

ABB MEASUREMENT & ANALYTICS | DATA SHEET

# ProcessMaster FEP630

## Electromagnetic flowmeter



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## Measurement made easy

The first choice for all industrial applications

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### Diagnostics for real-life situations

- To keep your process up and running
- Gas bubble, partial filling or empty pipe detection, Electrode impedance, conductivity and sensor temperature monitoring
- Clear Text Messages for simplified trouble shooting

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### On board Health Check

- Flowmeter sensor and transmitter integrity check utilizing fingerprint technology

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### Noise / Grounding Check

- Verify the installation is correct from day one

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### Service Interval Monitoring

- Receive timed notifications

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### Backwards Compatibility

- Protect your Investment in ABB flowmetering

## ProcessMaster series

ProcessMaster is available in two series – ProcessMaster 610 the good fit for everyday applications and ProcessMaster 630 the first choice for all process industry applications delivering best in class functionality and options.

Applicability	FEP610 series	FEP630 series
	Good fit for everyday applications	The first choice for all industrial applications
<b>Chemical Industry</b> Corrosive liquids, acids, bases	✓	✓
<b>Power</b> Coal slurry, Lime slurry, Cooling	✓	✓
<b>Mining</b> Abrasive slurries, hydraulic transport	✓	✓
<b>Pulp &amp; Paper</b> Stock Flows, Latex, Clay, Liquor, Chemicals	Up to 2 % Stock	Up to 4 % Stock
<b>Oil &amp; Gas</b> High pressure applications	✓	✓
<b>Food &amp; Beverage</b> Hygienic applications	✓	✓
<b>Measuring medium minimum conductivity</b>	20 µS/cm	5 µS/cm
<b>Measuring medium temperature</b>	Up to 130 °C (266 °F)	Up to 180 °C (356 °F)
<b>Pressure</b>	≤ PN 40 / CI 300	≤ PN 40 / CI 300
<b>Hazardous area</b>	–	Yes
<b>Features</b>	<b>FEP610 series</b>	<b>FEP630 series</b>
<b>Accuracy</b>	0.5 %	0.4 %, Option up to 0.2 %
<b>Nominal diameter</b>	DN 3 ... 2000 (1/8 ... 80 ")	DN 3 ... 2000 (1/8 ... 80 ")
<b>Liner material</b>	PTFE, Rubber, PFA, ETFE	PTFE, Rubber, PFA, ETFE, Ceramic Carbide
<b>I/O's</b>	1 x analog, 2 x digital	1 x analog, 2 x digital, Option for add-in modules
<b>Communication</b>	High Speed Infrared Port Communication based on HART DTM	HART, PROFIBUS, Modbus
<b>Process diagnostics</b>	Empty pipe	Empty pipe, Partially filling, Gas bubbles, Electrode Impedance, Conductivity, Sensor temperature
<b>Backwards compatibility</b>	–	Yes

## ... ProcessMaster series

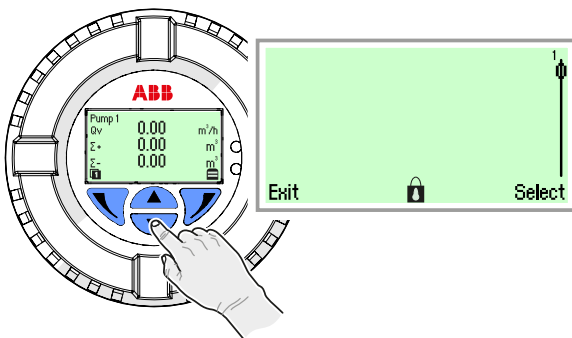
### Features and Functions

#### On-board Health Check

ProcessMaster's in-built fingerprint technology helps to ensure Sensor and Transmitter Integrity without the need to remove the flowmeter from the process. The Check provides a pass / failed result based on a comparison of the current flowmeter status to a set of reference data.

Benefits:

- Easy to operate
- No additional equipment required
- No training necessary
- Quick check of flowmeter integrity



#### Backwards Compatibility saves your Investment in ABB Flowmetering

Take advantage of new features and improved performance. Switch to the new product at your own timeline. Minimize the cost of change in stock keeping, documentation and change of internal processes.

Benefits:

- Drop in replacement
- Same terminal designation I/O's, sensor connections
- No need to change wiring documentation
- Sensor cable stays unchanged
- Identical operating philosophy: Easy Set-up and Sensor Set-up
- Common user experience, less training
- Less inventory, less cost

#### Diagnostics for real-life situations

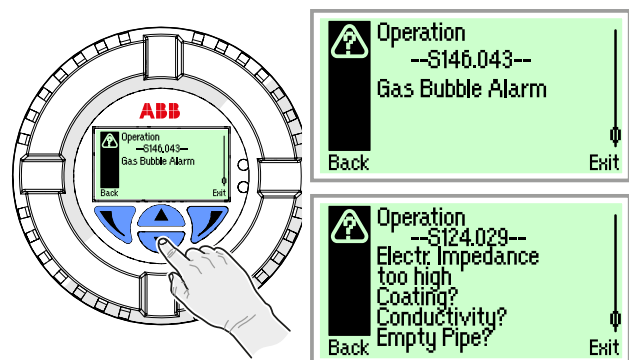
Detecting critical process conditions at an early stage helps reducing unscheduled downtime and maintenance.

Clear text messages simplify troubleshooting.

Device diagnostic information can be accessed without any intervention – either through the HMI or bus communication.

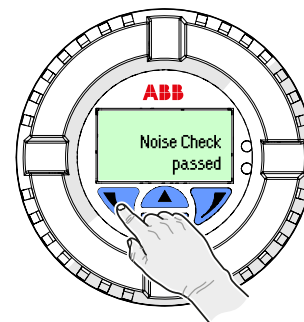
Benefits:

- Peace-of-mind that flowmeter is operating within its specification
- Prioritized alarms to correct most important alarm first
- Through-the-glass operation without the need to open the housing



#### Verify the Installation is correct - from day one

Improving quality and reducing cost can be a challenge if the flow measurement is unstable. A proper grounding is fundamental to an accurate electromagnetic flow measurement. ProcessMaster's in-built noise / grounding check helps getting the wiring / grounding right from day one without the need for further Tools.



## Diagnostic functions

### Standard functionality

#### Flowmeter sensor coil inductance

A measurement of the flowmeter sensor coil inductance can be triggered. This enables to check for the flowmeter sensor coil integrity.

#### Noise check / Grounding check

This function allows checking for noise and proper electrical grounding of the device. While the check is in progress, no flow measurement can take place.

Pre-requisites using the functionality:

- Flowmeter sensor must be completely filled
- No flow must occur in the flowmeter sensor

#### Fingerprint

The "fingerprint" database integrated in the transmitter allows for comparison of the values at the time of factory calibration or commissioning with the currently recorded values.

A quick "on-board health check" resulting in a pass / fail information can be performed.

For an in-depth verification, an external tool is available from ABB (in preparation).

#### Detection of partial filling

A partially filled sensor affects the flowmeter reading and the measuring accuracy.

If the flowmeter sensor is ordered with a full pipe detection electrode, which is located at the Top of the sensor, the transmitter's "Diagnosis TFE" function enables for an alarm in case the sensor tube starts to become partially filled.

Pre-requisites using the functionality:

- Nominal diameter: > DN 50 (> 2")
- Flowmeter sensor design level A
- Conductivity of the measuring medium: 20 ... 20000  $\mu\text{S}/\text{cm}$

Installation conditions:

- The flowmeter sensor must be installed horizontally with the terminal box pointing upward.

#### Verification

There is an Option for an in-depth verification of the device using an external Tool from ABB.

This Tool provides a brief documentation of the Verification results allowing for a print out.

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## ... ProcessMaster series

### Optional diagnostic functions

The extended diagnostics functionality package contains the following functions.

#### Gasbubble detection

Gas bubbles in the fluid effect the flowmeter reading and the accuracy.

Enhanced diagnostics feature the option for gas bubble detection to make the flow measurement most reliable. There is the option for a gas bubble alarm triggered once the actual gas bubble value exceeds the threshold configured. This alarm is shown in the HMI. The digital output flags an alarm if configured accordingly.

Pre-requisites using the functionality:

- Nominal diameter: DN 10 ... 300 (3/8 ... 12").
- Conductivity of the measuring medium: 20 ... 20000  $\mu\text{S}/\text{cm}$ .

Installation conditions:

- The flowmeter sensor can be installed either horizontally or vertically. Vertical installation is preferred.

#### Conductivity monitoring

The conductivity of the fluid can be monitored setting minimum / maximum alarm limits.

Once alarm limits are exceeded, the digital output flags an alarm if configured accordingly.

Conductivity is available as a 4 ... 20 mA output (Option card).

Pre-requisites using the functionality:

- Conductivity of the measuring medium: 20 ... 20000  $\mu\text{S}/\text{cm}$ .

#### Electrode impedance

An Impedance measurement between the electrode and ground can be triggered.

This enables to check for the electrode integrity.

#### Flowmeter sensor temperature

A flowmeter sensor temperature measurement can be triggered.

This enables to check for the flowmeter sensor temperature.

With flowmeter sensor temperature out of spec, the digital output flags an alarm if configured accordingly.

#### Transmitter in-house temperature

An in-house temperature measurement can be triggered.

This enables to check for the temperature inside the transmitter housing.

With the temperature out of spec, the digital output flags an alarm if configured accordingly.

### Batching function

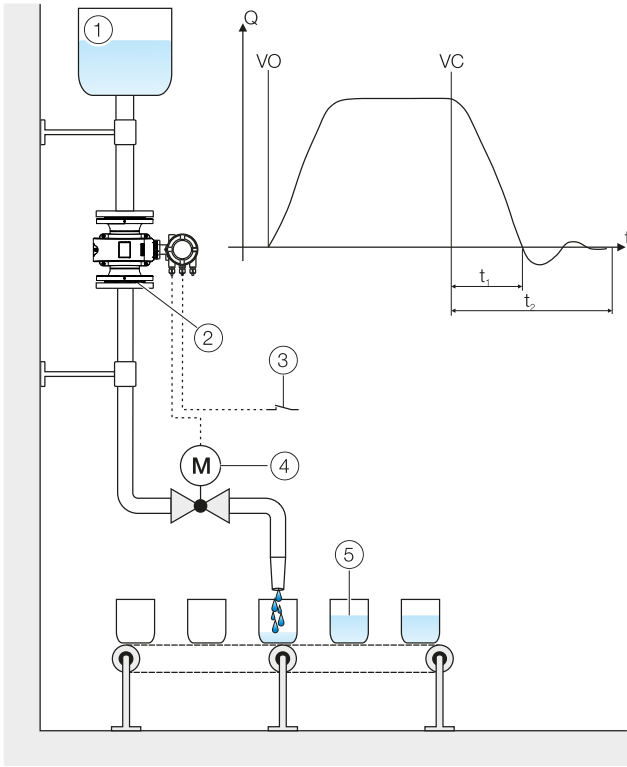


Fig. 1: Fill function (batch)

Pos.	Description
①	Supply tank
②	Flowmeter sensor
③	Start / stop fill operation (digital input with plug-in card)
④	Filling valve
⑤	Container to be filled
VO	Valve open (filling started)
VC	Valve closed (fill quantity reached)
$t_1$	Valve closing time
$t_2$	Overrun time

Table 1: Legend

The optional batching functionality allowing for batches with filling times >3 seconds.

Batch quantity is configurable and batch process can be started using the digital input (Option card).

Once batch quantity is reached closing the valve can be triggered using the digital output.

Batch quantity correction is calculated measuring the overrun quantity.

Low flow cut-off can be configured, if required.

## Overview – models

### Flowmeter sensor

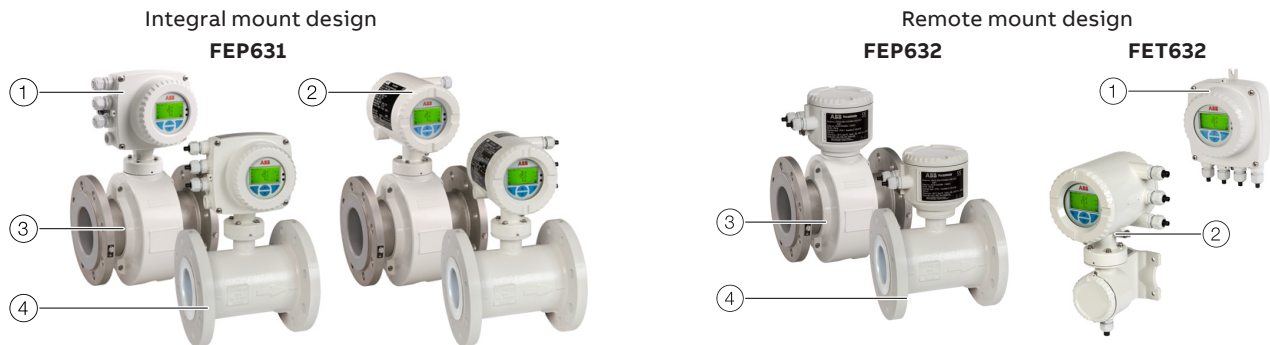


Fig. 2: Designs

Pos.	Description	Pos.	Description
①	Single-compartment transmitter housing	③	Flowmeter sensor, Design Level A (DN 3 ... 2000)
②	Dual-compartment transmitter housing	④	Flowmeter sensor, Design Level B (DN 25 ... 300)

Table 2: Legend

<b>Model</b>	ProcessMaster FEP631, FEP632, FET632
<b>Housing</b>	Integral mount design, remote mount design
<b>Measuring accuracy for liquids</b>	0.4 % of measured value, option for 0.3 % and 0.2 % of measured value
<b>Permissible measuring medium temperature <math>T_{\text{medium}}</math></b>	Standard: -25 ... 130 °C (-13 ... 266 °F) Option: -25 ... 180 °C (-13 ... 356 °F)
<b>Minimum conductivity</b>	> 5 $\mu\text{S/cm}$ (20 $\mu\text{S/cm}$ for demineralized water)
<b>Nominal pressure rating</b>	PN 10 ... 40, PN 63, PN 100; ASME CL 150, CL 300, CL 600; JIS 10K
<b>Nominal diameter</b>	DN 3 ... 2000 (1/10" ... 80")
<b>Process connection</b>	Flange according to DIN, ASME, JIS
<b>Process connection material</b>	Steel, cast iron, stainless steel
<b>Liner material</b>	Hard rubber (DN 25 ... 2000), soft rubber (DN 50 ... 2000), PTFE (DN 10 ... 600), PFA (DN 3 ... 200), ETFE (DN 25 ... 600), Ceramic Carbide (DN 25 ... 1000), Linatex (DN 50 ... 600)
<b>Electrode material</b>	Stainless steel, Hastelloy B, Hastelloy C, Platinum-Iridium, Tantalum, Titanium, Double layer, Tungsten carbide
<b>IP rating</b>	Integral mount design: IP 65 / IP 67 / NEMA 4X Remote mount design: IP 65 / IP 67 / IP 68 (sensor only) / NEMA 4X

Table 3: Overview flowmeter sensor

<b>Pressure Equipment Directive 2014/68/EU</b>	Conformity assessment in accordance with category III, fluid group 1
<b>CRN (Canadian Reg.Number)</b>	On request
<b>Explosion protection (In preparation)</b>	ATEX / IECEx Zone 1, 2, 21, 22 FM / cFM Cl 1 Div 1 ( $\leq$ DN 300), Cl 1 Div 2
<b>Further approvals</b>	At <a href="http://www.abb.com/flow">www.abb.com/flow</a> or on request

Table 4: Approvals



## Transmitter



Fig. 3: Designs

Pos.	Description	Pos.	Description
①	Dual-compartment transmitter housing	②	Single-compartment transmitter housing

Table 5: Legend

Model	FET632
Housing	Integral mount design, remote mount design.
IP rating	IP 65 / IP 67 / NEMA 4X
Cable length	Maximum 200 m (656 ft), remote mount design only
Power supply	100 ... 240 V AC (-15 / +10 %) 50 / 60 Hz, 16,8 ... 30 V DC
Outputs	Current output: 4 ... 20 mA, active or passive (configurable on site) Digital output 1: passive, configurable as pulse, frequency or switch output Digital output 2: passive, configurable as pulse or switch output
Additional outputs	The transmitter has two slots in the plug-in cards that can be used to extend the outputs. The following plug-in cards are available: <ul style="list-style-type: none"> <li>• Current output (passive)</li> <li>• Digital output (passive)</li> <li>• Digital input (passive)</li> <li>• 24 V DC power supply for active outputs</li> </ul>
Communication	Standard: HART 7.1 Option: PROFIBUS DP (in preparation) / Modbus (in preparation)

Table 6: Overview Transmitter

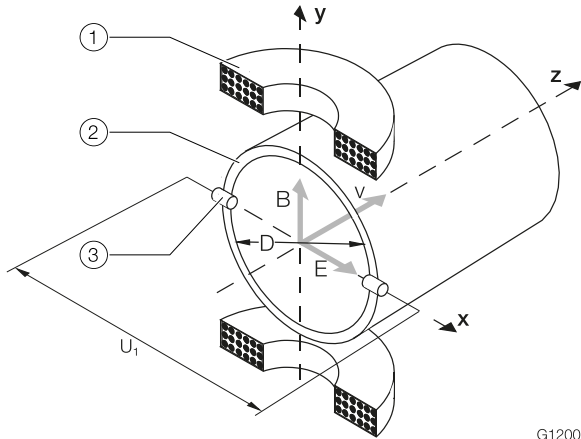
Explosion protection (in preparation)	ATEX / IECEx Zone 1, 2, 21, 22 FM / cFM Cl 1 Div 1, Cl 1 Div 2
Further approvals	At <a href="http://www.abb.com/flow">www.abb.com/flow</a> or on request.

Table 7: Approvals Transmitter

## ... Overview – models

### Measuring principle

Measurements performed by the electromagnetic flowmeter are based on Faraday’s law of induction. A voltage is generated in a conductor when it moves through a magnetic field.



G12000

Fig. 4: Electromagnetic flowmeter schematic

Pos.	Description
①	Magnet coil
②	Meter tube in electrode plane
③	Signal electrode

Table 8: Legend

$U_1 \sim B \times D \times v$	$qv = \frac{D^2 \times \pi}{4} \times v$	$U_1 \sim qv$
$U_1$ – Signal voltage	$v$ – Average flow velocity	
$B$ – Magnetic induction	$qv$ – Volume flow	
$D$ – Electrode spacing		

This principle is applied to a conductive fluid in the meter tube through which a magnetic field is generated perpendicular to the flow direction (see Fig. 4). The voltage induced in the fluid is measured by two electrodes located diametrically opposite each other. This signal voltage is proportional to the magnetic induction, the electrode spacing and the average flow velocity. Considering that the magnetic induction and the electrode spacing are constant values, a proportionality exists between the signal voltage  $U_1$  and the average flow velocity. From the equation for calculating the volume flowrate, it follows that the signal voltage is linearly proportional to the volume flowrate. The induced voltage is converted by the transmitter to standardized, analog and digital signals.

## Flowmeter sensor

### Measuring accuracy

#### Reference conditions

According to EN 29104	
Measuring medium temperature	20 °C (68 °F) ±2 K
Ambient temperature	20 °C (68 °F) ±2 K
Power supply	Nominal voltage acc. to name plate U = ±1 %, Frequency f = ±1 %
Installation condition	• Upstream >10 x DN, straight section • Downstream >5 x DN, straight section
Warm-up phase	30 min

### Measuring error and repeatability

#### Measuring error

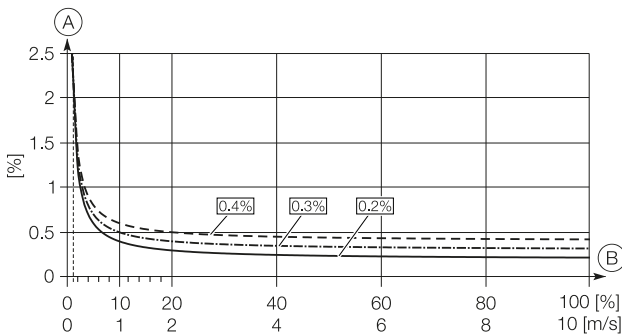


Fig. 5: Measuring error

Pos.	Description
(A)	Accuracy ± of measured value in %
(B)	Flow velocity v in m/s, Q / Q <sub>max</sub> DN in %

Table 9: Legend

#### Impulse output

##### Standard calibration DN 3 .... 2000

DN 3 .... 2000: ±0.4 % of measured value, ±0.02 % Q<sub>max</sub> DN<sup>1)</sup>

##### Optional calibration

DN 3 .... 600, 800: ±0.3 % of measured value, ±0.02 % Q<sub>max</sub> DN<sup>1)</sup>

Or

DN 10 .... 600, 800: ±0.2 % of measured value, ±0.02 % Q<sub>max</sub> DN<sup>1)</sup>

Table 10: Measuring error impulse output

1) Q<sub>max</sub> DN: See table in chapter "Measuring range table" on page 16.

#### Current output

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

Table 11: Measuring error current output

### Repeatability, response time

Repeatability	Response time <sup>1)</sup>
≤ 0.11 % of measured value, t <sub>meas</sub> = 100 s, v = 0.5 ... 10 m/s	As step function 0 ... 99 % 5 τ ≥ 200 ms at 25 Hz excitation frequency 5 τ ≥ 400 ms at 12.5 Hz excitation frequency 5 τ ≥ 500 ms at 6.25 Hz excitation frequency

Table 12: Repeatability, response time

1) Of current output with damping of 0.04 seconds.

### Permitted pipe vibration

In accordance with EN 60068-2-6.

Applicable to sensors in remote mount design and sensors in integral mount design.

- Maximum deflection: 0.15 mm (0.006 inch) in the 10 ... 58 Hz range
- Maximum acceleration: 2 g, in the 58 ... 150 Hz range

### IP rating

- IP 65 / IP 67 in accordance with EN 60529
- IP 68 in accordance with EN 60529 (for remote mount design only)
- NEMA 4X

### Signal cables

For remote mount design only.

The maximum signal cable length between flowmeter sensor and transmitter is 200 m (656 ft).

A 5 m (16.4 ft) cable is included in the scope of delivery.

If more than 5 m (16.4 ft) is required, the cable can be ordered separately (Part no. 3KQZ407123U0100).

For marine applications, a certified signal cable is available.

## ... Flowmeter sensor

### Temperature data

#### Storage temperature range

-40 ... 70 °C (-40 ... 158 °F)

The temperature range offered depends on a number of different factors.

These factors include the measuring medium temperature  $T_{\text{medium}}$ , the ambient temperature  $T_{\text{amb}}$ , the operating pressure  $P_{\text{medium}}$ , the liner material and the approvals for the explosion protection.

#### Maximum permissible cleaning temperature

CIP medium	Liner material	Cleaning temperature
Steam	PTFE, PFA	150 °C (302 °F)
Cleaning fluid	PTFE, PFA	140 °C (284 °F)

- The specified cleaning temperature applies for a maximum ambient temperature of 25 °C (77 °F). If the ambient temperature is > 25 °C (> 77 °F), the difference to the actual ambient temperature must be subtracted from the maximum cleaning temperature.
- The specified cleaning temperature may be applied for a maximum of 60 minutes.

**Ambient temperature as a function of measuring medium temperature  
Integral mount design**

<b>Standard flowmeter sensor design</b>					
<b>Liner material</b>	<b>Flange material</b>	<b>Ambient temperature range (T<sub>amb.</sub>)</b>		<b>Measuring medium temperature range (T<sub>medium</sub>)</b>	
		<b>Minimum</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Maximum</b>
Hard rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	85 °C (185 °F)
				-5 °C (23 °F) <sup>1)</sup>	80 °C (176 °F) <sup>1)</sup>
Hard rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	85 °C (185 °F)
				-5 °C (23 °F) <sup>1)</sup>	80 °C (176 °F) <sup>1)</sup>
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)	90 °C (194 °F)
			45 °C (113 °F)		130 °C (266 °F)
PTFE	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-25 °C (-13 °F)	90 °C (194 °F)
			-40 °C (-40 °F) <sup>2)</sup>		45 °C (113 °F)
Thick PTFE <sup>3)</sup>	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	90 °C (194 °F)
			45 °C (113 °F)		130 °C (266 °F)
Thick PTFE <sup>3)</sup>	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-25 °C (-13 °F)	90 °C (194 °F)
			-40 °C (-40 °F) <sup>2)</sup>		45 °C (113 °F)
PFA <sup>3)</sup>	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	90 °C (194 °F)
			45 °C (113 °F)		130 °C (266 °F)
PFA <sup>3)</sup>	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-25 °C (-13 °F)	90 °C (194 °F)
			-40 °C (-40 °F) <sup>2)</sup>		45 °C (113 °F)
ETFE <sup>3)</sup>	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	90 °C (194 °F)
			45 °C (113 °F)		130 °C (266 °F)
ETFE <sup>3)</sup>	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-25 °C (-13 °F)	90 °C (194 °F)
			-40 °C (-40 °F) <sup>2)</sup>		45 °C (113 °F)
Linatex <sup>1)</sup>	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	70 °C (158 °F)
Linatex <sup>1)</sup>	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-20 °C (-4 °F)	70 °C (158 °F)
Ceramic carbide	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	80 °C (176 °F)
			60 °C (140 °F)		80 °C (176 °F)
Ceramic carbide	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-20 °C (-4 °F)	80 °C (176 °F)
			60 °C (140 °F)		80 °C (176 °F)

## ... Flowmeter sensor

### High-temperature flowmeter sensor design<sup>3)</sup>

Liner material	Flange material	Ambient temperature range (T <sub>amb.</sub> )		Measuring medium temperature range (T <sub>medium</sub> )	
		Minimum	Maximum	Minimum	Maximum
Thick PTFE <sup>3)</sup>	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
Thick PTFE <sup>3)</sup>	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) <sup>2)</sup>	60 °C (140 °F)	-20 °C (-4 °F)	180 °C (356 °F)
PFA <sup>3)</sup>	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
PFA <sup>3)</sup>	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) <sup>2)</sup>	60 °C (140 °F)	-20 °C (-4 °F)	180 °C (356 °F)
ETFE <sup>3)</sup>	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
ETFE <sup>3)</sup>	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) <sup>2)</sup>	60 °C (140 °F)	-20 °C (-4 °F)	130 °C (266 °F)

1) For China production site only.

2) For low-temperature version only (option).

3) For design level "A" only.

**Remote mount design**

<b>Standard flowmeter sensor design</b>					
<b>Liner material</b>	<b>Flange material</b>	<b>Ambient temperature range (T<sub>amb.</sub>)</b>		<b>Measuring medium temperature range (T<sub>medium</sub>)</b>	
		<b>Minimum</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Maximum</b>
Hard rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	85 °C (185 °F)
				-5 °C (23 °F) <sup>1)</sup>	80 °C (176 °F) <sup>1)</sup>
Hard rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	85 °C (185 °F)
				-5 °C (23 °F) <sup>1)</sup>	80 °C (176 °F) <sup>1)</sup>
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)
			45 °C (113 °F)		130 °C (266 °F)
PTFE	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
		-40 °C (-40 °F) <sup>2)</sup>			
Thick PTFE <sup>3)</sup>	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
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		-40 °C (-40 °F) <sup>2)</sup>			
PFA <sup>3)</sup>	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
PFA <sup>3)</sup>	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
		-40 °C (-40 °F) <sup>2)</sup>			
ETFE <sup>3)</sup>	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
ETFE <sup>3)</sup>	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
Linatex <sup>1)</sup>	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	70 °C (158 °F)
					70 °C (158 °F)
Linatex <sup>1)</sup>	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-20 °C (-4 °F)	70 °C (158 °F)
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Ceramic carbide	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	80 °C (176 °F)
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Ceramic carbide	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-20 °C (-4 °F)	80 °C (176 °F)
					80 °C (176 °F)

<b>High-temperature flowmeter sensor design<sup>3)</sup></b>					
<b>Liner material</b>	<b>Flange material</b>	<b>Ambient temperature range (T<sub>amb.</sub>)</b>		<b>Measuring medium temperature range (T<sub>medium</sub>)</b>	
		<b>Minimum</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Maximum</b>
Thick PTFE <sup>3)</sup>	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
				180 °C (356 °F)	
Thick PTFE <sup>3)</sup>	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	180 °C (356 °F)
		-40 °C (-40 °F) <sup>2)</sup>			
PFA <sup>3)</sup>	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
PFA <sup>3)</sup>	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	180 °C (356 °F)
		-40 °C (-40 °F) <sup>2)</sup>			
ETFE <sup>3)</sup>	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
ETFE <sup>3)</sup>	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)
		-40 °C (-40 °F) <sup>2)</sup>			

1) For China production site only.  
 2) For low-temperature version only (option).  
 3) For design level "A" only.

## ... Flowmeter sensor

### Measuring range table

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		Minimum flow range end value	QmaxDN	Maximum flow range end value
DN	inch	$0.02 \times Q_{\max \text{ DN}}$ ( $\approx 0.2 \text{ m/s}$ )	$0 \dots \approx 10 \text{ m/s}$	$2 \times Q_{\max \text{ DN}}$ ( $\approx 20 \text{ m/s}$ )
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 m <sup>3</sup> /h (5.28 US gal/min)	60 m <sup>3</sup> /h (264 US gal/min)	120 m <sup>3</sup> /h (528 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)	240 m <sup>3</sup> /h (1057 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)	360 m <sup>3</sup> /h (1585 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)	480 m <sup>3</sup> /h (2113 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)	840 m <sup>3</sup> /h (3698 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)	1200 m <sup>3</sup> /h (5283 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)	2160 m <sup>3</sup> /h (9510 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)	3600 m <sup>3</sup> /h (15850 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)	4800 m <sup>3</sup> /h (21134 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)	6600 m <sup>3</sup> /h (29059 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)	9000 m <sup>3</sup> /h (39626 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)	12000 m <sup>3</sup> /h (52834 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)	13200 m <sup>3</sup> /h (58117 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)	19200 m <sup>3</sup> /h (84535 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)	26400 m <sup>3</sup> /h (116236 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)	31200 m <sup>3</sup> /h (137369 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)	36000 m <sup>3</sup> /h (158503 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)	48000 m <sup>3</sup> /h (211337 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)	54000 m <sup>3</sup> /h (237754 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)	61600 m <sup>3</sup> /h (271217 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)	66000 m <sup>3</sup> /h (290589 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)	84000 m <sup>3</sup> /h (369841 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)	108000 m <sup>3</sup> /h (475510 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)	126000 m <sup>3</sup> /h (554761 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)	144000 m <sup>3</sup> /h (634013 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)	180000 m <sup>3</sup> /h (792516 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)	228000 m <sup>3</sup> /h (1003853 US gal/min)



### Process connections

For an overview of the available process connection variants, see the chapter entitled "Overview – models" on page 8.

### Installation length

The flange devices comply with the installation lengths specified in ISO 13359.

For further details, refer to chapter "Dimensions" on page 27.

### Materials

#### Wetted parts

Part	Standard	Option
<b>Liner material</b>	PTFE, PFA, ETFE, hard rubber, soft rubber	Ceramic Carbide, Linatex
<b>Measurement and grounding electrode for liner material</b>		
• Hard rubber — Soft rubber	SST 1.4571 (AISI 316Ti)	Hastelloy B-3 (2.4600), Hastelloy C-4 (2.4610), titanium, Tantalum, Platinum-iridium, SST 1.4539 (AISI 904L)
• PTFE, PFA, ETFE	SST 1.4539 (AISI 904L)	SST 1.4571 (AISI 316Ti), Hastelloy B-3 (2.4600), Hastelloy C-4 (2.4610), Titanium, Tantalum, Platinum-iridium
<b>Grounding ring</b>	Stainless steel	On request
<b>Protection plate</b>	Stainless steel	On request

#### Non-wetted parts (process connection), Design level "A"



DN 3 ... 15 (1/10 ... 1/2")	Stainless steel <sup>1)</sup>	–
DN 20 ... 400 (3/4 ... 16")	Steel (galvanized) <sup>2)</sup>	Stainless steel <sup>1)</sup>
DN 450 ... 2000 (18 ... 80")	Steel (painted) <sup>2)</sup>	–

#### Non-wetted parts (process connection), Design level "B"



DN 25 ... 300 (1 ... 12")	Steel (painted) <sup>2)</sup> Cast Iron (painted) <sup>3)</sup>	–
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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)

2) 1.0038, 1.0460, 1.0570, 1.0432, ASTM A105, Q255A, 20#, 16Mn

3) EN-JS1025 (5.3103)

## ... Flowmeter sensor

### Sensor housing, Design level "A"



Part / DN	Material
<b>Housing</b>	
DN 3 ... 400 (1/10 ... 16")	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
<b>Meter tube</b>	Stainless steel <sup>4)</sup>
<b>Terminal box</b>	Aluminum alloy, painted, $\geq 80 \mu\text{m}$ thick, light gray, RAL 9002 Option: Plastic, gray white, RAL 9002 Option: Stainless Steel
<b>Cable gland<sup>5)</sup></b>	Polyamide, stainless Steel <sup>6)</sup>

### Sensor housing, Design level "B"



Part / DN	Material
<b>Housing / meter tube</b>	
DN 25 ... 300 (1 ... 12")	Steel (painted), cast Iron (painted) <sup>3)</sup> Paint coat: $\geq 80 \mu\text{m}$ thick, RAL 9002
<b>Terminal box</b>	Aluminum alloy, painted, $\geq 80 \mu\text{m}$ thick, light gray, RAL 9002 Option: Plastic, gray white, RAL 9002 Option: Stainless Steel
<b>Cable gland<sup>5)</sup></b>	Polyamide, stainless Steel <sup>6)</sup>

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

3) EN-JS1025 (5.3103)

4) 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

5) Cable gland with M20 x 1.5 or NPT thread, to be selected via the order number.

6) In the case of explosion-proof design or for ambient temperature of 40 °C (40 °F).

### Material loads for process connections

The limits for the permissible measuring medium temperature ( $T_{\text{medium}}$ ) and permissible pressure ( $P_{\text{medium}}$ ) are calculated on the basis of the lining and flange material used in the device (refer to the name plate on the device).

### Minimum permissible operating pressure

The following tables show the minimum permissible operating pressure ( $P_{\text{medium}}$ ) depending on measuring medium temperature ( $T_{\text{medium}}$ ) and the liner material.

#### Design level "A"



Liner material	Nominal diameter	$P_{\text{medium}}$ [mbar abs]	$T_{\text{medium}}$ <sup>1)</sup>
Hard rubber	DN 25 ... 2000 (1 ... 80")	0	< 85 °C (185 °F)
			< 80 °C (176 °F) <sup>2)</sup>
Soft rubber	DN 50 ... 2000 (2 ... 80")	0	< 60 °C (140 °F)
PTFE	DN 10 ... 600 (3/8 ... 24")	270	< 20 °C (68 °F)
		400	< 100 °C (212 °F)
		500	< 130 °C (266 °F)
Thick PTFE	DN 25 ... 80 (1 ... 3")	0	< 180 °C (356 °F)
	DN 100 ... 250 (4 ... 10")	67	< 180 °C (356 °F)
	DN 300 (12")	27	< 180 °C (356 °F)
PFA	DN 3 ... 200 (1/10 ... 8")	0	< 180 °C (356 °F)
ETFE	DN 25 ... 600 (1 ... 24")	100	< 130 °C (266 °F)
Ceramic Carbide	DN 25 ... 1000 (1 ... 40")	0	< 80 °C (176 °F)
Linatex <sup>2)</sup>	DN 50 ... 600 (6 ... 24")	0	< 70 °C (158 °F)

1) For CIP/SIP cleaning, higher temperatures are permitted for limited time periods; refer to the chapter "Maximum permissible cleaning temperature" on page 12.

2) For China production site only.

**Design level "B"**



Liner material	Nominal diameter	P <sub>medium</sub> [mbar abs]	T <sub>medium</sub> <sup>1)</sup>
PTFE	DN 25 ... 300 (1 ... 12")	270	< 20 °C (68 °F)
		400	< 100 °C (212 °F)
		500	< 130 °C (266 °F)

1) For CIP/SIP cleaning, higher temperatures are permitted for limited time periods; refer to the chapter "Maximum permissible cleaning temperature" on page 12.

Liner approvals on request; please contact ABB.

**Overview sensor design level "B"**

Sensor Size	Pressure rating	Carbon steel flange	PTFE	Electrode design: Standard	Grounding Electrodes	Sensor temp. Range: Standard Ambient temp. range: -20 ... 60 °C
	PN 40					
DN 25 (1")	CL 150	✓	✓	✓	✓	✓
	PN 40					
DN 32 (1 1/4")	CL 150	✓	✓	✓	✓	✓
	PN 40					
DN 40 (1 1/2")	CL 150	✓	✓	✓	✓	✓
	PN 40					
DN 50 (2")	CL 150	✓	✓	✓	✓	✓
	PN 16					
	PN 40					
DN 65 (2 1/2")	CL 150	✓	✓	✓	✓	✓
	PN 40					
DN 80 (3")	CL 150	✓	✓	✓	✓	✓
	PN 40					
DN 100 (4")	CL 150	✓	✓	✓	✓	✓
	PN 40					
DN 125 (5")	CL 150	✓	✓	✓	✓	✓
	PN 40					
DN 150 (6")	CL 150	✓	✓	✓	✓	✓
DN 200 (8")	in prep.	✓	✓	✓	✓	✓
DN 250 (10")	in prep.	✓	✓	✓	✓	✓
DN 300 (12")	in prep.	✓	✓	✓	✓	✓

### ... Flowmeter sensor

#### Material load

#### Flowmeter sensor design level "A"

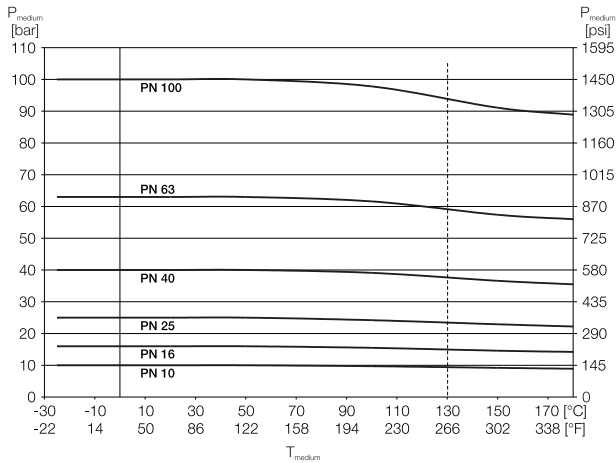


Fig. 6: DIN flange stainless steel up to DN 600 (24"); design level "A"

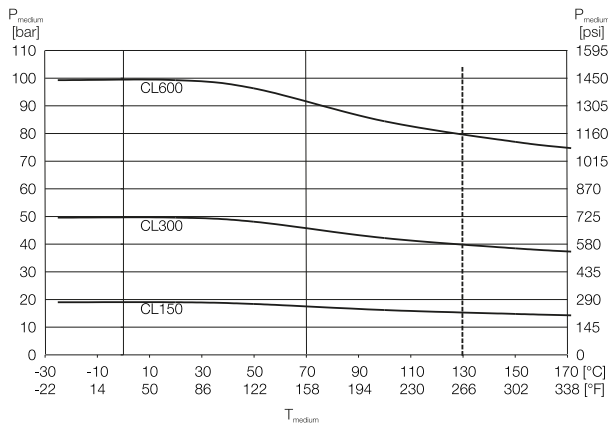


Fig. 7: ASME flange, stainless steel, up to DN 400 (16") (CL150/300) up to DN 1000 (40") (CL150); design level "A"

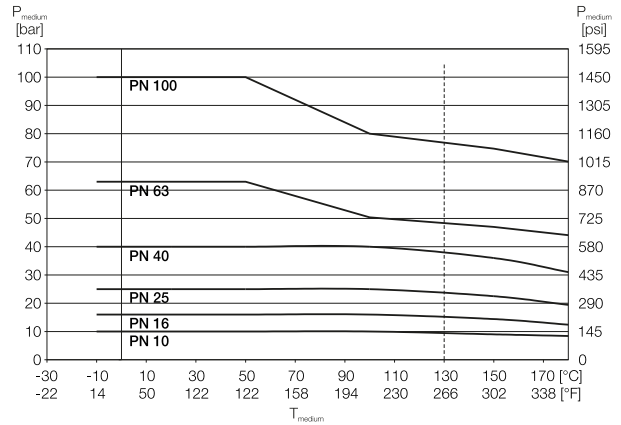


Fig. 8: DIN flange, steel, up to DN 600 (24"); design level "A"

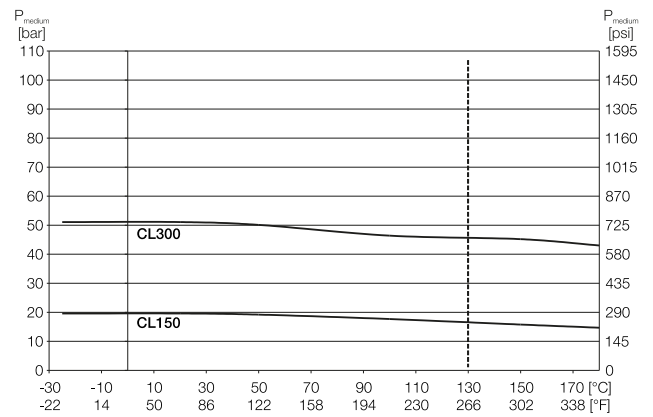


Fig. 9: ASME flange, steel, up to DN 400 (16") (CL150/300); up to DN 1000 (40") (CL150); design level "A"

DN	Material	PN	T <sub>medium</sub>	P <sub>medium</sub>
DN 32 ... 400 (1 1/4 ... 16")	Stainless steel	10	-25 ... 180 °C (-13 ... 356 °F)	10 bar (145 psi)
	Steel	10	-10 ... 180 °C (14 ... 356 °F)	10 bar (145 psi)

Table 13: Material load JIS 10K-B2210 flange

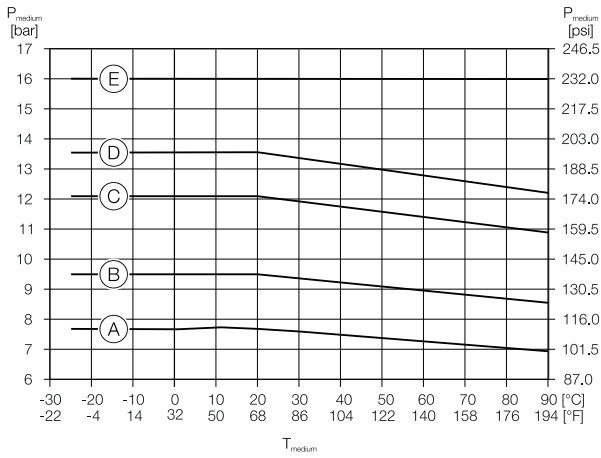


Fig. 10: DIN flange, stainless steel, DN 700 (28") up to DN 1000 (40"); design level "A"

Pos.	Nominal diameter / Pressure rating flowmeter sensor
(A)	DN 1000, PN 10
(B)	DN 700, DN800, DN900, PN 10
(C)	DN 1000, PN 16
(D)	DN 900, DN 800, PN 16
(E)	DN 700, PN 16

Table 14: Legend

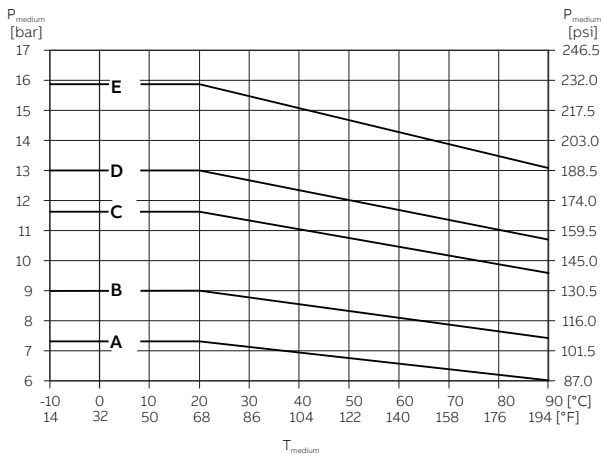


Fig. 11: DIN flange, steel, DN 700 (28") up to DN 1000 (40"); design level "A"

Pos.	Nominal diameter / Pressure rating flowmeter sensor
(A)	DN 1000, PN 10
(B)	DN 700, DN800, DN900, PN 10
(C)	DN 1000, PN 16
(D)	DN 900, DN 800, PN 16
(E)	DN 700, PN 16

Table 15: Legend

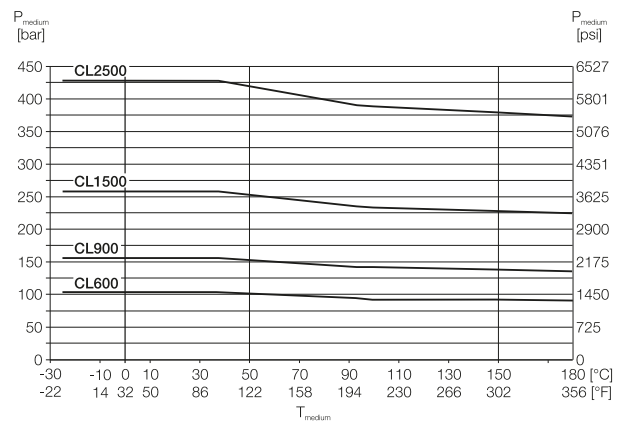


Fig. 12: ASME flange, Steel, DN 25 ... 400 (1 ... 24"); design level "A"

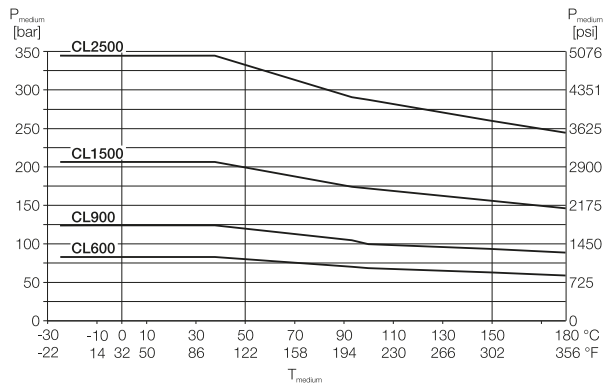


Fig. 13: ASME flange, stainless steel, DN 25 ... 400 (1 ... 24"); design level "A"

## ... Flowmeter sensor

### Flowmeter sensor design level "A"

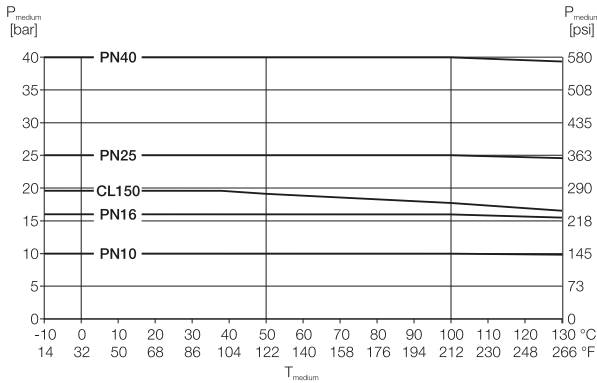


Fig. 14: Cast iron housing, DN 25 ... 600 (1 ... 24"); design level "B"

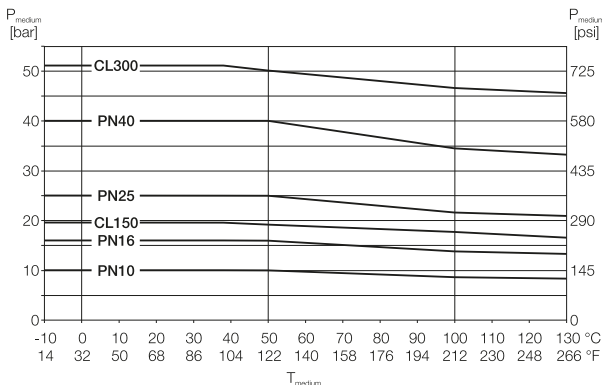


Fig. 15: Welded steel housing, DN 25 ... 600 (1 ... 24"); design level "B"

## Installation conditions

### General information

The following points must be observed during installation:

- The flow direction must correspond to the marking, if present.
- The maximum torque for all flange screws must be complied with.
- Secure the flange screws and nuts against pipe vibration.
- The devices must be installed without mechanical tension (torsion, bending).
- Install flange devices / wafer-type devices with plane parallel counterflanges and use appropriate gaskets only.
- Only gaskets made from a material that is compatible with the measuring medium and measuring medium temperature may be used.
- Gaskets must not extend into the flow area, since possible turbulence could influence the accuracy of the device.
- The piping may not exert any inadmissible forces or torques on the device.
- Make sure temperature limits are not exceeded operating the device.
- Vacuum shocks in the piping should be avoided to prevent damage to the liners (PTFE). Vacuum shocks can destroy the device.
- Do not remove the sealing plugs in the cable glands until you are ready to install the electrical cable.
- Make sure the gaskets for the housing cover are seated correctly. Carefully gasket the cover. Tighten the cover fittings.
- The transmitter with a remote mount design must be installed at a largely vibration-free location.
- Do not expose the transmitter and sensor to direct sunlight. Provide appropriate sun protection as necessary.
- When installing the transmitter in a control cabinet, make sure adequate cooling is provided.

### Devices with extended diagnostic functions

For devices with extended diagnostic functions different installation conditions may be valid.

For further information read and observe chapter "Diagnostic functions" on page 5.

**Brackets and supports**

**NOTICE – Potential damage to device!**

Improper support for the device may result in deformed housing and damage to internal magnet coils.

Place the supports at the edge of the flowmeter sensor housing (see arrows in Fig. 1).

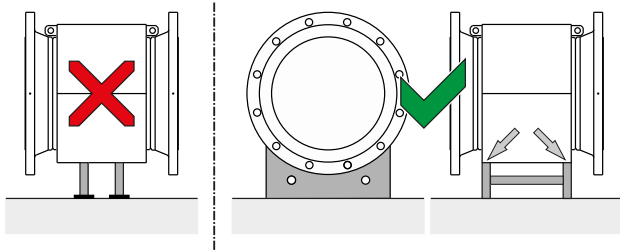


Fig. 1: Support for meter sizes larger than DN 400

Devices with meter sizes larger than DN 400 must be mounted with support on a sufficiently strong foundation.

**Gaskets**

The following points must be observed when installing gaskets:

- For achieve the best results, ensure the gaskets fit concentrically with the meter tube
- To ensure that the flow profile is not distorted, the gaskets must not protrude into the piping.
- The use of graphite with the flange or process connection gaskets is prohibited, because an electrically conductive coating may form on the inside of the meter tube.

**Devices with a hard rubber, soft rubber liner**

- Devices with a hard / soft rubber liner always require additional gaskets.
- ABB recommends using gaskets made from rubber or rubber-like sealing materials.
- When selecting the gaskets, ensure that the tightening torques specified in chapter are not exceeded.

**Devices with a PTFE, PFA or ETFE liner**

- Devices with a PTFE, PFA or ETFE liner do not require additional gaskets.

**Flow direction**

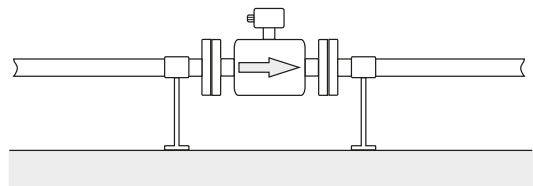


Fig. 2: Flow direction

The device measures the flowrate in both directions. Forward flow is the factory setting, as shown in Fig. 2.

**Elektrode axis**

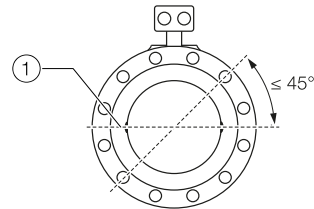


Fig. 16: Orientation of the electrode axis

The electrode axis ① should be horizontal if at all possible or no more than 45° from horizontal.

## ... Flowmeter sensor

### Mounting position

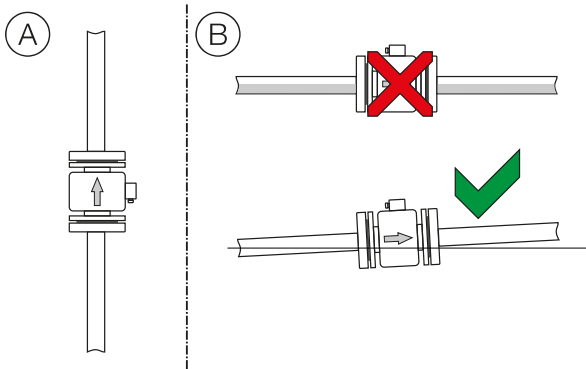
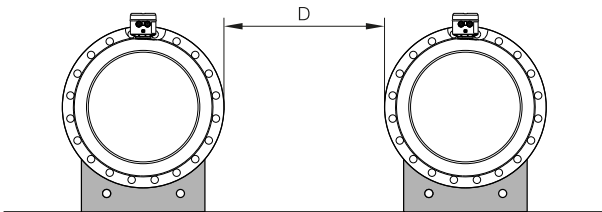


Fig. 17: Mounting position

- Ⓐ Vertical installation for measuring abrasive fluids, preferably with flow in upward direction.
- Ⓑ In case of horizontal installation, the Meter tube must always be completely full. Provide for a slight incline of the connection for degassing.

### Minimum distance



Distance D:  $\geq 1.0$  m (3.3 ft) for design level "A",  $\geq 0.7$  m (2.3 ft) for design level "B"

Fig. 3: Minimum distance

- In order to prevent the devices from interfering with each other, a minimum distance as shown in Fig. 3 must be maintained between the devices.
- The flowmeter sensor may not be operated in the vicinity of powerful electromagnetic fields, e.g., motors, pumps, transformers, etc. A minimum spacing of approx. 1 m (3.28 ft) should be maintained.
- For installation on or to steel parts (e.g. steel brackets), a minimum spacing of approx. 100 mm (3.94 inch) should be maintained (based on IEC801-2 and IECTC77B).

### Inlet and outlet sections

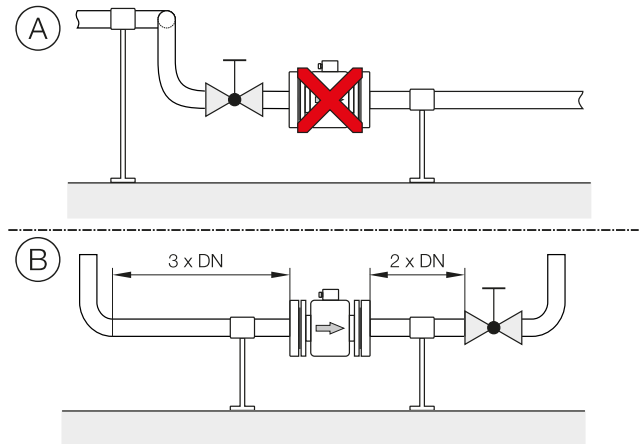


Fig. 18: In- and outlet section, turn-off component

Pos.	Description
①	Double elbow
②	Turn-off device

Table 16: Legend

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, 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.
- Ⓑ Inlet and outlet section: Length of straight inlet and outlet section of the flowmeter sensor. Experience has shown that, in most installations, inlet sections 3 x DN long and outlet sections 2 x DN long are sufficient (DN = nominal diameter of the flowmeter sensor). For test stands, the reference conditions of 10 x DN inlet section and 5 x DN outlet section must be provided, in accordance with EN 29104 / ISO 9104. Valves or other turn-off components should be installed in the outlet section. Butterfly valves must be installed so that the valve plate does not extend into the flowmeter sensor.



**Free inlet or outlet**

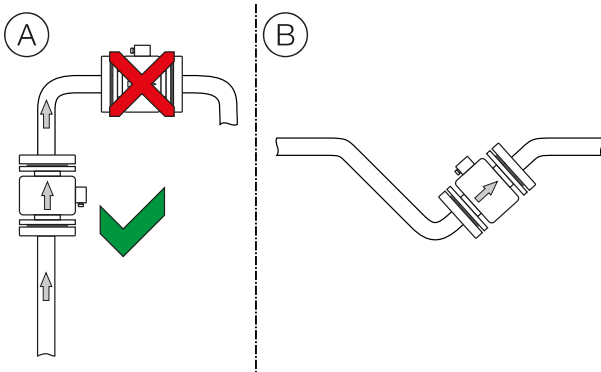


Fig. 19: Free inlet or outlet

- Ⓐ 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.
- Ⓑ Provide for a siphon fluid intake for free inlets or outlets so that the pipeline is always full.

**Strongly contaminated measuring media**

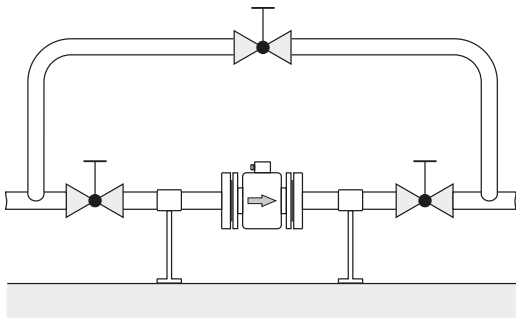


Fig. 4: Bypass connection

For strongly contaminated measuring media, 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.

**Sensor insulation**

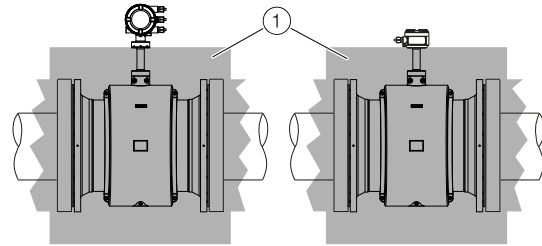


Fig. 20: Insulation of the flowmeter sensor

The high temperature design allows for complete thermal insulation of the flowmeter sensor. The pipeline and sensor must be insulated ① after installing the unit according to the illustration.

**Grounding**

The flowmeter sensor must be connected to ground potential. For technical reasons, this potential should be identical to the potential of the measuring medium. For plastic or insulated lined pipelines, the measuring medium 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 flowmeter sensor.

### ... Flowmeter sensor

#### Installation in the vicinity of pumps

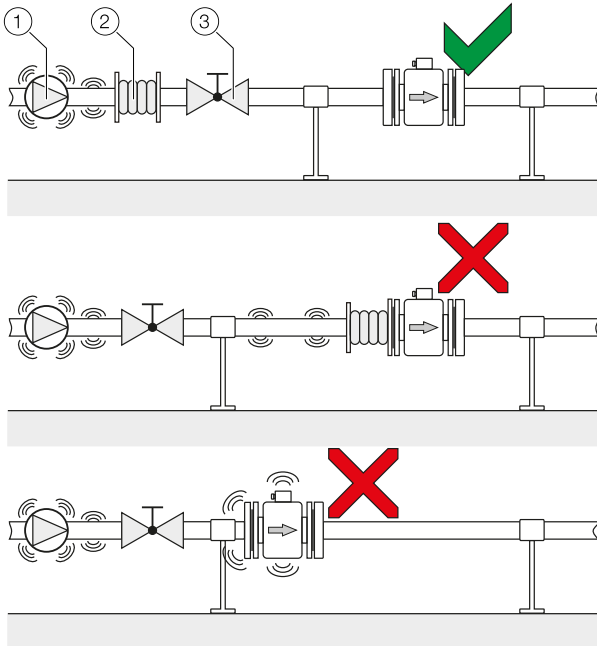


Fig. 21: Vibration damping

Pos.	Description
①	Pump
②	Damping device
③	Shut-off device

Table 17: Legend

Strong vibrations in the pipeline must be damped using flexible damping devices. The damping devices must be installed beyond the supported flowmeter section and outside of the section between the shut-off devices. Do not connect flexible damping devices directly to the flowmeter sensor.

#### Installation in pipelines with larger nominal diameters

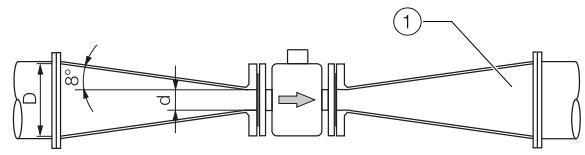


Fig. 22: Using reduction pieces

Determine the resulting pressure loss when using transition pieces ①:

1. Calculate the diameter ratio  $d/D$ .
2. Determine the flow velocity based on the flow rate nomogram (Fig. 5).
3. Read the pressure drop on the Y-axis in Fig. 5.

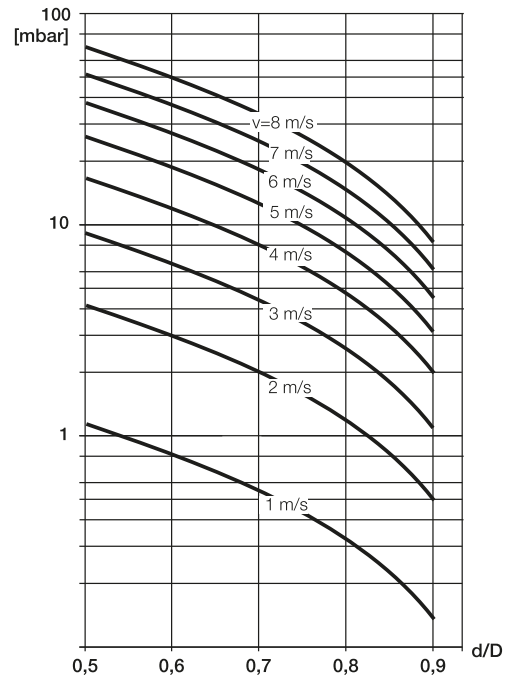


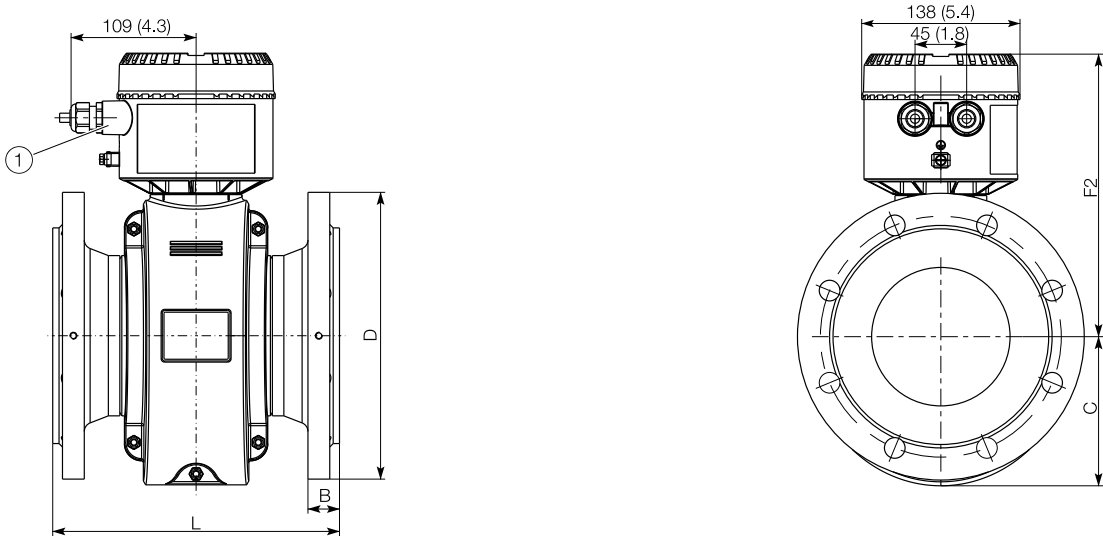
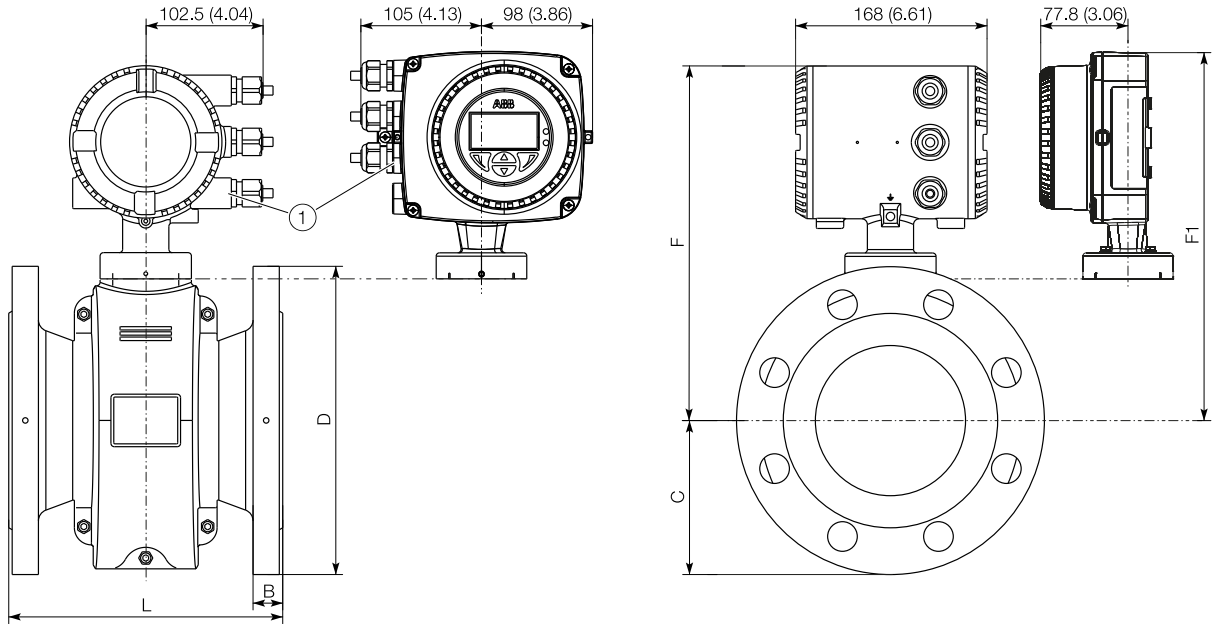
Fig. 5: Flow rate nomogram for pressure drop calculations for flange transition piece with  $\alpha/2 = 8^\circ$

**Dimensions**

**Flange DN 3 ... 100 (1/10 ... 4"), aluminum sensor housing (shell housing) — Design level "A"**

All specified dimensions and weights are in mm (inch) or kg (lb). The stated weights are approximate; the maximum weight is always stated.

**Integral mount design**



**Integral mount design**

① Female thread (either 1/2" NPT or M20 x 1,5) refer to model coding. With 1/2" NPT there will be a plug instead of the PG cable inlet.

Fig. 23

## ... Flowmeter sensor

**Dimensions – Flange device, aluminum sensor housing (shell housing) — Design level "A"**

Nominal diameter	Process connection	D	B	L <sup>2)3)</sup>	C	F <sup>7)</sup>	F1 <sup>7)</sup>	F2 <sup>7)</sup>	Weight
DN 3 ... 8 <sup>4)</sup> (1/8 ... 5/16 <sup>5)</sup> )	EN 1092-1 <sup>6)</sup> , PN 10 ... 40 <sup>3)</sup>	90 (3.54)	19 (0.75)	200 (7.84)	82 (3.23)	255 (10.04)	269 (10.6)	191 (7.52)	5.5 (12)
	ASME B16.5, CL 150	90 (3.54)	14.2 (0.56)						
	ASME B16.5, CL 300	95 (3.74)	17.3 (0.68)						
DN 10 (3/8 <sup>5)</sup> )	JIS 10K	90 (3.54)	15 (0.59)						
	EN 1092-1 <sup>6)</sup> , PN 10 ... 40 <sup>3)</sup>	95 (3.74)	19 (0.75)	200 (7.84)	82 (3.23)	255 (10.04)	269 (10.6)	191 (7.52)	5.5 (12)
	ASME B16.5, CL 150	90 (3.54)	14.2 (0.56)						
DN 15 (1/2")	ASME B16.5, CL 300	95.2 (3.75)	17.3 (0.68)						
	JIS 10K	95 (3.74)	15 (0.59)						
	EN 1092-1 <sup>6)</sup> , PN 10 ... 40 <sup>3)</sup>	105 (4.13)	21 (0.83)	200 (7.84)	82 (3.23)	255 (10.04)	269 (10.6)	191 (7.52)	6.5 (14)
DN 20 (3/4")	ASME B16.5, CL 150	98.6 (3.88)	15.7 (0.62)						
	ASME B16.5, CL 300	117.3 (4.62)	18.7 (0.74)						
	JIS 10K	100 (3.94)	17 (0.67)						
DN 25 (1")	EN 1092-1 <sup>6)</sup> , PN 10 ... 40 <sup>3)</sup>	115 (4.53)	21 (0.83)	200 (7.84)	82 (3.23)	255 (10.04)	269 (10.6)	191 (7.52)	7.5 (16.5)
	ASME B16.5, CL 150	108 (4.25)	17.2 (0.68)						
	ASME B16.5, CL 300	124 (4.88)	20.5 (0.81)						
DN 32 (1 1/4")	JIS 10K	125 (4.92)	17 (0.67)						
	EN 1092-1 <sup>6)</sup> , PN 10 ... 40 <sup>3)</sup>	140 (5.51)	21 (0.83)	200 (7.84)	92 (3.62)	262 (10.3)	276 (10.87)	198 (7.80)	8.5 (18.5)
	ASME B16.5, CL 150	117.3 (4.62)	18.7 (0.74)						
DN 40 (1 1/2")	ASME B16.5, CL 300	133.4 (5.25)	22.1 (0.87)						
	JIS 10K	135 (5.31)	19 (0.75)						
	EN 1092-1 <sup>6)</sup> , PN 10 ... 40 <sup>3)</sup>	150 (5.91)	21 (0.83)	200 (7.84)	92 (3.62)	262 (10.3)	276 (10.87)	198 (7.80)	9.5 (21)
DN 40 (1 1/2")	ASME B16.5, CL 150	127 (5.00)	20.5 (0.81)						
	ASME B16.5, CL 300	155.4 (6.12)	23.6 (0.93)						
	JIS 10K	140 (5.51)	19 (0.75)						

**Table 18: Dimensions DN 3 ... 40**

Tolerance for L: +0 / -3 mm (+0 / -0.018 in.)

Dimensions – Flange device, aluminum sensor housing (shell housing) — Design level "A"									
Nominal diameter	Process connection	D	B	L <sup>2)3)</sup>	C	F <sup>7)</sup>	F1 <sup>7)</sup>	F2 <sup>7)</sup>	Weight
DN 50 (2")	EN 1092-1 <sup>6)</sup> , PN 10 ... 40 <sup>3)</sup>	165 (6.50)	23 (0.91)	200 (7.87)	97.5 (3.84)	268 (10.55)	282 (11.1)	204 (8.0)	11 (24)
	ASME B16.5, CL 150	152.4 (6.00)	22.1 (0.87)						
	ASME B16.5, CL 300	165.1 (6.50)	25.4 (1.0)						
	JIS 10K	155 (6.10)	19 (0.75)						
	AS2129 table D, E	150 (5.91)	–						8.5 (18.5)
DN 65 (2 1/2")	EN 1092-1 <sup>6)</sup> , PN 16 <sup>3)</sup>	185 (7.28)	22 (0.87)	200 (7.87)	108.5 (4.25)	279 (10.98)	293 (11.54)	215 (8.46)	11.5 (25)
	EN 1092-1 <sup>6)</sup> , PN 40 <sup>3)</sup>	185 (7.28)	26 (1.02)						13.5 (30)
	ASME B16.5, CL 150	177.8 (7.00)	25.4 (1.0)						11.5 (25)
	ASME B16.5, CL 300	190.5 (7.50)	28.4 (1.12)						13.5 (30)
	JIS 10K	175 (6.89)	21 (0.83)						13.5 (30)
	AS2129 table D, E	165 (6.50)	–						–
DN 80 (3")	EN 1092-1 <sup>6)</sup> , N 10 ... 40 <sup>3)</sup>	200 (7.87)	28 (1.10)	200 (7.87)	108.5 (4.27)	279 (10.98)	293 (11.54)	215 (8.46)	15.5 (34)
	ASME B16.5, CL 150	190.5 (7.50)	26.9 (1.06)						15.5 (34)
	ASME B16.5, CL 300	210 (8.27)	31.4 (1.24)						17.5 (38.5)
	JIS 10K	185 (7.28)	21 (0.83)						17.5 (38.5)
	AS2129 table D, E	185 (7.28)	–						–
DN 100 (4")	EN 1092-1 <sup>6)</sup> PN 16 <sup>3)</sup>	220 (8.66)	24 (0.94)	250 (9.84)	122.5 (4.82)	301 (11.85)	315 (12.4)	237 (9.33)	17.5 (38.5)
	EN 1092-1 <sup>6)</sup> PN 25 ... 40 <sup>3)</sup>	235 (9.25)	28 (1.10)						21.5 (47)
	ASME B16.5 CL 150	228.6 (9.00)	27.4 (1.08)						19.5 (43)
	ASME B16.5 CL 300	254 (10.0)	35.8 (1.41)						28.5 (63)
	JIS 10K	210 (8.72)	21 (0.83)						17.5 (38.5)
	AS2129 table D, E	215 (8.46)	–						–

Table 19: Dimensions DN 50 ... 100

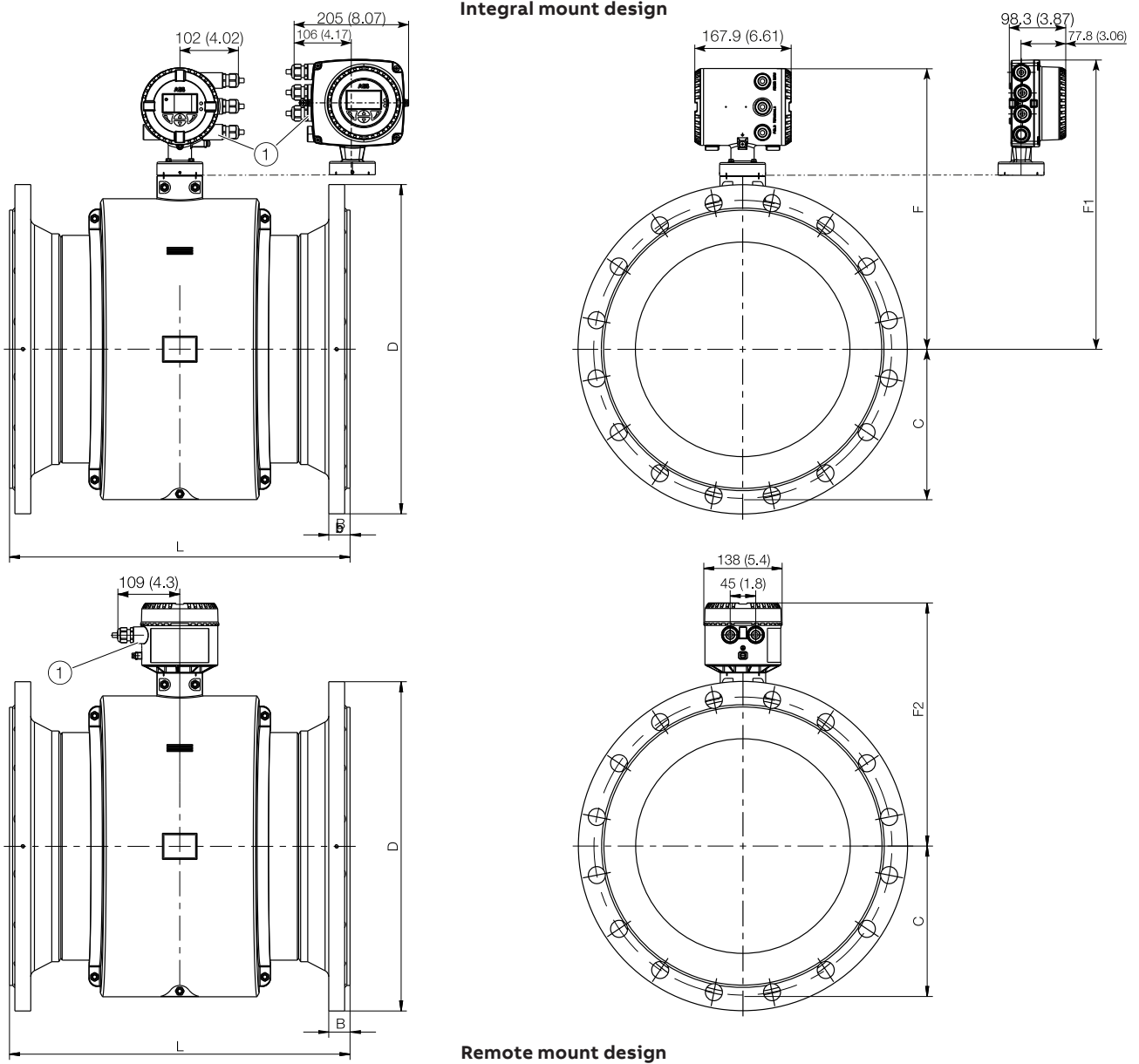
Tolerance for L: +0 / -3 mm (+0 / -0,018 in.)

- 1) Other pressure ratings on request.
- 2) If a grounding ring is fitted (attached to one side of the flange), dimension L increases as follows: by 3 mm (0.118 inch) for DN 3 ... 100, and by 5 mm (0.197 inch) for DN 125.
- 3) If protection plates are fitted (attached to both sides of the flange), dimension L increases as follows:  
by 6 mm (0.236 inch) for DN 3 ... 100, and by 10 mm (0.394 inch) for DN 125.
- 4) Connection flange DN 10.
- 5) Connection flange 1/2".
- 6) Connecting dimensions in accordance with EN 1092-1. For DN 65, PN 16 in accordance with EN 1092-1, please order PN 40.
- 7) For devices in high-temperature design, dimension F, F1, F2 increases by +127 mm (+5.0 inch).

... Flowmeter sensor

Flange DN 125 ... 400 (6 ... 16"), aluminum sensor housing (shell housing) — Design level "A"

All specified dimensions and weights are in mm (in.) or kg (lb.). The stated weights are approximate; the maximum weight is always stated.



① Female thread (either 1/2" NPT or M20 x 1,5) refer to model coding. With 1/2" NPT there will be a plug instead of the PG cable inlet.

Fig. 24

Dimensions – Flange device, aluminum sensor housing (shell housing) — Design level "A"									
Nominal diameter	Process connection	D	B	L <sup>2)3)</sup>	C	F <sup>7)</sup>	F1 <sup>7)</sup>	F2 <sup>7)</sup>	Weight
DN 125 (5")	EN 1092-1 <sup>6)</sup> PN 16 <sup>1)</sup>	250 (9,84)	25 (0,98)	250 (9,84)	130 (5,12)	311 (12,24)	325 (12,80)	247 (9,72)	20,5 (45)
	EN 1092-1 <sup>6)</sup> PN 25 ... 40 <sup>1)</sup>	270 (10,63)	29 (1,14)						27,5 (60,5)
	ASME B16.5 CL 150	254 (10,0)	27,9 (1,10)						20,5 (45)
	ASME B16.5 CL 300	279,4 (11,0)	39,1 (1,54)	450 (17,72)					33,5 (74)
	JIS 10K	250 (9,84)	27 (1,06)	250 (9,84)					20,5 (45)
	AS2129 table D, E	255 (10,04)	–						–
DN 150 (6")	EN 1092-1 PN 16 <sup>1)</sup>	285 (11,22)	25 (0,98)	300 (11,81)	146 (5,75)	358 (14,09)	372 (14,65)	294 (11,57)	31,5 (69,5)
	EN 1092-1 PN 25 ... 40 <sup>1)</sup>	300 (11,81)	31 (1,22)						37,5 (82,5)
	ASME B16.5 CL 150	279,4 (11,0)	29,4 (1,16)						31,5 (69,5)
	ASME B16.5 CL 300	317,5 (12,5)	40,5 (1,59)						45,5 (100)
	JIS 10K	280 (11,02)	28 (1,10)						31,5 (69,5)
	AS2129 table D, E	280 (11,02)	–						31,5 (69,5)
DN 200 (8")	EN 1092-1, PN 10 ... 16 <sup>1)</sup>	340 (13,39)	28 (1,10)	350 (13,78)	170,5 (6,71)	399 (15,71)	413 (16,26)	334 (13,15)	41,5 (90,5)
	EN 1092-1, PN 25 <sup>1)</sup>	360 (14,17)	34 (1,34)						53,5 (118)
	EN 1092-1, PN 40 <sup>1)</sup>	375 (14,76)	38 (1,50)						63,5 (151)
	ASME B16.5, CL 150	345 (13,58)	33,6 (1,32)						48,5 (107)
	ASME B16.5, CL 300	380 (14,96)	46,1 (1,81)						70,5 (155,5)
	JIS 10K	330 (12,99)	33 (1,30)						41,5 (90,5)
	AS2129 table D, E	335 (13,19)	–						48,5 (107)
DN 250 (10")	EN 1092-1, PN 10 <sup>1)</sup>	395 (15,55)	30 (1,18)	450 (17,72)	198 (7,80)	413 (16,26)	427 (16,81)	349 (13,74)	59,5 (131)
	EN 1092-1, PN 16 <sup>1)</sup>	405 (15,94)	30 (1,18)						63,5 (140)
	EN 1092-1, PN 25 <sup>1)</sup>	425 (16,73)	36 (1,42)						82,5 (182)
	EN 1092-1, PN 40 <sup>1)</sup>	450 (17,72)	42 (1,65)						93,5 (206)
	ASME B16.5, CL 150	405 (15,94)	35,2 (1,39)						68,5 (151)
	ASME B16.5, CL 300	445 (17,52)	52,8 (2,08)						103,5 (228)
	JIS 10K	400 (15,75)	37 (1,46)						63,5 (140)
	AS2129 table D, E	405 (15,94)	–						68,5 (151)
DN 300 (12")	EN 1092-1, PN 10 <sup>1)</sup>	445 (17,52)	31 (1,22)	500 (19,68)	228 (8,98)	436 (17,17)	450 (17,72)	372 (14,62)	72,5 (160)
	EN 1092-1, PN 16 <sup>1)</sup>	460 (18,11)	33 (1,30)						78,5 (173)
	EN 1092-1, PN 25 <sup>1)</sup>	485 (19,09)	39 (1,54)						98,5 (217)
	EN 1092-1, PN 40 <sup>1)</sup>	515 (20,28)	47 (1,85)	600 (23,62)					138,5 (305)
	ASME B16.5, CL 150	485 (19,09)	36,8 (1,45)	500 (19,68)					103,5 (228)
	ASME B16.5, CL 300	520 (20,47)	55,8 (2,20)						148,5 (327)
	JIS 10K	450 (17,72)	40 (1,57)						78,5 (173)
	AS2129 table D, E	455 (17,19)	–						103,5 (228)

Table 20: Dimensions DN 125 ... 300

Tolerance for L: +0 / -3 mm (+0 / -0,018 in.)

## ... Flowmeter sensor

Dimensions – Flange device, aluminum sensor housing (shell housing) — Design level "A"									
Nominal diameter	Process connection	D	B	L <sup>2) 3)</sup>	C	F <sup>7)</sup>	F1 <sup>7)</sup>	F2 <sup>7)</sup>	Weight
DN 350 (14")	EN 1092-1, PN 10 <sup>1)</sup>	505 (19,88)	31 (1,22)	550 (21,65)	267 (10,51)	451 (17,76)	465 (18,31)	416 (16,38)	93,5 (206)
	EN 1092-1, PN 16 <sup>1)</sup>	520 (20,47)	35 (1,38)						108,5 (239)
	EN 1092-1, PN 25 <sup>1)</sup>	555 (21,85)	43 (1,69)						143,5 (316)
	ASME B16.5, CL 150	535 (21,06)	40,1 (1,58)						128,5 (283)
	ASME B16.5, CL 300	585 (23,03)	58,8 (2,31)						196,5 (433)
	JIS 10K	490 (19,29)	–						108,5 (239)
	AS2129 table D, E	525 (20,67)	–						103,5 (228)
DN 400 (16")	EN 1092-1 PN 10 <sup>1)</sup>	565 (22,24)	31 (1,22)	600 (23,62)	267 (10,51)	493 (19,41)	507 (19,96)	416 (16,38)	101,5 (224)
	EN 1092-1 PN 16 <sup>1)</sup>	580 (22,83)	37 (1,46)						124,5 (274)
	EN 1092-1 PN 25 <sup>1)</sup>	620 (24,41)	45 (1,77)						168,5 (371)
	ASME B16.5 CL 150	595 (23,43)	41,6 (1,64)						173,5 (382)
	ASME B16.5 CL 300	650 (25,59)	62,2 (2,45)						262,5 (579)
	JIS 10K	560 (22,05)	–						124,5 (274)
	AS2129 table D, E	580 (22,83)	–						173,5 (382)

Table 21: Dimensions DN 350 ... 400

- 1) Other pressure ratings on request.
- 2) If a grounding ring is fitted (attached to one side of the flange) dimension L increases by 5 mm (0.197 inch).
- 3) If protection plates are fitted (attached to both sides of the flange) dimension L increases by 10 mm (0.394 inch).
- 4) For devices in high-temperature design, dimension F, F1, F2 increases by +127 mm (+5.0 inch).

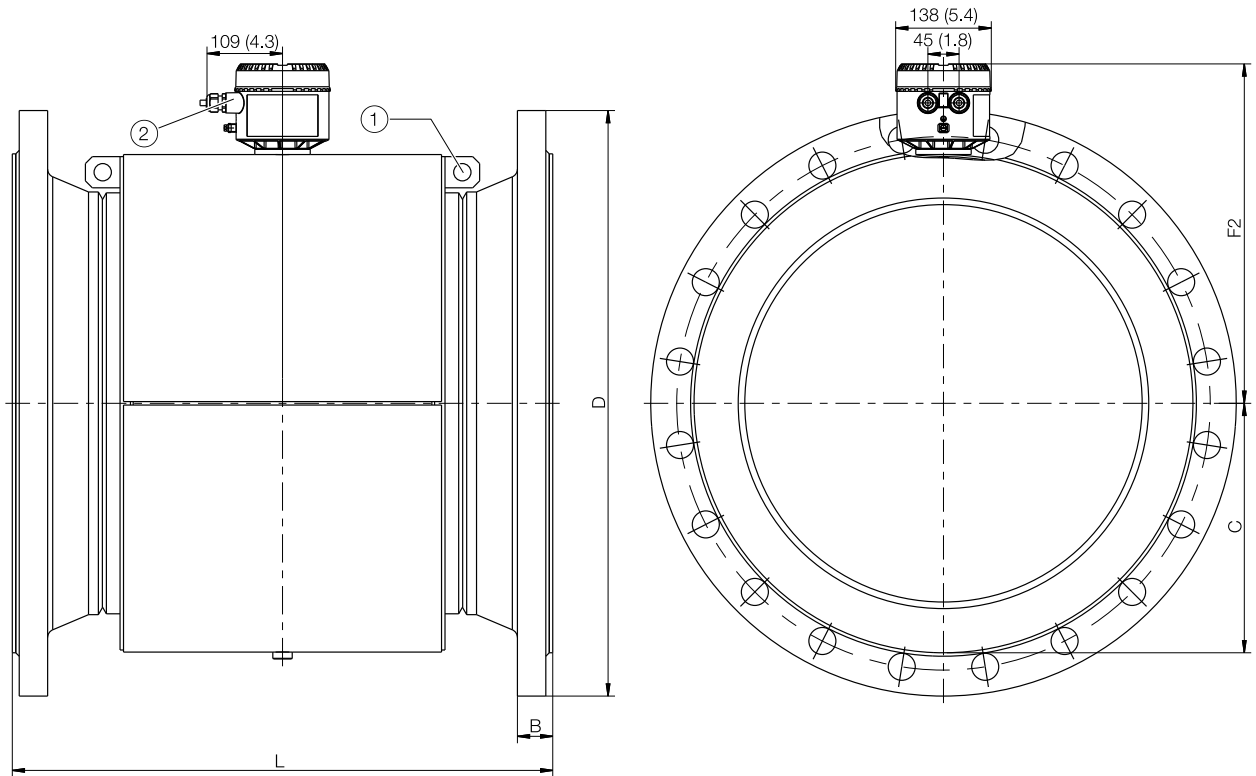
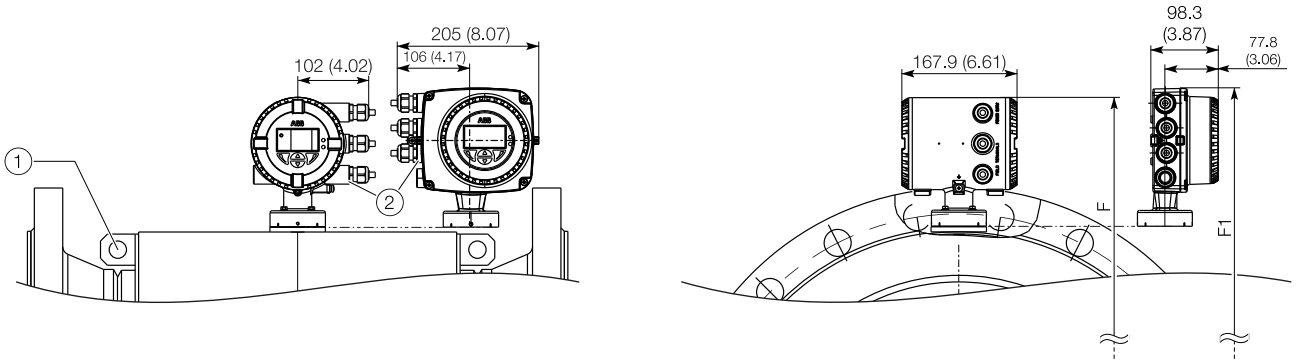
Tolerance for L: +0 / -3 mm (+0 / -0,018 in.)



**Flange DN 450 ... 2000 (18 ... 80"), steel sensor housing Design level "A"**

All specified dimensions and weights are in mm (in.) or kg (lb). The stated weights are approximate; the maximum weight is always stated.

**Integral mount design**



**Remote mount design**

- ① Transport lugs
- ② Female thread (either 1/2" NPT or M20 x 1,5) refer to model coding. With 1/2" NPT there will be a plug instead of the PG cable inlet.

Fig. 25

## ... Flowmeter sensor

Dimensions – Flange device, steel sensor housing Design level "A"									
Nominal diameter	Process connection	D	B	L <sup>2) 3)</sup>	C	F <sup>7)</sup>	F1 <sup>7)</sup>	F2 <sup>7)</sup>	Weight
DN 450 (18")	ASME B16.5, CL 150	635 (25.0)	44.6 (1.76)	686 (27.01)	310 (12.20)	501 (19.72)	515 (20.28)	437 (17.20)	258.5 (570)
	AS2129 table D, E	640 (25.20)	–						
DN 500 (20")	EN 1092-1, PN 10 <sup>1)</sup>	670 (26.38)	33 (1.30)	650 (25.59)	310 (12.20)	501 (19.72)	515 (20.28)	437 (17.20)	188.5 (416)
	EN 1092-1, PN 16 <sup>1)</sup>	715 (28.15)	39 (1.54)						238.5 (526)
	ASME B16.5, CL 150	698.5 (27.50)	47.9 (1.89)	762 (30.0)					298.5 (658)
	AS2129 table D, E	705 (27.76)	–	650 (25.59)					
DN 600 (24")	EN 1092-1, PN 10 <sup>1)</sup>	780 (30.71)	33 (1.30)	780 (30.71)	361 (14.21)	552 (21.73)	566 (22.28)	490 (19.29)	338.5 (746)
	EN 1092-1, PN 16 <sup>1)</sup>	840 (33.07)	41 (1.61)						316.5 (698)
	ASME B16.5, CL 150	812.8 (32.0)	52.8 (2.08)	914 (35.98)					423.5 (934)
	AS2129 table D, E	825 (32.48)	–	780 (30.71)					
DN 700 (28")	EN 1092-1, PN 10 <sup>1)</sup>	895 (35.24)	35 (1.38)	910 (35.83)	405 (15.94)	596 (23.46)	610 (24.02)	534 (21.02)	318.5 (702)
	EN 1092-1, PN 16 <sup>1)</sup>	910 (35.83)	36 (1.42)						438.5 (967)
	ASME B16.47, CL 150	836.7 (32.94)	49.5 (1.95)						348.5 (768)
DN 750 (30")	ASME B16.5, CL 150	888 (34.96)	44.5 (1.75)	990 (38.96)	431 (16.97)	606 (23.86)	620 (24.41)	560 (22.05)	474.5 (1046)
DN 800 (32")	EN 1092-1, PN 10 <sup>1)</sup>	1015 (39.96)	37 (1.46)	1040 (40.94)	455 (17.91)	646 (25.43)	660 (25.98)	584 (22.99)	418.5 (923)
	EN 1092-1, PN 16 <sup>1)</sup>	1025 (40.35)	43 (1.69)						488.5 (1077)
	ASME B16.47, CL 150	942 (37.09)	51 (2.01)						498.5 (1099)
DN 900 (36")	EN 1092-1, PN 10 <sup>1)</sup>	1115 (43.90)	39 (1.54)	1170 (46.06)	505 (19.88)	696 (27.40)	710 (27.95)	635 (25.0)	503.5 (1110)
	EN 1092-1, PN 16 <sup>1)</sup>	1125 (44.29)	45 (1.77)						588.5 (1297)
	ASME B16.47, CL 150	1157.1 (41.62)	57.3 (2.26)						678.5 (1496)
DN 1000 (40")	EN 1092-1, PN 10 <sup>1)</sup>	1230 (48.43)	39 (1.54)	1300 (51.18)	555 (21.85)	746 (29.37)	760 (29.92)	685 (26.97)	688.5 (1517)
	EN 1092-1, PN 16 <sup>1)</sup>	1255 (49.41)	47 (1.85)						848.5 (1870)
	ASME B16.47, CL 150	1174.8 (46.25)	60.6 (2.39)						878.5 (1937)
DN 1050 (42")	ASME B16.47, CL 150	1067 (42.01)	58.7 (2.31)	1365 (53.74)	607 (23.90)	771 (30.35)	785 (30.91)	737 (29.02)	930.5 (2051)
DN 1100 (44")	ASME B16.47, CL 150	1118 (44.02)	60.5 (2.38)	1430 (56.30)	607 (23.90)	–	–	737 (29.02)	960.5 (2117)
DN 1200 (48")	EN 1092-1, PN 10 <sup>1)</sup>	1455 (57.28)	43 (1.69)	1560 (61.42)	660 (25.98)	856 (33.7)	870 (34.25)	791 (31.14)	928.5 (2047)
	EN 1092-1, PN 16 <sup>1)</sup>	1485 (58.46)	53 (2.09)						1118.5 (2466)
DN 1400 (56")	EN 1092-1 PN 10 <sup>1)</sup>	1675 (65.94)	47 (1.85)	1820 (71.65)	755 (29.72)	950 (37.4)	964 (37.95)	885 (34.84)	1208.5 (2664)
	EN 1092-1 PN 16 <sup>1)</sup>	1685 (66.34)	57 (2.24)						1758.5 (3877)
DN 1500 (60")	ASME B16.47, CL 150	1676 (65.98)	76.2 (3.00)	1950 (76.77)	807 (31.77)	996 (39.21)	1010 (39.76)	937 (36.89)	1950.5 (4300)
DN 1600 (64")	EN 1092-1 PN 10 <sup>1)</sup>	1915 (75.39)	51 (2.01)	2080 (81.89)	865 (34.06)	1060 (41.73)	1074 (42.28)	996 (39.21)	1628.5 (3590)
	EN 1092-1 PN 16 <sup>1)</sup>	1930 (75.98)	63 (2.48)						2148.5 (4737)
DN 1800 (72")	EN 1092-1 PN 10 <sup>1)</sup>	2115 (83.27)	55 (2.17)	2340 (92.13)	980 (38.58)	1176 (46.3)	1190 (46.85)	1111 (43.74)	2228.5 (4913)
	EN 1092-1 PN 16 <sup>1)</sup>	2130 (83.86)	67 (2.64)						2898.5 (6390)
DN 2000 (80")	EN 1092-1 PN 10 <sup>1)</sup>	2325 (91.54)	59 (2.32)	2600 (102.36)	1090 (42.91)	1286 (50.63)	1300 (51.18)	1221 (48.07)	1878.5 (4141)
	EN 1092-1 PN 16 <sup>1)</sup>	2345 (92.32)	71 (2.80)						2648.5 (5839)

Table 22: Dimensions DN 450 ... 2000

Tolerance for L: DN 600 ... 2000 +0 / -10 mm (+0 / -0.394 in.)

1) Other pressure ratings on request.

2) If a grounding ring is fitted (attached to one side of the flange) dimension L increases by 5 mm (0.197 in.).

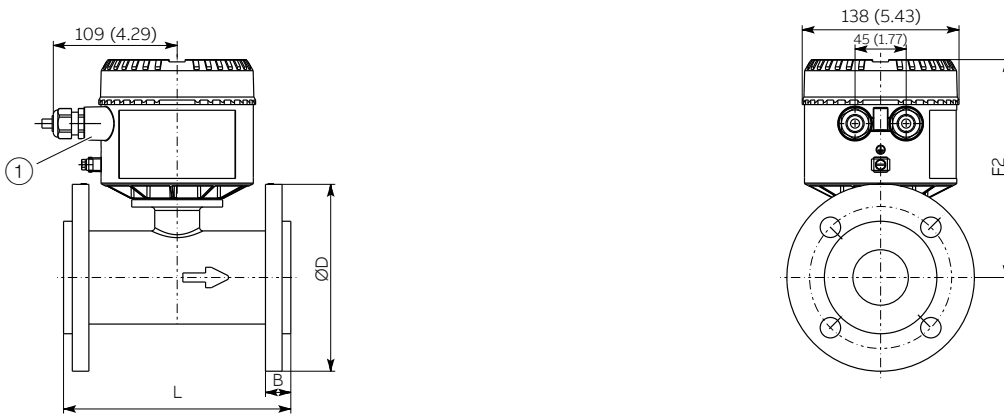
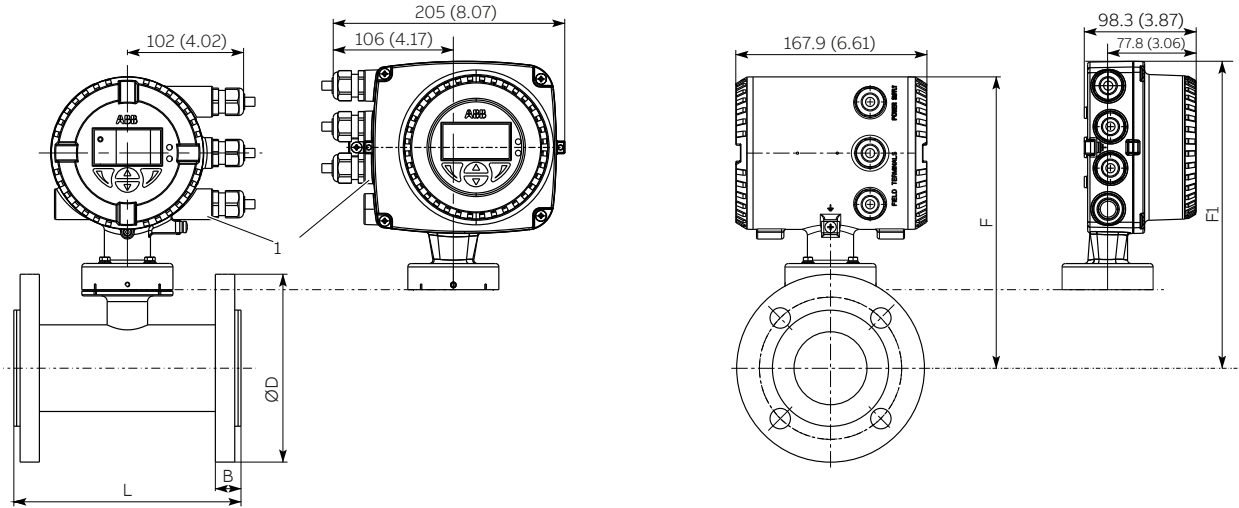
3) If protection plates are fitted (attached to both sides of the flange) dimension L increases by 10 mm (0.394 in.).

4) For devices in high-temperature design, dimension F, F1, F2 increases by +127 mm (+5.0 in.).

**Flange DN 25 ... 125 (1 ... 5"), cast iron sensor housing – Design level "B"**

All specified dimensions and weights are in mm (in.) or kg (lb). The stated weights are approximate; the maximum weight is always stated.

**Integral mount design**



**Remote mount design**

- ① Female thread (either 1/2" NPT or M20 x 1,5) refer to model coding. With 1/2" NPT there will be a plug instead of the PG cable inlet.

Fig. 26

## ... Flowmeter sensor

Dimensions – Flange device, cast iron sensor housing Design level "B"								
Nominal diameter	Process connection	D	B	L <sup>2) 3)</sup>	F <sup>7)</sup>	F1 <sup>7)</sup>	F2 <sup>7)</sup>	Weight
DN 25 (1")	EN 1092-1, PN 40 <sup>1)</sup>	115 (4.53)	23.1 (0.91)	200 (7.84)	244 (9.61)	258 (10.16)	180 (7.09)	6 (13)
	ASME B16.5, CL 150	115 (4.53)	23.1 (0.91)					
	ASME B16.5, CL 300	125 (4.92)	22 (0.87)					
	JIS 5K	95 (3.74)	15.5 (0.61)					5 (11)
	JIS10K, 20K	115 (4.53)	23.1 (0.91)					6 (13)
	AS2129 table D, E	115 (4.53)	23.1 (0.91)					
DN 32 (1 1/4")	EN 1092-1, PN 40 <sup>1)</sup>	150 (5.91)	25 (0.98)	200 (7.84)	249 (9.80)	263 (10.35)	185 (7.28)	7 (15)
	ASME B16.5 CL 150	150 (5.91)	25 (0.98)					
	ASME B16.5 CL 300	135 (5.31)	23 (0.91)					
	JIS 5K, 10K, 20K	150 (5.91)	25 (0.98)					
	AS2129 table D, E	150 (5.91)	25 (0.98)					
DN 40 (1 1/2")	EN 1092-1, PN 40 <sup>1)</sup>	150 (5.91)	23.5 (0.93)	200 (7.84)	254 (10.0)	268 (10.55)	190 (7.48)	8 (18)
	ASME B16.5 CL 150	150 (5.91)	23.5 (0.93)					
	ASME B16.5 CL 300	155 (6.10)	25 (0.98)					9 (20)
	JIS 5K	120 (4.72)	17.5 (0.69)					6 (13)
	JIS 10K	140 (5.51)	21.5 (0.85)					7 (15)
	JIS 20K	140 (5.51)	23.5 (0.93)					
	AS2129 table D	150 (5.91)	23.5 (0.93)					8 (18)
	AS2129 table E	150 (5.91)	23.5 (0.93)					6 (13)
	DN 50 (2")	EN 1092-1, PN 40 <sup>1)</sup>	165 (6.50)	27 (1.06)	200 (7.84)	257 (10.12)	271 (10.64)	193 (7.60)
ASME B16.5 CL 150		165 (6.50)	27 (1.06)					
ASME B16.5 CL 300		165 (6.50)	27 (1.06)					
JIS 5K		130 (5.12)	20 (0.79)					7 (15)
JIS 10K		165 (6.50)	27 (1.06)					8 (18)
JIS 20K		155 (6.10)	24 (0.94)					
AS2129 table D, E		150 (5.91)	18.5 (0.73)					
DN 65 (2 1/2")	EN 1092-1, PN16, PN 40 <sup>1)</sup>	185 (7.28)	30 (1.18)	200 (7.87)	271 (10.67)	285 (11.22)	207 (8.15)	12 (26)
	ASME B16.5 CL 150	185 (7.28)	30 (1.18)					12 (26)
	ASME B16.5 CL 300	190 (7.48)	30 (1.18)					13 (29)
	JIS 5K, 10K, 20K	185 (7.28)	30 (1.18)					12 (26)
	AS2129 table D, E	165 (6.50)	18 (0.71)					10 (22)

Table 23: Dimensions DN 25 ... 65 (1 ... 2 1/2")

Tolerance for L: +0 / -3 mm (+0 / -0.018 in.)

Dimensions – Flange device, cast iron sensor housing Design level "B"								
Nominal diameter	Process connection	D	B	L <sup>2) 3)</sup>	F <sup>7)</sup>	F1 <sup>7)</sup>	F2 <sup>7)</sup>	Weight
DN 80 (3")	EN 1092-1, PN 40 <sup>1)</sup>	205 (8.07)	30 (1.18)	200 (7.87)	275 (10.83)	289 (11.38)	211 (8.31)	14 (31)
	ASME B16.5 CL 150	205 (8.07)	30 (1.18)					14 (31)
	ASME B16.5 CL 300	210 (8.27)	33 (1.30)					17 (37)
	JIS 5K, 10K	205 (8.07)	30 (1.18)					14 (31)
	JIS 20K	200 (7.87)	28.5 (1.12)					13 (29)
	AS2129 table D, E	205 (8.07)	30 (1.18)					14 (31)
DN 100 (4")	EN 1092-1, PN 16 <sup>1)</sup>	235 (9.25)	29 (1.14)	250 (9.84)	306 (12.05)	320 (12.60)	242 (8.53)	15.5 (34)
	EN 1092-1, PN 40 <sup>1)</sup>	235 (9.25)	34 (1.34)					17.5 (39)
	ASME B16.5 CL 150	235 (9.25)	29 (1.14)					15.5 (34)
	ASME B16.5 CL 300	255 (10.04)	38.5 (1.52)					25.5 (56)
	JIS 5K	200 (7.87)	24 (0.94)					13 (29)
	JIS 10K, 20K	235 (9.25)	29 (1.14)					16 (35)
AS2129 table D, E	235 (9.25)	29 (1.14)					16 (35)	
DN 125 (5")	EN 1092-1, PN 16 <sup>1)</sup>	270 (10.63)	38.5 (1.52)	250 (9.84)	318 (12.52)	332 (13.07)	254 (10.0)	21 (46)
	EN 1092-1, PN 40 <sup>1)</sup>	270 (10.63)	36 (1.42)					21 (46)
	ASME B16.5 CL 150	270 (10.63)	38.5 (1.52)					21 (46)
	ASME B16.5 CL 300	280 (11.02)	42 (1.65)					32 (70)
	JIS 5K, 10K, 20K	270 (10.63)	38.5 (1.52)					21 (46)
	AS2129 table D, E	270 (10.63)	38 (1.50)					21 (46)

Table 24: Dimensions DN 80 ... 125 (3 ... 5")

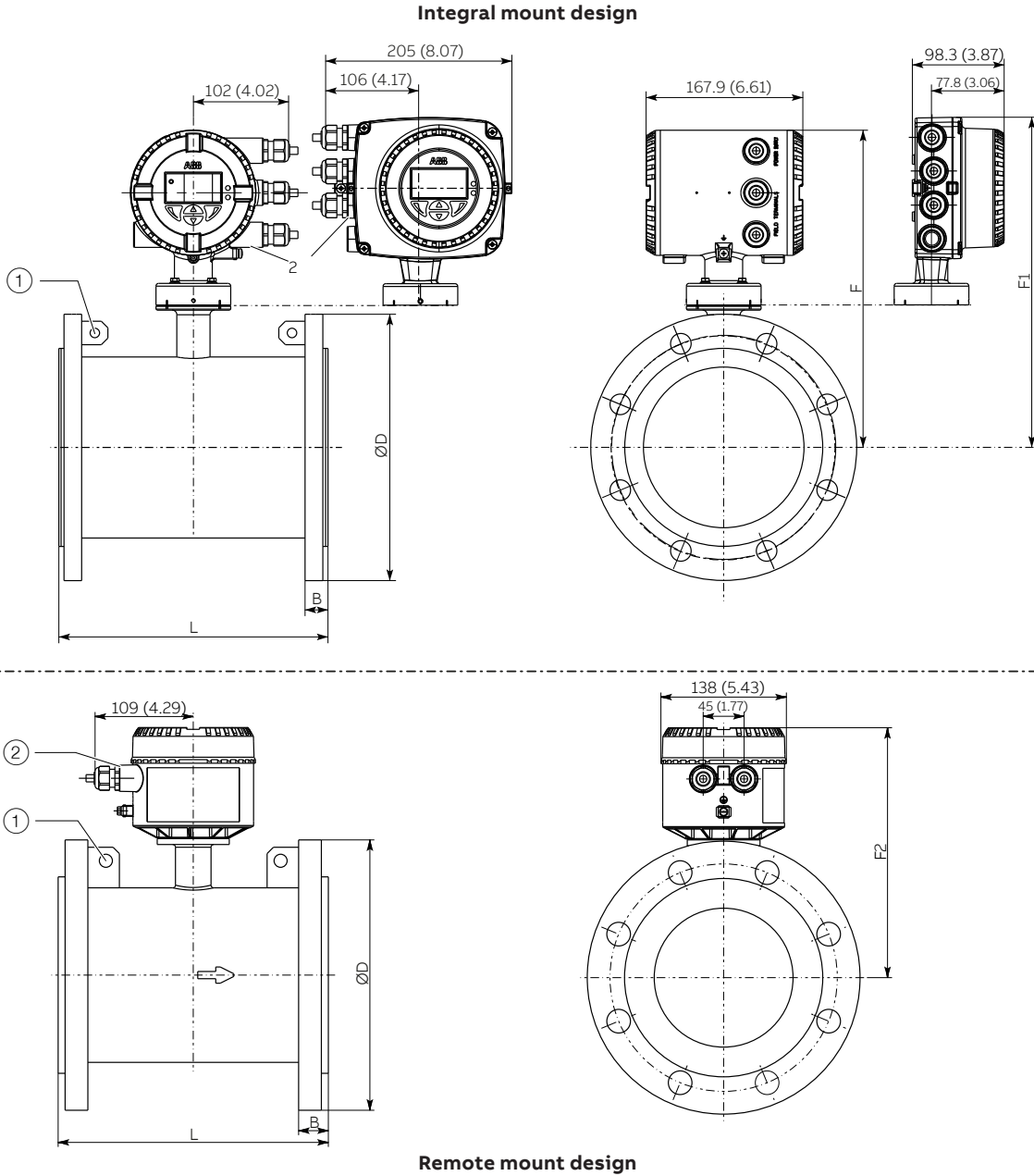
Tolerance for L: +0 / -3 mm (+0 / -0.018 in.)

- 1) Other pressure ratings on request.
- 2) If a grounding ring is fitted (attached to one side of the flange), dimension L increases by 5 mm (0.197 in.).
- 3) If protection plates are fitted (attached to both sides of the flange), dimension L increases by 10 mm (0.394 in.).
- 4) For devices in high-temperature design, dimension F, F1, F2 increases by +127 mm (+5.0 in.).

## ... Flowmeter sensor

### Flange DN 150 ... 600 (1 ... 24"), cast iron sensor housing – Design level "B"

All specified dimensions and weights are in mm (in.) or kg (lb). The stated weights are approximate; the maximum weight is always stated.



① Transport lugs

② Female thread (either 1/2" NPT or M20 x 1,5) refer to model coding. With 1/2" NPT there will be a plug instead of the PG cable inlet.

Fig. 27

Dimensions – Flange device, cast iron sensor housing Design level "B"								
Nominal diameter	Process connection	D	B	L <sup>2) 3)</sup>	F <sup>7)</sup>	F1 <sup>7)</sup>	F2 <sup>7)</sup>	Weight
DN 150 (6")	EN 1092-1, PN 16 <sup>1)</sup>	300 (11.81)	31.5 (1.24)	300 (11.81)	339 (13.35)	353 (13.90)	275 (10.83)	41 (90)
	EN 1092-1, PN 40 <sup>1)</sup>	300 (11.81)	38.5 (1.52)					41 (90)
	ASME B16.5 CL 150	280 (11.02)	32.5 (1.28)					36 (79)
	ASME B16.5 CL 300	320 (12.60)	44 (1.73)					47 (104)
	JIS 5K, 10K	300 (11.81)	31 (1.22)					41 (90)
	JIS 20K	305 (12.01)	36.5 (1.44)					37 (82)
	AS2129 table D	300 (11.81)	31 (1.22)					41 (90)
	AS2129 table E	280 (11.02)	24 (0.94)					31 (68)
DN 200 (8")	EN 1092-1, PN 10, PN 16 <sup>1)</sup>	375 (14.76)	35 (1.38)	350 (13.78)	364 (14.33)	378 (14.88)	301 (11.85)	66 (145)
	EN 1092-1 PN 25 <sup>1)</sup>	360 (14.17)	40 (1.57)					52 (115)
	EN 1092-1 PN 40 <sup>1)</sup>	375 (14.76)	44 (1.73)					59 (130)
	ASME B16.5 CL 150	375 (14.76)	35 (1.38)					66 (145)
	ASME B16.5 CL 300	380 (14.96)	51 (2.01)					67 (148)
	JIS 5K	320 (12.60)	28 (1.10)					38 (84)
	JIS 10K	330 (12.99)	30 (1.18)					40 (88)
	JIS 20K	375 (14.76)	35 (1.38)					66 (145)
	AS2129 table D, E	375 (14.76)	35 (1.38)					51 (112)
DN 250 (10")	EN 1092-1, PN 10 <sup>1)</sup>	405 (15.94)	37 (1.46)	450 (17.72)	390 (15.35)	404 (15.91)	326 (12.83)	49 (108)
	EN 1092-1, PN 16 <sup>1)</sup>	405 (15.94)	37 (1.46)					49 (108)
	EN 1092-1, PN 25 <sup>1)</sup>	425 (16.73)	40 (1.57)					60 (132)
	EN 1092-1, PN 40 <sup>1)</sup>	450 (17.72)	47 (1.85)					90 (198)
	ASME B16.5, CL 150	405 (15.94)	45.5 (1.79)					71 (156)
	ASME B16.5, CL 300	444.5 (17.50)	61 (2.40)					96 (211)
	JIS 5K, 10K	405 (15.94)	37 (1.46)					49 (108)
	JIS 20K	430 (16.93)	39 (1.45)					61 (135)
	AS2129 table D, E	405 (15.94)	37 (1.46)					49 (108)
DN 300 (12")	EN 1092-1, PN 10, PN 16 <sup>1)</sup>	475 (18.70)	38.5 (1.52)	500 (19.68)	415 (16.34)	429 (16.89)	351 (13.82)	71 (156)
	EN 1092-1, PN 25 <sup>1)</sup>	485 (19.09)	44 (1.73)					85 (187)
	EN 1092-1, PN 40 <sup>1)</sup>	515 (20.28)	58 (2.28)					95 (209)
	ASME B16.5, CL 150	485 (19.09)	50.5 (1.99)					111 (245)
	ASME B16.5, CL 300	521 (20.51)	69 (2.72)					141 (311)
	JIS 5K, 10K	475 (18.70)	38.5 (1.52)					61 (134)
	JIS 20K	480 (18.90)	42 (1.65)					81 (178)
	AS2129 table D, E	475 (18.70)	38.5 (1.52)					61 (134)

Table 25: Dimensions DN 150 ... 300 (6 ... 12")

Tolerance for L: DN 150 ... 200 +0 / -3 mm (+0 / -0,018 in.), DN 250 ... 300 +0 / -5 mm (+0 / -0,197 in.)

- 1) Other pressure ratings on request.
- 2) If a grounding ring is fitted (attached to one side of the flange), dimension L increases by 5 mm (0.197 in.).
- 3) If protection plates are fitted (attached to both sides of the flange), dimension L increases by 10 mm (0.394 in.).
- 4) For devices in high-temperature design, dimension F, F1, F2 increases by +127 mm (+5.0 in.).

## Transmitter

### Features

- 4 ... 20 mA current output
- Current output in the event of an alarm can be configured to 21 ... 22.6 mA (NAMUR NE43)
- Measuring range: Can be configured between 0.02 ...  $2 \times Q_{\max} \text{ DN}$
- Operating mode for flow measurement can be configured
- Programmable digital output. Can be configured as frequency output, pulse output or binary output.
- Two slots for optional plug-in cards for retrofitting additional current / digital outputs or a digital input.
- Damping: 0.04 ... 100 s configurable ( $1 \tau$ )
- Low flow cut-off: 0 ... 20 % for current and pulse output
- Parameterization by means of HART communication
- Empty pipe detection<sup>1)</sup>
- Simulation of current and binary output (manual process execution)

1) Requirements for Empty Pipe detector function:  
The conductivity of the fluid must be  $\geq 20 \mu\text{S}/\text{cm}$   
Nominal diameter must be  $\geq \text{DN } 10$

### LCD indicator (option)

- High-contrast LCD indicator
- Display of the current flow rate as well as the total flow rate
- Application-specific visualizations which the user can select. Two operator pages can be configured to display multiple values in parallel.
- Plain text fault diagnostics
- Menu-guided parameterization with four buttons
- "Easy Set-up" function for fast commissioning
- Parameterization of the device through the front glass with the housing closed

### Isolation of outputs

The digital output terminals 41 / 42 and 51 / 52 have a common ground.

The current output and the digital outputs are electrically isolated from each other.

### Optional plug-in cards

The transmitter has two slots (OC1, OC2) in which plug-in cards can be inserted to provide additional inputs and outputs.

The slots are located on the transmitter motherboard and can be accessed after removing the front housing cover.

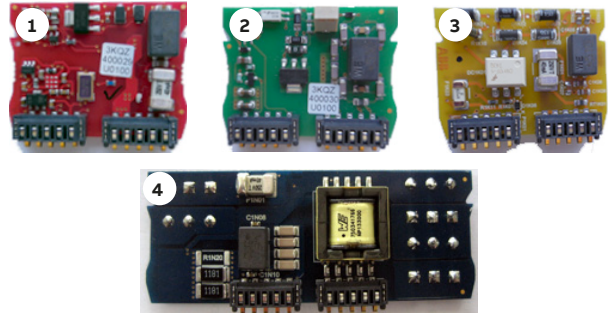


Fig. 28: Optional plug-in cards

Plug-in card		Number <sup>1)</sup>
①	Passive current output, 4 ... 20 mA (red) Order no. 3KQZ400029U0100	2
②	Passive digital output (green) Order no. 3KQZ400030U0100	1
③	Passive digital input (yellow) 3KQZ400032U0100	1
④	24 V DC power supply (blue) 3KQZ400031U0100	1

Table 26: Available plug-in cards

1) The "Number" column indicates the maximum number of plug-in cards of the same type that can be used.

### NOTICE

For an overview of possible plug-in card combinations, please refer to chapter "Optional plug-in cards" on page 40.



## IP rating

In accordance with EN60529: IP 65 / IP 67, NEMA 4X

## Vibration

In accordance with EN 60068-2

- In the 10 ... 58 Hz range, max. deflection 0.15 mm (0.006 inch)<sup>1)</sup>
- In the range of 58 ... 150 Hz, max. acceleration 2 g<sup>1)</sup>

1) Peak load

## Temperature data

	Standard	Optional
Ambient temperature	-20 ... 70 °C (-4 ... 158 °F)	-40 ... 70 °C (-40 ... 158 °F)
Storage temperature	-40 ... 70 °C (-40 ... 158 °F)	-

## NOTICE

When operating below -20 °C (-4 °F), the LCD display can no longer be read. Full functionality is assured at temperatures above -20 °C (-4 °F).

## Housing design

### Integral mount design

Housing	Cast aluminum, painted
Paint	≥ 80 µm thick, RAL 9002 (gray white)
Cable gland <sup>1)</sup>	Polyamide Stainless steel <sup>2)</sup>

### Remote mount design

Housing	Cast aluminum, painted
Paint	≥ 80 µm thick, RAL 9002 (gray white)
Cable gland <sup>1)</sup>	Polyamide Stainless steel <sup>2)</sup>
Weight	4.5 kg (9.92 lb)

1) Cable gland with M 20 x 1.5 or NPT thread, to be selected via the order number.  
2) On explosion-proof design for ambient temperature of -40 °C (-40 °F).

## Transmitter

### Dimensions

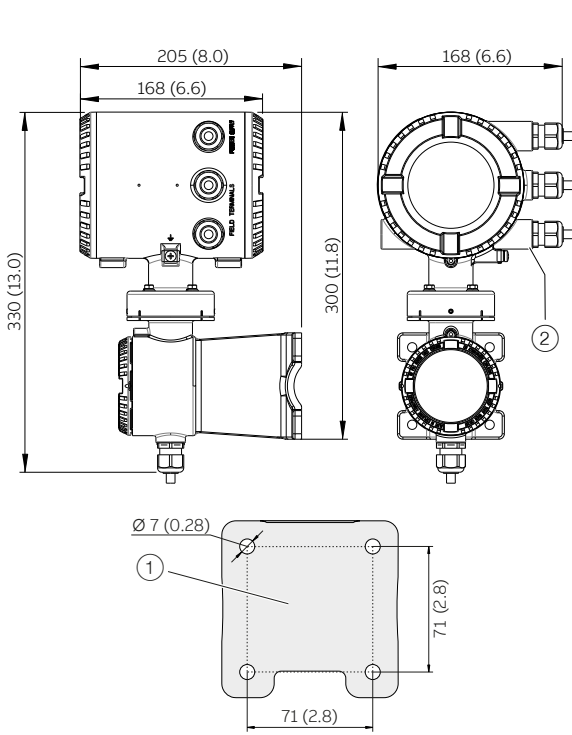


Fig. 29: Mounting dimensions of double-compartment housing

Pos.	Description
①	Hole pattern for mounting holes
②	Female thread (either 1/2" NPT or M20 x 1,5) refer to model coding. With 1/2" NPT there will be a plug instead of the PG cable inlet.

Table 27: Legend

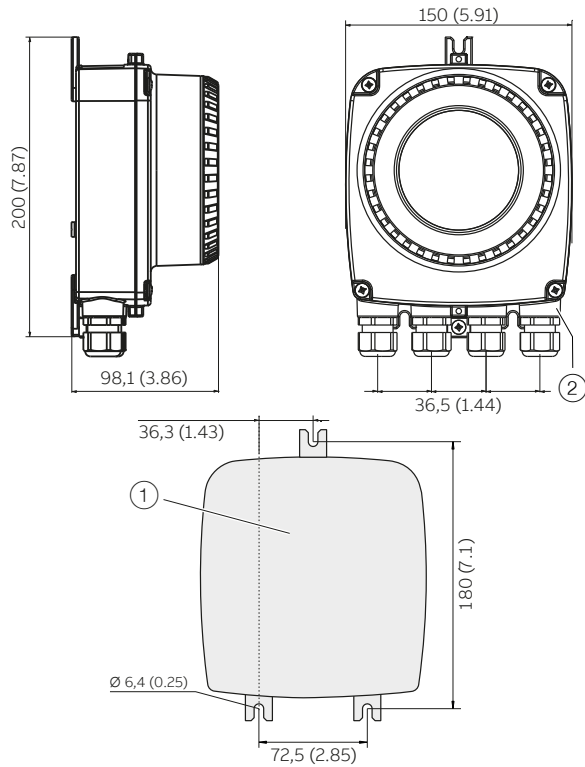


Fig. 30: Mounting dimensions single-compartment housing

Pos.	Description
①	Hole pattern for mounting holes
②	Female thread (either 1/2" NPT or M20 x 1,5) refer to model coding. With 1/2" NPT there will be a plug instead of the PG cable inlet

Table 28: Legend

## Electrical connections

### Connection diagram

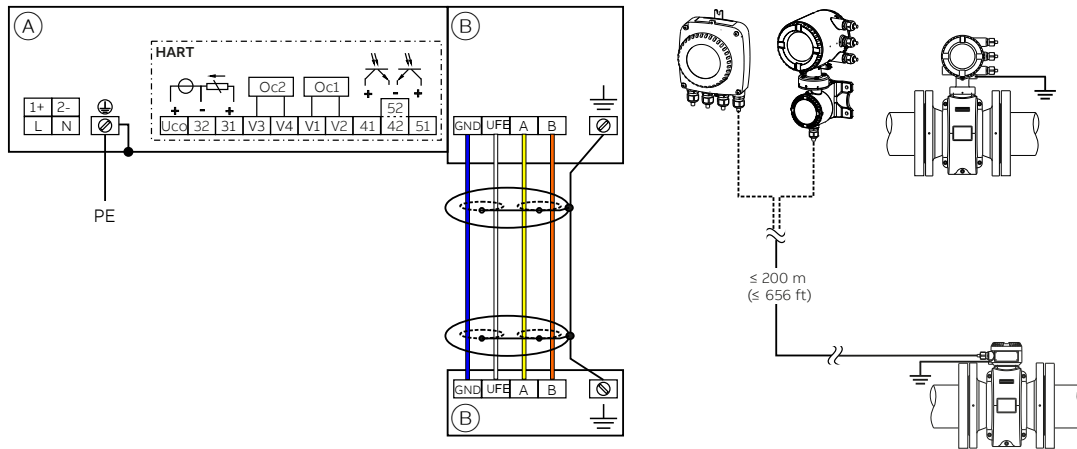


Fig. 31: Electrical connections

Pos.	Description
①	Connections for power supply and inputs / outputs
②	Connections for signal cable (remote mount design only)

Table 29: Legend

### NOTICE

For detailed information about grounding the transmitter and the flowmeter sensor, please refer to chapter "Grounding" in the Commissioning instruction or the operating instruction.

### Connections for the power supply

AC voltage	
Terminal	Function / comments
L	Phase
N	Neutral conductor
PE / ⊕	Protective earth (PE)
⏚	Potential equalization

AC voltage	
Terminal	Function / comments
1+	+
2-	-
PE / ⊕	Protective earth (PE)
⏚	Potential equalization

### Connections for inputs and outputs

Terminal	Function / comments
Uc0 / 32	Active 4 ... 20 mA current output / HART or Passive 4 ... 20 mA current output / HART
31 / 32	Passive 4 ... 20 mA current output / HART
41 / 42	Passive digital output DO1
51 / 52	Passive digital output DO2
V1 / V2	Plug-in card, slot Oc1
V3 / V4	Plug-in card, slot Oc2

For details, see chapter "Optional plug-in cards" on page 40.

### Connecting the signal cable

Only for remote mount design.

The sensor housing and transmitter housing must be connected to potential equalization.

Terminal	Function / comments
UFE	Sensor power supply
GND	Ground
A	Data line
B	Data line
⏚	Functional earth / Shielding

## ... Electrical connections

### Electrical data for inputs and outputs

#### Power supply

##### AC power supply

Terminals	L / N
Operating voltage	100 ... 240 V AC (-15 % / +10 %), 47 ... 64 Hz
Power consumption	S <sub>max</sub> : < 20 VA
Switch-on current	18.4 A, t < 3 ms

##### DC voltage supply

Terminals	1+ / 2-
Operating voltage	16.8 ... 30 V DC
Ripple	< 5 %
Power consumption	P <sub>max</sub> : < 20 W
Switch-on current	21 A, t < 10 ms

#### HART communication

A HART DTM in accordance with FDT1.2 standards is available. HART protocol based Integrations in other Tools or systems (e.g., Emerson AMS/Siemens PCS7) are available on request. The DTM, the DD and EDD is available for download from [www.abb.com/flow](http://www.abb.com/flow).

#### HART output

Terminals	Active: U <sub>co</sub> / 32 Passive: 31 / 32
Protocol	HART 7.1
Transmission	FSK modulation on current output 4 ... 20 mA in accordance with Bell 202 standard
Baud rate	1200 baud
Signal amplitude	Maximum 1.2 mAss
Current output load	Minimum 250 Ω
Cable	0,25 mm <sup>2</sup> (AWG 24), twisted
Maximum cable length	1200 m (3937 ft)

#### Current output U<sub>co</sub> / 32, 31 / 32

Can be configured for outputting mass flow and volume flow.

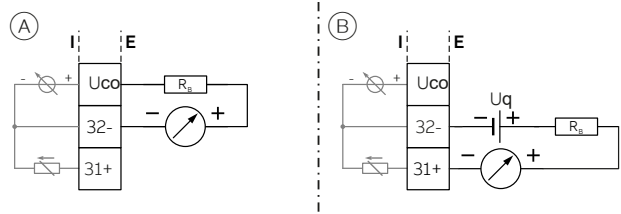
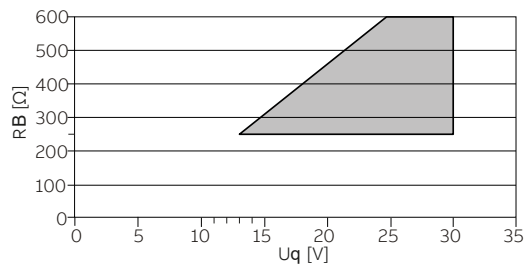


Fig. 32: (I = internal, E = external, R<sub>b</sub> = load, U<sub>q</sub> = Source voltage)

(A) Active current output U<sub>co</sub> / 32

(B) Passive current output 31 / 32



Permissible source voltage U<sub>q</sub> for passive outputs in relation to load resistance where I<sub>max</sub> = 22 mA. ■ = Permissible range

Fig. 33: Source voltage for passive outputs

	Active	Passive
Terminals	U <sub>co</sub> / 32	31 / 32
Output signal	4 ... 20 mA or 4 ... 12 ... 20 mA, switchable	4 ... 20 mA
Load R <sub>b</sub>	250 Ω ≤ R <sub>b</sub> ≤ 300 Ω	250 Ω ≤ R <sub>b</sub> ≤ 600 Ω
Source voltage U <sub>q</sub> <sup>1)</sup>	•	13 V ≤ U <sub>q</sub> ≤ 30 V
Measuring error	< 0.1 % of measured value	
Isolation	The current output and the digital outputs are electrically isolated from each other.	

Table 30: Electrical data current output U<sub>co</sub> / 32, 31 / 32

1) The source voltage U<sub>q</sub> depends on the load R<sub>b</sub> and must be within the permissible range.

**Digital output 41 / 42, 51 / 52**

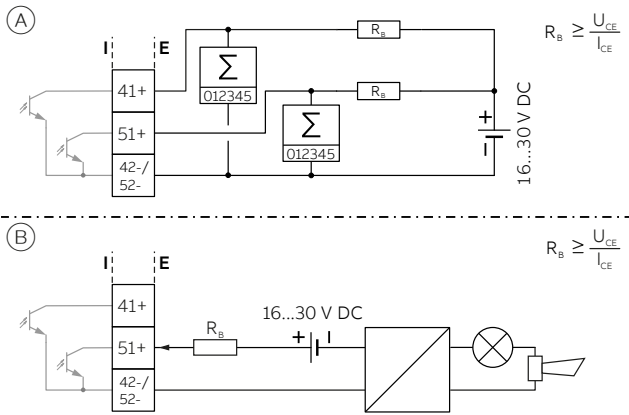


Fig. 34: (I = internal, E = external, R<sub>b</sub> = load)

- (A) Passive digital output 41 / 42, 51 / 52 as pulse or frequency output
- (B) Passive digital output 51 / 52 as binary output

Pulse / frequency output (passive)	
Terminals	41 / 42, 51 / 52
Output "closed"	0 V ≤ U <sub>CEL</sub> ≤ 3 V For f < 2.5 kHz: 2 mA < I <sub>CEL</sub> < 30 mA For f > 2.5 kHz: 10 mA < I <sub>CEL</sub> < 30 mA
Output "open"	16 V ≤ U <sub>CEH</sub> ≤ 30 V DC 0 mA ≤ I <sub>CEH</sub> ≤ 0.2 mA
f <sub>max</sub>	10.5 kHz
Pulse width	0.1 ... 2000 ms

Binary output (passive)	
Terminals	41 / 42, 51 / 52
Output "closed"	0 V ≤ U <sub>CEL</sub> ≤ 3 V 2 mA ≤ I <sub>CEL</sub> ≤ 30 mA
Output "open"	16 V ≤ U <sub>CEH</sub> ≤ 30 V DC 0 mA ≤ I <sub>CEH</sub> ≤ 0.2 mA
Switching function	Configurable

Table 31: Electrical data digital output 41 / 42, 51 / 52

**NOTICE**

- The Terminals 42 / 52 have a common ground. The Digital outputs 41 / 42 and 51 / 52 are not electrically isolated from each other. An electrically isolated digital output can be realized using a plug-in card.
- For mechanical counters, we recommend setting the pulse width to ≥ 30 ms and a maximum frequency of f<sub>max</sub> ≤ 3 kHz.

**Current output V1 / V2, V3 / V4 (plug-in card)**

Up to **two additional** current outputs can be implemented via the "Passive current output (red)" plug-in card. The plug-in card can be used in slot OC1 or in OC2.

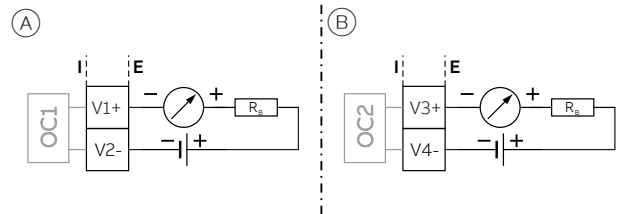
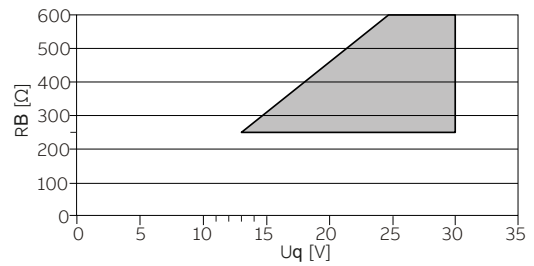


Fig. 35: (I = internal, E = external, R<sub>b</sub> = load)

- (A) Passive current output V1 / V2
- (B) Passive current output V3 / V4



Permissible source voltage U<sub>q</sub> for passive outputs in relation to load resistance where I<sub>max</sub> = 22 mA. ■ = Permissible range

Fig. 36: Source voltage for passive outputs

Passive current output	
Terminals	V1 / V2, V3 / V4
Output signal	4 ... 20 mA
Load R <sub>b</sub>	250 Ω ≤ R <sub>b</sub> ≤ 600 Ω
Source voltage	13 V ≤ U <sub>q</sub> ≤ 30 V
Measuring error	< 0.1 % of measured value

Table 32: Electrical data current output V1 / V2, V3 / V4

1) The source voltage U<sub>q</sub> depends on the load R<sub>b</sub> and must be within the permissible range.

## ... Electrical connections

### Digital output V1 / V2, V3 / V4 (plug-in card)

An additional binary output can be implemented via the "Passive digital output (green)" plug-in card.

The plug-in card can be used in slot OC1 or in OC2.

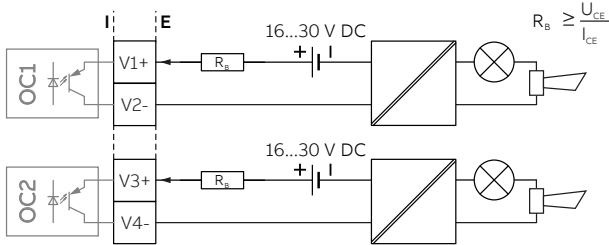


Fig. 37: Plug-in card as binary output (I = internal, E = external,  $R_b$  = load)

Binary output (passive)	
Terminals	V1 / V2, V3 / V4
Output "closed"	$0 \text{ V} \leq U_{\text{CEL}} \leq 3 \text{ V}$ $2 \text{ mA} < I_{\text{CEL}} < 30 \text{ mA}$
Output "open"	$16 \text{ V} \leq U_{\text{CEH}} \leq 30 \text{ V DC}$ $0 \text{ mA} \leq I_{\text{CEH}} \leq 0.2 \text{ mA}$
Switching function	Configurable

Table 33: Electrical data digital output V1 / V2, V3 / V4

### Digital input V1 / V2, V3 / V4 (plug-in card)

A digital input can be implemented via the "Passive digital input (yellow)" plug-in card.

The plug-in card can be used in slot OC1 or in OC2.

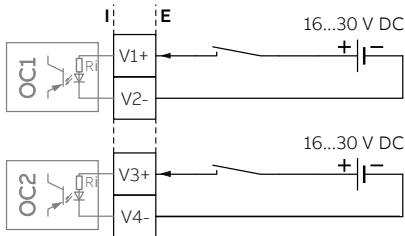


Fig. 38: Plug-in card as digital input (I = internal, E = external)

Digital input	
Terminals	V1 / V2, V3 / V4
Input "On"	$16 \text{ V} \leq U_{\text{KL}} \leq 30 \text{ V}$
Input "Off"	$0 \text{ V} \leq U_{\text{KL}} \leq 3 \text{ V}$
Internal resistance	$R_i = 6.5 \text{ k}\Omega$
Function	Configurable

Table 34: Electrical data digital input V1 / V2, V3 / V4

### 24 V DC power supply V1 / V2 (plug-in card)

The power supply plug-in card allows a passive output on the transmitter to be used as an active output. The power supply plug-in card allows a passive output on the transmitter to be used as an active output. See chapter "Connection examples" on page 47.

The plug-in card can only be used in slot OC1.

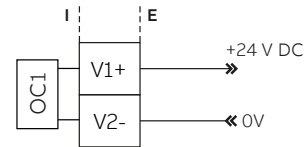


Fig. 39: (I = Internal, E = External)

### 24 V DC power supply

Terminals	V1 / V2
Function	For active connection of passive outputs
Output voltage	24 V DC at 0 mA, 17 V DC at 25 mA
Load rating $I_{\text{max}}$	25 mA, permanently short circuitproof

Table 35: Electrical data plug-in card 24 V DC power supply V1 / V2

### NOTICE

When using the device in potentially explosive atmospheres, the power supply plug-in card must only be used to power one passive output. It must not be connected to multiple passive outputs!

**Connection examples**

Input and output functions are configured via the device software in accordance with the desired application.

**Active digital output 41 / 42, 51 / 52, V3 / V4**

When the "24 V DC power supply (blue)" plug-in card is used, the digital outputs on the basic device and on the plug-in cards can also be wired as active digital outputs.

**NOTICE**

Each "power supply (blue)" plug-in card must only power one output.

It must not be connected to two outputs (e.g. digital output 41 / 42 and 51 / 52)!

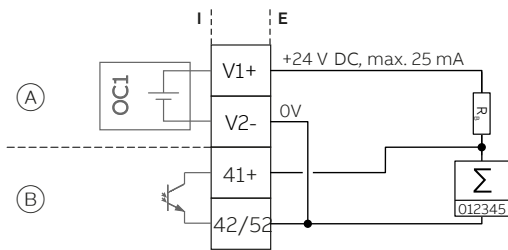


Fig. 40: Active digital output 41 / 42 (example)

- Ⓐ Plug-in card "Power supply (blue)" in slot 1
- Ⓑ Digital output 41 / 42

The connection example shows usage for digital output 41 / 42; the same applies to usage for digital output 51 / 52.

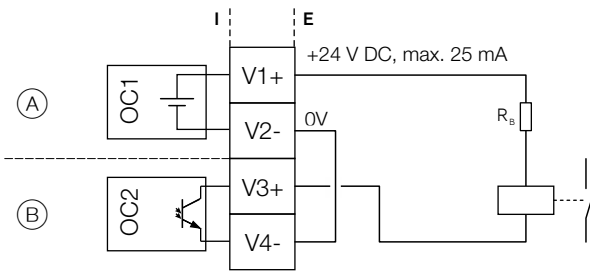


Fig. 41: Active digital output V3 / V4 (example)

- Ⓐ Plug-in card "Power supply (blue)" in slot 1
- Ⓑ Plug-in card "Digital output (green)" in slot 2

**Digital output 41 / 42, 51 / 52 passive connected to a Process Control System**

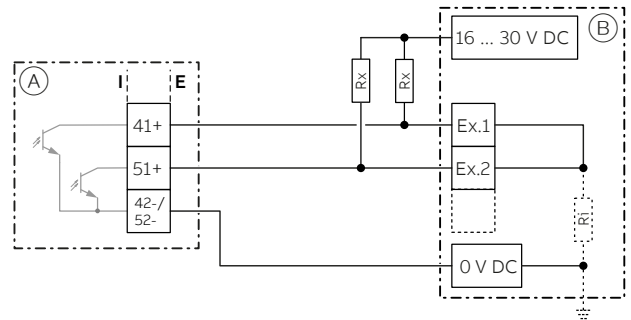


Fig. 42: Digital output 41 / 42, 51 / 52 passive connected to a Process Control System (Example)

Pos.	Description
Ⓐ	Transmitter
Ⓑ	Process Control System
Ex. 1	Input 1
Ex. 1	Input 2
R <sub>x</sub>	Resistor limiting the current
R <sub>i</sub>	Inner Resistor wit

Table 36: Legend

Resistor R<sub>x</sub> limits the current of the transmitter's Optocoupler output. The max. current is 25 mA. With 24 V DC voltage R<sub>x</sub> should be 1000 Ω / 1 W.

With „1“ (high state) at the digital output of the transmitter, the Input of the Process Control System will switch from 24 V DC to 0 V (low state).

## ... Electrical connections

### Active current output V3 / V4

When the "24 V DC power supply (blue)" plug-in card is used, the current output on the plug-in card can also be wired as the active current output.

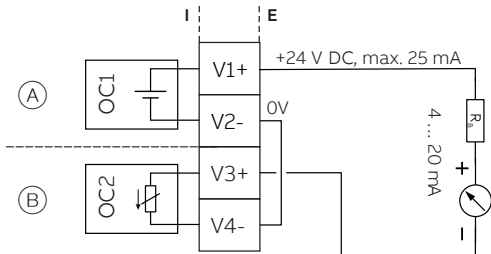


Fig. 43: Active current output V3 / V4 (example)

- Ⓐ Plug-in card "Power supply (blue)" in slot 1
- Ⓑ Plug-in card "Digital output (green)" in slot 2

### Active digital input V3 / V4

When the "24 V DC power supply (blue)" plug-in card is used, the digital input on the plug-in card can also be wired as the active digital input.

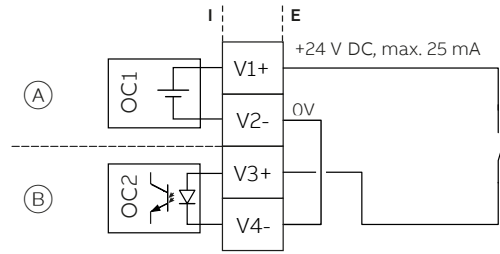


Fig. 44: Active digital input V3 / V4 (example)

- Ⓐ Plug-in card "Power supply (blue)" in slot 1
- Ⓑ Plug-in card "Passive digital input (yellow)" in slot 2



## Ordering Information

### ProcessMaster FEP631

Electromagnetic Flowmeter system, integral mount

	ProcessMaster FEP631	7,8	9,10	11,12,13,14	... 80,81
<b>Explosion Protection Certification</b>					
Without		Y0			
<b>Housing Type / Housing Material / Thread for Cable Glands</b>					
Single compartment / Aluminium / M20 x 1.5		4)	S1		
Single compartment / Aluminium / NPT 1/2 in.		4)	S2		
Dual compartment / Aluminium / M20 x 1.5		3)	D1		
Dual compartment / Aluminium / NPT 1/2 in.		3)	D2		
<b>Meter size</b>					
DN 3 (1/10 in.)				0003	
DN 4 (5/32 in.)				0004	
DN 6 (1/4 in.)				0006	
DN 8 (5/16 in.)				0008	
DN 10 (3/8 in.)				0010	
DN 15 (1/2 in.)				0015	
DN 20 (3/4 in.)				0020	
DN 25 (1 in.)				0025	
DN 32 (1-1/4 in.)				0032	
DN 40 (1-1/2 in.)				0040	
DN 50 (2 in.)				0050	
DN 65 (2-1/2 in.)				0065	
DN 80 (3 in.)				0080	
DN 100 (4 in.)				0100	
DN 125 (5 in.)				0125	
DN 150 (6 in.)				0150	
DN 200 (8 in.)				0200	
DN 250 (10 in.)				0250	
DN 300 (12 in.)				0300	
DN 350 (14 in.)				0350	
DN 400 (16 in.)				0400	
DN 450 (18 in.)				0450	
DN 500 (20 in.)				0500	
DN 600 (24 in.)				0600	
DN 700 (28 in.)				0700	
DN 750 (30 in.)				0750	
DN 800 (32 in.)				0800	
DN 900 (36 in.)				0900	
DN 1000 (40 in.)				1000	
DN 1050 (42 in.)				1050	

Continued on next page

## Ordering Information

ProcessMaster FEP631	7,8	...	11,12,13,14	15,16	17,18	19	20	...	80,81
<b>Meter size (continuation)</b>									
DN 1100 (44 in.)			1100						
DN 1200 (48 in.)			1200						
DN 1400 (54 in.)			1400						
DN 1500 (60 in.)			1500						
DN 1600 (66 in.)			1600						
DN 1800 (72 in.)			1800						
DN 2000 (80 in.)			2000						
<b>Process Connection Type</b>									
Flanges DIN PN 6				7)	D0				
Flanges DIN PN 10					D1				
Flanges DIN PN 16					D2				
Flanges DIN PN 25					D3				
Flanges DIN PN 40					D4				
Flanges DIN PN 63				6)	D5				
Flanges DIN PN 100				6)	D6				
Flansch ASME CL 150; B16.5 up to DN 600, B16.47 series B > DN 600				5)	A1				
Flansch ASME CL 300; B16.5 up to DN 600, B16.47 series B > DN 600				5)	A3				
Flansch ASME CL 600 RF				6)	A6				
Flanges JIS 10K					J1				
Flanges JIS 5K					J2				
Flanges JIS 20K					J3				
<b>Liner Material</b>									
Hard rubber				11)	R2				
Soft rubber				12)	R4				
ETFE				9)	E1				
PTFE				13)	T1				
PFA				10)	P1				
Thick PTFE				14)	T2				
Ceramic-Carbide				8)	C1				
Linatex				2)	R6				
Others					Z9				
<b>Process Connection Material</b>									
Carbon steel							B		
Stainless steel						15)	C		
Others							Z		
<b>Electrode Design</b>									
Standard								1	
Pointed head						16)	5		
Others								9	

Continued on next page

ProcessMaster FEP631	7,8	...	21	22	23	24,25	26	27	28,29	30	...	80,81
<b>Measuring Electrodes Material</b>												
Hast. C-4 (2.4610)			D									
Titanium			F									
Tantalum			G									
Hast. B-3 (2.4600)			H									
Platinum-Iridium			J									
Stainless steel 316Ti (1.4571)			S									
Double Layer		16)	W									
Tungsten Carbide, coated			T									
Others			Z									
<b>Grounding Electrode / Full Pipe Detection</b>												
No grounding electrode / No full pipe detection				0								
No grounding electrode / With full pipe detection			17)	1								
Grounding electrode / No full pipe detection			18)	2								
Grounding electrode / With full pipe detection			19)	3								
Others				9								
<b>Grounding Accessories</b>												
Without					A							
Grounding ring (1 off), mounted to flange				20)	B							
Grounding ring (2 off), mounted to flange				20)	C							
Others					Z							
<b>Protection Class Transmitter / Protection Class Sensor</b>												
IP 67 / IP 67						70						
<b>Power Supply</b>												
100 ... 230 V AC, 50 Hz							A					
24 V DC, 50 Hz							D					
100 ... 230 V AC, 60 Hz							C					
24 V DC, 60 Hz							E					
<b>Display</b>												
Without								0				
Display with Keypad								2				
<b>Outputs</b>												
Current output (active), 2 Digital outputs(passive)								21)	GO			
<b>Design Level</b>												
Specified by ABB									22)	A		
Specified by ABB									22)	B		

Continued on next page

## Ordering Information

ProcessMaster FEP631	7,8	...	31,32,33	34,35,36	37,38	39,40,41	42,43,44	45,46	47,48	49,50	51,52,53	54,55,56	...	80,81
<b>Option Card 1</b>														
Without			DR0											
1 x Digital Input			DRN											
1 x Digital Output			DRG											
24 V DC transmitter loop power supply			DRT											
1 x Analog Output passive (4...20mA)			DRA											
<b>Option Card 2</b>														
Without				DS0										
1 x Analog Output passive (4...20mA)				DSA										
1 x Digital Input				DSN										
1 x Digital Output				DSG										
<b>Usage Certifications</b>														
Without					C0									
Inspection certificate 3.1 acc. EN 10204					C2									
Others					CZ									
<b>Calibration Certifications</b>														
ABB Standard						CMA								
3rd party witnessed calibration						CMW								
5-point calibration acc. DAKKS					23)	CMD								
<b>Other Usage Certifications</b>														
Meter tube with PED certificate							CRP							
Meter tube without PED certificate (For China and USA production site only)														
CRA														
<b>Sensor Length</b>														
ABB Standard							J6							
<b>Other Options</b>														
Without									K0					
With Gore-tex membrane									KG					
<b>Documentation Language</b>														
German										M1				
English										M5				
Language package Western Europe / Scandinavia														
MW														
Language package Eastern Europe										ME				
Others										MZ				
<b>Pressure Bearing Parts Material Source</b>														
Standard											MS0			
<b>Tests and Reports</b>														
Without													CRO	
Pressure test acc. to DIN													CPD	

Continued on next page



## Ordering Information

### Notes for ProcessMaster FEP631

- 1) Not available with Single Compartment Housing
- 2) For China production site only.
- 3) Not available with Div1 in conjunction with -40°C
- 4) Not available with Zone 1 / Div 1
- 5) Flange DN 15 ... 600 according to ASME B16.5. Flange > DN 600 according to ASME 16.47 Serie B.
- 6) DN 25 ... DN 200 (1 ... 8 in.) Hard Rubber
- 7) Available from DN 1000 (40 in.)
- 8) Available from DN25-1000. With Tungsten-Carbide electrode only
- 9) Available from DN25-1000
- 10) Available from DN3-200
- 11) Available from DN25
- 12) Available from DN50
- 13) Available from DN10-600
- 14) Available from DN25-300
- 15) Material: Refer to data sheet. Available with Design Level A
- 16) Available from DN10-400
- 17) TFE Electrode for detection of partial filling, available from DN 50 (2 in.)
- 18) Grounding electrodes, material same as measuring electrodes material
- 19) Grounding electrodes, material same as measuring electrodes material TFE Electrode for detection of partial filling, available from DN 50 (2 in.)
- 20) Available with sensor size <= DN 600 (24 in.) and PTFE / Thick-PTFE / ETFE / PFA liner material. For material, refer to data sheet
- 21) Current output (active or passive) can be configured on site
- 22) Will be specified by ABB
- 23) Available with sensor size DN 50 ... DN 600 (2 ... 24 in.) / DN 800 (32 in.) and 5points Calibration
- 24) Not available with size DN 3-8 and > DN900. 0,2% calibration assumes 3 calibration points. If more than 3 calibration points are required, specify 5 points under "Number of test points".
- 25) 2 points calibration is Standard. If more than 2 test points are required, please specify 3 or 5 points with option "Number of Test points". Accuracy = 0.4 % of rate with size > DN 3
- 26) 3 or 5 test points to be specified
- 27) Maximum fluid temperature with standard sensor design:
  - 130 °C (266 °F) with PTFE, PFA, ETFE
  - 80 °C (194 °F / 176 °F) with hard rubber
  - 60 °C (140 °F) with soft rubber
- 28) Max. fluid temperature with high temperature sensor design:
  - 180 °C (356 °F) with PFA, Thick PTFE.
  - 130 °C (266 °F) with ETFE, PTFE liners.
  - Thick PTFE available for sensor size DN 25 ... DN 300. PFA available for sensor size DN 10 ... DN 200
- 29) Not available with Dakks calibration

## ProcessMaster FEP632

Electromagnetic Flowmeter system, remote mount design

	ProcessMaster FEP632	7,8	9,10	11,12,13,14	...	82,83
<b>Explosion Protection Certification</b>						
Without		Y0				
<b>Housing Type / Housing Material / Thread for Cable Glands</b>						
Remote / Plastic / M20 x 1.5			P1			
Remote / Plastic / NPT 1/2 in.			P2			
Remote / Aluminum / M20 x 1.5			A1			
Remote / Aluminum / NPT 1/2 in.			A2			
<b>Meter size</b>						
DN 3 (1/10 in.)				0003		
DN 4 (5/32 in.)				0004		
DN 6 (1/4 in.)				0006		
DN 8 (5/16 in.)				0008		
DN 10 (3/8 in.)				0010		
DN 15 (1/2 in.)				0015		
DN 20 (3/4 in.)				0020		
DN 25 (1 in.)				0025		
DN 32 (1-1/4 in.)				0032		
DN 40 (1-1/2 in.)				0040		
DN 50 (2 in.)				0050		
DN 65 (2-1/2 in.)				0065		
DN 80 (3 in.)				0080		
DN 100 (4 in.)				0100		
DN 125 (5 in.)				0125		
DN 150 (6 in.)				0150		
DN 200 (8 in.)				0200		
DN 250 (10 in.)				0250		
DN 300 (12 in.)				0300		
DN 350 (14 in.)				0350		
DN 400 (16 in.)				0400		
DN 450 (18 in.)				0450		
DN 500 (20 in.)				0500		
DN 600 (24 in.)				0600		
DN 700 (28 in.)				0700		
DN 750 (30 in.)				0750		
DN 800 (32 in.)				0800		
DN 900 (36 in.)				0900		
DN 1000 (40 in.)				1000		
DN 1050 (42 in.)				1050		

Continued on next page

## ... Ordering Information

ProcessMaster FEP632	7,8	...	11,12,13,14	15,16	17,18	19	20	...	82,83
<b>Meter size (continuation)</b>									
DN 1100 (44 in.)			1100						
DN 1200 (48 in.)			1200						
DN 1400 (54 in.)			1400						
DN 1500 (60 in.)			1500						
DN 1600 (66 in.)			1600						
DN 1800 (72 in.)			1800						
DN 2000 (80 in.)			2000						
<b>Process Connection Type</b>									
Flanges DIN PN 6				4) D0					
Flanges DIN PN 10				D1					
Flanges DIN PN 16				D2					
Flanges DIN PN 25				D3					
Flanges DIN PN 40				D4					
Flanges DIN PN 63				3) D5					
Flanges DIN PN 100				3) D6					
Flansch ASME CL 150; B16.5 up to DN 600, B16.47 series B > DN 600				2) A1					
Flansch ASME CL 300; B16.5 up to DN 600, B16.47 series B > DN 600				2) A3					
Flansch ASME CL 600 RF				3) A6					
Flanges JIS 10K				J1					
Flanges JIS 5K				J2					
Flanges JIS 20K				J3					
<b>Liner Material</b>									
Hard rubber				8) R2					
Soft rubber				9) R4					
ETFE				6) E1					
PTFE				10) T1					
PFA				7) P1					
Thick PTFE				11) T2					
Ceramic-Carbide				5) C1					
Linatex				1)					
Others				Z9					
<b>Process Connection Material</b>									
Carbon steel							B		
Stainless steel						12)	C		
Others							Z		
<b>Electrode Design</b>									
Standard								1	
Pointed head						13)	5		
Others								9	

Continued on next page



ProcessMaster FEP632	7,8	...	21	22	23	24,25	26	27	28,29	30	...	82,83
<b>Measuring Electrodes Material</b>												
Hast. C-4 (2.4610)			D									
Titanium			F									
Tantalum			G									
Hast. B-3 (2.4600)			H									
Platinum-Iridium			J									
Stainless steel 316Ti (1.4571)			S									
Double Layer		13)	W									
Tungsten Carbide, coated			T									
Others			Z									
<b>Grounding Electrode / Full Pipe Detection</b>												
No grounding electrode / No full pipe detection				0								
No grounding electrode / With full pipe detection			14)	1								
Grounding electrode / No full pipe detection			15)	2								
Grounding electrode / With full pipe detection			16)	3								
Others				9								
<b>Grounding Accessories</b>												
Without					A							
Grounding ring (1 off), mounted to flange				17)	B							
Grounding ring (2 off), mounted to flange				17)	C							
Others					Z							
<b>Protection Class Transmitter / Protection Class Sensor</b>												
IP 67 / IP 67						70						
IP 67 / IP 68					18)	76						
IP 67 / IP 68, signal cable fitted and potted					19)	77						
<b>Power Supply</b>												
Without							Y					
<b>Display</b>												
Without								0				
<b>Outputs</b>												
Without									Y0			
<b>Design Level</b>												
Specified by ABB									20)	A		
Specified by ABB									20)	B		

Continued on next page

## ... Ordering Information

ProcessMaster FEP632	7,8	...	31,32,33	34,35,36	37,38	39,40,41	42,43,44	45,46	47,48	49,50	51,52	53,54,55	56,57,58	...	82,83
<b>Option Card 1</b>															
Without			DRO												
<b>Option Card 2</b>															
Without				DSO											
<b>Usage Certifications</b>															
Without					C0										
Inspection certificate 3.1 acc. EN 10204					C2										
Others					CZ										
<b>Calibration Certifications</b>															
ABB Standard						CMA									
3rd party witnessed calibration						CMW									
5-point calibration acc. DAKKS						21) CMD									
<b>Other Usage Certifications</b>															
Meter tube with PED certificate								CRP							
Meter tube without PED certificate (For China and USA production site only)								CRA							
<b>Power Supply Line Frequency</b>															
50 Hz								22) F5							
60 Hz								23) F6							
<b>Sensor Length</b>															
ABB Standard										J6					
<b>Other Options</b>															
Without										K0					
With Gore-tex membrane										KG					
<b>Documentation Language</b>															
German										M1					
English										M5					
Language package Western Europe / Scandinavia										MW					
Language package Eastern Europe										ME					
Others										MZ					
<b>Pressure Bearing Parts Material Source</b>															
Standard												MS0			
<b>Tests and Reports</b>															
Without												CRO			
Pressure test acc. to DIN												CPD			

Continued on next page

ProcessMaster FEP632	7,8	...	59,60,61	62,63,64	65,66,67	68,69,70	71,72,73	...	82,83
<b>Sensorhousing Material</b>									
Standard			SMA						
<b>Configuration Type</b>									
Parameters set to factory defaults				NC1					
Parameters set customer specific				NCC					
<b>Transmitter Software Function Package</b>									
Standard					NFS				
Enhanced diagnostics					NFE				
Batch Functionality					NFB				
<b>Calibration Type</b>									
0,4% Factory Calibration						25)	RCD		
0,3% Factory Calibration (Option)						26)	RCE		
0,2% Factory Calibration (Option)						24)	RCB		
<b>Signal Cable</b>									
Without								SC0	
5 m (approx. 15 ft)								SC1	
10 m (approx. 30 ft)								SC2	
15 m (approx. 49 ft)								SC3	
20 m (approx. 66 ft)								SC4	
25 m (approx. 82 ft)								SC5	
30 m (approx. 98 ft)								SC6	
35 m (approx. 115 ft)								SC7	
40 m (approx. 131 ft)								SC8	
50 m (approx. 164 ft)								SCA	
60 m (approx. 197 ft)								SCB	
70 m (approx. 230 ft)								SCC	
80 m (approx. 262 ft)								SCD	
100 m (approx. 328 ft)								SCE	
125 m (approx. 410 ft)								SCF	
150 m (approx. 492 ft)								SCG	
175 m (approx. 574 ft)								SCH	
200 m (approx. 656 ft)								SCJ	

Continued on next page

## ... Ordering Information

ProcessMaster FEP632	7,8	...	74,75	76,77,78	79,80,81	82,83
<b>Device Identification Plate</b>						
Adhesive label			TC			
Stainless steel			T1			
Stainless steel and TAG plate (stainless steel)			TS			
Others			TZ			
<b>Temperature Range of Installation / Ambient Temperature Range</b>						
Standard design / -20 ... 60 °C (-4 ... 140 °F)			27)	TK1		
Standard design / -40 ... 60 °C (-40 ... 140 °F)			27)	TK4		
High temperature design / -20 ... 60 °C (-4 ... 140 °F)			28)	TKH		
High temperature design / -40 ... 60 °C (-40 ... 140 °F)			28)	TKK		
<b>Number of Testpoints</b>						
2 Points				29)	TV2	
3 Points				29)	TV3	
5 Points					TV5	
<b>Verification Capability</b>						
Disabled						V0
Enabled						V1

## Notes for ProcessMaster FEP632

- 1) For China production site only.
- 2) Flange DN 15 ... 600 according to ASME B16.5. Flange > DN 600 according to ASME 16.47 Serie B.
- 3) DN 25 ... DN 200 (1 ... 8 in.) Hard Rubber
- 4) Available from DN 1000 (40 in.)
- 5) Available from DN25-1000. With Tungsten-Carbide electrode only
- 6) Available from DN25-1000
- 7) Available from DN3-200
- 8) Available from DN25
- 9) Available from DN50
- 10) Available from DN10-600
- 11) Available from DN25-300
- 12) Material: Refer to data sheet. Available with Design Level A
- 13) Available from DN10-400
- 14) TFE Electrode for detection of partial filling, available from DN 50 (2 in.)
- 15) Grounding electrodes, material same as measuring electrodes material
- 16) Grounding electrodes, material same as measuring electrodes material TFE Electrode for detection of partial filling, available from DN 50 (2 in.)
- 17) Available with sensor size <= DN 600 (24 in.) and PTFE / Thick-PTFE / ETFE / PFA liner material. For material, refer to data sheet
- 18) Only available with remote transmitter, sealing compound (optional) D141B038U01
- 19) Only available with remote transmitter
- 20) Will be specified by ABB
- 21) Available with sensor size DN 50 ... DN 600 (2 ... 24 in.) / DN 800 (32 in.) and 5 points Calibration
- 22) 50 Hz (to be specified in case no Tx is ordered)
- 23) 60 Hz (to be specified in case no Tx is ordered)
- 24) Not available with size DN 3-8 and > DN900. 0,2% calibration assumes 3 calibration points. If more than 3 calibration points are required, specify 5 points under "Number of test points".
- 25) 2 points calibration is Standard. If more than 2 testpoints are required, please specify 3 or 5 points with option "Number of Testpoints". Accuracy = 0.4 % of rate with size > DN 3
- 26) 3 or 5 testpoints to be specified
- 27) Max. fluid temperature with standard sensor design:
  - 130 °C (266 °F) with PTFE, PFA, ETFE
  - 80 °C (194 °F / 176 °F) with hard rubber
  - 60 °C (140 °F) with soft rubber
- 28) Max. fluid temperature with high temperature sensor design:
  - 180 °C (356 °F) with PFA, Thick PTFE. Thick PTFE available for sensor size DN 25 ... DN 300. PFA available for sensor size DN 10 ... DN 200
  - 130 °C (266 °F) with ETFE, PTFE liners.
- 29) Not available with Dakks calibration

### Remote transmitter FET632

FET632 Electromagnetic Flowmeter, remote transmitter for ProcessMaster FEP630

Remote transmitter FET632	7,8	9,10	11,12	13	14	15,16	17,18,19	20,21,22	...	37,38,39
<b>Explosion Protection Certification</b>										
Without	Y0									
<b>Housing Type / Housing Material / Thread for Cable Glands</b>										
Field-mount / Single compartment / Aluminum / 4 x M20 x 1.5	3)	F1								
Field-mount / Single compartment / Aluminum / 4 x NPT 1/2 in.	3)	F2								
Wall-mount / Dual compartment / Aluminum / M20 x 1.5 (in preparaton)		W1								
Wall-mount / Dual compartment / Aluminum / NPT 1/2 in. (in preparaton)		W2								
<b>Protection Class Transmitter / Protection Class Sensor</b>										
IP 67 / IP 67			70							
<b>Power Supply</b>										
100 ... 230 V AC, 50 Hz				A						
24 V DC, 50 Hz				D						
100 ... 230 V AC, 60 Hz				C						
24 V DC, 60 Hz				E						
<b>Display</b>										
Without					0					
Display with Keypad					2					
<b>Outputs</b>										
1 Current output (active or passive), 2 Digital Outputs (passive), HART					4)	G0				
<b>Option Card 1</b>										
Without							DR0			
1 x Digital Input							DRN			
1 x Digital Output							DRG			
24 V DC transmitter loop power supply							DRT			
1 x Analog Output passive (4...20mA)							DRA			
<b>Option Card 2</b>										
Without								DS0		
1 x Analog Output passive (4...20mA)								DSA		
1 x Digital Input								DSN		
1 x Digital Output								DSG		

Continued on next page

## Ordering Information

	Remote transmitter FET632	7,8	...	23,24,25	26,27	28,29	30,31	32,33,34	35,36	37,38,39
<b>Potable Water and Food &amp; Beverage Approvals</b>										
Without				CWY						
<b>Other Options</b>										
Without					K0					
With Gore-tex membrane					KG					
<b>Documentation Language</b>										
German						M1				
English						M5				
Language package Western Europe / Scandinavia						MW				
Language package Eastern Europe						ME				
<b>Device Identification Plate</b>										
Adhesive label							TC			
Stainless steel							T1			
Stainless steel and TAG plate (stainless steel)							TS			
Others							TZ			
<b>Temperature Range of Installation / Ambient Temperature Range</b>										
Standard design / -20 ... 60 °C (-4 ... 140 °F)								TK1		
Standard design / -40 ... 60 °C (-40 ... 140 °F)								TK4		
<b>Remote Transmitter Mounting Kit</b>										
Without									B0	
2" Pipe Mounting Kit for Wall-mount / Dual compartment Housing									B1	
2" Pipe Mounting Kit for Field-mount / Single compartment Housing									B2	
<b>Transmitter Software Function Package</b>										
Legacy support / Backward compatibility										NFL

1) Not available with Single Compartment Housing

2) Not available with -40°C. Not available with Single Compartment Housing

3) Not available with Zone 1 / Div.1

4) Current output (active or passive) can be configured on site

## Accessories

Description	Order code
Infrared service port adapter FZA100	FZA100
	
Installation set for NPT 1/2" cable gland. For sealing the cable conduit during outdoor installation.	3KXF081300L001
	
Adapter M20x1.5 to 1/2"NPT	D365B269U01
	
Signal cable	D173D031U01

**Sales**



**Service**



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## Notes



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## Notes

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## Notes



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