Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Waterpilot FMX167

Hydrostatic Level Measurement
Reliable and rugged level probe with ceramic measuring cell
Compact device for level measurement in fresh water, wastewater and saltwater

Applications

The Waterpilot FMX167 is a pressure sensor for hydrostatic level measurement. Three versions of FMX167 are available at Endress+Hauser:

- FMX167 with an outer diameter = 22 mm (0.87 in): Version very suitable for drinking water applications and for use in probe tubes with small diameters
- FMX167 with an outer diameter = 42 mm (1.66 in): Heavy version and very easy to clean thanks to the flush-mounted diaphragm. Very suitable for wastewater and sewage treatment plants
- FMX167 with an outer diameter = 29 mm (1.15 in): Resistant version for use in saltwater and very suitable for applications on ships (e.g. ballast water tanks)

Your benefits

- High mechanical resistance to overload and aggressive media
- High-precision and long-term stability ceramic measuring cell
- Resistant to climatic changes thanks to potted electronics and 2-filter pressure compensation system
- 4…20 mA output signal with integrated overvoltage protection
- Simultaneous level and temperature measurement by optional integrated temperature sensor Pt 100
- Drinking water approval: KTW, NSF, ACS
- Certified to ATEX, FM and CSA
- Complete measuring point solutions through comprehensive accessories

Endress+Hauser

People for Process Automation

Table of contents

Function and system design

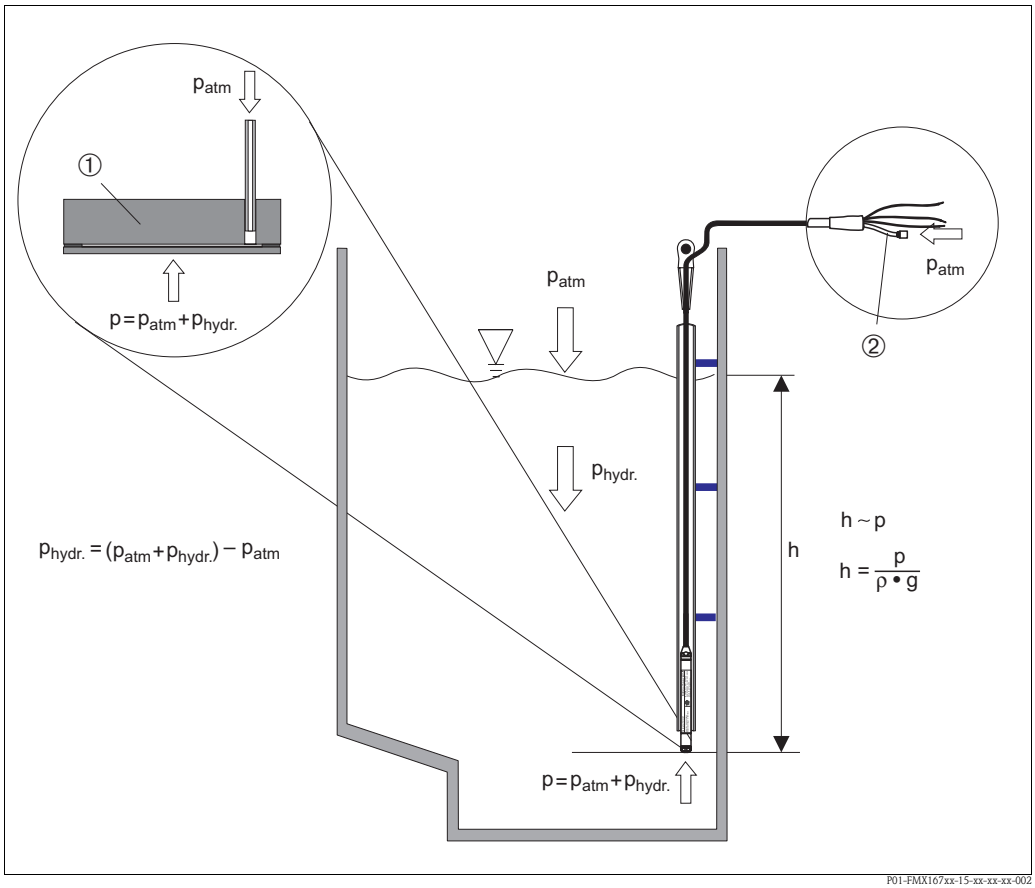
Device selection

Waterpilot FMX167	 P01-FMX167xx-16-xx-xx-xx-002	 P01-FMX167xx-16-xx-xx-xx-003	 P01-FMX167xx-16-xx-xx-xx-004
Field of application	Hydrostatic level measurement in deep wells e.g. drinking water	Hydrostatic level measurement in wastewater	Hydrostatic level measurement in saltwater
Process connection	– Suspension clamp – Extension cable mounting screw with G1 1/2 A or 1 1/2 NPT thread		
Outer diameter	22 mm (0.87 in)	42 mm (1.66 in)	Max. 29 mm (1.15 in)
Seals	– FKM Viton – EPDM[1]	– FKM Viton	– FKM Viton – EPDM
Measuring ranges	– Nine fixed pressure measuring ranges in bar, mH_2O, psi and ftH_2O, from 0...0.1 bar to 0...20 bar (0...1 mH_2O to 0...200 mH_2O/ 0...1.5 psi to 0...300 psi/0...3 ftH_2O to 0...600 ftH_2O) – Customer-specific measuring ranges; factory-calibrated		– Seven fixed pressure measuring ranges in bar, mH_2O, psi and ftH_2O, from 0...0.1 bar to 0...4 bar (0...1 mH_2O to 0...40 mH_2O/ 0...1.5 psi to 0...60 psi/ 0...3 ftH_2O to 0...150 ftH_2O) – Customer-specific measuring ranges; factory-calibrated
Overload	Up to 40 bar (580 psi)		Up to 25 bar (362 psi)
Process temperature	–10...+70°C (-14...+158°F)		0...+50°C (+32...+122°F)
Ambient temperature range	–10...+70°C (-14...+158°F)		0...+50°C (+32...+122°F)
Maximum measured error	±0.2 % of upper range value (URV)		
Supply voltage	10...30 V DC		
Output	4...20 mA		
Options	– Drinking water approval – Integrated Pt 100 temperature sensor – Integrated Pt 100 temperature sensor and temperature transmitter TMT181 (4...20 mA)	– Integrated Pt 100 temperature sensor – Integrated Pt 100 temperature sensor and temperature transmitter TMT181 (4...20 mA)	– Integrated Pt 100 temperature sensor – Integrated Pt 100 temperature sensor and temperature transmitter TMT181 (4...20 mA)
Specialties	– Integrated overvoltage protection – Large selection of approvals, including ATEX II 2 G, FM and CSA – High-precision, long-term stable and rugged ceramic measuring cell		

1) Recommended for drinking water applications, not suitable for use in hazardous areas

Measuring principle

The ceramic measuring cell is dry, i.e. pressure acts directly on the rugged ceramic diaphragm of Waterpilot FMX167 and causes it to move by max. 0.005 mm.
The effects of air pressure on the liquid surface are transferred via a pressure compensation tube through the extension cable to the rear of the ceramic diaphragm and compensated. Pressure-dependent changes in capacitance caused by diaphragm movement are measured at the electrodes of the ceramic carrier. The electronics convert the movement into a pressure-proportional signal which is linear to the medium level.



FMX167 measuring principle

1 *Ceramic measuring cell*
2 *Pressure compensation tube*
h *Level height*
p *Total pressure = hydrostatic pressure + atmospheric pressure*
ρ *Medium density*
g *Gravitational acceleration*
phydr. *Hydrostatic pressure*
patm *Atmospheric pressure*

Temperature measurement with optional Pt 100

Endress+Hauser offers an optional 4-wire Pt 100 resistance thermometer for Waterpilot FMX167 to measure level and temperature simultaneously. The Pt 100 belongs to Accuracy Class B to DIN EN 60751.

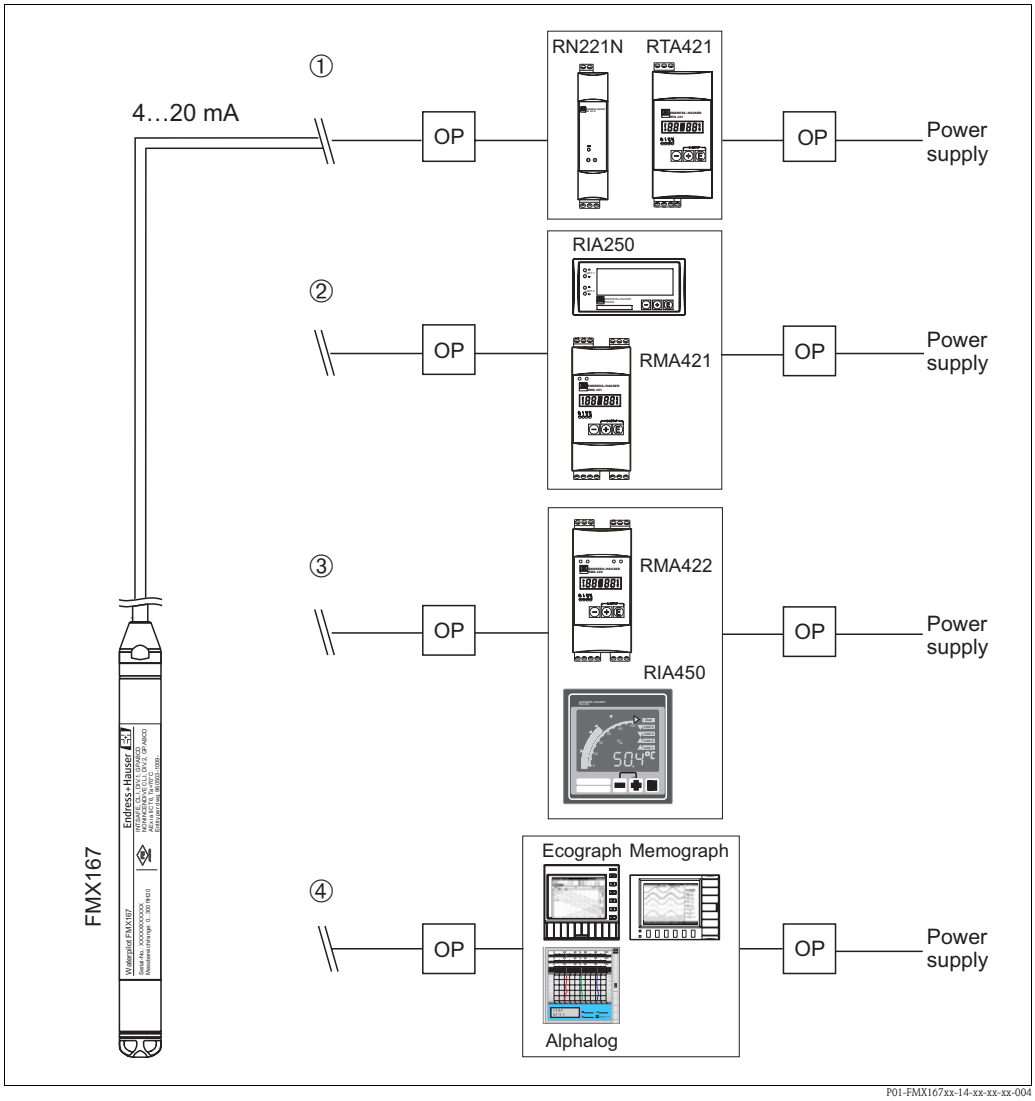
Temperature measurement with optional Pt 100 and temperature transmitter TMT181

To convert the Pt 100 signal to a 4…20 mA signal, Endress+Hauser also offers the TMT181 temperature transmitter.

Measuring system

The complete standard measuring system consists of Waterpilot FMX167 and a transmitter power supply unit with supply voltage of 10…30 V DC.

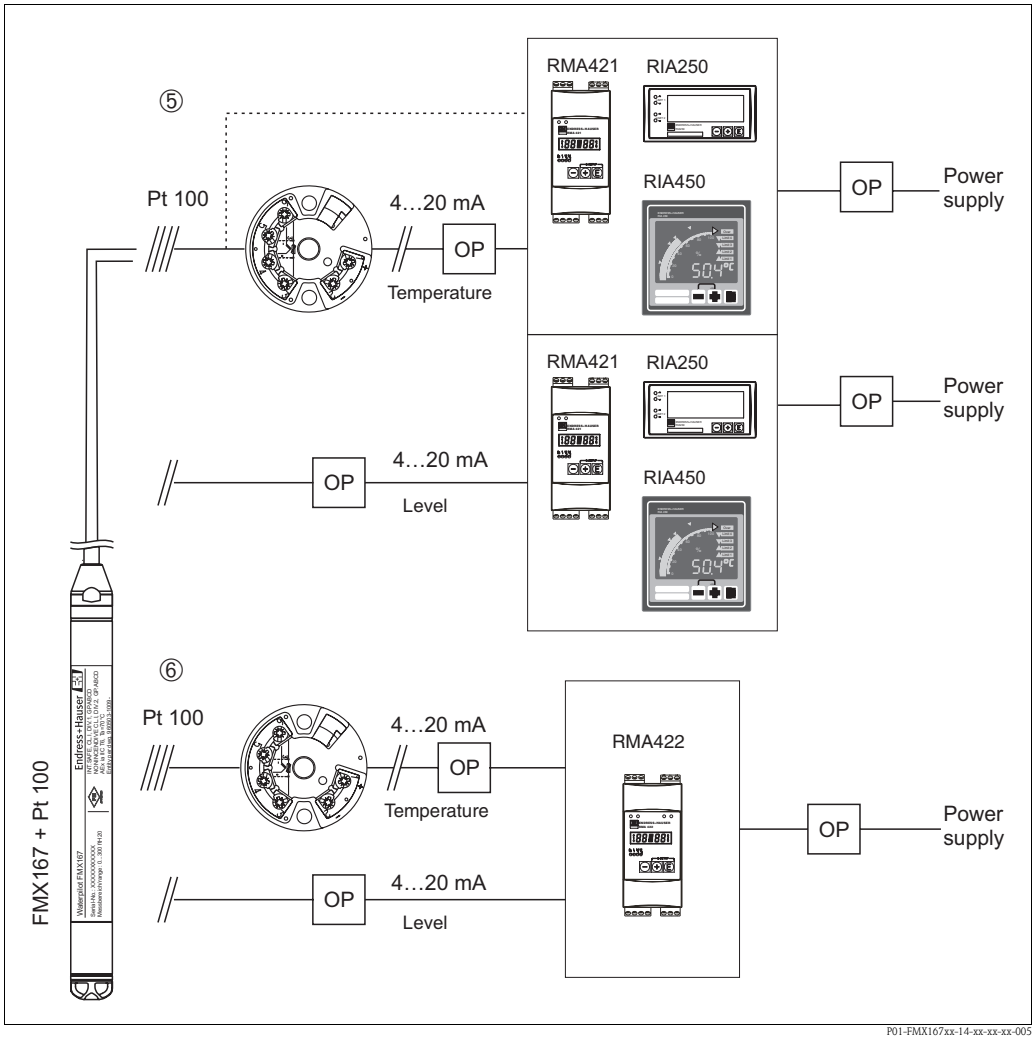
Example for other measuring point solutions with transmitter and possible evaluation units from Endress+Hauser:



Application examples with FMX167

OP Overvoltage protection e.g. HAW from Endress+Hauser

1. Simple cost-effective measuring point solution: Power supply of Waterpilot in hazardous and non-hazardous areas using RN221N active barrier.
   Power supply and additional control of two consumers, e.g. pumps, via limit switch RTA421 with onsite display.
2. Power supply, onsite display, two switch outputs and a signal adaptation (turn down) are integrated in evaluation devices RMA421 (for mounting on hat rails) and RIA250 (for panel mounting). The evaluation unit RMA421 also has a trend recognition function, e.g. optimizing pump control in stormwater overflow basins. This function detects and evaluates changes in a measurable value within a specific time period.
3. If several pumps are used, pump life can be prolonged by alternate switching. With alternating pump control, the pump which was out of service for the longest period of time is switched on. The evaluation units RIA450 (for panel mounting) and RMA422 (for mounting on hat rails) offer this function as well as several others.
4. State-of-the-art recording technology with monitor recorders from Endress+Hauser, e.g. Ecograph, Memograph or hardcopy recorders such as Alphalog for documenting, monitoring, visualizing and archiving.



P01-FMX167xx-14-xx-xx-xx-005

Application examples with FMX167 with Pt 100

OP Overvoltage protection e.g. HAW from Endress+Hauser

5. If you want to measure, display and evaluate temperature as well as level, e.g. to monitor temperature in fresh water to detect temperature limits for germ formation, you have the following options:
   The optional temperature transmitter can convert the Pt 100 signal into a 4…20 mA signal and transfer it to any customary evaluation unit. Evaluation devices RMA421, RIA250 and RIA450 also offer a direct input for the Pt 100 signal.
6. If you want to detect and evaluate level and temperature with one device, choose the evaluation unit RMA422 with two inputs. It even includes the mathematical operation for linking the input signals.

Input

Measured variable

FMX167 + Pt 100 (optional)

- Hydrostatic pressure of a liquid
- Pt 100: Temperature of a liquid

Temperature transmitter (optional)

- Temperature

Measuring range

- Nine fixed pressure measuring ranges in bar, mH_2O, psi and ftH_2O;
  → Page 18, "Ordering information" Section
- Customer-specific measuring ranges; factory-calibrated
- Temperature measurement from –10…+70°C (+14…+158°F) (optional with Pt 100)

Input signal

FMX167 + Pt 100 (optional)

- Change in capacitance
- Pt 100: Change in resistance

Temperature transmitter (optional)

- Pt 100 resistance signal, 4-wire

Output

Output signal

FMX167 + Pt 100 (optional)

- FMX167: 4...20 mA for hydrostatic pressure measured value, two-wire
- Pt 100: Temperature-dependent resistance of Pt 100

Temperature transmitter (optional)

- 4...20 mA for temperature measured value, two-wire

Load

FMX167 + Pt 100 (optional)

$$R_{tot} \leq \frac{U_b - 10\ V}{0.0225\ A} - 2 \cdot 0.09\frac{\Omega}{m} \cdot l - R_{add}$$

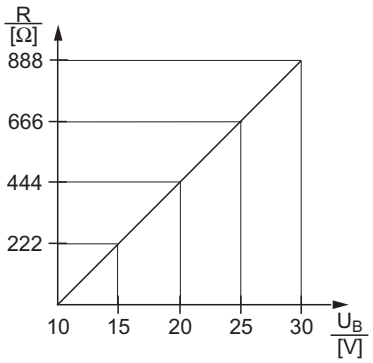
P01-FMX167xx-16-xx-xx-xx-000

Temperature transmitter (optional)

$$R_{tot} \leq \frac{U_b - 8\ V}{0.025\ A} - R_{add}$$

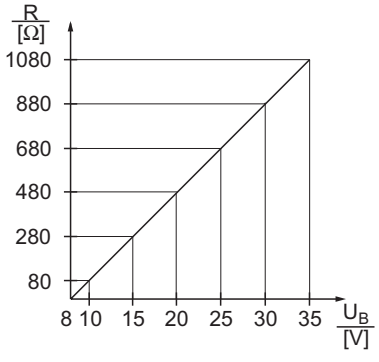
P01-FMX167xx-16-xx-xx-xx-001

Rtot = Max. load resistance [Ω]
Radd = Additional resistances such as resistance of evaluating device and/or display instrument, line resistance [Ω]
Ub = Supply voltage [V]
l = Simple length of extension cable [m] (cable resistance per wire ≤ 0.09 /Ωm)



P01-FMX167xx-05-xx-xx-xx-001

Load chart FMX167 for estimating load resistance. Subtract the additional resistances, e.g. resistance of extension cable, from the calculated value as shown in the equation.



P01-FMX167xx-05-xx-xx-xx-003

Load chart temperature transmitter for estimating load resistance. Subtract the additional resistances from the calculated value as shown in the equation.

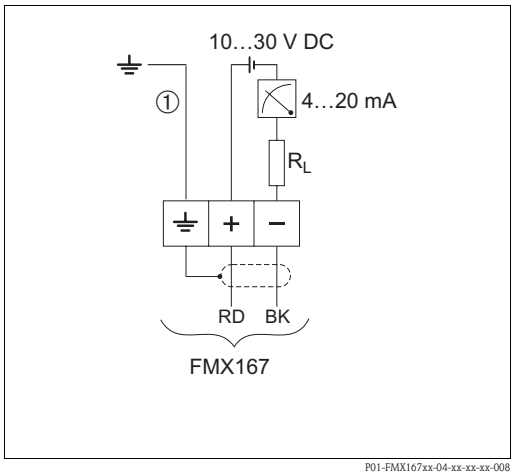
Power supply

Electrical connection

Note!

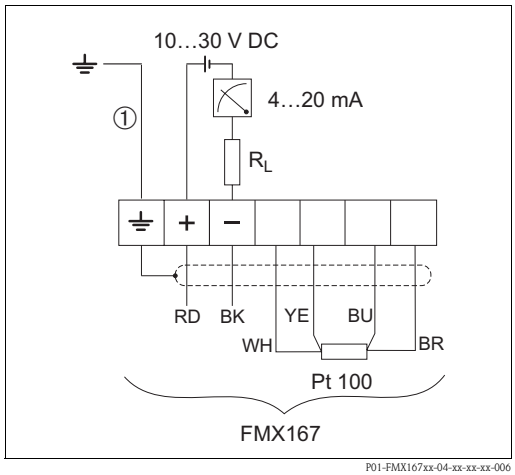
- When using the measuring device in hazardous areas, national standards and regulations as well as the Safety Instructions (XAs) or Installation or Control Drawings (ZDs) have to be observed. → See also Page 20, "Safety Instructions" and "Installation/Control Drawings" Sections.
- Reverse polarity protection is integrated in the Waterpilot FMX167 and in the temperature transmitter TMT181. Changing the polarities has no impact on operation.
- The cable must end in a dry room or in a proper terminal box. For installation outside, use the terminal box (IP 66/IP 67) with a GORE-TEX® filter from Endress+Hauser. The terminal box can be ordered using the order code of FMX167 (→ see Page 18, "Ordering information" Section) or an accessory (order number: 52006252).

Waterpilot FMX167, standard



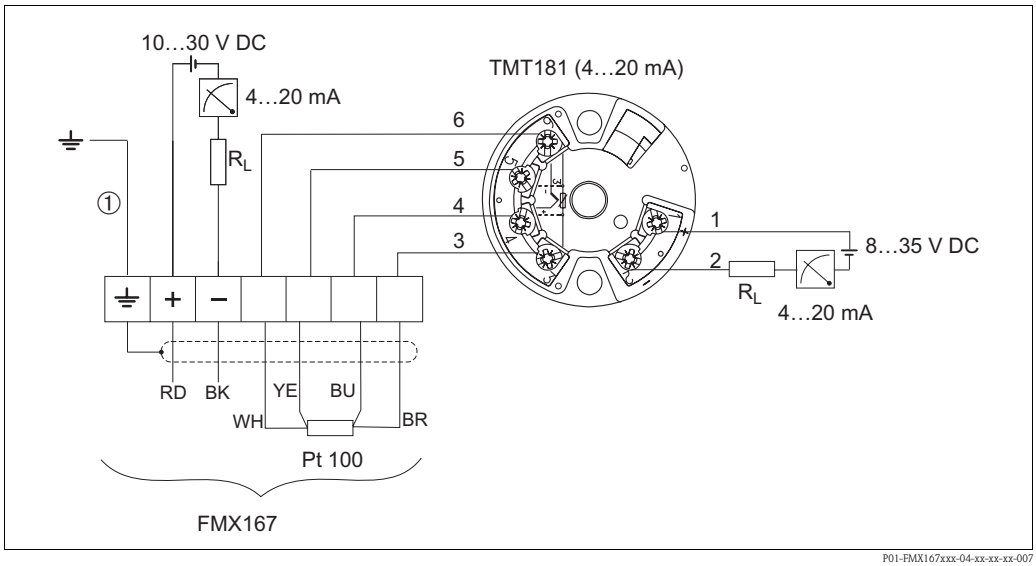
FMX167 electrical connection, versions "7" or "3" for Feature 70 "Additional options" in the order code (→ see Page 18).

Waterpilot FMX167 with Pt 100



FMX167 electrical connection with Pt 100, versions "1" or "4" for Feature 70 "Additional options" in the order code (→ see Page 18).

Waterpilot FMX167 with Pt 100 and TMT181 temperature transmitter (4...20 mA)



FMX167 with Pt 100 and TMT181 temperature transmitter (4...20 mA), version "5" for Feature 70 in the order code (→ see Page 18).

1 Not for FMX167 with outer diameter = 29 mm (1.15 in)

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

Supply voltage

Note!
- When using the measuring device in hazardous areas, national standards and regulations as well as the safety instructions (XAs) or Installation or Control Drawings (ZDs) have to be observed. → See also Page 20, "Safety Instructions" and "Installation/Control Drawings" Sections.

FMX167 + Pt 100 (optional)

- FMX167: 10...30 V DC
- Pt 100: 10...30 V DC

Temperature transmitter (optional)

- 8...35 V DC

Cable specifications

FMX167 + Pt 100 (optional)

- Commercially available instrument cable
- Terminals, terminal housing FMX167: 0.08...2.5 mm^2
- If the Pt 100 signal is directly connected to a display and/or evaluation unit, we recommend the use of a shielded cable.

Temperature transmitter (optional)

- Commercially available instrument cable
- Terminals, terminal housing FMX167: 0.08...2.5 mm^2
- Connection, transmitter: Max. 1.75 mm^2

Power consumption

FMX167 + Pt 100 (optional)

≤ 0.675 W at 30 V DC

Temperature transmitter (optional)

≤ 0.875 W at 35 V DC

Current consumption

FMX167 + Pt 100 (optional)

- Max. current consumption: ≤ 22.5 mA
  Min. current consumption: ≥ 3.5 mA
- Pt 100: ≤ 0.6 mA

Temperature transmitter (optional)

- Max. current consumption: ≤ 25 mA
  Min. current consumption: ≥ 3.5 mA
- Pt 100 via temperature transmitter: ≤ 0.6 mA

Residual ripple

FMX167 + Pt 100 (optional)

No effect for 4…20 mA signal up to ±5 % residual ripple within permissible range

Temperature transmitter (optional)

$U_{ss} \geq 5$ V at $U_B \geq 13$ V, $f_{max.} = 1$ kHz

Performance characteristics

Reference operating conditions

FMX167 + Pt 100 (optional)

DIN EN 60770 T_U = 25°C (77°F)

Temperature transmitter (optional)

Calibration temperature 23°C ± 5 K (73°F ± 5 K)

Maximum measured error

FMX167 + Pt 100 (optional)

- Non-linearity including hysteresis and non-repeatability as per DIN EN 60770: ±0.2% of upper range value (URV)
- Pt 100: Max. ±0.7 K (Class B to DIN EN 60751)

Temperature transmitter (optional)

- ±0.2 K
- With Pt 100: Max. ±0.9 K

Long-term stability

FMX167 + Pt 100 (optional)

±0.1% of upper range value (URL) per year

Temperature transmitter (optional)

≤ 0.1 K per year

Influence of medium temperature on the hydrostatic level measurement of FMX167

- Thermal change in zero signal and output span for typical application temperature range 0…+30°C (+32...+86°F): ±0.4% (±0.5%)* of the upper range limit (URL)
- Thermal change in zero signal and output span for the entire medium temperature range –10…+70°C (+14...+158°F): ±1.0% (±1.5%)* of the upper range limit (URL)
- Temperature coefficient (T_K) of zero signal and output span: 0.15%/10 K (0.3%/10 K)* of the upper range limit (URL)

* Specifications for sensors 0.1 bar (1 mH_2O, 1.5 psi, 3 ftH_2O) and 0.6 bar (6 mH_2O, 10 psi, 20 ftH_2O)

Warm-up period

FMX167 + Pt 100 (optional)

20 ms

Temperature transmitter (optional)

4 s

Rise time

FMX167 + Pt 100 (optional)

- FMX167: 80 ms
- Pt 100: 160 s

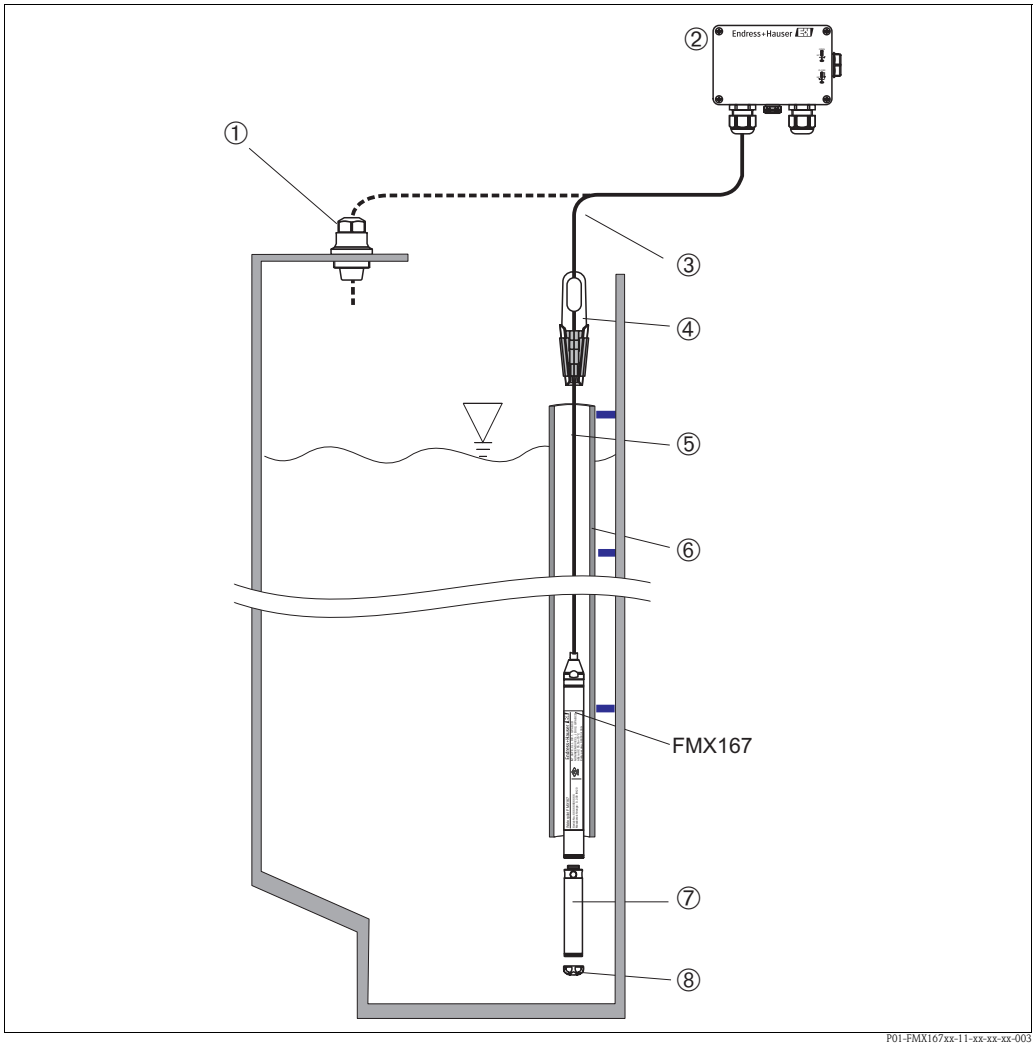
Settling time

FMX167 + Pt 100 (optional)

- FMX167: 150 ms
- Pt 100: 300 s

Installation

Installation instructions



Installation examples, here shown with FMX167 with an outer diameter = 22 mm (0.87 in)

1 Extension cable mounting screw can be ordered via order code or as an accessory, → see Page 14 and 19
2 Terminal housing can be ordered via order code or as an accessory, → see Page 15 and 19
3 Extension cable bending radius > 120 mm (4.72 in)
4 Suspension clamp can be ordered via order code or as an accessory, → see Page 14 and 19
5 Extension cable up to 300 m (384 ft), for max. length → see Page 16, "Extension cable" Section
6 Guide tube for FMX167 with outer diameter = 22 mm (0.87 in) internal diameter > 23 mm (0.91 in)
7 Additional weight can be ordered as an accessory for FMX167 with outer diameter = 22 mm (0.87 in) and 29 mm (1.15 in), → see Page 19
8 Protection cap

Note!
- A sideways movement of the level probe can lead to measuring errors. Therefore 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) bigger than the outer diameter of the selected FMX167.
- The cable must end in a dry room or in a proper terminal box. The terminal box from Endress+Hauser provides optimum humidity and climatic protection and is suitable for outdoor installation.

Environment

Ambient temperature range

FMX167 + Pt 100 (optional)

- FMX167 with outer diameter = 22 mm (0.87 in) and 42 mm (1.66 in): –10...+70°C (+14...+158°F) (= medium temperature)
- FMX167 with outer diameter = 29 mm (1.15 in): 0...+50°C (+32...+122°F) (= medium temperature)

Temperature transmitter (optional)

–40...+85°C (–40...+185°F)

Storage temperature

FMX167 + Pt 100 (optional)

–40...+80°C (–40...+185°F)

Temperature transmitter (optional)

–40...+100°C (–40...+212°F)

Degree of protection

FMX167 + Pt 100 (optional)

- IP 68, permanently hermetically sealed
- Optional terminal box: IP 66/IP 67

Temperature transmitter (optional)

- IP 00, moisture condensation permissible
- When mounted in the optional terminal boxes: IP 66/IP67

Electromagnetic compatibility (EMC)

FMX167 + Pt 100 (optional)

- Interference emission to EN 61326 Class B equipment, interference immunity to EN 61326 Appendix A (Industrial)
- Maximum deviation: < 0.5% of span

Temperature transmitter (optional)

- Interference emission to EN 61326 Class B equipment, interference immunity to EN 61326 Appendix A (Industrial)

Overvoltage protection

FMX167 + Pt 100 (optional)

Integrated overvoltage protection to EN 61000-4-5 ≤ 1.2kV
Install overvoltage protection ≥ 1.2 kV, external if necessary

Temperature transmitter (optional)

Install overvoltage protection, external if necessary.

Process

Medium temperature range

FMX167 + Pt 100 (optional)

- FMX167 with outer diameter = 22 mm (0.87 in) and 42 mm (1.66 in): –10...+70°C (+14...+158°F)
- FMX167 with outer diameter = 29 mm (1.15 in): 0...+50°C (+32...+122°F)

Temperature transmitter (optional)

–40...+85°C (–40...+185°C) (= ambient temperature), install temperature transmitter outside medium.

Medium temperature limits

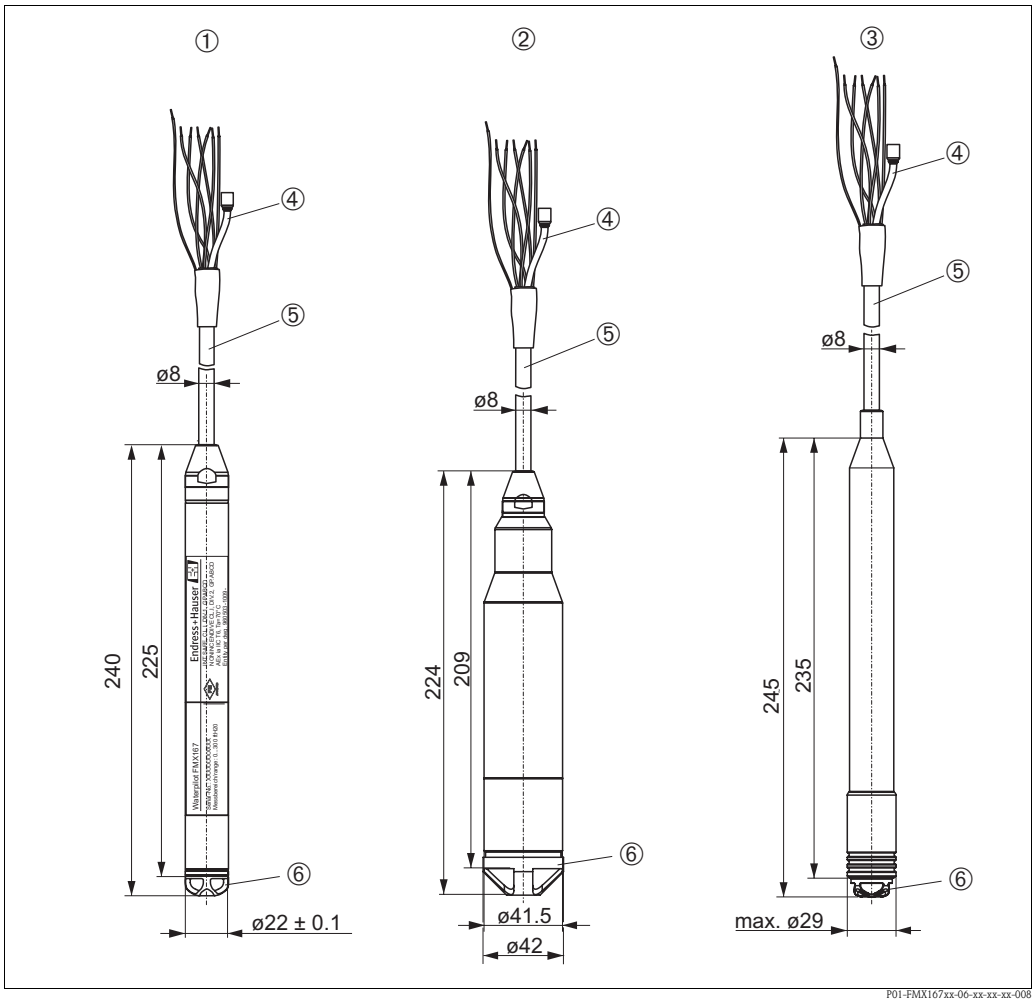
FMX167 + Pt 100 (optional)

- FMX167 with outer diameter = 22 mm (0.87 in) and 42 mm (1.66 in): –20...+70°C (–4...+158°F)
- FMX167 with outer diameter = 29 mm (1.15 in): 0...+50°C (+32...+122°F)

(You may operate the FMX167 in this temperature range. The specification can then be exceeded, e.g. measuring accuracy).

Mechanical construction

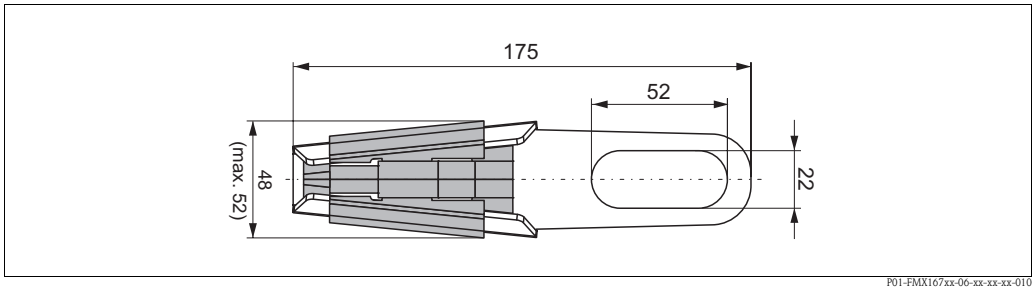
Dimensions of level probe



Versions of FMX167

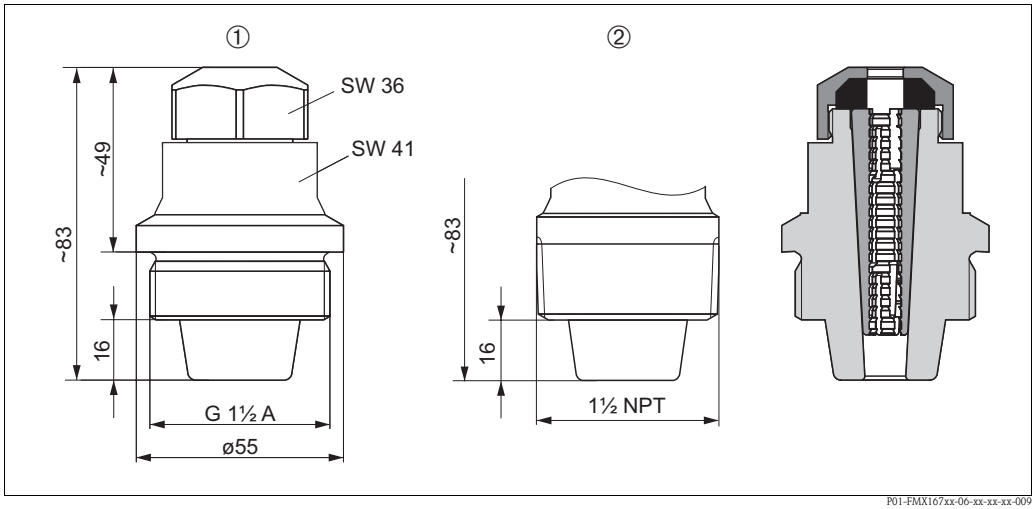
1 FMX167, version "A" or "D" for Feature 30 "Probe tube" in the order code (→ see Page 18)
2 FMX167, version "B" for Feature 30 "Probe tube" in the order code (→ see Page 18)
3 FMX167, version "C" for Feature 30 "Probe tube" in the order code (→ see Page 18)
4 Pressure compensation tube
5 Extension cable
6 Protection cap

Dimensions of suspension clamp



Suspension clamp, version 2 for Feature 20 "Connection" in the order code (→ see Page 18)

Dimensions of extension cable mounting screws

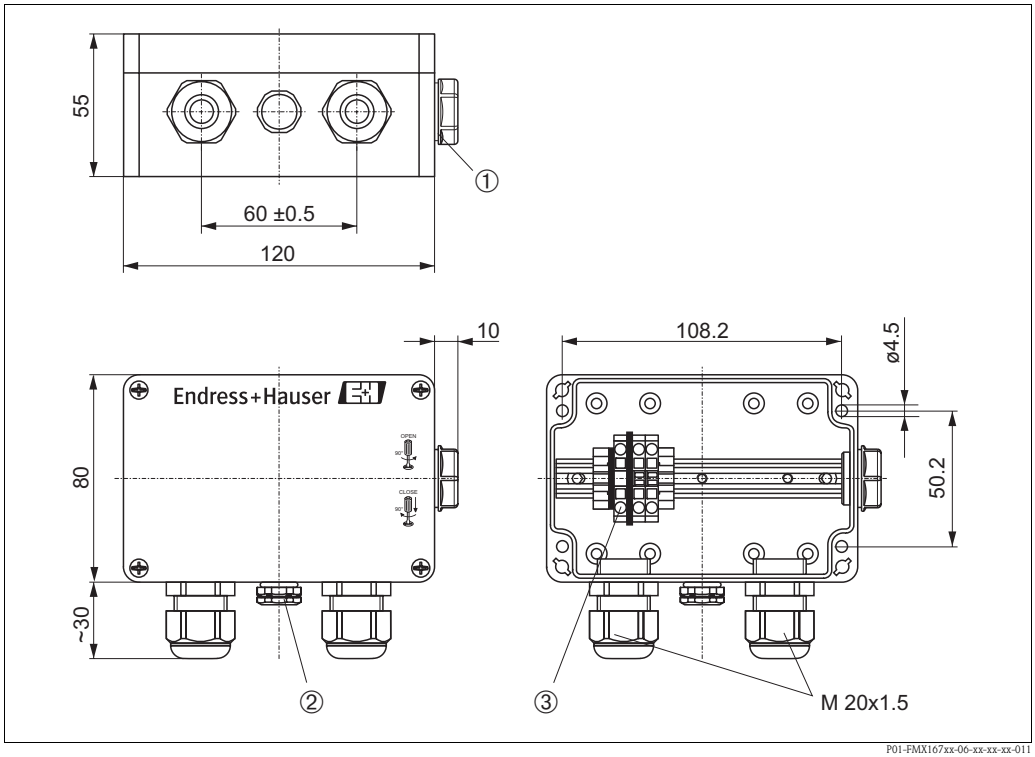


Extension cable mounting screws

1 Extension cable mounting screw G 1 1/2 A, version "3" for Feature 20 "Connection" in the order code (→ see Page 18)

2 Extension cable mounting screw 1 1/2 NPT, version "4" for Feature 20 "Connection" in the order code (→ see Page 18)

Dimensions of the terminal box IP 66/IP 67 with filter

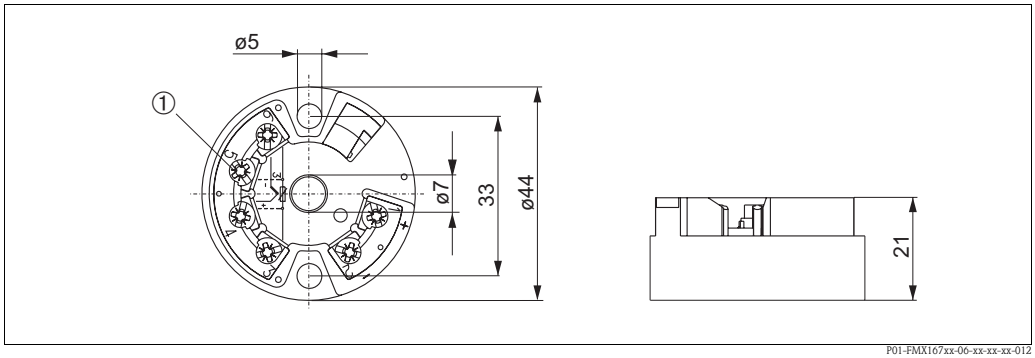


Terminal box

Version "3", "4" or "5" for Feature 70 "Additional options" in the order code (→ see Page 18)

1 Dummy plug M 20x1.5
2 GORE-TEX® filter
3 Terminals for 0.08...2.5 mm²

Dimensions of temperature transmitter TMT181



Temperature transmitter TMT181 (4...20 mA)

Version "5" for Feature 70 "Additional options" in the order code (→ see Page 18). The temperature transmitter can be used in non-hazardous areas and for EEx nA.

Weight

- Level probe, outer diameter = 22 mm (0.87 in): 290 g
- Level probe, outer diameter = 42 mm (1.66 in): 1150 g
- Level probe, outer diameter = 29 mm (1.15 in): 340 g
- Extension cable PE: 52 g/m
- Extension cable FEP: 108 g/m
- Suspension clamp: 170 g
- Extension cable mounting screw G 1 1/2 A: 770 g
- Extension cable mounting screw 1 1/2 NPT: 724 g
- Terminal box: 235 g
- Temperature transmitter: 40 g
- Additional weight: 300 g

Material

Level probe
- Level probe, outer diameter = 22 mm (0,87 in): 1.4435 (AISI 316L)
- Level probe, outer diameter = 42 mm (1.66 in): 1.4435 (AISI 316L)
- Level probe, outer diameter = 29 mm (1.15 in):
  – Level probe: 1.4435 (AISI 316L)
  – Sensor sleeve: PPS (polyphenylene sulfide)
  – Heat-shrink sleeve/cover: Polyolefin
  Metal does not come into contact with the medium.
- Process ceramic: Al_2O_3 aluminium oxide ceramic
- Seal (internal): EPDM or Viton
- Protective cap: PE-HD (high-density polyethylene)
- Extension cable insulation: Either PE (polyethylene) or FEP (fluorinated ethylene propylene). For more information, see the next Section – "Extension cable"
- Suspension clamp: 1.4404 (AISI 316L) and glass fiber reinforced PA (polyamide)
- Extension cable mounting screw G 1 1/2 A: 1.4301 (AISI 304)
- Extension cable mounting screw 1 1/2 NPT: 1.4301 (AISI 304)
- Terminal box: PC (polycarbonate)
- Temperature transmitter: Housing PC (polycarbonate)

Extension cable

Structure of PE extension cable
- Slip-resistant extension cable with strain-relief members made of Dynemo; shielded using aluminium-coated film; insulated with polyethylene (PE), black; copper wires, twisted
- Pressure compensation tube with Teflon filter

Structure of FEP extension cable
- Slip-resistant extension cable; shielded using galvanized steel wire netting; insulated with fluorinated ethylene propylene (FEP), black; copper wires, twisted
- Pressure compensation tube with Teflon filter

Cross-section of PE and FEP extension cable
- Total outer diameter: 8.0 mm ± 0.25 mm (0.315 inch ± 0.0098 inch)
- FMX167: 3 x 0.227 mm^2 + pressure compensation tube with Teflon filter
- FMX167 with Pt 100 (optional): 7 x 0.227 mm^2 + pressure compensation tube with Teflon filter
- Pressure compensation tube with Teflon filter:
  Outer diameter = 2.5 mm (0.098 inch), internal diameter = 1.5 mm (0.059 inch)

Cable resistance of PE and FEP extension cable
- Cable resistance per wire: ≤ 0.09 Ω/m

Cable length of PE and FEP extension cable
- Max. free suspended length (mechanical stability under load): 950 m (39370 inch)
- Please also refer to Page 7, "Load" Section.
- When using the measuring device in hazardous areas, national standards and regulations as well as the safety instructions (XAs) or Installation or Control Drawings (ZDs) have to be observed. → See also Page 20, "Safety Instructions" and "Installation/Control Drawings" Sections.

Further technical data of PE and FEP extension cable
- Minimum bending radius: 120 mm (4.72 inch)
- Tensile strength: Min. 950 N
- Cable extraction force: ≥ 450 N
  (The extension cable could be extracted from the level probe at a tensile force of ≥ 450 N.)
- Resistance to UV light
- PE: Approved for use with drinking water

Terminals
- 3 standard terminals in terminal box
- 4-terminal strip can be ordered as accessory, Order No. 52008938
  Wire cross-section 0.08…2.5 mm^2

Certificates and approvals

CE approval

By attaching the CE symbol, Endress+Hauser confirms that the instrument fulfills all the requirements of the relevant EC directives.

Ex approval, type of protection

- ATEX II 2 G EEx ia IIC T6[1]
- ATEX II 3 G EEx nA II T6
- FM: IS, Class I, Division 1, Groups A–D[1]
- CSA: IS, Class I, Division 1, Groups A–D[1]

1 Only for Waterpilot FMX167 without Pt 100

Waterpilot FMX167 with outer diameter = 22 mm (0.87 in) is only suitable for use in hazardous areas with the FKM Viton seal.

All explosion protection data are contained in separate explosion protection documentation which you can also request. Explosion protection documents are supplied as standard for all devices approved for use in explosion hazardous areas. → See also Page 20, "Safety Instructions" and "Installation/Control Drawings" Sections.

Drinking water approval (for FMX167 with d_O = 22 mm (0.87 in))

- KTW certificate
- NSF 61 approval
- ACS approval

Marine approval

- GL approval
- ABS approval

External standards and guidelines

DIN EN 60770 (IEC 60770):
Transmitters for use in industrial-control systems
Part 1: Methods for performance evaluation

DIN 16086:
Electrical pressure measuring instruments,
pressure sensors, pressure transmitters,
pressure measuring instruments, concepts, specifications on data sheets

EN 61326 (IEC 61326-1):
Electrical equipment for measurement, control and laboratory use – EMC requirements

Registered trademarks

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

Ordering information

FMX167

10	Approval
A	Version for non-hazardous area
B	ATEX II 2 G EEx ia IIC T6
C	ATEX II 3 G EEx nA II T6
S	FM IS, Class I, Division 1, Groups A – D
E	CSA IS, Class I, Division 1, Groups A – D
F	CSA General Purpose

20	Connection
1	Probe cable
2	Suspension clamp, AISI 316L
3	Cable mounting screw G 1 1/2, AISI 304
4	Cable mounting screw NPT 1 1/2, AISI 304

30	Probe tube:
A	Outer diameter d = 22 mm (0.87 in), AISI 316L
B	Outer diameter d = 42 mm (1.66 in), flush mount, AISI 316L
C	Outer diameter d = 29 mm (1.15 in), AISI 316L with heat-shrink sleeve PPS/polyolefin for saltwater applications
D	Outer diameter d = 22 mm (0.87 in), AISI 316L + drinking water approval KTW/NSF/ACS (can only be selected in conjunction with EPDM seal and PE probe cable)

40	Measuring range:				
	Measuring range	**Measuring range**		**Max. overload**	**Vacuum resistance**
BA	0...0.1 bar	MA	0...1 mH_2O	5 bar	0 bar_{abs}
BB	0...0.2 bar	MB	0...2 mH_2O	5 bar	0 bar_{abs}
BC	0...0.4 bar	MC	0...4 mH_2O	7 bar	0 bar_{abs}
BD	0...0.6 bar	MD	0...6 mH_2O	10 bar	0 bar_{abs}
BE	0...1.0 bar	ME	0...10 mH_2O	10 bar	0 bar_{abs}
BF	0...2.0 bar	MF	0...20 mH_2O	18 bar	0 bar_{abs}
BG	0...4.0 bar	MG	0...40 mH_2O	25 bar	0 bar_{abs}
BH	0...10.0 bar	MH	0...100 mH_2O	40 bar	0 bar_{abs}
BK	0...20.0 bar	MK	0...200 mH_2O	40 bar	0 bar_{abs}
PA	0...1.5 psi	FA	0...3 ftH_2O	73 psi	0 bar_{abs}
PB	0...3 psi	FB	0...6 ftH_2O	73 psi	0 bar_{abs}
PC	0...6 psi	FC	0...15 ftH_2O	101 psi	0 bar_{abs}
PD	0...10 psi	FD	0...20 ftH_2O	145 psi	0 bar_{abs}
PE	0...15 psi	FE	0...30 ftH_2O	145 psi	0 bar_{abs}
PF	0...30 psi	FF	0...60 ftH_2O	261 psi	0 bar_{abs}
PG	0...60 psi	FG	0...150 ftH_2O	362 psi	0 bar_{abs}
PH	0...150 psi	FH	0...300 ftH_2O	580 psi	0 bar_{abs}
PK	0...300 psi	FK	0...600 ftH_2O	580 psi	0 bar_{abs}
VV	Adjusted to customer specifications from 0 to ___ (upper range value) in ___ (unit), upper range value: 0.1 bar (1 mH_2O, 1.5 psi, 3 ftH_2O) to 20 bar (200 m_2HO, 300 psi, 600 ft_2HO)				

50	Sensor seal:
1	FKM Viton
2	EPDM

60	Probe cable:
A	... m, shortable, PE
B	10 m, shortable, PE
C	20 m, shortable, PE
E	30 ft, shortable, PE
F	60 ft, shortable, PE
G	... ft, shortable, PE
I	... m, shortable, FEP
K	10 m, shortable, FEP
L	20 m, shortable, FEP
M	30 ft, shortable, FEP
N	60 ft, shortable, FEP
P	... ft, shortable, FEP

FMX167								Complete order code

→ Ordering information for FMX167 continued on next page.

FMX167 (continued)

70								**Additional option:**	
								7	Basic version
								S	GL/ABS marine certificate
								1	Pt 100, 4-wire
								3	Terminal box IP66/67
								4	Terminal box IP66/67 + Pt 100, 4-wire
								5	Pt 100 + temperature transmitter TMT181, 2-wire, 4...20 mA = –20...+80°C (–4...+176°F)

FMX167								Complete order code

Accessories

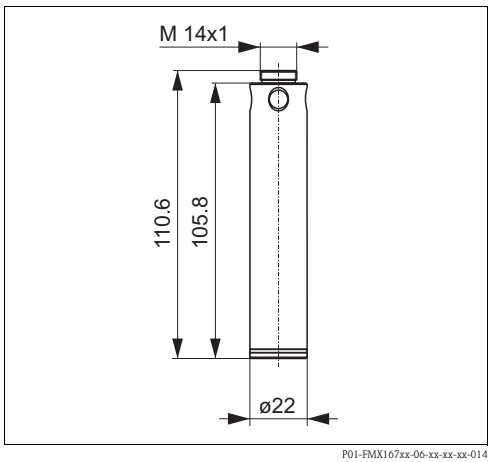
Suspension clamp

- Endress+Hauser offers a suspension clamp for simple FMX167 mounting. → See also Page 14.
- Material: 1.4404 (AISI 316L) and glass fiber reinforced PA (polyamide)
- Order number: 52006151

Terminal box

- Terminal box IP 66/IP 67 with GORE-TEX® filter incl. 3 mounted terminals.
  The terminal box is also suitable for installing a temperature transmitter (Order No. 52008794) or for four additional terminals (Order No. 52008938). → See also Page 15.
- Order number: 52006152

Additional weight (for FMX167 with d_O = 22 mm (0.87 in) and d_O = 29 mm (1.15 in))



- To prevent sideways movement leading to measuring errors or to ensure that the device lowers into a guide tube, Endress+Hauser provides additional weights.
  You can screw several weights together. The weights are then attached directly to the FMX167. For FMX167 with outer diameter = 29 mm (1.15 in), a maximum of 5 weights may be screwed on to FMX167.
- Material: 1.4435 (AISI 316L)
- Weight: 300 g
- Order number: 52006153

Temperature transmitter

- Temperature transmitter, 2-wire, preset for measuring range from –20…+80°C (–4...+176°F).
  This setting offers an easily displayable temperature range of 100 K. Note that the Pt 100 resistance thermometer is designed for a temperature range of –10...+70°C (+14...+158°F). → See also Page 15.
- Order number: 52008794

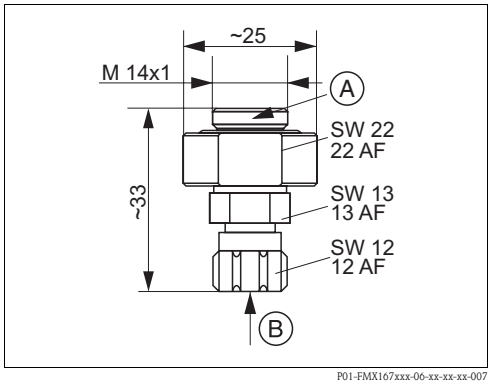
Extension cable mounting screw

- Endress+Hauser offers extension cable mounting screws to simplify the installation of the FMX167 and to close the measuring open. → See also Page 14.
- Material: 1.4301 (AISI 304)
- Order number for extension cable mounting screw with G 1 1/2 A thread: 52008264
- Order number for extension cable mounting screw with 1 1/2 NPT thread: 52009311

Terminals

- Four terminals in strip for FMX167 terminal box, suitable for wire cross-section of 0.08…2.5 mm^2
- Order number: 52008939

Test adapter (for FMX167 with d_O = 22 mm (0.87 in) and d_O = 29 mm (1.15 in))



Test adapter

A Connection suitable for level probe FMX167
B Connection compressed air hose, internal diameter, quick hose gland 4 mm (0.157 in)

- Endress+Hauser offers a test adapter to simplify the function test of level probes.
- Note the maximum pressure for the compressed air hose and the maximum level probe overload. → See also Page 18.
- The maximum pressure for the supplied quick hose gland is 10 bar (145 psi).
- Adapter material: 1.4301 (AISI 304)
- Quick hose gland material: Anodized aluminium
- Adapter weight: 39 g
- Order number: 52011868

Documentation

Field of Activities	■ Pressure Measurement: FA004P/00/en ■ Recording Technology: FA014R/09/de ■ System Components: FA016K/09/en
Technical Information	■ Temperature Head Transmitter iTEMP PCP TMT181: TI070R/09/en
Operating Instructions	■ Waterpilot FMX167: BA231P/00/en
Safety Instructions	■ ATEX II 2 G EEx ia IIC T6: XA131P/00/a3 ■ ATEX II 3 G EEx nA II T6: XA132P/00/a3
Installation/ Control Drawings	■ FM IS Class I, Div. 1, Groups A – D: ZD063P/00/en ■ CSA IS Class I, Div. 1, Groups A – D: ZD064P/00/en
Drinking water approval	■ SD126P/00/a3

International Head Quarter

Endress+Hauser
GmbH+Co. KG
Instruments International
Colmarer Str. 6
79576 Weil am Rhein
Deutschland

Tel. +49 76 21 9 75 02
Fax +49 76 21 9 75 34 5
www.endress.com
info@ii.endress.com

Endress+Hauser
People for Process Automation