

**ProcessMaster, HygienicMaster**  
**FEX300, FEX500**

FM / cFM Div. 1, Div. 2

**EN**

English

**Safety information for electrical equipment for potentially explosive areas in accordance with Factory Mutual Standards and Canadian Standards Association**  
Electromagnetic Flowmeter

**ABB**



# Electromagnetic Flowmeter

## ProcessMaster, HygienicMaster

### FEX300, FEX500

Safety information for electrical equipment for potentially explosive areas in accordance with  
Factory Mutual Standards and Canadian Standards Association - EN

SM/FEX300/FEX500/FM/CSA-EN

08.2017

Rev. E

Translation of the original instruction

#### Manufacturer:

##### **ABB Automation Products GmbH Measurement & Analytics**

Dransfelder Straße 2  
D-37079 Göttingen  
Germany  
Tel.: +49 551 905-0  
Fax: +49 551 905-777

##### **Customer service center**

Phone: +49 180 5 222 580  
Fax: +49 621 381 931-29031  
[automation.service@de.abb.com](mailto:automation.service@de.abb.com)

##### **ABB Inc. Measurement & Analytics**

125 E. County Line Road  
Warminster, PA 18974  
USA  
Tel.: +1 215 674 6000  
Fax: +1 215 674 7183

##### **ABB Engineering (Shanghai) Ltd. Measurement & Analytics**

No. 4528, Kangxin Highway,  
Pudong New District,  
Shanghai, 201319, P.R. China  
Tel.: +86(0) 21 6105 6666  
Fax: +86(0) 21 6105 6677  
Mail:  
[china.instrumentation@cn.abb.com](mailto:china.instrumentation@cn.abb.com)

© Copyright 2017 by ABB Automation Products GmbH  
Subject to changes without notice

This document is protected by copyright. It assists the user in safe and efficient operation of the device. The contents of this document, whether whole or in part, may not be copied or reproduced without prior approval by the copyright holder.

**IMPORTANT (NOTE)**

This document forms an integral part of the following manuals:

- Operating Instruction OI/FEX300/FEX500
- Commissioning instruction CI/FEX300/FEX500

<b>1 Certificates .....</b>	<b>4</b>
<b>2 Safety .....</b>	<b>5</b>
2.1 Operator liability .....	5
2.2 Technical limit values .....	5
2.3 Safety information for electrical installation.....	5
2.4 Symbols and warnings .....	5
<b>3 Device designs .....</b>	<b>6</b>
3.1 Model with compact design .....	6
3.1.1 Div. 1 .....	6
3.1.2 Div. 2 .....	7
3.2 Model with remount mount design .....	7
3.2.1 Div. 1 .....	8
3.2.2 Div.2 .....	9
3.3 Overview: The fast track to the device data .....	10
3.4 Name plate .....	11
3.4.1 Name plate for model with integral mount design (dual-compartment housing) .....	11
3.4.2 Name plate for model with integral mount design (single-compartment housing).....	12
3.4.3 Name plate for model with remote mount design .....	13
3.4.4 Name plate for transmitter.....	14
<b>4 Mounting .....</b>	<b>16</b>
4.1 Information about opening and closing the housing .....	16
4.2 Rotating the transmitter housing .....	17
4.3 Cable entries .....	17
4.4 High temperature version .....	18
4.5 Protection class IP 68.....	18
4.6 Information about using the device in areas with combustible dust.....	18
4.6.1 Maximum Allowable Surface Temperature .....	18
4.6.2 Minimum signal cable length.....	18
4.7 Electrical connection .....	19
4.8 Process sealing (Canada).....	20
<b>5 Ex relevant specifications for operation in Div. 1 .....</b>	<b>21</b>
5.1 Electrical connection .....	21
5.1.1 Flowmeter sensor and transmitter in Div. 1 .....	21
5.1.2 Flowmeter sensor in Div. 1 and transmitter in Div. 2 or outside the hazardous area .....	22
5.2 Electrical data for operation in zones 1, 21, 22 / Div. 1.....	23
5.2.1 Devices with HART protocol .....	23
5.2.2 Devices with PROFIBUS PA or FOUNDATION fieldbus .....	24
5.3 Temperature data for operation in Zone 1 / Div. 1 .....	25

<b>6 Ex relevant specifications for operation in Div. 2 .....</b>	<b>29</b>
6.1 Electrical connection .....	29
6.1.1 Flowmeter sensor and transmitter in Div. 2, or transmitter outside the hazardous area .....	29
6.2 Electrical data for operation in zones 2, 21, 22 / Div. 2 .....	30
6.2.1 Devices with HART protocol .....	30
6.2.2 Devices with PROFIBUS PA or FOUNDATION fieldbus .....	30
6.3 Temperature data for operation in Zone 2 / Div. 2 .....	30
<b>7 Commissioning.....</b>	<b>34</b>
7.1 Preliminary checks prior to start-up.....	34
7.2 Notes on combining the FEP325 flowmeter sensor with the FET325 transmitter or the FEP525 flowmeter sensor with the FET525 transmitter .....	34
7.3 Special features of the device design for operation in Div. 1 .....	35
7.3.1 Configuring the current output .....	35
7.3.2 Configuration of the digital outputs .....	35
7.4 Changing the type of protection .....	36
<b>8 Maintenance.....</b>	<b>37</b>
8.1 General information .....	37
8.2 Replacing the transmitter or sensor .....	38
8.2.1 Transmitter .....	38
8.2.2 Flowmeter sensor.....	39
<b>9 Appendix .....</b>	<b>40</b>
9.1 Approvals and certifications .....	40
9.2 Installation drawing HART IDM-10-A0258 .....	41
9.3 Installation drawing PROFIBUS PA / FOUNDATION Fieldbus IDM-10-A0266 .....	43

**1 Certificates**

These safety instructions related to explosion protection are valid in conjunction with the following certificates:

<b>Validity area</b>	<b>Certificates</b>
FM for USA	File 3034391
FM for Canada	File 3034391C

## 2 Safety

### 2.1 Operator liability

The operators must strictly observe the applicable national regulations with regards to installation, function tests, repairs, and maintenance of electrical devices (e.g., NEC, CEC).

### 2.2 Technical limit values

Particular attention must be paid to the limit values listed in the sections relating to "ex relevant specifications":

- The data for the signal inputs and outputs of the transmitter
- The permissible temperature data and limit values

### 2.3 Safety information for electrical installation

Never attempt electrical connection unless the power supply is switched off.

Ground the flowmeter sensor and transmitter housing. Make sure there is no risk of explosion.

### 2.4 Symbols and warnings



#### DANGER – <Serious damage to health / risk to life>

This symbol in conjunction with the signal word "Danger" indicates an imminent danger. Failure to observe this safety information will result in death or severe injury.



#### DANGER – <Serious damage to health / risk to life>

This symbol in conjunction with the signal word "Danger" indicates an imminent electrical hazard. Failure to observe this safety information will result in death or severe injury.



#### WARNING – <Bodily injury>

This symbol in conjunction with the signal word "Warning" indicates a possibly dangerous situation. Failure to observe this safety information may result in death or severe injury.



#### WARNING – <Bodily injury>

This symbol in conjunction with the signal word "Warning" indicates a potential electrical hazard. Failure to observe this safety information may result in death or severe injury.



#### CAUTION – <Minor injury>

This symbol in conjunction with the signal word "Caution" indicates a possibly dangerous situation. Failure to observe this safety information may result in minor or moderate injury. This may also be used for property damage warnings.



#### NOTICE – <Property damage>!

The symbol indicates a potentially damaging situation.

Failure to observe this safety information may result in damage to or destruction of the product and/or other system components.



#### IMPORTANT (NOTE)

This symbol indicates operator tips, particularly useful information, or important information about the product or its further uses. It does not indicate a dangerous or damaging situation.

## Device designs

### 3 Device designs

The devices are available in two series. ProcessMaster 300 / HygienicMaster 300 with basic functions and ProcessMaster 500 / HygienicMaster 500 with extended functions and options.

The series is identified by the fourth digit of the model number:

Model number / device series			
FEP3...	ProcessMaster 300	FEP5...	ProcessMaster 500
FEH3...	HygienicMaster 300	FEH5...	HygienicMaster 500

Devices suitable for use in potentially explosive atmospheres feature the corresponding Ex mark on their name plates.

The model for use in Div. 1 is identified by the character “R”, the model for use in 2 is identified by the character “P” in the model number.

#### 3.1 Model with compact design

The transmitter and the flowmeter sensor form a single mechanical entity.



#### IMPORTANT (NOTE)

For further information about the instruments' explosion protection approval please refer to the Ex test certificates (available on the product CD or under [www.abb.com/flow](http://www.abb.com/flow)).

##### 3.1.1 Div. 1

ProcessMaster 300 / ProcessMaster 500 FEP315.....R.... / FEP515.....R.... Div. 1	HygienicMaster 300 / HygienicMaster 500 FEH315.....R.... / FEH515.....R.... Div. 1
 G00886	 G00883
<b>USA</b> FM approved XP: CL I / DIV 1 / GP ABCD NI: CL III / DIV 1 DIP: CL II / DIV 1 / GP EFG DN 3-300: CL I, ZN 1 AEx d e ia ma IIC T6 ... T2 >DN 300: CL I, ZN 1 AEx d e ia IIC T6 ... T2 DN 3-2000: Zone 21 Ex tD iaD A21 IP6X T70°C ... T <sub>medium</sub>	<b>USA</b> FM approved XP: CL I / DIV 1 / GP ABCD NI: CL III/ DIV 1 DIP: CL II / DIV 1 / GP EFG CL I, ZN 1 AEx d e ia ma IIC T6...T2 Zone 21 Ex tD iaD A21 IP6X T70°C ... T <sub>medium</sub>
<b>Canada</b> cFM approved XP: CL I / DIV 1 / GP ABCD NI: CL III / DIV 1 DN 3-300: Ex d e ia ma IIC T6 ... T2 >DN 300 : Ex d e ia IIC T6 ... T2 DIP: CL II / DIV 1 / GP EFG	<b>Canada</b> cFM approved XP: CL I / DIV 1 / GP ABCD NI: CL III/ DIV 1 Ex d e ia ma IIC T6 ... T2 DIP: CL II/ DIV 1 / GP EFG

Fig. 1

## 3.1.2 Div. 2

ProcessMaster 300 / ProcessMaster 500 FEP315.....P.... / FEP515.....P.... Div. 2	HygienicMaster 300 / HygienicMaster 500 FEH315.....P.... / FEH515.....P.... Div. 2
<p>G01082-01</p>	<p>G01330</p>
<b>USA</b> FM approved, File 3034391 NI: CL I, II / DIV2 / GP ABCDFG / T4 ... T3 CL III / DIV1, 2 / T4 ... T3 CL I ZN2 AEx nA nC IIC T4 ... T3 DIP: CL II, III / DIV1 / GP EFG / T 70 °C ... T <sub>medium</sub> AEx tD 21 T70 °C ... T <sub>medium</sub>	<b>USA</b> FM approved, File 3034391 NI: CL I, II / DIV2 / GP ABCDFG / T4 ... T3 CL III / DIV1, 2 / T4 ... T3 CL I ZN2 AEx nA nC IIC T4 ... T3 DIP: CL II, III / DIV1 / GP EFG / T 70 °C ... T <sub>medium</sub> AEx tD 21 T70 °C ... T <sub>medium</sub>
<b>Canada</b> cFM approved, File 3034391C NI: CL I, II / DIV2 / GP ABCDFG / T4 ... T3 CL III / DIV1, 2 / T4 ... T3 CL I ZN2 Ex nA nC IIC T4 ... T3 DIP: CL II, III / DIV1 / GP EFG / T70 °C ... T <sub>medium</sub> DIP A21 TA T70 °C ... T <sub>medium</sub>	<b>Canada</b> cFM approved, File 3034391C NI: CL I, II / DIV2 / GP ABCDFG / T4 ... T3 CL III / DIV1, 2 / T4 ... T3 CL I ZN2 Ex nA nC IIC T4 ... T3 DIP: CL II, III / DIV1 / GP EFG / T70 °C ... T <sub>medium</sub> DIP A21 TA T70 °C ... T <sub>medium</sub>

- 1) Single-compartment housing  
 2) Dual-compartment housing

## 3.2 Model with remount mount design

The transmitter is mounted in a separate location from the flowmeter sensor. The electrical connection between the transmitter and flowmeter sensor may only be established using the signal cable supplied.

Application	Signal cable	
	D173D031U01	D173D027U01
Non-Ex. (< DN15)	✗	✓
Non-Ex. (≥ DN15)	✓	✓
Zone 2 / Div. 2 (< DN15)	✗	✓
Zone 2 / Div. 2 (≥ DN15)	✓	✓
Zone 1 / Div. 1 (all nominal diameter)	✗	✓

✗ Application not permissible  
 ✓ Application permissible

■ Standard on delivery

**IMPORTANT (NOTE)**

For further information about the instruments' explosion protection approval please refer to the Ex test certificates (available on the product CD or under [www.abb.com/flow](http://www.abb.com/flow)).

## 3.2.1 Div. 1

**DANGER - Risk of explosion caused by incorrect transmitter installation**

The FET321 / FET521 transmitter is not approved for hazardous areas.

The FET321 / FET521 transmitter must not be installed or operated in potentially explosive atmospheres.

If the FEP325 flowmeter sensor is combined with the FET321 or FET325 transmitter (Zone 2), the maximum permissible signal cable length is 50 m (164 ft) with a minimum conductivity of 5 µS/cm, without a pre-amplifier. The same is valid for the FEP525 flowmeter sensor with FET521 or FET525 (Zone 2) transmitter.

If the FEP325 flowmeter sensor is combined with the FET325 transmitter (Zone 1), 10 m (32.8 ft) signal cables are permanently connected to the transmitter. The same is valid for the FEP525 flowmeter sensor with FET525 (Zone 1) transmitter.

<b>Flowmeter sensor ProcessMaster 300 / ProcessMaster 500 FEP325.....R.... / FEP325.....R.... in hazardous area, Div. 1</b>		
 G00862		
<b>USA</b> FM approved XP: CL I / DIV 1 / GP ABCD NI: CL III / DIV 1 DIP: CL II / DIV 1 / GP EFG  DN 3-300: CL I, ZN 1 AEx d e ia ma IIC T6 ... T2 >DN 300: CL I, ZN 1 AEx d e ia IIC T6 ... T2 DN 3-2000: Zone 21 Ex tD iaD A21 IP6X T70°C ... T <sub>medium</sub>	<b>Canada</b> cFM approved XP: CL I / DIV 1 / GP ABCD NI: CL III / DIV 1 DN 3-300: Ex d e ia ma IIC T6 ... T2 >DN 300 : Ex d e ia IIC T6 ... T2 DIP: CL II / DIV 1 / GP EFG	
<b>Transmitter</b> <b>FET325.....R.... / FET525.....R.... in hazardous area, Div. 1</b>		
 G00863	 G01331	
<b>USA</b> FM approved XP: CL I / DIV 1 / GP ABCD IS: CL II/ DIV 1/ GP EFG  NI: CL III/ DIV 1 CL I, ZN 1 AEx d e [ia] IIC T6 Zone21 AEx tD [iaD] A21 IP6X T70°C	<b>USA</b> FM approved NI: CL I, II / DIV2 / GP ABCDFG / T4 CL III / DIV1, 2 / T4 CL I, II,III ZN 2 AEx nA nC T4 DIP: CL II, III / DIV1 / GP EFG / T70°C	<b>No Ex approval</b>
<b>Canada</b> cFM approved XP: CL I / DIV 1 / GP ABCD IS: CL II/ DIV 1/ GP EFG NI: CL III/ DIV 1 Ex d e [ia] IIC T6 Gb	<b>Canada</b> cFM approved NI: CL I, II/ DIV 2/ GP ABCDFG/ T4 CL III/ DIV 1, 2/ T4 Ex nA nC T4 DIP: CL II, III / DIV1 / GP EFG / T70°C DIP A21 TA 70°C	

- 1) Single-compartment housing  
 2) Dual-compartment housing

## 3.2.2 Div.2

**Risk of explosion caused by incorrect transmitter installation**

The FET321 / FET521 transmitter is not approved for hazardous areas.

The FET321 / FET521 transmitter must not be installed or operated in potentially explosive atmospheres.

Without a pre-amplifier, the maximum permissible signal cable length is 50 m (164 ft) with a minimum conductivity of 5  $\mu\text{S}/\text{cm}$ . With a pre-amplifier, the maximum permissible signal cable length is 200 m (656 ft).

Flowmeter sensor	
ProcessMaster 300 / ProcessMaster 500 FEP325.....P.... / FEP525.....P.... in hazardous area, Div. 2	HygienicMaster 300 / HygienicMaster 500 FEH325.....P.... / FEH525.....P.... in hazardous area, Div. 2
G00489	G00576
<b>USA</b> NI: CL I, II / DIV2 / GP ABCDFG / T4 ... T3 CL III / DIV1, 2 / T4 ... T3 CL I ZN2 AEx nA nC IIC T4 ... T3 DIP: CL II, III / DIV1 / GP EFG / T 70 °C ... T <sub>medium</sub> AEx tD 21 T70 °C ... T <sub>medium</sub>	<b>USA</b> NI: CL I, II / DIV2 / GP ABCDFG / T6 ... T3 CL III / DIV1, 2 / T6 ... T3 CL I ZN2 AEx nA nC T4 ... T3 DIP: CL II, III / DIV1 / GP EFG / T85°C ... T <sub>medium</sub> AEx tD 21 T70 °C ... T <sub>medium</sub>
<b>Canada</b> NI: CL I, II / DIV2 / GP ABCDFG / T4 ... T3 CL III / DIV1, 2 / T4 ... T3 CL I ZN2 Ex nA nC IIC T4 ... T3 DIP: CL II, III / DIV1 / GP EFG / T70 °C ... T <sub>medium</sub> DIP A21 TA T70 °C ... T <sub>medium</sub>	<b>Canada</b> NI: CL I, II / DIV2 / GP ABCDFG / T6 ... T3 CL III / DIV1, 2 / T6...T3 CL I ZN2 Ex nA nC T4 ... T3 DIP: CL II, III / DIV1 / GP EFG / T85°C ... T <sub>medium</sub> DIP A21 T <sub>A</sub> 85 °C ... T <sub>medium</sub>
Transmitter	
(The flowmeter sensors illustrated above can be combined with one of the two transmitters described below)	
FET325.....P.... / FET525.....P.... in hazardous area, Div. 2	FET321 / FET521 Outside the Ex area
G01331	G01331
<b>USA</b> NI: CL I, II / DIV2 / GP ABCDFG / T4 CL III / DIV1, 2 / T4 CL I, II,III ZN 2 AEx nA nC T4 DIP: CL II, III / DIV1 / GP EFG / T70°C	<b>No Ex approval!</b>
<b>Canada</b> NI: CL I, II/ DIV 2/ GP ABCDFG/ T4 CL III/ DIV 1, 2/ T4 Ex nA nC T4 DIP: CL II, III / DIV1 / GP EFG / T70°C DIP A21 TA 70°C	

## 3.3 Overview: The fast track to the device data

	Model	Ex certificate		Operation in zone	Electrical connection	Ex data
					Chapter	
ProcessMaster 300 / ProcessMaster 500	FEP315 or FEP515	FM	File 3034391	Div 1 Div 2	5.1.1	5.2 and 5.3
		CSA	File 3034391C		6.1.1	6.2 and 6.3
	FEP325 + FET325 or FEP525 + FET525	FM	File 3034391	Div 1 Div 2	5.1.2	5.2 and 5.3
		CSA	File 3034391C		6.1.1	6.2 and 6.3
HygienicMaster 300 / HygienicMaster 500	FEP325 + FET321 or FEP525 + FET521	FM	File 3034391	Div 1 Div 2	5.1.2	5.2 and 5.3
		CSA	File 3034391C		6.1.1	6.2 and 6.3
	FEH315 or FEH515	FM	File 3034391	Div 1 Div 2	5.1.1	5.2 and 5.3
		CSA	File 3034391C		6.1.1	6.2 and 6.3
	FEH325 + FET325 or FEH525 + FET525	FM	File 3034391	Div 1 Div 2	5.1.2	5.2 and 5.3
		CSA	File 3034391C		6.1.1	6.2 and 6.3
	FEH325 + FET321 or FEH525 + FET521	FM	File 3034391	Div 1 Div 2	5.1.2	5.2 and 5.3
		CSA	File 3034391C		6.1.1	6.2 and 6.3

**IMPORTANT (NOTE)**

All documentation, declarations of conformity and certificates are available in ABB's download area.

[www.abb.com/flow](http://www.abb.com/flow)

### 3.4 Name plate

#### 3.4.1 Name plate for model with integral mount design (dual-compartment housing)

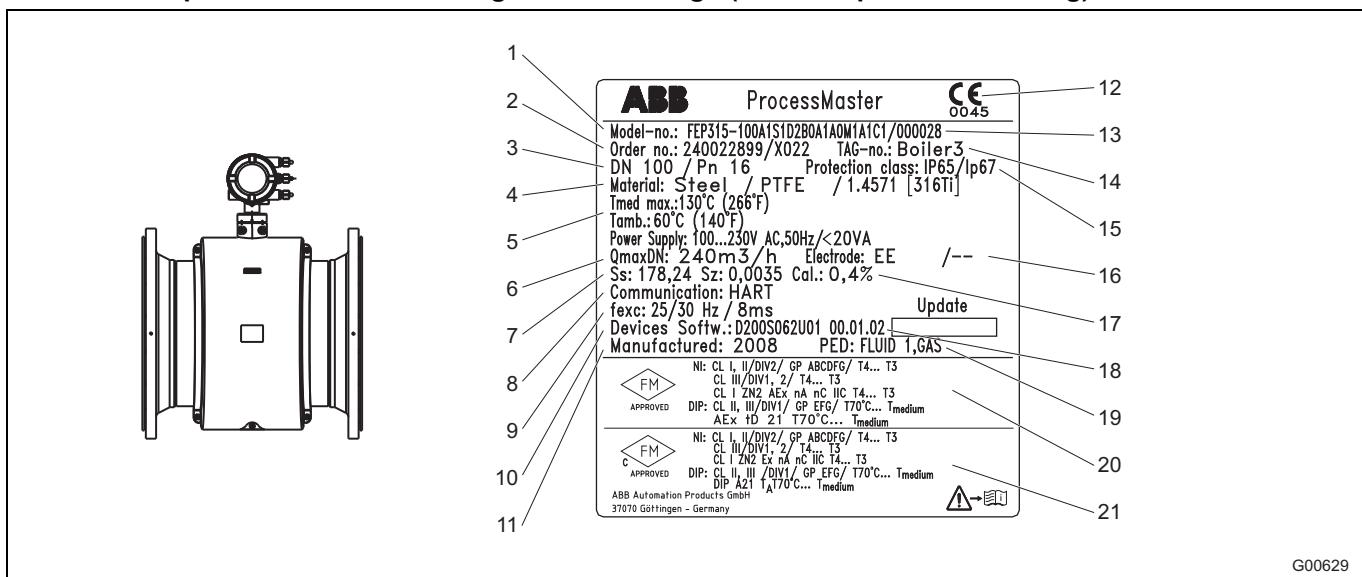


Fig.

- 1 Model number (for more detailed information about the technical design, refer to the data sheet or the order confirmation)
- 2 Order no.
- 3 Meter size and nominal pressure rating
- 4 Material: Flange/lining/electrode
- 5  $T_{\text{med}}$  = max. permissible fluid temperature
- 6  $T_{\text{amb}}$  = max. permissible ambient temperature
- 7 Calibration value Qmax DN
- 8 Calibration value Ss (span)
- 9 Calibration value Sz (zero point)
- 10 Communications protocol of transmitter
- 11 Excitation frequency of sensor coils
- 12 Software version
- 13 Year of manufacture
- 14 CE mark
- 15 Serial number for identification by the manufacturer
- 16 Client-specific TAG number (if specified)
- 17 Protection type according to EN 60529
- 18 Supplementary information: EE = grounding electrodes, TFE = partial filling electrode
- 19 Accuracy to which the unit was calibrated (e.g., 0.2% of rate)
- 20 Version level (xx.xx.xx)
- 21 Label indicating whether the unit is subject to the Pressure Equipment Directive (PED).
- Information on the relevant fluid group.  
Fluid group 1 = hazardous fluids, liquid, gaseous.  
(Pressure Equipment Directive = PED).
- If the pressure equipment is not subject to the Pressure Equipment Directive 2014/68/EU, it is classified in accordance with SEP (= sound engineering practice) as per Art. 3 Para. 3 of the PED.
- If no such information is present, it means that the device does not claim to comply with the requirements of the Pressure Equipment Directive 2014/68/EU.
- Water supplies and connected equipment accessories are classed as an exception in accordance with guideline 1/16 of Art. 1 Para. 3.2 of the Pressure Equipment Directive.
- Ex mark according to FM (example)
- Ex mark according to cFM (example)



#### IMPORTANT (NOTE)

Meters with 3A approval are labeled with an additional plate.

## Device designs

### 3.4.2 Name plate for model with integral mount design (single-compartment housing)

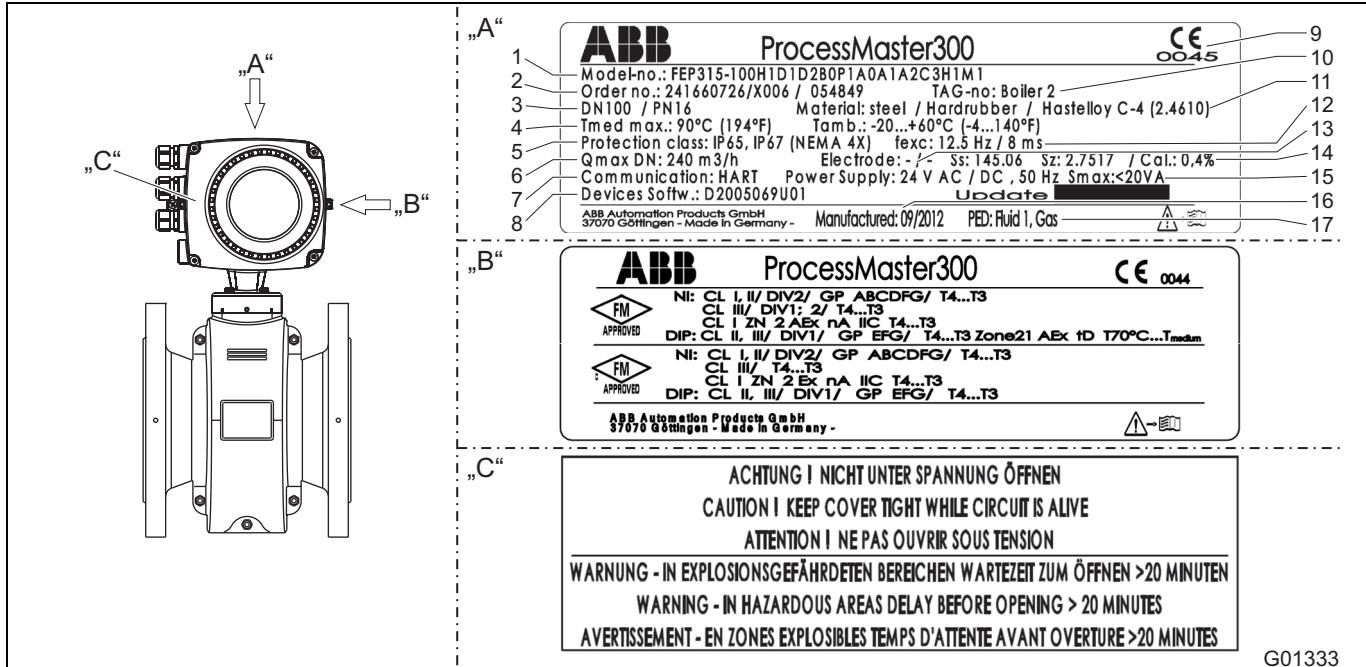


Fig. 2

#### „A“ Name plate

- 1 Model number (for more detailed information about the technical design, refer to the data sheet or the order confirmation)
- 2 Order no.
- 3 Meter size and nominal pressure rating
- 4 Tmed = maximum permissible fluid temperature  
Tamb = maximum permissible ambient temperature
- 5 Protection type according to EN 60529
- 6 Calibration value Qmax DN
- 7 Communications protocol of transmitter
- 8 Software version
- 9 CE mark
- 10 Client-specific TAG number (if specified)
- 11 Material: Flange/lining/electrode
- 12 Excitation frequency of sensor coils
- 13 Supplementary information: EE = grounding electrodes, TFE = partial filling electrode
- 14 Calibration value Ss (span)  
Calibration value Sz (zero point)  
Accuracy to which the unit was calibrated  
(e.g., 0.4% of rate)

#### „B“ Ex mark according to FM and cFM (example)

15 Supply voltage

16 Year of manufacture

17 Label indicating whether the unit is subject to the Pressure Equipment Directive (PED).  
Information on the relevant fluid group.  
Fluid group 1 = hazardous fluids, liquid, gaseous.  
(Pressure Equipment Directive = PED).  
If the pressure equipment is not subject to the Pressure Equipment Directive 2014/68/EU, it is classified in accordance with SEP (= sound engineering practice) as per Art. 3 Para. 3 of the PED.  
If no such information is present, it means that the device does not claim to comply with the requirements of the Pressure Equipment Directive 2014/68/EU. Water supplies and connected equipment accessories are classed as an exception in accordance with guideline 1/16 of Art. 1 Para. 3.2 of the Pressure Equipment Directive.

#### „C“ Safety mark



#### IMPORTANT (NOTE)

Meters with 3A approval are labeled with an additional plate.

### 3.4.3 Name plate for model with remote mount design

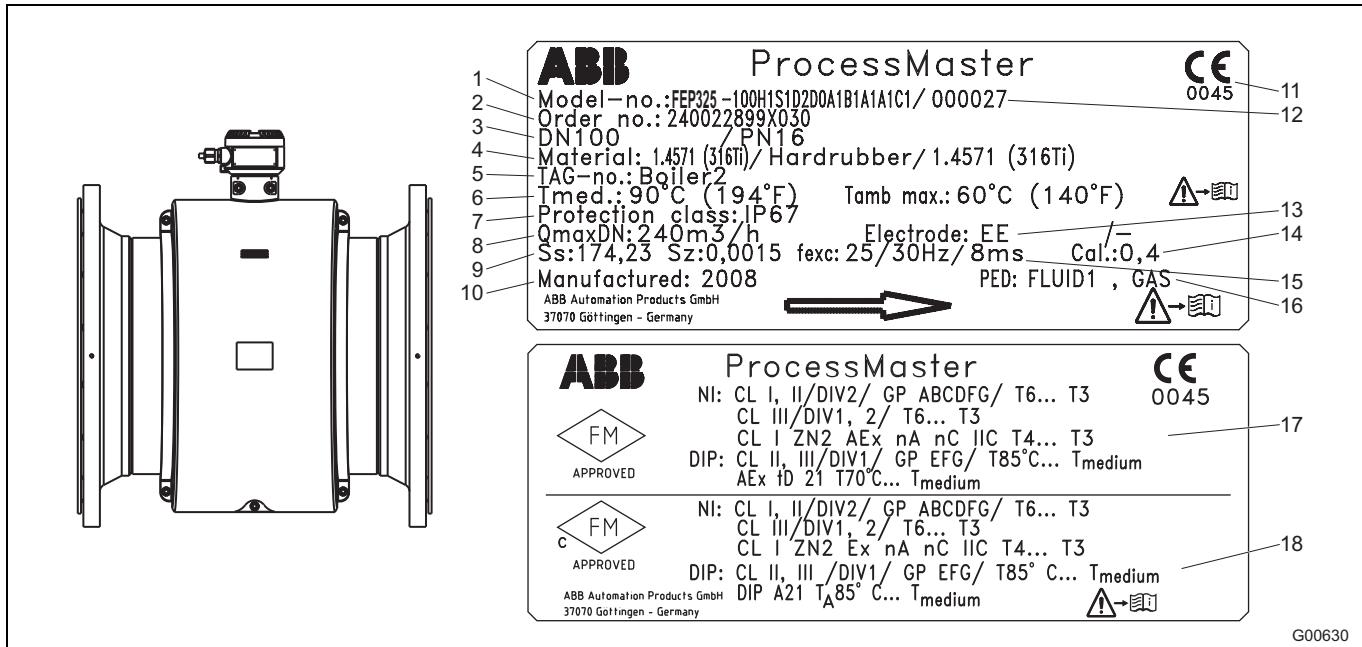


Fig. 3: Remote mount design

- 1 Model number (for more detailed information about the technical design, refer to the data sheet or the order confirmation)
- 2 Order no.
- 3 Meter size and nominal pressure rating
- 4 Material: Flange/lining/electrode
- 5 Client-specific TAG number (if specified)
- 6  $T_{med}$  = max. permissible fluid temperature  
 $T_{amb}$  = max. permissible ambient temperature
- 7 Protection type according to EN 60529
- 8 Calibration value Qmax DN
- 9 Calibration value Ss (span)  
Calibration value Sz (zero point)
- 10 Year of manufacture
- 11 CE mark
- 12 Serial number for identification by the manufacturer
- 13 Supplementary information: EE = grounding electrodes, TFE = partial filling electrode
- 14 Accuracy to which the unit was calibrated (e.g., 0.2% of rate)
- 15 Excitation frequency of sensor coils
- 16 Label indicating whether the unit is subject to the Pressure Equipment Directive (PED).  
Information on the relevant fluid group.  
Fluid group 1 = hazardous fluids, liquid, gaseous.  
(Pressure Equipment Directive = PED).  
If the pressure equipment is not subject to the Pressure Equipment Directive 2014/68/EU, it is classified in accordance with SEP (= sound engineering practice) as per Art. 3 Para. 3 of the PED.  
If no such information is present, it means that the device does not claim to comply with the requirements of the Pressure Equipment Directive 2014/68/EU.  
Water supplies and connected equipment accessories are classed as an exception in accordance with guideline 1/16 of Art. 1 Para. 3.2 of the Pressure Equipment Directive.
- 17 Ex mark according to FM (example)
- 18 Ex mark according to cFM (example)



#### IMPORTANT (NOTE)

Meters with 3A approval are labeled with an additional plate.

## 3.4.4 Name plate for transmitter

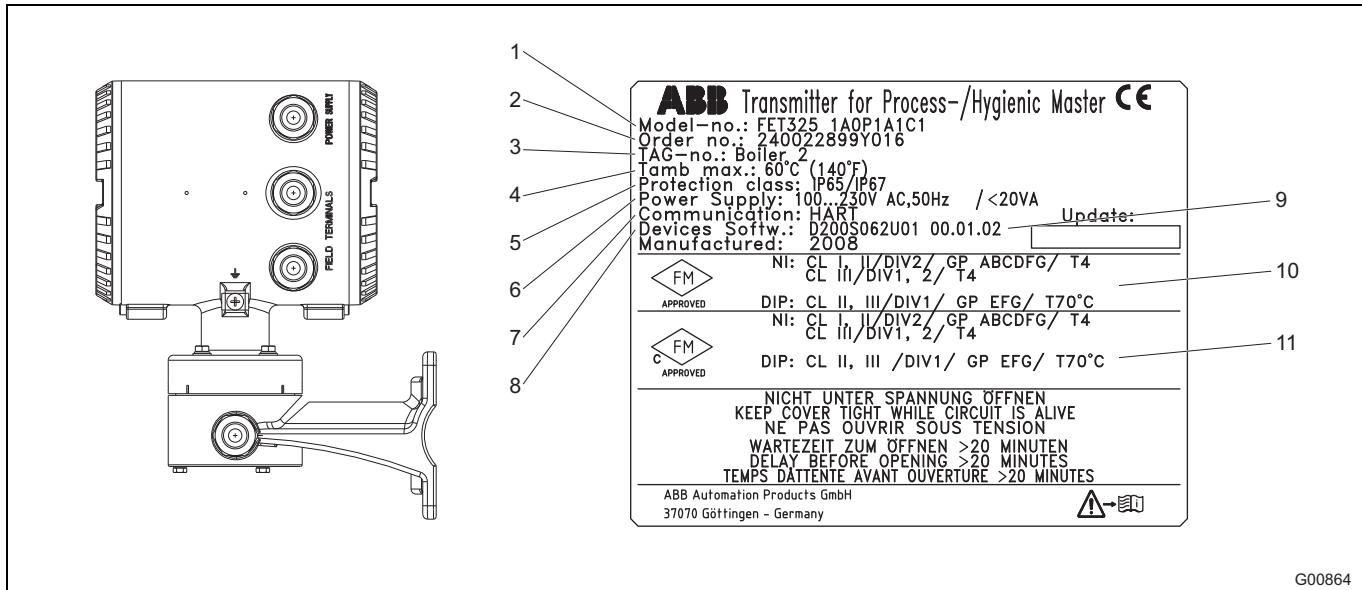


Fig. 4: External transmitter (remote mount design), model: FET325 / FET525 for Div. 1

- |                                                                                                                              |                                          |
|------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| 1 Model number (for more detailed information about the technical design, refer to the data sheet or the order confirmation) | 5 Protection type according to EN 60529  |
| 2 Order no.                                                                                                                  | 6 Supply voltage                         |
| 3 Client-specific TAG number (if specified)                                                                                  | 7 Communications protocol of transmitter |
| 4 $T_{amb}$ = max. permissible ambient temperature                                                                           | 8 Software version                       |
|                                                                                                                              | 9 Version level (xx.xx.xx)               |
|                                                                                                                              | 10 Ex mark according to FM (example)     |
|                                                                                                                              | 11 Ex mark according to cFM (example)    |

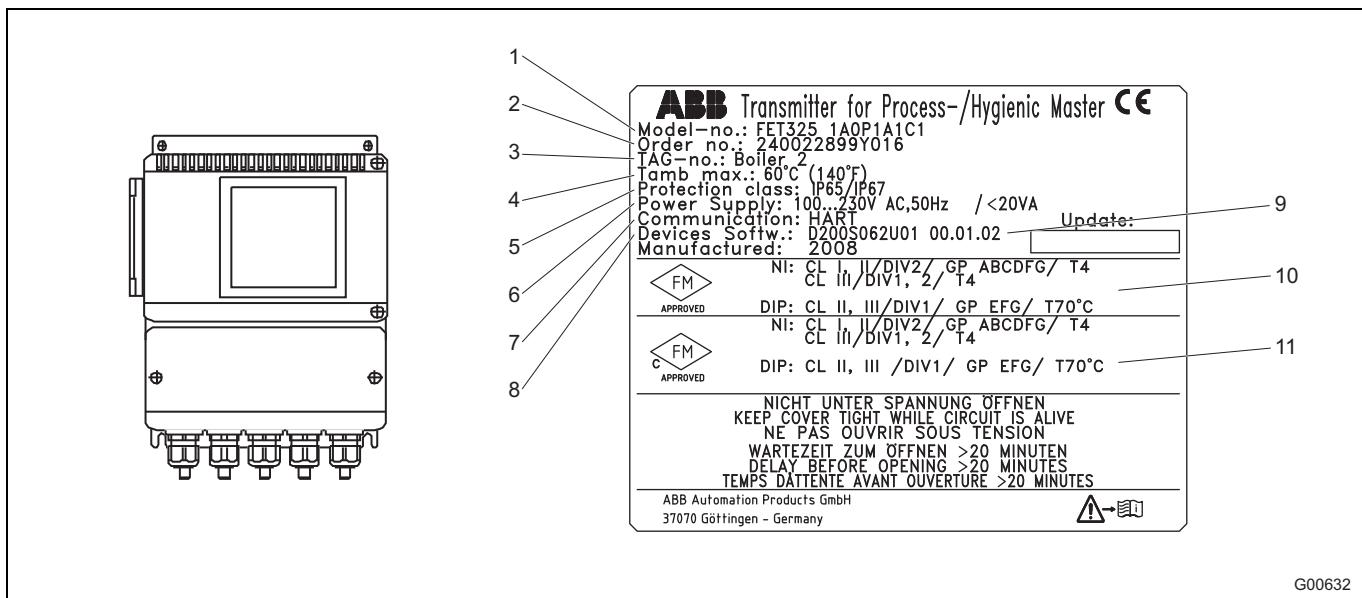


Fig. 5: External transmitter (remote mount design), models FET325 / FET525 for Zone 2

- |                                                                                                                              |                                          |
|------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| 1 Model number (for more detailed information about the technical design, refer to the data sheet or the order confirmation) | 5 Protection type according to EN 60529  |
| 2 Order no.                                                                                                                  | 6 Supply voltage                         |
| 3 Client-specific TAG number (if specified)                                                                                  | 7 Communications protocol of transmitter |
| 4 $T_{amb}$ = max. permissible ambient temperature                                                                           | 8 Software version                       |
|                                                                                                                              | 9 Version level (xx.xx.xx)               |
|                                                                                                                              | 10 Ex mark according to FM (example)     |
|                                                                                                                              | 11 Ex mark according to cFM (example)    |

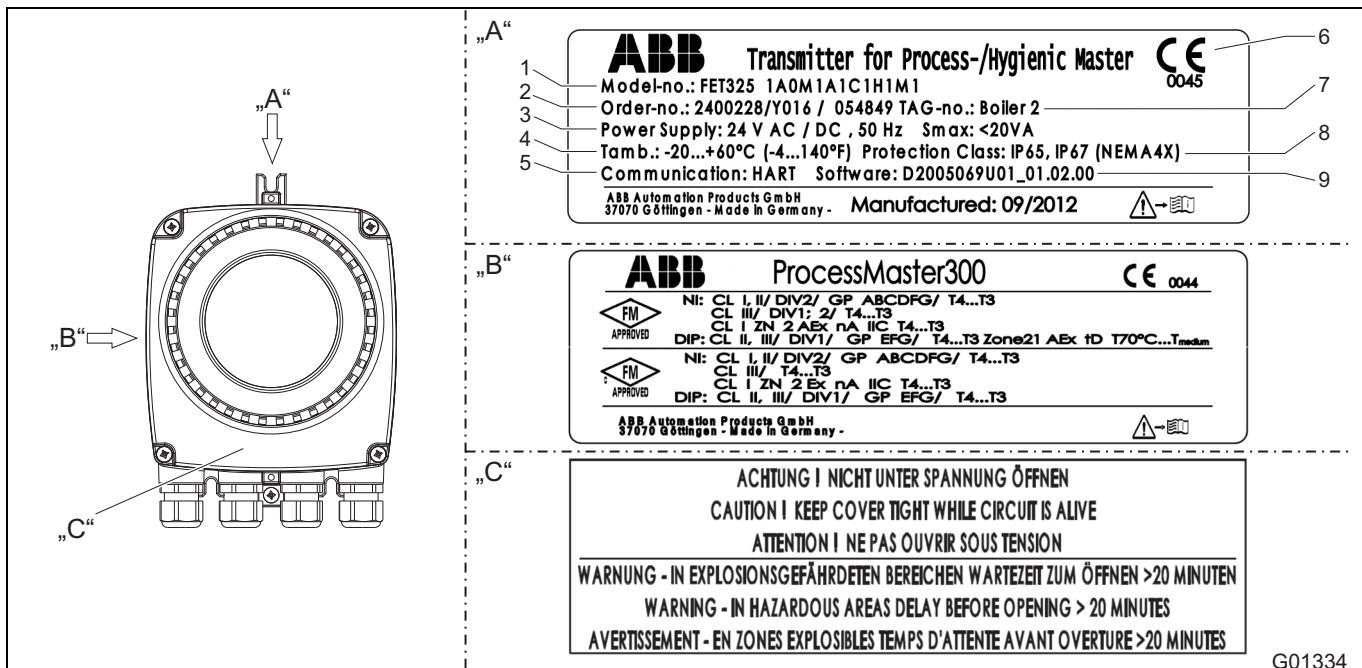


Fig. 6: External transmitter, model FET325 / FET525 for Zone 2 (single-compartment housing)

**,,A“ Name plate**

- 1 Model number (for more detailed information about the technical design, refer to the data sheet or the order confirmation)
- 2 Order no.
- 3 Supply voltage

**,,B“ Ex mark according to FM and cFM (example)**

- 4  $T_{amb}$  = maximum permissible ambient temperature
- 5 Communications protocol of transmitter
- 6 CE mark
- 7 Client-specific TAG number (if specified)
- 8 Protection type according to EN 60529
- 9 Software version

**,,C“ Safety mark**

## 4 Mounting

### 4.1 Information about opening and closing the housing

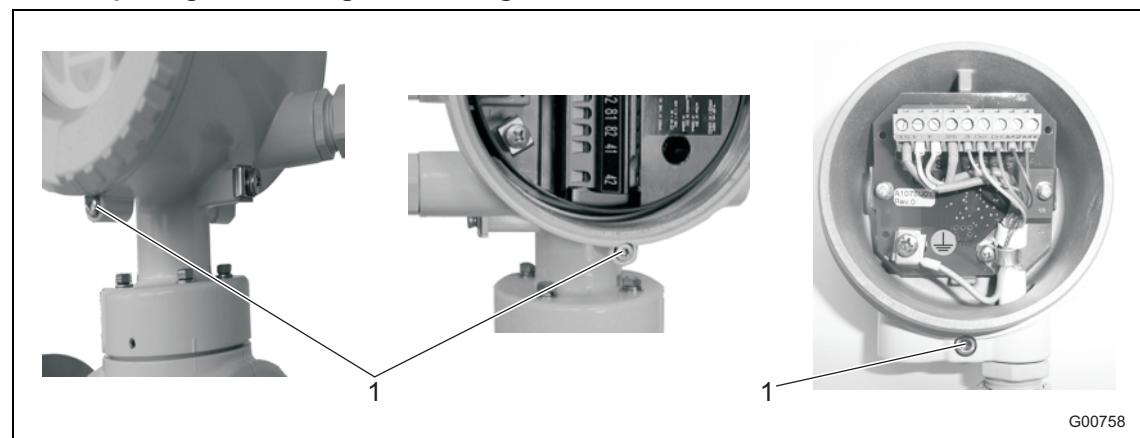


Fig. 7: Dual compartment housing - Cover safety device

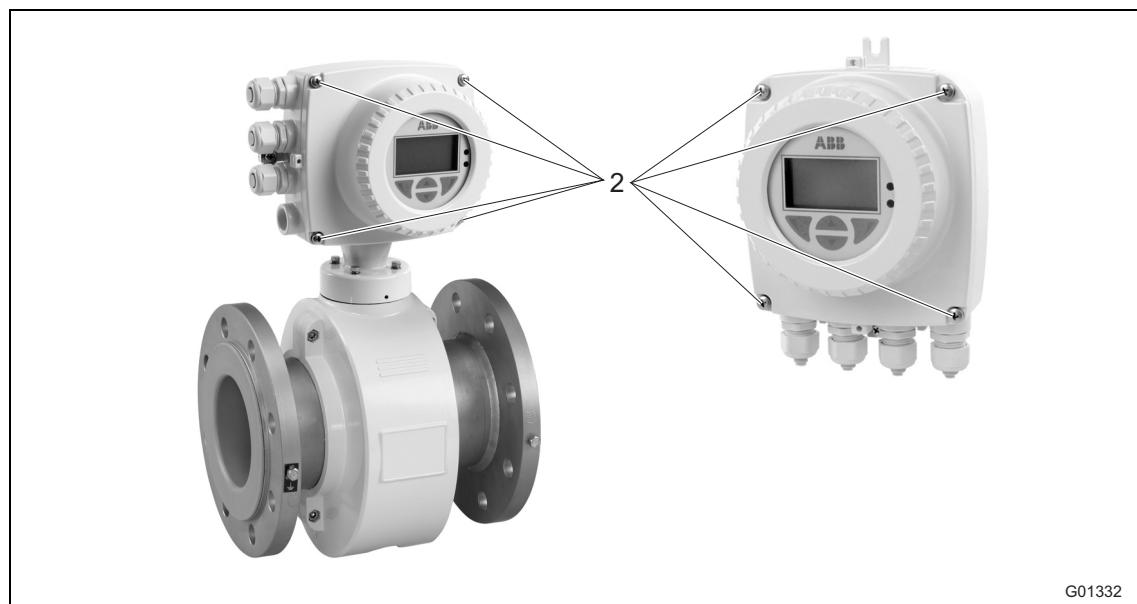


Fig. 8: Single compartment housing



#### DANGER - Risk of explosion!

When the housing cover is open, the explosion protection is suspended.

Before opening the housing switch off the power to all connection lines and wait at least 20 minutes.

#### Dual compartment housing (Fig. 7)

Release the cover safety device by screwing in the Allen screw (1).

Before closing the housing make sure that the gasket (O-ring) for the housing cover is seated correctly.

After closing the housing, lock the housing cover by unscrewing the Allen screw (1) to prevent opening the cover accidentally.

#### Single compartment housing (Fig. 8)

Unscrew the Phillips-head screws (2) and remove the housing cover.

#### 4.2 Rotating the transmitter housing

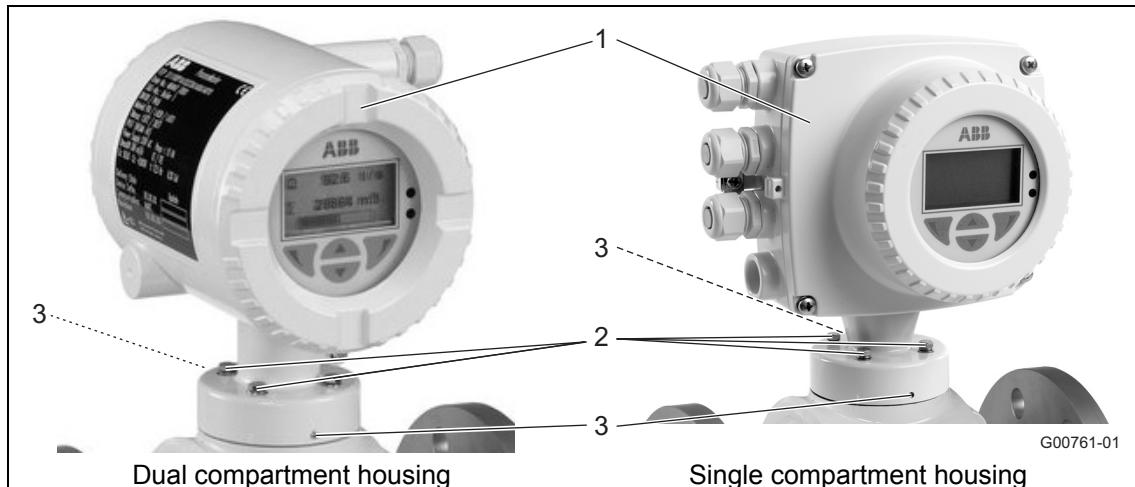


Fig. 9

1. Loosen the Allen screws (3) on the front and back sides, but do not remove entirely.
2. Loosen screws (2) and rotate the transmitter housing (1) by 90° to the left or right.
3. Retighten screws (2) and Allen screws (3).



##### DANGER - Risk of explosion!

When the screws for the transmitter housing are loosened, the explosion protection is suspended.

Tighten all screws (2, 3) for the transmitter housing prior to commissioning.

#### 4.3 Cable entries

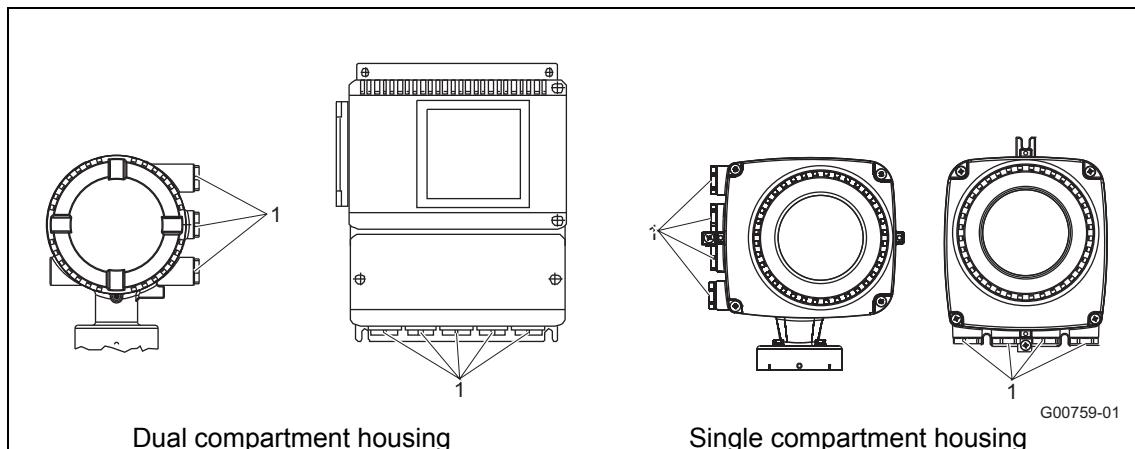


Fig. 10

The devices are delivered with 1/2" NPT or PF 1/2" threads with protective shipping plugs (1). Unused cable entries must be closed prior to commissioning using either approved threaded pipe connections or cable glands according to national regulations (NEC, CEC). Make sure that the threaded pipe connections, cable glands and possibly plugs are installed properly and sealed.

If the device is to be operated in areas with combustible dusts, a threaded pipe connection or cable gland with suitable approval must be used.

#### 4.4 High temperature version

The high temperature design allows for complete thermal insulation of the sensor, up to the maximum illustrated device height.

The pipeline and sensor must be insulated after installing the unit according to the following illustration.

The thermal resistance of the insulation must not exceed  $\lambda = 0.036 \text{ W}/(\text{mK})$ ; if it does, the thickness of the insulation must be reduced accordingly.

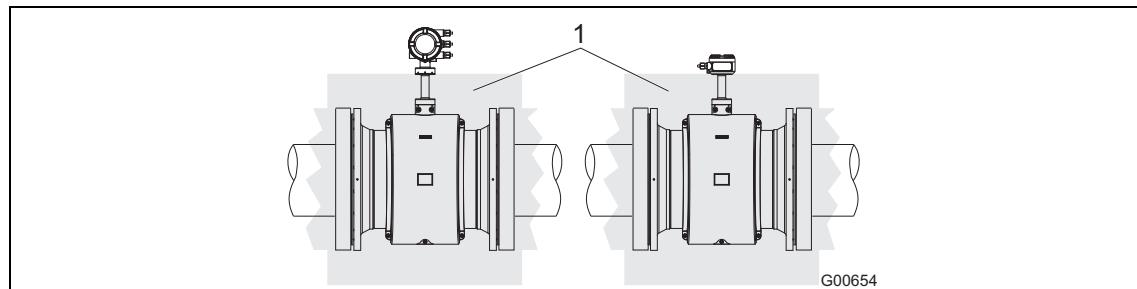


Fig. 11

1 Insulation

The surface temperature depends on the fluid temperature.

Model name	Maximum surface temperature
FEP325 / FEH325 FEP525 / FEH525	T 85 °C (185 °F) ... T <sub>medium</sub>
FEP315 / FEH315 FEP515 / FEH515	T 70 °C (158 °F) ... T <sub>medium</sub>

#### 4.5 Protection class IP 68

For installation, see the commissioning instruction.

#### 4.6 Information about using the device in areas with combustible dust

The device with dual-compartment transmitter housing is approved for use in potentially explosive areas (gas and dust).

The Ex certification is provided on the name plate.



##### DANGER - Risk of explosion!

The dust explosion protection is also provided by the housing.

Modifications to the housing are not allowed (e.g., removing or omitting parts).

##### 4.6.1 Maximum Allowable Surface Temperature

Model name	Maximum surface temperature
FEP325 / FEH325 FEP525 / FEH525	T 85 °C (185 °F) ... T <sub>medium</sub>
FEP315 / FEH315 FEP515 / FEH515	T 70 °C (158 °F) ... T <sub>medium</sub>
FET325 / FET525	T 70 °C (158 °F)

##### 4.6.2 Minimum signal cable length

In potentially explosive atmospheres, the signal cable must measure least 5 m (16.40 ft).

#### 4.7 Electrical connection

Electrical connection should be performed by following the information in the operating instructions OI/FEX300/FEX500 or the commissioning instructions CI/ FEX300/FEX500.

According to NEC standards, the separate ground connection between flowmeter sensor and transmitter can be established as follows:

1. Route the steel wire (1) in the signal cable under the clip.
2. Fit the steel wire (1) with protective tubing and wire end sleeve (2).
3. Connect to the grounding connection (3).

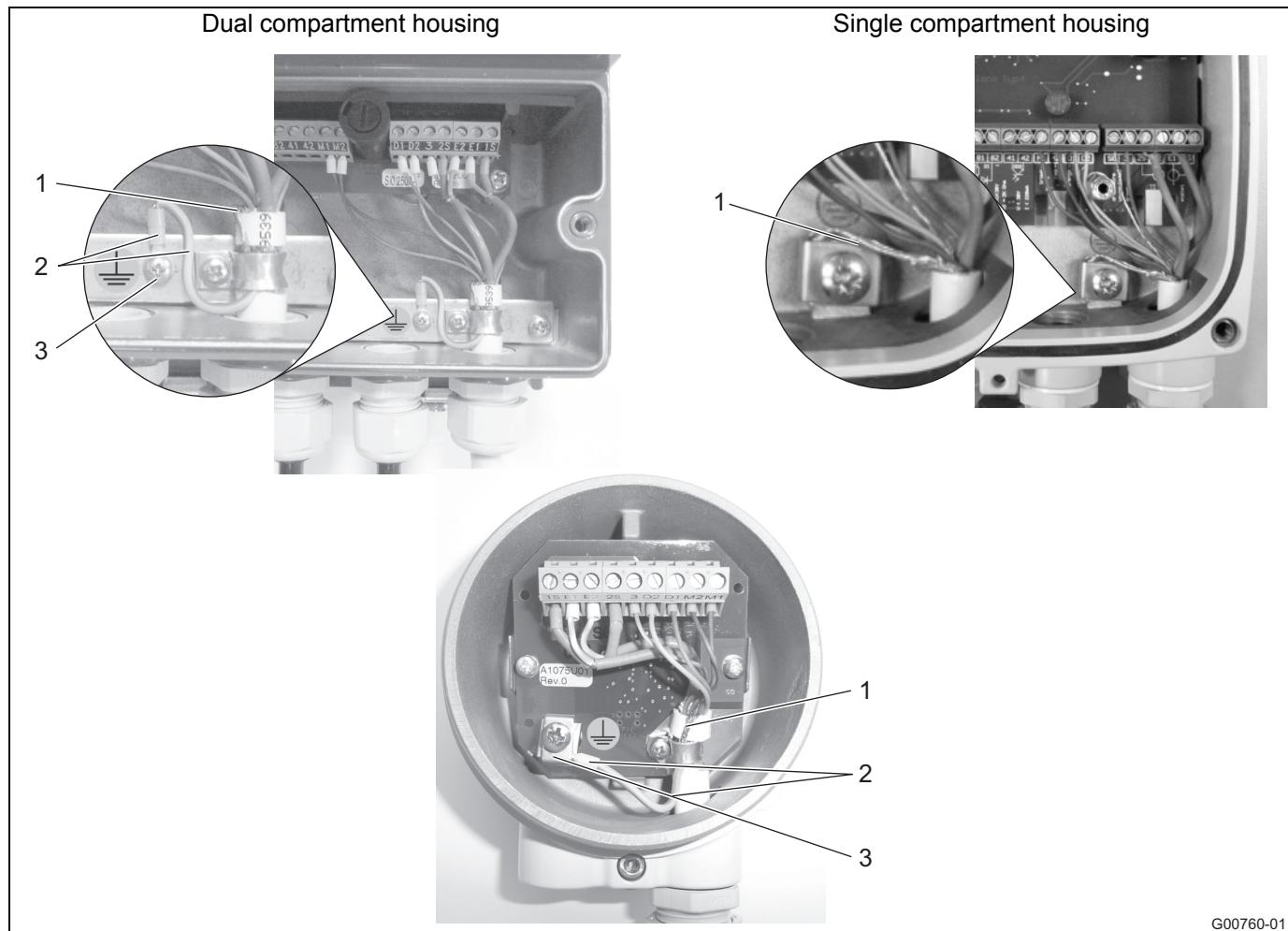


Fig. 12

#### 4.8 Process sealing (Canada)



##### **IMPORTANT (NOTE) - Devices with “Process sealing” in Canada**

If the devices are used in Canada in hazardous areas, Class II, Groups E, F and G, the maximum surface temperature must not exceed 165°C (329 °F).

All cable entries and cable outlets must be sealed at a distance of 18 inch (457.20 mm) from the device using "Conduits".

Usually, electrical supply lines to a device are laid in a pipeline system with the appropriate sealings (Conduits) to comply with the North American Standard.

This type of installation, however, involves the risk that, in the event of a measuring electrode in the flowmeter sensor becoming leaky, fluid can reach into the device and then further advance through the pipelines that contain the electrical supply cables.

In order to prevent this, the corresponding sealings (Process Seals) conforming to the requirements in acc. with ANSI/ISA 12.27.01 must be provided.

This electromagnetic flowmeter is designed as a "single seal" unit.

If the device is installed conforming to the regulations in accordance with ANSI/ISA 12.27.01, the device's operating data are limited to the following values, taking into account the limits of the corresponding lining:

##### Max. permissible operating temperature in acc. with ISA12.27.01

Lining material	Nominal diameter	Max. operating temperature in acc. with ISA12.27.01
Hard rubber	DN15 ... 400	0 °C ... 90 °C (32 °F ... 194 °F)
	DN450 ... 2000	Max. 90 °C (194 °F)
Soft rubber	DN50 ... 400	0 °C ... 60 °C (32 °F ... 140 °F)
	DN450 ... 2000	0 °C ... 60°C (140 °F)
PTFE	DN10 ... 400	-40 °C ... 170 °C (-40 °F ... 338 °F)
	DN450 ... 1000	Max. 130 °C (266 °F)
Thick PTFE	DN10 ... 400	-40 °C ... 170 °C (-40 °F ... 338 °F)
PFA	DN3 ... 200	-40 °C ... 170 °C (-40 °F ... 338 °F)
ETFE	DN25 ... 400	-40 °C ... 150 °C (-40 °F ... 302 °F)
	DN450 ... 1000	Max. 130 °C (266 °F)
Ceramic carbide	DN25 ... 400	0 °C ... 80 °C (32 °F ... 176 °F)
	DN450 ... 1000	0 °C ... 80 °C (32 °F ... 176 °F)

##### Max. permissible nominal pressure rating in acc. with ISA12.27.01

Model	Nominal diameter	Max. nominal pressure	Lining material
FEH	DN10 ... DN40	Class 150	All
	DN50 ... DN100	Class 150	All
FEP	DN10 ... DN50	Class 150	All
	DN65 ... DN400	Class 300	All
	DN65 ... DN400	Class 600	Hard rubber
	DN450 ... DN2600	Class 300	All

The operating temperature of the devices is determined by the fluid temperature and the ambient temperature.

## 5 Ex relevant specifications for operation in Div. 1

### 5.1 Electrical connection

#### 5.1.1 Flowmeter sensor and transmitter in Div. 1

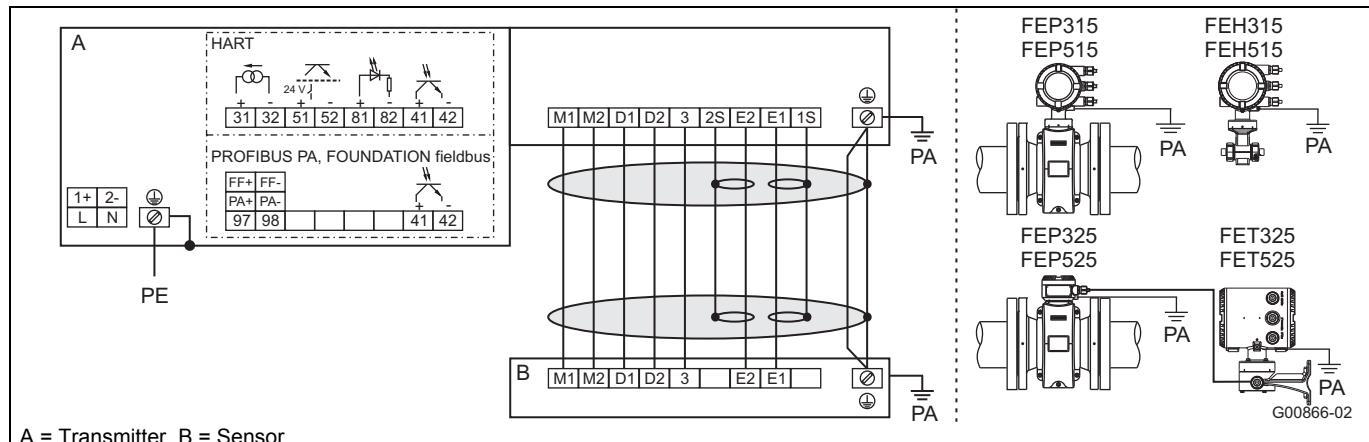


Fig. 13 HART, PROFIBUS PA and FOUNDATION fieldbus protocol

#### Power supply connections

AC power supply	
Terminal	Function / Notes
L	Live / Phase
N	Neutral
PE / ⊕	Protective earth (PE)

#### DC power supply

Terminal	Function / Notes
1+	+
2-	-
PE / ⊕	Protective earth (PE)

#### Sensor cable terminal connections

Only on remote mount design.

Terminal	Function / Notes	Wire color
M1	Magnet coil	Brown
M2	Magnet coil	Red
D1	Data line	Orange
D2	Data line	Yellow
⊕ / SE	Shield	-
E1	Signal line	Violet
1S	Schield for E1	-
E2	Signal line	Blue
2S	Schield for E2	-
3	Measurement potential	Green

#### Output connections

Terminal	Function / Notes
31 / 32	<b>Current / HART output</b> The current output is available in "active" or "passive" mode. The configuration must be specified ordering the meter, because it is not possible to change the configuration on site.
97 / 98	<b>Digital communication</b> PROFIBUS PA (PA+ / PA-) or FOUNDATION fieldbus (FF+ / FF-) in acc. with IEC 61158-2.
51 / 52	<b>Digital output DO1 passive</b> Function can be configured locally as „Pulse Output“ or „Digital Output“. Factory setting is „Pulse Output“.
81 / 82	<b>Digital input / contact input</b> Function can be configured locally as „External output switch-off“, „external totalizer reset“, „external totalizer stop“ or „other“. Only available in conjunction with current output „passive“.
41 / 42	<b>Digital output DO2 passive</b> Function can be configured locally as „Pulse Output“ or „Digital Output“. Factory setting is „Digital Output“, flow direction signaling.
PA	<b>Potential Equalization (PA)</b>

#### Note

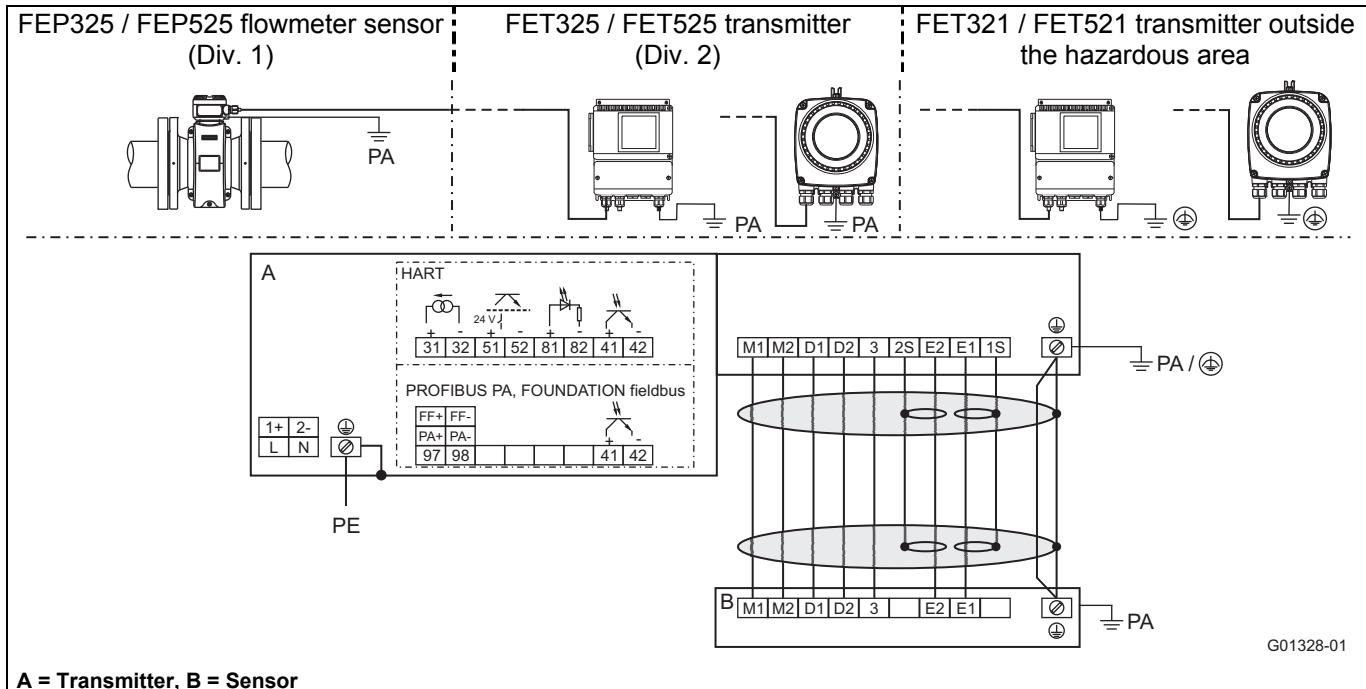
The housing for the transmitter and flowmeter sensor must be connected to the potential equalization PA. The operator must ensure that when connecting the protective conductor (PE) no potential differences can occur between protective conductor and potential equalization (PA).

FM-compliant installations must be performed in accordance with "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" (ANSI/ISA RP 12.6) and "National Electric Code®" (ANSI/NFPA 70 Sections 504 and 505).

For devices with remote mount design for use in FM / cFM Div. 1 or FM / cFM Div. 2 the signal cable between the flowmeter sensor and the transmitter must have a minimum length of 5 m (16.4 ft).

A temperature of 70 °C (158 °F) at the cable entry is assumed for the Ex calculations. Therefore, the cables used for the supply power and the signal inputs and outputs must have a minimum specification of 70 °C (158 °F).

## 5.1.2 Flowmeter sensor in Div. 1 and transmitter in Div. 2 or outside the hazardous area



### Power supply connections

AC power supply	
Terminal	Function / Notes
L	Live / Phase
N	Neutral
PE / $\ominus$	Protective earth (PE)

DC power supply	
Terminal	Function / Notes
1+	+
2-	-
PE / $\ominus$	Protective earth (PE)

### Sensor cable terminal connections

Only on remote mount design.

Terminal	Function / Notes	Wire color
M1	Magnet coil	Brown
M2	Magnet coil	Red
D1	Data line	Orange
D2	Data line	Yellow
$\oplus$ / SE	Shield	-
E1	Signal line	Violet
1S	Schield for E1	-
E2	Signal line	Blue
2S	Schield for E2	-
3	Measurement potential	Green

### Output connections

Terminal	Function / Notes
31 / 32	<b>Current / HART output</b> The current output is available in "active" or "passive" mode.
97 / 98	<b>Digital communication</b> PROFIBUS PA (PA+ / PA-) or FOUNDATION fieldbus (FF+ / FF-) in acc. with IEC 61158-2.
51 / 52	<b>Digital output DO1 active / passive</b> Function can be configured locally as „Pulse Output“ or „Digital Output“. Factory setting is „Pulse Output“.
81 / 82	<b>Digital input / contact input</b> Function can be configured locally as „External output switch-off“, „external totalizer reset“, „external totalizer stop“ or „other“.
41 / 42	<b>Digital output DO2 passive</b> Function can be configured locally as „Pulse Output“ or „Digital Output“. Factory setting is „Digital Output“, flow direction signaling.
PA	<b>Potential Equalization (PA)</b>
$\ominus$	<b>Functional ground</b> (only with transmitter outside the hazardous area)

### Note

The housing for the transmitter and flowmeter sensor must be connected to the potential equalization PA. The operator must ensure that when connecting the protective conductor (PE) no potential differences can occur between protective conductor and potential equalization (PA).

FM-compliant installations must be performed in accordance with "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" (ANSI/ISA RP 12.6) and "National Electric Code®" (ANSI/NFPA 70 Sections 504 and 505).

For devices with remote mount design for use in FM / cFM Div. 1 or FM / cFM Div. 2 the signal cable between the flowmeter sensor and the transmitter must have a minimum length of 5 m (16.4 ft).

A temperature of 70 °C (158 °F) at the cable entry is assumed for the Ex calculations. Therefore, the cables used for the supply power and the signal inputs and outputs must have a minimum specification of 70 °C (158 °F).

## 5.2 Electrical data for operation in zones 1, 21, 22 / Div. 1

### 5.2.1 Devices with HART protocol

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter. For the correct current output design (active/passive), see the marking contained in the device's terminal box.

Dependent upon the device design, an "active" or a "passive" output will be available. For devices designed for use in Ex Zone 1, the current output cannot be reconfigured locally. The configuration required for the current output (active/passive) must be specified when the order is placed.

**Model: FEP315, FEH315 / FEP515, FEH515 or FET325 / FET525**

Inputs and outputs	Operating values		Type of protection Ex i, IS					
	$U_N$ [V]	$I_N$ [mA]	$U_O$ [V]	$I_O$ [mA]	$P_O$ [mW]	$C_O$ [nF]	$C_{OPA}$ [nF]	$L_O$ [mH]
Active current / HART output ( <b>Terminals 31 / 32</b> ) Load: $250 \Omega \leq R \leq 300 \Omega$	30	30	20	100	500	210	195	6
			$U_I$ [V]	$I_I$ [mA]	$P_I$ [mW]	$C_I$ [nF]	$C_{IPA}$ [nF]	$L_I$ [mH]
			60	425 <sup>4)</sup>	2000 <sup>4)</sup>	8,4	24	0,065
Passive current / HART output ( <b>Terminals 31 / 32</b> ) Load: $250 \Omega \leq R \leq 650 \Omega$	30	30	$U_I$ [V]	$I_I$ [mA]	$P_I$ [mW]	$C_I$ [nF]	$C_{IPA}$ [nF]	$L_I$ [nH]
			60	500 <sup>4)</sup>	2000 <sup>4)</sup>	8,4	24	170
Passive digital output DO2 ( <b>Terminals 41 / 42</b> )	30	220	$U_I$ [V]	$I_I$ [mA]	$P_I$ [mW]	$C_I$ [nF]	$C_{IPA}$ [nF]	$L_I$ [nH]
			60	425 <sup>1)</sup> <sup>4)</sup> 500 <sup>2)</sup> <sup>4)</sup>	2000 <sup>4)</sup>	3,6	3,6	170
Passive digital output DO1 ( <b>Terminals 51 / 52</b> )	30	220	60	425 <sup>1)</sup> <sup>4)</sup> 500 <sup>2)</sup> <sup>4)</sup>	2000 <sup>4)</sup>	3,6	3,6	170
Passive digital input DI ( <b>Terminals 81/82</b> ) <sup>3)</sup>	30	10	60	500 <sup>4)</sup>	2000 <sup>4)</sup>	3,6	3,6	170

1) For "active" current output

2) For "passive" current output

3) Only available in conjunction with passive current output

4) Intrinsically safe single-channel or multi-channel barriers (supply isolators) with resistance characteristic must be used.

All inputs and outputs are electrically isolated from each other and from the power supply.

#### Note

The output circuits are designed in such a way that they can be connected to both intrinsically-safe and non-intrinsically-safe circuits. It is not permitted to combine intrinsically safe and non-intrinsically safe circuits. In the case of intrinsically safe circuits, potential equalization is required.

The rated voltage of the non-intrinsically safe circuits is  $U_M = 60$  V.

Provided that rated voltage  $U_M = 60$  V is not exceeded if connections are established to non-intrinsically safe external circuits, intrinsic safety is still guaranteed.

If the installation is changed from type of protection "non-intrinsically safe" to "intrinsically safe" or vice versa, the device must be checked in accordance with the instructions contained in section 7.4 "Changing the type of protection".

## 5.2.2 Devices with PROFIBUS PA or FOUNDATION fieldbus

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter. For the correct design (PROFIBUS PA or FOUNDATION fieldbus), see the marking contained in the device's terminal box.

For devices in Zone 1 / Div. 1 the bus termination must conform to the FISCO model or the explosion protection regulations, respectively.  
For devices in Zone 2 / Div. 2 the bus termination must conform to the FNICO model or the explosion protection regulations, respectively.

### Model: FEP315, FEH315 / FEP515, FEH515 or FET325 / FET525

The fieldbus and the digital output can be connected in zone 1 / Div. 1 in three different variants.

#### Variant 1: Intrinsically safe fieldbus connection in acc. with FISCO, intrinsically safe connection of the digital output

Inputs and outputs	Operating values		Type of protection Ex i, IS and FISCO					
	$U_N$ [V]	$I_N$ [mA]	$U_i$ [V]	$I_i$ [mA]	$P_i$ [mW]	$C_i$ [nF]	$C_{iPA}$ [nF]	$L_i$ [μH]
Passive digital output DO2 (terminals 41 / 42)	30	220	60	200 1)	5000 1)	3,6	3,6	0,17
Fieldbus (terminals 97 / 98)	32	30	17	380	5320	1	1	5

1) Intrinsically safe single-channel or multi-channel barriers (supply isolators) with resistance characteristic must be used.

#### Variant 2: Intrinsically safe fieldbus connection (not in acc. with FISCO!), intrinsically safe connection of the digital output

Inputs and outputs	Operating values		Type of protection Ex i, IS					
	$U_N$ [V]	$I_N$ [mA]	$U_i$ [V]	$I_i$ [mA]	$P_i$ [mW]	$C_i$ [nF]	$C_{iPA}$ [nF]	$L_i$ [μH]
Passive digital output DO2 (terminals 41 / 42)	30	220	60	200 1)	5000 1)	3,6	3,6	0,17
Fieldbus (terminals 97 / 98)	32	30	60	500	5000	1	1	5

1) Intrinsically safe single-channel or multi-channel barriers (supply isolators) with resistance characteristic must be used.

#### Variant 3: Fieldbus connection in acc. with FNICO (Zone 2, Div. 2), connection of digital output (Zone 2, Div. 2)

Inputs and outputs	Operating values		Type of protection Ex n, NI and FNICO					
	$U_N$ [V]	$I_N$ [mA]	$U_i$ [V]	$I_i$ [mA]	$P_i$ [mW]	$C_i$ [nF]	$C_{iPA}$ [nF]	$L_i$ [μH]
Passive digital output DO2 (terminals 41 / 42)	30	220	-	-	-	-	-	-
Fieldbus (terminals 97 / 98)	32	30	60	500 1)	5000 1)	1	1	5

1) Single-channel or multi-channel barriers (supply isolators) with resistance characteristic must be used.

All inputs and outputs are electrically isolated from each other and from the supply power.

#### Note

The output circuits are designed in such a way that they can be connected to both intrinsically-safe and non-intrinsically-safe circuits. It is not permitted to combine intrinsically safe and non-intrinsically safe circuits. In the case of intrinsically safe circuits, potential equalization is required.

The rated voltage of the non-intrinsically safe circuits is  $U_M = 60$  V. Provided that rated voltage  $U_M = 60$  V is not exceeded if connections are established to non-intrinsically safe external circuits, intrinsic safety is still given.

If the installation is changed from type of protection "non-intrinsically safe" to "intrinsically safe" or vice versa, the device must be checked in accordance with the instructions contained in section 7.4 "Changing the type of protection".

### 5.3 Temperature data for operation in Zone 1 / Div. 1

Model name	Surface temperature
FEP315 / FEH315 FEP515 / FEH515	70 °C (158 °F)
FEP325 / FEP525	85 °C (185 °F)
FET325 / FET525	70 °C (158 °F)

The surface temperature depends on the fluid temperature.

With increasing fluid temperature > 70 °C (158 °F) or > 85 °C (185 °F) the surface temperature also increases to the level of the fluid temperature.

#### Note

The maximum permissible fluid temperature depends on the lining and flange material, and is limited by the operating values in Table 1 and the explosion protection specifications in Tables 2 ... n.

**Table 1: Fluid temperature as a function of lining and flange material**

#### Models FEP315 / FEP325, FEP515 / FEP525

Materials		Fluid temperature (operating values)	
Lining	Flange	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F) -5 °C (23 °F) <sup>1)</sup>	90 °C (194 °F) 80 °C (176 °F) <sup>1)</sup>
Hard rubber	Stainless steel	-15 °C (5 °F) -5 °C (23 °F) <sup>1)</sup>	90 °C (194 °F) 80 °C (176 °F) <sup>1)</sup>
Soft rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)
Soft rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)
PTFE	Steel	-10 °C (14 °F)	130 °C (266 °F)
PTFE	Stainless steel	-25 °C (-13 °F)	130 °C (266 °F)
PFA	Steel	-10 °C (14 °F)	180 °C (356 °F)
PFA	Stainless steel	-25 °C (-13 °F)	180 °C (356 °F)
Thick PTFE	Steel	-10 °C (14 °F)	180 °C (356 °F)
Thick PTFE	Stainless steel	-25 °C (-13 °F)	180 °C (356 °F)
ETFE	Steel	-10 °C (14 °F)	130 °C (266 °F)
ETFE	Stainless steel	-25 °C (-13 °F)	130 °C (266 °F)

1) Only China production site

#### Models FEH315, FEH515

Lining	Process connection	Material	Fluid temperature (operating values)	
			Minimum	Maximum
PFA	Flange	Stainless steel	-25 °C (-13 °F)	180 °C (356 °F)
PFA	Wafer type	-	-25 °C (-13 °F)	130 °C (266 °F)
PFA	Variable process connection	Stainless steel	-25 °C (-13 °F)	130 °C (266 °F)

## Ex relevant specifications for operation in Div. 1



Table 2: Fluid temperature (Ex data) for ProcessMaster models FEP315, FEP515

Nominal diameter	Design	Temperature class	Ambient temperature											
			(- 40 °C) <sup>1)</sup> - 20 °C ... + 40 °C				(- 40 °C) <sup>1)</sup> - 20 °C ... + 50 °C				(- 40 °C) <sup>1)</sup> - 20 °C ... + 60 °C			
			Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated	
			Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust
DN 3 ... DN 100	NT	T1			130 °C				90 °C	30 °C	80 °C	40 °C		
	HT				180 °C				120 °C	20 °C	120 °C	20 °C		
	NT	T2			130 °C				90 °C	30 °C	80 °C	40 °C		
	HT				180 °C				120 °C	20 °C	120 °C	20 °C		
	NT	T3			130 °C				90 °C	30 °C	80 °C	40 °C		
	HT				180 °C				120 °C	20 °C	120 °C	20 °C		
	NT	T4			120 °C				90 °C	30 °C	80 °C	40 °C		
	HT				120 °C				120 °C	20 °C	120 °C	20 °C		
	NT	T5			85 °C				70 °C	30 °C	80 °C	40 °C		
	HT				85 °C				85 °C	20 °C	85 °C	20 °C		
	NT	T6			70 °C				70 °C	30 °C	70 °C	40 °C		
	HT				70 °C				70 °C	20 °C	70 °C	20 °C		
DN 125 ... DN 2000	NT	T1			130 °C				90 °C	30 °C	80 °C	40 °C		
	HT				180 °C				120 °C	20 °C	120 °C	20 °C		
	NT	T2			130 °C				90 °C	30 °C	80 °C	40 °C		
	HT				180 °C				120 °C	20 °C	120 °C	20 °C		
	NT	T3			130 °C				90 °C	30 °C	80 °C	40 °C		
	HT				180 °C				120 °C	20 °C	120 °C	20 °C		
	NT	T4			125 °C				90 °C	30 °C	80 °C	40 °C		
	HT				125 °C				120 °C	20 °C	120 °C	20 °C		
	NT	T5			90 °C				90 °C	30 °C	80 °C	40 °C		
	HT				90 °C				90 °C	20 °C	90 °C	20 °C		
	NT	T6			75 °C				75 °C	30 °C	75 °C	40 °C		
	HT				75 °C				75 °C	20 °C	75 °C	20 °C		

1) Low-temperature version (option)

NT: standard sensor design,  $T_{\text{medium}}$  maximum 130 °C (266 °F),

HT: high-temperature sensor design,  $T_{\text{medium}}$  maximum 180 °C (356 °F)

Not thermally insulated: The flowmeter sensor is not surrounded by pipe insulation material.

Thermally insulated: The flowmeter sensor is surrounded by pipe insulation material.

### Note

The standard version includes explosion protection for gases and dust. Explosion protection for dust is only available for devices featuring a transmitter in a dual-compartment housing.

- If the installation location for the device is classified as a potentially explosive area for gases and dust, the temperature data in the "Gas & dust" columns in the table must be taken into consideration.
- If the installation location for the device is classified as a potentially explosive area for gases only, the temperature data in the "Gas" column in the table must be taken into consideration.

Table 3: Fluid temperature (Ex data) for ProcessMaster models FEP325, FEP525

Nominal diameter	Design	Temperature class	Ambient temperature											
			(- 40 °C) <sup>1)</sup> - 20 °C ... + 40 °C				(- 40 °C) <sup>1)</sup> - 20 °C ... + 50 °C				(- 40 °C) <sup>1)</sup> - 20 °C ... + 60 °C			
			Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated	
			Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust
DN 3 ... DN 100	NT	T1			130 °C					110 °C	110 °C	110 °C	110 °C	
	HT				180 °C					160 °C	150 °C	160 °C	150 °C	
	NT	T2			130 °C					110 °C	110 °C	110 °C	110 °C	
	HT				180 °C					160 °C	150 °C	160 °C	150 °C	
	NT	T3			130 °C					110 °C	110 °C	110 °C	110 °C	
	HT				180 °C					160 °C	150 °C	160 °C	150 °C	
	NT	T4			120 °C					110 °C	110 °C	110 °C	110 °C	
	HT				120 °C					120 °C	120 °C	120 °C	120 °C	
	NT	T5			85 °C					85 °C	85 °C	85 °C	85 °C	
	HT				85 °C					85 °C	85 °C	85 °C	85 °C	
	NT	T6			70 °C					70 °C	70 °C	70 °C	70 °C	
	HT				70 °C					70 °C	70 °C	70 °C	70 °C	
DN 125 ... DN 2000	NT	T1			130 °C					110 °C	110 °C	110 °C	110 °C	
	HT				180 °C					160 °C	150 °C	160 °C	150 °C	
	NT	T2			130 °C					110 °C	110 °C	110 °C	110 °C	
	HT				180 °C					160 °C	150 °C	160 °C	150 °C	
	NT	T3			130 °C					110 °C	110 °C	110 °C	110 °C	
	HT				180 °C					160 °C	150 °C	160 °C	150 °C	
	NT	T4			125 °C					110 °C	110 °C	110 °C	110 °C	
	HT				125 °C					125 °C	125 °C	125 °C	125 °C	
	NT	T5			90 °C					90 °C	90 °C	90 °C	90 °C	
	HT				90 °C					90 °C	90 °C	90 °C	90 °C	
	NT	T6			75 °C					75 °C	75 °C	75 °C	75 °C	
	HT				75 °C					75 °C	75 °C	75 °C	75 °C	

1) Low-temperature version (option)

NT: standard sensor design, T<sub>medium</sub> maximum 130 °C (266 °F).HT: high-temperature sensor design, T<sub>medium</sub> maximum 180 °C (356 °F).

Not thermally insulated: The flowmeter sensor is not surrounded by pipe insulation material.

Thermally insulated: The flowmeter sensor is surrounded by pipe insulation material.

**Note**

The standard version includes explosion protection for gases and dust.

- If the installation location for the device is classified as a potentially explosive area for gases and dust, the temperature data in the "Gas & dust" columns in the table must be taken into consideration.
- If the installation location for the device is classified as a potentially explosive area for gases only, the temperature data in the "Gas" columns in the table must be taken into consideration.

## Ex relevant specifications for operation in Div. 1



Table 4: Fluid temperature (Ex data) for HygienicMaster models FEH315, FEH515

Nominal diameter	Design	Temperature class	Ambient temperature											
			(- 40 °C) <sup>1)</sup> - 20 °C ... + 40 °C				(- 40 °C) <sup>1)</sup> - 20 °C ... + 50 °C				(- 40 °C) <sup>1)</sup> - 20 °C ... + 60 °C			
			Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated	
			Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust
DN 3 ... DN 100	NT	T1	130 °C						110 °C	20 °C	80 °C	40 °C		
	HT		180 °C						120 °C	20 °C	120 °C	20 °C		
	NT	T2	130 °C						110 °C	20 °C	80 °C	40 °C		
	HT		180 °C						120 °C	20 °C	120 °C	20 °C		
	NT	T3	130 °C						110 °C	20 °C	80 °C	40 °C		
	HT		180 °C						120 °C	20 °C	120 °C	20 °C		
	NT	T4	120 °C						110 °C	20 °C	80 °C	40 °C		
	HT		120 °C						120 °C	20 °C	120 °C	20 °C		
	NT	T5	85 °C						85 °C	20 °C	80 °C	40 °C		
	HT		85 °C						85 °C	20 °C	85 °C	20 °C		
	NT	T6	70 °C						70 °C	20 °C	70 °C	40 °C		
	HT		70 °C						70 °C	20 °C	70 °C	20 °C		

1) Low-temperature version (option)

NT standard version,  $T_{medium}$  maximum 130 °C (266 °F).

HT high temperature version,  $T_{medium}$  maximum 180 °C (356 °F).

Not thermally insulated: The flowmeter sensor is not surrounded by pipe insulation material.

Thermally insulated: The flowmeter sensor is surrounded by pipe insulation material.

### Note

The standard version includes explosion protection for gases and dust. Explosion protection for dust is only available for devices featuring a transmitter in a dual-compartment housing.

- If the installation location for the device is classified as a potentially explosive area for gases and dust, the temperature data in the "Gas & dust" columns in the table must be taken into consideration.
- If the installation location for the device is classified as a potentially explosive area for gases only, the temperature data in the "Gas" column in the table must be taken into consideration.

## 6 Ex relevant specifications for operation in Div. 2

### 6.1 Electrical connection

#### 6.1.1 Flowmeter sensor and transmitter in Div. 2, or transmitter outside the hazardous area

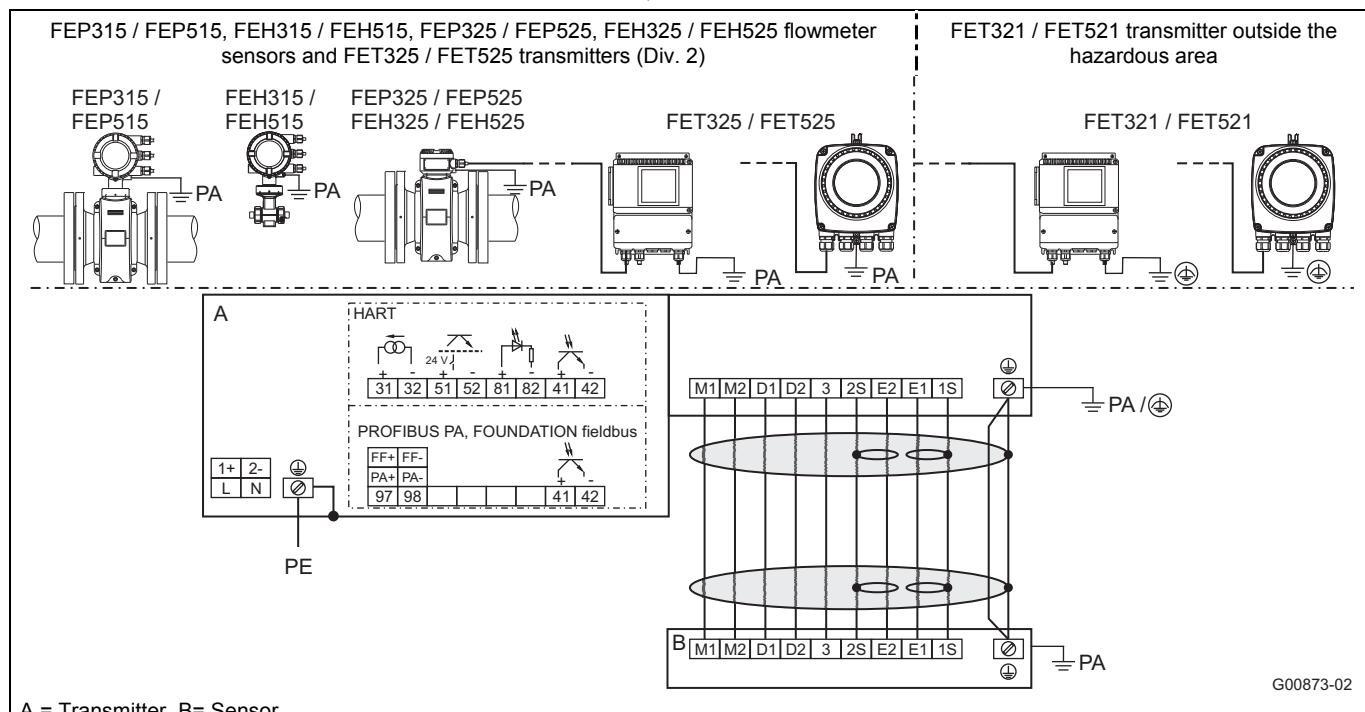


Fig. 15: HART, PROFIBUS PA and FOUNDATION fieldbus protocol

#### Power supply connections

AC power supply	
Terminal	Function / Notes
L	Live / Phase
N	Neutral
PE / $\ominus$	Protective earth (PE)

#### DC power supply

Terminal	Function / Notes
1+	+
2-	-
PE / $\ominus$	Protective earth (PE)

#### Sensor cable terminal connections

Only on remote mount design.

Terminal	Function / Notes	Wire color
M1	Magnet coil	Brown
M2	Magnet coil	Red
D1	Data line	Orange
D2	Data line	Yellow
$\oplus$ / SE	Shield	-
E1	Signal line	Violet
1S	Schield for E1	-
E2	Signal line	Blue
2S	Schield for E2	-
3	Measurement potential	Green

#### Note

The housing for the transmitter and flowmeter sensor must be connected to the potential equalization PA. The operator must ensure that when connecting the protective conductor (PE) no potential differences can occur between protective conductor and potential equalization (PA).

FM-compliant installations must be performed in accordance with "Installation of Intrinsically Safe Systems for Hazardous (Classified)

#### Output connections

Terminal	Function / Notes
31 / 32	<b>Current / HART output</b> The current output is available in "active" or "passive" mode.
97 / 98	<b>Digital communication</b> PROFIBUS PA (PA+ / PA-) or FOUNDATION fieldbus (FF+ / FF-) in acc. with IEC 61158-2.
51 / 52	<b>Digital output DO1 active / passive</b> Function can be configured locally as „Pulse Output“ or „Digital Output“. Factory setting is „Pulse Output“.
81 / 82	<b>Digital input / contact input</b> Function can be configured locally as „External output switch-off“, „external totalizer reset“, „external totalizer stop“ or „other“.
41 / 42	<b>Digital output DO2 passive</b> Function can be configured locally as „Pulse Output“ or „Digital Output“. Factory setting is „Digital Output“, flow direction signaling.
PA	<b>Potential Equalization (PA)</b>
$\ominus$	<b>Functional ground</b> (only for transmitter outside the hazardous area)

Locations" (ANSI/ISA RP 12.6) and "National Electric Code®" (ANSI/NFPA 70 Sections 504 and 505).

For devices with remote mount design for use in FM / cFM Div. 1 or FM / cFM Div. 2 the signal cable between the flowmeter sensor and the transmitter must have a minimum length of 5 m (16.4 ft).

A temperature of 70 °C (158 °F) at the cable entry is assumed for the Ex calculations. Therefore, the cables used for the supply power and the signal inputs and outputs must have a minimum specification of 70 °C (158 °F).

## Ex relevant specifications for operation in Div. 2



### 6.2 Electrical data for operation in zones 2, 21, 22 / Div. 2

#### 6.2.1 Devices with HART protocol

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter. For the correct current output design (active/passive), see the marking contained in the device's terminal box.

**Model: FEP315, FEH315 / FEP515, FEH515 or FET325 / FET525**

Signal inputs and outputs	Operating values		Type of protection Ex n/NI	
	U <sub>i</sub> [V]	I <sub>i</sub> [mA]	U <sub>i</sub> [V]	I <sub>i</sub> [mA]
Current / HARToutput, active/passive (terminals 31/32) Load: 250 Ω ≤ R ≤ 650 Ω	30	30	30	30
Digital output DO1, active/passive (terminals 51/52)	30	220	30	220
Digital output DO2, passive (terminals 41/42)	30	220	30	220
Digital input DI (terminals 81/82)	30	10	30	10

All inputs and outputs are electrically isolated from each other and from the supply power.

#### 6.2.2 Devices with PROFIBUS PA or FOUNDATION fieldbus

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter. For the correct design (PROFIBUS PA or FOUNDATION fieldbus), see the marking contained in the device's terminal box.

For devices in Zone 2 / Div. 2 the bus termination must conform to the FNICO model or the explosion protection regulations, respectively.

**Model: FEP315, FEH315 / FEP515, FEH515 or FET325 / FET525**

Inputs and outputs	Operating values		Type of protection Ex n, NI and FNICO					
	U <sub>N</sub> [V]	I <sub>N</sub> [mA]	U <sub>i</sub> [V]	I <sub>i</sub> [mA]	P <sub>i</sub> [mW]	C <sub>i</sub> [nF]	C <sub>IPA</sub> [nF]	L <sub>i</sub> [μH]
Digital output DO2, passive (terminals 41/42)	30	220	-	-	-	-	-	-
Fieldbus (terminals 97/98)	32	30	32	500 1)	7000 1)	1	1	5

1) Single-channel or multi-channel barriers (supply isolators) with resistance characteristic must be used.

### 6.3 Temperature data for operation in Zone 2 / Div. 2

Model name	Surface temperature
FEP315 / FEH315 FEP515 / FEH515	70 °C (158 °F)
FEP325 / FEH325 FEP525 / FEH525	85 °C (185 °F)
FET325 / FET525	70 °C (158 °F)

The surface temperature depends on the fluid temperature.

With increasing fluid temperature > 70 °C (> 158 °F) or > 85 °C (> 185 °F) the surface temperature also increases to the level of the fluid temperature.

#### Note

The maximum permissible fluid temperature depends on the lining and flange material, and is limited by the operating values in Table 1 and the explosion protection specifications in Tables 2 ... n.

**Table 1: Fluid temperature as a function of lining and flange material**
**Models FEP315 / FEP325, FEP515 / FEP525**

Materials		Fluid temperature (operating values)	
Lining	Flange	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F) -5 °C (23 °F) <sup>1)</sup>	90 °C (194 °F) 80 °C (176 °F) <sup>1)</sup>
Hard rubber	Stainless steel	-15 °C (5 °F) -5 °C (23 °F) <sup>1)</sup>	90 °C (194 °F) 80 °C (176 °F) <sup>1)</sup>
Soft rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)
Soft rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)
PTFE	Steel	-10 °C (14 °F)	130 °C (266 °F)
PTFE	Stainless steel	-25 °C (-13 °F)	130 °C (266 °F)
PFA	Steel	-10 °C (14 °F)	180 °C (356 °F)
PFA	Stainless steel	-25 °C (-13 °F)	180 °C (356 °F)
Thick PTFE	Steel	-10 °C (14 °F)	180 °C (356 °F)
Thick PTFE	Stainless steel	-25 °C (-13 °F)	180 °C (356 °F)
ETFE	Steel	-10 °C (14 °F)	130 °C (266 °F)
ETFE	Stainless steel	-25 °C (-13 °F)	130 °C (266 °F)

1) Only China production site

**Models FEH315 / FEH325, FEH515 / FEH525**

Lining	Process connection	Material	Fluid temperature (operating values)	
			Minimum	Maximum
PFA	Flange	Stainless steel	-25 °C (-13 °F)	180 °C (356 °F)
PFA	Wafer type	-	-25 °C (-13 °F)	130 °C (266 °F)
PFA	Variable process connection	Stainless steel	-25 °C (-13 °F)	130 °C (266 °F)

## Ex relevant specifications for operation in Div. 2



Table 2: Fluid temperature (Ex data) for ProcessMaster models FEP315, FEP515 and HygienicMaster models FEH315, FEH515

Nominal diameter	Design	Temperature class	Ambient temperature											
			- 20 °C ... + 40 °C				- 20 °C ... + 50 °C				- 20 °C ... + 60 °C			
			- 40 °C ... + 40 °C <sup>1)</sup>				- 40 °C ... + 50 °C <sup>1)</sup>				- 40 °C ... + 60 °C <sup>1)</sup>			
			Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated	
			Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust
ProcessMaster DN 3 ... DN 2000	NT	T1	130 °C	130 °C	---	---	130 °C	100 °C <sup>2)</sup> 110 °C <sup>3)</sup>	---	---	80 °C	40 °C	---	---
	HT		180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	40 °C	180 °C	40 °C	40 °C
HygienicMaster DN 3 ... DN 100	NT	T2	130 °C	130 °C	---	---	130 °C	100 °C <sup>2)</sup> 110 °C <sup>3)</sup>	---	---	80 °C	40 °C	---	---
	HT		180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	40 °C	180 °C	40 °C	40 °C
NT	T3	130 °C	130 °C	---	---	130 °C	100 °C <sup>2)</sup> 110 °C <sup>3)</sup>	---	---	80 °C	40 °C	---	---	---
		180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	40 °C	180 °C	40 °C	40 °C
NT	T4	130 °C	130 °C	---	---	130 °C	100 °C <sup>2)</sup> 110 °C <sup>3)</sup>	---	---	80 °C	40 °C	---	---	---
		130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	40 °C	130 °C	40 °C	40 °C

1) Low-temperature version (option)

2) Temperature values for ProcessMaster

3) Temperature values for HygienicMaster

NT: standard sensor design, T<sub>medium</sub> maximum 130 °C (266 °F)

HT: high-temperature sensor design, T<sub>medium</sub> maximum 180 °C (356 °F)

Not thermally insulated: The flowmeter sensor is not surrounded by pipe insulation material.

Thermally insulated: The flowmeter sensor is surrounded by pipe insulation material.

### Note

The standard version includes explosion protection for gases and dust. Explosion protection for dust is only available for devices featuring a transmitter in a dual-compartment housing.

- If the installation location for the device is classified as a potentially explosive area for gases and dust, the temperature data in the "Gas & dust" columns in the table must be taken into consideration.
- If the installation location for the device is classified as a potentially explosive area for gases only, the temperature data in the "Gas" column in the table must be taken into consideration.

**Table 3: Fluid temperature (Ex data) for ProcessMaster models FEP325, FEP525 and HygienicMaster models FEH325, FEH525**

Nominal diameter	Design	Temperature class	Ambient temperature											
			- 20 °C ... + 40 °C				- 20 °C ... + 50 °C				- 20 °C ... + 60 °C			
			- 40 °C ... + 40 °C <sup>1)</sup>				- 40 °C ... + 50 °C <sup>1)</sup>				- 40 °C ... + 60 °C <sup>1)</sup>			
			Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated	
			Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust
ProcessMaster DN 3 ... DN 2000	NT	T1	130 °C	130 °C	---	---	130 °C	130 °C	---	---	110 °C <sup>2)</sup> 120 °C <sup>3)</sup>	110 °C	---	---
			180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C
	HT	T2	130 °C	130 °C	---	---	130 °C	130 °C	---	---	110 °C <sup>2)</sup> 120 °C <sup>3)</sup>	110 °C	---	---
			180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C
	NT	T3	130 °C	130 °C	---	---	130 °C	130 °C	---	---	110 °C <sup>2)</sup> 120 °C <sup>3)</sup>	110 °C	---	---
			180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C
	NT	T4	130 °C	130 °C	---	---	130 °C	130 °C	---	---	110 °C <sup>2)</sup> 120 °C <sup>3)</sup>	110 °C	---	---
			130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C
	NT	T5	95 °C	95 °C	---	---	95 °C	95 °C	---	---	95 °C	95 °C	---	---
			95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C
	NT	T6	80 °C	80 °C	---	---	80 °C	80 °C	---	---	80 °C	80 °C	---	---
			80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C
HygienicMaster DN 3 ... DN 100	HT	T6	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C

1) Low-temperature version (option)

2) Temperature values for ProcessMaster

3) Temperature values for HygienicMaster

 NT: standard sensor design,  $T_{medium}$  maximum 130 °C (266 °F)

 HT: high-temperature sensor design,  $T_{medium}$  maximum 180 °C (356 °F)

Not thermally insulated: The flowmeter sensor is not surrounded by pipe insulation material.

Thermally insulated: The flowmeter sensor is surrounded by pipe insulation material.

#### Note

The standard version includes explosion protection for gases and dust.

- If the installation location for the device is classified as a potentially explosive area for gases and dust, the temperature data in the "Gas & dust" columns in the table must be taken into consideration.
- If the installation location for the device is classified as a potentially explosive area for gases only, the temperature data in the "Gas" columns in the table must be taken into consideration.

## 7 Commissioning

### 7.1 Preliminary checks prior to start-up

The following points must be checked before commissioning:

- The supply power must be switched off.
- The supply power must match information on the name plate.
- The pin assignment must correspond to the connection diagram.
- Sensor and transmitter must be grounded properly.
- The temperature limits must be observed.
- The sensor must be installed at a largely vibration-free location.
- The housing cover and its safety locking device must be sealed before switching on the supply power.
- For devices with remote mount design and an accuracy of 0.2 % of rate make sure that the flowmeter sensor and the transmitter match correctly.  
For this purpose, the final characters X1, X2, etc. are printed on the name plates of the flowmeter sensors, whereas the transmitters are identified by the final characters Y1, Y2, etc.  
Devices with the end characters X1 / Y1 or X2 / Y2, etc. fit with each other.
- Unused cable entries must be closed prior to commissioning using either approved threaded pipe connections or cable glands according to national guidelines (NEC, CEC).

### 7.2 Notes on combining the FEP325 flowmeter sensor with the FET325 transmitter or the FEP525 flowmeter sensor with the FET525 transmitter

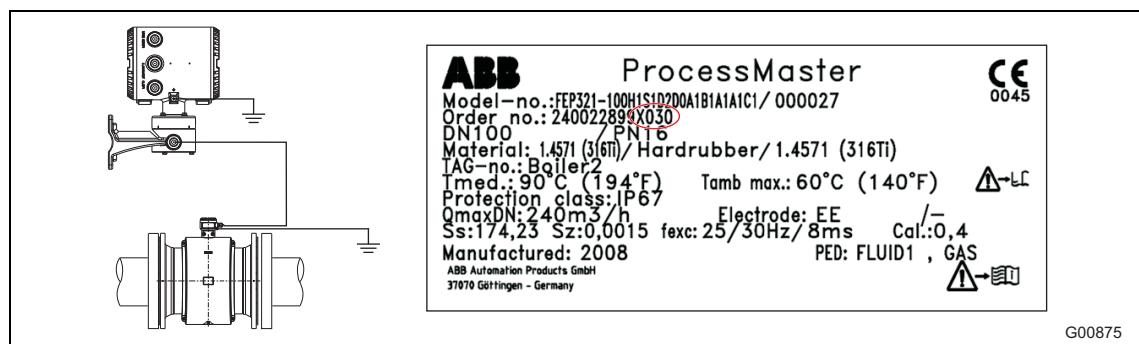


Fig. 16:

When combining the FEP325 flowmeter sensor with the FET325 transmitter, you must ensure that the flowmeter sensor is assigned to the transmitter correctly.

The same is valid for combining the FEP525 flowmeter sensor with the FET525 transmitter.

The flowmeter sensor is identified by means of the suffix (X01, X02, etc.) that forms part of the order number on the name plate.

The associated transmitter is identified by means of the suffix (Y01, Y02, etc.) that forms part of the order number on the name plate.

## 7.3 Special features of the device design for operation in Div. 1

### 7.3.1 Configuring the current output

On the device design for operation in Div. 1, the configuration of the current output cannot be changed once set.

The configuration required for the current output (active/passive) must be specified when the order is placed.

For the correct current output design (active/passive), see the marking contained in the device's terminal box.

### 7.3.2 Configuration of the digital outputs

On the device design for operation in Div. 1, the digital outputs DO1 (51/52) and DO2 (41/42) can be configured for connection to a NAMUR switching amplifier. On leaving the factory, the device is configured with the standard wiring (non-NAMUR).

Devices with PROFIBUS PA or FOUNDATION Fieldbus only have the digital output DO2 (41 / 52).



#### IMPORTANT (NOTE)

The outputs' type of protection remains unaffected by this. The devices connected to these outputs must conform to the applicable regulations for explosion protection.

The jumpers are located on the backplane in the transmitter housing.

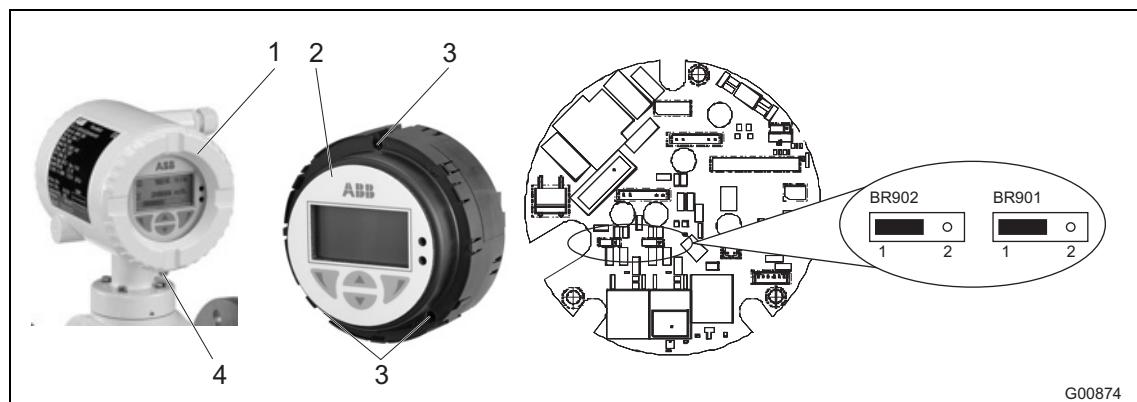


Fig. 17:

BR902 for digital output DO1	BR901 for digital output DO2
BR902 in position 1: Standard (non-NAMUR) BR902 in position 2: NAMUR	BR901 in position 1: Standard (non-NAMUR) BR901 in position 2: NAMUR

Configure the digital outputs as described:

1. Switch off the supply power and wait at least 20 minutes before the next step.
2. Open the cover safety device (4) and housing cover (1).
3. Loosen screws (3) and pull out transmitter plug-in (2).
4. Insert the jumpers in the required positions.
5. Put the transmitter plug-in (2) back into the housing and retighten the screws (3).
6. Close the housing cover (1) and lock the cover by unscrewing the screw (4).

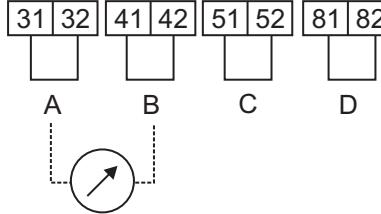
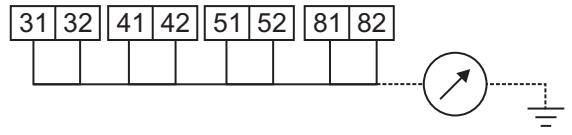
#### 7.4 Changing the type of protection

Models FEP315 / FEP515, FEH315 / FEH515, FEP325 / FEP525, FET325 / FET525 can provide various types of protection during operation:

- When connected to an intrinsically safe circuit in Div. 1, operated as an intrinsically safe device
- When connected to a non-intrinsically safe circuit in Div. 1, operated as a device with a flameproof enclosure
- When connected to a non-intrinsically safe circuit in Div. 2, operated as a non-sparking device

If a device which is already operational is required to provide a different type of protection, the following measures must be implemented/insulation checks must be performed in accordance with FM3600-ff.

A subsequent change of the type of protection is the sole responsibility of the operator.

No.	1. Type of protection	2. Type of protection	Required step/check
1	Div. 1: Device with flameproof enclosure, non-intrinsically-safe circuit	Div. 1: Intrinsically safe circuits	<ul style="list-style-type: none"> <li>• Switch off supply power. Use 500 VAC or 710 VDC to take the following measurements for one minute: Jumper terminals 31/32, 41/42, 51/52, 81/82. Then measure all jumpers (A,B,C,D) against one another.</li> </ul>  <p>G00884</p>
		Div. 2: Non-sparking	<ul style="list-style-type: none"> <li>• Switch off supply power. Use 500 VAC or 710 VDC to take the following measurements for one minute: Jumper terminals 31/32, 41/42, 51/52, 81/82. Then measure against the housing.</li> </ul>  <p>G00885</p>
		Div. 2: Non-sparking	<ul style="list-style-type: none"> <li>• Visual inspection</li> <li>• Special precautions/checks are not necessary.</li> </ul>
2	Div. 1: Intrinsically safe circuits	Div. 1: Device with flameproof enclosure, non-intrinsically-safe circuit	<ul style="list-style-type: none"> <li>• Visual inspection (no damage to the threads of the cover or the cable fittings)</li> </ul>
		Zone 2: Non-sparking	<ul style="list-style-type: none"> <li>• Special precautions/checks are not necessary.</li> </ul>
3	Div. 2: Non-sparking	Div. 1: Intrinsically safe circuits	<ul style="list-style-type: none"> <li>• Perform the checks described under No. 1.</li> </ul>
		Div. 1: Device with flameproof enclosure, non-intrinsically-safe circuit	<ul style="list-style-type: none"> <li>• Visual inspection (no damage to the threads of the cover or the cable fittings)</li> </ul>

## 8 Maintenance

### 8.1 General information

Repair and maintenance activities may only be performed by authorized customer service personnel.

When replacing or repairing individual components, original spare parts must be used.



#### DANGER - Risk of explosion!

When the housing cover is open, the explosion protection is suspended.

Before opening the housing switch off the power to all connection lines and wait at least 20 minutes.



#### WARNING – Electrical voltage risk!

When the housing is open, EMC protection is impaired and protection against contact is suspended.

Before opening the housing, switch off power to all connecting cables for the device.



#### NOTICE - Potential damage to parts

The electronic components of the printed circuit board can be damaged by static electricity (observe ESD guidelines).

Make sure that the static electricity in your body is discharged before touching electronic components.



#### IMPORTANT (NOTE)

Users must also observe the information in the operating and commissioning instruction for the device.

## 8.2 Replacing the transmitter or sensor



### IMPORTANT (NOTE)

- When replacing the transmitter or flowmeter sensor make sure that they are assigned correctly. It is not possible to operate a flowmeter sensor of the 300 series with a transmitter of the 500 series. The series (e.g., ProcessMaster 300 or ProcessMaster 500) is shown on the name plate of the transmitter or flowmeter sensor.
- After replacing the transmitter, the system data must be reimported according to information in the operating instruction (see the chapter "Downloading the system data").

### 8.2.1 Transmitter

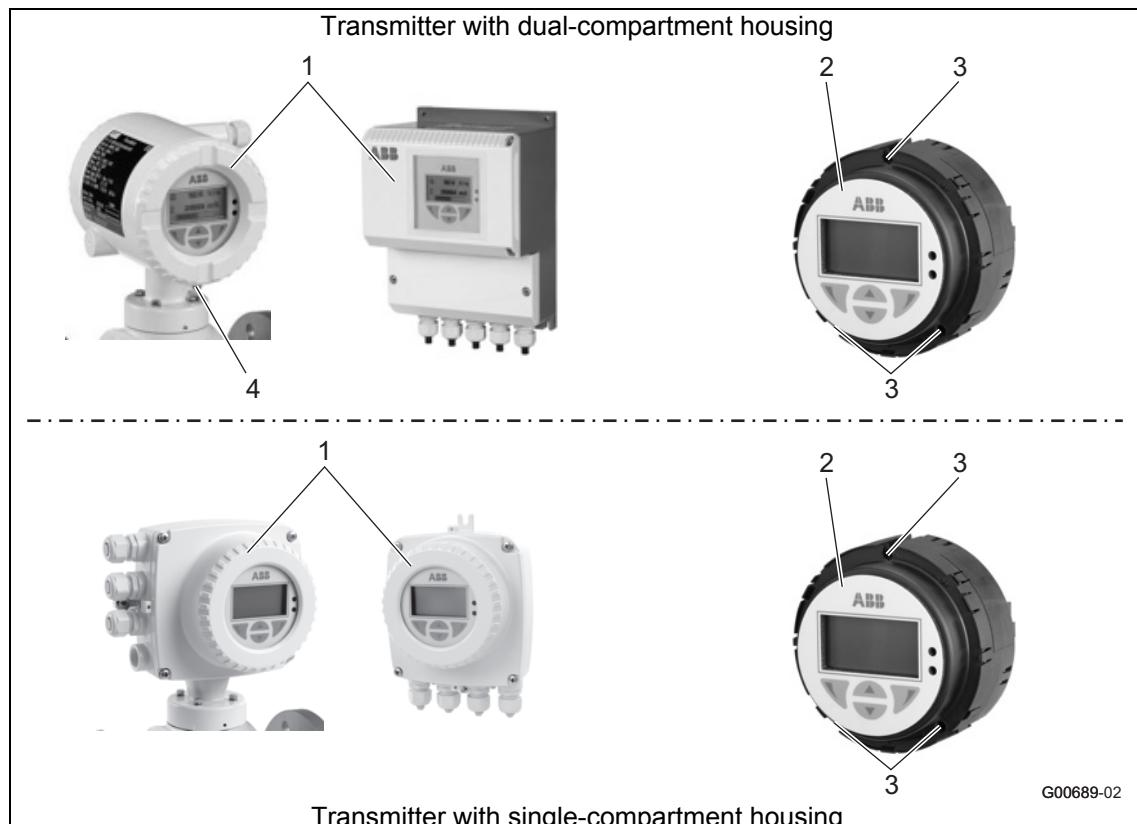
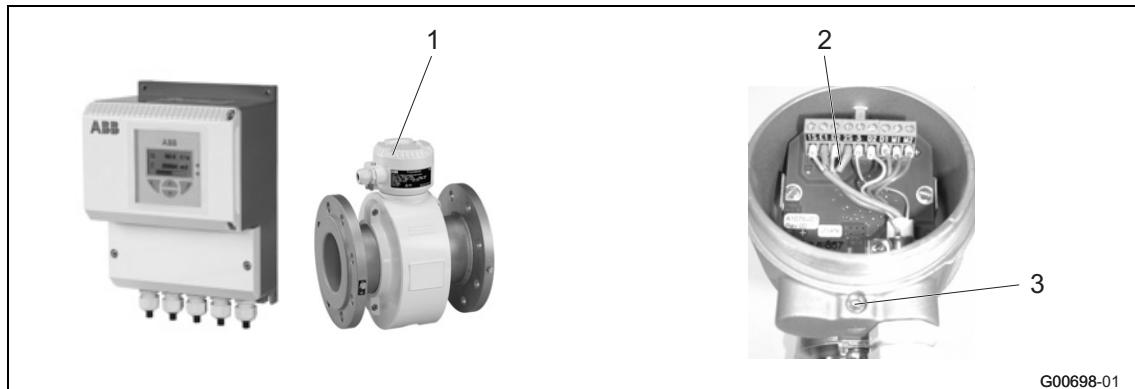


Fig. 18

Replace the transmitter plug-in as follows:

1. Switch off the supply power and wait at least 20 minutes before the next step.
2. Release the cover safety device (4) and housing cover (1).
3. Loosen screws (3) and pull out transmitter plug-in (2).
4. Replace transmitter plug-in and retighten screws (3).
5. Close the housing cover (1) and lock the cover by unscrewing the screw (4).

## 8.2.2 Flowmeter sensor



G00698-01

Fig. 19

Replace the flowmeter sensor as follows:

1. Switch off the supply power and wait at least 20 minutes before the next step.
2. Open the cover safety device (4) and housing cover (1).
3. Disconnect the signal cable (if necessary, remove the sealing compound).
4. Install the new sensor according to the installation instructions.
5. Complete the electrical connection according to the connection diagram.
6. Close the housing cover (1) and lock the cover by unscrewing the screw (3).

## 9 Appendix

### 9.1 Approvals and certifications

CE mark		The version of the meter in your possession meets the requirements of the following European directives: <ul style="list-style-type: none"><li>- EMC directive 2014/30/EU</li><li>- Low voltage directive 2014/35/EU</li><li>- RoHS Directive 2011/65/EU</li><li>- Pressure equipment directive (PED) 2014/68/EU</li><li>- ATEX directive 2014/34/EU</li></ul>
Explosion Protection	     	Identification for intended use in potentially explosive atmospheres according to: <ul style="list-style-type: none"><li>- ATEX directive (marking in addition to CE marking)</li><li>- IEC standards</li><li>- FM Approvals (US)</li><li>- cFM Approvals (Canada)</li><li>- NEPSI (China)</li><li>- GOST</li></ul>

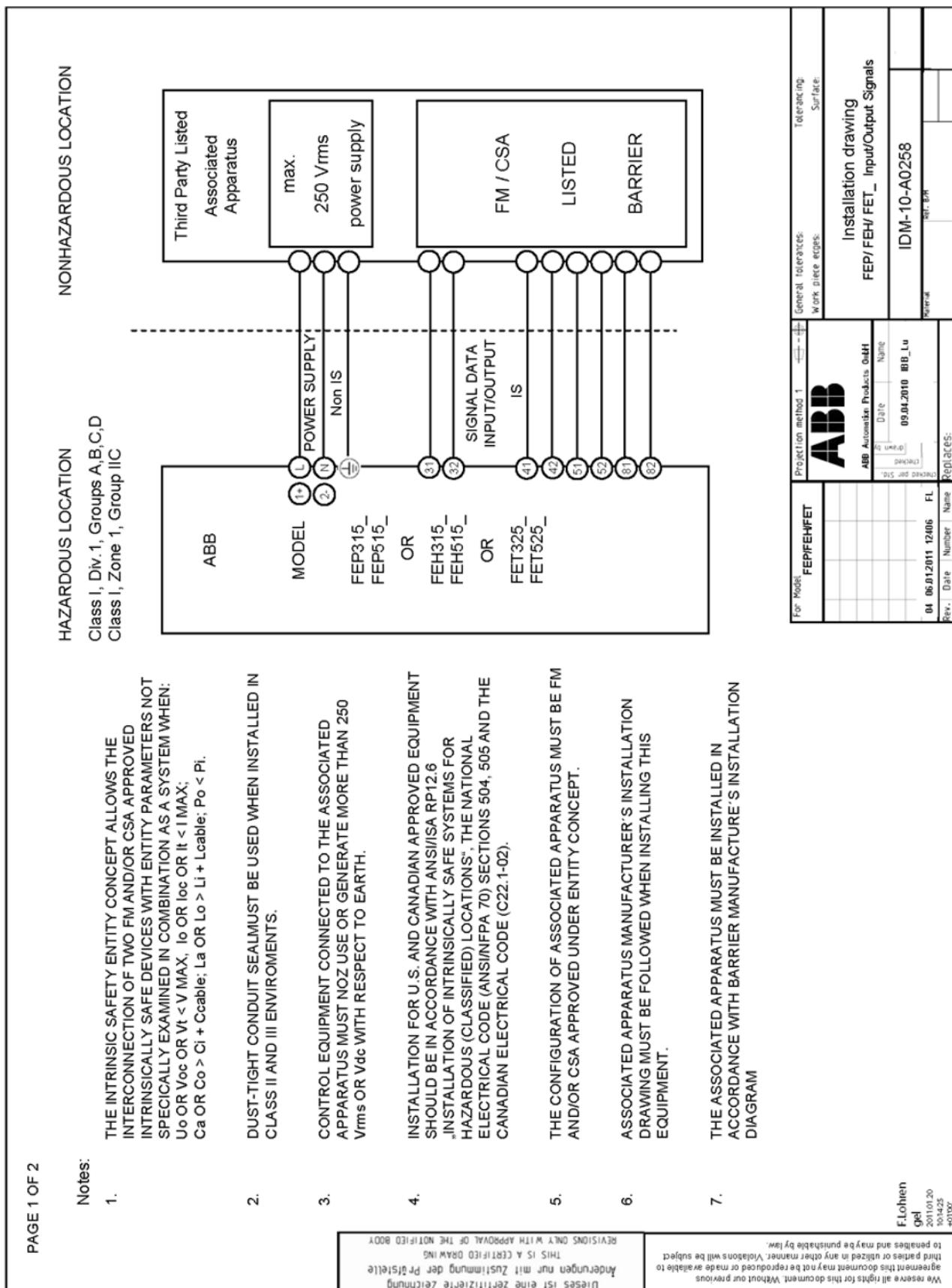


#### IMPORTANT (NOTE)

All documentation, declarations of conformity and certificates are available in ABB's download area.

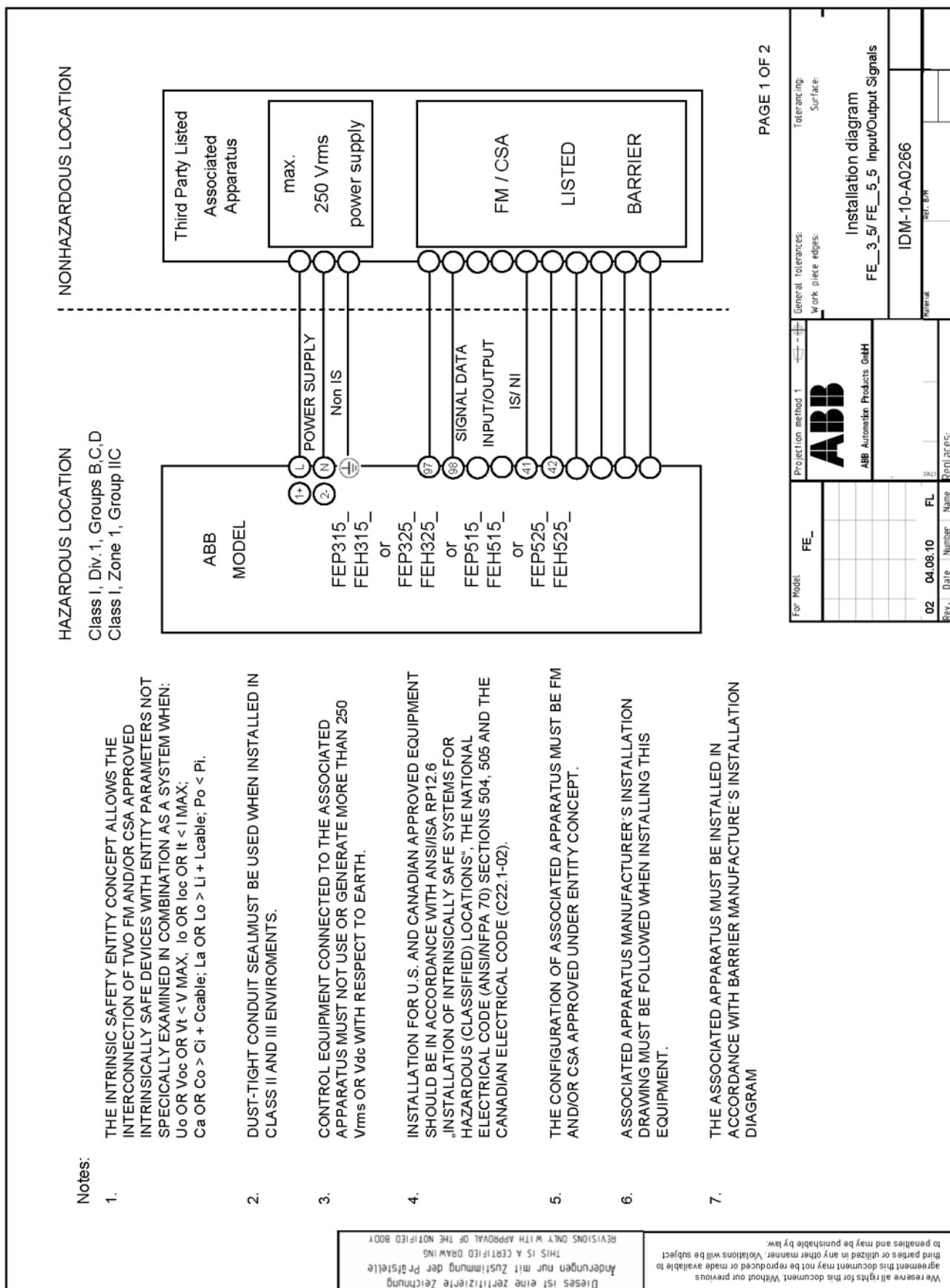
[www.abb.com/flow](http://www.abb.com/flow)

## **9.2 Installation drawing HART IDM-10-A0258**



PAGE 2 OF 2

### 9.3 Installation drawing PROFIBUS PA / FOUNDATION Fieldbus IDM-10-A0266



## Appendix



FEP_15...(M.P) FEH_15...(M.P) FET_25...(M.P)		Ex i / IS and FISCO				Ex n / NI and FNICO				Ex n / NI and FISCO				Ex n / NI and FNICO								
Profibus PA and Foundation Fieldbus FF		$U_i$ [V]	$I_h$ [mA]	$P_i$ [mW]	$C_i$ [nF]	$C_{IP^A}$ [nF]	$U_i$ [V]	$I_h$ [mA]	$P_i$ [mW]	$C_i$ [nF]	$C_{IP^A}$ [nF]	$U_i$ [V]	$I_h$ [mA]	$P_i$ [mW]	$C_i$ [nF]	$C_{IP^A}$ [nF]	$U_i$ [V]	$I_h$ [mA]	$P_i$ [mW]	$C_i$ [nF]	$C_{IP^A}$ [nF]	$L_i$ [μH]
Field- bus	Terminal 97/98 passive	-	-	-	-	-	-	-	32	500*	7000*	1	1	5	-	-	-	-	-	-		
Note: * Dual or single channel intrinsically safe barrier with resistive outputs																						
FEP_15...(M.P) FEH_15...(M.P) FET_25...(M.P)		$U_u$ [V]	$I_h$ [A]	$U_h$ [V]	$I_h$ [mA]	$U_i$ [V]	$I_h$ [mA]	$P_i$ [mW]	$C_i$ [nF]	$C_{IP^A}$ [nF]	$L_i$ [μH]	$U_u$ [V]	$I_h$ [A]	$U_h$ [V]	$I_h$ [mA]	$U_i$ [V]	$I_h$ [mA]	$P_i$ [mW]	$C_i$ [nF]	$C_{IP^A}$ [nF]	$L_i$ [μH]	
Field- bus	Terminal 97/98 passive	-	-	-	-	-	-	-	32	500	30	-	-	-	-	-	-	-	-	-	-	
Note: * Dual or single channel intrinsically safe barrier with resistive outputs																						
Profibus PA and Foundation Fieldbus FF		$U_u$ [V]	$I_h$ [A]	$U_h$ [V]	$I_h$ [mA]	$U_i$ [V]	$I_h$ [mA]	$P_i$ [mW]	$C_i$ [nF]	$C_{IP^A}$ [nF]	$L_i$ [μH]	$U_u$ [V]	$I_h$ [A]	$U_h$ [V]	$I_h$ [mA]	$U_i$ [V]	$I_h$ [mA]	$P_i$ [mW]	$C_i$ [nF]	$C_{IP^A}$ [nF]	$L_i$ [μH]	
Field- bus	Terminal 97/98 passive	-	-	-	-	-	-	-	32	500	32	-	-	-	-	-	-	-	-	-	-	
Note: * Dual or single channel intrinsically safe barrier with resistive outputs																						
Pulse Output A		$U_u$ [V]	$I_h$ [A]	$U_h$ [V]	$I_h$ [mA]	$U_i$ [V]	$I_h$ [mA]	$P_i$ [mW]	$C_i$ [nF]	$C_{IP^A}$ [nF]	$L_i$ [μH]	$U_u$ [V]	$I_h$ [A]	$U_h$ [V]	$I_h$ [mA]	$U_i$ [V]	$I_h$ [mA]	$P_i$ [mW]	$C_i$ [nF]	$C_{IP^A}$ [nF]	$L_i$ [μH]	
Terminal 41/42	-	-	30	220	30	220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

We reserve all rights for this document. Without our previous  
agreement no part of this document may be reproduced or made available  
to third parties or utilized in any other manner. Violations will be subject to  
lawsuit and may be pursued by law.  
THIS IS A CERTIFIED DRAWING OF THE NOTIFIED BODY  
REVISIONS ONLY WITH APPROVAL OF THE NOTIFIED BODY

Technical  
Surf. rate:

Work plate edges:

For Model	FE_	Projection method 1	General tolerances:	Technical drawing
				Surf. rate:
				Work plate edges:
				FE_3_5 / FE_5_5 Input/Output Signals

FE_10-A0266	IDM-10-A0266
Rev. Date	Number Name Replaces:



---

ABB has Sales & Customer Support expertise in over 100 countries worldwide.

[www.abb.com/flow](http://www.abb.com/flow)

The Company's policy is one of continuous product improvement and the right is reserved to modify the information contained herein without notice.

Printed in the Fed. Rep. of Germany (08.2017)

© ABB 2017

3KXF231301R4801

SM/FEX300/FEX500/FMC/CSA-EN Rev. E



**ABB Limited**  
**Measurement & Analytics**  
Howard Road, St. Neots  
Cambridgeshire, PE19 8EU  
UK  
Tel: +44 (0) 870 600 6122  
Fax: +44 (0)1480 213 339  
Mail: [enquiries.mp.uk@gb.abb.com](mailto:enquiries.mp.uk@gb.abb.com)

**ABB Inc.**  
**Measurement & Analytics**  
125 E. County Line Road  
Warminster, PA 18974  
USA  
Tel: +1 215 674 6000  
Fax: +1 215 674 7183

**ABB Automation Products GmbH**  
**Measurement & Analytics**  
Dransfelder Str. 2  
37079 Goettingen  
Germany  
Tel: +49 551 905-0  
Fax: +49 551 905-777  
Mail: [vertrieb.messtechnikprodukte@de.abb.com](mailto:vertrieb.messtechnikprodukte@de.abb.com)

**ABB Engineering (Shanghai) Ltd.**  
**Measurement & Analytics**  
No. 4528, Kangxin Highway, Pudong New District  
Shanghai, 201319,  
P.R. China  
Tel: +86(0) 21 6105 6666  
Fax: +86(0) 21 6105 6677  
Mail: [china.instrumentation@cn.abb.com](mailto:china.instrumentation@cn.abb.com)