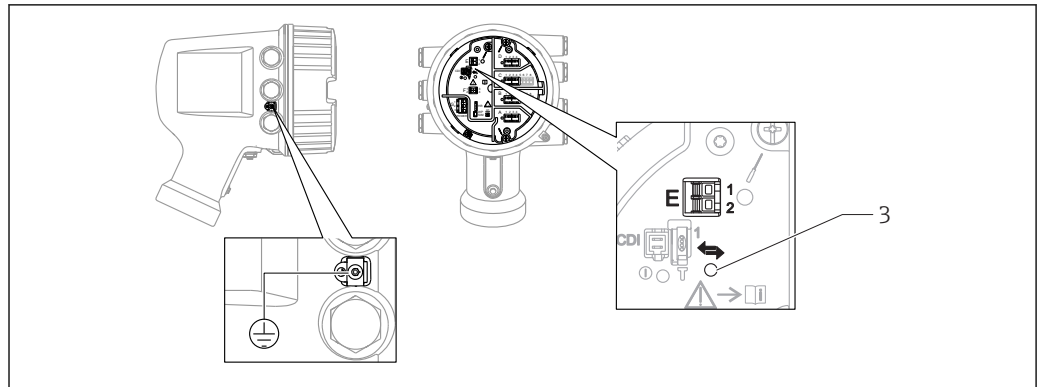
- 1 Remote display and operating module
- 2 Connecting cable
- 3 Tank Gauging device (NMR8x, NMS8x or NRF8x)

i The remote display and operating module DKX001 is available as an accessory. For details refer to SDO1763D.

- i**
 - The measured value is indicated on the DKX001 and on the local display and operating module simultaneously.
 - The operating menu cannot be accessed on both modules at the same time. If the operating menu is entered in one of these modules, the other module is automatically locked. This locking remains active until the menu is closed in the first module (back to measured value display).

1) maximum value; actual value depending on modules installed. 28.8 VA includes the nominal power, and the cabling specification has to meet this value. On the other hand, the effective power consumption is 12 W.

6.1.3 HART Ex i/IS interface




A0033414

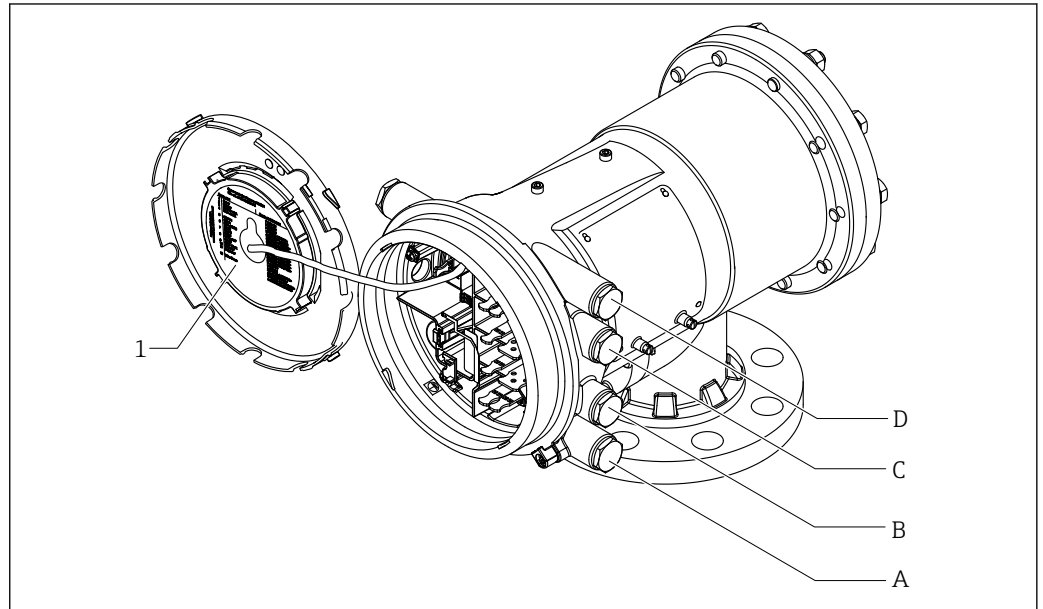
- E1* H+
E2 H-
 3 Orange LED: indicates data communication

i This interface always operates as the main HART master for connected HART slave transmitters. The Analog I/O modules, on the other hand, can be configured as a HART master or slave → 48 → 50.

6.1.4 Slots for I/O modules

The terminal compartment contains four slots (A, B, C and D) for I/O modules. Depending on the device version (ordering features 040, 050 and 060) these slots contain different I/O modules. The table below shows which module is located in which slot for a specific device version.

 The slot assignment for the device is also indicated on a label attached to the back cover of the display module.



A0030121

- 1 Label showing (among other things) the modules in the slots A to D.
- A Cable entry for slot A
- B Cable entry for slot B
- C Cable entry for slot C
- D Cable entry for slot D

"Primary Output" (040) = "Modbus" (A1)

| Ordering feature | | | Terminal area | | | |
|---|-------------------------------|---|---------------|----------------|----------------|---------|
| NMx8x - xxxx <u>XX</u> <u>XX</u> <u>XX</u> ... 040 050 060 | | | | | | |
| 040 Primary Output | 050 Secondary IO Analog | 060 Secondary IO Digital Ex d/XP | | | | |
| A1 | X0 | X0 | Modbus | - | - | - |
| A1 | X0 | A1 | Modbus | - | - | Digital |
| A1 | X0 | A2 | Modbus | - | Digital | Digital |
| A1 | X0 | A3 | Modbus | Digital | Digital | Digital |
| A1 | X0 | B1 | Modbus | Modbus | - | - |
| A1 | X0 | B2 | Modbus | Modbus | - | Digital |
| A1 | X0 | B3 | Modbus | Modbus | Digital | Digital |
| A1 | A1 | X0 | Modbus | Analog Ex d/XP | - | - |
| A1 | A1 | A1 | Modbus | Analog Ex d/XP | - | Digital |
| A1 | A1 | A2 | Modbus | Analog Ex d/XP | Digital | Digital |
| A1 | A1 | B1 | Modbus | Modbus | Analog Ex d/XP | - |
| A1 | A1 | B2 | Modbus | Modbus | Analog Ex d/XP | Digital |
| A1 | A2 | X0 | Modbus | Analog Ex d/XP | Analog Ex d/XP | - |
| A1 | A2 | A1 | Modbus | Analog Ex d/XP | Analog Ex d/XP | Digital |
| A1 | A2 | B1 | Modbus | Analog Ex d/XP | Analog Ex d/XP | Modbus |
| A1 | B1 | X0 | Modbus | Analog Ex i/IS | - | - |
| A1 | B1 | A1 | Modbus | Analog Ex i/IS | - | Digital |
| A1 | B1 | A2 | Modbus | Analog Ex i/IS | Digital | Digital |
| A1 | B1 | B1 | Modbus | Modbus | Analog Ex i/IS | - |
| A1 | B1 | B2 | Modbus | Modbus | Analog Ex i/IS | Digital |
| A1 | B2 | X0 | Modbus | Analog Ex i/IS | Analog Ex i/IS | - |
| A1 | B2 | A1 | Modbus | Analog Ex i/IS | Analog Ex i/IS | Digital |
| A1 | B2 | B1 | Modbus | Analog Ex i/IS | Analog Ex i/IS | Modbus |
| A1 | C2 | X0 | Modbus | Analog Ex i/IS | Analog Ex d/XP | - |
| A1 | C2 | A1 | Modbus | Analog Ex i/IS | Analog Ex d/XP | Digital |
| A1 | C2 | B1 | Modbus | Analog Ex i/IS | Analog Ex d/XP | Modbus |

"Primary Output" (040) = "V1" (B1)

| Ordering feature | | | Terminal area | | | |
|---|-------------------------------|---|---------------|----------------|----------------|---------|
| NMx8x - xxxx <u>XX</u> <u>XX</u> <u>XX</u> ... 040 050 060 | | | | | | |
| 040 Primary Output | 050 Secondary IO Analog | 060 Secondary IO Digital Ex d/XP | | | | |
| B1 | X0 | X0 | V1 | - | - | - |
| B1 | X0 | A1 | V1 | - | - | Digital |
| B1 | X0 | A2 | V1 | - | Digital | Digital |
| B1 | X0 | A3 | V1 | Digital | Digital | Digital |
| B1 | X0 | B1 | V1 | Modbus | - | - |
| B1 | X0 | B2 | V1 | Modbus | - | Digital |
| B1 | X0 | B3 | V1 | Modbus | Digital | Digital |
| B1 | A1 | X0 | V1 | Analog Ex d/XP | - | - |
| B1 | A1 | A1 | V1 | Analog Ex d/XP | - | Digital |
| B1 | A1 | A2 | V1 | Analog Ex d/XP | Digital | Digital |
| B1 | A1 | B1 | V1 | Modbus | Analog Ex d/XP | - |
| B1 | A1 | B2 | V1 | Modbus | Analog Ex d/XP | Digital |
| B1 | A2 | X0 | V1 | Analog Ex d/XP | Analog Ex d/XP | - |
| B1 | A2 | A1 | V1 | Analog Ex d/XP | Analog Ex d/XP | Digital |
| B1 | A2 | B1 | V1 | Analog Ex d/XP | Analog Ex d/XP | Modbus |
| B1 | B1 | X0 | V1 | Analog Ex i/IS | - | - |
| B1 | B1 | A1 | V1 | Analog Ex i/IS | - | Digital |
| B1 | B1 | A2 | V1 | Analog Ex i/IS | Digital | Digital |
| B1 | B1 | B1 | V1 | Modbus | Analog Ex i/IS | - |
| B1 | B1 | B2 | V1 | Modbus | Analog Ex i/IS | Digital |
| B1 | B2 | X0 | V1 | Analog Ex i/IS | Analog Ex i/IS | - |
| B1 | B2 | A1 | V1 | Analog Ex i/IS | Analog Ex i/IS | Digital |
| B1 | B2 | B1 | V1 | Analog Ex i/IS | Analog Ex i/IS | Modbus |
| B1 | C2 | X0 | V1 | Analog Ex i/IS | Analog Ex d/XP | - |
| B1 | C2 | A1 | V1 | Analog Ex i/IS | Analog Ex d/XP | Digital |
| B1 | C2 | B1 | V1 | Analog Ex i/IS | Analog Ex d/XP | Modbus |

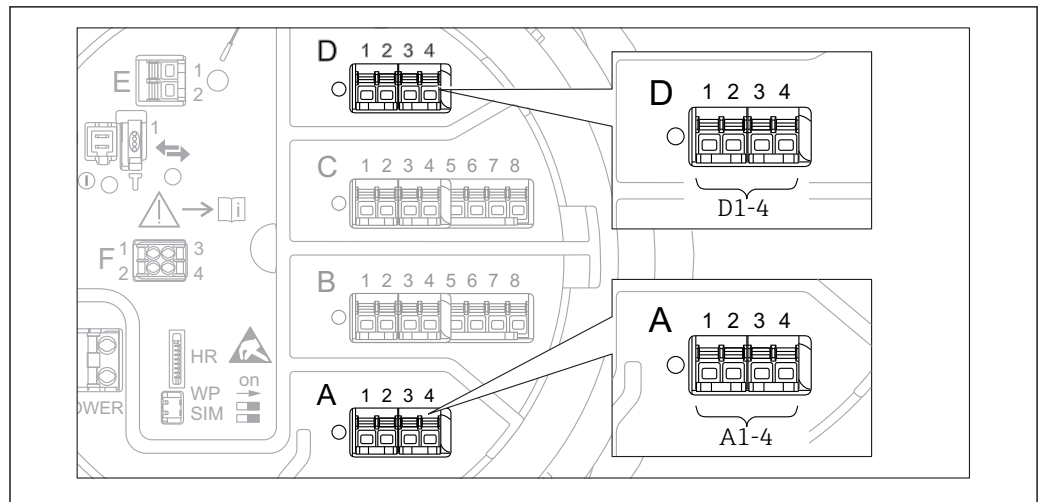
"Primary Output" (040) = "4-20mA HART Ex d" (E1)

| Ordering feature | | | Terminal area | | | |
|---|-------------------------------|---|---------------|----------------|----------------|---------|
| NMx8x - xxxx <u>XX</u> <u>XX</u> <u>XX</u> ... 040 050 060 | | | | | | |
| 040 Primary Output | 050 Secondary IO Analog | 060 Secondary IO Digital Ex d/XP | | | | |
| E1 | X0 | X0 | - | Analog Ex d/XP | - | - |
| E1 | X0 | A1 | - | Analog Ex d/XP | - | Digital |
| E1 | X0 | A2 | - | Analog Ex d/XP | Digital | Digital |
| E1 | X0 | A3 | Digital | Analog Ex d/XP | Digital | Digital |
| E1 | X0 | B1 | Modbus | Analog Ex d/XP | - | - |
| E1 | X0 | B2 | Modbus | Analog Ex d/XP | - | Digital |
| E1 | X0 | B3 | Modbus | Analog Ex d/XP | Digital | Digital |
| E1 | A1 | X0 | - | Analog Ex d/XP | Analog Ex d/XP | - |
| E1 | A1 | A1 | - | Analog Ex d/XP | Analog Ex d/XP | Digital |
| E1 | A1 | A2 | Digital | Analog Ex d/XP | Analog Ex d/XP | Digital |
| E1 | A1 | B1 | Modbus | Analog Ex d/XP | Analog Ex d/XP | - |
| E1 | A1 | B2 | Modbus | Analog Ex d/XP | Analog Ex d/XP | Digital |
| E1 | B1 | X0 | - | Analog Ex d/XP | Analog Ex i/IS | - |
| E1 | B1 | A1 | - | Analog Ex d/XP | Analog Ex i/IS | Digital |
| E1 | B1 | A2 | Digital | Analog Ex d/XP | Analog Ex i/IS | Digital |
| E1 | B1 | B1 | Modbus | Analog Ex d/XP | Analog Ex i/IS | - |
| E1 | B1 | B2 | Modbus | Analog Ex d/XP | Analog Ex i/IS | Digital |

"Primary Output" (040) = "4-20mA HART Ex i" (H1)

| Ordering feature | | | Terminal area | | | |
|---|-------------------------------|---|---------------|----------------|----------------|---------|
| NMx8x - xxxx <u>XX</u> <u>XX</u> <u>XX</u> ... 040 050 060 | | | | | | |
| 040 Primary Output | 050 Secondary IO Analog | 060 Secondary IO Digital Ex d/XP | | | | |
| H1 | X0 | X0 | - | Analog Ex i/IS | - | - |
| H1 | X0 | A1 | - | Analog Ex i/IS | - | Digital |
| H1 | X0 | A2 | - | Analog Ex i/IS | Digital | Digital |
| H1 | X0 | A3 | Digital | Analog Ex i/IS | Digital | Digital |
| H1 | X0 | B1 | Modbus | Analog Ex i/IS | - | - |
| H1 | X0 | B2 | Modbus | Analog Ex i/IS | - | Digital |
| H1 | X0 | B3 | Modbus | Analog Ex i/IS | Digital | Digital |
| H1 | A1 | X0 | - | Analog Ex i/IS | Analog Ex d/XP | - |
| H1 | A1 | A1 | - | Analog Ex i/IS | Analog Ex d/XP | Digital |
| H1 | A1 | A2 | Digital | Analog Ex i/IS | Analog Ex d/XP | Digital |
| H1 | A1 | B1 | Modbus | Analog Ex i/IS | Analog Ex d/XP | - |
| H1 | A1 | B2 | Modbus | Analog Ex i/IS | Analog Ex d/XP | Digital |
| H1 | B1 | X0 | - | Analog Ex i/IS | Analog Ex i/IS | - |
| H1 | B1 | A1 | - | Analog Ex i/IS | Analog Ex i/IS | Digital |
| H1 | B1 | A2 | Digital | Analog Ex i/IS | Analog Ex i/IS | Digital |
| H1 | B1 | B1 | Modbus | Analog Ex i/IS | Analog Ex i/IS | - |
| H1 | B1 | B2 | Modbus | Analog Ex i/IS | Analog Ex i/IS | Digital |

6.1.5 Terminals of the "Modbus" or "V1" module



15 Designation of the "Modbus" or "V1" modules (examples); depending on the device version these modules may also be in slot B or C.

Depending on the device version, the "Modbus" and/or "V1" module may be in different slots of the terminal compartment. In the operating menu the "Modbus" and "V1" interfaces are designated by the respective slot and the terminals within this slot: **A1-4, B1-4, C1-4, D1-4.**

Terminals of the "Modbus" module

| Terminal ¹⁾ | Name | Description |
|--|------|--|
| X1 | S | Cable shielding connected via a capacitor to EARTH |
| X2 | 0V | Common reference |
| X3 | B- | Non-inverting signal line |
| X4 | A+ | Inverting signal line |
| Designation of the module in the operating menu: Modbus X1-4 ; (X = A, B, C or D) | | |

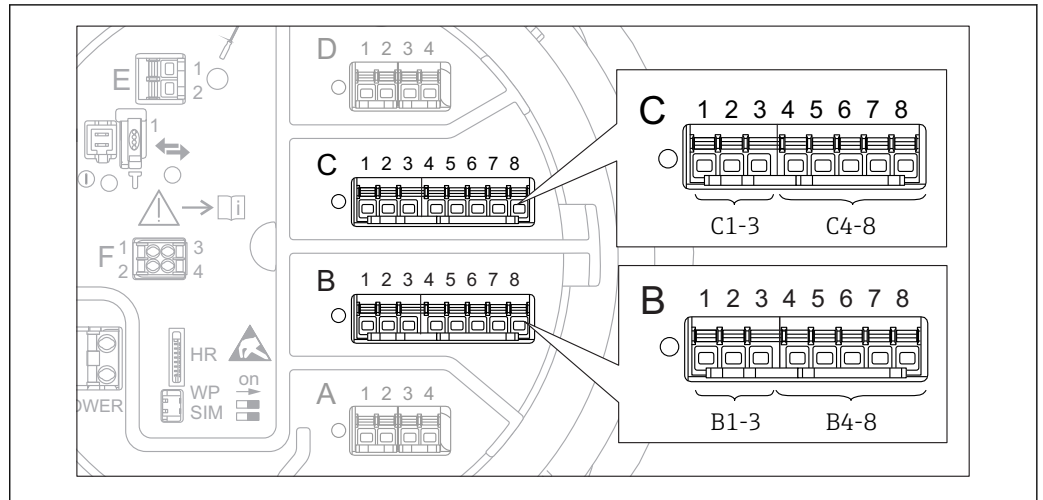
1) In this column, "X" stands for one of the slots "A", "B", "C", or "D".

Terminals of the "V1" module

| Terminal ¹⁾ | Name | Description |
|--|------|--|
| X1 | S | Cable shielding connected via capacitor to EARTH |
| X2 | | not connected |
| X3 | B- | Protocol loop signal - |
| X4 | A+ | Protocol loop signal + |
| Designation of the module in the operating menu: V1 X1-4 ; (X = A, B, C or D) | | |

1) In this column, "X" stands for one of the slots "A", "B", "C", or "D".

6.1.6 Terminals of the "Analog I/O" module (Ex d /XP or Ex i/IS)



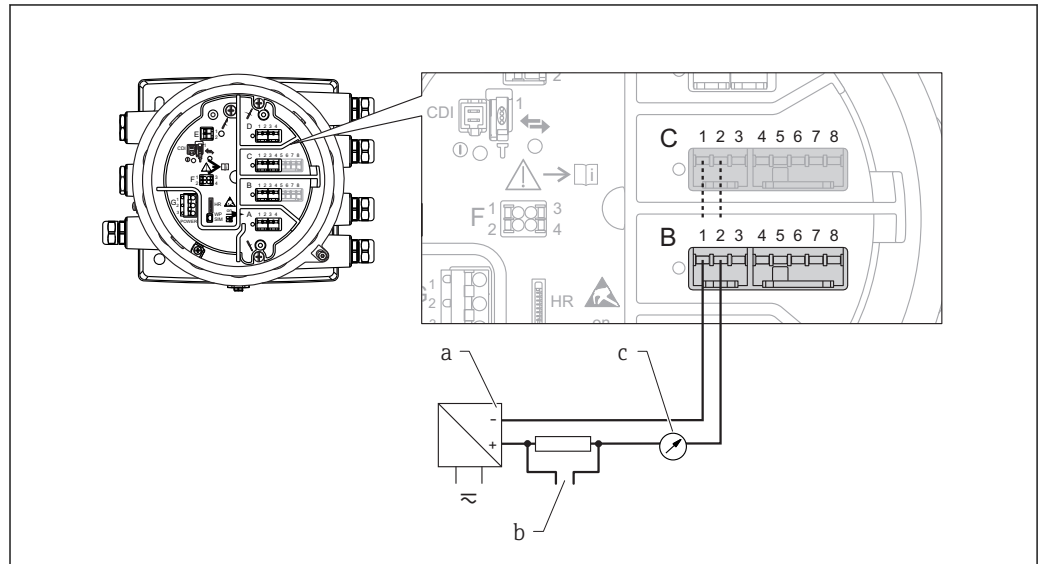
A0031168

| Terminals | Function | Connection diagrams | Designation in the operating menu |
|-----------|---------------------------------------|---|-----------------------------------|
| B1-3 | Analog input or output (configurable) | <ul style="list-style-type: none"> ■ Passive usage: → 48 ■ Active usage: → 50 | Analog I/O B1-3 (→ 205) |
| C1-3 | | | Analog I/O C1-3 (→ 205) |
| B4-8 | Analog input | RTD: → 51 | Analog IP B4-8 (→ 199) |
| C4-8 | | | Analog IP C4-8 (→ 199) |

6.1.7 Connection of the "Analog I/O" module for passive usage

- i** In the passive usage the supply voltage for the communication line must be supplied by an external source.
- The wiring must be in accordance with the intended operating mode of the Analog I/O module; see the drawings below.

"Operating mode" = "4..20mA output" or "HART slave +4..20mA output"

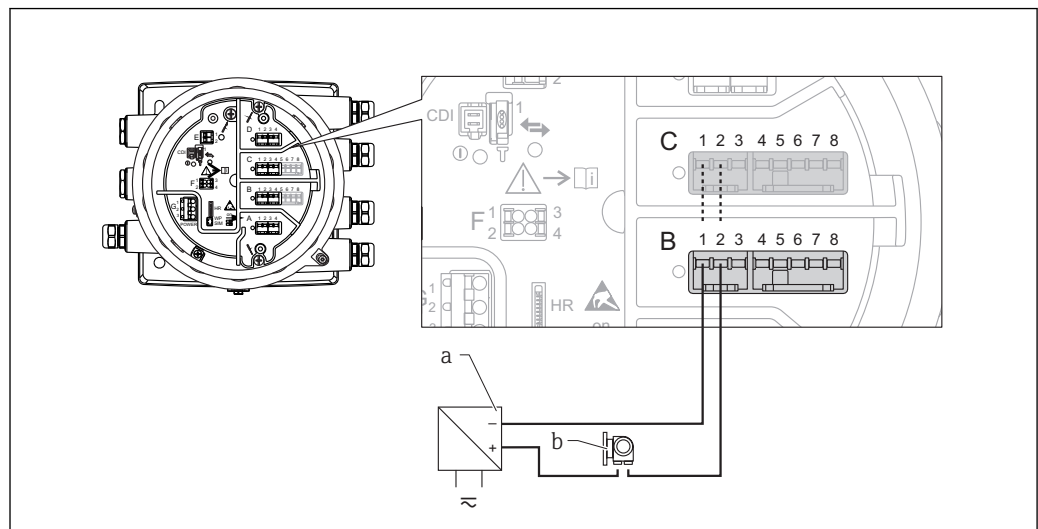


A0027931

16 Passive usage of the Analog I/O module in the output mode

- a Power supply
- b HART signal output
- c Analog signal evaluation

"Operating mode" = "4..20mA input" or "HART master+4..20mA input"

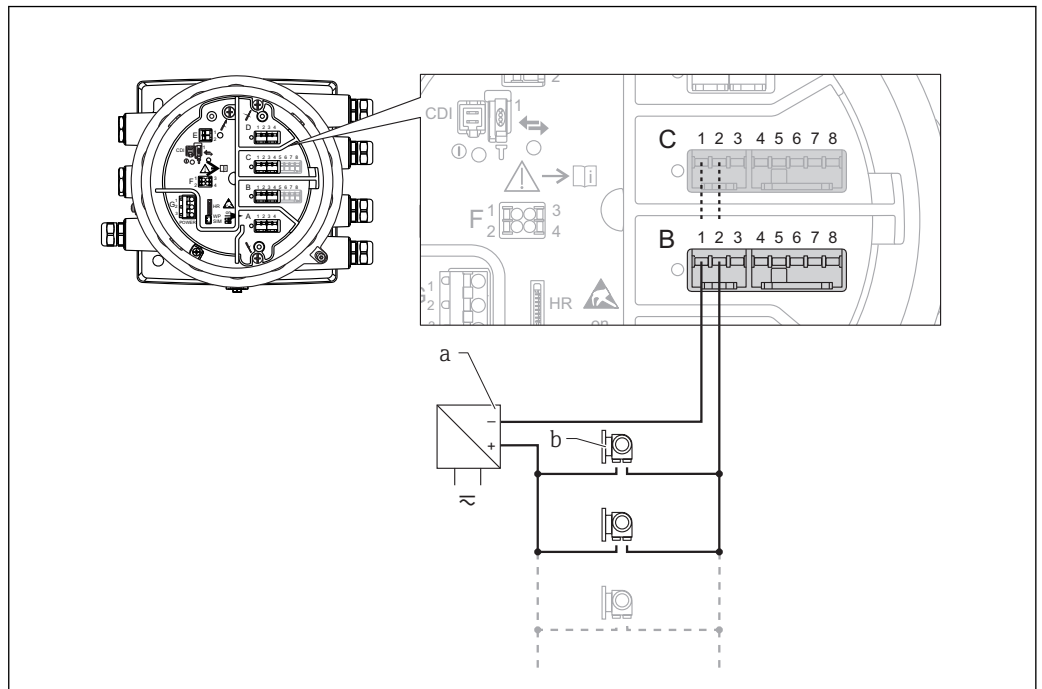


A0027933

17 Passive usage of the Analog I/O module in the input mode

- a Power supply
- b External device with 4...20mA and/or HART signal output

"Operating mode" = "HART master"



A0027934

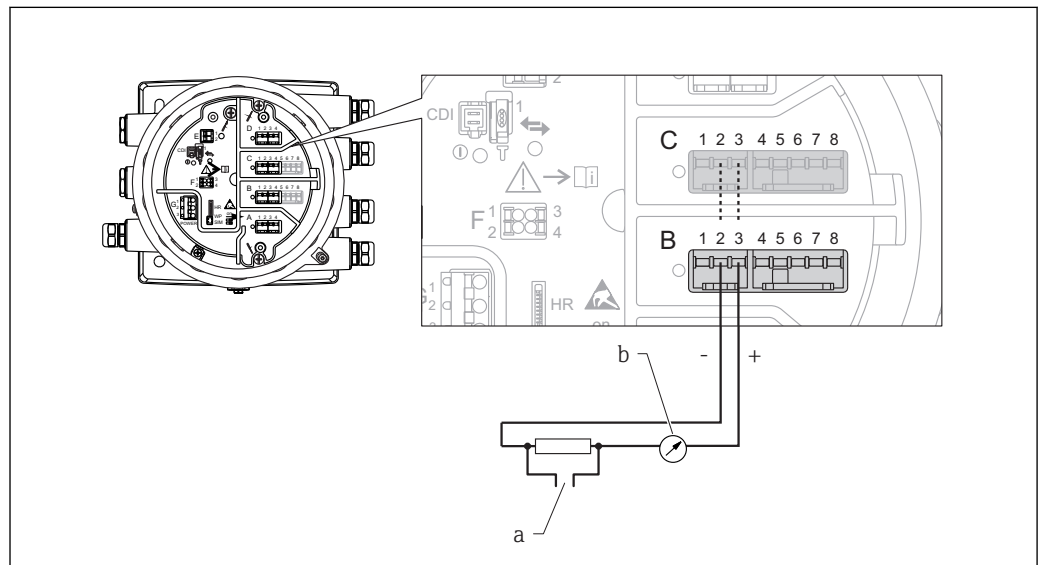
18 Passive usage of the Analog I/O module in the HART master mode

- a Power supply
- b Up to 6 external devices with HART signal output

6.1.8 Connection of the "Analog I/O" module for active usage

- i** In the active usage the supply voltage for the communication line is supplied by the device itself. There is no need of an external power supply.
 - The wiring must be in accordance with the intended operating mode of the Analog I/O module; see the drawings below.
- i** Maximum current consumption of the connected HART devices: 24 mA (i.e. 4 mA per device if 6 devices are connected).
 - Output voltage of the Ex-d module: 17.0 V@4 mA to 10.5 V@22 mA
 - Output voltage of the Ex-ia module: 18.5 V@4 mA to 12.5 V@22 mA

"Operating mode" = "4..20mA output" or "HART slave +4..20mA output"

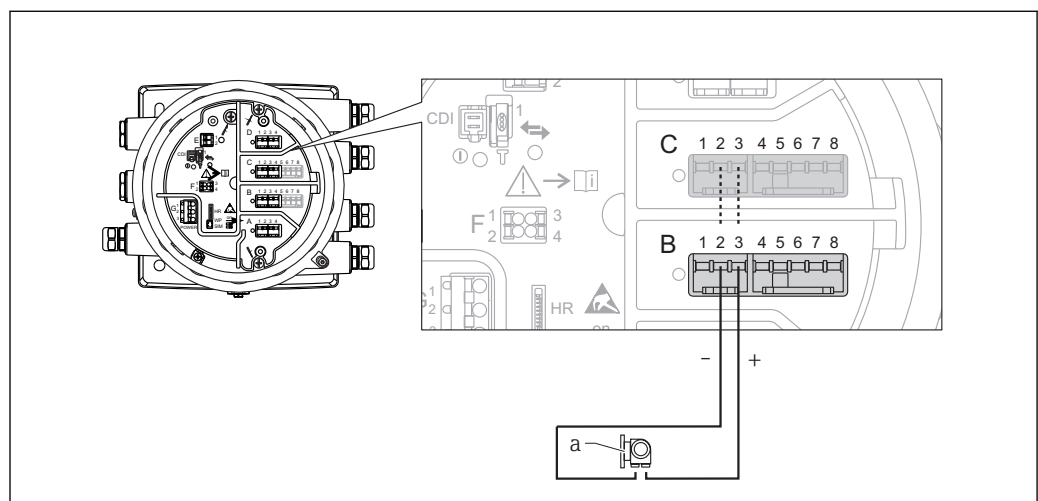


A0027932

19 Active usage of the Analog I/O module in the output mode

- a HART signal output
- b Analog signal evaluation

"Operating mode" = "4..20mA input" or "HART master+4..20mA input"

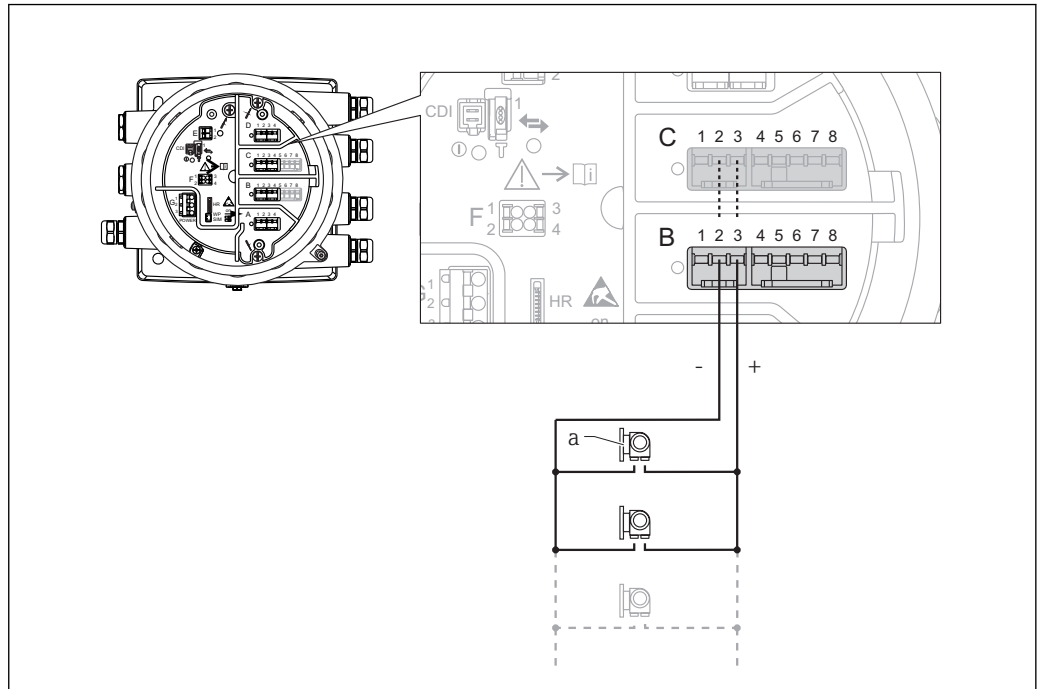


A0027935

20 Active usage of the Analog I/O module in the input mode

- a External device with 4...20mA and/or HART signal output

"Operating mode" = "HART master"



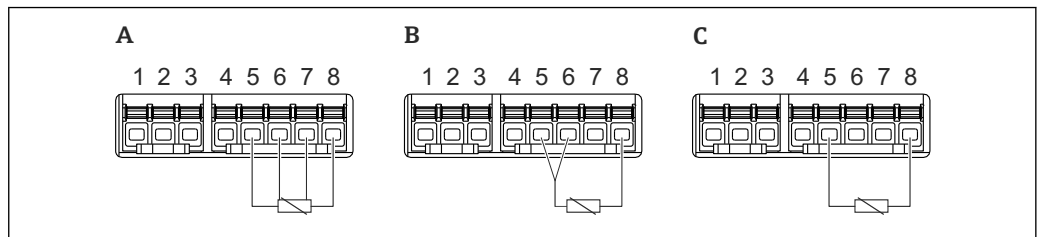
A0027936

21 Active usage of the Analog I/O module in the HART master mode

a Up to 6 external devices with HART signal output

i The maximum current consumption for the connected HART devices is 24 mA (i.e. 4 mA per device if 6 devices are connected).

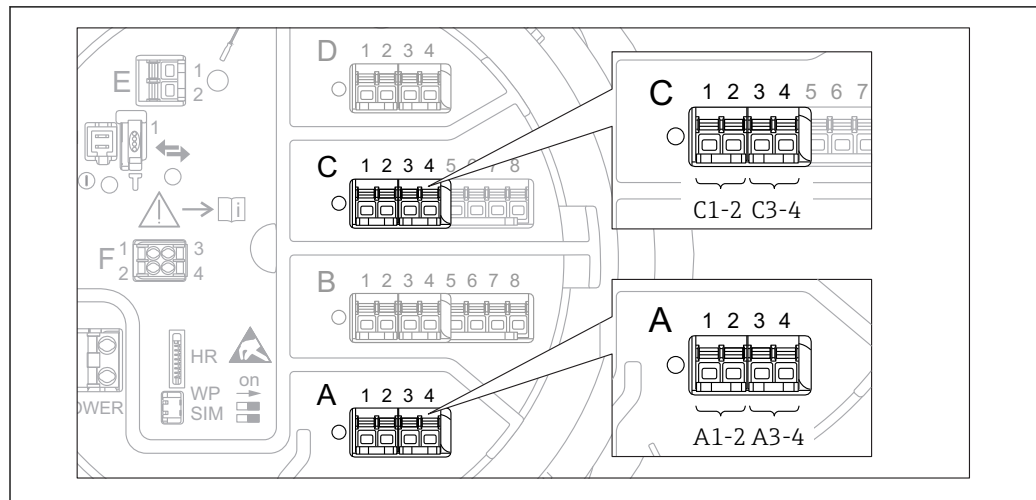
6.1.9 Connection of a RTD



A0026371

- A 4-wire RTD connection
- B 3-wire RTD connection
- C 2-wire RTD connection

6.1.10 Terminals of the "Digital I/O" module



A0026424

22 Designation of the digital inputs or outputs (examples)

- Each Digital IO Module provides two digital inputs or outputs.
- In the operating menu each input or output is designated by the respective slot and two terminals within this slot. **A1-2**, for example, denotes terminals 1 and 2 of slot **A**. The same is valid for slots **B**, **C** and **D** if they contain a Digital IO module.
- For each of these pairs of terminals, one of the following operating modes can be selected in the operating menu:
 - Disable
 - Passive Output
 - Passive Input
 - Active Input

6.2 Connecting requirements

6.2.1 Cable specification

Terminals

| Terminal | Wire cross section |
|---|---|
| Signal and power supply <ul style="list-style-type: none"> ▪ Spring terminals (NMx8x-xx1...) ▪ Screw terminals (NMx8x-xx2...) | 0.2 to 2.5 mm ² (24 to 13 AWG) |
| Ground terminal in the terminal compartment | max. 2.5 mm ² (13 AWG) |
| Ground terminal at the housing | max. 4 mm ² (11 AWG) |

Power supply line

Standard device cable is sufficient for the power line.

HART communication line

- Standard device cable is sufficient if only the analog signal is used.
- Shielded cable is recommended if using the HART protocol. Observe the grounding concept of the plant.

Modbus communication line

- Observe the cable conditions from the TIA-485-A, Telecommunications Industry Association.
- Additional conditions: Use shielded cable.

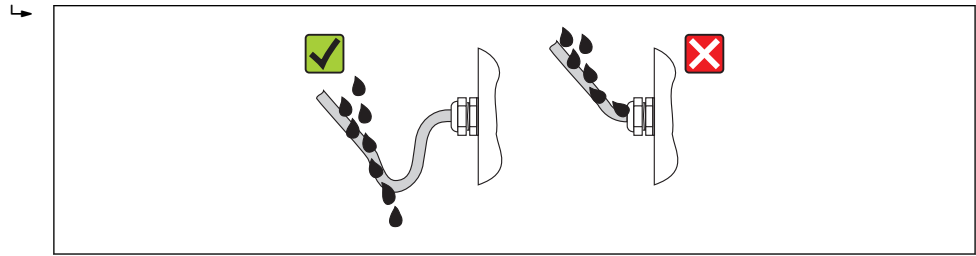
V1 communication line

- Two wire (twisted pair) screened or un-screened cable
- Resistance in one cable: $\leq 120 \Omega$
- Capacitance between lines: $\leq 0.3 \mu\text{F}$

6.3 Ensuring the degree of protection

To guarantee the specified degree of protection, carry out the following steps after the electrical connection:

1. Check that the housing seals are clean and fitted correctly. Dry, clean or replace the seals if necessary.
2. Tighten all housing screws and screw covers.
3. Firmly tighten the cable glands.
4. To ensure that moisture does not enter the cable entry, route the cable so that it loops down before the cable entry ("water trap").



A0013960

5. Insert blind plugs appropriate for the safety rating of the device (e.g. Ex d/XP).





6.4 Post-connection check

| | |
|-----------------------|---|
| <input type="radio"/> | Are cables or the device undamaged (visual inspection)? |
| <input type="radio"/> | Do the cables comply with the requirements? |
| <input type="radio"/> | Do the cables have adequate strain relief? |
| <input type="radio"/> | Are all cable glands installed, firmly tightened and correctly sealed? |
| <input type="radio"/> | Does the supply voltage match the specifications on the transmitter nameplate? |
| <input type="radio"/> | Is the terminal assignment correct → 38? |
| <input type="radio"/> | If required: Is the protective earth connected correctly ? |
| <input type="radio"/> | If supply voltage is present: Is the device ready for operation and do values appear on the display module? |
| <input type="radio"/> | Are all housing covers installed and firmly tightened? |
| <input type="radio"/> | Is the securing clamp tightened correctly? |

7 Operability

7.1 Overview of the operation options

The device is operated via an operating menu →  56. This menu can be accessed by the following interfaces:

- The display and operating module at the device or the remote display and operating module DKX001 (→  58).
- FieldCare connected through the service interface in the terminal compartment of the device (→  71).
- FieldCare connected through Tankvision Tank Scanner NXA820 (remote operation; →  72).
- FieldCare connected through Commubox FXA195 (→  149) to a HART interface of the device.



Confirm that the servo motor stops before changing parameters for safety use.


7.2 Structure and function of the operating menu

| Menu | Submenu / parameter | Meaning |
|---|---------------------------|---|
| Operation | Proservo parameters | Contains parameters to operate Proservo (e.g. Gauge command). |
| | Level | Shows the measured and calculated level values. |
| | Temperature | Shows the measured and calculated temperature values. |
| | Density | Shows the measured and calculated density values. |
| | Pressure | Shows the measured and calculated pressure values. |
| | GP values | Shows the general purpose values. |
| Setup | Standard parameters | Standard commissioning parameters |
| | Calibration | Calibration of the measurement |
| | Advanced setup | Contains further parameters and submenus: <ul style="list-style-type: none"> ▪ to adapt the device to special measuring conditions. ▪ to process the measured value. ▪ to configure the signal output. |
| Diagnostics | Diagnostic parameters | Indicates: <ul style="list-style-type: none"> ▪ The latest diagnostic messages and their timestamps. ▪ The operating time (overall time and time since last restart). ▪ The time according to the real-time clock. |
| | Diagnostic list | Contains up to 5 currently active error messages. |
| | Device information | Contains information needed to identify the device. |
| | Simulation | Used to simulate measured values or output values. |
| | Device check | Contains all parameters needed to check the measurement capability of the device. |
| Expert ¹⁾ Contains all parameters of the device (including those which are already contained in one of the other menus). This menu is organized according to the function blocks of the device. The parameter of the Expert menu are described in: GP01080G (NMS83) | System | Contains all general device parameters which do not affect the measurement or the communication interface. |
| | Sensor | Contains all parameters needed to configure the measurement. |
| | Input/output | Contains submenus to configure the analog and discrete I/O modules and connected HART devices. |
| | Communication | Contains all parameters needed to configure the digital communication interface. |
| | Application | Contains submenus to configure <ul style="list-style-type: none"> ▪ the tank gauging application ▪ the tank calculations ▪ the alarms. |

| Menu | Submenu / parameter | Meaning |
|------|---------------------|--|
| | Tank values | Shows measured and calculated tank values |
| | Diagnostics | Contains all parameters needed to detect and analyze operational errors. |

- 1) On entering the "Expert" menu, an access code is always requested. If a customer specific access code has not been defined, "0000" has to be entered.

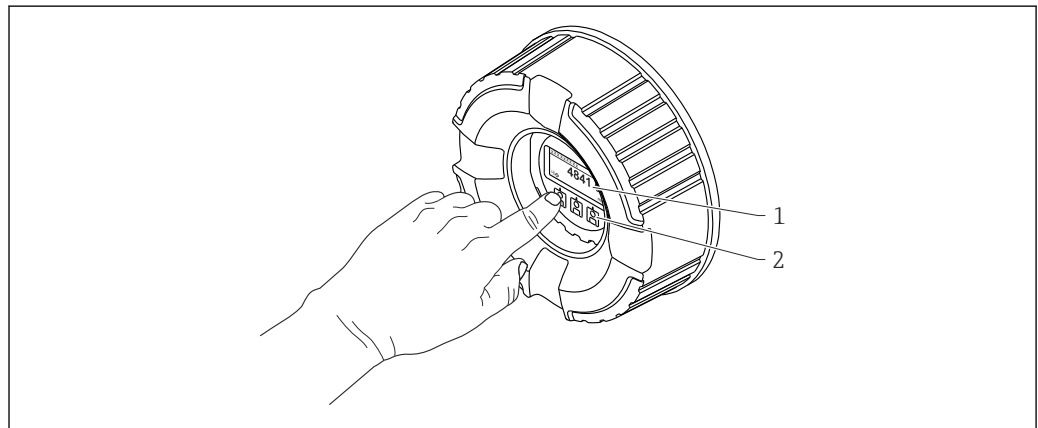
7.3 Access to the operating menu via the local or remote display and operating module.

- i
 - Operating via the remote display and operating module DKX001 (→  39) or the local display and operating module at the device are equivalent.
 - The measured value is indicated on the DKX001 and on the local display and operating module simultaneously.
 - The operating menu cannot be accessed on both modules at the same time. If the operating menu is entered in one of these modules, the other module is automatically locked. This locking remains active until the menu is closed in the first module (back to measured value display).


7.3.1 Display and operating elements

The device has an illuminated **liquid crystal display (LCD)** that shows measured and calculated values as well as the device status in the standard view. Other views are used to navigate through the operating menu and to set parameter values.

The device is operated by **three optical keys**, namely "-", "+" and "E". They are actuated when the appropriate field on the protective glass of the front is touched with the finger ("touch control").

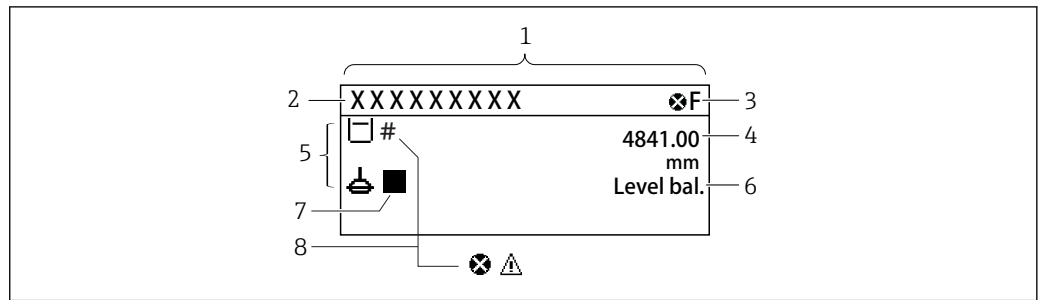


A0028345

 23 Display and operating elements

- 1 Liquid crystal display (LCD)
- 2 Optical keys; can be operated through the cover glass.

7.3.2 Standard view (measured value display)



A0028702

▣ 24 Typical appearance of the standard view (measured value display)

- 1 Display module
- 2 Device tag
- 3 Status area
- 4 Display area for measured values
- 5 Display area for measured value and status symbols
- 6 Gauge status indication
- 7 Gauge status symbol
- 8 Measured value status symbol

Status symbols












| Symbol | Meaning |
|----------------------|---|
| F A0013956 | "Failure" A device error is present. The measured value is no longer valid. |
| C A0013959 | "Function check" The device is in service mode (e.g. during a simulation). |
| S A0013958 | "Out of specification" The device is operated: <ul style="list-style-type: none"> ▪ Outside of its technical specifications (e.g. during startup or a cleaning) ▪ Outside of the configuration carried out by the user (e.g. level outside configured span) |
| M A0013957 | "Maintenance required" Maintenance is required. The measured value is still valid. |

Measured value symbols





| Symbol 1 | Symbol 2 | Measured value |
|----------------------|----------------------|--|
| A0028148 | | <ul style="list-style-type: none"> ▪ Tank level ▪ Measured level ▪ Tank level % |
| A0028149 | | Water level |
| T A0028528 | | Liquid temperature |
| T A0028528 | V A0027990 | Vapor temperature |
| T A0028528 | A A0027991 | Air temperature |
| A0027993 | | <ul style="list-style-type: none"> ▪ Tank ullage ▪ Tank ullage % |
| ρ A0028150 | | Observed density value |

| Symbol 1 | Symbol 2 | Measured value |
|---|---|--|
|  A0028150 |  A0027991 | Average profile density |
|  A0028151 |  A0028141 | P1 (bottom) |
|  A0028151 |  A0028142 | P2 (middle) |
|  A0028151 |  A0028146 | P3 (top) |
|  A0027992 |  A0028141 | GP 1 value This is used for an external device. |
|  A0027992 |  A0028142 | GP 2 value This is used for an external device. |
|  A0027992 |  A0028146 | GP 3 value This is used for an external device. |
|  A0027992 |  A0028147 | GP 4 value This is used for an external device. |
|  A0028149 |  A0028529 | Upper I/F level |
|  A0028149 |  A0027989 | Lower I/F level |
|  A0028150 |  A0028529 | Upper density |
|  A0028150 |  A0013957 | Middle density |
|  A0028150 |  A0027989 | Lower density |
|  A0028145 | | Bottom level |
|  A0027994 | | Displacer position |



Gauge command and gauge status symbols

| Symbol 1 | Symbol 2 | Meaning |
|---|---|--|
|  A0028139 | | Gauge command This shows current command. |
|  A0028143 |  A0028144 | Gauge status  : Displacer is unbalanced (Level/Interface not found yet).  : Displacer is balanced (Level/Interface measurement valid).  : Displacer is moving up.  : Displacer is moving down.  : Displacer stopped. |
|  A0027995 |  A0028138 | |
|  A0028140 | | |


Measured value status symbols

| Symbol | Meaning |
|---|---|
|  A0012102 | Status "Alarm" The measurement is interrupted. The output assumes the defined alarm value. A diagnostic message is generated. |
|  A0012103 | Status "Warning" The device continues measuring. A diagnostic message is generated. |
|  A0031169 | Calibration to regulatory standards disturbed Is displayed in the following situations: <ul style="list-style-type: none"> ▪ The write protection switch is OFF. →  69 ▪ The write protection switch is ON but the level value can currently not be guaranteed because the displacer is not balanced. |

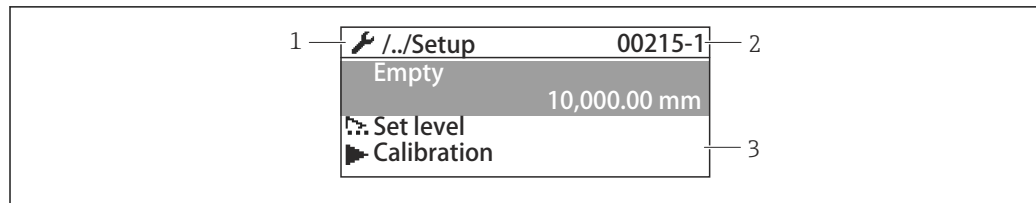
Locking state symbols

| Symbol | Meaning |
|---|---|
|  A0011978 | Display parameter Marks display-only parameters which cannot be edited. |
|  A0011979 | Device locked <ul style="list-style-type: none"> ▪ In front of a parameter name: The device is locked via software and/or hardware. ▪ In the header of the measured value screen: The device is locked via hardware. |

Meaning of the keys in the standard view

| Key | Meaning |
|---|---|
|  A0028326 | Enter key <ul style="list-style-type: none"> ▪ Pressing the key briefly opens the operating menu. ▪ Pressing the key for 2 s opens the context menu: <ul style="list-style-type: none"> - Level (visible if the keylock is inactive): Shows the measured levels. - Keylock on (visible if the keylock is inactive): Activates the keylock. - Keylock off (visible if the keylock is active): Deactivates the keylock. |

7.3.3 Navigation view










A0028347-EN





25 Navigation view

- 1 Current submenu or wizard
- 2 Quick access code
- 3 Display area for navigation

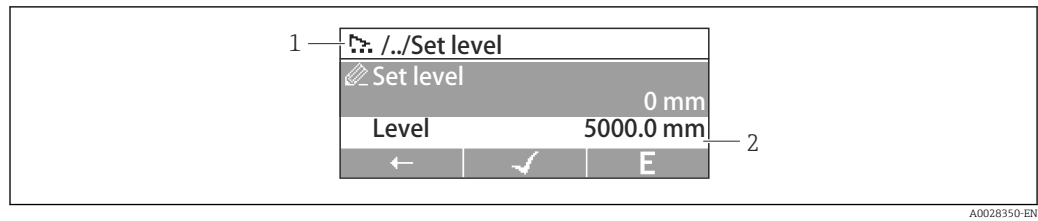
Navigation symbols

| Symbol | Meaning |
|---|---|
|  A0011975 | Operation Is displayed: <ul style="list-style-type: none"> ▪ in the main menu next to the selection Operation ▪ in the header, if you are in the Operation menu. |
|  A0011974 | Setup Is displayed: <ul style="list-style-type: none"> ▪ in the main menu next to the selection Setup ▪ in the header, if you are in the Setup menu |
|  A0011976 | Expert Is displayed: <ul style="list-style-type: none"> ▪ in the main menu next to the selection Expert ▪ in the header, if you are in the Expert menu |
|  A0011977 | Diagnostics Is displayed: <ul style="list-style-type: none"> ▪ in the main menu next to the selection Diagnostics ▪ in the header, if you are in the Diagnostics menu |
|  A0013967 | Submenu |
|  A0013968 | Wizard |
|  A0013963 | Parameter locked When displayed in front of a parameter name, indicates that the parameter is locked. |

Meaning of the keys in the navigation view

| Key | Meaning |
|--|--|
|  <p style="text-align: right; font-size: small;">A0028324</p> | <p>Minus key Moves the selection bar upwards in a picklist.</p> |
|  <p style="text-align: right; font-size: small;">A0028325</p> | <p>Plus key Moves the selection bar downwards in a picklist.</p> |
|  <p style="text-align: right; font-size: small;">A0028326</p> | <p>Enter key</p> <ul style="list-style-type: none"> ▪ Pressing the key briefly opens the selected menu, submenu or parameter. ▪ For parameters: Pressing the key for 2 s opens the help text for the function of the parameter (if present). |
|  <p style="text-align: right; font-size: small;">A0028327</p> | <p>Escape key combination (press keys simultaneously)</p> <ul style="list-style-type: none"> ▪ Pressing the keys briefly <ul style="list-style-type: none"> - Exits the current menu level and takes you to the next higher level. - If help text is open, closes the help text of the parameter. ▪ Pressing the keys for 2 s returns you to the measured value display ("standard view"). |

7.3.4 Wizard view








A0028350-EN

26 Wizard view on the display module

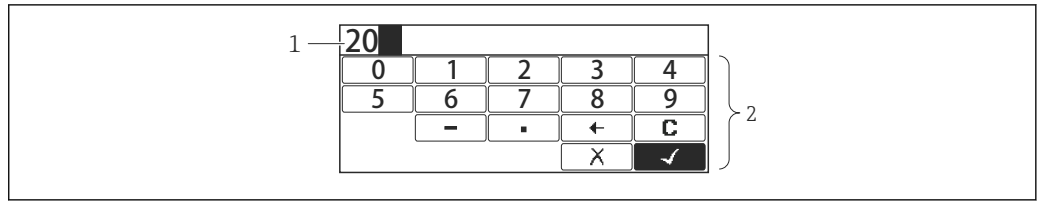
- 1 Current wizard
- 2 Display area for navigation

Wizard navigation symbols

| Symbol | Meaning |
|--|--|
|  A0013972 | Parameters within a wizard |
|  A0013978 | Switches to the previous parameter. |
|  A0013976 | Confirms the parameter value and switches to the next parameter. |
|  A0013977 | Opens the editing view of the parameter. |

 In the wizard view the meaning of the keys is indicated by the navigation symbol directly above the respective key (softkey functionality).








7.3.5 Numeric editor







A0028341

27 Numeric editor on the display module

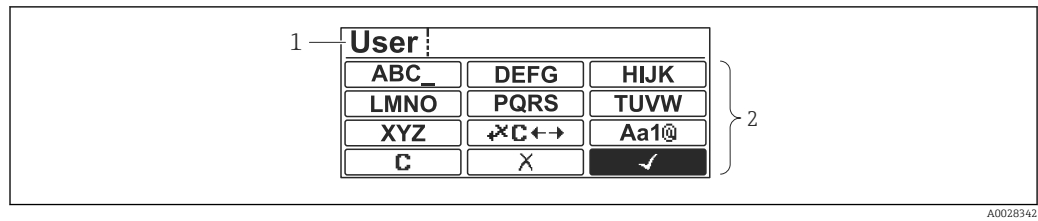
- 1 Display area of the entered value
- 2 Input mask

| Symbol | Meaning |
|---|--|
|  <p>A0013998</p> | Selection of numbers from 0 to 9. |
|  <p>A0016619</p> | Inserts decimal separator at the input position. |
|  <p>A0016620</p> | Inserts minus sign at the input position. |
|  <p>A0013985</p> | Confirms selection. |
|  <p>A0016621</p> | Moves the input position one position to the left. |
|  <p>A0013986</p> | Exits the input without applying the changes. |
|  <p>A0014040</p> | Clears all entered characters. |

Meaning of the keys in the numeric editor

| Key | Meaning |
|---|--|
|  <p>A0028324</p> | Minus key In the input mask, moves the selection bar to the left (backwards). |
|  <p>A0028325</p> | Plus key In the input mask, moves the selection bar to the right (forwards). |
|  <p>A0028326</p> | Enter key <ul style="list-style-type: none"> ■ Pressing the key briefly adds the selected number to the current decimal place or carries out the selected action. ■ Pressing the key for 2 s confirms the edited parameter value. |
|  <p>A0028327</p> | Escape key combination (press keys simultaneously) Closes the text or numeric editor without applying changes. |

7.3.6 Text editor



A0028342

28 Text editor on the display module

- 1 Display area of the entered text
- 2 Input mask





Text editor symbols

| Symbol | Meaning |
|---------------------------------|---|
| <small>A0013997</small> | Selection of letters from A to Z |
| <small>A0013981</small> | Toggle <ul style="list-style-type: none"> ▪ Between upper-case and lower-case letters ▪ For entering numbers ▪ For entering special characters |
| <small>A0013985</small> | Confirms selection. |
| <small>A0013987</small> | Switches to the selection of the correction tools. |
| <small>A0013986</small> | Exits the input without applying the changes. |
| <small>A0014040</small> | Clears all entered characters. |

Correction symbols under ✕C↔

| | |
|-----------------------------|--|
| <small>A0013989</small> | Clears all entered characters. |
| <small>A0013991</small> | Moves the input position one position to the right. |
| <small>A0013990</small> | Moves the input position one position to the left. |
| <small>A0013988</small> | Deletes one character immediately to the left of the input position. |

Meaning of the keys in the text editor

| Key | Meaning |
|---|---|
|  A0028324 | Minus key In the input mask, moves the selection bar to the left (backwards). |
|  A0028325 | Plus key In the input mask, moves the selection bar to the right (forwards). |
|  A0028326 | Enter key <ul style="list-style-type: none"> ▪ Pressing the key briefly <ul style="list-style-type: none"> - Opens the selected group. - Carries out the selected action. ▪ Pressing the key for 2 s confirms the edited parameter value. |
|  A0028327 | Escape key combination (press keys simultaneously) Closes the text or numeric editor without applying changes. |

7.3.7 Keypad lock

Automatic keypad lock


Operation via the local display is automatically locked:

- after a start-up or restart of the device.
- if the device has not been operated via the display for > 1 minute.




When attempting to access the operating menu while the keylock is enabled, the **Keylock on** message appears.

Disabling the keypad lock

1. The keylock is enabled.
 Press  for at least 2 seconds.
 ↳ A context menu appears.
2. Select **Keylock off** from the context menu.
 ↳ The keylock is disabled.

Manual activation of the keypad lock

After commissioning of the device the keypad lock can be activated manually.


1. The device is in the measured value display.
 Press  for at least 2 seconds.
 ↳ A context menu appears.
2. Select **Keylock on** from the context menu.
 ↳ The keylock is enabled.

7.3.8 Access code and user roles


Meaning of the access code

An access code can be defined in order to distinguish between the following user roles:


| User role | Definition |
|--------------------|---|
| Maintenance | <ul style="list-style-type: none"> ▪ Knows the access code. ▪ Has write access to all parameters (except service parameters). |
| Operator | <ul style="list-style-type: none"> ▪ Doesn't know the access code. ▪ Has write access to only a few parameters. |



-  The description of parameters states which role is needed at least for read and write access to each parameter.
- The current user role is indicated by the **Access status display** parameter.
- If the access code is "0000", every user is in the **Maintenance** role. This is the default setting on delivery of the device.

Defining an access code

1. Navigate to: Setup → Advanced setup → Administration → Define access code → Define access code
2. Enter the intended access code (max. 4 digits).
3. Repeat the same code in the **Confirm access code** parameter.
 - ↳ The user is in the **Operator** role. The -symbol appears in front of all write-protected parameters.

Switching to the "Maintenance" role

If the -symbol appears on the local display in front of a parameter, the parameter is write-protected because the user is in the **Operator** role. To switch to the **Maintenance** role, proceed as follows:

1. Press .
 - ↳ The input prompt for the access code appears.
2. Enter the access code.
 - ↳ The user is in the **Maintenance** role. The -symbol in front of the parameters disappears; all previously write-protected parameters are now re-enabled.

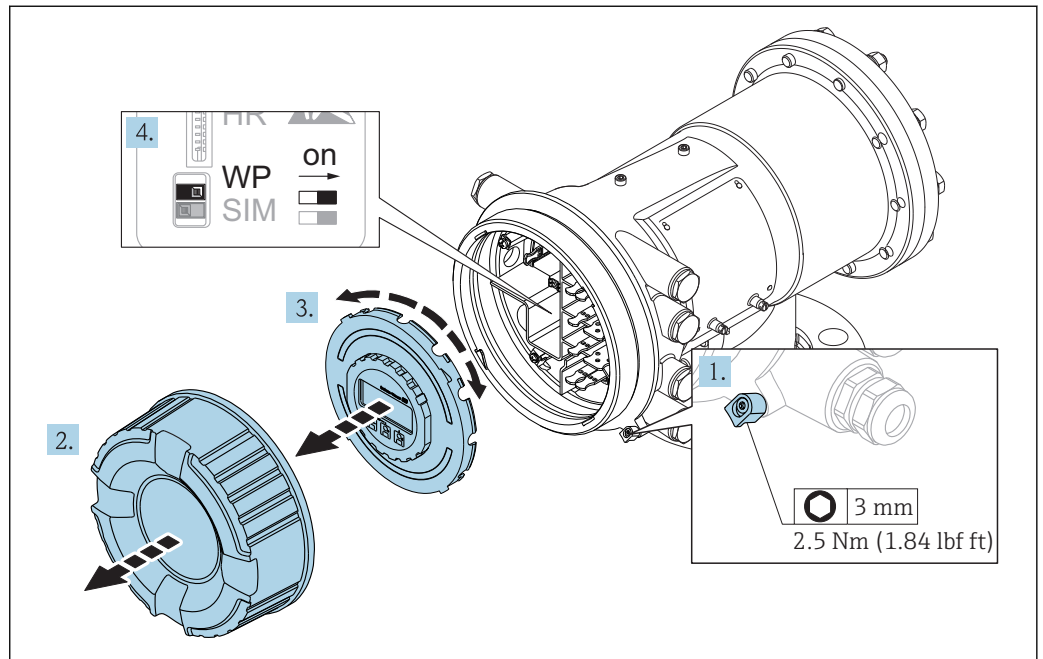
Switching back to the "Operator" role automatically

The user automatically switches back to the **Operator** role:

- if no key is pressed for 10 minutes in the navigation and editing mode.
- 60 s after going back from the navigation and editing mode to the standard view (measured value display).

7.3.9 Write protection switch

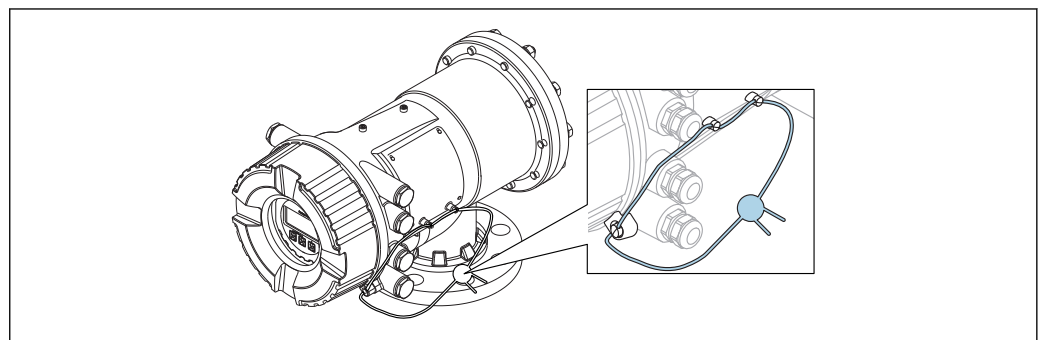
The operating menu can be locked by a hardware switch in the connection compartment. In this locking state W&M related parameters are read only.



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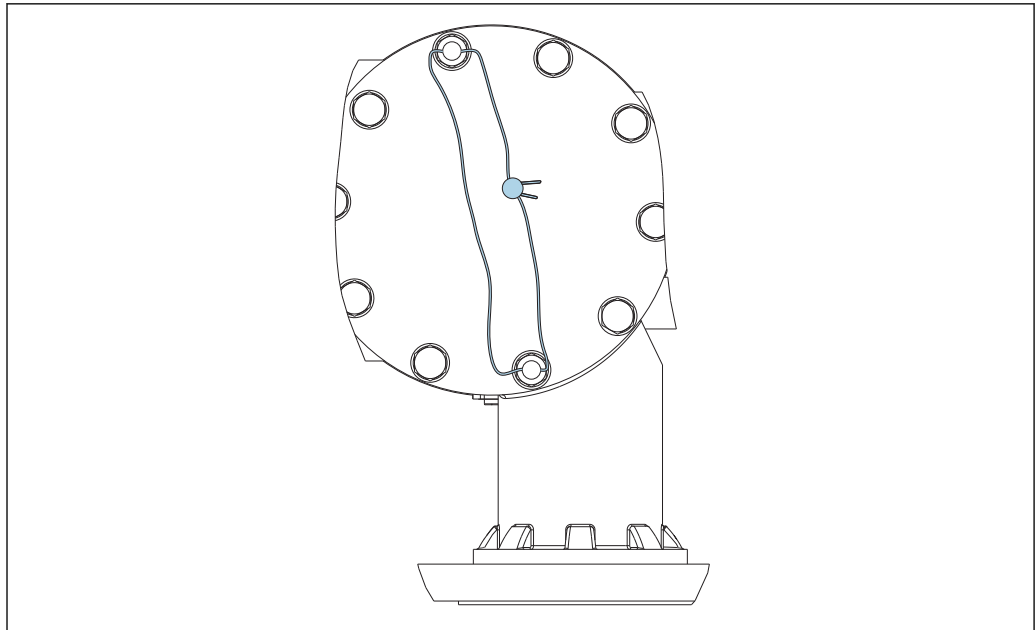
1. Loosen the securing clamp.
2. Unscrew the housing cover.
3. Pull out the display module with a gentle rotation movement.
4. Using a flat blade screwdriver or a similar tool, set the write protection switch (**WP**) into the desired position. **ON**: operating menu is locked; **OFF**: operating menu is unlocked.
5. Put the display module onto the connection compartment, screw the cover closed and tighten the securing clamp.

i To avoid access to the write protection switch, the cover of the connection compartment can be secured by a lead seal.

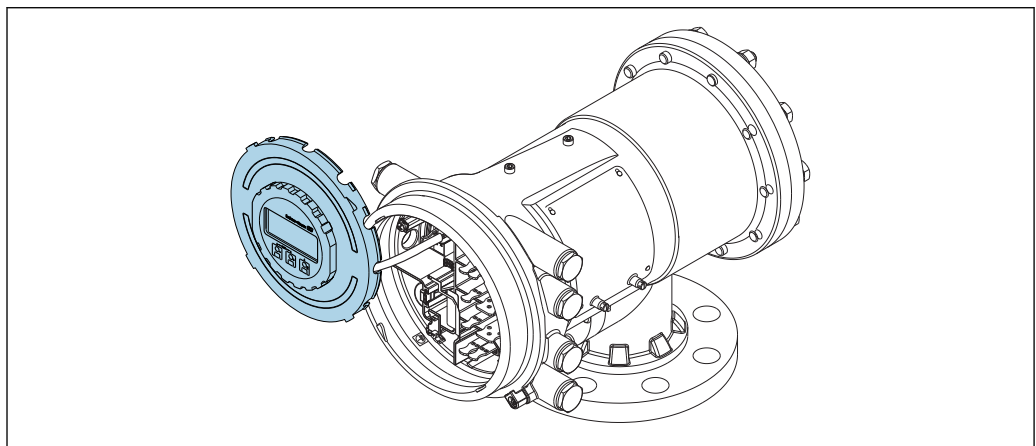


A003286

i The display module can be attached to the edge of the electronics compartment. This makes it easier to access the lock switch.



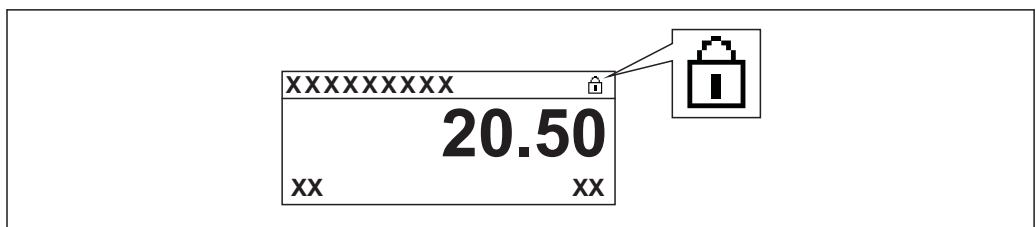
A0039458



A0029471

29 NMS83: Display module attached to the edge of the terminal compartment


Indication of the locking state



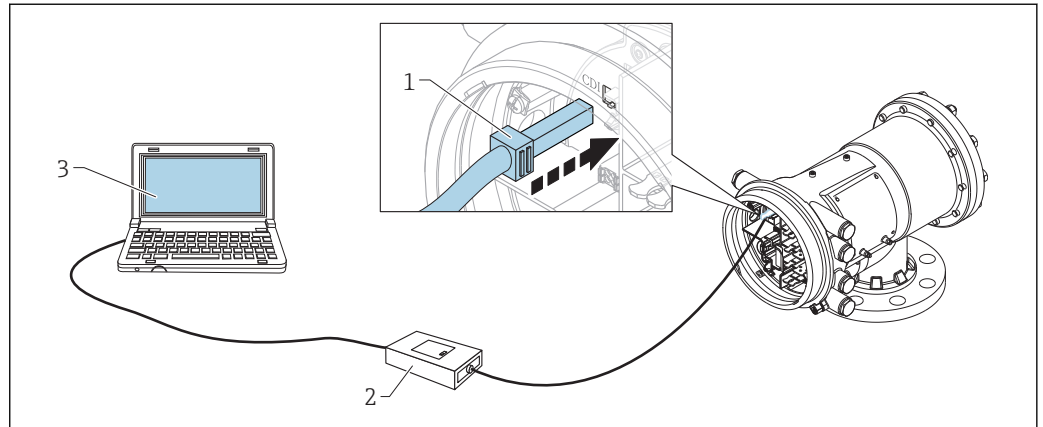
A0015870

30 Write protection symbol in the header of the display

Write protection via locking switch is indicated as follows:

- Locking status (→ 191) = Hardware locked
-  appears in the header of the display.

7.4 Access to the operating menu via the service interface and FieldCare



A0028871

31 Operation via service interface

- 1 Service interface (CDI = Endress+Hauser Common Data Interface)
- 2 Commubox FXA291
- 3 Computer with "FieldCare" operating tool and "CDI Communication FXA291" COM DTM



The "Save/Restore" function

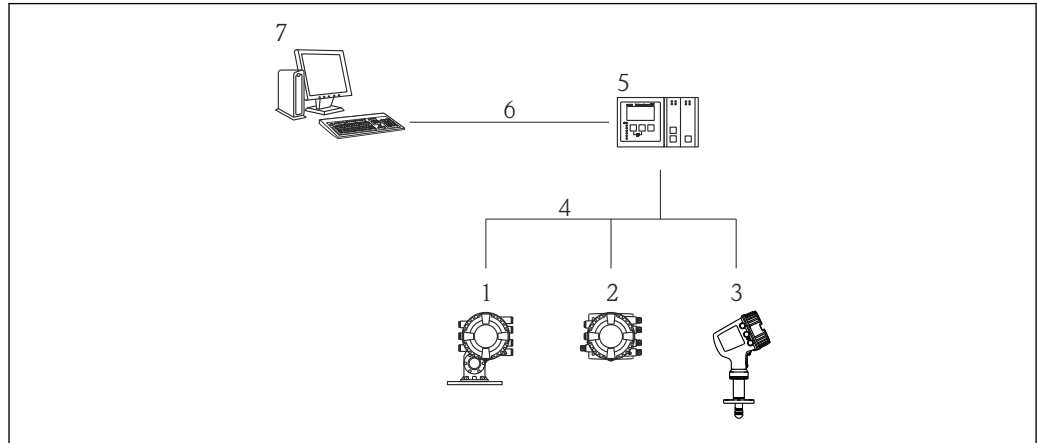
After a device configuration has been saved to a computer and restored to the device using the **Save/Restore** function of FieldCare, the device must be restarted by the following setting:

Setup → **Advanced setup** → **Administration** → **Device reset** = **Restart device**.

This ensures correct operation of the device after the restore.

7.5 Access to the operating menu via Tankvision Tank Scanner NXA820 and FieldCare

7.5.1 Wiring scheme



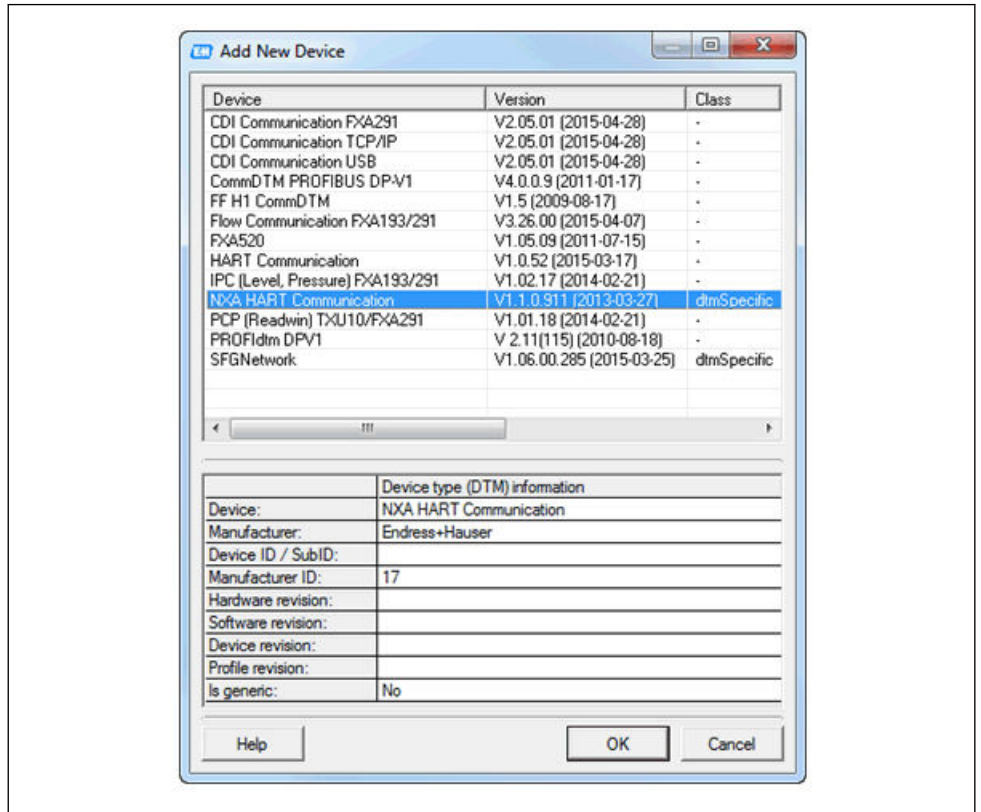
A0025621

32 Connection of Tank Gauging devices to FieldCare via the Tankvision Tank Scanner NXA820

- 1 Proservo NMS8x
- 2 Tankside Monitor NRF81
- 3 Micropilot NMR8x
- 4 Field protocol (e.g. Modbus, V1)
- 5 Tankvision Tank Scanner NXA820
- 6 Ethernet
- 7 Computer with FieldCare installed

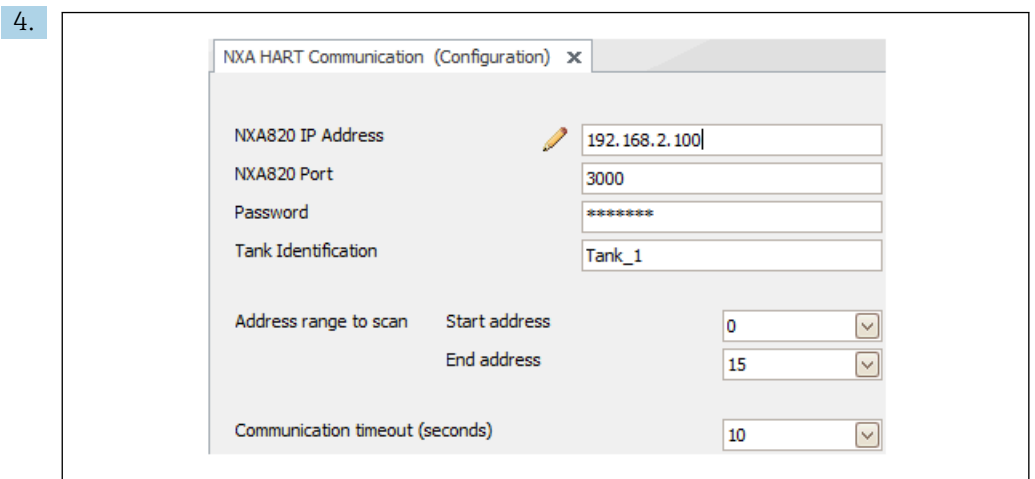
7.5.2 Establishing the connection between FieldCare and the device

1. Make sure the **HART CommDTM NXA** is installed and update the DTM catalogue if required.
2. Create a new project in FieldCare.
- 3.



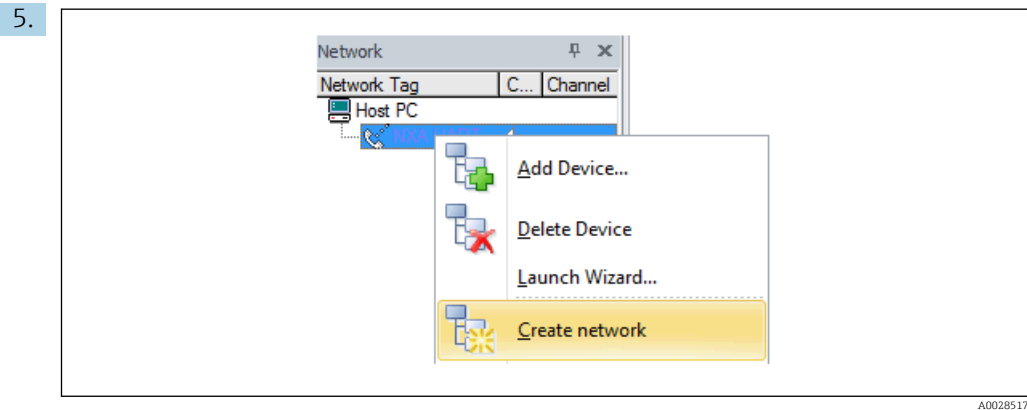
A0028515

Add a new device: **NXA HART Communication**



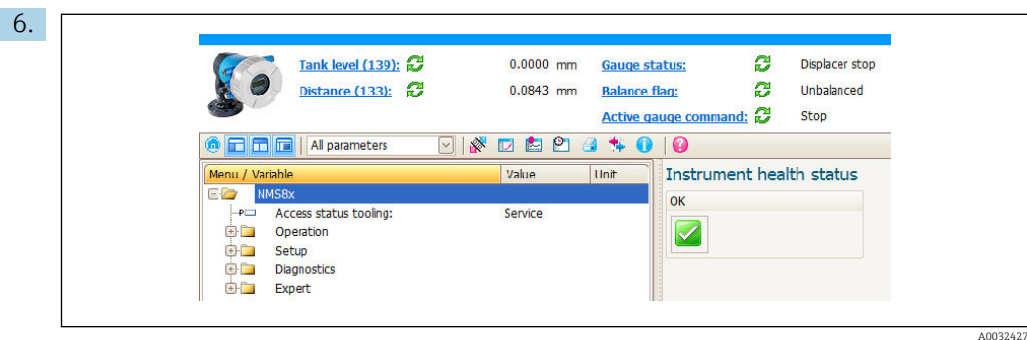
A0028516

Open the configuration of the DTM and enter the required data (IP address of the NXA820; "Password" = "hart"; "Tank identification" only with NXA V1.05 or higher)



Select **Create network** from the context menu.

↳ The device is detected and the DTM is assigned.



↳ The device can be configured.

i The "Save/Restore" function

After a device configuration has been saved to a computer and restored to the device using the **Save/Restore** function of FieldCare, the device must be restarted by the following setting:

Setup → **Advanced setup** → **Administration** → **Device reset** = **Restart device**.

This ensures correct operation of the device after the restore.

8 System integration

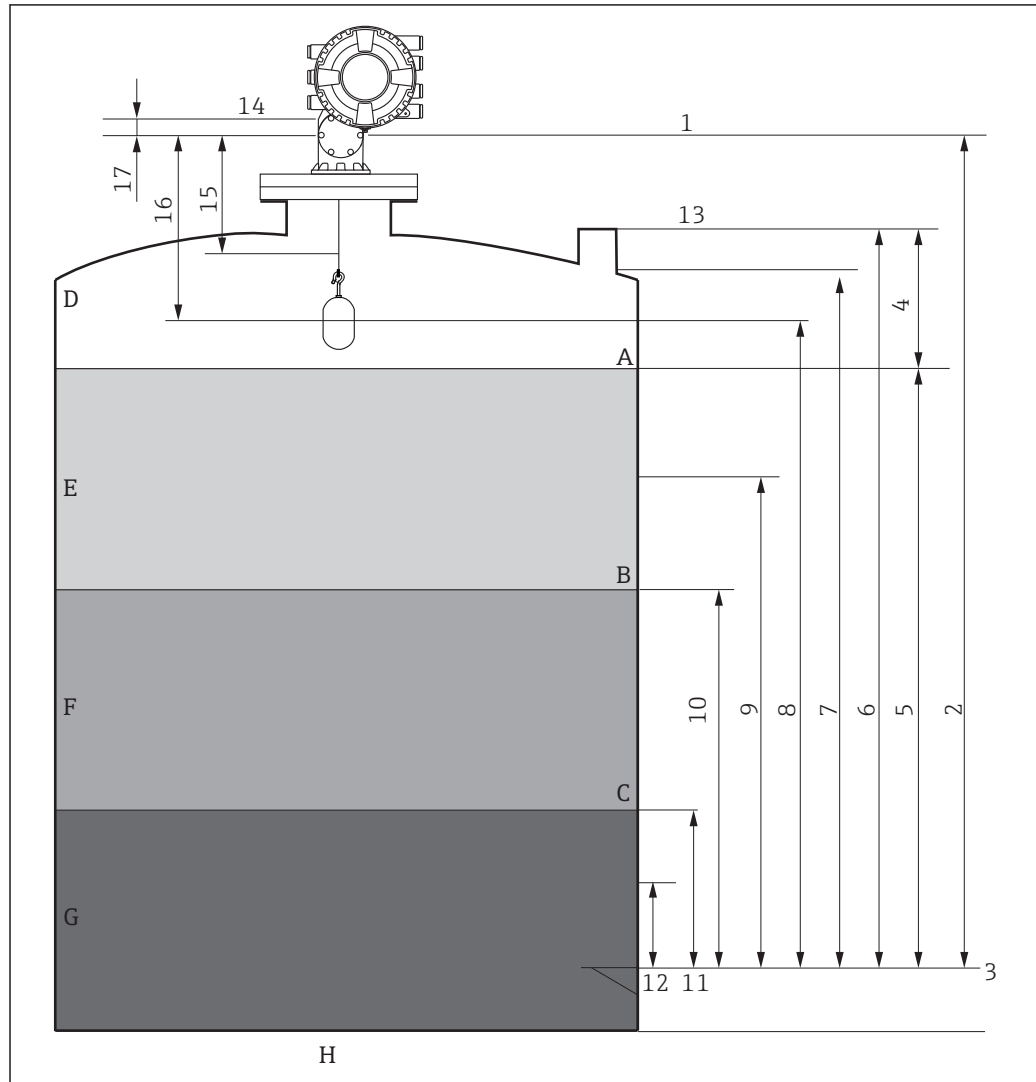
8.1 Overview of the Device Description files (DTM)

To integrate the device via HART into FieldCare, a Device Description file (DTM) according to the following specification is required:

| | |
|---------------------|--|
| Manufacturer ID | 0x11 |
| Device type (NMS8x) | 0x112D |
| HART specification | 7.0 |
| DD files | For information and files see: www.endress.com |

9 Commissioning

9.1 Terms related to tank measurement



A0033283

33 Terms concerning NMS8x installation (e.g. NMS81)

- A Liquid level
- B Upper interface
- C Lower interface
- D Gas phase
- E Upper phase
- F Middle phase
- G Lower phase
- H Tank bottom
- 1 Gauge reference height
- 2 Empty
- 3 Datum plate
- 4 Tank ullage
- 5 Tank level
- 6 Tank reference height
- 7 High stop level
- 8 Displacer position
- 9 Standby level
- 10 Upper interface level
- 11 Lower interface level
- 12 Low stop level
- 13 Dipping reference


- 14 Mechanical stop
- 15 Slow hoist zone
- 16 Distance
- 17 Reference position

9.2 Initial settings

Depending on NMS8x specification, some of the initial settings described below may not be required.


9.2.1 Setting the display language

Setting the display language via the display module

1. While in the standard view (→  59), press "E". If required, select **Keylock off** from the context menu and press "E" again.
 - ↳ The **Language** parameter appears.
2. Open the **Language** parameter and select the display language.

Setting the display language via an operating tool (e.g. FieldCare)

1. Navigate to: Setup → Advanced setup → Display → Language
2. Select the display language.

 This setting only affects the language on the display module. To set the language in the operating tool use the language setting functionality of FieldCare or DeviceCare, respectively.

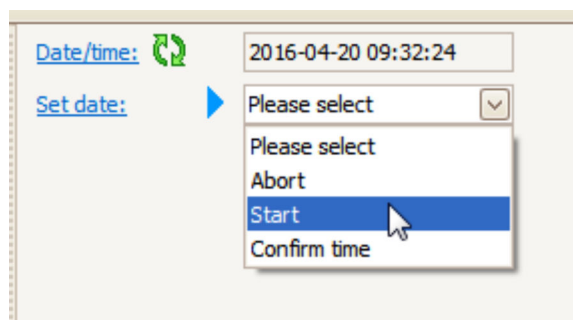
9.2.2 Setting the real-time clock

Setting the real-time clock via the display module

1. Navigate to: Setup → Advanced setup → Date / time → Set date
2. Use the following parameters to set the the real-time clock to the current date and time: **Year, Month, Day, Hour, Minutes**.




Setting the real-time clock via an operating tool (e.g. FieldCare)

1. Navigate to: Setup → Advanced setup → Date / time
- 2.






Go to the **Set date** parameter and select the **Start** option.

3.

| | | |
|----------------------------|---|---------------------|
| Date/time: |  | 2016-04-20 09:34:25 |
| Set date: |   | Please select |
| Year: | | 2016 |
| Month: | | 4 |
| Day: | | 20 |
| Hour: | | 9 |
| Minute: | | 34 |

Use the following parameters to set the date and time: **Year, Month, Day, Hour, Minutes.**

4.

| | | |
|----------------------------|---|---------------------|
| Date/time: |  | 2016-04-20 09:35:49 |
| Set date: |   | Please select |
| Year: | | Please select |
| Month: | | Abort |
| Day: | | Start |
| Hour: | | Confirm time |
| Minute: | | 9 |
| | | 34 |

Go to the **Set date** parameter and select the **Confirm time** option.

↳ The real-time clock is set to the current date and time.

9.3 Calibration

After installing or replacing NMS8x or its parts (sensor module, detector unit, wire drum, or measuring wire), several calibration steps are required. All calibration steps may not be required, depending on whether the device is being installed, adjusted, or replaced (see table below).

| Type of installation/replacement | Calibration step | | |
|---|--------------------|-----------------------|------------------|
| | Sensor calibration | Reference calibration | Drum calibration |
| All-in one | Not required | Not required | Not required |
| Displacer shipped separately | Required | Required | Required |
| Displacer installation through calibration window | Required | Required | Required |
| Replacement/ maintenance | Drum | Required | Required |
| | Displacer | Not required | Required |
| | Sensor module | Not required | Required |
| | Detector unit | Required | Required |

9.3.1 Verification of displacer and wire drum

Prior to installation of NMS8x, confirm that all of the following data of the displacer and the wire drum on the nameplate match with those programmed into the device.

Parameters to be confirmed

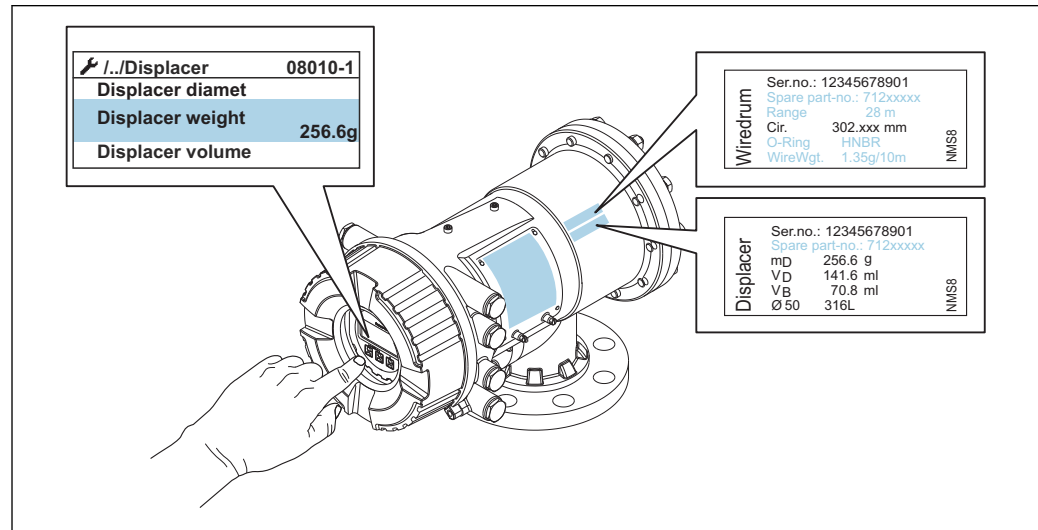
| Parameters | Navigate to: |
|--------------------------|---|
| Displacer diameter | Setup → Advanced setup → Sensor config → Displacer → Displacer diameter |
| Displacer weight | Setup → Advanced setup → Sensor config → Displacer → Displacer weight |
| Displacer volume | Setup → Advanced setup → Sensor config → Displacer → Displacer volume |
| Displacer balance volume | Setup → Advanced setup → Sensor config → Displacer → Displacer balance volume |
| Drum circumference | Setup → Advanced setup → Sensor config → Wire drum |
| Wire weight | Expert → Sensor → Sensor config → Wire drum → Wire weight |

Data verification

Data verification procedure

1. Check the displacer diameter, weight, volume, and balance volume for the **Displacer diameter** parameter, the **Displacer weight** parameter, the **Displacer volume** parameter, and the **Displacer balance volume** parameter.
2. Check the drum circumference and wire weight for the **Drum circumference** parameter and **Wire weight** parameter.

This completes the data verification procedure.



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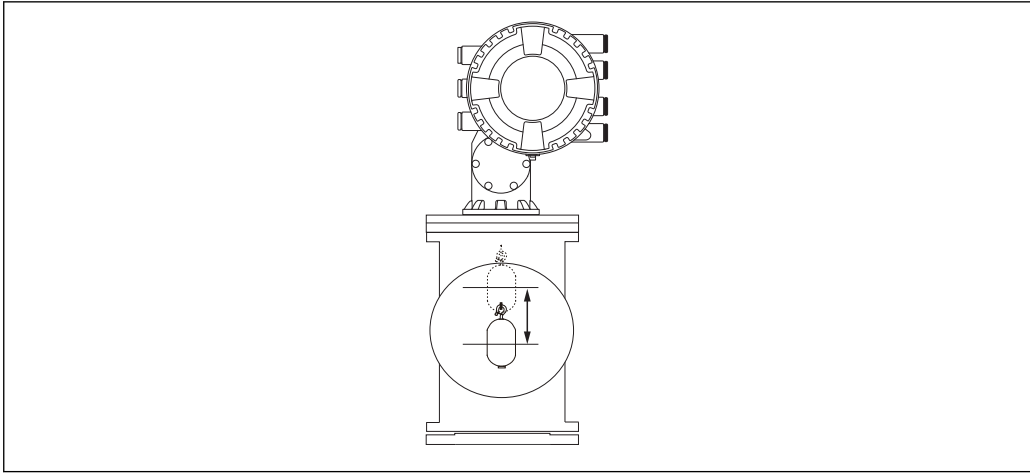
34 Data verification

9.3.2 Move displacer

The move displacer operation is optional and can be used to change the current position of the displacer in order to perform the calibration steps more easily.

1. Make sure that the wire drum stopper has been removed.
2. Navigate to: Setup → Calibration → Move displacer → Move distance
3. Input the relative moving distance for the **Move distance** parameter.
4. Select the **Move down** option or the **Move up** option
5. Select the **Yes**.

This completes move displacer commands procedure.



A0027996


35 Move displacer

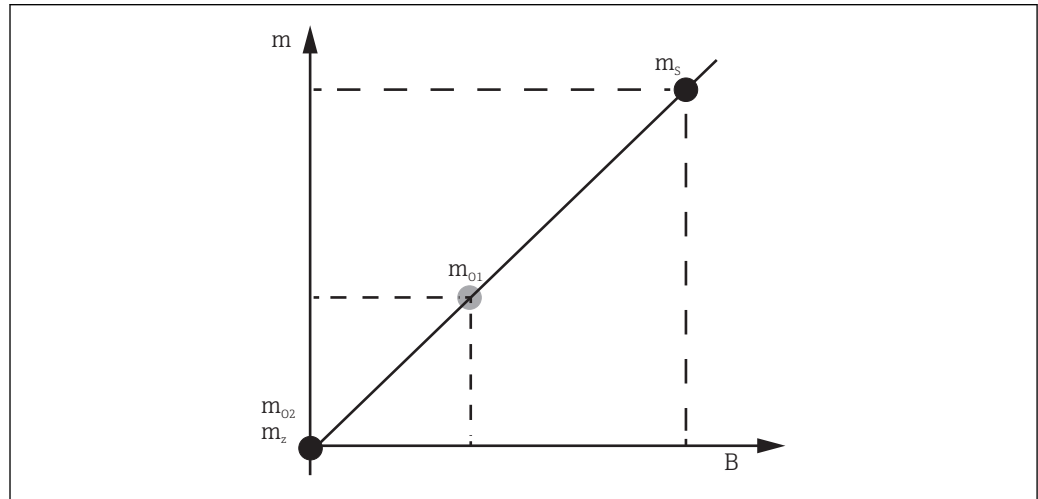
9.3.3 Sensor calibration

Sensor calibration adjusts the weight measurement of the detector unit. The calibration consists of three steps as follows.


- ADC zero calibration
- ADC offset calibration
- ADC span calibration

For the ADC offset weight calibration, either 0 g or an offset weight (0 to 100 g) can be used.

 Using an offset weight other than 0 g is recommended for density measurement.














A0029472

 36 Concept of sensor calibration

- m Weight of displacer
 B Binary value of AD-Converter
 m_s Span weight
 m_{o1} Offset weight in case of 0 to 100 g (50 g is recommended.)
 m_{o2} Offset weight in case of 0 g
 m_z Zero weight

Calibration procedure

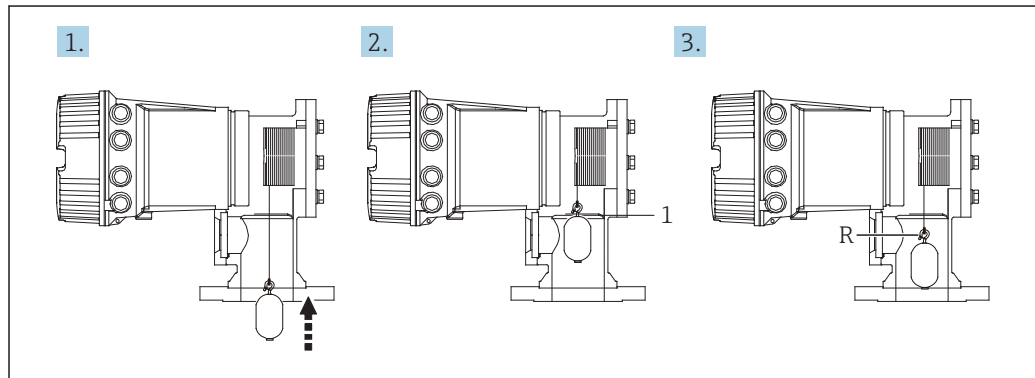
| Step | Using displacer | Using offset weight | Description |
|------|---|---|---|
| 1. |  A0030475 |  A0030475 | <ul style="list-style-type: none"> ▪ Navigate to: Setup → Calibration → Sensor calibration → Sensor calibration ▪ Input the offset weight for the Offset weight parameter used in step 3 (0.0 g in case of using the displacer only). ▪ Input the value for the Span weight parameter used in step 4 (weight of displacer indicated on nameplate). |
| 2. |  A0030474 |  A0028001 | <ul style="list-style-type: none"> ▪ Hold up or remove the displacer. ▪ Select <input checked="" type="checkbox"/> for next parameter. ▪ Measuring zero weight option is shown on the display. ▪ Wait until the Zero calibration parameter shows the Finished option and calibration status shows Idle. <p> When the displacer is being held up, do not release it until this step is completed.</p> |
| 3. |  A0030474 |  A0028002 | <ul style="list-style-type: none"> ▪ Confirm that the Offset calibration parameter shows the Place offset weight option. ▪ Hold up the displacer or attach the offset weight. ▪ Select <input checked="" type="checkbox"/> for next parameter. ▪ Measuring offset weight option is shown on the display. ▪ Wait until the Offset calibration parameter shows the Finished option and Calibration status shows Idle. <p> When the displacer is being held up, do not release it until this step is completed.</p> |
| 4. |  A0030475 |  A0030475 | <ul style="list-style-type: none"> ▪ Release the displacer or mount it on the measuring ring if an offset weight was used in the previous step. ▪ Select <input checked="" type="checkbox"/> for next parameter. ▪ Measuring span weight option is shown on the display. ▪ Confirm that the Span calibration parameter shows the Finished option and Calibration status shows Idle. ▪ Select the Next option. ▪ Confirm that the Sensor calibration parameter shows the Calibration finished option and Calibration status shows Idle. <p>This completes sensor calibration procedure.</p> <p> Do not swing the displacer and keep it in as stable a position as possible.</p> |

9.3.4 Reference calibration

The reference calibration defines the zero distance position of the displacer from the mechanical stop.

1. Navigate to: Setup → Calibration → Reference calibration → Reference calibration
2. Select the **Start** option
3. Check the reference position (e.g. 70 mm (2.76 in)).
↳ The reference position is preset prior to delivery.
4. Confirm that the displacer is correctly attached to the measuring wire.
5. The reference calibration starts automatically.

This completes the reference calibration.



A0028003

37 Reference calibration sequence

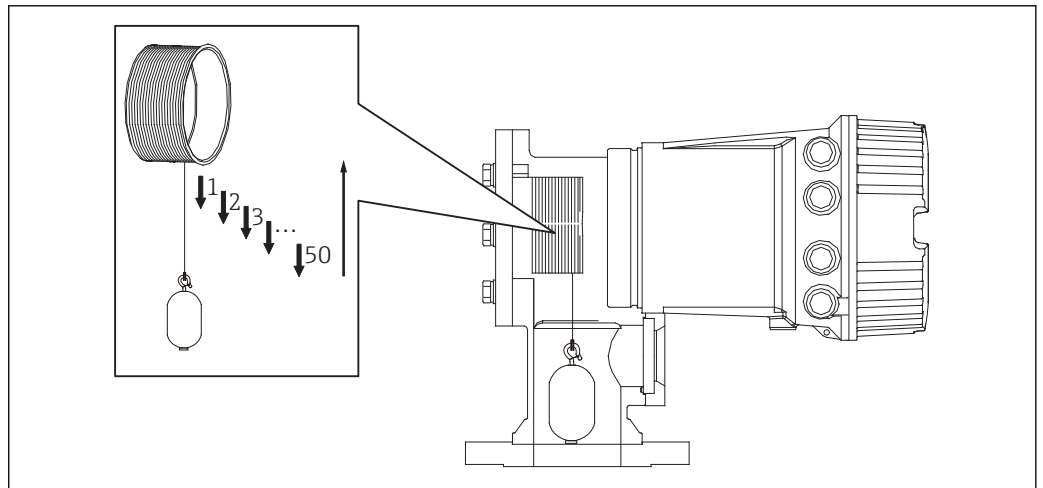
- 1 Mechanical stop
R Reference position

9.3.5 Drum calibration

1. Navigate to: Setup → Calibration → Drum calibration → Drum calibration
2. Ensure a distance of 500 mm (19.69 in) or more from the bottom of the displacer to the liquid level.
3. Confirm that the displacer weight is correct for the **Set high weight** parameter.
4. Select the **Start** option.
 - ↳ The drum calibration starts automatically.
The drum calibration records fifty points which will take approximately eleven minutes.
5. Select the **No** option as usual for the **Make low table** parameter.
 - ↳ To make a low table for special applications, select the **Yes** and use 50 g weight.

This completes drum calibration procedure.

- i** To cancel any calibration, press $\square + \oplus$ simultaneously. If the drum calibration is canceled while making the new table, the old table remains effective. If making a new table fails due to an obstruction, NMS8x will not accept the new table and shows an error message.



A0029123

38 Making drum table

9.3.6 Commissioning check

This procedure is to confirm that all calibration steps have been completed appropriately.

1. Navigate to: Diagnostics → Device check → Commissioning check → Commissioning check
2. Select the **Start** option.
 - ↳ **Executing** option is shown on the verify drum table.
3. Select the **Next** option.
4. Confirm that the **Commissioning check** wizard shows the **Finished** option.
5. Confirm that the **Result drum check** parameter is passed.

This completes the commissioning check procedure.

9.4 Configuring the measuring device

| Configuration task | Description |
|---|---|
| Configuring the level and interface measurement | Setting density → 87 |
| | Setting tank height → 88 |
| | Setting high and low stop → 89 |
| Level calibration | Setting for open tank with liquid → 90 |
| | Setting for open tank without liquid → 91 |
| | Setting for closed tank → 92 |
| | Setting process condition → 93 |
| Configuring the density measurement | Setting spot density → 93 |
| | Setting tank profile → 96 |
| | Setting interface profile → 97 |
| | Setting manual profile → 98 |

9.4.1 Configuring the level and interface measurement

The level measurement is to measure the position where the displacer is balanced (immersion point) in the liquid. When the liquid surface level changes, the displacer continuously follows the position to measure the liquid level. To define the appropriate level measurement, the following settings are required prior to operation.

The interface measurement can determine the interface between different liquids in a tank (e.g. water and oil). Up to two different interfaces can be determined within a maximum of three phases in a tank.

Setting the density of application

Density values for three liquid phases are set as follows prior to delivery.

- Upper density: 800 kg/m³
- Middle density: 1 000 kg/m³
- Lower density: 1 200 kg/m³

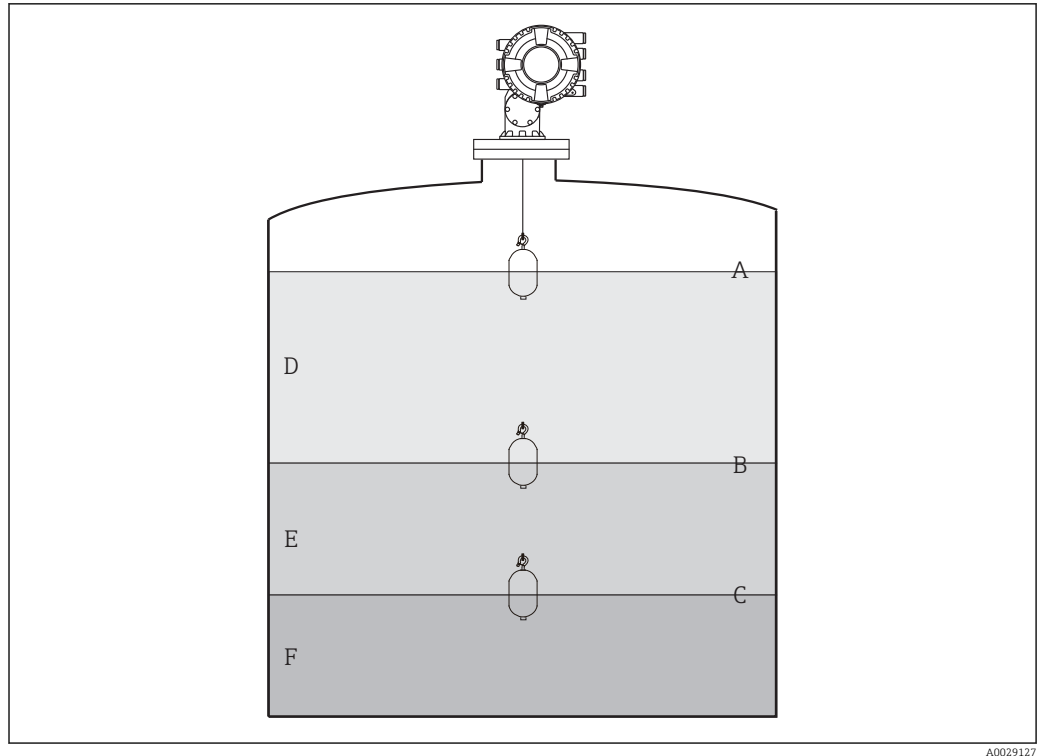
Change the data to reflect the actual density values. For tanks with only one liquid phase, set the upper density. For tanks with two or three phases, set middle and bottom densities as well.

| Number of phases | Parameters to be set |
|------------------|----------------------------|
| 1 phase | Upper density |
| 2 phases | Upper/middle density |
| 3 phases | Upper/middle/lower density |

 When performing an interface measurement, the minimum density difference between phases should be at least 100 kg/m³.

Setting the density

1. Navigate to: Setup → Upper density , Setup → Middle density and Setup → Lower density
2. Input the value to Upper, Middle, and Lower densities accordingly.



39 Tank configuration

- A Liquid level
- B Upper interface
- C Lower interface
- D Upper phase (density)
- E Middle phase (density)
- F Lower phase (density)

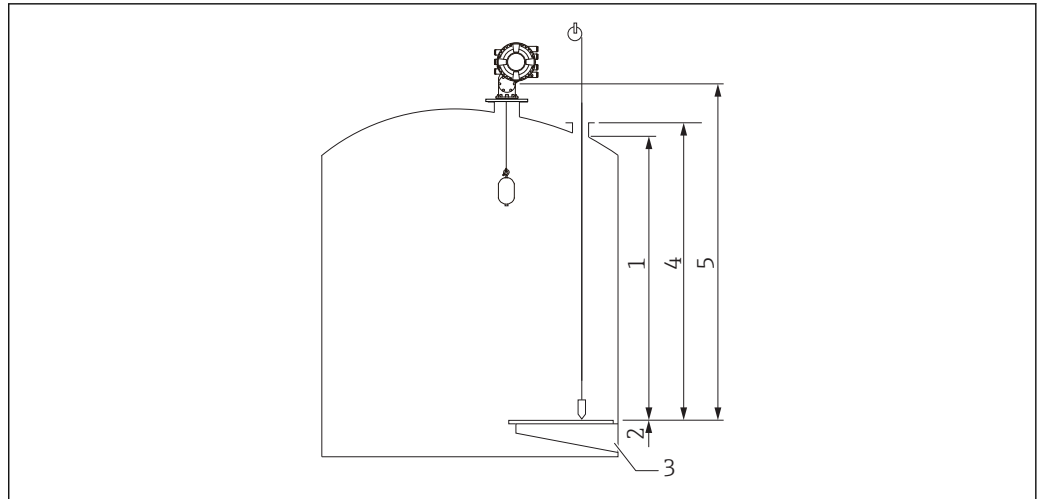
Setting the tank height

To measure the tank level correctly, the tank reference height and empty (distance from reference point to datum plate) must be set in advance.

- i** Tank reference height: Set by the customer to represent the height of the tank. Distance between the dipping reference and the datum plate. Used for percentage calculation and as reference for the ullage level.
- Empty: Distance between the zero point of device and datum plate. Empty is automatically adjusted by the **Set level** parameter.
- Refer to Level calibration for details how to determine the empty parameter accurately. → 90

Setting the tank reference height and empty

1. Navigate to: Setup → Empty
2. Input the empty value.
3. Navigate to: Setup → Tank reference height
4. Input the value of tank reference height.



A0028023

40 Tank height

- 1 High stop
- 2 Low stop
- 3 Datum plate
- 4 Tank reference height
- 5 Empty

Setting the high stop and low stop

The high stop and low stop determine the highest and lowest points of displacer movement. Set these data to the desired actual upper and lower limit values.

i If the displacer should be able to determine a tank bottom that is below the datum plate, set the low stop to a negative value. To make sure that the displacer travels up to the reference position, set the high stop to a value greater than or equal to empty.

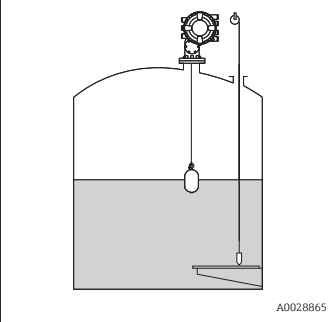
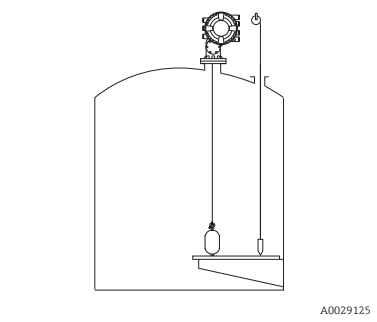
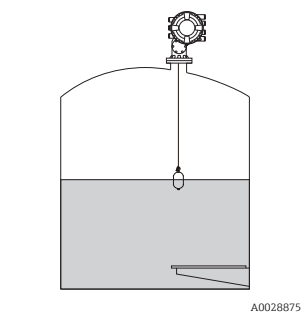
High stop and low stop setting procedure

1. Navigate to: Setup → High stop level
2. Input the actual value for high stop.
3. Navigate to: Setup → Low stop level
4. Input the actual value for low stop.

This completes upper and lower stop setting procedure.

9.4.2 Level calibration


The following table shows the most likely options for setting the level calibration.

| Open tank with liquid | Open tank without liquid | Closed tank |
|--|---|--|
|  A0028865 |  A0029125 |  A0028875 |

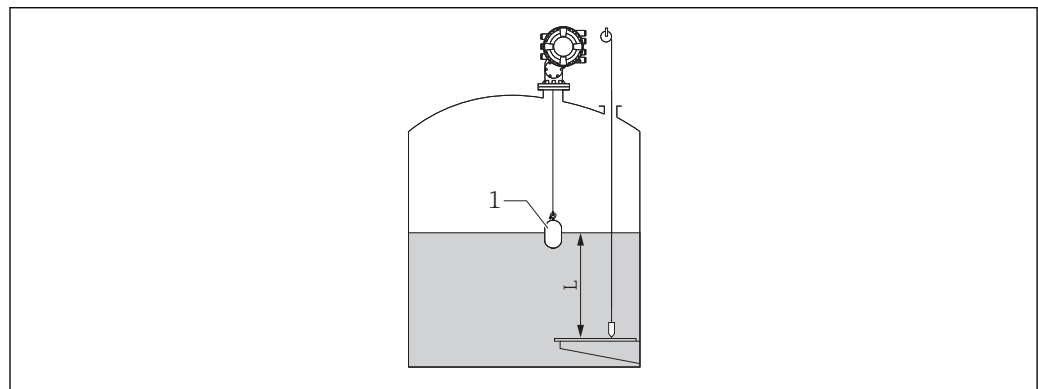
Setting for an open tank with liquid


Level setting procedure

1. Navigate to: Setup → Gauge command
2. Select the **Level** option for the **Gauge command** parameter.
↳ The displacer automatically searches for the point where it balances.
3. Wait until the displacer is balanced on the liquid.
4. Perform dipping to determine the liquid level (L) in the tank.
5. Navigate to: Setup → Set level
6. Input the determined level value for the **Set level** parameter.

 The **Set level** parameter adjusts the **Empty** parameter to reflect the new level value.

This completes setting for open tank with liquid procedure.



 41 Set level for opened tank with liquid

1 Displacer
L Measured value

Setting for an open tank without liquid


If there is no liquid in the tank, the following procedure can be used to set the tank bottom or datum plate to 0 mm for the tank level.

Level setting procedure

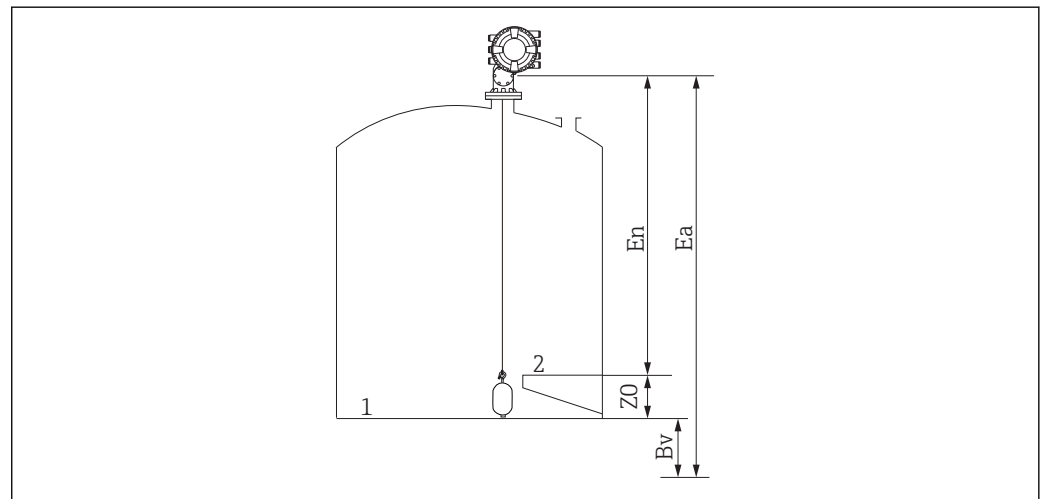
1. Navigate to: Operation → Gauge command → Gauge command
2. Select the **Bottom level** option to measure the tank bottom.
3. Navigate to: Operation → One-time command status
4. Wait until the **Finished** option is shown.
5. Navigate to: Operation → Level → Bottom level
6. Read the **Bottom level** parameter (Bv).
7. Navigate to: Setup → Empty
8. Read the actual empty value (Ea).
9. Calculate the new empty value using following formula.
↳ $En = Ea - Bv - Z0$
10. Input the calculated value for the **Empty** parameter.

Example: $Ea = 28m, Bv = 10.5m, Z0 = 0.5m$
 $En = 28m - 10.5m = 17m$

A0029473

-  The parameter Z0 defines the distance between the desired 0mm level value and the physical tank bottom (if displacer measures the datum plate, Z0 = 0 mm (0 in)).
- Bottom level operation considers the immersion depth of the displacer in the measurement.

This completes the level setting for open tank without liquid procedure.



A0028134

 42 Open tank without liquid

- 1 Tank bottom
- 2 Datum plate
- Ea Initial empty setting
- Bv Initial bottom level
- En New empty
- Z0 Distance from tank bottom to datum plate

-  It is recommended to repeating the level calibration when there is liquid in the tank (→  90).

Setting for a closed tank

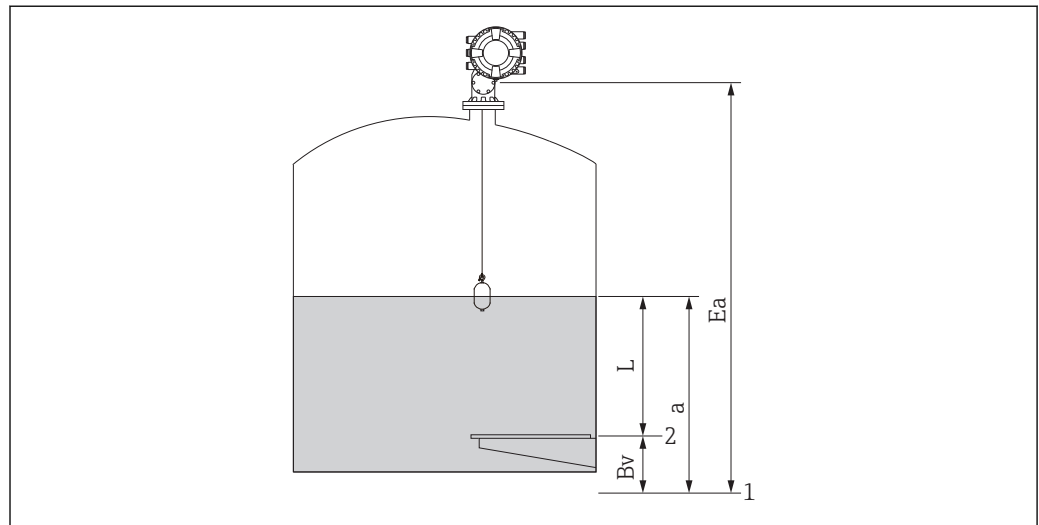
For tanks that cannot be hand-dipped, follow the procedure shown below.

Level setting procedure

1. Navigate to: Operation → Gauge command → Gauge command
2. Select the **Bottom level** option to measure the tank bottom.
 - ↳ NMS8x measures the tank bottom and returns to level if the post gauge command is set to level (default).
3. Navigate to: Operation → One-time command status
4. Wait until the **Finished** option is shown.
5. Navigate to: Operation → Level → Bottom level
6. Read the bottom value (Bv).
7. Navigate to: Operation → Level → Tank level (a)
8. Calculate the level value (L) by using following formula.
 - ↳ $L = a - Bv$
9. Navigate to: Setup → Set level
10. Input the value L for the **Set level** parameter.

This completes the level setting procedure.

i If the datum plate is not zero (e.g. Z mm), adjust the set level value (L) by subtracting Z from the value L ($L = a - Bv - Z$).



A0029124

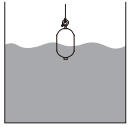
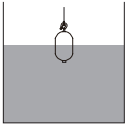
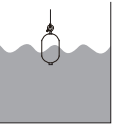
43 Closed tank

- 1 Initial zero level position
- 2 Datum plate
- Ea Initial setting of Empty
- Bv Bottom level
- a Tank level
- L Set level value

Selecting the process condition

The process condition is used to adjust the device to the application. By changing this parameter, several balancing parameters are adjusted automatically to make setup easier.

1. Navigate to: Setup → Process condition
2. Select an appropriate condition for the **Process condition** parameter.

| Parameter name | Process condition | | |
|-------------------|---|---|---|
| Parameter setting | Universal (Default setting) | Calm surface | Turbulent surface |
| Description |  A0029128 |  A0029129 |  A0028030 |
| | Provides reliable results in various applications and for various liquids. | For storage tanks with a calm surface and focus on highest accuracy measurement. | For applications where the surface is turbulent. |

9.4.3 Configuring the density measurement

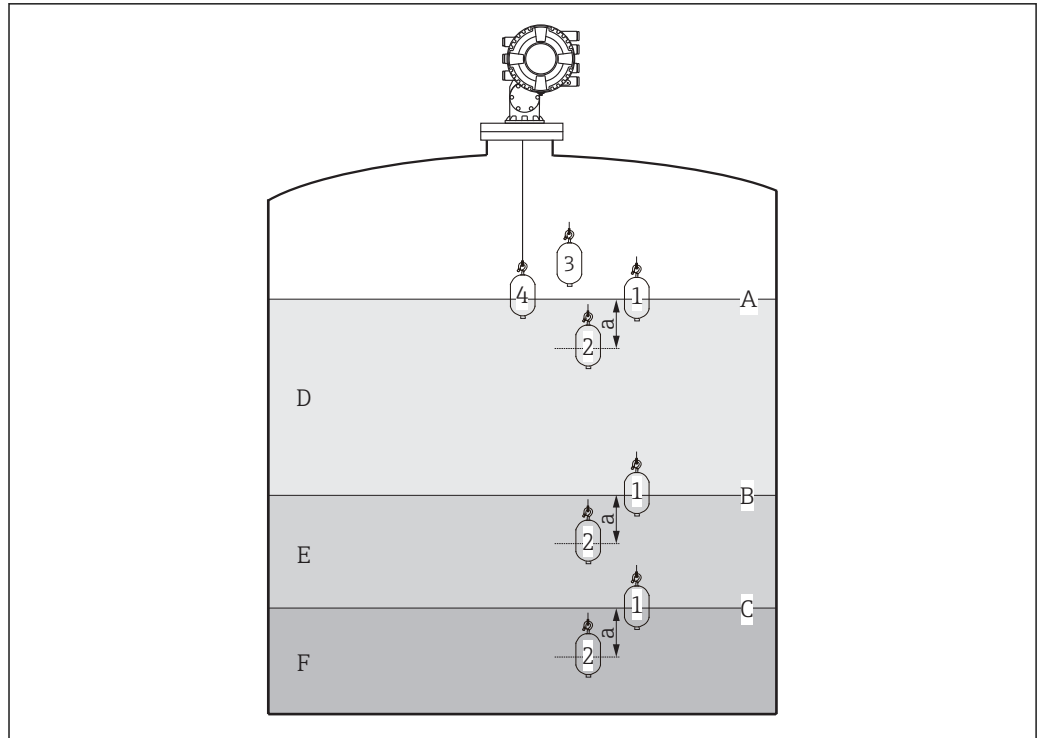
The density measurement is performed to confirm and maintain the quality of the liquid.

The density measurement is largely divided into two methods as shown below.

| Density methods | Gauge command | Description |
|-----------------|--|---|
| Spot density | Upper density Middle density Lower density | One spot density measurement for designated layer <ul style="list-style-type: none"> ▪ Upper density is for upper layer. ▪ Middle density is for middle layer. ▪ Lower density is for lower layer. |
| Profile density | Tank profile | Profile between the bottom of the tank and the level position <ul style="list-style-type: none"> ▪ Normal mode ▪ Compensation mode |
| | Interface profile | Profile between the upper interface (I/F) and the level position <ul style="list-style-type: none"> ▪ Normal mode ▪ Compensation mode |
| | Manual profile | Profile between the desired start point and the level position <ul style="list-style-type: none"> ▪ Normal mode ▪ Compensation mode |

Spot density measurement

Three different spot density gauge commands are available as shown below.



A0029469

44 Spot density (The numbers show the order of displacer movement.)

- A Liquid level
- B Upper interface
- C Lower interface
- D Upper density
- E Middle density
- F Lower density
- a Submersion depth

The submersion depth (a) is set to 150 mm (5.91 in) prior to delivery. To change the submersion depth, perform the following steps.

1. Navigate to: Setup → Advanced setup → Sensor config → Spot density → Submersion depth
2. Input the desired value for the **Submersion depth** parameter.

Setting the spot density

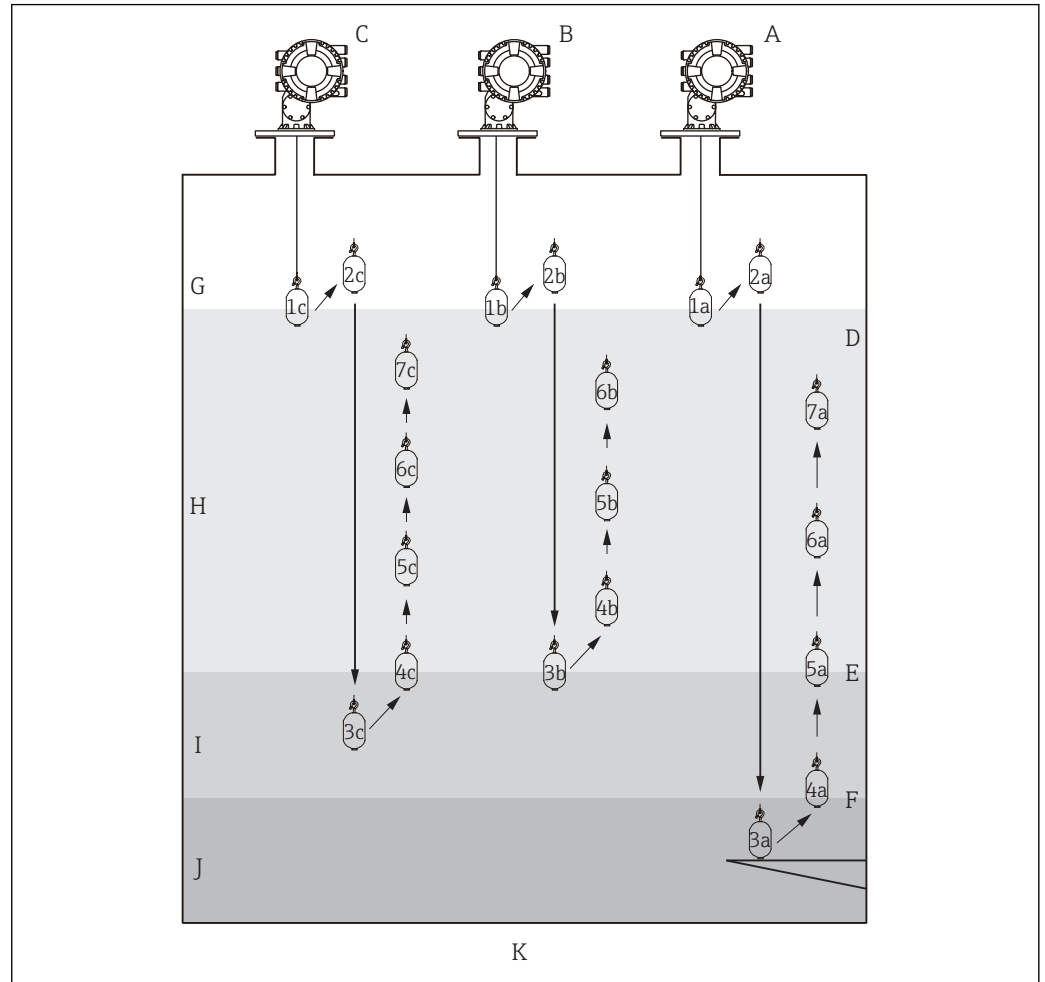
1. Navigate to: Operation → Gauge command → Gauge command
2. Select the **Upper density** option, the **Middle density** option, or the **Lower density** option for the **Gauge command** parameter.
3. Verify that the value that was examined in a laboratory and the actual value that was measured in the tank are the same or within an allowable range.
4. Adjust the value if necessary.
 - ↳ Navigate to: Setup → Advanced setup → Sensor config → Spot density
Select the **Upper density offset** parameter, the **Middle density offset** parameter, and the **Lower density offset** parameter and input the desired values for each offset.

This completes the setting spot density procedure.

Profile density measurement

Profile density has three gauge commands as shown below.

i NMS8x measures a density profile according to a defined interval of up to 50 points.



A0029106

45 Overview of profile density (1a, 2a, 3a...show the order of displacer movements.)

- A Tank profile
- B Interface profile
- C Manual profile
- D Liquid level
- E Upper interface
- F Lower interface
- G Gas phase
- H Upper density
- I Middle density
- J Lower density
- K Tank bottom

i Density measurement has two types of modes.

- Normal measure mode: Profile points are measured at exactly configured positions.
- Compensation mode: Profile points are measured at multiples of the wire drum circumference to further improve accuracy.

Select normal mode as usual. However, when selecting compensation mode, NMS8x automatically adjusts the measurement positions to where the density measurement can be the most accurate.

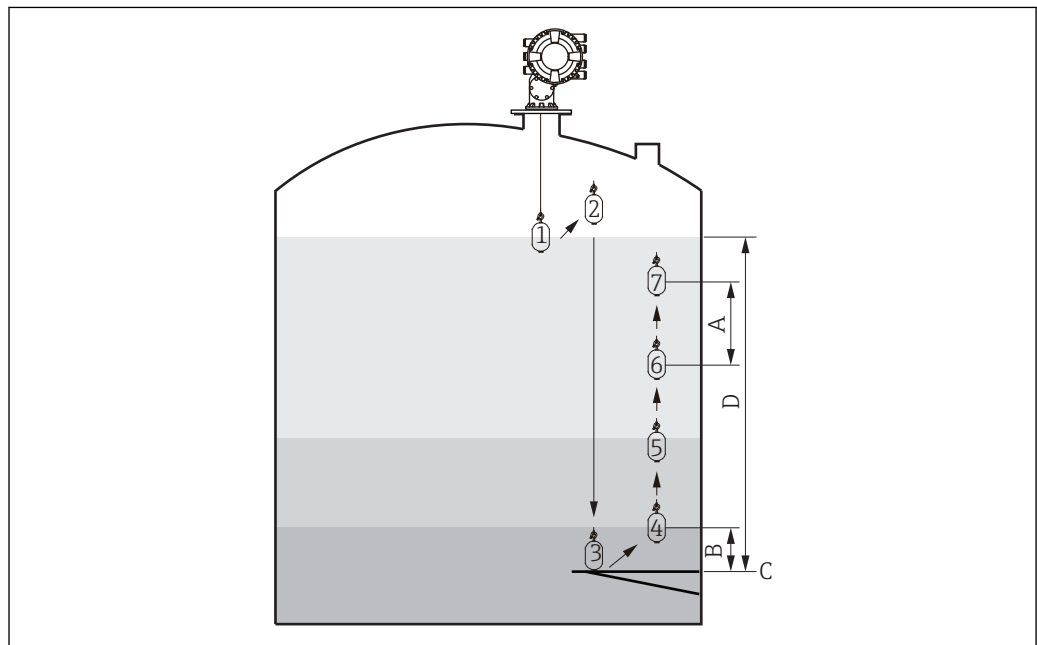
Tank profile measurement

Setting tank profile procedure

The tank profile operation measures a profile starting at the physical tank bottom up to the liquid level.

1. Navigate to: Setup → Advanced setup → Sensor config → Profile density → Profile density offset distance
2. Input the desired value for the **Profile density offset distance** parameter.
 - ↳ The value of the profile density offset distance defines the distance between the start point (upper interface) and the first measurement point.
3. Navigate to: Setup → Advanced setup → Sensor config → Profile density → Profile density interval
4. Input the desired value for the **Profile density interval** parameter.
5. Set **Tank profile** option in the **Gauge command** parameter to start measurement.

This completes the setting tank profile procedure.



A0029108

46 Tank profile movement (The numbers show the order of the displacer movement.)

- A Profile density interval
- B Profile density offset distance
- C Datum plate
- D Tank profile range

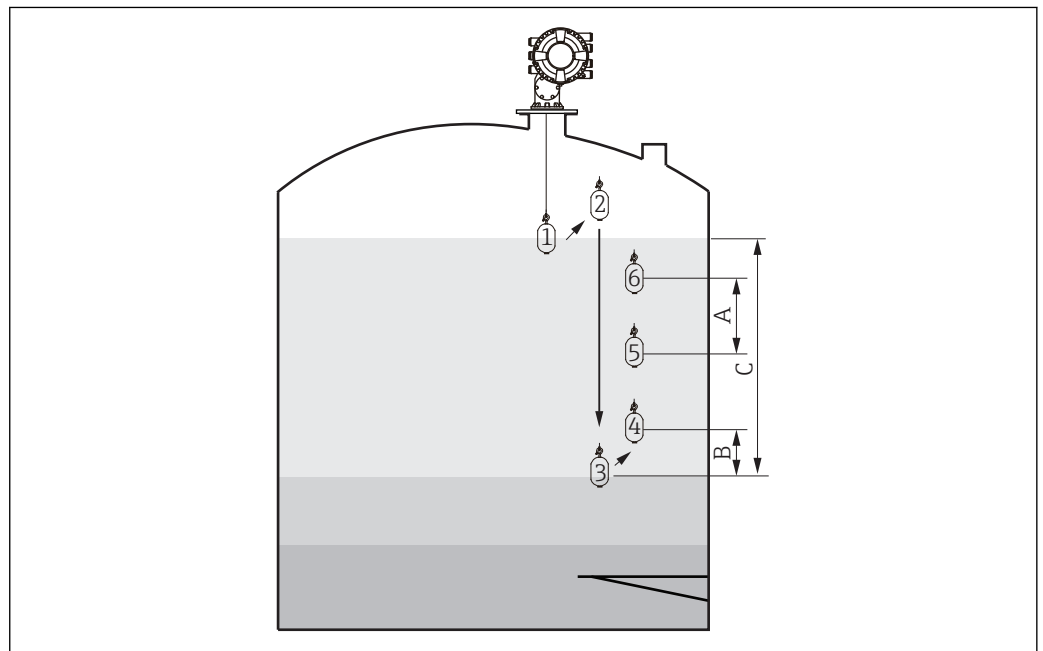
Interface profile measurement

Setting interface profile procedure

The interface profile operation measures a profile starting at the upper interface level up to the liquid level.

1. Navigate to: Setup → Advanced setup → Sensor config → Profile density → Profile density offset distance
2. Input the desired value for the **Profile density offset distance** parameter.
 - ↳ The value of the profile density offset distance defines the distance between the start point (upper interface profile) and the first measurement point.
3. Navigate to: Setup → Advanced setup → Sensor config → Profile density → Profile density interval
4. Input the desired value for the **Profile density interval** parameter.
5. Set **Interface profile** option in the **Gauge command** parameter to start measurement.

This completes the setting interface profile procedure.



47 Interface profile movement (The numbers show the order of the displacer movement.)

- A Profile density interval
- B Profile density offset distance
- C Tank profile range

A0029110

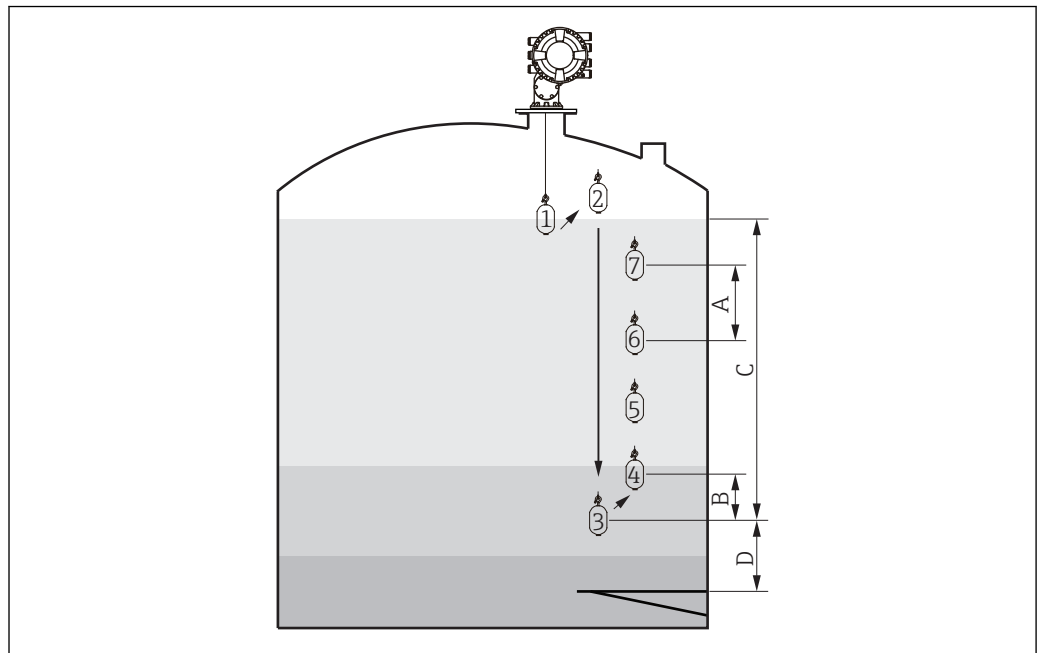
Manual profile measurement

Setting manual profile procedure

The manual profile operation measures a profile starting at a manually specified level up to the liquid level.

1. Navigate to: Setup → Advanced setup → Sensor config → Profile density → Manual profile level
2. Input the desired value for the **Manual profile level** parameter.
3. Navigate to: Setup → Advanced setup → Sensor config → Profile density → Profile density offset distance
 - ↳ For the manual profile, the level offset can be set to 0 so that the first point can be measured at the manual profile level.
4. Input the desired value for the **Profile density offset distance** parameter.
 - ↳ The value of the profile density offset distance defines the distance between the start point (manual profile) and the first measurement point.
5. Navigate to: Setup → Advanced setup → Sensor config → Profile density → Profile density interval
6. Input the desired value for the **Profile density interval** parameter.
7. Set **Manual profile** option in the **Gauge command** parameter to start measurement.

















This completes the setting manual profile.



48 Manual profile movement (The numbers show the order of the displacer movement.)

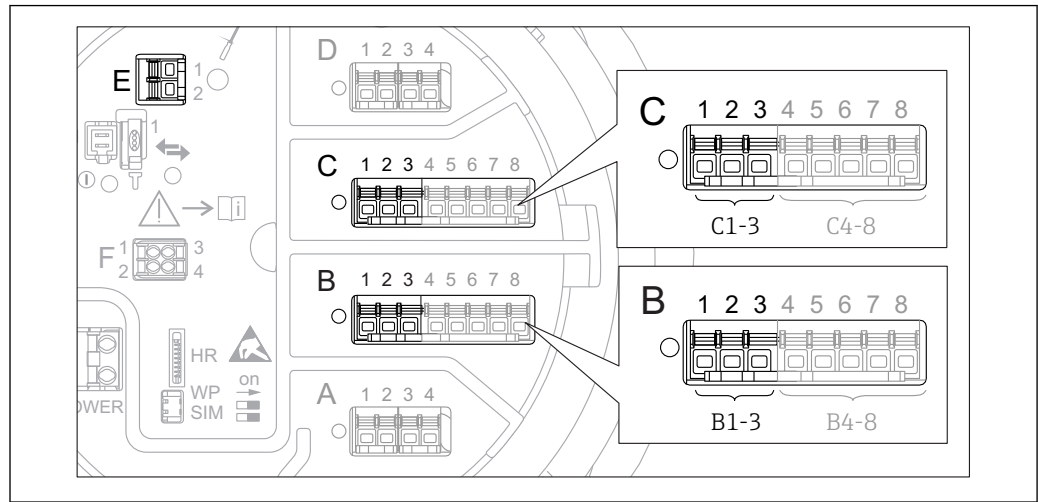
- A Profile density interval
- B Profile density offset distance
- C Manual profile range
- D Manual profile level

9.5 Configuring the tank gauging application

| Configuration of the inputs: | Description |
|---|---|
| HART inputs | →  100 |
| NMT532/539 connected via HART | →  102 |
| 4-20mA inputs | →  103 |
| RTD input | →  104 |
| Digital inputs | →  106 |
| Configuration of the data processing in the device: | Description |
| Linking input values to tank variables | →  108 |
| Tank calculation: Direct Level Measurement | →  109 |
| Tank calculation: Hybrid Tank Measurement System (HTMS) | →  110 |
| Tank calculation: Correction of the Hydrostatic Tank Deformation (HyTD) | →  111 |
| Tank calculation: Thermal Tank Shell Correction (CTSh) | →  112 |
| Alarms (limit evaluation) | →  113 |
| Configuration of the signal output: | Description |
| 4-20mA output | →  114 |
| HART slave + 4-20mA output | →  115 |
| Modbus | →  117 |
| V1 | →  118 |
| Digital outputs | →  119 |

9.5.1 Configuration of the HART inputs

Connecting and addressing HART devices



49 Possible terminals for HART loops

- B Analog I/O module in slot B (availability depending on device version → 41)
- C Analog I/O module in slot C (availability depending on device version → 41)
- E HART Ex is output (available in all device versions)

i HART devices must be configured and given a unique HART address in the range from 1 to 15 via their own user interface before they are connected to the Proservo NMS8x²⁾. Make sure they are connected as defined by the terminal assignment → 47. Devices with an address larger than 15 are not recognized by the Proservo.

Slot B or C: Setting the operating mode of the Analog I/O module



i This section is not relevant for the HART Ex is output (Slot E). This output always functions as a HART master for the connected HART slaves.

If HART devices are connected to an Analog I/O module (slot B or C in the terminal compartment), this module must be configured as follows:






1. Navigate to the submenu of the respective Analog I/O module: Setup → Advanced setup → Input/output → Analog I/O X1-3
2. Go to the **Operating mode** parameter (→ 205).
3. If only one HART device is connected to this loop:
Select the **HART master+4..20mA input** option. In this case the 4-20mA signal can be used in addition to the HART signal. For the configuration of the 4-20mA input: → 103.
4. If up to 6 HART devices are connected to this loop:
Select the **HART master** option.

2) The current software does not support HART devices with address 0 (zero).

Defining the type of measured value

-  This setting can be skipped for a connected Prothermo NMT5xx as the type of measured value is automatically recognized by the Proservo NMS8x in this case.
- 
 - The measured values can only be used in the system if the unit of the assigned HART variable fits the type of measured value. The HART variable assigned to **Output temperature**, for example, has to be in °C or °F.
 - A HART variable with unit "%" can not be used for **Output level**. Instead, the HART variable must be in mm, m, ft or in.


The type of measured value must be specified for each HART variable (PV, SV, TV and QV). To do so, proceed as follows:

1. Navigate to: Setup → Advanced setup → Input/output → HART devices
 - ↳ There is a submenu for each connected HART device.
2. For each device go to the corresponding submenu.
3. If the device measures a pressure:
 - Go to the **Output pressure** parameter (→  195) and specify which of the four HART variables contains the measured pressure. Only a HART variable with a pressure unit may be selected.
4. If the device measures a density:
 - Go to the **Output density** parameter (→  196) and specify which of the four HART variables contains the measured density. Only a HART variable with a density unit may be selected.
5. If the device measures a temperature:
 - Go to the **Output temperature** parameter (→  196) and specify which of the four HART variables contains the measured temperature. Only a HART variable with a temperature unit may be selected.
6. If the device measures the vapor temperature:
 - Go to the **Output vapor temperature** parameter (→  197) and specify which of the four HART variables contains the measured vapor temperature. Only a HART variable with a temperature unit may be selected.
7. If the device measures a level:
 - Go to the **Output level** parameter (→  197) and specify which of the four HART variables contains the measured level. Only a HART variable with a level unit (not "%") may be selected.

Disconnecting HART devices

When a HART device is disconnected from the device, it must also be logically removed as follows:

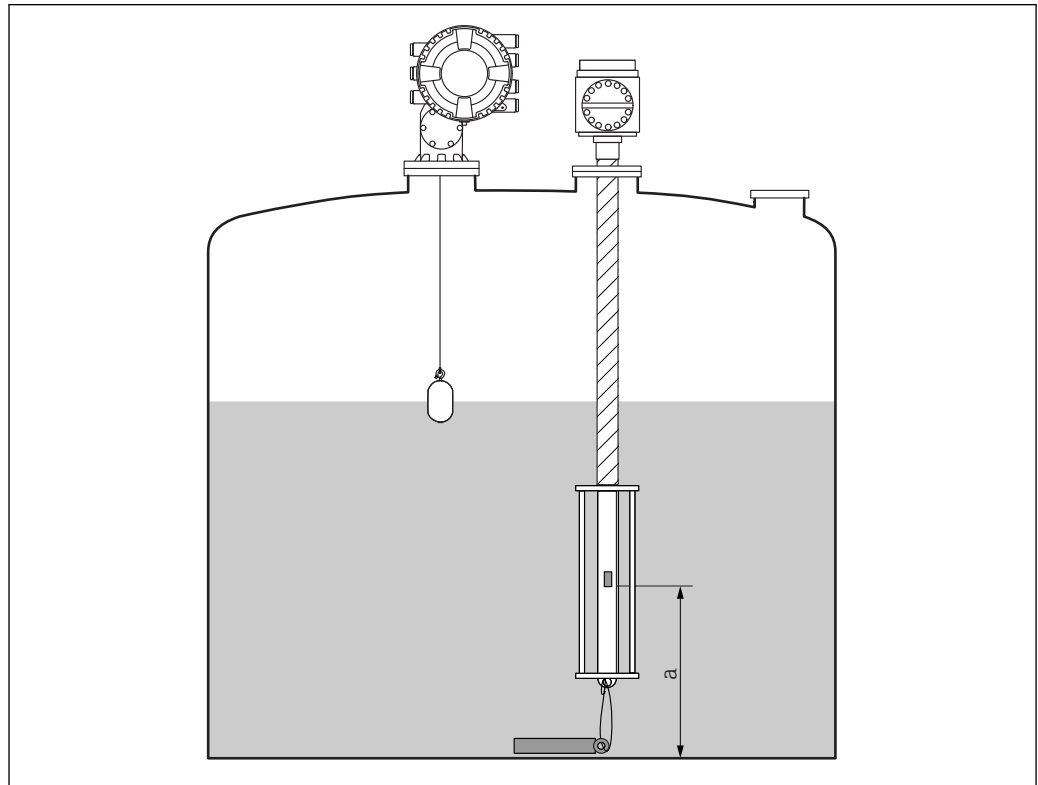
1. Navigate to Setup → Advanced setup → Input/output → HART devices → Forget device → Forget device
2. Select the HART device to be removed.


-  This procedure is also necessary if a defective device is exchanged.

9.5.2 Configuration of a connected Prothermo NMT532/NMT539


If a Prothermo NMT532 or NMT539 temperature transmitter is connected via HART, it can be configured as follows:

1. Navigate to: Expert → Input/output → HART devices → HART Device(s) → NMT device config; here, **HART Device(s)** is the name of the connected Prothermo.
2. Go to the **Configure device?** parameter and select **Yes**.
3. Go to the **Bottom point** parameter and enter the position of the bottom temperature element (see picture below).

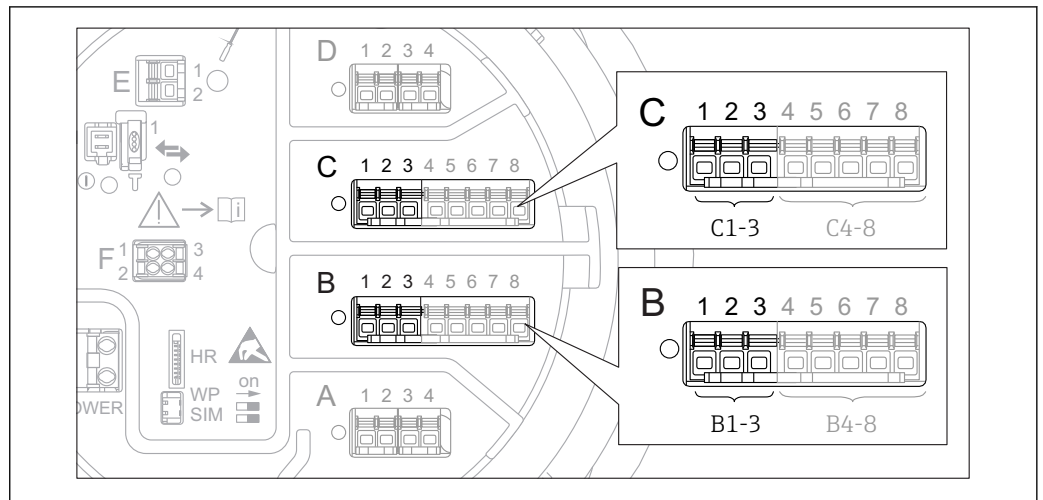


 50 Position of the bottom temperature element

- a* Distance from bottom temperature element to zero reference (tank bottom or datum plate). The standard factory default setting is 500 mm (19.69 in), and it can be adjusted according to the actual installation.

-  To check the temperatures measured by the individual elements, go to the following submenu: Operation → Temperature → NMT element values → Element temperature
There is a **Element temperature X** parameter for each element of the Prothermo.

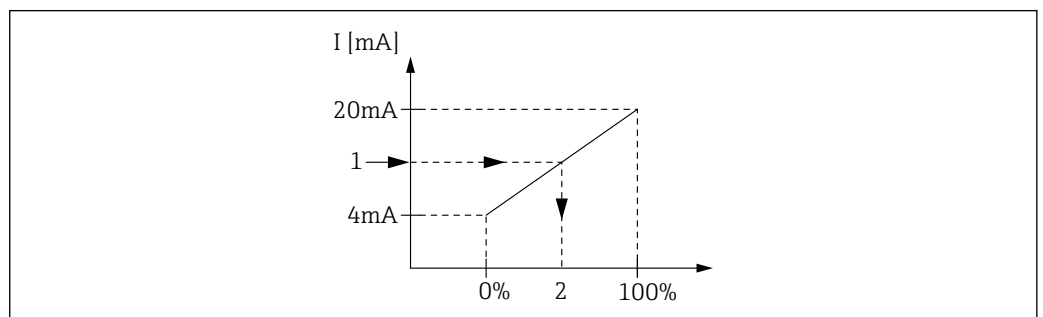
9.5.3 Configuration of the 4-20mA inputs



51 Possible locations of the Analog I/O modules, which can be used as a 4-20mA input. The order code of the device determines which of these modules is actually present → 41.

For each Analog I/O module to which a 4-20mA device is connected, proceed as follows:

1. Make sure the 4-20mA devices are connected as defined by the terminal assignment → 47.
2. Navigate to the submenu of the respective Analog I/O module: Setup → Advanced setup → Input/output → Analog I/O X1-3
3. Go to the **Operating mode** parameter (→ 205) and select **4..20mA input** or **HART master+4..20mA input**.
4. Go to the **Process variable** parameter (→ 211) and specify which process variable is transmitted by the connected device.
5. Go to the **Analog input 0% value** parameter (→ 211) and define which value of the process variable corresponds to an input current of 4 mA (see diagram below).
6. Go to the **Analog input 100% value** parameter (→ 211) and define which value of the process variable corresponds to an input current of 20 mA (see diagram below).
7. Go to the **Process value** parameter (→ 212) and check whether the indicated value matches the actual value of the process variable.

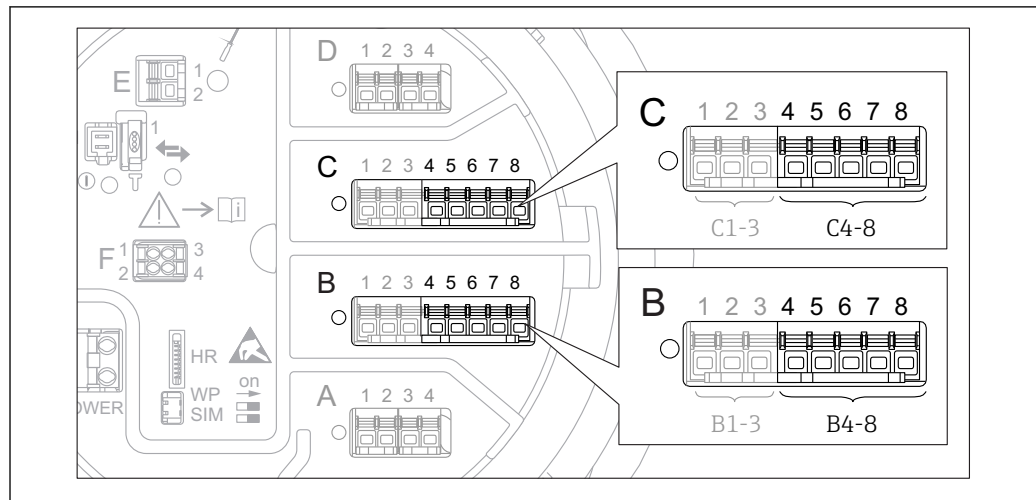


52 Scaling of the 4-20mA input to the process variable

- 1 Input value in mA
- 2 Process value

i The **Analog I/O** submenu contains additional parameters for a more detailed configuration of the Analog Input. For a description refer to : → 205

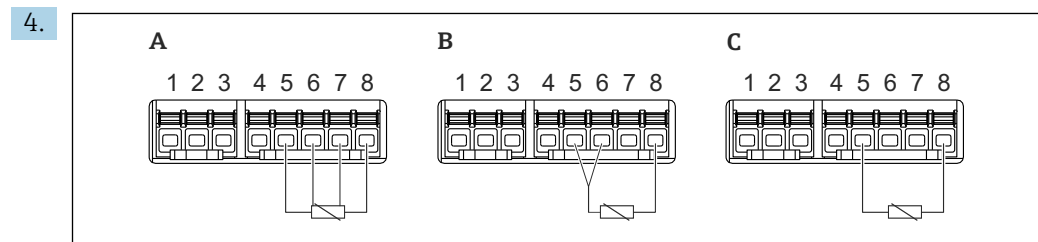
9.5.4 Configuration of a connected RTD



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- 53 Possible locations of the Analog I/O modules, to which an RTD can be connected. The order code of the device determines which of these modules is actually present → 41.

1. Make sure the RTD is connected as defined by the terminal assignment → 51.
2. Navigate to the submenu of the respective Analog I/O module: Setup → Advanced setup → Input/output → Analog IP X4-8.
3. Go to the **RTD type** parameter (→ 199) and specify the type of the connected RTD.



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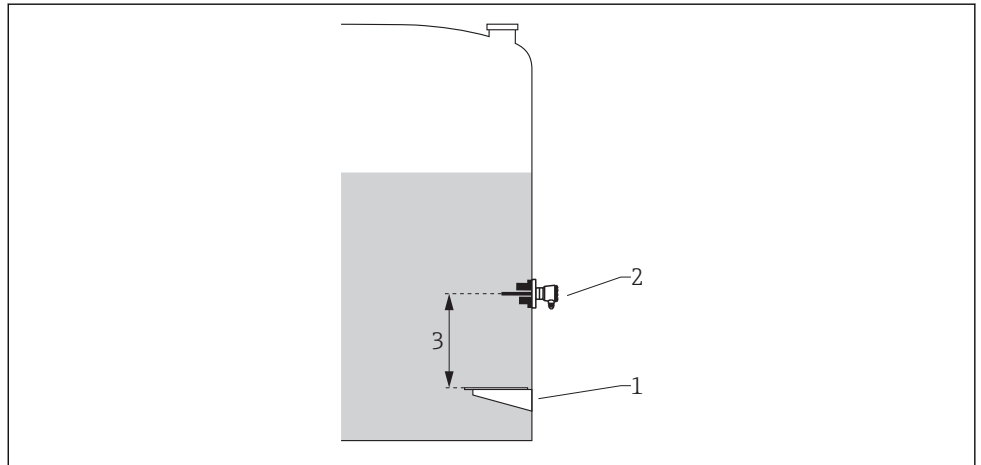
54 RTD connection types

- A 2 wire RTD connection
- B 3 wire RTD connection
- C 4 wire RTD connection

Go to the **RTD connection type** parameter (→ 200) and specify the type of connection of the RTD (2-, 3- or 4-wire).

5. Go to the **Input value** parameter (→ 202) and check whether the indicated temperature matches the actual temperature.
6. Go to the **Minimum probe temperature** parameter (→ 202) and specify the minimum approved temperature of the connected RTD.
7. Go to the **Maximum probe temperature** parameter (→ 202) and specify the maximum approved temperature of the connected RTD.

8.



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- 1 Datum plate
- 2 RTD
- 3 Probe position (→ 203)

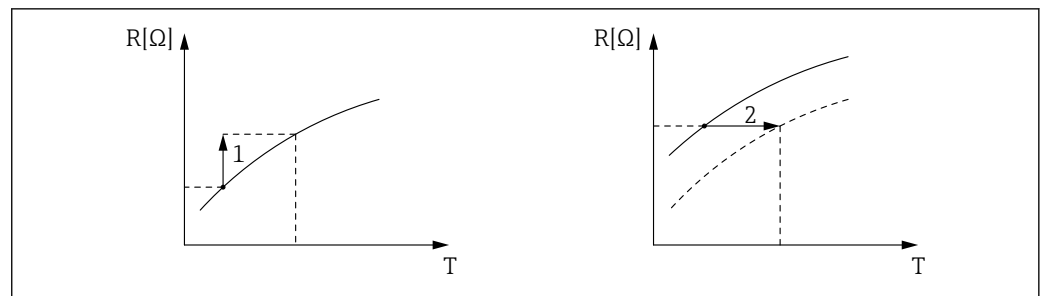
Go to the **Probe position** parameter and enter the mounting position of the RTD (measured from the datum plate).

↳ This parameter, in conjunction with the measured level, determines whether the measured temperature refers to the product or to the gas phase.

Offset for resistance and/or temperature

i An offset for the resistance or the temperature can be defined in the following submenu: Expert → Input/output → Analog IP X4-8.

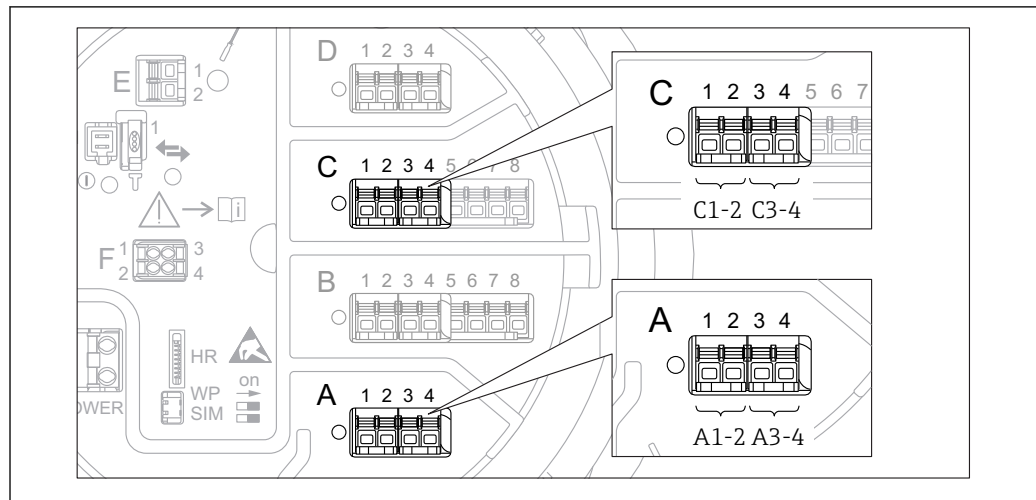
- **Ohms offset** is added to the measured resistance before the calculation of the temperature.
- **Temperature offset after conversion** is added to the measured temperature.



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- 1 Ohms offset
- 2 Temperature offset after conversion

9.5.5 Configuration of the digital inputs

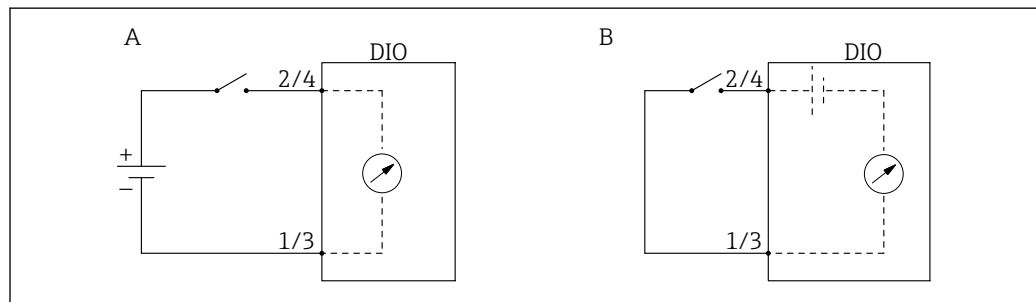


55 Possible locations of the Digital I/O modules (examples); the order code defines the number and location of digital input modules → 41.

There is a **Digital Xx-x** submenu for each digital I/O module of the device. "X" designates the slot in the terminal compartment, "x-x" the terminals within this slot. The most important parameters of this submenu are **Operating mode** and **Contact type**.

The "Operating mode" parameter

Setup → Advanced setup → Input/output → Digital Xx-x → Operating mode



A "Operating mode" = "Input passive"

B "Operating mode" = "Input active"

Meaning of the options

- **Input passive**

The DIO module measures the voltage provided by an external source. Depending on the status of the external switch, this voltage is 0 at the input (switch open) or exceeds a certain limit voltage (switch closed). These two states represent the digital signal.

- **Input active**



The DIO module provides a voltage and uses it to detect whether the external switch is open or closed.

The "Contact type" parameter

Setup → Advanced setup → Input/output → Digital Xx-x → Contact type

This parameter determines how the state of the external switch is mapped to the internal states of the DIO module:


| State of the external switch | Internal state of the DIO module | |
|--|----------------------------------|--------------------------------|
| | Contact type = Normally open | Contact type = Normally closed |
| Open | Inactive | Active |
| Closed | Active | Inactive |
| Behavior in special situations: | | |
| During start-up | Unknown | Unknown |
| Fault in measurement | Error | Error |

- 
 The internal state of the Digital Input can be transferred to a Digital Output or can be used to control the measurement.
- The **Digital Xx-x** submenu contains additional parameters for a more detailed configuration of the Digital Input. For a description refer to →  215.

9.5.6 Linking input values to tank variables

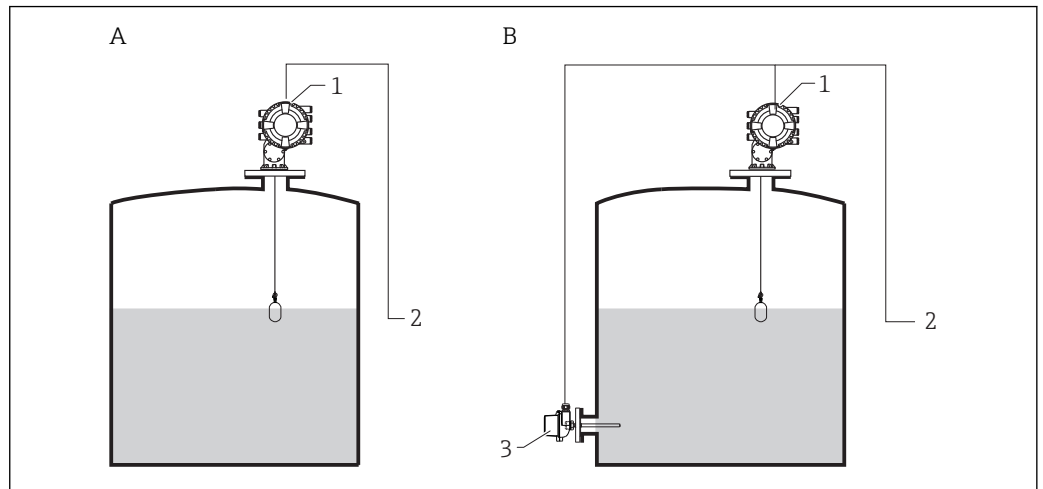
Measured values must be linked to tank variables before they can be used in the Tank Gauging application. This is done by defining the source of each tank variable in the following parameters:

| Tank variable | Parameter defining the source of this variable |
|---|--|
| Product level | <ul style="list-style-type: none"> ■ Setup → Level source ■ Setup → Advanced setup → Application → Tank configuration → Level → Level source |
| Bottom water level | Setup → Advanced setup → Application → Tank configuration → Level → Water level source |
| Average or spot temperature of the product | <ul style="list-style-type: none"> ■ Setup → Liquid temp source ■ Setup → Advanced setup → Application → Tank configuration → Temperature → Liquid temp source |
| Temperature of the air surrounding the tank | Setup → Advanced setup → Application → Tank configuration → Temperature → Air temperature source |
| Temperature of the vapor above the product | Setup → Advanced setup → Tank configuration → Temperature → Vapor temp source |
| Density of the product | Setup → Advanced setup → Application → Tank configuration → Density → Observed density source |
| Bottom pressure (P1) | Setup → Advanced setup → Application → Tank configuration → Pressure → P1 (bottom) source |
| Top pressure (P3) | Setup → Advanced setup → Application → Tank configuration → Pressure → P3 (top) source |

 Depending on the application not all these parameters will be relevant in a given situation.

9.5.7 Tank calculation: Direct level measurement

If no tank calculation is configured, level and temperature are measured directly.



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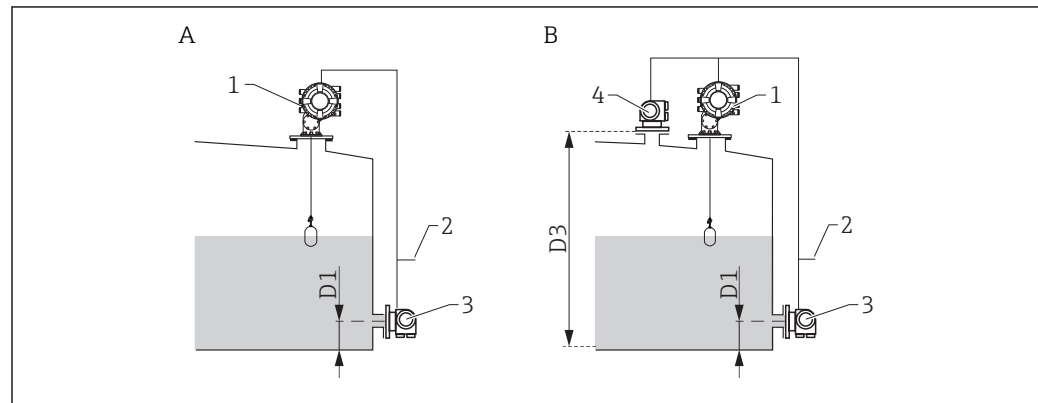
- A Direct level measurement (without temperature)
 B Direct level and temperature measurement
 1 NMS8x
 2 To inventory management system
 3 Temperature transmitter

1. Navigate to: "Setup → Level source" and specify from which device the level is obtained.
2. If a temperature transmitter is connected:
 Navigate to: "Setup → Liquid temp source" and specify from which device the temperature is obtained.

9.5.8 Tank calculation: Hybrid tank measurement system (HTMS)

HTMS uses level and pressure measurements to calculate the density of the medium.

i In non-atmospheric (i.e. pressurized) tanks it is recommended to use the **HTMS P1+P3** mode. Two pressure sensors are required in this case. In atmospheric (i.e. unpressurized) tanks the **HTMS P1** with only one pressure sensor is sufficient.

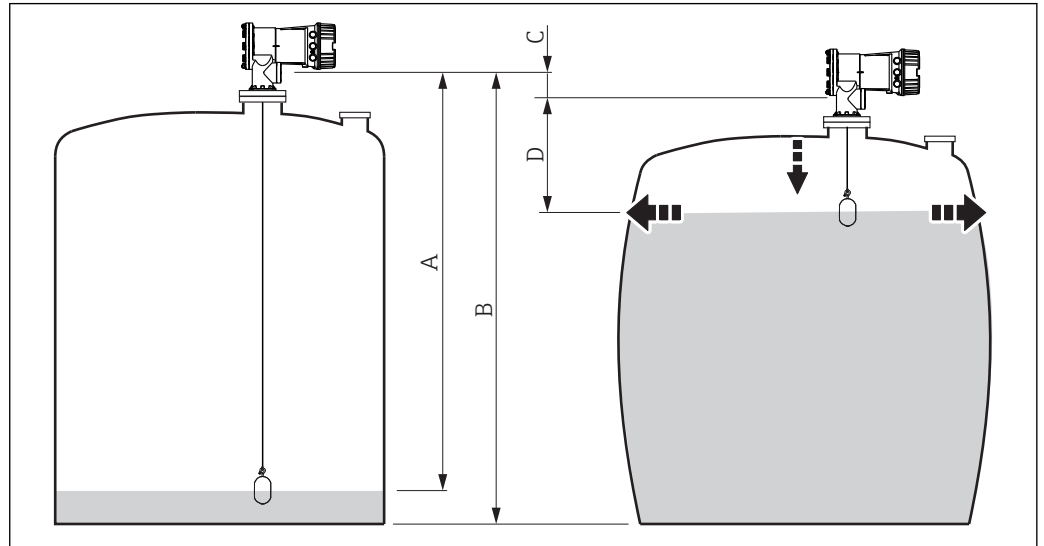


- A The "HTMS P1" measurement mode
 B The "HTMS P1+P3" measurement mode
 D1 P1 position
 D3 P3 position
 1 NMS8x
 2 To inventory management system
 3 Pressure sensor (bottom)
 4 Pressure sensor (top)

1. Navigate to Setup → Advanced setup → Application → Tank configuration → Level
2. Go to **Level source** (→ 📖 181) and specify from which device the level is obtained.
3. Navigate to Setup → Advanced setup → Application → Tank configuration → Pressure
4. Go to **P1 (bottom) source** (→ 📖 253) and specify from which device the bottom pressure (P1) is obtained.
5. If a top pressure transmitter (P3) is connected:
 Go to **P3 (top) source** (→ 📖 255) and specify from which device the bottom pressure (P1) is obtained.
6. Navigate to: Setup → Advanced setup → Application → Tank calculation → HTMS
7. Go to **HTMS mode** (→ 📖 270) and specify the HTMS mode.
8. Navigate to Setup → Advanced setup → Application → Tank configuration → Density
9. Go to **Observed density source** (→ 📖 251) and select **HTMS**.
10. Use the other parameters of the **HTMS** submenu to configure the calculation. For a detailed description: → 📖 268

9.5.9 Tank calculation: Hydrostatic Tank Deformation (HyTD)

Hydrostatic Tank Deformation can be used to compensate the vertical movement of the Gauge Reference Height (GRH) due to bulging of the tank shell caused by the hydrostatic pressure exerted by the liquid stored in the tank. The compensation is based on a linear approximation obtained from manual hand dips at several levels divided over the full range of the tank.



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56 Correction of the hydrostatic tank deformation (HyTD)

- A "Distance" (tank nearly empty)
- B Gauge Reference Height (GRH)
- C HyTD correction value
- D "Distance" (tank filled)

i The Correction of the Hydrostatic Tank Deformation is configured in the **HyTD** submenu (→ 260)

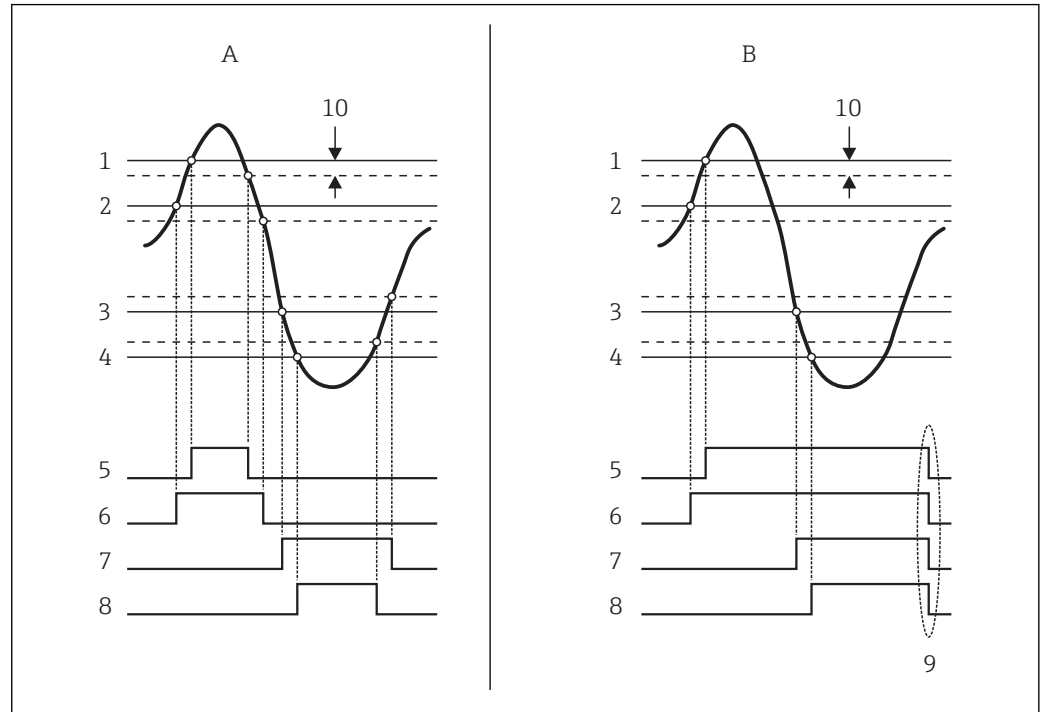
9.5.10 Tank calculation: Thermal tank shell correction (CTSh)

CTSh (correction for the thermal expansion of the tank shell) compensates for effects on the Gauge Reference Height (GRH) and on the expansion or contraction of the measuring wire due to temperature effects on the tank shell or stilling well. The temperature effects are separated into two parts, respectively affecting the 'dry' and 'wetted' part of the tank shell or stilling well. The correction function is based on thermal expansion coefficients of steel and insulation factors for both the 'dry' and 'wet' parts of the wire and the tank shell. The temperatures used for the correction can be selected from on manual or measured values.

-  This correction is recommended for the following situations:
 - if the operating temperature deviates considerably from the temperature during calibration ($\Delta T > 10\text{ }^{\circ}\text{C}$ (18 °F))
 - for extremely high tanks
 - for refrigerated, cryogenic or heated applications
-  As the use of this correction will influence the innage level reading, it is recommended to ensure the manual hand dip and level verification procedures are being conducted correctly before enabling this correction method.
-  This mode cannot be used in conjunction with HTG because the level is not measured relative to the gauge reference height with HTG.

9.5.11 Configuration of the alarms (limit evaluation)

A limit evaluation can be configured for up to 4 tank variables. The limit evaluation issues an alarm if the value exceeds an upper limit or falls below a lower limit, respectively. The limit values can be defined by the user.



57 Principle of the limit evaluation

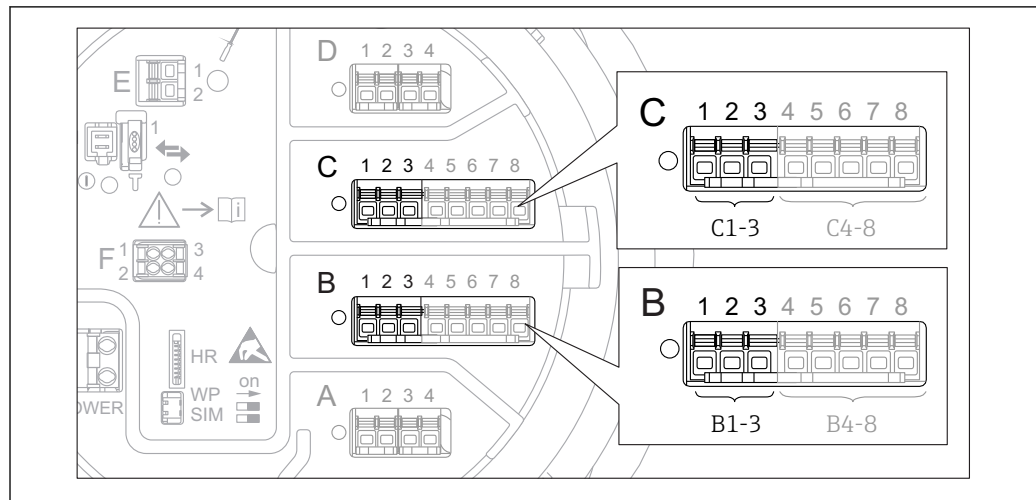
- A Alarm mode = On
- B Alarm mode = Latching
- 1 HH alarm value
- 2 H alarm value
- 3 L alarm value
- 4 LL alarm value
- 5 HH alarm
- 6 H alarm
- 7 L alarm
- 8 LL alarm
- 9 "Clear alarm" = "Yes" or power off-on
- 10 Hysteresis

The limit evaluation is configured in the **Alarm 1 to 4** submenus.

Navigation path: Setup → Advanced setup → Alarm → Alarm 1 to 4

i For **Alarm mode = Latching** all alarms remain active until the user selects **Clear alarm = Yes** or the power is switched off and on.

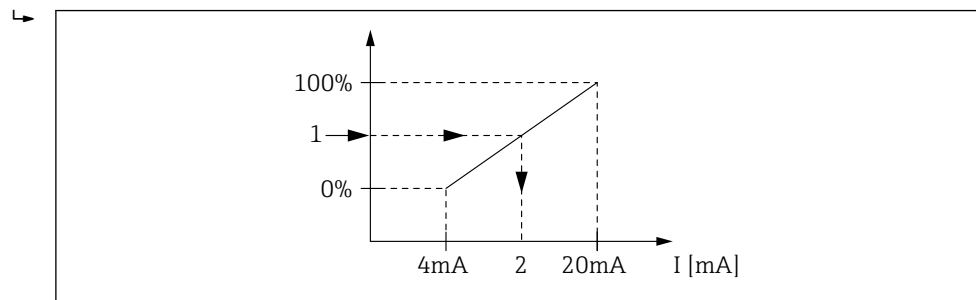
9.5.12 Configuration of the 4-20mA output



58 Possible locations of the Analog I/O modules, which can be used as a 4-20mA output. The order code of the device determines which of these modules is actually present → 41.

Each Analog I/O module of the device can be configured as a 4...20mA analog output. To do so, proceed as follows:

1. Navigate to: Setup → Advanced setup → Input/output → Analog I/O X1-3.
2. Go to the **Operating mode** parameter and select **4..20mA output** or **HART slave +4..20mA output**³⁾.
3. Go to the **Analog input source** parameter and select the tank variable which is to be transmitted via the 4...20mA output.
4. Go to the **0 % value** parameter and enter the value of the selected tank variable which will be mapped to 4 mA.
5. Go to the **100 % value** parameter and enter the value of the selected tank variable which will be mapped to 20 mA.



59 Scaling of the tank variable to the output current

- 1 Tank variable
- 2 Output current



i After startup of the device, as long as the assigned tank variable is not yet available, the output current assumes the defined error value.

i The **Analog I/O** submenu contains more parameters which can be used for a more detailed configuration of the analog output. For a description see → 205

3) "HART slave +4..20mA output" means that the Analog I/O module serves as a HART slave which cyclically sends up to four HART variables to a HART master. For the configuration of the HART output: → 115

9.5.13 Configuration of the HART slave + 4-20mA output

If **Operating mode = HART slave +4..20mA output** has been selected for an Analog I/O module, it serves as a HART slave which sends up to four HART variables to a HART master.

 The 4-20 mA signal can be used in this case, too. For its configuration: →  114

Standard case: PV = 4-20mA signal

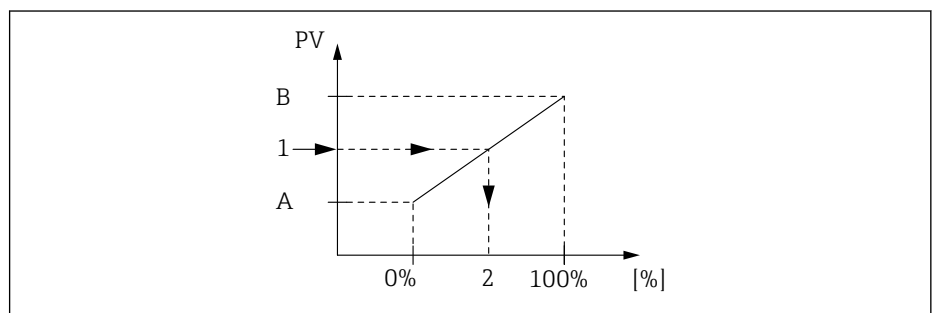
By default, the Primary Variable (PV) is identical to the tank variable transmitted by the 4-20mA output. To define the other HART variables and to configure the HART output in more detail, proceed as follows:


1. Navigate to: Setup → Advanced setup → Communication → HART output → Configuration
2. Go to the **System polling address** parameter and set the HART slave address of the device.
3. Use the following parameters to assign tank variables to the second to fourth HART variable: **Assign SV**, **Assign TV**, **Assign QV**.
 - ↳ The four HART variables are transmitted to a connected HART Master.

Special case: PV ≠ 4-20mA signal

In exceptional cases it might be required that the Primary Variable (PV) transmits a different tank variable than the 4-20mA output. This is configured as follows.



1. Navigate to: Setup → Advanced setup → Communication → HART output → Configuration
2. Go to the **PV source** parameter and select **Custom**.
 - ↳ The following additional parameters appear in the submenu: **Assign PV**, **0 % value**, **100 % value** and **PV mA selector**.
3. Go to the **Assign PV** parameter and select the tank variable to be transmitted as the Primary Variable (PV).
4. Use the **0 % value** and **100 % value** parameters to define a range for the PV. The **Percent of range** parameter indicates the percentage for the actual value of the PV. It is included in the cyclical output to the HART master.
 - ↳



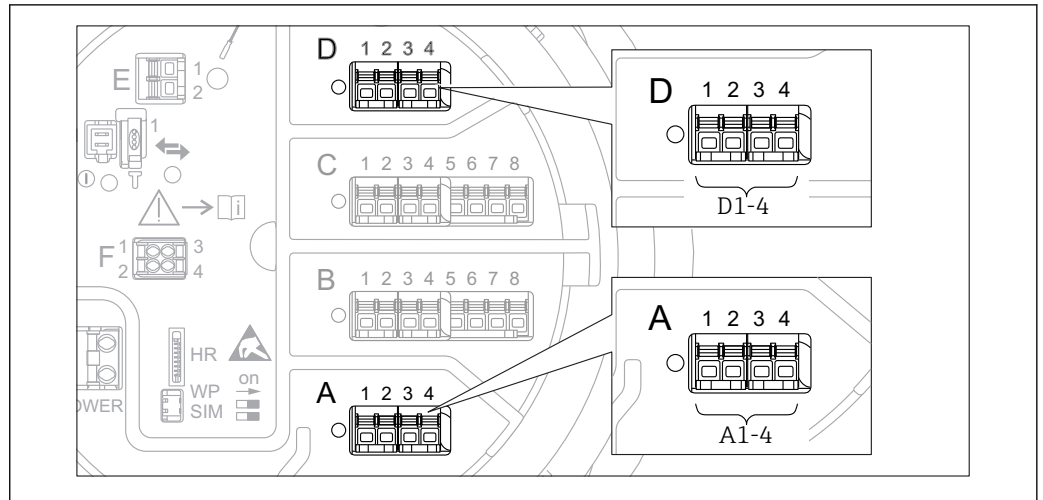
 60 Scaling of the tank variable to the percentage

- A 0 % value
- B 100 % value
- 1 Primary variable (PV)
- 2 Percent of range

5. Use the **PV mA selector** parameter to define whether the output current of an Analog I/O module is to be included in the cyclical HART output.

-  After startup of the device, as long as the assigned tank variable is not yet available, the output current assumes the defined error value.
-  The **PV mA selector** parameter does not influence the output current at the terminals of the Analog I/O module. It only defines whether the value of this current is part of the HART output or not.

9.5.14 Configuration of the Modbus output



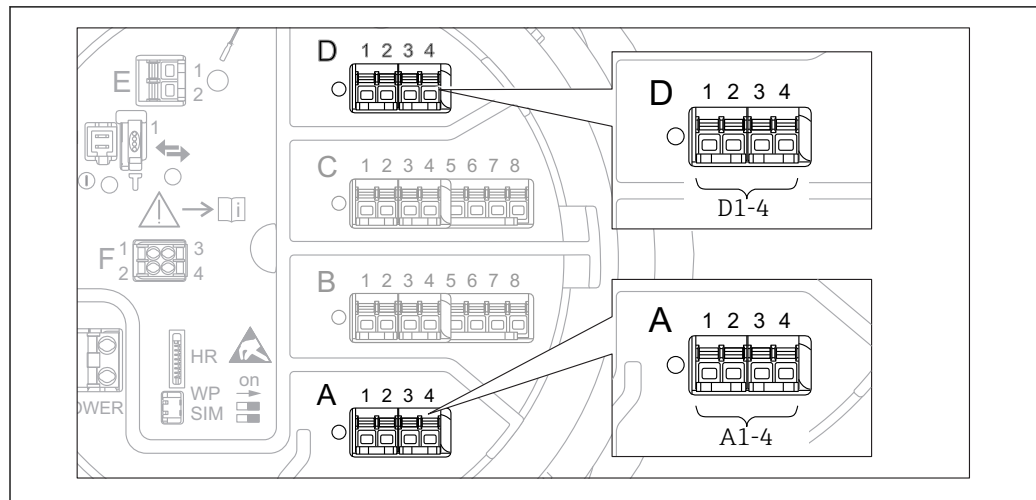
61 Possible locations of the Modbus modules (examples); depending on the device version these modules may also be in slot B or C → 41.

The Proservo NMS8x acts as a Modbus slave. Measured or calculated tank values are stored in registers which can be requested by a Modbus master.

The following submenu is used to configure the communication between the device and the Modbus master:

Setup → Advanced setup → Communication → Modbus X1-4 → Configuration (→ 225)

9.5.15 Configuration of the V1 output

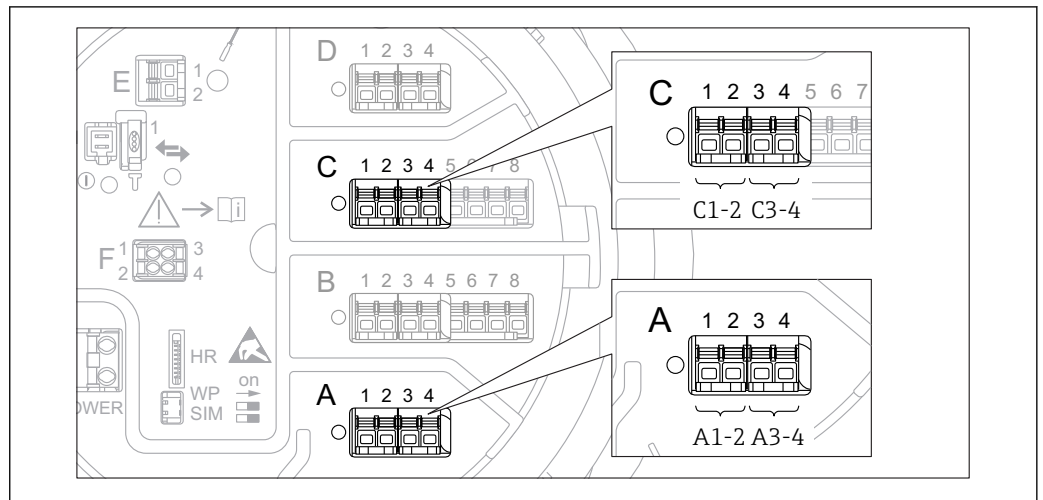


62 Possible locations of the V1 modules (examples); depending on the device version these modules may also be in slot B or C → 41.

The following submenus are used to configure the V1 communication between the device and the control system:

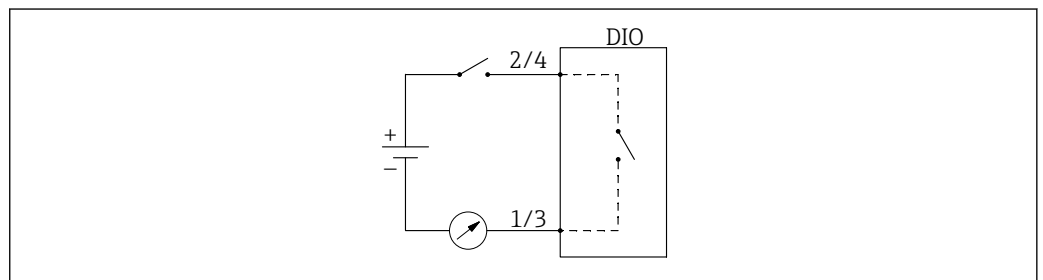
- Setup → Advanced setup → Communication → V1 X1-4 → Configuration (→ 228)
- Setup → Advanced setup → Communication → V1 X1-4 → V1 input selector (→ 231)

9.5.16 Configuration of the digital outputs



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63 Possible locations of the Digital I/O modules (examples); the order code defines the number and location of Digital I/O modules → 41.



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64 Usage of the Digital I/O module as a digital output

There is a **Digital Xx-x** submenu for each digital I/O module of the device. "X" designates the slot in the terminal compartment, "x-x" the terminals within this slot. The most important parameters of this submenu are **Operating mode**, **Digital input source** and **Contact type**.



A digital output can be used to

- output the state of an alarm (if an alarm has been configured → 113)
- transmit the status of a digital input (if a digital input has been configured → 106)


To configure a digital output, proceed as follows:

1. Navigate to Setup → Advanced setup → Input/output → Digital Xx-x, where Xx-x designates the digital I/O module to be configured.
2. Go to the **Operating mode** parameter and select the **Output passive** option.
3. Go to the **Digital input source** parameter and select the alarm or digital input to be transmitted.
4. Go to the **Contact type** parameter and select how the internal state of the alarm or digital input is to be mapped to the digital output (see table below).


| <ul style="list-style-type: none"> ▪ State of the alarm ▪ Internal state of the digital input | Switching state of the digital output | |
|---|---------------------------------------|--------------------------------|
| | Contact type = Normally open | Contact type = Normally closed |
| Inactive | Open | Closed |
| Active | Closed | Open |

- 
 - For SIL applications, **Contact type** is automatically set to **Normally closed** by the device when starting the SIL confirmation procedure.
 - In case of a power supply failure, the switching state is always "open", irrespective of the selected option.
 - The **Digital Xx-x** submenu contains additional parameters for a more detailed configuration of the Digital Input. For a description refer to →  215.

9.6 Advanced settings



For a more detailed configuration of the signal inputs, the tank calculations and the signal outputs refer to the **Advanced setup** submenu (→  191).

9.7 Simulation

To check the correct configuration of the device and of the control system, it is possible to simulate different situations (measured values, diagnostic messages etc.). See the **Simulation** submenu (→  315) for details.

9.8 Protecting settings from unauthorized access

There are two possibilities to protect the settings from unauthorized access:

- By an access code (→  68)
This locks the access via the display and operating module.
- By the protection switch (→  69)
This locks the access to W&M-related parameters by any user interface (display and operating module, FieldCare, other configuration tools).

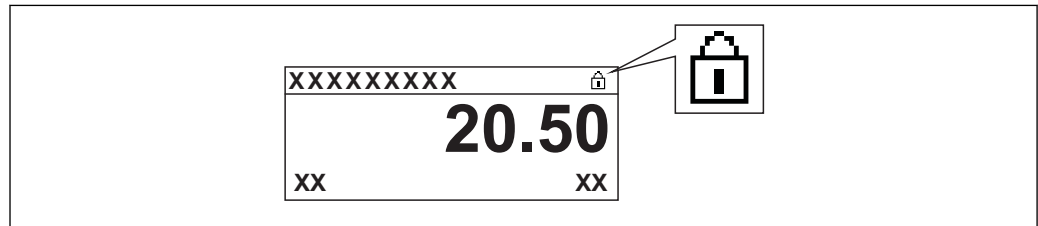
10 Operation

10.1 Reading off the device locking status

Depending on the locking state of the device some operations may be locked. The current locking status is indicated at: Setup → Advanced setup → Locking status. The following table summarizes the different locking statuses:

| Locking status | Meaning | Unlocking procedure |
|-----------------------------|--|--|
| Hardware locked | The device is locked by the write-protection switch in the terminal compartment. | → 69 |
| SIL locked | The device is in SIL-locked mode. | See the SIL Safety manual |
| CT active - all parameters | The custody transfer mode is active. | → 69 |
| WHG locked (in preparation) | The device is in WHG-locked mode. | in preparation |
| Temporarily locked | Write access to the parameters is temporarily lock due to device-internal processing (e.g. data upload/download, reset). Once the internal processing has been completed, the parameters can be changed again. | Wait for completion of the device-internal processing. |

A locking is indicated by the write protection symbol in the header of the display:



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10.2 Reading off measured values

Tank values can be read off in the following submenus:

- Operation → Level
- Operation → Temperature
- Operation → Density
- Operation → Pressure

10.3 Gauge commands

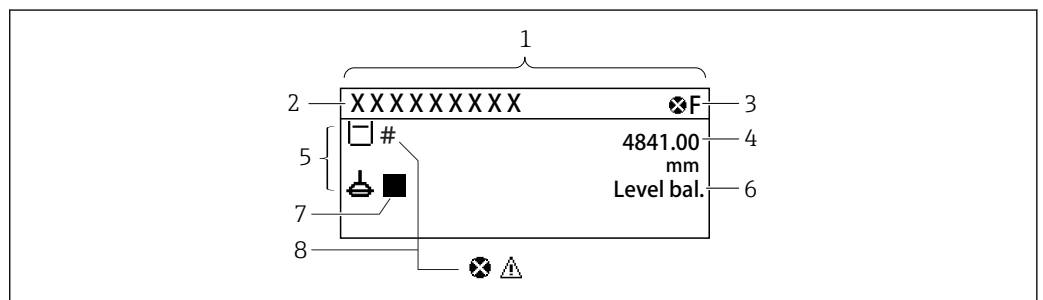
10.3.1 Overview of available device functions

Gauge commands are mainly divided into two categories.

- Continuous gauge command
- One-time gauge command (non-continuous)

i One-time gauge commands have a defined end state. After a one-time gauge command is completed, another gauge command is executed which is defined by the **Post gauge command** parameter. If **Post gauge command** is set to **None**, the operation will stop.

The gauge command can be chosen by navigating to Operation → Gauge command. The status of the gauge command execution is shown in the **Gauge status** parameter. The gauge status is displayed on the home screen by default.



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65 Typical appearance of the standard view (measured value display)


- 1 Display module
- 2 Device tag
- 3 Status area
- 4 Display area for measured values
- 5 Display area for measured value and status symbols
- 6 Gauge status indication
- 7 Gauge status symbol
- 8 Measured value status symbol

For details of status symbols → **58**

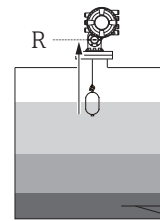
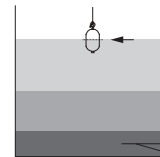
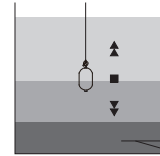
When a one-time gauge command is executed, additional information is shown in the **One-time command status** parameter in the operation menu.

10.3.2 Descriptions of gauge commands

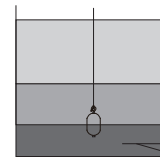
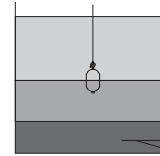
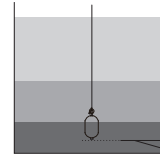
The following table shows the available gauge commands and functions of NMS8x.

 The numbers in the figures show the sequence of displacer movement.

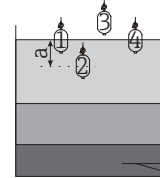
| Gauge command | Descriptions | Post gauge command |
|-----------------|---|------------------------|
| Stop | Displacer stops. | Not available |
| Level | The displacer searches for the liquid level surface and balances there. | Not available |
| Up | The displacer moves up to the reference position. | Not available |
| Bottom level | The displacer searches for the tank bottom. After determining the bottom value, the post gauge command is executed. | Customer setting value |
| Upper I/F level | The displacer searches for the upper interface level and balances there. | Not available |
| Lower I/F level | The displacer searches for the lower interface level and balances there. | Not available |
| Upper density | NMS8x performs a spot density measurement in the upper phase of the tank. After completing the measurement, the post gauge command is executed. | Customer setting value |



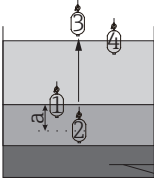
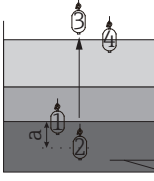
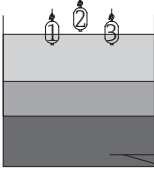
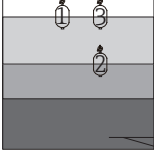
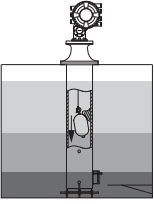
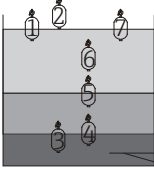
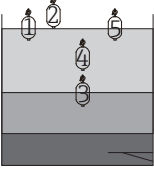
R Reference position

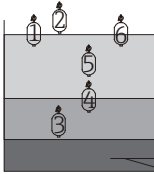

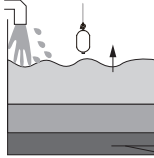


A0029485



a Immersion depth

| Gauge command | Descriptions | | Post gauge command |
|---------------------|--|---|------------------------|
| Middle density | NMS8x performs a spot density measurement in the middle phase of the tank. After completing the measurement, the post gauge command is executed. |  <p><i>a</i> Immersion depth</p> | Customer setting value |
| Lower density | NMS8x performs a spot density measurement in the lower phase of the tank. After completing measurement, the post gauge command is executed. |  <p><i>a</i> Immersion depth</p> | Customer setting value |
| Repeatability | <p>The displacer is taken out of the liquid. After that, the displacer returns to the level measurement. This can be used for a function check.</p> <p>i This gauge command should only be executed if the current gauge command is level.</p> |  | Level |
| Water dip | The displacer searches for the upper interface level. After balancing on the liquid, the post gauge command is executed. |  | Customer setting value |
| Release overtension | <p>When the displacer hits any obstacle in the tank and gets stuck (Error message: Overtension) this command will release the tension on the wire by moving down a short distance.</p> <p>i During an overtension error, no other gauge command will be executed.</p> |  | Stop |
| Tank profile | Density profile measurement of the tank (tank bottom to level) |  | Customer setting value |
| Interface profile | Density profile measurement of the upper interface (upper I/F level to level) |  | Customer setting value |

| Gauge command | Descriptions | | Post gauge command |
|----------------|---|---|------------------------|
| Manual profile | Density profile measurement from a manually set position to level |  | Customer setting value |
| Level standby | <p>The displacer moves to a set position and stays there until the tank level reaches this position. After that, gauge command is changed back to level.</p> <p> This function can be used when supplying or discharging liquid.</p> |  | Level |

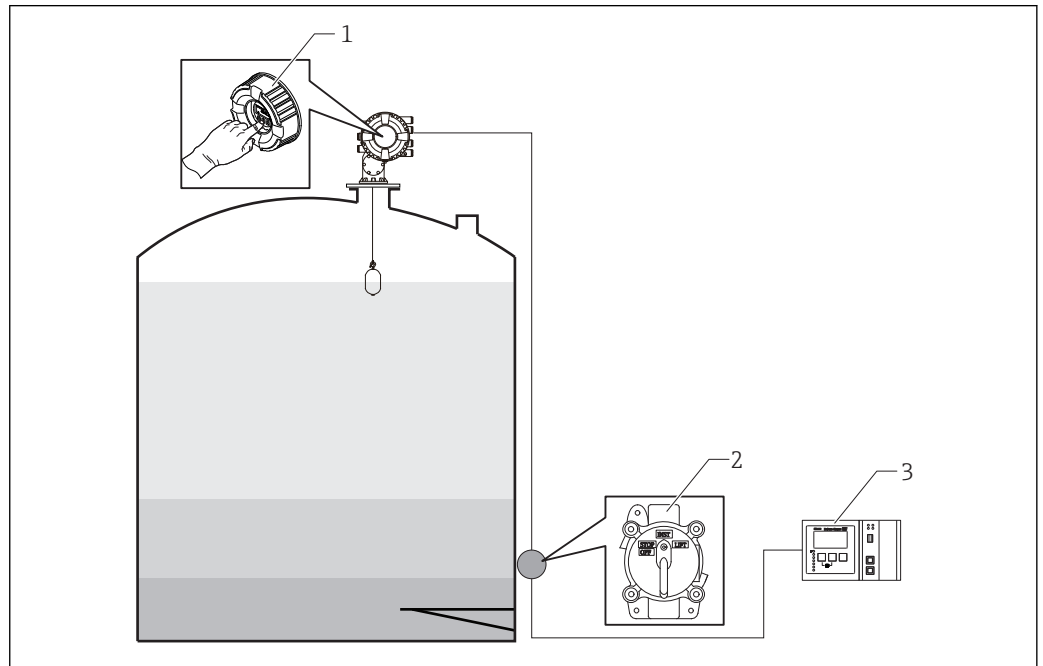
10.3.3 Sources for gauge commands

Gauge commands can be sent via various sources.

- Displays or CDI (e.g. FieldCare)
- Digital input (e.g. control switch)
- Fieldbus (Modbus, V1, HART)

The last received gauge command via any sources will be executed as usual.

i During calibration, gauge commands are not accepted from any sources.



- 1 Display operation
- 2 Digital input (e.g. control switch)
- 3 Tankvision

Gauge command priorities

The priority of the gauge command for NMS8x is very simple. The last received gauge command via any sources will be executed to take of the former gauge command. However the priority varies depending on the devices. When replacing the device with the NMS8x, check the priorities shown below.

NOTICE

Undesired gauge command will be executed.

If the setting is not changed, an undesired gauge command will be executed (e.g. Level command via Fieldbus would overwrite Stop command for maintenance.).

- ▶ If the system has been automatically or semi-automatically programmed for operation, maintenance or other purposes, the setting should be changed corresponding to use.

Proservo NMS8x

| By display | | From digital input | | From Fieldbus | |
|-------------|----------|--------------------|----------|---------------|----------|
| Command | Priority | Command | Priority | Command | Priority |
| Level | 1 | Level | 1 | Level | 1 |
| Interface | 1 | Interface | 1 | Interface | 1 |
| Tank bottom | 1 | Tank bottom | 1 | Tank bottom | 1 |

| By display | | From digital input | | From Fieldbus | |
|-----------------|---|--------------------|---|-----------------|---|
| Spot density | 1 | Spot density | 1 | Spot density | 1 |
| Profile density | 1 | Profile density | 1 | Profile density | 1 |
| Up | 1 | Up | 1 | Up | 1 |
| Stop | 1 | Stop | 1 | Stop | 1 |

Proservo NMS5/NMS7

| By display | | From NRF560 | | From digital input | | From Fieldbus | |
|-----------------|----------|-----------------|----------|--------------------|----------|-----------------|----------|
| Command | Priority | Command | Priority | Command | Priority | Command | Priority |
| Level | 4 | Level | 4 | Level | 4 | Level | 4 |
| Interface | 2 | Interface | 3 | Interface | 1 | Interface | 4 |
| Tank bottom | 2 | Tank bottom | 3 | N/A | N/A | Tank bottom | 4 |
| Spot density | 2 | Spot density | 3 | N/A | N/A | Spot density | 4 |
| Profile density | 2 | Profile density | 3 | N/A | N/A | Profile density | 4 |
| Up | 2 | Up | 3 | Up | 1 | Up | 4 |
| Stop | 2 | Stop | 3 | Stop | 1 | Stop | 4 |

Servo level gauge TGM5

| By display | | From NRF560 | | From DRM9700 | | From digital input | | From Fieldbus | |
|-----------------|----------|-----------------|----------|--------------|----------|--------------------|----------|-----------------|----------|
| Command | Priority | Command | Priority | Command | Priority | Command | Priority | Command | Priority |
| Level | 4 | Level | 4 | Level | 4 | Level | 4 | Level | 4 |
| Interface | 2 | Interface | 3 | N/A | N/A | N/A | N/A | Interface | 4 |
| Tank bottom | 2 | Tank bottom | 3 | N/A | N/A | N/A | N/A | Tank bottom | 4 |
| Spot density | 2 | Spot density | 3 | N/A | N/A | N/A | N/A | Spot density | 4 |
| Profile density | 2 | Profile density | 3 | N/A | N/A | N/A | N/A | Profile density | 4 |
| Up | 2 | Up | 3 | Up | 1 | Up | 1 | Up | 4 |
| Stop | 2 | Stop | 3 | N/A | N/A | Stop | 1 | Stop | 4 |

Servo level gauge TGM4000

| By display | | From DRM9700 | | From digital input | | From Fieldbus | |
|-----------------|----------|--------------|----------|--------------------|----------|-----------------|----------|
| Command | Priority | Command | Priority | Command | Priority | Command | Priority |
| Level | 4 | Level | 4 | Level | 4 | Level | 4 |
| Interface | 2 | Interface | 1 | N/A | N/A | Interface | 4 |
| Tank bottom | 2 | N/A | N/A | N/A | N/A | Tank bottom | 4 |
| Spot density | 2 | N/A | N/A | N/A | N/A | Spot density | 4 |
| Profile density | 2 | N/A | N/A | N/A | N/A | Profile density | 4 |
| Up | 2 | Up | 1 | Up | 1 | Up | 4 |
| Stop | 2 | Stop | N/A | Stop | 1 | Stop | 4 |

11 Diagnostics and troubleshooting

11.1 General trouble shooting

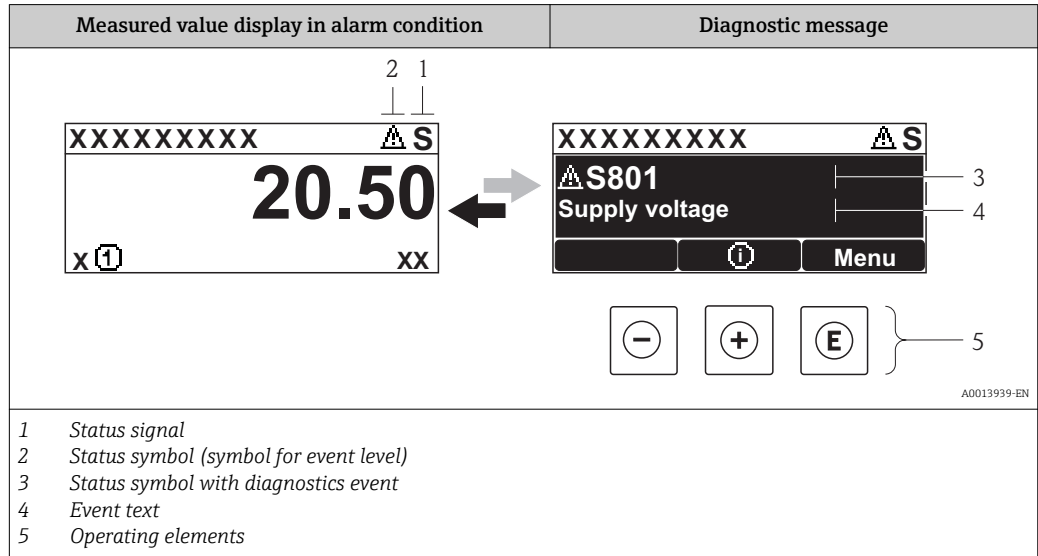
11.1.1 General errors

| Error | Possible cause | Remedial action |
|--|---|--|
| Device does not respond. | Supply voltage not connected. | Connect the correct voltage. |
| | The cables do not contact the terminals properly. | Ensure electrical contact between the cable and the terminal. |
| Values on the display invisible | The plug of the display cable is not connected correctly. | Connect the plug correctly. |
| | Display is defective. | Replace display. |
| | Display contrast too low. | Set Setup → Advanced setup → Display → Contrast display to a value $\geq 60\%$. |
| "Communication error" is indicated on the display when starting the device or connecting the display | Electromagnetic interference | Check grounding of the device. |
| | Broken display cable or display plug. | Exchange display. |
| CDI communication does not work. | Wrong setting of the COM port on the computer. | Check the setting of the COM port on the computer (e.g. FieldCare) and change it if necessary. |
| Device measures incorrectly. | Parametrization error | Check and adjust parameterization. |

11.2 Diagnostic information on local display

11.2.1 Diagnostic message

Faults detected by the self-monitoring system of the measuring device are displayed as a diagnostic message in alternation with the measured value display.



Status signals

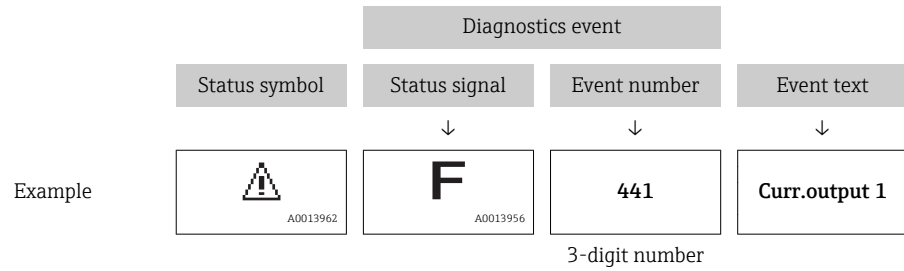
| | |
|-------------------------------------|---|
| F <small>A0013956</small> | "Failure" A device error is present. The measured value is no longer valid. |
| C <small>A0013959</small> | "Function check" The device is in service mode (e.g. during a simulation or a warning). |
| S <small>A0013958</small> | "Out of specification" The device is operated: <ul style="list-style-type: none"> ▪ Outside of its technical specifications (e.g. during startup or a cleaning) ▪ Outside of the configuration carried out by the user (e.g. level outside configured span) |
| M <small>A0013957</small> | "Maintenance required" Maintenance is required. The measured value is still valid. |


Status symbol (symbol for event level)

| | |
|-----------------------------|---|
| <small>A0013961</small> | "Alarm" status The measurement is interrupted. The signal outputs take on the defined alarm condition. A diagnostic message is generated. |
| <small>A0013962</small> | "Warning" status The device continues to measure. A diagnostic message is generated. |



Diagnostics event and event text

The fault can be identified using the diagnostics event. The event text helps you by providing information about the fault. In addition, the corresponding symbol is displayed before the diagnostics event.

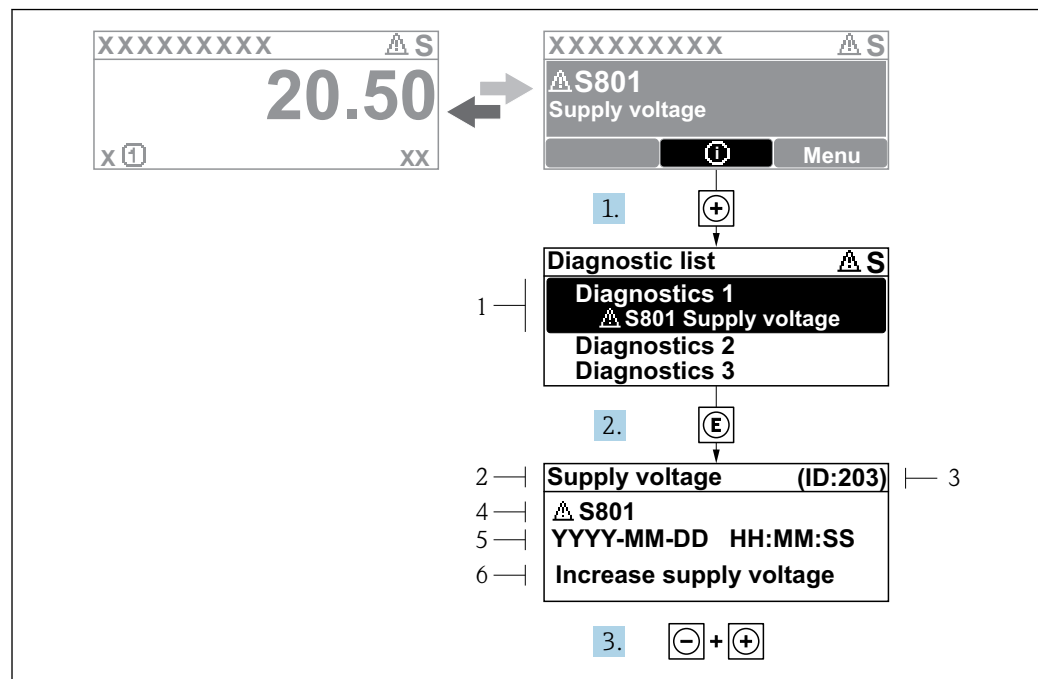


If two or more diagnostic messages are pending simultaneously, only the message with the highest priority is shown. Additional pending diagnostic messages can be shown in **Diagnostic list** submenu (→  311).

Operating elements

| Operating functions in menu, submenu | |
|---|---|
|  A0013970 | Plus key Opens the message about the remedial measures. |
|  A0013952 | Enter key Opens the operating menu. |

11.2.2 Calling up remedial measures



66 Message for remedial measures

- 1 Diagnostic information
- 2 Short text
- 3 Service ID
- 4 Diagnostic behavior with diagnostic code
- 5 Operation time of occurrence
- 6 Remedial measures

A diagnostic message appears in the standard view (measured value display).

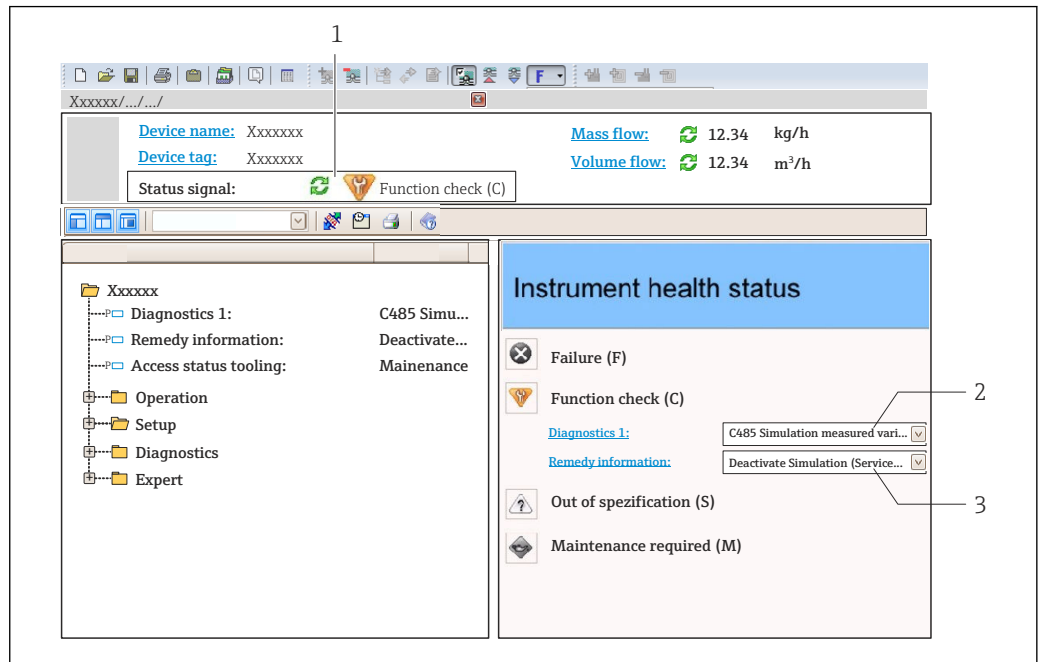
1. Press \oplus (ⓘ symbol).
 - ↳ The **Diagnostic list** submenu opens.
2. Select the desired diagnostic event with \oplus or \ominus and press ⓔ .
 - ↳ The message for the remedial measures for the selected diagnostic event opens.
3. Press $\ominus + \oplus$ simultaneously.
 - ↳ The message for the remedial measures closes.

The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or in the **Previous diagnostics**.

1. Press ⓔ .
 - ↳ The message for the remedial measures for the selected diagnostic event opens.
2. Press $\ominus + \oplus$ simultaneously.
 - ↳ The message for the remedial measures closes.

11.3 Diagnostic information in FieldCare

Any faults detected by the measuring device are displayed on the home page of the operating tool once the connection has been established.







- 1 Status area with status signal
- 2 Diagnostic information
- 3 Remedial measures with Service ID

i Furthermore, diagnostic events that have occurred can be viewed in the **Diagnostic list** submenu.

11.3.1 Status signals

The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

| Symbol | Meaning |
|--|---|
|  <small>A0017271</small> | Failure A device error has occurred. The measured value is no longer valid. |
|  <small>A0017278</small> | Function check The device is in service mode (e.g. during a simulation or a warning). |
|  <small>A0017277</small> | Out of specification The device is operated outside its technical specification limits (e.g. outside the process temperature range) |
|  <small>A0017276</small> | Maintenance required Maintenance is required. The measured value is still valid. |

i The status signals are categorized in accordance with VDI/VDE 2650 and NAMUR Recommendation NE 107.

11.3.2 Calling up remedy information

Remedy information is provided for every diagnostic event to ensure that problems can be rectified quickly:

- On the home page
Remedy information is displayed in a separate field below the diagnostics information.
- In the **Diagnostics** menu
Remedy information can be called up in the working area of the user interface.

The user is in the **Diagnostics** menu.

1. Call up the desired parameter.
2. On the right in the working area, mouse over the parameter.
 - ↳ A tool tip with remedy information for the diagnostic event appears.

11.4 Overview of the diagnostic messages

| Diagnostic number | Short text | Remedy instructions | Status signal [from the factory] | Diagnostic behavior [from the factory] |
|---------------------------------|--------------------------------|---|----------------------------------|--|
| Diagnostic of sensor | | | | |
| 102 | Sensor incompatible error | 1. Restart device 2. Contact service | F | Alarm |
| 150 | Detector error | 1. Restart device 2. Check electrical connections of detector 3. Replace detector unit | F | Alarm |
| 151 | Sensor electronic failure | Replace sensor electronic module | F | Alarm |
| Diagnostic of electronic | | | | |
| 242 | Software incompatible | 1. Check software 2. Flash or change main electronics module | F | Alarm |
| 252 | Modules incompatible | 1. Check if correct electronic modul is plugged 2. Replace electronic module | F | Alarm |
| 261 | Electronic modules | 1. Restart device 2. Check electronic modules 3. Change I/O Modul or main electronics | F | Alarm |
| 262 | Module connection | 1. Check module connections 2. Change electronic modules | F | Alarm |
| 270 | Main electronic failure | Replace main electronics | F | Alarm |
| 271 | Main electronic failure | 1. Restart device 2. Change main electronic module | F | Alarm |
| 272 | Main electronic failure | 1. Restart device 2. Contact service | F | Alarm |
| 273 | Main electronic failure | 1. Emergency operation via display 2. Change main electronics | F | Alarm |
| 275 | I/O module failure | 1. Restart device 2. Change I/O module | F | Alarm |
| 276 | I/O module faulty | 1. Restart device 2. Change I/O module | F | Alarm |
| 282 | Data storage | 1. Restart device 2. Contact service | F | Alarm |
| 283 | Memory content | 1. Transfer data or reset device 2. Contact service | F | Alarm |
| 284 | Detector SW update in progress | Firmware update active, please wait! | F | Alarm |
| 311 | Electronic failure | Maintenance required! 1. Do not perform reset 2. Contact service | M | Warning |
| 333 | System recovery required | HW change detected System configuration recovery required Go to menu on device and perform recovery | F | Alarm |
| 334 | System recovery failure | HW changed, system recovery failure. Return to factory | F | Alarm |

| Diagnostic number | Short text | Remedy instructions | Status signal [from the factory] | Diagnostic behavior [from the factory] |
|------------------------------------|---------------------------------------|--|----------------------------------|--|
| 381 | Displacer distance invalid | 1. Calibrate sensor 2. Restart device 3. Replace sensor electronics | F | Alarm |
| 382 | Sensor communication | 1. Check connection of sensor electronics 2. Restart device 3. Replace sensor electronics | F | Alarm |
| Diagnostic of configuration | | | | |
| 400 | AIO simulation output | Deactivate simulation AIO output | C | Warning |
| 401 | DIO simulation output | Deactivate simulation DIO output | C | Warning |
| 403 | Calibration AIO | 1. Restart device 2. Change I/O module | F | Alarm |
| 404 | Calibration AIP | 1. Restart device 2. Change I/O module | F | Alarm |
| 405 | COMM timeout DIO 1 to 8 | 1. Check wiring 2. Change I/O module | F | Alarm |
| 406 | IOM offline | 1. Check wiring 2. Change I/O module | F | Alarm |
| 407 | COMM timeout AIO 1 to 2 | 1. Check wiring 2. Change I/O module | F | Alarm |
| 408 | Invalid range AIO 1 to 2 | 1. Check device configuration. 2. Check wiring. | C | Warning |
| 409 | RTD temp out of range 1 to 2 | 1. Check electronic modules 2. Change I/O or main electronic module | C | Warning |
| 410 | Data transfer | 1. Check connection 2. Retry data transfer | F | Alarm |
| 411 | Hart device 1 to 15 has malfunction | 1. Check HART device 2. Change HART device | F | Alarm ¹⁾ |
| 412 | Processing download | Download active, please wait | C | Warning |
| 413 | NMT 1 to 15: element is open or short | 1. Check NMT wiring connection 2. Replace NMT | C | Warning |
| 415 | Hart device 1 to 15 offline | 1. Check HART device 2. Change HART device | C | Warning |
| 434 | Real time clock defective | Replace main electronics | C | Warning |
| 436 | Date/Time incorrect | Check date and time settings. | M | Warning |
| 437 | Configuration incompatible | 1. Restart device 2. Contact service | F | Alarm |
| 438 | Dataset | 1. Check data set file 2. Check device configuration 3. Up- and download new configuration | M | Warning |
| 441 | AIO 1 to 2 current output alarm | 1. Check process 2. Check current output settings | F | Alarm |
| 442 | AIO 1 to 2 current output warning | 1. Check process 2. Check current output settings | C | Warning |
| 443 | AIO 1 to 2 Input not HART compatible | Change PV source or AIO input source. | C | Warning |
| 484 | Failure mode simulation | Deactivate simulation | C | Alarm |

| Diagnostic number | Short text | Remedy instructions | Status signal [from the factory] | Diagnostic behavior [from the factory] |
|-------------------|---|-----------------------|----------------------------------|--|
| 495 | Diagnostic event simulation | Deactivate simulation | C | Warning |
| 500 | AIO C1-3 source no longer valid | Change input source | C | Warning |
| 501 | Level source no longer valid | Change input source | C | Warning |
| 502 | GP1 source no longer valid | Change input source | C | Warning |
| 503 | GP2 source no longer valid | Change input source | C | Warning |
| 504 | GP3 source no longer valid | Change input source | C | Warning |
| 505 | GP4 source no longer valid | Change input source | C | Warning |
| 506 | Water level source no longer valid | Change input source | C | Warning |
| 507 | Liquid temp source no longer valid | Change input source | C | Warning |
| 508 | Vapor temperatur source no longer valid | Change input source | C | Warning |
| 509 | Air temperature source no longer valid | Change input source | C | Warning |
| 510 | P1 source no longer valid | Change input source | C | Warning |
| 511 | P2 source no longer valid | Change input source | C | Warning |
| 512 | P3 source no longer valid | Change input source | C | Warning |
| 513 | Upper density source no longer valid | Change input source | C | Warning |
| 514 | Middle density source no longer valid | Change input source | C | Warning |
| 515 | Lower density source no longer valid | Change input source | C | Warning |
| 516 | Gauge command source no longer valid | Change input source | C | Warning |
| 517 | Gauge status source no longer valid | Change input source | C | Warning |
| 518 | Average density source no longer valid | Change input source | C | Warning |
| 519 | Upper interface source no longer valid | Change input source | C | Warning |
| 520 | Lower interface source no longer valid | Change input source | C | Warning |
| 521 | Bottom level source no longer valid | Change input source | C | Warning |
| 522 | Displacer position source not valid | Change input source | C | Warning |
| 523 | Distance source no longer valid | Change input source | C | Warning |
| 524 | Balance flag source no longer valid | Change input source | C | Warning |
| 525 | One time cmd source no longer valid | Change input source | C | Warning |
| 526 | Alarm 1 to 4 source no longer valid | Change input source | C | Warning |

| Diagnostic number | Short text | Remedy instructions | Status signal [from the factory] | Diagnostic behavior [from the factory] |
|-------------------|--|--|----------------------------------|--|
| 527 | AIO B1-3 source no longer valid | Change input source | C | Warning |
| 528 | CTSh | 1. Check device configuration. 2. Check wiring. | C | Warning |
| 529 | HTG | 1. Check device configuration. 2. Check wiring. | C | Warning |
| 530 | HTMS | 1. Check device configuration. 2. Check wiring. | C | Warning |
| 531 | HyTD correction value | 1. Check device configuration. 2. Check wiring. | C | Warning |
| 532 | HART output: PV source not valid | Change input source | C | Warning |
| 533 | HART output: SV source not valid | Change input source | C | Warning |
| 534 | HART output: QV source not valid | Change input source | C | Warning |
| 535 | HART output: TV source not valid | Change input source | C | Warning |
| 536 | Display: source no longer valid | Change input source | C | Warning |
| 537 | Trend: source no longer valid | Change input source | C | Warning |
| 538 | HART output: PV mA source not valid | Change input source | C | Warning |
| 539 | Modbus 1-4 SP source invalid | Set valid SP input selector | C | Warning |
| 540 | V1 1-4 SP source invalid | Set valid SP input selector | C | Warning |
| 541 | Modbus 1-4 alarm source invalid | Set valid alarm input selector | C | Warning |
| 542 | V1 1-4 alarm source invalid | Set valid alarm input selector | C | Warning |
| 543 | Modbus 1-4 analog source invalid | Set valid analog input selector | C | Warning |
| 544 | V1 1-4 analog source invalid | Set valid analog input selector | C | Warning |
| 545 | Modbus 1-4 user value source invalid | Set valid user value input selector | C | Warning |
| 546 | Modbus 1-4 discrete value source invalid | Set valid user discrete input selector | C | Warning |
| 547 | V1 1-4 user value source invalid | Set valid user value input selector | C | Warning |
| 548 | V1 1-4 discrete value source invalid | Set valid user discrete input selector | C | Warning |
| 549 | Modbus 1-4 percent source invalid | Set valid percentage input selector | C | Warning |
| 550 | V1 1-4 percent source invalid | Set valid percentage input selector | C | Warning |
| 560 | Calibration mandatory | 1. Carry out weight calibration 2. Carry out reference calibration 3. Carry out drum calibration | C | Alarm |
| 564 | DIO B1-2 source no longer valid | Change input source | C | Warning |
| 565 | DIO B3-4 source not valid | Change input source | C | Warning |

| Diagnostic number | Short text | Remedy instructions | Status signal [from the factory] | Diagnostic behavior [from the factory] |
|------------------------------|------------------------------------|---|----------------------------------|--|
| 566 | DIO C1-2 source no longer valid | Change input source | C | Warning |
| 567 | DIO C3-4 source no longer valid | Change input source | C | Warning |
| 568 | DIO D1-2 source no longer valid | Change input source | C | Warning |
| 569 | DIO D3-4 source no longer valid | Change input source | C | Warning |
| 585 | Simulation distance | Deactivate simulation | C | Warning |
| 586 | Record map | Recording of mapping please wait | C | Warning |
| 598 | DIO A1-2 source no longer valid | Change input source | C | Warning |
| 599 | DIO A3-4 source no longer valid | Change input source | C | Warning |
| Diagnostic of process | | | | |
| 801 | Energy too low | Increase supply voltage | S | Warning |
| 803 | Current loop | 1. Check device configuration. 2. Check wiring. | F | Alarm |
| 803 | Current loop 1 to 2 | | M | Warning |
| 803 | Current loop | | C | Warning |
| 825 | System temperature | 1. Check ambient temperature 2. Check process temperature | S | Warning |
| 825 | System temperature | | F | Alarm |
| 826 | Sensor temperature | 1. Check ambient temperature 2. Check process temperature | S | Warning |
| 826 | Sensor temperature | | F | Alarm |
| 844 | Process value out of specification | 1. Check process value 2. Check application 3. Check sensor | S | Alarm ¹⁾ |
| 844 | Process value out of specification | | S | Warning |
| 903 | Current loop 1 to 2 | 1. Check device configuration. 2. Check wiring. | F | Alarm |
| 904 | Digital output 1 to 8 | 1. Check device configuration. 2. Check wiring. | F | Alarm |
| 941 | Echo lost | 1. Check process value 2. Check application 3. Check sensor | S | Warning |
| 942 | In safety distance | 1. Check level 2. Check safety distance 3. Reset self holding | S | Warning |
| 943 | In blocking distance | Reduced accuracy Check level | S | Warning |
| 950 | Advanced diagnostics | Maintain your diagnostic event | M | Warning |
| 961 | Alarm 1 to 4 HighHigh | 1. Check alarm source 2. Check configuration settings | C | Warning |
| 962 | Alarm 1 to 4 High | 1. Check alarm source 2. Check configuration settings | C | Warning |
| 963 | Alarm 1 to 4 Low | 1. Check alarm source 2. Check configuration settings | C | Warning |

| Diagnostic number | Short text | Remedy instructions | Status signal [from the factory] | Diagnostic behavior [from the factory] |
|-------------------|-----------------------|---|----------------------------------|--|
| 964 | Alarm 1 to 4 LowLow | 1. Check alarm source 2. Check configuration settings | C | Warning |
| 965 | Alarm 1 to 4 HighHigh | 1. Check alarm source 2. Check configuration settings | F | Alarm |
| 966 | Alarm 1 to 4 High | 1. Check alarm source 2. Check configuration settings | F | Alarm |
| 967 | Alarm 1 to 4 Low | 1. Check alarm source 2. Check configuration settings | F | Alarm |
| 968 | Alarm 1 to 4 LowLow | 1. Check alarm source 2. Check configuration settings | F | Alarm |
| 970 | Overtension | 1. Check displacer and process conditions 2. Release overtension | C | Alarm |
| 971 | Undertension | Check displacer and process. | C | Alarm |

- 1) Diagnostic behavior can be changed.




11.5 Diagnostic list

In the Diagnostic list submenu, up to 5 currently pending diagnostic messages can be displayed. If more than 5 messages are pending, the messages with the highest priority are shown on the display.


Navigation path

Diagnostics → Diagnostic list


Calling up and closing the remedial measures

1. Press .
 - ↳ The message for the remedial measures for the selected diagnostic event opens.
2. Press  +  simultaneously.
 - ↳ The message about the remedial measures closes.

11.6 Reset measuring device

To reset the device to a defined state use the **Device reset** parameter (→  307).

11.7 Device information

Information on the device (order code, hardware and software version of the individual modules etc.) can be found in the **Device information** submenu (→  312).

11.8 Firmware history

| Date | Software version | Modifications | Documentation (NMS83) | | |
|---------|------------------|---------------------------|------------------------|---------------------------|-----------------------|
| | | | Operating Instructions | Description of Parameters | Technical Information |
| 04.2016 | 01.00.zz | Original software | BA01462G/00/EN/01.16 | GP01080G/00/EN/01.16 | TI01250G/00/EN/01.16 |
| 12.2016 | 01.02.zz | Bugfixes and improvements | BA01462G/00/EN/02.17 | GP01080G/00/EN/01.17 | TI01250G/00/EN/02.17 |
| 07.2018 | 01.03.zz | Software update | BA01462G/00/EN/04.18 | GP01080G/00/EN/02.18 | TI01250G/00/EN/04.18 |

12 Maintenance

12.1 Maintenance tasks

No special maintenance work is required.

12.1.1 Exterior cleaning

When cleaning the exterior of measuring devices, always use cleaning agents that do not attack the surface of the housing or the seals.

12.2 Endress+Hauser services

Endress+Hauser offers a wide variety of services for maintenance such as recalibration, maintenance service or device tests.



Your Endress+Hauser Sales Center can provide detailed information on the services.

13 Repair

13.1 General information on repairs

13.1.1 Repair concept

The Endress+Hauser repair concept assumes that the devices have a modular design and that repairs can be done by the Endress+Hauser service or specially trained customers.

Spare parts are contained in suitable kits. They contain the related replacement instructions.

For more information on service and spare parts, contact the Service Department at Endress+Hauser.

13.1.2 Repairs to Ex-approved devices



When carrying out repairs to Ex-approved devices, please note the following:

- Repairs to Ex-approved devices may only be carried out by trained personnel or by the Endress+Hauser Service.
- Comply with the prevailing standards, national Ex-area regulations, safety instructions (XA) and certificates.
- Only use original spare parts from Endress+Hauser.
- When ordering a spare part, please note the device designation on the nameplate. Only replace parts with identical parts.
- Carry out repairs according to the instructions. On completion of repairs, carry out the specified routine test on the device.
- Only Endress+Hauser Service may convert a certified device into a different certified variant.
- Document all repair work and conversions.

13.1.3 Replacement of a device or electronic module

After a complete device or the electronic mainboard has been replaced, the parameters can be downloaded into the instrument again via FieldCare.

Condition: The configuration of the old device has been saved to the computer via FieldCare.

 If an electronic module of the sensor or other parts of the sensor have been replaced, the servo calibration must be repeated. Please refer to →  79.

The "Save/Restore" function

After a device configuration has been saved to a computer and restored to the device using the **Save/Restore** function of FieldCare, the device must be restarted by the following setting:

Setup → **Advanced setup** → **Administration** → **Device reset** = **Restart device**.

This ensures correct operation of the device after the restore.

13.2 Spare parts


Some interchangeable measuring device components are listed on an overview sign in the connection compartment cover.

The spare part overview sign contains the following information:

- A list of the most important spare parts for the measuring device, including their ordering information.
- The URL for the *W@M Device Viewer* (www.endress.com/deviceviewer):
All the spare parts for the measuring device, along with the order code, are listed here and can be ordered. If available, users can also download the associated Installation Instructions.

13.3 Endress+Hauser services

Endress+Hauser offers a wide range of services.

 Your Endress+Hauser Sales Center can provide detailed information on the services.

13.4 Return

The measuring device must be returned if it is need of repair or a factory calibration, or if the wrong measuring device has been delivered or ordered. Legal specifications require Endress+Hauser, as an ISO-certified company, to follow certain procedures when handling products that are in contact with the medium.

To ensure safe, swift and professional device returns, please refer to the procedure and conditions for returning devices provided on the Endress+Hauser website at <http://www.endress.com/support/return-material>

13.5 Disposal

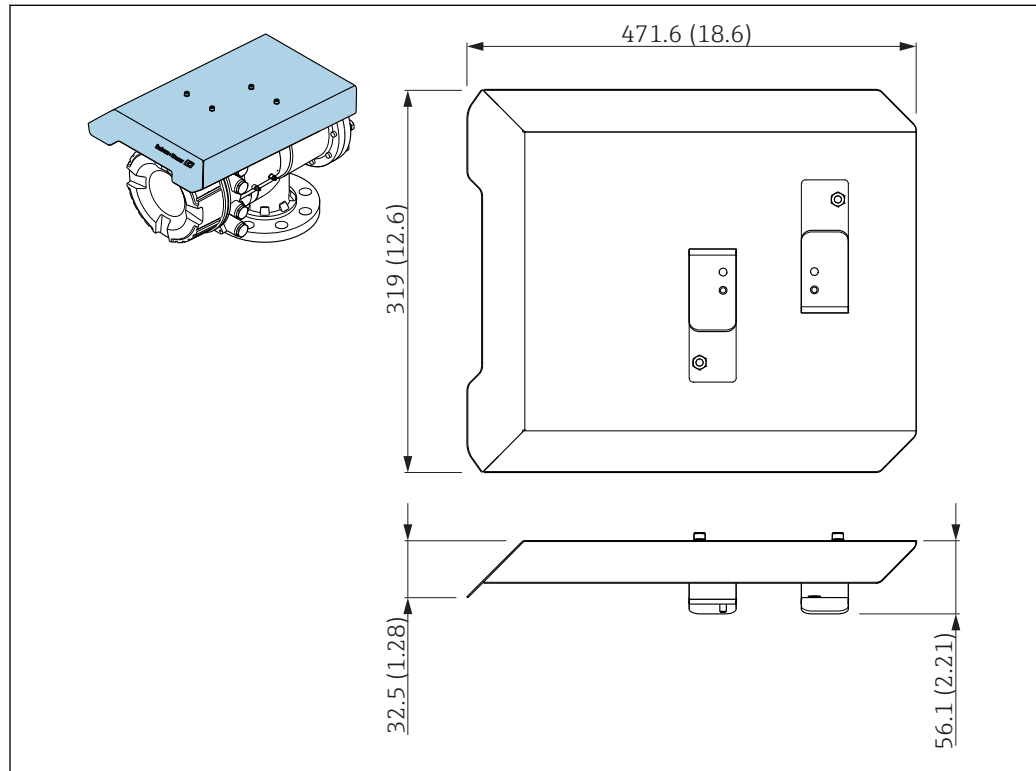
Observe the following notes during disposal:

- Observe valid federal/national regulations.
- Ensure proper separation and reuse of the device components.

14 Accessories

14.1 Device-specific accessories

14.1.1 Weather protection cover



A0028872

67 Weather protection cover; dimensions: mm (in)

Materials

| Part | Material |
|--|---------------|
| Protection cover and mounting brackets | 316L (1.4404) |
| Screws and washers | A4 |

- i
 - The weather protection cover can be ordered together with the device:
Ordering feature 620 "Accessory Enclosed", option PA "Weather Protection Cover")
 - It can also be ordered as an accessory:
Order code: 71305035 (for NMS8x)

14.1.2 Calibration chamber

A calibration chamber is recommended for use with tank level gauges in order to allow maintenance (removing the 70 mm (2.76 in) displacer or larger), while the tank is in service. Contact your Endress+Hauser Sales Center if necessary.

14.1.3 Ball valve

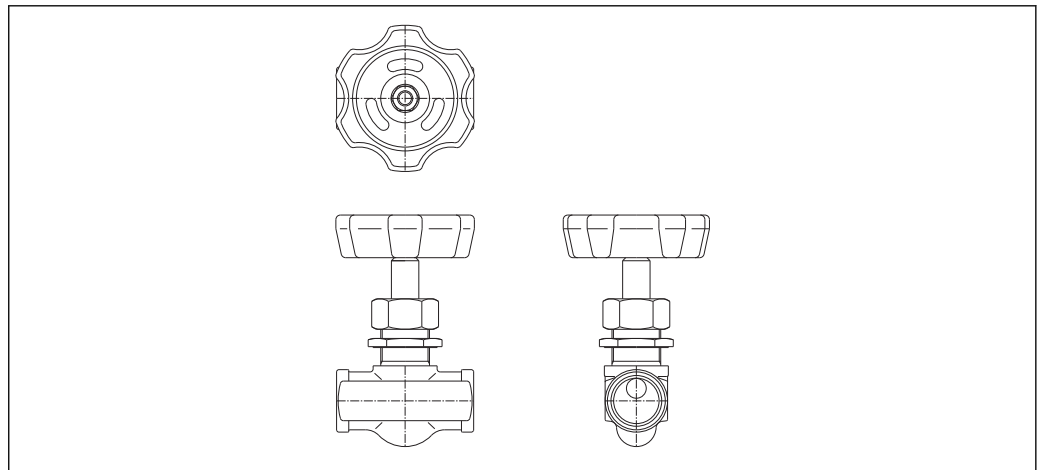
Ball valves are recommended for use with tank level gauges in order to allow maintenance such as removing displacers while tank is in service. Contact your Endress+Hauser Sales Center if necessary.

14.1.4 Control switch

A control switch is used for field mounted tank gauges. This provides additional gauge operation contact switching in order to control the gauge’s operation, such as hoisting up the displacer. Contact your Endress+Hauser Sales Center if necessary.

14.1.5 Relief valve and pressure gauge

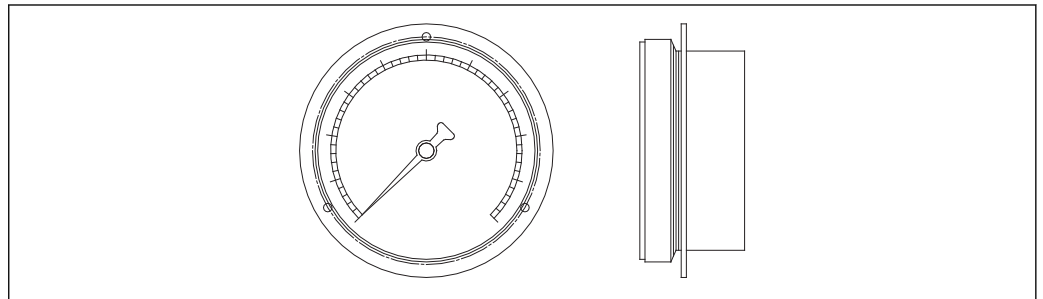
A relief valve is used to release pressure inside the housing of NMS8x before maintenance.



A0028881

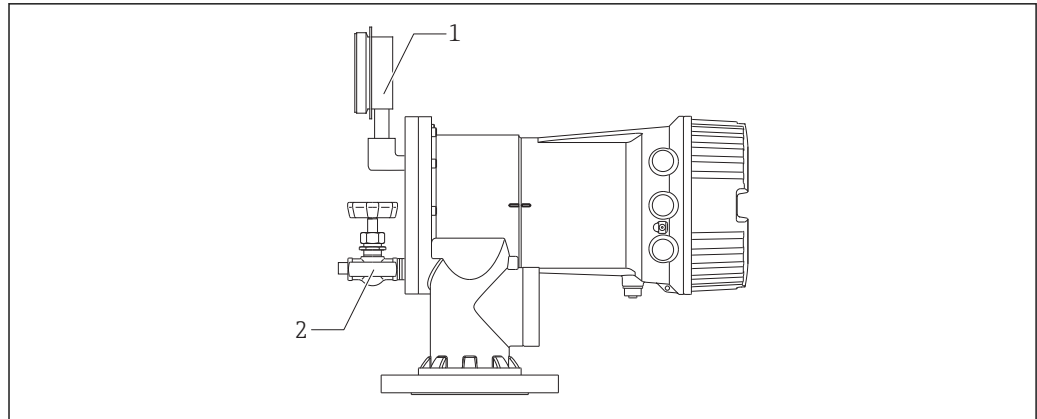
68 Relief valve

A pressure gauge is used to check process pressure inside the housing.



A0028882

69 Pressure gauge



A0029104

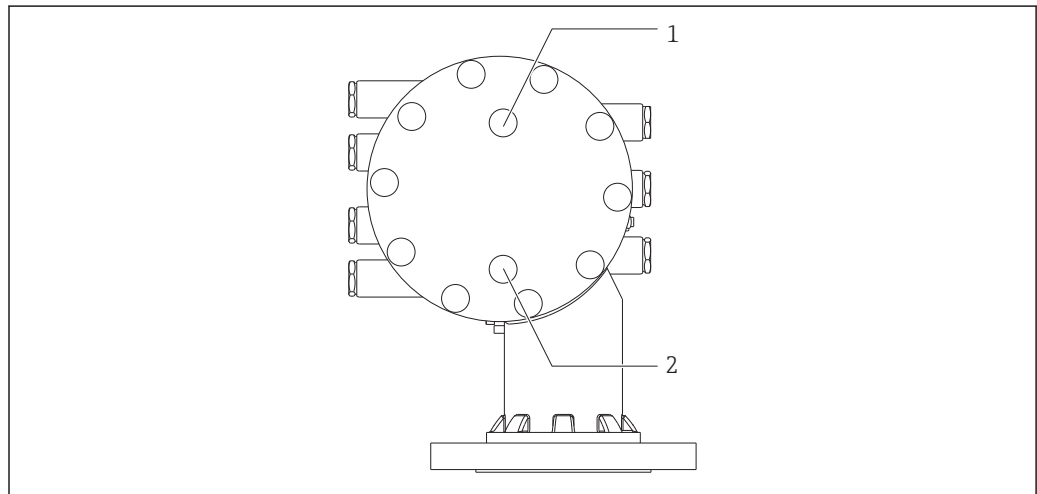
70 Mounting position of relief valve and pressure gauge

- 1 Pressure gauge
- 2 Relief valve

14.1.6 Cleaning nozzle and gas purging nozzle

A cleaning nozzle used for washing inside housing is especially recommended for F&B or alcohol applications.

A gas purging nozzle used for purging gas inside the housing is especially recommended for a nitrogen blanket for petrochemical or chemical applications.




A0028884


71 Holes for cleaning nozzle and gas purging nozzle


- 1 Cleaning nozzle
- 2 Gas purging nozzle


14.2 Communication-specific accessories

| Accessory | Description |
|----------------------------|--|
| WirelessHART Adapter SWA70 | <p>Connects field devices to a WirelessHART network. The WirelessHART adapter can be mounted directly at a HART device and is easily integrated into an existing HART network. It ensures safe data transmission and can be operated in parallel with other wireless networks.</p> <p> For details refer to Operating Instructions BA00061S</p> |



14.3 Service-specific accessories

| Accessory | Description |
|----------------------|---|
| Commubox FXA195 HART | <p>For intrinsically safe HART communication with FieldCare via the USB interface.</p> <p> For details refer to Technical Information TI00404F</p> |

| Accessory | Description |
|-----------------|---|
| Commubox FXA291 | <p>Connects Endress+Hauser field devices with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a computer.</p> <p> For details refer to Technical Information TI00405C</p> |

| Accessory | Description |
|-----------|--|
| FieldCare | <p>Endress+Hauser's FDT-based Plant Asset Management tool. Helps to configure and maintain all field devices of your plant. By supplying status information it also supports the diagnosis of the devices.</p> <p> For details refer to Operating Instructions BA00027S and BA00059S.</p> |

14.4 System components

| Accessory | Description |
|--|---|
| RIA15 | <p>Compact process display unit with very low voltage drop for universal use to display 4 to 20 mA/HART signals</p> <p> For details refer to Technical Information TI01043K.</p> |
| Tankvision <ul style="list-style-type: none"> ▪ Tank Scanner NXA820 ▪ Data Concentrator NXA821 ▪ Host Link NXA822 | <p>Inventory Management System with completely integrated software for operation via standard web browser</p> <p> For details refer to Technical Information TI00419G.</p> |

15 Operating menu

- i
 - 📄 : Navigation path for operating module at the device
 - 📄 : Navigation path for operating tool (e.g. FieldCare)
 - 🔒 : Parameter can be locked via software locking

15.1 Overview of the operating menu

- i
 - This section lists the parameters of the following menus:
 - Operation (→ 📄 161)
 - Setup (→ 📄 177)
 - Diagnostics (→ 📄 308)
 - For the **Expert** menu refer to the "Description of Device Parameters" (GP) of the respective device.
 - Depending on the device version and parametrization some parameters will not be available in a given situation. For details refer to the "Prerequisite" category in the description of the respective parameter.
 - The representation essentially corresponds to the menu in an operating tool (e.g. FieldCare). On the local display there may be minor differences in the menu structure. Details are mentioned in the description of the respective submenu.

























Navigation

📄 📄 Operating tool

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| Gauge command | → 📄 161 |
| Distance | → 📄 162 |
| Net weight | → 📄 162 |
| Gauge status | → 📄 163 |
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15.2 "Operation" menu

The **Operation** menu (→ 161) shows the most important measured values and allows to issue a gauge command.

Navigation Operation

Gauge command

Navigation Operation → Gauge command

Description Gauge operation command to choose the measurement mode of the device.

- Selection**
- Stop
 - Level
 - Up
 - Bottom level
 - Upper I/F level
 - Lower I/F level
 - Upper density
 - Middle density
 - Lower density
 - Repeatability
 - Water dip
 - Release overtension
 - Tank profile
 - Interface profile
 - Manual profile
 - Level standby

Factory setting Stop

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Distance

Navigation  Operation → Distance

Description Shows measured distance from reference position.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Net weight

Navigation   Operation → Net weight

Description Shows the corrected weight data from the detector, as compensated by the drum table, This weight is used for measurement.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Gauge status

Navigation  Operation → Gauge status

Description Indicates the current status of the device gauge command.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Balance flag

Navigation  Operation → Balance flag

Description Indicates the validity of the Measurement. If balanced, corresponding Value (Liquid Level, Upper Interface, Lower Interface, Tank Bottom) is updated.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Standby level



Navigation  Operation → Standby level

Description Defines the position in the tank where the displacer waits for the liquid level to rise during standby level gauge command.


User entry -999 999.9 to 999 999.9 mm

Factory setting 0 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

One-time command status

Navigation  Operation → One-time command status

Description Indicates the status of the last executed one-time gauge command.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

15.2.1 "Level" submenu

Navigation  Operation → Level

Tank level

Navigation  Operation → Level → Tank level

Description Shows the distance from the zero position (tank bottom or datum plate) to the product surface.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Tank Level %

Navigation  Operation → Level → Tank Level %

Description Shows the level as a percentage of the full measuring range.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Tank ullage

Navigation  Operation → Level → Tank ullage

Description Shows the remaining empty space in the tank.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Tank ullage %

Navigation  Operation → Level → Tank ullage %

Description Shows the remaining empty space in percentage related to parameter tank reference height.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Upper interface level

Navigation  Operation → Level → Upper interface level

Description Shows measured interface level from zero position (tank bottom or datum plate). Value is updated when device generates a valid Interface measurement.

Additional information

| | |
|--------------|-------------|
| Read access | Maintenance |
| Write access | - |

Upper interface level timestamp

Navigation  Operation → Level → Upper interface level timestamp

Description Shows timestamp for the last measured upper interface level.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Lower interface level

Navigation  Operation → Level → Lower interface level

Description Shows measured interface level from zero position (tank bottom or datum plate). Value is updated when device generates a valid interface measurement.

Additional information

| | |
|--------------|-------------|
| Read access | Maintenance |
| Write access | - |

Lower interface level timestamp

Navigation  Operation → Level → Lower interface level timestamp

Description Shows timestamp of the last measured lower interface level.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Bottom level

Navigation  Operation → Level → Bottom level

Description Shows the bottom level.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Bottom level timestamp

Navigation  Operation → Level → Bottom level timestamp

Description Shows the timestamp for measured bottom level.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Water level


Navigation  Operation → Level → Water level

Description Shows the bottom water level.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Measured level

Navigation  Operation → Level → Measured level

Description Shows the measured level without any correction from the tank calculations.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Distance

Navigation  Operation → Level → Distance

Description Shows measured distance from reference position.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Displacer position

Navigation  Operation → Level → Displacer position

Description Shows the displacer position.


Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

15.2.2 "Temperature" submenu

Navigation  Operation → Temperature

Air temperature

Navigation  Operation → Temperature → Air temperature

Description Shows the air temperature.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Liquid temperature


Navigation  Operation → Temperature → Liquid temperature

Description Shows the average or spot temperature of the measured liquid.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Vapor temperature


Navigation  Operation → Temperature → Vapor temperature


Description Shows the measured vapor temperature.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

"NMT element values" submenu


 This submenu is only visible if a Prothermo NMT is connected.

Navigation  Operation → Temperature → NMT element values

"Element temperature" submenu

Navigation  Operation → Temperature → NMT element values → Element temperature

Element temperature 1 to 24

Navigation  Operation → Temperature → NMT element values → Element temperature → Element temperature 1 to 24

Description Shows the temperature of an element in the NMT.


Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

"Element position" submenu

Navigation  Operation → Temperature → NMT element values → Element position

Element position 1 to 24

Navigation  Operation → Temperature → NMT element values → Element position → Element position 1 to 24

Description Shows the position of the selected element in the NMT.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

15.2.3 "Density" submenu

Navigation   Operation → Density



Observed density

Navigation   Operation → Density → Observed density

Description Calculated density of the product.



Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

 This value is calculated from different measured variables depending on the selected calculation method →  258.

Vapor density



Navigation   Operation → Density → Vapor density

Description Defines the density of the gas phase in the tank.

User entry 0.0 to 500.0 kg/m³

Factory setting 1.2 kg/m³

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Air density**Navigation**

Operation → Density → Air density

Description

Defines the density of the air surrounding the tank.

User entry

0.0 to 500.0 kg/m³

Factory setting

1.2 kg/m³

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Measured upper density**Navigation**

Operation → Density → Measured upper density

Description

Shows the density of the upper phase.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Upper density timestamp**Navigation**

Operation → Density → Upper density timestamp

Description

Shows timestamp of the last measured upper density.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Measured middle density**Navigation**

Operation → Density → Measured middle density

Description



Density of the middle phase.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Middle Density Timestamp

Navigation

  Operation → Density → Middle Density Timestamp

Description



Shows the timestamp of the last measured middle density.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Measured lower density

Navigation

  Operation → Density → Measured lower density

Description



Density of the lower phase.

Additional information

| | |
|--------------|-------------|
| Read access | Maintenance |
| Write access | - |

Lower density timestamp

Navigation

  Operation → Density → Lower density timestamp

Description

Shows timestamp of last measured lower density.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Profile point

Navigation

  Operation → Density → Profile point

Description

Shows actual number of Density Points measured so far in current operation, and the total Number of Points after Density Profile Operation is complete.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Profile average density


Navigation Operation → Density → Profile average density**Description**

Shows the average density calculated after a profile density measurement is complete.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Profile density timestamp


Navigation Operation → Density → Profile density timestamp**Description**

Shows the timestamp when the last average density profile was finished.


Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

"Profile density" submenu

Navigation  Operation → Density → Profile density

Profile density 0 to 49

Navigation  Operation → Density → Profile density → Profile density 0 to 49

Description Shows the density measurement at the corresponding profile density position.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Profile density position 0 to 49

Navigation  Operation → Density → Profile density → Profile density position 0 to 49

Description Shows the position where the corresponding density was measured.



Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

15.2.4 "Pressure" submenu

Navigation   Operation → Pressure

P1 (bottom)


Navigation   Operation → Pressure → P1 (bottom)

Description Shows the pressure at the tank bottom.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

P3 (top)

Navigation Operation → Pressure → P3 (top)**Description**

Shows the pressure (P3) at the top transmitter.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

15.2.5 "GP values" submenu

Navigation  Operation → GP values

GP 1 to 4 name

Navigation  Operation → GP values → GP 1 name


Description Defines the label associated with the respective GP value.

Factory setting GP Value 1

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

GP Value 1

Navigation  Operation → GP values → GP Value 1

Description Displays the value that will be used as general purpose value.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

GP Value 2


Navigation  Operation → GP values → GP Value 2

Description Displays the value that will be used as general purpose value.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

GP Value 3

Navigation  Operation → GP values → GP Value 3

Description Displays the value that will be used as general purpose value.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

GP Value 4

Navigation Operation → GP values → GP Value 4**Description**





Displays the value that will be used as general purpose value.



Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |





15.3 "Setup" menu

Navigation   Setup


| | | | | | |
|---|--|-------------|----------|--------------|-------------|
| Device tag  | | | | | |
| Navigation |   Setup → Device tag | | | | |
| Description | Enter a unique name for the measuring point to identify the device quickly within the plant. | | | | |
| Factory setting | NMS8x | | | | |
| Additional information | <table border="1"> <tr> <td>Read access</td> <td>Operator</td> </tr> <tr> <td>Write access</td> <td>Maintenance</td> </tr> </table> | Read access | Operator | Write access | Maintenance |
| Read access | Operator | | | | |
| Write access | Maintenance | | | | |
| Units preset  | | | | | |

| | | | | | |
|-------------------------------|--|-------------|----------|--------------|-------------|
| Navigation |   Setup → Units preset | | | | |
| Description | Defines a set of units for length, pressure and temperature. | | | | |
| Selection | <ul style="list-style-type: none"> ■ mm, bar, °C ■ m, bar, °C ■ mm, PSI, °C ■ ft, PSI, °F ■ ft-in-16, PSI, °F ■ ft-in-8, PSI, °F ■ Customer value | | | | |
| Factory setting | mm, bar, °C | | | | |
| Additional information | <table border="1"> <tr> <td>Read access</td> <td>Operator</td> </tr> <tr> <td>Write access</td> <td>Maintenance</td> </tr> </table> | Read access | Operator | Write access | Maintenance |
| Read access | Operator | | | | |
| Write access | Maintenance | | | | |

If the **Customer value** option is selected, the units are defined in the following parameters:

- Distance unit (→  300)
- Pressure unit (→  301)
- Temperature unit (→  301)
- Density unit (→  301)

In any other case these are read-only parameters used to indicate the respective unit.

Upper density


Navigation   Setup → Upper density


Description Sets the density of the upper phase of the liquid.

User entry 50 to 2 000 kg/m³

Factory setting 800 kg/m³

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Middle density


Navigation   Setup → Middle density


Description Sets Density of Middle Phase in the Tank if three Phases are available. Otherwise used for the Lower Phase in the Tank if two Phases are available.

User entry 50 to 2 000 kg/m³

Factory setting 1 000 kg/m³

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Lower density


Navigation   Setup → Lower density

Description Sets the density of the lower Phase in the tank if three phases are available.

User entry 50 to 2 000 kg/m³

Factory setting 1 200 kg/m³

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Gauge command



Navigation Setup → Gauge command

Description Gauge operation command to choose the measurement mode of the device.

- Selection**
- Stop
 - Level
 - Up
 - Bottom level
 - Upper I/F level
 - Lower I/F level
 - Upper density
 - Middle density
 - Lower density
 - Repeatability
 - Water dip
 - Release overtension
 - Tank profile
 - Interface profile
 - Manual profile
 - Level standby

Factory setting Stop

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Process condition



Navigation Setup → Process condition

Description Select tank liquid condition.

- Selection**
- Universal
 - Calm surface
 - Turbulent surface

Factory setting Universal

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Empty



Navigation Setup → Empty

Description Distance from reference point to zero position (tank bottom or datum plate).

User entry 0 to 10 000.00 mm

Factory setting Dependent on the device version

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

 The reference point is the reference line of the calibration window.

Tank reference height 

Navigation   Setup → Tank reference height

Description Defines the distance from the dipping reference point to the zero position (tank bottom or datum plate).

User entry 0 to 10 000.00 mm

Factory setting Dependent on the device version

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Tank level

Navigation   Setup → Tank level

Description Shows the distance from the zero position (tank bottom or datum plate) to the product surface.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Set level 

Navigation  Setup → Set level


Description If the level measured by the device does not match the actual level obtained by a manual dip, enter the correct level into this parameter.

User entry 0 to 10 000.00 mm



Factory setting 0 mm

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

The device adjusts the **Empty** parameter (→  179) according to the entered value, such that the measured level will match the actual level.

Level source**Navigation**

  Setup → Level source

Description

Defines the source of the level value.

Selection

- No input value
- HART device 1 ... 15 level
- Level SR *
- Level *
- Displacer position *
- AIO B1-3 value *
- AIO C1-3 value *
- AIP B4-8 value *
- AIP C4-8 value *



Factory setting

Dependent on the device version

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

High stop level**Navigation**

  Setup → High stop level

Description

Position of the displacer high stop as measured from defined zero position (tank bottom or datum plate).

User entry

-999 999.9 to 999 999.9 mm

Factory setting

20 000 mm

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

* Visibility depends on order options or device settings

Low stop level
**Navigation**

Setup → Low stop level

Description

Position of the displacer low stop as measured from defined zero position (tank bottom or datum plate).

User entry

–999 999.9 to 999 999.9 mm

Factory setting

0 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Distance
Navigation

Setup → Distance

Description

Shows measured distance from reference position.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Liquid temp source
**Navigation**

Setup → Liquid temp source

Description

Defines source from which the liquid temperature is obtained.

Selection

- Manual value
- HART device 1 ... 15 temperature
- AIO B1-3 value
- AIO C1-3 value
- AIP B4-8 value
- AIP C4-8 value

Factory setting

Manual value

Additional information


| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

15.3.1 "Calibration" submenu


| | |
|-------------|-------------|
| Read access | Maintenance |
|-------------|-------------|

Navigation  Setup → Calibration

"Move displacer" wizard

Navigation  Setup → Calibration → Move displacer

Move distance

Navigation  Setup → Calibration → Move displacer → Move distance

Description Up or down movement of displacer in mm.


User entry 0 to 999 999.9 mm

Factory setting 0 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Distance


Navigation  Setup → Calibration → Move displacer → Distance

Description Shows measured distance from reference position.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Move displacer

Navigation  Setup → Calibration → Move displacer → Move displacer

Selection



- Stop
- Move down
- Move up

Factory setting Stop

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Motor status**Navigation**

  Setup → Calibration → Move displacer → Motor status

Description

Shows the current moving Direction of the Motor.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Move displacer**Navigation**

  Setup → Calibration → Move displacer → Move displacer

Selection

- No
- Yes



Factory setting

No


Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"Sensor calibration" wizard

Navigation   Setup → Calibration → Sensor calibration

Sensor calibration

Navigation   Setup → Calibration → Sensor calibration → Sensor calibration

Description This sequence calibrates the sensor of the servo.

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Offset weight

Navigation   Setup → Calibration → Sensor calibration → Offset weight

Description Sets the weight that is used for the lower point sensor calibration. Changing the value will delete the calibration data.

User entry 0 to 150 g



Factory setting Dependent on the device version

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

 For density measurement application, it is recommended to apply 50 g.

Span weight

Navigation   Setup → Calibration → Sensor calibration → Span weight

Description Sets the weight that is used for the middle point sensor calibration. Changing the value will delete the calibration data.

User entry 10 to 999.9 g

Factory setting Dependent on the device version

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Zero calibration
**Navigation**

Setup → Calibration → Sensor calibration → Zero calibration

Description

In this step the sensor calibration zero weight will be done.

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Calibration status
Navigation

Setup → Calibration → Sensor calibration → Calibration status

Description

Gives feedback on the latest status of the calibration process.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Offset calibration
**Navigation**

Setup → Calibration → Sensor calibration → Offset calibration

Description

In this step the sensor calibration with offset weight will be done.

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Span calibration
**Navigation**

Setup → Calibration → Sensor calibration → Span calibration



Description


In this step the sensor calibration with span weight will be done.



Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"Reference calibration" wizard

Navigation   Setup → Calibration → Reference calibration


Reference calibration 

Navigation   Setup → Calibration → Reference calibration → Reference calibration

Description This sequence will move the displacer to the mechanical stop and set the reference position.

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Reference position 

Navigation   Setup → Calibration → Reference calibration → Reference position


Description Defines in mm, during reference calibration, the distance between mechanical stop inside the drum housing and the middle of the wire ring.



User entry 0 to 9999.9 mm

Factory setting Dependent on the device version

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Progress 

Navigation   Setup → Calibration → Reference calibration → Progress

Description Gives feedback on the latest status of the reference calibration process.

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Calibration status



Navigation Setup → Calibration → Reference calibration → Calibration status**Description**

Gives feedback on the latest status of the calibration process.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

"Drum calibration" wizard

Navigation   Setup → Calibration → Drum calibration


Drum calibration 

Navigation   Setup → Calibration → Drum calibration → Drum calibration

Description This sequence will perform a drum calibration.

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Set high weight 

Navigation   Setup → Calibration → Drum calibration → Set high weight


Description High weight that is used for a drum calibration (normally it is the displacer weight).



User entry 10 to 999.9 g

Factory setting Dependent on the device version

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Make drum table 

Navigation   Setup → Calibration → Drum calibration → Make drum table

Description This will perform a drum calibration.

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Drum table point

Navigation   Setup → Calibration → Drum calibration → Drum table point



Description Shows the currently measured point of the drum calibration. Maximum number of measured points is 50.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Calibration status

Navigation

  Setup → Calibration → Drum calibration → Calibration status

Description

Gives feedback on the latest status of the calibration process.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Make low table



Navigation

  Setup → Calibration → Drum calibration → Make low table

Description

For additional accuracy it is possible to perform a second drum calibration with low weight. Choose 'Yes' or 'No' to start/stop calibration.

Selection

- No
- Yes

Factory setting

No

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Set low weight



Navigation

  Setup → Calibration → Drum calibration → Set low weight

Description

Set weight for additional drum calibration sequence.

User entry

10 to 999.9 g

Factory setting

Dependent on the device version

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

15.3.2 "Advanced setup" submenu

Navigation   Setup → Advanced setup

Locking status


Navigation   Setup → Advanced setup → Locking status

Description Indicates the write protection with the highest priority that is currently active.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Access status tooling

Navigation  Setup → Advanced setup → Access status tooling

Description Shows the access authorization to the parameters via the operating tool.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Enter access code


Navigation   Setup → Advanced setup → Enter access code

Description Enter access code to disable write protection of parameters.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | Operator |

"Input/output" submenu

Navigation  Setup → Advanced setup → Input/output

"HART devices" submenu

Navigation  Setup → Advanced setup → Input/output → HART devices

Number of devices

Navigation

 Setup → Advanced setup → Input/output → HART devices → Number of devices


Description



Shows the number of devices on the HART bus.

Additional information



| | |
|---------------------|----------|
| Read access | Operator |
| Write access | - |

"HART Device(s)" submenu

 There is a **HART Device(s)** submenu for each HART slave device found on the HART loop.

Navigation   Setup → Advanced setup → Input/output → HART devices → HART Device(s)

Device name



Navigation   Setup → Advanced setup → Input/output → HART devices → HART Device(s) → Device name

Description Shows the name of the transmitter.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Polling address


Navigation   Setup → Advanced setup → Input/output → HART devices → HART Device(s) → Polling address

Description Shows the polling address of the transmitter.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Device tag

Navigation   Setup → Advanced setup → Input/output → HART devices → HART Device(s) → Device tag

Description Shows the device tag of the transmitter.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Operating mode



Navigation Setup → Advanced setup → Input/output → HART devices → HART Device(s) → Operating mode

Prerequisite Not available if the HART device is a Prothermo NMT.

Description Selection of the operation mode PV only or PV,SV,TV,QV. Devines which values are polled from the connected HART Device.

- Selection**
- PV only
 - PV,SV,TV & QV
 - Level ⁴⁾
 - Measured level ⁴⁾

Factory setting PV,SV,TV & QV

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Communication status

Navigation Setup → Advanced setup → Input/output → HART devices → HART Device(s) → Communication status

Description Shows the operating status of the transmitter.

- User interface**
- Operating normally
 - Device offline

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

#blank# (HART PV - designation dependent on device)

Navigation Setup → Advanced setup → Input/output → HART devices → HART Device(s) → #blank#


Description Shows the first HART variable (PV).

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

4) only visible if the conneced device is a Micropilot

#blank# (HART SV - designation dependent on device)

Navigation  Setup → Advanced setup → Input/output → HART devices → HART Device(s) → #blank#


Prerequisite For HART devices other than NMT: **Operating mode** (→  194) = PV,SV,TV & QV

Description Shows the second HART variable (SV).

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

#blank# (HART TV - designation dependent on device)

Navigation  Setup → Advanced setup → Input/output → HART devices → HART Device(s) → #blank#


Prerequisite For HART devices other than NMT: **Operating mode** (→  194) = PV,SV,TV & QV

Description Shows the third HART variable (TV).

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

#blank# (HART QV - designation dependent on device)

Navigation  Setup → Advanced setup → Input/output → HART devices → HART Device(s) → #blank#

Prerequisite For HART devices other than NMT: **Operating mode** (→  194) = PV,SV,TV & QV


Description Shows the fourth HART variable (QV).

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Output pressure



Navigation  Setup → Advanced setup → Input/output → HART devices → HART Device(s) → Output pressure

Prerequisite Not available for Micropilot S FMR5xx and Prothermo 53x. (In these cases the measured variables are allocated automatically).


Description Defines which HART variable is the pressure.



- Selection**
- No value
 - Primary variable (PV)
 - Secondary variable (SV)
 - Tertiary variable (TV)
 - Quaternary variable (QV)

Factory setting No value

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Output density 

Navigation   Setup → Advanced setup → Input/output → HART devices → HART Device(s) → Output density

Prerequisite Not available for Micropilot S FMR5xx and Prothermo 53x. (In these cases the measured variables are allocated automatically).


Description Defines which HART variable is the density.



- Selection**
- No value
 - Primary variable (PV)
 - Secondary variable (SV)
 - Tertiary variable (TV)
 - Quaternary variable (QV)

Factory setting No value

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Output temperature 

Navigation   Setup → Advanced setup → Input/output → HART devices → HART Device(s) → Output temperature

Prerequisite Not available for Micropilot S FMR5xx and Prothermo 53x. (In these cases the measured variables are allocated automatically).

Description Defines which HART variable is the temperature.

- Selection**
- No value
 - Primary variable (PV)
 - Secondary variable (SV)
 - Tertiary variable (TV)
 - Quaternary variable (QV)

Factory setting No value

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Output vapor temperature



Navigation

Setup → Advanced setup → Input/output → HART devices → HART Device(s) → Output vapor temperature

Prerequisite

Not available for Micropilot S FMR5xx and Prothermo 53x. (In these cases the measured variables are allocated automatically).

Description

Defines which HART variable is the vapor temperature.

Selection

- No value
- Primary variable (PV)
- Secondary variable (SV)
- Tertiary variable (TV)
- Quaternary variable (QV)

Factory setting

No value

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Output level



Navigation

Setup → Advanced setup → Input/output → HART devices → HART Device(s) → Output level

Prerequisite

Not available for Micropilot S FMR5xx and Prothermo 53x. (In these cases the measured variables are allocated automatically).

Description

Defines which HART variable is the level.

Selection

- No value
- Primary variable (PV)
- Secondary variable (SV)
- Tertiary variable (TV)
- Quaternary variable (QV)

Factory setting



No value


Additional information


| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |


"Forget device" wizard

| | |
|-------------|-------------|
| Read access | Maintenance |
|-------------|-------------|

 This submenu is only visible if **Number of devices** (→  **192**) ≥ 1.

Navigation  Setup → Advanced setup → Input/output → HART devices → Forget device

Forget device 

Navigation  Setup → Advanced setup → Input/output → HART devices → Forget device → Forget device

Description With this function an offline device can be deleted from the device list.

- Selection**
- HART Device 1 *
 - HART Device 2 *
 - HART Device 3 *
 - HART Device 4 *
 - HART Device 5 *
 - HART Device 6 *
 - HART Device 7 *
 - HART Device 8 *
 - HART Device 9 *
 - HART Device 10 *
 - HART Device 11 *
 - HART Device 12 *
 - HART Device 13 *
 - HART Device 14 *
 - HART Device 15 *
 - None

Factory setting None

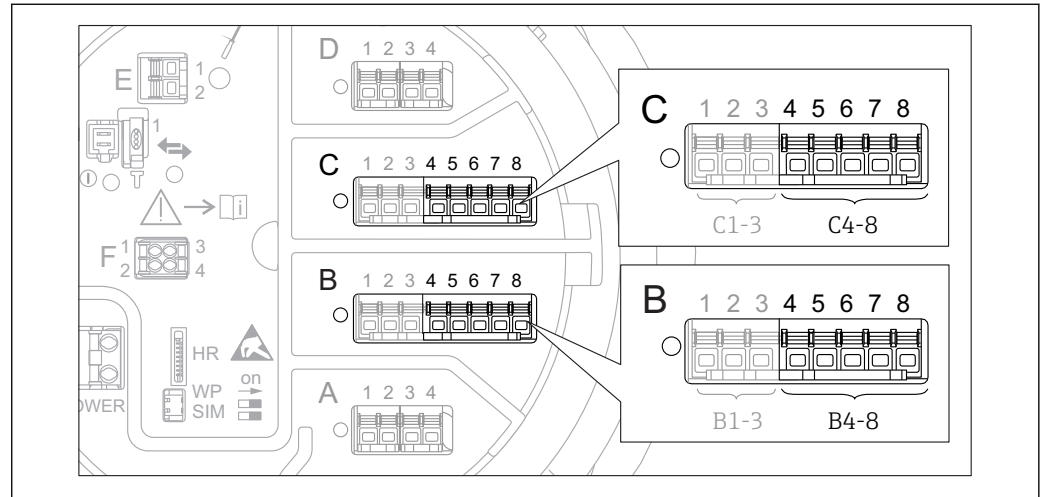
Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

* Visibility depends on order options or device settings

"Analog IP" submenu

i There is a **Analog IP** submenu for each Analog I/O module of the device. This submenu refers to terminals 4 to 8 of this module (the analog input). They are primarily used to connect an RTD. For terminals 1 to 3 (analog input or output) refer to → **205**.



72 Terminals for the "Analog IP" submenu ("B4-8" or "C4-8", respectively)

Navigation **☰** Setup → Advanced setup → Input/output → Analog IP

Operating mode **🔒**

Navigation **☰** Setup → Advanced setup → Input/output → Analog IP → Operating mode

Description Defines the operating mode of the analog input.

- Selection**
- Disabled
 - RTD temperature input
 - Gauge power supply

Factory setting Disabled

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

RTD type **🔒**

Navigation **☰** Setup → Advanced setup → Input/output → Analog IP → RTD type

Prerequisite **Operating mode** (→ **199**) = RTD temperature input

Description Defines the type of the connected RTD.

- Selection**
- Cu50 (w=1.428, GOST)
 - Cu53 (w=1.426, GOST)
 - Cu90; 0°C (w=1.4274, GOST)
 - Cu100; 25°C (w=1.4274, GOST)
 - Cu100; 0°C(w=1.4274, GOST)
 - Pt46 (w=1.391, GOST)
 - Pt50 (w=1.391, GOST)
 - Pt100(385) (a=0.00385, IEC751)
 - Pt100(389) (a=0.00389, Canadian)
 - Pt100(391) (a=0.003916, JIS1604)
 - Pt100 (w=1.391, GOST)
 - Pt500(385) (a=0.00385, IEC751)
 - Pt1000(385) (a=0.00385, IEC751)
 - Ni100(617) (a=0.00617, DIN43760)
 - Ni120(672) (a=0.00672, DIN43760)
 - Ni1000(617) (a=0.00617, DIN43760)

Factory setting Pt100(385) (a=0.00385, IEC751)

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

RTD connection type



Navigation Setup → Advanced setup → Input/output → Analog IP → RTD connection type

Prerequisite **Operating mode (→ 199) = RTD temperature input**

Description Defines the connection type of the RTD.

- Selection**
- 4 wire RTD connection
 - 2 wire RTD connection
 - 3 wire RTD connection

Factory setting 4 wire RTD connection

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Process value

Navigation Setup → Advanced setup → Input/output → Analog IP → Process value

Prerequisite **Operating mode (→ 199) ≠ Disabled**

Description Shows the measured value received via the analog input.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Process variable



Navigation

Setup → Advanced setup → Input/output → Analog IP → Process variable

Prerequisite

Operating mode (→ 199) ≠ RTD temperature input

Description

Determines type of measured value.

Selection

- Level linearized
- Temperature
- Pressure
- Density

Factory setting

Level linearized

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

0 % value



Navigation

Setup → Advanced setup → Input/output → Analog IP → 0 % value

Prerequisite

Operating mode (→ 199) = 4..20mA input

Description

Defines the value represented by a current of 4mA.

User entry

-100 000 to 100 000 mm

Factory setting

0 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

100 % value



Navigation

Setup → Advanced setup → Input/output → Analog IP → 100 % value

Prerequisite

Operating mode (→ 199) = 4..20mA input

Description

Defines the value represented by a current of 20mA.

User entry -100 000 to 100 000 mm

Factory setting 0 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Input value

Navigation  Setup → Advanced setup → Input/output → Analog IP → Input value

Prerequisite **Operating mode (→  199) ≠ Disabled**


Description Shows the value received via the analog input.


Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Minimum probe temperature



Navigation  Setup → Advanced setup → Input/output → Analog IP → Minimum probe temperature

Prerequisite **Operating mode (→  199) = RTD temperature input**

Description Minimum approved temperature of the connected probe. If the temperature falls below this value, the W&M status will be 'invalid'.

User entry -213 to 927 °C


Factory setting -100 °C


Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Maximum probe temperature



Navigation  Setup → Advanced setup → Input/output → Analog IP → Maximum probe temperature

Prerequisite **Operating mode (→  199) = RTD temperature input**

Description Maximum approved temperature of the connected probe. If the temperature rises above this value, the W&M status will be 'invalid'.

User entry -213 to 927 °C

Factory setting 250 °C

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Probe position



Navigation Setup → Advanced setup → Input/output → Analog IP → Probe position

Prerequisite **Operating mode (→ 199) = RTD temperature input**

Description Position of the temperature probe, measured from zero position (tank bottom or datum plate). This parameter, in conjunction with the measured level, determines whether the temperature probe is still covered by the product. If this is no longer the case, the status of the temperature value will be 'invalid'.

User entry -5 000 to 30 000 mm

Factory setting 5 000 mm

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Damping factor



Navigation Setup → Advanced setup → Input/output → Analog IP → Damping factor

Prerequisite **Operating mode (→ 199) ≠ Disabled**

Description Defines the damping constant (in seconds).



User entry 0 to 999.9 s

Factory setting 0 s

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Gauge current

Navigation Setup → Advanced setup → Input/output → Analog IP → Gauge current**Prerequisite****Operating mode (→  199) = Gauge power supply****Description**

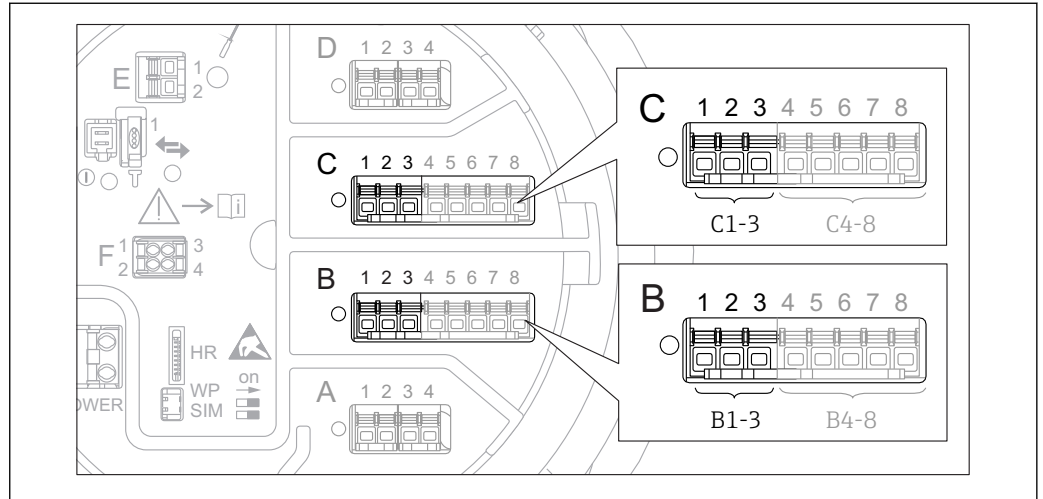
Shows the current on the power supply line for the connected device.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

"Analog I/O" submenu

i There is a **Analog I/O** submenu for each Analog I/O module of the device. This submenu refers to terminals 1 to 3 of this module (an analog input or output). For terminals 4 to 8 (always an analog input) refer to → 199.



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73 Terminals for the "Analog I/O" submenu ("B1-3" or "C1-3", respectively)

Navigation Setup → Advanced setup → Input/output → Analog I/O

Operating mode

Navigation Setup → Advanced setup → Input/output → Analog I/O → Operating mode

Description Defines the operating mode of the analog I/O module.

- Selection**
- Disabled
 - 4..20mA input
 - HART master+4..20mA input
 - HART master
 - 4..20mA output
 - HART slave +4..20mA output


Factory setting Disabled

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |


Meaning of the options

| Operating mode (→ 205) | Direction of signal | Type of signal |
|---------------------------|-------------------------------------|---|
| Disabled | - | - |
| 4..20mA input | Input from 1 external device | Analog (4...20mA) |
| HART master+4..20mA input | Input from 1 external device | <ul style="list-style-type: none"> ■ Analog (4...20mA) ■ HART |
| HART master | Input from up to 6 external devices | HART |




| Operating mode (→  205) | Direction of signal | Type of signal |
|--|-----------------------------|---|
| 4...20mA output | Output to higher-level unit | Analog (4...20mA) |
| HART slave +4...20mA output | Output to higher-level unit | <ul style="list-style-type: none"> ■ Analog (4...20mA) ■ HART |

Depending on the terminals used, the Analog I/O module is used in the passive or active mode.

| Mode | Terminals of the I/O module | | |
|---|-----------------------------|---|----------|
| | 1 | 2 | 3 |
| Passive (power supply from external source) | - | + | not used |
| Active (power supplied by the device itself) | not used | - | + |

-  In the active mode the following conditions must be met:
- Maximum current consumption of the connected HART devices: 24 mA (i.e. 4 mA per device if 6 devices are connected).
 - Output voltage of the Ex-d module: 17.0 V@4 mA to 10.5 V@22 mA
 - Output voltage of the Ex-ia module: 18.5 V@4 mA to 12.5 V@22 mA

Current span 

- Navigation**   Setup → Advanced setup → Input/output → Analog I/O → Current span
- Prerequisite** **Operating mode** parameter (→  205) ≠ **Disabled** option or **HART master** option
- Description** Defines the current range for the measured value transmission.
- Selection**
- 4...20 mA NAMUR
 - 4...20 mA US
 - 4...20 mA
 - Fixed current *
- Factory setting** 4...20 mA NAMUR

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Meaning of the options

| Option | Current range for process variable | Lower alarm signal level | Upper alarm signal level |
|-----------------|------------------------------------|--------------------------|--------------------------|
| 4...20 mA | 4 to 20.5 mA | < 3.6 mA | > 21.95 mA |
| 4...20 mA NAMUR | 3.8 to 20.5 mA | < 3.6 mA | > 21.95 mA |


* Visibility depends on order options or device settings

| Option | Current range for process variable | Lower alarm signal level | Upper alarm signal level |
|---------------|--|--------------------------|--------------------------|
| 4...20 mA US | 3.9 to 20.8 mA | < 3.6 mA | > 21.95 mA |
| Fixed current | Constant current, defined in the Fixed current parameter (→ 207). | | |

 In the case of an error, the output current assumes the value defined in the **Failure mode** parameter (→ 208).

Fixed current



Navigation  Setup → Advanced setup → Input/output → Analog I/O → Fixed current

Prerequisite **Current span (→ 206) = Fixed current**

Description Defines the fixed output current.

User entry 4 to 22.5 mA

Factory setting 4 mA

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Analog input source



Navigation  Setup → Advanced setup → Input/output → Analog I/O → Analog input source

Prerequisite

- **Operating mode (→ 205) = 4..20mA output or HART slave +4..20mA output**
- **Current span (→ 206) ≠ Fixed current**

Description Defines the process variable transmitted via the AIO.

Selection

- None
- Tank level
- Tank level %
- Tank ullage
- Tank ullage %
- Measured level
- Distance
- Displacer position
- Water level
- Upper interface level
- Lower interface level
- Bottom level
- Tank reference height
- Liquid temperature
- Vapor temperature
- Air temperature

- Observed density value
- Average profile density ⁵⁾
- Upper density
- Middle density
- Lower density
- P1 (bottom)
- P2 (middle)
- P3 (top)
- GP 1 ... 4 value
- AIO B1-3 value ⁵⁾
- AIO B1-3 value mA ⁵⁾
- AIO C1-3 value ⁵⁾
- AIO C1-3 value mA ⁵⁾
- AIP B4-8 value ⁵⁾
- AIP C4-8 value ⁵⁾
- Element temperature 1 ... 24 ⁵⁾
- HART device 1...15 PV ⁵⁾
- HART device 1 ... 15 PV mA ⁵⁾
- HART device 1 ... 15 PV % ⁵⁾
- HART device 1 ... 15 SV ⁵⁾
- HART device 1 ... 15 TV ⁵⁾
- HART device 1 ... 15 QV ⁵⁾

Factory setting

Tank level

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Failure mode



Navigation

Setup → Advanced setup → Input/output → Analog I/O → Failure mode

Prerequisite

Operating mode (→ 205) = 4..20mA output or HART slave +4..20mA output

Description

Defines the output behavior in case of an error.

Selection

- Min.
- Max.
- Last valid value
- Actual value
- Defined value

Factory setting

Max.

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

⁵⁾ Visibility depends on order options or device settings

Error value



Navigation Setup → Advanced setup → Input/output → Analog I/O → Error value

Prerequisite **Failure mode (→ 208) = Defined value**

Description Defines the output value in case of an error.

User entry 3.4 to 22.6 mA

Factory setting 22 mA

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Input value

Navigation Setup → Advanced setup → Input/output → Analog I/O → Input value

Prerequisite **▪ Operating mode (→ 205) = 4..20mA output or HART slave +4..20mA output**
▪ Current span (→ 206) ≠ Fixed current

Description Shows the input value of the analog I/O module.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

0 % value



Navigation Setup → Advanced setup → Input/output → Analog I/O → 0 % value

Prerequisite **▪ Operating mode (→ 205) = 4..20mA output or HART slave +4..20mA output**
▪ Current span (→ 206) ≠ Fixed current

Description Value corresponding to an output current of 0% (4mA).

User entry Signed floating-point number

Factory setting 0 Unitless

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

100 % value



Navigation

Setup → Advanced setup → Input/output → Analog I/O → 100 % value

Prerequisite

- Operating mode (→ 205) = 4..20mA output or HART slave +4..20mA output
- Current span (→ 206) ≠ Fixed current

Description

Value corresponding to an output current of 100% (20mA).

User entry

Signed floating-point number

Factory setting

0 Unitless

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Input value %

Navigation

Setup → Advanced setup → Input/output → Analog I/O → Input value %

Prerequisite

- Operating mode (→ 205) = 4..20mA output or HART slave +4..20mA output
- Current span (→ 206) ≠ Fixed current

Description

Shows the output value as a percentage of the complete 4...20mA range.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Output value

Navigation

Setup → Advanced setup → Input/output → Analog I/O → Output value

Prerequisite

Operating mode (→ 205) = 4..20mA output or HART slave +4..20mA output

Description

Shows the output value in mA.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Process variable



- Navigation** Setup → Advanced setup → Input/output → Analog I/O → Process variable
- Prerequisite** **Operating mode (→ 205) = 4..20mA input or HART master+4..20mA input**
- Description** Defines the type of measuring variable.
- Selection**
 - Level linearized
 - Temperature
 - Pressure
 - Density
- Factory setting** Level linearized

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Analog input 0% value



- Navigation** Setup → Advanced setup → Input/output → Analog I/O → Analog input 0% value
- Prerequisite** **Operating mode (→ 205) = 4..20mA input or HART master+4..20mA input**
- Description** Value corresponding to an input current of 0% (4mA).
- User entry** -100 000 to 100 000 mm
- Factory setting** 0 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Analog input 100% value



- Navigation** Setup → Advanced setup → Input/output → Analog I/O → Analog input 100% value
- Prerequisite** **Operating mode (→ 205) = 4..20mA input or HART master+4..20mA input**
- Description** Value corresponding to an input current of 100% (20mA).
- User entry** -100 000 to 100 000 mm
- Factory setting** 0 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Error event type**Navigation**

Setup → Advanced setup → Input/output → Analog I/O → Error event type

Prerequisite

Operating mode (→ 205) ≠ Disabled or HART master

Description

Defines the type of event message (alarm/warning) in case of an error or output out of range in the analog I/O module.

Selection

- None
- Warning
- Alarm

Factory setting

Warning

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Process value**Navigation**

Setup → Advanced setup → Input/output → Analog I/O → Process value

Prerequisite

Operating mode (→ 205) = 4..20mA input or HART master+4..20mA input

Description

Shows the input value scaled to customer units.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Input value in mA**Navigation**

Setup → Advanced setup → Input/output → Analog I/O → Input value in mA

Prerequisite

Operating mode (→ 205) = 4..20mA input or HART master+4..20mA input


Description


Shows the input value in mA.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Input value percent

Navigation  Setup → Advanced setup → Input/output → Analog I/O → Input value percent

Prerequisite **Operating mode (→  205) = 4..20mA input or HART master+4..20mA input**


Description Shows the input value as a percentage of the complete 4...20mA current range.


Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Damping factor



Navigation  Setup → Advanced setup → Input/output → Analog I/O → Damping factor

Prerequisite **Operating mode (→  205) ≠ Disabled or HART master**

Description Defines the damping constant (in seconds).

User entry 0 to 999.9 s


Factory setting 0 s

Additional information


| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Used for SIL/WHG



Navigation  Setup → Advanced setup → Input/output → Analog I/O → Used for SIL/WHG

Prerequisite

- **Operating mode (→  205) = 4..20mA output or HART slave +4..20mA output**
- The device has a SIL approval.

Description Determines whether the discrete I/O module is in SIL/WHG mode.

Selection

- Enabled
- Disabled

Factory setting Disabled

Additional information


| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Expected SIL/WHG chain

Navigation

 Setup → Advanced setup → Input/output → Analog I/O → Expected SIL/WHG chain

Prerequisite

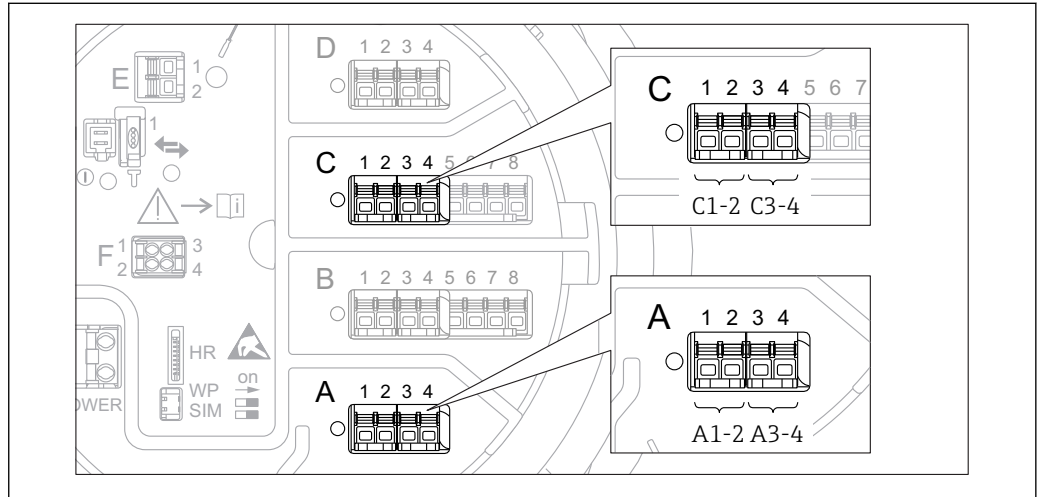
- **Operating mode (→  205) = 4..20mA output or HART slave +4..20mA output**
- The device has a SIL approval.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

"Digital Xx-x" submenu

- i
 - In the operating menu, each digital input or output is designated by the respective slot of the terminal compartment and two terminals within this slot. **A1-2**, for example, denotes terminals 1 and 2 of slot **A**. The same is valid for slots **B**, **C** and **D** if they contain a Digital IO module.
 - In this document, **Xx-x** designates any of these submenus. The structure of all these submenus is the same.



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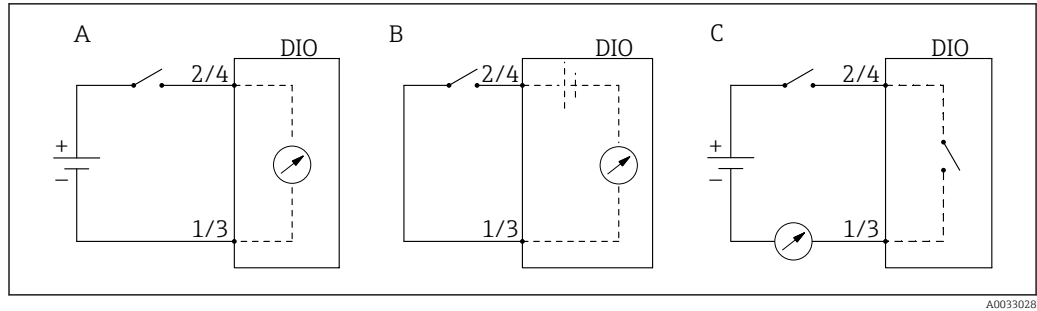
74 Designation of the digital inputs or outputs (examples)

Navigation ☰ Setup → Advanced setup → Input/output → Digital Xx-x

Operating mode 🔒

| | |
|------------------------|---|
| Navigation | ☰ Setup → Advanced setup → Input/output → Digital Xx-x → Operating mode |
| Description | Defines the operating mode of the discrete I/O module. |
| Selection | <ul style="list-style-type: none"> ▪ Disabled ▪ Output passive ▪ Input passive ▪ Input active |
| Factory setting | Disabled |

Additional information



75 Operating modes of the Digital I/O module

- A Input passive
- B Input active
- C Output passive

Digital input source



Navigation

Setup → Advanced setup → Input/output → Digital Xx-x → Digital input source

Prerequisite

Operating mode (→ 215) = Output passive

Description

Defines which device state is indicated by the digital output.

Selection

- None
- Alarm x any
- Alarm x High
- Alarm x HighHigh
- Alarm x High or HighHigh
- Alarm x Low
- Alarm x LowLow
- Alarm x Low or LowLow
- Digital Xx-x
- Pri. Modbus x
- Sec. Modbus x

Factory setting

None

Additional information

Meaning of the options

- Alarm x any, Alarm x High, Alarm x HighHigh, Alarm x High or HighHigh, Alarm x Low, Alarm x LowLow, Alarm x Low or LowLow

The digital output indicates if the selected alarm is currently active. The alarms themselves are defined in the **Alarm 1 to 4** submenus.

- Digital Xx-x⁶⁾

The digital signal present at the digital input Xx-x is passed through to the digital output.



- Modbus A1-4 Discrete x
- Modbus B1-4 Discrete x
- Modbus C1-4 Discrete x
- Modbus D1-4 Discrete x


The digital value written by the Modbus Master device to the **Modbus discrete x** parameter⁷⁾ is passed to the digital output. For details refer to Special Documentation SD02066G.

6) Only present if "Operating mode (→ 215)" = "Input passive" or "Input active" for the respective Digital I/O module.

7) Expert → Communication → Modbus Xx-x → Modbus discrete x

Input value

Navigation   Setup → Advanced setup → Input/output → Digital Xx-x → Input value

Prerequisite **Operating mode (→  215) = "Input passive" option or "Input active" option**

Description Shows the digital input value.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Contact type



Navigation   Setup → Advanced setup → Input/output → Digital Xx-x → Contact type

Prerequisite **Operating mode (→  215) ≠ Disabled**

Description Determines the switching behavior of the input or output.



Selection


- Normally open
- Normally closed

Factory setting Normally open

Output simulation



Navigation   Setup → Advanced setup → Input/output → Digital Xx-x → Output simulation

Prerequisite **Operating mode (→  215) = Output passive**

Description Sets the output to a specific simulated value.

Selection

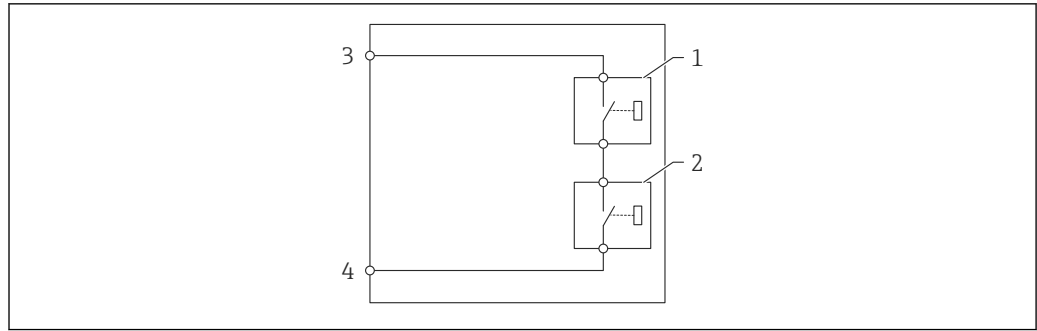
- Disable
- Simulating active
- Simulating inactive
- Fault 1
- Fault 2

Factory setting Disable

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

The digital output consists of two relays connected in series:



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76 The two relays of a digital output

1/2 The relays

3/4 The terminals of the digital output

The switching state of these relays is defined by the **Output simulation** parameter as follows:

| Output simulation | State of relay 1 | State of relay 2 | Expected result on the terminals of the I/O module |
|---------------------|------------------|------------------|--|
| Simulating active | Closed | Closed | Closed |
| Simulating inactive | Open | Open | Open |
| Fault 1 | Closed | Open | Open |
| Fault 2 | Open | Closed | Open |

i The **Fault 1** and **Fault 2** options can be used to check the correct switching behavior of the two relays.

Output value

Navigation

Setup → Advanced setup → Input/output → Digital Xx-x → Output values

Prerequisite

Operating mode (→ 215) = Output passive

Description

Shows the digital output value.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Readback value

Navigation

Setup → Advanced setup → Input/output → Digital Xx-x → Readback value

Prerequisite

Operating mode (→ 215) = Output passive

Description

Shows the value read back from the output.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Used for SIL/WHG



Navigation

Setup → Advanced setup → Input/output → Digital Xx-x → Used for SIL/WHG

Prerequisite

- **Operating mode** (→ 215) = **Output passive**
- The device has a SIL certificate.

Description

Determines whether the discrete I/O module is in SIL/WHG mode.

Selection

- Enabled
- Disabled

Factory setting


Disabled


Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"Digital input mapping" submenu

Navigation  Setup → Advanced setup → Input/output → Digital input mapping

Digital input source 1 

Navigation  Setup → Advanced setup → Input/output → Digital input mapping → Digital input source 1


Description Selects the source of digital input #1 (for gauge command).

- Selection**
- None
 - Digital A1-2 *
 - Digital A3-4 *
 - Digital B1-2 *
 - Digital B3-4 *
 - Digital C1-2 *
 - Digital C3-4 *
 - Digital D1-2 *
 - Digital D3-4 *

Factory setting None

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Digital input source 2 

Navigation  Setup → Advanced setup → Input/output → Digital input mapping → Digital input source 2

Description Selects the source of digital input #2 (for gauge command).

- Selection**
- None
 - Digital A1-2 *
 - Digital A3-4 *
 - Digital B1-2 *
 - Digital B3-4 *
 - Digital C1-2 *
 - Digital C3-4 *
 - Digital D1-2 *
 - Digital D3-4 *

Factory setting None

* Visibility depends on order options or device settings

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Gauge command 0



Navigation

Setup → Advanced setup → Input/output → Digital input mapping → Gauge command 0

Prerequisite

Digital input source 1 (→ 220) ≠ None

Description

Gauge command assigned to digital input combination 0 (DI2=0, DI1=0).

Selection

- Stop
- Level
- Up
- Bottom level
- Upper I/F level
- Lower I/F level
- Upper density
- Middle density
- Lower density
- Repeatability
- Water dip
- Release overtension
- Tank profile
- Interface profile
- Manual profile
- Level standby

Factory setting

Level

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Gauge command 1



Navigation

Setup → Advanced setup → Input/output → Digital input mapping → Gauge command 1

Prerequisite

Digital input source 1 (→ 220) ≠ None

Description

Gauge command assigned to digital input combination 1 (DI2=0, DI1=1).

Selection

- Stop
- Level
- Up
- Bottom level
- Upper I/F level
- Lower I/F level

- Upper density
- Middle density
- Lower density
- Repeatability
- Water dip
- Release overtension
- Tank profile
- Interface profile
- Manual profile
- Level standby

Factory setting

Up

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Gauge command 2



Navigation

Setup → Advanced setup → Input/output → Digital input mapping → Gauge command 2

Prerequisite

- **Digital input source 1** (→ 220) ≠ None
- **Digital input source 2** (→ 220) ≠ None

Description

Gauge command assigned to digital Input combination 2 (DI2=1, DI1=0).

Selection

- Stop
- Level
- Up
- Bottom level
- Upper I/F level
- Lower I/F level
- Upper density
- Middle density
- Lower density
- Repeatability
- Water dip
- Release overtension
- Tank profile
- Interface profile
- Manual profile
- Level standby

Factory setting

Stop

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Gauge command 3



Navigation Setup → Advanced setup → Input/output → Digital input mapping → Gauge command 3

Prerequisite ■ **Digital input source 1** (→ 220) ≠ None
 ■ **Digital input source 2** (→ 220) ≠ None

Description Gauge command assigned to digital input combination 3 (DI2=1, DI1=1).

- Selection**
- Stop
 - Level
 - Up
 - Bottom level
 - Upper I/F level
 - Lower I/F level
 - Upper density
 - Middle density
 - Lower density
 - Repeatability
 - Water dip
 - Release overtension
 - Tank profile
 - Interface profile
 - Manual profile
 - Level standby

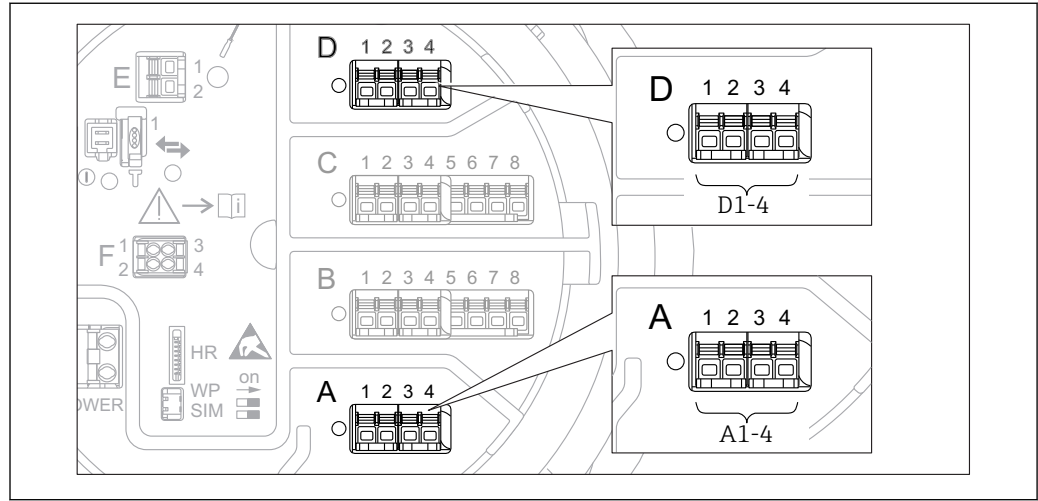
Factory setting Upper I/F level

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"Communication" submenu

This menu contains a submenu for each digital communication interface of the device. The communication interfaces are designated by "X1-4" where "X" specifies the slot in the terminal compartment and "1-4" the terminals within this slot.



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77 Designation of the "Modbus" or "V1" modules (examples); depending on the device version these modules may also be in slot B or C.

Navigation Setup → Advanced setup → Communication

"Modbus X1-4" or "V1 X1-4" submenu

This submenu is only present for devices with **MODBUS** and/or **V1** communication interface. There is one submenu of this type for each communication interface.

Navigation Setup → Advanced setup → Communication → Modbus X1-4 / V1 X1-4

Communication interface protocol

Navigation Setup → Advanced setup → Communication → Modbus X1-4 / V1 X1-4 → Communication interface protocol


Description Shows the type of communication protocol.


Additional information


| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |


"Configuration" submenu

This submenu is only present for devices with a **MODBUS** communication interface.

Navigation  Setup → Advanced setup → Communication → Modbus X1-4 → Configuration

Baudrate 

Navigation  Setup → Advanced setup → Communication → Modbus X1-4 → Configuration → Baudrate

Prerequisite **Communication interface protocol (→  224) = MODBUS**

Description Defines the baud rate of the Modbus communication.


- Selection**
- 300 BAUD
 - 600 BAUD
 - 1200 BAUD
 - 2400 BAUD
 - 4800 BAUD
 - 9600 BAUD
 - 19200 BAUD


Factory setting 9600 BAUD

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Parity 

Navigation  Setup → Advanced setup → Communication → Modbus X1-4 → Configuration → Parity

Prerequisite **Communication interface protocol (→  224) = MODBUS**


Description Defines the parity of the Modbus communication.



- Selection**
- Odd
 - Even
 - None / 1 stop bit
 - None / 2 stop bits


Factory setting None / 1 stop bit

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Modbus address 

Navigation   Setup → Advanced setup → Communication → Modbus X1-4 → Configuration → Device ID

Prerequisite **Communication interface protocol (→  224) = MODBUS**


Description Defines the Modbus address of the device.



User entry 1 to 247


Factory setting 1

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Float swap mode 

Navigation   Setup → Advanced setup → Communication → Modbus X1-4 → Configuration → Float swap mode

Prerequisite **Communication interface protocol (→  224) = MODBUS**

Description Sets the format of how the floating point value is transferred on Modbus.


Selection



- Normal 3-2-1-0
- Swap 0-1-2-3
- WW Swap 1-0-3-2


Factory setting Swap 0-1-2-3

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Bus termination 

Navigation   Setup → Advanced setup → Communication → Modbus X1-4 → Configuration → Bus termination

Prerequisite **Communication interface protocol (→  224) = MODBUS**

Description Activates or deactivates the bus termination at the device. Should only be activated on the last device in a loop.

Selection

- Off
- On

Factory setting


Off


Additional information


| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"Configuration" submenu

This submenu is only present for devices with a **V1** communication interface.

Navigation  Setup → Advanced setup → Communication → V1 X1-4 → Configuration

Communication interface protocol variant 

Navigation  Setup → Advanced setup → Communication → V1 X1-4 → Configuration → Communication interface protocol variant

Description Determines which variant of the V1 protocol is used.


User interface


- None
- V1 *


Factory setting None

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

V1 address 

Navigation  Setup → Advanced setup → Communication → V1 X1-4 → Configuration → V1 address

Prerequisite **Communication interface protocol variant (→  228) = V1**

Description Identifier of the device for the V1 communication.

User entry 0 to 99

Factory setting 1

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

* Visibility depends on order options or device settings

V1 address



| | | | | | |
|-------------------------------|---|-------------|----------|--------------|-------------|
| Navigation | Setup → Advanced setup → Communication → V1 X1-4 → Configuration → V1 address | | | | |
| Prerequisite | Communication interface protocol variant (→ 228) | | | | |
| Description | Identifier of the previous device for V1 communication. | | | | |
| User entry | 0 to 255 | | | | |
| Factory setting | 1 | | | | |
| Additional information | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Read access</td> <td>Operator</td> </tr> <tr> <td>Write access</td> <td>Maintenance</td> </tr> </table> | Read access | Operator | Write access | Maintenance |
| Read access | Operator | | | | |
| Write access | Maintenance | | | | |

Level mapping



| | | | | | |
|-------------------------------|---|-------------|----------|--------------|-------------|
| Navigation | Setup → Advanced setup → Communication → V1 X1-4 → Configuration → Level mapping | | | | |
| Prerequisite | Communication interface protocol (→ 224) = V1 | | | | |
| Description | Determines the transmittable range of levels. | | | | |
| Selection | <ul style="list-style-type: none"> ■ +ve ■ +ve & -ve | | | | |
| Factory setting | +ve | | | | |
| Additional information | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Read access</td> <td>Operator</td> </tr> <tr> <td>Write access</td> <td>Maintenance</td> </tr> </table> | Read access | Operator | Write access | Maintenance |
| Read access | Operator | | | | |
| Write access | Maintenance | | | | |

In V1, the level is always represented by a number in the range from 0 to 999 999. This number corresponds to a level as follows:

"Level mapping" = "+ve"

| Number | Corresponding level |
|---------|---------------------|
| 0 | 0.0 mm |
| 999 999 | 99 999.9 mm |

"Level mapping" = "+ve & -ve"

| Number | Corresponding level |
|---------|---------------------|
| 0 | 0.0 mm |
| 500 000 | 50 000.0 mm |

| Number | Corresponding level |
|---------|---------------------|
| 500 001 | -0.1 mm |
| 999 999 | -49 999.9 mm |

Line impedance



Navigation Setup → Advanced setup → Communication → V1 X1-4 → Configuration → Line impedance

Prerequisite **Communication interface protocol (→ 224) = V1**

Description Adjusts the impedance of the communication line.

User entry 0 to 15

Factory setting 15

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

The line impedance affects the voltage difference between a logical 0 and a logical 1 on the message of the device to the bus. The default setting is suitable for most applications.

Compatibility mode



Navigation Setup → Advanced setup → Communication → Modbus Xx-x / V1 Xx-x → Configuration → Compatibility mode

Description Defines the compatibility mode.

Selection

- NMS5x
- NMS8x

Factory setting NMS8x


Additional information


| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"V1 input selector" submenu

This submenu is only present for devices with a **V1** communication interface.

Navigation  Setup → Advanced setup → Communication → V1 X1-4 → V1 input selector

Alarm 1 input source 

Navigation  Setup → Advanced setup → Communication → V1 X1-4 → V1 input selector → Alarm 1 input source

Description Determines which discrete value will be transmitted as V1 alarm 1 status.


- Selection**
- None
 - Alarm 1-4 any
 - Alarm 1-4 HighHigh
 - Alarm 1-4 High or HighHigh
 - Alarm 1-4 High
 - Alarm 1-4 Low
 - Alarm 1-4 Low or LowLow
 - Alarm 1-4 LowLow

Factory setting None

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Alarm 2 input source 

Navigation  Setup → Advanced setup → Communication → V1 X1-4 → V1 input selector → Alarm 2 input source

Description Determines which discrete value will be transmitted as V1 alarm 2 status.

- Selection**
- None
 - Alarm 1-4 any
 - Alarm 1-4 HighHigh
 - Alarm 1-4 High or HighHigh
 - Alarm 1-4 High
 - Alarm 1-4 Low
 - Alarm 1-4 Low or LowLow
 - Alarm 1-4 LowLow

Factory setting None

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Value percent selector

**Navigation**

Setup → Advanced setup → Communication → V1 X1-4 → V1 input selector → Value percent selector

Description

Selects which value shall be transmitted as a 0..100% value in the V1 Z0/Z1 message.

Selection

- None
- Tank level %
- Tank ullage %
- AIO B1-3 value % *
- AIO C1-3 value % *

Factory setting

None

Additional information


| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |


* Visibility depends on order options or device settings


"HART output" submenu

Navigation  Setup → Advanced setup → Communication → HART output

"Configuration" submenu

Navigation  Setup → Advanced setup → Communication → HART output → Configuration

System polling address 

Navigation  Setup → Advanced setup → Communication → HART output → Configuration → System polling address

Description Device address for HART communication.


User entry 0 to 63

Factory setting 15

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

No. of preambles 

Navigation  Setup → Advanced setup → Communication → HART output → Configuration → No. of preambles


Description Defines the number of preambles in the HART telegram.


User entry 5 to 20

Factory setting 5

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

PV source 

Navigation  Setup → Advanced setup → Communication → HART output → Configuration → PV source

Description Decides, if the PV configuration is according to an analog output (HART slave) or customized (in case of HART tunneling only).

- Selection**
- AIO B1-3 *
 - AIO C1-3 *
 - Custom

Factory setting Custom

Additional information

| | |
|--------------|-------------|
| Read access | Maintenance |
| Write access | Maintenance |

Assign PV



Navigation Setup → Advanced setup → Communication → HART output → Configuration → Assign PV

Prerequisite PV source (→ 233) = Custom

Description Assigns a tank variable to the primary HART variable (PV).

- Selection**
- None
 - Tank level
 - Tank ullage
 - Measured level
 - Distance
 - Displacer position
 - Water level
 - Upper interface level
 - Lower interface level
 - Bottom level
 - Tank reference height
 - Liquid temperature
 - Vapor temperature
 - Air temperature
 - Observed density value
 - Average profile density
 - Upper density
 - Middle density
 - Lower density
 - P1 (bottom)
 - P2 (middle)
 - P3 (top)
 - GP 1 value
 - GP 2 value
 - GP 3 value
 - GP 4 value

Factory setting Tank level

* Visibility depends on order options or device settings

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

 The **Measured level** option doesn't contain a unit. If a unit is needed, select the **Tank level** option.

0 % value



Navigation

 Setup → Advanced setup → Communication → HART output → Configuration → 0 % value

Prerequisite

PV source = Custom

Description

0% value of the primary variable (PV).

User entry

-100 000 to 100 000 mm

Factory setting

0 mm


Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

100 % value



Navigation

 Setup → Advanced setup → Communication → HART output → Configuration → 100 % value

Prerequisite

PV source = Custom

Description

100% value of the primary variable (PV).

User entry

-100 000 to 100 000 mm

Factory setting

0 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

PV mA selector



Navigation

 Setup → Advanced setup → Communication → HART output → Configuration → PV mA selector

Prerequisite

PV source = Custom

Description Assigns a current to the primary HART variable (PV).


Selection

- None
- AIO B1-3 value mA *
- AIO C1-3 value mA *

Factory setting None

| | | |
|-------------------------------|---------------------|-------------|
| Additional information | Read access | Operator |
| | Write access | Maintenance |


Primary variable (PV)

Navigation  Setup → Advanced setup → Communication → HART output → Configuration → Primary variable (PV)

Description Shows the value of the primary HART variable (PV).

| | | |
|-------------------------------|---------------------|----------|
| Additional information | Read access | Operator |
| | Write access | - |


Percent of range

Navigation  Setup → Advanced setup → Communication → HART output → Configuration → Percent of range

Description Shows the value of the primary variable (PV) as a percentage of the defined 0% to 100% range.

| | | |
|-------------------------------|---------------------|----------|
| Additional information | Read access | Operator |
| | Write access | - |

Assign SV

Navigation  Setup → Advanced setup → Communication → HART output → Configuration → Assign SV

Description Assigns a tank variable to the secondary HART variable (SV).

Selection

- None
- Tank level
- Tank ullage

* Visibility depends on order options or device settings


- Measured level
- Distance
- Displacer position
- Water level
- Upper interface level
- Lower interface level
- Bottom level
- Tank reference height
- Liquid temperature
- Vapor temperature
- Air temperature
- Observed density value
- Average profile density
- Upper density
- Middle density
- Lower density
- P1 (bottom)
- P2 (middle)
- P3 (top)
- GP 1 value
- GP 2 value
- GP 3 value
- GP 4 value

Factory setting

Liquid temperature


Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

 The **Measured level** option doesn't contain a unit. If a unit is needed, select the **Tank level** option.

Secondary variable (SV)

Navigation

 Setup → Advanced setup → Communication → HART output → Configuration → Secondary variable (SV)

Prerequisite

Assign SV (→  236) ≠ None

Description

Shows the value of the secondary HART variable (SV).

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Assign TV



Navigation Setup → Advanced setup → Communication → HART output → Configuration → Assign TV

Description Assigns a tank variable to the third HART variable (TV).

- Selection**
- None
 - Tank level
 - Tank ullage
 - Measured level
 - Distance
 - Displacer position
 - Water level
 - Upper interface level
 - Lower interface level
 - Bottom level
 - Tank reference height
 - Liquid temperature
 - Vapor temperature
 - Air temperature
 - Observed density value
 - Average profile density
 - Upper density
 - Middle density
 - Lower density
 - P1 (bottom)
 - P2 (middle)
 - P3 (top)
 - GP 1 value
 - GP 2 value
 - GP 3 value
 - GP 4 value

Factory setting Water level

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

The **Measured level** option doesn't contain a unit. If a unit is needed, select the **Tank level** option.

Tertiary variable (TV)

Navigation Setup → Advanced setup → Communication → HART output → Configuration → Tertiary variable (TV)

Prerequisite **Assign TV (→ 238) ≠ None**

Description Shows the value of the third HART variable (TV).

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Assign QV



Navigation

Setup → Advanced setup → Communication → HART output → Configuration → Assign QV

Description

Assigns a tank variable to the fourth HART variable (QV).

Selection

- None
- Tank level
- Tank ullage
- Measured level
- Distance
- Displacer position
- Water level
- Upper interface level
- Lower interface level
- Bottom level
- Tank reference height
- Liquid temperature
- Vapor temperature
- Air temperature
- Observed density value
- Average profile density
- Upper density
- Middle density
- Lower density
- P1 (bottom)
- P2 (middle)
- P3 (top)
- GP 1 value
- GP 2 value
- GP 3 value
- GP 4 value

Factory setting

Observed density value


Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

The **Measured level** option doesn't contain a unit. If a unit is needed, select the **Tank level** option.

Quaternary variable (QV)

Navigation

 Setup → Advanced setup → Communication → HART output → Configuration
→ Quaternary variable (QV)

Prerequisite

Assign QV (→  239) ≠ None

Description


Shows the value of the fourth HART variable (QV).


Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

"Information" submenu

Navigation  Setup → Advanced setup → Communication → HART output → Information

HART short tag 


Navigation  Setup → Advanced setup → Communication → HART output → Information → HART short tag


Description Defines the short tag for the measuring point. Maximum length: 8 characters Allowed characters: A-Z, 0-9, certain special characters.

Factory setting NMS8x

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Device tag 


Navigation  Setup → Advanced setup → Communication → HART output → Information → Device tag


Description Enter a unique name for the measuring point to identify the device quickly within the plant.

Factory setting NMS8x

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

HART descriptor 

Navigation  Setup → Advanced setup → Communication → HART output → Information → HART descriptor

Description User defined HART descriptor (16 characters).

Factory setting NMS8x

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

HART message**Navigation**

Setup → Advanced setup → Communication → HART output → Information → HART message

Description

User defined HART message (32 characters).

Factory setting

NMS8x

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

HART date code**Navigation**

Setup → Advanced setup → Communication → HART output → Information → HART date code

Description

Enter date of the last configuration change. Use this format yyyy-mm-dd.


Factory setting

2009-07-20


Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |


"Application" submenu


Navigation  Setup → Advanced setup → Application


"Tank configuration" submenu

Navigation  Setup → Advanced setup → Application → Tank configuration

"Level" submenu

Navigation  Setup → Advanced setup → Application → Tank configuration → Level

Level source 

Navigation  Setup → Advanced setup → Application → Tank configuration → Level → Level source

Description Defines the source of the level value.

- Selection**
- No input value
 - HART device 1 ... 15 level
 - Level SR*
 - Level*
 - Displacer position*
 - AIO B1-3 value*
 - AIO C1-3 value*
 - AIP B4-8 value*
 - AIP C4-8 value*

Factory setting Dependent on the device version

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Empty 

Navigation  Setup → Advanced setup → Application → Tank configuration → Level → Empty

Description Distance from reference point to zero position (tank bottom or datum plate).

User entry 0 to 10 000.00 mm

Factory setting Dependent on the device version


* Visibility depends on order options or device settings

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

 The reference point is the reference line of the calibration window.

Tank reference height**Navigation**

 Setup → Advanced setup → Application → Tank configuration → Level → Tank reference height

Description

Defines the distance from the dipping reference point to the zero position (tank bottom or datum plate).

User entry

0 to 10 000.00 mm

Factory setting

Dependent on the device version

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Tank level**Navigation**

 Setup → Advanced setup → Application → Tank configuration → Level → Tank level

Description

Shows the distance from the zero position (tank bottom or datum plate) to the product surface.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Set level**Navigation**

 Setup → Advanced setup → Application → Tank configuration → Level → Set level

Description

If the level measured by the device does not match the actual level obtained by a manual dip, enter the correct level into this parameter.

User entry


0 to 10 000.00 mm

Factory setting



0 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

The device adjusts the **Empty** parameter (→  179) according to the entered value, such that the measured level will match the actual level.

Water level source 

Navigation   Setup → Advanced setup → Application → Tank configuration → Level → Water level source


Description Defines the source of the bottom water level.

- Selection**
- Manual value
 - Bottom level
 - HART device 1 ... 15 level
 - AIO B1-3 value
 - AIO C1-3 value
 - AIP B4-8 value
 - AIP C4-8 value

Factory setting Manual value

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Manual water level 

Navigation   Setup → Advanced setup → Application → Tank configuration → Level → Manual water level

Prerequisite **Water level source (→  245) = Manual value**

Description Defines the manual value of the bottom water level.



User entry -2 000 to 5 000 mm

Factory setting 0 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Water level

Navigation   Setup → Advanced setup → Application → Tank configuration → Level → Water level


Description Shows the bottom water level.


Additional information


| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

"Temperature" submenu

| | |
|-------------|-------------|
| Read access | Maintenance |
|-------------|-------------|

Navigation  Setup → Advanced setup → Application → Tank configuration → Temperature

Liquid temp source 

Navigation  Setup → Advanced setup → Application → Tank configuration → Temperature → Liquid temp source


Description Defines source from which the liquid temperature is obtained.


- Selection**
- Manual value
 - HART device 1 ... 15 temperature
 - AIO B1-3 value
 - AIO C1-3 value
 - AIP B4-8 value
 - AIP C4-8 value


Factory setting Manual value

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Manual liquid temperature 

Navigation  Setup → Advanced setup → Application → Tank configuration → Temperature → Manual liquid temperature

Prerequisite **Liquid temp source (→  182) = Manual value**

Description Defines the manual value of the liquid temperature.



User entry -50 to 300 °C

Factory setting 25 °C

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Liquid temperature


Navigation   Setup → Advanced setup → Application → Tank configuration → Temperature → Liquid temperature

Description Shows the average or spot temperature of the measured liquid.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Air temperature source

Navigation   Setup → Advanced setup → Application → Tank configuration → Temperature → Air temperature source

Description Defines source from which the air temperature is obtained.



- Selection**
- Manual value
 - HART device 1 ... 15 temperature
 - AIO B1-3 value
 - AIO C1-3 value
 - AIP B4-8 value
 - AIP C4-8 value


Factory setting Manual value

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Manual air temperature

Navigation   Setup → Advanced setup → Application → Tank configuration → Temperature → Manual air temperature

Prerequisite **Air temperature source** (→  248) = **Manual value**

Description Defines the manual value of the air temperature.


User entry -50 to 300 °C

Factory setting 25 °C

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Air temperature

Navigation  Setup → Advanced setup → Application → Tank configuration → Temperature → Air temperature


Description Shows the air temperature.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Vapor temp source



Navigation  Setup → Advanced setup → Application → Tank configuration → Temperature → Vapor temp source

Description Defines the source from which the vapor temperature is obtained.

- Selection**
- Manual value
 - HART device 1 ... 15 vapor temp
 - AIO B1-3 value
 - AIO C1-3 value
 - AIP B4-8 value
 - AIP C4-8 value

Factory setting Manual value


Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Manual vapor temperature



Navigation  Setup → Advanced setup → Application → Tank configuration → Temperature → Manual vapor temperature

Prerequisite **Vapor temp source (→  249) = Manual value**

Description Defines the manual value of the vapor temperature.

User entry -50 to 300 °C


Factory setting 25 °C

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Vapor temperature

Navigation

 Setup → Advanced setup → Application → Tank configuration → Temperature
→ Vapor temperature

Description


Shows the measured vapor temperature.


Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

"Density" submenu

Navigation  Setup → Advanced setup → Application → Tank configuration → Density

Observed density source 

Navigation  Setup → Advanced setup → Application → Tank configuration → Density → Observed density source

Description Determines how the density is obtained.


- Selection**
- HTG *
 - HTMS *
 - Average profile density *
 - Upper density
 - Middle density
 - Lower density

Factory setting Dependent on the device version

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |


Observed density


Navigation  Setup → Advanced setup → Application → Tank configuration → Density → Observed density

Description Shows the measured or calculated density.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Air density 

Navigation  Setup → Advanced setup → Application → Tank configuration → Density → Air density

Description Defines the density of the air surrounding the tank.

User entry 0.0 to 500.0 kg/m³

* Visibility depends on order options or device settings

Factory setting 1.2 kg/m³

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Vapor density



Navigation

Setup → Advanced setup → Application → Tank configuration → Density → Vapor density

Description

Defines the density of the gas phase in the tank.

User entry

0.0 to 500.0 kg/m³


Factory setting


1.2 kg/m³


Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"Pressure" submenu

Navigation  Setup → Advanced setup → Application → Tank configuration → Pressure

P1 (bottom) source 

Navigation  Setup → Advanced setup → Application → Tank configuration → Pressure → P1 (bottom) source

Description Defines the source of the bottom pressure (P1).

- Selection**
- Manual value
 - HART device 1 ... 15 pressure
 - AIO B1-3 value
 - AIO C1-3 value
 - AIP B4-8 value
 - AIP C4-8 value

Factory setting Manual value

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |


P1 (bottom)


Navigation  Setup → Advanced setup → Application → Tank configuration → Pressure → P1 (bottom)

Description Shows the pressure at the tank bottom.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

P1 (bottom) manual pressure 

Navigation  Setup → Advanced setup → Application → Tank configuration → Pressure → P1 (bottom) manual pressure

Prerequisite P1 (bottom) source (→  253) = Manual value


Description Defines the manual value of the bottom pressure (P1).

User entry -25 to 25 bar

Factory setting 0 bar

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

P1 position 

Navigation

  Setup → Advanced setup → Application → Tank configuration → Pressure → P1 position

Description

Defines the position of the bottom pressure transmitter (P1), measured from zero position (tank bottom or datum plate).

User entry


-10 000 to 100 000 mm

Factory setting



5 000 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

P1 offset 

Navigation

  Setup → Advanced setup → Application → Tank configuration → Pressure → P1 offset

Description

Offset for the bottom pressure (P1). The offset is added to the measured pressure prior to any tank calculation.

User entry

-25 to 25 bar

Factory setting



0 bar

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

P1 absolute / gauge 

Navigation

  Setup → Advanced setup → Application → Tank configuration → Pressure → P1 absolute / gauge

Description

Defines whether the connected pressure transmitter measures an absolute or a gauge pressure.

Selection

- Absolute
- Gauge

Factory setting

Gauge

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

P3 (top) source



Navigation

Setup → Advanced setup → Application → Tank configuration → Pressure → P3 (top) source

Description

Defines the source of the top pressure (P3).

Selection

- Manual value
- HART device 1 ... 15 pressure
- AIO B1-3 value
- AIO C1-3 value
- AIP B4-8 value
- AIP C4-8 value

Factory setting

Manual value

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

P3 (top)

Navigation

Setup → Advanced setup → Application → Tank configuration → Pressure → P3 (top)

Description

Shows the pressure (P3) at the top transmitter.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

P3 (top) manual pressure



Navigation

Setup → Advanced setup → Application → Tank configuration → Pressure → P3 (top) manual pressure

Prerequisite

P3 (top) source (→ 255) = Manual value

Description

Defines the manual value of the top pressure (P3).

User entry

-2.5 to 2.5 bar

Factory setting

0 bar

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

P3 position**Navigation**

Setup → Advanced setup → Application → Tank configuration → Pressure → P3 position

Description

Defines the position of the top pressure transmitter (P3), measured from zero position (tank bottom or datum plate).

User entry

0 to 100 000 mm

Factory setting

20 000 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

P3 offset**Navigation**

Setup → Advanced setup → Application → Tank configuration → Pressure → P3 offset

Description

Offset for the top pressure (P3). The offset is added to the measured pressure prior to any tank calculation.

User entry

-2.5 to 2.5 bar

Factory setting

0 bar

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

P3 absolute / gauge**Navigation**

Setup → Advanced setup → Application → Tank configuration → Pressure → P3 absolute / gauge

Description

Defines whether the connected pressure transmitter measures an absolute or a gauge pressure.

Selection

- Absolute
- Gauge

Factory setting

Gauge

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Ambient pressure



Navigation

Setup → Advanced setup → Application → Tank configuration → Pressure → Ambient pressure

Description

Defines the manual value of the ambient pressure.

User entry

0 to 2.5 bar

Factory setting

1 bar

Additional information

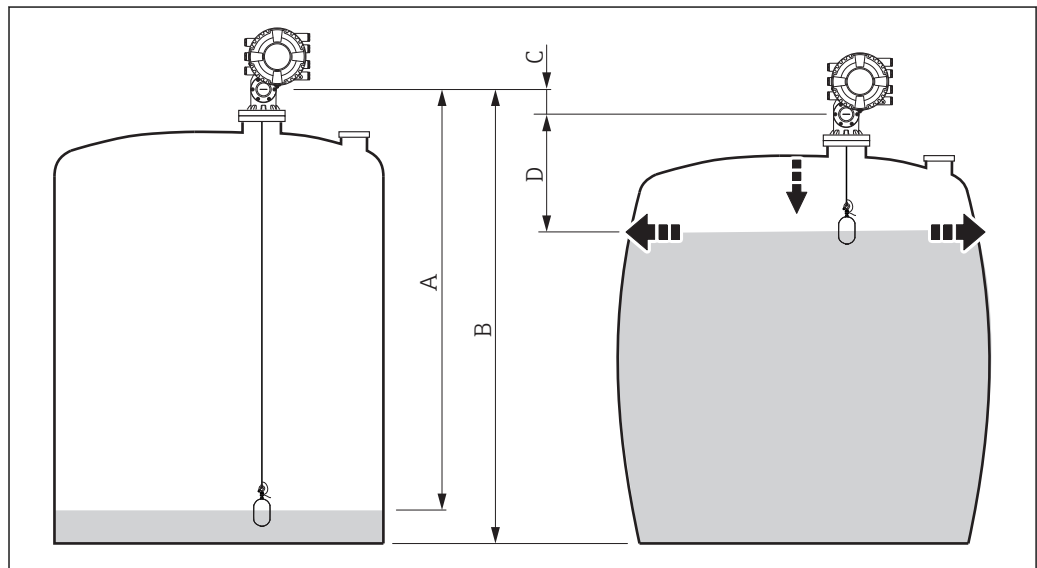
| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"Tank calculation" submenu


Navigation  Setup → Advanced setup → Application → Tank calculation

*"HyTD" submenu**Overview*

Hydrostatic Tank Deformation can be used to compensate the vertical movement of the Gauge Reference Height (GRH) due to bulging of the tank shell caused by the hydrostatic pressure exerted by the liquid stored in the tank. The compensation is based on a linear approximation obtained from manual hand dips at several levels distributed over the full range of the tank.



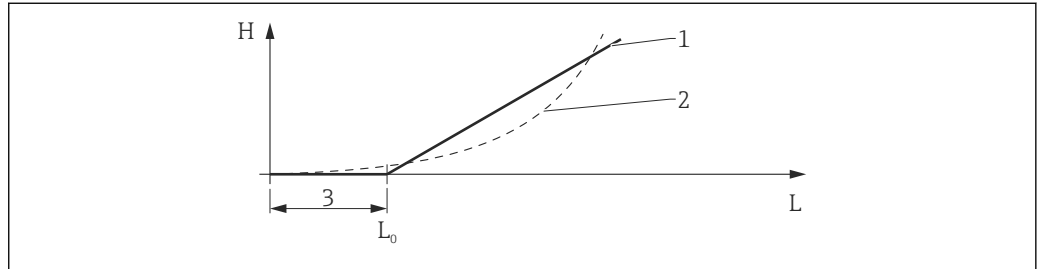
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 78 Correction of the hydrostatic tank deformation (HyTD)

- A "Distance" (level below L_0 → "HyTD correction value" = 0)
- B Gauge Reference Height (GRH)
- C HyTD correction value
- D "Distance" (level above L_0 → "HyTD correction value" > 0)

Linear approximation of the HyTD correction

The real amount of deformation varies non-linearly with the level due to the construction of the tank. However, as the correction values are typically small compared to the measured level, a simple straight line method can be used with good results.



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79 Calculation of the HyTD correction

- 1 Linear correction according to "Deformation factor (→ 261)"
- 2 Real correction
- 3 Starting level (→ 260)
- L Measured level
- H HyTD correction value (→ 260)

Calculation of the HyTD correction

$$L \leq L_0 \Rightarrow C_{HyTD} = 0$$

$$L > L_0 \Rightarrow C_{HyTD} = - (L - L_0) \times D$$


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| | |
|-------------------------|-----------------------|
| L | Measured level |
| L₀ | Starting level |
| C_{HyTD} | HyTD correction value |
| D | Deformation factor |

Description of parameters

Navigation  Setup → Advanced setup → Application → Tank calculation → HyTD

HyTD correction value

Navigation  Setup → Advanced setup → Application → Tank calculation → HyTD → HyTD correction value

Description Shows the correction value from the Hydrostatic Tank Deformation.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

HyTD mode



Navigation  Setup → Advanced setup → Application → Tank calculation → HyTD → HyTD mode

Description Activates or deactivates the calculation of the Hydrostatic Tank Deformation.

Selection

- No
- Yes

Factory setting No

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Starting level



Navigation  Setup → Advanced setup → Application → Tank calculation → HyTD → Starting level

Description Defines the starting level for the Hydrostatic Tank Deformation. Levels below this value are not corrected.

User entry 0 to 5 000 mm

Factory setting 500 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Deformation factor



Navigation

Setup → Advanced setup → Application → Tank calculation → HyTD → Deformation factor

Description

Defines the deformation factor for the HyTD (change of device position per change of level).

User entry

-1.0 to 1.0 %

Factory setting




0.2 %

Additional information

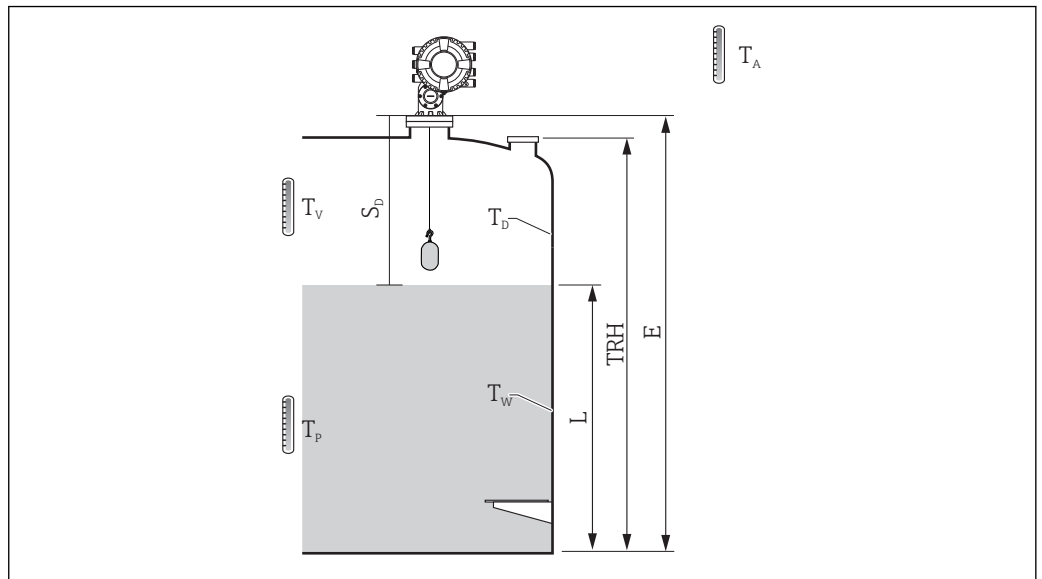
| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

*"CTSh" submenu**Overview*

CTSh (correction for the thermal expansion of the tank shell) compensates for effects on the Gauge Reference Height (GRH) and on the expansion or contraction of the measuring wire due to temperature effects on the tank shell or stilling well. The temperature effects are separated into two parts, respectively affecting the 'dry' and 'wetted' part of the tank shell or stilling well. The correction function is based on thermal expansion coefficients of steel and insulation factors for both the 'dry' and 'wet' parts of the wire and the tank shell. The temperatures used for the correction can be selected from on manual or measured values.

-  This correction is recommended for the following situations:
 - if the operating temperature deviates considerably from the temperature during calibration ($\Delta T > 10\text{ °C}$ (18 °F))
 - for extremely high tanks
 - for refrigerated, cryogenic or heated applications
-  As the use of this correction will influence the innage level reading, it is recommended to ensure the manual hand dip and level verification procedures are being conducted correctly before enabling this correction method.
-  This mode cannot be used in conjunction with HTG because the level is not measured relative to the gauge reference height with HTG.

CTSh: Calculation of the wall temperature



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80 Parameters for the CTSh calculation

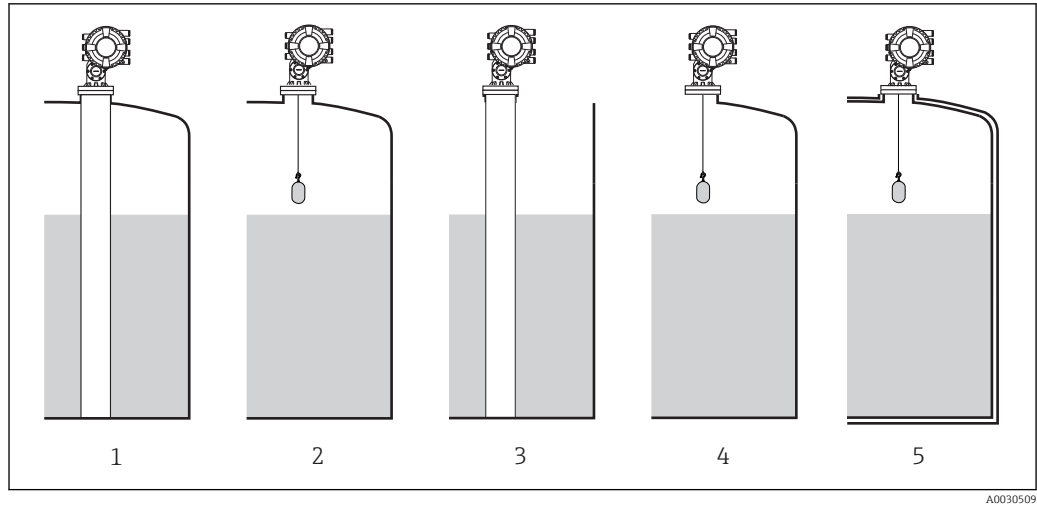
| | |
|------------|---|
| T_W | Temperature of the wetted part of the tank shell |
| T_D | Temperature of the dry part of the tank shell |
| T_P | Product temperature |
| T_V | Vapor temperature (in the tank) |
| T_A | Ambient temperature (atmosphere surrounding the tank) |
| S_d | Measured distance (Empty to Level) |
| TRH | Tank reference height |
| E | Empty |
| L | Level |

CTSh: Calculation of the wall temperature

Depending on the parameters **Covered tank** (→ 265) and **Stilling well** (→ 266), the temperatures T_W of the wetted and T_D of the dry part of the tank wall are calculated as follows:

| Covered tank (→ 265) | Stilling well (→ 266) | T_W | T_D |
|----------------------|-----------------------|-------------------------|-------------------------|
| Covered | Yes ¹⁾ | T_P | T_V |
| | No | $(7/8) T_P + (1/8) T_A$ | $(1/2) T_V + (1/2) T_A$ |
| Open top | Yes | T_P | T_A |
| | No | $(7/8) T_P + (1/8) T_A$ | T_A |

1) This option is also valid for insulated tanks without a stilling well. This is due to the temperature inside and outside of the tank shell being the same due to the insulation of the tank.




- 1 Covered tank (→ 265) = Covered; Stilling well (→ 266) = Yes
- 2 Covered tank (→ 265) = Covered; Stilling well (→ 266) = No
- 3 Covered tank (→ 265) = Open top; Stilling well (→ 266) = Yes
- 4 Covered tank (→ 265) = Open top; Stilling well (→ 266) = No
- 5 Insulated tank: Covered tank (→ 265) = Open top; Stilling well (→ 266) = Yes

CTSh: Calculation of the correction


$$C_{CTSh} = \alpha_{\text{tank}} (TRH - L) (T_D - T_{\text{cal}}) + \alpha_{\text{tank}} L (T_W - T_{\text{cal}}) - \alpha_{\text{wire}} S_D (T_v - T_{\text{cal}})$$

| | |
|-------------------------|--|
| TRH | Tank reference height |
| L | Level |
| T_D | Temperature of the dry part of the tank shell (calculated from T _p , T _v and T _A) |
| T_W | Temperature of the wetted part of the tank shell (calculated from T _p , T _v and T _A) |
| T_{cal} | Temperature at which the measurement has been calibrated |
| α_{tank} | Linear expansion coefficient of tank |
| α_{wire} | Linear expansion coefficient of wire |
| C_{CTSh} | CTSh correction value |

Description of parameters

Navigation  Setup → Advanced setup → Application → Tank calculation → CTSh

CTSh correction value

Navigation  Setup → Advanced setup → Application → Tank calculation → CTSh → CTSh correction value

Description Shows the CTSh correction value.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

CTSh mode



Navigation  Setup → Advanced setup → Application → Tank calculation → CTSh → CTSh mode

Description Activates or deactivates the CTSh.

- Selection**
- No
 - Yes
 - With wire *
 - Only wire *

Factory setting No

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Covered tank



Navigation  Setup → Advanced setup → Application → Tank calculation → CTSh → Covered tank

Description Determines whether the tank is covered.


- Selection**
- Open top
 - Covered

Factory setting Open top


* Visibility depends on order options or device settings

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

 The **Covered** option is only valid for fixed tank roofs. For a floating roof select **Open top**.

Stilling well**Navigation**

 Setup → Advanced setup → Application → Tank calculation → CTSh → Stilling well

Description

Determines whether the device is mounted on a stilling well.

Selection

- No
- Yes


Factory setting

No

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Calibration temperature**Navigation**

 Setup → Advanced setup → Application → Tank calculation → CTSh → Calibration temperature

Description

Specify temperature at which the measurement has been calibrated.

User entry

-50 to 250 °C

Factory setting

25 °C

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Linear expansion coefficient**Navigation**

 Setup → Advanced setup → Application → Tank calculation → CTSh → Linear expansion coefficient

Description

Defines the linear expansion coefficient of the tank shell material.

User entry

0 to 100 ppm

Factory setting

15 ppm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Wire expansion coefficient



Navigation

Setup → Advanced setup → Application → Tank calculation → CTSh → Wire expansion coefficient

Description

Defines the expansion coefficient of the wire material of the drum. Value is programmed in factory.

User entry

0 to 100 ppm

Factory setting

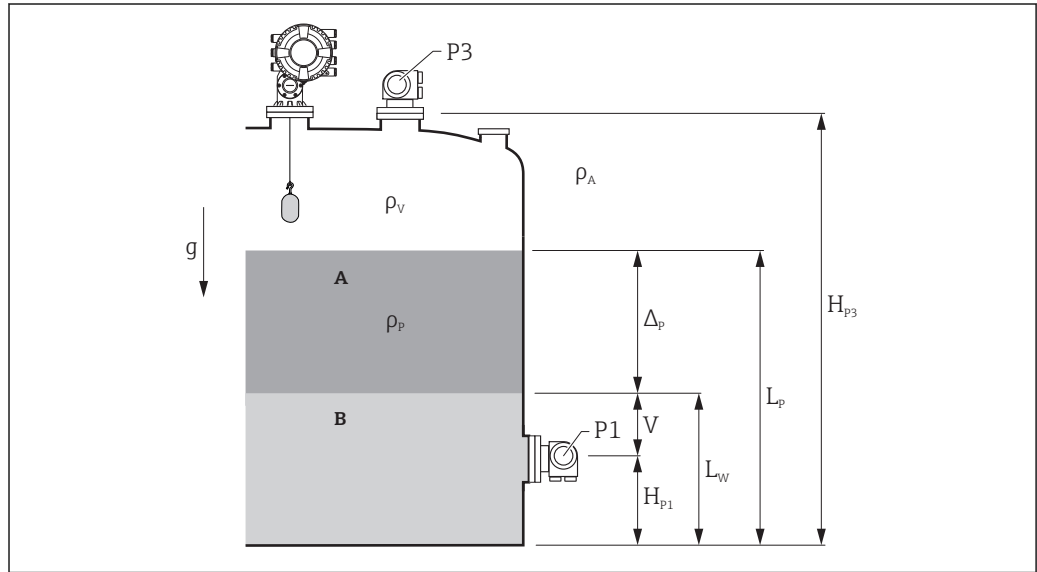
15 ppm

"HTMS" submenu

Overview

The Hybrid Tank Measurement System (HTMS) is a method to calculate the density of a product in a tank based on both a (top mounted) level and at least one (bottom mounted) pressure measurement. An additional pressure sensor can be installed at the top of the tank to provide information about the vapor pressure and to make the density calculation more accurate. The calculation method also takes into account a possible level of water at the bottom of the tank to make density calculations as accurate as possible.

HTMS parameters




81 HTMS parameters

- A Product
- B Water


| Parameter | Navigation path |
|--|---|
| P1 (Bottom pressure) | Setup → Advanced setup → Tank configuration → Pressure → P1 (bottom) |
| H_{p1} (Position of P1 transmitter) | Setup → Advanced setup → Tank configuration → Pressure → P1 position |
| P3 (Top pressure) | Setup → Advanced setup → Tank configuration → Pressure → P3 (top) |
| H_{p3} (Position of P3 transmitter) | Setup → Advanced setup → Tank configuration → Pressure → P3 position |
| ρ_p (Density of the product ¹⁾) | <ul style="list-style-type: none"> ■ Measured value: Setup → Advanced setup → Calculation → HTMS → Density value ■ User-defined value: Setup → Advanced setup → Calculation → HTMS → Manual upper density |
| ρ_v (Vapor density) | Expert → Application → Tank configuration → Density → Vapor density |
| ρ_A (Ambient air temperature) | Setup → Advanced setup → Tank configuration → Density → Air density |
| g (Local gravity) | Expert → Application → Tank Calculation → Local gravity |
| L_p (Level of the product) | Operation → Tank level |
| L_w (Bottom water level) | Operation → Water level |
| $V = L_p - L_w$ | |
| $\Delta p = L_p - L_w = L_p - V - H_{p1}$ | |

1) Depending on the situation this parameter is measured or a user-defined value is used.

HTMS modes

Two HTMS modes can be selected in the **HTMS mode** parameter (→  270). The mode determines whether one or two pressure values are used. Depending on the selected mode a number of additional parameters are required for the calculation of the product density.

 The **HTMS P1+P3** option must be used in pressurized tanks in order to compensate for the pressure of the vapor phase.

| HTMS mode (→  270) | Measured variables | Required additional parameters | Calculated variables |
|--|---|---|--|
| HTMS P1 | <ul style="list-style-type: none"> ▪ P₁ ▪ L_P | <ul style="list-style-type: none"> ▪ g ▪ H_{P1} ▪ L_W (optional) | ρ _P |
| HTMS P1+P3 | <ul style="list-style-type: none"> ▪ P₁ ▪ P₃ ▪ L_P | <ul style="list-style-type: none"> ▪ ρ_V ▪ ρ_A ▪ g ▪ H_{P1} ▪ H_{P3} ▪ L_W (optional) | ρ _P (more precise calculation for pressurized tanks) |

Minimum level

The density of the product can only be calculated if the product has a minimum thickness :


$$\Delta_p \geq \Delta_{p, \min}$$

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This is equivalent to the following condition for the product level:

$$L_p - V \geq \Delta_{p, \min} + H_{P1} = L_{\min}$$


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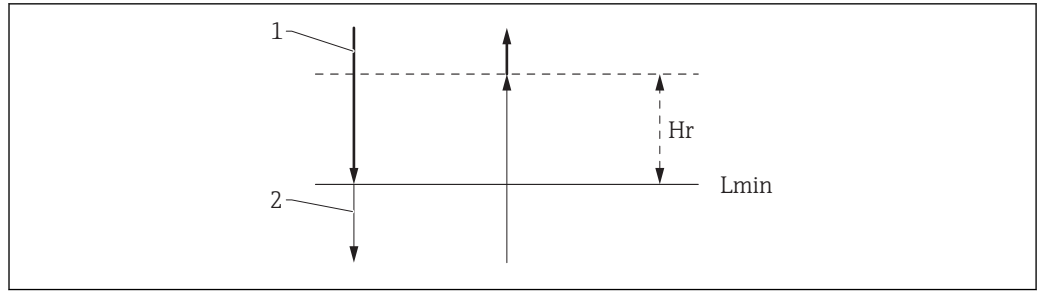
L_{min} is defined in the **Minimum level** parameter (→  271). As can be seen from the formula it always must be bigger than H_{P1}.

If L_p - V falls below this limit, the density is calculated as follows:

- If a previous calculated value is available, this value will be kept as long as no new calculation is possible.
- If no value was previously calculated, the manual value (defined in the **Manual upper density** parameter) will be used.

Hysteresis

The level of the product in a tank is not constant but slightly varies, due for example to filling disturbances. If the level oscillates around the changeover level (**Minimum level** (→  271)), the algorithm will constantly switch between calculating the value and holding the previous result. To avoid this effect a positional hysteresis is defined around the changeover point.



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82 HTMS hysteresis

- 1 Value calculated
- 2 Value held/manual
- L_{min} Minimum level (→ 271)
- H_r Hysteresis (→ 272)

Description of parameters

Navigation Setup → Advanced setup → Application → Tank calculation → HTMS

HTMS mode

| | | | | | |
|-------------------------------|---|-------------|----------|--------------|-------------|
| Navigation | Setup → Advanced setup → Application → Tank calculation → HTMS → HTMS mode | | | | |
| Description | Defines the HTMS mode. Depending on the mode one or two pressure transmitters are used. | | | | |
| Selection | <ul style="list-style-type: none"> ■ HTMS P1 ■ HTMS P1+P3 | | | | |
| Factory setting | HTMS P1 | | | | |
| Additional information | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Read access</td> <td style="padding: 2px;">Operator</td> </tr> <tr> <td style="padding: 2px;">Write access</td> <td style="padding: 2px;">Maintenance</td> </tr> </table> | Read access | Operator | Write access | Maintenance |
| Read access | Operator | | | | |
| Write access | Maintenance | | | | |

Meaning of the options

- HTMS P1
Only a bottom pressure transmitter (P1) is used.
- HTMS P1+P3
A bottom (P1) and top (P3) pressure transmitter are used. This option should be selected for pressurized tanks.

Manual density

| | |
|--------------------|---|
| Navigation | Setup → Advanced setup → Application → Tank calculation → HTMS → Manual density |
| Description | Defines the manual density. |


User entry 0 to 3 000 kg/m³

Factory setting 800 kg/m³

Additional information

| | |
|--------------|-------------|
| Read access | Maintenance |
| Write access | Maintenance |


Density value

Navigation  Setup → Advanced setup → Application → Tank calculation → HTMS → Density value

Description Shows the calculated product density.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Minimum level 

Navigation  Setup → Advanced setup → Application → Tank calculation → HTMS → Minimum level


Description Defines the minimum product level for a HTMS calculation. If Lp - V falls below the limit defined in this parameter, the density retains its last value or the manual value is used instead.

User entry 0 to 20 000 mm

Factory setting 7 000 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Minimum pressure 

Navigation  Setup → Advanced setup → Application → Tank calculation → HTMS → Minimum pressure

Description Defines the minimum pressure for a HTMS calculation. If the pressure P1 (or the difference P1 - P3) falls below the limit defined in this parameter, the density retains its last value or the manual value is used instead.

User entry 0 to 100 bar

Factory setting 0.1 bar

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Safety distance**Navigation**

Setup → Advanced setup → Application → Tank calculation → HTMS → Safety distance

Description

Defines the minimum level which must be present above the bottom pressure sensor before its signal is used for the calculation.

User entry

0 to 10 000 mm

Factory setting

2 000 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Hysteresis**Navigation**

Setup → Advanced setup → Application → Tank calculation → HTMS → Hysteresis

Description

Defines the hysteresis for the HTMS calculation. Prevents constant switching if the level is near the switch-over point.

User entry

0 to 2 000 mm

Factory setting

50 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Water density**Navigation**

Setup → Advanced setup → Application → Tank calculation → HTMS → Water density

Description

Density of the water in the tank.

User entry

Signed floating-point number


Factory setting

1 000 kg/m³

Additional information


| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"Alarm" submenu

Navigation  Setup → Advanced setup → Application → Alarm → Alarm → Alarm mode

Alarm mode



Navigation  Setup → Advanced setup → Application → Alarm → Alarm → Alarm mode

Description Defines the alarm mode of the selected alarm.


- Selection**
- Off
 - On
 - Latching

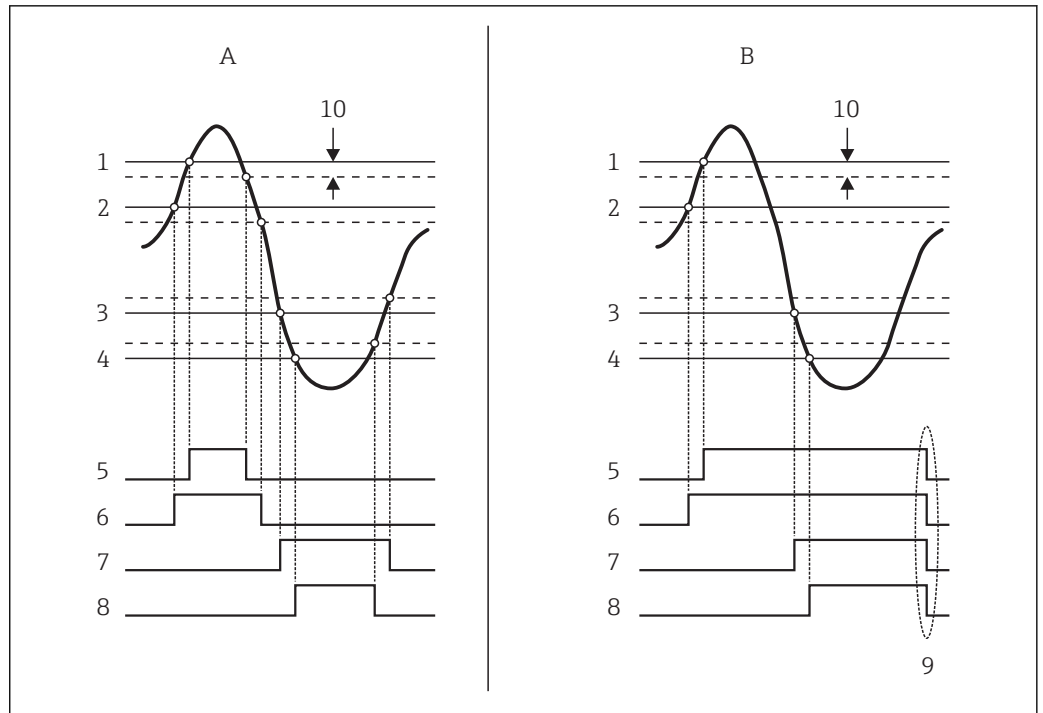
Factory setting Off

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Meaning of the options

- **Off**
No alarms are generated.
- **On**
An alarm disappears if the alarm condition is no longer present (taking into consideration the hysteresis).
- **Latching**
All alarms remain active until the user selects **Clear alarm** (→  280) = **Yes** or the power is switched off and on.



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83 Principle of the limit evaluation

- A Alarm mode (→ 274) = On
- B Alarm mode (→ 274) = Latching
- 1 HH alarm value (→ 277)
- 2 H alarm value (→ 277)
- 3 L alarm value (→ 278)
- 4 LL alarm value (→ 278)
- 5 HH alarm (→ 278)
- 6 H alarm (→ 279)
- 7 L alarm (→ 279)
- 8 LL alarm (→ 279)
- 9 "Clear alarm (→ 280)" = "Yes" or power off-on
- 10 Hysteresis (→ 281)

Error value



Navigation

Setup → Advanced setup → Application → Alarm → Alarm → Error value

Prerequisite

Alarm mode (→ 274) ≠ Off

Description

Defines the alarm to be issued if the input value is invalid.

Selection

- No alarm
- HH+H alarm
- H alarm
- L alarm
- LL+L alarm
- All alarms

Factory setting

All alarms

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Alarm value source



Navigation Setup → Advanced setup → Application → Alarm → Alarm → Alarm value source

Prerequisite **Alarm mode (→ 274) ≠ Off**

Description Determines the process variable to be monitored.



- Selection**
- Tank level
 - Liquid temperature
 - Vapor temperature
 - Water level
 - P1 (bottom)
 - P2 (middle)
 - P3 (top)
 - Observed density value
 - Volume
 - Flow velocity
 - Volume flow
 - Vapor density
 - Middle density
 - Upper density
 - Correction
 - Tank level %
 - GP 1...4 value
 - Measured level
 - P3 position
 - Tank reference height
 - Local gravity
 - P1 position
 - Manual density
 - Tank ullage
 - Average profile density
 - Lower density
 - Upper interface level
 - Lower interface level
 - Bottom level
 - Displacer position
 - HART device 1...15 PV
 - HART device 1...15 SV
 - HART device 1...15 TV
 - HART device 1...15 QV
 - HART device 1...15 PV mA
 - HART device 1...15 PV %
 - Element temperature 1...24
 - AIO B1-3 value
 - AIO C1-3 value
 - AIP B4-8 value
 - AIP C4-8 value
 - None


Factory setting None

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Alarm value

Navigation   Setup → Advanced setup → Application → Alarm → Alarm → Alarm value

Prerequisite **Alarm mode** (→  274) ≠ Off

Description Shows the current value of the process variable being monitored.


User interface Signed floating-point number



Factory setting 0 None


Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

HH alarm value



Navigation   Setup → Advanced setup → Application → Alarm → Alarm → HH alarm value

Prerequisite **Alarm mode** (→  274) ≠ Off

Description Defines the high-high(HH) limit value.


User entry Signed floating-point number



Factory setting 0 None


Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

H alarm value



Navigation   Setup → Advanced setup → Application → Alarm → Alarm → H alarm value

Prerequisite **Alarm mode** (→  274) ≠ Off

Description Defines the high(H) limit value.

User entry Signed floating-point number

Factory setting 0 None

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

L alarm value



Navigation Setup → Advanced setup → Application → Alarm → Alarm → L alarm value

Prerequisite **Alarm mode (→ 274) ≠ Off**

Description Defines the low limit value.

User entry Signed floating-point number

Factory setting 0 None

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

LL alarm value



Navigation Setup → Advanced setup → Application → Alarm → Alarm → LL alarm value

Prerequisite **Alarm mode (→ 274) ≠ Off**

Description Defines the low-low(LL) limit value.

User entry Signed floating-point number

Factory setting 0 None

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

HH alarm

Navigation Setup → Advanced setup → Application → Alarm → Alarm → HH alarm



Prerequisite **Alarm mode (→ 274) ≠ Off**

Description Shows whether an HH alarm is currently active.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

H alarm

Navigation   Setup → Advanced setup → Application → Alarm → Alarm → H alarm



Prerequisite **Alarm mode (→  274) ≠ Off**

Description Shows whether an H alarm is currently active.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

HH+H alarm

Navigation   Setup → Advanced setup → Application → Alarm → Alarm → HH+H alarm

Prerequisite **Alarm mode (→  274) ≠ Off**

Description Shows whether an HH or H alarm is currently active.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

L alarm

Navigation   Setup → Advanced setup → Application → Alarm → Alarm → L alarm

Prerequisite **Alarm mode (→  274) ≠ Off**

Description Shows whether an L alarm is currently active.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

LL alarm

Navigation   Setup → Advanced setup → Application → Alarm → Alarm → LL alarm

Prerequisite **Alarm mode (→  274) ≠ Off**

Description Shows whether an LL alarm is currently active.


Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

LL+L alarm**Navigation**

 Setup → Advanced setup → Application → Alarm → Alarm → LL+L alarm

Prerequisite

Alarm mode (→  274) ≠ Off

Description

Shows whether an LL or L alarm is currently active.


Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Any error**Navigation**

 Setup → Advanced setup → Application → Alarm → Alarm → Any error

Prerequisite

Alarm mode (→  274) ≠ Off

Description

Show whether any alarm is currently active.

User interface

- Unknown
- Inactive
- Active
- Error


Factory setting

Unknown

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Clear alarm**Navigation**

 Setup → Advanced setup → Application → Alarm → Alarm → Clear alarm

Prerequisite

Alarm mode (→  274) = Latching

Description

Deletes an alarm which is still active although the alarm condition is no longer present.

Selection

- No
- Yes

Factory setting

No

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Alarm hysteresis**Navigation**

Setup → Advanced setup → Application → Alarm → Alarm → Alarm hysteresis

Prerequisite

Alarm mode (→ 274) ≠ Off

Description

Defines the hysteresis for the limit values. The hysteresis prevents constant changes of the alarm state if the level is near one of the limit values.

User entry

Signed floating-point number

Factory setting

0.001

Additional information

| | |
|--------------|-------------|
| Read access | Maintenance |
| Write access | Maintenance |

Damping factor**Navigation**

Setup → Advanced setup → Application → Alarm → Alarm → Damping factor

Description

Defines the damping constant (in seconds).

User entry

0 to 999.9 s


Factory setting


0 s


Additional information


| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |



"Safety settings" submenu

Navigation  Setup → Advanced setup → Safety settings


Output out of range 

| | | | | | |
|-------------------------------|---|-------------|----------|--------------|-------------|
| Navigation |  Setup → Advanced setup → Safety settings → Output out of range | | | | |
| Description | Selection of behavior between Alarm or Last valid value when displacer reached HighStoplevel, LowStopLevel or ReferencePosition. | | | | |
| Selection | <ul style="list-style-type: none"> ■ Last valid value ■ Alarm | | | | |
| Factory setting | Last valid value | | | | |
| Additional information | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Read access</td> <td style="padding: 2px;">Operator</td> </tr> <tr> <td style="padding: 2px;">Write access</td> <td style="padding: 2px;">Maintenance</td> </tr> </table> | Read access | Operator | Write access | Maintenance |
| Read access | Operator | | | | |
| Write access | Maintenance | | | | |

Output out of range 

| | | | | | |
|-------------------------------|---|-------------|----------|--------------|-------------|
| Navigation |  Setup → Advanced setup → Safety settings → Output out of range | | | | |
| Description | Selection of behavior when displacer reached High stop level (→  181), Low stop level or Reference position . | | | | |
| Selection | <ul style="list-style-type: none"> ■ Last valid value ■ Alarm | | | | |
| Factory setting | Last valid value | | | | |
| Additional information | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Read access</td> <td style="padding: 2px;">Operator</td> </tr> <tr> <td style="padding: 2px;">Write access</td> <td style="padding: 2px;">Maintenance</td> </tr> </table> | Read access | Operator | Write access | Maintenance |
| Read access | Operator | | | | |
| Write access | Maintenance | | | | |

High stop level 

| | |
|------------------------|--|
| Navigation |  Setup → Advanced setup → Safety settings → High stop level |
| Description | Position of the displacer high stop as measured from defined zero position (tank bottom or datum plate). |
| User entry | -999 999.9 to 999 999.9 mm |
| Factory setting | Dependent on the device version |

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Low stop level



Navigation

Setup → Advanced setup → Safety settings → Low stop level

Description

Position of the displacer low stop as measured from defined zero position (tank bottom or datum plate).

User entry

-999 999.9 to 999 999.9 mm

Factory setting

0 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Slow hoist zone



Navigation

Setup → Advanced setup → Safety settings → Slow hoist zone

Description

Defines the interval in millimeters, measured down from the Reference Position, in which the Displacer reduces moving speed.

User entry

10 to 999 999.9 mm

Factory setting

70 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Overtension weight



Navigation

Setup → Advanced setup → Safety settings → Overtension weight

Description

Sets the minimum Weight in grams when Overtension Alarm will be set.

User entry

100 to 999.9 g

Factory setting

350 g

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Undertension weight

**Navigation**

Setup → Advanced setup → Safety settings → Undertension weight

Description

Defines the undertension error weight. Undertension error will be issued if displacer weight is below this value longer than 7 seconds.

User entry

0 to 300 g


Factory setting

10 g

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"Sensor config" submenu

Navigation  Setup → Advanced setup → Sensor config

Post gauge command



Navigation  Setup → Advanced setup → Sensor config → Post gauge command

Description Defines the gauge command that will be executed after a one-time gauge command has finished.

- Selection**
- Stop
 - Level
 - Up
 - Upper I/F level
 - Lower I/F level
 - None


Factory setting Level


Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"Displacer" submenu

Navigation  Setup → Advanced setup → Sensor config → Displacer

Displacer type 

Navigation  Setup → Advanced setup → Sensor config → Displacer → Displacer type


Description Chooses the type of displacer used.


- Selection**
- Custom diameter
 - Diameter 30 mm
 - Diameter 50 mm
 - Diameter 70 mm
 - Diameter 110 mm


Factory setting Dependent on the device version

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Displacer diameter 

Navigation  Setup → Advanced setup → Sensor config → Displacer → Displacer diameter

Prerequisite **Displacer type** (→  286) = **Custom diameter**


Description Sets the diameter of the cylindrical part of displacer.


User entry 0 to 999.9 mm

Factory setting See label on the device.

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Displacer weight 

Navigation  Setup → Advanced setup → Sensor config → Displacer → Displacer weight

Description Set the weight of the displacer in air. Indicated on the displacer in grams.

User entry 10 to 999.9 g

Factory setting See label on the device.

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Displacer volume



Navigation

Setup → Advanced setup → Sensor config → Displacer → Displacer volume

Description

Displacer volume indicated on displacer in milliliter.

User entry

10 to 999.9 ml

Factory setting

See label on the device.

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Displacer balance volume



Navigation

Setup → Advanced setup → Sensor config → Displacer → Displacer balance volume

Description

Defines the balance volume of the displacer as the lower part of displacer immersed in liquid. Units in milliliters. Indicated on displacer.

User entry

10 to 999.9 ml

Factory setting

See label on the device.

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Displacer height



Navigation

Setup → Advanced setup → Sensor config → Displacer → Displacer height

Description

Sets the displacer height in mm.

User entry

10 to 300 mm

Factory setting

Dependent on the device version

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Immersion depth

**Navigation**

Setup → Advanced setup → Sensor config → Displacer → Immersion depth

Description

Defines distance (mm) from displacer bottom to balancing line defined by balanced volume. Value is needed for correct bottom level measurement.

User entry

0 to 99.9 mm

Factory setting


Dependent on the device version


Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"Wiredrum" submenu

Navigation  Setup → Advanced setup → Sensor config → Wiredrum

Drum circumference 

Navigation  Setup → Advanced setup → Sensor config → Wiredrum → Drum circumference


Description Sets the circumference of the wire drum. Indicated in Label.

User entry 100 to 999.9 mm

Factory setting See label on the device.

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Wire weight 

Navigation  Setup → Advanced setup → Sensor config → Wiredrum → Wire weight

Description Defines the weight of the measuring wire in g/10m. Indicated on Label.


User entry 0 to 999.9 g


Factory setting See label on the device.

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"Spot density" submenu

Navigation  Setup → Advanced setup → Sensor config → Spot density

Upper density offset 

Navigation  Setup → Advanced setup → Sensor config → Spot density → Upper density offset


Description Defines an offset value which is added to the measured upper density value.

User entry -999.99 to 999.99 kg/m³

Factory setting 0 kg/m³

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Middle density offset 

Navigation  Setup → Advanced setup → Sensor config → Spot density → Middle density offset


Description Defines an Offset Value which is added to the measured Middle Density Value.

User entry -999.99 to 999.99 kg/m³

Factory setting 0 kg/m³

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Lower density offset 

Navigation  Setup → Advanced setup → Sensor config → Spot density → Lower density offset

Description Defines an offset value which is added to the measured lower density value.

User entry -999.99 to 999.99 kg/m³

Factory setting 0 kg/m³

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Submersion depth



Navigation Setup → Advanced setup → Sensor config → Spot density → Submersion depth

Description Sets the displacer submersion depth (mm) for spot density operations.


User entry 50 to 99 999.9 mm


Factory setting 150 mm


Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"Profile density" submenu

Navigation  Setup → Advanced setup → Sensor config → Profile density

Density measurement mode 

Navigation  Setup → Advanced setup → Sensor config → Profile density → Density measurement mode

Description In normal measure mode, measures at specified positions. In compensation mode measures using next integer value of drum turns to improve accuracy.


Selection

- Normal measure mode
- Compensation mode

Factory setting Normal measure mode

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Manual profile level 

Navigation  Setup → Advanced setup → Sensor config → Profile density → Manual profile level


Description Sets the level position in the tank where the manual profile density operation starts.

User entry -999 999.9 to 999 999.9 mm

Factory setting 1 000 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Profile density offset distance 

Navigation  Setup → Advanced setup → Sensor config → Profile density → Profile density offset distance

Description Profile density offset distance [mm] is the distance between start point and first measurement point.

User entry 0 to 999 999.9 mm

Factory setting 500 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Profile density interval



Navigation

Setup → Advanced setup → Sensor config → Profile density → Profile density interval

Description

Sets the interval between two measurement points in profile density operation.

User entry

1 to 100 000 mm

Factory setting

1 000 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Profile density offset



Navigation

Setup → Advanced setup → Sensor config → Profile density → Profile density offset

Description

Defines an offset value which is added to the measured profile density value.

User entry

-999.99 to 999.99 kg/m³

Factory setting

0 kg/m³

Additional information


| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"Display" submenu

This menu is only visible if the device has a local display.

Navigation  Setup → Advanced setup → Display

Language

Navigation  Setup → Advanced setup → Display → Language

Prerequisite The device has a local display.

Description Set display language.


- Selection**
- English
 - Deutsch *
 - Français *
 - Español *
 - Italiano *
 - Nederlands *
 - Portuguesa *
 - Polski *
 - русский язык (Russian) *
 - Svenska *
 - Türkçe *
 - 中文 (Chinese) *
 - 日本語 (Japanese) *
 - 한국어 (Korean) *
 - العربية (Arabic) *
 - Bahasa Indonesia *
 - ภาษาไทย (Thai) *
 - tiếng Việt (Vietnamese) *
 - čeština (Czech) *

Factory setting English

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | Operator |

Format display

Navigation  Setup → Advanced setup → Display → Format display

Prerequisite The device has a local display.

Description Select how measured values are shown on the display.



* Visibility depends on order options or device settings

- Selection**
- 1 value, max. size
 - 1 bargraph + 1 value
 - 2 values
 - 1 value large + 2 values
 - 4 values

Factory setting 2 values



Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | Operator |

- The **Value 1 to 4 display** (→  295) parameters specify which measured values are shown on the display and in which order.
- If more measured values are specified than the current display mode permits, the values alternate on the device display. The display time until the next change is configured in the **Display interval** parameter (→  298).

Value 1 to 4 display



Navigation   Setup → Advanced setup → Display → Value 1 display

Prerequisite The device has a local display.

Description Select the measured value that is shown on the local display.

- Selection**
- None ⁸⁾
 - Tank level
 - Measured level
 - Tank level %
 - Water level ⁸⁾
 - Liquid temperature ⁸⁾
 - Vapor temperature ⁸⁾
 - Air temperature ⁸⁾
 - Tank ullage
 - Tank ullage %
 - Observed density value ⁸⁾
 - P1 (bottom) ⁸⁾
 - P2 (middle) ⁸⁾
 - P3 (top) ⁸⁾
 - GP 1 value ⁸⁾
 - GP 2 value ⁸⁾
 - GP 3 value ⁸⁾
 - GP 4 value ⁸⁾
 - Gauge command ⁸⁾
 - Gauge status ⁸⁾
 - AIO B1-3 value ⁸⁾
 - AIO B1-3 value mA ⁸⁾
 - AIO B1-3 value % ⁸⁾
 - AIO C1-3 value ⁸⁾
 - AIO C1-3 value mA ⁸⁾
 - AIO C1-3 value % ⁸⁾

8) not available for the **Value 1 display** parameter

- AIP B4-8 value ⁸⁾
- AIP B4-8 value mA ⁸⁾
- AIP B4-8 value % ⁸⁾
- AIP C4-8 value ⁸⁾
- AIP C4-8 value mA ⁸⁾
- AIP C4-8 value % ⁸⁾

Factory setting

Depending on device version

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Decimal places 1 to 4



Navigation

Setup → Advanced setup → Display → Decimal places 1

Prerequisite

The device has a local display.

Description

This selection does not affect the measurement and calculation accuracy of the device.

Selection

- X
- X.X
- X.XX
- X.XXX
- X.XXXX

Factory setting

x.x

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Separator



Navigation

Setup → Advanced setup → Display → Separator

Prerequisite

The device has a local display.

Description

Select decimal separator for displaying numerical values.

Selection

- .
- ,

Factory setting

.

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Number format



Navigation Setup → Advanced setup → Display → Number format

Prerequisite The device has a local display.

Description Choose number format for the display.

- Selection**
- Decimal
 - ft-in-1/16"

Factory setting Decimal

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

The **ft-in-1/16"** option is only valid for distance values.

Header



Navigation Setup → Advanced setup → Display → Header

Prerequisite The device has a local display.

Description Select header contents on local display.

- Selection**
- Device tag
 - Free text

Factory setting Device tag

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Meaning of the options

- **Device tag**
The header contents is defined in the **Device tag** parameter (→ 312).
- **Free text**
The header contents is defined in the **Header text** parameter (→ 297).

Header text



Navigation Setup → Advanced setup → Display → Header text

Prerequisite Header (→ 297) = Free text



Description Enter display header text.

Factory setting TG-Platform

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Display interval

Navigation   Setup → Advanced setup → Display → Display interval

Description Set time measured values are shown on display if display alternates between values.



User entry 1 to 10 s

Factory setting 5 s

Additional information

| | |
|---------------------|----------|
| Read access | Operator |
| Write access | Operator |

Display damping

Navigation   Setup → Advanced setup → Display → Display damping

Prerequisite The device has a local display.

Description Set display reaction time to fluctuations in the measured value.



User entry 0.0 to 999.9 s

Factory setting 0.0 s

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Backlight

Navigation   Setup → Advanced setup → Display → Backlight

Prerequisite The device has a local display.

Description Switch the local display backlight on and off.


Selection ▪ Disable
 ▪ Enable

Factory setting Enable

Additional information

| | |
|---------------------|----------|
| Read access | Operator |
| Write access | Operator |

Contrast display

Navigation  Setup → Advanced setup → Display → Contrast display

Prerequisite The device has a local display.

Description Adjust local display contrast setting to ambient conditions (e.g. lighting or reading angle).


User entry 20 to 80 %


Factory setting 30 %


Additional information

| | |
|---------------------|----------|
| Read access | Operator |
| Write access | Operator |

"System units" submenu

Navigation  Setup → Advanced setup → System units

Units preset 

Navigation  Setup → Advanced setup → System units → Units preset

Description Defines a set of units for length, pressure and temperature.





- Selection**
- mm, bar, °C
 - m, bar, °C
 - mm, PSI, °C
 - ft, PSI, °F
 - ft-in-16, PSI, °F
 - ft-in-8, PSI, °F
 - Customer value

Factory setting mm, bar, °C


Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

If the **Customer value** option is selected, the units are defined in the following parameters:

- Distance unit (→  300)
- Pressure unit (→  301)
- Temperature unit (→  301)
- Density unit (→  301)

In any other case these are read-only parameters used to indicate the respective unit.

Distance unit 


Navigation  Setup → Advanced setup → System units → Distance unit

Description Select distance unit.

- Selection**
- | | |
|--|--|
| <p><i>SI units</i></p> <ul style="list-style-type: none"> ■ m ■ mm ■ cm | <p><i>US units</i></p> <ul style="list-style-type: none"> ■ ft ■ in ■ ft-in-16 ■ ft-in-8 |
|--|--|

Factory setting mm

Additional information

| | |
|--------------|---|
| Read access | Operator |
| Write access | Maintenance (if Units preset (→  177) = Customer value) |

Pressure unit



Navigation Setup → Advanced setup → System units → Pressure unit

Description Select process pressure unit.

Selection

| | | |
|--|------------------------|--|
| <i>SI units</i> ■ bar ■ Pa ■ kPa ■ MPa ■ mbar a | <i>US units</i> psi | <i>Other units</i> ■ inH2O ■ inH2O (68°F) ■ ftH2O (68°F) ■ mmH2O ■ mmHg |
|--|------------------------|--|

Factory setting bar

Additional information

| | |
|--------------|--|
| Read access | Operator |
| Write access | Maintenance (if Units preset (→ 177) = Customer value) |

Temperature unit



Navigation Setup → Advanced setup → System units → Temperature unit

Description Select temperature unit.

Selection

| | |
|--------------------------------|---------------------------------|
| <i>SI units</i> ■ °C ■ K | <i>US units</i> ■ °F ■ °R |
|--------------------------------|---------------------------------|

Factory setting °C

Additional information

| | |
|--------------|--|
| Read access | Operator |
| Write access | Maintenance (if Units preset (→ 177) = Customer value) |

Density unit



Navigation Setup → Advanced setup → System units → Density unit

Description Select density unit.


Selection

| | | |
|--|--|---------------------------------------|
| <i>SI units</i> ■ g/cm ³ ■ g/ml ■ g/l ■ kg/l ■ kg/dm ³ ■ kg/m ³ | <i>US units</i> ■ lb/ft ³ ■ lb/gal (us) ■ lb/in ³ ■ STon/yd ³ | <i>Other units</i> ■ °API ■ SGU |
|--|--|---------------------------------------|


Factory settingkg/m³**Additional information**

| | |
|---------------------|---|
| Read access | Operator |
| Write access | Maintenance (if Units preset (→  177) = Customer value) |

"Date / time" submenu

Navigation  Setup → Advanced setup → Date / time

Date/time

Navigation  Setup → Advanced setup → Date / time → Date/time


Description Displays the device internal real time clock.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Set date



Navigation  Setup → Advanced setup → Date / time → Set date

Description Controls the setting of the real-time clock.

Selection

- Please select
- Abort
- Start
- Confirm time

Factory setting Please select

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |


Meaning of the options

- **Please select**
Prompts the user to select an action.
- **Abort**
Discards the entered date and time.
- **Start**
Starts the setting of the real time clock.
- **Confirm time**
Sets the real-time clock to the entered date and time.

Year



Navigation  Setup → Advanced setup → Date / time → Year

Prerequisite Set date (→  303) = Start

Description Enter the current year.


User entry 2 016 to 2 079


Factory setting 2 016

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Month

Navigation  Setup → Advanced setup → Date / time → Month

Prerequisite **Set date (→  303) = Start**

Description Enter the current month.

User entry 1 to 12


Factory setting 1

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Day

Navigation  Setup → Advanced setup → Date / time → Day

Prerequisite **Set date (→  303) = Start**

Description Enter the current day.

User entry 1 to 31


Factory setting 1

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Hour

Navigation  Setup → Advanced setup → Date / time → Hour

Prerequisite **Set date (→  303) = Start**

Description Enter the current hour.

User entry 0 to 23

Factory setting 0

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Minute



Navigation Setup → Advanced setup → Date / time → Minute

Prerequisite Set date (→ 303) = Start

Description Enter the current minute.


User entry 0 to 59


Factory setting 0

Additional information


| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

"SIL confirmation" wizard

-  The **SIL confirmation** wizard is only available for devices with SIL or WHG approval (Feature 590: "Additional Approval", option LA: "SIL" or LC: "WHG overflow prevention") which are currently **not** in the SIL- or WHG-locked state.
- The **SIL confirmation** wizard is required to lock the device according to SIL or WHG. For details refer to the "Functional Safety Manual" of the respective device, which describes the locking procedure and the parameters of this wizard.


Navigation  Setup → Advanced setup → SIL confirmation


"Deactivate SIL/WHG" wizard

-  The **Deactivate SIL/WHG** wizard is only available for devices with SIL or WHG approval (Feature 590: "Additional Approval", option LA: "SIL" or LC: "WHG overflow prevention") which are currently in the SIL- or WHG-locked state.
- The **Deactivate SIL/WHG** wizard is required to undo the locking of the device according to SIL or WHG. For details refer to the "Functional Safety Manual" of the respective device, which describes the locking procedure and the parameters of this wizard.

Navigation  Setup → Advanced setup → Deactivate SIL/WHG

"Administration" submenu

Navigation  Setup → Advanced setup → Administration

Define access code 

Navigation  Setup → Advanced setup → Administration → Define access code





Description Define release code for write access to parameters.

User entry 0 to 9999

Factory setting 0

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

-  If the factory setting is not changed or 0 is defined as the access code, the parameters are not write-protected and the configuration data of the device can then always be modified. The user is logged on in the *Maintenance* role.
-  The write protection affects all parameters marked with the  symbol in this document.
-  Once the access code has been defined, write-protected parameters can only be modified if the access code is entered in the **Enter access code** parameter.

Device reset 

Navigation   Setup → Advanced setup → Administration → Device reset

Description Reset the device configuration - either entirely or in part - to a defined state.

Selection

- Cancel
- To fieldbus defaults **
- To factory defaults *
- Restart device

Factory setting Cancel

Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

** Visibility depends on communication
 * Visibility depends on order options or device settings

15.4 "Diagnostics" menu

Navigation  Diagnostics

Actual diagnostics

Navigation  Diagnostics → Actual diagnostics


Description Shows the current occurred diagnostic event along with its diagnostic information.



Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

The display consists of:

- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

 If several messages are active at the same time, the messages with the highest priority is displayed.

 Information on what is causing the message, and remedy measures, can be viewed via the  symbol on the display.

Timestamp

Navigation  Diagnostics → Timestamp

Description Displays the timestamp for the currently active diagnostic message.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Previous diagnostics

Navigation  Diagnostics → Previous diagnostics


Description Shows the diagnostic event that occurred prior to the current diagnostic event along with its diagnostic information.


Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

The display consists of:

- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

 If several messages are active at the same time, the messages with the highest priority is displayed.

 Information on what is causing the message, and remedy measures, can be viewed via the ⓘ symbol on the display.

Timestamp

Navigation  Diagnostics → Timestamp

Description Shows the timestamp of the previous diagnostic message.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Operating time from restart

Navigation  Diagnostics → Operating time from restart

Description Shows the time the device has been in operation since the last device restart.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Operating time

Navigation  Diagnostics → Operating time

Description Indicates how long the device has been in operation.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Date/time

Navigation Diagnostics → Date/time**Description**

Displays the device internal real time clock.



Additional information

| | |
|---------------------|----------|
| Read access | Operator |
| Write access | - |


15.4.1 "Diagnostic list" submenu

Navigation   Diagnostics → Diagnostic list



Diagnostics 1 to 5

| | |
|-------------------------------|--|
| Navigation |   Diagnostics → Diagnostic list → Diagnostics 1 to 5 |
| Description | Display the current diagnostics messages with the highest to fifth-highest priority. |
| Additional information | The display consists of: <ul style="list-style-type: none">■ Symbol for event behavior■ Code for diagnostic behavior■ Operating time of occurrence■ Event text |



Timestamp 1 to 5

| | |
|--------------------|---|
| Navigation |  Diagnostics → Diagnostic list → Timestamp |
| Description | Timestamp of the diagnostic message. |

15.4.2 "Device information" submenu

Navigation   Diagnostics → Device information

Device tag

Navigation   Diagnostics → Device information → Device tag

Description Shows the device tag.

Factory setting NMS8x

Additional information

| | |
|---------------------|----------|
| Read access | Operator |
| Write access | - |

Serial number

Navigation   Diagnostics → Device information → Serial number

Description Shows the serial number of the measuring device.

Additional information

| | |
|---------------------|----------|
| Read access | Operator |
| Write access | - |

Firmware version



Navigation   Diagnostics → Device information → Firmware version

Description Shows the device firmware version installed.

Additional information

| | |
|---------------------|----------|
| Read access | Operator |
| Write access | - |

Firmware CRC

Navigation   Diagnostics → Device information → Firmware CRC


Description Result of the cyclic redundancy check of the firmware.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Weight and measures configuration CRC

Navigation

 Diagnostics → Device information → Weight and measures configuration CRC

Description


Result of the cyclic redundancy check of the weights and measure relevant parameters.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Device name

Navigation

 Diagnostics → Device information → Device name

Description

Shows the name of the transmitter.


Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Order code



Navigation

 Diagnostics → Device information → Order code

Description

Shows the device order code.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | Service |

Extended order code 1 to 3



Navigation

 Diagnostics → Device information → Extended order code 1

Description

Display the three parts of the extended order code.


Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | Service |


The extended order code indicates the selected option of all ordering features and thus uniquely identifies the device.

15.4.3 "Simulation" submenu

| | |
|-------------|-------------|
| Read access | Maintenance |
|-------------|-------------|

Navigation  Diagnostics → Simulation

Device alarm simulation

Navigation   Diagnostics → Simulation → Device alarm simulation

Description Switch the device alarm on and off.

Selection



- Off
- On

Factory setting Off

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Diagnostic event simulation

Navigation   Diagnostics → Simulation → Diagnostic event simulation


Description Select a diagnostic event to simulate this event.

Selection The diagnostic events of the device

Factory setting Off

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

 To terminate the simulation, select **Off**.

Simulation distance on

Navigation   Diagnostics → Simulation → Simulation distance on

Description Switches the distance simulation on or off.

Selection

- Off
- On

Factory setting Off

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Simulation distance



Navigation Diagnostics → Simulation → Simulation distance

Prerequisite **Simulation distance on (→ 315) = On**

Description Defines the distance value to be simulated.

User entry Signed floating-point number

Factory setting 0 mm

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Current output simulation



Navigation Diagnostics → Simulation → Current output 1 simulation

Diagnostics → Simulation → Current output 2 simulation

Prerequisite

- The device has an Anlog I/O module.
- **Operating mode (→ 205) = 4..20mA output or HART slave +4..20mA output**

Description Switches the simulation of the current on or off.

Selection

- Off
- On

Factory setting Off

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Simulation value



Navigation Diagnostics → Simulation → Simulation value

Diagnostics → Simulation → Simulation value

Prerequisite **Current output simulation (→ 316) = On**

Description Defines the current to be simulated.

User entry 3.4 to 23 mA

Factory setting The current at the time the simulation was started.


Additional information

| | |
|---------------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

15.4.4 "Device check" submenu

Navigation  Diagnostics → Device check

Result drum check


Navigation  Diagnostics → Device check → Result drum check


Description Gives feedback on the latest status of the commissioning check.


Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

"Commissioning check" wizard

Navigation  Diagnostics → Device check → Commissioning check

Commissioning check 

Navigation  Diagnostics → Device check → Commissioning check → Commissioning check

Description This sequence supports checking of the hardware on sensor side and correct installation of the sensor.

Additional information

| | |
|--------------|-------------|
| Read access | Operator |
| Write access | Maintenance |

Result drum check


Navigation  Diagnostics → Device check → Commissioning check → Result drum check

Description Gives feedback on the latest status of the commissioning check.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

Step X / 11

Navigation  Diagnostics → Device check → Commissioning check → Step X / 11

Description Indicates which step of the commissioning check is currently running.

Additional information

| | |
|--------------|----------|
| Read access | Operator |
| Write access | - |

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