

## Technical Information

# Prosonic M FMU40/41/42/43/44

## Ultrasonic Level Measurement

Compact transmitters for non-contact level measurement of fluids, pastes and coarse bulk materials



FMU40

FMU41

FMU42

FMU43

FMU44

### Application

- Continuous, non-contact level measurement in fluids, pastes, sullages and coarse bulk materials
- Flow measurement in open channels and measuring weirs
- System integration via:
  - HART® (standard), 4 to 20 mA
  - PROFIBUS® PA
  - FOUNDATION™ Fieldbus
- Maximum measuring range:
  - FMU 40: 16 ft (5 m) in fluids / 6 ft (2 m) in bulk materials
  - FMU 41: 26 ft (8 m) in fluids / 12 ft (3.5 m) in bulk materials
  - FMU 42: 33 ft (10 m) in fluids / 16 ft (5 m) in bulk materials
  - FMU 43: 50 ft (15 m) in fluids / 23 ft (7 m) in bulk materials
  - FMU44: 65 ft (20 m) in fluids / 33 ft (10 m) in bulk materials

### Features and benefits

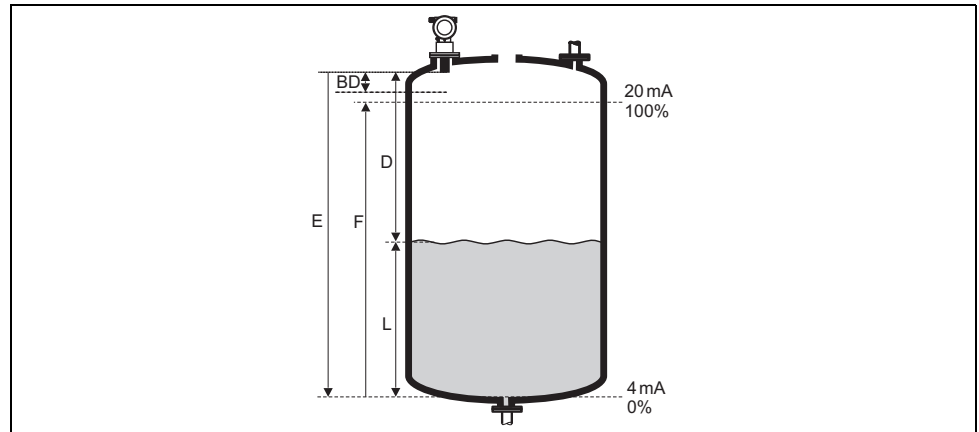
- Quick and simple commissioning via menu-guided local operation with four-line plain text display
- Envelope curves on the local display for simple diagnosis
- Easy remote operation, diagnosis and measuring point documentation with the supplied FieldCare operating program.
- Suitable for explosion hazardous areas (Gas-Ex, Dust-Ex)
- Linearization function (up to 32 points) for conversion of the measured value into any unit of length, volume or flow rate
- Non-contact measurement method minimizes service requirements
- Optional remote display and operation (up to 65 ft / 20 m) from transmitter)
- Installation possible from thread G 1½", 1½" NPT, 2" NPT or universal slip-on flange
- Integrated temperature sensor for automatic correction of the temperature dependent sound velocity

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## Function and system design

### Measuring principle



**E:** Empty distance; **F:** Span (full distance); **D:** Distance from sensor membrane - product surface; **L:** Level; **BD:** Blocking distance

Sensor	BD	Max. range fluids	Max. range bulk materials
FMU40	9.8" (0.25 m)	16 ft (5 m)	6.5 ft (2 m)
FMU41	13.8" (0.35 m)	26 ft (8 m)	11.5 ft (3.5 m)
FMU42	15.7" (0.4 m)	33 ft (10 m)	16 ft (5 m)
FMU43	23.6" (0.6 m)	50 ft (15 m)	23 ft (7 m)
FMU44	19.7" (0.5 m)	65 ft (20 m)	33 ft (10 m)

### Time-of-flight method

The sensor of the Prosonic M transmits ultrasonic pulses in the direction of the product surface. The pulses are reflected back and received by the sensor. The Prosonic M measures the time  $t$  between pulse transmission and reception. The instrument uses the time  $t$  (and the velocity of sound  $c$ ) to calculate the distance  $D$  between the sensor membrane and the product surface:

$$D = c \cdot t / 2$$

As the device knows the empty distance  $E$  from a user entry, it can calculate the level as follows:

$$L = E - D$$

An integrated temperature sensor compensates for changes in the velocity of sound caused by temperature changes.

### Interference echo suppression

The interference echo suppression feature on the Prosonic M ensures that interference echos (e.g. from edges, welded joints and installations) are not interpreted as a level echo.

### Calibration

Enter the empty distance  $E$  and the span  $F$  to calibrate the device.

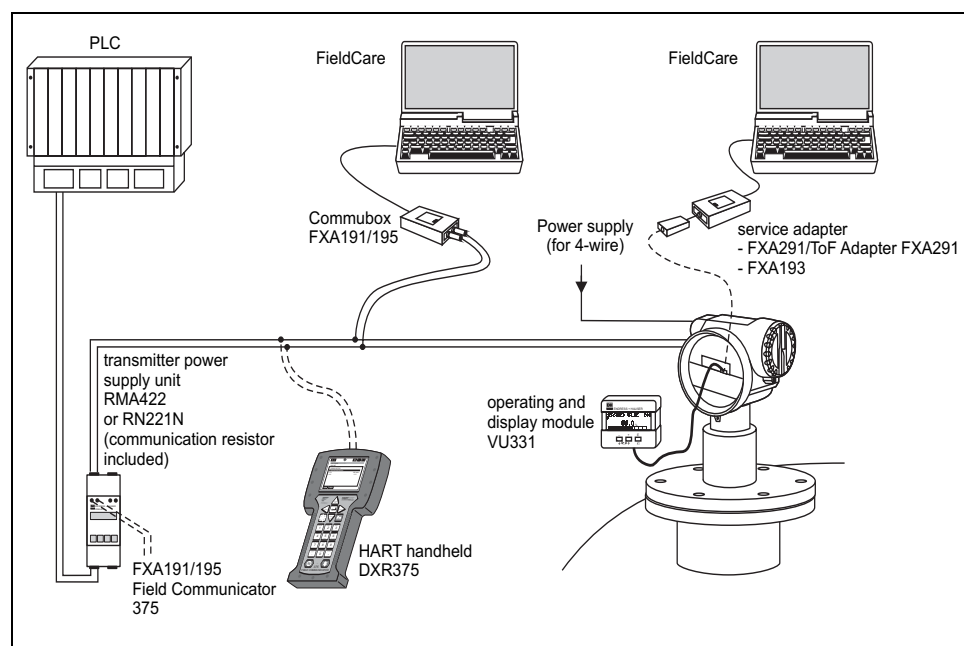
### Blocking distance

Span  $F$  may not extend into the blocking distance  $BD$ . Level echos from the blocking distance cannot be evaluated due to the transient characteristics of the sensor.

## Equipment architecture

## 4 to 20 mA output with HART protocol

The complete measuring system consists of:



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If the HART communication resistor is not built into the supply unit, it is necessary to insert a communication resistor of 250  $\Omega$  into the 2-wire line.

#### Local operation

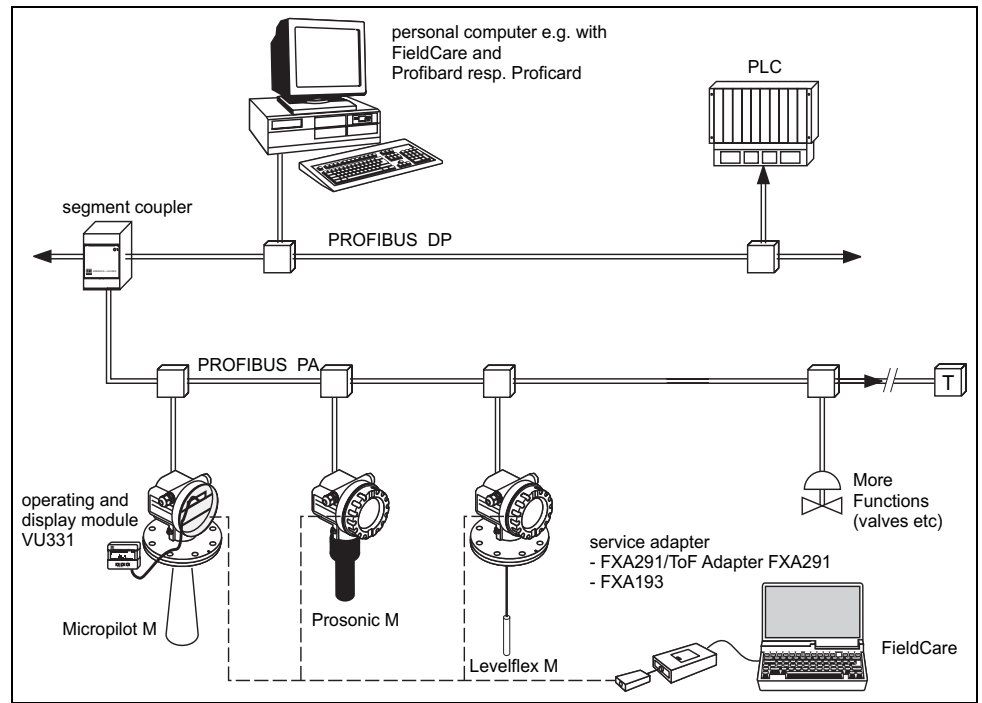
- with display and operating module VU 331
- with a Personal Computer, FXA 193 and the operating software FieldCare

#### Remote operation

- with HART handheld terminal DXR 375
- with a Personal Computer, Commubox FXA 191 and the operating software COMMUWIN II respectively FieldCare.

### System integration using PROFIBUS PA

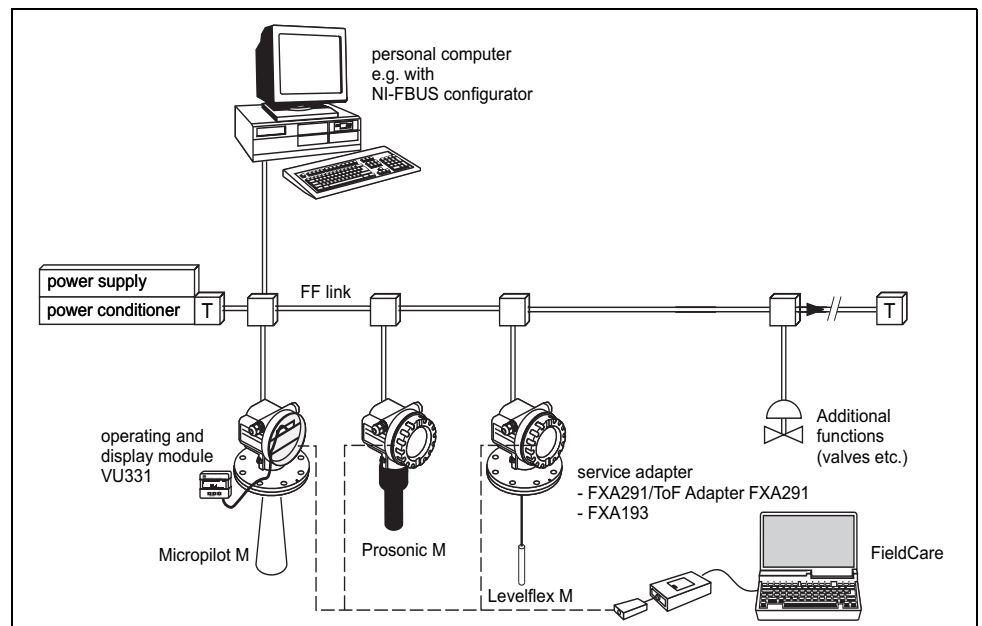
A maximum of 32 transmitters (8 if mounted in an explosion hazardous location EEx ia IIC according to FISCO-model) can be connected to the bus. The segment coupler provides the operating voltage to the bus. Both on-site as well as remote operation are possible.



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### System integration using Foundation Fieldbus (FF)

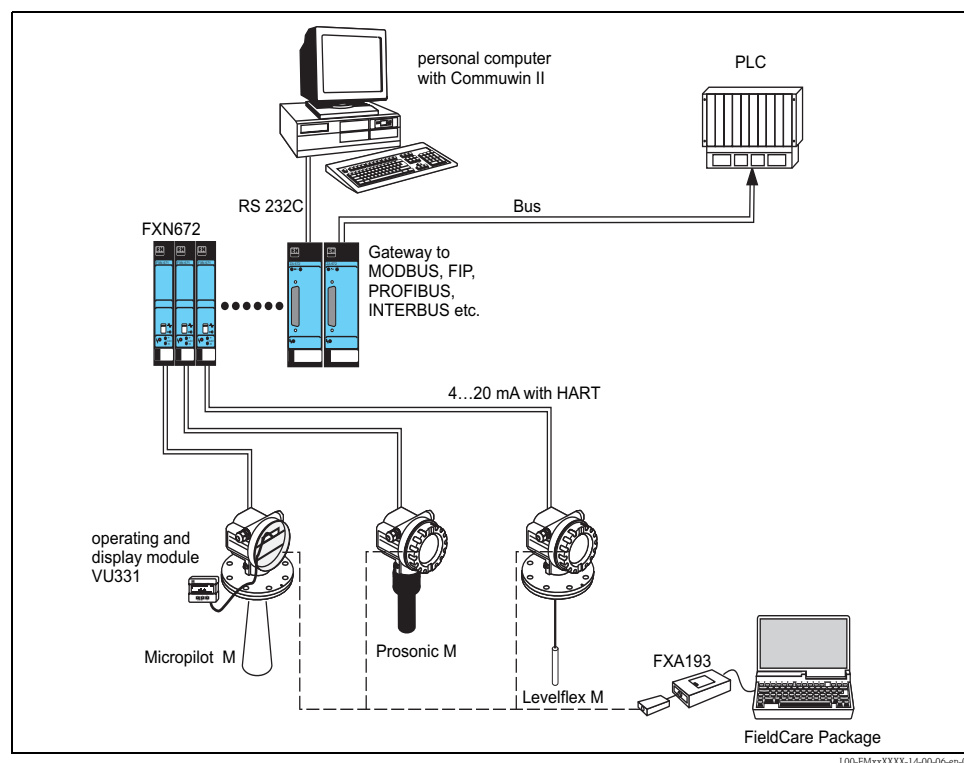
A maximum of 32 transmitters (standard or EEx d) can be connected to the bus. For protection class EEx ia: the maximum number of transmitters depends on the established rules and standards for intrinsically safe circuits (EN 60070-14) and proof of intrinsic safety. Both local and remote operation are possible.



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### System integration using Endress+Hauser Rackbus

You can interconnect a maximum of 64 2-wire devices with HART protocol to a Rackbus. Use an FXN 672 interface module for each device. You can integrate this bus into a higher-level bus by using a ZA gateway. Gateways are available for MODBUS, FIP, PROFIBUS, INTERBUS etc. Both on-site and remote operation are possible.



Hinweis!

The FXN672 can be used with all 2-wire devices of the Prosonic M family.

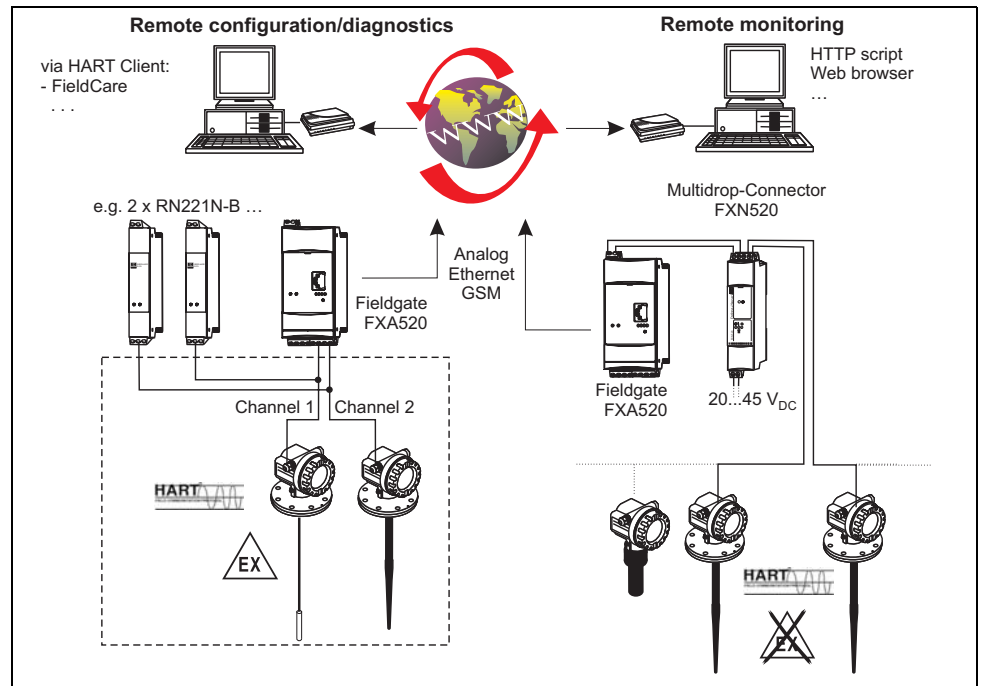
### System integration via Fieldgate

#### Vendor Managed Inventory

By using Fieldgate to interrogate tank or silo levels remotely, suppliers of raw materials can provide their regular customers with information about the current supplies at any time and, for example, account for them in their own production planning. For their part, the Fieldgate monitors the configured level limits and, if required, automatically activates the next supply. The spectrum of options here ranges from a simple purchasing requisition via e-mail through to fully automatic order administration by coupling XML data into the planning systems on both sides.

#### Remote maintenance of measuring equipment

Fieldgates not only transfer the current measured values, they also alert the responsible standby personnel, if required, via e-mail or SMS. In the event of an alarm or also when performing routine checks, service technicians can diagnose and configure connected HART devices remotely. All that is required for this is the corresponding HART operating software (e.g. FieldCare, ...) for the connected device. Fieldgate passes on the information transparently, so that all options for the respective operating software are available remotely. Some local service operations can be avoided by using remote diagnosis and remote configuration and all others can at least be better planned and prepared.



**Note!**

The number of instruments which can be connected in multidrop mode can be calculated by the "FieldNetCalc" program. A description of this program can be found in Technical Information TI 400F (Multidrop Connector FXN520). The program is available from your Endress+Hauser sales organization or in the internet at: "[www.endress.com](http://www.endress.com) Download" (Text Search = "Fieldnetcalc").

## Input

<b>Measured variable</b>	<p>The distance D between the sensor membrane and the product surface is measured.</p> <p>Using the linearisation function, the device uses D to calculate:</p> <ul style="list-style-type: none"> <li>■ level L in any units</li> <li>■ volume V in any units</li> <li>■ flow Q across measuring weirs or open channels in any units</li> </ul>
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<b>Measuring range</b>	<p>The measuring range is limited by the range of a sensor. The sensor range is, in turn, dependent on the operating conditions. To estimate the actual range, proceed as follows (see also the calculation example in the diagram):</p> <ol style="list-style-type: none"> <li>1. Determine which of the influences shown in the following table are appropriate for your process.</li> <li>2. Add the corresponding attenuation values.</li> <li>3. From the total attenuation, use the diagram to calculate the range.</li> </ol>
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Fluid surface	Attenuation
Calm	0 dB
Waves	5 to 10 dB
Strong turbulence (e.g. stirrers)	10 to 20 dB
Foaming	Ask Endress+Hauser

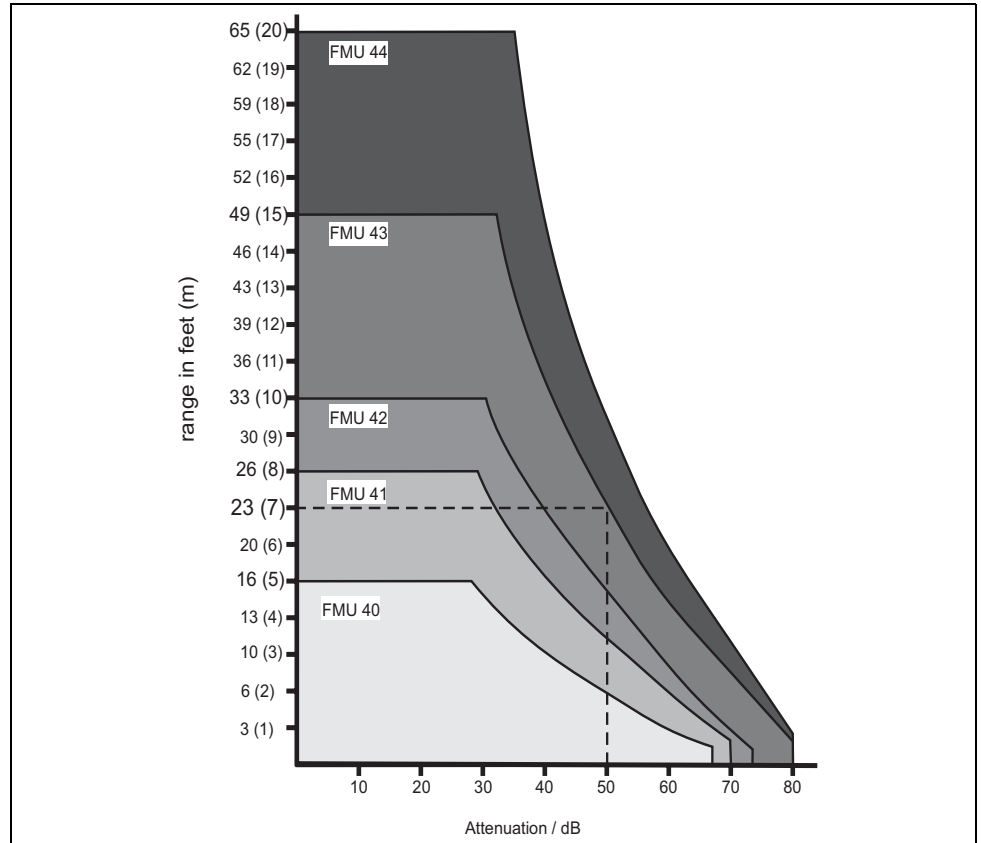
Bulk material surface	Attenuation
Hard, rough (e.g. rubble)	40 dB
Soft (e.g. peat, dust-covered clinker)	40 to 60 dB

Dust	Attenuation
No dust formation	0 dB
Little dust formation	5 dB
Heavy dust formation	5 to 20 dB

Filling curtain in detection range	Attenuation
None	0 dB
Small quantities	5 to 10 dB
Large quantities	10 to 40 dB

Temperature difference between sensor and product surface	Attenuation
to 68°F (20°C)	0 dB
to 104°F (40°C)	5 to 10 dB
to 176°F (80°C)	10 to 20 dB





**Example (for FMU 43)**

For typical solid applications, a certain amount of dust coverage is normally present. Therefore, the following range results from the table and the diagram

- Dust-covered rubble approx. 50 dB
  - no dust formation 0 dB
  - No filling curtain in detection range 0 dB
  - Temperature diff. < 68°F (20°C) 0 dB
- 
- approx. 50 dB      => range approx. 23 ft (7 m)

These measuring conditions have been taken into account during the calculation of the maximum measuring range in solid applications.

**Operating frequency**

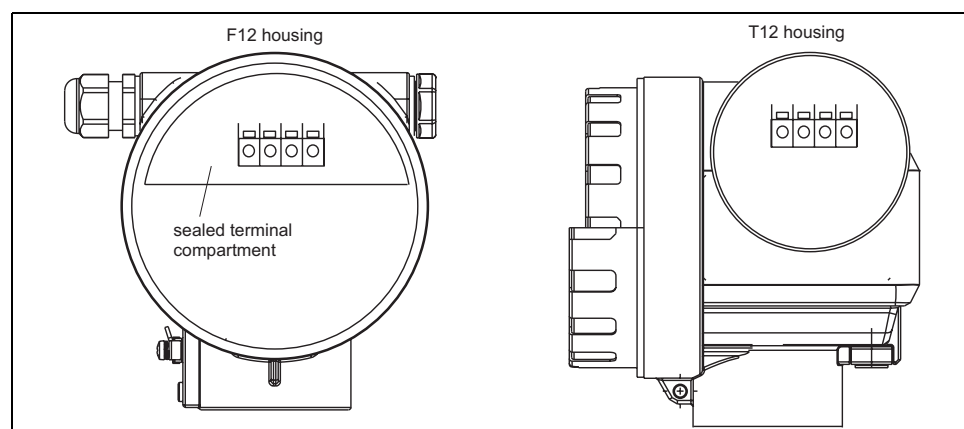
Sensor	Operating frequency
FMU40	approx. 70 kHz
FMU41	approx. 50 kHz
FMU42	approx. 42 kHz
FMU43	approx. 35 kHz
FMU44	approx. 30 kHz

## Output

<b>Output signal</b>	according to the instrument version ordered: <ul style="list-style-type: none"> <li>■ 4 to 20 mA with HART protocol</li> <li>■ PROFIBUS PA</li> <li>■ Foundation Fieldbus (FF)</li> </ul>
<b>Signal on alarm</b>	Error information can be accessed via the following interfaces: <ul style="list-style-type: none"> <li>■ Local display (error symbol, error code and plain text description)</li> <li>■ Current output (error current configurable)</li> <li>■ Digital interface</li> </ul>
<b>Load HART</b>	Minimum load for HART communication: 250 $\Omega$
<b>Output damping</b>	Freely selectable, 0 to 255 s
<b>Linearization</b>	<p>The linearization function of the Prosonic M allows conversion of the measured value into any unit of length or volume. In open channels or measuring weirs, also a flow linearization is possible (calculation of the flow from the measured level). The linearization table for calculating the volume in an horizontal cylindrical tank is preprogrammed. You can also enter any number of other tables containing up to 32 value pairs either manually or semi-automatically (by filling the vessel under controlled conditions).</p> <p>The supplied FieldCare operating program can automatically calculate the table for any tank, weir or flume and upload it into the device.</p> <p>Flow curves for open channels can be calculated and entered into the instrument by FieldCare as well.</p>

## Auxiliary energy

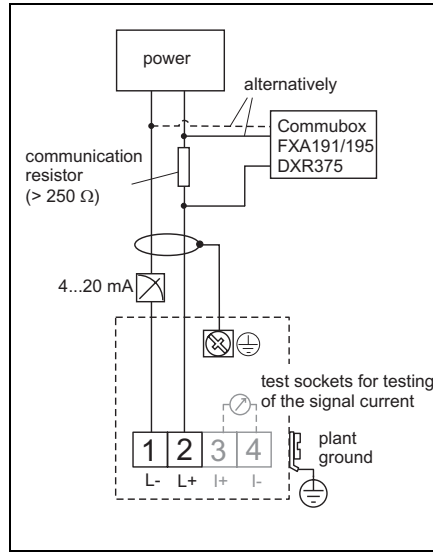
<b>Terminal compartment</b>	In the F12 housing, the terminals are located underneath the housing cover. In the T12 housing, they are under the cover of the separate terminal compartment.
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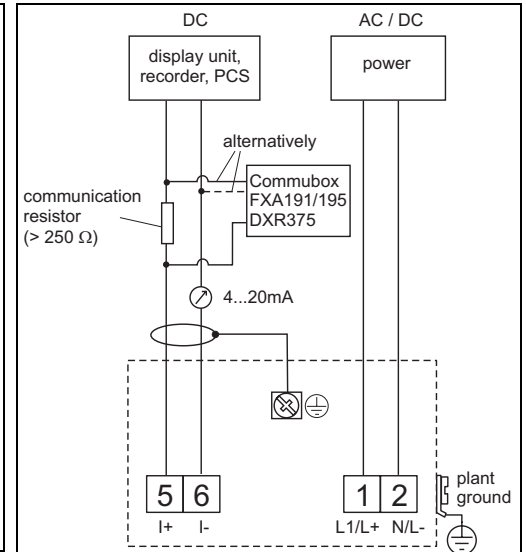
**Terminal assignment**

**4 to 20 mA with HART, 2-wire**



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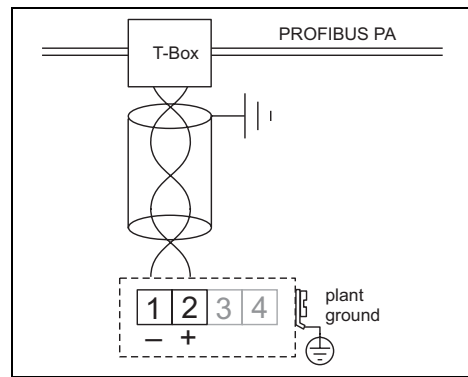
**4 to 20 mA active with HART, 4-wire**



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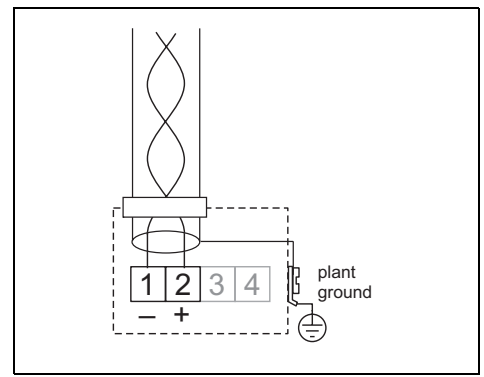
- Connect the connecting line to the screw terminals (line cross-sections of 20 to 14 AWG / 0.5 to 2.5mm) in the terminal compartment.
- Use 2-wire twisted pair cable with shield for the connection.
- Protective circuitry against reverse polarity, RFI and over-voltage peaks is built into the device (see also Technical Information TI 241F/00/en "EMC Test Procedures")

**PROFIBUS PA**



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**FOUNDATION Fieldbus**



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The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary energy. Use 2-wire twisted pair cable with shield.

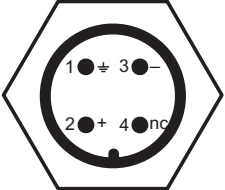
Refer to the following operating manuals for information on cable types, and how to set up and ground the network:

- BA 198F/00/de „PROFIBIS -DP/-PA, Guidelines for planning and commissioning“
- BA 013S/04/en „Foundation Fieldbus, Installation and Commissioning Guidelines“

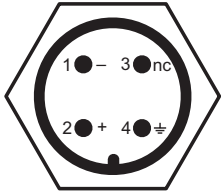
**Fieldbus plug connectors**

For the versions with fieldbus plug connector (M12 or 7/8"), the signal line can be connected without opening the housing.

**Pin assignment of the M12 plug connector (PROFIBUS PA plug)**

 <p style="text-align: right; font-size: small;">L00-FMxxxxx-04-00-00-yy-016</p>	Pin	Meaning
	1	Ground
	2	Signal +
	3	Signal -
	4	not connected

**Pin assignment of the 7/8" plug connector (FOUNDATION Fieldbus plug)**

 <p style="text-align: right; font-size: small;">L00-FMxxxxx-04-00-00-yy-017</p>	Pin	Meaning
	1	Signal -
	2	Signal +
	3	not connected
	4	ground

**Supply voltage****HART, 2-wire**

The following values are the voltages across the terminals directly at the instrument:

Version		Current consumption	Terminal voltage minimum	Terminal voltage maximum
2-wire HART	Standard	4 mA	14 V	36 V
		20 mA	8 V	36 V
	IS (EEx ia)	4 mA	14 V	30 V
		20 mA	8 V	30 V
	XP (EEx d)	4 mA	14 V	30 V
		20 mA	11 V	30 V
Fixed current, adjustable, e.g. for solar power operation (measured value via HART)	Standard	11 mA	10 V	36 V
	IS (EEx ia)	11 mA	10 V	30 V
Fixed current for HART multidrop mode	Standard	4 mA <sup>1)</sup>	14 V	36 V
	IS (EEx ia)	4 mA <sup>1)</sup>	14 V	30 V

1) Start-up current 11 mA

**HART, 4-wire, active**

Version	Voltage	max. load
DC	10.5 to 32 V	600 Ω
AC 50/60 Hz	90 to 253 V	600 Ω

**Terminals**

Cable cross-section: 0.5 to 2.5 mm (20 to 14 AWG)

<b>Cable entry</b>	<ul style="list-style-type: none"> <li>■ Cable gland: M20x1.5 (recommended cable diameter 6 to 10 mm)</li> <li>■ Cable entry G ½ or ½" NPT</li> <li>■ PROFIBUS-PA M12 plug</li> <li>■ Fieldbus Foundation 7/8" plug</li> </ul>
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<b>Power consumption</b>	<table border="1"> <thead> <tr> <th>Version</th> <th>Power consumption</th> </tr> </thead> <tbody> <tr> <td>2-wire</td> <td>51 mW to 800 mW</td> </tr> <tr> <td>4-wire AC</td> <td>max. 4VA</td> </tr> <tr> <td>4-wire DC; FMU 40/41</td> <td>330 mW to 830 mW</td> </tr> <tr> <td>4-wire DC; FMU 42/43</td> <td>600 mW to 1 W</td> </tr> </tbody> </table>	Version	Power consumption	2-wire	51 mW to 800 mW	4-wire AC	max. 4VA	4-wire DC; FMU 40/41	330 mW to 830 mW	4-wire DC; FMU 42/43	600 mW to 1 W
Version	Power consumption										
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4-wire AC	max. 4VA										
4-wire DC; FMU 40/41	330 mW to 830 mW										
4-wire DC; FMU 42/43	600 mW to 1 W										

<b>Current consumption (2-wire-instruments)</b>	<table border="1"> <thead> <tr> <th>Communication</th> <th>Current consumption</th> </tr> </thead> <tbody> <tr> <td>HART</td> <td>3.6 to 22 mA</td> </tr> <tr> <td>PROFIBUS PA</td> <td>max. 13 mA</td> </tr> <tr> <td>Foundation Fieldbus</td> <td>max. 15 mA</td> </tr> </tbody> </table>	Communication	Current consumption	HART	3.6 to 22 mA	PROFIBUS PA	max. 13 mA	Foundation Fieldbus	max. 15 mA
Communication	Current consumption								
HART	3.6 to 22 mA								
PROFIBUS PA	max. 13 mA								
Foundation Fieldbus	max. 15 mA								

<b>HART ripple</b>	47 to 125 Hz: $V_{pp} = 200$ mV (measured at 500 $\Omega$ )
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<b>Max. noise HART</b>	500 Hz to 10 kHz: $V_{rms} = 2.2$ mV (measured at 500 $\Omega$ )
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<b>Galvanic isolation</b>	With 4-wire devices, the evaluation electronics and power voltage are galvanically isolated from each other.
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## Performance characteristics

<b>Reaction time</b>	<p>The reaction time depends on the parameter settings. The minimum values are:</p> <ul style="list-style-type: none"> <li>■ 2-wire devices (FMU40/41/42): min. 2 s</li> <li>■ 2-wire devices (FMU43 - PROFIBUS PA or FOUNDATION Fieldbus): min. 2 s</li> <li>■ 2-wire devices (FMU44): min. 3 s</li> <li>■ 4-wire devices (FMU40/41/42/43/44): 0.5 s</li> </ul>
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<b>Reference operating conditions</b>	<ul style="list-style-type: none"> <li>■ Temperature = +68°F (20°C)</li> <li>■ Pressure = 14.7 psia (1013 mbar abs.)</li> <li>■ Humidity = 50 %</li> <li>■ Ideal reflective surface (e.g. calm, smooth fluid surface)</li> <li>■ No interference reflections within signal beam</li> <li>■ Set application parameters: <ul style="list-style-type: none"> <li>– Tank shape = flat ceiling</li> <li>– Medium property = liquid</li> <li>– process conditions = calm surface</li> </ul> </li> </ul>
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<b>Measured value resolution</b>	<table border="1"> <thead> <tr> <th>Sensor</th> <th>Measured value resolution</th> </tr> </thead> <tbody> <tr> <td>FMU40</td> <td>0.04" (1 mm)</td> </tr> <tr> <td>FMU41</td> <td>0.04" (1 mm)</td> </tr> <tr> <td>FMU42</td> <td>0.08" (2 mm)</td> </tr> <tr> <td>FMU43</td> <td>0.08" (2 mm)</td> </tr> <tr> <td>FMU44</td> <td>0.08" (2 mm)</td> </tr> </tbody> </table>	Sensor	Measured value resolution	FMU40	0.04" (1 mm)	FMU41	0.04" (1 mm)	FMU42	0.08" (2 mm)	FMU43	0.08" (2 mm)	FMU44	0.08" (2 mm)
Sensor	Measured value resolution												
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FMU41	0.04" (1 mm)												
FMU42	0.08" (2 mm)												
FMU43	0.08" (2 mm)												
FMU44	0.08" (2 mm)												

**Pulse frequency**

- 2-wire devices (FMU40/41/42): max. 0.5 Hz
- 2-wire devices (FMU43 - PROFIBUS PA or FOUNDATION Fieldbus): max. 0.5 Hz
- 2-wire devices (FMU44): max. 0.3 Hz
- 4-wire devices (FMU40/41/42/43/44): max. 2 Hz

The exact values are dependent on the type of device and the parameter settings.

**Measuring error**

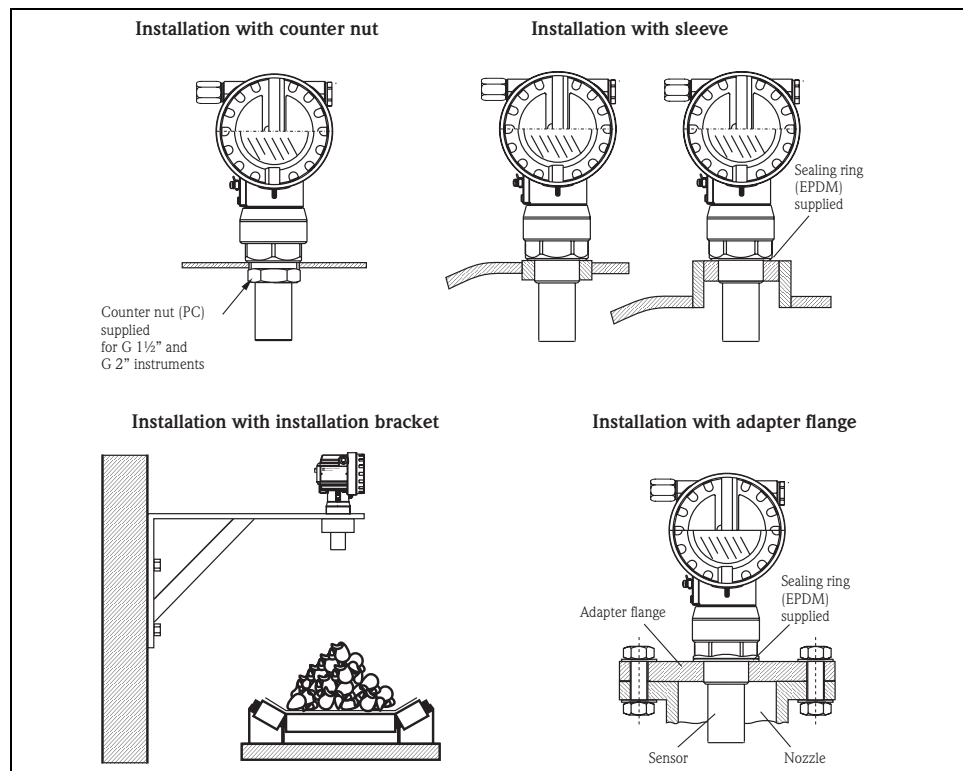
Typical specifications for reference operating conditions (include linearity, repeatability, and hysteresis):

Sensor	Measuring error
FMU40	$\pm 0.08''$ (2 mm) or 0.2% of set measuring distance (empty calibration) <sup>1</sup>
FMU41	$\pm 0.08''$ (2 mm) or 0.2% of set measuring distance (empty calibration) <sup>1</sup>
FMU42	$\pm 0.16''$ (4 mm) or 0.2% of set measuring distance (empty calibration) <sup>1</sup>
FMU43	$\pm 0.16''$ (4 mm) or 0.2% of set measuring distance (empty calibration) <sup>1</sup>
FMU44	$\pm 0.16''$ (4 mm) or 0.2% of set measuring distance (empty calibration) <sup>1</sup>

<sup>1</sup>whichever is greater

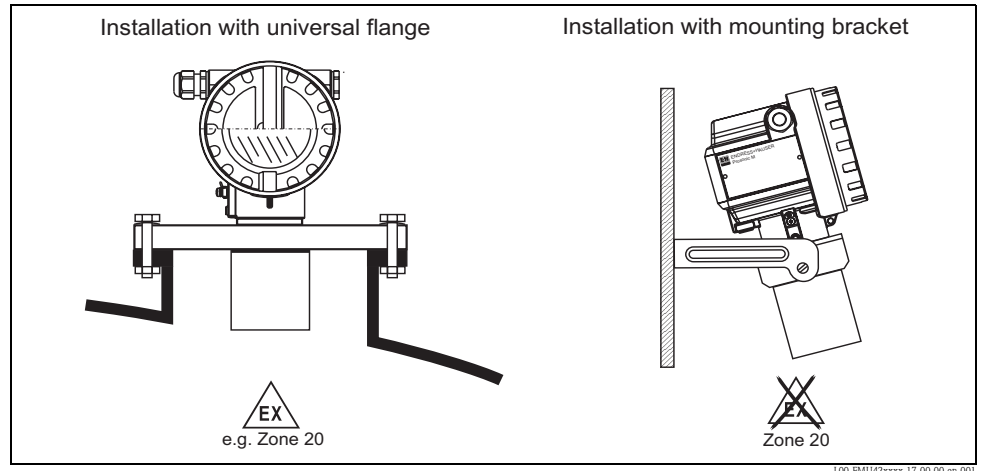
**Influence of the vapor pressure**

The vapor pressure at 20°C (68°F) gives a hint on the accuracy of the ultrasonic level measurement. If the vapor pressure at 20°C (68°F) is below 50 mbar (0.7 psi), ultrasonic level measurement is possible with very high accuracy. This is valid for water, aqueous solutions, water-solid-solutions, dilute acids (hydrochloric acid, sulfuric acid, ...), dilute bases (caustic soda, ...), oils, greases, slurries, pastes, ... High vapor pressures or outgassing media (ethanol, acetone, ammonia, ...) can influence the accuracy. If conditions like these are present, please contact the Endress+Hauser support.

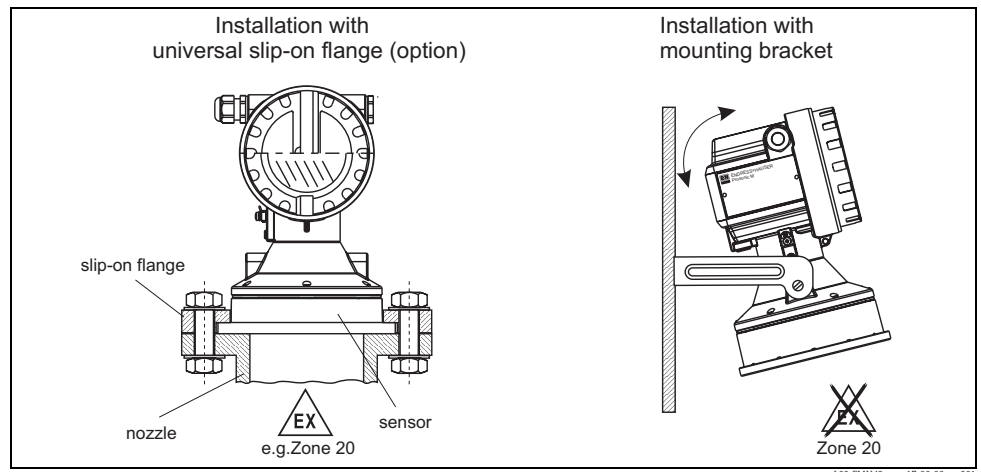
**Installation conditions****Installation variants FMU 40, FMU 41**

For installation bracket or adapter flange s. chapter "Accessories".

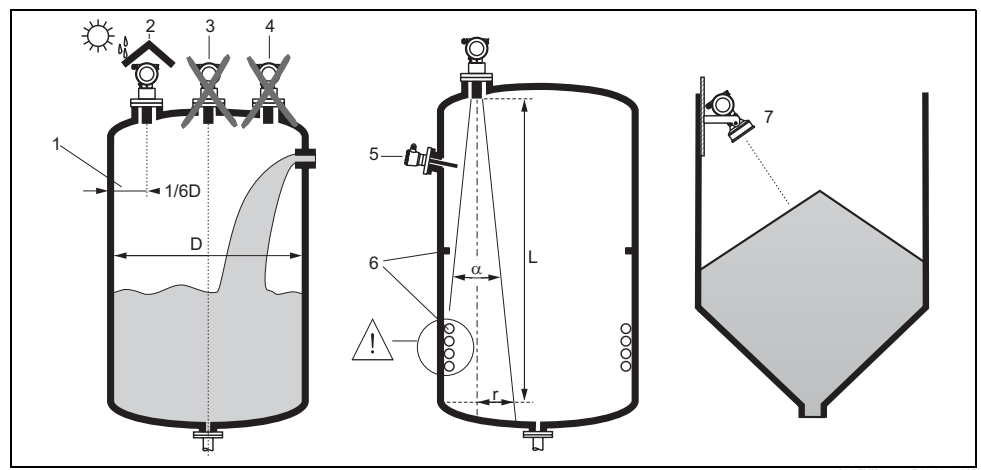
Installation variants FMU42, FMU44



Installation variants FMU 43



Installation conditions for level measurements



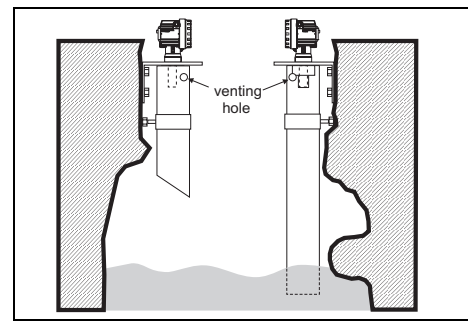
- Do not install the sensor in the middle of the tank (3). We recommend leaving a distance between the sensor and the tank wall (1) measuring 1/6 of the tank diameter.
- Use a protective cover, in order to protect the device from direct sun or rain (2).
- Avoid measurements through the filling curtain (4).

- Make sure that equipment (5) such as limit switches, temperature sensors, etc. are not located within the emitting angle  $\alpha$ . In particular, symmetrical equipment (6) such as heating coils, baffles etc. can influence measurement.
- Align the sensor so that it is vertical to the product surface (7).
- Never install two ultrasonic measuring devices in a tank, as the two signals may affect each other.
- To estimate the detection range, use the 3 dB emitting angle  $\alpha$ .

Sensor	$\alpha$	$L_{max}$	$r_{max}$
FMU40	11°	16 ft (5 m)	18.9" (0.48 m)
FMU41	11°	26 ft (8 m)	30.3" (0.77 m)
FMU42	9°	33 ft (10 m)	31.1" (0.79 m)
FMU43	6°	50 ft (15 m)	31.1" (0.79 m)
FMU44	11°	65 ft (20 m)	76" (1.93 m)

**Installation in narrow shafts**

In narrow shafts with strong interference echoes, we recommend using an ultrasound guide pipe (e.g. PE or PVC wastewater pipe) with a minimum diameter of 4" (100 mm). Make sure that the pipe is not soiled by accumulated dirt. If necessary, clean the pipe at regular intervals.

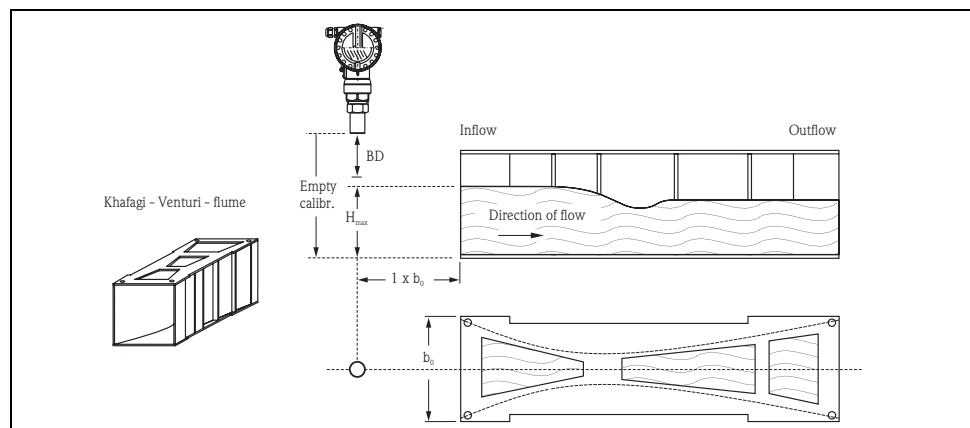


L00-FMU4xxxx-17-00-00-en-010

**Installation conditions for flow measurements**

- Install the Prosonic M at the inflow side, as close above the maximum water level  $H_{max}$  as possible (take into account the blocking distance BD).
- Position the Prosonic M in the middle of the channel or weir.
- Align the sensor membrane parallel to the water surface.
- Keep to the installation distance of the channel or weir.
- You can enter the "Flow to Level" linearisation curve ("Q/h curve") using FieldCare or manually via the local display.

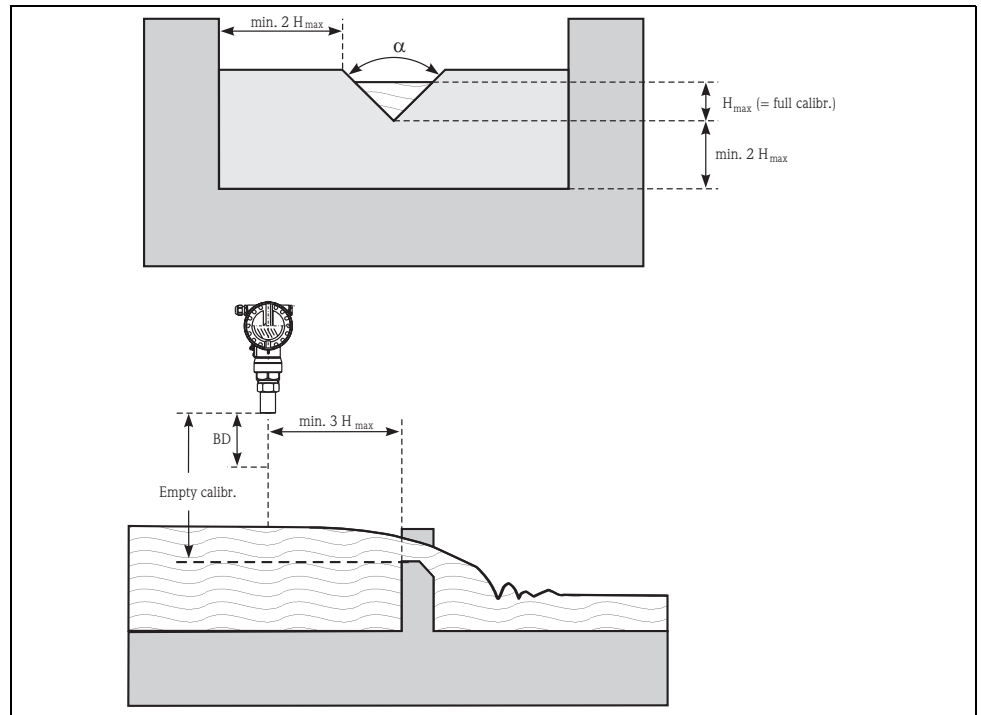
**Example: Khafagi-Venturi flume**



L00-FMU4xxxx-17-00-00-en-003



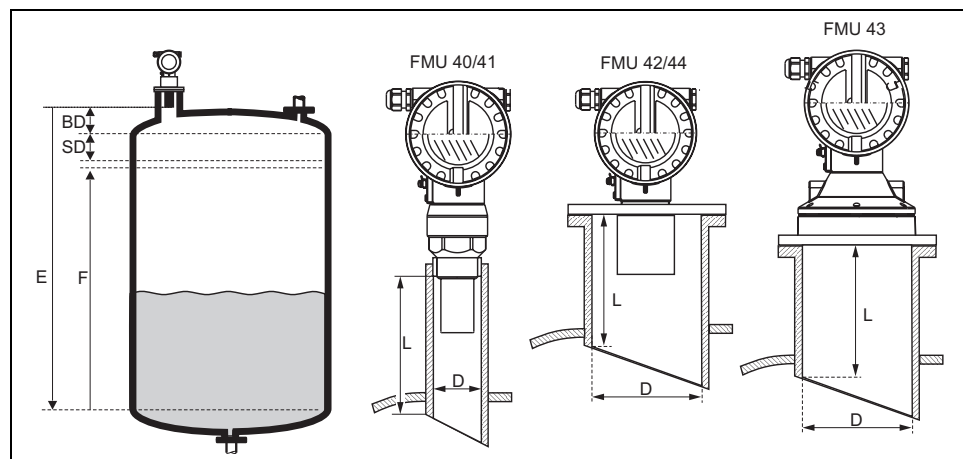
Example: Triangular weir



100-FMU4xxx-17-00-00-en-012

### Blocking distance, nozzle installation

Install the Prosonic M at a height so that the blocking distance BD is not undershot, even at maximum fill level. Use a pipe nozzle if you cannot maintain the blocking distance in any other way. The interior of the nozzle must be smooth and may not contain any edges or welded joints. In particular, there should be no burr on the inside of the tank side nozzle end. Note the specified limits for nozzle diameter and length. To minimize disturbing factors, we recommend an angled nozzle edge (ideally 45°).



BD: blocking distance; SD: safety distance; E: empty calibration; F: full calibration (span); D: nozzle diameter; L: nozzle length

Nozzle diameter	Maximum nozzle length				
	FMU40	FMU41	FMU42	FMU43	FMU44
DN50/2"	3.15" (80 mm)				
DN80/3"	9.45" (240 mm)	9.45" (240 mm)	9.80" (250 mm)		
DN100/4"	11.8" (300 mm)	11.8" (300 mm)	11.8" (300 mm)	11.8" (300 mm)	
DN150/6"	15.7" (400 mm)	15.7" (400 mm)	15.7" (400 mm)	11.8" (300 mm)	15.7" (400 mm)
DN200/8"	15.7" (400 mm)	15.7" (400 mm)	15.7" (400 mm)	11.8" (300 mm)	15.7" (400 mm)
DN250/10"	15.7" (400 mm)	15.7" (400 mm)	15.7" (400 mm)	11.8" (300 mm)	15.7" (400 mm)
DN300/12"	15.7" (400 mm)	15.7" (400 mm)	15.7" (400 mm)	11.8" (300 mm)	15.7" (400 mm)
Emitting angle $\alpha$	11°	11°	9°	6°	11°
Blocking distance	9.8" (0.25 m)	13.8" (0.35 m)	15.7" (0.4 m)	23.6" (0.6 m)	19.7" (0.5 m)
Max. range in liquids	16 ft (5 m)	26 ft (8 m)	33 ft (10 m)	50 ft (15 m)	65 ft (20 m)
Max. range in solids	6.5 ft (2 m)	11.5 ft (3.5 m)	16 ft (5 m)	23 ft (7 m)	33 ft (10 m)



#### Caution!


If the blocking distance is undershot, it may cause device malfunction.



#### Note!

In order to notice if the level approaches the blocking distance, you can specify a safety distance (SD). If the level is within this safety distance, the Prosonic M outputs a warning or alarm message.

## Ambient conditions

<b>Ambient temperature</b>	-40 to +176°F (-40°C to +80°C) The functionality of the LC display becomes restricted at $T_u < -4^\circ\text{F}$ ( $-20^\circ\text{C}$ ) and $T_u > +140^\circ\text{F}$ ( $+60^\circ\text{C}$ ). If the device is operated outdoors in strong sunlight, you should use a protective cover.
<b>Storage temperature</b>	-40 to +176°F (-40°C to +80°C)
<b>Resistance to alternating temperature cycles</b>	to DIN EN 60068-2-14; Nb test : +80°C/-40°C, 1 K/min, 100 cycles
<b>Climate class</b>	DIN EN 60068-2-38 (Test Z/AD) DIN/IEC 68 T2-30Db
<b>Ingress protection</b>	<ul style="list-style-type: none"> <li>■ With closed housing, tested according to           <ul style="list-style-type: none"> <li>– IP 68, NEMA 6P (24h at 1.83m under water surface)</li> <li>– IP 66, NEMA 4x</li> </ul> </li> <li>■ With open housing: IP 20, NEMA 1 (also ingress protection of the display)</li> </ul> <div style="display: flex; align-items: center; margin-top: 10px;">  <p>Caution! Degree of protection IP 68 NEMA 6P applies for M12 PROFIBUS-PA plugs only when the PROFIBUS cable is plugged in.</p> </div>
<b>Vibration resistance</b>	DIN EN 60068-2-64 / IEC 68-2-64: 20 to 2000 Hz, 1 (m/s <sup>2</sup> ) <sup>2</sup> /Hz; 3 x 100 min
<b>Electromagnetic compatibility (EMC)</b>	<ul style="list-style-type: none"> <li>■ Interference emission to EN 61326, Equipment Class B</li> <li>■ Interference immunity to EN 61326, Appendix A (Industrial) and NAMUR Recommendation NE 21 (EMC).</li> <li>■ A standard installation cable is sufficient if only the analogue signal is used. Use a shielded cable when working with a superimposed communication signal (HART).</li> </ul>

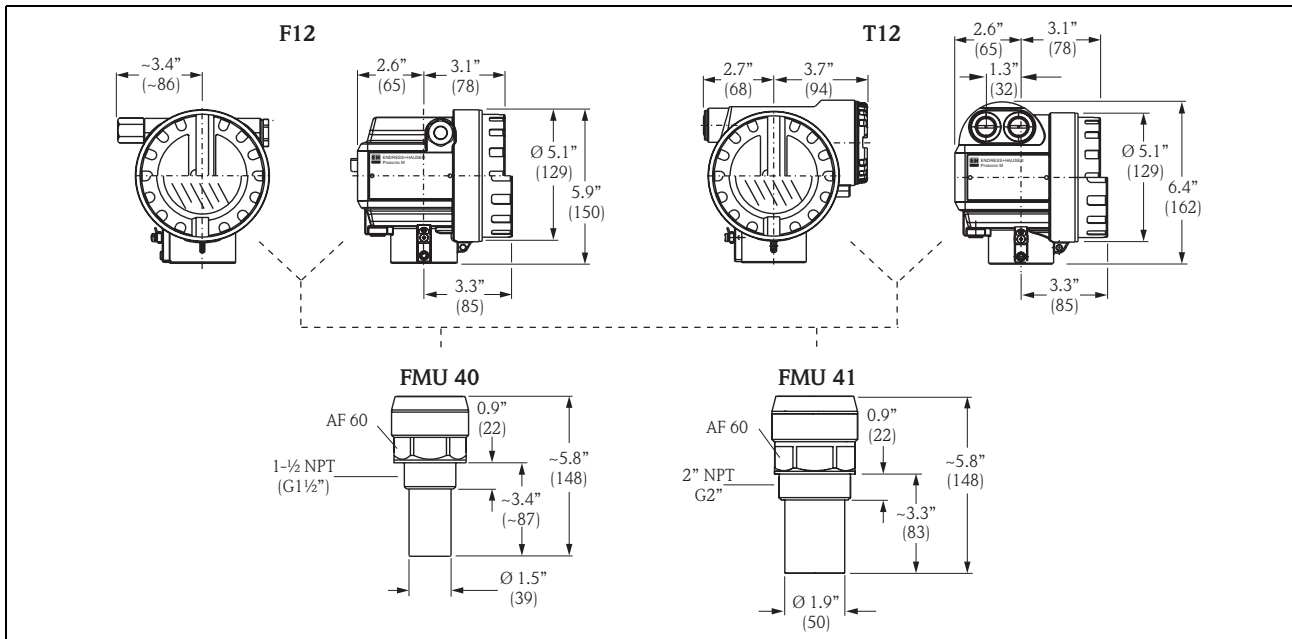
## Process conditions

<b>Process temperature</b>	-40 to +176°F (-40°C to +80°C) A temperature sensor is integrated in the sensor for correction of the temperature-dependent time-of-flight.
<b>Process pressure</b>	<ul style="list-style-type: none"> <li>■ FMU 40/41: 10 to 44 psia (0.7 bar to 3bar abs.)</li> <li>■ FMU 42/43/44: 10 to 36 psia (0.7 bar to 2.5bar abs.)</li> </ul>

## Mechanical construction

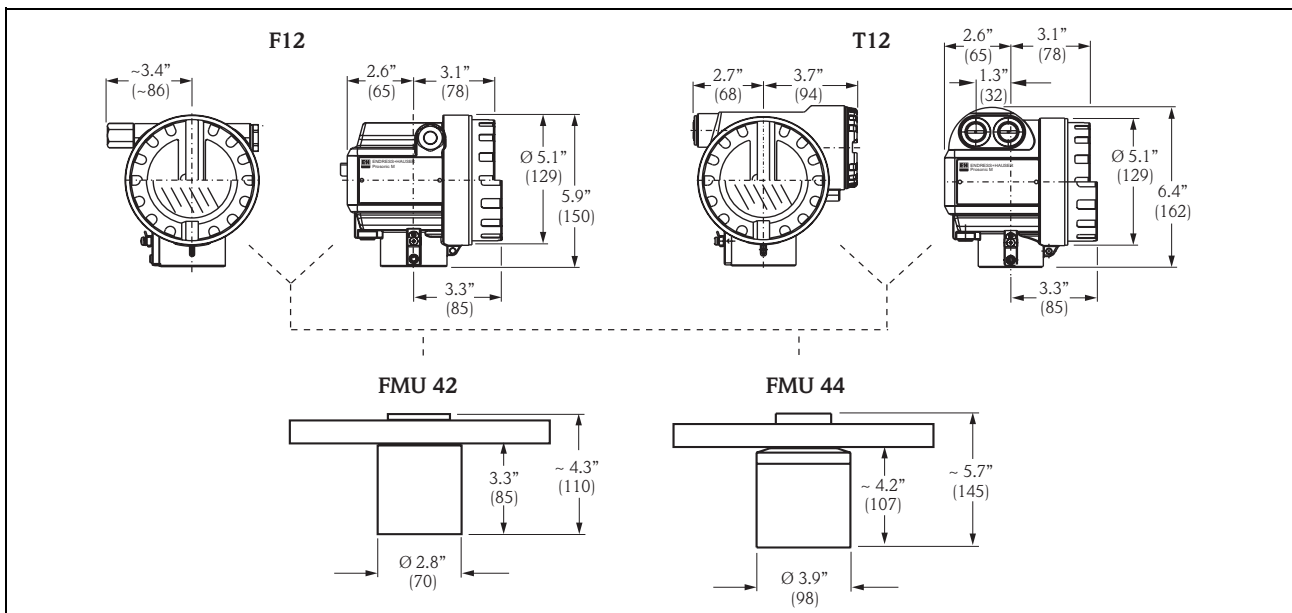
Design; dimensions

FMU40, FMU41



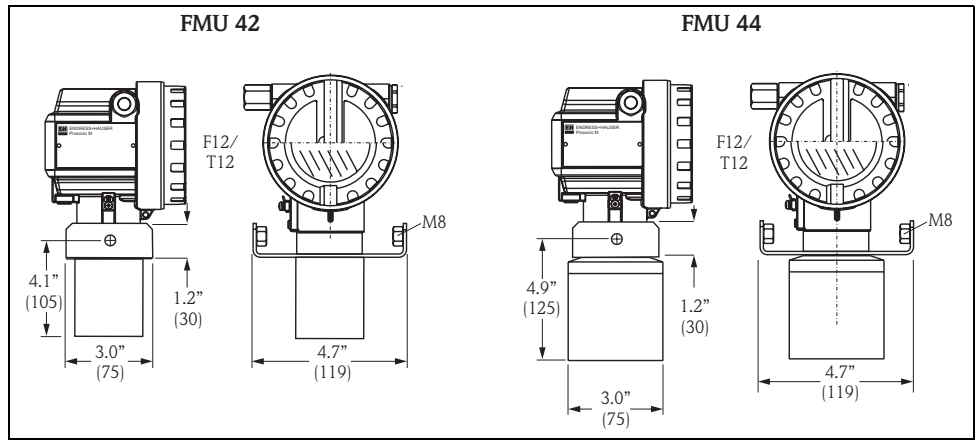
Dimensions in inches (mm)

FMU42, FMU44 with slip-on flange



Dimensions in inches (mm)

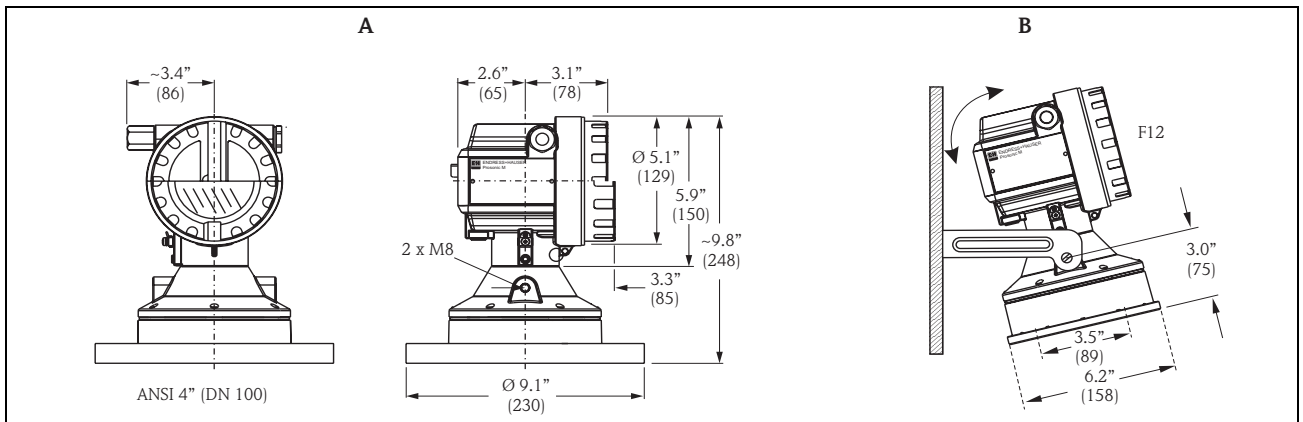
**FMU42, FMU44 with mounting bracket**



L00-FMU4xxxx-06-00-00-yy-008

Dimensions in inches (mm)

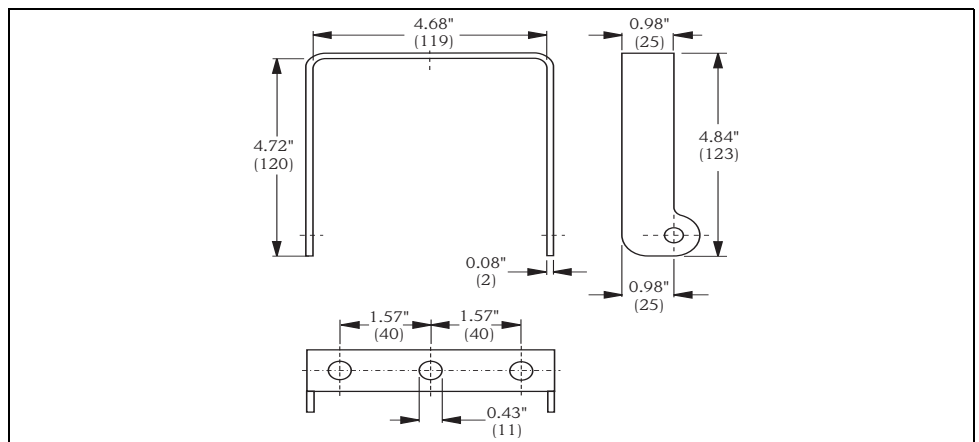
**FMU43**



L00-FMU4xxxx-06-00-00-yy-009

Dimensions in inches (mm);  
A: with slip-on flange; B: with mounting bracket

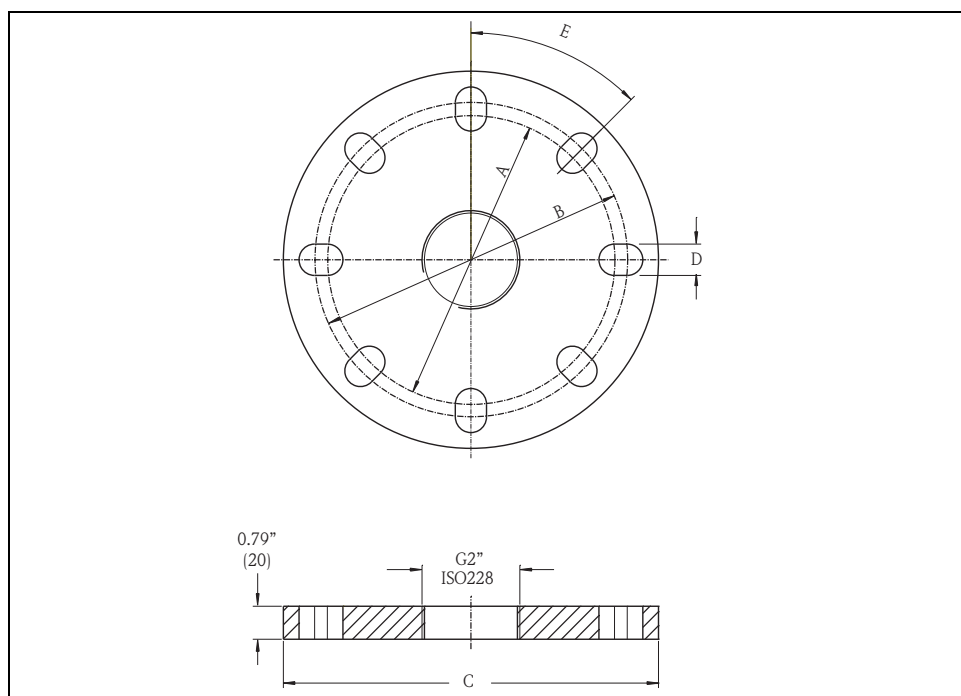
**Mounting bracket for FMU42, FMU43 and FMU44**



L00-FMU4xxxx-06-00-00-yy-010

Dimensions in inches (mm)

Flanges for FMU42 and FMU44



L00-FMU4xxxx-06-00-00-yy-011

suitable for	A	B	C	D	E	number of boreholes
3" 150lbs / DN80 PN16 / 10K 80	150 mm (5.91")	160 mm (6.30")	200 mm (7.87")	19 mm (0.75")	45°	8
4" 150 lbs / DN100 PN16 / 10K 100	175 mm (6.90")	190.5 mm (7.50")	228.6 mm (9.00")	19 mm (0.75")	45°	8
6" 150 lbs / DN150 PN16 / 10 K 150	240 mm (9.45")	241.3 mm (9.50")	285 mm (11.22")	23 mm (0.91")	45°	8
8" 150 lbs	298.5 mm (11.75")	298.5 mm (11.75")	342.9 mm (13.50")	22.5 mm (0.89")	45°	8
DN200 PN16 / 10 K 200	290 mm (11.42")	295 mm (11.61")	340 mm (13.39")	23 mm (0.91")	30°	12

Weight

Sensor	Weight
FMU40	approx. 5.5 lb (2.5 kg)
FMU41	approx. 6 lb (2.6 kg)
FMU42	approx. 6.6 lb (3 kg)
FMU43	approx. 8 lb (3.5 kg)
FMU44	approx. 9 lb (4 kg)

**Housing design**

**Types of housings**

- F12 housing with sealed terminal compartment for standard or EEx ia (intrinsically safe) applications
- T12 housing with separate terminal compartment and explosion proof encapsulation

**Material**

Aluminum, seawater resistant, powder-coated

**Cover**

- Aluminum, for version without local display
- Inspection glass for version with local display. This version cannot be supplied together with the ATEX II 1/2 D certificate.

**Process connection, sealing material, sensor material**

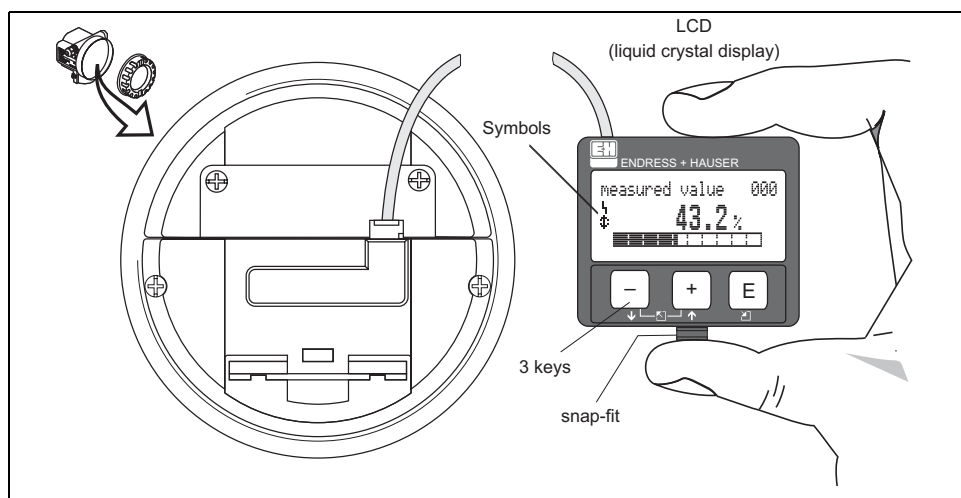
Sensor	Process connection	Material in contact with process
FMU40	<ul style="list-style-type: none"> <li>■ Thread G 1½"</li> <li>■ Thread NPT 1½" - 11.5</li> </ul>	Sensor: PVDF Seal: EPDM
FMU41	<ul style="list-style-type: none"> <li>■ Thread 2"</li> <li>■ Thread NPT 2" - 11.5</li> </ul>	Sensor: PVDF Seal: EPDM
FMU42	<ul style="list-style-type: none"> <li>■ Universal flange DN 80 PN16 / ANSI 3" 150 lbs / JIS 10K 80</li> <li>■ Universal flange DN 100 PN16 / ANSI 4" 150 lbs / JIS 10K 100</li> <li>■ Mounting bracket</li> </ul>	Sensor: PVDF Seal: VITON or EPDM Flange: PP, PVDF or SS 316L (1.4435 or 1.4404) <sup>1)</sup>
FMU43	<ul style="list-style-type: none"> <li>■ Universal flange DN 100 / ANSI 4" / JIS16K100</li> <li>■ Mounting bracket</li> </ul>	Sensor: UP and SS 316Ti Seal: EPDM Flange: PP or SS 316Ti
FMU44	<ul style="list-style-type: none"> <li>■ Universal flange DN 100 PN16 / ANSI 4" 150 lbs / JIS 10K 100</li> <li>■ Universal flange DN 150 PN16 / ANSI 6" 150 lbs / JIS 10K 150</li> <li>■ Universal flange DN200 PN16 / JIS 10K 200</li> <li>■ Flange ANSI 8" 150 lbs</li> <li>■ Mounting bracket</li> </ul>	Sensor PVDF Seal: VITON or EPDM Flange: PP, PVDF or SS 316L (1.4435 or 1.4404) <sup>1)</sup>

1) Endress+Hauser supplies DIN/EN flanges made of stainless steel AISI 316L with the material number 1.4435 or 1.4404. With regard to their temperature stability properties, the materials 1.4435 and 1.4404 are grouped under 13E0 in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

## Human interface

### Display and operating elements

The LCD module VU 331 for display and operation is located beneath the housing cover. The measured value is legible through the glass in the cover. Open the cover to operate the device.



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Symbol in display				
Meaning	Alarm	Warning	Communication	Security Locking

### Function of the keys

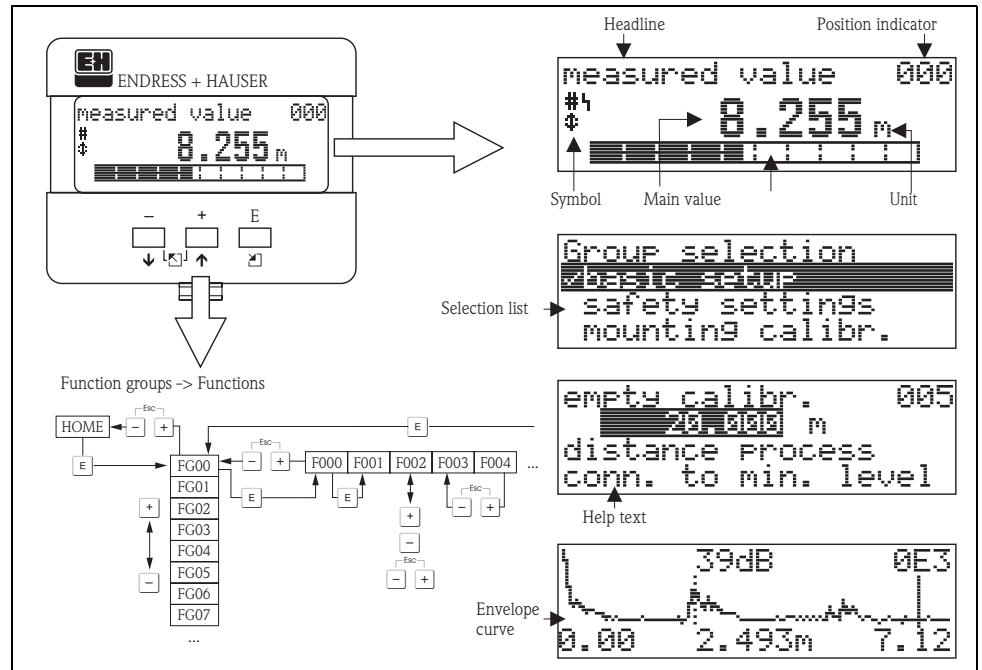
Key(s)	Meaning
or	Navigate upwards in the selection list Edit numeric value within a function
or	Navigate downwards in the selection list Edit numeric value within a function
or	Navigate to the left within a function group
	Navigate to the right within a function group, confirmation.
and or and	Contrast settings of the LCD
and  and	Hardware lock / unlock After a hardware lock, an operation of the instrument via display or communication is not possible! The hardware can only be unlocked via the display. An unlock parameter must be entered to do so.



**Local operation**

**Operation with VU 331**

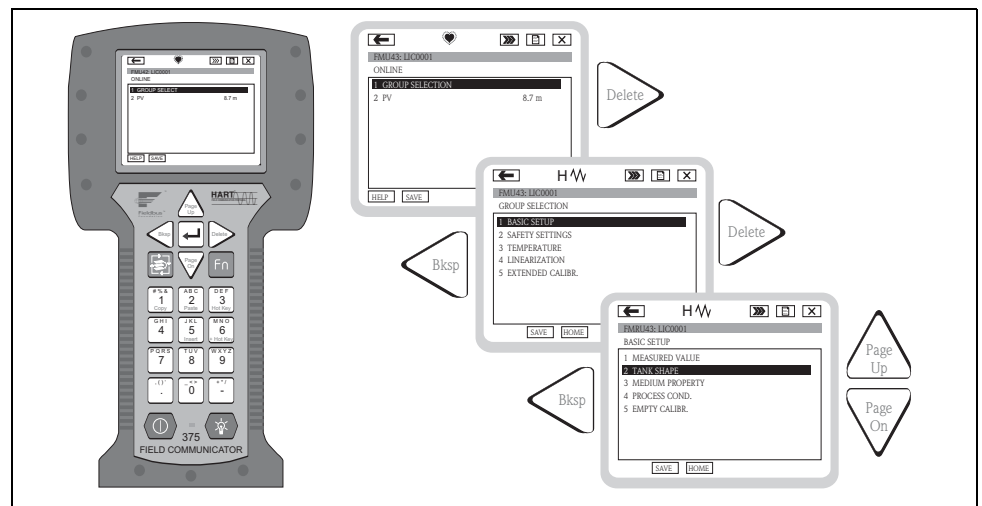
The LC-Display VU 331 allows configuration via 3 keys directly at the instrument. All device functions can be set through a menu system. The menu consists of function groups and functions. Within a function, application parameters can be read or adjusted. The user is guided through a complete configuration procedure.



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**Operation with the handheld terminal DXR 375**

On devices with HART communication, you can also access the menu using the handheld terminal DXR 375.



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**Remote operation****Operation with FieldCare**

FieldCare is Endress+Hauser's FDT based Plant Asset Management Tool. It can configure all intelligent field devices in your plant and supports you in managing them. By using status information, it also provides a simple but effective means of checking their health.

- Supports Ethernet, HART, PROFIBUS, FOUNDATION Fieldbus etc.
- Operates all Endress+Hauser devices
- Operates all third-party actuators, I/O systems and sensors supporting the FDT standard
- Ensures full functionality for all devices with DTMs
- Offers generic profile operation for any third-party fieldbus device that does not have a vendor DTM

**Operation with Commuwin II (for communication variants HART or PROFIBUS-PA)**

Commuwin II is an operating software with graphical support (MS Windows) for intelligent transmitters with the communication protocols Rackbus, Rackbus RS-485, HART and PROFIBUS-PA.

Commuwin II supports the following functions:

- Online configuration of transmitters
- Loading and saving of instrument data (Upload/Download)
- Orderly visualisation of measured values and limit values
- Display and recording of measured values with a line recorder

It is not possible to display envelope curves with Commuwin II. To display them, please use the ToF Tool program supplied.

Connections:

- HART with Commubox FXA 191 (available as accessory)
- PROFIBUS PA

**Operation with NI-FBUS Configurator (only Foundation Fieldbus)**

The NI-FBUS Configurator is an easy-to-use graphical environment for creating linkages, loops, and a schedule based on the fieldbus concepts.

You can use the NI-FBUS Configurator to configure a fieldbus network as follows:

- Set block and device tags
- Set device addresses
- Create and edit function block control strategies (function block applications)
- Configure vendor-defined function and transducer blocks
- Create and edit schedules
- Read and write to function block control strategies (function block applications)
- Invoke Device Description (DD) methods
- Display DD menus
- Download a configuration
- Verify a configuration and compare it to a saved configuration
- Monitor a downloaded configuration
- Replace devices
- Save and print a configuration

**Certificates and Approvals****CE mark**

The measuring system meets the legal requirements of the EC-guidelines. Endress+Hauser confirms the instrument passing the required tests by attaching the CE-mark.

**Ex approval**

The available certificates are listed in the ordering information. Note the associated safety instructions (XA) and control or installation drawings (ZD).

**External standards and guidelines****EN 60529**

Protection class of housing (IP-code)

**EN 61326**

Electromagnetic compatibility (EMC requirements)

**NAMUR**

Standards committee for measurement and control in the chemical industry

## Ordering information

### Product structure FMU 40

				Certificates
	A			Variant for non-hazardous area
	E			NEPSI Ex nA II T6
	G			ATEX II 3G EEx nA II T6
	I			NEPSI Ex ia IIC T6
	J			NEPSI Ex d(ia) IIC T6
	K			TIIS Ex ia II C T6
	N			CSA General Purpose
	Q			NEPSI DIP
	S			FM IS Cl. I,II,III Div. 1 Gr. A-G / NI Cl. I Div. 2
	T			FM XP Cl. I,II,III Div. 1 Gr. A-G
	U			CSA IS Cl. I,II,III Div. 1 Gr. A-G / NI Cl. I Div. 2
	V			CSA XP Cl. I,II,III Div. 1 Gr. A-G
	1			ATEX II 1/2 G or II 2 G; EEX ia IIC T6
	2			ATEX II 1/2D, Alu blind cover
	4			ATEX II 1/2 G or II 2 G; EEX d [ia] IIC T6
	5			ATEX II 1/3D
	Y			Special certificate
				Process connection
	R			G 1½" thread ISO 228
	N			NPT 1½" - 11,5 thread
	Y			Special version
				Power supply/communication
	B			2 wire, 4...20mA-loop/HART
	H			4 wire, 10,5...32VDC / 4-20mA HART
	G			4 wire, 90...253VAC / 4-20mA HART
	D			2 wire, PROFIBUS PA
	F			2 wire, Foundation Fieldbus
	Y			Special version
				Display / on-site operation
	1			Without LC display
	2			With LC display VU 331 incl. on-site operation
	3			Prepared for remote display FHX 40
	9			Special version
				Housing
	A			Aluminum F12 housing coated to IP 68
	C			Aluminum T12 housing coated to IP 68; with separate terminal compartment
	D			Aluminum T12 housing coated to IP 68; with separate terminal compartment; with overvoltage protection
	9			Special version
				Screw union/entry
	2			M20x1.5 screw union
	3			G 1/2" entry
	4			NPT 1/2" entry
	5			M12 PROFIBUS-PA plug-in connector
	6			7/8" FF plug
	9			Special version
FMU 40 -				Product designation

## Product structure FMU 41

Certificates	
A	Variant for non-hazardous area
E	NEPSI Ex nA II T6
G	ATEX II 3G EEx nA II T6
I	NEPSI Ex ia IIC T6
J	NEPSI Ex d(Ia) IIC T6
K	TIIS Ex ia II C T6
N	CSA General Purpose
Q	NEPSI DIP
S	FM IS Cl. I,II,III Div. 1 Gr. A-G / NI Cl. I Div. 2
T	FM XP Cl. I,II,III Div. 1 Gr. A-G
U	CSA IS Cl. I,II,III Div. 1 Gr. A-G / NI Cl. I Div. 2
V	CSA XP Cl. I,II,III Div. 1 Gr. A-G
1	ATEX II 1/2 G or II 2 G; EEX ia IIC T6
2	ATEX II 1/2D, Alu blind cover
4	ATEX II 1/2 G or II 2 G; EEX d [ia] IIC T6
5	ATEX II 1/3D
Y	Special certificate
Process connection	
R	G 2" threadISO 228
N	NPT 2" - 11.5 thread
Y	Special version
Power supply/communication	
B	2 wire, 4...20mA-loop/HART
H	4 wire, 10.5...32VDC / 4-20mA HART
G	4 wire, 90...253VAC / 4-20mA HART
D	2 wire, PROFIBUS PA
F	2 wire, Foundation Fieldbus
Y	Special version
Display / on-site operation	
1	Without LC display
2	With LC display VU 331 incl. on-site operation
3	Prepared for remote display FHX 40
9	Special version
Housing	
A	Aluminum F12 housing coated to IP 68
C	Aluminum T12 housing coated to IP 68 with separate terminal compartment
D	Aluminum T12 housing coated to IP 68; with separate terminal compartment; with overvoltage protection
9	Special version
Screw union/entry	
2	M20x1.5 screw union
3	G 1/2" entry
4	NPT 1/2" entry
5	M12 PROFIBUS-PA plug-in connector
6	7/8" FF plug
9	Special version
FMU 41 -	Product designation

**Product structure FMU 42**

<b>Certificates</b>				
A				Variant for non-hazardous area
E				NEPSI Ex nA II T6
G				ATEX II 3G EEx nA II T6
I				NEPSI Ex ia IIC T6
J				NEPSI Ex d (Ia) IIC T6
K				TIIS Ex ia II C T6 (in preparation)
N				CSA General Purpose
Q				NEPSI DIP
S				FM IS Cl. I,II,III Div. 1 Gr. A-G / NI Cl. I Div. 2
T				FM XP Cl. I,II,III Div. 1 Gr. A-G
U				CSA IS Cl. I,II,III Div. 1 Gr. A-G / NI Cl. I Div. 2
V				CSA XP Cl. I,II,III Div. 1 Gr. A-G
1				ATEX II 1/2 G EEx ia IIC T6
2				ATEX II 1/2 D, Alu bond cover
4				ATEX II 1/2 G EEx d [ia] IIC T6
5				ATEX II 1/3D
Y				Special certificate
<b>Process connection</b>				
M				Mounting bracket FAU20
P				UNI flange 3"/DN80/80, PP, max. 2.5bar abs./ 36psia suitable for 3" 150lbs / DN80 PN16 / 10K 80
Q				UNI flange 3"/DN80/80, PVDF, max. 2.5bar abs./ 36psia suitable for 3" 150lbs / DN80 PN16 / 10K 80
S				UNI flange 3"/DN80/80, 316L, max. 2.5bar abs./ 36psia suitable for 3" 150lbs / DN80 PN16 / 10K 80
T				UNI flange 4"/DN100/100, PP, max. 2.5bar abs./ 36psia suitable for 4" 150lbs / DN100 PN16 / 10K100
U				UNI flange 4"/DN100/100, PVDF, max. 2.5bar abs./ 36psia suitable for 4" 150lbs / DN100 PN16 / 10K100
V				UNI flange 4"/DN100/100, 316L, max. 2.5bar abs./ 36psia suitable for 4" 150lbs / DN100 PN16 / 10K100
Y				Special version
<b>Power supply/communication</b>				
B				2 wire, 4...20mA-loop/HART
H				4 wire, 10.5...32VDC / 4-20mA HART
G				4 wire, 90...253VAC / 4-20mA HART
D				2 wire, PROFIBUS PA
F				2 wire, Foundation Fieldbus
Y				Special version
<b>Display / on-site operation</b>				
1				Without LC display
2				With LC display VU 331 incl. on-site operation
3				Prepared for remote display FHX 40
9				Special version
<b>Housing</b>				
A				Aluminum F12 housing coated to IP 68
C				Aluminum T12 housing coated to IP 68, with separate terminal compartment
D				Aluminum T 12 housing coated to IP 68, with separate terminal compartment; with overvoltage protection
Y				Special version
<b>Gland/Entry</b>				
2				M20x1.5 gland
3				G 1/2" entry
4				NPT 1/2" entry
5				M12 PROFIBUS-PA plug
6				7/8" FF plug
9				Special version
<b>Sealing Sensor/Flange</b>				
2				VITON flat sealing

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										<b>Sealing Sensor/Flange</b>	
										3	EPDM flat sealing
										9	special version
										<b>Additional options</b>	
										A	Additional options not selected
FMU 42 -											Product designation

**Product structure FMU 43**

				<b>Certificates</b>	
				A	Variant for non-hazardous area
				M	FM DIP Class II, III, Div. 1, Gr. E,F,G NI
				N	CSA General Purpose
				P	CSA DIP, Class II, III, Div. 1, Gr. E,F,G NI
				Q	NEPSI DIP
				2	ATEX II 1/2 D or II 2 D, Aluminium Deckel
				5	ATEX II 1/3 D or II 3 D, Sichtdeckel
				Y	Special version
				<b>Process connection/material</b>	
				P	Flange DN 100/ANSI 4"/JIS 16K100, PP (universal slip-on flange included)
				S	Flange DN 100/ANSI 4"/JIS 16K100, SS 316TI (universal slip-on flange included)
				K	Without slip-on flange/without mounting bracket (customer mounting equipment)
				M	With mounting bracket
				Y	Special version
				<b>Power supply/communication</b>	
				H	4 wire, 10.5...32VDC / 4-20mA HART
				G	4 wire, 90...253VAC / 4-20mA HART
				D	2 wire, PROFIBUS PA
				F	2 wire, Foundation Fieldbus
				Y	Special version
				<b>Display / on-site operation</b>	
				1	Without LC display
				2	With LC display VU 331 incl. on-site operation
				3	Prepared for remote display FHX 40
				9	Special version
				<b>Housing</b>	
				A	Aluminium F12 housing coated to IP 68
				9	Special version
				<b>Screw union/entry</b>	
				2	M20x1.5 screw union
				3	G 1/2" entry
				4	NPT 1/2" entry
				5	M12 PROFIBUS-PA plug-in connector
				6	7/8" FF plug
				9	Special version
FMU 43 -					Product designation

## Product structure FMU 44

		<b>Approval</b>	
	A	Non-hazardous area	
	1	ATEX II 1/2G EEx ia IIC T6 (in preparation)	
	4	ATEX II 1/2G EEx d (ia) IIC T6 (in preparation)	
	G	ATEX II 3 G EEx nA II T6 (in preparation)	
	2	ATEX II 1/2 D, Alu blind cover (in preparation)	
	5	ATEX II 1/3 D	
	S	FM IS Cl.I,II,III Div.1 Gr.A-G, NI Cl.I Div.2 (in preparation)	
	T	FM XP Cl.I,II,III Div.1 Gr.A-G (in preparation)	
	N	CSA General Purpose	
	U	CSA IS Cl.I,II,III Div.1 Gr.A-G, NI Cl.I Div.2	
	V	CSA XP Cl.I,II,III Div.1 Gr.A-G	
	K	TIIS EEx ia IIC T6 (in preparation)	
	I	NEPSI Ex ia IIC T6 (in preparation)	
	J	NEPSI Ex d(ia) IIC T6 (in preparation)	
	E	NEPSI Ex nA II T6 (in preparation)	
	Q	NEPSI DIP (in preparation)	
	Y	Special version, to be specified	
		<b>Process connection</b>	
	A	8" 150lbs FF, 316L, max 2.5bar abs./36psia	
	E	UNI flange 6"/DN150/150, PP, max 2.5bar abs./ 36psia, suitable for 6" 150lbs / DN150 PN16 / 10K 150	
	F	UNI flange 6"/DN150/150, PVDF, max 2.5bar abs./36psia, suitable for 6" 150lbs /DN150 PN16 / 10K 150	
	G	UNI flange 6"/DN150/150, 316L, max 2.5bar abs. 36psia, suitable for 6" 150lbs / DN150 PN16 / 10K 150	
	H	UNI flange DN200/200, PP, max 2.5bar abs./ 36 psia, suitable for DN200 PN16 / 10K 200	
	J	UNI flange DN200/200, PVDF, max 2.5bar abs./ 36psia, suitable for DN200 PN16 / 10K 200	
	K	UNI flange DN200/200, 316L, max 2.5bar abs./ 36psia, suitable for DN200 PN16 / 10K 200	
	L	8" 150lbs FF, PP, max 2.5bar abs./ 36psia	
	M	Mounting bracket FAU20	
	N	8" 150lbs FF, PVDF, max 2.5bar abs./ 36psia	
	T	UNI flange 4"/DN100/100, PP, max 2.5bar abs./ 36psia, suitable for 4" 150lbs / DN100 PN16 / 10K 100	
	U	UNI flange 4"/DN100/100, PVDF, max. 2.5bar abs./ 36 psia, suitable for 4" 150lbs / DN100 PN16 / 10K 100	
	V	UNI flange 4"/DN100/100, 316L, max 2.5bar abs./ 36psia, suitable for 4" 150lbs / DN100 PN16 / 10K 100	
	Y	Special version, to be specified	
		<b>Power supply; Output</b>	
	B	2-wire; 4-20mA HART	
	D	2-wire; PROFIBUS PA	
	F	2-wire; FOUNDATION Fieldbus	
	G	4-wire 90-250VAC; 4-20mA HART	
	H	4-wire 10.5-32VDC; 4-20mA HART	
	Y	Special version, to be specified	
		<b>Operation</b>	
	1	w/o display, via communication	
	2	4-line display VU331, Envelope curve display on site	
	3	Prepared for FHX40, Remote display (accessory)	
	9	Special version, to be specified	
FMU 44 -		product designation, part 1	



										<b>Housing</b>	
										A	F12 Alu, coated IP68 NEMA6P
										C	T12 Alu, coated IP68 NEMA6P, Separate conn. compartment
										D	T12 Alu, coated IP68 NEMA6P + OVP, Sep. conn. compartment, OVP = overvoltage protection
										9	Special version, to be specified
										<b>Cable entry</b>	
										2	Gland M20 (EEx d > thread M20)
										3	Thread G1/2
										4	Thread NPT 1/2
										5	Plug M12
										6	Plug 7/8"
										9	Special version, to be specified
										<b>Process Sealing Sensor/ Flange</b>	
										2	Viton
										3	EPDM
										9	Special version, to be specified
										<b>Additional option</b>	
										A	Basic version
										Y	Special version, to be specified
FMU 44 -											complete product designation

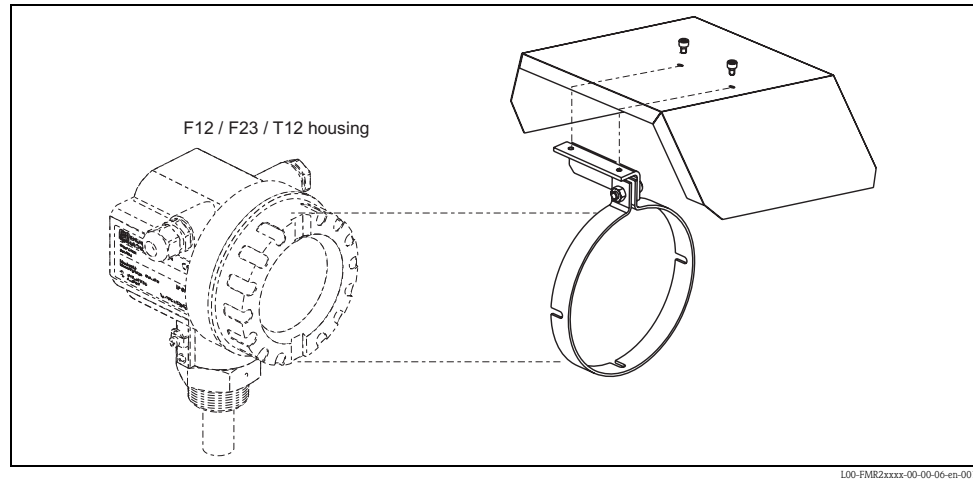
**Scope of delivery**

- Instrument according to the version ordered
- FieldCare software
- Operating manual according to the communication version
- for certified instrument versions: Safety Instructions, Control- or Installation drawings
- for FMU 40 \*R\*\*\*\* and FMU 41 \*R\*\*\*\*: counter nut (PC)
- for FMU 40/41: sealing ring (EPDM)
- for gland M20x1.5:
  - 1 cable gland for 2-wire instruments
  - 2 cable glands for 4-wire instruments
 The cable glands are mounted on delivery.

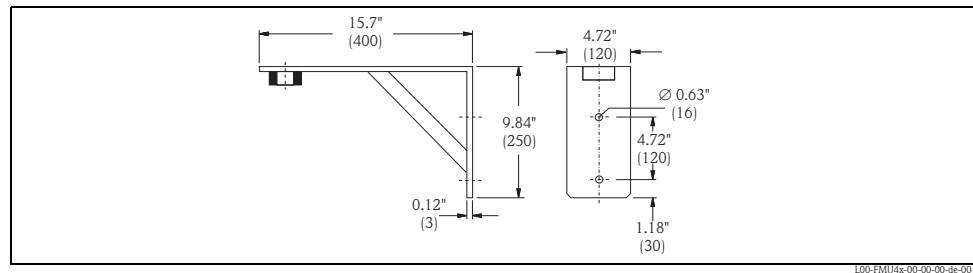
## Accessories

### Weather protection cover

A Weather protection cover made of stainless steel is recommended for outdoor mounting (order code: 543199-0001). The shipment includes the protective cover and tension clamp.



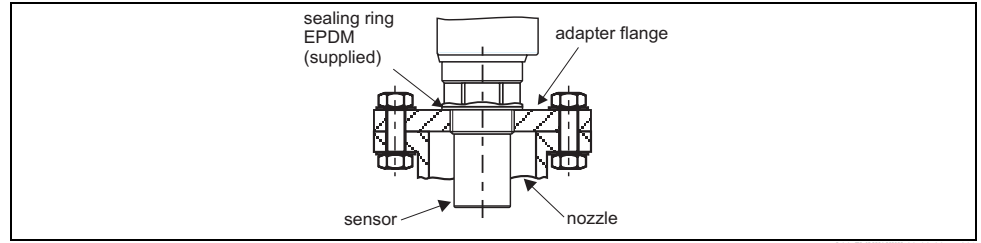
### Installation bracket for FMU 40/41



- for FMU 40, G1½: Order No. 942669-0000
- for FMU 41, G2: Order No. 942669-0001

suited for NPT 1½" and 2" as well

**Adapter flange**



L00-FMU33XX-00-00-en-001

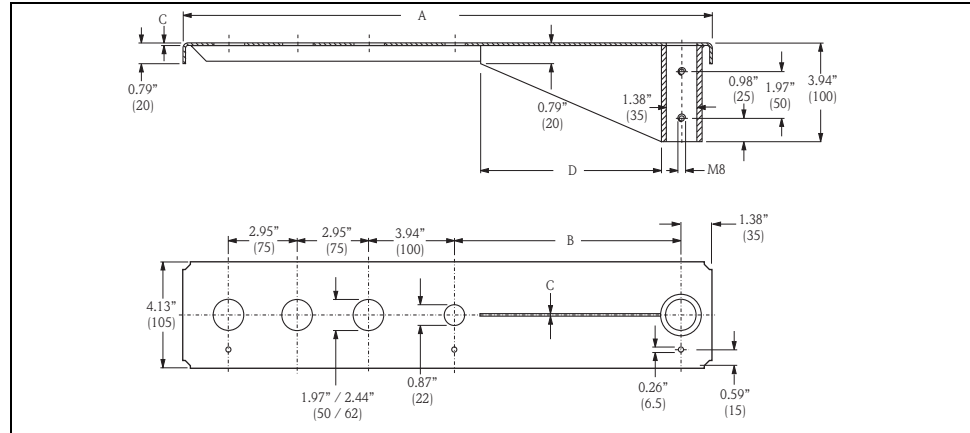
**Version with metrical thread (FAU 70 E)**

		<b>Process Connection</b>	
	12	DN 50 PN 16 A, flange EN1092-1 (DIN2527 B)	
	14	DN 80 PN 16 A, flange EN1092-1 (DIN2527 B)	
	15	DN 100 PN 16, A, flange EN1092-1 (DIN2527 B)	
		<b>Sensor Connection</b>	
	3	Thread ISO228 G1-1/2	
	4	Thread ISO228 G2	
		<b>Flange Material</b>	
	2	316L	
	7	Polypropylene	
FAU 70 E			Product designation

**Version with conical thread(FAU 70 A)**

		<b>Process Connection</b>	
	22	2" 150lbs FF, flange ANSI B16.5	
	24	3" 150lbs FF, flange ANSI B16.5	
	25	4" 150lbs FF, flange ANSI B16.5	
		<b>Sensor Connection</b>	
	5	Thread NPT1-1/2	
	6	Thread NPT2	
		<b>Flange Material</b>	
	2	316L	
	7	Polypropylene	
FAU 70 A			Product designation

Cantilever

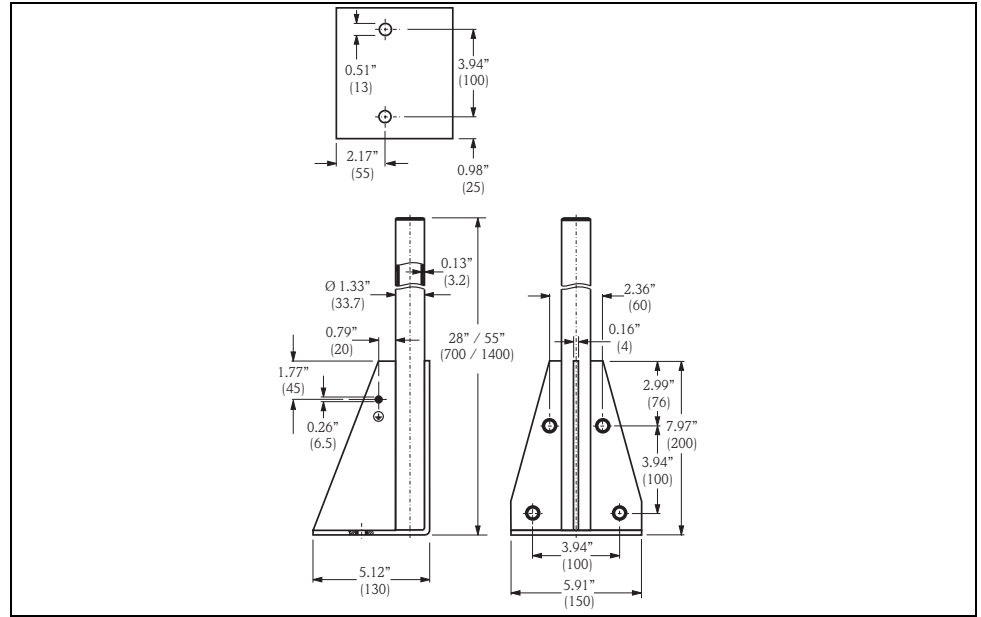


L00-FMU14xxxx-06-00-00-yy-005

A	B	C	D	for Sensor	Material	Order Code
23" 585 mm	9.83" 250 mm	0.08" 2 mm	7.87" 200 mm	FMU 40	316Ti/1.4571	52014132
					galv. steel	52014131
				FMU 41	316Ti/1.4571	52014136
					galv. steel	52014135
42.7" 1085 mm	29.5" 750 mm	0.12" 3 mm	11.8" 300 mm	FMU 40	316Ti/1.4571	52014134
					galv. steel	52014133
				FMU 41	316Ti/1.4571	52014138
					galv. steel	52014137

- The 1.97" (50 mm) or 2.44" (62 mm) orifices serve for the mounting of the FMU 40 or FMU 41 sensor, respectively.
- The 0.87" (22 mm) orifice may be used for an additional sensor.

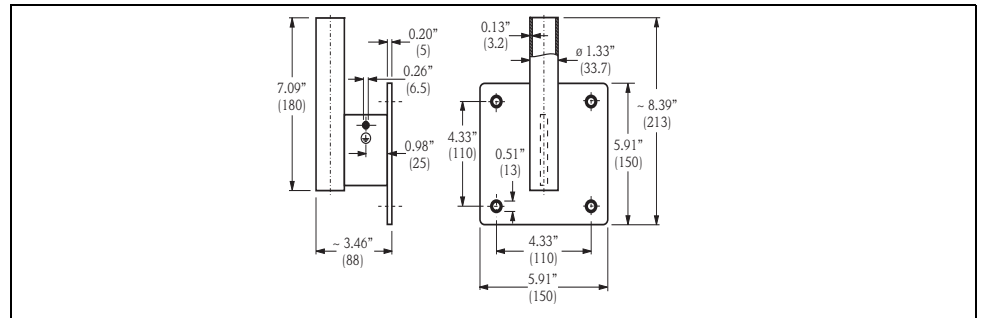
Mounting Frame



L00-FM14x-00-00-yy-yy-005

Height	Material	Order Code
28" (700 mm)	galv. steel	919791-0000
28" (700 mm)	1.4301 (AISI 304)	919791-0001
55" (1400 mm)	galv. steel	919791-0002
55" (1400 mm)	1.4301 (AISI 304)	919791-0003

Wall Bracket



L00-FM14x-00-00-yy-yy-006

Material	Order Code
galv. steel	919792-0000
316Ti/1.4571	919792-0001

Commubox FXA191 HART

For intrinsically safe communication with FieldCare via the RS232C interface. For details refer to TI237F/00/en.

Commubox FXA195 HART

For intrinsically safe communication with FieldCare via the USB interface. For details refer to TI404F/00/en.

**Service Interface FXA193**

The Service-Interface connects the Service plug of Proline and ToF instruments with the 9 pin RS 232C interface of a PC. (USB connectors must be equipped with a usual commercial USB/Serial adapter.)

**Product structure**

Approvals	
A	For use in non-hazardous areas
B	ATEX II (1) GD
C	CSA/FM Class I Div. 1
D	ATEX, CSA, FM
9	other
Connection cable	
B	Connection cable for ToF devices
E	Connection cable for Proline and ToF devices
H	Connection cable for Proline and ToF devices and Connection cable for Ex two-wire devices
X	without connection cable
9	others
<b>FXA193-</b>	Complete product designation

**Associated documentation**

- Technical Information: TI063D
- Safety Instructions for ATEX II (1) GD: XA077D
- Supplementary information for the cable adapters: SD092D

**Commubox FXA291**

The Commubox FXA291 connects Endress+Hauser field instruments with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a personal computer or a notebook. For details refer to TI405C/07/en.

**Note!**

For the following Endress+Hauser instruments you need the "ToF Adapter FXA291" as an additional accessory:

- Cerabar S PMC71, PMP7x
- Deltabar S PMD7x, FMD7x
- Deltapilot S FMB70
- Gammapilot M FMG60
- Levelflex M FMP4x
- Micropilot FMR130/FMR131
- Micropilot M FMR2xx
- Micropilot S FMR53x, FMR540
- Prosonic FMU860/861/862
- Prosonic M FMU4x
- Tank Side Monitor NRF590 (with additional adapter cable)
- Prosonic S FMU9x

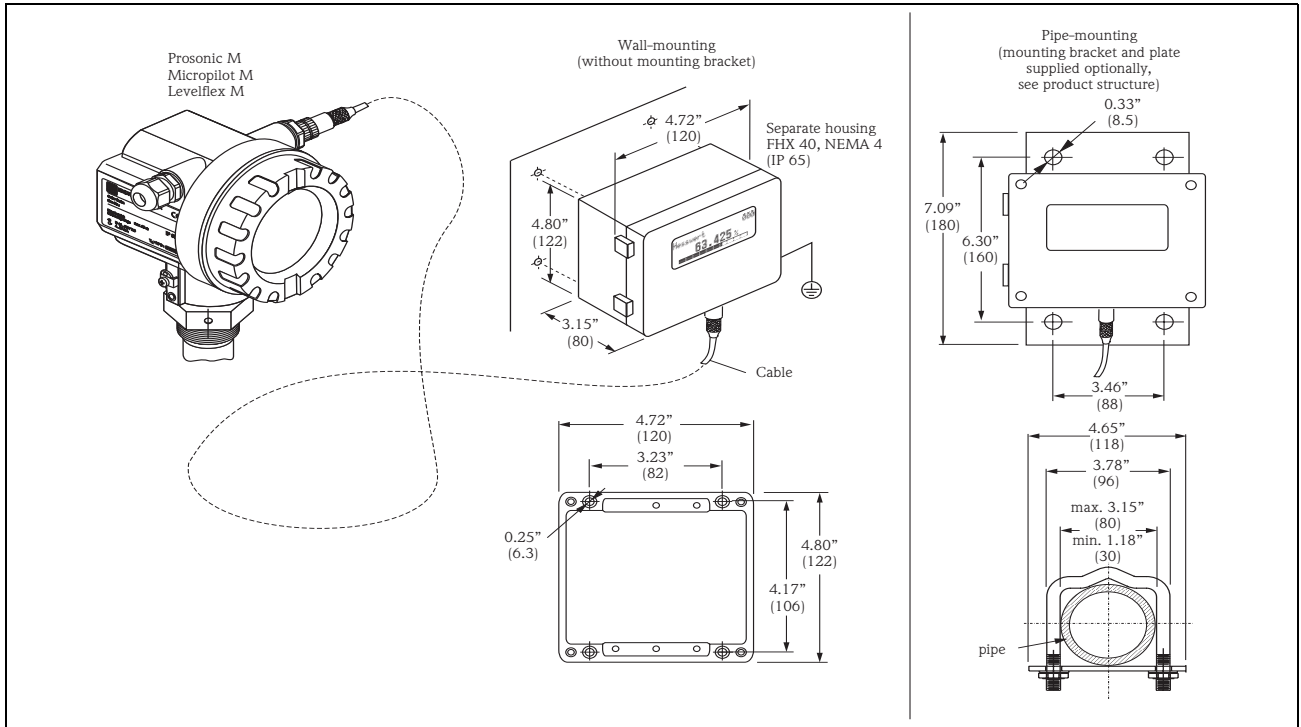
**ToF Adapter FXA291**

The ToF Adapter FXA291 connects the Commubox FXA291 via the USB interface of a personal computer or a notebook to the following Endress+Hauser instruments:

- Cerabar S PMC71, PMP7x
- Deltabar S PMD7x, FMD7x
- Deltapilot S FMB70
- Gammapilot M FMG60
- Levelflex M FMP4x
- Micropilot FMR130/FMR131
- Micropilot M FMR2xx
- Micropilot S FMR53x, FMR540
- Prosonic FMU860/861/862
- Prosonic M FMU4x
- Tank Side Monitor NRF590 (with additional adapter cable)
- Prosonic S FMU9x

For details refer to KA271F/00/a2.

Remote display FHX40



L00-FMzxxxx-00-00-06-en-003

Technical data (cable and housing) and product structure:

Max. cable length	20 m (65 ft)
Temperature range	-30 to +70°C (-22 to 158°F)
Degree of protection	IP65/67 (housing); IP68 (cable) acc. to IEC 60529
Materials	Housing: AlSi12; cable glands: nickle plated brass
Dimensions	122x150x80 mm (HxWxD) / 4.8" x 5.9" x 3.2"

<b>Approval:</b>	
A	Nn-hazardous area
I	ATEX II 2 G EEx ia IIC T6, ATEX II 3D
S	FM IS CLI Div.1 Gr.A-D
U	CSA IS Cl.I Div.1 Gr.A-D
N	CSA General Purpose
K	TIIS ia IIC T6 (in preparation)
<b>Cable:</b>	
1	20m/65ft; for HART
5	20m/65ft; for PROFIBUS PA/FOUNDATION Fieldbus
<b>Additional option:</b>	
A	Basic version
B	Mounting bracket, pipe 1" / 2"
<b>FHX40 -</b>	Complete product designation

For connection of the remote display FHX40 use the cable which fits the communication version of the respective instrument.

## Supplementary documentation

<b>System Information</b>	<b>SI 005F</b> Ultrasonic level measurement
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**Operating manual** Depending on the communication variant ordered, the following operating manuals are supplied with the device:

Communication	Operating manual
4 to 20mA, HART	BA 237F
Profibus PA	BA 238F
Foundation Fieldbus	BA 239F

These instructions describe the installation and first commissioning of the Prosonic M. From the operating menu, all functions are included, which are required for standard measurement tasks. Additional functions are **not** contained in the manual.

<b>Description of device functions</b>	<b>BA 240F</b> This contains a detailed description of <b>all</b> the functions of the Prosonic M and is valid for all communication variants. A pdf file of this document can be found <ul style="list-style-type: none"> <li>■ in the supplied "ToF Tool - FieldTool Package" at "Help/ToF Tool Help/ Online Manual/ Operating Manual/Ultrasonic/Prosonic M FMU4x Functions"<sup>1)</sup>.</li> <li>■ in the internet at "www.endress.com". Click "Download" and enter the product code "FMU4*" into the search form.</li> </ul>
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<b>Short instructions</b>	<b>KA 183F</b> Can be found under the device housing cover. The most important menu functions are summarised on this sheet. It is intended primarily as a memory jogger for users who are familiar with the operating concept of Endress+Hauser time-of-flight instruments.
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**Safety Instructions ATEX** The following safety instructions are supplied with ATEX-certified device versions. If the devices are used in explosive areas, comply with all the specifications in these safety instructions.

Instrument version	Certificate	Communication	Housing	Safety Instructions
<ul style="list-style-type: none"> <li>■ FMU40 - 1*B*A*</li> <li>■ FMU41 - 1*B*A*</li> <li>■ FMU42 - 1*B*A***</li> </ul>	ATEX II 1/2 G or II 2 G EEx ia II C T6	HART (2-wire)	F12	XA 174F
<ul style="list-style-type: none"> <li>■ FMU40 - 1*B*D*</li> <li>■ FMU41 - 1*B*D*</li> <li>■ FMU42 - 1*B*D***</li> </ul>	ATEX II 1/2 G or II 2 G EEx ia II C T6	HART (2-wire)	T12 with overvoltage protection	XA 224F
<ul style="list-style-type: none"> <li>■ FMU40 - 1*D*A* - 1*F*A*</li> <li>■ FMU41 - 1*D*A* - 1*F*A*</li> <li>■ FMU42 - 1*D*A*** - 1*F*A***</li> </ul>	ATEX II 1/2 G or II 2 G EEx ia II C T6	<ul style="list-style-type: none"> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	F12	XA 175F
<ul style="list-style-type: none"> <li>■ FMU40 - 1*D*D* - 1*F*D*</li> <li>■ FMU41 - 1*D*D* - 1*F*D*</li> <li>■ FMU42 - 1*D*D*** - 1*F*D***</li> </ul>	ATEX II 1/2 G or II 2 G EEx ia II C T6	<ul style="list-style-type: none"> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	T12 with overvoltage protection	XA 225F

1) If the Operating Instructions have not been installed together with the "ToF Tool - FieldTool Package", they can be added to the installation subsequently.



Instrument version	Certificate	Communication	Housing	Safety Instructions
<ul style="list-style-type: none"> <li>■ FMU40 - 4*B*C*</li> <li style="padding-left: 20px;">- 4*D*C*</li> <li style="padding-left: 20px;">- 4*F*C*</li> <li>■ FMU41 - 4*B*C*</li> <li style="padding-left: 20px;">- 4*D*C*</li> <li style="padding-left: 20px;">- 4*F*C*</li> <li>■ FMU42 - 4*B*C***</li> <li style="padding-left: 20px;">- 4*D*C***</li> <li style="padding-left: 20px;">- 4*F*C***</li> </ul>	ATEX II 1/2 G or II 2 G EEx d [ia] II C T6	<ul style="list-style-type: none"> <li>■ HART (2-wire)</li> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	T12	XA 176F
<ul style="list-style-type: none"> <li>■ FMU40 - G*****</li> <li>■ FMU41 - G*****</li> <li>■ FMU42 - G*****</li> </ul>	ATEX II 3G EEx nA II T6	<ul style="list-style-type: none"> <li>■ HART (2-wire)</li> <li>■ HART (4-wire, DC)</li> <li>■ HART (4-wire, AC)</li> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	<ul style="list-style-type: none"> <li>■ F12</li> <li>■ T12</li> <li>■ T12 with overvoltage protection</li> </ul>	XA 179F
<ul style="list-style-type: none"> <li>■ FMU40 - 2*B*A*</li> <li style="padding-left: 20px;">- 2*D*A*</li> <li style="padding-left: 20px;">- 2*F*A*</li> <li style="padding-left: 20px;">- 5*B*A*</li> <li style="padding-left: 20px;">- 5*D*A*</li> <li style="padding-left: 20px;">- 5*F*A*</li> <li>■ FMU41 - 2*B*A*</li> <li style="padding-left: 20px;">- 2*D*A*</li> <li style="padding-left: 20px;">- 2*F*A*</li> <li style="padding-left: 20px;">- 5*B*A*</li> <li style="padding-left: 20px;">- 5*D*A*</li> <li style="padding-left: 20px;">- 5*F*A*</li> <li>■ FMU42 - 2*B*A***</li> <li style="padding-left: 20px;">- 2*D*A***</li> <li style="padding-left: 20px;">- 2*F*A***</li> <li style="padding-left: 20px;">- 5*B*A***</li> <li style="padding-left: 20px;">- 5*D*A***</li> <li style="padding-left: 20px;">- 5*F*A***</li> </ul>	<ul style="list-style-type: none"> <li>■ ATEX II 1/2D</li> <li>■ ATEX II 1/3D</li> </ul>	<ul style="list-style-type: none"> <li>■ HART (2-wire)</li> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	F12	XA 180F
<ul style="list-style-type: none"> <li>■ FMU40 - 2*G*A*</li> <li style="padding-left: 20px;">- 2*H*A*</li> <li style="padding-left: 20px;">- 5*G*A*</li> <li style="padding-left: 20px;">- 5*H*A*</li> <li>■ FMU41 - 2*G*A*</li> <li style="padding-left: 20px;">- 2*H*A*</li> <li style="padding-left: 20px;">- 5*G*A*</li> <li style="padding-left: 20px;">- 5*H*A*</li> <li>■ FMU42 - 2*G*A***</li> <li style="padding-left: 20px;">- 2*H*A***</li> <li style="padding-left: 20px;">- 5*G*A***</li> <li style="padding-left: 20px;">- 5*H*A***</li> </ul>	<ul style="list-style-type: none"> <li>■ ATEX II 1/2D</li> <li>■ ATEX II 1/3 D</li> </ul>	<ul style="list-style-type: none"> <li>■ HART (4-wire, DC)</li> <li>■ HART (4-wire, AC)</li> </ul>	F12	XA 259
<ul style="list-style-type: none"> <li>■ FMU43 - 2*G*A*</li> <li style="padding-left: 20px;">- 2*H*A*</li> <li style="padding-left: 20px;">- 5*G*A*</li> <li style="padding-left: 20px;">- 5*H*A*</li> </ul>	<ul style="list-style-type: none"> <li>■ ATEX II 1/2 D or II 2 D</li> <li>■ ATEX II 1/3 D or II 3 D</li> </ul>	<ul style="list-style-type: none"> <li>■ HART (4-wire, DC)</li> <li>■ HART (4-wire, AC)</li> </ul>	F12	XA 177F
<ul style="list-style-type: none"> <li>■ FMU43 - 2*D*A*</li> <li style="padding-left: 20px;">- 2*F*A*</li> <li style="padding-left: 20px;">- 5*D*A*</li> <li style="padding-left: 20px;">- 5*F*A*</li> </ul>	<ul style="list-style-type: none"> <li>■ ATEX II 1/2 D or II 2 D</li> <li>■ ATEX II 1/3 D or II 3 D</li> </ul>	<ul style="list-style-type: none"> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	F12	XA 178F

**Safety Instructions NEPSI**

The following safety instructions are supplied with NEPSI-certified device versions. If the devices are used in explosive areas, comply with all the specifications in these safety instructions.

Instrument version	Certificate	Communication	Housing	Safety Instructions
<ul style="list-style-type: none"> <li>■ FMU40 - I*B*A*</li> <li>■ FMU41 - I*B*A*</li> <li>■ FMU42 - I*B*A***</li> </ul>	Ex ia II C T1 ... T6 NEPSI GYJ071468	HART (2-wire)	F12	XA 436F
<ul style="list-style-type: none"> <li>■ FMU40 - I*B*D*</li> <li>■ FMU41 - I*B*D*</li> <li>■ FMU42 - I*B*D***</li> </ul>	Ex ia II C T1 ... T6 NEPSI GYJ071468	HART (2-wire)	T12 with overvoltage protection	XA 442F
<ul style="list-style-type: none"> <li>■ FMU40 - I*D*A*</li> <li style="padding-left: 20px;">- I*F*A*</li> <li>■ FMU41 - I*D*A*</li> <li style="padding-left: 20px;">- I*F*A*</li> <li>■ FMU42 - I*D*A***</li> <li style="padding-left: 20px;">- I*F*A***</li> </ul>	Ex ia II C T1 ... T6 NEPSI GYK071468	<ul style="list-style-type: none"> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	F12	XA 437F
<ul style="list-style-type: none"> <li>■ FMU40 - I*D*D*</li> <li style="padding-left: 20px;">- I*F*D*</li> <li>■ FMU41 - I*D*D*</li> <li style="padding-left: 20px;">- I*F*D*</li> <li>■ FMU42 - I*D*D***</li> <li style="padding-left: 20px;">- I*F*D***</li> </ul>	Ex ia II C T1 ... T6 NEPSI GYJ071468	<ul style="list-style-type: none"> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	T12 with overvoltage protection	XA 443F
<ul style="list-style-type: none"> <li>■ FMU40 - J*B*C*</li> <li style="padding-left: 20px;">- J*D*C*</li> <li style="padding-left: 20px;">- J*F*C*</li> <li>■ FMU41 - J*B*C*</li> <li style="padding-left: 20px;">- J*D*C*</li> <li style="padding-left: 20px;">- J*F*C*</li> <li>■ FMU42 - J*B*C***</li> <li style="padding-left: 20px;">- J*D*C***</li> <li style="padding-left: 20px;">- J*F*C***</li> </ul>	Ex d [ia] II C T1 ... T6 NEPSI GYJ071468	<ul style="list-style-type: none"> <li>■ HART (2-wire)</li> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	T12	XA 438F
<ul style="list-style-type: none"> <li>■ FMU40 - Q*B*A*</li> <li style="padding-left: 20px;">- Q*D*A*</li> <li style="padding-left: 20px;">- Q*F*A*</li> <li>■ FMU41 - Q*B*A*</li> <li style="padding-left: 20px;">- Q*D*A*</li> <li style="padding-left: 20px;">- Q*F*A*</li> <li>■ FMU42 - Q*B*A***</li> <li style="padding-left: 20px;">- Q*D*A***</li> <li style="padding-left: 20px;">- Q*F*A***</li> </ul>	DIP A21/A22 T <sub>A</sub> , T* NEPSI GYJ071468	<ul style="list-style-type: none"> <li>■ HART (2-wire)</li> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	F12	XA 441F
<ul style="list-style-type: none"> <li>■ FMU40 - Q*G*A*</li> <li style="padding-left: 20px;">- Q*H*A*</li> <li>■ FMU41 - Q*G*A*</li> <li style="padding-left: 20px;">- Q*H*A*</li> <li>■ FMU42 - Q*G*A***</li> <li style="padding-left: 20px;">- Q*H*A***</li> </ul>	DIP A21/A22 T <sub>A</sub> , T* NEPSI GYJ071468	<ul style="list-style-type: none"> <li>■ HART (4-wire, DC)</li> <li>■ HART (4-wire, AC)</li> </ul>	F12	XA 444F
<ul style="list-style-type: none"> <li>■ FMU43 - Q*G*A*</li> <li style="padding-left: 20px;">- Q*H*A*</li> </ul>	DIP A21/A22 T <sub>A</sub> , T*	<ul style="list-style-type: none"> <li>■ HART (4-wire, DC)</li> <li>■ HART (4-wire, AC)</li> </ul>	F12	XA 439F
<ul style="list-style-type: none"> <li>■ FMU43 - Q*D*A*</li> <li style="padding-left: 20px;">- Q*F*A*</li> </ul>	DIP A21/A22 T <sub>A</sub> , T*	<ul style="list-style-type: none"> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	F12	XA 440F
<ul style="list-style-type: none"> <li>■ FMU40 - E*****</li> <li>■ FMU41 - E*****</li> <li>■ FMU42 - E*****</li> </ul>	NEPSI Ex nA IIC T6	<ul style="list-style-type: none"> <li>■ HART</li> <li>■ Profibus PA</li> <li>■ Foundation Fieldbus</li> </ul>	<ul style="list-style-type: none"> <li>■ F12</li> <li>■ T12</li> </ul>	XA 403F

**Control drawings Installation drawings** The following control or installation drawings are supplied with the FM, CSA and TIIS-certified device versions:

Instrument version	Certificate	Communication	Housing	Control or Installation Drawing
<ul style="list-style-type: none"> <li>■ FMU40 - S*B*A*</li> <li>■ FMU41 - S*B*A*</li> <li>■ FMU42 - S*B*A***</li> </ul>	FM IS	HART (2-wire)	F12	ZD 096F
<ul style="list-style-type: none"> <li>■ FMU40 - S*D*A* - S*F*A*</li> <li>■ FMU41 - S*D*A* - S*F*A*</li> <li>■ FMU42 - S*D*A*** - S*F*A***</li> </ul>	FM IS	<ul style="list-style-type: none"> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	F12	ZD 097F
<ul style="list-style-type: none"> <li>■ FMU40 - S*B*D*</li> <li>■ FMU41 - S*B*D*</li> <li>■ FMU42 - S*B*D***</li> </ul>	FM IS	HART (2-wire)	T12 with overvoltage protection	ZD 139F
<ul style="list-style-type: none"> <li>■ FMU40 - S*D* D* - S*F*D*</li> <li>■ FMU41 - S*D* D* - S*F*D*</li> <li>■ FMU42 - S*D* D*** - S*F*D***</li> </ul>	FM IS	<ul style="list-style-type: none"> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	T12 with overvoltage protection	ZD 140F
<ul style="list-style-type: none"> <li>■ FMU40 - T*B*C* - T*D*C* - T*F*C*</li> <li>■ FMU41 - T*B*C* - T*D*C* - T*F*C*</li> <li>■ FMU42 - T*B*C*** - T*D*C*** - T*F*C***</li> </ul>	FM XP	<ul style="list-style-type: none"> <li>■ HART (2-wire)</li> <li>■ Profibus PA</li> <li>■ Foundation Fieldbus</li> </ul>	T12	ZD 098F
<ul style="list-style-type: none"> <li>■ FMU40 - U*B*A*</li> <li>■ FMU41 - U*B*A*</li> <li>■ FMU42 - U*B*A***</li> <li>■ FMU44 - U*B*A***</li> </ul>	CSA IS	HART (2-wire)	F12	ZD 088F
<ul style="list-style-type: none"> <li>■ FMU40 - U*D*A* - U*F*A*</li> <li>■ FMU41 - U*D*A* - U*F*A*</li> <li>■ FMU42 - U*D*A*** - U*F*A***</li> <li>■ FMU44 - U*D*A*** - U*F*A***</li> </ul>	CSA IS	<ul style="list-style-type: none"> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	F12	ZD 099F
<ul style="list-style-type: none"> <li>■ FMU40 - U*B* D*</li> <li>■ FMU41 - U*B* D*</li> <li>■ FMU42 - U*B* D***</li> <li>■ FMU44 - U*B* D***</li> </ul>	CSA IS	HART (2-wire)	T12 with overvoltage protection	ZD 101F
<ul style="list-style-type: none"> <li>■ FMU40 - U*D*D* - U*F*D*</li> <li>■ FMU41 - U*D*D* - U*F*D*</li> <li>■ FMU42 - U*D*D*** - U*F*D***</li> <li>■ FMU44 - U*D*D*** - U*F*D***</li> </ul>	CSA IS	<ul style="list-style-type: none"> <li>■ Profibus-PA</li> <li>■ Foundation Fieldbus</li> </ul>	T12 with overvoltage protection	ZD 102F

Instrument version	Certificate	Communication	Housing	Control or Installation Drawing
<ul style="list-style-type: none"> <li>■ FMU40 - V*B*C* - V*D*C* - V*F*C*</li> <li>■ FMU41 - V*B*C* - V*D*C* - V*F*C*</li> <li>■ FMU42 - V*B*C*** - V*D*C*** - V*F*C***</li> <li>■ FMU44 - V*B*C*** - V*D*C*** - V*F*C***</li> </ul>	CSA XP	<ul style="list-style-type: none"> <li>■ HART (2-wire)</li> <li>■ Profibus PA</li> <li>■ Foundation Fieldbus</li> </ul>	T12	ZD 100F
<ul style="list-style-type: none"> <li>■ FMU 40 - K*****</li> <li>■ FMU 41 - K*****</li> </ul>	TIIS Ex ia IIC T6	HART	F12	ZD 138F

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