

Process Master DATASHEET

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ProcessMaster FEP300

Electromagnetic flowmeter

The process industry's first choice



One solution for all your needs

- The versatile product tailored to meet all your process applications

Versatile and simple configuration

- Through glass configuration eliminating the need to remove the cover and reducing commissioning time
- Soft key based functionality
- “Easy Set-up” function

State-of-the-art memory technology

- Revolutionary data storage enables transmitter interchange without the need for reconfiguration

ScanMaster in situ verification software option

- Allows the customer to perform in situ verification of the flowmeter and plant

Advanced diagnostics for real-life situations

- Simplified plant trouble shooting increases productivity and process safety
- Status messages in accordance with NAMUR
- Help texts in the display

Un-paralleled service ability

- Fault finding help texts in the display
- Minimized down time with replaceable electronics cartridge
- Universal transmitter reduces spare parts inventory costs and storage costs

Approvals for explosion protection

- In accordance with ATEX, IECEx, FM, cFM, NEPSI and GOST

HART, PROFIBUS PA, FOUNDATION fieldbus

- Access to all status information

The Company

ABB is 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 a world leader in process automation technology our worldwide presence, comprehensive service and application oriented know-how make ABB a leading supplier of flow measurement products.

Introduction

Setting the standard for the process industry

ProcessMaster is designed specifically to meet the increased requirements on advanced flowmeters. The modular design concept offers flexibility, cost-saving operation and reliability whilst providing a long service life and exceptionally low maintenance.

Integration into ABB asset management systems and usage of the selfmonitoring and diagnostic functions increase the plant availability and reduce downtimes.

ScanMaster - the diagnostic tool

Can I rely on the measured values?

How can I determine the technical condition of my device? ScanMaster can answer these frequently asked questions.

And ScanMaster allows you to easily check the device for proper functioning either through its Infra-red service port or through the HART commands.



Advanced diagnostic functions

Using its advanced diagnostic functions, the device monitors both its own operability and the process.

Limit values for the diagnostic parameters can be set locally. When these limits are exceeded, an alarm is tripped.

For further analysis, the diagnostic data can be read out via an advanced DTM. Critical states can, thus, be recognized early and appropriate measures can be taken.

As a result, productivity is increased and downtimes are avoided. The status messages are classified in accordance with the NAMUR recommendations.

In the event of an error, a diagnostic-dependent help text appears on the display which considerably simplifies and accelerates the troubleshooting procedure. The gives maximum safety for the process.

Flow performance

Using a higher excitation frequency for the transmitter, ProcessMaster is a flowmeter with an especially short response time. With its advanced filtering methods, the device improves accuracy even under difficult conditions by separating the noise from the measuring signal. This leads to a maximum measuring error of 0.2 % of rate. Self-cleaning, double-sealed polished measuring electrodes enhance the device's reliability and performance.

Easy and quick commissioning

Advanced data storage inside the sensor eliminates the need to match sensor and transmitter in the field. The on-board sensor memory automatically identifies the transmitter. On power-on, the transmitter self-configuration function is run, and replicates all sensor data and TAG specific parameters into the transmitter. This eliminates the opportunity for errors and leads to an increased startup speed and reliability.

Intuitive, convenient navigation

The factory-set parameters can be modified quickly and easily via the user-friendly display and the non-contact buttons, without opening the housing.

The "Easy Set-up" function reliably guides unpracticed users through the menu step by step.

The softkey-based functionality makes handling a breeze - it's just like using a cell phone. During the configuration, the permissible range of each parameter is indicated on the display and invalid entries are rejected.

Universal transmitter - powerful and flexible

The backlit display can be easily rotated without the need for any tools. The contrast is adjustable and the display fully configurable. The character size, number of lines and display resolution (number of decimals) can be set as required. In multiplex mode, several different display options can be pre-configured and invoked one after the other.

The smart modular design of the transmitter unit allows for easy disassembly without the need to unscrew cables or unplug connectors.

Whether count pulses, 20 mA signals or the status output are active or passive, the universal transmitter always delivers the correct signal. HART is used as the standard protocol. Optionally, the transmitter is available with PROFIBUS PA or FOUNDATION fieldbus communication.

The universal transmitter simplifies the spare parts inventory and reduces the stockholding costs.

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.



ProcessMaster - always the first choice

ProcessMaster sets the standard for the process industry. It meets the various requirements of NAMUR. 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. As a result, ProcessMaster can be used universally. This reduces costs and increases safety.

Overview of the ProcessMaster series

ProcessMaster is available in two series. ProcessMaster 300, which sets the standard in Process Flow measurement and ProcessMaster 500 with best in class extended functionality and options. The following table gives an overview.

	ProcessMaster	
	FEP300	FEP500
Measuring accuracy 0.4 % (optionally 0.2 %) of rate	X	-
Measuring accuracy 0.3 % (optionally 0.2 %) of rate	-	X
Batch functions Presetting counter, overrun correction, external start/stop, batch end contact	-	X
Other software functions Mass units, editable counter,	X	X
Two measuring ranges	-	X
Graphic display Line recorder function	X	X
Diagnostic functions Detection of gas bubbles or deposits on electrodes, conductivity monitoring, temperature monitoring, finger print, trend	-	X
Partially filled Recognition through partial filling electrode (TFE)	X	X
Hardware options Versions for extremely abrasive fluids: <ul style="list-style-type: none"> • Ceramic carbide liner, • Wolfram carbide electrodes, • Double layer electrodes 	-	X
Startup functions Grounding check	-	X
Fieldbus PROFIBUS PA, FOUNDATION fieldbus	X	X
Verifications / Diagnostic tool ScanMaster	X	X

This data sheet describes ProcessMaster 300.

For ProcessMaster 500 refer to data sheet DS/FEP500

Overview - models

















Integral mount design

FEP311 (without explosion protection)		FEP315 (Zone 2 / Div.2)	FEP315 (Zone 1 / Div.1)
1) 	2) 	2) 	2) 
G01082-01		G00487-01	G00886-01

Measured value error	Standard: 0.4 % of rate, Optional: 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, AS2129
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 ... 600), Elastomer (DN 50 ... 600), Linatex (DN 50 ... 600)
Conductivity	> 5 µS/cm (20 µS/cm for demineralized water)
Electrodes	Stainless steel, Hastelloy B, Hastelloy C, Platinum-iridium, Tantalum, Titanium, Tungsten carbide
Process connection material	Steel, stainless steel
IP rating	IP 65, IP 67
Measuring medium temperature	-25 ... 180 °C (-13 ... 356 °F)
Power supply	100 ... 230 V AC (-15 / +10%), 24 V AC (-30 / +10%), 24 V DC (-30 / +30%)
Current output	4 ... 20 mA, active or passive
Pulse output	Can be configured locally as active or passive
Contact output / Contact input	Optocoupler, programmable function
Display	Graphical display, configurable
Housing	Integral mount design, choice of single-compartment housing or dual-compartment housing
Communication	HART protocol (standard), PROFIBUS PA, FOUNDATION fieldbus (option)
Explosion protection approvals	<ul style="list-style-type: none"> • ATEX / IECEx zone 1, 2, 21, 22 • NEPSI zone 1, 2 • FM / cFM CI 1Div 1, CI 1 Div 2 • GOST zone 1, 2
Pressure Equipment Directive 97/23/EC	Conformity assessment in accordance with category III, fluid group 1
CRN (Canadian Reg. Number)	On request

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

Remote mount design

Flowmeter sensor											
FEP321 (without explosion protection)		FEP325 (Zone 2 / Div. 2)		FEP325 (Zone 1 / Div. 1)							
<div>1)</div> <div>2)</div> <div>G01083-01</div>		<div>1)</div> <div>2)</div> <div>G01083-01</div>		<div>1)</div> <div>G00862</div>							
Transmitter											
FET321 (without explosion protection)		FET325 (Zone 2, Div. 2)		FET321 (without explosion protection)							
<div>3)</div> <div>4)</div> <div>G01084-02</div>		<div>3)</div> <div>4)</div> <div>G01084-02</div>		<div>3)</div> <div>4)</div> <div>G01084-02</div>		<div>4)</div> <div>G00863-01</div>		<div>3)</div> <div>4)</div> <div>G01084-02</div>		<div>3)</div> <div>4)</div> <div>G01084-02</div>	

Flowmeter sensor	
Measured value error	Standard: 0.4 % of rate, Optional: 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, AS2129
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 ... 600), Elastomer (DN 50 ... 600), Linatex (DN 50 ... 600)
Conductivity	> 5 µS/cm (20 µS/cm for demineralized water)
Electrodes	Stainless steel, Hastelloy B, Hastelloy C, Platinum-iridium, Tantalum, Titanium, Tungsten carbide
Process connection material	Steel, stainless steel
IP rating	IP 65, IP 67, IP 68, (NEMA 4X)
Measuring medium temperature	-25 ... 180 °C (-13 ... 356 °F)
Transmitter	
Power supply	100 ... 230 V AC (-15 / +10%), 24 V AC (-30 / +10%), 24 V DC (-30 / +30%)
Current output	4 ... 20 mA, active or passive
Pulse output	Can be configured locally as active or passive
Contact output / Contact input	Optocoupler, programmable function
Display	Graphical display, configurable
Housing	Field-mount housing: choice of single-compartment housing or dual-compartment housing
Communication	HART protocol (standard), PROFIBUS PA, FOUNDATION fieldbus (option)
Approvals	
Explosion protection approvals	<ul style="list-style-type: none"> • ATEX / IECEx zone 1, 2, 21, 22 • FM / cFM Cl 1 Div 1, Cl 1 Div 2 • NEPSI zone 1, 2 • GOST zone 1, 2
Pressure Equipment Directive 97/23/EC	Conformity assessment in accordance with category III, fluid group 1
CRN (Canadian Reg. Number)	On request

- 1) Aluminium terminal box
 2) Plastic terminal box
 3) Single-compartment housing
 4) Dual-compartment housing

Specification - general

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.

Maximum measuring error

Impulse output

- Standard calibration:
± 0.4 % of measured value,
± 0.02 % $Q_{max_{DN}}$ (DN 3 ... 2000)
- Optional calibration:
± 0.2 % of measured value,
± 0.02 % $Q_{max_{DN}}$ (DN 10 ... 600, 800)

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

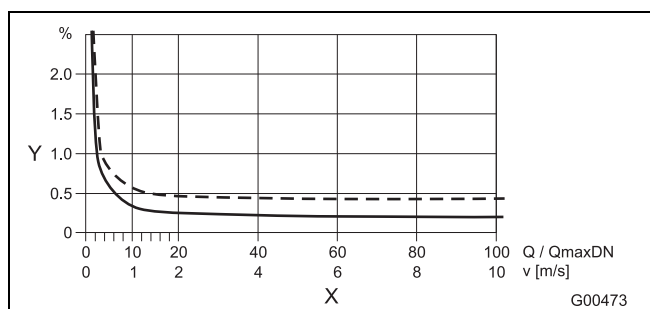


Fig. 1

Y Accuracy ± of measured value in [%]
X Flow velocity v in [m/s], $Q / Q_{max_{DN}}$ [%]

Analog output effects

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

Reproducibility, response time

Reproducibility	≤ 0.11 % of measured value, $t_{meas} = 100 \text{ s}$, $v = 0.5 \dots 10 \text{ m/s}$
Response time of current output with damping of 0.02 seconds	As step function 0 ... 99 % $5 \tau \geq 200 \text{ ms}$ at 25 Hz excitation frequency $5 \tau \geq 400 \text{ ms}$ at 12.5 Hz excitation frequency $5 \tau \geq 500 \text{ ms}$ at 6.25 Hz excitation frequency

Flowmeter sizes, flow range

The flow range end value can be set between $0.02 \times Q_{\max \text{ DN}}$ and $2 \times Q_{\max \text{ DN}}$.

Nominal diameter DN	"	Min. flow range end value $0.02 \times Q_{\max \text{ DN}}$ ($\approx 0.2 \text{ m/s}$)	$Q_{\max \text{ DN}}$ 0 ... $\approx 10 \text{ m/s}$	Max. flow range end value $2 \times Q_{\max \text{ DN}}$ ($\approx 20 \text{ m/s}$)
3	1/10	0.08 l/min (0.02 US gal/min)	4 l/min (1.06 US gal/min)	8 l/min (2.11 US gal/min)
4	5/32	0.16 l/min (0.04 US gal/min)	8 l/min (2.11 US gal/min)	16 l/min (4.23 US gal/min)
6	1/4	0.4 l/min (0.11 US gal/min)	20 l/min (5.28 US gal/min)	40 l/min (10.57 US gal/min)
8	5/16	0.6 l/min (0.16 US gal/min)	30 l/min (7.93 US gal/min)	60 l/min (15.85 US gal/min)
10	3/8	0.9 l/min (0.24 US gal/min)	45 l/min (11.9 US gal/min)	90 l/min (23.78 US gal/min)
15	1/2	2 l/min (0.53 US gal/min)	100 l/min (26.4 US gal/min)	200 l/min (52.8 US gal/min)
20	3/4	3 l/min (0.79 US gal/min)	150 l/min (39.6 US gal/min)	300 l/min (79.3 US gal/min)
25	1	4 l/min (1.06 US gal/min)	200 l/min (52.8 US gal/min)	400 l/min (106 US gal/min)
32	1 1/4	8 l/min (2.11 US gal/min)	400 l/min (106 US gal/min)	800 l/min (211 US gal/min)
40	1 1/2	12 l/min (3.17 US gal/min)	600 l/min (159 US gal/min)	1200 l/min (317 US gal/min)
50	2	1.2 m3/h (5.28 US gal/min)	60 m3/h (264 US gal/min)	120 m3/h (528 US gal/min)
65	2 1/2	2.4 m3/h (10.57 US gal/min)	120 m3/h (528 US gal/min)	240 m3/h (1057 US gal/min)
80	3	3.6 m3/h (15.9 US gal/min)	180 m3/h (793 US gal/min)	360 m3/h (1585 US gal/min)
100	4	4.8 m3/h (21.1 US gal/min)	240 m3/h (1057 US gal/min)	480 m3/h (2113 US gal/min)
125	5	8.4 m3/h (37 US gal/min)	420 m3/h (1849 US gal/min)	840 m3/h (3698 US gal/min)
150	6	12 m3/h (52.8 US gal/min)	600 m3/h (2642 US gal/min)	1200 m3/h (5283 US gal/min)
200	8	21.6 m3/h (95.1 US gal/min)	1080 m3/h (4755 US gal/min)	2160 m3/h (9510 US gal/min)
250	10	36 m3/h (159 US gal/min)	1800 m3/h (7925 US gal/min)	3600 m3/h (15850 US gal/min)
300	12	48 m3/h (211 US gal/min)	2400 m3/h (10567 US gal/min)	4800 m3/h (21134 US gal/min)
350	14	66 m3/h (291 US gal/min)	3300 m3/h (14529 US gal/min)	6600 m3/h (29059 US gal/min)
400	16	90 m3/h (396 US gal/min)	4500 m3/h (19813 US gal/min)	9000 m3/h (39626 US gal/min)
450	18	120 m3/h (528 US gal/min)	6000 m3/h (26417 US gal/min)	12000 m3/h (52834 US gal/min)
500	20	132 m3/h (581 US gal/min)	6600 m3/h (29059 US gal/min)	13200 m3/h (58117 US gal/min)
600	24	192 m3/h (845 US gal/min)	9600 m3/h (42268 US gal/min)	19200 m3/h (84535 US gal/min)
700	28	264 m3/h (1162 US gal/min)	13200 m3/h (58118 US gal/min)	26400 m3/h (116236 US gal/min)
760	30	312 m3/h (1374 US gal/min)	15600 m3/h (68685 US gal/min)	31200 m3/h (137369 US gal/min)
800	32	360 m3/h (1585 US gal/min)	18000 m3/h (79252 US gal/min)	36000 m3/h (158503 US gal/min)
900	36	480 m3/h (2113 US gal/min)	24000 m3/h (105669 US gal/min)	48000 m3/h (211337 US gal/min)
1000	40	540 m3/h (2378 US gal/min)	27000 m3/h (118877 US gal/min)	54000 m3/h (237754 US gal/min)
1050	42	616 m3/h (2712 US gal/min)	30800 m3/h (135608 US gal/min)	61600 m3/h (271217 US gal/min)
1100	44	660 m3/h (3038 US gal/min)	33000 m3/h (151899 US gal/min)	66000 m3/h (290589 US gal/min)
1200	48	840 m3/h (3698 US gal/min)	42000 m3/h (184920 US gal/min)	84000 m3/h (369841 US gal/min)
1400	54	1080 m3/h (4755 US gal/min)	54000 m3/h (237755 US gal/min)	108000 m3/h (475510 US gal/min)
1500	60	1260 m3/h (5548 US gal/min)	63000 m3/h (277381 US gal/min)	126000 m3/h (554761 US gal/min)
1600	66	1440 m3/h (6340 US gal/min)	72000 m3/h (317006 US gal/min)	144000 m3/h (634013 US gal/min)
1800	72	1800 m3/h (7925 US gal/min)	90000 m3/h (396258 US gal/min)	180000 m3/h (792516 US gal/min)
2000	80	2280 m3/h (10039 US gal/min)	114000 m3/h (501927 US gal/min)	228000 m3/h (1003853 US gal/min)

Specifications - sensor

IP rating

According to EN 60529

IP 65, P 67, NEMA 4X

IP 68 (for remote mount design only)

Pipeline vibration

According to EN 60068-2-6

- 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

Installation length

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

Signal cable

For remote mount design only

A 5 m (16.4 ft) cable is supplied.

If you require more than 5 m (16.4 ft), a signal cable can be separately purchased (for ordering informations see the following table or section „Accessories“).

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

- ✗ Application not permissible ■ Standard on delivery
 ✓ Application permissible

For the transmitter designed for use in zone 1, Div 1 (model FET325), 10 m (32.8 ft) of signal cable is permanently connected to the transmitter.

Signal cable length and preamplifier

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

Maximum signal cable length between flowmeter sensor and transmitter:

Preamplifier	Signal cable length
Without	Max. 50 m (164 ft) for conductivity ≥ 5 µS/cm
With	Max. 200 m (656 ft) for conductivity ≥ 5 µS/cm

Temperature data

The temperature range of the product is dependent upon a number of factors which influence the specification. These factors include - fluid temperature, ambient temperature, operating pressure, lining material and hazardous area classification.

Storage temperature

-40 ... 70 °C (-40 ... 158 °F)

Minimum permissible pressure as a function of fluid temperature

Lining	Nominal diameter	Operating mbar abs.	at T _{Operating} ¹⁾
Hard rubber	15 ... 2000 (1/2 ... 80")	0	< 90 °C (194 °F) < 80 °C (176 °F) ²⁾
Soft rubber	50 ... 2000 (2 ... 80")	0	< 60 °C (140 °F)
PTFE	10 ... 600 (3/8 ... 24")	270 400 500	< 20 °C (68 °F) < 100 °C (212 °F) < 130 °C (266 °F)
Thick PTFE, high-temp. design	25 ... 80 100 ... 250 300	0 67 27	< 180 °C (356 °F) < 180 °C (356 °F) < 180 °C (356 °F)
PFA	3 ... 200 (1/10 ... 8")	0	< 180 °C (356 °F)
Elastomer ³⁾	50 ... 600 (2 ... 24")	100	< 130 °C (266 °F)
ETFE	25 ... 600 (1 ... 24")	100	< 130 °C (266 °F)
Linatex	50 ... 600 (2 ... 24")	0	< 70 °C (158 °F)

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

2) Only China production site.

3) Only USA production site.

Liner approvals upon request, please contact ABB.

Maximum 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_{max} - Δ °C.
 (Δ °C = T_{amb} - 25 °C)

Maximum ambient temperature as a function of fluid temperature**Note**

When using the device in potentially explosive areas, the additional temperature specifications in the section titled "Ex relevant specifications" must be observed.

Integral mount design (standard sensor design)

Lining	Flange material	Ambient temperature		Fluid temperature	
		Minimum temperature	Max. temperature	Minimum temperature	Max. temperature
Hard rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F) -5 °C (23 °F) ¹⁾	90 °C (194 °F) 80 °C (176 °F) ¹⁾
Hard rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F) -5 °C (23 °F) ¹⁾	90 °C (194 °F) 80 °C (176 °F) ¹⁾
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) -40 °C (-40 °F) ⁵⁾	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
PFA	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	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
Thick 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)
Thick PTFE	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
ETFE	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	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
Elastomer	Steel	-10 °C (14 °F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14 °F)	130 °C (266 °F)
Elastomer	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F) 45 °C (113 °F)	-20 °C (-4 °F)	130 °C (266 °F)
Linatex	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	70 °C (158 °F)
Linatex	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-20 °C (-4 °F)	70 °C (158 °F)

Integral mount design (high-temperature sensor design)

Lining	Flange material	Ambient temperature		Fluid temperature	
		Minimum temperature	Max. temperature	Minimum temperature	Max. temperature
PFA	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
PFA	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-20 °C (-13 °F)	180 °C (356 °F)
Thick PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
Thick PTFE	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-20 °C (-13 °F)	180 °C (356 °F)
ETFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
ETFE	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-20 °C (-13 °F)	130 °C (266 °F)

1) Only China production site

2) For (optional) low-temperature version, only

Note

When using the device in potentially explosive areas, the additional temperature specifications in the section titled "Ex relevant specifications" must be observed.

Remote mount design (standard sensor design)

Lining	Flange material	Ambient temperature		Fluid temperature	
		Minimum temperature	Max. temperature	Minimum temperature	Max. temperature
Hard rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F) -5 °C (23 °F) ¹⁾	90 °C (194 °F) 80 °C (176 °F) ¹⁾
Hard rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F) -5 °C (23 °F) ¹⁾	90 °C (194 °F) 80 °C (176 °F) ¹⁾
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) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
PFA	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
PFA	Stainless steel	-25 °C (-13 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
Thick PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
Thick PTFE	Stainless steel	-25 °C (-13 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
ETFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
ETFE	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
Elastomer	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
Elastomer	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-20 °C (-4 °F)	130 °C (266 °F)
Linatex	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	70 °C (158 °F)
Linatex	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-20 °C (-4 °F)	70 °C (158 °F)

Remote mount design (high-temperature sensor design)

Lining	Flange material	Ambient temperature		Fluid temperature	
		Minimum temperature	Max. temperature	Minimum temperature	Max. temperature
PFA	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
PFA	Stainless steel	-25 °C (-13 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-25 °C (-13 °F)	180 °C (356 °F)
Thick PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
Thick PTFE	Stainless steel	-25 °C (-13 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-25 °C (-13 °F)	180 °C (356 °F)
ETFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
ETFE	Stainless steel	-25 °C (-13 °F) -40 °C (-40 °F) ²⁾	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)

1) Only China production site

2) For (optional) low-temperature version, only

Materials for flowmeter sensors

Wetted parts

Part	Standard	Option
Lining	PTFE, PFA, ETFE, hard rubber, soft rubber	Elastomer, Linatex
Measurement and grounding electrode for:		
- Hard rubber	CrNi steel 1.4571 (AISI 316Ti)	Hastelloy B-3 (2.4600), Hastelloy C-4 (2.4610), Titanium, Tantalum, Platinum-iridium, 1.4539 (AISI 904L), Tungsten carbide
- Soft rubber		
- Linatex		
- PTFE, PFA, ETFE	CrNi steel 1.4539 (AISI 904L)	CrNi steel 1.4571 (AISI 316Ti) Hast. C-4 (2.4610) Hast. B-3 (2.4600) Titanium, Tantalum, Platinum-iridium
Grounding plate	Stainless steel	On request
Protection plate	Stainless steel	On request

Non-wetted parts (process connection)

DN	Standard	Option
3 ... 15 (1/10 ... 1/2")	Stainless steel ¹⁾	-
20 ... 400 (3/4 ... 16")	Steel (galvanized) ²⁾	Stainless steel ¹⁾
450 ... 2000 (18 ... 80")	Steel (painted) ²⁾	-

The process connections are made of one of the materials listed below:

- 1) 1.4301 (AISI 304), 1.4307, 1.4404 (AISI 316L) 1.4435 (AISI 316L), 1.4541 (AISI 321) 1.4571 (AISI 316Ti), ASTM A182 F304, ASTM A182 F304L, ASTM A182 F316L, ASTM A182 F321, ASTM A182 F316Ti, ASTM A182 F316, 0Cr18Ni9, 0Cr18Ni10, 0Cr17Ni13Mo2, 0Cr27Ni12Mo3, 1Cr18Ni9Ti, 0Cr18Ni12Mo2Ti
- 2) 1.0038, 1.0460, 1.0570, 1.0432, ASTM A105, Q255A, 20#, 16Mn

Flowmeter sensor housing

	Standard
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
Terminal box	Aluminum alloy, painted, $\geq 80 \mu\text{m}$ thick, light gray, RAL 9002
or	Plastic, light gray, RAL 9002
Meter tube	Stainless steel ³⁾
Cable gland	Polyamide
	Stainless steel (in the case of hazardous area design for ambient temperature of -40°C (40°F))

The meter tube is made of one of the materials listed below:

- 3) 1.4301, 1.4307, 1.4404, 1.4435, 1.4541, 1.4571
ASTM materials:
Grade TP304, TP304L, TP316L, TP321, TP316Ti, TP317L, 0Cr18Ni9, 00Cr18Ni10, 0Cr17Ni14Mo2, 0Cr27Ni12Mo3, 0Cr18Ni10Ti

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 to DN 600 (24")

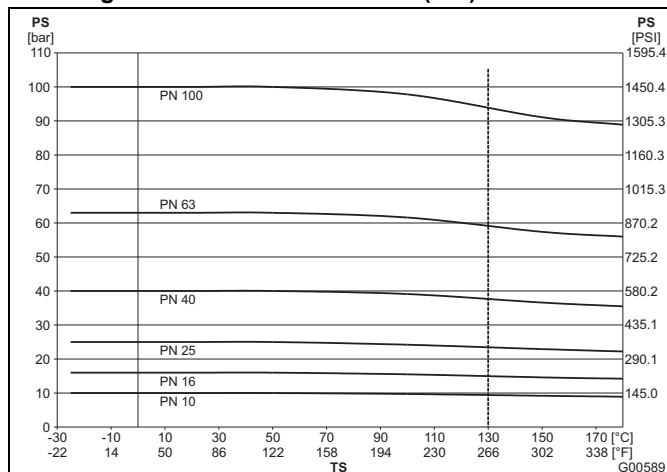


Fig. 2

ASME flange, stainless steel, up to DN 400 (16") (CL150/300) up to DN 1000 (40") (CL150)

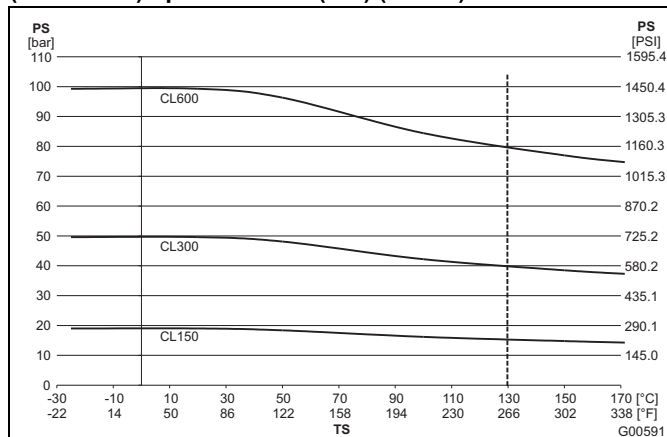


Fig. 3

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

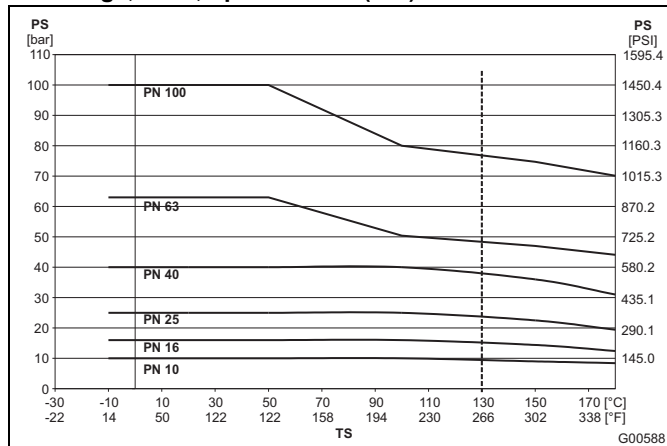


Fig. 4

ASME flange, steel, up to DN 400 (16") (CL150/300); up to DN 1000 (40") (CL150)

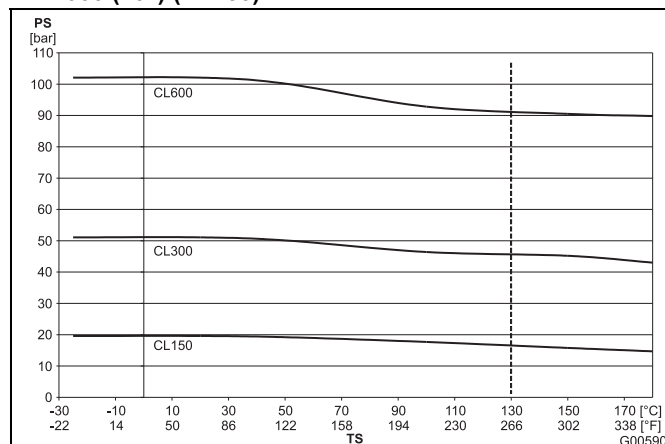


Fig. 5

JIS 10K-B2210 flange

Nominal diameter	Material	PN	TS	PS
32 ... 400 (1 1/4 ... 16")	Stainless steel	10	-25 ... 180 °C (-13 ... 356 °F)	10 bar (145 psi)
32 ... 400 (1 1/4 ... 16")	Steel	10	-25 ... 180 °C (-13 ... 356 °F)	10 bar (145 psi)

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

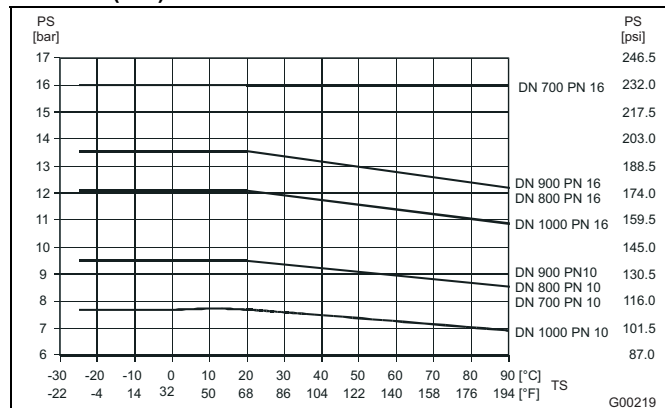


Fig. 6

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

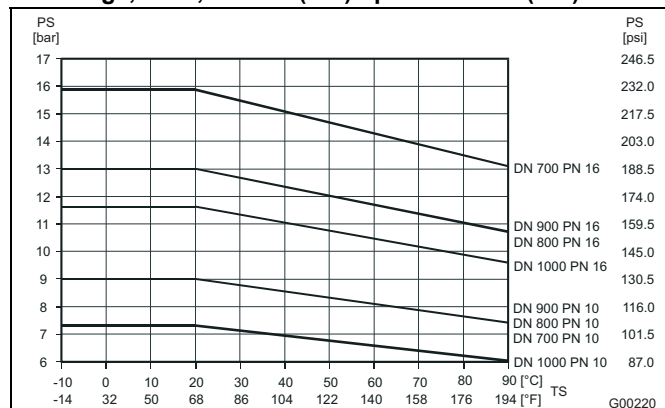


Fig. 7

Specifications - transmitter

IP rating

According to EN 60529

IP 65, IP 67, NEMA 4X

Vibration

According to EN 60068-2

- In the range 10 ... 58 Hz with max. 0.15 mm (0.006 inch) deflection ¹⁾
- In the range 58 ... 150 Hz max. 2 g acceleration ¹⁾

1) Peak load

Temperature data

Ambient temperature

-20 ... 60 °C (-4 ... 140 °F) Standard range

-40 ... 60 °C (-40 ... 140 °F) Extended range

Storage temperature

-40 ... 70 °C (-40 ... 158 °F)

Electrical data and options

Power supply

Supply voltage	100 ... 230 V AC (-15 % / +10 %), 47 ... 64 Hz 24 V AC (-30 % / +10 %), 47 ... 64 Hz 24 V DC (-30 % / +30 %), ripple: < 5 %
Power consumption	
AC	≤ 20 VA
DC	12 W (switch-on current 5.6 A)
Screw terminals	Max. 2,5 mm ² (AWG 14)

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. The same is valid for the signal outputs of the versions with PROFIBUS PA and FOUNDATION fieldbus.

Empty pipe detection

The function requires:

A conductivity of the measured fluid $\geq 20 \mu\text{S/cm}$, a signal cable length $\leq 50 \text{ m}$ (164 ft), a nominal diameter $\text{DN} \geq \text{DN } 10$, and the flowmeter sensor must not be provided with a preamplifier.

Mechanical properties

Integral mount design	
Housing	Cast aluminum, painted
Paint	Paint coat $\geq 80 \mu\text{m}$ thick, RAL 9002 (light gray)
Cable gland	Polyamide
	Stainless steel ¹⁾

Remote mount design	
Housing	Cast aluminum, painted
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
	Stainless steel ¹⁾
Weight	4.5 kg (9.92 lb)

1) In the case of hazardous area design for ambient temperature of -40 °C (40 °F)

Electrical connections

HART, PROFIBUS PA and FOUNDATION fieldbus protocol for non-explosion-proof design flowmeters

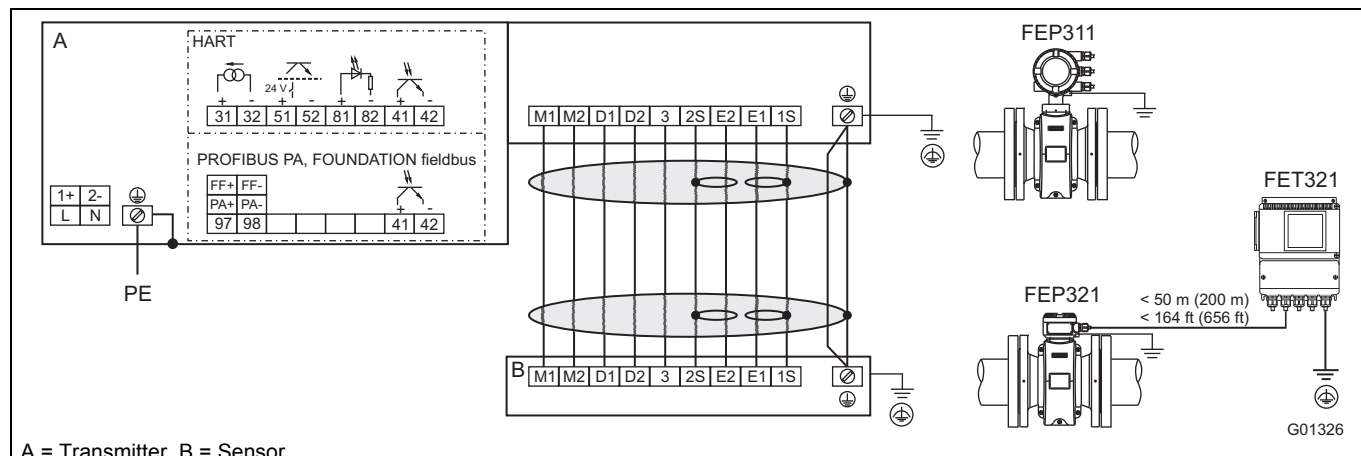


Fig. 8

Power supply connections

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

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

Sensor cable terminal connections

Only on remote mount design.

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

Output connections

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

Electrical data

Current / HART output

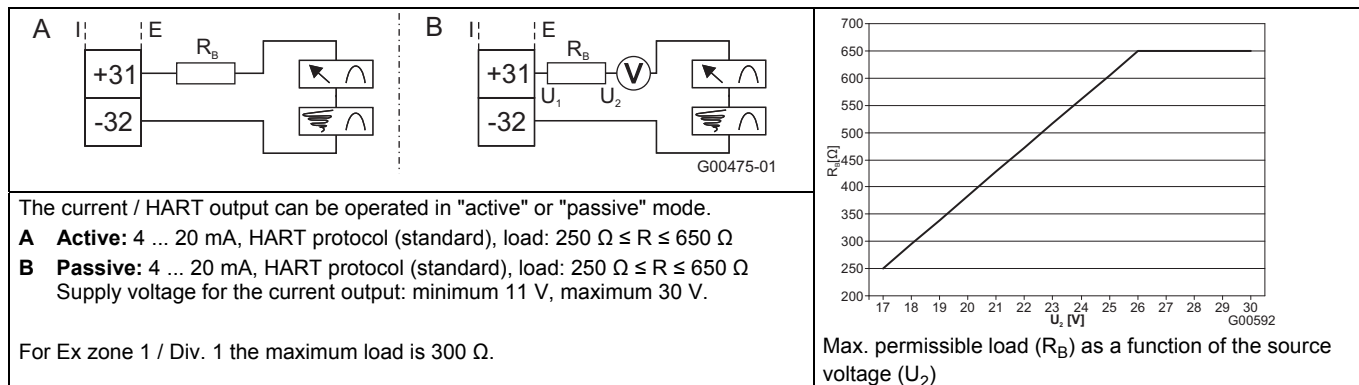


Fig. 9: (I = internal, E = external)

Digital output DO1

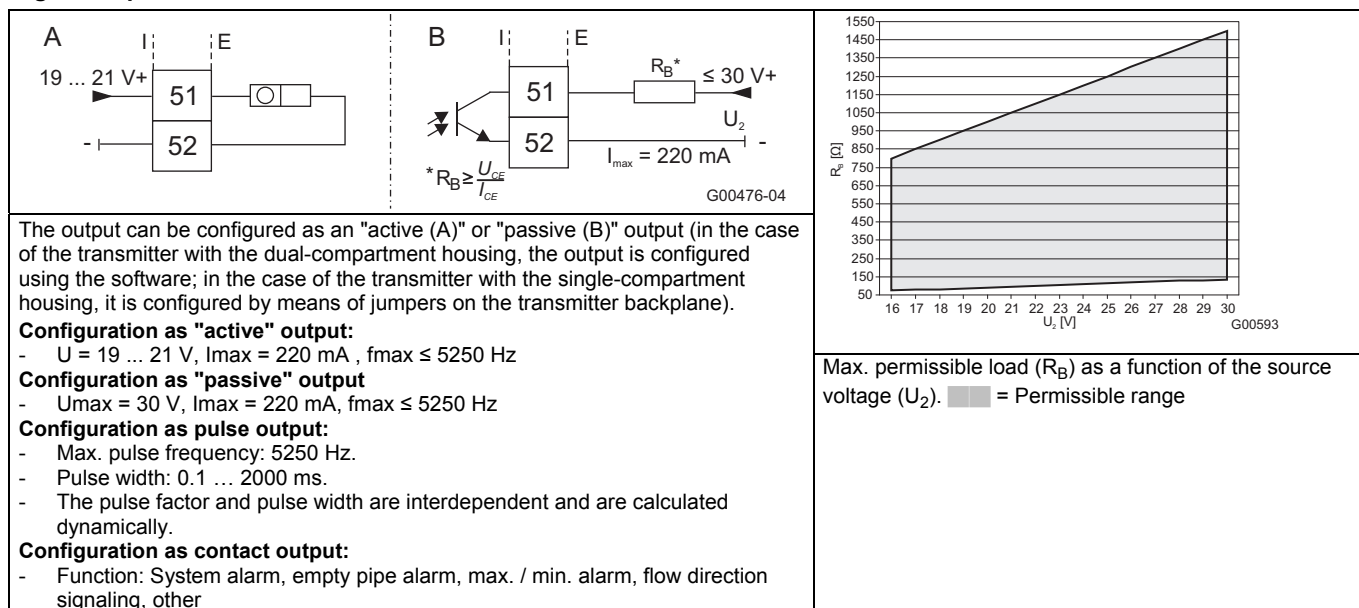


Fig. 10: (I = internal, E = external)

Digital output DO2

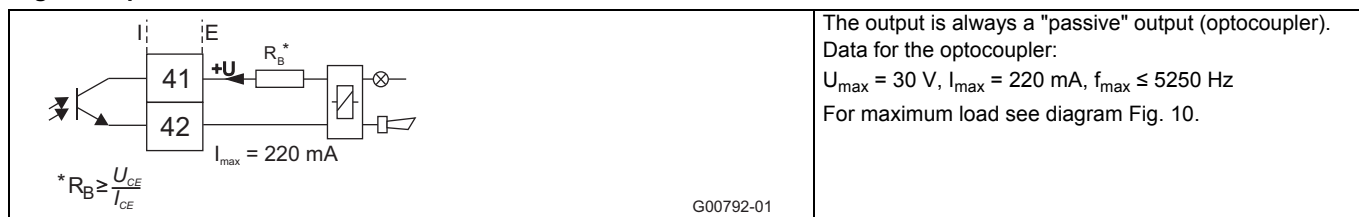


Fig. 11: (I = internal, E = external)

Digital input DI

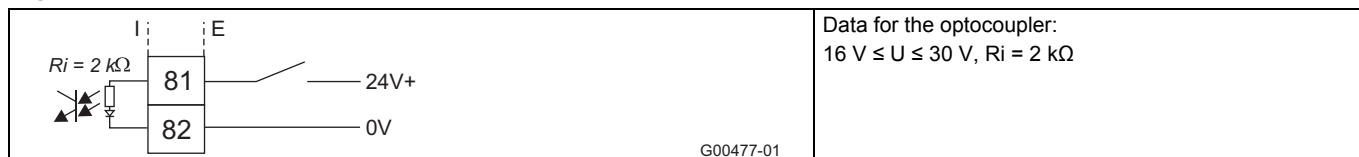
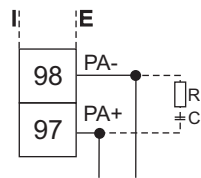


Fig. 12: (I = internal, E = external)

Digital communication

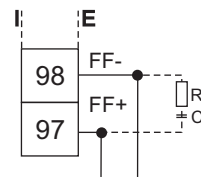


PROFIBUS PA (PA+ / PA-)

$U = 9 \dots 32 \text{ V}$, $I = 10 \text{ mA}$ (normal operation), $I = 13 \text{ mA}$ (in the event of an error / FDE)

Bus connection with integrated protection against polarity reversal.
The bus address can be set via the DIP switches in the device (with dual-compartment transmitter housing only), the transmitter display or the fieldbus.

The resistance R and condenser C form the bus termination. They must be installed when the device is connected to the end of the entire bus cable. $R = 100 \Omega$; $C = 1 \mu\text{F}$



G00248-01

FOUNDATION fieldbus (FF+ / FF-)

$U = 9 \dots 32 \text{ V}$, $I = 10 \text{ mA}$ (normal operation), $I = 13 \text{ mA}$ (in the event of an error / FDE)

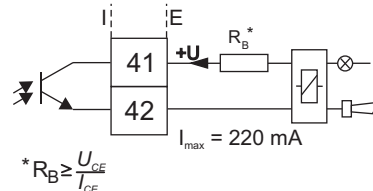
Bus connection with integrated protection against polarity reversal

Fig. 13: (I = internal, E = external)

Connection examples

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)

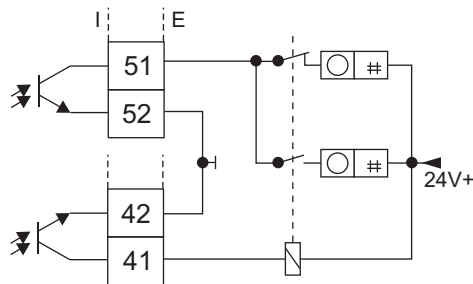


G00792-01

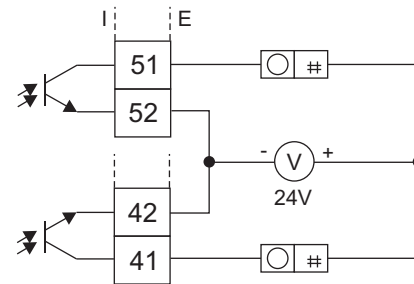
Fig. 14: (I = internal, E = external)

Digital outputs DO1 and DO2

Separate forward and reverse pulses



Separate forward and reverse pulses (alternative connection)

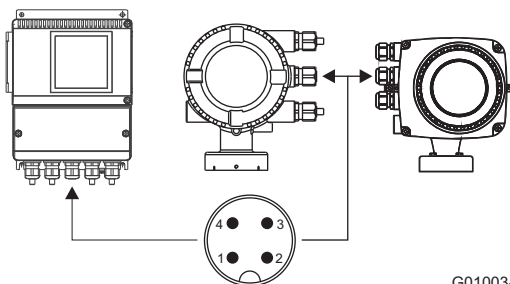


G00791

Fig. 15: (I = internal, E = external)

PROFIBUS PA - Connection via M12 plug

Only in non-hazardous areas



G01003-01

Pin assignment

(Front view showing pin insert and pins)

PIN 1 = PA+

PIN 2 = nc

PIN 3 = PA-

PIN 4 = shield

Fig. 16

Digital communication

HART protocol

The unit is registered with the HART Communication Foundation.

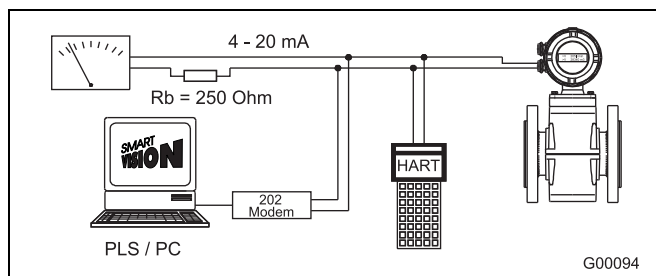


Fig. 17

Configuration	Directly on the device Software DAT200 Asset Vision Basic (+ HART-DTM)
Transmission	FSK modulation on current output 4 ... 20 mA acc. to Bell 202 standard
Max. signal amplitude	1.2 mA _{SS}
Current output load	Min. 250 Ω, max. = 560 Ω
Cable	AWG 24 twisted
Max. cable length	1500 m
Baud rate	1,200 baud
Display	Log. 1: 1,200 Hz Log. 0: 2,200 Hz

For additional information, see separate interface documentation.

System integration

In conjunction with the DTM (Device Type Manager) available for the device, communication (configuration, parameterization) can occur with the corresponding framework applications according to FDT 1.21 (DAT200 Asset Vision Basic).

Other tool/system integrations (e.g., Emerson AMS/Siemens PCS7) are available upon request.

A free of charge version of the DAT200 Asset Vision Basic framework application for HART® or PROFIBUS is available upon request.

The required DTMs are contained on the DAT200 Asset Vision Basic DVD or in the DTM Library. They can also be downloaded from www.abb.com/flow.

PROFIBUS PA

The interface conforms to profile 3.01 (PROFIBUS standard, EN 50170, DIN 19245 [PRO91]).

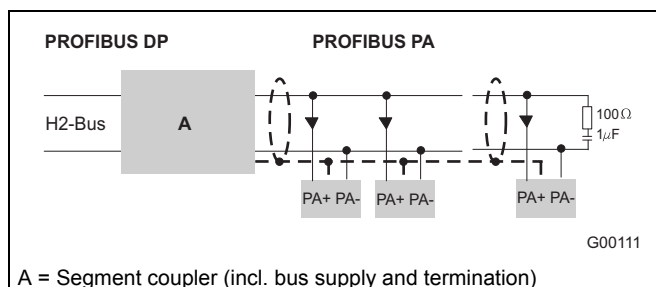


Fig. 18: Example for PROFIBUS PA interface connection

PROFIBUS PA ID no	0x3430
Alternative standard ID no	0x9700 or 0x9740
Configuration	Directly on the device Software DAT200 Asset Vision Basic (+ PROFIBUS PA-DTM)
Transmission signal	Acc. to IEC 61158-2
Cable	Shielded, twisted cable (acc. to IEC 61158-2, types A or B are preferred)

Bus topology

- Tree and/or line structure
- Bus termination: passive at both ends of the main bus line (RC element R = 100 Ω, C = 1 μF)

Voltage / current consumption

- Average current consumption: 10 mA
- In the event of an error, the integrated FDE function (=Fault Disconnection Electronic) integrated in the device ensures that the current consumption can rise to a maximum of 13 mA.
- The upper current limit is restricted electronically.
- The voltage on the bus line must lie in the range of 9 ... 32 V DC.

For additional information, see separate interface documentation.

System integration

ABB provides three different GSD files (equipment master data) which can be integrated in the system.

Users decide at system integration whether to install the full range of functions or only part.

The change-over is done using the "ID-number selector" parameter.

ID number 0x9700,	GSD file name: PA139700.gsd
ID number 0x9740,	GSD file name: PA139740.gsd
ID number 0x3430,	GSD file name: ABB_3430.gsd

The GSD files can be downloaded from www.abb.com/flow.

The files required for operation can be downloaded from www.profibus.com.

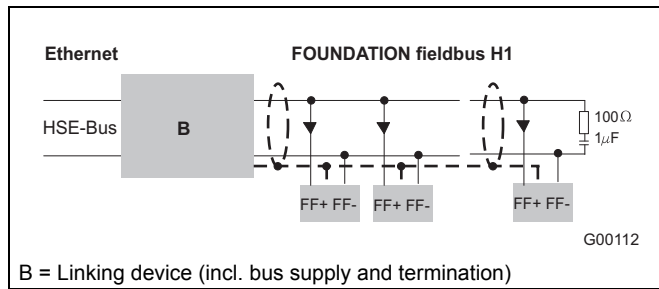
FOUNDATION fieldbus (FF)

Fig. 19: Example for FOUNDATION fieldbus interface connection

Interoperability test campaign no.	ITK 5.20
Manufacturer ID	0x000320
Device ID	0x0124
Configuration	<ul style="list-style-type: none"> • Directly on the device • Via services integrated in the system • National configurator
Transmission signal	Acc. to IEC 61158-2

Bus topology

- Tree and/or line structure
- Bus termination: passive at both ends of the main bus line (RC element R = 100 Ω, C = 1 μF)

Voltage / current consumption

- Average current consumption: 10 mA
- In the event of an error, the integrated FDE function (=Fault Disconnection Electronic) integrated in the device ensures that the current consumption can rise to a maximum of 13 mA.
- Upper current limit: electronically restricted.
- The voltage on the bus line must lie in the range of 9 ... 32 V DC.

Bus address

The bus address is automatically assigned or can be set in the system manually.

The identifier (ID) is formed using a unique combination of manufacturer ID, device ID, and device serial number.

System integration

The following are required:

- DD (Device Description) file, which includes the device description.
- The CFF (Common File Format) file is required for engineering the segment. Engineering can be performed online or offline.

The files can be downloaded from www.abb.com/flow.

The files required for operation can also be downloaded from <http://www.fieldbus.org>.

Ex relevant specifications

Electrical connection for operation in zones 1, 21, 22 / Div. 1

Flowmeter sensor and transmitter in zone 1 / Div. 1

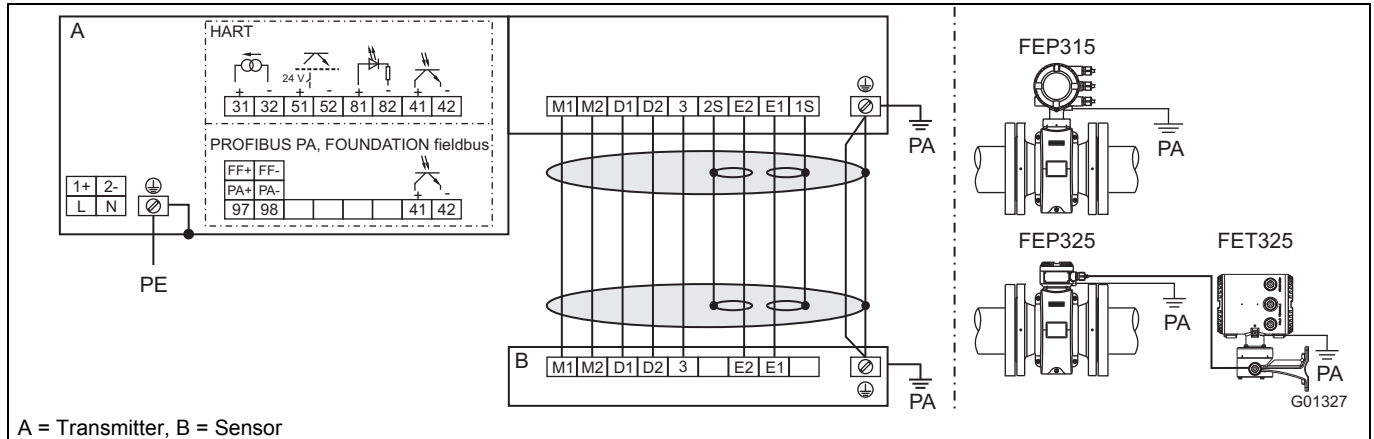


Fig. 20: HART, PROFIBUS PA and FOUNDATION Fieldbus protocol

Power supply connections

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

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

Sensor cable terminal connections

Only on remote mount design.

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

Output connections

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

Note

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

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

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

Flowmeter sensor in zone 1 / Div. 1 and transmitter in zone 2 / Div. 2 or outside the hazardous area

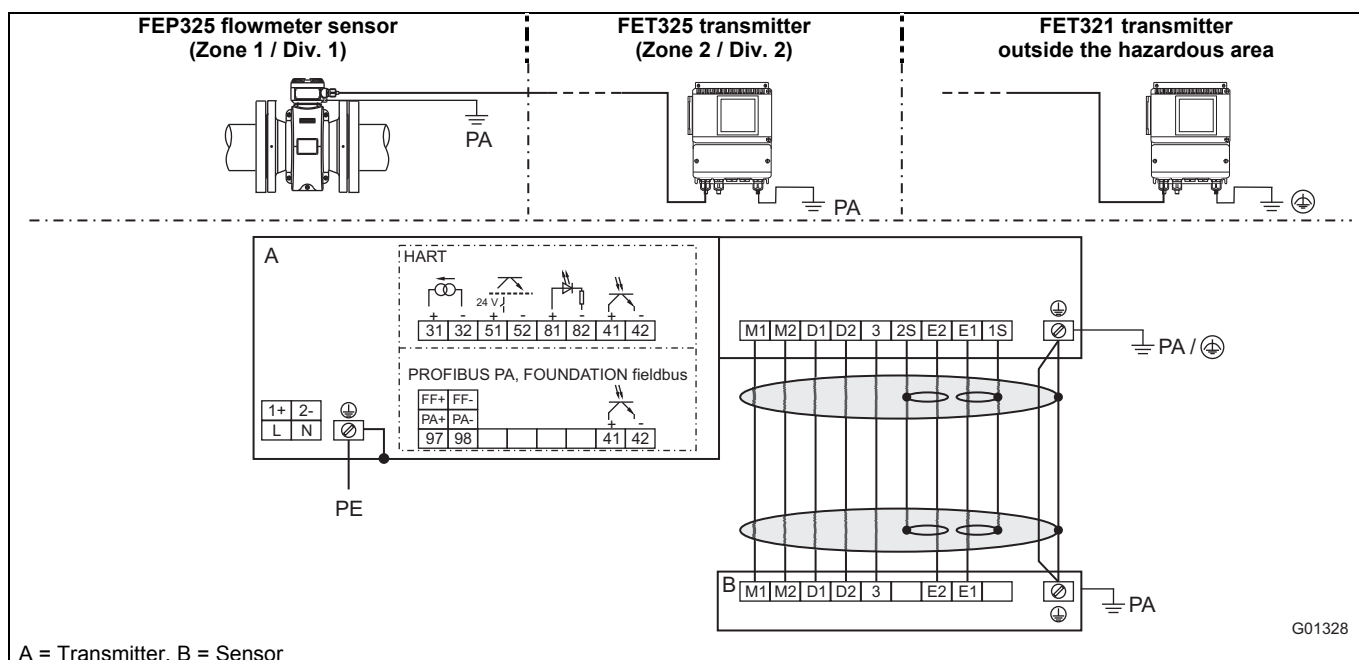


Fig. 21: HART, PROFIBUS PA and FOUNDATION fieldbus protocol

Power supply connections

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

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

Sensor cable terminal connections

Only on remote mount design.

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

Output connections

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

Note

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

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

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

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

Devices with HART protocol

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

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

Model FEP315 or FET325

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

1) For "active" current output

2) For "passive" current output

3) Only available in conjunction with passive current output

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

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

Note

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

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

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

Devices with PROFIBUS PA or FOUNDATION fieldbus

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

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

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

Model FEP315 or FET325

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

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

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

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

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

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

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

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

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

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

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

Note

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

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

Temperature data

Note

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

Table 1: Fluid temperature as a function of lining and flange material for models FEP315 and FEP325

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

1) Only China production site

Table 2: Fluid temperature for model FEP315

Nominal diameter	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 sensor design, T_{medium} maximum 130 °C (266 °F),HT: high-temperature sensor design, T_{medium} maximum 180 °C (356 °F)

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

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

Note

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

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

Table 3: Fluid temperature for model FEP325

Nominal diameter	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 sensor design, T_{medium} maximum 130 °C (266 °F).HT: high-temperature sensor design, T_{medium} maximum 180 °C (356 °F).

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

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

Note

The standard version includes explosion protection for gases and dust.

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

Electrical connection for operation in zone 2, 21, 22 / Div. 2

Flowmeter sensor and transmitter in zone 2 / Div. 2, or transmitter outside the hazardous area

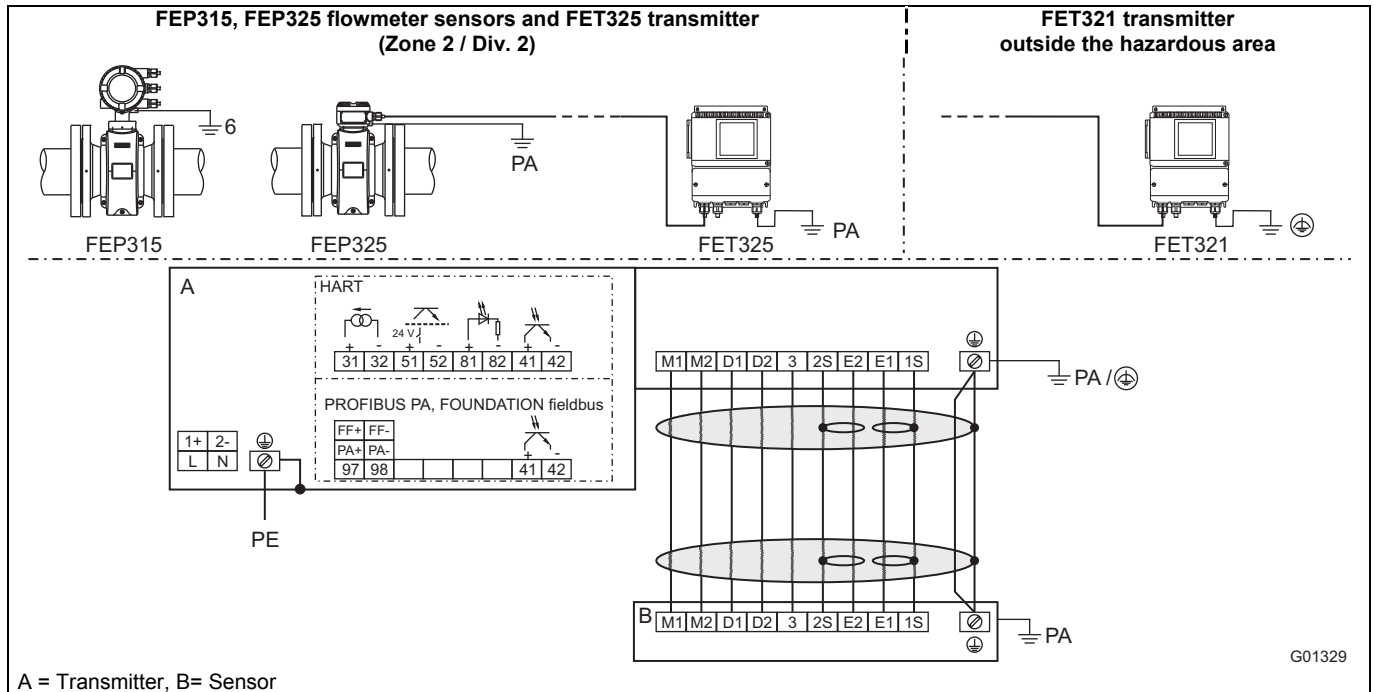


Fig. 22: HART, PROFIBUS PA and FOUNDATION fieldbus protocol

Power supply connections

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

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

Sensor cable terminal connections

Only on remote mount design.

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

Output connections

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

Note

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

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

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

Devices with HART protocol

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

Model FEP315 or FET325

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

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

Devices with PROFIBUS PA or FOUNDATION fieldbus

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

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

Model FEP315 or FET325

Inputs and outputs	Operating values		Type of protection Ex n, NI and FNICO					
	U _N [V]	I _N [mA]	U _i [V]	I _i [mA]	P _i [mW]	C _i [nF]	C _{iPA} [nF]	L _i [μH]
Digital output DO2, passive (terminals 41/42)	30	220	-	-	-	-	-	-
Fieldbus (terminals 97/98)	32	30	32	500 ¹⁾	7000 ¹⁾	1	1	5

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

Temperature data

Table 1: Fluid temperature as a function of lining and flange material for models FEP315 and FEP325

Materials		Fluid temperature (operating values)	
Lining	Flange	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F)	90 °C (194 °F)
		-5 °C (23 °F) ¹⁾	80 °C (176 °F) ¹⁾
Hard rubber	Stainless steel	-15 °C (5 °F)	90 °C (194 °F)
		-5 °C (23 °F) ¹⁾	80 °C (176 °F) ¹⁾
Soft rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)
		-15 °C (5 °F)	60 °C (140 °F)
PTFE	Steel	-10 °C (14 °F)	130 °C (266 °F)
		-25 °C (-13 °F)	130 °C (266 °F)
PFA	Steel	-10 °C (14 °F)	180 °C (356 °F)
		-25 °C (-13 °F)	180 °C (356 °F)
Thick PTFE	Steel	-10 °C (14 °F)	180 °C (356 °F)
		-25 °C (-13 °F)	180 °C (356 °F)
Elastomer ²⁾	Steel	-10 °C (14 °F)	130 °C (266 °F)
		-20 °C (-4 °F)	130 °C (266 °F)
ETFE	Steel	-10 °C (14 °F)	130 °C (266 °F)
		-25 °C (-13 °F)	130 °C (266 °F)

¹⁾ Only China production site

²⁾ USA production site, only (only for FM / cFM Div 2)

Table 2: Fluid temperature for model FEP315

Nominal diameter		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	---	---	
	HT		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	T2	130 °C	130 °C	---	---	130 °C	100 °C 2) 110 °C 3)	---	---	80 °C	40 °C	---	---	
	HT		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	---	---	
	HT		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	T4	130 °C	130 °C	---	---	130 °C	100 °C 2) 110 °C 3)	---	---	80 °C	40 °C	---	---	
	HT		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 sensor design, T_{medium} maximum 130 °C (266 °F)HT: high-temperature sensor design, T_{medium} maximum 180 °C (356 °F)

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

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

Note

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

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

Table 3: Fluid temperature for model FEP325

Nominal diameter	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	---	---
			180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C
	HT	T2	130 °C	130 °C	---	---	130 °C	130 °C	---	---	110 °C ²⁾ 120 °C ³⁾	110 °C	---	---
			180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C
	NT	T3	130 °C	130 °C	---	---	130 °C	130 °C	---	---	110 °C ²⁾ 120 °C ³⁾	110 °C	---	---
			180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C	180 °C
	HT	T4	130 °C	130 °C	---	---	130 °C	130 °C	---	---	110 °C ²⁾ 120 °C ³⁾	110 °C	---	---
			130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C
	NT	T5	95 °C	95 °C	---	---	95 °C	95 °C	---	---	95 °C	95 °C	---	---
			95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C	95 °C
	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	80 °C	80 °C	80 °C	80 °C	80 °C	80 °C

1) Low-temperature version (option)

2) Temperature values for ProcessMaster

3) Temperature values for HygienicMaster

NT: standard sensor design, T_{medium} maximum 130 °C (266 °F)HT: high-temperature sensor design, T_{medium} maximum 180 °C (356 °F)

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

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

Note

The standard version includes explosion protection for gases and dust.

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

Specifications for operation in areas with combustible dust

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

The Ex certification is provided on the name plate.



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).

Maximum allowable surface temperature

Model	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.

Minimum signal cable length

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

Installation requirements

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.

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.

Flow direction

The device measures the flowrate in both directions. Forward flow is the factory setting, as shown in Fig. 23.

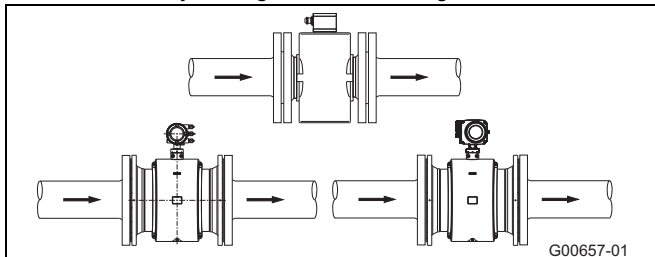


Fig. 23

Electrode axis

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

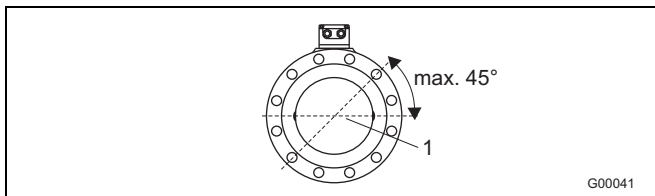


Fig. 24

Inlet and outlet pipe sections

The metering principle is independent of the flow profile as long as standing eddies do not extend into the metering section, such as may occur after double elbows (1), in the event of tangential inflow, or where half-open gate valves are located upstream of the flowmeter sensor.

In such cases, measures must be put in place to normalize the flow profile.

- Do not install fittings, manifolds, valves, etc., directly in front of the flowmeter sensor (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).

Experience has shown that, in most installations, straight inlet sections 3 x DN long and straight outlet sections 2 x DN long are sufficient (DN = nominal diameter of the sensor Fig. 25).

For test stands, the reference conditions of 10 x DN straight inlet and 5 x DN straight outlet must be provided, in accordance with EN 29104 / ISO 9104.

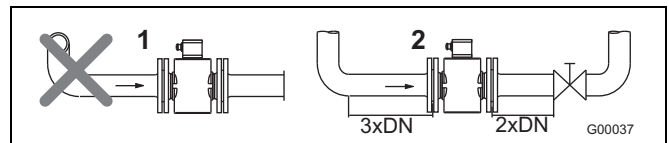


Fig. 25

Vertical connections

Vertical installation for measuring abrasive fluids, preferably with flow in upward direction.

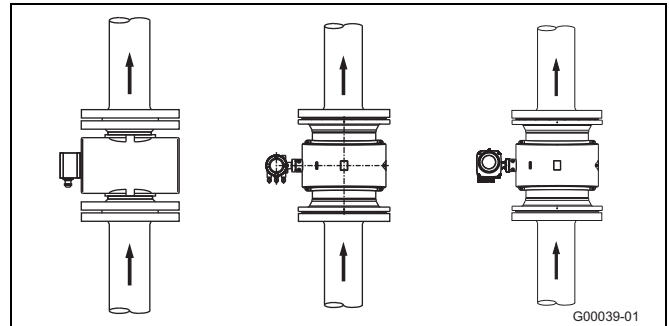


Fig. 26

Horizontal connections

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

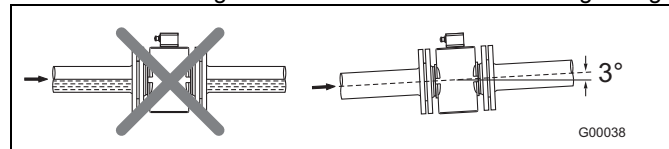


Fig. 27

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).

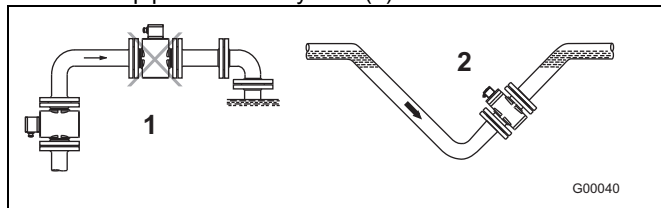


Fig. 28

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.

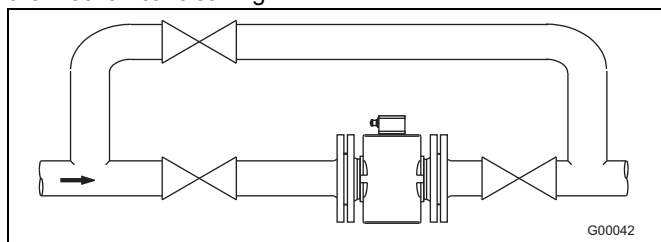


Fig. 29

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.

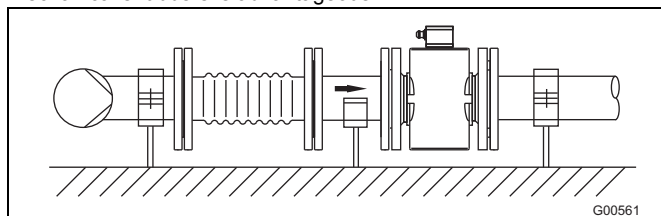


Fig. 30

Installation of 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.

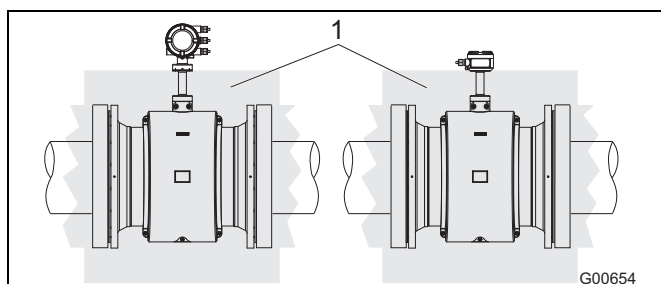


Fig. 31

1 Insulation

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. 33).
- Read the pressure drop on the Y-axis in Fig. 33.

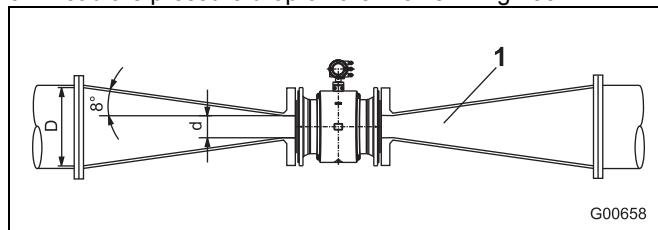


Fig. 32

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

Nomograph for pressure drop calculations

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

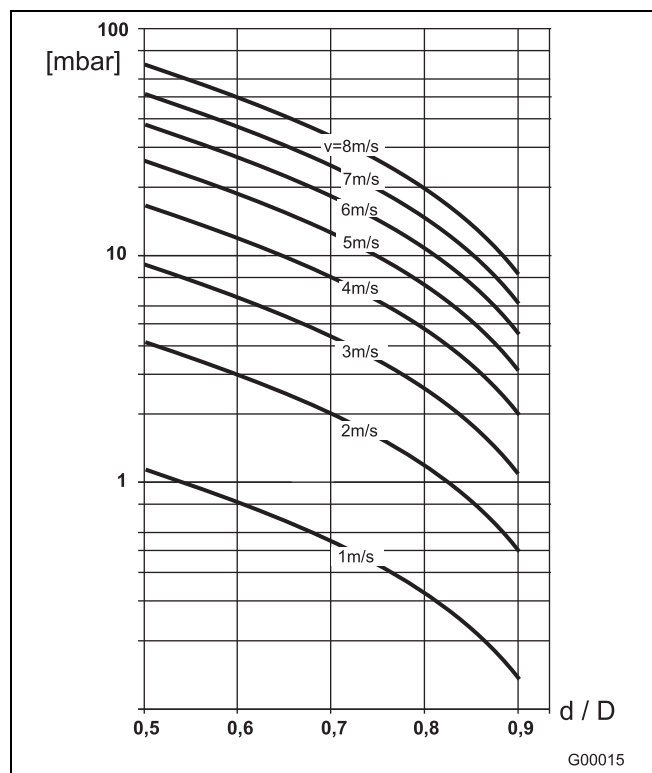


Fig. 33

Dimensions

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

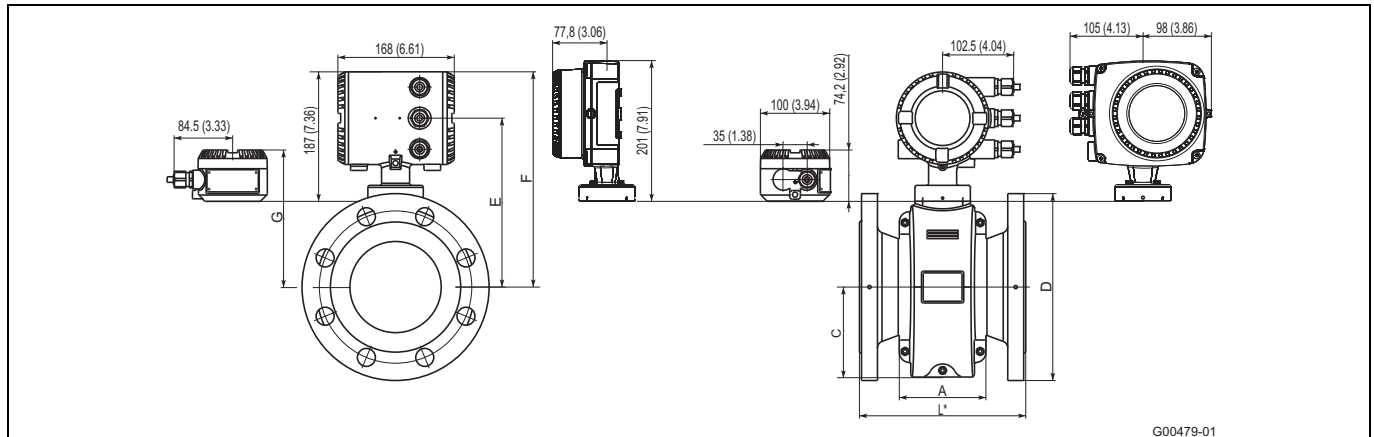


Fig. 34: Dimensions in mm (inch)

Dimensions mm (inch)									Approx. weight kg (lb)	
DN	Process connection	D	L 2) 3) 8)	F 4)	C	E 4)	G 4)	A	Integral	Remote
3 ... 8 ⁵⁾ (1/8 ... 5/16 ⁶⁾) 10 (3/8 ⁶⁾)	EN 1092-1 ⁷⁾	90	200 (7.84)	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)	113 (4.45)	7 (15)	5 (11)
	PN 10 ... 40 ¹⁾	(3.54)								
	ASME B16.5 CL 150	89								
	ASME B16.5 CL 300	96								
15 (1/2)	JIS 10K	90	200 (7.84)	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)	113 (4.45)	7 (15)	5 (11)
		(3.54)								
	EN 1092-1 ⁷⁾	95								
	PN 10 ... 40 ¹⁾	(3.74)								
20 (3/4)	ASME B16.5 CL 150	89	200 (7.84)	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)	113 (4.45)	8 (18)	6 (13)
		(3.50)								
	ASME B16.5 CL 300	96								
	JIS 10K	95								
25 (1)		(3.74)	200 (7.84)	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)	113 (4.45)	9 (20)	7 (15)
	EN 1092-1 ⁷⁾	115								
	PN 10 ... 40 ¹⁾	(4.53)								
	ASME B16.5 CL 150	108								
32 (1 1/4)		(4.25)	200 (7.87)	262 (10.31)	92 (3.62)	195 (7.68)	150 (5.91)	113 (4.45)	10 (22)	8 (18)
	ASME B16.5 CL 300	124								
	JIS 10K	125								
		(4.92)								
40 (1 1/2)	EN 1092-1 ⁷⁾	140	200 (7.87)	262 (10.31)	92 (3.62)	195 (7.68)	150 (5.91)	113 (4.45)	11 (24)	9 (20)
	PN 10 ... 40 ¹⁾	(5.51)								
	ASME B16.5 CL 150	118								
	ASME B16.5 CL 300	134								
40 (1 1/2)	JIS 10K	135	200 (7.87)	262 (10.31)	92 (3.62)	195 (7.68)	150 (5.91)	113 (4.45)	11 (24)	9 (20)
		(5.31)								
	EN 1092-1 ⁷⁾	150								
	PN 10 ... 40 ¹⁾	(5.91)								
40 (1 1/2)	ASME B16.5 CL 150	127	200 (7.87)	262 (10.31)	92 (3.62)	195 (7.68)	150 (5.91)	113 (4.45)	11 (24)	9 (20)
		(5.00)								
	ASME B16.5 CL 300	156								
	JIS 10K	140								
40 (1 1/2)		(5.51)								

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

DN	Process connection	Dimensions mm (inch)							Approx. weight kg (lb)	
		D	L 2) 3) 8)	F 4)	C	E 4)	G 4)	A	Integral	Remote
50 (2)	EN 1092-1 7)	165	200 (7.87)	268 (10.55)	97 (3.82)	201 (7.91)	156 (6.14)	115 (4.53)	12 (26)	10 (22)
	PN 10 ... 40 1)	(6.50)								
	ASME B16.5 CL 150	153 (6.02)								
	ASME B16.5 CL 300	165 (6.50)								
	JIS 10K	155 (6.10)								
	AS2129 table D	150	200 (7.87)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)	104 (4.09)	15 (33)	13 (29)
	AS2129 table E	150 (5.91)								
	EN 1092-1 7)	185								
	PN 10 ... 40 1)	(7.28)								
	ASME B16.5 CL 150	178 (7.01)								
65 (2 1/2)	ASME B16.5 CL 300	191 (7.52)	200 (7.87)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)	104 (4.09)	13 (29)	11 (24)
	JIS 10K	175 (6.89)								
	AS2129 table D	165								
	AS2129 table E	165 (6.50)								
	EN 1092-1 7)	200								
80 (3)	PN 10 ... 40 1)	(7.87)	200 (7.87)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)	104 (4.09)	17 (38)	15 (33)
	ASME B16.5 CL 150	191 (7.52)								
	ASME B16.5 CL 300	210 (8.27)								
	JIS 10K	185 (7.28)								
	AS2129 table D	185								
	AS2129 table E	178 (7.28)								
	EN 1092-1 7)	220	250 (9.84)	301 (11.85)	122 (4.80)	234 (9.21)	189 (7.44)	125 (4.92)	19 (42)	17 (38)
	PN 10 ... 16 1)	(8.66)								
	EN 1092-1 7)	235								
	PN 25 ... 40 1)	(9.25)								
	ASME B16.5 CL 150	229 (9.02)								
100 (4)	ASME B16.5 CL 300	254 (10.0)								
	JIS 10K	210 (8.72)								
	AS2129 table D	215								
	AS2129 table E	215 (8.46)								
	EN 1092-1 7)	250	250 (9.84)	311 (12.24)	130 (5.12)	244 (9.61)	199 (7.83)	125 (4.92)	22 (49)	20 (44)
125 (5)	PN 10 ... 16 1)	(9.84)								
	EN 1092-1 7)	270								
	PN 25 ... 40 1)	(10.63)								
	ASME B16.5 CL 150	254 (10.0)								
	ASME B16.5 CL 300	280 (11.02)								
	JIS 10K	250 (9.84)								
	AS2129 table D	255								
	AS2129 table E	255 (10.04)								
	EN 1092-1 7)	270								
	PN 25 ... 40 1)	(10.63)								
	ASME B16.5 CL 150	254 (10.0)								
	ASME B16.5 CL 300	280 (11.02)								
	JIS 10K	250 (9.84)								
	AS2129 table D	255								
	AS2129 table E	255 (10.04)								

Tolerance L: +0 / -0.118 inch

- 1) Other pressure ratings upon 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 sensor design	0		0	
	High-temperature sensor design	+127 mm (+5 inch)		+127 mm (+5 inch)	
Explosion protection Zone 1, Div. 1	Standard sensor design	+74 mm (+2.91 inch)		+47 mm (+1.85 inch)	
	High-temperature sensor design	+127 mm (+5 inch)		+174 mm (+6.85 inch)	
Explosion protection Zone 2, Div. 2	Standard sensor design	0		0	
	High-temperature sensor design	+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) For devices with ordering code "Installation length JN" (China production site) the installation length corresponds to the ISO installation length.

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

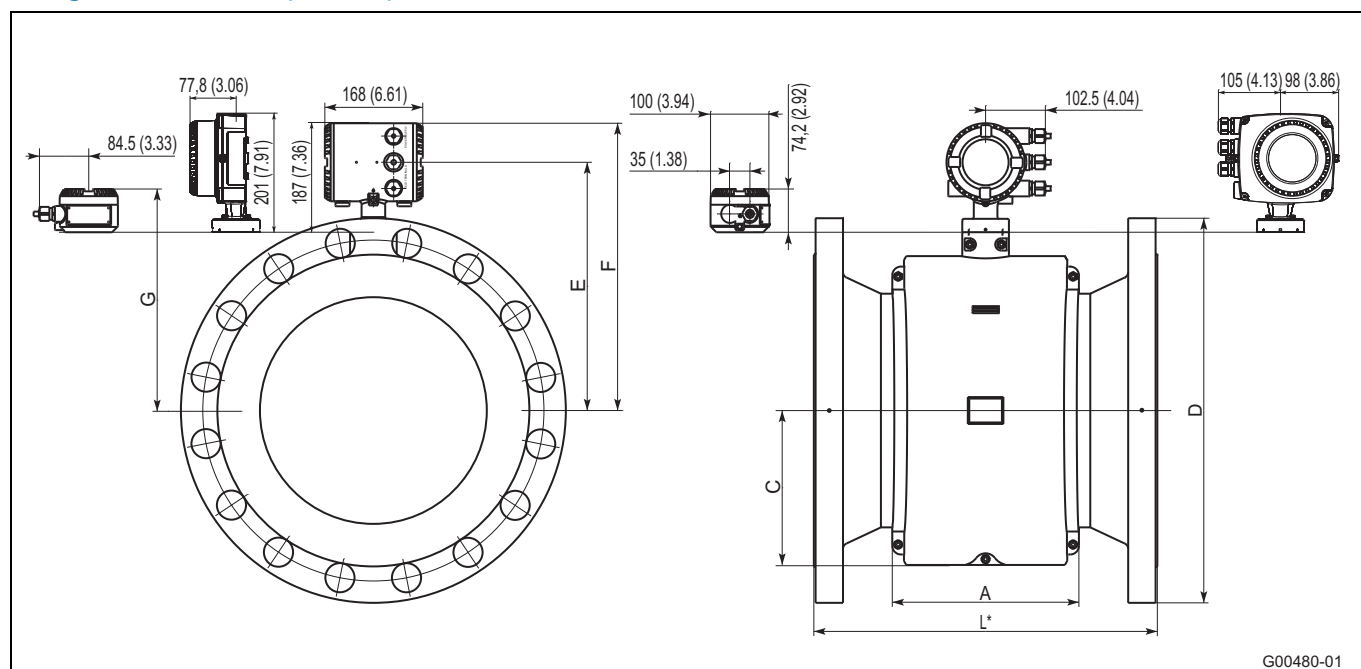


Fig. 35: Dimensions in mm (inch)

Dimensions mm (inch)									Approx. weight kg (lb)	
DN	Process connection	D	L ^{2) 3)}	F ⁴⁾	C	E ⁴⁾	G ⁴⁾	A	Integral	Remote
150 (6)	EN 1092-1 PN 10 ... 16 ¹⁾	285 (11,22)	300 (11,81)	358 (14,09)	146 (5,75)	291 (11,46)	246 (9,69)	166 (6,54)	33 (73)	31 (68)
	EN 1092-1 PN 25 ... 40 ¹⁾	300 (11,81)							39 (86)	37 (82)
	ASME B16.5 CL 150	280 (11,02)							33 (73)	31 (68)
	ASME B16.5 CL 300	381 (15)							47 (104)	45 (99)
	JIS 10K	280 (11,02)							33 (73)	31 (68)
	AS2129 table D	280							33 (73)	31 (68)
	AS2129 table E	280 (11,02)							33 (73)	31 (68)
200 (8)	EN 1092-1 PN 10 ... 16 ¹⁾	340 (13,39)	350 (13,78)	399 (15,71)	170 (6,69)	331 (13,03)	286 (11,26)	200 (7,87)	41 (90)	39 (86)
	EN 1092-1 PN 25 ... 40 ¹⁾	340 (13,39)							43 (95)	41 (90)
	ASME B16.5 CL 150	343 (13,5)							50 (110)	48 (106)
	ASME B16.5 CL 300	381 (15)							72 (158)	70 (154)
	JIS 10K	330 (12,99)							43 (95)	41 (90)
	AS2129 table D	335							50 (110)	48 (106)
	AS2129 table E	335 (13,19)							50 (110)	48 (106)
250 (10)	EN 1092-1 PN 10 ... 16 ¹⁾	395 (15,55)	450 (17,72)	413 (16,26)	198 (7,80)	346 (13,62)	301 (11,85)	235 (9,25)	61 (135)	59 (130)
	EN 1092-1 PN 25 ... 40 ¹⁾	405 (15,94)							65 (143)	63 (139)
	ASME B16.5 CL 150	407 (16,02)							70 (154)	68 (150)
	ASME B16.5 CL 300	445 (17,52)							105 (232)	103 (227)
	JIS 10K	400 (15,75)							65 (143)	63 (139)
	AS2129 table D	405							70 (154)	68 (150)
	AS2129 table E	405 (15,94)							70 (154)	68 (150)

Tolerance L: DN 150 ... 200 +0 / -3 mm (+0 / -0,118 inch), DN 250 ... 400 +0 / -5 mm (+0 / -0,197 inch)

Dimensions mm (inch)									Approx. weight kg (lb)	
DN	Process connection	D	L 2) 3)	F 4)	C	E 4)	G 4)	A	Integral	Remote
300 (12)	EN 1092-1 PN 10 ... 16 1)	445 (17,52)	500 (19,68)	436 (17,17)	228 (8,98)	369 (14,53)	324 (12,76)	272 (10,71)	74 (163)	72 (159)
	EN 1092-1 PN 25 ... 40 1)	460 (18,11)							80 (176)	78 (172)
	ASME B16.5 CL 150	483 (19,02)							105 (232)	103 (227)
	ASME B16.5 CL 300	521 (20,51)							150 (331)	148 (326)
	JIS 10K	445 (17,52)							80 (176)	78 (172)
	AS2129 table D	455 (17,19)							105 (232)	103 (227)
	AS2129 table E									
350 (14)	EN 1092-1 PN 10 ... 16 1)	505 (19,88)	550 (21,65)	451 (17,76)	265 (10,43)	384 (15,12)	339 (13,35)	322 (12,68)	95 (209)	93 (203)
	EN 1092-1 PN 25 ... 40 1)	520 (20,47)							110 (243)	108 (238)
	ASME B16.5 CL 150	533 (20,98)							105 (232)	103 (227)
	ASME B16.5 CL 300	584 (22,99)							140 (309)	138 (304)
	JIS 10K	490 (19,29)							110 (243)	108 (238)
	AS2129 table D	525 (20,67)							105 (232)	103 (227)
	AS2129 table E									
400 (16)	EN 1092-1 PN 10 ... 16 1)	565 (22,24)	600 (23,62)	493 (19,41)	265 (10,43)	426 (16,77)	381 (15,00)	322 (12,68)	103 (227)	101 (223)
	EN 1092-1 PN 25 ... 40 1)	580 (22,83)							126 (278)	124 (273)
	ASME B16.5 CL 150	597 (23,50)							175 (386)	173 (381)
	ASME B16.5 CL 300	647 (25,47)							265 (584)	263 (580)
	JIS 10K	560 (22,05)							126 (278)	124 (273)
	AS2129 table D	580 (22,83)							175 (386)	173 (381)
	AS2129 table E									

Tolerance L: DN 150 ... 200 +0 / -3 mm (+0 / -0,118 inch), DN 250 ... 400 +0 / -5 mm (+0 / -0,197 inch)

1) Other pressure ratings upon 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 sensor design	0
	High-temperature sensor design	+127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard sensor design	+74 mm (+2,91 inch)
	High-temperature sensor design	+174 mm (+6,85 inch)
Explosion protection Zone 2, Div. 2	Standard sensor design	0
	High-temperature sensor design	+127 mm (+5 inch)

Flange DN 450 ... 2000 (18 ... 80")

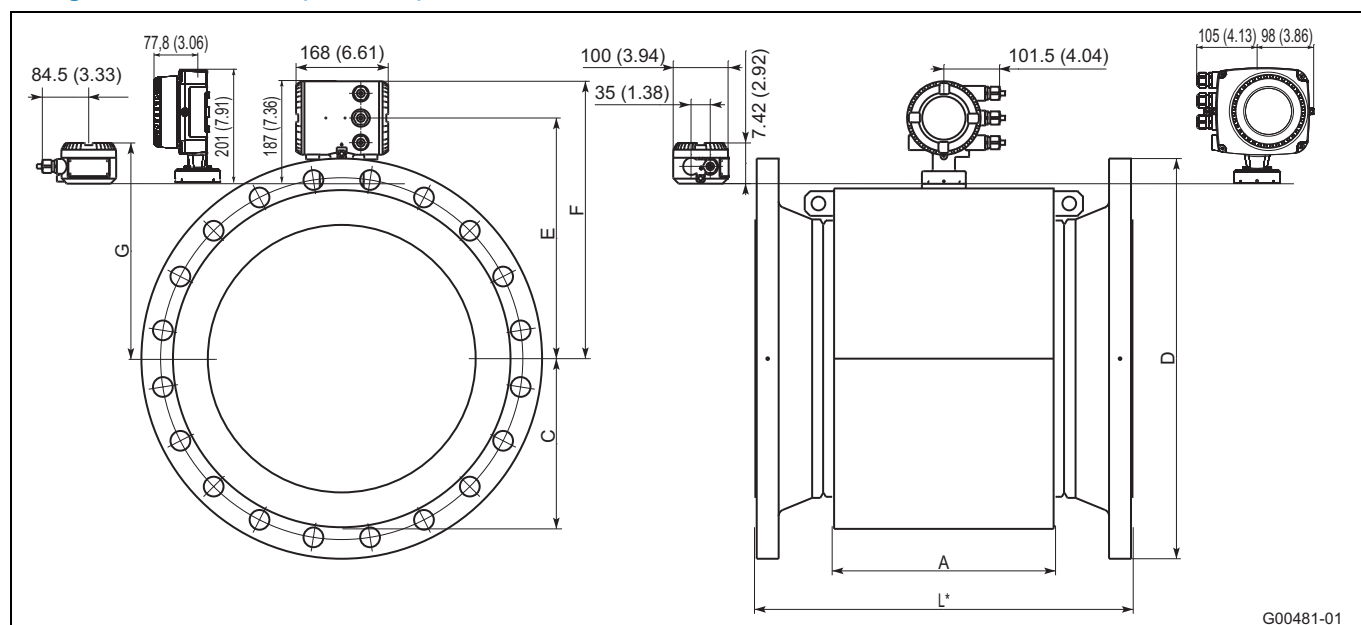


Fig. 36: Dimensions in mm (inch)

Dimensions mm (inch)									Approx. weight kg (lb)	
DN	Process connection	D	L ^{2) 3)}	F ⁴⁾	C	E ⁴⁾	G ⁴⁾	A	Integral	Remote
450 (18)	ASME B16.5 CL 150	635 (25.0)	686 (27.01)	501 (19.72)	310 (12.20)	434 (17.09)	389 (15.31)	-	260 (573)	258 (569)
	AS2129 table D AS2129 table E	640 (25.20)								
500 (20)	EN 1092-1 PN 10 ¹⁾	670 (26.38)	650 (25.59)	501 (19.72)	310 (12.20)	434 (17.09)	389 (15.31)	407 (16.02)	190 (419)	188 (415)
	EN 1092-1 PN 16 ¹⁾	715 (28.15)							240 (529)	238 (525)
	ASME B16.5 CL 150	699 (27.52)							300 (661)	298 (657)
	AS2129 table D AS2129 table E	705 (27.76)								
600 (24)	EN 1092-1 PN 10 ¹⁾	780 (30.71)	780 (30.71)	552 (21.73)	361 (14.21)	485 (19.09)	440 (17.32)	469 (18.46)	246 (542)	244 (537)
	EN 1092-1 PN 16 ¹⁾	840 (33.07)							318 (701)	316 (697)
	ASME B16.5 CL 150	813 (32.01)							425 (937)	423 (933)
	AS2129 table D AS2129 table E	825 (32.48)								
700 (28)	EN 1092-1 PN 10 ¹⁾	895 (35.24)	910 (35.83)	596 (23.46)	405 (15.94)	529 (20.83)	484 (19.06)	537 (21.14)	320 (706)	318 (701)
	EN 1092-1 PN 16 ¹⁾	910 (35.83)							440 (970)	438 (966)
	ASME B16.5 CL 150	837 (32.95)							350 (772)	348 (767)
760 (30)	ASME B16.5 CL 150	888 (34.96)	990 (38.96)	606 (23.86)	435 (17.13)	539 (21.22)	494 (19.45)	-	230 (507)	228 (503)
800 (32)	EN 1092-1 PN 10 ¹⁾	1015 (39.96)	1040 (40.94)	646 (25.43)	455 (17.91)	579 (22.8)	534 (21.02)	605 (23.82)	420 (926)	418 (922)
	EN 1092-1 PN 16 ¹⁾	1025 (40.35)							490 (1080)	488 (1076)
900 (36)	EN 1092-1 PN 10 ¹⁾	1115 (43.90)	1170 (46.06)	696 (27.40)	505 (19.88)	629 (24.76)	584 (22.99)	671 (26.42)	505 (1113)	503 (1109)
	EN 1092-1 PN 16 ¹⁾	1125 (44.29)							590 (1301)	588 (1296)
	ASME B16.5 CL 150	1057 (41.61)							680 (1499)	678 (1495)

Tolerance L: DN 450 ... 500 +0 / -5 mm (+0 / -0,197 inch), DN 600 ... 2000 +0 / -10 mm (+0 / -0,394 inch)

Dimensions mm (inch)									Approx. weight kg (lb)	
DN	Process connection	D	L 2) 3)	F 4)	C	E 4)	G 4)	A	Integral	Remote
1000 (40)	EN 1092-1 PN 10 ¹⁾	1230 (48.43)	1300 (51.18)	746 (29.37)	555 (21.85)	679 (26.73)	634 (24.96)	739 (29.09)	690 (1521)	688 (1516)
	EN 1092-1 PN 16 ¹⁾	1255 (49.41)							850 (1873)	848 (1869)
	ASME B16.5 CL 150	1380 (54.33)							880 (1940)	878 (1936)
1050 (42)	ASME B16.5 CL 150	1067 (42.01)	1365 (53.74)	771 (30.35)	580 (22.83)	704 (27.72)	659 (25.94)	-	-	-
1100 (44)	ASME B16.5 CL 150	1118 (44.02)	1430 (56.30)	-	-	-	-	-	-	-
1200 (40)	EN 1092-1 PN 10 ¹⁾	1405 (55.31)	1560 (61.42)	856 (33.7)	660 (25.98)	789 (31.06)	742 (29.21)	800 (31.5)	700 (1543)	698 (1538)
	EN 1092-1 PN 16 ¹⁾	1455 (57.28)							930 (2050)	928 (2046)
1400 (40)	EN 1092-1 PN 10 ¹⁾	1630 (64.17)	1820 (71.65)	950 (37.4)	755 (29.72)	884 (34.8)	838 (32.99)	900 (35.43)	810 (1786)	808 (1781)
	EN 1092-1 PN 16 ¹⁾	1675 (65.94)							1210 (2668)	1208 (2663)
1500 (60)	ASME B16.5 CL 150	1676 (65.98)	1950 (76.77)	996 (39.21)	805 (31.69)	929 (36.57)	884 (34.80)	-	-	-
1600 (40)	EN 1092-1 PN 10 ¹⁾	1830 (72.05)	2080 (81.89)	1060 (41.73)	865 (34.06)	994 (39.13)	948 (37.32)	990 (38.98)	1180 (2602)	1178 (2597)
	EN 1092-1 PN 16 ¹⁾	1915 (75.39)							1630 (3593)	1628 (3589)
1800 (40)	EN 1092-1 PN 10 ¹⁾	2045 (80.51)	2340 (92.13)	1176 (46.3)	980 (38.58)	1109 (43.66)	1062 (41.81)	1080 (42.52)	1490 (3285)	1488 (3280)
	EN 1092-1 PN 16 ¹⁾	2115 (83.27)							2230 (4916)	2228 (4912)
2000 (40)	EN 1092-1 PN 10 ¹⁾	2265 (89.17)	2600 (102.36)	1286 (50.63)	1090 (42.91)	1219 (47.99)	1172 (46.14)	1170 (46.06)	1880 (4145)	1878 (4140)
	EN 1092-1 PN 16 ¹⁾	2325 (91.54)							2650 (5842)	2648 (5838)

Tolerance L: DN 450 ... 500 +0 / -5 mm (+0 / -0,197 inch), DN 600 ... 2000 +0 / -10 mm (+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 sensor design	0
	High-temperature sensor design	+127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard sensor design	+74 mm (+2.91 inch)
	High-temperature sensor design	+127 mm (+5 inch)
Explosion protection Zone 2, Div. 2	Standard sensor design	0
	High-temperature sensor design	+127 mm (+5 inch)

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

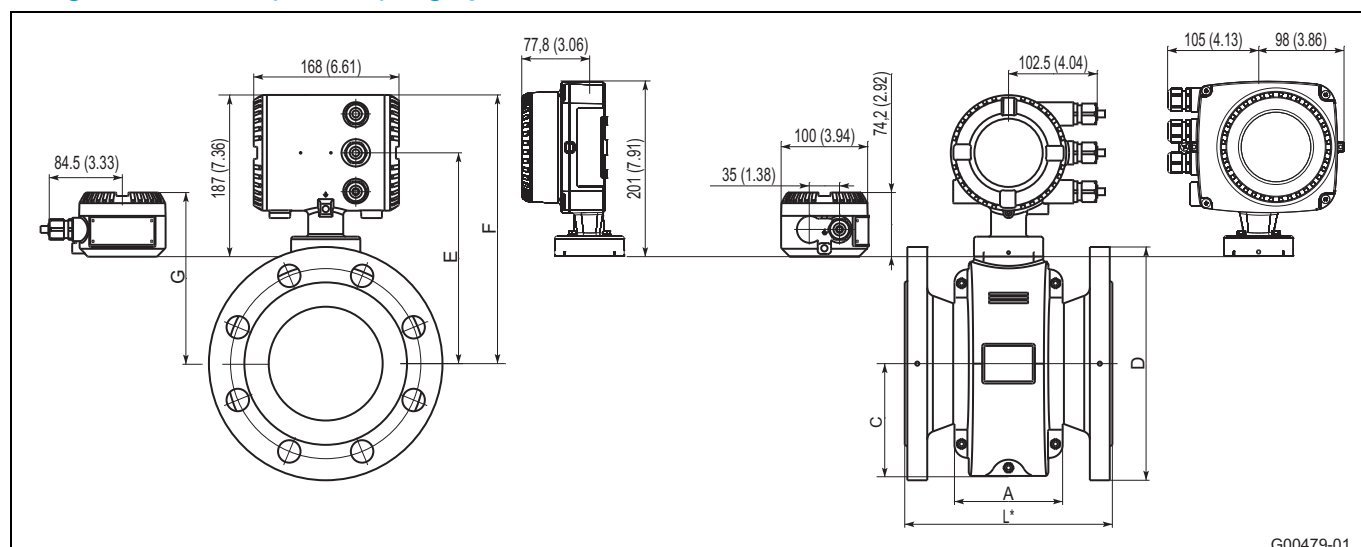


Fig. 37: Dimensions in mm (inch)

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

Dimensions mm (inch)									Approx. weight kg (lb)	
DN	PN	D	L ^{1) 2)}	F ⁴⁾	C	E ³⁾	G ³⁾	A	Integral	Remote
15 (1/2)	63 ... 100	105 (4,13)	270 (10,63)	255 (10,04)	82 (3,23)	188 (7,4)	143 (5,63)	113 (4,45)	10 (22)	8 (18)
25 (1)	63 ... 100	140 (5,51)	270 (10,63)	255 (10,04)	82 (3,23)	188 (7,4)	143 (5,63)	113 (4,45)	12 (27)	10 (22)
40 (1 1/2)	63 ... 100	170 (6,69)	280 (11,02)	262 (10,31)	92 (3,62)	195 (7,68)	150 (5,91)	113 (4,45)	13 / 14 (29 / 31)	11 / 12 (24 / 27)
50 (2)	63	180 (7,09)	280 (11,02)	268 (10,55)	97 (3,82)	201 (7,91)	156 (6,14)	115 (4,53)	15 (33)	13 (29)
	100	195 (7,68)	280 (11,02)	268 (10,55)	97 (3,82)	201 (7,91)	156 (6,14)	115 (4,53)	18 (40)	16 (35)
65 (2 1/2)	63	205 (8,07)	330 (12,99)	279 (10,98)	108 (4,25)	212 (8,35)	167 (6,57)	104 (4,09)	18 (40)	16 (35)
	100	220 (8,66)	330 (12,99)	279 (10,98)	108 (4,25)	212 (8,35)	167 (6,57)	104 (4,09)	23 (51)	21 (46)
80 (3)	63	215 (8,46)	340 (13,39)	279 (10,98)	108 (4,25)	212 (8,35)	167 (6,57)	104 (4,09)	22 (49)	20 (44)
	100	230 (9,06)	340 (13,39)	279 (10,98)	108 (4,25)	212 (8,35)	167 (6,57)	104 (4,09)	26 (57)	24 (53)
100 (4)	63	250 (9,84)	400 (15,75)	301 (11,85)	122 (4,8)	234 (9,21)	189 (7,44)	125 (4,92)	29 (64)	27 (60)
	100	265 (10,43)	400 (15,75)	301 (11,85)	122 (4,8)	234 (9,21)	189 (7,44)	125 (4,92)	38 (84)	26 (57)
125 (5)	63	295 (11,61)	450 (17,72)	311 (12,24)	130 (5,12)	244 (9,61)	199 (7,83)	125 (4,92)	on request	on request
	100	315 (12,4)	450 (17,72)	311 (12,24)	130 (5,12)	244 (9,61)	199 (7,83)	125 (4,92)		
150 (6)	63	345 (13,58)	450 (17,72)	358 (14,09)	146 (5,75)	291 (11,46)	246 (9,69)	166 (6,54)		
	100	355 (13,98)	450 (17,72)	358 (14,09)	146 (5,75)	291 (11,46)	246 (9,69)	166 (6,54)		
200 (8)	63	415 (16,34)	500 (19,69)	399 (15,71)	170 (6,69)	331 (13,03)	286 (11,26)	200 (7,87)		
	100	430 (16,93)	500 (19,69)	399 (15,71)	170 (6,69)	331 (13,03)	286 (11,26)	200 (7,87)		

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 sensor design	0
	High-temperature sensor design	+127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard sensor design	+74 mm (+2.91 inch)
	High-temperature sensor design	+127 mm (+5 inch)
Explosion protection Zone 2, Div. 2	Standard sensor design	0
	High-temperature sensor design	+127 mm (+5 inch)

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

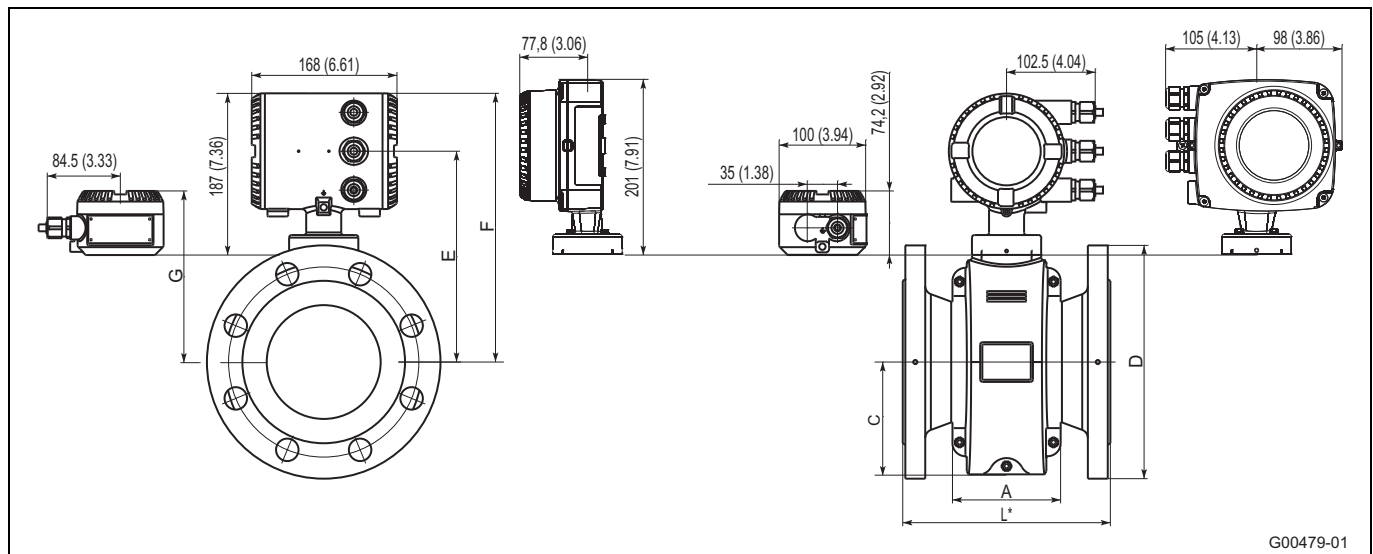


Fig. 38: Dimensions in mm (inch)

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

Dimensions [mm (inch)]									Approx. weight [kg (lb)]	
DN	PN 1)	D	L 1) 2)	F 4)	C	E 3)	G 3)	A	Integral mount design	Remote mount design
15	CL 600	95 (3.74)	270 (10.63)	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)	113 (4.45)	12 (26)	10 (22)
25	CL 600	124 (4.88)	270 (10.63)	255 (10.04)	82 (3.23)	188 (7.4)	143 (5.63)	113 (4.45)	12 (26)	10 (22)
40	CL 600	156 (6.14)	280 (11.02)	262 (10.31)	92 (3.62)	195 (7.68)	150 (5.91)	113 (4.45)	13 (29)	11 (24)
50	CL 600	165 (6.5)	280 (11.02)	268 (10.55)	97 (3.82)	201 (7.91)	156 (6.14)	115 (4.53)	15 (33)	13 (29)
65	CL 600	190 (7.48)	330 (12.99)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)	104 (4.09)	20 (44)	18 (40)
80	CL 600	210 (8.27)	340 (13.39)	279 (10.98)	108 (4.25)	212 (8.35)	167 (6.57)	104 (4.09)	25 (55)	23 (51)
100	CL 600	273 (10.75)	400 (15.75)	301 (11.85)	122 (4.8)	234 (9.21)	189 (7.44)	125 (4.92)	46 (101)	44 (97)
125	CL 600	330 (12.99)	450 (17.72)	311 (12.24)	130 (5.12)	244 (9.61)	199 (7.83)	125 (4.92)	On request	On request
150	CL 600	355 (13.98)	450 (17.72)	358 (14.09)	146 (5.75)	291 (11.46)	246 (9.69)	166 (6.54)		
200	CL 600	420 (16.54)	500 (19.69)	399 (15.71)	170 (6.69)	331 (13.03)	286 (11.26)	200 (7.87)		

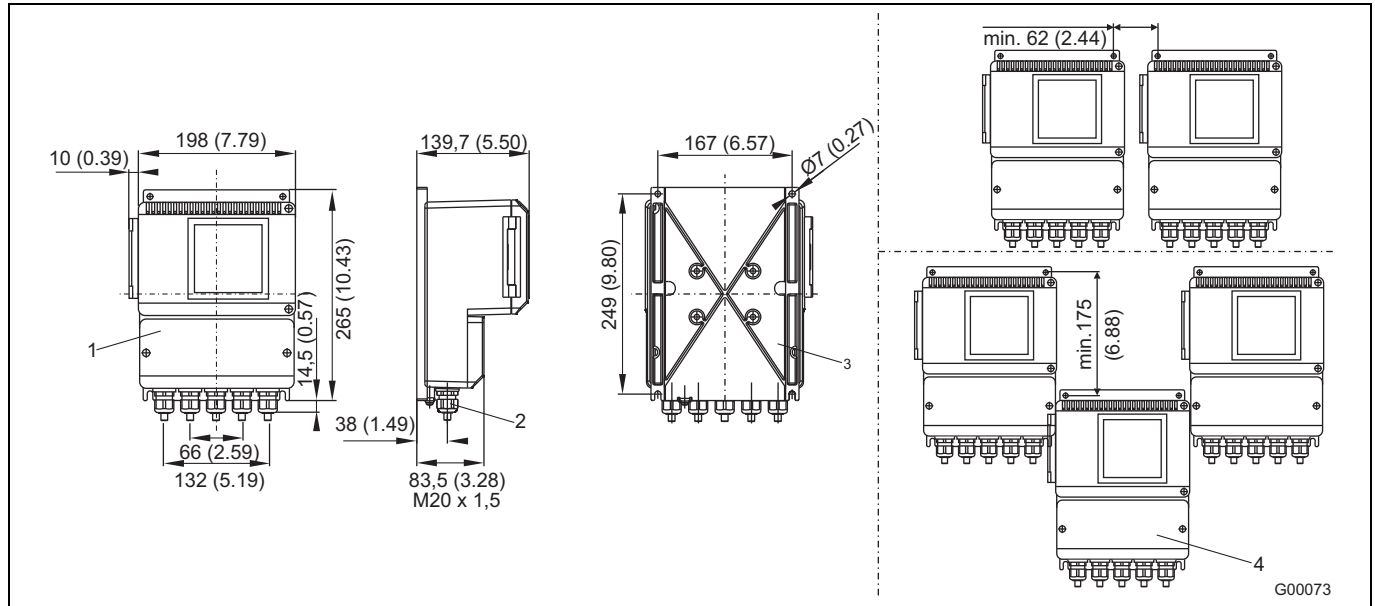
Tolerance L: +0 / -3 mm (+0 / -0.018 inch)

- 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.

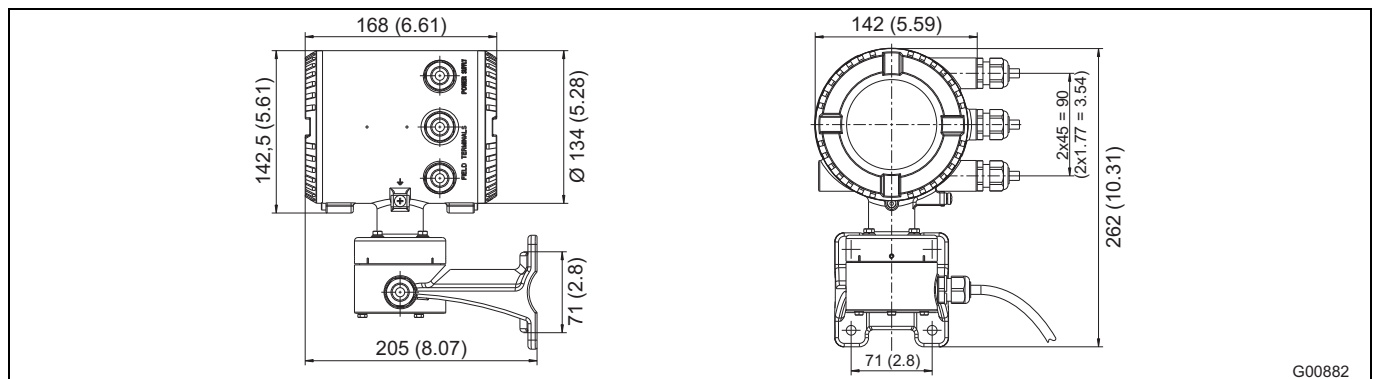
Device design	Dimension E, F	Dimension G
Without explosion protection	Standard sensor design	0
	High-temperature sensor design	+127 mm (+5 inch)
Explosion protection Zone 1, Div. 1	Standard sensor design	+74 mm (+2.91 inch)
	High-temperature sensor design	+127 mm (+5 inch)
Explosion protection Zone 2,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

Transmitter

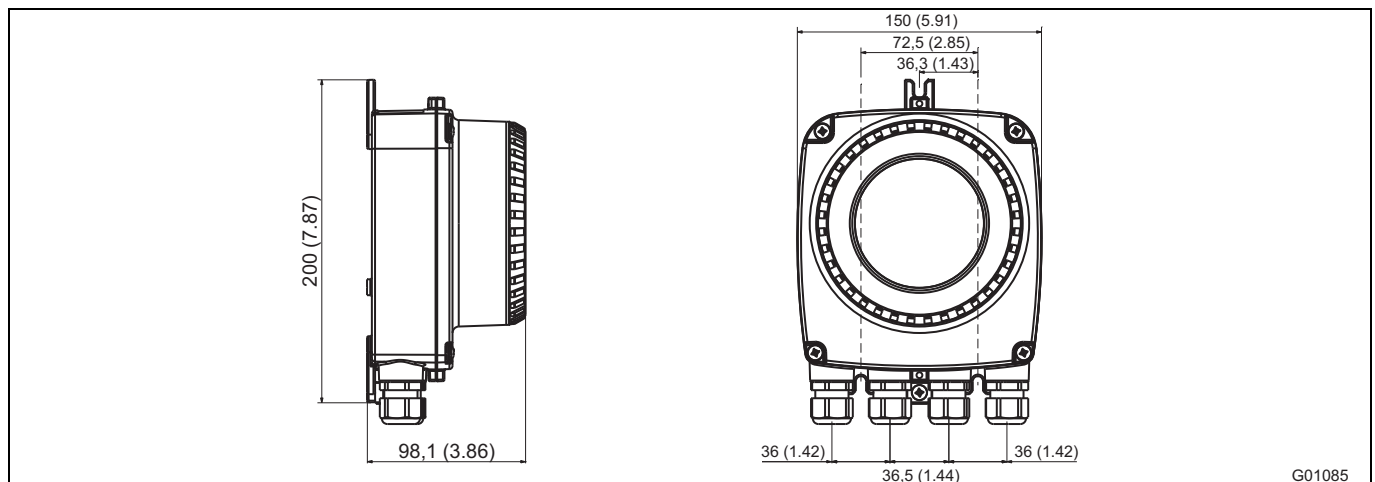
Model FET321 and FET325 (dual-compartment housing) for Ex zone 2 / Div 2



Model FET325 (dual-compartment housing) for Ex zone 1 / Div. 1



Model FET321 (single-compartment housing)



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