Brief Operating Instructions
RIA15

Loop-powered 4 to 20 mA process display unit
with HART® communication

HART
COMMUNICATION PROTOCOL
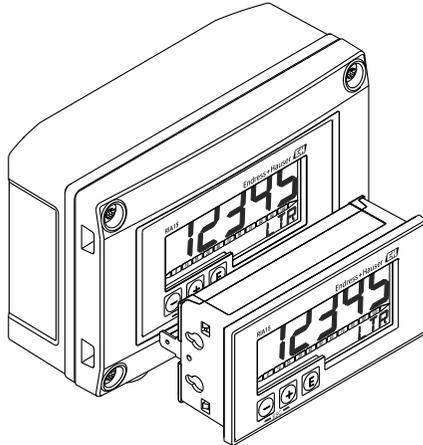
These Instructions are Brief Operating Instructions; they do not
replace the Operating Instructions included in the scope of
supply.

Detailed information can be found in the Operating
Instructions and the additional documentation.

Available for all device versions via:
- Internet: www.endress.com/deviceviewer
- Smart phone/tablet: Endress+Hauser Operations App

Endress+Hauser [EH]

People for Process Automation

Order code: XXXXX-XXXXXX
Ser. no.: XXXXXXXXXXXX
Ext. ord. cd.: XXX.XXXX.XX

Endress+Hauser

1.

Serial number

2. **www.endress.com/deviceviewer**

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A0023555
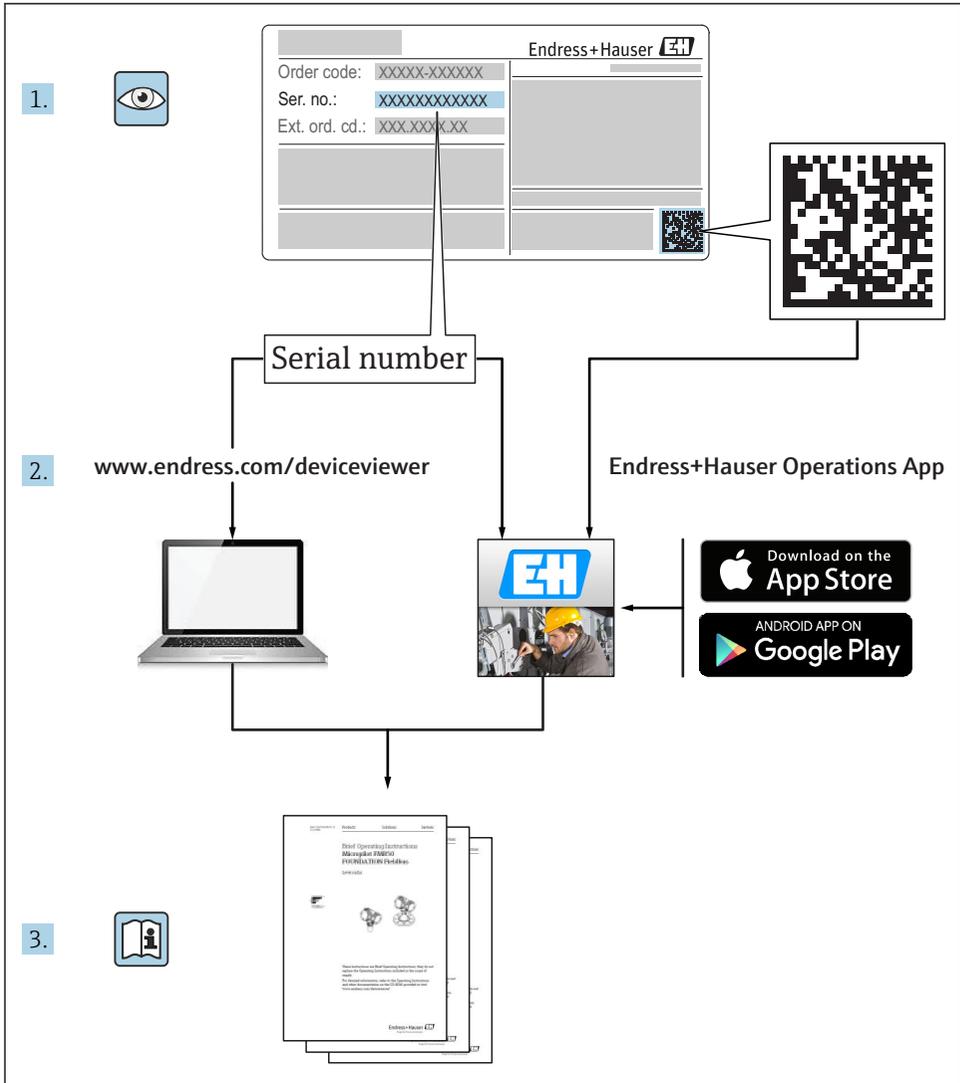
Table of contents

1   Document information

1.1   Document conventions

1.1.1   Safety symbols

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

1.1.2   Electrical symbols

Symbol	Meaning
⎓ _{A0011197}	**Direct current** A terminal to which DC voltage is applied or through which direct current flows.
∼ _{A0011198}	**Alternating current** A terminal to which alternating voltage is applied or through which alternating current flows.
≂ _{A0017381}	**Direct current and alternating current** • A terminal to which alternating voltage or DC voltage is applied. • A terminal through which alternating current or direct current flows.
⏚ _{A0011200}	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
⏚ _{A0011199}	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.
▽ _{A0011201}	**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.
⚠ _{A0012751}	**ESD - Electrostatic discharge** Protect the terminals against electrostatic discharge. Failure to comply with this instruction can result in the destruction of parts or malfunction of the electronics.

1.1.3   Symbols for certain types of information

Symbol	Meaning	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	1., 2., 3. ...	Series of steps
↳	Result of a step	👁	Visual inspection

1.1.4   Symbols in graphics

Symbol	Meaning
1, 2, 3,...	Item numbers
1. , 2. , 3. ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
≈➡ _{A0013441}	Flow direction
⟨EX⟩ _{A0011187}	**Hazardous area** Indicates a hazardous area.
⟨EX⟩ _{A0011188}	**Safe area (non-hazardous area)** Indicates a non-hazardous area.

1.1.5   Tool symbols

Symbol	Meaning
▯ ✎ _{A0011220}	Flat blade screwdriver
⬡ ✎ _{A0011221}	Allen key

Symbol	Meaning
A0011222	Open-ended wrench
A0013442	Torx screwdriver

1.2 Registered trademarks

HART®
Registered trademark of the HART® Communication Foundation

2 Safety instructions

2.1 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 beginning work, the specialist staff must have read and understood the instructions
  in the Operating Instructions and supplementary documentation as well as in the
  certificates (depending on the application)
▶ Following instructions and basic conditions

2.2 Designated use

The process display unit displays analog process variables or HART ® process variables on its
screen.

The device is powered via the 4 to 20 mA current loop and does not require an additional
power supply.

• The manufacturer accepts no liability for damages resulting from incorrect use or use other
  than that designated. It is not permitted to convert or modify the device in any way.
• Panel-mounted device
  The device is designed for installation in a panel and must only be operated in an installed
  state.
• Field device:
  The device is designed for installation in the field.
• The device may only be operated under the permitted ambient conditions .

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.

Environmental requirements

If a plastic transmitter housing is permanently exposed to certain steam and air mixtures, this can damage the housing.
▶ If you are unsure, please contact your Endress+Hauser Sales Center for clarification.
▶ If used in an approval-related area, observe the information on the nameplate.

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. It also complies with the EC directives listed in the device-specific EC Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.

3   Identification

3.1   Nameplate

The nameplate is located on the right-hand side of the housing in the case of the field device, and on the rear of the housing in the case of the panel-mounted device.
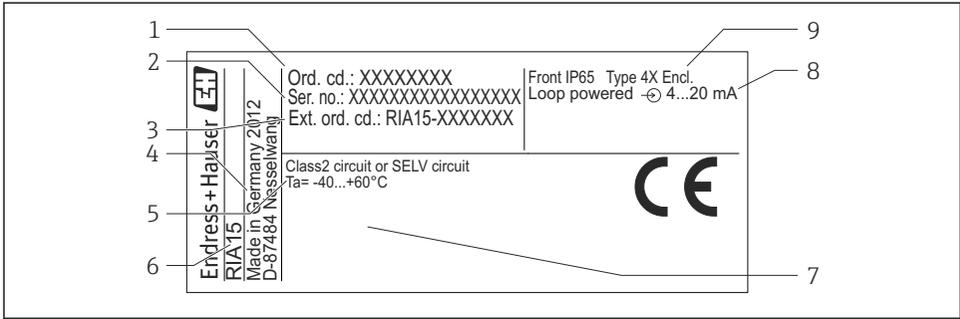
⊠ 1   Nameplate of the process display unit (example)

1	*Order code of the device*	*6*	*Device designation*
2	*Serial number of the device*	*7*	*Approvals (optional)*
3	*Extended order code of the device*	*8*	*Input signal*
4	*Manufacturer's address*	*9*	*Housing degree of protection*
5	*Ambient temperature range*		

3.2   Scope of delivery

The scope of delivery of the device comprises:
- Panel-mounted device
  - Process display unit
  - Brief Operating Instructions
  - Ex Safety Instructions (optional)
  - Fastening fixtures
  - HART® communication resistance module (optional)
- Field device
  - Process display unit
  - Brief Operating Instructions
  - Ex Safety Instructions (optional)
  - Fastening fixtures for wall/pipe mounting (optional)
  - HART® communication resistance module (optional)
  - Weather protection cover (optional)

3.3   Certificates and approvals

An overview of all available approvals is provided in the "Technical data" section in the relevant Operating Instructions.

3.3.1   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.

3.3.2 EAC mark

The product meets the legal requirements of the EEU guidelines. The manufacturer confirms the successful testing of the product by affixing the EAC mark.

3.4 HART® protocol certification

The RIA15 is registered by the HART® Communication Foundation. The device fulfills the requirements of HCF Specification, Revision 7.1. This version is downwards compatible with all sensors/actuators with HART® versions ≥ 5.0.

4 Installation

4.1 Incoming acceptance, transport, storage

Compliance with the permitted environmental and storage conditions is mandatory. Precise specifications for this are provided in the "Technical data" in the relevant Operating Instructions.

4.1.1 Incoming acceptance

On receipt of the goods, check the following points:
• Is the packaging or the content damaged?
• Is the delivery complete? Compare the scope of delivery against the information on your order form.

4.1.2 Transport and storage

Please note the following:
• Pack the device so that is protected against impact for storage and transport. The original packaging provides optimum protection.
• The permitted storage temperature is −40 to +85 °C (−40 to +185 °F); it is possible to store the device at borderline temperatures for a limited period (48 hours maximum).

4.2 Installation conditions

ℹ️ At temperatures below −25 °C (−13 °F) the readability of the display can no longer be guaranteed.

4.2.1 Display unit in the panel-mount housing

Permitted ambient temperature range −40 to 60 °C (−40 to 140 °F), horizontal orientation. IP65 protection at front, IP20 at rear

See "Technical data" section in the relevant Operating Instructions.

4.2.2 Display unit in the field housing

Permitted ambient temperature range −40 to 60 °C (−40 to 140 °F). IP67 protection, NEMA 4x (aluminum housing).

See "Technical data" section in the relevant Operating Instructions.

4.3 Installation instructions

For the dimensions of the device, see the "Technical data" section in the relevant Operating Instructions.

4.3.1 Panel housing
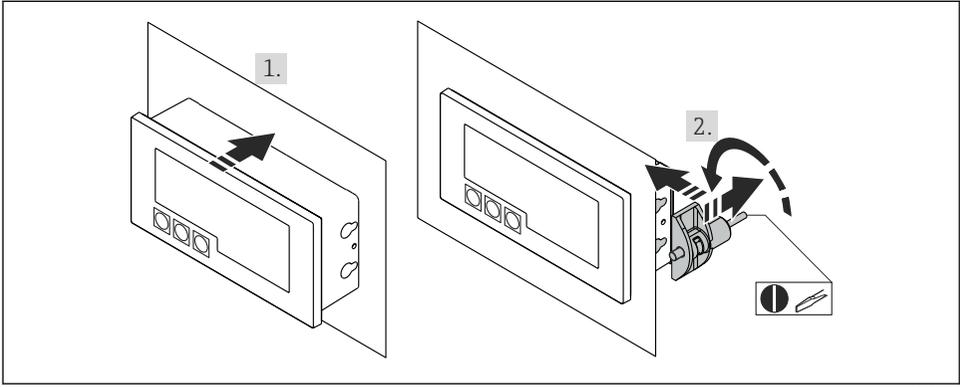
⊠ 2   Installation instructions for the panel housing

Installation in a panel with a panel cutout 92x45 mm (3.62x1.77 in), max. panel thickness 13 mm (0.51 in).

1. Slot the device into the panel cutout from the front.

2. Fit the mounting clips on the side of the housing and tighten the threaded rods.

4.3.2 Field housing

Pipe mounting (with optional mounting kit)

The device can be mounted on a pipe with a diameter of up to 50.8 mm (2 in) with the mounting kit (optionally available).
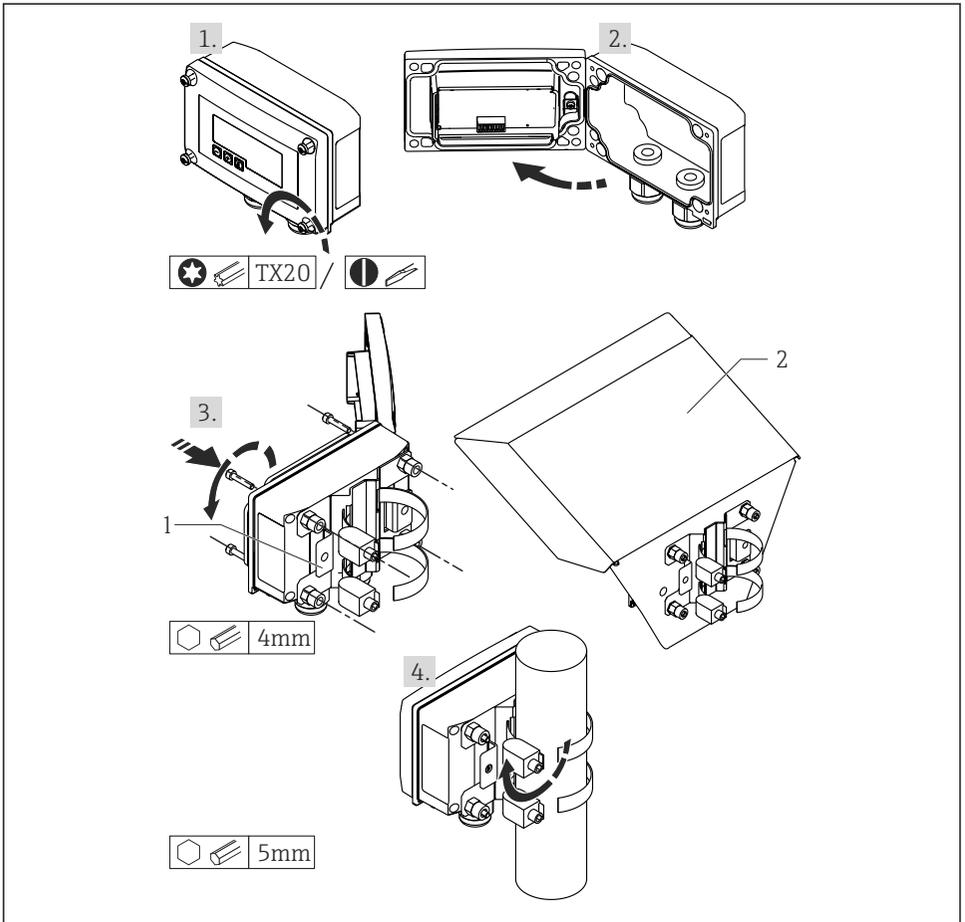
A0017789

⊠ *3   Mounting the process display unit on a pipe*

1   Mounting plate for pipe/wall mounting
2   Weather protection cover (optional)

1. Release the 4 housing screws

2. Open the housing

3. Secure the mounting plate to the rear of the device with 4 screws supplied. The optional weather protection cover can be secured between the device and the mounting plate.

4. Guide the two gripper clamps through the mounting plate, fit them around the pipe and tighten.

Wall mounting

With optionally available mounting kit.
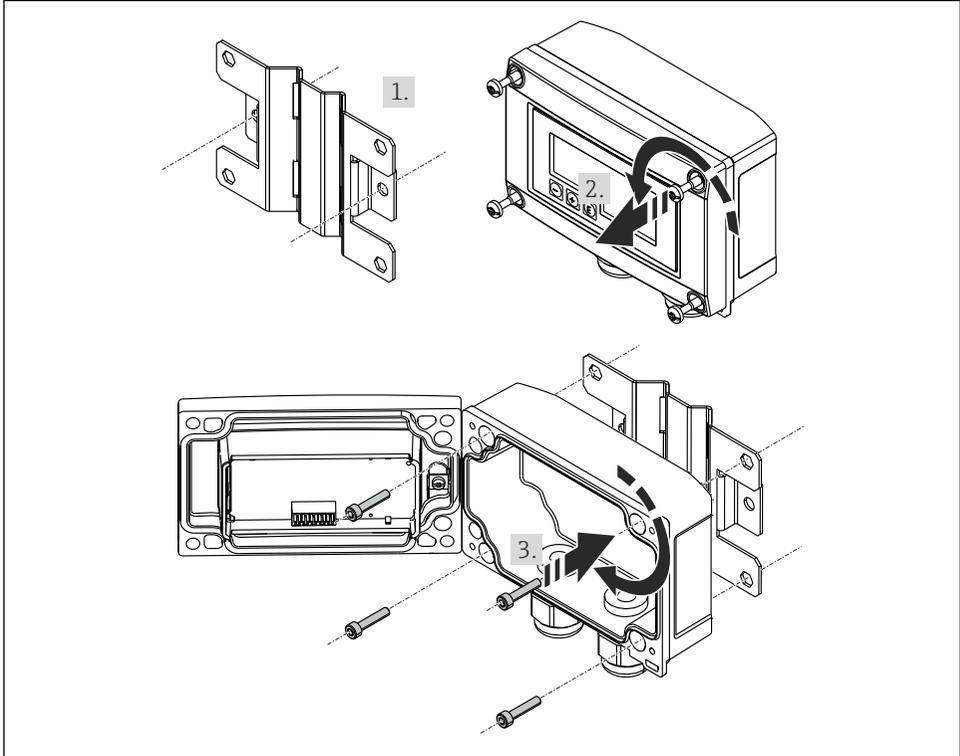
A0017803

⊡ 4   *Mounting the process display unit on a wall*

1. Use the mounting plate as a stencil for 2 6 mm (0.24 in) bore holes, 82 mm (3.23 in) apart, and secure the plate on the wall with 2 screws (not supplied).
2. Open the housing.
3. Secure the display unit on the mounting plate with the 4 screws supplied.
4. Close the cover and tighten the screws.

Without a mounting kit.

1. Open the housing.
2. Use the device as a stencil for 4 6 mm (0.24 in) bore holes, 99 mm (3.9 in) apart on the horizontal plane, 66 mm (2.6 in) apart on the vertical plane.
3. Secure the display unit on the wall with 4 screws.

4. Close the cover and tighten the housing screws.

4.3.3   Mounting the optional HART® communication resistance module

Panel housing

The HART® communication resistance module is available as an accessory, see section Accessories in the relevant Operating instructions.
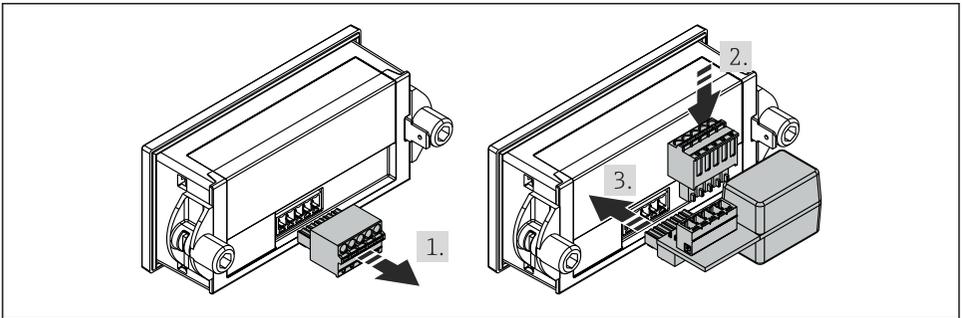
A0020785

⊞ *5   Mounting the optional HART® communication resistance module*

1. Unplug the pluggable terminal block.

2. Plug terminal block into the suitable plug-in position on the HART® communication resistance module.

3. Plug the HART® communication resistance module into the plug-in position on the housing.

Field housing

The HART® communication resistance module is available as an accessory, see section Accessories in the relevant Operating instructions.
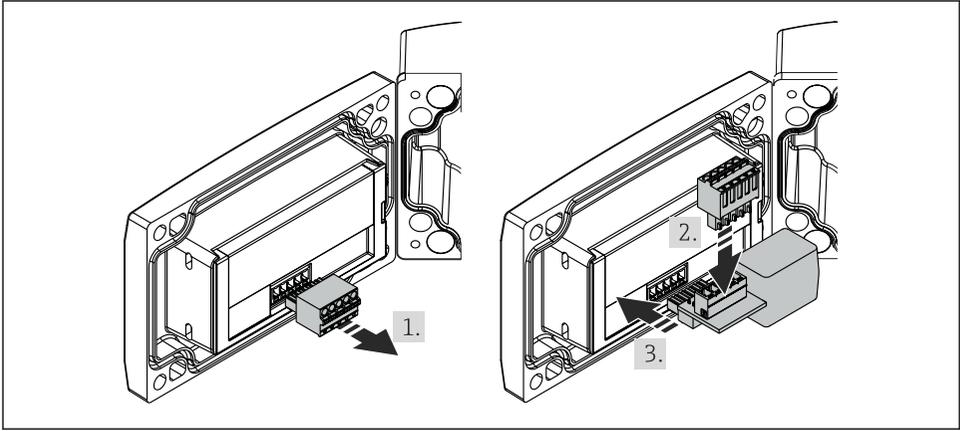
A0020844

⊡ *6   Mounting the optional HART® communication resistance module*

1. Unplug the pluggable terminal block.

2. Plug terminal block into the suitable plug-in position on the HART® communication resistance module.

3. Plug the HART® communication resistance module into the plug-in position in the housing.

4.4   Post-installation check

4.4.1   Display unit in the panel-mount housing

• Is the seal undamaged?
• Are the mounting clips securely fastened on the housing of the device?
• Are the threaded rods properly tightened?
• Is the device located in the center of the panel cutout?

4.4.2   Display unit in the field housing

• Is the seal undamaged?
• Is the housing firmly screwed to the mounting plate?
• Is the mounting bracket firmly secured on the wall/pipe?
• Are the housing screws firmly tightened?

5   Wiring

⚠ WARNING

Danger! Electric voltage!
▶ The entire connection of the device must take place while the device is de-energized.

Only certified devices (optionally available) may be connected in the hazardous area
▶ Observe corresponding notes and wiring diagrams in the Ex-specific supplement to these Operating Instructions. If you have any questions, please do not hesitate to contact your E+H representative.

NOTICE

SELV/Class 2 device
▶ The device may only be powered by a power unit with an energy-limited circuit in accordance with IEC 61010-1: 'SELV or Class 2 circuit'.

Device destroyed if current too high
▶ Do not operate the device at a voltage source without a current limiter. Instead, operate the device only in the current loop with a transmitter.

• **Panel housing:**
  The terminals are located on the rear of the housing.
• **Field housing:**
  The terminals are located inside the housing. The device has two M16 cable entries. The housing must be opened for wiring purposes.

Operation of the spring terminals
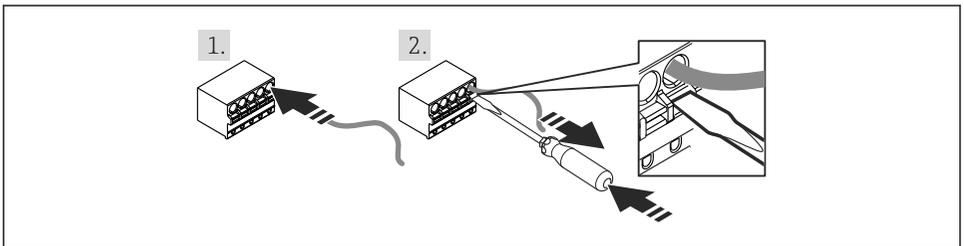
🔲 *7   Operation of the spring terminals*

1. When using rigid cables with a ferrule, just plug the cable into the terminal. No tools required. With flexible wires the spring mechanism of the terminal must be operated as shown in step 2.

2. In order to loosen the cable, push the spring mechanism in completely using a screwdriver or other suitable tool and pull out the cable.

5.1 Quick wiring guide

Terminal	Description
+	Positive connection, current measurement
-	Negative connection, current measurement (without backlighting)
LED	Negative connection, current measurement (with backlighting)
⊏	Auxiliary terminals (electrically connected internally)

⊥	Functional grounding:
	• Panel-mounted device:
	  Terminal on the rear of the housing
	• Field device:
	  Terminal in the housing

5.2 Connection in 4 to 20 mA mode

The following diagrams show how the process display unit is connected in 4 to 20 mA mode.

	Connection without backlighting	Connection with backlighting
Connection with transmitter power supply and transmitter	 A0017704 *1 Transmitter power supply*	 A0017705 *1 Transmitter power supply*
Connection with transmitter power supply and transmitter using the auxiliary terminal	 A0017706 *1 Transmitter power supply*	 A0017707 *1 Transmitter power supply*

	Connection without backlighting	Connection with backlighting
Connection with PLC and transmitter	A0019720 *1 PLC*	A0019721 *1 PLC*
Connection without transmitter power supply directly in the 4 to 20 mA circuit	A0017708 *2 4 to 20 mA power source*	A0017709 *2 4 to 20 mA power source*
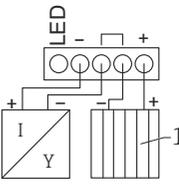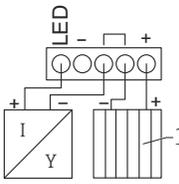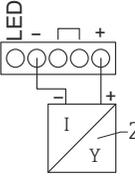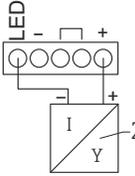
5.3 Connection in HART mode

The following diagrams show how the process display unit is connected in HART mode.

5.3.1 HART® connection

NOTICE

Undefined behavior due to incorrect wiring of an actuator

▶ When installing the process display unit together with an actuator, the Operating Instructions for the actuator must be followed!

The HART® communication resistance of 230 Ω in the signal line is always necessary in the case of a low-impedance power supply. It must be installed between the power supply and the display unit.

	Circuit diagram / Description
2-wire sensor with process display unit and transmitter power supply, without backlighting	 *1* *Sensor* *2* *Power supply* *3* *HART® resistance*
2-wire sensor with process display unit and transmitter power supply, with backlighting	 *1* *Sensor* *2* *Power supply* *3* *HART® resistance*
4-wire sensor with process display unit and transmitter power supply, without backlighting	 *1* *HART® resistance* *2* *Current measuring device (optional)* *3* *Sensor* *4* *Power supply 4-wire device*

Circuit diagram / Description
4-wire sensor with process display unit and transmitter power supply, with backlighting   A0019571   *1*   *HART® resistance*   *2*   *Current measuring device (optional)*   *3*   *Sensor*   *4*   *Power supply 4-wire device*
Current output with process display unit and actuator (e.g. actuator valve), without backlighting   A0019573   *1*   *Actuator*   *2*   *Power supply 4-wire device*   *3*   *Current output*
Current output with process display unit and actuator (e.g. actuator valve), with backlighting   A0019574   *1*   *Actuator*   *2*   *Power supply 4-wire device*   *3*   *Current output*

Circuit diagram / Description
Multi-drop 2-wire sensors with process display unit and transmitter power supply   A0019575   1   *Sensors*   2   *Power supply*   3   *HART® resistance*
Multi-drop 2-wire sensors with process display unit and transmitter power supply, with backlighting   A0019722   1   *Sensors*   2   *Power supply*   3   *HART® resistance*
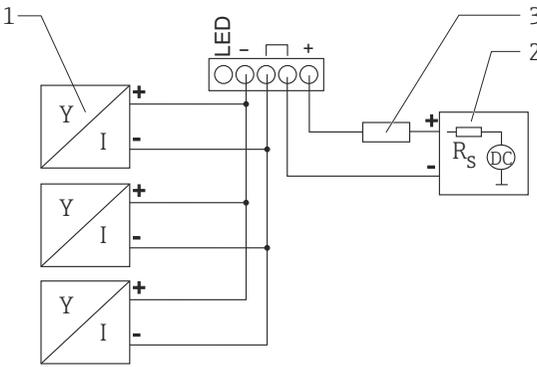
|	Circuit diagram / Description
2-wire sensor with process display unit and active barrier RN221N as transmitter power supply	 *1* *Sensor* *2* *HART® primary master* *3* *HART® resistance*
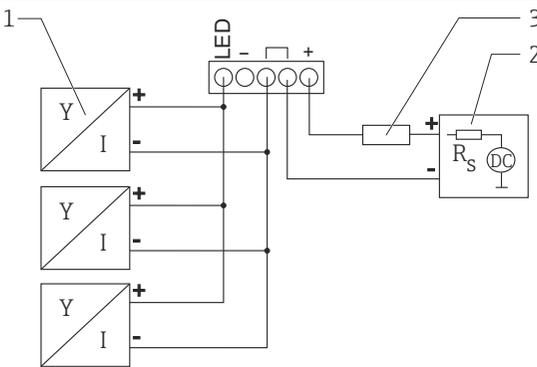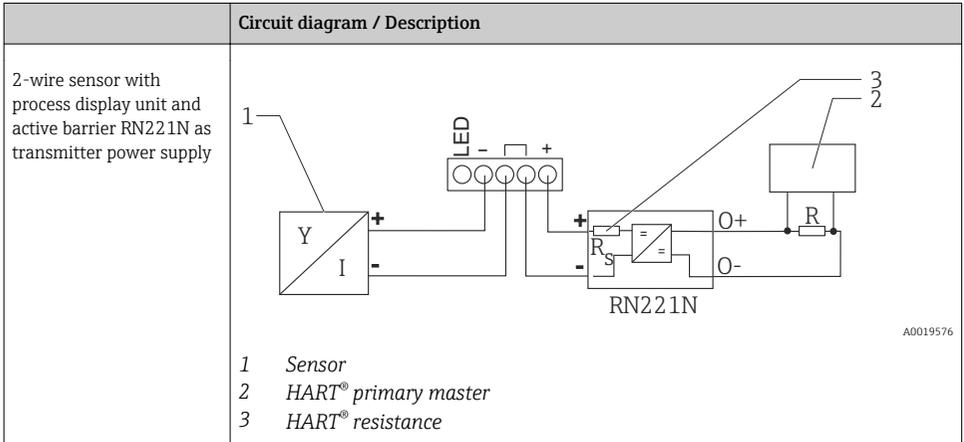
Optional HART® communication resistance module

A HART® communication resistance module is available as an accessory, see the "Accessories" section in the relevant Operating Instructions.

Please refer to the section on installation when mounting the HART® communication resistance module → 🖹 13

Wiring

	Circuit diagram / Description
2-wire sensor with process display unit and transmitter power supply, without backlighting	1 HART® communication resistance module 2 Sensor 3 Power supply
2-wire sensor with process display unit and transmitter power supply, with backlighting	1 HART® communication resistance module 2 Sensor 3 Power supply

Circuit diagram / Description
4-wire sensor with process display unit and transmitter power supply, without backlighting   A0020837   *1   HART® communication resistance module*   *2   Power supply 4-wire device*   *3   Sensor*
4-wire sensor with process display unit and transmitter power supply, with backlighting   A0020838   *1   HART® communication resistance module*   *2   Power supply 4-wire device*   *3   Sensor*

5.4   Wiring with switchable backlighting

An additional current-limited current source is required to implement switchable backlighting, e.g. active barrier RN221N. This current source is used to supply the LED backlighting of up to 7 RIA15 process display units without causing an additional voltage drop in the measurement loop. The backlighting can be switched on and off using an external switch.

The following shows connection examples for the hazardous area. Wiring is similar for the non-hazardous area; however, it is not necessary to use Ex-certified devices.

5.4.1 Connection diagram for one process display unit
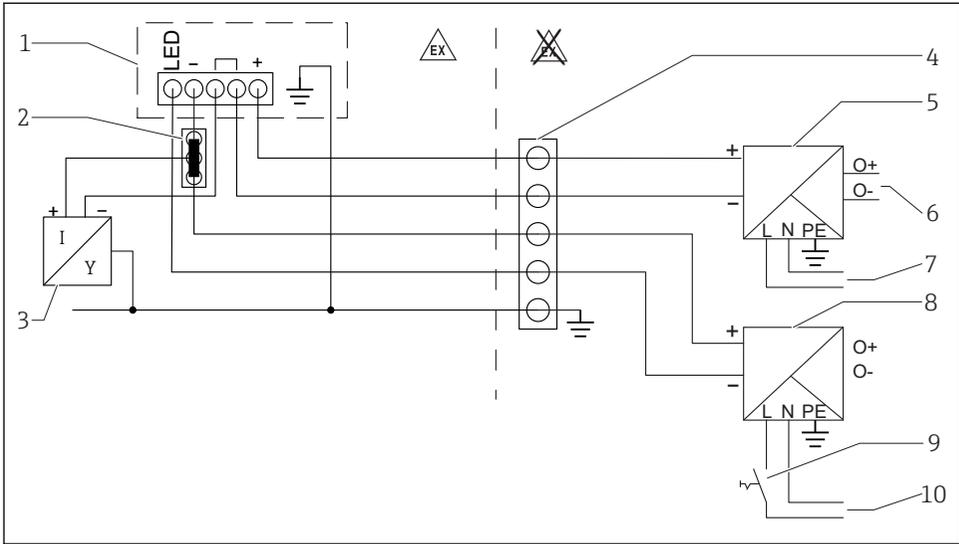
A0028248

1   *Process display unit RIA15*
2   *3-wire connector, e.g. WAGO 221 series*
3   *2-wire sensor*
4   *Terminal block on top-hat rail*
5   *Active barrier, e.g. RN221N*
6   *4 to 20 mA output to the control unit*
7   *Power supply*
8   *Current source, e.g. RN221N*
9   *Switch to activate backlighting*
10 *Power supply*

5.4.2   Connection diagram for multiple process display units
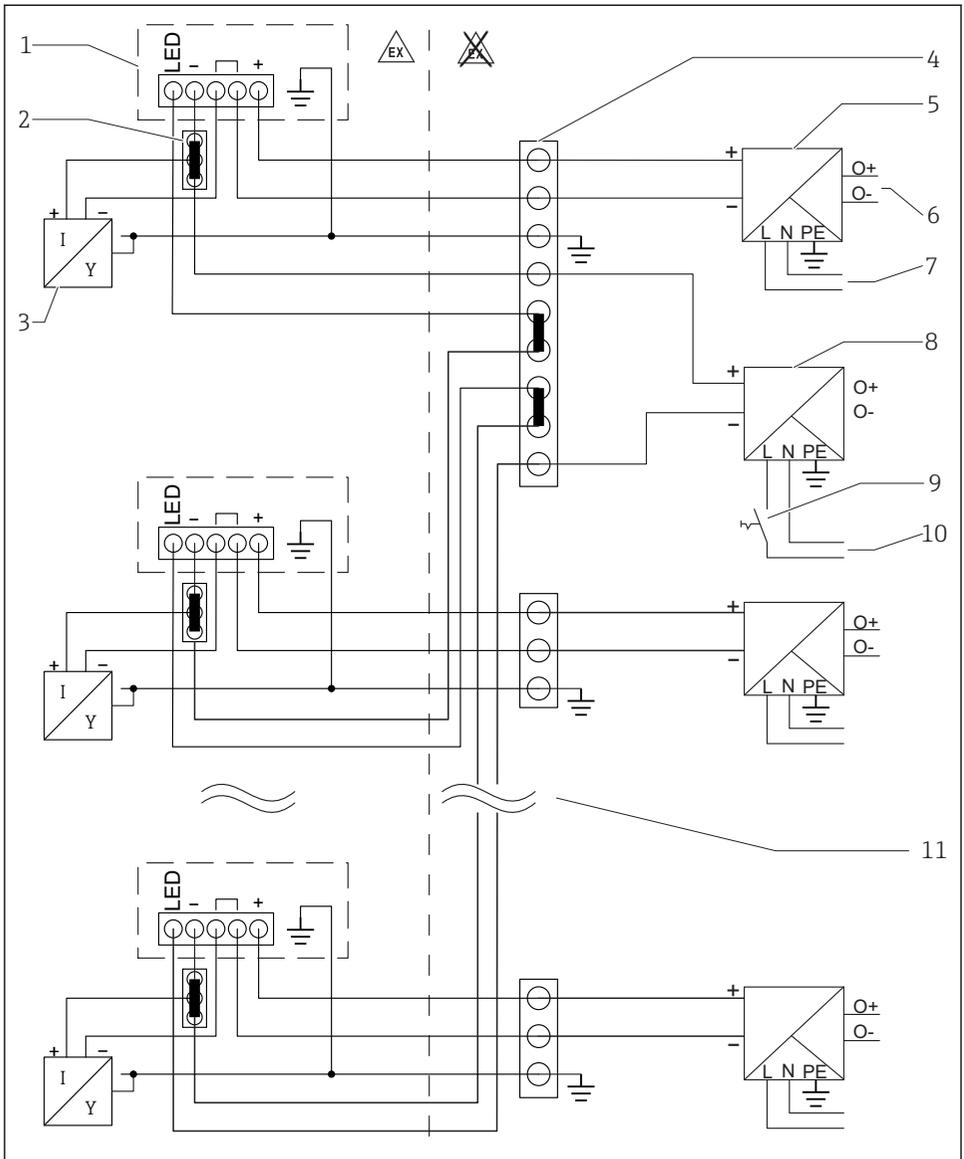
A0028249

1   Process display unit RIA15
2   3-wire connector, e.g. WAGO 221 series
3   2-wire sensor
4   Terminal block on top-hat rail
5   Active barrier, e.g. RN221N

6   4 to 20 mA output to the control unit
7   Power supply
8   Current source, e.g. RN221N
9   Switch to activate backlighting
10   Power supply
11   Can be extended to 7 devices

5.5   Inserting the cable, field housing
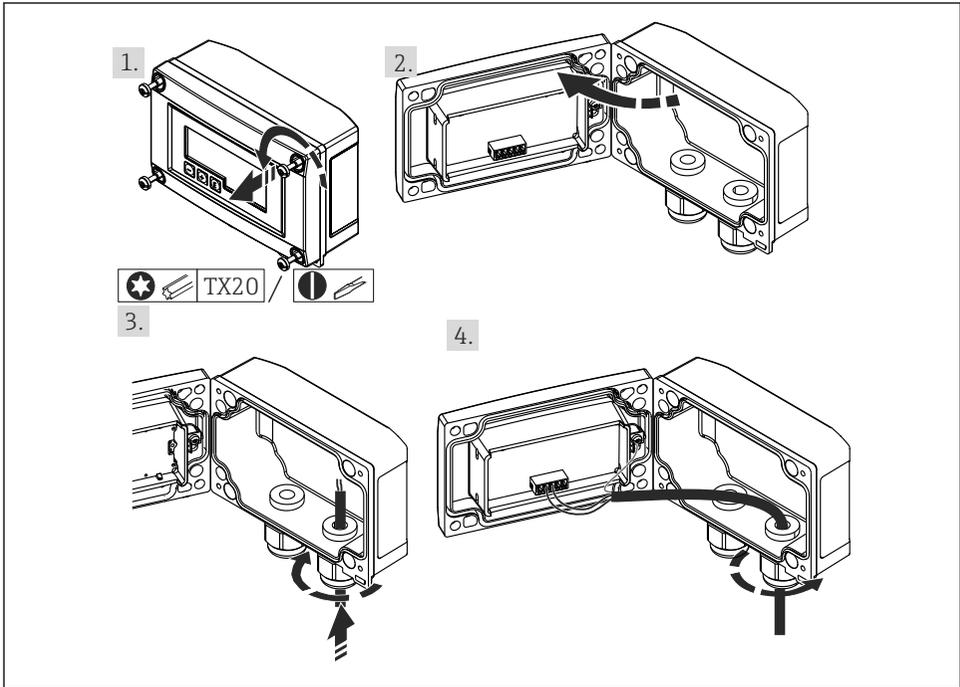
A0017830

⊡ *8   Inserting the cable, field housing*

Inserting the cable, field housing, connection without transmitter power supply (example)

1. Release the housing screws

2. Open the housing

3. Open the cable gland (M16) and insert the cable

4. Connect the cable incl. functional grounding and close the cable gland

5.6   Shielding and grounding

Optimum electromagnetic compatibility (EMC) can only be guaranteed if the system components and, in particular, the lines are shielded and the shield forms as complete a cover as possible.

HART® communication allows three different types of shielding:
• Shielding at both ends
• Shielding at one end on the feed side with capacitance termination at the field device
• Shielding at one end on the feed side

The best results with regard to EMC are achieved in most cases with one-sided shielding on the feed side (without capacitance termination at the field device). Operation in the event of disturbance variables as per NAMUR NE21 is thus guaranteed.

NOTICE

If the shielding of the cable is grounded at more than one point in systems without potential matching, power supply frequency equalizing currents can occur that damage the signal cable or have a serious effect on signal transmission.

▶ In such cases the shielding of the signal cable is to be grounded on one side only, i.e. it must not be connected to the ground terminal of the housing. The shield that is not connected should be insulated!

5.7   Connecting to functional grounding

5.7.1   Panel-mounted device

For EMC reasons, the functional grounding should always be connected. When the device is used in the hazardous area (with optional Ex approval) the connection is obligatory.
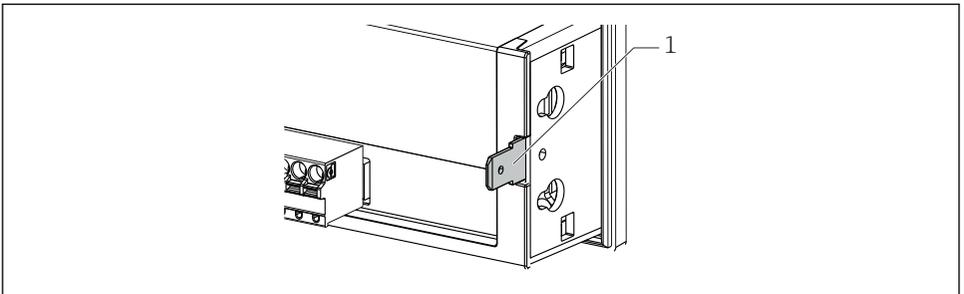

⊞ 9   Functional grounding terminal on panel-mounted device

5.7.2   Field device

For EMC reasons, the functional grounding should always be connected. When used in the hazardous area (with optional Ex approval), the connection is obligatory and the field housing must be grounded via a grounding screw fitted on the outside of the housing.
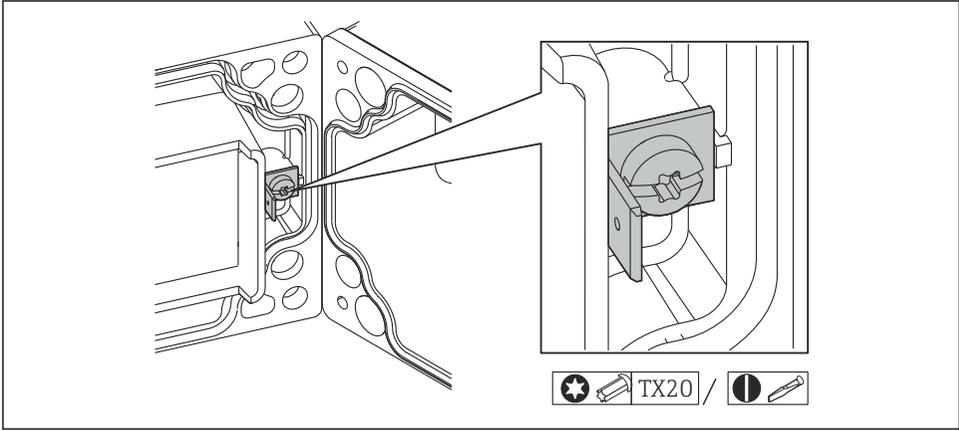
 *10   *Functional grounding terminal in field housing*
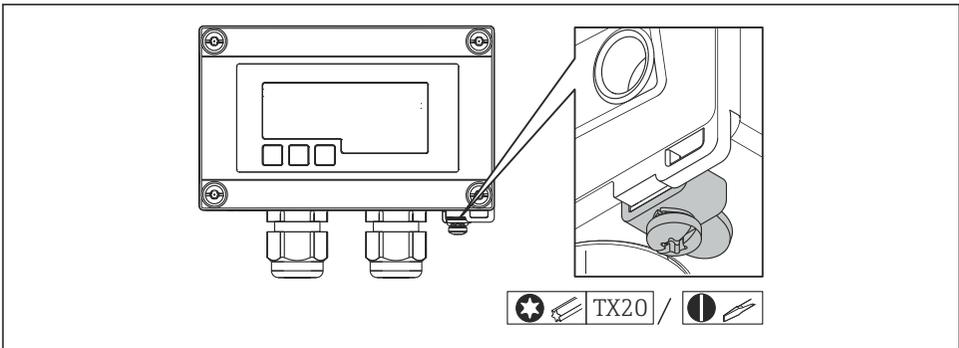
 *11   *Ground terminal on field housing*

5.8   Degree of protection

5.8.1   Field housing

The devices meet all the requirements of IP67. It is absolutely essential to comply with the following points to ensure this protection is guaranteed after mounting or servicing the device:

• The housing seal must be clean and undamaged when inserted into the groove. The seal must be cleaned, dried or replaced if necessary.
• The cables used for connection must be of the specified outside diameter (e.g. M16 x 1.5, cable diameter 5 to 10 mm (0.2 to 0.39 in)).
• Mount the measuring device in such a way that the cable entries point downwards.
• Replace unused cable entries with dummy plugs.
• The housing cover and the cable entries must be firmly tightened.

5.8.2   Panel housing

The front of the device meets the requirements of IP65. It is absolutely essential to comply with the following points to ensure this protection is guaranteed after mounting or servicing the device:

• The seal between the front of the housing and the panel must be clean and undamaged. The seal must be cleaned, dried or replaced if necessary.
• The threaded rods of the panel mounting clips must be firmly tightened.

5.9   Post-connection check

Device condition and specifications	Notes
Are cables or the device damaged?	Visual inspection
Electrical connection	**Notes**
Does the supply current match the specifications on the nameplate?	-
Are the cables, incl. functional grounding, connected correctly and strain-relieved?	-
Field housing: Are the cable glands securely closed?	-

6   Operation
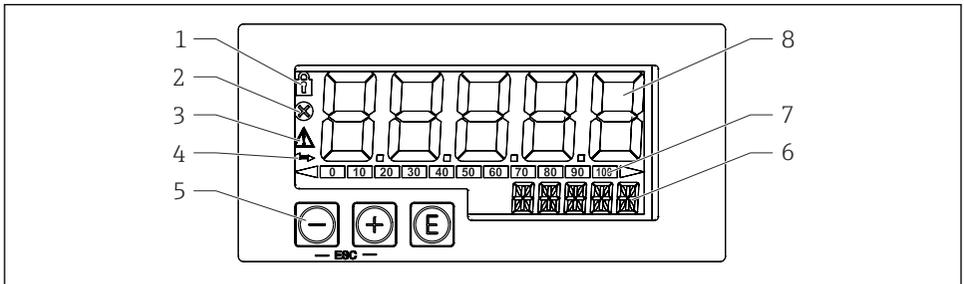
A0017719

⊡ *12   Display and operating elements of the process display unit*

1   Symbol: operating menu disabled
2   Symbol: error
3   Symbol: warning
4   Symbol: HART® communication active
5   Operating keys "-", "+", "E"
6   14-segment display for unit/TAG
7   Bar graph with indicators for under range and over range
8   5-digit 7-segment display for measured value, digit height 17 mm (0.67 in)

The device is operated using three operating keys on the front of the housing. The device setup can be disabled with a 4-digit user code. If the setup is disabled, a padlock symbol appears on the display when an operating parameter is selected.

(E) A0017716	Enter key; calling up the operating menu, confirming the option/setting parameters in the operating menu
(−) A0017714	Selecting and setting/changing values in the operating menu; pressing the '-' and '+' keys simultaneously takes the user back up a menu level. The configured value is not saved.
(+) A0017715	

6.1 Operating functions

The operating functions of the process display unit are divided into the following menus. The individual parameters and settings are described in the "Commissioning" section of the relevant Operating Instructions.

If the operating menu is disabled by means of a user code, the individual menus and parameters can be displayed but not changed. To change a parameter, the user code must be entered. As the display unit can only display digits in the 7-segment display and not alphanumeric characters, the procedure for number parameters is different to that for text parameters.

If the operating position contains only numbers as parameters, the operating position is displayed in the 14-segment display and the configured parameter is displayed in the 7-segment display. To edit, press the 'E'-button followed by the user code.

If the operating position contains text parameters, only the operating position is initially displayed in the 14-segment display. If the 'E' button is pressed again, the configured parameter is displayed in the 14-segment display. To edit, press the '+' button followed by the user code.

Setup (SETUP)	Basic device settings
Diagnostics (DIAG)	Device information, display of error messages
Expert (EXPRT)	Expert settings for the device setup The Expert menu is protected from editing by an access code (default 0000).

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