Technical Information
Waterpilot FMX21

Hydrostatic level measurement

Compact transmitter for level measurement

Application

The Waterpilot FMX21 is a pressure sensor for hydrostatic level measurement.

Endress+Hauser offers three different versions of the device:
- FMX21 with a stainless steel housing, external diameter of 22 mm (0.87 in): This version is excellently suited to drinking water applications and for use in bore holes and wells with small diameters
- FMX21 with a stainless steel housing, external diameter of 42 mm (1.65 in): Heavy-duty version and easy to clean thanks to flush-mounted process isolating diaphragm, ideally suited to wastewater and wastewater treatment plants
- FMX21 with plastic insulation, external diameter of 29 mm (1.14 in): Robust version for use in salt water and excellently suited to applications on ships (e.g. ballast water tanks)

Your benefits

- High resistance to overload
- High-precision, robust ceramic measuring cell with long-term stability
- Climate proofed sensor thanks to completely potted electronics and 2-filter pressure compensation system
- Simultaneous measurement of level and temperature with optionally integrated Pt100 temperature sensor
- Accuracy
  - Standard reference accuracy ±0.2 %
  - PLATINUM version ±0.1 %
- Automatic density compensation to increase accuracy
- Usage in drinking water: KTW, NSF, ACS
- Approvals: ATEX, FM, CSA
- Marine approvals: GL, ABS, BV, DNV
- Extensive range of accessories provides complete measuring point solutions

Endress+Hauser
People for Process Automation

Table of contents

About this document . . . 4
Document function . . . 4
Symbols used . . . 4
Supplementary documentation . . . 5
Terms and abbreviations . . . 6
Turn down calculation . . . 7

Function and system design . . . 8
Device version . . . 8
Measuring principle . . . 9
Measuring system . . . 10
Level measurement with absolute pressure probe and external pressure signal for FMX21 4 to 20 mA HART . . . 12
Density compensation with the Pt100 temperature sensor for FMX21 4 to 20 mA HART . . . 12
Communication protocol . . . 13
System integration . . . 13

Input . . . 14
Measured variable . . . 14
Measuring range . . . 14
Input signal . . . 15

Output . . . 16
Output signal . . . 16
Signal range . . . 16
Maximum load for FMX21 4 to 20 mA Analog . . . 16
Maximum load for FMX21 4 to 20 mA HART . . . 16
Damping for FMX21 4 to 20 mA HART . . . 17
Protocol-specific data for FMX21 4 to 20 mA HART . . . 18

Power supply . . . 19
Supply voltage . . . 19
Power consumption . . . 19
Current consumption . . . 19
Connecting the device . . . 19
Terminals in the terminal box . . . 23
Probe cable . . . 24
Cable resistance . . . 24
Cable specifications . . . 24
Residual ripple for FMX21 4 to 20 mA Analog . . . 24
Residual ripple for FMX21 4 to 20 mA HART . . . 24

Performance characteristics . . . 25
Reference operating conditions . . . 25
Reference accuracy . . . 25
Resolution . . . 25
Long-term stability . . . 26
Influence of medium temperature . . . 26
Warm-up period . . . 26
Response time . . . 26

Installation . . . 27
Installation instructions . . . 27
Additional installation instructions . . . 27
Cable length . . . 28
Technical data for cable . . . 29
Cable marking . . . 29
Cable shortening kit . . . 30

Environment . . . 31
Ambient temperature range . . . 31
Storage temperature range . . . 31
Degree of protection . . . 31
Electromagnetic compatibility (EMC) . . . 32
Overvoltage protection . . . 32

Process . . . 33
Medium temperature range . . . 33
Medium temperature limit . . . 33
Pressure specifications . . . 34

Mechanical construction . . . 35
Dimensions of the level probe . . . 35
Dimensions of the mounting clamp . . . 36
Dimensions of cable mounting screw . . . 36
Dimensions of terminal box IP66, IP67 with filter . . . 37
Dimensions of the TMT181 temperature head transmitter for FMX21 4 to 20 mA Analog . . . 38
Dimensions of the TMT182 temperature head transmitter for FMX21 4 to 20 mA HART . . . 38
Terminal box with integrated TMT181 temperature head transmitter for FMX21 4 to 20 mA Analog . . . 39
Terminal box with integrated TMT182 temperature head transmitter for FMX21 4 to 20 mA HART . . . 39
Additional weight . . . 40
Testing adapter . . . 40
RIA15 in the field housing . . . 41
HART communication resistor . . . 41
Weight . . . 42
Materials . . . 43

Operability . . . 46
FMX21 4 to 20 mA Analog . . . 46
FMX21 4 to 20 mA HART . . . 46
RIA15 . . . 46

Certificates and approvals . . . 47
CE mark . . . 47
RCM-Tick marking . . . 47
Ex approvals . . . 47
EAC conformity . . . 47
Drinking water approval . . . 47
Marine approval . . . 47
Other standards and guidelines . . . 48
Calibration . . . 48
Pressure Equipment Directive 2014/68/EU (PED) . . . 48
Calibration unit . . . 48
Service . . . 49
Downloading the Declaration of Conformity . . . 49

Ordering information . . . 50
Scope of delivery . . . 50
Configuration data sheet . . . 50

Accessories **52**
Service-specific accessories 53

Supplementary documentation **54**
Field of Activities 54
Technical Information 54
Operating Instructions 54
Brief Operating Instructions 54
Safety Instructions (XA) 54
Drinking water approval 54

Registered trademarks **54**
GORE-TEX® 54
TEFLON® 54
HART® 54
FieldCare® 55
DeviceCare® 55
iTEMP® 55

About this document

Document function

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

Symbols used

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

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.

Symbols for certain types of information

Symbol	Meaning
✓	**Permitted** Procedures, processes or actions that are permitted.
✓✓	**Preferred** Procedures, processes or actions that are preferred.
✗	**Forbidden** Procedures, processes or actions that are forbidden.
i	**Tip** Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Visual inspection

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

Supplementary documentation

The document types listed are available:
In the Download Area of the Endress+Hauser Internet site: www.endress.com → Download

Brief Operating Instructions (KA): getting the 1st measured value quickly

FMX21 4 to 20 mA Analog - KA01244P:

FMX21 4 to 20 mA HART - KA01189P:

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

Operating Instructions (BA): your comprehensive reference

FMX21 4 to 20 mA Analog - BA01605P:

FMX21 4 to 20 mA HART - BA00380P:

RIA15 - BA01170K:

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.

Safety Instructions (XA)

Depending on the approval, the following Safety Instructions (XA) are supplied with the device. They are an integral part of the Operating Instructions.

Directive	Type of protection	Category	Documentation	Option [1]
ATEX	Ex ia IIC	II 2 G	XA00454P	BD
ATEX	Ex nA IIC	II 3 G	XA00485P	BE
IECEx	Ex ia IIC	n/a	XA00455P	IC
CSA C/US	Ex ia IIC	n/a	ZD00232P (960008976)	CE
FM	AEx ia IIC	n/a	ZD00231P (960008975)	FE
NEPSI	Ex ia IIC	n/a	XA00456P	NA
INMETRO	Ex ia IIC	n/a	XA01066P	MA

1) Product Configurator order code for "Approval"

The nameplate indicates the Safety Instructions (XA) that are relevant to the device.

Terms and abbreviations

Item	Term/abbreviation	Explanation
1	OPL	The OPL (over pressure limit = sensor overload limit) for the measuring device depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Also observe pressure-temperature dependency. The OPL may only be applied for a limited period of time.
2	MWP	The MWP (maximum working pressure) for the sensors depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Also observe pressure-temperature dependency. The MWP may be applied at the device for an unlimited period. The MWP can also be found on the nameplate.
3	Maximum sensor measuring range	Span between LRL and URL This sensor measuring range is equivalent to the maximum calibratable/adjustable span.
4	Calibrated/adjusted span	Span between LRV and URV Factory setting: 0 to URL Other calibrated spans can be ordered as customized spans.
p	-	Pressure
-	LRL	Lower range limit
-	URL	Upper range limit
-	LRV	Lower range value
-	URV	Upper range value
-	TD (turn down)	Turn down Example - see the following section.
-	PE	Polyethylene
-	FEP	Fluorinated ethylene propylene
-	PUR	Polyurethane

Turn down calculation

1 *Calibrated/adjusted span*
2 *Zero point-based span (4 to 20 mA Analog: customer-specific span can only be set at the factory when ordered)*
3 *URL sensor*

Example

- Sensor:10 bar (150 psi)
- Upper range value (URL) = 10 bar (150 psi)

Turn down (TD):

$$TD = \frac{URL}{|URV - LRV|}$$

$$TD = \frac{10\ bar\ (150\ psi)}{|5\ bar\ (75\ psi) - 0\ bar\ (0\ psi)|} = 2$$

In this example, the TD is 2:1.
This span is based on the zero point.

- Calibrated/adjusted span: 0 to 5 bar (0 to 75 psi)
- Lower range value (LRV) = 0 bar (0 psi)
- Upper range value (URV) = 5 bar (75 psi)

Function and system design

Device version

Outer diameter	22 mm (0.87 in)	42 mm (1.65 in)	Max. 29 mm (1.14 in)
	A0018640	A0018641	A0018642
Field of application	Hydrostatic level measurement in deep wells e.g. drinking water	Hydrostatic level measurement in wastewater	Hydrostatic level measurement in saltwater
	NOTICE **The Waterpilot is not suitable for use in biogas plants since the gases can diffuse through the elastomers (seals, cable).** ▶ For applications involving biogas, Endress+Hauser offers the Deltapilot level measuring device.		
Process connection	▪ Suspension clamp ▪ Cable mounting screw with G 1½" A or NPT 1½" thread		
Extension cable	PE, PUR, FEP → 🗎 45		
Seals	▪ FKM Viton ▪ EPDM [1]	FKM Viton	▪ FKM Viton ▪ EPDM [1]
Measuring ranges	▪ Relative pressure: 0 to 0.1 bar (0 to 1.5 psi) to 0 to 20 bar (0 to 300 psi) ▪ Absolute pressure: 0 to 2 bar (0 to 30 psi) to 0 to 20 bar (0 to 300 psi)		▪ Relative pressure: 0 to 0.1 bar (0 to 1.5 psi) to 0 to 4 bar (0 to 60 psi) ▪ Absolute pressure: 0 to 2 bar (0 to 30 psi) to 0 to 4 bar (0 to 60 psi)
	▪ Customer-specific measuring ranges; factory-calibrated. ▪ The following output units can be configured: %, mbar, bar, kPa, MPa, mmH_2O, mH_2O, inH_2O, ftH_2O, psi and numerous level units.		
Overload	to 40 bar (600 psi)		to 25 bar (375 psi)
Process temperature range	−10 to +70 °C (+14 to +158 °F)		0 to +50 °C (+32 to +122 °F)
Reference accuracy	▪ ±0.2 % of the set span ▪ Optional: ±0.1 % of set span (PLATINUM version)		
Supply voltage	10.5 to 35 V DC, Ex: 10.5 to 30 V DC		
Output	▪ 4 to 20 mA Analog ▪ 4 to 20 mA HART (can be inverted) with superimposed digital communication protocol HART 6.0, 2-wire		
Options	Drinking water approval	–	
	▪ Wide range of approvals, including ATEX, FM, CSA ▪ Numerous accessories ▪ Integrated Pt100 temperature sensor and TMT181 temperature head transmitter (4 to 20 mA) ▪ Integrated Pt100 temperature sensor and TMT182 temperature head transmitter (4 to 20 mA HART) ▪ Marine approval		
Specialties	▪ High-precision, robust ceramic measuring cell with long-term stability ▪ Automatic density compensation ▪ Customer-specific cable marking		

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

Measuring principle

The ceramic measuring cell is a dry measuring cell i.e. the pressure acts directly on the robust, ceramic process isolating diaphragm of the Waterpilot FMX21. Changes in air pressure are guided via a pressure compensation tube through the extension cable to the rear of the ceramic process isolating diaphragm and are compensated for. A pressure-dependent change in capacitance, caused by the movement of the process isolating diaphragm, is measured at the electrodes of the ceramic carrier. The electronics unit then converts this to a signal that is proportional to the pressure and linear to the level.

A0019140

1 Ceramic measuring cell
2 Pressure compensation tube
h Height level
p Total pressure = atmospheric pressure + hydrostatic pressure
ρ Density of the medium
g Acceleration due to gravity
$P_{hydr.}$ Hydrostatic pressure
P_{atm} Atmospheric pressure
P_{sens} Pressure displayed on the sensor

Temperature measurement with optional Pt100 resistance thermometer [1)]

For simultaneous measurement of level and temperature, Endress+Hauser offers the Waterpilot FMX21 with an optional 4-wire Pt100 resistance thermometer → 🗎 52. The Pt100 is categorized as Accuracy Class B as per DIN EN 60751.

Temperature measurement with optional Pt100 and TMT181 temperature head transmitter for FMX21 4 to 20 mA Analog [1)]

To convert the temperature signal to an analog, scalable 4 to 20 mA output signal, Endress+Hauser also offers the TMT181 temperature head transmitter.

Ordering information: → 🗎 50; "Accessories" → 🗎 52. Technical Information TI00070R.

Temperature measurement with optional Pt100 and TMT182 temperature head transmitter for FMX21 4 to 20 mA HART [1)]

Endress+Hauser also offers the TMT182 temperature head transmitter with HART protocol for converting the temperature signal to an analog, scalable 4 to 20 mA output signal superimposed with HART 6.0. See also: "Density compensation with Pt100 temperature sensor" → 🗎 12

Ordering information: → 🗎 50; "Accessories" → 🗎 52. Technical Information TI00078R.

1) Not for use in hazardous areas.

Measuring system

Application examples

As standard, the complete measuring system consists of a Waterpilot FMX21 and a transmitter power supply unit with a supply voltage of 10.5 to 30 V DC (hazardous areas) or 10.5 to 35 V DC (non-hazardous areas).

Possible measuring point solutions with a transmitter and evaluation units from Endress+Hauser:

A0018644

1 *Waterpilot FMX21*
2 *4 to 20 mA or 4 to 20 mA HART*
3+4 *Overvoltage protection, e.g. HAW from Endress+Hauser (not for use in hazardous areas) HAW562; for DIN rail: HAW562/intrinsically safe HAW562Z. Selection in accordance with supply voltage.*
5 *Power supply*

A: Easy and cost-effective measuring point solution: power supplied to the Waterpilot in hazardous and non-hazardous areas via the RN221N active barrier. Power supply and additional control of two appliances, such as pumps, via the RTA421 limit value switch with local display.

B: The RIA45 evaluation unit (for panel mounting) or the RIA46 evaluation unit (for field installation) offers power supply, local display and two switch outputs. If the RIA15 is used, the basic settings for the FMX21 HART can be made via the display module.

C: If several pumps are used, the pump service 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 RIA452 evaluation unit (for panel mounting) offers this option in addition to numerous other functions.

D: State-of-the-art recording technology with graphic display recorders from Endress+Hauser, such as Ecograph T, Memograph M for documentation, monitoring, visualization and archiving purposes.

Application examples with the Pt100

As standard, the complete measuring system consists of a Waterpilot FMX21 and a transmitter power supply unit with a supply voltage of 10.5 to 30 V DC (hazardous areas) or 10.5 to 35 V DC (non-hazardous areas).

Possible measuring point solutions with a transmitter and evaluation units from Endress+Hauser:

1 *Waterpilot FMX21*
2 *Connection for integrated Pt100 in the FMX21*
3 *Temperature for 4 to 20 mA or 4 to 20 mA HART*
4 *Level for 4 to 20 mA or 4 to 20 mA HART*
5 *Overvoltage protection, e.g. HAW from Endress+Hauser (not for use in hazardous areas) on the sensor side for field installation: HAW569; for DIN rail: HAW562/intrinsically safe HAW562Z. Selection in accordance with supply voltage.*
6 *Overvoltage protection, e.g. HAW from Endress+Hauser (not for use in hazardous areas) on the supply side for DIN rail: HAW561 (115/230 V) and HAW561K (24/48 V AC/DC). Selection in accordance with supply voltage.*
7 *Power supply*

E: If you wish to measure, display and evaluate the temperature as well as the level, e.g. to monitor the temperature in fresh water for the purpose of detecting temperature limits for germ formation, the options available to you include the following: The optionally available TMT182 temperature head transmitter can convert the Pt100 signal to a 4 to 20 mA signal or a 4 to 20 mA HART signal and transfer it to any commonly used evaluation unit. The RMA42, RIA45 and RIA452 evaluation units also offer a direct input for the Pt100 signal.

F: If you wish to record and evaluate the level and temperature measured value with one device, use the RMA42, RIA45 and RIA46 evaluation units with two inputs. It is even possible to mathematically link the input signals with this unit. These evaluation units are HART-compatible.

Level measurement with absolute pressure probe and external pressure signal for FMX21 4 to 20 mA HART

A0018757

1 *Fieldgate FXA520*
2 *Multidrop Connector FXN520*
3 *Cerabar*
4 *Waterpilot FMX21 4 to 20 mA HART*

It is advisable to use an absolute pressure probe for applications in which condensation can occur. For level measurement using an absolute pressure probe, the measured value is affected by fluctuations in the ambient pressure. To correct the resulting measured error, you can connect an external absolute pressure sensor (e.g. Cerabar) to the HART signal line, switch the Waterpilot to burst mode and operate the Cerabar in the "Electr. Delta P" mode. The external absolute pressure sensor then calculates the difference between the two pressure signals and can thus determine the level precisely. Only one level measured value can be corrected in this way.

If using intrinsically safe devices, the regulations for interconnecting intrinsically safe circuits as stipulated in IEC60079-14 (proof of intrinsic safety) must be observed.

Density compensation with the Pt100 temperature sensor for FMX21 4 to 20 mA HART

The Waterpilot FMX21 4 to 20 mA HART can correct measured errors that result from fluctuations in the density of the water caused by temperature. Users can choose from the following options:

Use the internally measured sensor temperature of the FMX21

The internally measured sensor temperature is calculated in the Waterpilot FMX21 4 to 20 mA HART for density compensation. The level signal is thus corrected according to the density characteristic line of water.

Use the optional internal temperature sensor for density compensation in a suitable HART master (e.g. PLC)

The Waterpilot FMX21 4 to 20 mA HART is optionally available with a Pt100 temperature sensor. To convert the Pt100 signal to a 4 to 20 mA HART signal, Endress+Hauser also offers the TMT182 temperature head transmitter.

The temperature and pressure signals are queried by a HART master (e.g. PLC), where a corrected level value can be generated using a stored linearization table or density function (of a chosen medium).

A0018763

1 *HART master, e.g. PLC (programmable logic controller)*
2 *FXN520 Multidrop Connector*
3 *TMT182 temperature head transmitter*
4 *Waterpilot FMX21 4 to 20 mA HART*

Use an external temperature signal, which is transmitted to the FMX21 4 to 20 mA HART via the HART burst mode

The Waterpilot FMX21 4 to 20 mA HART is optionally available with a Pt100 temperature sensor. With this option, the signal of the Pt100 is evaluated with a HART-compliant temperature transmitter (min. HART 5.0) that supports the BURST mode. The temperature signal can thus be transmitted to the FMX21 4 to 20 mA HART. The FMX21 4 to 20 mA HART uses this signal for density correction of the level signal.

The TMT182 temperature head transmitter is not suitable for this configuration.

A0018764

1 *Fieldgate FXA520*
2 *Multidrop Connector FXN520*
3 *HART-compatible temperature transmitter (e.g. TMT82)*
4 *Waterpilot FMX21 4 to 20 mA HART*

Without additional compensation due to the anomaly of water, errors of up to 4% may occur at a temperature of 70 °C (158 °F), for example. With density compensation, this error can be decreased to 0.5 % in the entire temperature range from 0 to +70 °C (+32 to +158 °F).

More information can be found in the Technical Information:

- TI01010T: TMT82 temperature transmitter (4 to 20 mA HART)
- TI00369F: Fieldgate FXA520
- TI00400F: Multidrop Connector FXN520

Communication protocol

- 4 to 20 mA Analog
  Ordering information: Product Configurator order code for "Output", option "1"
- 4...20 mA HART
  Ordering information: Product Configurator order code for "Output", option "2"

System integration

The device can be given a tag name.

Ordering information: Product Configurator order code for "Identification", option "Z1"

Input

Measured variable

FMX21 + Pt100 (optional)

- Hydrostatic pressure of a liquid
- Pt100: Temperature

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog

Temperature

TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART

Temperature

Measuring range

- Customer-specific measuring ranges or calibration that has been preset in the factory
- Temperature measurement of −10 to +70 °C (+14 to +158 °F) with Pt100 (optional)

Relative pressure

Sensor measuring range [bar (psi)]	Lowest calibratable span [1] [bar (psi)]	Vacuum resistance [bar_{abs} (psi_{abs})]	Option [2]
0.1 (1.5)	0.01 (0.15)	0.3 (4.5)	1C
0.2 (3.0)	0.02 (0.3)	0.3 (4.5)	1D
0.4 (6.0)	0.04 (1.0)	0	1F
0.6 (9.0)	0.06 (1.0)	0	1G
1.0 (15.0)	0.1 (1.5)	0	1H
2.0 (30.0)	0.2 (3.0)	0	1K
4.0 (60.0)	0.4 (6.0)	0	1M
10.0 (150) [3]	1.0 (15)	0	1P
20.0 (300) [3]	2.0 (30)	0	1Q

1) Largest turn down that can be configured at the factory: 10:1, higher turn down can be configured on request or in the device (for FMX21 4 to 20 mA HART).
2) Product Configurator order code for "Sensor range"
3) These measuring ranges are not available for the special version with plastic insulation, external diameter of 29 mm (1.14 in).

Absolute pressure

Sensor measuring range [bar (psi)]	Lowest calibratable span [1] [bar (psi)]	Vacuum resistance [bar_{abs} (psi_{abs})]	Option [2]
2.0 (30.0)	0.2 (3.0)	0	2K
4.0 (60.0)	0.4 (6.0)	0	2M
10.0 (150) [3]	1.0 (15)	0	2P
20.0 (300) [3]	2.0 (30)	0	2Q

1) Largest turn down that can be configured at the factory: 10:1, higher turn down can be configured on request or in the device (for FMX21 4 to 20 mA HART).
2) Product Configurator order code for "Sensor range"
3) These measuring ranges are not available for the special version with plastic insulation, external diameter of 29 mm (1.14 in).

Input signal

FMX21 + Pt100 (optional)

- Change in capacitance
- Pt100: Change in resistance

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog

Pt100 resistance signal, 4 wire

TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART

Pt100 resistance signal, 4 wire

Output

Output signal

FMX21 + Pt100 (optional)

- 4 to 20 mA Analog, 2-wire for hydrostatic pressure measured value.
  Ordering information: Product Configurator order code for "Output", option "1"
- 4 to 20 mA HART with superimposed digital communication protocol HART 6.0, 2-wire for hydrostatic pressure measured value.
  Ordering information: Product Configurator order code for "Output", option "2"
  Options:
  – Max. alarm (factory setting 22mA): can be set from 21 to 23 mA
  – Hold measured value: last measured value is held
  – Min. alarm: 3.6 mA
- Pt100: temperature-dependent resistance value

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog

4 to 20 mA Analog for temperature measured value, 2-wire

TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART

4 to 20 mA HART with superimposed digital communication protocol HART 5.0 for temperature measured value, 2-wire

Signal range

3.8 mA to 20.5 mA

Maximum load for FMX21 4 to 20 mA Analog

The maximum load resistance depends on the supply voltage (U) and must be determined individually for each current loop, see formula and diagrams for FMX21 and temperature head transmitter. The total resistance resulting from the resistances of the connected devices, the connecting cable and, where applicable, the resistance of the extension cable may not exceed the load resistance value.

$$R_{Lmax} \leq \frac{U - 10.5\ V}{23\ mA} - 2 \cdot 0.09\ \frac{\Omega}{m} \cdot L - R_{add}$$

$$R_{Lmax} \leq \frac{U - 8\ V}{0.025\ A} - R_{add}$$

A0030561-EN

A FMX21 4 to 20 mA Analog load chart for estimating the load resistance. Additional resistances, such as the resistance of the extension cable, have to be subtracted from the value calculated as shown in the equation.
B Load diagram for TMT181 temperature head transmitter for estimating the load resistance. Additional resistances must be subtracted from the value calculated as shown in the equation
R_{Lmax} Max. load resistance [Ω]
R_{add} Additional resistances such as resistance of evaluating device and/or display unit, cable resistance [Ω]
U Supply voltage [V]
L Basic length of extension cable [m] (cable resistance per wire 0.09 Ω/m)

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 (XA).

Maximum load for FMX21 4 to 20 mA HART

The maximum load resistance depends on the supply voltage (U) and must be determined individually for each current loop, see formula and diagrams for FMX21 and temperature head

transmitter. The total resistance resulting from the resistances of the connected devices, the connecting cable and, where applicable, the resistance of the extension cable may not exceed the load resistance value.

A FMX21 4 to 20 mA HART load chart for estimating the load resistance. Additional resistances, such as the resistance of the extension cable, have to be subtracted from the value calculated as shown in the equation.
B Load diagram for TMT182 temperature head transmitter for estimating the load resistance. Additional resistances must be subtracted from the value calculated as shown in the equation
R_{Lmax} Max. load resistance [Ω]
R_{add} Additional resistances such as resistance of evaluating device and/or display unit, cable resistance [Ω]
U Supply voltage [V]
L Basic length of extension cable [m] (cable resistance per wire 0.09 Ω/m)

- 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 (XA).
- When operating via a handheld terminal or via a PC with an operating program, a minimum communication resistance of 250 Ω must be taken into account.

Damping for FMX21 4 to 20 mA HART

- Via HART handheld device or PC with operating program: continuous from 0 to 999 s
- Factory setting: 2 s

Protocol-specific data for FMX21 4 to 20 mA HART

Manufacturer ID	17 (11 hex)
Device type code	25 (19 hex)
Device revision	01 (01 hex) - SW version 01.00.zz
HART specification	6
DD revision	01
Device description files (DTM, DD)	Information and files under: ▪ www.endress.com ▪ www.fieldcommgroup.org
HART load	Min. 250 Ω
HART device variables	The dynamic variables SV, TV and QV may be assigned to any device variable: **Standard process values for SV, TV (second and third device variable) are dependent on the measuring mode:** ▪ Pressure ▪ Level **Standard process value for QV (fourth device variable) is the sensor temperature:** Temperature **Measured values for PV (first device variable) are dependent on the measuring mode:** ▪ Pressure ▪ Level ▪ Tank content
Supported functions	▪ Burst mode ▪ Additional transmitter status ▪ Device locking ▪ Alternative measuring modes ▪ Catch variable ▪ Long tag

Power supply

⚠ WARNING

Electrical safety is compromised by an incorrect connection!

- ▶ When using the measuring device in a hazardous area, the relevant national standards and guidelines as well as the Safety Instructions (XAs) or installation or control drawings (ZDs) must be adhered to. All data relating to explosion protection can be found in separate documentation which is available on request. This documentation is supplied with the devices as standard → 📄 5

Supply voltage

FMX21 + Pt100 (optional)

- 10.5 to 35 V (not hazardous areas)
- 10.5 to 30 V (hazardous areas)

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog

8 to 35 V DC

TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART

11.5 to 35 V DC

Power consumption

FMX21 + Pt100 (optional)

- ≤ 0.805 W at 35 V DC (non-hazardous area)
- ≤ 0.690 W at 30 V DC (hazardous area)

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog

≤ 0.875 W at 35 V DC

TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART

≤ 0.805 W at 35 V DC

Current consumption

FMX21 + Pt100 (optional)

Max. current consumption: ≤ 23 mA
Min. current consumption: ≥ 3.6 mA

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog

- Max. current consumption: ≤ 25 mA
- Min. current consumption: ≥ 3.5 mA

TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART

- Max. current consumption: ≤ 23 mA
- Min. current consumption: ≥ 3.5 mA

Connecting the device

- Waterpilot
  Reverse polarity protection is integrated in the Waterpilot FMX21 and the temperature head transmitter. Changing the polarities will not result in damage to the devices.
- The cable must end in a dry room or a suitable terminal box. The terminal box (IP66/IP67) with GORE-TEX® filter from Endress+Hauser is suitable for outdoor installation. The terminal box may be ordered as an accessory using the order code for the FMX21, Product Configurator order code for "Accessories enclosed", option "PS".

The electrical connection is established with the corresponding wires of the probe cable and with the optional use of the terminal box → 📄 37 and a power supply (e.g. RN221N active barrier → 📄 10).

Waterpilot with Pt100

A0019441

A Waterpilot FMX21
B Waterpilot FMX21 with Pt100 (not for use in hazardous areas); option "NB", Product Configurator order code for "Accessories"
a Not for the FMX21 with external diameter of 29 mm (1.14 in)
b 10.5 to 30 V DC (hazardous area), 10.5 to 35 V DC
c 4...20 mA
d Resistance (R_L)
e Pt100

Waterpilot with Pt100 and TMT181 temperature head transmitter for FMX21 4 to 20 mA Analog

A0030945

a Not for the FMX21 with external diameter of 29 mm (1.14 in)
b 10.5 to 35 V DC
c 4...20 mA
d Resistance (R_L)
e TMT181 temperature head transmitter (4 to 20 mA) (not for use in hazardous areas)
f 8 to 35 V DC
g Pt100
1...6 Pin assignment

Ordering information:

Pt100: Product Configurator order code for "Accessories mounted", option "NB"

TMT181: Product Configurator order code for "Accessories enclosed", option "PX"

Waterpilot with Pt100 and TMT182 temperature head transmitter for FMX21 4 to 20 mA HART

a Not for the FMX21 with external diameter of 29 mm (1.14 in)
b 10.5 to 35 V DC
c 4...20 mA
d Resistance (R_L)
e TMT182 temperature head transmitter (4 to 20 mA) (not for use in hazardous areas)
f 11.5 to 35 V DC
g Pt100
1...6 Pin assignment

Ordering information:

Pt100: Product Configurator order code for "Accessories mounted", option "NB"

TMT182: Product Configurator order code for "Accessories enclosed", option "PT"

Waterpilot FMX21 with RIA15

The RIA15 remote display can be ordered together with the device.

Product structure, feature 620 "Accessory enclosed":
- Option R4 "Remote display RIA15 non-hazardous area, field housing"
- Option R5 "Remote display RIA15 Ex= explosion protection approval, field housing"

Compensation of the atmospheric pressure must be ensured for the installation. A black, vented cable gland is supplied for this purpose.

The RIA15 process display unit is loop-powered and does not require any external power supply.

The voltage drop to be taken into account is:
- ≤1 V in the standard version with 4 to 20 mA communication
- ≤1.9 V with HART communication
- and an additional 2.9 V if display light is used

	Circuit diagram / Description
Waterpilot FMX21 connection, HART communication and RIA15 **without** backlight	 *1 Waterpilot FMX21 block diagram, HART with RIA15 process display unit without light* *1 Waterpilot FMX21* *2 Power supply* *3 HART resistance*
Waterpilot FMX21 connection, HART communication and RIA15 **with** backlight	 *2 Waterpilot FMX21 block diagram, HART with RIA15 process display unit with light* *1 Waterpilot FMX21* *2 Power supply* *3 HART resistance*

Waterpilot FMX21, RIA15 with installed HART communication resistor module

The HART communication module for installation in the RIA15 can be ordered together with the device.

Product structure, feature 620 "Accessory enclosed":
- Option R6 "HART communication resistor hazardous / non-hazardous area"
- The **voltage drop** to be taken into account is max. **7 V**

Compensation of the atmospheric pressure must be ensured for the installation. A black, vented cable gland is supplied for this purpose.

	Circuit diagram / Description
Waterpilot FMX21 connection and RIA15 **without** backlight	 *3 Waterpilot FMX21 block diagram, RIA15 without light, HART communication resistor module* *1 HART communication resistor module* *2 Waterpilot FMX21* *3 Power supply*
Waterpilot FMX21 connection and RIA15 **with** backlight	 *4 Waterpilot FMX21 block diagram, RIA15 with light, HART communication resistor module* *1 HART communication resistor module* *2 Waterpilot FMX21* *3 Power supply*

Wire colors

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

Connection data

Connection classification as per IEC 61010-1:
- Overvoltage category 1
- Pollution level 1

Connection data in the hazardous area

See relevant XA.

Terminals in the terminal box

- Three terminals as standard in the terminal box (terminal box can optionally be ordered as an enclosed accessory → 📖 52)
- 4-terminal strip can be ordered as an accessory, order number: 52008938 cable cross-section 0.08 to 2.5 mm^2 (28 to 14 AWG)

The 4-terminal strip is not designed for use in hazardous areas incl. CSA GP.

Probe cable	▪ Overall external diameter: 8 mm (0.31 in) ±0.25 mm (0.01 in) ▪ Pressure compensation tube with Teflon filter: External diameter of 2.5 mm (0.1 in), internal diameter of 1.5 mm (0.06 in) **Cross-section** ▪ FMX21: 3 x 0.2 mm^2 (3 x 26 AWG) + pressure compensation tube with Teflon filter ▪ FMX21 with Pt100 (optional): 7 x 0.2 mm^2 (7 x 26 AWG) + pressure compensation tube with Teflon filter
Cable resistance	per wire: ≤ 0.09 Ω/m
Cable specifications	Endress+Hauser recommends using shielded, twisted-pair two-wire cables. The probe cables are shielded for device versions with outer diameters of 22 mm (0.87 in) and 42 mm (1.65 in). **FMX21 + Pt100 (optional)** ▪ Commercially available instrument cable ▪ Terminals, terminal box: 0.08 to 2.5 mm^2 (28 to 14 AWG) **TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog** ▪ Commercially available instrument cable ▪ Terminals, terminal box: 0.08 to 2.5 mm^2 (28 to 14 AWG) ▪ Transmitter connection: max. 1.75 mm^2 (15 AWG) **TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART** ▪ Commercially available instrument cable ▪ Terminals, terminal box: 0.08 to 2.5 mm^2 (28 to 14 AWG) ▪ Transmitter connection: max. 1.75 mm^2 (15 AWG)
Residual ripple for FMX21 4 to 20 mA Analog	**FMX21 + Pt100 (optional)** No impact on the 4 to 20 mA signal up to ±5 % residual ripple within the permitted voltage range. **TMT181 temperature head transmitter (optional)** U_{ss} ≥ 5 V at U ≥ 13 V, $f_{max.}$ = 1 kHz
Residual ripple for FMX21 4 to 20 mA HART	**FMX21 + Pt100 (optional)** No impact on the 4 to 20 mA signal up to ±5 % residual ripple within the permitted voltage range (according to HART Hardware Specification HCF_SPEC-54 (DIN IEC 60381-1)). **TMT182 temperature head transmitter (optional)** U_{ss} ≥ 3 V at U ≥ 13 V, $f_{max.}$ = 1 kHz

Performance characteristics

Reference operating conditions

FMX21 + Pt100 (optional)

- As per IEC 60770
- Ambient temperature T_U = constant, in the range of +21 to +33 °C (+70 to +91 °F)
- Humidity φ = constant, in the range of 20 to 80 % rH
- Ambient pressure p_U = constant, in the range of 860 to 1060 mbar (12.47 to 15.37 psi)
- Position of measuring cell constant, vertical in the range of ±1°
- Input of LOW SENSOR TRIM and HIGH SENSOR TRIM for lower range value and upper range value (only for HART)
- Supply voltage constant: 21 V DC to 27 V DC
- Load with HART: 250 Ω
- Pt100: DIN EN 60770, T_U = +25 °C (+77 °F)

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog

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

TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART

Calibration temperature +25 °C (+77 °F) ±5 K

Reference accuracy

FMX21 + Pt100 (optional)

The reference accuracy comprises the non-linearity after limit point configuration, hysteresis and non-reproducibility in accordance IEC 60770.

Standard version [2]:
Setting ±0.2 %
– to TD 5:1: < 0.2 % of set span
– from TD 5:1 to TD 20:1 ±(0.02 x TD+0.1)

Platinum version [3]:
- Setting ±0.1 % (optional)
  – to TD 5:1: < 0.1 % of set span
  – from TD 5:1 to TD 20:1 ±(0.02 x TD)
- Class B as per DIN EN 60751
  Pt100: max. ±1 K

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog

- ±0.2 K
- With Pt100: max. ±0.9 K

TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART

- ±0.2 K
- With Pt100: max. ±0.9 K

Resolution

Current output: 1 µA

Reading cycle

HART commands: on average 2 to 3 per second

2) Ordering information: Product Configurator order code for "Reference accuracy", option "G"
3) Ordering information: Product Configurator order code for "Reference accuracy", option "D"

Long-term stability	**FMX21 + Pt100 (optional)** ▪ ≤ 0.1 % of URL/year ▪ ≤ 0.25 % of URL/5 years **TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog** ≤ 0.1 K per year **TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART** ≤ 0.1 K per year
Influence of medium temperature	▪ Thermal change in the zero output and the output span: 0 to +30 °C (+32 to +86 °F): < (0.15 + 0.15 x TD)% of set span −10 to +70 °C (+14 to +158 °F): < (0.4 + 0.4 x TD)% of set span ▪ Temperature coefficient (T_K) of the zero output and the output span −10 to +70 °C (+14 to +158 °F): 0.1 % / 10 K of URL
Warm-up period	**FMX21 + Pt100 (optional)** ▪ FMX21: < 6 s ▪ Pt100: 300 s **TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog** 4 s **TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART** 4 s
Response time	**FMX21 + Pt100 (optional)** ▪ FMX21: 400 ms (T90 time), 500 ms (T99 time) ▪ Pt100: 160 s (T90 time), 300 s (T99 time)

Installation

Installation instructions

A0018770

1 *Cable mounting screw can be ordered via the order code or as an accessory → 📄 52*
2 *Terminal box can be ordered via the order code or as an accessory → 📄 52*
3 *Bending radius of extension cable > 120 mm (4.72 in)*
4 *Mounting clamp can be ordered via the order code or as an accessory → 📄 52*
5 *Extension cable, cable length → 📄 28*
6 *Guide tube*
7 *Waterpilot FMX21*
8 *Additional weight can be ordered as an accessory for the FMX21 with external diameter of 22 mm (0.87 in) and 29 mm (1.14 in)→ 📄 52*
9 *Protection cap*

Additional installation instructions

- 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) greater than the external diameter of the selected FMX21.
- To avoid mechanical damage to the measuring cell, the device is equipped with a protection cap.
- The cable must end in a dry room or a suitable terminal box. The terminal box from Endress +Hauser provides humidity and climatic protection and is suitable for installation outdoors → 📄 52.
- Cable length tolerance: < 5 m (16 ft): ±17.5 mm (0.69 in); > 5 m (16 ft): ±0.2 %
- If the cable is shortened, the filter at the pressure compensation tube must be reattached. Endress +Hauser offers a cable shortening kit for this purpose → 📄 52 (documentation SD00552P/00/A6).

- Endress+Hauser recommends using twisted, shielded cable.
- In shipbuilding applications, measures are required to restrict the spread of fire along cable looms.
- The length of the extension cable depends on the intended level zero point. The height of the protection cap must be taken into consideration when designing the layout of the measuring point. The level zero point (E) corresponds to the position of the process isolating diaphragm. Level zero point = E; tip of probe = L (see the following diagram).
  For dimensions, see "Mechanical construction" section.

A0026013

Cable length

- Pay attention to the "Load"
- Cable lengths available for order
  - Customer-specific in meters or feet
  - Limited cable length when performing installation with freely suspended device with cable mounting screw or mounting clamp, as well as for Ex approval: max. 300 m (984 ft).

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.

A0020556

A Length of extension cable

Cable	Option [1)]
10 m cable, can be shortened, PE	10
20 m cable, can be shortened, PE	11
..... m cable, can be shortened, PE	15
30 ft cable, can be shortened, PE	20
60 ft cable, can be shortened, PE	21
..... ft cable, can be shortened, PE	25
10 m cable, can be shortened, FEP	30
20 m cable, can be shortened, FEP	31

Cable	Option [1]
..... m cable, can be shortened, FEP	35
30 ft cable, can be shortened, FEP	40
60 ft cable, can be shortened, FEP	41
..... ft cable, can be shortened, FEP	45
10 m cable, can be shortened, PUR	50
20 m cable, can be shortened, PUR	51
..... m cable, can be shortened, PUR	55
30 ft cable, can be shortened, PUR	60
60 ft cable, can be shortened, PUR	61
..... ft cable, can be shortened, PUR	65

1) Ordering information: Product Configurator order code for "Probe connection"

Technical data for cable

- Minimum bending radius: 120 mm (4.72 in)
- Tensile strength: max. 950 N (213.56 lbf)
- Cable extraction force (= tensile force required to extract the cable from the probe):
  - PE, FEP: typically ≥ 400 N (89.92 lbf), PUR: typically ≥ 150 N (33.72 lbf)
  - when used in hazardous area: ≥ 100 N (73.75 lbf)
- UV-resistant (UV = ultraviolet)
- PE: For use in drinking water

Cable marking

A0030955

- To make installation easier, Endress+Hauser marks the extension cable if a customer-specific length has been ordered.
  Ordering information: Product Configurator order code for "Service", option "IR" or "IS".
- Cable marking tolerance (distance to lower end of level probe):
  Cable length < 5 m (16 ft): ±17.5 mm (0.69 in)
  Cable length > 5 m (16 ft): ±0.2 %
- Material: PET, stick-on label: acrylic
- Immunity to temperature change: −30 to +100 °C (−22 to +212 °F)

NOTICE

The marking is used exclusively for installation purposes.

▶ The mark must be thoroughly removed without trace in the case of devices with drinking water approval. The extension cable must not be damaged in the process.

Not for use of the FMX21 in hazardous areas.

Cable shortening kit

A0030948

The cable shortening kit is used to shorten a cable easily and professionally.

The cable shortening kit is not designed for the FMX21 with FM/CSA approval.

- Ordering information: Product Configurator order code for "Accessories enclosed", option "PW"
- Associated documentation SD00552P/00/A6.

Environment

Ambient temperature range

FMX21 + Pt100 (optional)

- With external diameter of 22 mm (0.87 in) and 42 mm (1.65 in):
  −10 to +70 °C (+14 to +158 °F) (= medium temperature)
- With external diameter of29 mm (1.14 in):
  0 to +50 °C (+32 to +122 °F) (= medium temperature)

Cable

(when mounted in a fixed position)
- With PE: −30 to +70 °C (−22 to +158 °F)
- With FEP: −40 to +70 °C (−40 to +158 °F)
- With PUR: −40 to +70 °C (−40 to +158 °F)

Terminal box

−40 to +80 °C (−40 to +176 °F)

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog

−40 to +85 °C (−40 to +185 °F)

Temperature head transmitter 2-wire, configured for a measuring range of −20 to +80 °C (−4 to +176 °F). This configuration offers a temperature range of 100 K which can be easily mapped. Please note that the Pt100 resistance temperature detector is suitable for a temperature range of −10 to +70 °C (14 to +158 °F)

The TMT181 temperature head transmitter is not designed for use in hazardous areas incl. CSA GP.

TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART

−40 to +85 °C (−40 to +185 °F)

Temperature head transmitter 2-wire, configured for a measuring range of −20 to +80 °C (−4 to +176 °F). This configuration offers a temperature range of 100 K which can be easily mapped. Please note that the Pt100 resistance temperature detector is suitable for a temperature range of −10 to +70 °C (14 to +158 °F)

The TMT182 temperature head transmitter is not designed for use in hazardous areas incl. CSA GP.

Storage temperature range

FMX21 + Pt100 (optional)

−40 to +80 °C (−40 to +176 °F)

Cable

(when mounted in a fixed position)
- With PE: −30 to +70 °C (−22 to +158 °F)
- With FEP: −30 to +80 °C (−22 to +176 °F)
- With PUR: −40 to +80 °C (−40 to +176 °F)

Terminal box

−40 to +80 °C (−40 to +176 °F)

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog

−40 to +100 °C (−40 to +212 °F)

TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART

−40 to +100 °C (−40 to +212 °F)

Degree of protection

FMX21 + Pt100 (optional)

IP68, permanently hermetically sealed at 20 bar (290 psi) (~200 m H_2O)

Terminal box (optional)

IP66, IP67

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog

IP00, condensation permitted

When installed in the optional terminal boxes: IP66/IP67

TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART

IP00, condensation permitted

Electromagnetic compatibility (EMC)

FMX21 + Pt100 (optional)

- EMC in accordance with all relevant requirements of EN 61326 series. For details, refer to the Declaration of Conformity.
- Maximum deviation: < 0.5 % of span.

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog

Interference emission to EN 61326 Class B equipment, interference immunity to EN 61326 Appendix A (Industrial). For details, refer to the Declaration of Conformity.

TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART

EMC in accordance with all relevant requirements of EN 61326 series. For details, refer to the Declaration of Conformity.

Overvoltage protection

FMX21 + Pt100 (optional)

- Integrated overvoltage protection as per EN 61000-4-5 (500 V symmetrical/1000 V asymmetrical)
- Overvoltage protection ≥ 1.0 kV, external if necessary

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog

Provide overvoltage protection, externally if necessary → 🗎 10.

TMT182 temperature head transmitter (optional) for FMX21 4 to 20 mA HART

Provide overvoltage protection, externally if necessary → 🗎 10.

Process

Medium temperature range

FMX21 + Pt100 (optional)

- With external diameter of 22 mm (0.87 in) and 42 mm (1.65 in):
  −10 to +70 °C (+14 to +158 °F)
- With external diameter of 29 mm (1.14 in):
  0 to +50 °C (+32 to +122 °F)

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA Analog

−40 to +85 °C (−40 to +185 °F)

(= ambient temperature), install temperature head transmitter outside the medium.

Temperature head transmitter 2-wire, configured for a measuring range of −20 to +80 °C (−4 to +176 °F). This configuration offers a temperature range of 100 K which can be easily mapped. Please note that the Pt100 resistance temperature detector is suitable for a temperature range of −10 to +70 °C (14 to +158 °F)

The TMT181 temperature head transmitter is not designed for use in hazardous areas incl. CSA GP.

TMT181 temperature head transmitter (optional) for FMX21 4 to 20 mA HART

−40 to +85 °C (−40 to +185 °F)

(= ambient temperature), install temperature head transmitter outside the medium.

Temperature head transmitter 2-wire, configured for a measuring range of −20 to +80 °C (−4 to +176 °F). This configuration offers a temperature range of 100 K which can be easily mapped. Please note that the Pt100 resistance temperature detector is suitable for a temperature range of −10 to +70 °C (14 to +158 °F)

The TMT182 temperature head transmitter is not designed for use in hazardous areas incl. CSA GP.

Medium temperature limit

FMX21 + Pt100 (optional)

With external diameter of 22 mm (0.87 in) and 42 mm (1.65 in):
−20 to +70 °C (−4 to +158 °F)

In hazardous areas incl. CSA GP, the medium temperature limit is −10 to +70 °C (+14 to +158 °F).

With external diameter of29 mm (1.14 in): 0 to +50 °C (+32 to +122 °F)

The FMX21 may be operated in this temperature range. The specification values, such as accuracy, may be exceeded.

Pressure specifications

WARNING

The maximum pressure for the measuring device depends on the lowest-rated element with regard to pressure.

- For pressure specifications, see the "Measuring range" section and the "Mechanical construction" section.
- The measuring device must be operated only within the specified limits!
- The Pressure Equipment Directive (2014/68/EU) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.
- MWP (maximum working pressure): The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of +20 °C (+68 °F) and may be applied to the device for an unlimited time. Observe temperature dependency of the MWP.
- OPL (Over Pressure Limit = sensor overload limit): The test pressure corresponds to the over pressure limit of the sensor and may only be applied for a limited time period to ensure measurement within specification and in order to avoid permanent damage. In the case of sensor range and process connections where the over pressure limit (OPL) of the process connection is smaller than the nominal value of the sensor, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If you want to use the entire sensor range, select a process connection with a higher OPL value.
- avoid steam hammering! Steam hammering can cause zero point drifts. Recommendation: Residue (such as condensation or drops of water) can remain on the process isolating diaphragm after CIP cleaning and lead to local steam hammering if steam cleaning is performed again. In practice, drying the process isolating diaphragm (e.g. by blowing) has proved to prevent steam hammering.

Mechanical construction

Dimensions of the level probe

A Product Configurator order code for "Probe tube", option "1" or "Accessories"
B Product Configurator order code for "Probe tube", option "2"
C Product Configurator order code for "Probe tube", option "5"
1 Pressure compensation tube
2 Extension cable (length, see → 28
3 Protection cap

Engineering unit mm (in)

Dimensions of the mounting clamp

Engineering unit mm (in)

Ordering information: Product Configurator order code for "Accessories", option "PO" → 📄 52

Dimensions of cable mounting screw

A G 1½" A: Product Configurator order code for "Accessories", option "PQ" → 📄 52
B NPT 1½": Product Configurator order code for "Accessories", option "PR" → 📄 52

Engineering unit mm (in)

Use only in unpressurized vessels.

Dimensions of terminal box IP66, IP67 with filter

1 *Dummy plug M20x1.5*
2 *Cable gland M20x1.5*
3 *4 to 20 mA; terminals for 0.08 to 2.5 mm (28 to 14 AWG)0.08 to.2.5 mm²*
4 *Ground connection; terminals for 0.08 to 2.5 mm (28 to 14 AWG)0.08 to 2.5 mm²*
5 *GORE-TEX® filter*

Engineering unit mm (in)

Terminal box IP66/IP67 with GORE-TEX® filter incl. 3 integrated terminals. The terminal box is also suitable for the installation of a temperature head transmitter or four other terminals

Ordering information:
- Terminal box: Product Configurator order code for "Accessories enclosed", option "PS" → 📄 52
- TMT181: Product Configurator order code for "Accessories enclosed", option "PX" → 📄 52
- TMT182: Product Configurator order code for "Accessories enclosed", option "PT" → 📄 52

The terminal box is not designed for the FMX21 with type of protection Ex nA in hazardous areas. If the terminal box is used in a hazardous area, the Safety Instructions of the relevant device must be observed, as well as the applicable regulations for explosion protection.

If the FMX21 with optional Pt100 is supplied, a terminal strip is provided with the terminal box for the purpose of wiring the Pt100.

The 4-terminal strip is not designed for use in hazardous areas incl. CSA GP.

Dimensions of the TMT181 temperature head transmitter for FMX21 4 to 20 mA Analog

Engineering unit mm (in)

Ordering information:

Product Configurator order code for "Accessories enclosed", option "PX" → 📄 52

Dimensions of the TMT182 temperature head transmitter for FMX21 4 to 20 mA HART

Engineering unit mm (in)

Ordering information:

Product Configurator order code for "Accessories enclosed", option "PT" → 📄 52

Terminal box with integrated TMT181 temperature head transmitter for FMX21 4 to 20 mA Analog

1 *Terminal box*
2 *Terminal strip/terminals*
3 *TMT181 temperature head transmitter*

Engineering unit mm (in)

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

Terminal box with integrated TMT182 temperature head transmitter for FMX21 4 to 20 mA HART

1 *Terminal box*
2 *Terminal strip/terminals*
3 *TMT182 temperature head transmitter*

Engineering unit mm (in)

A distance of > 7 mm (0.28 in) must be maintained between the terminal strip and the TMT182 temperature head transmitter.

Additional weight

For FMX21 with external diameter of 22 mm (0.87 in) or 29 mm (1.14 in)

- Endress+Hauser offers additional weights to prevent sideways movement that results in measuring errors, or to make it easier to lower the device in a guide tube. You can screw several weights together. The weights are screwed directly onto the FMX21. For the FMX21 with external diameter of 29 mm (1.14 in), a maximum of 5 weights may be screwed on. In conjunction with the Ex nA approval, a maximum of one additional weight is permitted for the FMX21 with external diameter of 29 mm (1.14 in).
- Order number: 52006153 Ordering information: Product Configurator order code for "Accessories enclosed", option "PU"

Engineering unit mm (in)

Testing adapter

For FMX21 with external diameter of 22 mm (0.87 in) or 29 mm (1.14 in)

- Endress+Hauser offers a testing adapter to ease function-testing of the level probes.
- Observe the maximum pressure for compressed air hose and maximum overload for level probe → 📄 14
- Maximum pressure for the quick coupling piece provided: 10 bar (145 psi)
- Adapter material: 304 (1.4301)
- Material of quick coupling piece: anodized aluminum
- Order number 52011868
  Ordering information: Product Configurator order code for "Accessories enclosed", option "PV"

1 FMX21 level probe connection
2 Compressed air hose connection, internal diameter, quick coupling piece 4 mm (0.16 in)

Engineering unit mm (in)

RIA15 in the field housing

5 *Dimensions of RIA15 in field housing, engineering unit: mm (in)*

The RIA15 remote display can be ordered together with the device. Product structure, feature 620 "Accessories enclosed":

- Option R4 "Remote display RIA15 non-hazardous area, field housing"
- Option R5 "Remote display RIA15 Ex= explosion protection approval, field housing"

Alternatively available as an accessory, for details see Technical Information TI01043K and Operating Instructions BA01170K

HART communication resistor

6 *Dimensions of HART communication resistor, engineering unit: mm (in)*

A communication resistor is required for HART communication. If this is not already present (e.g. in the power supply RMA, RN221N, RNS221, ...), it can be ordered with the device via the product structure, feature 620 "Accessories enclosed": option R6 "HART communication resistor hazardous / non-hazardous area".

Alternatively available as an accessory, for details see Technical Information TI01043K and Operating Instructions BA01170K

The HART communication resistor is specially designed for use with the RIA15 and can be attached easily.

1. Disconnect plug-in terminal block.
2. Insert the terminal block into the slot provided on the HART communication resistor module.
3. Insert the HART communication resistor in the slot in the housing.

Weight

Component part		Weight
Level probe, external diameter of 22 mm (0.87 in)		344 g (12.133 oz)
Level probe, external diameter of 42 mm (1.65 in)		1 376 g (48.532 oz)
Level probe, external diameter of 29 mm (1.14 in)		394 g (13.896 oz)
Extension cable	PE	52 g/m (0.035 lbs/1 ft)
	PUR	60 g/m (0.040 lbs/1 ft)
	FEP	108 g/m (0.072 lbs/1 ft)
Suspension clamp		170 g (5.996 oz)
Cable mounting screw G 1½" A		770 g (27.158 oz)
Cable mounting screw NPT 1½"		724 g (25.535 oz)
Terminal box		235 g (8.288 oz)
TMT181 temperature head transmitter		40 g (1.411 oz)
TMT182 temperature head transmitter		40 g (1.411 oz)
Additional weight		300 g (10.581 oz)
Testing adapter		39 g (1.376 oz)

Materials

Materials in contact with process

Item number	Component part	Material
1	▪ A: Level probe, external diameter of 22 mm (0.87 in) ▪ B: Level probe, external diameter of 42 mm (1.65 in) ▪ C: Level probe, max. external diameter of 29 mm (1.14 in)	316L (1.4404/1.4435) [1]
1.1	Sensor sleeve	PPS (Polyphenylene sulfide)
1.2	Heat-shrink tube	Polyolefin and hot melt adhesive
	The heat-shrink tube around the level probe acts as insulation. It prevents electrical contact between the level probe and the tank. Electrochemical corrosion is thus avoided.	
2	Protection cap for A and C: with outer diameter 22 mm (0.87 in) and 29 mm (1.14 in) (order number: 52008999)	POM
	Protection cap for B: device with outer diameter 42 mm (1.65 in) (order number: 917755-0000)	PFA
3	Process ceramic	Al_2O_3 (Aluminum oxide ceramic)
4	Seal	EPDM [2]
		FKM Viton [3]
5	Extension cable insulation Additional information	Choose from: ▪ PE-LD (Low-density polyethylene) ▪ FEP (Fluorinated ethylene propylene) ▪ PUR (Polyurethane)

1) Material 316L (1.4404/1.4435) is not in contact with the process in the case of level probe C
2) Product Configurator order code for "Seal", option "H"
3) Product Configurator order code for "Seal", option "A"

Materials not in contact with process

Item number	Component part	Material
6	Pressure compensation tube	PA
7	Heat-shrink tube	Polyolefin

Terminal box (not in contact with process)

A0018917

Item number	Component part	Material
1	Housing	PC
2	Mounting screws (4 x)	A2
3	Seal	CR (Chloroprene rubber)
4	Dummy plug M20x1.5	PBT-GF30
5	Cable gland M20x1.5	PE-HD
6		PA6
7		PA6-GF30
8	Pressure compensation filter	PA6-GF10, ePTFE
9	Pressure compensation filter, O-ring	Silicone (VMQ)

Cable mounting screw (not in contact with process)

A0018918

Item number	Component part	Material
1	Cover for cable mounting screw	304 (1.4301)
2	Sealing ring	NBR
3	Clamping sleeves	PA66-GF35
4	Adapter for cable mounting screw G 1½" A, NPT 1½"	304 (1.4301)
5	Seal ® Only for G 1½" A	EPDM

Suspension clamp

A0030950

Material: 316L (1.4404) and fiber-glass reinforced PA (polyamide)

Additional weight

A0030954

Material: 316L (1.4435)

Testing adapter for FMX21 with outer diameter 22 mm (0.87 in) or 29 mm (1.14 in)

A0030956

Adapter material: 304 (1.4301)

Material of quick coupling piece: anodized aluminum

Testing adapter for FMX21 with outer diameter 42 mm (1.65 in)

A0030957

Adapter material: 304 (1.4301)

Material of quick coupling piece: anodized aluminum

Extension cable

PE	PUR	FEP
▪ Abrasion-resistant extension cable with strain-relief members made of high-strength PE fibers ▪ Shielded (aluminum) ▪ Insulated with polyethylene (PE), black ▪ Copper wires, twisted ▪ Pressure compensation tube with Teflon filter	▪ Abrasion-resistant extension cable with strain-relief members made of high-strength PE fibers ▪ Shielded (aluminum) ▪ Insulated with polyurethane (PUR), black ▪ Copper wires, twisted ▪ Pressure compensation tube with Teflon filter	▪ Abrasion-resistant extension cable ▪ Shielded with galvanized steel wire netting ▪ Insulated with fluorinated ethylene propylene (FEP), black ▪ Copper wires, twisted ▪ Pressure compensation tube with Teflon filter

Operability

FMX21 4 to 20 mA Analog

No display or other operation facility is required to operate the device. However, the measured values can be read out with optional evaluation units.

FMX21 4 to 20 mA HART

FieldCare

FieldCare is an Endress+Hauser asset management tool based on FDT technology. With FieldCare, you can configure all Endress+Hauser devices as well as devices from other manufacturers that support the FDT standard.

FieldCare supports the following functions:
- Configuration of transmitters in online and offline mode
- Loading and saving device data (upload/download)
- Documentation of the measuring point

Connection options:
- Via Commubox FXA195 and the USB interface of a computer
- Via Fieldgate FXA520

For additional information and free download of FieldCare, see → www.de.endress.com → Download → Text Search: FieldCare

DeviceCare

Function scope

Tool for connecting and configuring Endress+Hauser field devices.

The fastest way to configure Endress+Hauser field devices is with the dedicated "DeviceCare" tool. Together with the device type managers (DTMs) it presents a convenient, comprehensive solution.

For details, see Innovation brochure IN01047S

Field Xpert SFX

Field Xpert SFX is an industrial PDA with integrated 3.5" touchscreen from Endress+Hauser based on Windows Mobile. It offers wireless communication via the optional VIATOR® Bluetooth ® modem as a point-to-point connection to a HART device, or via WiFi and Endress+Hauser's Fieldgate FXA520 to one or more HART devices. Field Xpert also works as a stand-alone device for asset management applications. For details, refer to BA00060S/04/EN.

RIA15

The RIA15 can be used as a local display unit and for the basic commissioning of the Waterpilot FMX21 hydrostatic level sensor via HART.

Certificates and approvals

CE mark

The device meets the legal requirements of the relevant EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

RCM-Tick marking

The supplied product or measuring system meets the ACMA (Australian Communications and Media Authority) requirements for network integrity, interoperability, performance characteristics as well as health and safety regulations. Here, especially the regulatory arrangements for electromagnetic compatibility are met. The products are labelled with the RCM- Tick marking on the name plate.

A0029561

Ex approvals

- ATEX
- CSA C/US
- FM
- IEC
- NEPSI
- INMETRO

- The approvals apply exclusively to the Waterpilot FMX21 without Pt100 and without TMT181/TMT182.
- Waterpilot FMX21 is only available for use in hazardous areas with the FKM Viton seal.
- All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all Ex-systems → 📄 5.

EAC conformity

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

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

Drinking water approval

For FMX21 with an external diameter of 22 mm (0.87 in) with EPDM seal

Designation	Option [1]
KTW	LQ
NSF61	LR
ACS	LS

1) Product Configurator order code for "Additional ordering information (optional)"

Marine approval

For FMX21 with outer diameter 22 mm (0.87 in).

Designation	Option [1]
GL	LE
ABS	LF
BV	LH
DNV	LI

1) Product Configurator order code for "Additional ordering information (optional)"

Other standards and guidelines

The applicable European guidelines and standards can be found in the relevant EU Declarations of Conformity. The following were also applied:

DIN EN 60770 (IEC 60770):

Transmitters for use in industrial process control systems Part 1: Methods for performance evaluation

Methods for evaluating the performance of transmitters for control and regulation in industrial process control systems.

DIN 16086:

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

Procedure for writing specifications in data sheets for electrical pressure measuring instruments, pressure sensors and pressure transmitters.

EN 61326:

Electrical equipment for measurement, control and laboratory use – EMC requirements

EN 61010-1 (IEC 61010-1):

Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures

EN 60529:

Degrees of protection provided by enclosures (IP code)

Calibration

Designation	Option [1]
Factory calibration certificate, 5-point	F1

1) Product Configurator order code for "Calibration"

Pressure Equipment Directive 2014/68/EU (PED)

Pressure equipment with allowable pressure ≤ 200 bar (2 900 psi)

Pressure equipment (with a maximum allowable pressure PS ≤ 200 bar (2 900 psi)) can be classified as pressure accessories in accordance with Pressure Equipment Directive 2014/68/EU. If the maximum allowable pressure is ≤ 200 bar (2 900 psi) and the pressurized volume of the pressure equipment is ≤ 0.1 l, the pressure equipment is subject to the Pressure Equipment Directive (cf. Pressure Equipment Directive 2014/68/EU, Article 4, point 3). The Pressure Equipment Directive only requires that the pressure equipment shall be designed and manufactured in accordance with the "sound engineering practice of a Member State".

Reasons:

- Pressure Equipment Directive (PED) 2014/68/EU Article 4, point 3
- Pressure equipment directive 2014/68/EU, Commission's Working Group "Pressure", Guideline A-05 + A-06

Note:

A partial examination shall be performed for pressure instruments that are part of safety equipment for the protection of a pipe or vessel from exceeding allowable limits (safety accessory in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).

Calibration unit

Designation	Option [1]
Sensor range; %	A
Sensor range; mbar/bar	B
Sensor range; kPa/MPa	C
Sensor range; mm/m H2O	D
Sensor range; in H2O/ft H2O	E

Designation	Option [1]
Sensor range; psi	F
Customized pressure; see additional specification	J
Customized level; see additional specification	K

1) Product Configurator order code for "Calibration; unit"

Service

Designation	Option [1]
Configured min alarm current	IA
Adjusted HART Burst Mode PV	IB
Adjusted density compensation	IC
... m cable marking>installation	IR
... ft cable marking>installation	IS
Special version	I9

1) Product Configurator order code for "Service"'

Downloading the Declaration of Conformity

http://www.endress.com/en/download

A0031778

1. Select "Approvals & Certificates"
2. Select "Manufact. Declaration"
3. Enter the required product code
4. Click "Search"

The available downloads are displayed.

Ordering information

Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center: www.addresses.endress.com

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly from the Endress+Hauser Online Shop

Scope of delivery

- Measuring device
- Optional accessories
- Brief Operating Instructions
- Certificates

Configuration data sheet

Level

The following configuration data sheet must be completed and included with the order if option "K: customized level" has been selected for order code "090: Calibration; unit" in the product structure.

Pressure unit				Output unit (scaled unit)				
				Mass	Lengths	Volume	Volume	Percent
❑ mbar	❑ mmH_2O	❑ mmHg	❑ Pa	❑ kg	❑ m	❑ l	❑ gal	❑ %
❑ bar	❑ mH_2O		❑ kPa	❑ t	❑ dm	❑ hl	❑ Igal	
	❑ ftH_2O		❑ MPa	❑ lb	❑ cm			
❑ psi	❑ inH_2O	❑ kgf/cm^2			❑ mm	❑ m^3		
						❑ ft^3		
					❑ ft	❑ in^3		
					❑ inch			

Empty calibration [a]: Low pressure value (empty)	_____ [pressure engineering unit]	Empty calibration [a]: Low pressure value (empty)	_____ [scaled unit]
Full calibration [b]: High pressure value (full)	_____ [pressure engineering unit]	Full calibration [b]: High measured value (full)	_____ [scaled unit]

Damping		
Damping:	_____	sec

Pressure

The following configuration data sheet must be completed and included with the order if option "J: customized pressure" has been selected for order code "090: Calibration; unit" in the product structure.

Pressure unit			
❑ mbar	❑ mmH_2O	❑ mmHg	❑ Pa
❑ bar	❑ mH_2O		❑ kPa
	❑ ftH_2O		❑ MPa
❑ psi	❑ inH_2O	❑ kgf/cm^2	

Calibration range / Output		
Lower-range value (LRV):	_____	[pressure engineering unit]
Upper-range value (URV):	_____	[pressure engineering unit]

Damping		
Damping:	_____	sec

Accessories

CAUTION

Observe the additional information in the individual sections!

- For additional information, see the sections "Mechanical construction" → 📄 35 , "Environment", → 📄 31, "Process" → 📄 33 and "Installation" → 📄 27.

Designation	Diagram	Description	Order number / ordering information
Suspension clamp	A0030950	For easy installation of the FMX21, Endress+Hauser offers a mounting clamp .	▪ 52006151 ▪ Product Configurator order code for "Accessory enclosed", option "PO"
Terminal box	A0030967	Terminal box for terminal strip, temperature head transmitter and Pt100.	▪ 52006152 ▪ Product Configurator order code for "Accessories enclosed", option "PS"
4-terminal strip/terminals	A0030951	4-terminal strip for wiring	52008938
TMT181 temperature head transmitter for FMX21 4 to 20 mA Analog	A0030952	PC-programmable (PCP) temperature head transmitter for the conversion of various input signals	▪ 52008794 ▪ Product Configurator order code for "Accessories enclosed", option "PX"
TMT182 temperature head transmitter for FMX21 4 to 20 mA HART	A0030952	PC-programmable (PCP) temperature head transmitter for the conversion of various input signals	▪ 51001023 ▪ Product Configurator order code for "Accessories enclosed", option "PT"
Cable mounting screws	A B A0030953 *A G 1½" A* *B NPT 1½"*	Endress+Hauser offers a cable mounting screw for easy FMX21 mounting and to seal the measuring aperture.	▪ G 1½" A – 52008264 – Product Configurator order code for "Accessories enclosed", option "PQ" ▪ NPT 1½" – 52009311 – Product Configurator order code for "Accessories enclosed", option "PR"
Additional weight for FMX21 with outer diameter 22 mm (0.87 in) or 29 mm (1.14 in)	A0030954	Endress+Hauser offers additional weights to prevent sideways movement that results in measuring errors, or to make it easier to lower the device in a guide tube.	▪ 52006153 ▪ Product Configurator order code for "Accessories enclosed", option "PU"

Designation	Diagram	Description	Order number / ordering information
Cable shortening kit	A0030948	The cable shortening kit is used to shorten a cable easily and professionally.	▪ 71222671 ▪ Product Configurator order code for "Accessories enclosed", option "PW"
Testing adapter for FMX21 with outer diameter 22 mm (0.87 in) or 29 mm (1.14 in)	A0030956	Endress+Hauser offers a testing adapter to ease function-testing of the level probes.	▪ 52011868 ▪ Product Configurator order code for "Accessories enclosed", option "PV"
Testing adapter for FMX21 with outer diameter 42 mm (1.65 in)	A0030957	Endress+Hauser offers a testing adapter to ease function-testing of the level probes. ▪ Observe the maximum pressure for compressed air hose and maximum overload for level probe ▪ Maximum pressure for the quick coupling piece provided: 10 bar (145 psi)	71110310
RIA15 in the field housing	A0036164	Remote display RIA15 non-hazardous	Product structure, feature 620 "Accessory enclosed", option R4 "Remote display RIA15 non-hazardous area, field housing"
		Remote display RIA15 hazardous	Product structure, feature 620 "Accessory enclosed", option R5 "Remote display RIA15 Ex= explosion protection approval, field housing"
HART communication resistor	A0036165	HART communication resistor, hazardous / non-hazardous area, for use with RIA15	Product structure, feature 620 "Accessory enclosed", option R6 "HART communication resistor hazardous / non-hazardous area"

Service-specific accessories

Accessories	Description
DeviceCare SFE100	Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus field devices Technical Information TI01134S DeviceCare is available for download at www.software-products.endress.com. You need to register in the Endress+Hauser software portal to download the application.
FieldCare SFE500	FDT-based plant asset management tool FieldCare can configure all smart field units in your plant and helps you manage them. By using the status information, FieldCare is also a simple but effective way of checking the status and condition of the field devices. Technical Information TI00028S

Supplementary documentation

The following document types are also available in the Downloads area of the Endress+Hauser website: www.endress.com → Downloads

Field of Activities

- Pressure measurement: FA00004P/00/EN
- Recording technology: FA00014R/09/EN
- System components: FA00016K/09/EN

Technical Information

- Deltapilot M: TI00437P/00/EN
- Temperature head transmitter iTEMP TMT181: TI00070R/09/EN
- Temperature head transmitter iTEMP HART TMT182: TI00078R/09/EN
- RIA15: TI01043K/09/EN

Operating Instructions

- Waterpilot FMX21 4 to 20 mA Analog: BA01605P/00/EN
- Waterpilot FMX21 4 to 20 mA HART: BA00380P/00/EN
- RIA15: BA01170K/09/EN
- Cable shortening kit: SD00552P/00/A6
- Field Xpert: BA01211S/04/EN

Brief Operating Instructions

- Waterpilot FMX21 4 to 20 mA Analog: KA01244P/00/EN - Brief Operating Instructions for the device
- Waterpilot FMX21 4 to 20 mA HART: KA01189P/00/EN - Brief Operating Instructions for the device

Safety Instructions (XA)

Depending on the approval, the following Safety Instructions (XA) are supplied with the device. They are an integral part of the Operating Instructions.

Directive	Type of protection	Category	Documentation	Option [1]
ATEX	Ex ia IIC	II 2 G	XA00454P	BD
ATEX	Ex nA IIC	II 3 G	XA00485P	BE
IECEx	Ex ia IIC	n/a	XA00455P	IC
CSA C/US	Ex ia IIC	n/a	ZD00232P (960008976)	CE
FM	AEx ia IIC	n/a	ZD00231P (960008975)	FE
NEPSI	Ex ia IIC	n/a	XA00456P	NA
INMETRO	Ex ia IIC	n/a	XA01066P	MA

1) Product Configurator order code for "Approval"

The nameplate indicates the Safety Instructions (XA) that are relevant to the device.

Drinking water approval

- SD00289P/00/A3 (NSF)
- SD00319P/00/A3 (KTW)
- SD00320P/00/A3 (ACS)

Registered trademarks

GORE-TEX®

Trademark of W.L. Gore & Associates, Inc., USA.

TEFLON®

Trademark of E.I. Du Pont de Nemours & Co., Wilmington, USA.

HART®

Registered trademark of the FieldComm Group, Austin, USA

FieldCare®	Trademark of Endress+Hauser Process Solutions AG.
DeviceCare®	Trademark of Endress+Hauser Process Solutions AG.
iTEMP®	Trademark of Endress+Hauser Wetzer GmbH + Co. KG, Nesselwang, D..

71397581

www.addresses.endress.com

Endress+Hauser

People for Process Automation