

ABB MEASUREMENT & ANALYTICS | DATA SHEET

# ProcessMaster wafer FEM630

## 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, 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 flow metering

## ProcessMaster wafer series

ProcessMaster wafer 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	FEM610 series	FEM630 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> dedicated wafer	✓	✓
<b>Measuring medium minimum conductivity</b>	20 µS/cm	5 µS/cm
<b>Measuring medium temperature</b>	-13...266 °F (-25...130 °C)	-13...266 °F (-25...130 °C)
<b>Pressure</b>	ASME CL 150, 300	ASME CL 150, 300
<b>Hazardous area</b>	–	Yes

Features	FEM610 series	FEM630 series
<b>Accuracy</b>	0.5 %	0.4 %
<b>Nominal diameter</b>	1/10" ... 4" (DN3 ... 100)	1/10" ... 4" (DN3 ... 100)
<b>Liner material</b>	ETFE (Tefzel)	ETFE (Tefzel)
<b>I/Os</b>	1 × analog, 2 × digital	1 × analog, 2 × digital, option for add-in modules
<b>Communication</b>	High Speed Infrared Port Communication based on HART DTM	HART, Profibus DP, Modbus RTU, Modbus TCP, Ethernet IP
<b>Process diagnostics</b>	Empty pipe	Empty pipe, Gas bubbles, Electrode Impedance, Conductivity
<b>Backwards compatibility</b>	–	Yes

## ... ProcessMaster series

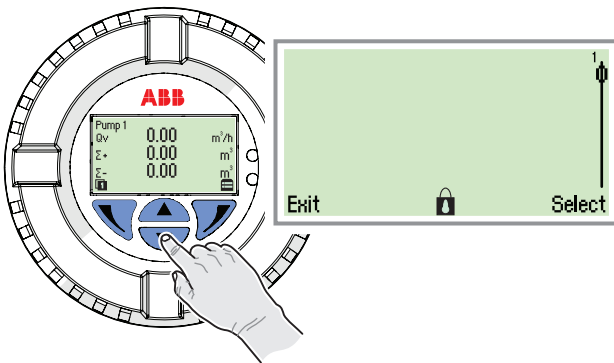
### Features and Functions

#### 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 Flow metering

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

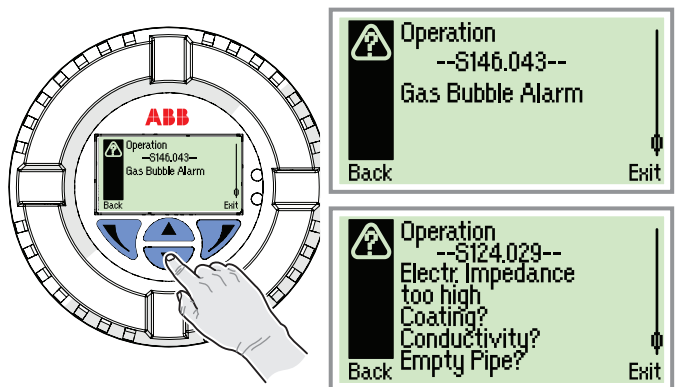
#### Diagnostics for real-life situations

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.

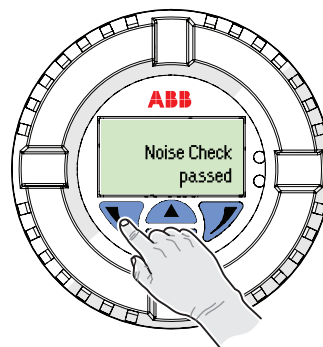
##### Benefits:

- 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.





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## ... ProcessMaster series

### 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).

#### 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.

## ... ProcessMaster series

### Optional diagnostic functions

The extended diagnostics functionality package contains the following functions.

#### Gas bubble 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: 3/8" ... 4" DN10 ... DN100
- 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 with flow traveling in the up direction 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.

## ... ProcessMaster series

### Batching function

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.

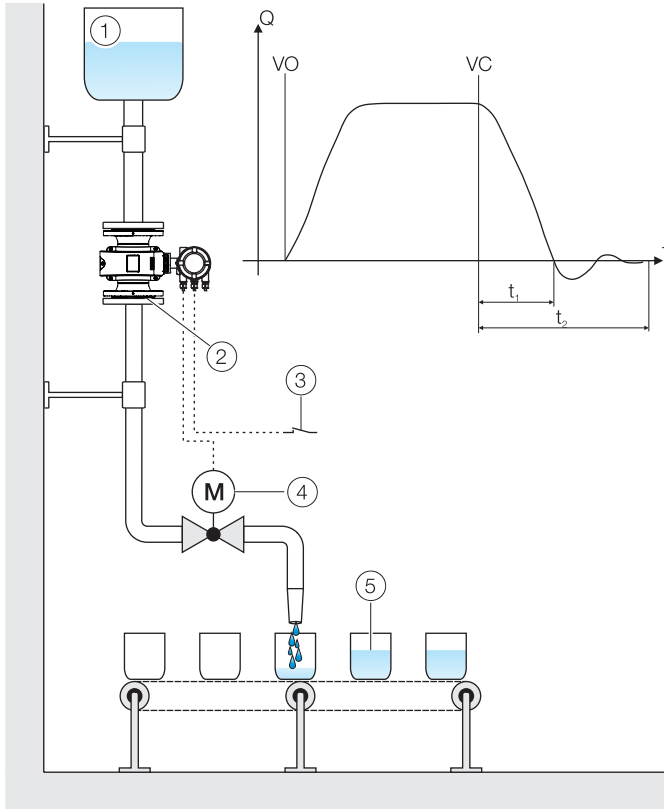


Figure 1 Fill function (batch)

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



Overview – models

Flowmeter sensor

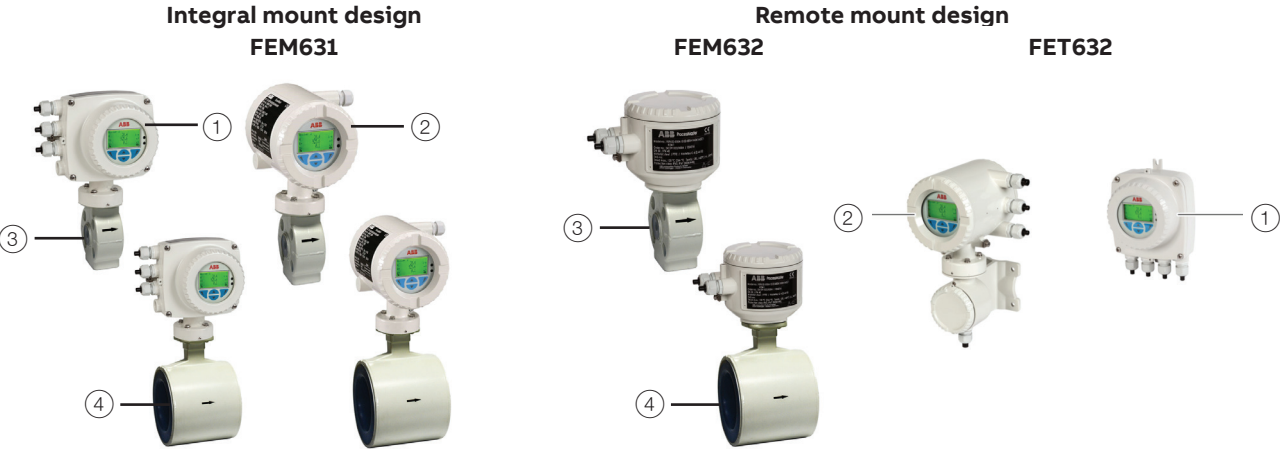


Figure 2 Designs

Pos.	Description
①	Single-compartment transmitter housing
②	Dual-compartment transmitter housing
③	Flowmeter sensor DN 3 to 10 (1/10 to 1/2 inch)
④	Flowmeter sensor DN15 to 100 (1/2 to 4 inch)

Table 2 Legend

Model	ProcessMaster FEM631, FEM632, FET632
Housing	Integral mount design, remote mount design
Measuring accuracy for liquids	0.4 % of measured value
Permissible measuring medium temperature $T_{medium}$	Standard: -25 ... 130 °C (-13 ... 266 °F)
Minimum conductivity	> 5 µS/cm (20 µS/cm for demineralized water)
Nominal pressure rating	ASME CL 150, CL 300
Nominal diameter	1/10" ... 4" (DN3 ... DN100)
Process connection	Wafer style connection
Liner material	ETFE
Electrode material	Hastelloy C, Platinum-Iridium, Tantalum
IP rating	Integral design: IP 65 / IP 67 / NEMA 4X; Remote design: IP 65 / IP 67 / IP 68 (sensor only) / NEMA 4X

Table 3 Overview flowmeter sensor

Explosion protection	cFM <sub>US</sub> Class I, Div.1, Class I, Div. 2 e e al se
Further approvals	At <a href="http://www.abb.com/flow">www.abb.com/flow</a> or on request

Table 4 Approvals

...Overview – models

Transmitter



Figure 3 Designs

Pos.	Description
②	Dual-compartment transmitter housing
①	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     ft (    0m) 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, Modbus RTU, Modbus TCP, Ethernet IP

Table 6 Overview Transmitter

Explosion protection	c <sub>FM</sub> US Class I, Div.1, Class I, Div. 2    e   e   al    se
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.

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.

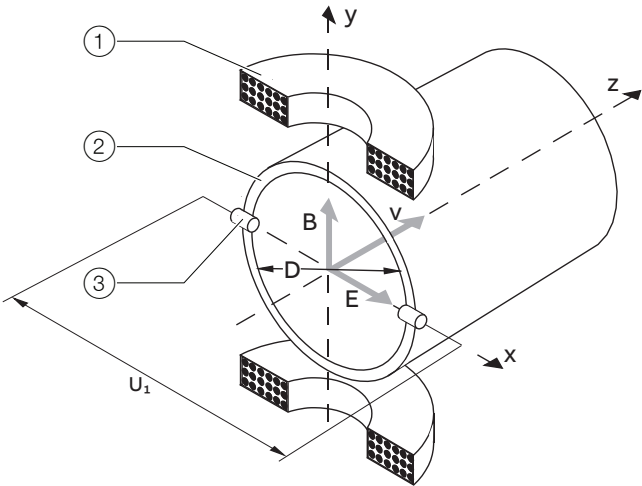


Figure 4 Electromagnetic flowmeter schematic

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		



## Flowmeter sensor

### Measuring accuracy

#### Reference conditions

According to EN 29104	Description
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	<ul style="list-style-type: none"> <li>Upstream &gt;10 x DN, straight section</li> <li>Downstream &gt;5 x DN, straight section</li> </ul>
Warm-up phase	30 min

#### Measuring error and repeatability

##### Measuring error

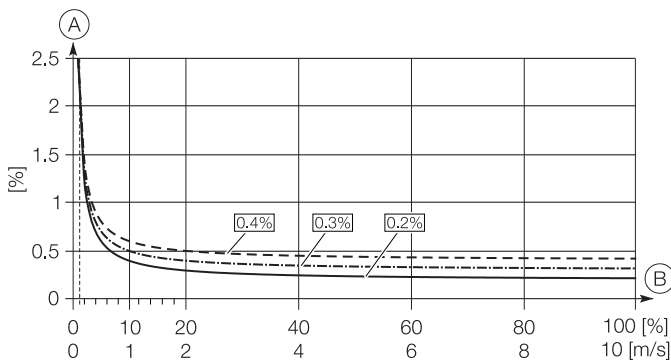


Figure 5 Measuring error

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 1/10" ... 4"  
1/10" ... 4": ±0.4 % 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 14

#### Current output

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

Table 11 Measuring error current output

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 t <sup>3</sup> 200 ms at 25 Hz excitation frequency 5 t <sup>3</sup> 400 ms at 12.5 Hz excitation frequency 5 t <sup>3</sup> 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 656 ft (200M)

## ...Flowmeter sensor

### Temperature data

#### Storage temperature range

-4 ... 149 °F (-20 ... 65 °C)

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	ETFE (Tefzel)	266 °F (130 °C)
Cleaning fluid	ETFE (Tefzel)	266 °F (130 °C)

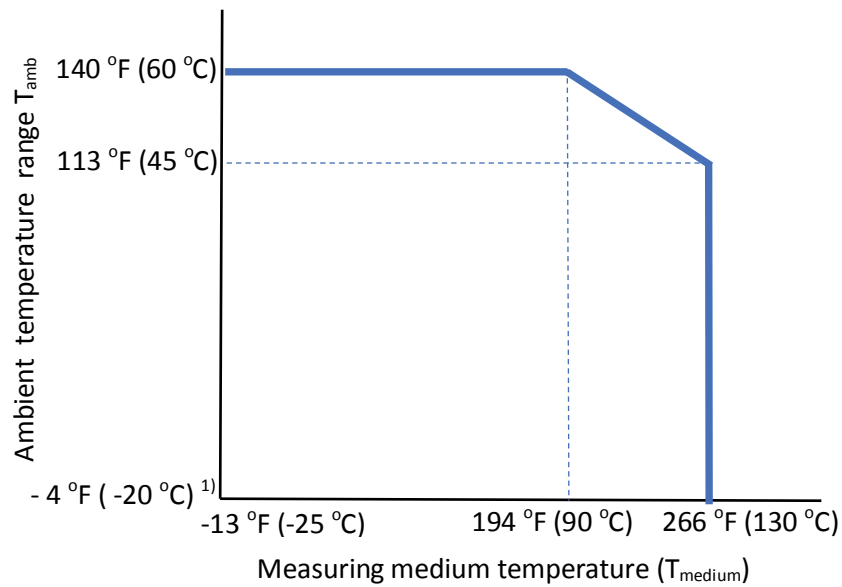
- The specified cleaning temperature applies for a maximum ambient temperature of 77 °F (25 °C). If the ambient temperature is > 77 °F (>25 °C), the difference to the actual ambient temperature must be subtracted from the maximum cleaning temperature.
- The specified cleaning temperature may be applied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

## ...Flowmeter sensor

### Ambient temperature as a function of measuring medium temperature

Integral and remote mount designs

Maximum permissible combination of ambient and medium temperatures  
(Standard version of the  $c_{FM_{US}}$  Class I, Div. 1 and  $c_{FM_{US}}$  Class I, Div. 2)



<sup>1)</sup>Minimum ambient temperature is 14 °F (-10 °C) with carbon steel mating flanges. Stainless steel mating flanges must be used to reach the -4 °F (-20 °C) temperature.



## ...Flowmeter sensor

### Measuring range table

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

Nominal diameter		Minimum flow range end value	QmaxDN	Maximum flow range end value
DN	inch	$0.02 \times Q_{\max \text{DN}}$ ( $\approx 0.66$ ft/s or 0.2 m/s)	0 ... $\approx 33$ ft/s or 10 m/s	$2 \times Q_{\max \text{DN}}$ ( $\approx 66$ ft/s or 20 m/s)
3	1/10	0.02 US gal/min (0.08 l/min)	1.06 US gal/min (4 l/min)	2.11 US gal/min (8 l/min)
4	5/32	0.04 US gal/min (0.16 l/min)	2.11 US gal/min (8 l/min)	4.23 US gal/min (16 l/min)
6	1/4	0.11 US gal/min (0.4 l/min)	5.28 US gal/min (20 l/min)	10.57 US gal/min (40 l/min)
10	3/8	0.24 US gal/min (0.9 l/min)	11.9 US gal/min (45 l/min)	23.78 US gal/min (90 l/min)
15	1/2	0.53 US gal/min (2 l/min)	26.4 US gal/min (100 l/min)	52.8 US gal/min (200 l/min)
25	1	1.06 US gal/min (4 l/min)	52.8 US gal/min (200 l/min)	106 US gal/min (400 l/min)
40	1 1/2	3.17 US gal/min (12 l/min)	159 US gal/min (600 l/min)	317 US gal/min (1200 l/min)
50	2	5.28 US gal/min (1.2 m3/h)	264 US gal/min (60 m3/h)	528 US gal/min (120 m3/h)
80	3	15.9 US gal/min (3.6 m3/h)	793 US gal/min (180 m3/h)	1585 US gal/min (360 m3/h)
100	4	21.1 US gal/min (4.8 m3/h)	1057 US gal/min (240 m3/h)	2113 US gal/min (480 m3/h)

## ...Flowmeter sensor

### Process connections

Meters are wafer style and clamp between customer's pipeline flanges.

### Installation length

For further details, refer to chapter "Dimensions" on page 20.

## Materials

Wetted parts		
Part	Standard	Option
Liner material	ETFE	
Measurement and grounding electrode for liner material		
Electrode material	Hastelloy C-4 (2.4610)	Tantalum, Platinum-iridium,
Grounding ring	Stainless steel	On request

### Flowmeter sensor housing



Component	Standard	Option
Housing	Cast aluminum, painted, paint coat > 80 µm thick, light gray, RAL 9002	
Terminal Box	Aluminum alloy, painted, > 80µm thick, light gray, RAL 9002	Plastic, gray white, RAL 9002
Meter Tube	304 Stainless steel	
Cable gland <sup>1</sup>	Polyamide, Stainless steel	

1. Cable gland with M 20 x 1.5 or NPT thread, to be selected via the order model number

## ...Flowmeter sensor

### 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. 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 .

#### Flow direction

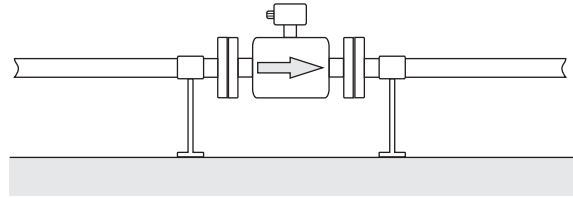


Figure 6 Flow direction

The device measures the flowrate in both directions. Forward flow is the factory setting, as shown in Fig. 6.

#### Electrode axis

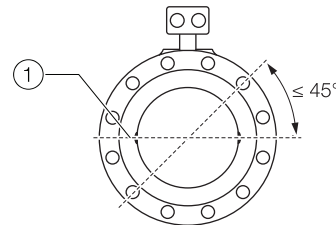


Figure 7 Orientation of the electrode axis

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

#### 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.



## ...Flowmeter sensor

### Mounting position

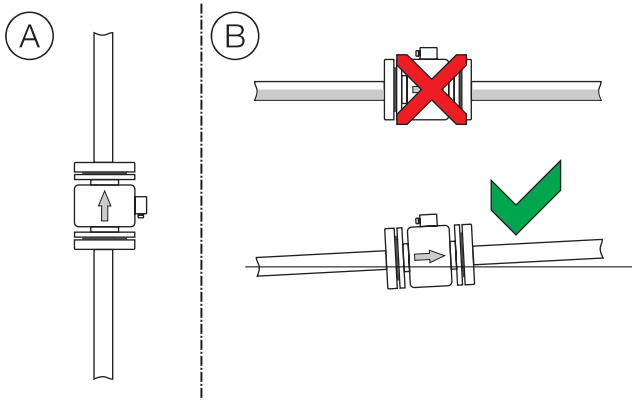
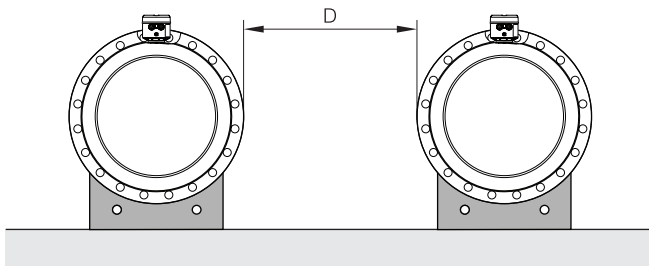


Figure 8 Mounting position

- (A) Vertical installation for measuring abrasive fluids, preferably with flow in upward direction.
- (B) 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

#### ProcessMaster FEMxxx



Distance D:  $\geq 1.0$  m (3.3 ft)

Figure 9 Minimum distance

- In order to prevent the devices from interfering with each other, a minimum distance as shown in Fig. 9 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

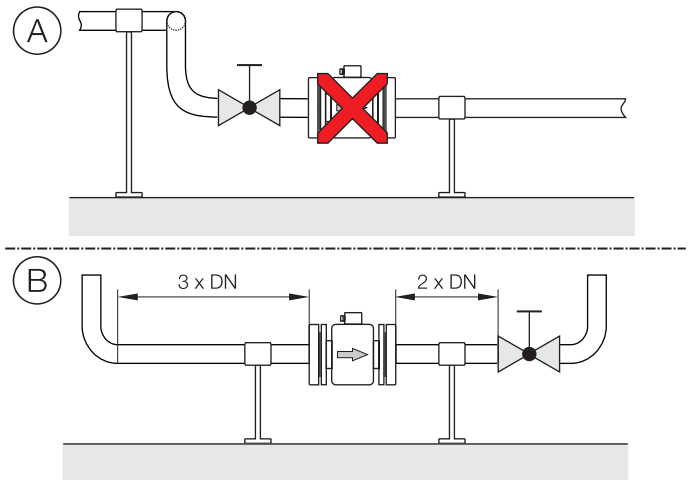


Figure 10 In- and outlet section, turn-off component

Pos.	Description
①	Double elbow
②	Turn-off device

Table 13 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.

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

## ...Flowmeter sensor

### Free inlet or outlet

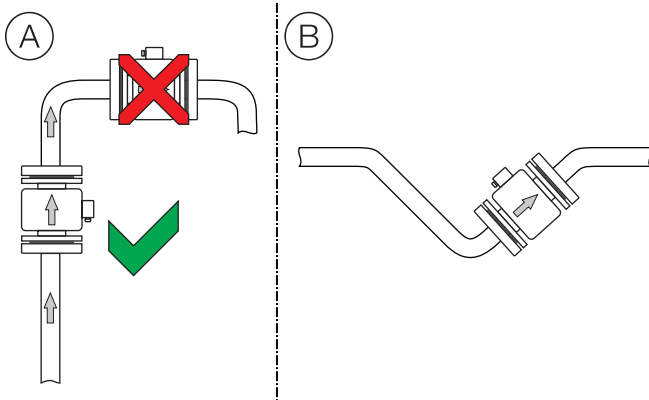


Figure 11 Free inlet or outlet

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

### Strongly contaminated measuring media

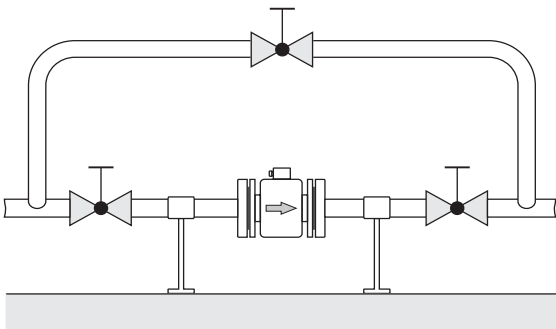


Figure 12 Bypass connection

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.

### 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

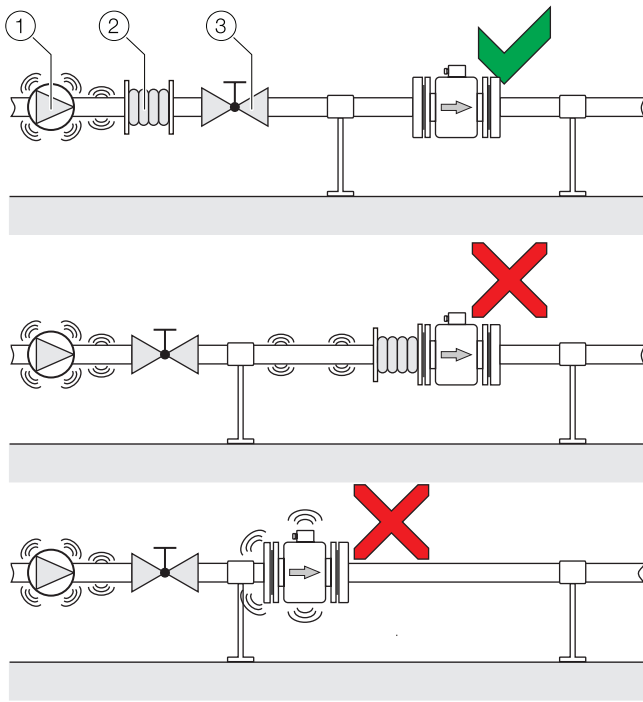


Figure 13 Vibration damping

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

Table 14 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

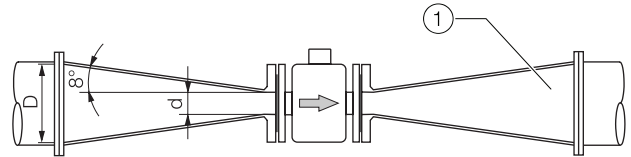


Figure 14 Using reduction pieces

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. 15).
- 3 Read the pressure drop on the Y-axis in Fig. 15.

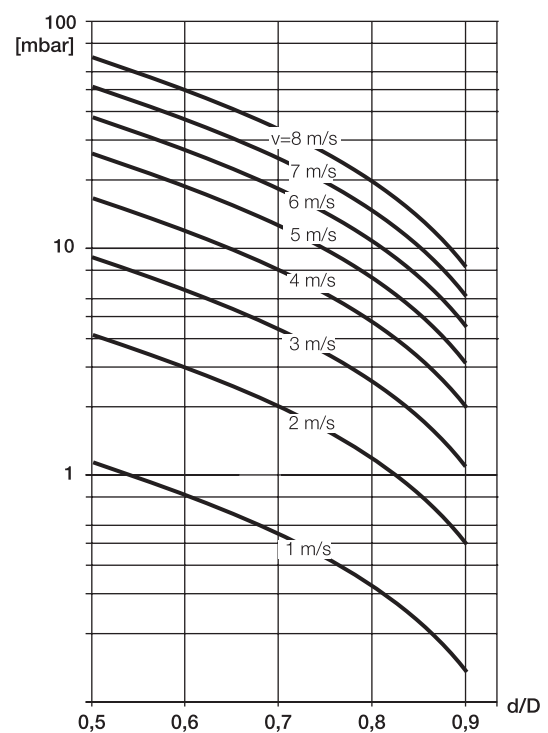
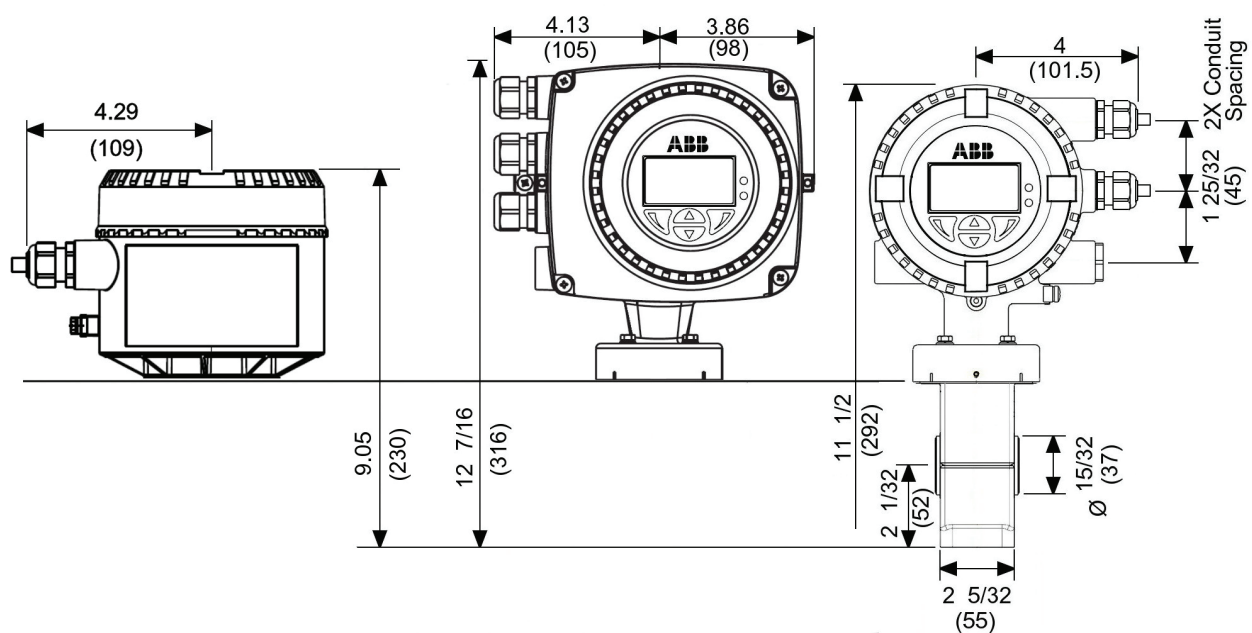
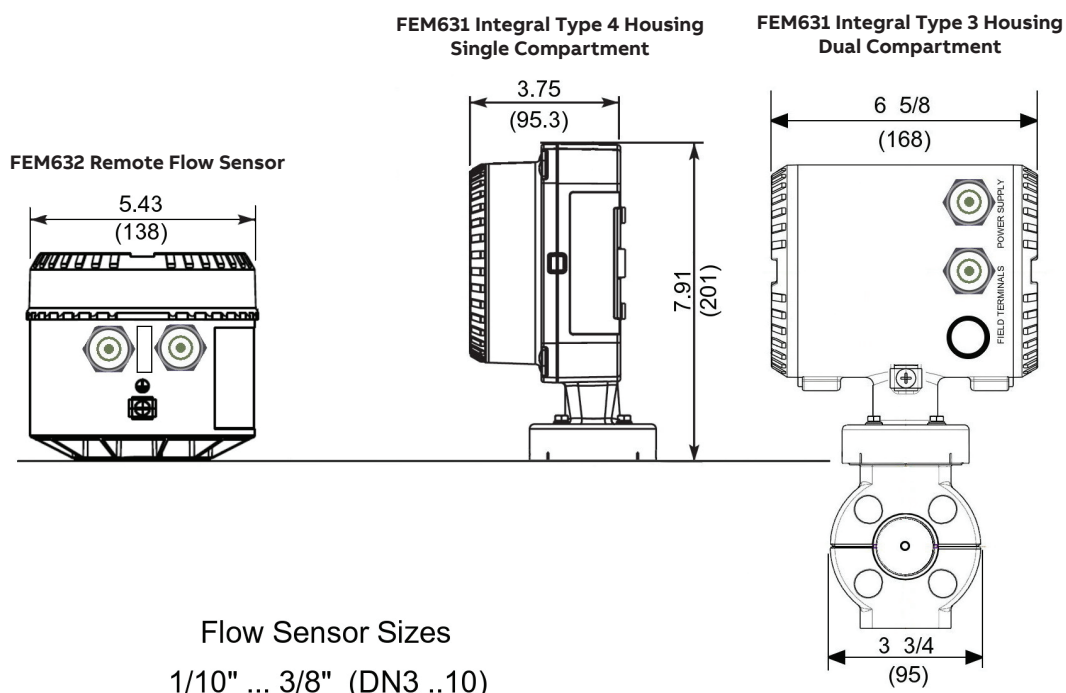


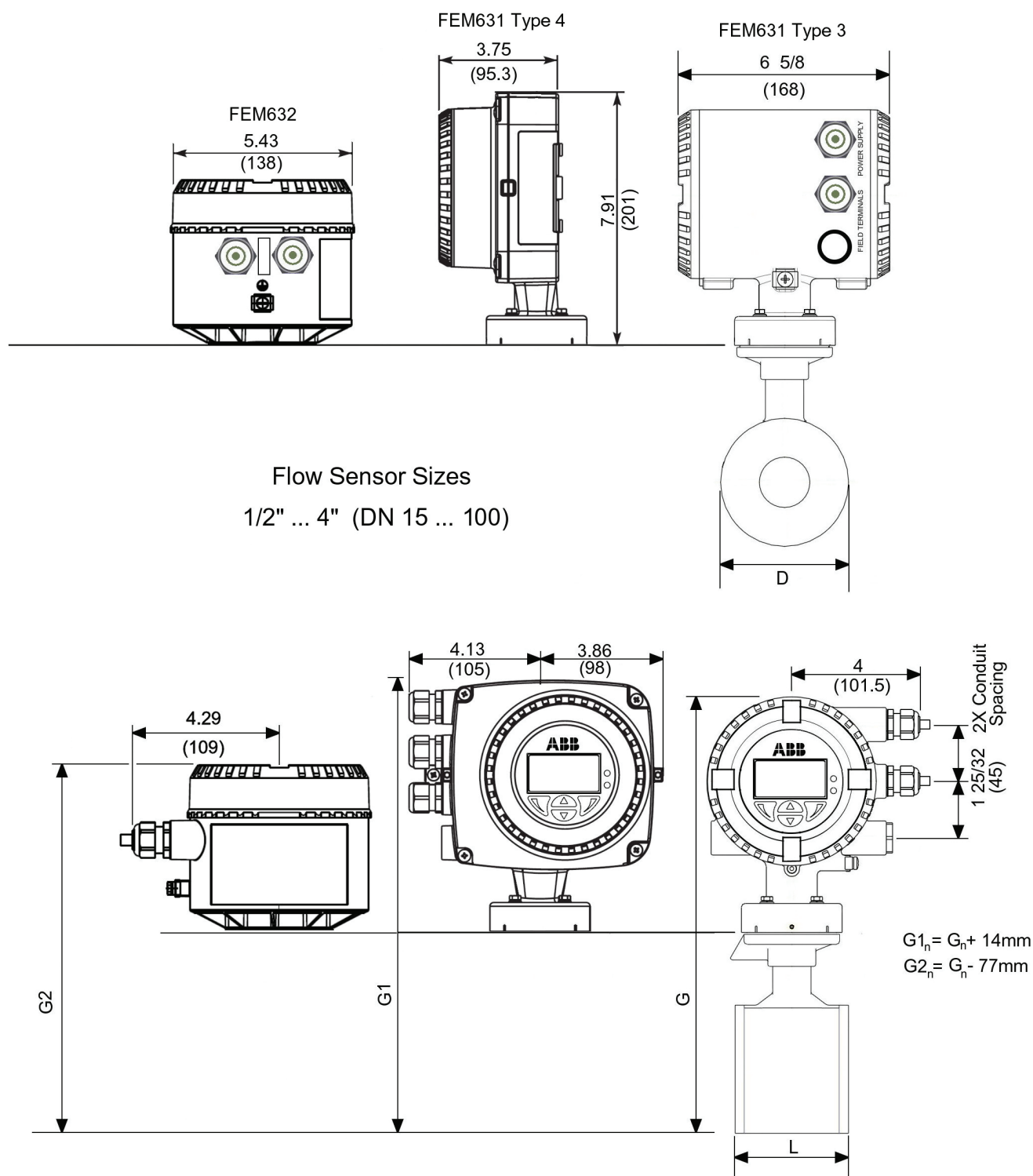
Figure 15 Flow rate nomogram for pressure drop calculations for flange transition piece with  $\alpha/2 = 8^\circ$

## Dimensions





## ...Dimensions



Dimensions - inches / (mm)							Approximate weight lb / (kg)	
Size Inch / (DN)	D	L	G3	G2	G1	G	Integral mount design	Remote mount design
1/2 (15)	1-7/8 (48)	2-5/32 (55)	7-1/32(179)	9-1/16 (230)	12-1/16 (306)	11-1/2 (292)	10.5 (4.8)	6 (2.7)
1 (25)	2-5/8 (67)	2-5/32(55)	7-27/32 (199)	9-27/32 (250)	12-27/32 (326)	12-9/32 (312)	11.5 (5.2)	7 (2.7)
1-1/2 (40)	3-3/8 (86)	2-3/4 (70)	8-9/16 (217)	10-1/2 (268)	13-9/16 (330)	13(330)	12.5 (5.7)	7 (3.2)
2 (50)	4 (102)	3-11/32 (85)	9-3/16 (233)	11-3/16 (284)	14-3/16 (360)	13-5/8 (346)	13.5 (6.1)	9 (4.1)
3 (80)	5-1/4 (133)	4-23/32 (120)	10-13/32 (264)	12-13/32 (315)	15-7/16 (391)	14-27/32 (377)	17.5 (7.7)	12 (5.5)
4 (100)	6-1/2 (165)	5-29/32 (150)	11-21/32 (296)	13-21/32 (347)	16-11/16 (423)	16-1/8 (409)	23.5 (10.7)	18 (8.2)

## 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  $\geq 20 \mu\text{S/cm}$   
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.

Plug-in card	Description
	Current output, 4 to 20 mA passive (red) Order no.: 3KQZ400029U0100
	Passive digital output (green) Order no.: 3KQZ400030U0100
	Passive digital input (yellow) Order no.: 3KQZ400032U0100
	Loop power supply 24 V DC (blue) Order no.: 3KQZ400031U0100
	Modbus RTU RS485 (white) Order no.: 3KQZ400028U0100
	PROFIBUS DP (white) Order no.: 3KQZ400027U0100
	Ethernet IP, Modbus Order no.: 3KQZ400037U0100
	Power over Ethernet (POE) Order no.: 3KQZ400039U0100

## ...Transmitter

### 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
Ambient temperature	-20 ... 70 °C (-4 ... 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.

...Transmitter

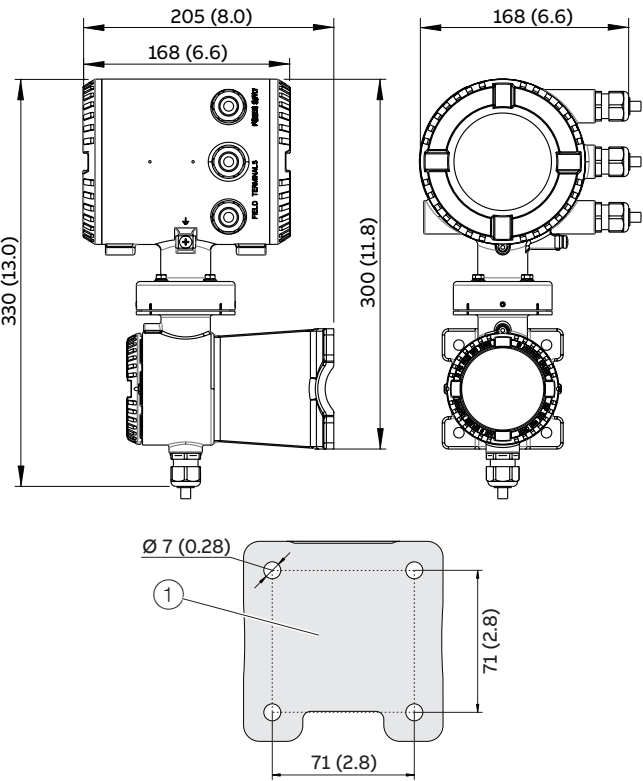


Figure 17 Mounting dimensions of double-compartment housing

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 16 Legend

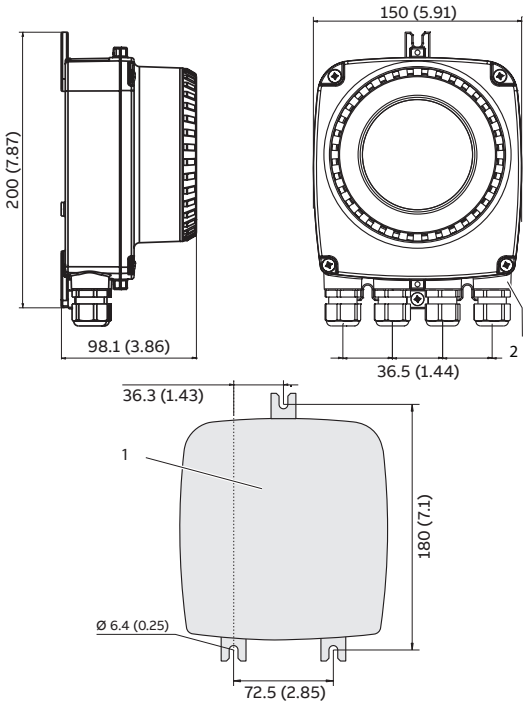


Figure 18 Mounting dimensions single-compartment housing

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 17 Legend

## Electrical connections

### Connection diagram

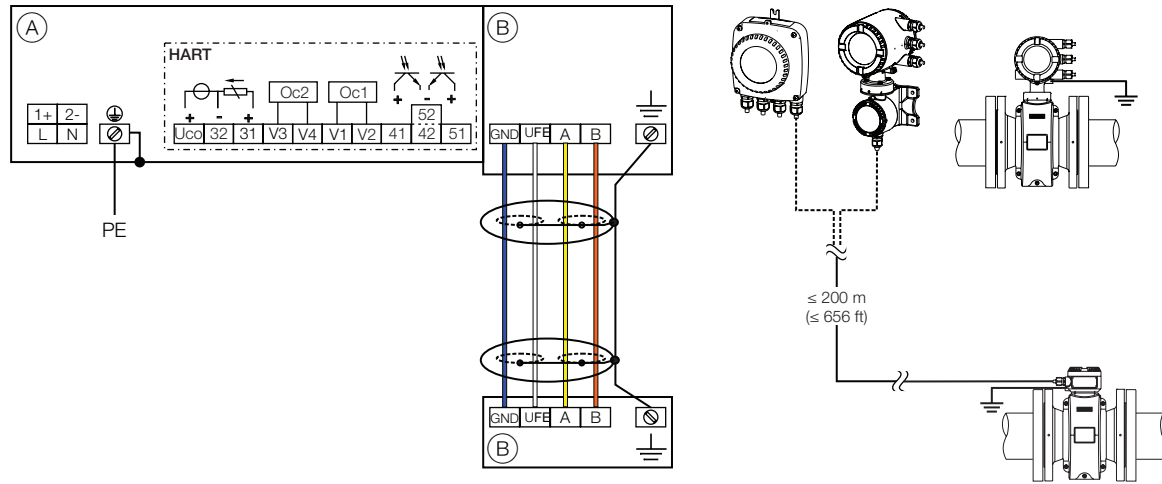


Figure 19 Mounting dimensions of double-compartment housing

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

Table 18 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
DC voltage	
Terminal	Function / comments
1+	+
2-	-
PE /	Protective earth (PE)
	Potential equalization

### Connections for inputs and outputs

Terminal	Function / comments
Uco / 32	Active 4 ... 20 mA current output / HART or
31 / 32	Passive 4 ... 20 mA current output / HART
41 / 42	Passive digital output DO1
51 / 52	Passive digital output DO2
V <sup>1</sup> / V <sup>2</sup> V <sup>3</sup> / V <sup>4</sup>	Plug-in card, slot Oc1 Plug-in card, slot Oc2 For details, see chapter "Optional plug-in cards" on page 27 .

### 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: Uco / 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 Uco / 32, 31 / 32

Can be configured for outputting mass flow and volume flow.

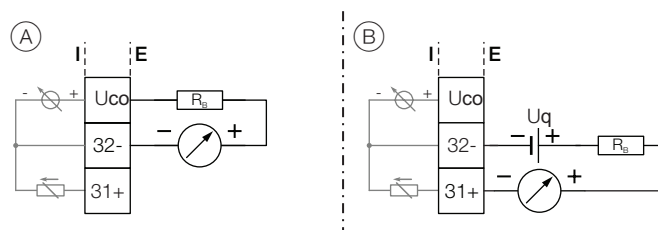
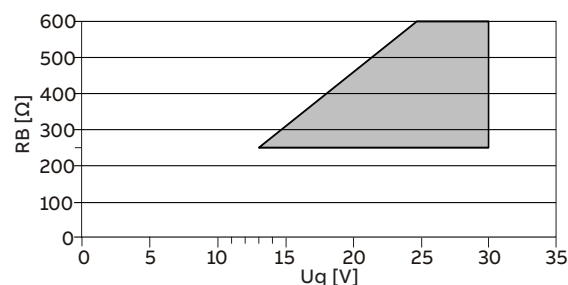


Figure 20 (I = internal, E = external, R<sub>g</sub> = load, U<sub>q</sub> = Source voltage)

(A) Active current output Uco / 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

Figure 21 Source voltage for passive outputs

	Active	Passive
Terminals	Uco / 32	31 / 32
Output signal	4 ... 20 mA or 4 ... 12 ... 20 mA, switchable	4 ... 20 mA
Load R <sub>g</sub>	250 Ω ≤ R <sub>B</sub> ≤ 300 Ω	250 Ω ≤ R <sub>B</sub> ≤ 600 Ω
Source voltage U <sub>q1</sub>	•	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 19 Electrical data current output Uco / 32, 31 / 32

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

## ...Electrical connections

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

Can be configured as pulse, frequency or binary output.

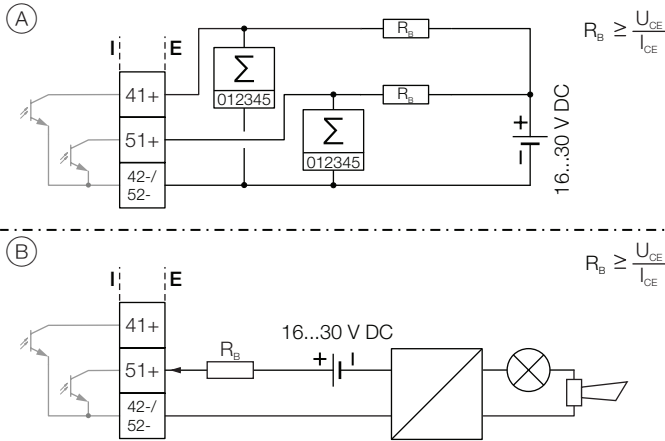


Figure 22 (I = internal, E = external,  $R_B$  = load)

- (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"	$0 \text{ V} \leq U_{\text{CEL}} \leq 3 \text{ V}$ For $f < 2.5 \text{ kHz}$ : $2 \text{ mA} < I_{\text{CEL}} < 30 \text{ mA}$ For $f > 2.5 \text{ kHz}$ : $10 \text{ mA} < I_{\text{CEL}} < 30 \text{ mA}$
Output "open"	$16 \text{ V} \leq U_{\text{CEH}} \leq 30 \text{ V DC}$ $0 \text{ mA} \leq I_{\text{CEH}} \leq 0.2 \text{ mA}$
fmax	10.5 kHz
Pulse width	0.1 ... 2000 ms

Binary output, pasive	
Terminals	51 / 52
Output "closed"	$0 \text{ V} \leq U_{\text{CEL}} \leq 3 \text{ V}$ $2 \text{ mA} \leq I_{\text{CEL}} \leq 30 \text{ mA}$
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 20 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  $\geq 30 \text{ ms}$  and a maximum frequency of  $f_{\text{max}} \leq 3 \text{ kHz}$ .

### 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.

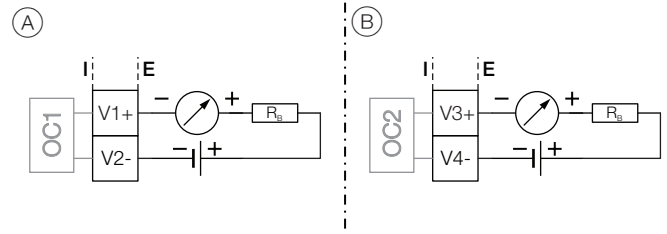


Figure 23 (I = internal, E = external,  $R_B$  = load)

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

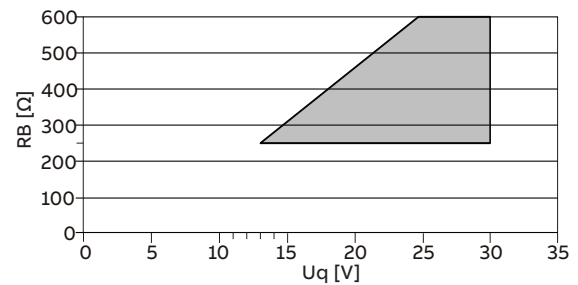


Figure 24 Source voltage for passive outputs

Permissible source voltage  $U_q$  for passive outputs in relation to load resistance where  $I_{\text{max}} = 22 \text{ mA}$ . ■ = Permissible range

Passive current output	
Terminals	V1 / V2, V3 / V4
Output signal	4 ... 20 mA
Load $R_B$	$250 \Omega \leq R_B \leq 600 \Omega$
Source voltage	$13 \text{ V} \leq U_q \leq 30 \text{ V}$
Measuring error	$< 0.1 \%$ of measured value

Table 21 Electrical data current output V1 / V2, V3 / V4

- The source voltage  $U_q$  depends on the load  $R_B$  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

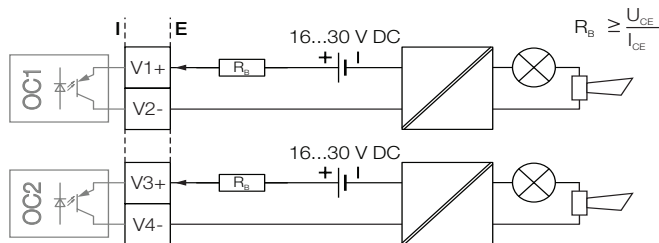


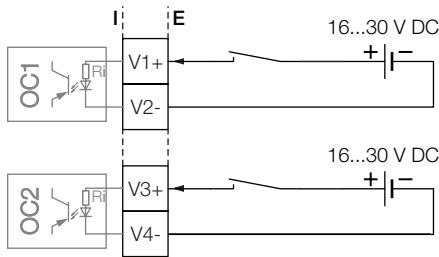
Figure 25 Plug-in card as binary output (I = internal, E = external, R<sub>b</sub> = load)

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 22 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.



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 23 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. See chapter "Connection examples" on page 29 .  
The plug-in card can only be used in slot OC1.

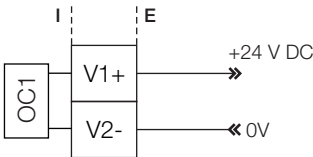


Figure 26 (I = Internal, E = External)

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 <sub>max</sub>	25 mA, permanently short circuit-proof

Table 24 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!

...Electrical connections

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)!

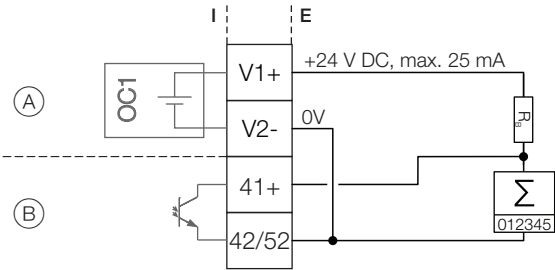


Figure 27 Active digital output 41 / 42 (example)

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

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

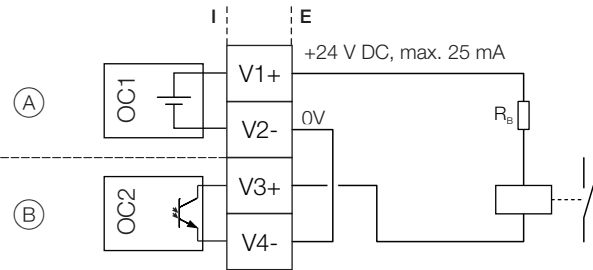


Figure 28 Active digital output V3 / V4 (example)

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

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

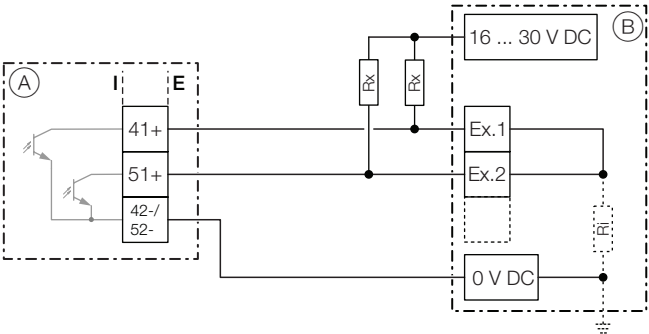


Figure 29 Digital output 41 / 42, 51 / 52 passive connected to a Process Control System (Example)

Pos.	Description
(A)	Transmitter
(B)	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 within the Process Control System

Table 25 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.

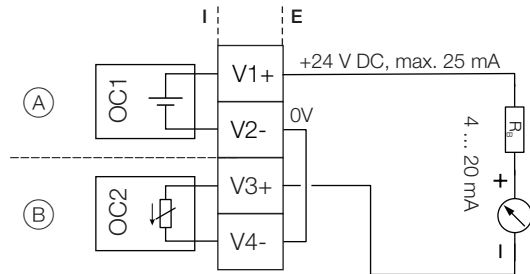


Figure 30 Active current output V3 / V4 (example)

- Ⓐ Plug-in card "Power supply (blue)" in slot 1
- Ⓑ Plug-in card "Passive current output (red)" 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.

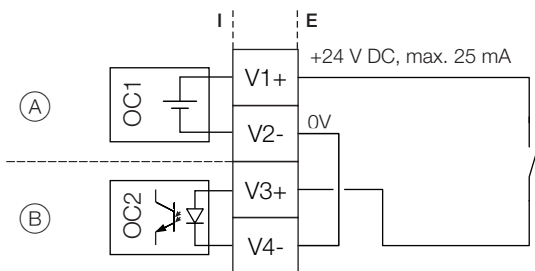


Figure 31 Active digital input V3 / V4 (example)

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

### Modbus / PROFIBUS DP interface V1 / V2 (plug-in card)

A Modbus or PROFIBUS DP interface can be implemented by using the 'Modbus RTU, RS485 (white)' or 'PROFIBUS DP, RS485 (white)' plug-in cards.

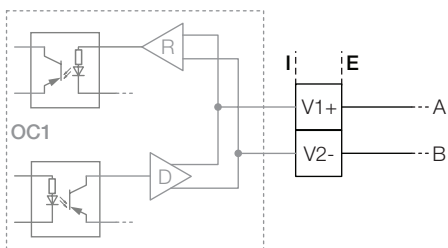


Figure 32 Plug-in card as a Modbus / PROFIBUS DP interface  
(I = internal, E = external)

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

## ... Electrical connections

### ...Digital communication

#### Ethernet IP communication



Figure 54 Ethernet communication plug-in card

#### One port connection without power over Ethernet

##### Terminal designation:

Port	Pin	Function	Color coding
1	Pin 1	RD+	White/Orange
1	Pin 2	RD-	Orange
1	Pin 3	TD+	White/Green
1	Pin 4	TD-	Green

Standard Ethernet 10/100 BASE-T/TX (IEEE802.3) single port connection.

#### One port connection with power over Ethernet

##### Terminal designation:

Port	Pin	Function	Color coding
1	Pin 1	RD+	White/Orange
1	Pin 2	RD-	Orange
1	Pin 3	TD+	White/Green
1	Pin 4	TD-	Green
2	Pin 1	DC+	White/Blue
2	Pin 2	DC-	Blue
2	Pin 3	DC-	White/Brown
2	Pin 4	DC-	Brown

Standard Ethernet 10/100 BASE-T/TX (IEEE802.3) single port connection.

#### Two port connection without power over Ethernet

##### Terminal designation:

Port	Pin	Function	Color coding
1	Pin 1	RD+	White/Orange
1	Pin 2	RD-	Orange
1	Pin 3	TD+	White/Green
1	Pin 4	TD-	Green
2	Pin 1	RD+	White/Orange
2	Pin 2	RD-	Orange
2	Pin 3	TD+	White/Green
2	Pin 4	TD-	Green

**Ethernet communication**

Equipped with an Ethernet Card, ProcessMaster/HygienicMaster 630 provides 2 Ethernet Ports supporting a Ring, Star and Daisy Chain Network configuration.

In addition to the Ethernet Card, a plug-in Card providing 'Power over Ethernet' is available. This Card allows to power the 24 V DC Version of the flowmeter through Ethernet without the need for additional power supply.

**Ethernet/IP proctocol**

**Note.**

The Ethernet/IP protocol is not secure, as such. The application should be assessed before Implementation to ensure the protocol is suitable.

ProcessMaster and HygienicMaster’s Ethernet IP protocol implemented, supports cyclic Communication. Process Variables, Diagnostic Data and Device Status Information can be accessed cyclically.

For Device Configuration a Webserver is available providing full access to all parameter and diagnostic data.

Ethernet IP Interface	
Configuration	Through the Webserver or the local operating Interface (Display).
EtherNet/IP ProductCode	5002
EDS file	FEW530_FEPFEH630_01_01.eds
Device profile	Profile 0x43, Generic Device, (keyable).
Supporte standards and protocols	Common Industrial Protocol (CIP™) Vol1, Ed 3.25 EtherNet/IP Adaptation of CIP™, Vol2, Ed 1.23
Cable	Cat 5

**Further Ethernet communication protocols**

**Note**

The device supports following security modes:

**Secured Protocols:**

- Webserver https:
- Security modes
- Used ports by Webserver: TCP 443
- Security is based on .x509 Certificates
- Protocol could be deactivated via HMI.

**Unsecured protocols:**

- EtherNet/IP and Modbus TCP
- Used ports by EtherNet/IP: TCP 44818, UDP 2222
- Used ports by Modbus/TCP: TCP 502
- All protocols can be enabled / disabled in the HMI Menu.Ethernet

## Ordering information

### ProcessMaster FEM631

Electromagnetic Flowmeter system, integral mount

	ProcessMaster Wafer FEM631	7,8	9,10	11,12,13,14	15,16	17,18	19	20	21	22	...	58,59
<b>Explosion Protection Certification</b>												
Without		Y0										
cFM <sub>US</sub> Class I, Div 1 <sup>1</sup>		F1										
cFM <sub>US</sub> Class I, Div 2 <sup>1</sup>		F2										
<b>Housing Type / Housing Material / Thread or Cable Glands</b>												
Single compartment / Aluminium / M20 x 1.5 <sup>2</sup>			S1									
Single compartment / Aluminium / NPT 1/2 in. <sup>2</sup>			S2									
Dual compartment / Aluminium / M20 x 1.5			D1									
Dual compartment / Aluminium / NPT 1/2 in.			D2									
<b>Meter size</b>												
DN 3 (1/10 in.)				0003								
DN 4 (5/32 in.)				0004								
DN 6 (1/4 in.)				0006								
DN 10 (3/8 in.)				0010								
DN 15 (1/2 in.)				0015								
DN 25 (1 in.)				0025								
DN 40 (1-1/2 in.)				0040								
DN 50 (2 in.)				0050								
DN 80 (3 in.)				0080								
DN 100 (4 in.)				0100								
<b>Process Connection Type</b>												
Wafer Style					W1							
<b>Liner Material</b>												
ETFE						E1						
<b>Process Connection Material</b>												
Without process connection, gasket and mounting bracket								Y				
<b>Electrode Design</b>												
Standard									1			
<b>Measuring Electrodes Material</b>												
Hast. C-4 (2.4610)										D		
Tantalum										G		
Platinum-Iridium										J		
<b>Grounding Electrode / Full Pipe Detection</b>												
No grounding electrode / No full pipe detection											0	

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## ...Ordering information

ProcessMaster Wafer FEM631	7,8	...	23	24,25	26	27	28,29	30	31,32,33	34,35,36	37,38	...	58,59
<b>Grounding Accessories</b>										Additional ordering codes			
Without			A										
Grounding ring (2)			E										
<b>Protection Class Transmitter / Protection Class Sensor</b>													
IP 67 / IP 67, NEMA 4X				70									
<b>Power Supply</b>													
100 ... 240 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 or passive), 2 Digital outputs(passive) <sup>3</sup>							G0						
Current output 1 (active), digital output 1 & 2 (passive). HART. MODBUS RTU <sup>7</sup>							M1						
Current output 1 (active). digital output 1 & 2 (passive). HART. PROFIBUS DP <sup>8</sup>							D1						
Current output 1 (active or passive), digital output 1 & 2 (passive), HART. 1 port Ethernet <sup>9</sup>							E2						
Current output 1 (active or passive), digital output 1 & 2 (passive). HART, 2 port Ethernet <sup>9</sup>							E3						
Current output 1 (active or passive), digital output 1 & 2 (passive), HART. 1 port Ethernet + POE <sup>10</sup>							E4						
<b>Design Level</b>													
Specified by ABB <sup>4</sup>								A					
<b>Option Card 1</b>													
Without									DRO				
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				
Modbus									DRM				
Profibus DP									DRD				
Card for Ethernet IP, Modbus TCP <sup>11</sup>									DR6				
<b>Option Card 2</b>													
Without										DS0			
1 x Analog Output passive (4...20mA)										DSA			
1 x Digital Output										DSN			
24 V DC transmitter loop power supply										DSG			
Module Power over Ethernet/Modbus TCP <sup>12</sup>										DS8			
<b>Documentation Language</b>													
English												M5	

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## ...Ordering information

ProcessMaster Wafer FEM631		7,8	...	39,40,41	42,43,44	45,46	47,48,49	50,51,52	53,54	55,56,57	58,59
Configuration Type				Additional ordering codes							
Parameters set customer specific				NCC							
Transmitter Software Function Package											
Standard					NFS						
Enhanced diagnostics					NFE						
Batch functionality					NFB						
Device Identification Plate											
Adhesive label					TC						
Stainless steel					T1						
Stainless steel and TAG plate (stainless steel)					TS						
Others					TZ						
Temperature range of installation/ambient temperature											
High temperature design /-4 ...140 °F (-20...60 °C) <sup>7</sup>						TK1					
Number of Testpoints											
3 Points <sup>5</sup>								TV3			
5 Points <sup>5</sup>								TV5			
Verification Capability											
disabled									V0		
enabled									V1		
Communication options activated											
Ethernet IP										GCE	
Modbus TCP										GCM	
Webserver										GCW	
Hardware Kits											
ANSI 150 Hardware Kit <sup>6</sup>											AH

### Notes for ProcessMaster FEM631

- 1 Not available with Single Compartment Housing
- 2 Not available with Zone 1 / Div 1
- 3 Current output (active or passive) can be configured on site
- 4 Will be specified by ABB
- 5 3 points calibration is standard. Optional 5 points available.
- 6 Meters are wafer style and clamp between customer's pipeline flanges. Mounting hardware kits are available and include: stud bolts, nuts, KLINGERSIL gaskets and adaptor
- 7 To be configured in conjunction with Option Card 1 = Mod bus RTU
- 8 To be configured in conjunction with Option Card 1 = Profibus DP
- 9 To be configured in conjunction with Option Card 1 = Ethernet IP or Modbus TCP
- 10 To be configured in conjunction with Option Card 1 = Ethernet IP or Modbus TCP & Option Card 2 = Power over Ethernet/Modbus TCP
- 11 Available with single compartment housing only, Non Ex or Zone 2, Div. 2 only
- 12 Available with single compartment housing only and with 24 V power supply unit

## ...Ordering information

### ProcessMaster FEM632

Electromagnetic Flowmeter system, remote mount design

ProcessMaster Wafer FEM632	7,8	9,10	11,12,13,14	15,16	17,18	19	20	21	22	...	56,57
<b>Explosion Protection Certification</b>											
Without	Y0										
cFM <sub>US</sub> Class I, Div 1 <sup>1</sup>	F1										
cFM <sub>US</sub> Class I, Div 2 <sup>1</sup>	F2										
<b>Housing Type / Housing Material / Thread or Cable Glands</b>											
Remote / Plastic / M20 x 1.5 <sup>2</sup>		P1									
Remote / Plastic / NPT 1/2 in. <sup>2</sup>		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 10 (3/8 in.)			0010								
DN 15 (1/2 in.)			0015								
DN 25 (1 in.)			0025								
DN 40 (1-1/2 in.)			0040								
DN 50 (2 in.)			0050								
DN 80 (3 in.)			0080								
DN 100 (4 in.)			0100								
<b>Process Connection Type</b>											
Wafer Style				W1							
<b>Liner Material</b>											
ETFE					E1						
<b>Process Connection Material</b>											
Without process connection, gasket and mounting bracket						Y					
<b>Electrode Design</b>											
Standard							1				
<b>Measuring Electrodes Material</b>											
Hast. C-4 (2.4610)								D			
Tantalum								G			
Platinum-Iridium								J			
<b>Grounding Electrode / Full Pipe Detection</b>											
No grounding electrode / No full pipe detection									0		

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## ...Ordering information

ProcessMaster Wafer FEM632	7,8	...	23	24,25	26	27	28,29	30	31,32,33	34,35,36	37,38	39,40	...	56,57
<b>Grounding Accessories</b>									Additional ordering codes					
Without			A											
Grounding ring (2)			E											
<b>Protection Class Transmitter / Protection Class Sensor</b>														
IP 67 / IP 67, NEMA 4X				70										
IP 67 / IP 68, NEMA 4X				76										
IP 67 / IP 68, signal cable fitted and potted, NEMA 4X				77										
<b>Power Supply</b>														
Without					Y									
<b>Display</b>														
Without						0								
<b>Outputs</b>														
Without							Y0							
<b>Design Level</b>														
Specified by ABB <sup>3</sup>								A						
<b>Option Card 1</b>														
Without									DR0					
<b>Option Card 2</b>														
Without										DS0				
<b>Power Supply Line Frequency</b>														
50Hz <sup>4</sup>											F5			
60Hz <sup>4</sup>											F6			
<b>Documentation Language</b>														
English												M5		

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## ...Ordering information

	ProcessMaster Wafer FEM632	7,8	...	41,42,43	44,45,46	47,48,49	50,51	52,53	54,55	56,57
<b>Configuration Type</b>	Additional ordering codes									
Parameters set customer specific	NCC									
<b>Transmitter Software Function Package</b>										
Standard	NFS									
Enhanced diagnostics	NFE									
Batch functionality	NFB									
<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									
<b>Device Identification Plate</b>										
Adhesive label	TC									
Stainless steel	T1									
Stainless steel and TAG plate (stainless steel)	TS									
Others	TZ									
<b>Number of Testpoints</b>										
3 Points <sup>5</sup>	TV3									
5 Points <sup>5</sup>	TV5									
<b>Verification Capability</b>										
disabled	V0									
enabled	V1									
<b>Hardware Kits</b>										
ANSI 150 Hardware Kit <sup>6</sup>	AH									

### Notes for ProcessMaster FEM632

- 1 Not available with plastic material housing (codes P1 or P2)
- 2 Not available with cFM<sub>US</sub> approvals (codes F1 or F2)
- 3 Will be specified by ABB
- 4 When ordering a sensor without a transmitter, specify the mains frequency
- 5 3 points calibration is standard. Optional 5 points available.
- 6 Meters are wafer style and clamp between customer's pipeline flanges. Mounting hardware kits are available and include: stud bolts, nuts, KLINGERSIL gaskets and adaptor
- 7 Consult the technical services for more information

## ...Ordering information

### Remote transmitter FET632

#### FET632 Electromagnetic Flowmeter, remote transmitter for ProcessMaster FEM630

	ProcessMaster Wafer FET632	7,8	9,10	11,12	13	14	15,16	17,18,19	20,21,22	...	32,33,34
<b>Explosion Protection Certification</b>											
Without		Y0									
cFM <sub>US</sub> Class I, Div 1 <sup>1</sup>		F1									
cFM <sub>US</sub> Class I, Div 2 <sup>1</sup>		F2									
<b>Housing Type / Housing Material / Thread or Cable Glands</b>											
Field-mount / Single compartment / Aluminum / 4 x M20 x 1.5 <sup>2</sup>			F1								
Field-mount / Single compartment / Aluminum / 4 x NPT 1/2 in. <sup>2</sup>			F2								
Wall-mount / Dual compartment / Aluminum / M20 x 1.5			W1								
Wall-mount / Dual compartment / Aluminum / NPT 1/2 in.			W2								
<b>Protection Class Transmitter / Protection Class Sensor</b>											
IP 67 / IP 67 NEMA 4X				70							
<b>Power Supply</b>											
100 ... 240 V AC, 50 Hz					A						
24 V DC, 50 Hz					D						
100 ... 240 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 <sup>3</sup>							G0				
Current output 1 (active), digital output 1 & 2 (passive). HART. MODBUS RTU <sup>4</sup>							M1				
Current output 1 (active). digital output 1 & 2 (passive). HART. PROFIBUS DP <sup>5</sup>							D1				
Current output 1 (active or passive), digital output 1 & 2 (passive), HART. 1 port Ethernet <sup>6</sup>							E2				
Current output 1 (active or passive), digital output 1 & 2 (passive). HART, 2 port Ethernet <sup>6</sup>							E3				
Current output 1 (active or passive), digital output 1 & 2 (passive), HART. 1 port Ethernet + POE <sup>7</sup>							E4				
<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			
Modbus								DRM			
Profibus DP								DRD			
Card for Ethernet IP, Modbus TCP <sup>8</sup>								DR6			
<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		
Module Power over Ethernet/Modbus TCP <sup>9</sup>									DS8		

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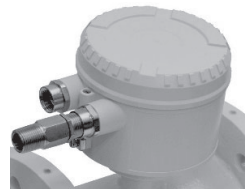


## ...Ordering information

	ProcessMaster Wafer FET632	7,8	...	23,24	25,26	27,28	29,30,31	32,33,34
<b>Documentation Language</b>	Additional ordering codes							
English		M5						
<b>Device Identification Plate</b>								
Adhesive label				TC				
Stainless steel				T1				
<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>								
Standard							NFS	
Enhanced diagnostics							NFE	
Batch functionality							NFB	
<b>Communication options activated</b>								
Ethernet IP								GCE
Modbus TCP								GCM
Webserver								GCW

### Notes for Remote Transmitter FET632

- 1 Not available with Single Compartment Housing
- 2 Not available with Zone 1 / Div. 1
- 3 Current output (active or passive) can be configured on site
- 4 To be configured in conjunction with Option Card 1 = Mod bus RTU
- 5 To be configured in conjunction with Option Card 1 = Profibus DP
- 6 To be configured in conjunction with Option Card 1 = Ethernet IP or Modbus TCP
- 7 To be configured in conjunction with Option Card 1 = Ethernet IP or Modbus TCP & Option Card 2 = Power over Ethernet/Modbus TCP
- 8 Available with single compartment housing only, Non Ex or Zone 2, Div. 2 only
- 9 Available with single compartment housing only and with 24 V power supply unit

Accessories

Description	Order code
Infrared service port adapter FZA100	D674A897U01
	
Installation set for NPT 1/2" cable gland. For sealing the cable conduit during outdoor installation.	3KXF081300L0001*
	
Adapter M20x1.5 to 1/2"NPT	D365B269U01*
	
Data link cable	3KXS360040L0003*
	
Signal cable	
3KQZ407123U0500	5 m (approx. 15 ft)
3KQZ407123U1000	10 m (approx. 30 ft)
3KQZ407123U1500	15 m (approx. 49 ft)
3KQZ407123U2000	20 m (approx. 66 ft)
3KQZ407123U2500	25 m (approx. 82 ft)
3KQZ407123U3000	30 m (approx. 98 ft)
3KQZ407123U3500	35 m (approx. 115 ft)
3KQZ407123U4000	40 m (approx. 131 ft)
3KQZ407123U5000	50 m (approx. 164 ft)
3KQZ407123U8000	80 m (approx. 262 ft)
3KQZ407123U1H00	100 m (approx. 328 ft)
3KQZ407123U1F00	150 m (approx. 492 ft)
3KQZ407123U2H00	200 m (approx. 656 ft)
ABB Ability Verification Tool	SRV500*

\*Available from ABB Service

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Sales



Service







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