

■ **Intuitive navigation and softkeys**

- „Easy Set-up“ guides the operator step by step through the menu to set parameters as quickly as possible. With the softkey functionality, the configuration is as simple as using a mobile phone

■ **Through-the-glass control**

- Assures access to the meter without the need to remove the cover

■ **State-of-the-art diagnostics and simplified troubleshooting**

- Monitors the meter's operability and the process. Alarms and warnings are classified in accordance with NAMUR NE107. During alarm conditions the display indicates actions required

■ **High accuracy**

- Higher excitation frequency combined with advanced filtering leads to an accuracy up to 0.2 %

■ **Common electronic**

- Lowers inventory costs and number of spare parts

■ **Data stored inside the sensor**

- This leads to increased speed of start-up and eliminates the opportunity for errors

■ **Backwards compatible**

- Existing FXE4000 installations can be upgraded to the latest technology using the ProcessMaster transmitter with the existing installed sensor



**The first choice for all  
industry applications**

## The Company

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

## Introduction

### Setting the Standard

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

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

### State-of-the-art Diagnostics and Simplified Troubleshooting

ProcessMaster monitors its own operability and your process.

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

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

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

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

### Superior control through advanced sensor design

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

### All Data is stored in the right place – the Sensor

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

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

## Intuitive navigation and configuration

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

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

## Powerful and flexible transmitter

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

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

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

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

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

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

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

## Assured Quality






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

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## 1 ProcessMaster - Technical data at a glance

Model Overview					
Complete Systems		Separate Components			
FEP311	FEP321	FEP381	FET321	FET301	
					
G00487	G00488	G00489	G00490	G00491	
		Sensor only	Transmitter only	Electronic only	

Model number	FEP311, FEP321
Accuracy	Standard: 0,4 % of rate Option: 0,2 % of rate
Size	3 ... 2000 [1/10 ... 80"]
Process Connection	Flange according to DIN 2501/ EN 1092-1, ASME B16.5 / B16.47, JIS 10K
Pressure rating	PN 10...40, ASME CL 150, 300, 600
Liner	Hard/soft rubber, PTFE, PFA, ETFE
Conductivity	> 5 µS/cm, (20 µS/cm for demineralized water)
Electrodes	SST 1.4571[316Ti], SST 1.4539 [904L] , Hastelloy B, Hastelloy C, Platinum-Iridium, Tantalum, Titanium
Process Connection Material	Carbon Steel, SST 1.4571 [316Ti]
Protection Class	IP 67, IP 68
Fluid Temperature	-25 ... 180 °C [-13 ... 356 °F]
<b>Approvals</b>	
EEx Design	ATEX / IEC Zone 2, 21 pending ATEX / IEC Zone 2, 22 pending FM /CSA Cl.1Div1,Div2 pending
Press. Equip. Dir. 97/23/EG	Conformity per category III, Fluid group 1
CRN ( Canadian Reg.Number)	Upon request
<b>Converter</b>	
Supply Power	AC 100 ... 230 V (-15/+10 %), AC 24 V (-30/+10 %), DC 24V (-30/+30 %)
Current Output	4 ... 20 mA active or passive
Pulse Output	Active pulse or passiv pulse, software configurable
Contact Output	Optocoupler, function software programmable
Contact Input	Optocoupler, function software programmable
Local Display	Graphical display, configurable
Housing	Integral mounted or field mounted
Communication	HART protocol (standard)

For Food and Pharmaceutical applications, please refer to the HygienicMaster datasheet

## 2 Performance specifications

### 2.1 Measuring accuracy

#### 2.1.1 Reference conditions per EN 29104

Fluid temperatures	20 °C (68 °F) ± 2 K
Ambient temperature	20 °C (68 °F) ± 2 K
Supply power	Line voltage per name plate Un ± 1 %, Frequency f ± 1 %
Installation conditions	- Upstream >10 x DN straight section. - Downstream >5 x DN straight section.
Warm up phase	30 min

#### 2.1.2 Maximum measurement error

##### Pulse output

- Standard calibration; 0.4 % of rate:  
± 0.4 % of rate ± 0.02 % of  $Q_{maxDN}$
- Optional calibration; 0.2 % of rate:  
± 0.2 % of rate ± 0.02 % of  $Q_{maxDN}$

For  $Q_{maxDN}$  refer to table in chapter Flowmeter sizes, Flow range

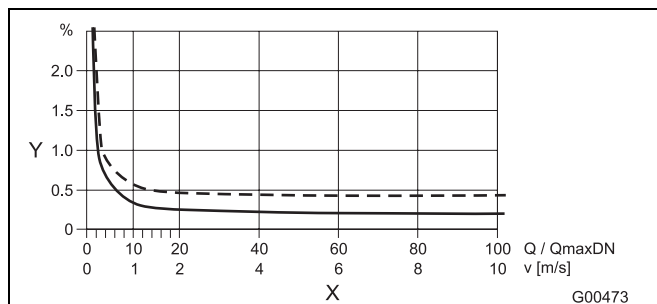


Fig. 1

- Y Accuracy ± of rate in [%]  
 X Flow velocity v in [m/s]  
 Q /  $Q_{maxDN}$  [%]

##### Analog output effects

Same as pulse output plus ± 0.1 % of rate + 0.01 mA.

### 2.2 Repeatability, Response time

Reproducibility	≤ 0.11 % of rate $t_{mess} = 100$ s, v=0,5 ... 10m/s
Response time	For a step change 0 ... 99 % (corresponds to 5 $\tau$ ) ≥ 200 ms at 25 Hz excitation frequency

## 2.3 Flowmeter sizes, Flow range

Meter size		Min. Flow range 0 ... ≈ 0.2 m/s	Q <sub>max</sub> <sub>DN</sub> 0 ... ≈ 10 m/s
DN	"		
3	1 / 10	0,08 l/min (0,02 US gal/min)	4 l/min (1,06 US gal/min)
4	5 / 32	0,16 l/min (0,04 US gal/min)	8 l/min (2,11 US gal/min)
6	1 / 4	0,4 l/min (0,11 US gal/min)	20 l/min (5,28 US gal/min)
8	5 / 16	0,6 l/min (0,16 US gal/min)	30 l/min (7,93 US gal/min)
10	3 / 8	0,9 l/min (0,24 US gal/min)	45 l/min (11,9 US gal/min)
15	1 / 2	2 l/min (0,53 US gal/min)	100 l/min (26,4 US gal/min)
20	3 / 4	3 l/min (0,79 US gal/min)	150 l/min (39,6 US gal/min)
25	1	4 l/min (1,06 US gal/min)	200 l/min (52,8 US gal/min)
32	1 1/4	8 l/min (2,11 US gal/min)	400 l/min (106 US gal/min)
40	1 1/2	12 l/min (3,17 US gal/min)	600 l/min (159 US gal/min)
50	2	1,2 m <sup>3</sup> /h (5,28 US gal/min)	60 m <sup>3</sup> /h (264 US gal/min)
65	2 1/2	2,4 m <sup>3</sup> /h (10,57 US gal/min)	120 m <sup>3</sup> /h (528 US gal/min)
80	3	3,6 m <sup>3</sup> /h (15,9 US gal/min)	180 m <sup>3</sup> /h (793 US gal/min)
100	4	4,8 m <sup>3</sup> /h (21,1 US gal/min)	240 m <sup>3</sup> /h (1057 US gal/min)
125	5	8,4 m <sup>3</sup> /h (37 US gal/min)	420 m <sup>3</sup> /h (1849 US gal/min)
150	6	12 m <sup>3</sup> /h (52,8 US gal/min)	600 m <sup>3</sup> /h (2642 US gal/min)
200	8	21,6 m <sup>3</sup> /h (95,1 US gal/min)	1080 m <sup>3</sup> /h (4755 US gal/min)
250	10	36 m <sup>3</sup> /h (159 US gal/min)	1800 m <sup>3</sup> /h (7925 US gal/min)
300	12	48 m <sup>3</sup> /h (211 US gal/min)	2400 m <sup>3</sup> /h (10567 US gal/min)
350	14	66 m <sup>3</sup> /h (291 US gal/min)	3300 m <sup>3</sup> /h (14529 US gal/min)
400	16	90 m <sup>3</sup> /h (396 US gal/min)	4500 m <sup>3</sup> /h (19813 US gal/min)
450	18	120 m <sup>3</sup> /h (528 US gal/min)	6000 m <sup>3</sup> /h (26417 US gal/min)
500	20	132 m <sup>3</sup> /h (581 US gal/min)	6600 m <sup>3</sup> /h (29059 US gal/min)
600	24	192 m <sup>3</sup> /h (845 US gal/min)	9600 m <sup>3</sup> /h (42268 US gal/min)
700	28	264 m <sup>3</sup> /h (1162 US gal/min)	13200 m <sup>3</sup> /h (58118 US gal/min)
760	30	312 m <sup>3</sup> /h (1374 US gal/min)	15600 m <sup>3</sup> /h (68685 US gal/min)
800	32	360 m <sup>3</sup> /h (1585 US gal/min)	18000 m <sup>3</sup> /h (79252 US gal/min)
900	36	480 m <sup>3</sup> /h (2113 US gal/min)	24000 m <sup>3</sup> /h (105669 US gal/min)
1000	40	540 m <sup>3</sup> /h (2378 US gal/min)	27000 m <sup>3</sup> /h (118877 US gal/min)
1050	42	616 m <sup>3</sup> /h (2712 US gal/min)	30800 m <sup>3</sup> /h (135608 US gal/min)
1100	44	660 m <sup>3</sup> /h (3038 US gal/min)	33000 m <sup>3</sup> /h (151899 US gal/min)
1200	48	840 m <sup>3</sup> /h (3698 US gal/min)	42000 m <sup>3</sup> /h (184920 US gal/min)
1400	54	1080 m <sup>3</sup> /h (4755 US gal/min)	54000 m <sup>3</sup> /h (237755 US gal/min)
1500	60	1260 m <sup>3</sup> /h (5548 US gal/min)	63000 m <sup>3</sup> /h (277381 US gal/min)
1600	66	1440 m <sup>3</sup> /h (6340 US gal/min)	72000 m <sup>3</sup> /h (317006 US gal/min)
1800	72	1800 m <sup>3</sup> /h (7925 US gal/min)	90000 m <sup>3</sup> /h (396258 US gal/min)
2000	80	2280 m <sup>3</sup> /h (10039 US gal/min)	114000 m <sup>3</sup> /h (501927 US gal/min)

Flowrange can be set between 0.2 m/s and 20 m/s (2 x Q<sub>max</sub><sub>DN</sub>)

### 3 Functional specifications

#### 3.1 Sensor

##### 3.1.1 Protection class per EN 60529

IP 67

IP 68 (only for remote flowmeter sensor)

##### 3.1.2 Pipeline vibration following EN 60068-2-6

The following applies for integral design:  
(sensor and transmitter all in one piece)

- In the range of 10 ... 58 Hz max. 0.15 mm deflection
- In the range of 58 ... 150 Hz max. 2 g acceleration

The following applies for remote design:

Transmitter

- In the range of 10 ... 58 Hz max. 0.15 mm deflection
- In the range of 58 ... 150 Hz max. 2 g acceleration

Flowmeter sensor

- In the range of 10 ... 58 Hz max. 0.15 mm deflection
- In the range of 58 ... 150 Hz max. 2 g acceleration

##### 3.1.3 Laid length

The flanged flowmeters comply with the installation lengths defined in VDI/VDE 2641, ISO 13359 or DVGW (W420, Design WP, ISO 4064 short).

##### 3.1.4 Signal Cable (remote design only):

Scope of delivery: 5 m.

If more than 5 m is required, the cable can be ordered under the order number D173D027U01.

##### Pre-amplifier:

Max. signal cable length between flowmeter sensor and transmitter:

a) without pre-amplifier:

- max. 50 m for conductivities  $\geq 5 \mu\text{S/cm}$

For longer signal cable length a pre-amplifier is required

b) with pre-amplifier:

- max. 200 m for conductivities  $\geq 5 \mu\text{S/cm}$

##### 3.1.5 Temperature limitations

###### Storage Temperature:

- 20 °C ... 70 °C (-4 °F ... 158 °F)

###### Min. allow. pressure as a function of fluid temperature:

Liner	Meter size	Operation at mbar abs.	T <sub>Operation</sub> *
Hard rubber	15 ... 2000 (1/2 ... 80")	0	< 90 °C (194 °F)
Soft rubber	50 ... 2000 (2 ... 80")	0	< 60 °C (140 °F)
PTFE KTW approved	10 ... 600 (3/8 ... 24")	270 400 500	< 20 °C (68 °F) < 100 °C (212 °F) < 130 °C (266 °F)
Thick PTFE Hightemp. 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)
ETFE	25 ... 1000 (1 ... 40")	100	< 130 °C (266 °F)

\* Higher temperatures are allowed for CIP/SIP cleaning for limited time periods, see Table „Maximum allowable cleaning Temperature“.

###### Max. allowable cleaning Temperature:

CIP-Cleaning	Liner	T <sub>max</sub>	T <sub>max</sub> - minutes	T <sub>Amb.</sub>
Steam cleaning	PTFE, PFA	150 °C (302 °F)	60	25 °C (77 °F)
Liquid cleaning	PTFE, PFA	140 °C (284 °F)	60	25 °C (77 °F)

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

**Allowable ambient temperature as a function of fluid temperature:****Integral mount (Model FEP311), Standard temperature design**

Liner	Flangematerial	Ambient temperature		Fluid temperature	
		min. temp.	max. temp.	min. temp.	max. temp.
Hard-rubber	Steel	-10 °C (14°F)	60 °C (140 °F)	-10 °C (14°F)	90 °C (194 °F)
Hard-rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	90 °C (194 °F)
Soft-rubber	Steel	-10 °C (14°F)	60 °C (140 °F)	-10 °C (14°F)	60 °C (140 °F)
Soft-rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	60 °C (140 °F)
PTFE	Steel	-10 °C (14°F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14°F)	90 °C (194 °F) 130 °C (266 °F)
PTFE	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
PFA	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)	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)	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)	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)

**Integral mount (Model FEP311), High temperature design**

Liner	Flangematerial	Ambient temperature		Fluid temperature	
		min. temp.	max. temp.	min. temp.	max. temp.
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)	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)	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)	60 °C (140 °F)	-20 °C (-13 °F)	130 °C (266 °F)

## Note:

Thick PTFE available DN25 and up

PFA (High Temperature Design) available DN10 and up

ETFE available DN25 and up



**Remote mount (Model FEP321, FEP381), Standard temperature design**

Liner	Flangematerial	Ambient temperature		Fluid temperature	
		min. temp.	max. temp.	min. temp.	max. temp.
Hard-rubber	Steel	-10 °C (14°F)	60 °C (140 °F)	-10 °C (14°F)	90 °C (194 °F)
Hard-rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	90 °C (194 °F)
Soft-rubber	Steel	-10 °C (14°F)	60 °C (140 °F)	-10 °C (14°F)	60 °C (140 °F)
Soft-rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	60 °C (140 °F)
PTFE	Steel	-10 °C (14°F)	60 °C (140 °F)	-10 °C (14°F)	130 °C (266 °F)
PTFE	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
PFA	Steel	-10 °C (14°F)	60 °C (140 °F)	-10 °C (14°F)	130 °C (266 °F)
PFA	Stainless steel	-25 °C (-13 °F)	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)	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)

**Remote mount (Model FEP321, FEP381), High temperature design:**

Liner	Flangematerial	Ambient temperature		Fluid temperature	
		min. temp.	max. temp.	min. temp.	max. temp.
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)	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)	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)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)

### 3.1.6 Pressure limitations, Material load

Limits for the allowable fluid temperature (TS) and allowable pressure (PS) are a function of the liner and flange materials of the flowmeter (see instrument name plate).

#### DIN-Flange SS 1.4571 [316Ti] to DN 600 (24")

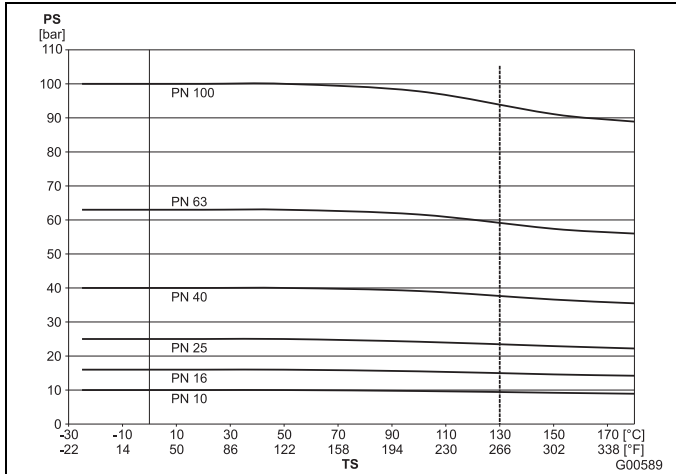


Fig. 2

#### ASME Flange SS1.4571[316Ti] to DN 300 (12") (CL150/300) to DN 1000 (40") (CL150)

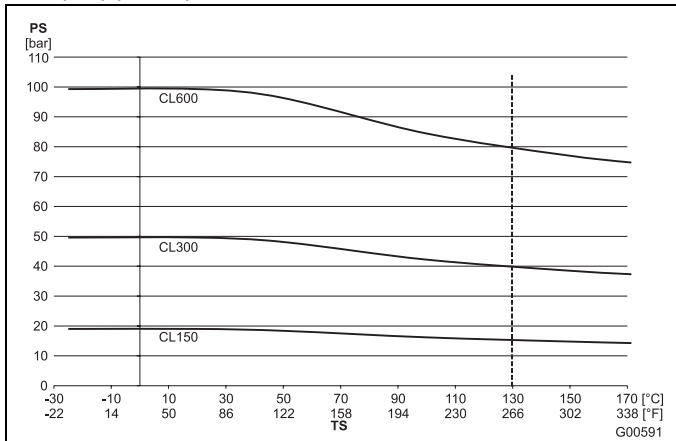


Fig. 3

#### DIN-Flange Steel to DN 600 (24")

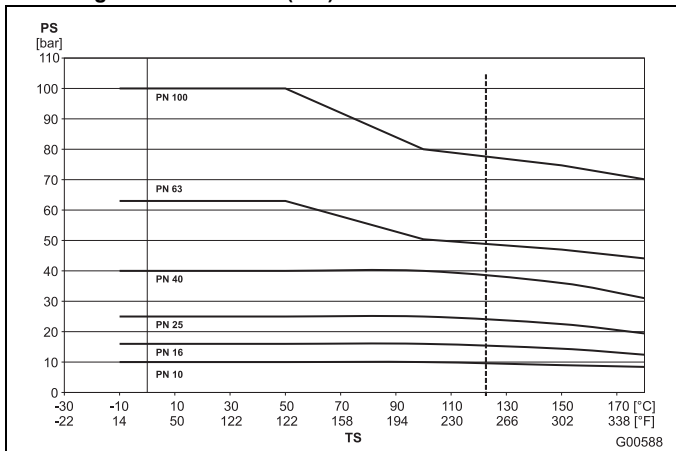


Fig. 4

#### ASME flange carbon steel to DN 300 (12") (CL150/300) to DN 1000 (40") (CL150)

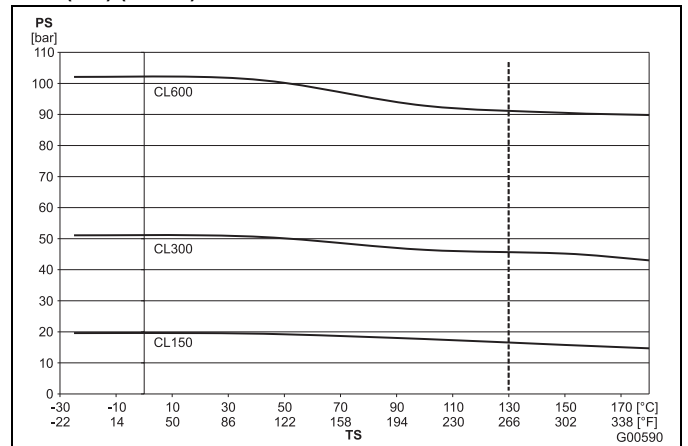


Fig. 5

#### JIS 10K-B2210 flange

Meter size	Material	PN	TS	PS [bar]
32 ... 100 (1¼ ... 4")	SS1.4571-[316Ti]	10	-25 ... 180 °C (-13 ... 356 °F)	10 (145 psi)
32 ... 100 (1¼ ... 4")	Carbon Steel	10	-25 ... 180 °C (14 ... 356 °F)	10 (145 psi)

#### DIN-Flange SS 1.4571 [316Ti] to DN 700 (28") to DN 1000 (40")

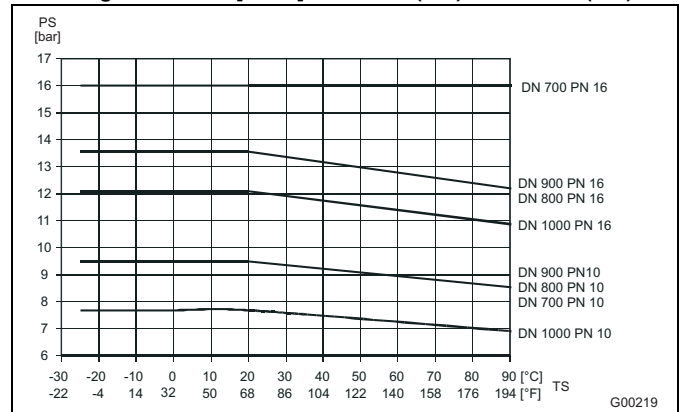


Abb. 6

#### DIN-Flange carbon steel DN 700 (28") to DN 1000 (40")

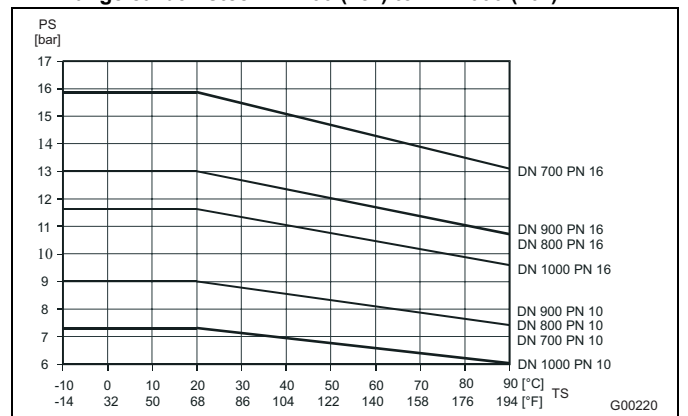


Fig. 7

## 3.2 Transmitter

### 3.2.1 Electrical specifications

<b>Supply power</b>	AC: 100 ... 230 V (- 15/+10 %) AC: 24 V (- 30/+10 %) DC: 24 V (- 30/+30 %), ripple: < 5 %
<b>Supply frequency</b>	47 ... 64 Hz
<b>Magnetic field supply</b>	6¼ Hz, 7½ Hz 12½ Hz, 15 Hz, 25 Hz, 30 Hz (50/60 Hz Power supply)
<b>Power consumption</b>	S ≤ 20 VA (Sensor and transmitter)
<b>Ambient temperature</b>	-20 ... 60 °C (-4 ... 140 °F) Standard -40 ... 60 °C (-40 ... 140 °F) Extended
<b>Storage temperature</b>	-20 ... 70 °C (-4 ... 158 °F)
<b>Protection Class of transmitter housing</b>	IP 67
<b>Electrical connections</b>	Screw terminals

### 3.2.2 In- / outputs

#### Isolation in- / outputs

The current output, Digital output DO1 and DO2 and Digital input are isolated from the flowmeter sensor circuit/ input circuit and from each others.

#### Empty pipe detection

The "empty pipe detection" requires:

conductivity ≥ 20 µS/cm , signal cable length ≤ 50m, DN ≥ DN 10

3.2.3 Interconnection diagram

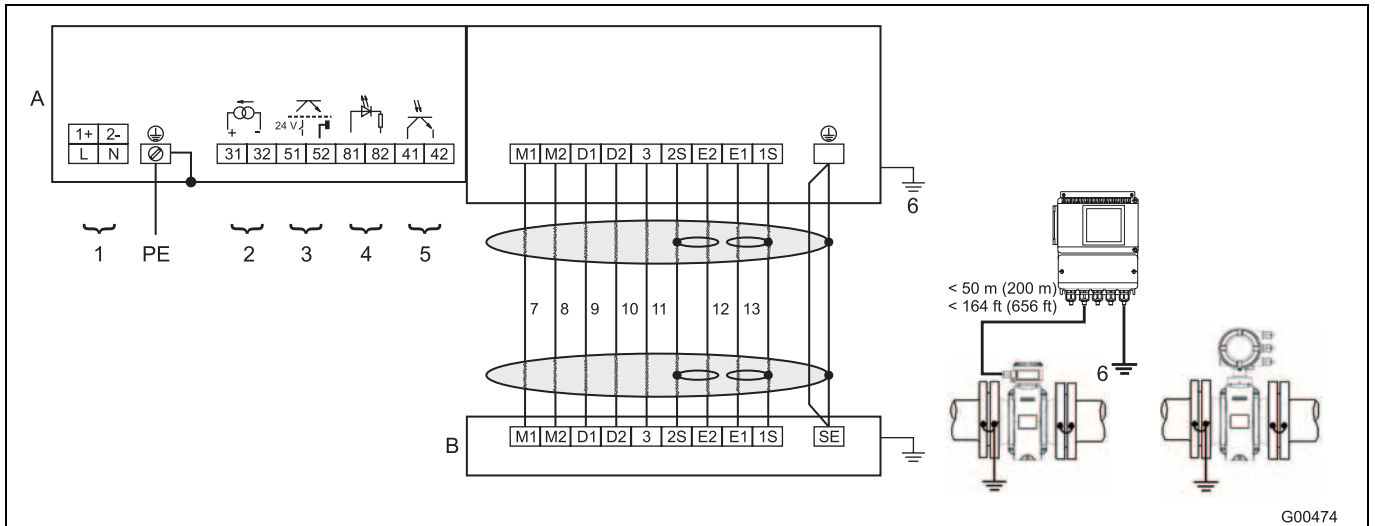


Fig. 8

A Transmitter

B Flowmeter sensor

1 Supply Power:

See name plate

2 Current output (Terminals 31 / 32)

Output can be set to either "active" or "passive" configuration on site.

- Active: 4 ... 20 mA, HART protocol (standard), Load:  $\leq 650 \Omega$
  - Passive: 4 ... 20 mA, HART protocol (standard), Load:  $250 \Omega \leq R \leq 650 \Omega$
- Supply voltage for the 20mA signal: min. 17V, max. 30 V

3 Digital output DO2 (Terminals 41 / 42) (pulse output / contact output)

The function is software selectable (pulse output or contact output).

Factory Default: "Contact output", Flow direction Indication

The Output is always a "passive" output configuration (Optocoupler).

Optocoupler specifications:  $U_{max} = 30\text{ V}$ ,  $I_{max} = 220\text{ mA}$ ,  $f_{max} \leq 5250\text{ Hz}$

4 Digital output DO1 (Terminals 51 / 52) (pulse output / contact output)

The function is software selectable (pulse output or contact output).

Factory Default: "Pulse output". Setting this output to "active" or "passive" configuration is software selectable.

- Configured as a pulse output
  - max. Pulse frequency: 5250 Hz.
  - Pulse width: 0.1 ... 2000 ms.
  - Pulse factor and pulse width depend on each others. They are calculated dynamically.
- Configured as a contact output
  - Function: System monitoring, Empty Pipe, max./min. Alarm, Flow direction indication
- Output set to "active" configuration
  - $U = 19 \dots 21\text{ V}$ ,  $I_{max} = 220\text{ mA}$ ,  $f_{max} \leq 5250\text{ Hz}$
- Output set to "passive" configuration
  - $U_{max} = 30\text{ V}$ ,  $I_{max} = 220\text{ mA}$ ,  $f_{max} \leq 5250\text{ Hz}$

5 Digital input (Terminals 81 / 82) (contact input)

Function is software selectable:

External zero return, External totalizer reset, External totalizer stop, others

Optocoupler specifications:  $16\text{ V} \leq U \leq 30\text{ V}$ ,  $R_i = 2\text{ k}\Omega$

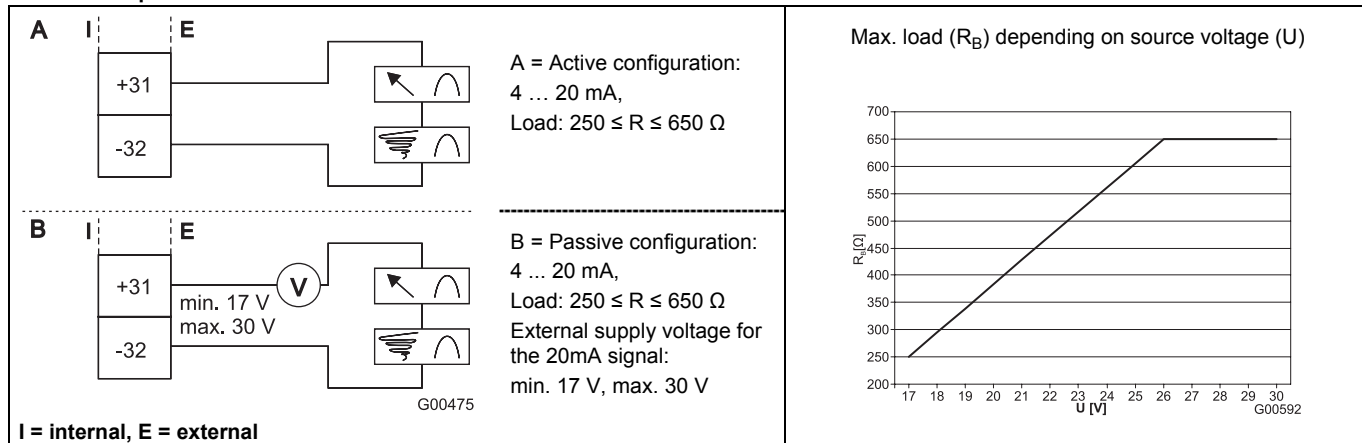
6 Functional ground

7 = brown, 8 = red, 9 = orange, 10 = yellow, 11 = green, 12 = blue, 13 = violet

G00474

Interconnection examples for the peripherals with analog communication

Current Output



Max. load ( $R_B$ ) depending on source voltage (U)

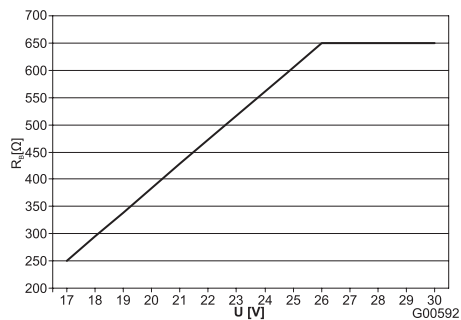
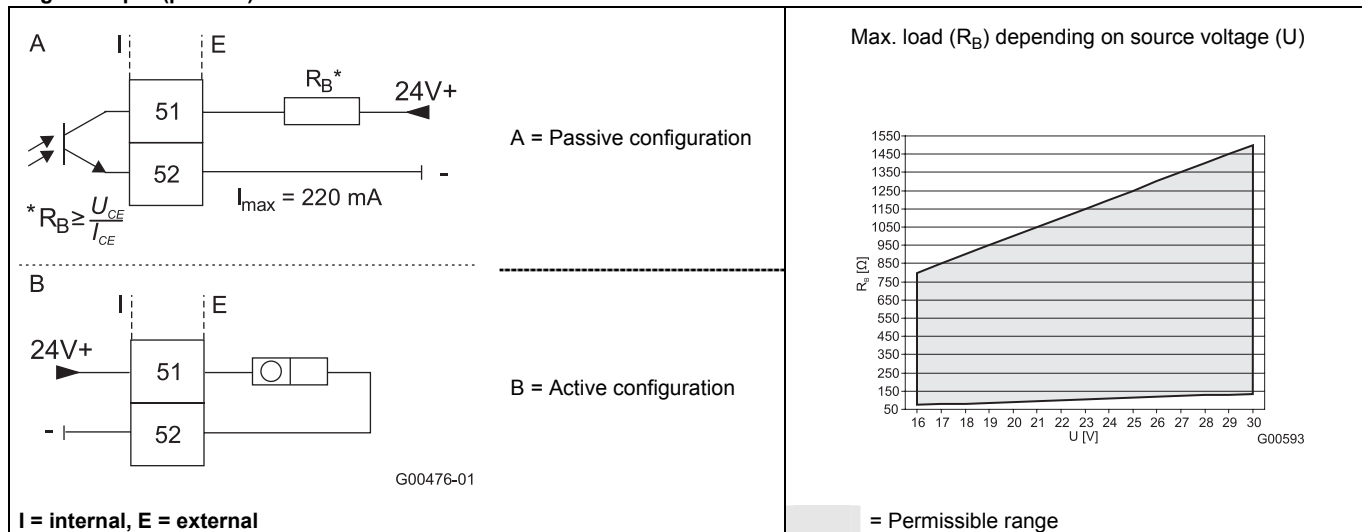
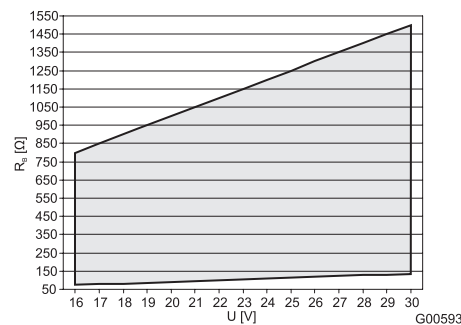


Fig. 9

Digital output (passive)



Max. load ( $R_B$ ) depending on source voltage (U)



▨ = Permissible range

Fig. 10

**Digital input for external zero return**

**External totalizer reset**

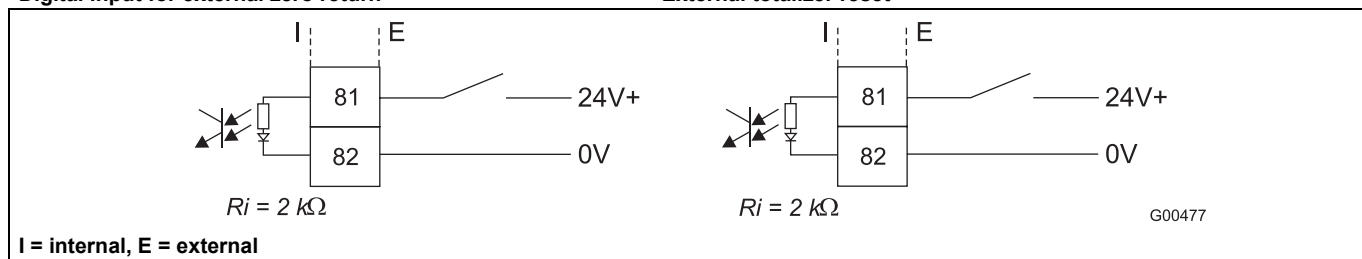


Fig. 11

**Digital output for system monitor, Max.-Min.-Alarm, Empty pipe or Forward/Reverse direction signal (Function assigned in software)**

**Digital output passive optocoupler, Separate forward and reverse pulses on contact output**

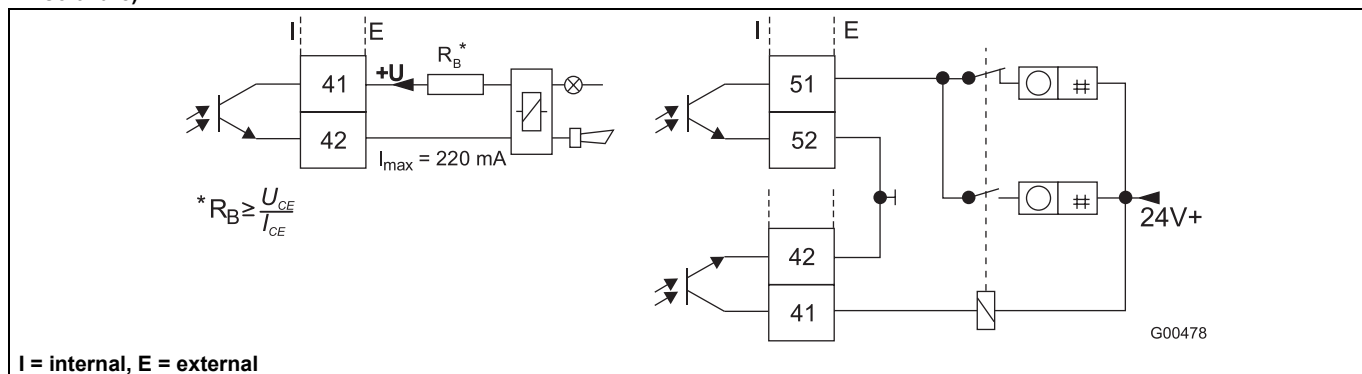


Fig. 12

### 3.3 Physical Specification

#### 3.3.1 Sensor

##### Wetted parts

Part	Standard	Options
<b>Liner</b>	PTFE, PFA, ETFE, Hardrubber, Softrubber	–
<b>Signal and ground electrodes for:</b> - Hard rubber - Soft rubber	SST 1.4571 [316Ti]	Hastelloy B-3 (2.4600), Hastelloy C-4 (2.4610), Titanium, Tantalum, Platinum-Iridium, 1.4539 [904L]
- PTFE, PFA, ETFE	SST 1.4539 [904L]	SST 1.4571[316Ti] Hastelloy C-4 (2.4610) Hastelloy B-3 (2.4600) Titanium, Tantalum, Platinum-Iridium
<b>Ground ring</b>	SST 1.4571 [316Ti]	Upon request
<b>Protection ring</b>	SST 1.4571 [316Ti]	Upon request

##### Non-wetted parts

	Standard	Options
<b>Flange</b> DN 3 ... 15 (1/10 ... 1/2") DN 20 ... 400 (3/4 ... 16")	SST 1.4571 [316Ti] (standard) Steel (Zink plated)  DIN/EN flanges: RST37/ST52/C22-8 ASME flanges: A105/C21	SST 1.4571[316Ti]
DN 450 ... 2000 (18 ... 80")	Steel (painted)  DIN/EN flanges: RST37/ST52/C22-8 ASME flanges: A105/C21	SST 1.4571[316Ti]

##### Sensor housing material

	Standard	Options
<b>Housing</b> DN 3 ... 400 (1/10 ... 16")	Two-piece cast aluminum housing, painted, paint coat 60 µm thick, RAL 9002	–
DN 450 ... 2000 (18 ... 80")	Welded steel construction, painted, paint coat 60 µm thick, RAL 9002	–
<b>Connection box</b>	Cast alum., painted, 60 µm thick, frame: dark gray, RAL7012, cover: light gray, RAL 9002	–
<b>Meter tube</b>	SST 1.4301 [304]	–
<b>Cable gland</b>	Polyamide	–

#### 3.3.2 Transmitter

##### Housing, color, cable gland

Integral design (Sensor and transmitter all in one piece)	
<b>Housing</b>	Cast aluminum housing, painted
<b>Color</b>	paint coat 60 µm thick; RAL 9002 light gray
<b>Cable gland</b>	Polyamide
Remote design (Transmitter separately mounted from Sensor )	
<b>Housing</b>	Cast aluminum housing, painted
<b>Color</b>	paint coat 60 µm thick, rear section RAL 7012 dark gray, front section (cover) RAL 9002 light gray
<b>Cable gland</b>	Polyamide
<b>Weight</b>	4,5 kg

## 4 Installation requirements

### 4.1 Grounding

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

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

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

### 4.2 Mounting

The following points must be observed for the installation:

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

### 4.2.1 Electrode axis

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

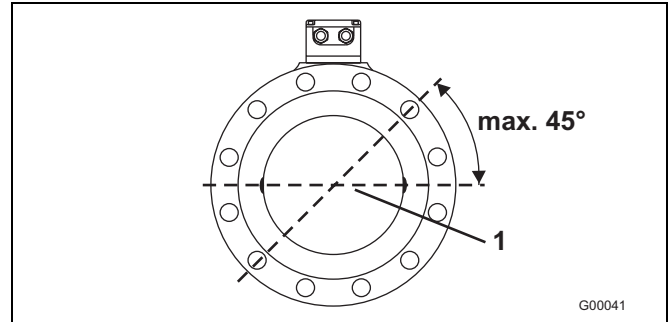


Fig. 13

### 4.2.2 In- and outlet pipe sections

Straight inlet section	Straight outlet section
≥ 3 x DN	≥ 2 x DN

DN = Flowmeter primary size

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

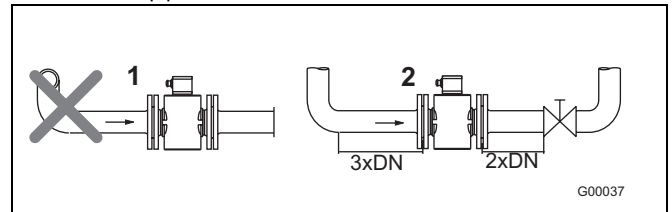


Fig. 14

### 4.2.3 Vertical connections

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

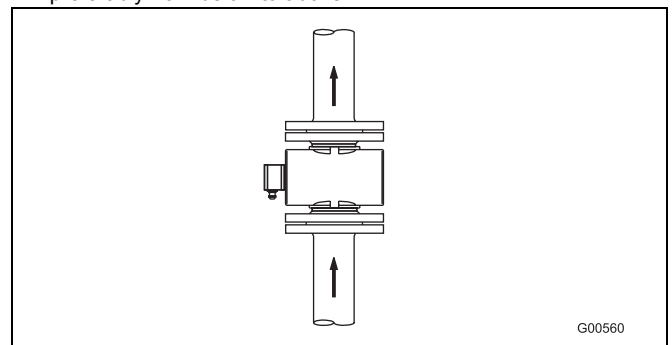


Fig. 15



#### 4.2.4 Horizontal connections

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

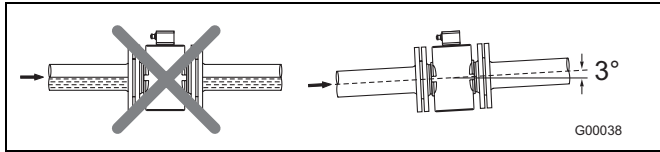


Fig. 16

#### 4.2.5 Free inlet or outlet

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

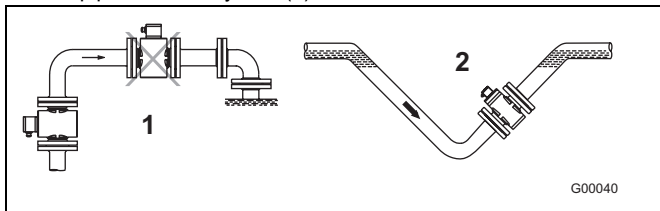


Fig. 17

#### 4.2.6 Strongly contaminated fluids

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

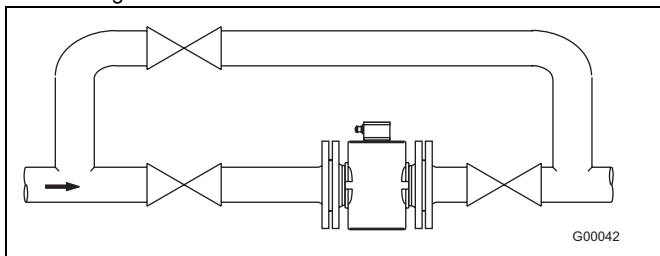


Fig. 18

#### 4.2.7 Installation in the vicinity of pumps

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

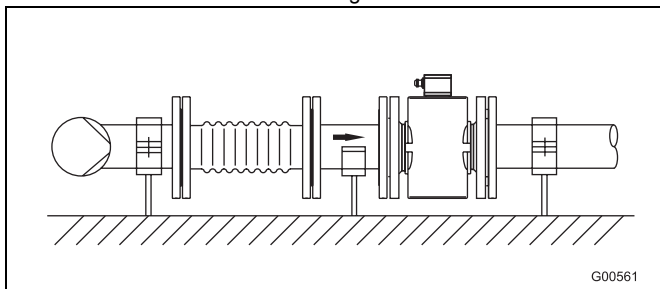


Fig. 19

## 5 Dimensional drawings

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

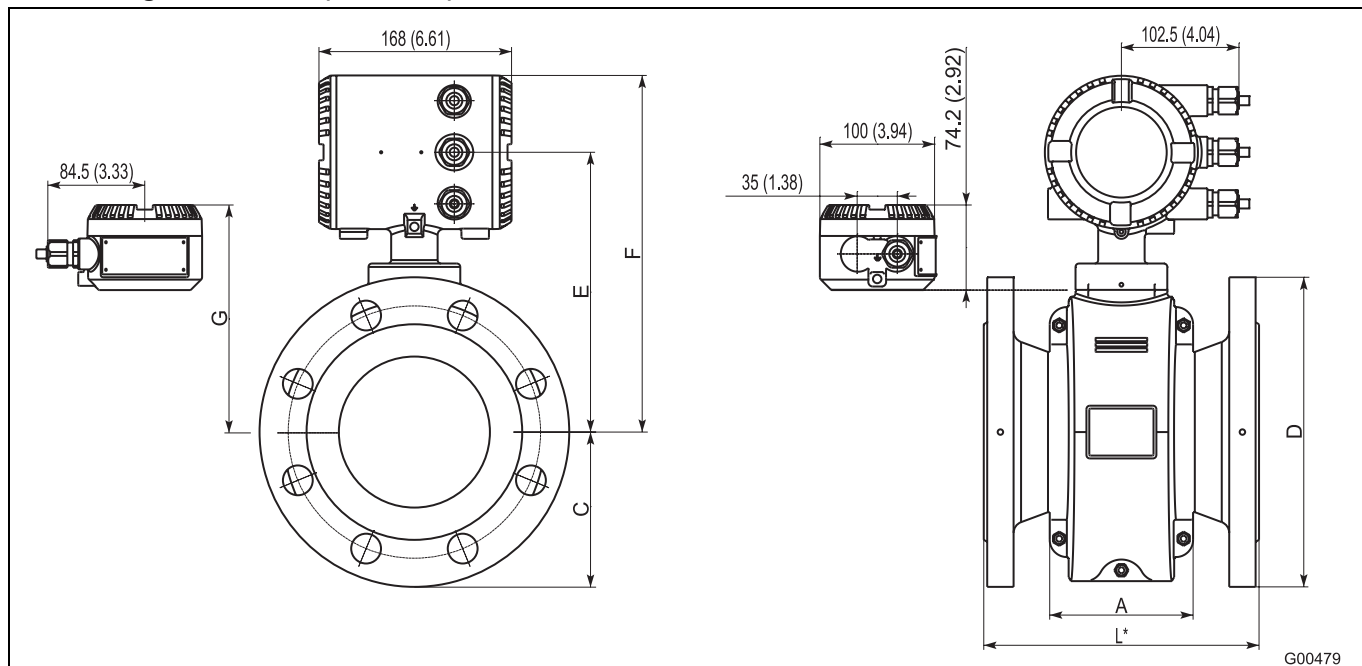


Fig. 20: Dimensions in mm (inch)

#### Flanges according to DIN/EN 1092-1 <sup>7)</sup>

DN	PN <sup>1)</sup>	Dimensions [mm]						Weight approx. [kg]	
		D	L <sup>2)3)</sup>	F <sup>4)</sup>	C	E <sup>4)</sup>	G <sup>4)</sup>	Integral Mount	Remote Mount
3-8 <sup>5)</sup>	10 ... 40	90	130	258	82	191	148	7	5
10	10 ... 40	90	200	382	82	315	143	7	5
15	10 ... 40	95	200	382	82	315	143	8	6
20	10 ... 40	105	200	382	82	315	143	8	6
25	10 ... 40	115	200	382	82	315	143	9	7
32	10 ... 40	140	200	389	92	322	150	11	9
40	10 ... 40	150	200	389	92	322	150	11	9
50	10 ... 40	165	200	395	97	328	156	13	11
65	10 ... 40	185	200	406	108	339	167	17	15
80	10 ... 40	200	200	406	108	339	167	20	18
100	10 ... 16	220	250	428	122	361	189	23	21
	25 ... 40	235	250	428	122	361	189	29	27
125	10 ... 16	250	250	438	130	371	199	30	28
	25 ... 40	270	250	438	130	371	199	36	34

Tolerance L: +0 / -3 mm

DN (inch)	PN <sup>1)</sup>	Dimensions [inch]						Weight approx. [lb]	
		D	L <sup>2)3)</sup>	F <sup>4)</sup>	C	E <sup>4)</sup>	G <sup>4)</sup>	Integral Mount	Remote Mount
3-8 <sup>5)</sup> (1/8 ... 5/16)	10 ... 40	3.54	5.12	10.16	3.23	7.52	5.83	15.43	11
10 (3/8)	10 ... 40	3.54	7.87	15.04	3.23	12.40	5.63	15.43	11
15 (1/2)	10 ... 40	3.74	7.87	15.04	3.23	12.40	5.63	17.64	13.23
20 (3/4)	10 ... 40	4.13	7.87	15.04	3.23	12.40	5.63	17.64	13.23
25 (1)	10 ... 40	4.53	7.87	15.04	3.23	12.40	5.63	19.84	15.43
32 (1 1/4)	10 ... 40	5.51	7.87	15.31	3.62	12.68	5.91	24.25	19.84
40 (1 1/2)	10 ... 40	5.91	7.87	15.31	3.62	12.68	5.91	24.25	19.84
50 (2)	10 ... 40	6.50	7.87	15.55	3.82	12.91	6.14	28.66	24.25
65 (2 1/2)	10 ... 40	7.28	7.87	15.98	4.25	13.35	6.57	37.48	33.07
80 (3)	10 ... 40	7.87	7.87	15.98	4.25	13.35	6.57	44.09	39.68
100 (4)	10 ... 16	8.66	9.84	16.85	4.80	14.21	7.44	50.71	46.30
	25 ... 40	9.25	9.84	16.85	4.80	14.21	7.44	63.93	59.52
125 (5)	10 ... 16	9.84	9.84	17.24	5.12	14.61	7.83	66.14	61.73
	25 ... 40	10.63	9.84	17.24	5.12	14.61	7.83	79.37	75

Tolerance L: +0 / -0.018 inch

## Flanges according to ASME B16.5

		Dimensions [mm]							Weight approx. [kg]	
DN	Inch	CL150	CL300	ISO 13359					Integral Mount	Remote Mount
		D	D	L <sup>2) 3)</sup>	F <sup>4)</sup>	C	E <sup>4)</sup>	G <sup>4)</sup>		
3-8	1/8 ... 5/16 <sup>6)</sup>	89	96	130	258	82	191	148	7	5
10	3/8 <sup>6)</sup>	89	96	200	382	82	315	143	7	5
15	1/2	89	96	200	382	82	315	143	8	6
20	3/4	98	118	200	382	82	315	143	8	6
25	1	108	124	200	382	82	315	143	9	7
32	1 1/4	118	134	200	389	92	322	150	11	9
40	1 1/2	127	156	200	389	92	322	150	11	9
50	2	153	165	200	395	97	328	156	13	11
65	2 1/2	178	191	200	406	108	339	167	17	15
80	3	191	210	200	406	108	339	167	20	18
100	4	229	254	250	428	122	361	189	23	21
125	5	254	280	250	438	130	371	199	30	28

Tolerance L: +0 / -3 mm

		Dimensions [inch]							Weight approx. [lb]	
DN	Inch	CL150	CL300	ISO 13359					Integral Mount	Remote Mount
		D	D	L <sup>2) 3)</sup>	F <sup>4)</sup>	C	E <sup>4)</sup>	G <sup>4)</sup>		
3-8	1/8 ... 5/16 <sup>6)</sup>	3.50	3.78	5.12	10.2	3.23	7.52	5.83	15.4	11
10	3/8 <sup>6)</sup>	3.50	3.78	7.87	15.0	3.23	12.4	5.63	15.4	11
15	1/2	3.50	3.78	7.87	15.0	3.23	12.4	5.63	17.6	13.2
20	3/4	3.86	4.65	7.87	15.0	3.23	12.4	5.63	17.6	13.2
25	1	4.25	4.88	7.87	15.0	3.23	12.4	5.63	19.8	15.4
32	1 1/4	4.65	5.28	7.87	15.3	3.62	12.7	5.91	24.3	19.8
40	1 1/2	5.00	6.14	7.87	15.3	3.62	12.7	5.91	24.3	19.8
50	2	6.02	6.50	7.87	15.6	3.82	12.9	6.14	28.7	24.3
65	2 1/2	7.01	7.52	7.87	16.0	4.25	13.3	6.57	37.5	33.1
80	3	7.52	8.27	7.87	16.0	4.25	13.3	6.57	44.1	39.7
100	4	9.02	10.0	9.84	16.9	4.80	14.2	7.44	63.9	59.5
125	5	10.0	11.0	9.84	17.2	5.12	14.6	7.83	79.4	75

Tolerance L: +0 / -0.118 inch

- 1) Other press. ratings upon request.
- 2) If a ground plate (one-sided mounted on the flange) is mounted, the L dimension increases as follows: DN 3 ... 100 by 3 mm (0.118 inch) for DN 125 by 5 mm (0.197 inch)
- 3) If protection plates (dual-sided mounted on the flange) are mounted, the L dimension increases as follows: DN 3 ... 100 by 6 mm (0.236 inch) for DN 125 by 10 mm (0.394 inch).
- 4) With hightemperature Design the dimension increases by 112 mm (4.41 inch)
- 5) Connection flange DN 10
- 6) Connection flange 1/2"
- 7) Connection dimensions according to EN 1092-1. For DN 65, PN 16 according to EN 1092-1 please order PN 40.

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

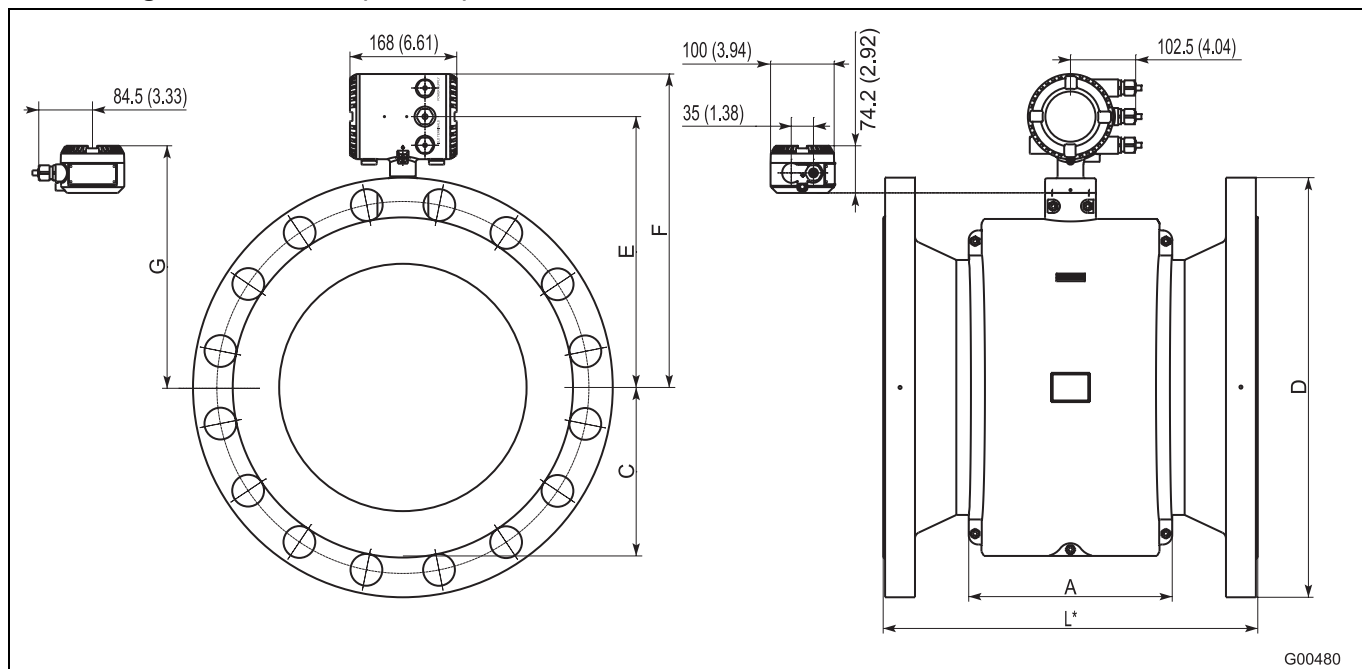


Fig. 21: Dimensions in mm (inch)

Flanges according to DIN/EN 1092-1

DN	PN <sup>1)</sup>	Dimensions [mm]						Weight approx. [kg]	
		D	L <sup>2) 3)</sup>	F <sup>4)</sup>	C	E <sup>4)</sup>	G <sup>4)</sup>	Integral Mount	Remote Mount
150	10 ... 16	285	300	485	146	418	246	40	38
	25 ... 40	300	300	485	146	418	246	45	43
200	10	340	350	526	170	458	286	67	65
	16	340	350	526	170	458	286	67	65
250	10	395	450	540	198	473	301	106	104
	16	405	450	540	198	473	301	106	104
300	10	445	500	563	228	496	324	120	118
	16	460	500	563	228	496	324	120	118
350	10	505	550	578	265	511	339	146	144
	16	520	550	578	265	511	339	146	144
400	10	565	600	620	265	553	381	180	178
	16	580	600	620	265	553	381	180	178

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

DN (inch)	PN <sup>1)</sup>	Dimensions [inch]						Weight approx. [lb]	
		D	L <sup>2) 3)</sup>	F <sup>4)</sup>	C	E <sup>4)</sup>	G <sup>4)</sup>	Integral Mount	Remote Mount
150 (6)	10 ... 16	11.22	11.81	19.09	5.75	16.46	9.69	88.18	83.78
	25 ... 40	11.81	11.81	19.09	5.75	16.46	9.69	99.21	94.80
200 (8)	10	13.39	13.78	20.71	6.69	18.03	11.26	147.71	143.30
	16	13.39	13.78	20.71	6.69	18.03	11.26	147.71	143.30
250 (10)	10	15.55	17.72	21.26	7.80	18.62	11.85	233.69	229.28
	16	15.94	17.72	21.26	7.80	18.62	11.85	233.69	229.28
300 (12)	10	17.52	19.68	22.17	8.98	19.53	12.76	264.55	260.15
	16	18.11	19.68	22.17	8.98	19.53	12.76	264.55	260.15
350 (14)	10	19.88	21.65	22.76	10.43	20.12	13.35	321.87	317.47
	16	20.47	21.65	22.76	10.43	20.12	13.35	321.87	317.47
400 (16)	10	22.24	23.62	24.41	10.43	21.77	15.00	396.83	392.42
	16	22.83	23.62	24.41	10.43	21.77	15.00	396.83	392.42

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

## Flanges according to ASME B16.5

Dimensions [mm]									Weight approx. [kg]	
DN	Inch	CL150	CL300	ISO 13359	F <sup>4)</sup>	C	E <sup>4)</sup>	G <sup>4)</sup>	Integral Mount	Remote Mount
		D	D	L <sup>2) 3)</sup>						
150	6	280	318	300	485	146	418	246	40	38
200	8	343	381	350	526	170	458	286	67	65
250	10	407	445	450	540	198	473	301	106	104
300	12	483	521	500	563	228	496	324	120	118
350	14	533	-	550	578	265	511	339	146	144
400	16	597	-	600	620	265	553	381	180	178

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

Dimensions [inch]									Weight approx. [lb]	
DN	Inch	CL150	CL300	ISO 13359	F <sup>4)</sup>	C	E <sup>4)</sup>	G <sup>4)</sup>	Integral Mount	Remote Mount
		D	D	L <sup>2) 3)</sup>						
150	6	11.02	12.52	11.81	19.09	5.75	16.46	9.69	106	101
200	8	13.50	15.00	13.78	20.71	6.69	18.03	11.26	159	154
250	10	16.02	17.52	17.72	21.26	7.80	18.62	11.85	229	225
300	12	19.02	20.51	19.68	22.17	8.98	19.53	12.76	313	309
350	14	20.98	-	21.65	22.76	10.43	20.12	13.35	421	417
400	16	23.50	-	23.62	24.41	10.43	21.77	15.00	511	507

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

- 1) Other press. ratings upon request.  
 2) If a ground plate (one-sided mounted on the flange) is mounted, the L dimension increases by 5 mm (0.197 inch).  
 3) If protection plates (dual-sided mounted on the flange) are mounted, the L dimension increases by 10 mm (0.394 inch).  
 4) With hightemperature design the dimension increases by 112 mm (4.41 inch).

5.3 Flange DN 450 ... 1000 (18 ... 40" )<sup>5)</sup>

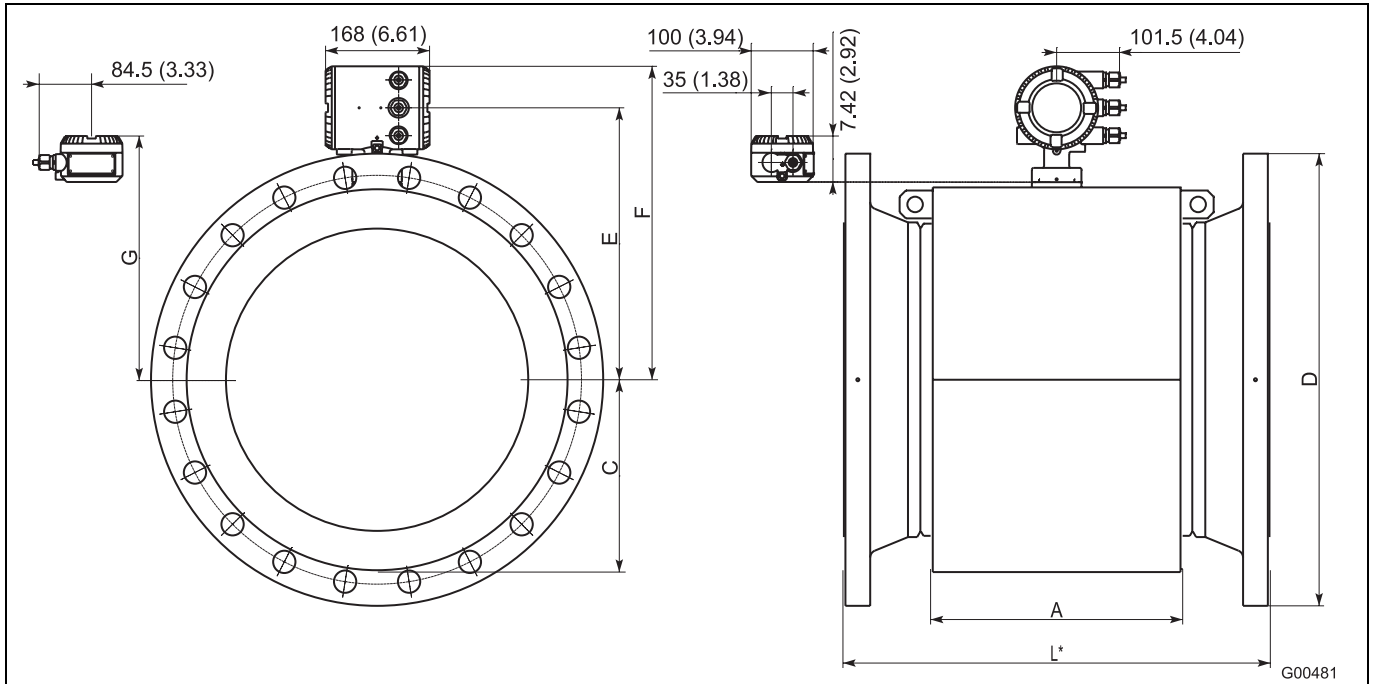


Fig. 22: Dimensions in mm (inch)

Flanges according to DIN/EN 1092-1

Dimensions [mm]								Weight approx. [kg]	
DN	PN <sup>1)</sup>	D	L <sup>2) 3)</sup>	F <sup>4)</sup>	C	E <sup>4)</sup>	G <sup>4)</sup>	Integral Mount	Remote Mount
500	10	670	650	502	310	435	389	196	194
600	10	780	780	553	361	486	440	276	274
700	10	895	910	597	405	530	484	319	317
800	10	1015	1040	647	455	580	534	409	407
900	10	1115	1170	697	505	630	584	487	485
1000	10	1230	1300	747	555	680	634	579	577

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

Dimensions [inch]								Weight approx. [lb]	
DN (inch)	PN <sup>1)</sup>	D	L <sup>2) 3)</sup>	F <sup>4)</sup>	C	E <sup>4)</sup>	G <sup>4)</sup>	Integral Mount	Remote Mount
500 (20)	10	26.38	25.59	19.76	12.20	17.13	15.31	432.11	427.70
600 (24)	10	30.71	30.71	21.77	14.21	19.13	17.32	608.48	604.07
700 (28)	10	35.24	35.83	23.50	15.94	20.87	19.06	703.27	698.86
800 (32)	10	39.96	40.94	25.47	17.91	22.83	21.02	901.69	897.28
900 (36)	10	43.90	46.06	27.44	19.88	24.80	22.99	1073.65	1069.24
1000 (40)	10	48.43	51.18	29.41	21.85	26.77	24.96	1276.47	1272.07

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

**Flanges up to DN600 (24") according to ASME B16.5, Flanges DN700 ... 1000 (28 ... 40") according to ASME B16.47 series B**

Dimensions [mm]									Weight approx. [kg]	
									Integral Mount	Remote Mount
		CL150	ISO 13359	ABB (old installation length)					CL150	CL150
DN	Inch	D	L <sup>2) 3)</sup>	L <sup>2) 3)</sup>	F <sup>4)</sup>	C	E <sup>4)</sup>	G <sup>4)</sup>	approx. kg	approx. kg
450	18	635	686	-	553	361	486	440	188	190
500	20	699	762	780	553	361	486	440	196	194
600	24	813	914	850	597	405	530	484	276	274
700	28	837	-	910	647	455	580	534	319	317
800	32	942	-	1040	697	505	630	584	409	407
900	36	1057	-	1170	747	555	680	634	487	485
1000	40	1380	-	1300	553	361	486	440	579	577

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

Dimensions [inch]									Weight approx. [lb]	
									Integral Mount	Remote Mount
		CL150	ISO 13359	ABB (old installation length)					CL150	CL150
DN	Inch	D		L <sup>2) 3)</sup>	F <sup>4)</sup>	C	E <sup>4)</sup>	G <sup>4)</sup>	approx. lb	approx. lb
450	18	25.0	27.01	-					518	513
500	20	27.52	30.0	30.71	19.76	12.20	17.83	15.31	590	584
600	24	32.01	35.98	33.46	21.77	14.21	19.13	17.32	725	720
700	28	32.95	-	35.83	23.50	15.94	20.87	19.06	853	848
800	32	37.09	-	40.94	25.47	17.91	22.83	21.02	1135	1131
900	36	41.61	-	46.06	27.44	19.88	24.80	22.99	1463	1459
1000	40	54.33	-	51.18	29.41	21.85	26.77	24.96	2500	2495

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

- 1) Other pressure ratings upon request.
- 2) If a ground plate (one-sided mounted on the flange) is mounted, the L dimension increases for: DN 400 ... 600 by 5 mm (0.197 inch).
- 3) If protection plates (dual-sided mounted on the flange) are mounted, the L dimension increases for: DN 400 ... 600 by 10 mm (0.394 inch).
- 4) With hightemperature Design the dimension increases by 112 mm (4.41 inch)
- 5) Dimensioned Drawing for > DN1000 (40") upon request

5.4 Converter housing and mounting arrangements

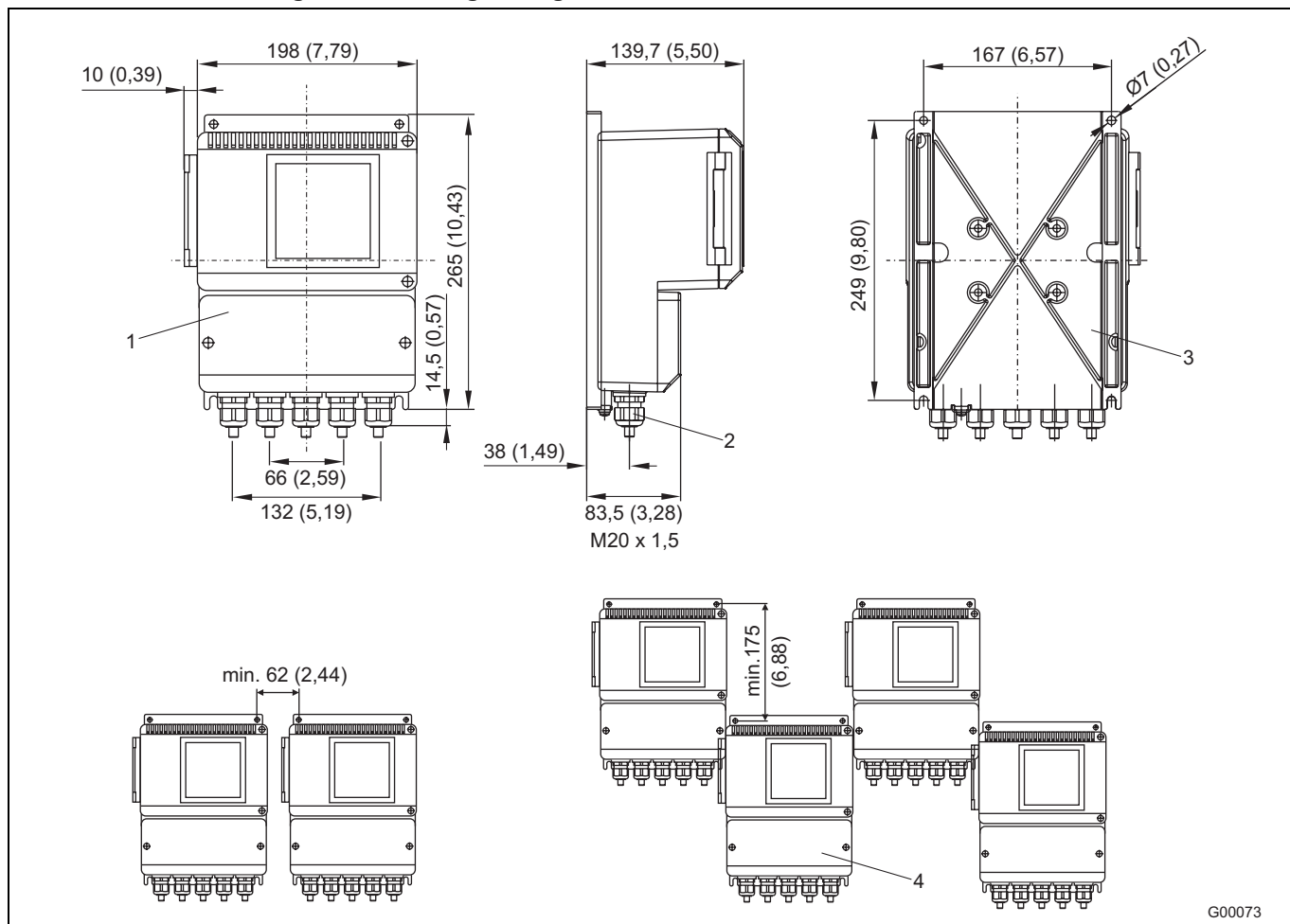


Fig. 23: Dimensions in mm (inch)

- 1 Field mount housing with window
- 2 Cable connector M20 x 1.5
- 3 Mounting holes for pipe mounting set for a 2" – pipe installation; mounting set upon request (order no. 612B091U07)
- 4 Protection class IP 67



## 6 Ordering information

### 6.1 Electromagnetic Flowmeter ProcessMaster FEP311, FEP321

Variant digit No.	Main code																											Add. code		
	1 - 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27								
<b>Flowmetersystem integral mount FEP311</b>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX			
<b>Flowmetersystem remote mount FEP321</b>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX			
<b>Bore Diameter</b>																														
DN 3 (1/10 in.)		0	0	3																										
DN 4 (5/32 in.)		0	0	4																										
DN 6 (1/4 in.)		0	0	6																										
DN 8 (5/16 in.)		0	0	8																										
DN 10 (3/8 in.)		0	1	0																										
DN 15 (1/2 in.)		0	1	5																										
DN 20 (3/4 in.)		0	2	0																										
DN 25 (1 in.)		0	2	5																										
DN 32 (1-1/4 in.)		0	3	2																										
DN 40 (1-1/2 in.)		0	4	0																										
DN 50 (2 in.)		0	5	0																										
DN 65 (2-1/2 in.)		0	6	5																										
DN 80 (3 in.)		0	8	0																										
DN 100 (4 in.)		1	0	0																										
DN 125 (5 in.)		1	2	5																										
DN 150 (6 in.)		1	5	0																										
DN 200 (8 in.)		2	0	0																										
DN 250 (10 in.)		2	5	0																										
DN 300 (12 in.)		3	0	0																										
DN 350 (14 in.)		3	5	0																										
DN 400 (16 in.)		4	0	0																										
DN 450 (18 in.)		4	5	0																										
DN 500 (20 in.)		5	0	0																										
DN 600 (24 in.)		6	0	0																										
DN 700 (28 in.)		7	0	0																										
DN 800 (32 in.)		8	0	0																										
DN 900 (36 in.)		9	0	0																										
DN 1000 (40 in.)		0	0	1																										
DN 1200 (48 in.)		2	0	1																										
DN 1400 (54 in.)		4	0	1																										
DN 1600 (66 in.)		6	0	1																										
DN 1800 (72 in.)		8	0	1																										
DN 2000 (80 in.)		0	0	2																										
<b>Liner Material</b>																														
PTFE																													A	
ETFE																													E	
Thick PTFE																													F	
Hard rubber																													H	
PFA																													P	
Soft rubber																													S	
<b>Electrode Design</b>																														
Standard																													1	
Pointed Head ≥ DN10 (3/8in.), material 1.4539 (904L)																													5	
<b>Measuring Electrodes Material</b>																														
Stainless steel 904 (1.4539)																													A	
Hastelloy C-4 (2.4610)																													D	
Titanium																														F
Tantalum																														G
Hastelloy B-3 (2.4600)																														H
Platinum-Iridium																														J
Stainless steel 316Ti (1.4571)																													S	

Continued on next page

Continuation

													Main code														Add. code			
Variant digit No.	1 - 6						7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27			
<b>Flowmetersystem integral mount</b>	<b>FEP311</b>						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX		
<b>Flowmetersystem remote mount</b>	<b>FEP321</b>						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX			
<b>Grounding Accessories</b>																														
Standard												1																		
Grounding electrodes material, see measuring electrode material	1)											2																		
Grounding plates, SST 1.4571(316 Ti), mounted onto one side	2)											3																		
Protection plates, SST 1.4571(316 Ti), mounted onto both sides												4																		
<b>Process Connection Type</b>																														
Flanges DIN PN 10												D	1																	
Flanges DIN PN 16												D	2																	
Flanges DIN PN 25												D	3																	
Flanges DIN PN 40												D	4																	
Flanges DIN PN 64, DN 15 ... DN 200 (1/2 in. ... 8 in.) Hardrubber												D	5																	
Flanges DIN PN 100, DN 15 ... DN 200 (1/2 in. ... 8 in.) Hardrubber												D	6																	
Flanges ASME Class 150, ISO laid length												A	1																	
Flanges ASME Class 300, ISO laid length												A	3																	
Flanges ASME Class 600, ≤ DN 200 (8 in.), Hardrubber												A	6																	
Flanges JIS 10K												J	1																	
<b>Process Connection Material</b>																														
Carbon steel flanges, ≥ DN 20												B																		
316Ti (1.4571) stainless steel flanges												D																		
<b>Usage Certifications</b>																														
Meter tube with PED (pressure equipment directive)												0																		
Material monitoring with inspection certificate 3.1 acc. EN 10204												2																		
Pressure test acc. AD2000												3																		
Material monitoring with inspection certificate 3.1 acc. EN 10204 and Press. test acc. AD2000												4																		
Material monitoring with inspection certificate 3.2 acc. EN 10204												7																		
<b>Calibration Type</b>																														
Standard accuracy												A																		
Enhanced accuracy												B																		
Witnessed factory calibration												M																		
5-point calibration acc. to DKD												T																		
<b>Temperature Range of Sensor / Ambient Temperature Range</b>																														
Standard design / -20 ... 60 °C (-4 ... 140 °F)												1																		
Hightemperatur design / -20 ... 60 °C (-4 ... 140 °F)												3																		
<b>Nameplate Language and Type</b>																														
English (adhesive label)												A																		
English (stainless steel)												B																		
English (stainless steel) and TAG Plate (stainless steel)												C																		
<b>Signal Cable Length and Type</b>																														
Without signal cable												0																		
5 m (approx 15 ft.) standard cable												1																		
10 m (approx 30 ft.) standard cable												2																		
20 m (approx 60 ft.) standard cable												3																		
30 m (approx 100 ft.) standard cable												4																		
50 m (approx 165 ft.) standard cable												5																		
Others												9																		

Continued on next page

- 1) Available only for meter size DN 3 ... 300 (1/10 ... 12 inch). The ProcessMaster sensor with hardrubber liner and sizes ≤ DN100 (4inch) includes a conductive flag for grounding as a standard. Additional grounding electrodes are not required.
- 2) Grounding plate, only possible for sensor size ≤ DN 300 (12 in.) and PTFE / PFA lining.

Continuation

		Main code																				23	24	25	26	27	Add. code					
Variant digit No.	1 - 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27										
<b>Flowmetersystem integral mount</b>	<b>FEP311</b>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX								
<b>Flowmetersystem remote mount</b>	<b>FEP321</b>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX								
<b>Explosion Protection Certification</b> Without																		A														
<b>Protection Class Transmitter / Sensor</b>																																
IP67 (NEMA 4X) / IP67 (NEMA 4X)																																
IP67 (NEMA 4X) / IP68 (NEMA 4X)																																
IP67 (NEMA 4X) / IP68 (NEMA 4X), cable fitted and potted																																
<b>Cable Conduits</b>																																
M20 x 1,5																																
NPT 1/2 in.																																
PF 1/2 in.																																
<b>Power Supply</b>																																
100 ... 230 V AC, 50 Hz																																
24 V AC / DC, 50 Hz																																
100 ... 230 V AC, 60 Hz																																
24 V AC / DC, 60 Hz																																
<b>Input and Output Signal Type</b>																																
HART + 20 mA passive + Pulse + Contact I/O																																
HART + 20 mA active + Pulse + Contact I/O																																
<b>Configuration Type / Diagnostics Type</b>																																
Parameters are set to factory defaults / Standarddiagnostic functions acivated																																
Parameters set acc. to customer / Standarddiagnostic functions acivated																																
<b>Accessories</b>																																
With pre-amplifier installed in sensor terminalbox																															AP	
<b>Number of testpoints</b>																																
3 Points																																P3
5 Points																																P5

1) Only available with remote transmitter, sealing compound (optional) D141B038U01

6.2 Electromagnetic Flowmeter ProcessMaster FEP381

		Main code																				Add. code	
Variant digit No.	1 - 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	XX
<b>Remote sensor, without Transmitter</b>	<b>FEP381</b>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX
<b>Bore Diameter</b>																							
	DN 3 (1/10 in.)	0	0	3																			
	DN 4 (5/32 in.)	0	0	4																			
	DN 6 (1/4 in.)	0	0	6																			
	DN 8 (5/16 in.)	0	0	8																			
	DN 10 (3/8 in.)	0	1	0																			
	DN 15 (1/2 in.)	0	1	5																			
	DN 20 (3/4 in.)	0	2	0																			
	DN 25 (1 in.)	0	2	5																			
	DN 32 (1-1/4 in.)	0	3	2																			
	DN 40 (1-1/2 in.)	0	4	0																			
	DN 50 (2 in.)	0	5	0																			
	DN 65 (2-1/2 in.)	0	6	5																			
	DN 80 (3 in.)	0	8	0																			
	DN 100 (4 in.)	1	0	0																			
	DN 125 (5 in.)	1	2	5																			
	DN 150 (6 in.)	1	5	0																			
	DN 200 (8 in.)	2	0	0																			
	DN 250 (10 in.)	2	5	0																			
	DN 300 (12 in.)	3	0	0																			
	DN 350 (14 in.)	3	5	0																			
	DN 400 (16 in.)	4	0	0																			
	DN 450 (18 in.)	4	5	0																			
	DN 500 (20 in.)	5	0	0																			
	DN 600 (24 in.)	6	0	0																			
	DN 700 (28 in.)	7	0	0																			
	DN 800 (32 in.)	8	0	0																			
	DN 900 (36 in.)	9	0	0																			
	DN 1000 (40 in.)	0	0	1																			
	DN 1200 (48 in.)	2	0	1																			
	DN 1400 (54 in.)	4	0	1																			
	DN 1600 (66 in.)	6	0	1																			
	DN 1800 (72 in.)	8	0	1																			
	DN 2000 (80 in.)	0	0	2																			
<b>Liner Material</b>																							
	PTFE																						A
	ETFE																						E
	Thick PTFE																						F
	Hard rubber																						H
	PFA																						P
	Soft rubber																						S
<b>Electrode Design</b>																							
	Standard																						1
	Pointed head ≥ DN 10 (3/8 in.), material 1.4539 (904L)																						5
<b>Measuring Electrodes Material</b>																							
	Stainless steel 904 (1.4539)																						A
	Hastelloy C-4 (2.4610)																						D
	Titanium																						F
	Tantalum																						G
	Hastelloy B-3 (2.4600)																						H
	Platinum-Iridium																						J
	Stainless steel 316Ti (1.4571)																						S

Continued on next page

Continuation

													Main code														Add. code	
Variant digit No.													14	15	16	17	18	19	20	21	22	23	24	25	26	27	XX	
1	2	3	4	5	6	7	8	9	10	11	12	13	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX
<b>Remote sensor, without Transmitter</b>													<b>FEP381</b>														XX	
<b>Grounding Accessories</b>																												
Standard													1															
Grounding electrodes material, see measuring electrode material 1)													2															
Grounding plates, SST 1.4571(316 Ti), mounted onto one side 2)													3															
Protection plates, SST 1.4571(316 Ti), mounted onto both sides													4															
<b>Process Connection Type</b>																												
Flanges DIN PN 10													D 1															
Flanges DIN PN 16													D 2															
Flanges DIN PN 25													D 3															
Flanges DIN PN 40													D 4															
Flanges DIN PN 64, DN 15 ... DN 200 (1/2 in. ... 8 in.) Hardrubber													D 5															
Flanges DIN PN 100, DN 15 ... DN 200 (1/2 in. ... 8 in.) Hardrubber													D 6															
Flanges ASME Class 150, ISO laid length													A 1															
Flanges ASME Class 300, ISO laid length													A 3															
Flanges ASME Class 600, ≤ DN 200 (8 in.), Hardrubber													A 6															
Flanges JIS 10K													J 1															
<b>Process Connection Material</b>																												
Carbon steel flanges, ≥ DN 20													B															
316Ti (1.4571) stainless steel flanges													D															
<b>Usage Certifications</b>																												
Meter tube with PED (pressure equipment directive)													0															
Material monitoring with inspection certificate 3.1 acc. EN 10204													2															
Pressure test acc. AD2000													3															
Material monitoring with inspection certificate 3.1 acc. EN 10204 and Press. test acc. AD2000													4															
Material monitoring with inspection certificate 3.2 acc. EN 10204													7															
<b>Calibration Type</b>																												
Standard accuracy													A															
Witnessed factory calibration													M															
5-point calibration acc. to DKD													T															
<b>Temperature Range of Sensor / Ambient Temperature Range</b>																												
Standard design / -20 ... 60 °C (-4 ... 140 °F)													1															
Hightemperatur design / -20 ... 60 °C (-4 ... 140 °F)													3															
<b>Nameplate Language and Type</b>																												
English (adhesive label)													A															
English (stainless steel)													B															
English (stainless steel) and TAG Plate (stainless steel)													C															
<b>Signal Cable Length and Type</b>																												
Without signal cable													0															
5 m (approx 15 ft.) standard cable													1															
10 m (approx 30 ft.) standard cable													2															
20 m (approx 60 ft.) standard cable													3															
30 m (approx 100 ft.) standard cable													4															
50 m (approx 165 ft.) standard cable													5															
Others													9															

Continued on next page

1) Available only for meter size DN 3 ... 300 (1/10 ... 12 inch). The ProcessMaster sensor with hardrubber liner and sizes ≥ DN100 (4 inch) includes a conductive flag for grounding as a standard. Additional grounding electrodes are nor required.

2) Grounding plate, only possible for sensor ≤ DN 300 (12 in.) and PTFE / PFA lining.

Continuation

		Main code																				Add. code																													
Variant digit No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	XX																						
<b>Remote sensor, without Transmitter</b>		FEP381																					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX		
<b>Explosion Protection Certification</b>																							A																												
<b>Without</b>																							A																												
<b>Protection Class Transmitter / Sensor</b>																							1																												
IP67 (NEMA 4X) / IP67 (NEMA 4X)																							1																												
IP67 (NEMA 4X) / IP68 (NEMA 4X)																							1)		2																										
IP67 (NEMA 4X) / IP68 (NEMA 4X), cable fitted and potted																							3																												
<b>Cable Conduits</b>																							A																												
M20 x 1,5																							A																												
NPT 1/2 in.																							B																												
PF 1/2 in.																							C																												
<b>Power Supply</b>																							0																												
<b>Without</b>																							0																												
<b>Input and Output Signal Type</b>																							Y																												
<b>Without</b>																							Y																												
<b>Configuration Type / Diagnostics Type</b>																							1																												
Parameters are set to factory defaults / Standarddiagnostic functions acivated																							1																												
Parameters set acc. to customer / Standarddiagnostic functions acivated																							3																												
<b>Accessories</b>																							AP																												
<b>With pre-amplifier installed in sensor terminalbox</b>																							AP																												
<b>Number of testpoints</b>																							P3																												
3 Points																							P3																												
5 Points																							P5																												

1 ) Only available with remote transmitter, sealing compound (optional) D141B038U01

6.3 Electromagnetic Flowmeter FET321, FET301

		Main code										Add. code
Variant digit No.		1 - 6	7	8	9	10	11	12	13	14	15	
<b>Remote Transmitter for ProcessMaster / HygienicMaster</b>		<b>FET321</b>	X	X	X	X	X	X	X	X	X	XX
<b>Cartridge for ProcessMaster / HygienicMaster</b>		<b>FET301</b>	X	X	X	X	X	X	X	X	X	XX
<b>Temperature Range of Sensor / Ambient Temperature Range</b>												
Standard design / -20 ... 60 °C (-4 ... 140 °F)			1									
<b>Nameplate Language and Type</b>												
English (adhesive label)				A								
English (stainless steel)				B								
English (stainless steel) and TAG Plate (stainless steel)				C								
<b>Signal Cable Length and Type</b>												
Without signal cable					0							
<b>Explosion Protection Certification</b>												
Without						A						
<b>Protection Class Transmitter / Sensor</b>												
IP 67 (NEMA 4X) / IP 67 (NEMA 4X)							1					
<b>Cable Conduits</b>												
M20 x 1.5								A				
NPT 1/2 in.								B				
PF 1/2 in.								C				
<b>Power Supply</b>												
100 ... 230 V AC, 50 Hz										1		
24 V AC / DC, 50 Hz										2		
100 ... 230 V AC, 60 Hz										3		
24 V AC / DC, 60 Hz										4		
<b>Input and Output Signal Type</b>												
HART + 20 mA passive + Pulse + Contact I/O											B	
HART + 20 mA active + Pulse + Contact I/O											C	
<b>Configuration Type / Diagnostics Type</b>												
Without												
For example replacement sensor											0	
<b>Other Options</b>												
With Gore-tex membrane												KG

**6.4 Flowmeter Sensor Simulator FXC4000**

for converter types FET321,FXM2000-XM2, FES7000-ES7

		main code					
Variant digit No.		1 - 5	6	7	8	9	10
<b>Flowmeter Primary Simulator FXC4000</b>		<b>55XC4</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>Flow Signal Setting</b>							
Without (adapter only)			0				
3-position digitswitch with 1000 steps			1				
Others			9				
<b>Power Supply 1)</b>							
Without (adapter only)				0			
With Schuko plug, 110 ... 240 V AC, 50 / 60 Hz				1			
With 4 mm plug, 24 ... 48 V AC/DC				2			
With US plug, 110 ... 240 V AC, 50 / 60 Hz				3			
Others				9			
<b>Accessories</b>							
Without					0		
Adapter for converter type FXE4000-E4, FXM2000-XM2,					1		
Adapter plate for converter FSM4000-S4					5		
Adapter plate for converter FET321					6		
Others					9		
<b>Design Level (Specified by ABB)</b>						*	
<b>Name Plate</b>							
German							1
Englisch							2
French							3
Others							9

1) Power supply is for converter supplying

