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71633337
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Brief Operating Instructions
Tankside Monitor NRF81

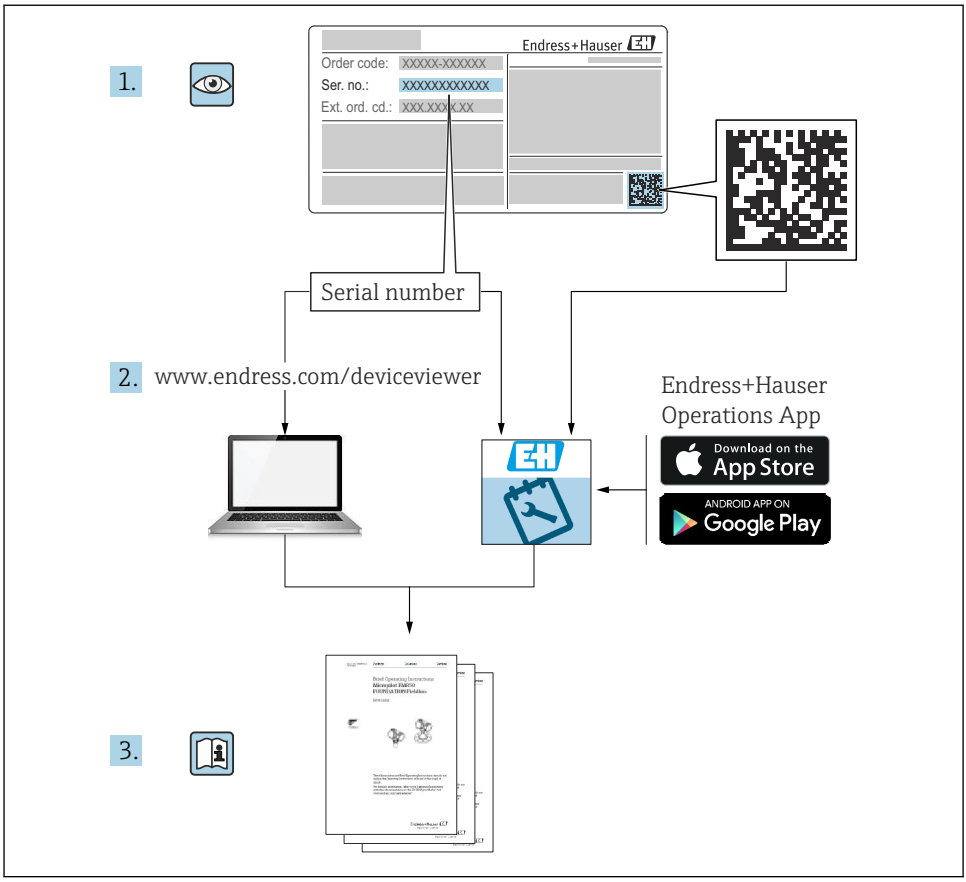
Tank Gauging

These Instructions are Brief Operating Instructions; they are not a substitute for the Operating Instructions pertaining to the device.

Detailed information about the device can be found in the Operating Instructions and the other documentation:
Available for all device versions via:
- Internet: www.endress.com/deviceviewer
- Smart phone/tablet: *Endress+Hauser Operations App*

Endress+Hauser
People for Process Automation

1 Associated documentation



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2 About this document

2.1 Symbols

2.1.1 Safety symbols

⚠ DANGER
This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

⚠ WARNING
This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

⚠ CAUTION
This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE
This symbol contains information on procedures and other facts which do not result in personal injury.

2.1.2 Electrical symbols

Alternating current

Direct current and alternating current

Direct current

Ground connection

A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

⏚ Protective earth (PE)

Ground terminals that must be connected to ground prior to establishing any other connections.

The ground terminals are located on the interior and exterior of the device:
- Interior ground terminal: protective earth is connected to the mains supply.
- Exterior ground terminal: device is connected to the plant grounding system.

2.1.3 Tool symbols

Phillips head screwdriver

Flat blade screwdriver


Torx screwdriver


Allen key


Open-ended wrench

2.1.4 Symbols for certain types of information and graphics

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 graphic

▶
Notice or individual step to be observed

1., 2., 3.
Series of steps


Result of a step


Visual inspection


Operation via operating tool


Write-protected parameter

1, 2, 3, ...
Item numbers

A, B, C, ...
Views

⚠ → 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

3 Basic safety instructions

3.1 Requirements for the personnel

The personnel must fulfill the following requirements for its tasks:
- 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.

3.2 Intended use

Application and measured materials
The device described in these Operating Instructions is a monitoring unit for use with the Endress+Hauser Micropilot M and Micropilot S-series radars and other HART compatible devices. Mounted at the tank side, it provides indication of measured data, allows configuration and supplies intrinsically safe (i.s.) or explosion proof (XP) power to the connected sensors on the tank. Various industry standard digital gauging communication protocols support integration into open architecture tank gauging and inventory systems.

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).
- 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.

3.3 Workplace safety

For work on and with the device:
- Wear the required personal protective equipment according to federal/national regulations.

3.4 Operational safety

Risk of injury!
- Operate the device only if it is in proper technical condition, free from errors and faults.
- The operator is responsible for interference-free operation of the device.

Hazardous area

To eliminate danger to persons or the facility when the device is used in the hazardous area (e.g. explosion protection):
- Check the nameplate to verify if the device ordered can be put to its intended use in the hazardous area.
- Observe the specifications in the separate supplementary documentation that is an integral part of these instructions.

3.5 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 the general safety standards and legal requirements.

NOTICE

Loss of degree of protection by opening of the device in humid environments
- If the device is opened in a humid environment, the degree of protection indicated on the nameplate is no longer valid. This may also impair the safe operation of the device.

3.5.1 CE mark

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

The manufacturer confirms successful testing of the device by affixing to it the CE mark.

3.5.2 EAC conformity

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

The manufacturer confirms successful testing of the device by affixing to it the EAC mark.

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 device:
- Nameplate specifications
- Enter the serial number from the nameplate in the *Device Viewer* (www.endress.com/deviceviewer): all the information about the device and an overview of the Technical Documentation supplied with the device are displayed.
- Enter the serial number on the nameplate 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 about the device and the technical documentation pertaining to the device is displayed.

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

4.2.1 Manufacturer address

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

Place of manufacture: 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

⚠ CAUTION

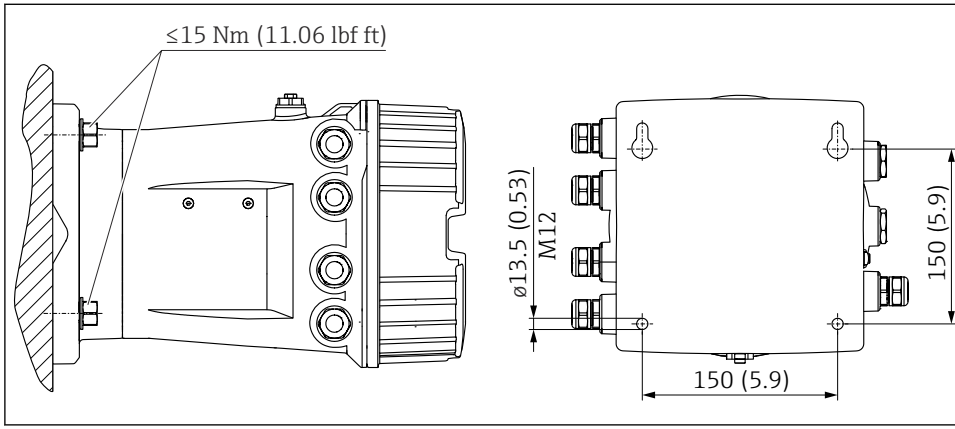
Risk of injury

- ▶ 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 18 kg (39.6 lb) (IEC 61010).

5 Mounting

5.1 Mounting requirements

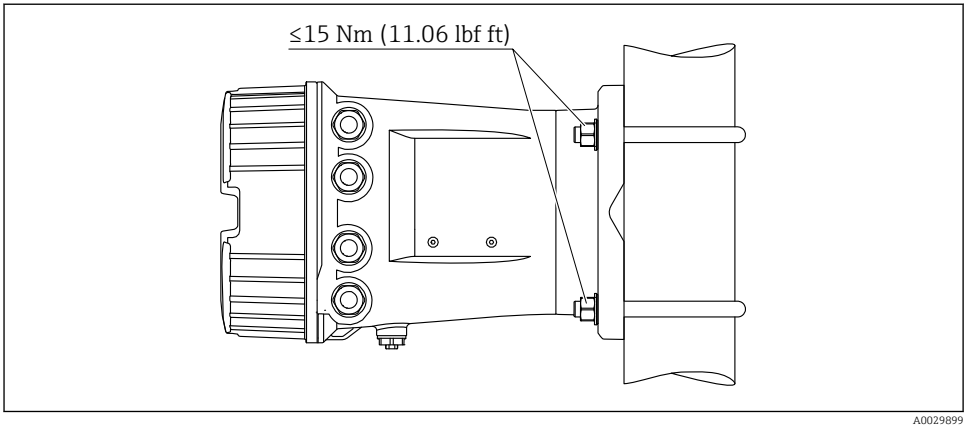
5.1.1 Wall mounting



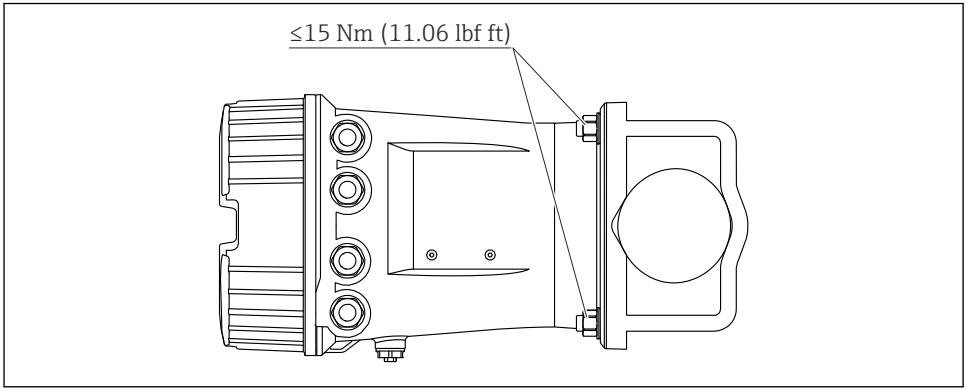
1 Wall mounting of the Tankside Monitor

5.1.2 Pipe mounting

Ordering feature 620 "Accessory enclosed"	Mounting kit
PV	Mounting kit, pipe, DN32-50 (1-1/4" - 2")
PW	Mounting kit, pipe, DN80 (3")



2 Mounting of the Tankside Monitor at a vertical pipe



3 Mounting of the Tankside Monitor at a horizontal pipe

6 Electrical connection

6.1 Connecting requirements

6.1.1 Cable specification

Terminals

Wire cross section 0.2 to 2.5 mm² (24 to 13 AWG)
Use for terminals with function: Signal and power supply
- Spring terminals (NRF81-xx1...)
- Screw terminals (NRF81-xx2...)

Wire cross section max. 2.5 mm² (13 AWG)
Use for terminals with function: Ground terminal in the terminal compartment

Wire cross section max. 4 mm² (11 AWG)
Use for terminals with function: Ground terminal at the housing

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

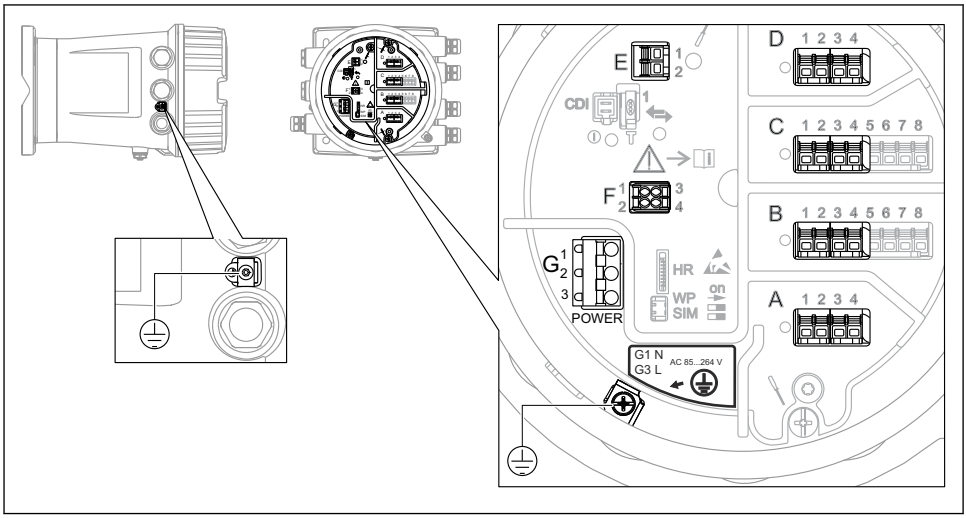
- 2-wire twisted pair, screened or unscreened cable
- Resistance in one cable: ≤ 120 Ω
- Capacitance between lines: ≤ 0.3 µF

WM550 communication line

- 2-wire twisted pair, unscreened cable
- Cross section minimum 0.5 mm² (20 AWG)
- Maximum total cable resistance: ≤ 250 Ω
- Cable with low capacitance

6.2 Connecting the device

6.2.1 Terminal assignment



4 *Terminal compartment (typical example) and ground terminals*

Housing thread
The threads of the electronics and connection compartment can be coated with an anti-friction coating.
The following applies for all housing materials:
Do not lubricate the housing threads.

Terminal area A/B/C/D (slots for I/O modules)
Module: Up to four I/O modules, depending on the order code
- Modules with four terminals can be in any of these slots.
- Modules with eight terminals can be in slot B or C.

The exact assignment of the modules to the slots is dependent on the device version → 17.

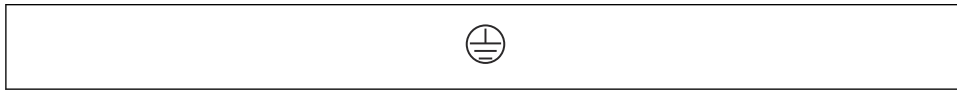
Terminal area E
Module: HART Ex i/IS interface
- E1: H+
- E2: H-

Terminal area F
Remote display
- 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)

Terminal area G (for High voltage AC power supply and Low voltage AC power supply)
- G1: N
- G2: not connected
- G3: L

Terminal area G (for Low voltage DC power supply)
- G1: L-
- G2: not connected
- G3: L+

Terminal area: Protective ground
Module: Protective ground connection (M4 screw)



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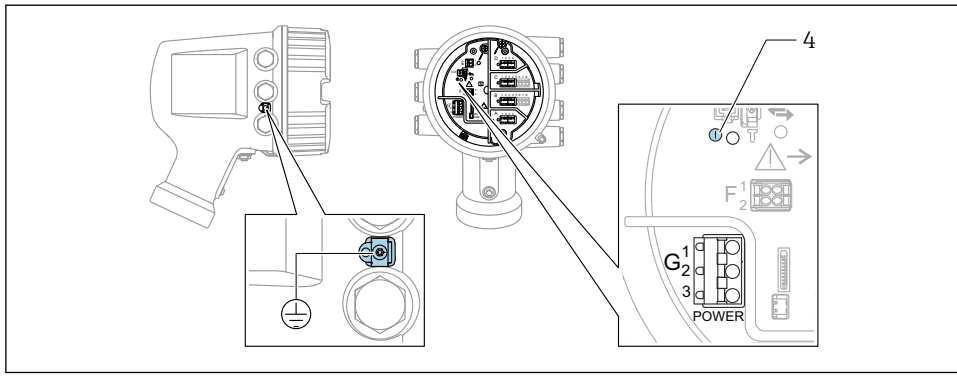
5 Terminal area: Protective ground

Power supply



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

The supply voltage is also indicated on the nameplate.

Supply voltage

High voltage AC power supply:
Operational value:
100 to 240 V_{AC} (- 15 % + 10 %) = 85 to 264 V_{AC} , 50/60 Hz

Low voltage AC power supply:
Operational value:
65 V_{AC} (- 20 % + 15 %) = 52 to 75 V_{AC} , 50/60 Hz

Low voltage DC power supply:
Operational value:
24 to 55 V_{DC} (- 20 % + 15 %) = 19 to 64 V_{DC}

Power consumption

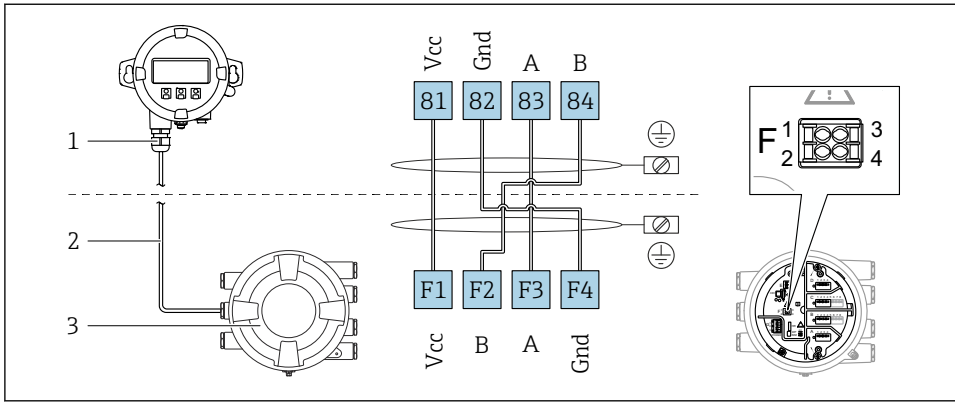
Maximum power varies depending on the configuration of the modules. The value shows maximum apparent power, select the applicable cables accordingly. The actual consumed effective power is 12 W.

High voltage AC power supply:
28.8 VA

Low voltage AC power supply:
21.6 VA

Low voltage DC power supply:
13.4 W

Remote display and operating module DKX001



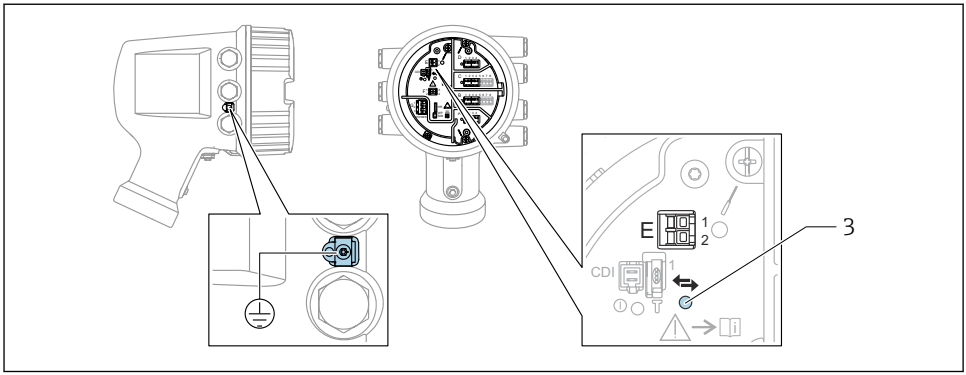
6 *Connection of the remote display and operating module DKX001 to the Tank Gauging device (NMR8x, NMS8x or NRF8x)*

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

The remote display and operating module DKX001 is available as an accessory. For details refer to SD01763D.

- 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).

HART Ex i/IS interface



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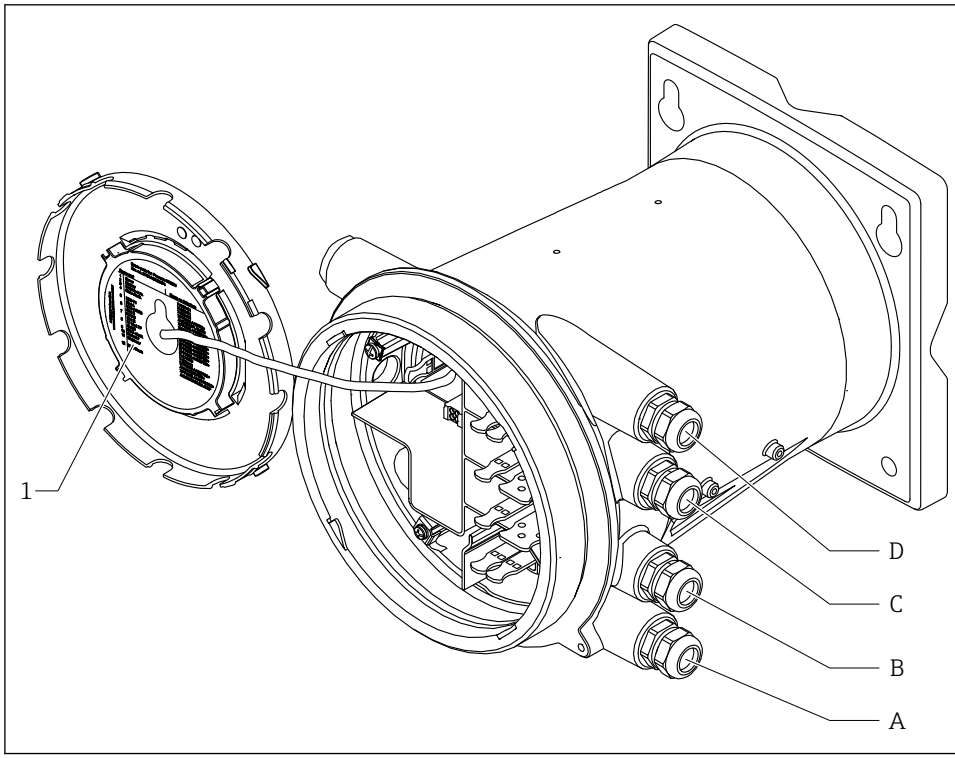
E1 H+
E2 H-
3 Orange LED: indicates data communication

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 → 20 → 23.

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



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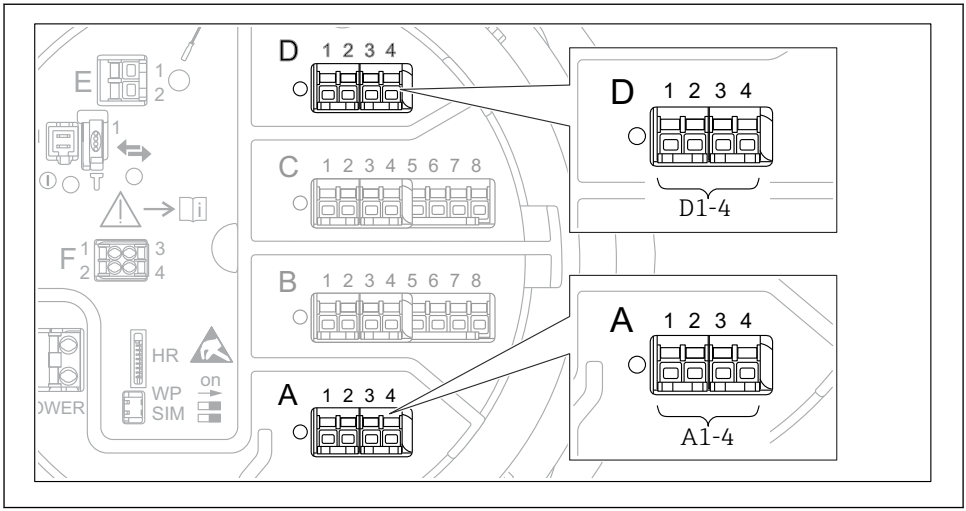
1 Label showing (among other things) the modules in the slots A to D.
A Cable entry for slot A
B Cable entry for slot B
C Cable entry for slot C
D Cable entry for slot D

Terminals of the "Modbus" module, "V1" module or "WM550" module



7 Designation of the "Modbus", "V1" or "WM550" 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" or "WM550" module may be in different slots of the terminal compartment. In the operating menu the "Modbus" and "V1" or "WM550" 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
Designation of the module in the operating menu: **Modbus X1-4**; (X = A, B, C or D)
- X1 [1)]
  - Terminal name: S
  - Description: Cable shielding connected via a capacitor to EARTH
- X2 [1)]
  - Terminal name: 0V
  - Description: Common reference
- X3 [1)]
  - Terminal name: B-
  - Description: Non-inverting signal line
- X4 [1)]
  - Terminal name: A+
  - Description: Inverting signal line

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

Terminals of the "V1" and "WM550" module
Designation of the module in the operating menu: **V1 X1-4** or **WM550 X1-4**; (X = A, B, C or D)

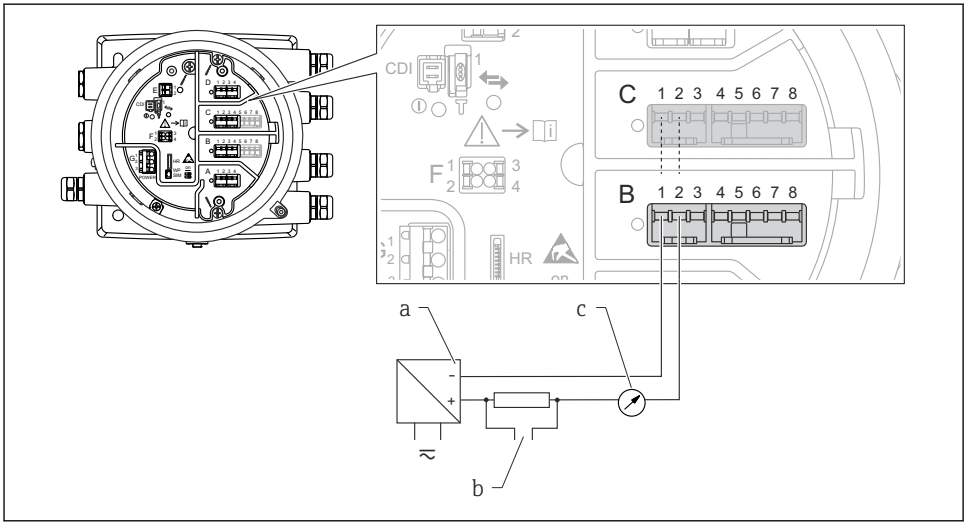
- X1 [2)]
  - Terminal name: S
  - Description: Cable shielding connected via a capacitor to EARTH
- X2 [1)]
  - Terminal name: -
  - Description: not connected
- X3 [1)]
  - Terminal name: B-
  - Description: Protocol loop signal -
- X4 [1)]
  - Terminal name: A+
  - Description: Protocol loop signal +

2) Here, "X" stands for one of the slots "A", "B", "C", or "D".

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

- 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"



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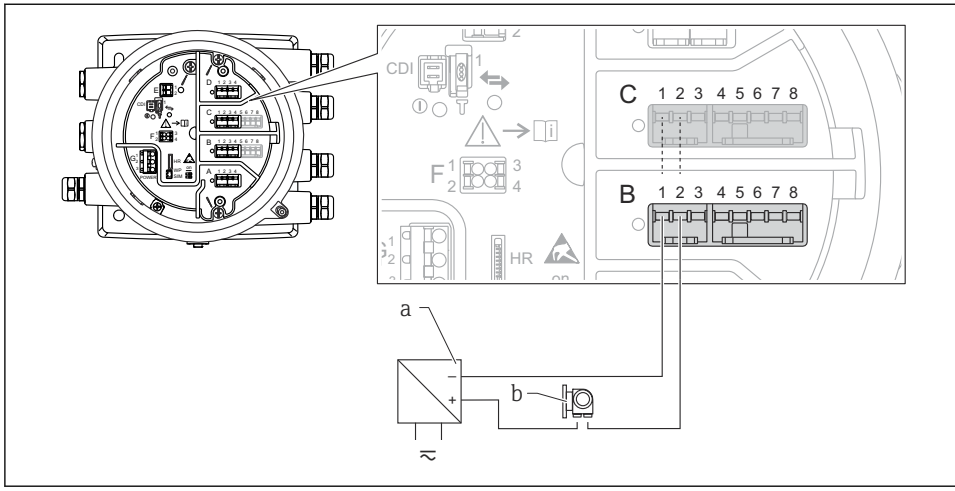
8 *Passive usage of the Analog I/O module in the output mode*

a Power supply
b HART signal output
c Analog signal evaluation

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



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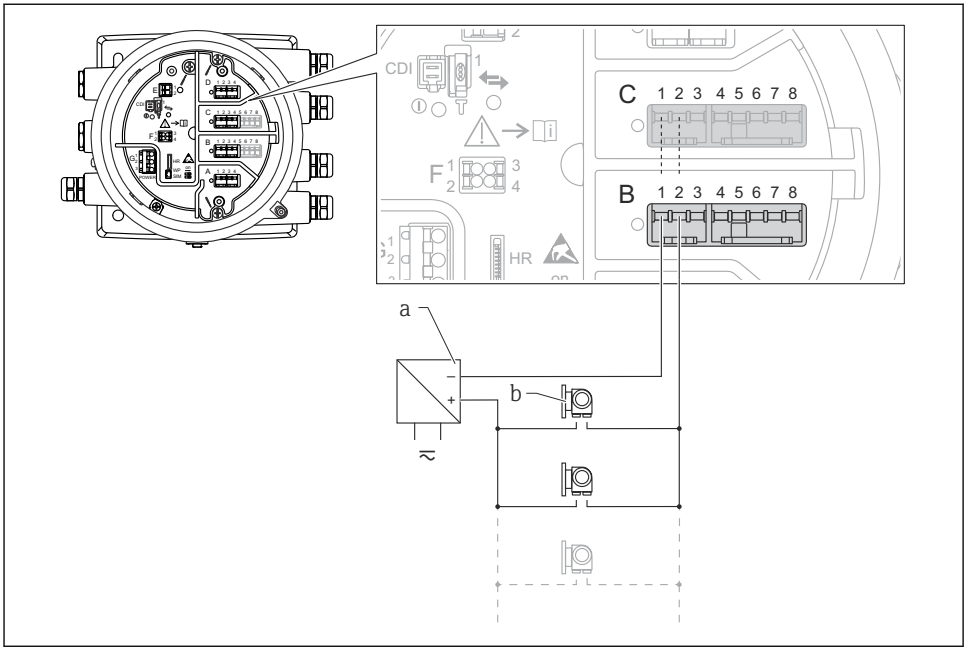
9 Passive usage of the Analog I/O module in the input mode

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

"Operating mode" = "HART master"



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

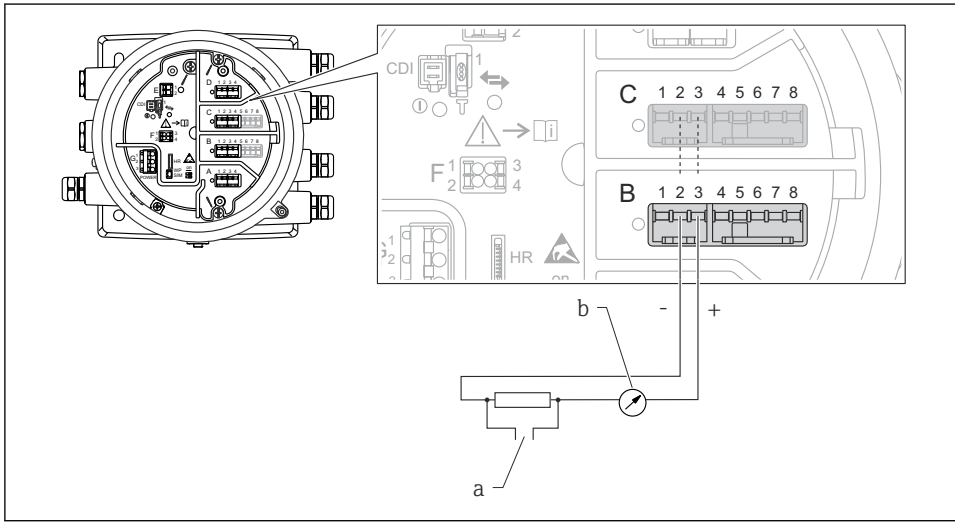
a Power supply
b Up to 6 external devices with HART signal output

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

- 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.

- 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

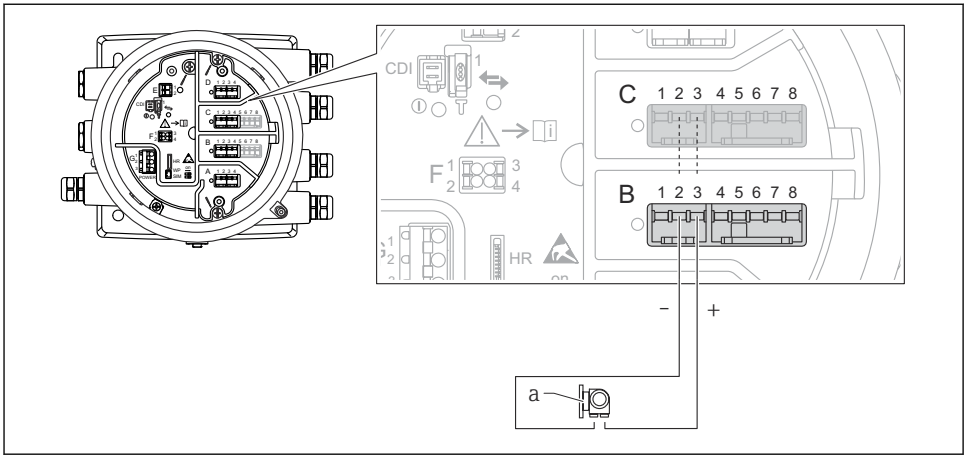
"Operating mode" = "4..20mA output" or "HART slave +4..20mA output"



11 *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"



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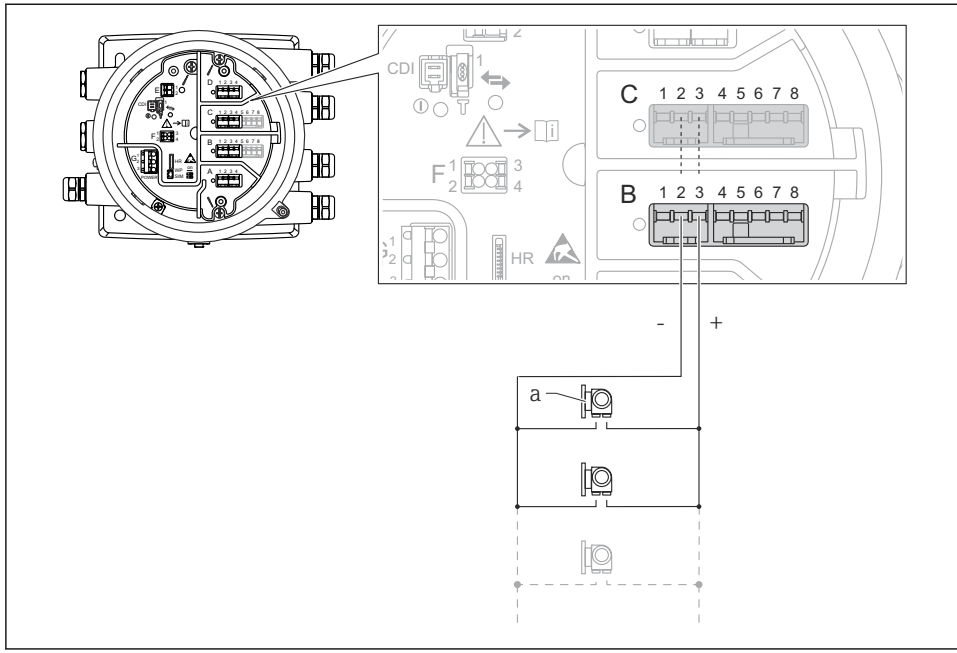
12 Active usage of the Analog I/O module in the input mode

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

"Operating mode" = "HART master"

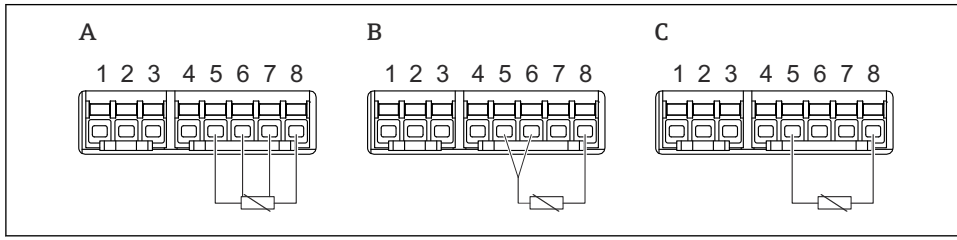


13 Active usage of the Analog I/O module in the HART master mode

a Up to 6 external devices with HART signal output

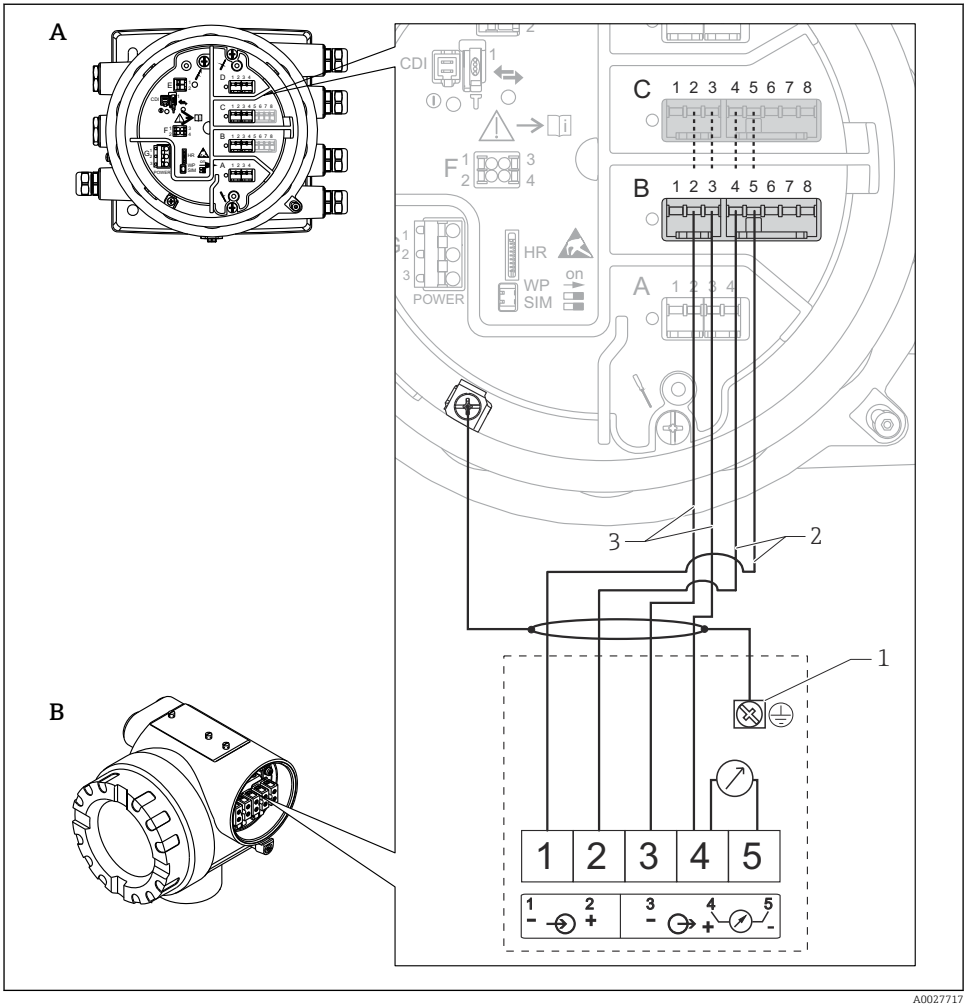
The maximum current consumption for the connected HART devices is 24 mA (i.e. 4 mA per device if 6 devices are connected).

Connection of a RTD



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

Connection of a Micropilot S FMR5xx

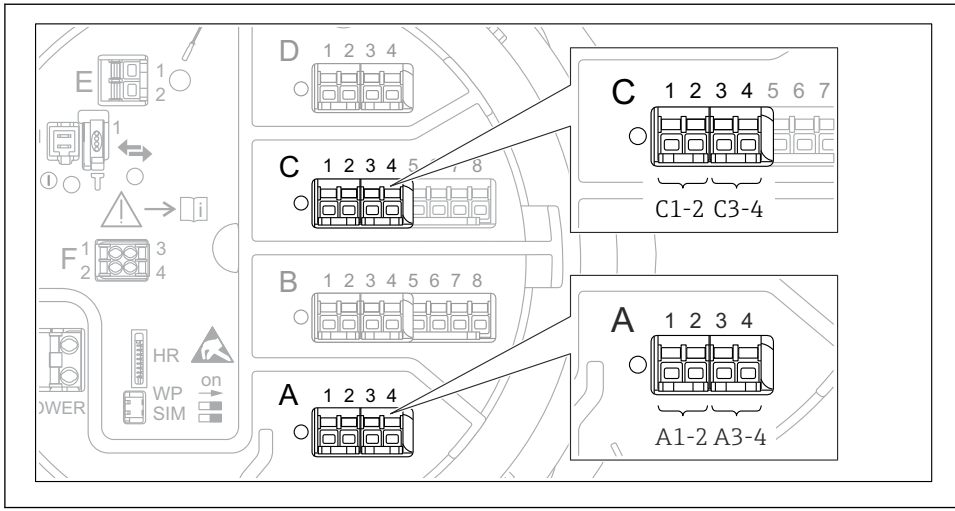


14 *Connection of a Micropilot S FMR5xx to the Analog input module of a Tankside Monitor NRF81*

A Tankside Monitor NRF81
B Micropilot S FMR5xx
1 Grounding
2 Power supply (from NRF81 to FMR5xx)
3 4-20mA/HART signal (from FMR5xx to NRF81)

If connected in this way, the Micropilot S FMR5xx gets its supply voltage from the Tankside Monitor NRF81.

Terminals of the "Digital I/O" module



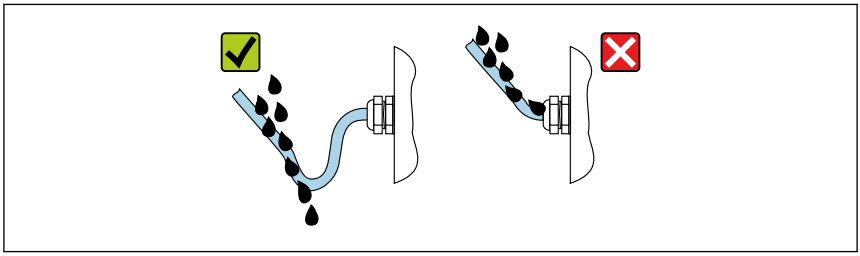
15 Designation of the digital inputs or outputs (examples)

- 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

6.3 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").



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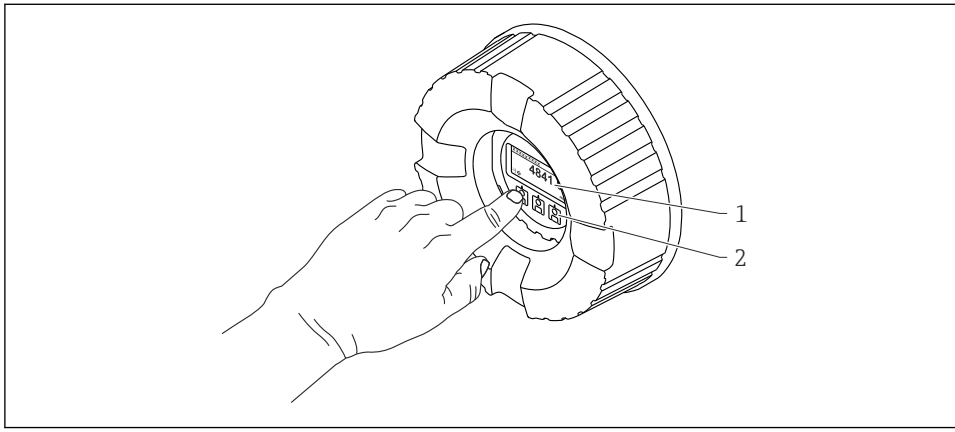
5. Insert blind plugs appropriate for the safety rating of the device (e.g. Ex d/XP).

7 Commissioning

7.1 Operating methods

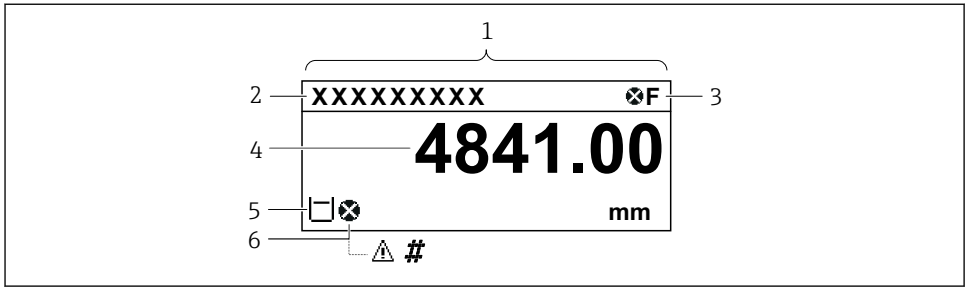
7.1.1 Operation via the local display



16 Display and operating elements

1 Liquid crystal display (LCD)
2 Optical keys; can be operated through the cover glass. If used without the cover glass, lightly place your finger in front of the optical sensor for activation. Do not press hard.

Standard view (measured value display)



17 *Typical appearance of the standard view (measured value display)*

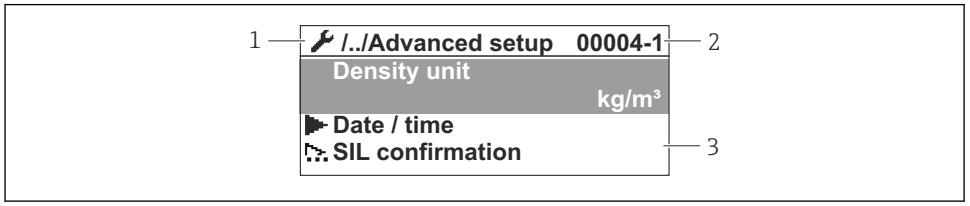
1 *Display module*
2 *Device tag*
3 *Status area*
4 *Display area for measured values*
5 *Display area for measured value and status symbols*
6 *Measured value status symbol*

For the meaning of the display symbols refer to the Operating Instructions (BA) of the device.

Navigation view (operating menu)

To access the operating menu (navigation view), proceed as follows:

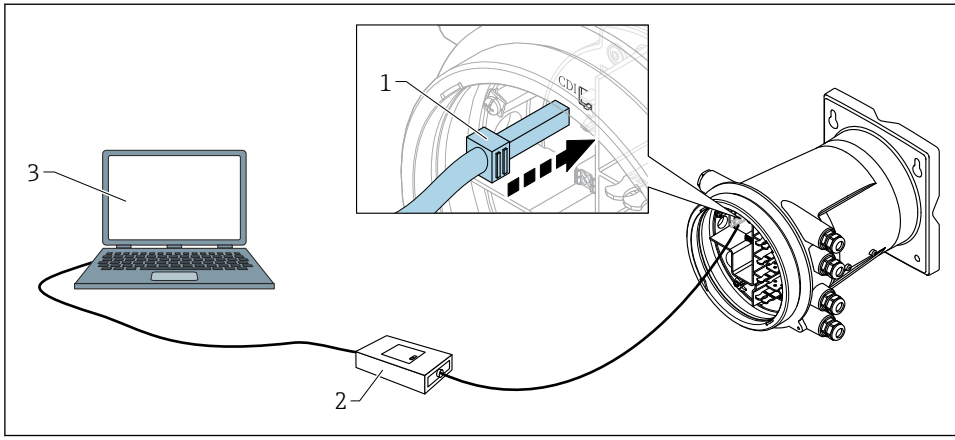
1. While in the standard view, press **E** for at least two seconds.
   ↳ A context menu appears.
2. Select **Keylock off** from the context menu and confirm by pressing **E**.
3. Press **E** again to access the oprating menu.



18 *Navigation view*

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

7.1.2 Operation via service interface and FieldCare/DeviceCare



19 *Operation via service interface*

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

7.2 Initial settings

7.2.1 Setting the display language

Setting the display language via the display module

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

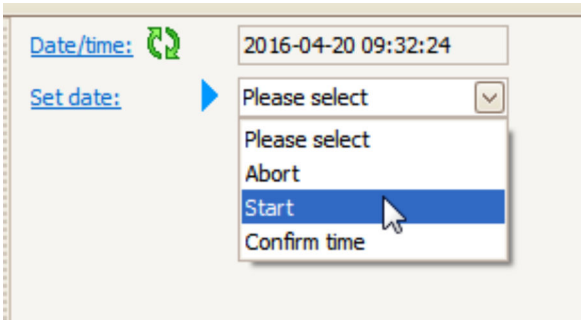
7.2.2 Setting the real-time clock

Setting the real-time clock via the display module

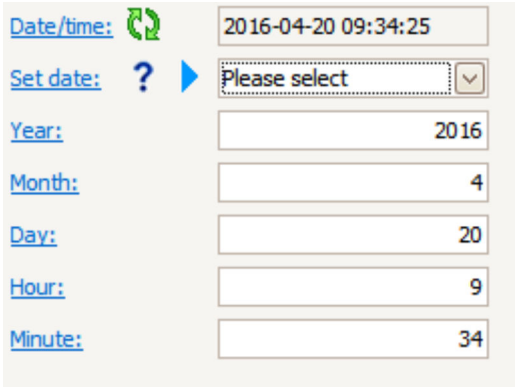
1. Navigate to: Setup → Advanced setup → Date / time → Set date

2. Use the following parameters to set the 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)

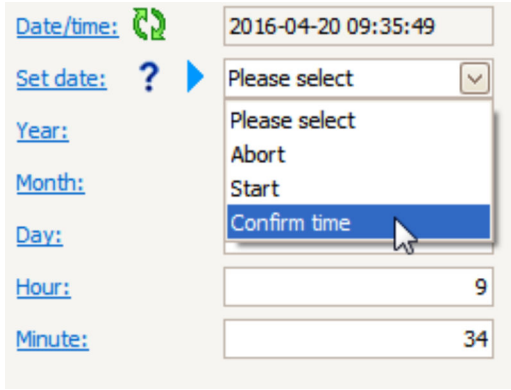
1. Navigate to: Setup → Advanced setup → Date / time
2. 

   Go to the Set date and select the Start.

3. 

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

4.



Go to the Set date and select the Confirm time.

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

7.3 Calibration and configuration

Calibration and configuration of the inputs and signal output, see manual Operating Instructions.

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