

■ Intuitive operation

- The "Easy Set-up" function guides you through the menu step by step, enabling easy, quick, and reliable parameterization. The softkey-based functionality makes handling a breeze - it's just like using a cell phone.

■ Non-contact buttons

- Enable the device to be parameterized without the need to open the housing

■ Diagnostics for real-life situations

- Operational reliability monitoring for the device and the industrial process. Status messages are classified in accordance with NAMUR recommendations. Diagnostics-related help text on the display facilitates troubleshooting.

■ Maximum measuring accuracy

- A high excitation frequency and modern filtering methods allow maximum accuracy (max. measuring error: 0.2 % of measured value).

■ Universal transmitter

- Reduces spare parts inventory costs and storage costs

■ Flowmeter sensor featuring state-of-the-art memory technology

- Prevents errors and enables quick and reliable commissioning

■ Approvals for explosion protection

- In accordance with ATEX, IECEx
- In accordance with FM, cFM



The process industry's first choice

The Company

We are an established world force in the design and manufacture of instrumentation for industrial process control, flow measurement, gas and liquid analysis and environmental applications. As part of ABB, a world leader in process automation, we offer customers application expertise, service and support worldwide. We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support. The quality, accuracy and performance of the company's products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology. Over ten flow calibration plants are operated by ABB, which is indicative of our dedication to quality and accuracy.

Introduction

Setting the Standard

ProcessMaster is designed specifically for the process industry. It meets the stringent demands for enhanced metering, allowing more efficient and cost effective operation and compliance with increasing requirements.

ProcessMaster's modular design offers the industry's widest range of liners, electrodes and sizes to meet the needs of even the most demanding applications.

State-of-the-art Diagnostics and Simplified Troubleshooting

ProcessMaster monitors its own operability and your process.

The diagnostic parameters can be set to a limit value and an alarm can be activated as soon as the limit is exceeded.

The infrared port makes the export of recorded data for further analysis and evaluation very easy. This enables the identification and elimination of critical factors at an early stage. As a result, the process can be optimized for greater productivity and less downtime.

In accordance with NAMUR NE107, alarms and warnings are classified with the status classifications such as 'maintenance required,' 'function check,' 'failure,' and 'outside of specification.'

In an alarm situation, the display simplifies troubleshooting by indicating the steps to be taken to solve the problem.

Superior control through advanced sensor design

Revolutionary self-cleaning and double sealed electrodes enhance reliability and performance. Using a higher excitation frequency combined with advanced filtering, ProcessMaster improves accuracy by separating the noise from the electrode signal. This leads to an accuracy of up to $\pm 0.2\%$.

All Data is stored in the right place – the Sensor

Advanced data storage inside the sensor eliminates the need to match sensor and transmitter in the field. The on-board sensor memory eliminates the opportunity for errors.

On initial installation, the self-configuration sequence automatically replicates all data into the transmitter leading to increased speed of start-up. The redundant data in both the sensor and the transmitter memory is continually updated during all operations to ensure total integrity of the measurement.

Intuitive navigation and configuration

The user-friendly interface allows quick and simple data entry for all parameters. „Easy Set-up“ guides the operator step-by-step through the menu to set parameters as fast as possible, thereby simplifying the commissioning phase.

With the softkey functionality, the configuration is as simple as using a mobile phone.

Powerful and flexible transmitter

The backlit, graphical display can be easily rotated through 270 degrees without the need for any tools.

'Through-the-glass' control allows access to the meter in hazardous areas without the need to remove the cover.

The ABB universal Human Machine Interface (HMI) simplifies operation, maintenance and training; thereby reducing cost of ownership and providing one common user experience.

All product versions utilize a common electronics cartridge to simplify installation and reduce the number of spare parts. The same cartridge is used in both integral and remote installations and features active/passive current and pulse outputs. Standard HART protocol enables online modification and monitoring of parameters.

ProcessMaster sets the standard for the process industry. The product line meets the various requirements of NAMUR, such as NE21, NE43, NE70, NE80...

ProcessMaster is a universal device according to the pressure equipment directive.

In compliance with the requirements of NAMUR, the devices are categorized under category III for pipelines. This means that they can be used anywhere. This reduces inventory stock costs and increases safety.

Assured Quality

ProcessMaster is designed and manufactured in accordance with international quality procedures (ISO 9001) and all flowmeters are calibrated on nationally-traceable calibration rigs to provide the end-user with complete assurance of both quality and performance of the meter.

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1 ProcessMaster - Overview of technology

Model overview (Compact design)		
FEP311 (without explosion protection)  G00487	FEP315 (Explosion protection Zone 2 / Div.2)  G00487	FEP315 (Explosion protection Zone 1 / Div.1)  G00886
	ATEX II 3 G Ex nA nC IIC T4 ... T3 II 2 D Ex tD A21 IP6X T70 °C ... T _{medium}	ATEX DN 3-300: II 2G Ex d e ia ma op is IIC T6...T2 >DN 300: II 2G Ex d e ia op is IIC T6...T2 II 2 D Ex tD iaD A21 IP6X T70°C ... T _{medium}
	IEC Ex nA nC IIC T4 ... T3 Ex tD A21 IP6X T70 °C ... T _{medium}	IEC DN 3-300: Ex d e ia ma op is IIC T6 ... T2 Gb >DN 300 : Ex d e ia op is IIC T6 ... T2 Gb Ex tD iaD A21 IP6X T70°C... T _{medium}
	FM 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 _{medium} AEx tD 21 T70 °C ... T _{medium} cFM 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 _{medium} DIP A21 T _A T70 °C ... T _{medium}	FM 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 _{medium} cFM 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

Model number	FEP311, FEP315
Measured value error	Standard: 0.4 % of measured value Option: 0,2 % of rate
Nominal size range	DN 3 ... 2000 (1/10 " ... 80 ")
Process connection	Flange in accordance with DIN 2501/EN 1092-1, ASME B16.5/B16.47, JIS 10K
Nominal pressure	PN 10 ... 100, ASME CL 150, 300, 600
Lining	Hard rubber (DN 15 ... 2000), soft rubber (DN 50 ... 2000), PTFE (DN 10 ... 600), PFA (DN 3 ... 200), ETFE (DN 25 ... 1000)
Conductivity	> 5 µS/cm (20 µS/cm for demineralized water)
Electrodes	Stainless steel 1.4571 [316Ti], 1.4539 [904L], Hastelloy B, Hastelloy C, platinum-iridium, tantalum, titanium
Process connection material	Steel, stainless steel 1.4571 [316Ti]
Protection class	IP 65, IP 67, IP 68, (NEMA 4X)
Medium temperature	-25 ... 180 °C (-13 ... 356 °F)
Approvals	
Explosion protection approvals	ATEX/IECEx Zone 1, 2, 21, 22 FM/cFM Cl 1 Div 1, Cl 1 Div 2
Pressure Equipment Directive 97/23/EC	Conformity assessment in accordance with category III, fluid group 1
CRN (Canadian Reg. Number)	On request
Transmitter	
Supply power	AC 100 ... 230 V (-15 / +10%), AC 24 V (-30 / +10%), DC 24 V (-30 / +30%)
current output	4 ... 20 mA, active or passive
Pulse output	Can be configured locally as active or passive using software
Contact output	Optocoupler, programmable function
Contact input	Optocoupler, programmable function
Display	Graphical display, configurable
Housing	Compact design
Communication	HART protocol (standard)

For food and beverage and pharmaceutical applications, refer to the HygienicMaster data sheet

Model overview (Design with remote transmitter)		
Flowmeter sensor		
FEP321 (without explosion protection)	FEP325 (explosion protection Zone 2 / Div.) 2)	FEP325 (explosion protection Zone 1 / Div.) 1)
		
	ATEX II 3 G Ex nA IIC T6 ... T3 II 2 D Ex tD A21 IP6X T85 °C ... T _{medium}	ATEX DN 3-300: II 2G Ex e ia ma IIC T6 ... T2 >DN 300 : II 2G Ex e ia IIC T6 ... T2 II 2 D Ex tD A21 IP6X T85 °C ... T _{medium}
	IEC Ex nA IIC T6 ... T3 Ex tD A21 IP6X T85 °C ... T _{medium}	IEC DN 3-300: Ex e ia ma IIC T6 ... T2 Gb >DN 300 : Ex e ia IIC T6 ... T2 Gb Ex tD A21 IP6X T85 °C ... T _{medium}
	FM 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 _{medium} AEx tD 21 T70 °C ... T _{medium}	FM 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 _{medium}
	cFM 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 _{medium} DIP A21 TA T70 °C ... T _{medium}	cFM 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

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Model overview (Design with remote transmitter)					
Flowmeter sensor					
FEP321 (without explosion protection)	FEP325 (explosion protection Zone 2 / Div.) 2)		FEP325 (explosion protection Zone 1 / Div.) 1)		
 G00489	 G00489		 G00862		
Transmitter					
FET321 (without explosion protection)	FET325 (explosion protection Zone 2, Div. 2)	FET321 (without explosion protection)	FET325 (explosion protection Zone 1, Div. 1)	FET325 (explosion protection Zone 2, Div. 2)	FET321 (without explosion protection)
 G00490	 G00490		 G00863	 G00490	
	ATEX II 3 G Ex nA IIC T4 II 2 D Ex tD A21 IP6X T70°C		ATEX II 2 (2) G Ex d e op is [ia] IIC T6 II 2 (2) D Ex tD [iaD] A21 IP6X T70°C	ATEX II 3 G Ex nA IIC T4 II 2 D Ex tD A21 IP6X T70°C	
	IEC Ex nA IIC T4 Ex tD A21 IP6X T70°C		IEC Ex d e op is [ia Gb] IIC T6 Gb Ex tD [iaD] A21 IP6X T70°C	IEC Ex nA IIC T4 Ex tD A21 IP6X T70°C	
	FM NI: CL I, II / DIV 2/ GP ABCDFG/ T4 CL III / DIV 1, 2/ T4 CL I, II,III ZN 2 AEx nA IIC T4 DIP: CL II, III/ DIV 1/ GP EFG/ T70°C		FM 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	FM NI: CL I, II / DIV 2/ GP ABCDFG/ T4 CL III / DIV 1, 2/ T4 CL I, II,III ZN 2 AEx nA IIC T4 DIP: CL II, III/ DIV 1/ GP EFG/ T70°C	
	cFM NI: CL I, II/ DIV 2/ GP ABCDFG/ T4 CL III/ DIV 1, 2/ T4 Ex nA IIC T4 DIP: CL II, III/ DIV 1/ GP EFG/ T70°C DIP A21 TA 70°C		cFM 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	cFM NI: CL I, II/ DIV 2/ GP ABCDFG/ T4 CL III/ DIV 1, 2/ T4 Ex nA IIC T4 DIP: CL II, III/ DIV 1/ GP EFG/ T70°C DIP A21 TA 70°C	

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Model number	FEP321, FEP325, FET321, FET325
Measured value error	Standard: 0.4 % of measured value Option: 0.2 % of rate
Nominal size range	DN 3 ... 2000 (1/10 " ... 80 ")
Process connection	Flange in accordance with DIN 2501/EN 1092-1, ASME B16.5/B16.47, JIS 10K
Nominal pressure	PN 10 ... 100, ASME CL 150, 300, 600
Lining	Hard rubber (DN 15 ... 2000), soft rubber (DN 50 ... 2000), PTFE (DN 10 ... 600), PFA (DN 3 ... 200), ETFE (DN 25 ... 1000)
Conductivity	> 5 µS/cm (20 µS/cm for demineralized water)
Electrodes	Stainless steel 1.4571 [316Ti], 1.4539 [904L], Hastelloy B, Hastelloy C, platinum-iridium, tantalum, titanium
Process connection material	Steel, stainless steel 1.4571 [316Ti]
Protection class	IP 65, IP 67, IP 68, (NEMA 4X)
Medium temperature	-25 ... 180 °C (-13 ... 356 °F)
Approvals	
Explosion protection approvals	ATEX / IECEx Zone 1, 2, 21, 22 FM / cFM Cl 1 Div 1, Cl 1 Div 2
Pressure Equipment Directive 97/23/EC	Conformity assessment in accordance with category III, fluid group 1
CRN (Canadian Reg. Number)	On request
Transmitter	
Supply power	AC 100 ... 230 V (-15 / +10%), AC 24 V (-30 / +10%), DC 24 V (-30 / +30%)
current output	4 ... 20 mA, active or passive
Pulse output	Can be configured locally as active or passive using software
Contact output	Optocoupler, programmable function
Contact input	Optocoupler, programmable function
Display	Graphical display, configurable
Housing	Remote transmitter
Communication	HART protocol (standard)

For food and beverage and pharmaceutical applications, refer to the HygienicMaster data sheet

2 Performance specifications

2.1 General

2.1.1 Reference conditions according to EN 29104

Fluid temperature	20 °C (68 °F) ± 2 K
Ambient temperature	20 °C (68 °F) ± 2 K
Supply power	Nominal voltage acc. to name plate $U_n \pm 1 \%$, frequency $f \pm 1 \%$
Installation conditions	- Upstream >10 x DN, straight section - Downstream >5 x DN, straight section
Warm-up phase	30 min.

2.1.2 Maximum measuring error

Pulse output

- Standard calibration:
 $\pm 0.4 \%$ of measured value, $\pm 0.02 \%$ $Q_{\max DN}$
- Optional calibration:
 $\pm 0.2 \%$ of measured value, $\pm 0.02 \%$ $Q_{\max DN}$

$Q_{\max DN}$: See table in Section 2.4, "Flowmeter sizes. flow range".

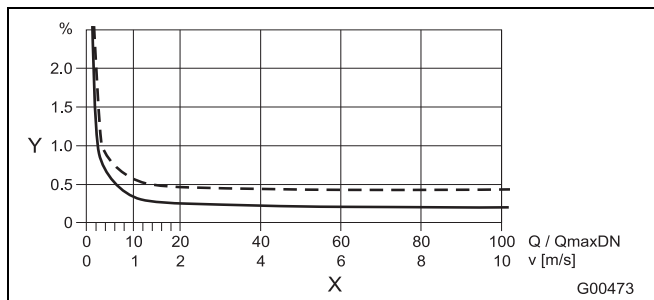


Fig. 1

Y Accuracy $\pm$ of measured value in [%]

X Flow velocity v in [m/s], $Q/Q_{\max DN}$ [%]

Analog output effects

Same as pulse output plus $\pm 0.1 \%$ of measured value ± 0.01 mA

2.2 Reproducibility, response time

Reproducibility	$\leq 0.11 \%$ of measured value, $t_{\text{meas}} = 100$ s, $v = 0.5 \dots 10$ m/s
Response time	As step function 0 ... 99 % $5 \tau \geq 200$ ms at 25 Hz excitation frequency $5 \tau \geq 400$ ms at 12.5 Hz excitation frequency

2.3 Transmitter

2.3.1 Electrical properties

Supply power	AC: 100 ... 230 V (-15 % / +10 %) AC: 24 V (-30 % / +10 %) DC: 24 V (-30 % / +30 %) Ripple: < 5 %
Line frequency	47 ... 64 Hz
Excitation frequency	6 1/4 Hz, 7 1/2 Hz, 12 1/2 Hz, 15 Hz, 25 Hz, 30 Hz (50/60 Hz supply power)
Power consumption	$S \leq 20$ VA (flowmeter sensor incl. transmitter)
Electr. connection	Screw terminals

2.3.1.1 Inputs/outputs

Isolation of input/outputs

The current output, digital outputs DO1 and DO2, and digital input are electrically isolated from the flowmeter sensor input circuit and from each other.

2.3.1.2 Empty pipe detection

The "Empty Pipe Detection" function requires:

The fluid that is being measured to have a conductivity of $\geq 20 \mu\text{S/cm}$, and also calls for a signal cable length of ≤ 50 m (164 ft), a nominal size DN $\geq$ DN 10, and the absence of a preamplifier.

2.3.2 Mechanical properties

Compact design (Transmitter installed directly on the sensor)	
Housing	Cast aluminum, coated
Paint	Paint coat, $\geq 80 \mu\text{m}$ thick, RAL 9002, light gray
Cable gland	Polyamide
Remote design	
Housing	Cast aluminum, coated
Paint	Paint coat $\geq 80 \mu\text{m}$ thick, mid-section RAL 7012, dark gray, front cover / rear cover RAL 9002, light gray
Cable gland	Polyamide
Weight	4.5 kg (9.92 lb)

2.3.2.1 Storage temperature, ambient temperature

Ambient temp.

-20 ... 60 °C (-4 ... 140 °F) standard

-40 ... 60 °C (-40 ... 140 °F) Advanced mode

Storage Temperature

-20 ... 70 °C (-4 ... 158 °F)

2.3.2.2 Protection class for transmitter housing

IP 65 / IP 67, NEMA 4X

2.3.2.3 Vibration according to EN 60068-2

Transmitter

- In the range 10 ... 58 Hz max. 0.15 mm (0.006 inch) deflection*
- In the range 58 ... 150 Hz max. 2 g acceleration*

* = Peak load

2.4 Flowmeter sizes. flow range

Meter size		Min. flow range end value	Q _{max} _{DN}
DN	"	0.02 x Q _{max} DN (≈ 0.2 m/s)	0 ... ≈ 10 m/s
3	1/10	0.08 l/min (0.02 US gal/min)	4 l/min (1.06 US gal/min)
4	5/32	0.16 l/min (0.04 US gal/min)	8 l/min (2.11 US gal/min)
6	1/4	0.4 l/min (0.11 US gal/min)	20 l/min (5.28 US gal/min)
8	5/16	0.6 l/min (0.16 US gal/min)	30 l/min (7.93 US gal/min)
10	3/8	0.9 l/min (0.24 US gal/min)	45 l/min (11.9 US gal/min)
15	1/2	2 l/min (0.53 US gal/min)	100 l/min (26.4 US gal/min)
20	3/4	3 l/min (0.79 US gal/min)	150 l/min (39.6 US gal/min)
25	1	4 l/min (1.06 US gal/min)	200 l/min (52.8 US gal/min)
32	1 1/4	8 l/min (2.11 US gal/min)	400 l/min (106 US gal/min)
40	1 1/2	12 l/min (3.17 US gal/min)	600 l/min (159 US gal/min)
50	2	1.2 m ³ /h (5.28 US gal/min)	60 m ³ /h (264 US gal/min)
65	2 1/2	2.4 m ³ /h (10.57 US gal/min)	120 m ³ /h (528 US gal/min)
80	3	3.6 m ³ /h (15.9 US gal/min)	180 m ³ /h (793 US gal/min)
100	4	4.8 m ³ /h (21.1 US gal/min)	240 m ³ /h (1057 US gal/min)
125	5	8.4 m ³ /h (37 US gal/min)	420 m ³ /h (1849 US gal/min)
150	6	12 m ³ /h (52.8 US gal/min)	600 m ³ /h (2642 US gal/min)
200	8	21.6 m ³ /h (95.1 US gal/min)	1080 m ³ /h (4755 US gal/min)
250	10	36 m ³ /h (159 US gal/min)	1800 m ³ /h (7925 US gal/min)
300	12	48 m ³ /h (211 US gal/min)	2400 m ³ /h (10567 US gal/min)
350	14	66 m ³ /h (291 US gal/min)	3300 m ³ /h (14529 US gal/min)
400	16	90 m ³ /h (396 US gal/min)	4500 m ³ /h (19813 US gal/min)
450	18	120 m ³ /h (528 US gal/min)	6000 m ³ /h (26417 US gal/min)
500	20	132 m ³ /h (581 US gal/min)	6600 m ³ /h (29059 US gal/min)
600	24	192 m ³ /h (845 US gal/min)	9600 m ³ /h (42268 US gal/min)
700	28	264 m ³ /h (1162 US gal/min)	13200 m ³ /h (58118 US gal/min)
760	30	312 m ³ /h (1374 US gal/min)	15600 m ³ /h (68685 US gal/min)
800	32	360 m ³ /h (1585 US gal/min)	18000 m ³ /h (79252 US gal/min)
900	36	480 m ³ /h (2113 US gal/min)	24000 m ³ /h (105669 US gal/min)
1000	40	540 m ³ /h (2378 US gal/min)	27000 m ³ /h (118877 US gal/min)
1050	42	616 m ³ /h (2712 US gal/min)	30800 m ³ /h (135608 US gal/min)
1100	44	660 m ³ /h (3038 US gal/min)	33000 m ³ /h (151899 US gal/min)
1200	48	840 m ³ /h (3698 US gal/min)	42000 m ³ /h (184920 US gal/min)
1400	54	1080 m ³ /h (4755 US gal/min)	54000 m ³ /h (237755 US gal/min)
1500	60	1260 m ³ /h (5548 US gal/min)	63000 m ³ /h (277381 US gal/min)
1600	66	1440 m ³ /h (6340 US gal/min)	72000 m ³ /h (317006 US gal/min)
1800	72	1800 m ³ /h (7925 US gal/min)	90000 m ³ /h (396258 US gal/min)
2000	80	2280 m ³ /h (10039 US gal/min)	114000 m ³ /h (501927 US gal/min)

The flow range end value can be set between 0.02 x Q_{max}DN and 2 x Q_{max}DN.

3 Functional specifications

3.1 Flowmeter sensor

3.1.1 Protection type according to EN 60529

IP 65, P 67, NEMA 4X

IP 68 (for external flowmeter sensors only)

3.1.2 Pipeline vibration according to EN 60068-2-6

The following applies to compact devices:

(transmitter mounted directly on the flowmeter sensor)

- In the 10 ... 58 Hz range with max. 0.15 mm (0.006 inch) deflection
- In the 58 ... 150 Hz range with max. 2 g acceleration

The following applies to devices with a separate transmitter:

Transmitter

- In the 10 ... 58 Hz range with max. 0.15 mm (0.006 inch) deflection
- In the 58 ... 150 Hz range with max. 2 g acceleration

Flowmeter sensor

- In the 10 ... 58 Hz range with max. 0.15 mm (0.006 inch) deflection
- In the 58 ... 150 Hz range with max. 2 g acceleration

3.1.3 Installation length

The flanged units comply with the installation lengths specified in VDI/VDE 2641, ISO 13359, or according to DVGW (process sheet W420, design WP, ISO 4064 short).

3.1.4 Signal cable (for external transmitters only)

A 5 m (16.4 ft) cable is supplied.

If you require more than 5 m (16.4 ft), a cable can be purchased using order number D173D027U01.

In the case of the transmitter design intended for use in Zone 1, Div 1 (Model FET325), 10 m (32.8 ft) signal cables are permanently connected to the transmitter.

Preamplifier

Max. signal cable length between flowmeter sensor and transmitter:

a) Without preamplifier:

- Max. 50 m (164 ft) for conductivity $\geq 5 \mu\text{S/cm}$

A preamplifier is required for cables > 50 m (164 ft).

b) With preamplifier

- Max. 200 m (656 ft) for conductivity $\geq 5 \mu\text{S/cm}$

3.1.5 Temperature range

Storage temperature

-20 ... 70 °C (-4 ... 70.00 °C)

Min. permissible pressure as a function of fluid temperature:

Lining	Nominal size	Operating pressure at	T _{Operating} ¹⁾
Hard rubber	15 ... 2000 (1/2 ... 80")	0	< 90 °C (194 °F)
Soft rubber	50 ... 2000 (2 ... 80")	0	< 60 °C (140 °F)
PTFE	10 ... 600 (3/8 ... 24")	270	< 20 °C (68 °F)
KTW-approved		400	< 100 °C (212 °F)
		500	< 130 °C (266 °F)
Thick PTFE, high-temp. design	25 ... 80 100 ... 250 300	0	< 180 °C (356 °F)
		67	< 180 °C (356 °F)
		27	< 180 °C (356 °F)
PFA	3 ... 200 (1/10 ... 8")	0	< 180 °C (356 °F)
ETFE	25 ... 1000 (1 ... 40")	100	< 130 °C (266 °F)

1) For CIP/SIP cleaning, higher temperatures are permitted for limited time periods; refer to the table titled "Max. permissible cleaning temperature".

Max. permissible cleaning temperature:

CIP cleaning	Sensor lining	T _{max}	T _{max} minutes	T _{amb.}
Steam cleaning	PTFE, PFA	150 °C (302 °F)	60	25 °C (77 °F)
Fluids	PTFE, PFA	140 °C (284 °F)	60	25 °C (77 °F)

If the ambient temperature is > 25 °C, the difference must be subtracted from the max. cleaning temperature. $T_{\text{max}} - \Delta$ °C.

(Δ °C = $T_{\text{amb}} - 25$ °C)

Max. ambient temperature as a function of fluid temperature:**Important**

When using the device in potentially explosive atmospheres, please observe the additional temperature specifications in the section of this data sheet titled "Ex relevant specifications" and the separate Ex safety instructions (SM/FEP300/FEH300/ATEX/IECEX) and (SM/FEP300/FEH300/FM/CSA).

Models FEP311, FEP315 (standard temperature version)

Lining	Flange material	Ambient temperature		Fluid temperature	
		Min. temp.	Max. temp.	Min. temp.	Max. temp.
Hard rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	90 °C (194 °F)
Hard rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	90 °C (194 °F)
Soft rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	60 °C (140 °F)
Soft rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	60 °C (140 °F)
PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14 °F)	90 °C (194 °F) 130 °C (266 °F)
PTFE	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
PFA ¹⁾	Steel	-10 °C (14 °F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14 °F)	90 °C (194 °F) 130 °C (266 °F)
PFA ¹⁾	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
Thick PTFE ²⁾	Steel	-10 °C (14 °F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14 °F)	90 °C (194 °F) 130 °C (266 °F)
Thick PTFE ²⁾	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
ETFE ³⁾	Steel	-10 °C (14 °F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14 °F)	90 °C (194 °F) 130 °C (266 °F)
ETFE ³⁾	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)

Models FEP311, FEP315 (high-temperature version)

Lining	Flange material	Ambient temperature		Fluid temperature	
		Min. temp.	Max. temp.	Min. temp.	Max. temp.
PFA ¹⁾	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
PFA ¹⁾	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-20 °C (-13 °F)	180 °C (356 °F)
Thick PTFE ²⁾	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
Thick PTFE ²⁾	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-20 °C (-13 °F)	180 °C (356 °F)
ETFE ³⁾	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
ETFE ³⁾	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-20 °C (-13 °F)	130 °C (266 °F)

1) PFA (high-temperature version) can be obtained for nominal sizes ≥ DN 10

2) Thick PTFE can be obtained for nominal sizes ≥ DN 25

3) ETFE can be obtained for nominal sizes ≥ DN 25

**Important**

When using the device in potentially explosive atmospheres, please observe the additional temperature specifications in the section of this data sheet titled "Ex relevant specifications" and the separate Ex safety instructions (SM/FEP300/FEH300/ATEX/IECEX) and (SM/FEP300/FEH300/FM/CSA).

Models FEP321, FEP325 (standard temperature version)

Lining	Flange material	Ambient temperature		Fluid temperature	
		Min. temp.	Max. temp.	Min. temp.	Max. temp.
Hard rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	90 °C (194 °F)
Hard rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	90 °C (194 °F)
Soft rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	60 °C (140 °F)
Soft rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	60 °C (140 °F)
PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
PTFE	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
PFA ¹⁾	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
PFA ¹⁾	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
Thick PTFE ²⁾	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
Thick PTFE ²⁾	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
ETFE ³⁾	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
ETFE ³⁾	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)

Models FEP321, FEP325 (high-temperature version)

Lining	Flange material	Ambient temperature		Fluid temperature	
		Min. temp.	Max. temp.	Min. temp.	Max. temp.
PFA ¹⁾	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
PFA ¹⁾	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	180 °C (356 °F)
Thick PTFE ²⁾	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
Thick PTFE ²⁾	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	180 °C (356 °F)
ETFE ³⁾	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
ETFE ³⁾	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)

1) PFA (high-temperature version) can be obtained for nominal sizes ≥ DN 10

2) Thick PTFE can be obtained for nominal sizes ≥ DN 25

3) ETFE can be obtained for nominal sizes ≥ DN 25

3.1.6 Material load

Limits for the permissible fluid temperature (TS) and permissible pressure (PS) are calculated on the basis of the lining and flange material used in the device (refer to the name plate on the device).

DIN flange, stainless steel, 1.4571 [316Ti] up to DN 600 (24")

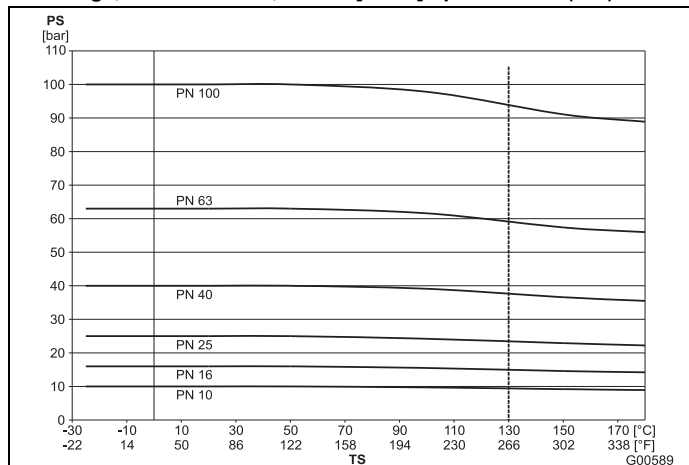


Fig. 2:

ASME flange, stainless steel 1.4571 [316Ti], up to DN 300 (12") (CL150/300); up to DN 1000 (40") (CL150)

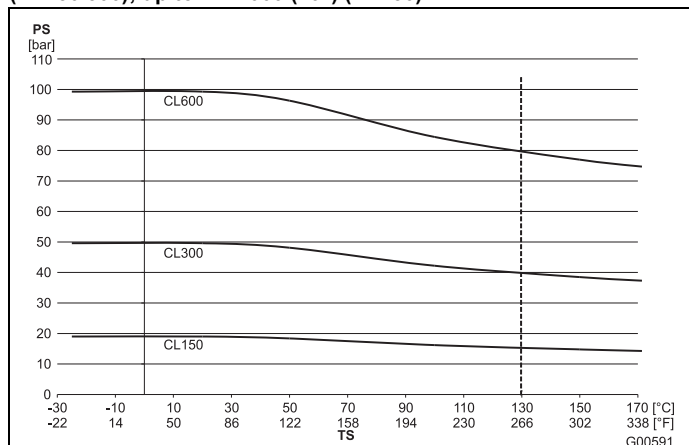


Fig. 3

DIN flange, steel, up to DN 600 (24")

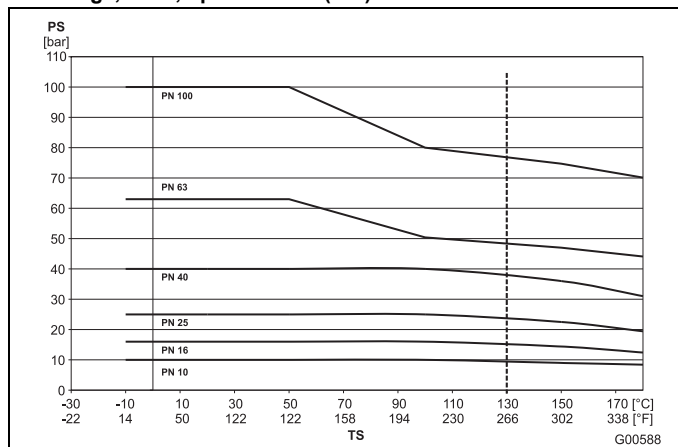


Fig. 4

ASME flange, steel, up to DN 300 (12") (CL150/300); up to DN 1000 (40") (CL150)

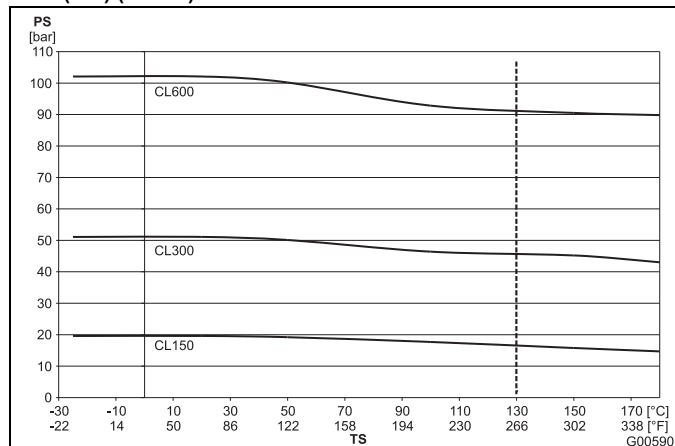


Fig. 5

JIS 10K-B2210 flange

Nominal size	Material	PN	TS	PS [bar]
32 ... 100 (1 1/4 ... 4")	Stainless steel 1.4571[316Ti]	10	-25 ... 180 °C (-13 ... 356 °F)	10 (145 psi)
32 ... 100 (1 1/4 ... 4")	Steel	10	-25 ... 180 °C (14 ... 356 °F)	10 (145 psi)

DIN flange, stainless steel 1.4571 [316Ti], DN 700 (28") up to DN 1000 (40")

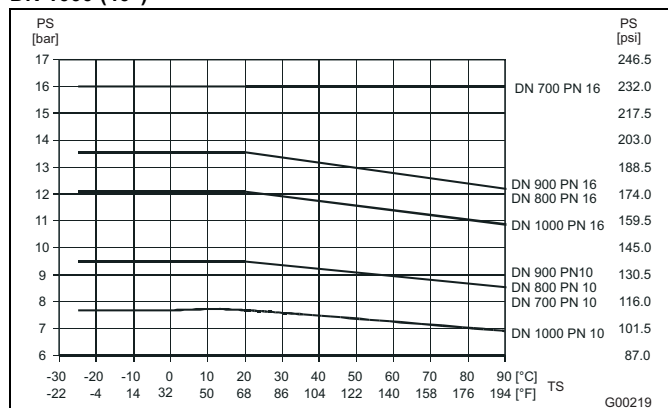


Fig. 6

DIN flange, steel, DN 700 (28") up to DN 1000 (40")

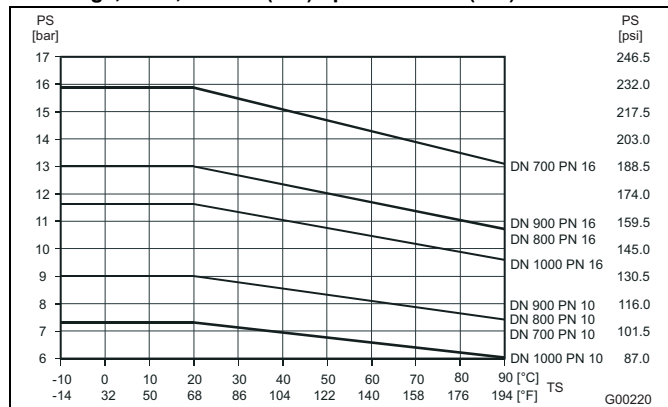


Fig. 7

3.1.7 Sensor

Process-wetted parts

Part	Standard	Option
Liner	PTFE, PFA, ETFE, hard rubber, soft rubber	–
Measurement and grounding electrode for: - Hard rubber - Soft rubber	Stainless steel 1.4571 [316Ti]	Hastelloy B-3 (2.4600), Hastelloy C-4 (2.4610) , titanium, tantalum, platinum-iridium, 1.4539 [904L]
- PTFE, PFA, ETFE	Stainless steel 1.4539 [904L]	Stainless steel 1.4571 [316Ti] Hast. C-4 (2.4610) Hast. B-3 (2.4600) Titanium, tantalum, platinum-iridium
Grounding plate	Stainless steel 1.4571 [316Ti]	upon request
Protection plate	Stainless steel 1.4571 [316Ti]	upon request

Non-wetted parts

	Standard	Option
Flanges DN 3 ... 15 (1/10 ... 1/2") DN 20 ... 400 (3/4 ... 16")	Stainless steel 1.4571 [316Ti] (standard) Steel (galvanized) DIN/EN flange: RST37/ST52/C22-8 ASME flange: A105/C21	Stainless steel 1.4571- [316Ti]
DN 450 ... 2000 (18 ... 80")	Steel (painted) DIN/EN flange: RST37/ST52/C22-8 ASME flange: A105/C21	Stainless steel 1.4571- [316Ti]

Sensor housing

	Standard	Option
Housing DN 3 ... 400 (1/10 ... 16")	Dual-shell casing, cast aluminum, painted, paint coat, $\geq 80 \mu\text{m}$ thick, RAL 9002	–
DN 450 ... 2000 (18 ... 80")	Welded steel design, painted, paint coat, $\geq 80 \mu\text{m}$ thick, RAL 9002	–
Connection box	Aluminum alloy, painted, $\geq 80 \mu\text{m}$ thick, light gray, RAL 9002	–
Meter tube	SS 1.4301	–
PG-Connector	Polyamide	–

3.1.8 Electrical Connection Diagram for Models FEP311, FEP321, FET321

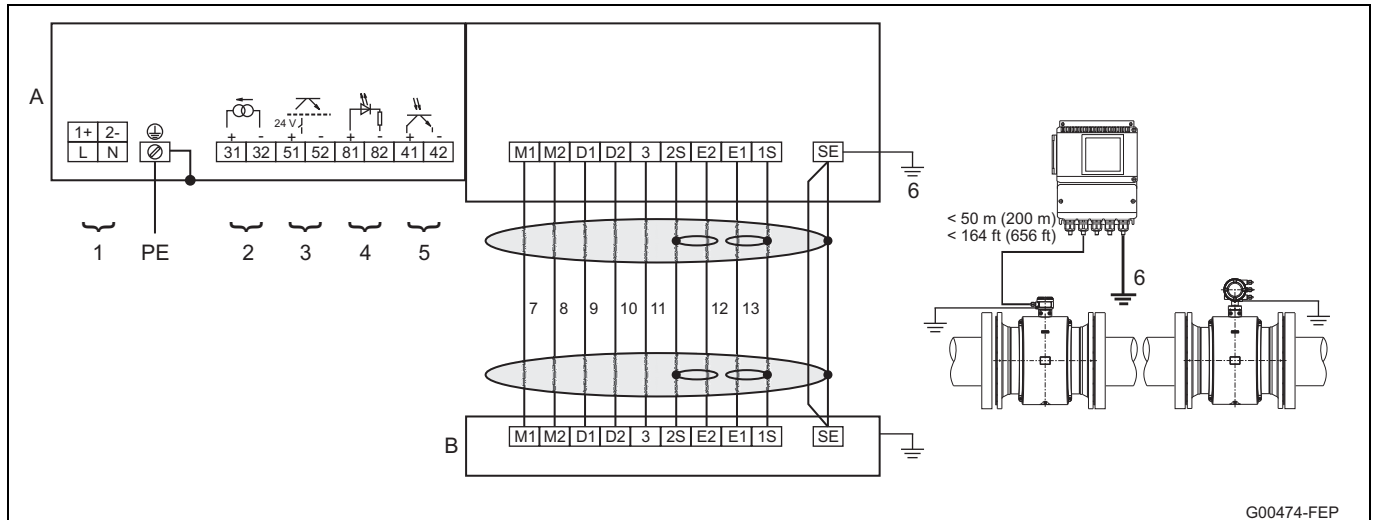
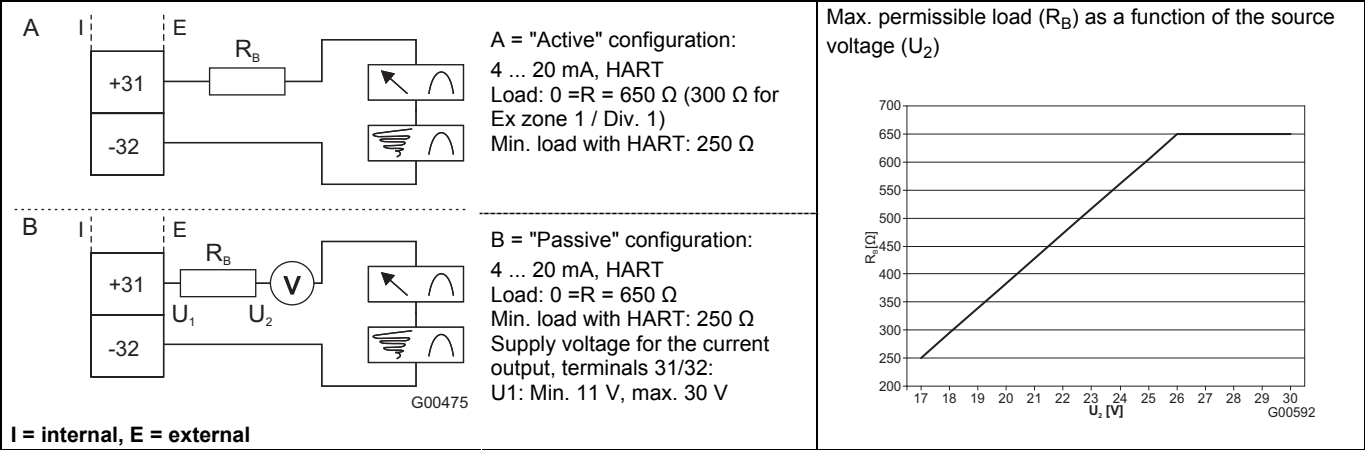


Fig. 8

- A Transmitter**
B Flowmeter sensor
- 1 Supply power:**
 See name plate
- 2 Current output (terminals 31/32)**
 The current output can be operated in "active" or "passive" mode.
 • Active: 4 ... 20 mA, HART protocol (standard), load: $250 \Omega \leq R \leq 650 \Omega$
 • Passive: 4 ... 20 mA, HART protocol (standard), load: $250 \Omega \leq R \leq 650 \Omega$
 Supply voltage for the current output: min. 11 V, max. 30 V at terminals 31/32.
- 3 Digital output DO1 (terminals 51/52) (pulse output or digital output)**
 Function can be configured locally as "Pulse Output" or "Digital Output" using software. Factory setting is "Pulse Output".
 The output can be configured as an "active" or "passive" output.
 Configuration is performed using software.
 • Configuration as pulse output
 Max. pulse frequency: 5,250 Hz.
 Pulse width: 0.1 ... 2,000 ms.
 The pulse factor and pulse width are interdependent and are calculated dynamically.
 • Configuration as contact output
 Function: System alarm, empty pipe alarm, max./min. alarm, flow direction signaling, other
 • Configuration as "active" output
 $U = 19 \dots 21 \text{ V}$, $I_{\max} = 220 \text{ mA}$, $f_{\max} \leq 5,250 \text{ Hz}$
 • Configuration as "passive" output
 $U_{\max} = 30 \text{ V}$, $I_{\max} = 220 \text{ mA}$, $f_{\max} \leq 5,250 \text{ Hz}$
- 4 Digital input (terminals 81/82) (contact input)**
 Function can be configured locally using software:
 External output switch-off, external totalizer reset, external totalizer stop, other
 Data for the optocoupler: $16 \text{ V} \leq U \leq 30 \text{ V}$, $R_i = 2 \text{ k}\Omega$
- 5 Digital output DO2 (terminals 41/42) (pulse output or digital output)**
 Function can be configured locally as "Pulse Output" or "Digital Output" using software.
 Factory setting is "Digital Output", flow direction signaling.
 The output is always a "passive" output (optocoupler).
 Data for the optocoupler: $U_{\max} = 30 \text{ V}$, $I_{\max} = 220 \text{ mA}$, $f_{\max} \leq 5,250 \text{ Hz}$
- 6 Functional ground**
7 Brown
8 Red
9 Orange
10 Yellow
11 Green
12 Blue
13 Violet

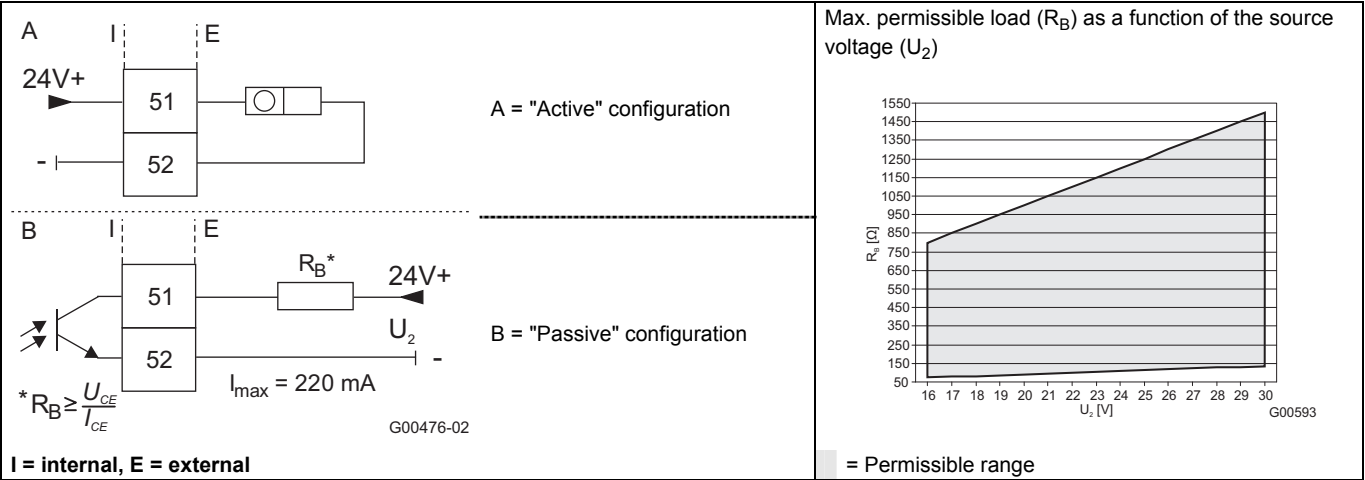
Connection examples for the peripherals
current output



I = internal, E = external

Fig. 9

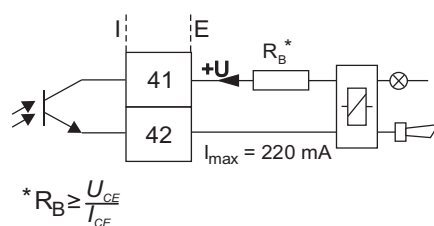
Digital output DO1



I = internal, E = external

Fig. 10

Digital output DO2, e.g., for system monitoring, max./min. alarm, empty meter tube or forward/reverse signal, or counting pulses (function can be configured using software)



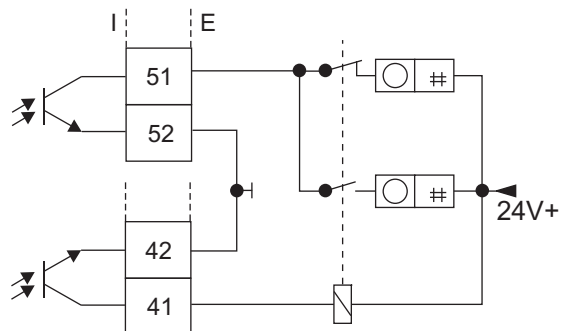
G00792

I = internal, E = external

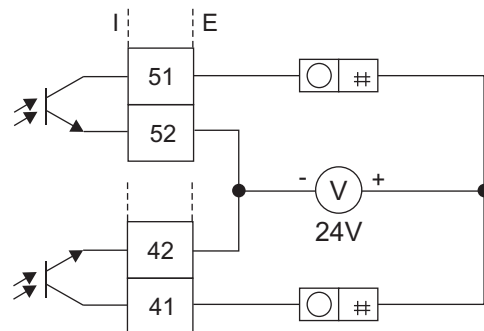
Fig. 11

Digital outputs DO1 and DO2, separate forward and reverse pulses

Digital outputs DO1 and DO2, separate forward and reverse pulses (alternative connection)



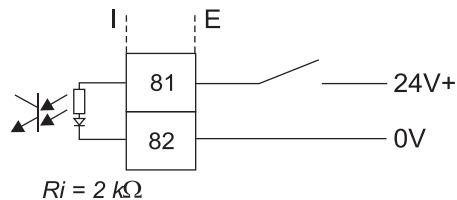
I = internal, E = external



G00791

Fig. 12

Digital input for external output switch-off or external totalizer reset



G00477

I = internal, E = external

Fig. 13

4 Ex-relevant specifications for operation in zones 1, 21, 22 / Div. 1

4.1 General

Devices with model names FEP315 and FEP325 are approved for operation in the following potentially explosive areas:

- ATEX/IECEx Zone 1, 2, 21, 22
- FM Div.1 / Div. 2
- cFM Div.1 / Div 2

**Important**

For detailed information on the individual approvals, refer to Section 1, "ProcessMaster - Overview of technology ".

**Important**

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).

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

4.2 Electrical connection

4.2.1 Connection Diagram for FEP315, FEP325 and FET325 in Zone 1 / Div. 1

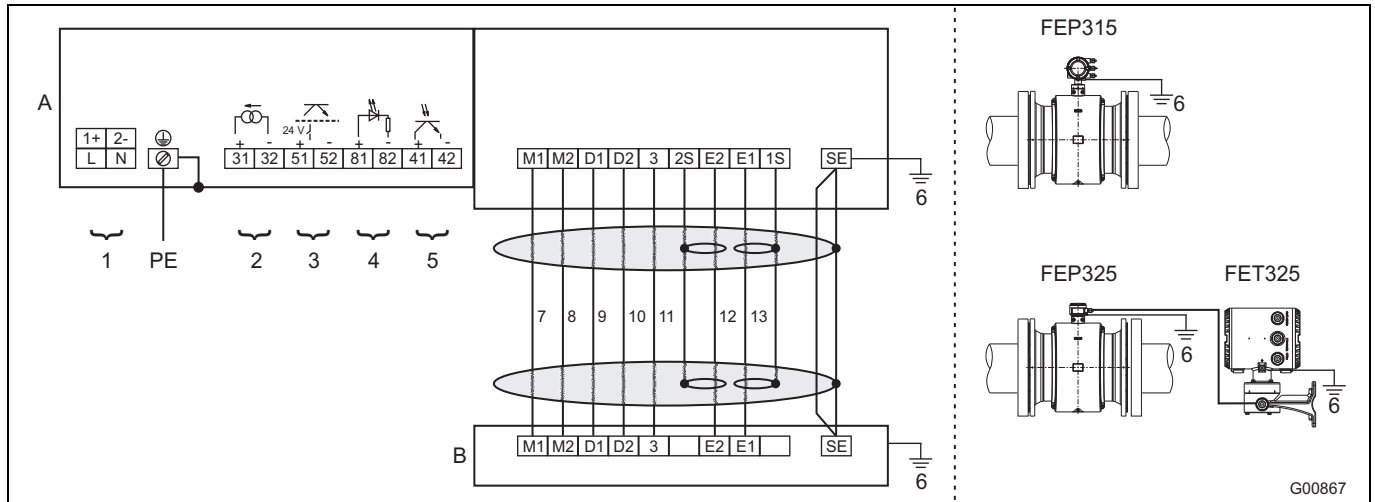


Fig. 14

A Transmitter

B Flowmeter sensor

1 Supply power:

See name plate

2 Current output (terminals 31 / 32)

Depending on the design, either an "active" or "passive" output will be available.

For devices designed for use in Ex Zone 1, the current output cannot be reconfigured locally.

- Active: 4 ... 20 mA, HART protocol (standard), load: $250\ \Omega \leq R \leq 300\ \Omega$
- Passive: 4 ... 20 mA, HART protocol (standard), load: $250\ \Omega \leq R \leq 650\ \Omega$, Supply voltage for the current output: min. 11 V, max. 30 V at terminals 31 / 32.

3 Digital output DO1 (terminal 51 / 52)

The output is always a "passive" output (optocoupler).

- Data for the optocoupler: $U_{\max} = 30\text{ V}$, $I_{\max} = 220\text{ mA}$, Function can be configured locally as "Pulse Output" or "Digital Output" using software. Factory setting is "Pulse Output".
- Configuration as pulse output Max. pulse frequency: 5250 Hz, pulse width: 0.1 ... 2,000 ms. The pulse factor and pulse width are interdependent and are calculated dynamically.
- Configuration as contact output. Function: System alarm, empty pipe alarm, max./min. alarm, flow direction signaling, other

4 Digital input: (Terminal 81 / 82)

Only available in combination with "passive" current output.

Function can be configured locally using software: External output switch-off, external totalizer reset, external totalizer stop, other Data for the optocoupler: $16\text{ V} \leq U \leq 30\text{ V}$, $R_i = 2\text{ k}\Omega$

5 Digital output DO2 (terminal 41 / 42)

The output is always a "passive" output (optocoupler).

Data for the optocoupler: $U_{\max} = 30\text{ V}$, $I_{\max} = 220\text{ mA}$

Function can be configured locally as "Pulse Output" or "Digital Output" using software. Factory setting is "Digital Output", flow direction signaling.

6 Potential equalization PA

7 Brown

8 Red

9 Orange

10 Yellow

11 Green

12 Blue

13 Violet

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

The electrical specifications are operating values.

4.2.2 Connection Diagram for Model FEP325 in Zone 1 / Div. 1 and FET325 transmitter in Zone 2 / Div. 2 or FET321 outside the Ex Zone

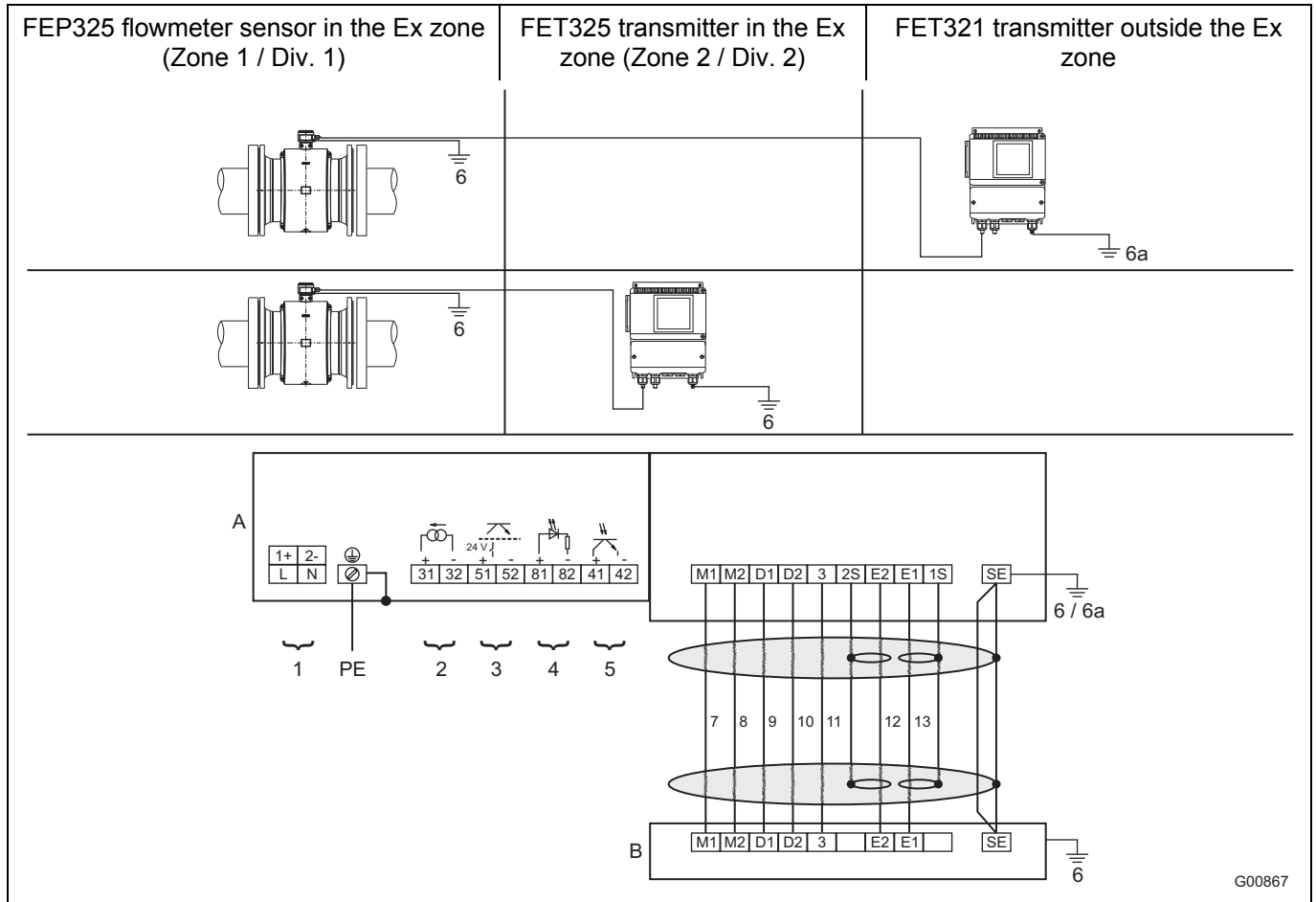


Fig. 15

- All inputs and outputs are electrically isolated from each other and from the supply power.
The electrical specifications are operating values.

4.3 Electrical data

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter. Refer to the label on the device for information about the design of the current output (active/passive).

Model: FEP315 or FET325

Inputs/outputs	Explosion protection class Ex e, XP		Operating values		Explosion protection class Ex nA, NI		Explosion protection class Ex ia, IS					
	U_M [V]	I_M [mA]	U_N [V]	I_N [mA]	U_N [V]	I_N [mA]	U_O [V]	I_O [mA]	P_O [mW]	C_O [nF]	C_{OPA} [nF]	L_O [mH]
Current output, active Terminal 31/32	60	35	30	30	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	2000	8.4	24	0,065
Current output, passive (4 ... Terminal 31/32	60	35	30	30	30	30	U_I [V]	I_I [mA]	P_I [mW]	C_I [nF]	C_{IPA} [nF]	L_I [mH]
							60	500	2000	8.4	24	170
Digital output DO2, passive Terminal 41/42	60	35	30	220	30	220	U_I [V]	I_I [mA]	P_I [mW]	C_I [nF]	C_{IPA} [nF]	L_I [mH]
							60	425 ¹⁾ 500 ²⁾	2000	3.6	3.6	170
Digital output DO1, passive Terminal 51/52	60	35	30	220	30	220	60	425 ¹⁾ 500 ²⁾	2000	3.6	3.6	170
Digital input DI ³⁾ passive Terminal 81/82	60	35	30	10	30	10	60	500	2000	3.6	3.6	170

1) With "active" current output

2) With "passive" current output

3) Available only in connection with passive current output

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

Special connection requirements:

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. On intrinsically safe circuits, equipotential bonding must be in place along the entire length of the cable used for the current outputs.

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

If the rated voltage $U_M = 60$ V is not exceeded when connecting non-intrinsically safe circuits, the intrinsic safety is maintained.

4.4 Temperature values

Model name	Surface temperature
FEP315	70 °C (158 °F)
FEP325	85 °C (185 °F)
FET325	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.



Important

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

Materials		Fluid temperature (operating values)	
Lining	Flange	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F)	90 °C (194 °F)
Hard rubber	Stainless steel	-15 °C (5 °F)	90 °C (194 °F)
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)

Table 2: Fluid temperature (Ex data) for ProcessMaster Model FEP315

Nominal size	Design	Temperature class	Ambient temperature											
			(- 40 °C) ¹⁾ - 20 °C ... + 40 °C				(- 40 °C) ¹⁾ - 20 °C ... + 50 °C				(- 40 °C) ¹⁾ - 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 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.

i

Important

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.

Table 3: Fluid temperature (Ex data) for ProcessMaster Model FEP325

Nominal size	Design	Temperature class	Ambient temperature											
			(- 40 °C) ¹⁾ - 20 °C ... + 40 °C				(- 40 °C) ¹⁾ - 20 °C ... + 50 °C				(- 40 °C) ¹⁾ - 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 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.

i

Important

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.

4.5 Special features of version designed for operation in Ex zone 1 / Div. 1

4.5.1 Configuring the current output

For devices designed for use in Ex Zone 1 / Div.1, the current output cannot be reconfigured subsequently.

The desired configuration of current output (active / passive) must be provided when ordering.

Refer to the label on the device for information about the design of the current output (active / passive).

4.5.2 Configuration of digital outputs

For version designed for operation in Ex zone 1 / Div. 1, the digital outputs DO1 (51 / 52) and DO2 (41 / 42) can be configured on a NAMUR switching amplifier. In the factory setting, the outputs are configured in default connection (non-NAMUR).

i

Important

The explosion protection class of the outputs remains unchanged. The units connected to these outputs must comply with applicable Ex regulations.

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

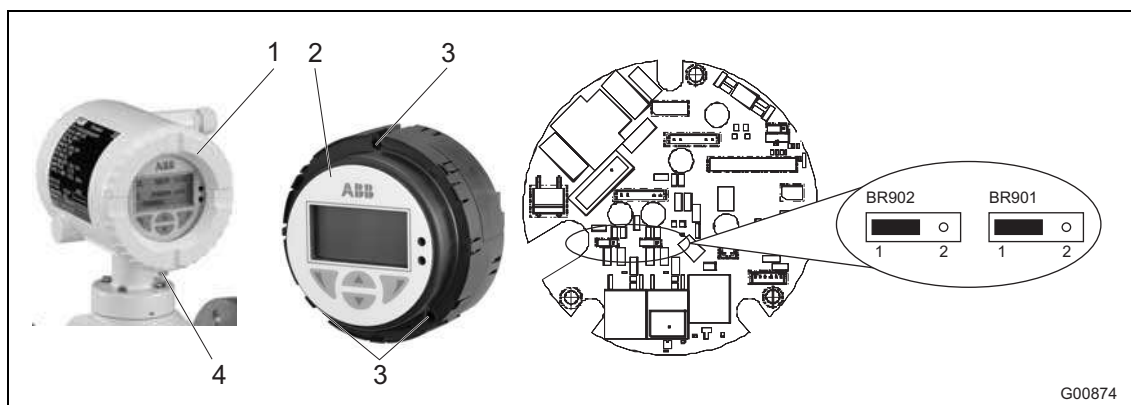


Fig. 16:

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 according to the description:

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 at the required position.
5. Reinsert transmitter module (2) and retighten the screws (3).
6. Close the housing cover (1) and lock the cover by unscrewing the screw (4).

5 Ex-relevant specifications for operation in zones 2, 21, 22 / Div. 2

5.1 General

Devices with model names FEP315 and FEP325 are approved for operation in the following potentially explosive areas:

- ATEX/IECEX Zone 1, 2, 21, 22
- FM Div.1 / Div. 2
- cFM Div.1 / Div 2



Important

For detailed information on the individual approvals, refer to Section 1, "ProcessMaster - Overview of technology ".

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

5.2 Electrical connection

5.2.1 Connection Diagram for Model FEP315, FET325 in Zone 2 / Div. 2, FET321 outside the Ex Zone

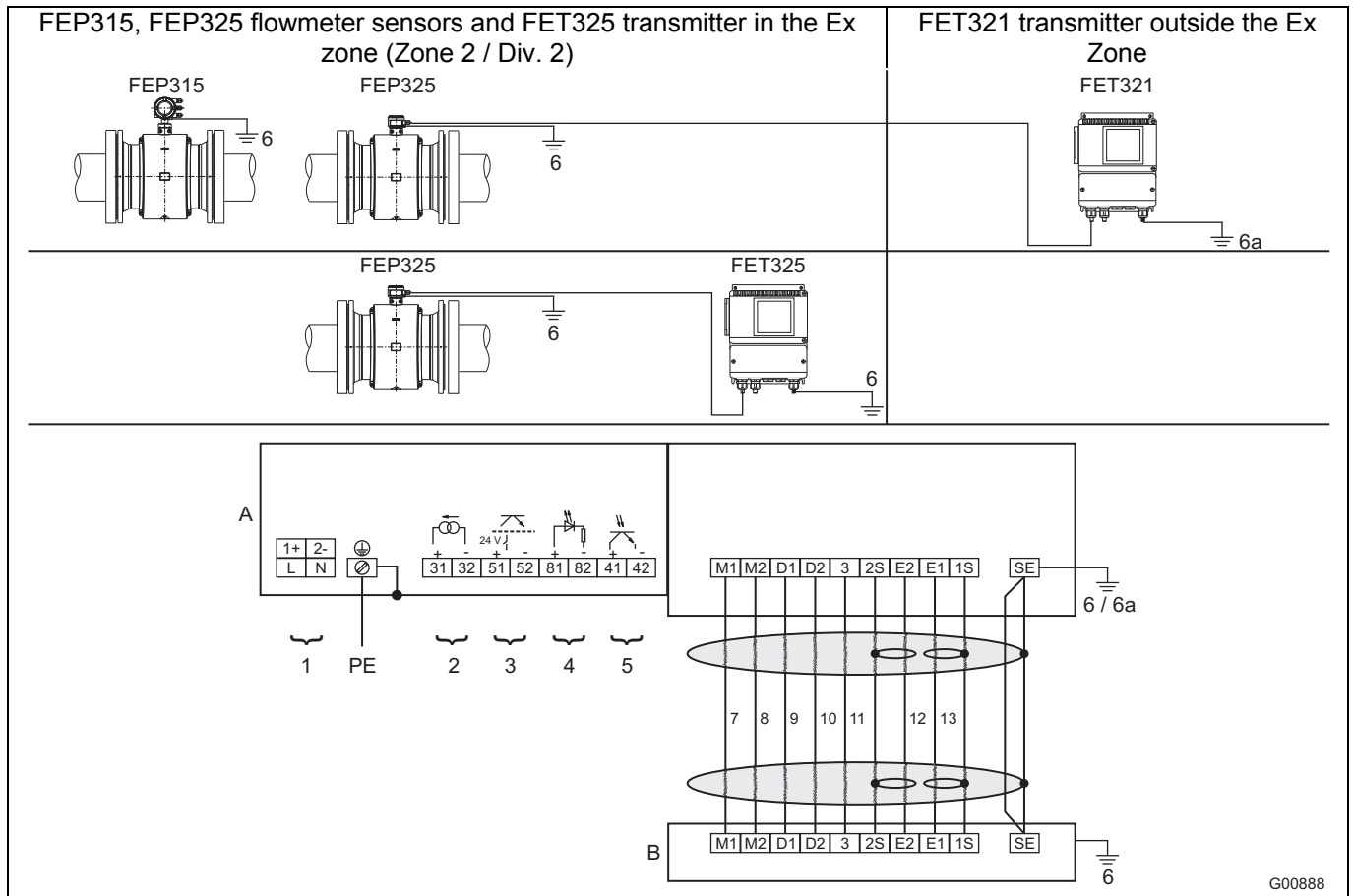


Fig. 17

A Transmitter

B Flowmeter sensor

1 Supply power:

See name plate

2 Current output (terminals 31 / 32)

The current output can be configured locally as an "active" or "passive" output.

- Active: 4 ... 20 mA, HART protocol (standard), load: $250 \Omega \leq R \leq 650 \Omega$
 - Passive: 4 ... 20 mA, HART protocol (standard), load: $250 \Omega \leq R \leq 650 \Omega$
- Supply voltage for the current output: min. 11 V, max. 30 V at terminals 31 / 32.

3 Digital output DO1 (terminal 51 / 52)

The digital output can be configured locally as an "active" or "passive" output.

- Active: $U = 19 \dots 21 \text{ V}$, $I_{\max} = 220 \text{ mA}$, $f_{\max} \leq 5250 \text{ Hz}$
 - Passive: $U_{\max} = 30 \text{ V}$, $I_{\max} = 220 \text{ mA}$, $f_{\max} \leq 5,250 \text{ Hz}$
- Function can be configured locally as "Pulse Output" or "Digital Output" using software. Factory setting is "Pulse Output".
- Configuration as pulse output Max. pulse frequency: 5250 Hz, pulse width: 0.1 ... 2,000 ms. The pulse factor and pulse width are interdependent and are calculated dynamically.
 - Configuration as contact output. Function: System alarm, empty pipe alarm, max./min. alarm, flow direction signaling, other

4 Digital input: (Terminal 81 / 82)

Function can be configured locally using software: External output switch-off, external totalizer reset, external totalizer stop, other

Data for the optocoupler: $16 \text{ V} \leq U \leq 30 \text{ V}$, $R_i = 2 \text{ k}\Omega$

5 Digital output DO2 (terminal 41 / 42)

The output is always a "passive" output (optocoupler).

Data for the optocoupler: $U_{\max} = 30 \text{ V}$, $I_{\max} = 220 \text{ mA}$, $f_{\max} \leq 5,250 \text{ Hz}$

Function can be configured locally as "Pulse Output" or "Digital Output" using software. Factory setting is "Digital Output", flow direction signaling.

6 Potential equalization PA

6a Functional ground (only with transmitter FET321 outside the explosion-free area)

- 7 Brown
- 8 red
- 9 Orange
- 10 yellow
- 11 Green
- 12 blue
- 13 Violet

All inputs and outputs are electrically isolated from each other and from the supply power.
The electrical specifications are operating values.

5.3 Electrical data

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter.

	Ex data		Operating values	
	Ex n/NI			
Signal inputs and outputs	U _i [V]	I _i [mA]	U _i [V]	I _i [mA]
current output Active/passive Terminal 31/32	30	30	30	30
Digital output DO1 Active/passive Terminal 51/52	30	220	30	220
Digital output DO2 Passive Terminal 41/42	30	220	30	220
Digital input DI Terminal 81/82	30	10	30	10

5.4 Temperature values

Model name	Surface temperature
FEP315	70 °C (158 °F)
FEP325	85 °C (185 °F)
FET325	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.

5.4.1 Temperature limit values



Important

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

Materials		Fluid temperature (operating values)	
Lining	Flange	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F)	90 °C (194 °F)
Hard rubber	Stainless steel	-15 °C (5 °F)	90 °C (194 °F)
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)

Table 2: Fluid temperature (Ex data) for ProcessMaster model FEP315 and HygienicMaster model FEH315

Nominal size	Design	Temperature class	Ambient temperature											
			- 20 °C ... + 40 °C				- 20 °C ... + 50 °C				- 20 °C ... + 60 °C			
			- 40 °C ... + 40 °C ¹⁾				- 40 °C ... + 50 °C ¹⁾				- 40 °C ... + 60 °C ¹⁾			
			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 HygienicMaster DN 3 ... DN 100	NT	T1	130 °C	130 °C	---	---	130 °C	100 °C ²⁾ 110 °C ³⁾	---	---	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
	HT	T2	130 °C	130 °C	---	---	130 °C	100 °C ²⁾ 110 °C ³⁾	---	---	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
	NT	T3	130 °C	130 °C	---	---	130 °C	100 °C ²⁾ 110 °C ³⁾	---	---	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
	HT	T4	130 °C	130 °C	---	---	130 °C	100 °C ²⁾ 110 °C ³⁾	---	---	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

1) Low-temperature version (option)

2) Temperature values for ProcessMaster

3) Temperature values for HygienicMaster

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.



Important

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.

Table 3: Fluid temperature (Ex data) for ProcessMaster model FEP325 and HygienicMaster model FEH325

Nominal size	Design	Temperature class	Ambient temperature											
			- 20 °C ... + 40 °C				- 20 °C ... + 50 °C				- 20 °C ... + 60 °C			
			- 40 °C ... + 40 °C ¹⁾				- 40 °C ... + 50 °C ¹⁾				- 40 °C ... + 60 °C ¹⁾			
			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 HygienicMaster DN 3 ... DN 100	NT	T1	130 °C	130 °C	---	---	130 °C	130 °C	---	---	110 °C ²⁾ 120 °C ³⁾	110 °C	---	---
	HT	T1	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	T2	130 °C	130 °C	---	---	130 °C	130 °C	---	---	110 °C ²⁾ 120 °C ³⁾	110 °C	---	---
	HT	T2	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 ²⁾ 120 °C ³⁾	110 °C	---	---
	HT	T3	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 ²⁾ 120 °C ³⁾	110 °C	---	---
	HT	T4	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	---	---
	HT	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
	NT	T6	80 °C	80 °C	---	---	80 °C	80 °C	---	---	80 °C	80 °C	---	---
	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 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.

i

Important

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.

6 Explosion protection specifications for operation in areas with combustible dust

6.1 Information about using the device in areas with combustible dust

The device is approved for use in potentially explosive areas (gas and dust).

The Ex certification is provided on the name plate.



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).

6.1.1 Maximum Allowable Surface Temperature

Model name	Maximum surface temperature
FEP325	T 85 °C (185 °F) ... T _{medium}
FEP315	T 70 °C (158 °F) ... T _{medium}
FET325	T 70 °C (158 °F)

The maximum surface temperature is applicable to dust layers of up to 5 mm (0.20 inch) in thickness. The minimum permissible ignition and smoldering temperatures of the dust atmosphere should be calculated in accordance with IEC61241ff.

With thicker dust layers, the maximum permissible surface temperature must be reduced. The dust can be conductive or non-conductive. IEC61241ff must be observed.

6.1.2 Min. signal cable length

In explosion protection areas, the signal cable cannot be shorter than 5 m (16.4 ft).

7 Installation requirements

7.1 Grounding

The flowmeter sensor must be connected to ground potential. For technical reasons, this potential should be identical to the potential of the metering fluid.

For plastic or insulated lined pipelines, the fluid is grounded by installing ground plates. When there are stray potentials present in the pipeline, a ground plate is recommended on both ends of the meter sensor.

For flowmeter sensor with hardrubber liners, sizes DN 100/4" and larger, a conductive element is incorporated in the liner. This assures that the fluid is grounded.

7.2 Mounting

The following points must be observed for the installation:

- The meter tube must always be completely full.
- The flow direction must correspond to the identification if present.
- The maximum torque for all flange connections must be complied with. The max torque depends on the temperature, pressure, material of the flange bolts and gaskets and has to be chosen accordingly.
- The devices must be installed without mechanical tension (torsion, bending).
- Flowmeters with coplanar counter flanges may only be installed with suitable seals.
- Use flange seals made from a compatible material for the fluid and fluid temperatures.
- Seals must not extend into the flow area since possible turbulence could influence the device accuracy.
- The pipeline may not exert any unallowable forces and torques on the device.
- Do not remove the plugs in the cable connectors until you are ready to install the electrical cable.
- Install the separate converter at a largely vibration-free location.
- Do not expose the converter to direct sunlight or provide for appropriate sun protection where necessary.

The device measures the flowrate in both directions. Forward flow is the factory setting, as shown in Fig. 18.

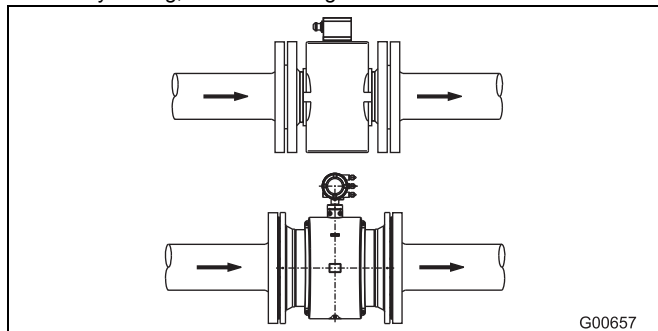


Fig. 18

7.2.1 Electrode axis

Electrode axis (1) should be horizontal if at all possible or no more than 45° from horizontal.

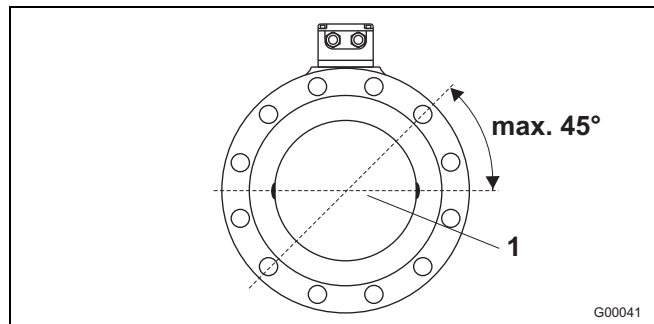


Fig. 19

7.2.2 In- and outlet pipe sections

Straight inlet section	Straight outlet section
$\geq 3 \times \text{DN}$	$\geq 2 \times \text{DN}$

DN = Flowmeter sensor size

- Do not install fittings, manifolds, valves etc. directly in front of the meter tube (1).
- Butterfly valves must be installed so that the valve plate does not extend into the flowmeter sensor.
- Valves or other turn-off components should be installed in the outlet pipe section (2).
- For compliance with the measuring accuracy, observe the inlet and outlet pipe sections.

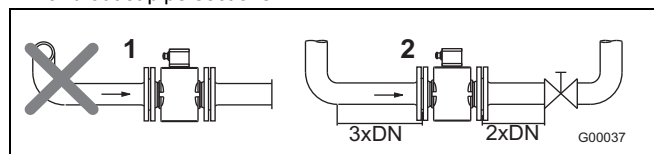


Fig. 20

7.2.3 Vertical connections

- Vertical installation for measurement of abrasive fluids, flow preferably from below to above.

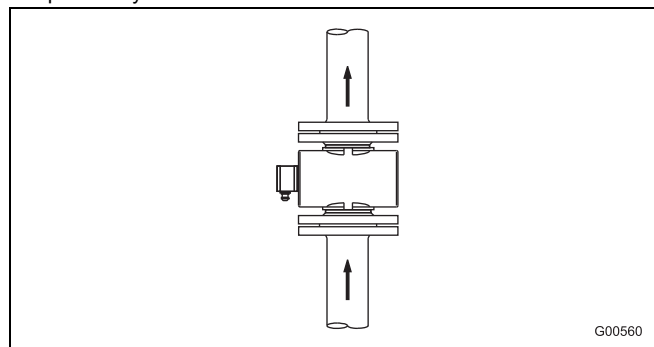


Fig. 21

7.2.4 Horizontal connections

- Meter tube must always be completely full.
- Provide for a slight incline of the connection for degassing.

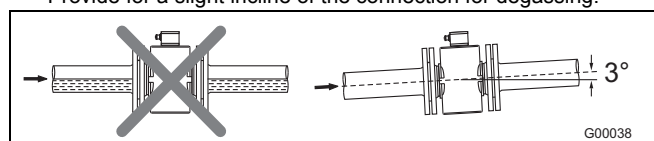


Fig. 22

7.2.5 Free inlet or outlet

- Do not install the flowmeter at the highest point or in the draining-off side of the pipeline, flowmeter runs empty, air bubbles can form (1).
- Provide for a siphon fluid intake for free inlets or outlets so that the pipeline is always full (2).

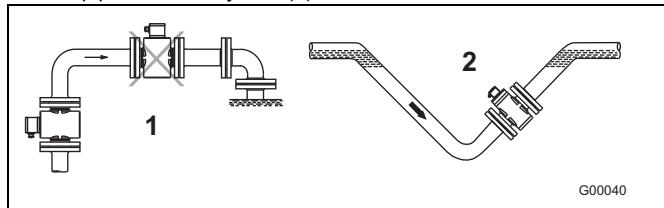


Fig. 23

7.2.6 Strongly contaminated fluids

- For strongly contaminated fluids, a bypass connection according to the figure is recommended so that operation of the system can continue to run without interruption during the mechanical cleaning.

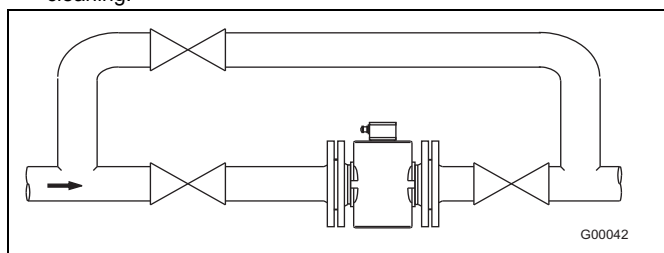


Fig. 24

7.2.7 Installation in the vicinity of pumps

- For flowmeter primaries which are to be installed in the vicinity of pumps or other vibration generating equipment, the utilization of mechanical snubbers is advantageous.

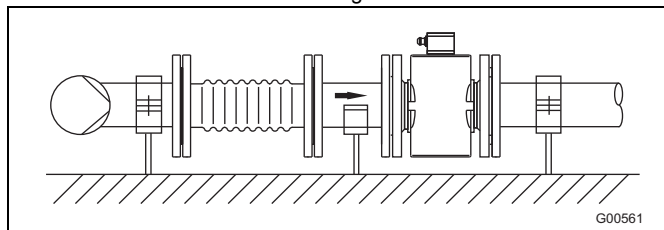


Fig. 25

7.2.8 Installing the high temperature design

The high temperature design allows for complete thermal insulation of the sensor. The pipeline and sensor must be insulated after installing the unit according to the following illustration.

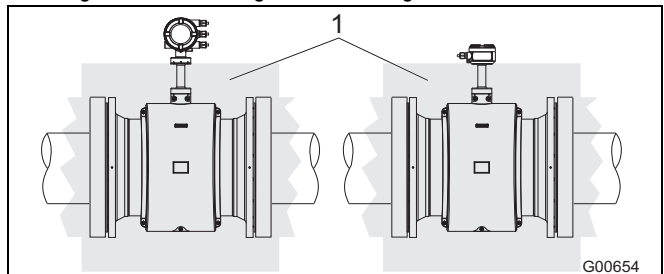


Fig. 26

1 Insulation

7.2.9 Installation in pipelines with larger nominal diameters

Determine the resulting pressure loss when using reduction pieces (1):

- Calculate the diameter ratio d/D .
- Determine the flow velocity based on the flow range nomograph (Fig. 28).
- Read the pressure drop on the Y-axis in Fig. 28.

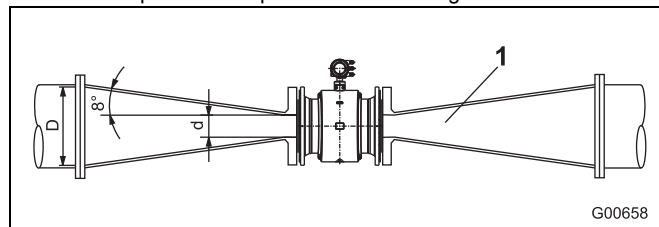


Fig. 27

- 1 = Flange transition piece
 d = Inside diameter of the flowmeter
 V = flow velocity [m/s]
 Δp = pressure loss [mbar]
 D = Inside diameter of the pipeline

Nomograph for pressure drop calculations

For flange transition piece with $\alpha/2 = 8^\circ$

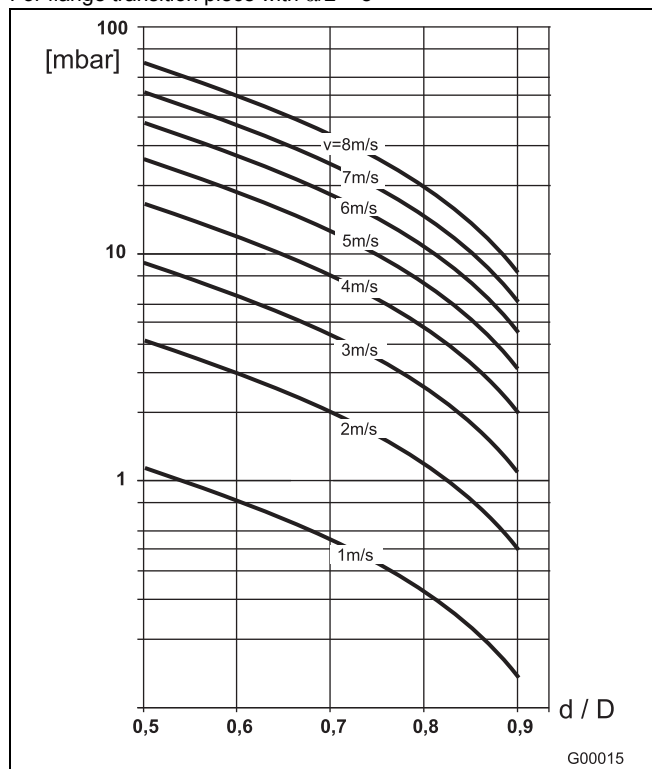


Fig. 28

8 Dimensions

8.1 Flange, DN 3 ... 125 (1/10 ... 5")

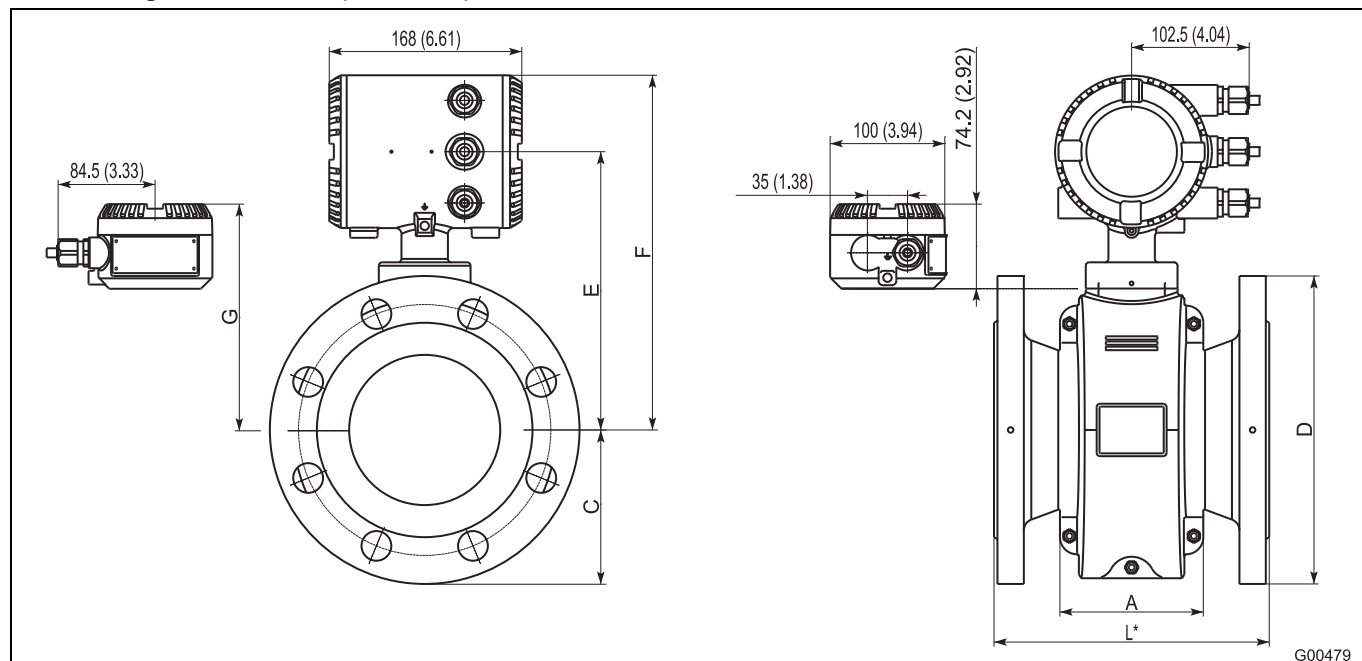


Fig. 29: Dimensions in mm (inch)

Flange in acc. with DIN/EN 1092-1 ⁷⁾

Dimensions [mm]								Approx. weight [kg]	
DN	PN ¹⁾	D	L ^{2) 3)}	F ⁴⁾	C	E ⁴⁾	G ⁴⁾	Compact design	Ext. Transmitter
3 ... 8 ⁵⁾	10 ... 40	90	200	255	82	188	143	7	5
10	10 ... 40	90	200	255	82	188	143	7	5
15	10 ... 40	95	200	255	82	188	143	8	6
20	10 ... 40	105	200	255	82	188	143	8	6
25	10 ... 40	115	200	255	82	188	143	9	7
32	10 ... 40	140	200	262	92	195	150	11	9
40	10 ... 40	150	200	262	92	195	150	11	9
50	10 ... 40	165	200	268	97	201	156	13	11
65	10 ... 40	185	200	279	108	212	167	17	15
80	10 ... 40	200	200	279	108	212	167	20	18
100	10 ... 16	220	250	301	122	234	189	23	21
	25 ... 40	235	250	301	122	234	189	29	27
125	10 ... 16	250	250	311	130	244	199	30	28
	25 ... 40	270	250	311	130	244	199	36	34

Tolerance L: +0 / -3 mm

Dimensions [inch]								Approx. weight [lb]	
DN (inch)	PN ¹⁾	D	L ^{2) 3)}	F ⁴⁾	C	E ⁴⁾	G ⁴⁾	Compact design	Ext. Transmitter
3 ... 8 ⁵⁾ (1/8 ... 5/16)	10 ... 40	3.54	7.87	10.04	3.23	7.40	5.63	15.43	11
10 (3/8)	10 ... 40	3.54	7.87	10.04	3.23	7.40	5.63	15.43	11
15 (1/2)	10 ... 40	3.74	7.87	10.04	3.23	7.40	5.63	17.64	13.23
20 (3/4)	10 ... 40	4.13	7.87	10.04	3.23	7.40	5.63	17.64	13.23
25 (1)	10 ... 40	4.53	7.87	10.04	3.23	7.40	5.63	19.84	15.43
32 (1 1/4)	10 ... 40	5.51	7.87	10.31	3.62	7.68	5.91	24.25	19.84
40 (1 1/2)	10 ... 40	5.91	7.87	10.31	3.62	7.68	5.91	24.25	19.84
50 (2)	10 ... 40	6.50	7.87	10.55	3.82	7.91	6.14	28.66	24.25
65 (2 1/2)	10 ... 40	7.28	7.87	10.98	4.25	8.35	6.57	37.48	33.07
80 (3)	10 ... 40	7.87	7.87	10.98	4.25	8.35	6.57	44.09	39.68
100 (4)	10 ... 16	8.66	9.84	11.85	4.80	9.21	7.44	50.71	46.30
	25 ... 40	9.25	9.84	11.85	4.80	9.21	7.44	63.93	59.52
125 (5)	10 ... 16	9.84	9.84	12.24	5.12	9.61	7.83	66.14	61.73
	25 ... 40	10.63	9.84	12.24	5.12	9.61	7.83	79.37	75

Tolerance L: +0 / -0,018 inch

Flange in acc. with ASME B16.5

Dimensions [mm]									Approx. weight [kg]	
DN	Inch	CL150	CL300	ISO 13359					Compact design	Ext. Transmitter
		D	D	L 2) 3)	F 4)	C	E 4)	G 4)		
3 ... 8	1/8 ... 5/16 6)	89	96	200	255	82	188	143	7	5
10	3/8 6)	89	96	200	255	82	188	143	7	5
15	1/2	89	96	200	255	82	188	143	8	6
20	3/4	98	118	200	255	82	188	143	8	6
25	1	108	124	200	255	82	188	143	9	7
32	1 1/4	118	134	200	262	92	195	150	11	9
40	1 1/2	127	156	200	262	92	195	150	11	9
50	2	153	165	200	268	97	201	156	13	11
65	2 1/2	178	191	200	279	108	212	167	17	15
80	3	191	210	200	279	108	212	167	20	18
100	4	229	254	250	301	122	234	189	23	21
125	5	254	280	250	311	130	244	199	30	28

Tolerance L: +0 / -3 mm

Dimensions [inch]									Approx. weight [lb]	
DN	Inch	CL150	CL300	ISO 13359					Compact design	Ext. Transmitter
		D	D	L 2) 3)	F 4)	C	E 4)	G 4)		
3 ... 8	1/8 ... 5/16 6)	3.50	3.78	7.87	10.04	3.23	7.40	5.63	15.4	11
10	3/8 6)	3.50	3.78	7.87	10.04	3.23	7.40	5.63	15.4	11
15	1/2	3.50	3.78	7.87	10.04	3.23	7.40	5.63	17.6	13.2
20	3/4	3.86	4.65	7.87	10.04	3.23	7.40	5.63	17.6	13.2
25	1	4.25	4.88	7.87	10.04	3.23	7.40	5.63	19.8	15.4
32	1 1/4	4.65	5.28	7.87	10.31	3.62	7.68	5.91	24.3	19.8
40	1 1/2	5.00	6.14	7.87	10.31	3.62	7.68	5.91	24.3	19.8
50	2	6.02	6.50	7.87	10.55	3.82	7.91	6.14	28.7	24.3
65	2 1/2	7.01	7.52	7.87	10.98	4.25	8.35	6.57	37.5	33.1
80	3	7.52	8.27	7.87	10.98	4.25	8.35	6.57	44.1	39.7
100	4	9.02	10.0	9.84	11.85	4.80	9.21	7.44	63.9	59.5
125	5	10.0	11.0	9.84	12.24	5.12	9.61	7.83	79.4	75

Tolerance L: +0 / -0.118 inch

1) Other pressure ratings available on request.

2) If a grounding plate is installed (attached to one side of the flange), this increases dimension L as follows: DN 3 ... 100 by 3 mm (0.118 inch); DN 125 by 5 mm (0.197 inch).

3) If protection plates are installed (attached to both sides of the flange), this increases dimension L as follows: DN 3 ... 100 by 6 mm (0.236 inch); DN 125 by 10 mm (0.394 inch).

4) Depending on the device design, the dimensions change according to the following table.

Device design		Dimension E, F	Dimension G
Without explosion protection	Standard temperature design	0	0
	High temperature version	+127 mm (+5 inch)	+127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard temperature design	+74 mm (+2.91 inch)	+47 mm (+1.85 inch)
	High temperature version	+127 mm (+5 inch)	+174 mm (+6.85 inch)
Explosion protection Zone 2, Div. 2	Standard temperature design	0	0
	High temperature version	+127 mm (+5 inch)	+127 mm (+5 inch)

5) Connection flange DN 10

6) Connection flange 1/2"

7) Connecting dimensions in acc. with EN 1092-1. For DN 65, PN 16 in acc. with EN 1092-1, please order PN 40.

8.2 Flange DN 150 ... 400 (6 ... 16")

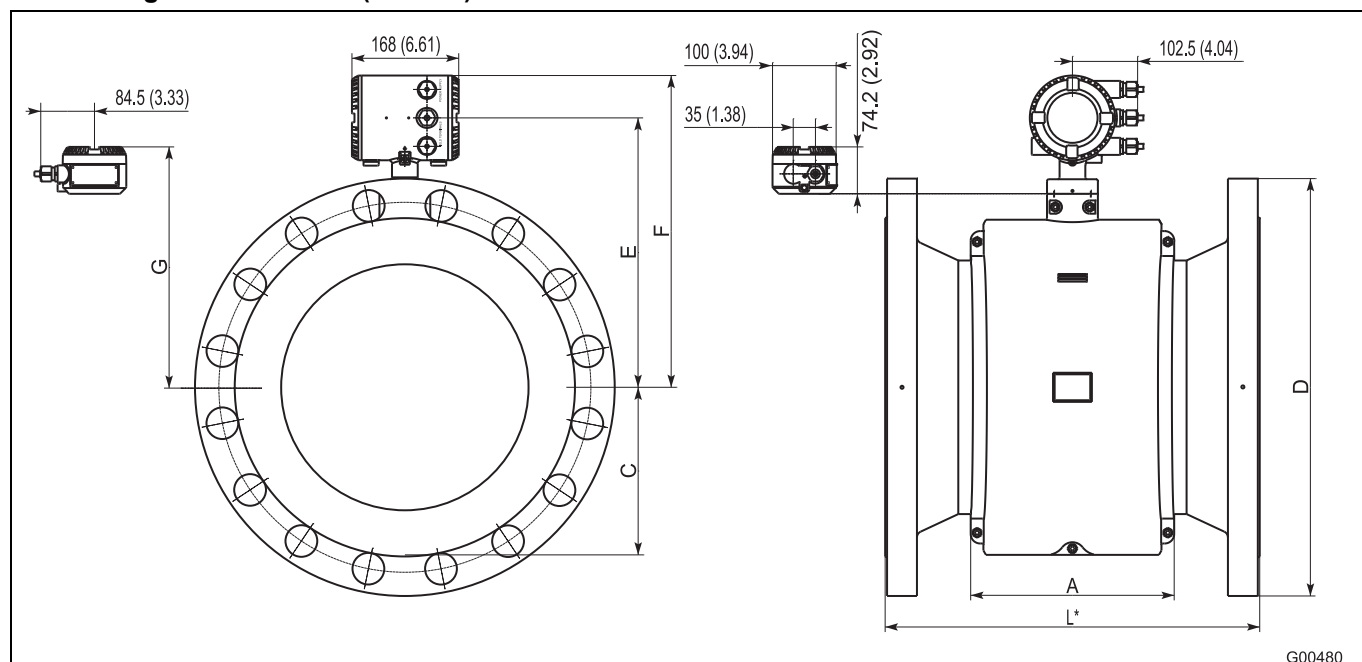


Fig. 30: Dimensions in mm (inch)

Flange in acc. with DIN/EN 1092-1

Dimensions [mm]								Approx. weight [kg]	
DN	PN ¹⁾	D	L ^{2) 3)}	F ⁴⁾	C	E ⁴⁾	G ⁴⁾	Compact design	Ext. Transmitter
150	10 ... 16	285	300	358	146	291	246	40	38
	25 ... 40	300	300	358	146	291	246	45	43
200	10	340	350	399	170	331	286	67	65
	16	340	350	399	170	331	286	67	65
250	10	395	450	413	198	346	301	106	104
	16	405	450	413	198	346	301	106	104
300	10	445	500	436	228	369	324	120	118
	16	460	500	436	228	369	324	120	118
350	10	505	550	451	265	384	339	146	144
	16	520	550	451	265	384	339	146	144
400	10	565	600	493	265	426	381	180	178
	16	580	600	493	265	426	381	180	178

Tolerance L: DN 150 ... 200 +0 / -3 mm, DN 250 ... 400 +0 / -5 mm

Dimensions [inch]								Approx. weight [lb]	
DN (inch)	PN ¹⁾	D	L ^{2) 3)}	F ⁴⁾	C	E ⁴⁾	G ⁴⁾	Compact design	Ext. Transmitter
150 (6)	10 ... 16	11.22	11.81	14.09	5.75	11.46	9.69	88.18	83.78
	25 ... 40	11.81	11.81	14.09	5.75	11.46	9.69	99.21	94.80
200 (8)	10	13.39	13.78	15.71	6.69	13.03	11.26	147.71	143.30
	16	13.39	13.78	15.71	6.69	13.03	11.26	147.71	143.30
250 (10)	10	15.55	17.72	16.26	7.80	13.62	11.85	233.69	229.28
	16	15.94	17.72	16.26	7.80	13.62	11.85	233.69	229.28
300 (12)	10	17.52	19.68	17.17	8.98	14.53	12.76	264.55	260.15
	16	18.11	19.68	17.17	8.98	14.53	12.76	264.55	260.15
350 (14)	10	19.88	21.65	17.76	10.43	15.12	13.35	321.87	317.47
	16	20.47	21.65	17.76	10.43	15.12	13.35	321.87	317.47
400 (16)	10	22.24	23.62	19.41	10.43	16.77	15.00	396.83	392.42
	16	22.83	23.62	19.41	10.43	16.77	15.00	396.83	392.42

Tolerance L: DN 150 ... 200 +0 / -0.118 inch, DN 250 ... 400 +0 / -0.197 inch

Flange in acc. with ASME B16.5

Dimensions [mm]									Approx. weight [kg]	
DN	Inch	CL150	CL300	ISO 13359					Compact design	Ext. transmitter
		D	D	L 2) 3)	F 4)	C	E 4)	G 4)		
150	6	280	318	300	358	146	291	246	40	38
200	8	343	381	350	399	170	331	286	67	65
250	10	407	445	450	413	198	346	301	106	104
300	12	483	521	500	436	228	369	324	120	118
350	14	533	-	550	451	265	384	339	146	144
400	16	597	-	600	493	265	426	381	180	178

Tolerance L: DN 150 ... 200 +0 / -3 mm, DN 250 ... 400 +0 / -5 mm

Dimensions [inch]									Approx. weight [lb]	
DN	Inch	CL150	CL300	ISO 13359					Compact design	Ext. transmitter
		D	D	L 2) 3)	F 4)	C	E 4)	G 4)		
150	6	11.02	12.52	11.81	14.09	5.75	11.46	9.69	106	101
200	8	13.50	15.00	13.78	15.71	6.69	13.03	11.26	159	154
250	10	16.02	17.52	17.72	16.26	7.80	13.62	11.85	229	225
300	12	19.02	20.51	19.68	17.17	8.98	14.53	12.76	313	309
350	14	20.98	-	21.65	17.76	10.43	15.12	13.35	421	417
400	16	23.50	-	23.62	19.41	10.43	16.77	15.00	511	507

Tolerance L: DN 150 ... 200 +0 / -0.118 inch, DN 250 ... 400 +0 / -0.197 inch

1) Other pressure ratings available on request.

2) If a grounding plate is installed (attached to one side of the flange), this increases dimension L by 5 mm (0.197 inch).

3) If protection plates are installed (attached to both sides of the flange), this increases dimension L by 10 mm (0.394 inch).

4) Depending on the device design, the dimensions change according to the following table.

Device design		Dimension E, F	Dimension G
Without explosion protection	Standard temperature design	0	0
	High temperature version	+127 mm (+5 inch)	+127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard temperature design	+74 mm (+2.91 inch)	+47 mm (+1.85 inch)
	High temperature version	+127 mm (+5 inch)	+174 mm (+6.85 inch)
Explosion protection Zone 2, Div. 2	Standard temperature design	0	0
	High temperature version	+127 mm (+5 inch)	+127 mm (+5 inch)

8.3 Flange DN 450 ... 1000 (18 ... 40")

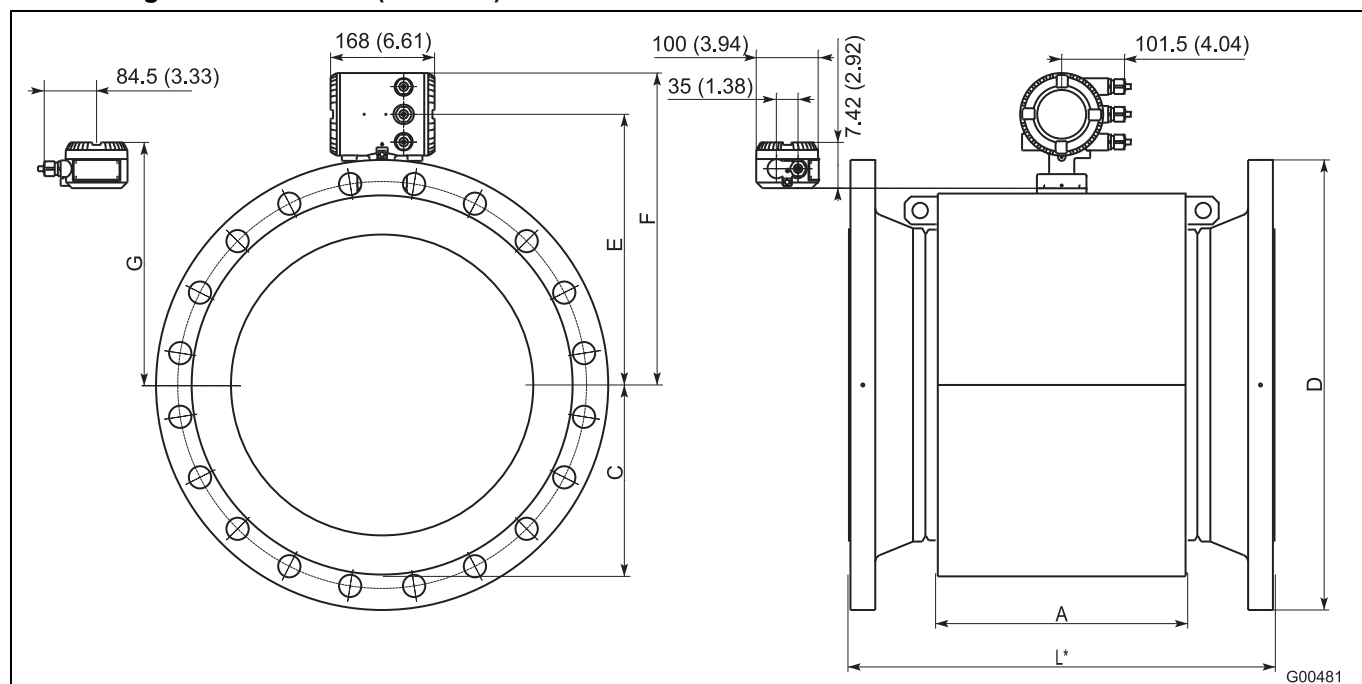


Fig. 31: Dimensions in mm (inch)

Flange in acc. with DIN/EN 1092-1

Dimensions [mm]								Approx. weight [kg]	
DN	PN 1)	D	L 2) 3)	F 4)	C	E 4)	G 4)	Compact design	Ext. transmitter
500	10	670	650	501	310	434	389	196	194
600	10	780	780	552	361	485	440	276	274
700	10	895	910	596	405	529	484	319	317
800	10	1015	1040	646	455	579	534	409	407
900	10	1115	1170	696	505	629	584	487	485
1000	10	1230	1300	746	555	679	634	579	577

Tolerance L: DN 450 ... 500 +0 / -5 mm, DN 600 ... 2000 +0 / -10 mm

Dimensions [inch]								Approx. weight [lb]	
DN (inch)	PN ¹⁾	D	L ^{2) 3)}	F ⁴⁾	C	E ⁴⁾	G ⁴⁾	Compact design	Ext. transmitter
500 (20)	10	26.38	25.59	19.72	12.20	17.09	15.31	432.11	427.70
600 (24)	10	30.71	30.71	21.73	14.21	19.09	17.32	608.48	604.07
700 (28)	10	35.24	35.83	23.46	15.94	20.83	19.06	703.27	698.86
800 (32)	10	39.96	40.94	25.43	17.91	22.80	21.02	901.69	897.28
900 (36)	10	43.90	46.06	27.40	19.88	24.76	22.99	1073.65	1069.24
1000 (40)	10	48.43	51.18	29.37	21.85	26.73	24.96	1276.47	1272.07

Tolerance L: DN 500 +0 / -0.197 inch, DN 600 ... 2000 +0 / -0.394 inch

Flange up to DN 600 (24") in acc. with ASME B16.5, flange DN 700 ... 1000 (28 ... 40") in acc. with ASME B16.47, Series B

Dimensions [mm]									Approx. weight [kg]	
									Compact design	Ext. Transmitter
		CL150	ISO 13359	ABB (previous installation length)					CL150	CL150
DN	Inch	D	L 2) 3)	L 2) 3)	F 4)	C	E 4)	G 4)	Approx. kg	Approx. kg
450	18	635	686	-	501	310	434	389	188	190
500	20	699	762	-	501	310	434	389	196	194
600	24	813	914	-	552	361	485	440	276	274
700	28	837	-	910	596	405	529	484	319	317
800	32	942	-	1040	646	455	579	534	409	407
900	36	1057	-	1170	696	505	629	584	487	485
1000	40	1380	-	1300	746	555	679	634	579	577

Tolerance L: DN 450 ... 500 +0 / -5 mm, DN 600 ... 2000 +0 / -10 mm

Dimensions [inch]									Approx. weight [lb]	
									Compact design	Ext. Transmitter
		CL150	ISO 13359	ABB (previous installation length)					CL150	CL150
DN	Inch	D	L 2) 3)	L 2) 3)	F 4)	C	E 4)	G 4)	Approx. lb	Approx. lb
450	18	25.0	27.01	-	19.72	12.20	17.09	15.31	518	513
500	20	27.52	30.0	-	19.72	12.20	17.09	15.31	590	584
600	24	32.01	35.98	-	21.73	14.21	19.09	17.32	725	720
700	28	32.95	-	35.83	23.46	15.94	20.83	19.06	853	848
800	32	37.09	-	40.94	25.43	17.91	22.80	21.02	1135	1131
900	36	41.61	-	46.06	27.40	19.88	24.76	22.99	1463	1459
1000	40	54.33	-	51.18	29.37	21.85	26.73	24.96	2500	2495

Tolerance L: DN 450 ... 500 +0 / -0.197 inch, DN 600 ... 2000 +0 / -0.394 inch

1) Other pressure ratings available on request.

2) If a grounding plate is installed (attached to one side of the flange), this increases dimension L as follows: DN 400 ... 600 by 5 mm (0.197 inch).

3) If protection plates are installed (attached to both sides of the flange), this increases dimension L as follows: DN 400 ... 600 by 10 mm (0.394 inch).

4) Depending on the device design, the dimensions change according to the following table.

Device design		Dimension E, F	Dimension G
Without explosion protection	Standard temperature design	0	0
	High temperature version	+127 mm (+5 inch)	+127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard temperature design	+74 mm (+2.91 inch)	+47 mm (+1.85 inch)
	High temperature version	+127 mm (+5 inch)	+174 mm (+6.85 inch)
Explosion protection Zone 2, Div. 2	Standard temperature design	0	0
	High temperature version	+127 mm (+5 inch)	+127 mm (+5 inch)

8.4 Flange DN 15 ... 200 (1/2 ... 8"), high-pressure versions PN 63 and PN 100

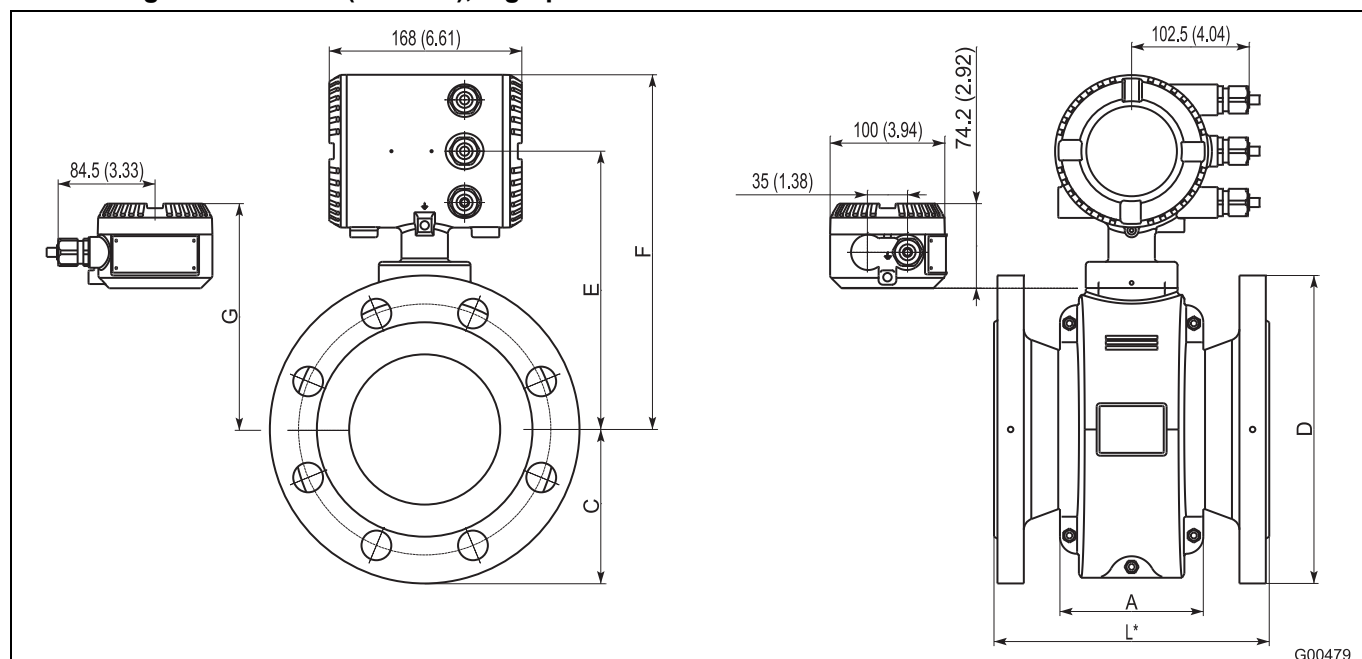


Fig. 32: Dimensions in mm (inch)

Flange in acc. with DIN 2636 (PN 63) and DIN 2637 (PN 100)

		Dimensions [mm (inch)]					
DN	PN	D	L ^{1) 2)}	F ⁴⁾	C	E ³⁾	G ³⁾
15	64 ... 100	105 (4.13)	270 (10.63)	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)
25	64 ... 100	140 (5.51)	270 (10.63)	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)
40	64 ... 100	170 (6.69)	280 (11.02)	262 (10.31)	92 (3.62)	195 (7.68)	150 (5.91)
50	64	180 (7.09)	280 (11.02)	268 (10.55)	97 (3.82)	201 (7.91)	156 (6.14)
	100	195 (7.68)	280 (11.02)	268 (10.55)	97 (3.82)	201 (7.91)	156 (6.14)
65	64	208 (8.19)	330 (12.99)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)
	100	220 (8.66)	330 (12.99)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)
80	64	215 (8.46)	340 (13.39)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)
	100	230 (9.06)	340 (13.39)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)
100	64	250 (9.84)	400 (15.75)	301 (11.85)	122 (4.8)	234 (9.21)	189 (7.44)
	100	265 (10.43)	400 (15.75)	301 (11.85)	122 (4.8)	234 (9.21)	189 (7.44)

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Dimensions [mm (inch)]							
DN	PN	D	L 1) 2)	F 4)	C	E 3)	G 3)
125	64	295 (11.61)	450 (17.72)	311 (12.24)	130 (5.12)	244 (9.61)	199 (7.83)
	100	315 (12.4)	450 (17.72)	311 (12.24)	130 (5.12)	244 (9.61)	199 (7.83)
150	64	345 (13.58)	450 (17.72)	358 (14.09)	146 (5.75)	291 (11.46)	246 (9.69)
	100	355 (13.98)	450 (17.72)	358 (14.09)	146 (5.75)	291 (11.46)	246 (9.69)
200	64	415 (16.34)	500 (19.69)	399 (15.71)	170 (6.69)	331 (13.03)	286 (11.26)
	100	430 (16.93)	500 (19.69)	399 (15.71)	170 (6.69)	331 (13.03)	286 (11.26)

Tolerance L: +0 / -3 mm (+0 / -0,018 inch)

1) If a grounding plate is installed (attached to one side of the flange), this increases dimension L as follows: DN 3 ... 100 by 3 mm (0.118 inch); DN 125 by 5 mm (0.197 inch).

2) If protection plates are installed (attached to both sides of the flange), this increases dimension L as follows: DN 3 ... 100 by 6 mm (0.236 inch); DN 125 by 10 mm (0.394 inch).

3) Depending on the device design, the dimensions change according to the following table.

Device design		Dimension E, F	Dimension G
Without explosion protection	Standard temperature design	0	0
	High temperature version	+127 mm (+5 inch)	+127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard temperature design	+74 mm (+2.91 inch)	+47 mm (+1.85 inch)
	High temperature version	+127 mm (+5 inch)	+174 mm (+6.85 inch)
Explosion protection Zone 2, Div. 2	Standard temperature design	0	0
	High temperature version	+127 mm (+5 inch)	+127 mm (+5 inch)

8.5 Flange DN 15 ... 200 (1/2 ... 8"), high-pressure version CL 600

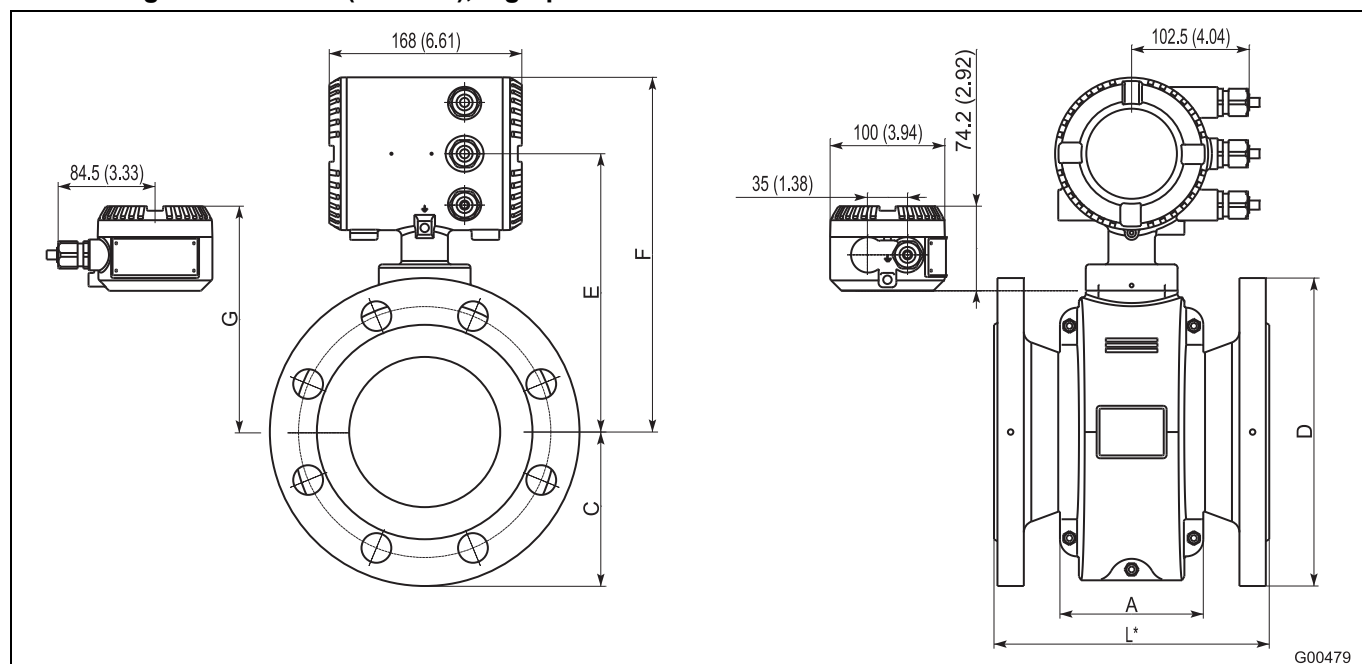


Fig. 33: Dimensions in mm (inch)

Flange in acc. with ASME B16.5, CL 600

Dimensions [mm (inch)]							
DN	PN ¹⁾	D	L ^{1) 2)}	F ⁴⁾	C	E ³⁾	G ³⁾
15	64 ... 100	95 (3.74)	270 (10.63)	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)
25	64 ... 100	124 (4.88)	270 (10.63)	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)
40	64 ... 100	156 (6.14)	280 (11.02)	262 (10.31)	92 (3.62)	195 (7.68)	150 (5.91)
50	64	165 (6.5)	280 (11.02)	268 (10.55)	97 (3.82)	201 (7.91)	156 (6.14)
	100	165 (6.5)	280 (11.02)	268 (10.55)	97 (3.82)	201 (7.91)	156 (6.14)
65	64	190 (7.48)	330 (12.99)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)
	100	190 (7.48)	330 (12.99)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)
80	64	210 (8.27)	340 (13.39)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)
	100	210 (8.27)	340 (13.39)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)
100	64	273 (10.75)	400 (15.75)	301 (11.85)	122 (4.8)	234 (9.21)	189 (7.44)
	100	273 (10.75)	400 (15.75)	301 (11.85)	122 (4.8)	234 (9.21)	189 (7.44)

Continued on next page

Continued

Dimensions [mm (inch)]							
DN	PN ¹⁾	D	L ^{1) 2)}	F ⁴⁾	C	E ³⁾	G ³⁾
125	64	330 (12.99)	450 (17.72)	311 (12.24)	130 (5.12)	244 (9.61)	199 (7.83)
	100	330 (12.99)	450 (17.72)	311 (12.24)	130 (5.12)	244 (9.61)	199 (7.83)
150	64	355 (13.98)	450 (17.72)	358 (14.09)	146 (5.75)	291 (11.46)	246 (9.69)
	100	355 (13.98)	450 (17.72)	358 (14.09)	146 (5.75)	291 (11.46)	246 (9.69)
200	64	422 (16.61)	500 (19.69)	399 (15.71)	170 (6.69)	331 (13.03)	286 (11.26)
	100	422 (16.61)	500 (19.69)	399 (15.71)	170 (6.69)	331 (13.03)	286 (11.26)

Tolerance L: +0 / -3 mm (+0 / -0,018 inch)

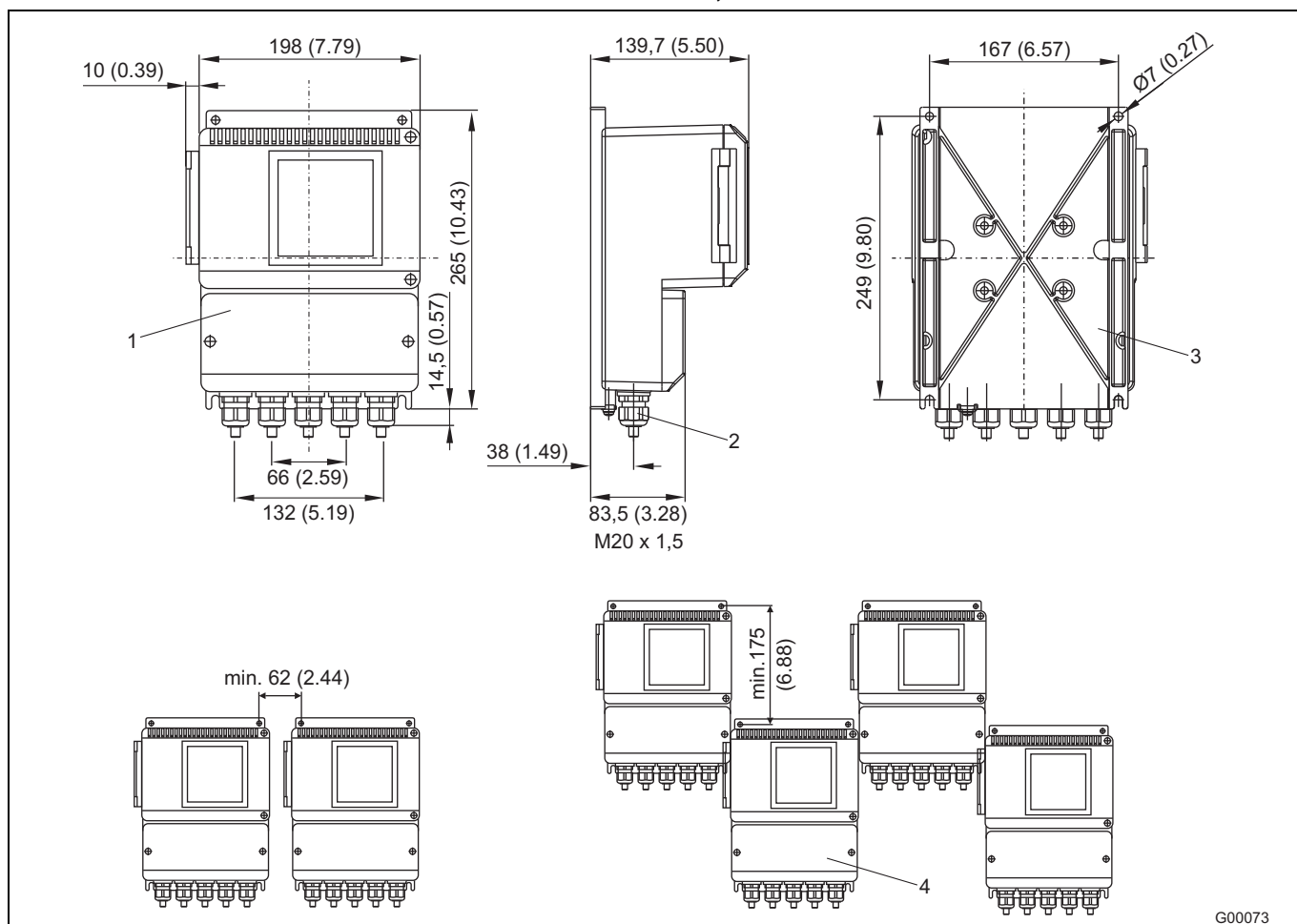
1) If a grounding plate is installed (attached to one side of the flange), this increases dimension L as follows: DN 3 ... 100 by 3 mm (0.118 inch); DN 125 by 5 mm (0.197 inch).

2) If protection plates are installed (attached to both sides of the flange), this increases dimension L as follows: DN 3 ... 100 by 6 mm (0,236 inch); DN 125 by 10 mm (0,394 inch).

3) Depending on the device design, the dimensions change according to the following table.

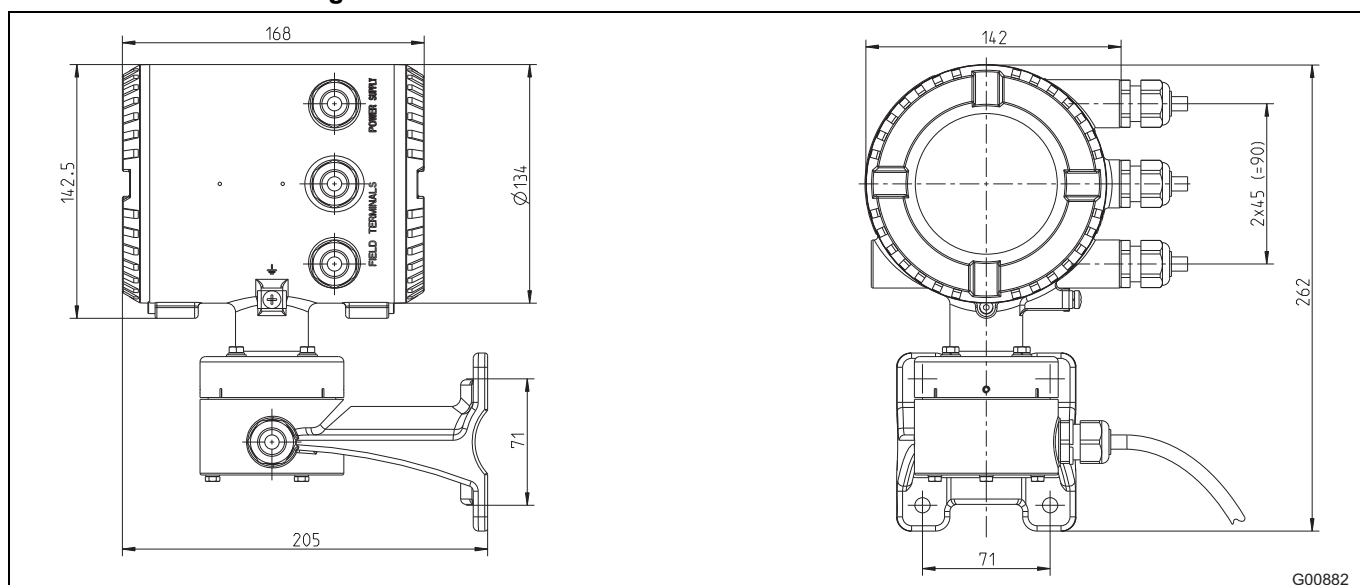
Device design		Dimension E, F	Dimension G
Without explosion protection	Standard temperature design	0	0
	High temperature version	+127 mm (+5 inch)	+127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard temperature design	+74 mm (+2.91 inch)	+47 mm (+1.85 inch)
	High temperature version	+127 mm (+5 inch)	+174 mm (+6.85 inch)
Explosion protection Zone 2, Div. 2	Standard temperature design	0	0
	High temperature version	+127 mm (+5 inch)	+127 mm (+5 inch)

8.6 Flowmeter sensor model FET321 and FET325 zone 2, Div 2



- 1 Field-mount housing with window
- 2 Cable gland M20 x 1.5
- 3 Installation holes for pipe mounting set, for 2" pipe installation; mounting set available on request (order no. 3KXF081100L0001)
- 4 Protection class IP 67

8.7 Transmitter housing for model FET325 for Ex zone 1 / Div. 1



9 Ordering information

9.1 ProcessMaster FEP311, FEP315 electromagnetic flowmeter, compact unit

Main order number																											Additional order no.
Version number	1 - 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27					
Without explosion protection	FEP311	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX				
With explosion protection	FEP315	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX				
Nominal size																											
DN 3 (1/10 in.)		0	0	3																							
DN 4 (5/32 in.)		0	0	4																							
DN 6 (1/4 in.)		0	0	6																							
DN 8 (5/16 in.)		0	0	8																							
DN 10 (3/8 in.)		0	1	0																							
DN 15 (1/2 in.)		0	1	5																							
DN 20 (3/4 in.)		0	2	0																							
DN 25 (1 in.)		0	2	5																							
DN 32 (1 1/4 in.)		0	3	2																							
DN 40 (1 1/2 in.)		0	4	0																							
DN 50 (2 in.)		0	5	0																							
DN 65 (2 1/2 in.)		0	6	5																							
DN 80 (3 in.)		0	8	0																							
DN 100 (4 in.)		1	0	0																							
DN 125 (5 in.)		1	2	5																							
DN 150 (6 in.)		1	5	0																							
DN 200 (8 in.)		2	0	0																							
DN 250 (10 in.)		2	5	0																							
DN 300 (12 in.)		3	0	0																							
DN 350 (14 in.)		3	5	0																							
DN 400 (16 in.)		4	0	0																							
DN 450 (18 in.)		4	5	0																							
DN 500 (20 in.)		5	0	0																							
DN 600 (24 in.)		6	0	0																							
DN 700 (28 in.)		7	0	0																							
DN 800 (32 in.)		8	0	0																							
DN 900 (36 in.)		9	0	0																							
DN 1000 (40 in.)		0	0	1																							
DN 1200 (48 in.)		2	0	1																							
DN 1400 (54 in.)		4	0	1																							
DN 1600 (66 in.)		6	0	1																							
DN 1800 (72 in.)		8	0	1																							
DN 2000 (80 in.)		0	0	2																							
Lining material																											
PTFE						A																					
ETFE						E																					
Thick PTFE						F																					
Hard rubber						H																					
PFA						P																					
Soft rubber						S																					
Electrode design																											
Standard						1																					
Pointed head						1)	5																				
Signal electrode material																											
Stainless steel 1.4539 (904)							A																				
Hastelloy C-4 (2.4610)							D																				
Titanium							F																				
Tantalum							G																				
Hastelloy B-3 (2.4600)							H																				
Platinum-iridium							J																				
Stainless steel 1.4571 (316 Ti)							S																				

Continued on next page

1) Signal electrode material: 1.4539 (904).

Continued

Main order number																											Additional order no.								
Version number	1 - 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27													
Without explosion protection	FEP311	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX												
With explosion protection	FEP315	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX												
Grounding accessories																																			
Standard																											1								
Grounding electrodes (for material, refer to "Signal electrode material")																											2) 2								
Grounding plate, 1.4571(316 Ti), attached to one side of the flange																											3) 3								
Protection plates, 1.4571(316 Ti), attached to both sides of the flange																											4) 4								
Process connection																																			
Flange DIN PN 6																											5) D 0								
Flange DIN PN 10																											D 1								
Flange DIN PN 16																											D 2								
Flange DIN PN 25																											D 3								
Flange DIN PN 40																											D 4								
Flange DIN PN 64																											6) D 5								
Flange DIN PN 100																											6) D 6								
Flange, ASME CL 150, ISO-compliant installation length																											A 1								
Flange, ASME CL 300, ISO-compliant installation length																											A 3								
Flange, ASME CL 600									6) A 6																										
Flange, JIS 10K									J 1																										
Process connection material																																			
Steel																											B								
Stainless steel flange 1.4571 (316 Ti)									D																										
Certificates																																			
Meter tube with DGRL approval																											0								
Material confirmation with inspection certificate 3.1 to EN 10204																											2								
Pressure test to AD-2000																											3								
Material confirmation with inspection certificate 3.1 to EN 10204 and pressure test to AD-2000																											4								
Material confirmation with inspection certificate 3.2 to EN 10204									7																										
Calibration																																			
Standard accuracy																											7) A								
Increased accuracy																											8) B								
Standard accuracy for certified calibration																											M								
5-point DKD calibration									T																										
Sensor temperature range / Ambient temperature range																																			
Standard sensor design / -20 ... 60 °C (-4 ... 140 °F)																											9) 1								
High-temperature sensor design / -20 ... 60 °C (-4 ... 140 °F)																											10) 3								
Name plate																																			
Sticker																											A								
Stainless steel																											B								
Stainless steel and stainless steel tag plate																											C								
Signal cable length																																			
No cable																											0								

Continued on next page

- 2) Only available in DN 3 ... DN 400 (1/10 ... 16 inch) range. A conductive element is integrated as standard into the ProcessMaster with hard rubber lining and DN ≥ DN 100 (4 inch). There is no need for grounding electrodes.
- 3) Grounding plates can only be used for sensors ≤ DN 600 (24 inch) and PTFE/thick PTFE/ETFE/PFA linings.
- 4) Protection plates can only be used for sensors ≤ DN 600 (24 inch) and PTFE/thick PTFE/ETFE/PFA linings.
- 5) Available from DN 1000.
- 6) Only available in DN 15 ... DN 200 (1/2 ... 8 inch) range (hard rubber).
- 7) Standard accuracy (0.4% of measured value) assumes 2 calibration points. If more than 2 calibration points are required, you must specify 3 points under "Number of test points".
- 8) Increased accuracy (0.2% of measured value) assumes 3 calibration points. If more than 3 calibration points are required, you must specify 5 points under "Number of test points" (increased accuracy is available for DN 10 ... 800).
- 9) Maximum fluid temperature for standard sensor design: 130 °C (266 °F) with PTFE, PFA, ETFE, thick PTFE; 90 °C (194 °F) with hard rubber; 60 °C (140 °F) with soft rubber.
- 10) Maximum fluid temperature for high-temperature sensor design: 180 °C (356 °F) with PFA, thick PTFE; 130 °C (266 °F) with ETFE, PTFE (high temperature sensor design available only up to DN 300).

Continued

Main order number																											Additional order no.
Version number	1 - 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27					
Without explosion protection	FEP311	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
With explosion protection	FEP315	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
Explosion protection																	A L M P 11) R										
None																											
ATEX/IEC Zone 1, 21, 22																											
ATEX/IEC Zone 2, 21, 22																											
FM/cFM Cl 1 Div. 2, Zone 2																											
FM/cFM Cl 1 Div. 1, Zone 1																											
Protection type for transmitter/sensor																											
IP67 (NEMA 4X) / IP67 (NEMA 4X)																	1										
Other																	9										
Cable gland																											
M20 x 1.5																		A									
1/2 in. NPT																		B									
PF 1/2 in.																		C									
Supply power																											
100 ... 230 V AC, 50 Hz																			1								
24 V AC/DC, 50 Hz																			2								
100 ... 230 V AC, 60 Hz																			3								
24 V AC/DC, 60 Hz																			4								
Signal inputs and outputs																											
HART + 20 mA passive + pulses + contact input/output																	12) 13)		B								
HART + 20 mA active + pulses + contact input/output																			C								
12)																											
HART + 20 mA active + pulses + contact output																			D								
13)																											
Default settings / Diagnostics																											
Parameters are at factory settings / Standard diagnostics functions activated																			1								
Parameters set according to customer specifications / Standard diagnostics functions activated																			3								
Language of documentation																											
German																						M1					
English																						M5					
Western Europe/Scandinavia language package																						MW					
Eastern Europe language package																						ME					
Number of test points																											
3 points																						P3					
5 points																						P5					
Additional certificates																											
Russia Metrological and GOST R certificate																						CG1					
Kazakhstan Metrological and GOST K certificate																						CG2					
Ukraine Metrological certificate																						CG3					
White Russia Metrological certificate																						CG6					
Additional Ex certificates and approvals																											
Russia GOST-Ex and RTN certificate																						EG7					
Kazakhstan Ex applications certificate																						EG3					
Ukraine GOST Ex and RTN application certificate																						EG5					
White Russia GGTN certificate																						EG9					

11) Div. 1 design available only with DN 300.

12) Option available with model FEP311.

13) Option available with model FEP315.

9.2 ProcessMaster FEP321, FEP325 electromagnetic flowmeter, with remote transmitter

Main order number																											Additional order no.	
Version number	1 - 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27						
Without explosion protection	FEP321	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX					
With explosion protection	FEP325	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX					
Nominal size																												
DN 3 (1/10 in.)		0	0	3																								
DN 4 (5/32 in.)		0	0	4																								
DN 6 (1/4 in.)		0	0	6																								
DN 8 (5/16 in.)		0	0	8																								
DN 10 (3/8 in.)		0	1	0																								
DN 15 (1/2 in.)		0	1	5																								
DN 20 (3/4 in.)		0	2	0																								
DN 25 (1 in.)		0	2	5																								
DN 32 (1 1/4 in.)		0	3	2																								
DN 40 (1 1/2 in.)		0	4	0																								
DN 50 (2 in.)		0	5	0																								
DN 65 (2 1/2 in.)		0	6	5																								
DN 80 (3 in.)		0	8	0																								
DN 100 (4 in.)		1	0	0																								
DN 125 (5 in.)		1	2	5																								
DN 150 (6 in.)		1	5	0																								
DN 200 (8 in.)		2	0	0																								
DN 250 (10 in.)		2	5	0																								
DN 300 (12 in.)		3	0	0																								
DN 350 (14 in.)		3	5	0																								
DN 400 (16 in.)		4	0	0																								
DN 450 (18 in.)		4	5	0																								
DN 500 (20 in.)		5	0	0																								
DN 600 (24 in.)		6	0	0																								
DN 700 (28 in.)		7	0	0																								
DN 800 (32 in.)		8	0	0																								
DN 900 (36 in.)		9	0	0																								
DN 1000 (40 in.)		0	0	1																								
DN 1200 (48 in.)		2	0	1																								
DN 1400 (54 in.)		4	0	1																								
DN 1600 (66 in.)		6	0	1																								
DN 1800 (72 in.)		8	0	1																								
DN 2000 (80 in.)		0	0	2																								
Lining material																												
PTFE							A																					
ETFE							E																					
Thick PTFE							F																					
Hard rubber							H																					
PFA							P																					
Soft rubber							S																					
Electrode design																												
Standard							1																					
Pointed head						1)	5																					
Signal electrode material																												
Stainless steel 1.4539 (904)							A																					
Hastelloy C-4 (2.4610)							D																					
Titanium							F																					
Tantalum							G																					
Hastelloy B-3 (2.4600)							H																					
Platinum-iridium							J																					
Stainless steel 1.4571 (316 Ti)							S																					

Continued on next page

1) Signal electrode material: 1.4539 (904).

Continued

		Main order number																											Additional order no.
Version number	1 - 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27							
Without explosion protection	FEP321	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX						
With explosion protection	FEP325	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX						
Signal cable length																	11)												
No cable																	12)	0											
5 m (approx. 15 ft.) standard cable																		1											
10 m (approx. 30 ft.) standard cable																		2											
20 m (approx. 60 ft.) standard cable																		3											
30 m (approx. 100 ft.) standard cable																		4											
50 m (approx. 165 ft.) standard cable																		5											
80 m (approx. 260 ft.) standard cable																		6											
100 m (approx. 325 ft.) standard cable																		7											
150 m (approx. 490 ft.) standard cable																		8											
Explosion protection																													
None																		A											
ATEX/IEC Zone 1, 21, 22																		L											
ATEX/IEC Zone 2, 21, 22																		M											
FM/cFM Cl 1 Div.2, Zone 2																		P											
FM/cFM Cl 1 Div.1, Zone 1																	13)	R											
Protection type for transmitter/sensor																													
IP67 (NEMA 4X) / IP67 (NEMA 4X)																		1											
IP67 (NEMA 4X) / IP68 (NEMA 6X)																	14)	2											
IP67 (NEMA 4X) / IP68 (NEMA 6X), signal cable connected and sealed in																	15)	3											
Cable gland																													
M20 x 1.5																													
1/2 in. NPT																													
PF 1/2 in.																													
Supply power																													
None																													
Signal inputs and outputs																													
None																													
Default settings / Diagnostics																													
Parameters are at factory settings / Standard diagnostics functions activated																													
Parameters set according to customer specifications / Standard diagnostics functions activated																													
Accessories																													
With preamplifier, integrated into sensor housing																	16) 17)												
Language of documentation																													
German																													
English																													
Western Europe/Scandinavia language package																													
Eastern Europe language package																													
Number of test points																													
3 points																													
5 points																													
Additional certificates																													
Russia	Metrological and GOST R certificate																												
Kazakhstan	Metrological and GOST K certificate																												
Ukraine	Metrological certificate																												
White Russia	Metrological certificate																												
Additional Ex certificates and approvals																													
Russia	GOST-Ex and RTN certificate																												
Kazakhstan	Ex applications certificate																												
Ukraine	GOST Ex and RTN application certificate																												
White Russia	GGTN certificate																												

11) For flowmeter sensor model FEP325 designed for Zone 1 or Div 1, signal cable length can be max. 50 m (164 ft) in combination with transmitter model FET321 or transmitter model FET 325 designed for Zone 2 or Div 2. For sensor model FEP325 designed for Zone 1 or Div 1, signal cable length can be max. 10 m (32.8 ft) in combination with transmitter model FET325 designed for Zone 1 or Div 1.

12) Selectable when flowmeter sensor is ordered as a spare part.

13) Div. 1 design available up to DN300.

14) Only with external transmitter, sealing compound (optional) D141B038U01.

15) Not with NPT cable gland.

16) Preamplifier is required, if signal cable length > 50 m (approx. 165 ft.).

17) Not supported with FEP325 designed for Zone 1 or Div 1 (max. 50 m (164 ft) signal cable length).

9.3 FET321, FET325 external transmitter for ProcessMaster/HygienicMaster

Main order number															Additional order no.	
Version number																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Without explosion protection						FET321	X	X	X	X	X	X	X	X	X	XX
With explosion protection						FET325	X	X	X	X	X	X	X	X	X	XX
Sensor temperature range / Ambient temperature range																
Standard sensor design / -20 ... 60 °C (-4 ... 140 °F)						1										
High-temperature sensor design / -20 ... 60 °C (-4 ... 140 °F)						3										
Name plate																
Sticker						A										
Stainless steel						B										
Stainless steel and stainless steel tag plate						C										
Signal cable length																
No signal cable						1) 0										
Explosion protection																
None						A										
ATEX/IEC Zone 1, 21, 22						L										
ATEX/IEC Zone 2, 21, 22						M										
FM/cFM CI 1 Div.2, Zone 2						P										
FM/cFM CI 1 Div.1, Zone 1						R										
Protection type for transmitter/sensor																
IP 67 (NEMA 4X) / IP 67 (NEMA 4X)						1										
Cable gland																
M20 x 1.5						A										
1/2 in. NPT						B										
PF 1/2 in.						C										
Supply power																
100 ... 230 V AC, 50 Hz						1										
24 V AC/DC, 50 Hz						2										
100 ... 230 V AC, 60 Hz						3										
24 V AC/DC, 60 Hz						4										
Signal inputs and outputs																
HART + 20 mA passive + pulses + contact input/output						2) 3) B										
HART + 20 mA active + pulses + contact input/output						2) C										
HART + 20 mA active + pulses + contact output						3) D										
Default settings / Diagnostics																
None						4) 0										
Parameters are at factory settings / Standard diagnostics functions activated						1										
Parameters set according to customer specifications / Standard diagnostics functions activated						3										
Additional options																
With Gore-Tex diaphragm																5) KG
Language of documentation																
German																M1
English																M5
Western Europe/Scandinavia language package																MW
Eastern Europe language package																ME
Additional certificates																
Russia Metrological and GOST R certificate																CG1
Kazakhstan Metrological and GOST K certificate																CG2
Ukraine Metrological certificate																CG3
White Russia Metrological certificate																CG6
Additional Ex certificates and approvals																
Russia GOST-Ex and RTN certificate																EG7
Kazakhstan Ex applications certificate																EG3
Ukraine GOST Ex and RTN application certificate																EG5
White Russia GG TN certificate																EG9

- 1) For model FET325 designed for Ex zone 1, 10 m (32.81 ft) of cable is connected to the transmitter.
- 2) Option available with model FET321 or model FET325 designed for Zone 2 or Div. 2
- 3) Available for model FET325 designed for Zone 1 or Div 1
- 4) Must be selected if transmitter is being ordered as a spare part or without a sensor.
- 5) Model FET321 only.

9.4 FET301 transmitter plug-in module for ProcessMaster/HygienicMaster

		Main order number										Additional order no.	
Version number		1 - 6	7	8	9	10	11	12	13	14	15		
Transmitter plug-in module		FET301	X	X	X	X	X	X	X	X	X		
Sensor temperature range / Ambient temperature range												XX	
Standard sensor design / -20 ... 60 °C (-4 ... 140 °F)		1											
Name plate													
Sticker			A										
Signal cable length													
No signal cable			0										
Explosion protection													
None				A									
Protection type for transmitter/sensor													
Other					9								
Cable gland													
Other						Z							
Supply power													
100 ... 230 V AC, 50 Hz										1			
24 V AC/DC, 50 Hz										2			
100 ... 230 V AC, 60 Hz										3			
24 V AC/DC, 60 Hz										4			
Signal inputs and outputs													
HART + 20 mA passive + pulses + contact input/output											B		
HART + 20 mA active + pulses + contact input/output											C		
Default settings / Diagnostics													
None											0		
Language of documentation													
German												M1	
English												M5	
Western Europe/Scandinavia language package												MW	
Eastern Europe language package												ME	

9.5 FXC4000 flowmeter sensor simulator

		Main order number					
Version number		1 - 5	6	7	8	9	10
FXC4000 flowmeter sensor simulator		55XC4	X	X	X	X	X
Flow signal setting							
None (adapter only)		0					
3-digit switch in 1,000 increments		1					
Other		9					
Power supply 1)							
None (adapter only)		0					
Grounding plug for 110 ... 240 V AC, 50/60 Hz		1					
With 4 mm plug, 24 ... 48 V AC/DC		2					
With US plug, 110 ... 240 V AC, 50/60 Hz		3					
Other		9					
Additional equipment							
None				0			
Adapter for FXE4000-E4, FXM2000-XM2, FXF2000-DF23 transmitter				1			
Adapter board for FSM4000-S4 transmitter				5			
Adapter board for FET321, FET325 transmitter				6			
Other				9			
Design level (specified by ABB)						*	
Name plate							
German							1
English							2
French							3
Other							9

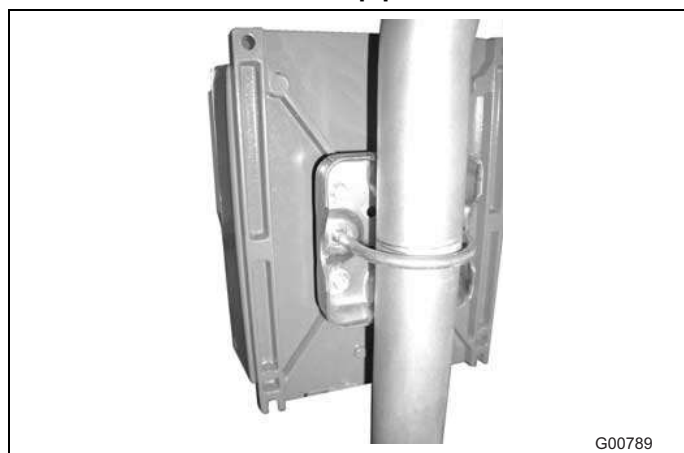
1) Power supply for transmitter.

9.6 Infrared service port adapter type FZA100



G00788

9.7 Installation set for 2" pipe installation in field-mount housing



G00789

Part number: 3KXF081100L0001

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