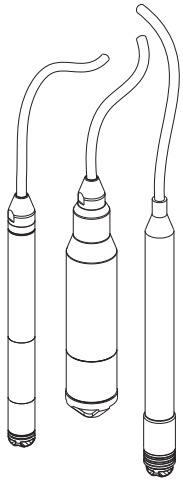
KA01190P/00/EN/01.15
71294708

Brief Operating Instructions
Waterpilot FMX167

Hydrostatic level measurement

HART COMMUNICATION PROTOCOL



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*

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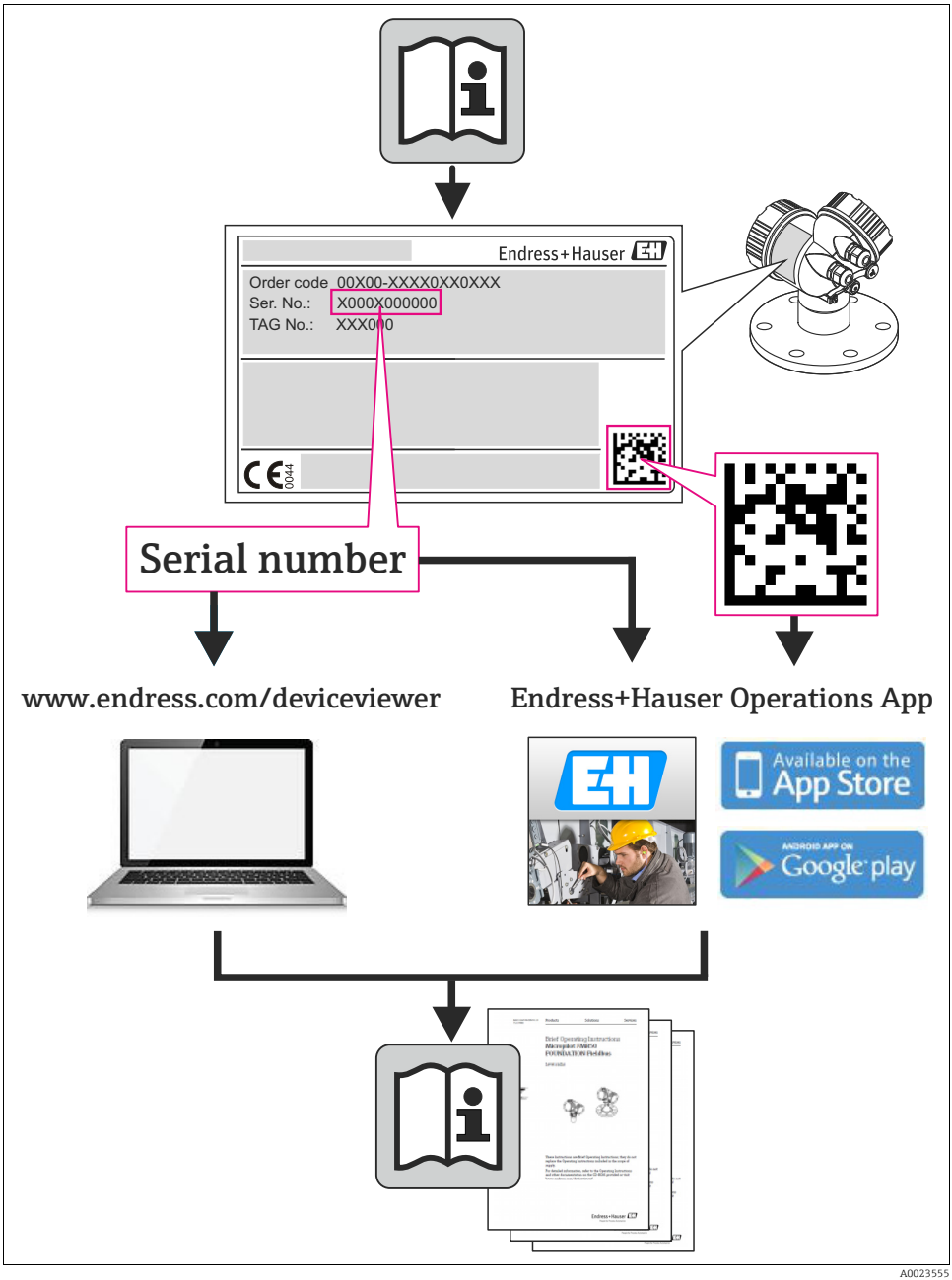
Endress+Hauser
Order code 00X00-XXXX0XX0XXX
Ser. No.: X000X000000
TAG No.: XXX000
0044
Serial number
www.endress.com/deviceviewer
Endress+Hauser Operations App
Available on the App Store
ANDROID APP ON Google play
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Inhaltsverzeichnis

1 Document information

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 used

1.2.1 Safety symbols

Symbol	Meaning
 A0011189-DE	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in seriousor fatal injury.
 A0011190-DE	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in seriousor fatal injury.
 A0011191-DE	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minoror medium injury.
 A0011192-DE	**NOTICE!** This symbol contains information on procedures and other facts which do not result in personalinjury.

1.2.2 Electrical symbols

Symbol	Meaning	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
 A0011221	Allen key
 A0011222	Hexagon wrench

1.2.4 Symbols for certain types of information

Symbol	Meaning
 A0011182	**Permitted** Indicates procedures, processes or actions that are permitted.
 A0011184	**Forbidden** Indicates procedures, processes or actions that are forbidden.
 A0011193	**Tip** Indicates additional information.
 A0015482	Reference to documentation
 A0015484	Reference to page
 A0015487	Reference to graphic
1. , 2. , 3. , ...	Series of steps
 A0018343	Result of a sequence of actions
 A0015502	Visual inspection

1.2.5 Symbols in graphics

Symbol	Meaning
1, 2, 3, 4, ...	Item numbers
1. , 2. , 3. , ...	Series of steps
A, **B**, **C**, **D**, ...	Views

1.2.6 Symbols at the device

Symbol	Meaning
 A0019159	**Safety instructions** Observe the safety instructions contained in the associated Operating Instructions.

1.2.7 Registered trademarks

GORE-TEX®
Registered trademarks of W.L. Gore & Associates, Inc., USA

TEFLON®
E.I. Du Pont de Nemours & Co., Wilmington, USA brand.

2 Basic safety instructions

2.1 Designated use

The Waterpilot FMX167 is a hydrostatic pressure sensor for measuring the level of fresh water, wastewater and salt water. The temperature is measured simultaneously in the case of sensor versions with a Pt100 resistance thermometer. An optional temperature head transmitter converts the Pt100 signal to a 4 to 20 mA signal.

The manufacturer accepts no liability for damages resulting from incorrect use or use other than that designated.

2.2 Installation, commissioning and operation

The Waterpilot FMX167 and the (optional) TMT181 temperature head transmitter are designed to meet state-of-the-art safety requirements and comply with applicable regulations and EC Directives. If used incorrectly or for applications for which they are not intended, the devices can be a source of application-related danger, e.g. product overflow due to incorrect installation or configuration. For this reason, installation, connection to the electricity supply, commissioning, operation and maintenance of the measuring system must only be carried out by trained, qualified specialists authorized to perform such work by the facility's owner-operator. The specialist staff must have read and understood these Operating Instructions and must follow the instructions they contain. Modifications and repairs to the devices are permissible only if they are expressly allowed in the Operating Instructions. Pay particular attention to the data and information on the nameplate.

2.3 Operational and process safety

Alternative monitoring measures have to be taken while configuring, testing or servicing the device to ensure the operational and process safety.

2.3.1 Hazardous area (optional)

Devices for use in hazardous areas bear an additional marking on the nameplate (→ 8). If using the measuring system in hazardous areas, the appropriate national standards and regulations must be observed. The device is accompanied by separate Ex documentation, which is an integral part of this documentation. The installation regulations, connection values and safety instructions listed in this document must be observed. The documentation number of the related Safety Instructions (XA) is also indicated on the nameplate.

- Ensure that all personnel are suitably qualified.
- Measuring point requirements with regard to measurement and safety must be observed.
- Please refer to the "Ordering information" section of Technical Information TI00351P/00/EN for versions for approvals in the order code.

3 Incoming acceptance and product identification

3.1 Incoming acceptance

- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

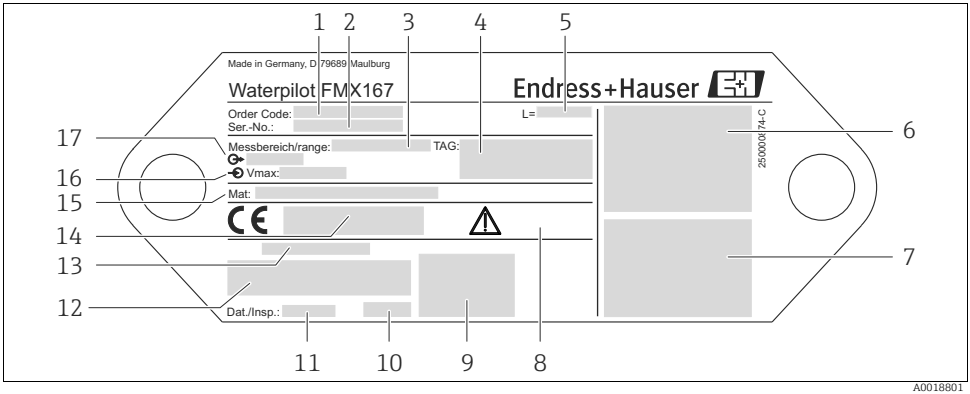
3.2 Product identification

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

- Nameplate specifications
- 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

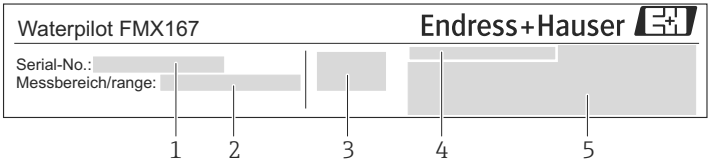
3.2.1 Identifying the measuring device via the nameplate

The nameplate is secured to the extension cable of the FMX167 (→ 11).



1 *Order code (See the specifications on the order confirmation for the meanings of the individual letters and digits.*
2 *Serial number*
3 *Nominal measuring range*
4 *TAG (Tagging)*
5 *Length of the extension cable*
6 *FMX167 connection diagram*
7 *Pt100 connection diagram (if the Waterpilot was ordered with Pt100)*
8 *Observe the information on installation in the Operating Instructions!*
9 *Approval symbol (optional)*
10 *Symbol: Observe Safety Instructions, with information on the documentation number, e.g. XA00131P (optional)*
11 *Test date (optional)*
12 *Text for approval (optional)*
13 *Identification number of the notified body for ATEX (optional)*
14 *Ex symbol (CSA, FM, optional)*
15 *Wetted materials*
16 *Supply voltage*
17 *Output*

In addition, the FMX167 with an outer diameter of 22 mm (0.87 in) and 42 mm (1.65 in) also bears the following information:



1 *Serial number*
2 *Nominal measuring range*
3 *CE mark or approval symbol*
4 *Identification number of the notified body for ATEX (optional)*
5 *Text for approval (optional)*

3.2.2 Identifying the measuring device via the order code

Specific device features make up the order code. You can assign these features in the "Ordering information" section of Technical Information TI00351P/00/EN.

3.3 Transport and storage

3.3.1 Transport

NOTICE

Devices or cable may be damaged

- ▶ Comply with the safety instructions, transport conditions for devices over 18kg (39.6lbs) (DIN EN 61010-1).
- ▶ Transport the measuring device to the measuring point in its original packaging.

3.3.2 Storage

See operating instructions.

3.4 Scope of delivery

The scope of delivery comprises:
- Waterpilot FMX167, optionally with integrated Pt100 resistance thermometer
- Optional accessories (see operating instructions)

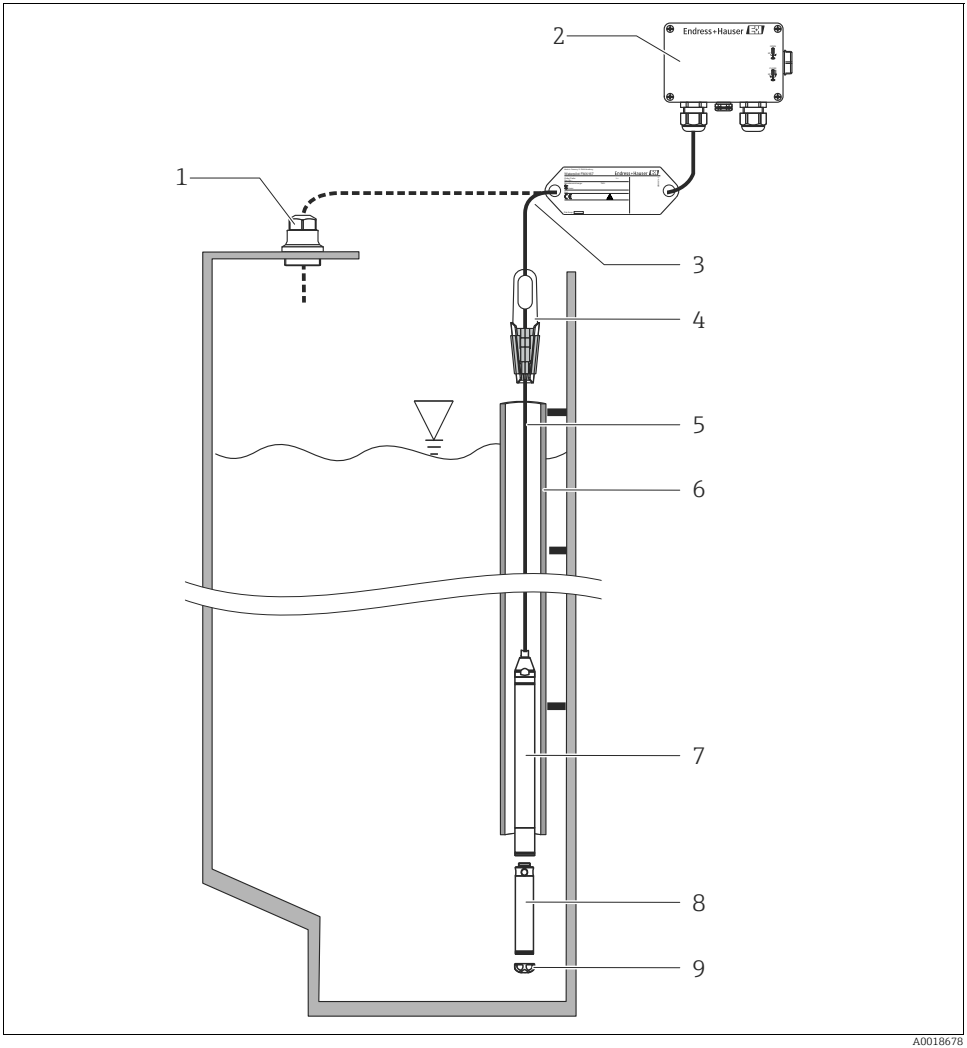
Documentation supplied:
- Operating Instructions BA00231P (this document)
- Calibration report/Final inspection report
- SD00126P drinking water approval (optional)
- Devices suitable for use in hazardous areas: Additional documentation such as Safety Instructions (XA)

3.5 CE mark, Declaration of Conformity

The devices are designed to meet state-of-the-art safety requirements, have been tested and left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations as listed in the EC Declaration of Conformity and thus comply with the legal requirements of the EC Directives. Endress+Hauser confirms the conformity of the device by affixing to it the CE mark.

4 Mounting

4.1 Mounting requirements



Installation examples, here illustrated with FMX167 with an outer diameter of 22 mm (0.87 in)

1 Extension cable mounting screw (can be ordered as an accessory)
2 Terminal box (can be ordered as an accessory)
3 Extension cable bending radius >120 mm (4.72 in)
4 Mounting clamp (can be ordered as an accessory)

5 Extension cable
6 Guide pipe
7 Waterpilot FMX167
8 Additional weight can be ordered as an accessory for FMX167 with an outer diameter of 22 mm (0.87 in) and 29 mm (1.14 in)
9 Protection cap

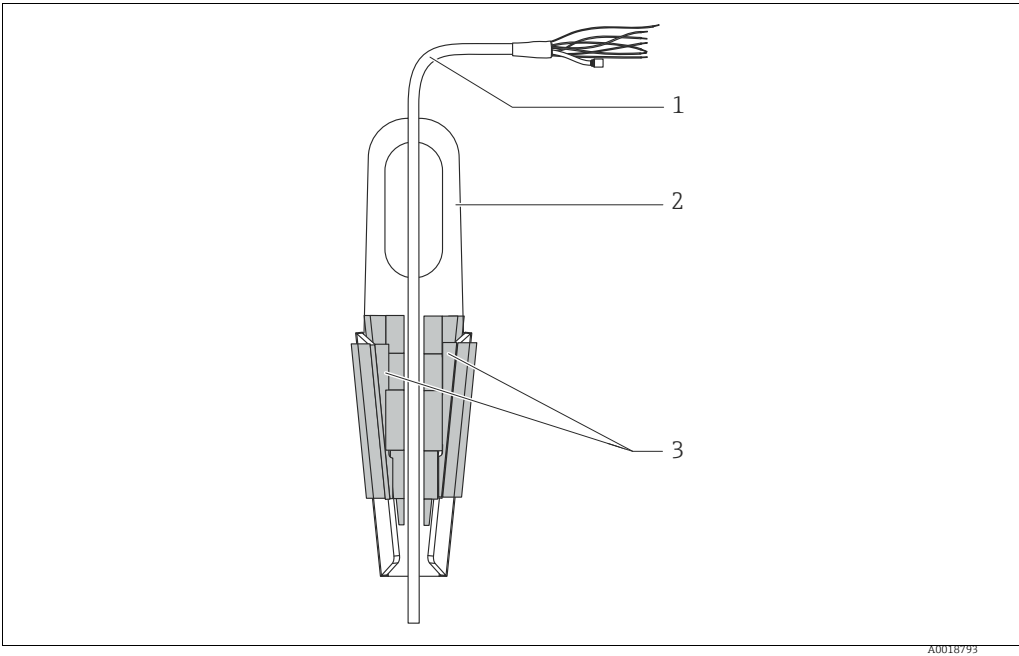
4.1.1 Additional mounting instruction

- Cable length
  - Customer-specific length in meters or feet.
  - Limited cable length when performing installation with freely suspended device with extension cable mounting screw or mounting clamp, as well as for FM/CSA approval: max. 300 m (984 ft).
- Sideways movement of the level probe can result in measuring errors. For this reason, install the probe at a point free from flow and turbulence, or use a guide tube. The internal diameter of the guide tube should be at least 1 mm (0.04 in) larger than the outer diameter of the selected FMX167.
- The device is provided with a protection cap to prevent mechanical damage to the measuring cell.
- The cable must end in a dry room or a suitable terminal box. The terminal box from Endress+Hauser provides optimum humidity and climatic protection and is suitable for outdoor installation.
- If the cable is shortened, the filter at the pressure compensation tube has to be reattached. Endress+Hauser offers a cable shortening kit for this purpose, see the documentation SD00552P/00/A6.
- Endress+Hauser recommends using twisted, shielded cables for any further wiring.

4.1.2 Dimensions

For dimensions, please refer to Technical Information TI00351P/00/EN for the Waterpilot, "Mechanical construction" section (→ see also: www.endress.com → Select Country → Download → Media Type: Documentation).

4.2 Mounting the Waterpilot with a mounting clamp

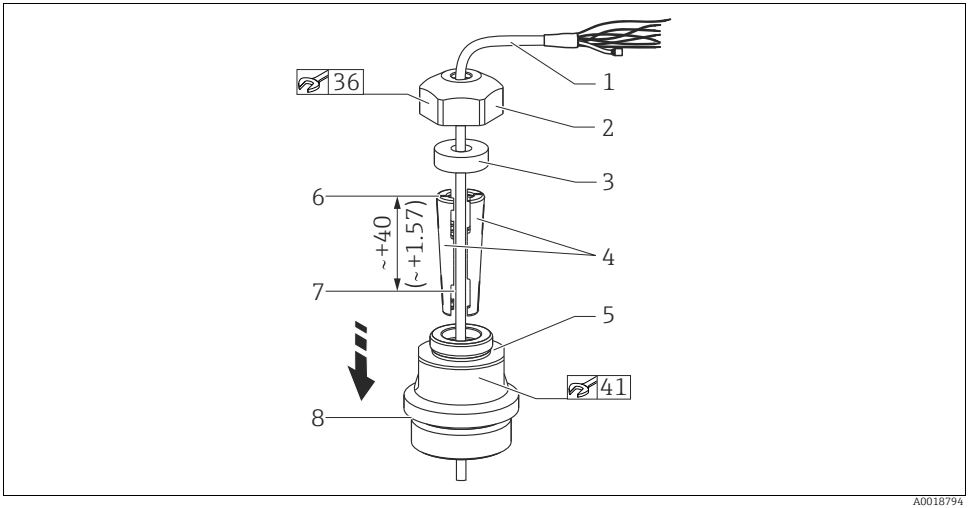


1 Extension cable
2 Mounting clamp
3 Clamping jaws

4.2.1 Mounting the mounting clamp:

1. Mount the mounting clamp (item 2). When selecting the place to fix the unit, take the weight of the extension cable (item 1) and the device into account.
2. Raise the clamping jaws (item 3). Position the extension cable (item 1) between the clamping jaws as illustrated in the graphic.
3. Hold the extension cable in position (item 1) and push the clamping jaws (item 3) back down. Tap the clamping jaws gently from above to fix in place.

4.3 Mounting with an extension cable mounting screw



Illustrated with thread G 1½". Dimensions in mm (in)

1 *Extension cable*
2 *Cover mounting screw*
3 *Sealing ring*
4 *Clamping sleeves*
5 *Mounting screw adapter*
6 *Top edge of clamping sleeve*
7 *Required length of extension cable and probe before assembly*
8 *After assembly, item 7 is located next to the mounting screw with G 1½" thread: height of sealing surface of the adapter or NPT 1½" thread height of thread run-out of adapter*

If you want to lower the level probe to a certain depth, place the top edge of the clamping sleeve 40 mm (1.57 in) higher than the required depth. Then push the extension cable and the clamping sleeve into the adapter as described in Step 6 in the following section.

4.3.1 Mounting extension cable mounting screw with G 1½" or NPT 1½" thread:

1. Mark the desired length of the extension cable on the extension cable.
2. Insert the probe through the measuring aperture and carefully lower on the extension cable. Fix the extension cable to prevent it from slipping.
3. Push the adapter (item 5) over the extension cable and screw it tightly into the measuring aperture.
4. Push the sealing ring (item 3) and cover (item 2) onto the cable from above. Press the sealing ring into the cover.
5. Place the clamping sleeve (item 4) around the extension cable at the mark (item 1) in accordance with step 1.

6. Push the extension cable with the clamping sleeve (item 4) into the adapter (item 5).
7. Push the cover (item 2) and sealing ring (item 3) onto the adapter (item 5) and screw tightly to the adapter.

Reverse the sequence of steps to remove the extension cable mounting screw.

⚠ CAUTION

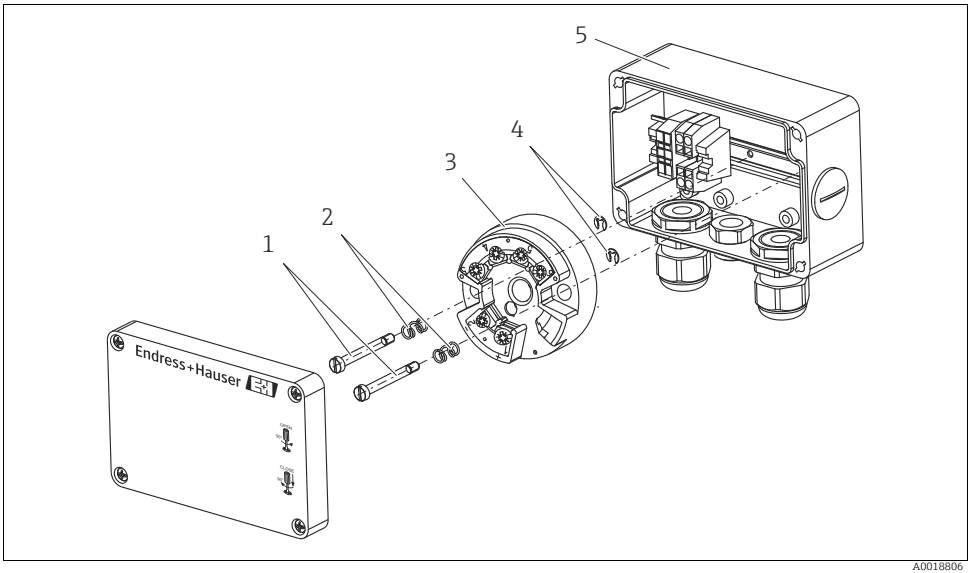
Risk of injury

- Application in unpressurized containers only.

4.4 Mounting the terminal box

The optional ˚ is mounted with four screws (M4). For the dimensions of the terminal box, please refer to Technical Information TI00351P/00/EN for the Waterpilot, "Mechanical construction" section (→ see also: www.endress.com → Select Country → Download → Media Type: Documentation).

4.5 Mounting the TMT181 temperature head transmitter



A0018806

Temperature head transmitter with terminal box

1 Mounting screws
2 Mounting springs
3 TMT181 temperature head transmitter
4 Circlips
5 Terminal box

Only open the terminal box with a screwdriver.

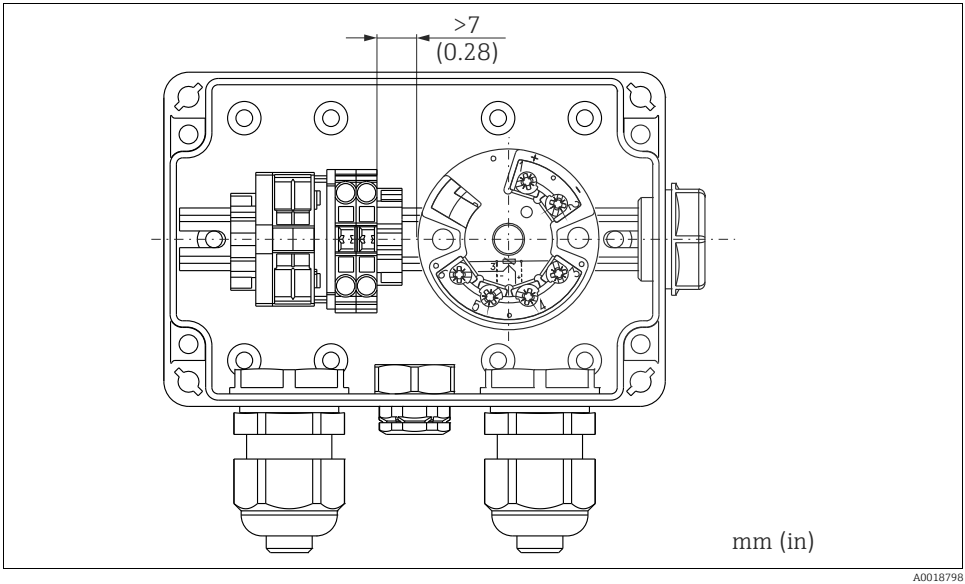
4.5.1 Mounting the temperature head transmitter

1. Guide the mounting screws (item 1) with the mounting springs (item 2) through the guide holes of the temperature head transmitter (item 3).
2. Fix the mounting screws with the circlips (item 4). Circlips, mounting screws and springs are included in the scope of delivery for the temperature head transmitter.
3. Screw the temperature head transmitter into the field housing tightly. (Max. width of screwdriver blade 6 mm (0.24 in))

NOTICE

Prevent damage to the temperature head transmitter.

- Do not tighten the mounting screw too tightly.



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A distance of > 7 mm (> 0.28 in) must be maintained between the terminal strip and the TMT181 temperature head transmitter.

4.6 Post-mounting check

Check that all screws are firmly seated.

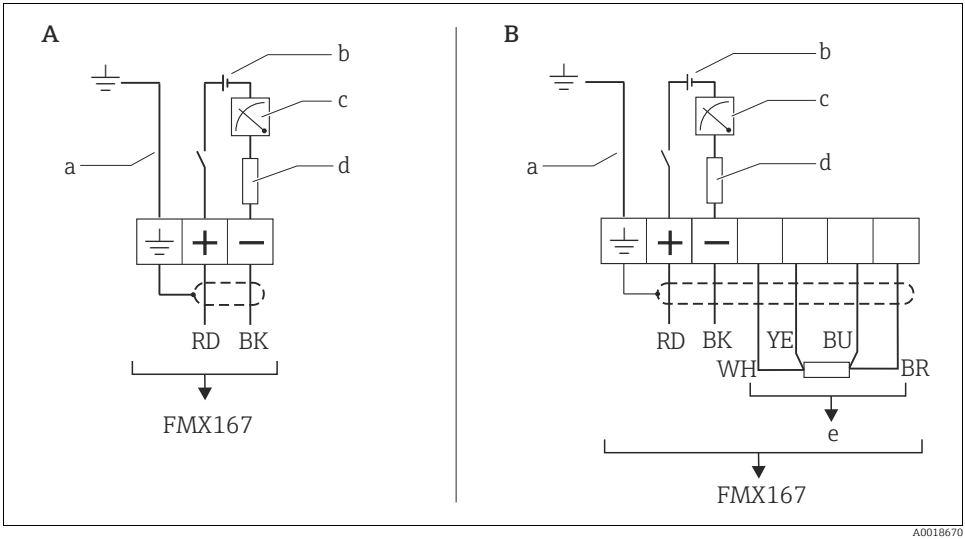
5 Electrical connection

5.1 Connecting the device

⚠ WARNING

Explosion hazard!

- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- The supply voltage must match the supply voltage on the nameplate (→ 🖹 8).
- Switch off the supply voltage before connecting the device.
- The cable must end in a dry room or a suitable terminal box. The IP66/IP67 terminal box with a GORE-TEX® from Endress+Hauser is suitable for outdoor installation (→ 🖹 15).
- Connect the device in accordance with the following diagrams. Reverse polarity protection is integrated in both the Waterpilot FMX167 and TMT181 temperature head transmitter. Changing the polarities will not result in the destruction of the devices.
- A suitable circuit breaker should be provided for the device in accordance with IEC/EN 61010.



A *Waterpilot FMX167, versions "7" or "3" for Feature 70 "Additional options" in the order code*

B *Waterpilot FMX167 with Pt100 (not for use in hazardous areas), versions "1" or "4" for feature 70 "Additional options" in the order code*

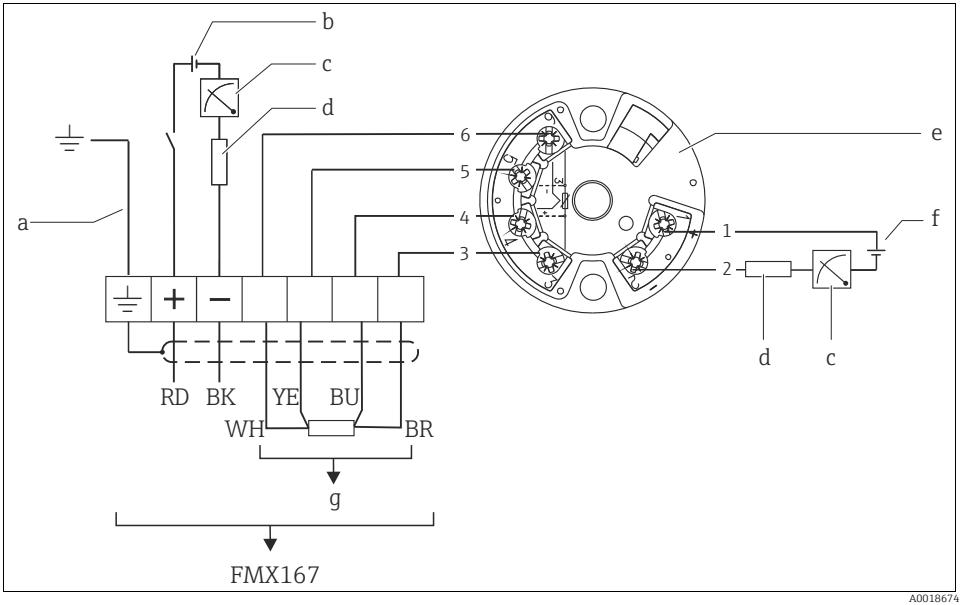
a *Not for FMX167 with outer diameter 29 mm (1.14 in)*

b *10 to 30 V DC*

c *4 to 20 mA*

d *Resistance (R_L)*

e *Pt100*



Waterpilot FMX167 with Pt100 and TMT181 (4 to 20 mA) (not for use in hazardous areas), version "5" for feature 70 in the order code

a *Not for FMX167 with outer diameter 29 mm (1.14 in)*
b *10 to 30 V DC*
c *4 to 20 mA*
d *Resistance (R_L)*
e *TMT181 temperature head transmitter (4 to 20 mA)*
f *8 to 35 V DC*
g *Pt100*

[1] Not for use in hazardous areas.

Wire colors
RD = red, BK = black, WH = white, YE = yellow, BU = blue, BR = brown

5.1.1 Supply voltage

FMX167	FMX167 + Pt100	TMT181 temperature head transmitter
10 to 30 V DC	10 to 30 V DC	8 to 35 V DC

5.1.2 Cable specification

- FMX167 with optional Pt100
  - Commercially available, shielded instrument cable

  - Terminals, FMX167 terminal box: 0.08 to 2.5 mm^2 (28 to 14 AWG)
- TMT181 temperature head transmitter (optional)
  - Commercially available instrument cable
  - Terminals, FMX167 terminal box: 0.08 to 2.5 mm^2 (28 to 14 AWG)
  - Transmitter terminals: max. 1.75 mm^2 (16 AWG)

The extension cables are shielded for versions with outer diameters of 22 mm (0.87 in) or 42 mm (1.65 in).

In the following cases, Endress+Hauser recommends the use of a shielded cable as the cable extension:
- For large distances between the end of the extension cable and the display and/or evaluation unit.
- For large distances between the end of the extension cable and the temperature head transmitter.
- When directly connecting the Pt100 signal to a display and/or evaluation unit.

5.1.3 Power consumption, current consumption

	FMX167	FMX167 + Pt100	TMT181 temperature head transmitter
Power consumption	≤ 0.675 W at 30 V DC	≤ 0.675 W at 30 V DC	≤ 0.875 W at 35 V DC
Current consumption	Max. ≤ 22.5 mA Min. ≥ 3.5 mA	Max. ≤ 22.5 mA Min. ≥ 3.5 mA Pt100: ≤ 0.6 mA	Max. ≤ 25 mA Min. ≥ 3.5 mA

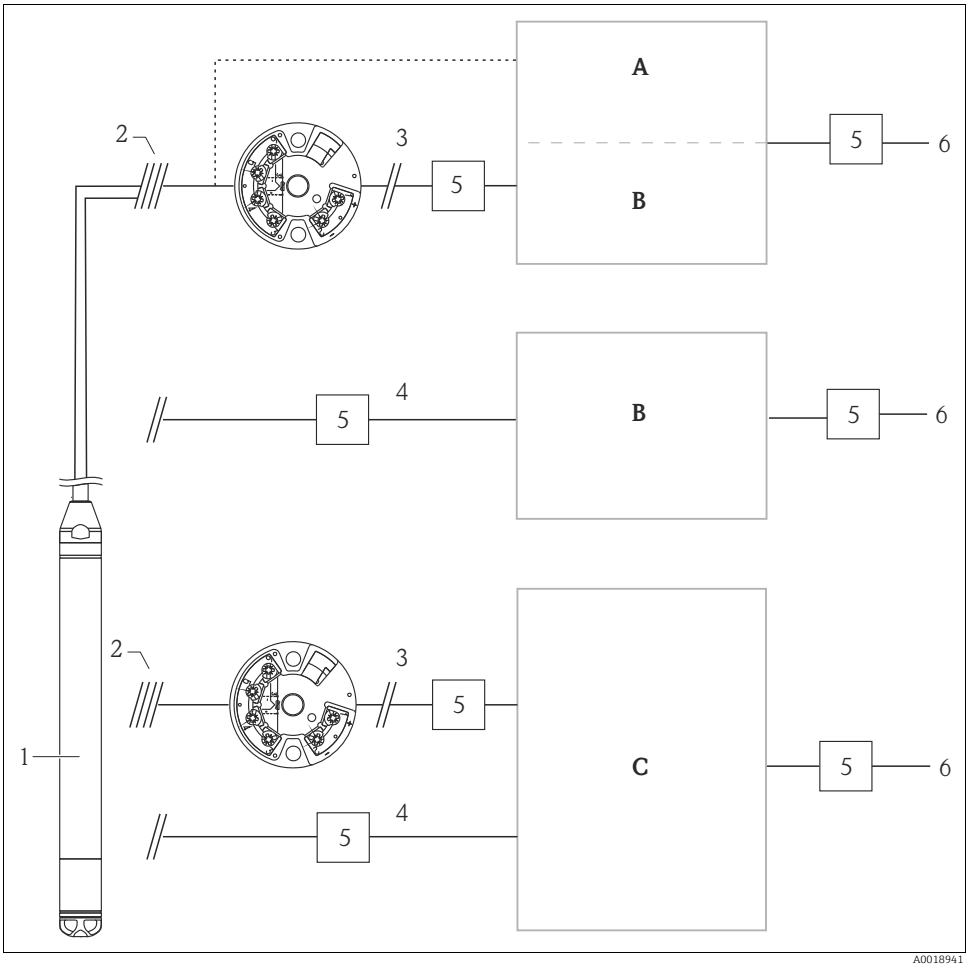
5.1.4 Load

See operating instructions.

5.2 Measuring unit electrical connection

5.2.1 Overvoltage protection

To protect the Waterpilot FMX167 and the TMT181 temperature head transmitter from large interference voltage peaks, Endress+Hauser recommends installing external overvoltage protection upstream and downstream of the display and/or evaluation unit as shown in the graphic.
Overvoltage protection in accordance with EN 61000 (500 V symmetrical/1000 V asymmetrical) is integrated in the Waterpilot FMX167 as standard.



A *Power supply, display and evaluation unit with one input for Pt100*
B *Power supply, display and evaluation unit with one input for 4 to 20 mA*
C *Power supply, display and evaluation unit with two inputs for 4 to 20 mA*
1 *Waterpilot FMX167*
2 *Connection for integrated Pt100 temperature sensor in the FMX167*
3 *4 to 20 mA (Temperature)*
4 *4 to 20 mA (Level)*
5 *Overvoltage protection (OP), e.g. HAW from Endress+Hauser (not for use in hazardous areas)*
6 *Power supply*

5.3 Post-connection check

The following checks must be performed after completing electrical connection of the device:
- Does the supply voltage match the specifications on the nameplate?
- Is the device connected as described in Kap. 5.1 "Connecting the device"?
- Are all screws firmly tightened?
- Optional terminal box: are the cable glands leaktight?

6 Operability

Endress+Hauser offers comprehensive measuring point solutions with display and/or evaluation units for the Waterpilot and TMT181 temperature head transmitter.

Please contact your Endress+Hauser sales representative, if you have any other questions. Contact addresses can be found on the Internet: www.endress.com/worldwide.

www.addresses.endress.com

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