

ABB MEASUREMENT & ANALYTICS | DATA SHEET

# SensyMaster FMT430, FMT450

Thermal mass flowmeter



---

## Measurement made easy

Precise and dynamic direct mass flow measurement of gas

---

### Efficient top-quality thermal sensor elements

- Single-chip design on ceramic carrier material for top long-term stability
- Effective protective frames of the sensor elements with flow-forming characteristics for top repeat precision

---

### Powerful electronic unit on a common ABB platform

- Quick commissioning with Easy Setup
- Easy operation thanks to common ABB operation concept
- Modular inputs and outputs with plug-in cards
- 'Plug-and-play' electronic unit swap with SensorApplicationMemory
- Top precision with dynamic temperature compensation

---

### ApplicationSelector

- Up to 8 configurable applications for top flexibility

---

### Integrated diagnosis and device verification

- Low costs thanks to longer maintenance cycles
- Higher system availability with preventative maintenance
- Process security thanks to sensor element verification

## Overview – models

### Sensor

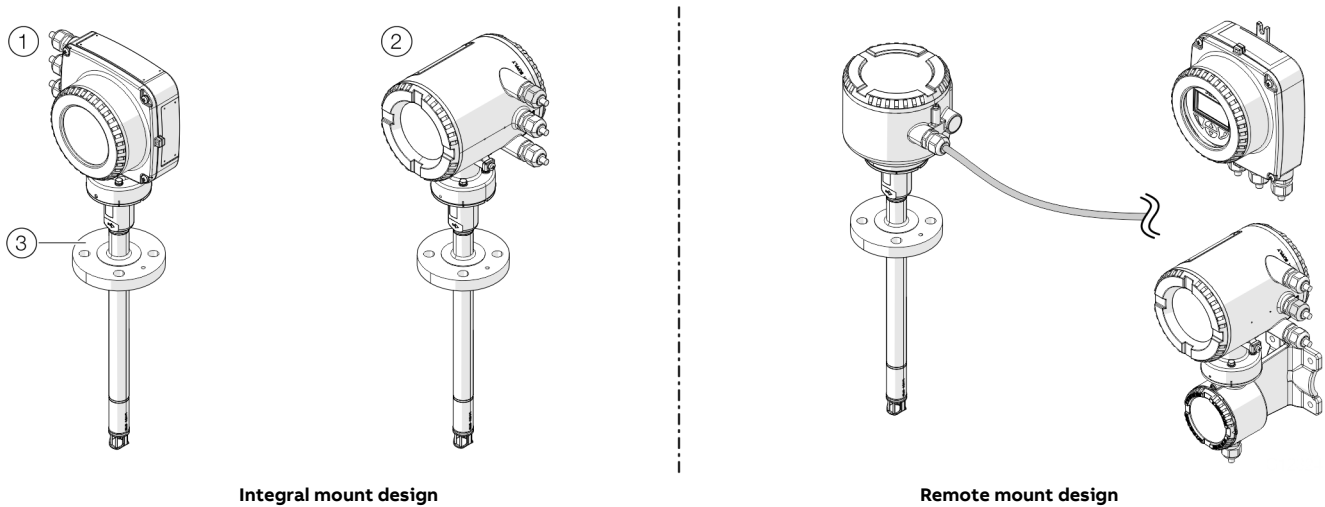


Figure 1: Sensor FMT430, FMT450 (example)

Model	FMT430	FMT450
Design	Integral mount design, remote mount design; transmitter optionally in single-compartment housing (1) or dual-compartment housing (2)	
Measuring media	Gas and gas mixtures with known composition, see table <b>Available gas types</b> on page 8	
Measuring accuracy for gases* Air	±1.2 % of $Q_m$ in the range of 10 to 100 % of the standard measuring range; ±0.12 % of the $Q_{max, DN}$ possible in the nominal diameter in the range of 0 to 10 % of the measuring range	±0.6 % of the measured value, ± 0.05% of the $Q_{max, DN}$ possible in the nominal diameter
Other gases (with optional operating gas calibration)	—	±1.6 % of the measured value, ±0.1 % of the $Q_{max, DN}$ possible in the nominal diameter
Extended measuring range	Yes, optional (depending on the gas type, with limited measuring accuracy as needed)	Yes, optional (depending on the gas type, with limited measuring accuracy as needed)
Measuring medium temperature $T_{medium}$	Standard design: -20 to 150 °C (-4 to 302 °F) Temperature information for high temperature**, cryogenic temperature and DVGW design, see <b>Measured medium temperature</b> on page 13.	Standard design: -20 to 150 °C (-4 to 302 °F)
Ambient temperature $T_{ambient}$	Standard: -20 to 70 °C (-4 to 158 °F) Optional: -40 to 70 °C (-40 to 158 °F)	
Sensor connection (3)	Flange DN 25 – PN 40, threaded connection DIN 11851, compression fitting	
Wetted materials	Stainless steel, ceramic sensor element	
IP rating	In accordance with EN 60529: IP 65 / IP 67	
NEMA rating	In accordance with NEMA 4X	

#### Approvals and certificates

ATEX/IECEX/UKEX explosion protection	Zone 0, 1, 2, 21, 22
Explosion protection conforming to cFMus	Class I Div. 1, Class I Div. 2, Zone 1, 2, 21
Additional approvals	Available on our website <a href="http://abb.com/flow">abb.com/flow</a> or on request

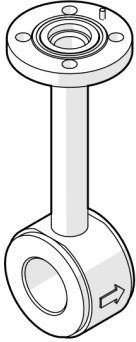
\* The stated measuring accuracy only applies under the reference conditions in the stated standard measuring range.

\*\* Not in connection with explosion-proof design.

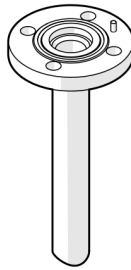
## ... Overview – models

### Process connections

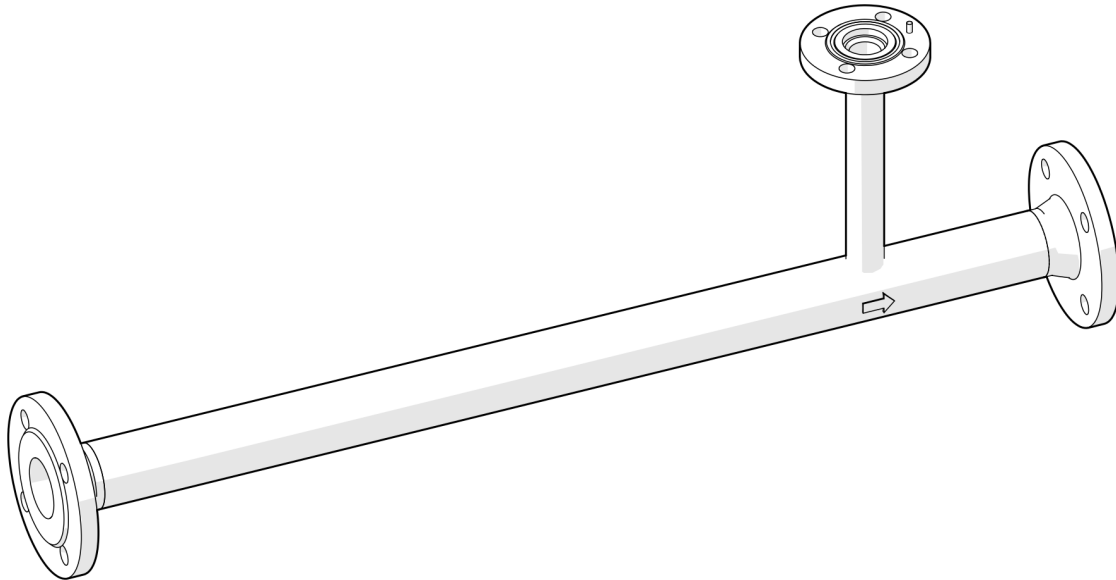
FMT091 – Wafer type design



FMT094 – Weld-on adapter



FMT094 – Weld-on adapter with clamp ring threading



FMT092 – Partial measuring section

Figure 2: Pipe components (examples)

#### Pipe components

FMT091 – Wafer type design	In accordance with EN 1092-1: DN 40 to 200, PN 40 In accordance with ASME B16.5: 1½ to 8 in, CL 150 to 300
FMT092 – Partial measuring section	Flange in accordance with EN 1092-1: DN 25 to 100 (larger nominal diameters on request), PN 10 to 40 Flange in accordance with ASME B16.5: 1½ to 8 in, CL 150 to 300 Male thread DN 25 to 80, R1 to 3 in
FMT094 – Weld-on adapter	For rectangular ducts or pipe diameters $\geq$ DN 80 (3 in.), PN 16 to 40
Options	With ball valve (order code SCA) or integrated hot tap fitting (order code SCB, SCC, SCD)
ATEX/IECEx/UKEX explosion protection	Zone 1, 2, 21, 22
Explosion protection conforming to cFMus	Can be used in Div. 1, Div. 2, Zone 1, 2, 21

---

**Wetted materials for pipe components**

---

Stainless steel, galvanized

---

---

**Temperature data for pipe components**

---

Measuring medium temperature  $T_{\text{medium}}$  Standard: -20 to 150 °C (-4 to 302 °F)

---

Ambient temperature  $T_{\text{amb}}$ , for pipe Standard: -20 to 70 °C (-4 to 158 °F), optional: -40 to 70 °C (-40 to 158 °F)  
components **without** ball valve or integrated hot tap fitting. Depending on the selected **ambient temperature range (TA3/TA9)** of the sensor and O-ring design.

---

Ambient temperature  $T_{\text{amb}}$ , for pipe Standard: -20 to 70 °C (-4 to 158 °F)  
components with ball valve or integrated hot tap fitting

---

**(Sensor connection options: SCA, SCB, SCD)**

---

## ... Overview – models

### Transmitter

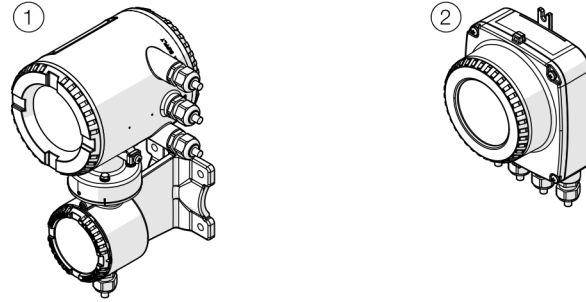


Figure 3: Transmitter with remote mount design

Model	FMT432	FMT452
Design	Integral mount design (see <b>Figure 1</b> on page 3), remote mount design; transmitter optionally in single-compartment housing (2) or dual-compartment housing (1)	
IP rating	In accordance with EN 60529: IP 65 / IP 67	
NEMA rating	In accordance with NEMA 4X	
Signal cable length	Maximum 100 m (328 ft), with remote mount design only	
Power supply	24 V DC, $\pm 20\%$ ; 100 to 240 V AC ( $-15\%$ / $+10\%$ , 47 to 64 Hz)	
Outputs in basic version	Current output: 4 to 20 mA active or passive Digital output 1: passive, configurable as pulse, frequency or switch output Digital output 2: passive, configurable as pulse, frequency or switch output	
Additional optional outputs	The transmitter has two slots in which plug-in cards can be inserted to provide additional inputs and outputs. The following plug-in cards are available: <ul style="list-style-type: none"> <li>• Current output (maximum two expansion cards simultaneously)</li> <li>• Digital output (maximum one expansion card)</li> <li>• Digital input (maximum two expansion cards)</li> <li>• 24 V DC power supply for active outputs (maximum one expansion card)</li> </ul>	
Communication	Standard: HART® 7.1; optional: PROFIBUS DP® / Modbus®	
External output zero return	Yes	
External totalizer reset	Yes	
Counter	Yes	
ApplicationSelector	Yes, up to 2 applications	Yes, up to 8 applications
Preconfigured applications	Yes, up to 2 applications	Yes, up to 4 applications
Freely configurable applications	No	Yes, up to 4 applications
Selectable nominal diameters	Yes	Yes
Selectable gas type	No	Yes
Filling function	No	Yes, optional
"VeriMass" diagnosis function	Yes, optional	Yes, optional

#### Approvals and certificates

Additional approvals Available on our website [abb.com/flow](http://abb.com/flow) or on request

## Device description

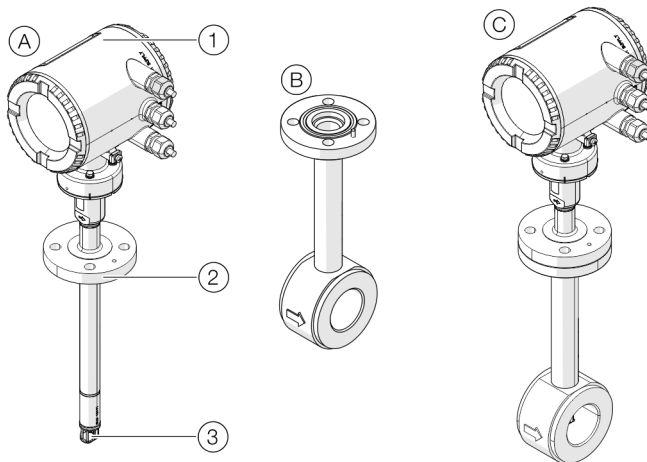
The SensyMaster FMT430, FMT450 works in accordance with the measuring principle of a hot-film anemometer. This measurement method allows for direct measurement of the gas mass flow.

Taking into account the standard density, the norm volume flow can be displayed without the need for additional pressure and temperature compensation.

The transmitter is equipped with an analog / HART® output (4 to 20 mA) and two fast digital outputs that can be configured as pulse, frequency or binary outputs.

Optionally, the transmitter can be extended using plug-in cards with further inputs and outputs as well as a Modbus® or PROFIBUS DP® interface.

The SensyMaster FMT430, FMT450 is used in the process industry for the flow measurement of gases and gas mixtures.



- (A) Sensor
- (B) Pipe component
- (C) Sensor with pipe component
- (1) Transmitter
- (2) Sensor connection
- (3) Thermal sensor elements

Figure 4: Sensor (example, wafer type design)

The SensyMaster FMT430, FMT450 is composed of the components sensor and pipe component (process connection).

The pipe component can be delivered in various designs. In addition, a weld-on adapter makes it possible to install the flowmeter sensor in rectangular ducts or pipelines with any diameter.

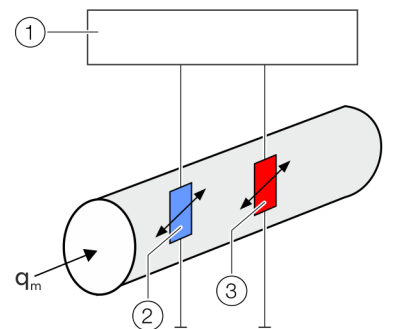
## Measuring principle

Thermal flow metering procedures use different ways to evaluate the flow dependent cooling of a heated resistor as measuring signal.

In a hotfilm anemometer with constant temperature difference control, the heated platinum resistor is maintained at a constant overtemperature in relation to an unheated platinum sensor inside the gas flow.

The heating power required for maintaining the overtemperature depends directly on the flow rate and the material properties of the gas. With a known (and constant) gas composition the mass-flow can be determined by electronically evaluating the heater current / mass-flow curve without additional pressure and temperature compensation. Together with the standard density of the gas this results directly in the standard volume flow.

Considering the high measuring range dynamics up to 1:100, an accuracy smaller than 1 % of the measuring value is achieved.



- (1) Transmitter
- (2) Gas temperature measurement resistor
- (3) Heating resistor

Figure 5: Measuring principle (simplified)

The transmitter has three signals available. In addition to the heating power, the temperatures of the measuring medium and the heater resistance are included herein, which can be used to compensate the temperature dependency of gas parameters.

By storing the gas data in the transmitter the optimal tailoring can be calculated and performed at any operating point.

## ... Overview – models

### Advantages of the SensyMaster measuring principle

- Through the provision of several primary and secondary signals, they can be output in parallel through the HART®, Modbus® or PROFIBUS® interface. This saves a gas temperature measurement.
- Regulating the sensor element and adjusting the signal processing to the process becomes possible through the implementation of fully digital signal processing. Thus, an optimum measuring dynamic can always be achieved even under changing operating conditions.
- The SensyMaster measuring principle can offer an even larger measuring range.

### Typical applications

- Gas volume measurement in the chemical industry and process technology
- Pressurized air balancing
- Gas burner controls
- Digester gas and activation air measurements in sewage plants
- Gas measurement in air separators
- Hydrogen measurements in the process

### ApplicationSelector – integrated data bank for gases

The thermal mass flowmeter SensyMaster FMT430, FMT450 has an integrated gas data bank (see table **Available gas types** on page 8).

Two (FMTx30) or eight (FMTx50) different applications can be defined in total.

Up to two or four applications can also be factory-preconfigured on request.

The operator can define their own applications (only with FMTx50):

- For each application, the gas type can be chosen from a table, additionally gas mixtures of up to ten different gases can also be configured.
- For each application the pipeline diameter can be configured.
- For each application the parameters for the flow rate and temperature measurement can be configured.

### Available gas types

Air	Ketene – CH <sub>2</sub> CO
Nitrogen – N <sub>2</sub>	Diketene – C <sub>4</sub> H <sub>4</sub> O <sub>2</sub>
Oxygen – O <sub>2</sub>	Ethane – C <sub>2</sub> H <sub>6</sub>
Methane – CH <sub>4</sub>	Ethanol – C <sub>2</sub> H <sub>5</sub> OH
Carbon dioxide – CO <sub>2</sub>	Ethylene – C <sub>2</sub> H <sub>4</sub>
Hydrogen – H <sub>2</sub>	Formaldehyde – CH <sub>2</sub> O
Biogas Type 1*	Helium – He
Propane – C <sub>3</sub> H <sub>8</sub>	Hexane – C <sub>6</sub> H <sub>14</sub>
Argon – Ar	Hydrogen sulphide – H <sub>2</sub> S
Natural gas Type 1*	Methanol – CH <sub>3</sub> OH
Acetone – C <sub>3</sub> H <sub>6</sub> O	Neon – Ne
Acetylene – C <sub>2</sub> H <sub>2</sub>	Nitrogen oxide – NO
Ammonia – NH <sub>3</sub>	Ozone – O <sub>3</sub>
1.2-Butadiene – C <sub>4</sub> H <sub>6</sub>	Pentane – C <sub>5</sub> H <sub>12</sub>
1.3-Butadiene – C <sub>4</sub> H <sub>6</sub>	Propadiene – C <sub>3</sub> H <sub>4</sub>
Butane – C <sub>4</sub> H <sub>10</sub>	Propylene – C <sub>3</sub> H <sub>6</sub>
1 Butane – C <sub>4</sub> H <sub>8</sub>	Water vapor – H <sub>2</sub> O
Carbon monoxide – CO	

\* In the case of natural gas and biogas, the exact composition must be provided.

### Note

In the case of hydrogen and helium gas types as pure gas or as a component of a gas mixture with a concentration of over 10 %, an optional process gas calibration should always be additionally ordered.

That way, any possible additional measuring errors due to the special characteristics of gases are avoided.

### Note

For measuring medium H<sub>2</sub> or He in nominal diameter DN 25 to DN 50 or 1 to 2 in please use pipe component design 2 (FMT092) with flow straightener.



## Diagnosis and self-monitoring

The thermal mass flowmeter SensyMaster FMT430, FMT450 also includes the internal monitoring of the transmitter and the sensor.

Amongst other things, the following functions and components are monitored:

- Monitoring of the power supply
- Limit value monitoring of the process values, temperature monitoring of the measuring medium
- Monitoring of the sensor element for line break and short-circuit
- Monitoring of the SensorApplicationMemory

## Sensor element check 'VeriMass. (optional)

### SensorCheck

VeriMass includes the SensorCheck, which verifies the integrity of the measuring elements and can notify of possible deposits on the measuring elements.

The SensorCheck relies on the comparison of fingerprints. The fingerprint includes values that are based on the temperature and heat conductivity of the measuring element. For instance, a fingerprint created during installation can be compared with a fingerprint created at a later point in time.

The SensorCheck must be started in the transmitter and always performed at zero flow under the same conditions. The comparison of values delivers information on possible damage or contamination of the measuring elements.

## FillMass batch function

### Only for FMT450

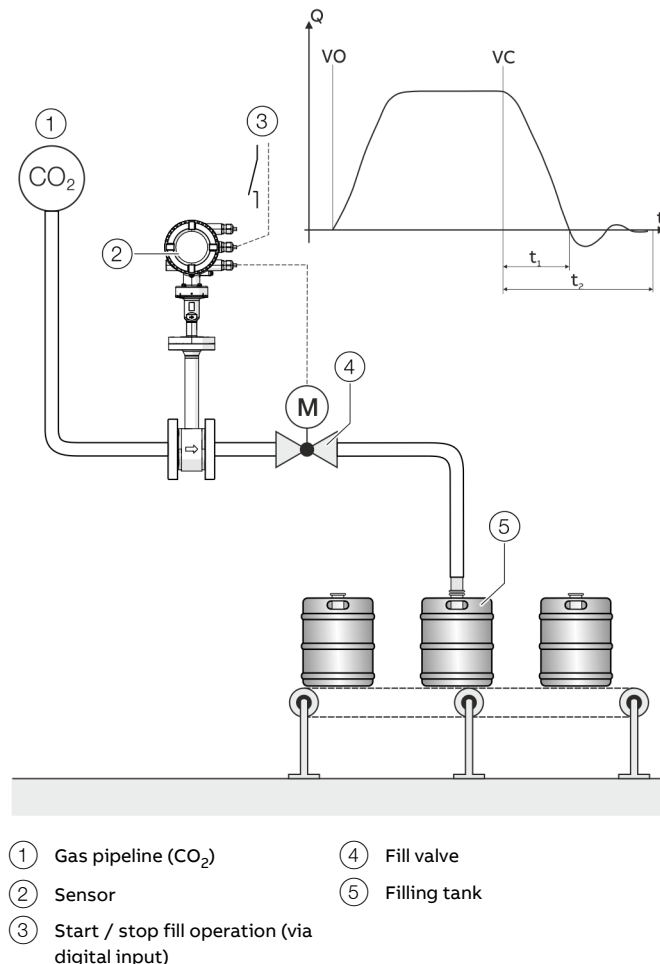


Figure 6: FillMass filling function (example CO<sub>2</sub> fill)

### Diagram legend

VO	Valve open (filling started)
VC	Valve closed (fill quantity reached)
t <sub>1</sub>	Valve closing time
t <sub>2</sub>	Overrun time

The integrated FillMass fill function allows filling processes with filling times of > 3 seconds.

For this purpose, the filling quantity is given via an adjustable totalizer.

The fill function is controlled via the HART interface or via the digital input.

The valve is triggered via one of the digital outputs and closed again once the preset filling quantity is reached.

The transmitter measures the overrun quantity and calculates the overrun correction from this.

Additionally, the low flow cut-off can be activated if required.

# Flowmeter sensor

## Installation conditions

### Installation location and assembly

Note the following points when selecting the installation location and when mounting the sensor:

- The ambient conditions (IP rating, ambient temperature range  $T_{ambient}$ ) of the device must be adhered to at the installation location.
- Sensors and transmitters must not be exposed to direct sunlight. If necessary, provide a suitable means of sun protection on site. The limit values for ambient temperature  $T_{ambient}$  must be adhered to.
- On flange devices, ensure that the counterflanges of the piping are aligned plane parallel. Only install flange devices with suitable gaskets.
- Prevent the sensor from coming into contact with other objects.
- The device is designed for industrial applications. No special EMC protective measures are required if the electromagnetic fields and interference at the installation location of the device comply with 'Best Practice' (in accordance with the standards listed in the declaration of conformity).  
Maintain a suitable distance from electromagnetic fields and interference that extend beyond the usual dimensions.

### Seals

Users are responsible for selecting and mounting suitable gaskets (material, shape).

Note the following points when selecting and mounting gaskets:

- Use gaskets made from a material that is compatible with the measuring medium and measuring medium temperature.
- Gaskets must not extend into the flow area, since possible turbulence may influence the accuracy of the device.

### Inlet and outlet sections

The figures below show the recommended inlet and outlet sections for various installations.

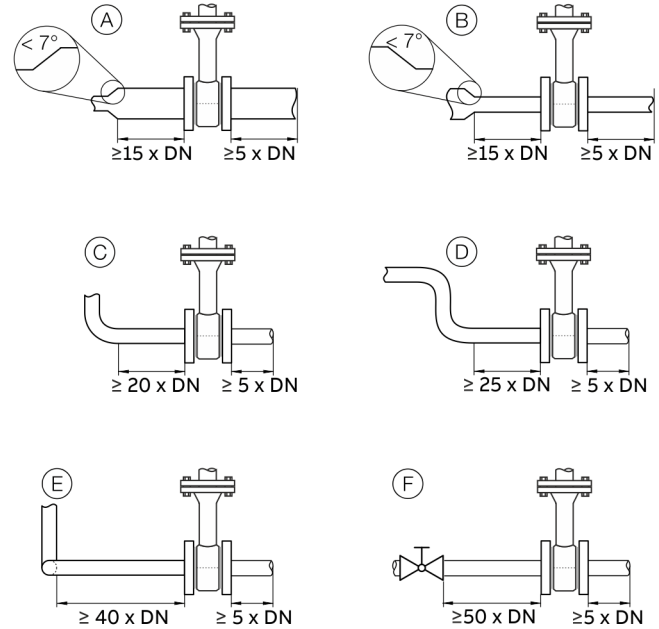


Figure 7: Inlet and outlet sections

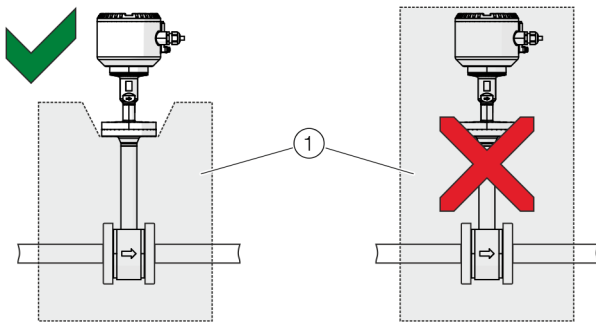
Installation	Inlet section	Outlet section
(A) Pipe extension	min. 15 × DN	min. 5 × DN
(B) Pipe reduction	min. 15 × DN	
(C) 90° Pipe elbow	min. 20 × DN	
(D) 2 × 90° pipe elbow in one level	min. 25 × DN	
(E) 2 × 90° pipe elbow in two levels	min. 40 × DN	
(F) Control Valve	min. 50 × DN	

To achieve the specified measuring accuracy, the indicated inlet and outlet sections are required.  
 In case of combinations of several inlet-side effects, e.g. valve and reduction, the longer inlet section must be taken into account.

In case of confined spaces at the installation site, the outlet section can be shortened to  $3 \times DN$ . However, reducing the specified inlet section will reduce the achievable level of accuracy.  
 A high repeatability of the measured value is maintained.

In case of insufficient inlet and outlet sections, a special calibration may be possible. To do this, a detailed reconciliation is necessary for individual cases.  
 The specified inlet and outlet sections must be doubled for gases with a very low density (hydrogen, helium).

**Sensor insulation**



① Insulation

Figure 8: Isolation of the sensor

The sensor may be insulated as shown in **Figure 8**.

**Installation at high ambient temperatures**

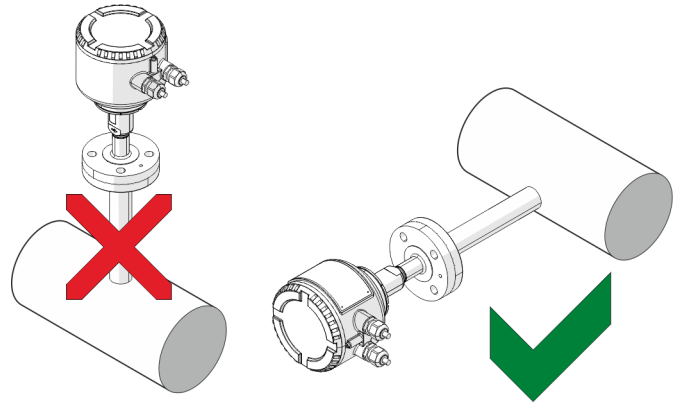


Figure 9: Mounting position at high ambient temperatures

Under high but permissible ambient temperatures, avoid additional thermal stress from heat convection or radiation, since these sources of heat may exceed the permissible ambient temperature on the equipment surface.

If the device needs to be installed directly on a hot, horizontal piping, we recommend installing it on the side. In such cases, you should avoid installing it in the 12 o'clock position, otherwise the warm air that rises up will cause additional heating of the electronics.

## ... Flowmeter sensor

### Measuring accuracy

#### Measured error

The stated measured error only applies under the reference conditions in the stated measuring range. Special calibration on request.

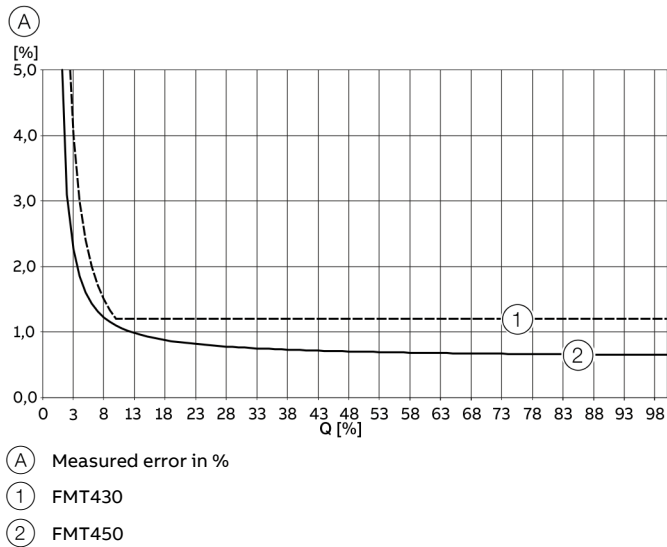


Figure 10: Measured error under reference conditions

Measured medium	FMT430	FMT450
Air	<ul style="list-style-type: none"> <li>±1.2 % of the measured value in the range of 10 to 100 % of the measuring range</li> <li>±0.12 % of the measuring range end value possible in the nominal diameter in the range of 0 to 10 % of the measuring range</li> </ul>	<ul style="list-style-type: none"> <li>±0.6 % of the measured value end value possible in the nominal diameter</li> <li>±0.1 % of the measuring range end value possible in the nominal diameter</li> </ul>
Other gases (with optional operating gas calibration)	—	<ul style="list-style-type: none"> <li>±1.6 % of the measured value</li> <li>±0.1 % of the measuring range end value possible in the nominal diameter</li> </ul>

Table 1 Measured error

#### Reference conditions

##### Calibration with air

Calibration gas	Air
Temperature	21 °C, ±2°C
Designation of gas connections	Atmospheric pressure
Relative humidity	40 to 60 %
Test laboratory	In accordance with ISO / IEC 17025

##### Calibration with process gas

Order code	RP, RM
------------	--------

ABB offers the possibility of calibrating thermal mass flowmeters with non-corrosive and non-toxic gases and mixtures of such, subject to availability.

The availability of gases should be inquired prior to ordering with ABB.

For the following gases: argon (Ar), helium (He), hydrogen (H<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>), ABB recommends operating gas calibration.

The exact reference conditions are noted in the respective calibration certificate.

#### Repeatability

< 0.2 % of the measured value, measuring time: 10 s

#### Response time

T<sub>63</sub> = 0.5 s

#### Effect of the measuring medium temperature

< 0.025 % of the measured value per Kelvin (depending on the gas type)

#### Effect of the measuring medium pressure

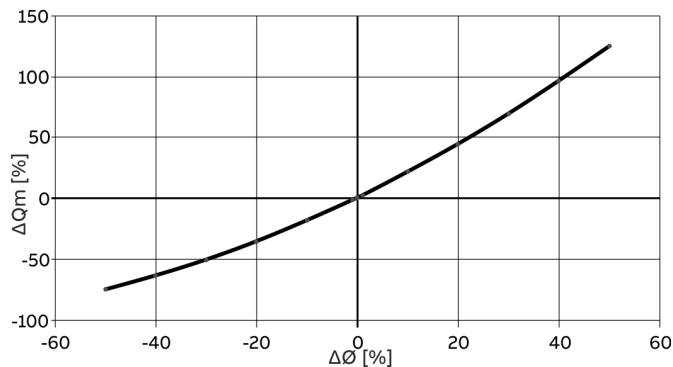
< 0.1 % of the measured value per 100 kPa (1 bar) (depending on the gas type)

#### Influence of the relative humidity of the measuring medium

0.2 % of the measured value per 10 % RH in the range from 15 to 70 % RH

### Influence of the pipe cross-section

If the inside diameter configured in the device does not correspond with the real diameter of the piping, measuring errors in the flow measurement occur.



Δ Qm [%] Measuring error mass flowmeter in %

Δ Ø [%] Deviation piping inside diameter in %

Figure 11: Influence of the pipe cross-section

## Ambient conditions

### Note

When using the device in potentially explosive atmospheres, note the additional temperature data in **Temperature data** on page 48!

### Ambient temperature

- Standard: -20 to 70 °C (-4 to 158 °F)
- Optional: -40 to 70 °C (-40 to 158 °F)

### Storage temperature range

Standard design:

-20 to 85 °C (-4 to 185 °F),

Low temperature design:

-40 to 85 °C (-40 to 185 °F)

### Relative humidity

Maximum 85 % RH, annual average ≤ 65 % RH

### IP rating

In accordance with EN 60529: IP 65 / IP 67

### NEMA IP rating

NEMA 4X

## Permitted pipe vibration

In accordance with IEC 60068-2-6

Maximum acceleration: 2 g in the frequency range of 10 to 150 Hz

## Process conditions

### Note

When using the device in potentially explosive atmospheres, note the additional temperature data in **Temperature data** on page 48!

### Measured medium temperature

Devices with ceramic sensor element and flanged connection:

Design	T <sub>medium</sub>
Standard and explosion-proof design	-20 to 150 °C (-4 to 302 °F)
High temperature design*	-20 to 300 °C (-4 to 572 °F)
Low temperature design	-40 to 150 °C (-40 to 302 °F)
DVGW Version	-20 to 100°C (-4 to 212 °F)

\* Not in connection with explosion-proof design.

The approved measuring medium temperature T<sub>medium</sub> also depends on the selected sensor connection and the design of the pipe components.

The following temperature specifications apply:

Sensor connection	T <sub>medium</sub>
Flange DN25	-40 to maximum 300 °C (-40 to maximum 508 °F)
Threaded connection DIN 11851	-20 to 140 °C (-4 to 284 °F)
Clamp ring fitting	-40 to 150 °C (-40 to 302 °F)
Pipe components with ball valve	Maximum 150 °C (302 °F)
Integrated hot tap fitting	-20 to 150 °C (-4 to 302 °F)

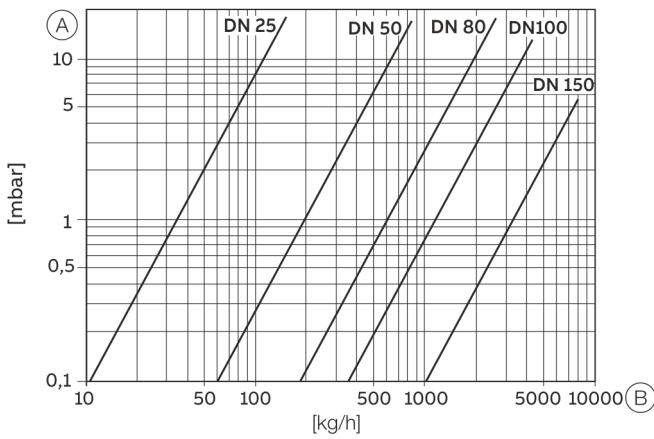
## ... Flowmeter sensor

### Operating pressure

#### Maximum operating pressure

Sensor connection	Maximum measuring medium pressure $P_{medium}$
Flange in accordance with DIN EN 1092, PN 40	4 MPa, 40 bar (580 psi)
Threaded connection DIN 11851	1.6 MPa, 16 bar (232 psi)
Clamp ring fitting	2 MPa, 20 bar (290 psi)
Integrated hot tap fitting	See <b>Integrated hot tap fitting</b> on page 30

#### Pressure loss



(A) Pressure loss (B) Mass flow

Figure 12: Pressure loss in logarithmic representation

### Sensor installation length

The sensor is available in different installation lengths. Refer to **Sensor** on page 32.

### Sensor connection

The following sensor connections are available for connecting the sensor to the pipe components or the process:

Sensor connection
Flange in accordance with EN 1092-1 DN 25, PN 40
Male thread in accordance with DIN 11851, PN 16
Compression fitting NPT 1 in male thread, PN 20

### Materials

#### Materials for the sensor

Wetted components	Material
Sensor	Stainless steel 1.4404 (AISI 316L)
Sensor element	Ceramic
Sensor connection gasket (O-ring)	<ul style="list-style-type: none"> <li>Viton® (standard)</li> <li>Kalrez® 4079 / Kalrez® 1050 (for high temperature design)</li> <li>Kalrez® 1050 (for oxygen)</li> <li>Kalrez® Spectrum 6375 (for ammonia)</li> <li>EPDM (DIN 11851)</li> <li>FKM® (for low temperature design)</li> <li>HNBR® (for DVGW design)</li> </ul>

## Measuring range table

### Non-Ex areas / Zone 2 / Division 2

The recommended value for applications with air (other gases on request) under atmospheric conditions. For hydrogen and helium, the measuring range lower limit is typically approx. 10 % of the upper limit.

#### Devices with process connections in accordance with EN 1029-1

Nominal diameter	Standard measuring range		Extended measuring range	
	Q <sub>max</sub> [kg/h]	Q <sub>max</sub> [Nm <sup>3</sup> /h]**	Q <sub>max</sub> [kg/h]	Q <sub>max</sub> [Nm <sup>3</sup> /h]**
DN 25 (1 in)	180	140	240	180
DN 40 (1½ in)	450	350	590	450
DN 50 (2 in)	800	620	1050	800
DN 65 (2½ in)	1400	1100	1800	1400
DN 80 (3 in)	1900	1500	2500	1900
DN 100 (4 in)	3200	2500	4100	3200
DN 125 (5 in)	4800	3800	6200	4800
DN 150 (6 in)	7000	5500	9000	7000
DN 200 (8 in)	11800	9200	15000	12000
Ø to 3000 mm (118 in)*	2500000	1900000	3200000	2500000

#### Device with process connections in accordance with ASME B16.5

Nominal diameter	Standard measuring range		Extended measuring range	
	Q <sub>max</sub> [lbs/h]	Q <sub>max</sub> [ft <sup>3</sup> /h]**	Q <sub>max</sub> [lbs/h]	Q <sub>max</sub> [ft <sup>3</sup> /h]**
1 in	350	4500	450	5900
1½ in	880	11000	1100	14500
2 in	1600	21000	2000	28000
3 in	3700	50000	4900	66000
4 in	6400	83000	8400	108000
6 in	14500	190000	19000	248000
8 in	25500	325000	33100	425000
Ø to 3000 mm (118 in)*	5500000	71000000	7100000	93000000

\* Rectangular ducts and larger diameters on request

\*\* Applies for air at 0 °C (32 °F) / 1013.25 hPa (14.696 psia)

\*\*\* Applies for air at 15 °C (59 °F) / 1013.25 hPa (14.696 psia)

## ... Flowmeter sensor

### Zone 0 / Zone 1 / Division 1

#### Devices with process connections in accordance with EN 1029-1

Nominal diameter	Q <sub>max</sub> [kg/h]	Q <sub>max</sub> [Nm <sup>3</sup> /h]**
DN 25 (1 in)	150	120
DN 40 (1½ in)	380	300
DN 50 (2 in)	650	500
DN 65 (2½ in)	1200	920
DN 80 (3 in)	1700	1300
DN 100 (4 in)	3000	2300
DN 125 (5 in)	4500	3500
DN 150 (6 in)	6500	5000
DN 200 (8 in)	11000	8500
Ø to 3000 mm (118 in)*	2300000	1800000

#### Device with process connections in accordance with ASME B16.5

Nominal diameter	Q <sub>max</sub> [lbs/h]	Q <sub>max</sub> [ft <sup>3</sup> /h]***
1 in	290	3800
1½ in	750	10000
2 in	1400	18000
3 in	3400	45000
4 in	6000	80000
6 in	14000	180000
8 in	24000	310000

\* Rectangular ducts and larger diameters on request

\*\* Applies for air at 0 °C (32 °F) / 1013.25 hPa (14.696 psia)

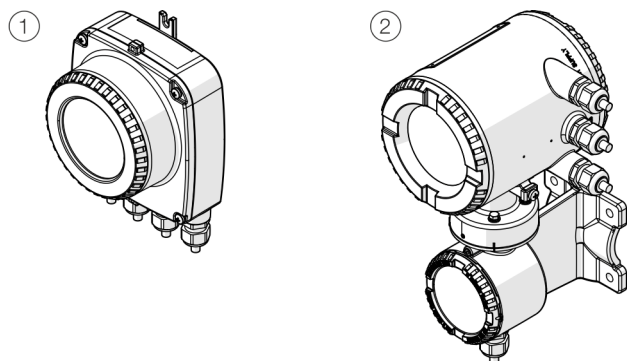
\*\*\* Applies for air at 15 °C (59 °F) / 1013.25 hPa (14.696 psia)

#### Note

For additional information on dependencies and restrictions, and for help on product selection, please refer to the Online ABB Product Selection Assistant (PSA) for flow rate at [abb.com/flow-selector](http://abb.com/flow-selector).



## Transmitter



- ① Single-compartment housing  
② Dual-compartment housing

Figure 13: Transmitter in field mount housing (remote mount design)

## Features

- 4 to 20 mA current / HART 7 output.
- In the event of an alarm, current output can be adjusted to 21 to 23 mA (NAMUR NE43).
- Programmable digital output. Can be configured as a frequency, pulse or binary output.
- Two slots for optional plug-in cards for retrofitting additional current outputs, digital outputs and digital inputs.
- Parameterization by means of HART communication.
- Damping: can be adjusted 0.2 to 100 s ( $1 \tau$ ).
- Low flow cut-off: 0 to 10 % for current and pulse output.
- Measuring medium parameters can be changed at any time (pressure and temperature influence, units, etc.).
- Simulation of current and binary output (manual process execution).

### LCD indicator (option)

- Indicator of all measured values of the SensyMaster (e.g. mass flow, standard volume flow, temperature).
- Application-specific visualizations which the user can select. Four 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.
- Operation through the front glass via capacitive buttons.

### Optional plug-in cards

The transmitter has two slots (OC1, OC2) into 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.

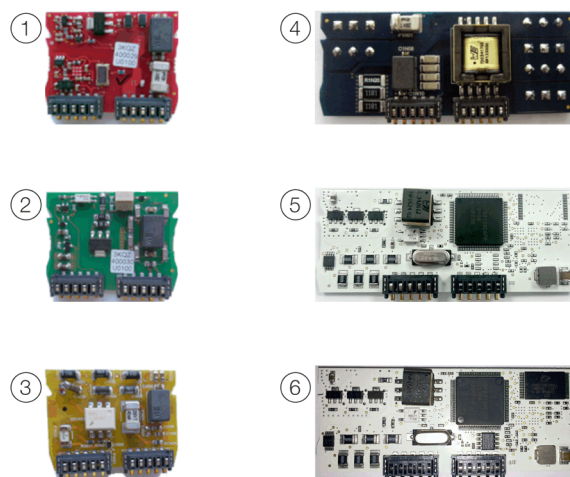


Figure 14: Plug-in cards

Plug-in card	Quantity
① Current output, 4 to 20 mA passive (red) Order no.: 3KQZ400029U0100	2*
② Passive digital output (green) Order no.: 3KQZ400030U0100	1
③ Passive digital input (yellow) Order no.: 3KQZ400032U0100	1
④ 24 V DC voltage supply (blue) Order no.: 3KQZ400031U0100	1
⑤ Modbus RTU® RS485 (white) Order no.: 3KQZ400028U0100	1
⑥ PROFIBUS DP® (white) Order no.: 3KQZ400027U0100	1

\* The 'Number' column indicates the maximum number of plug-in cards of the same type that can be used.

### Note

For an overview of the possible plug-in card combinations, refer to **Ordering Information** on page 56.

## ... Transmitter

### IP rating

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

### Vibration

In accordance with EN 60068-2

- In the range from 10 to 58 Hz maximum deflection 0.15 mm (0.006 inch)\*
- In the range from 58 to 150 Hz, maximum acceleration 1 g\*

\* Isolated peak load: 2 g

### Approved relative humidity

In accordance with EN 60068-2-30

### Temperature Data

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

#### Note

When operating below -20 °C (-4 °F), the LCD display can no longer be read and the electronics should be operated with as few vibrations as possible.

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	Polyamide, M20 × 1.5 or ½ in NPT Stainless steel*, M20 × 1.5 or ½ in NPT

#### Remote mount design

Housing	Cast aluminum, painted
Paint	≥ 80 µm thick, RAL 9002 (gray white)
Cable gland	Polyamide, M20 × 1.5 or ½ in NPT Stainless steel*, M20 × 1.5 or ½ in NPT
Weight dual-compartment housing	4.5 kg (9.92 lb)
Weight single-compartment housing	2.1 kg (4.6 lb)

\* in the case of explosion-proof design for ambient temperature of -40 °C (40 °F)

### Signal cables

The signal cable used for the connection of the transmitter and sensor must fulfill at least the following technical specifications.

#### Cable specification

Impedance	100 to 120 Ω
Withstand voltage	120 V
Outer diameter	6 to 12 mm (0.24 to 0.47 in)
Cable design	Two wire pairs as a star-quad cable
Conductor cross-section	Length-dependent
Shield	Copper braid with approximately 85 % coverage
Temperature range	Depends on application.

#### Maximum signal cable length

0.25 mm <sup>2</sup> (AWG 24)	25 m (82 ft)
0.34 mm <sup>2</sup> (AWG 22)	40 m (131 ft)
0.5 mm <sup>2</sup> (AWG 20)	65 m (213 ft)
0.75 mm <sup>2</sup> (AWG 19)	100 m (328 ft)

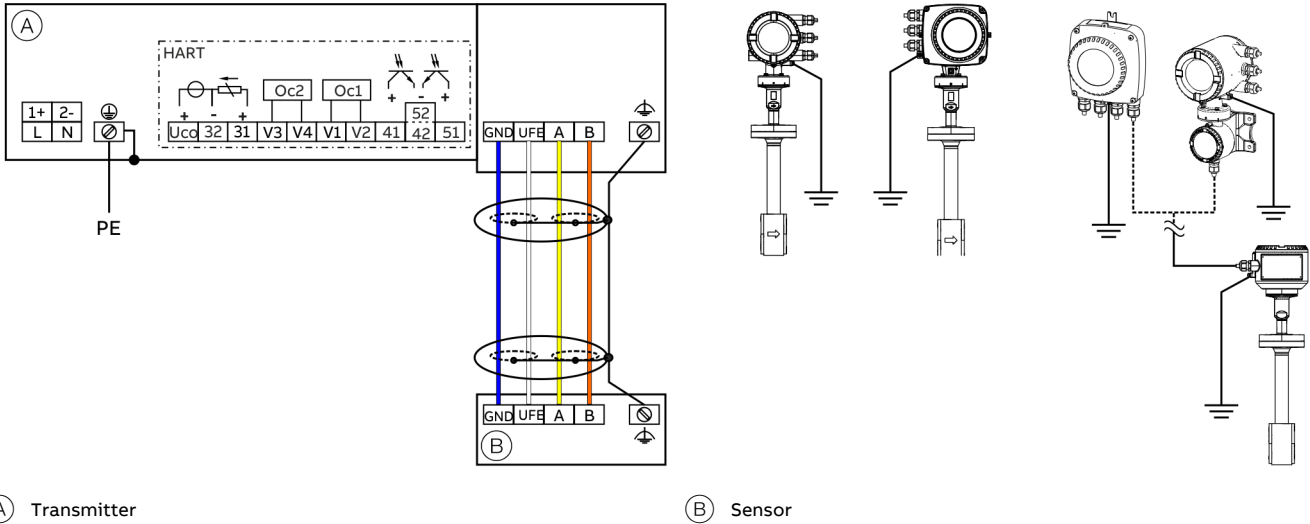
#### Recommended cables

It is recommended to use an ABB signal cable with the order number 3KQZ407123U0100 for standard applications.

The ABB signal cable fulfills the above-mentioned cable specification and can be utilized unrestrictedly up to an ambient temperature of  $T_{amb.} = 80\text{ °C}$  (176 °F).

## Electrical connections

### Electrical connection (HART protocol)



(A) Transmitter

(B) Sensor

Figure 15: Electrical connection

### 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

### Connecting the signal cable

Only for remote mount design.

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

Terminal	Function / comments
U <sub>FE</sub>	Sensor power supply
GND	Ground
A	Data line
B	Data line
≡	Functional earth / Shielding

### Connections for inputs and outputs

Terminal	Function / comments
U <sub>co</sub> / 32	Current output 4 to 20 mA- / HART® output, active or
31 / 32	Current output 4 to 20 mA- / HART® output, passive
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 **Optional plug-in cards** on page 17.

## ... Transmitter

### Electrical data for inputs and outputs

**Note**

When using the device in potentially explosive atmospheres, note the additional temperature data in **Use in potentially explosive atmospheres** on page 43!

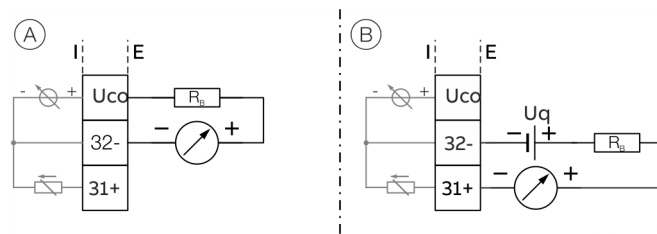
**Power supply L / N, 1+ / 2-**

AC voltage	
Terminals	L / N
Operating voltage	100 to 240 V AC, 50 / 60 Hz
Power consumption	< 20 VA

DC voltage	
Terminals	1+ / 2-
Operating voltage	19 to 30 V DC
Power consumption	< 20 W

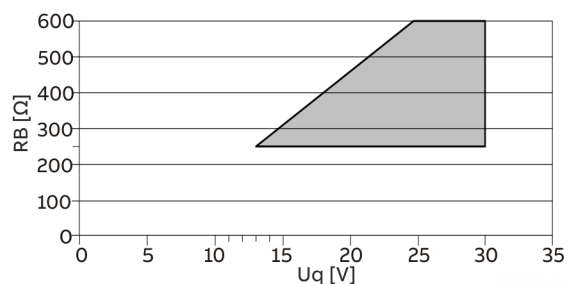
**Current output 32 / Uco, 31 / 32 (basic device)**

Can be configured for outputting mass flow, volume flow, density and temperature via on-site software.



(A) Current output 31 / Uco, active (B) Current output 31 / 32, passive

Figure 16: (I = internal, E = external, RB = load)



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

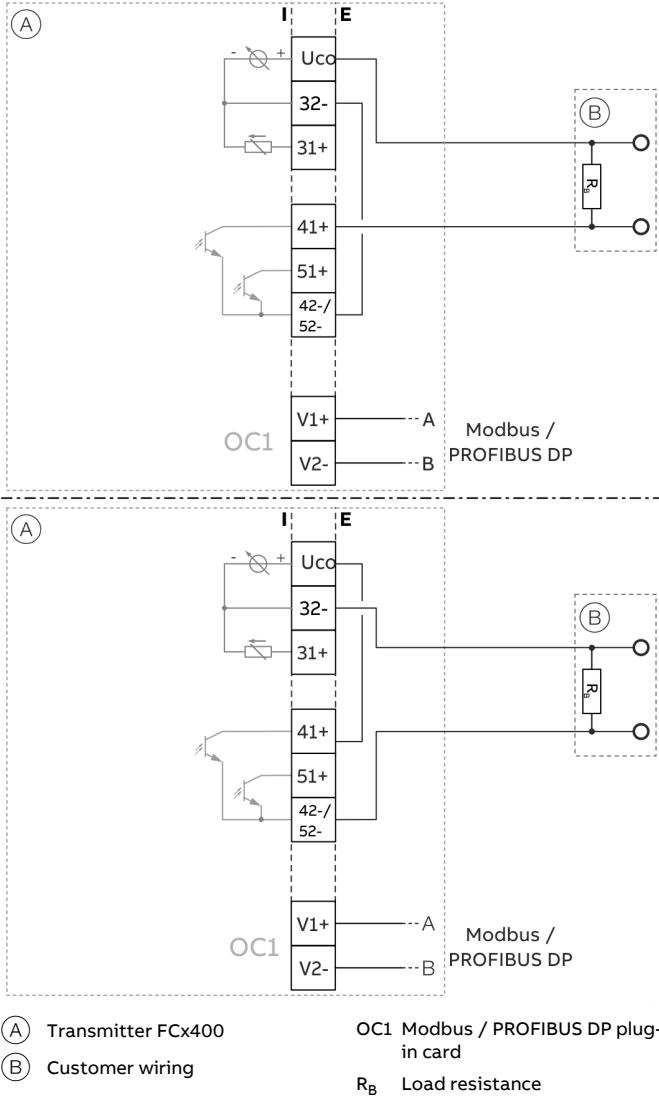
Figure 17: Source voltage for passive outputs

Current output	Active	Passive
Terminals	Uco / 32	31 / 32
Output signal	4 to 20 mA	
Load $R_B$	$250 \Omega \leq R_B \leq 300 \Omega$	$250 \Omega \leq R_B \leq 600 \Omega$
Source voltage $U_q^*$	—	$13 \text{ V} \leq U_q \leq 30 \text{ V}$
Measuring error	< 0.1 % of measured value	
Resolution	0.4 $\mu\text{A}$ per digit	

\* The source voltage  $U_q$  is dependent of the load  $R_B$  and must be placed in an additional area.

For information on communication via the HART protocol, refer to **HART® Communication** on page 27.

**Current output  $U_{co} / 32$  as loop power supply for digital output 41 / 42 or 51 / 52**



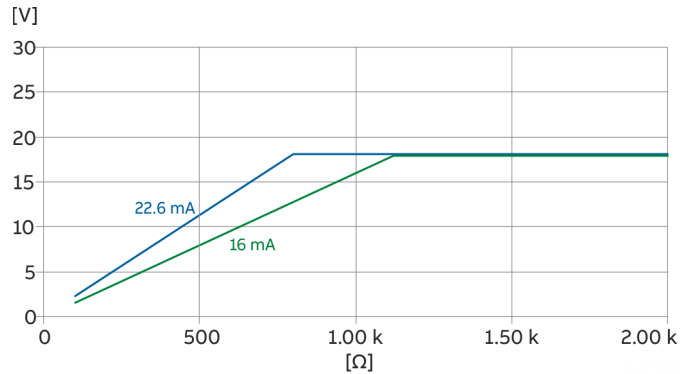
**Figure 18: Current output  $U_{co} / 32$  in power mode**

In the case of digital communication via Modbus / PROFIBUS DP, the current output  $U_{co} / 32$  can be switched to the 'Power Mode' operating mode through the software. The current output 31/32/ $U_{co}$  is set permanently to 22.6 mA and no longer follows the selected process variable. HART communication is deactivated. As a result, the passive digital outputs 41 / 42 or 51 / 52 can also be operated as active digital outputs.

The load resistance  $R_B$  needs to be integrated by the customer outside of the transmitter housing.

Loop power supply 24 V DC operating mode	
Terminals	$U_{co} / 32$
Function	For active connection of passive outputs
Output Voltage	Load dependent, see Figure 19.
Load rating $I_{max}$	22.6 mA, permanently short circuit-proof

**Table 2: Specification current output  $U_{co} / 32$  in power mode**

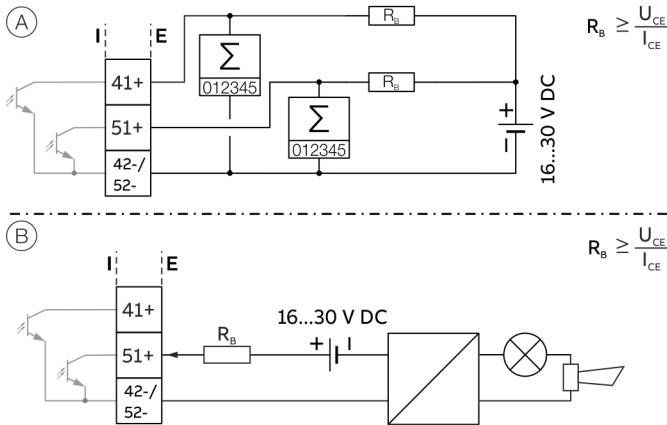


**Figure 19: Output voltage dependent on load resistance**

## ... Transmitter

### Digital output 41 / 42, 51 / 52 (basic device)

Can be configured as pulse, frequency or binary output via on-site software.



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

Figure 20: (I = internal, E = external, R<sub>B</sub> = load)

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	0.05 to 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> ≤ 3 V DC 0 mA ≤ I <sub>CEH</sub> ≤ 0.2 mA
Switching function	Can be configured using software.

### Note

- Terminals 42 / 52 have common grounding. Digital outputs 41 / 42 and 51 / 52 are not electrically isolated from each other. An electrically isolated digital output can be made using a plug-in module.
- If using a mechanical counter, it is advisable to set a pulse width of ≥ 30 ms and a maximum frequency of f<sub>max</sub> ≤ 3 kHz.

### 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.

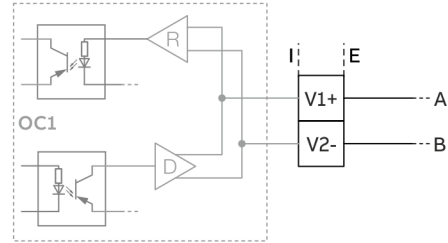


Figure 21: Plug-in card as a Modbus / PROFIBUS DP interface (I = internal, E = external)

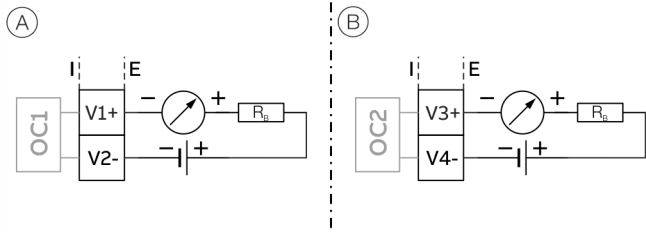
The corresponding plug-in card can only be used in slot OC1.

For information on communication through the Modbus or PROFIBUS DP protocols, refer to chapters **Modbus® communication** on page 27 and **PROFIBUS DP® communication** on page 28.

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

Up to two additional plug-in modules can be implemented via the 'Passive current output (red)' option module.

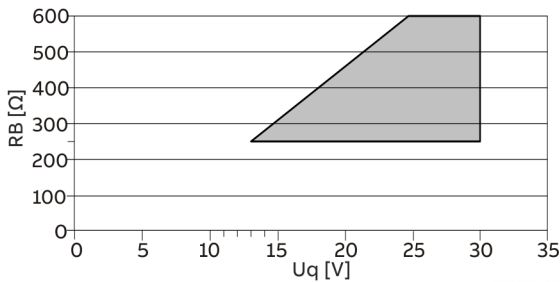
Can be configured for outputting mass flow, volume flow, density and temperature via on-site software.



(A) Current output V1 / V2, passive (B) Current output V3 / V4, passive

Figure 22: (I = internal, E = external, RB = load)

The plug-in module can be used in slot OC1 and OC2.



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

Figure 23: Source voltage for passive outputs

<b>Passive current output</b>	
Terminals	V1 / V2, V3 / V4
Output signal	4 to 20 mA
Load $R_B$	$250 \Omega \leq R_B \leq 600 \Omega$
Source voltage $U_q^*$	$13 \text{ V} \leq U_q \leq 30 \text{ V}$
Measuring error	< 0.1 % of measured value
Resolution	0.4 $\mu\text{A}$ per digit

\* The source voltage  $U_q$  is dependent of the load  $R_B$  and must be placed in an additional area.

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

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

Can be configured as an alarm output, etc. via on-site software.

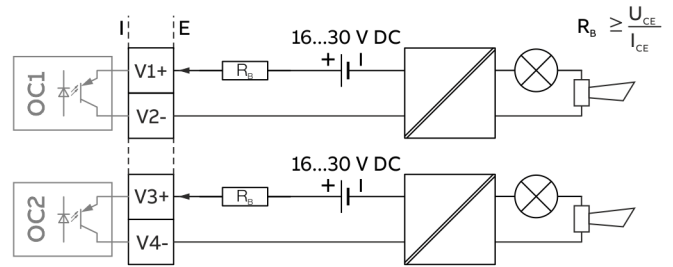


Figure 24: Plug-in card as binary output (I = internal, E = external, RB = load)

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

<b>Binary output (passive)</b>	
Terminals	V1 / V2, V3 / V4
Output 'closed'	$0 \text{ V} \leq U_{CEL} \leq 3 \text{ V}$ $2 \text{ mA} < I_{CEL} < 30 \text{ mA}$
Output 'open'	$16 \text{ V} \leq U_{CEH} \leq 30 \text{ V DC}$ $0 \text{ mA} \leq I_{CEH} \leq 0.2 \text{ mA}$
Switching function	Can be configured using software.

## ... Transmitter

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

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

Can be configured as an input for external counter reset, external output deactivation etc. via on-site software.

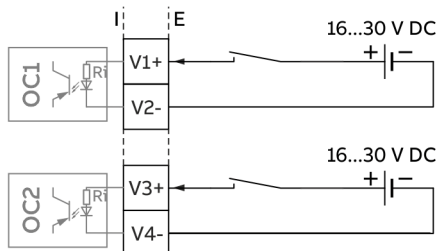


Figure 25: Plug-in card as digital input (I = internal, E = external)

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

#### Digital input

Terminals	V1 / V2, V3 / V4
Input 'On'	$16\text{ V} \leq U_{KL} \leq 30\text{ V}$
Input 'Off'	$0\text{ V} \leq U_{KL} \leq 3\text{ V}$
Internal resistance $R_i$	6.5 k $\Omega$
Function	Can be configured using software.

### 24 V DC loop power supply (plug-in module)

Use of the 'loop power supply (blue)' plug-in card allows a passive output on the transmitter to be used as an active output. See also **Connection examples** on page 25.

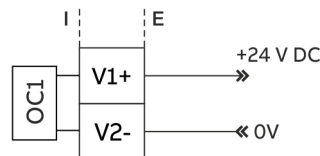


Figure 26: (I = Internal, E = External)

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

#### Loop power supply 24 V DC

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 $I_{max}$	25 mA, permanently short circuit-proof

#### Note

If the device is used in potentially explosive atmospheres, the plug-in card for the power supply may only be used to supply a passive output. It is not allowed, to connect it to multiple passive outputs!



**Connection examples**

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

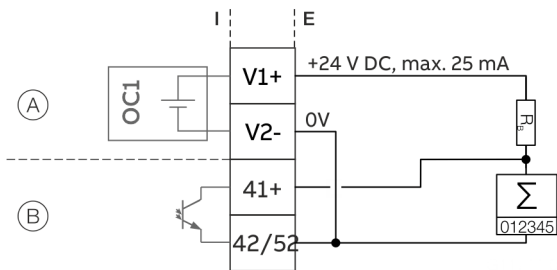
**Digital output 41 / 42, 51 / 52, V3 / V4 active**

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

**Note**

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

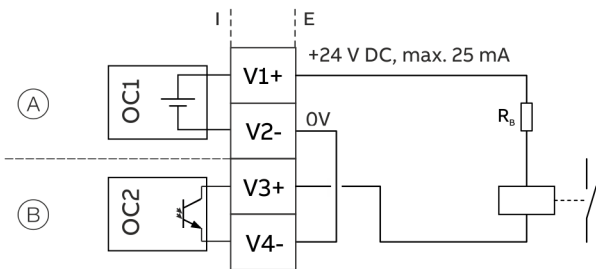
It must not be connected to two outputs (for example digital output 41 / 42 and 51 / 52)!



- (A) 'Loop power supply (blue)' plug-in card in slot 1
- (B) Digital output, digital output 41 / 42

Figure 27: Active digital output 41 / 42 (example)

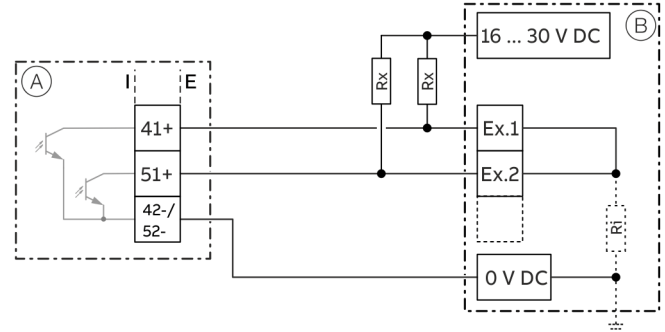
The connection example shows usage for digital output 41 / 42; the same applies to usage for digital output 51 / 52.



- (A) 'Loop power supply (blue)' plug-in card in slot 1
- (B) 'Digital output (green)' plug-in card in slot 2

Figure 28: Active digital output V3 / V4 (example)

**Digital output 41 / 42, 51 / 52 passive on distributed control system**



- (A) Transmitter
- (B) Distributed control system / Memory programmable controller
- Ex. 1 Input 1
- Ex. 2 Input 2
- R<sub>X</sub> Resistor for current limitation
- R<sub>I</sub> Distributed control system internal resistance

Figure 29: Digital output 41 / 42 on distributed control system (example)

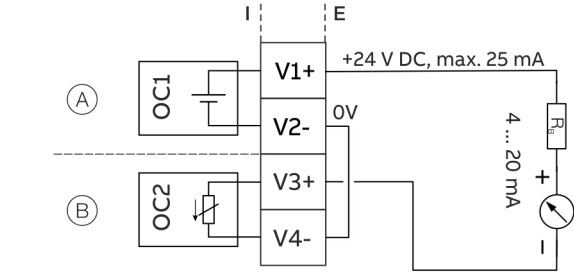
The R<sub>X</sub> resistors limit the maximum current through the optoelectronic coupler of the digital outputs in the transmitter.

The maximum permissible current is 25 mA. An R<sub>X</sub> value of 1000 Ω / 1 W is recommended at a voltage level of 24 V DC. The input on the distributed control system is reduced from 24 V DC to 0 V DC (falling edge) with '1' at the digital output.

## ... Transmitter

### Current output V3 / V4 active

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

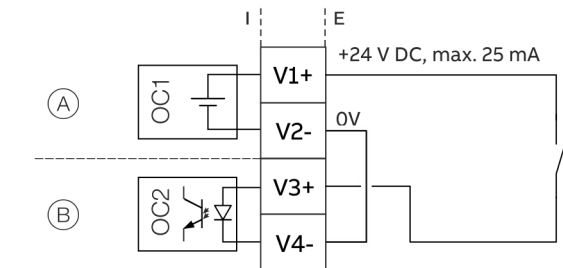


- (A) 'Loop power supply (blue)' plug-in card in slot 1
- (B) 'Passive current output (red)' plug-in card in slot 2

Figure 30: Active current output V3 / V4 (example)

### Digital input V3 / V4 active

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



- (A) 'Loop power supply (blue)' plug-in card in slot 1
- (B) 'Passive digital input (yellow)' plug-in card in slot 2

Figure 31: Active digital output V3 / V4 (example)

### Connection versions digital output 41 / 42, 51 / 52

Depending on the wiring of digital outputs DO 41 / 42 and 51 / 52, they can be used parallel or only individually. The electrical isolation between the digital outputs also depends on the wiring.

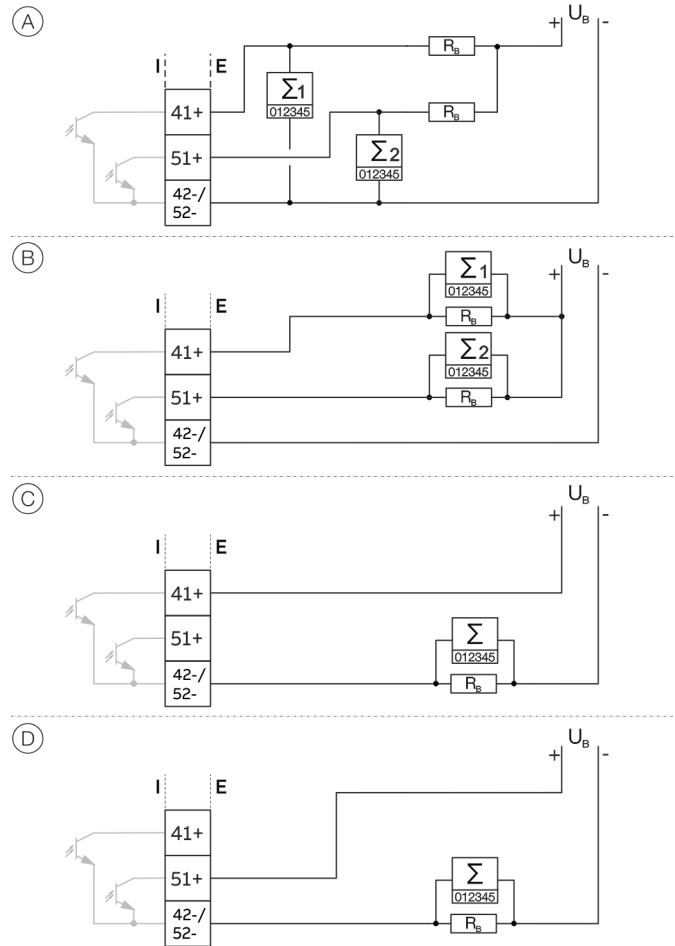


Figure 32: Connection versions digital output 41 / 42 and 51 / 52

	DO 41 / 42 and 51 / 52 can be used parallel	DO 41 / 42 and 51 / 52 electrically isolated
(A)	Yes	No
(B)	Yes	Yes
(C)	No, only DO 41 / 42 can be used	No
(D)	No, only DO 51 / 52 can be used	No

Table 3: Connection versions digital output

## Digital communication

### FDI – Field Device Integration

The Device Type Driver for the SensyMaster flowmeter is based on FDI technology and can either be integrated in a control system or loaded onto a PC with the ABB Ability™ Field Information Manager (FIM).

This allows you to work with the same user interface in the commissioning phase, during operation, and for service tasks involving monitoring the device, parameterization, and reading out data.

### HART® Communication

#### Note

The HART® protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

In connection with the DTM (Device Type Manager) available to the device, communication (configuration, parameterization) can be carried out FDT 0.98 or 1.2. Other tool or system integrations (e.g. Emerson AMS / Siemens PCS7) on request.

The necessary DTMs and other files can be downloaded 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 to 20 mA in accordance with the Bell 202 standard
Baud rate	1200 baud
Signal amplitude	Maximum 1.2 mAss

#### Factory setting of the HART® process variables

Process variable	Process value
Primary Value (PV)	Mass flow
Secondary Value (SV)	Temperature
Tertiary Value (TV)	Mass (counter)
Quaternary Value (QV)	Standard flow rate

The process values of the HART® variables can be set in the device menu.

### Modbus® communication

#### Note

The Modbus® protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

Modbus is an open standard owned and administrated by an independent group of device manufacturers styled the Modbus Organization ([www.modbus.org/](http://www.modbus.org/)).

Using the Modbus protocol allows devices made by different manufacturers to exchange information via the same communication bus, without the need for any special interface devices to be used.

#### Modbus protocol

Terminals	V1 / V2
Configuration	Via the Modbus interface or via the local operating interface in connection with a corresponding Device Type Manager (DTM)
Transmission	Modbus RTU - RS485 serial connection
Baud rate	2400, 4800, 9600, 19200, 38400, 56000, 57600, 115200 baud Factory setting: 9600 baud
Parity	None, even, odd Factory setting: odd
Stop bit	One, two Factory setting: One
IEEE format	Little endian, big endian Factory setting: Little endian
Typical response time	< 100 ms
Response delay time	0 to 200 milliseconds Factory setting: 10 milliseconds

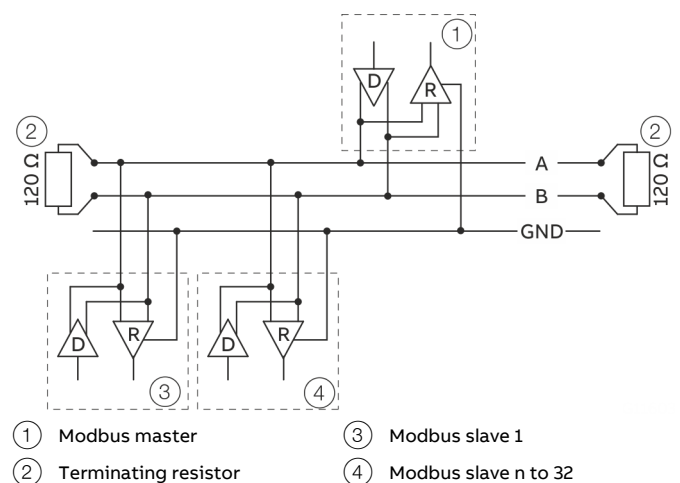


Figure 33: Communication with the Modbus protocol

### Cable specification

The maximum permissible length is dependent on the baud rate, the cable (diameter, capacity and surge impedance), the number of loads in the device chain, and the network configuration (2-core or 4-core).

- At a baud rate of 9600 and with a conductor cross-section of at least 0.14 mm<sup>2</sup> (AWG 26), the maximum length is 1000 m (3280 ft).
- When using a 4-core cable as a 2-wire wiring system, the maximum length must be halved.
- The spur lines must be short, a maximum of 20 m (66 ft).
- When using a distributor with 'n' connections, each branch must have a maximum length of 40 m (131 ft) divided by 'n.'

The maximum cable length depends on the type of cable used. The following standard values apply:

- Up to 6 m (20 ft):  
cable with standard shielding or twisted-pair cable.
- Up to 300 m (984 ft):  
double twisted-pair cable with overall foil shielding and integrated earth cable.
- Up to 1200 m (3937 ft):  
double twisted-pair cable with individual foil shielding and integrated earth cables. Example: Belden 9729 or equivalent cable.

A category 5 cable can be used for Modbus RS485 up to a maximum length of 600 m (1968 ft). For the symmetrical pairs in RS485 systems, a surge impedance of more than 100 Ω is preferred, especially at a baud rate of 19200 and above.

### PROFIBUS DP® communication

#### Note

The PROFIBUS DP® protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

#### PROFIBUS DP interface

Terminals	V1 / V2
Configuration	Via the PROFIBUS DP interface or via the local operating interface in connection with a corresponding Device Type Manager (DTM)
Transmission	In accordance with IEC 61158-2
Baud rate	9.6 kbps, 19.2 kbps, 45.45 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1.5 Mbps The baud rate is automatically detected and does not need to be configured manually
Device profile	PA Profile 3.02
Bus address	Address range 0 to 126 Factory setting: 126

Only one of the three different GSD files provided by ABB is needed for commissioning.

Parameterization of the device can be performed via the display, or through a device driver in the form of an FDI, EDD (Electronic Device Description) or DTM (Device Type Manager).

FDI, You can download EDD, DTM and GSD from [www.abb.com/flow](http://www.abb.com/flow).

The files required for operation can also be downloaded from [www.profibus.com](http://www.profibus.com).

ABB provides three different GSD files which can be integrated in the system.

ID number	GSD file name	
0x9740	PA139740.gsd	1xAI, 1xTOT
0x3435	ABB_3435.gsd	6xAI, 2xTOT, 1xDI, 2xDO
0x9700	PA139700.gsd	1xAI

Users decide at system integration whether to install the full range of functions or only part. Switching is made using the 'Ident Nr. Selector' parameter.

Refer to Operating instruction.

### Limits and rules when using ABB fieldbus accessories

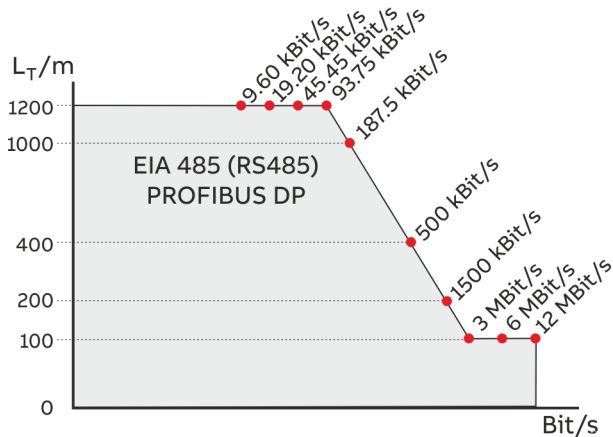


Figure 34: Bus cable length depends on the transmission rate

#### Pro PROFIBUS Line

(Line = Starts at DP Master and goes to last DP/PA Slave)

- Approximately 4 to 8 DP segments through the repeater (see repeater data sheets)
- Recommended DP transfer rate 500 to 1500 kBit/s
- The slowest DP node determines the transfer rate of the DP line
- Number of PROFIBUS DP and PA nodes  $\leq 126$  (addresses 0 to 125)

#### Per PROFIBUS DP segment

- Number of DP nodes  $\leq 32$   
(Node = Devices with / without PROFIBUS address)
- Bus termination required at the beginning and end of each DP segment!
- Trunk cable length ( $L_T$ ) see diagram  
(length dependent on transfer rate)
- Cable length of at least 1 m between two DP nodes at  $\geq 1500$  kBit/s!
- Spur cable length ( $L_S$ ), at  $\leq 1500$  kBit/s:  $L_S \leq 0.25$  m,  
at  $> 1500$  kBit/s:  $L_S = 0.00$  m!
- At 1500 kBit/s and ABB DP cable type A:
  - Sum of all spur cable lengths ( $L_S$ )  $\leq 6.60$  m, trunk cable length ( $L_T$ )  $> 6.60$  m,  
total length =  $L_T + (\sum L_S) \leq 200$  m,  
maximum 22 DP nodes  
(= 6.60 m / (0.25 m + 0.05 m spare))

## Pipe components

The pipe components are available with the following process connections:

Type	Process connection
FMT091	<b>Wafer type design</b> <ul style="list-style-type: none"> <li>• DN 25 to 200, PN 40 in accordance with EN 1092-1</li> <li>• 1 to 8 in, CL 150 / CL 300 in accordance with ASME B 16.5</li> </ul>
FMT092	<b>Partial measuring section</b> (optional with flow straightener) <ul style="list-style-type: none"> <li>• DN 25 to 100, PN 40, flange in accordance with EN 1092-1</li> <li>• 1 to 8 in, CL 150 / CL 300, flange in accordance with ASME B 16.5</li> <li>• DN 25 to 80, PN 10, flange in accordance with EN1092-1 B1</li> <li>• DN 25 to 80, PN 10, male thread R1 to 3 in</li> </ul>
FMT094	<b>Weld-on adapter</b> The ball valve variants are available for all designs (FMT091/FMT092/FMT094) for rectangular ducts or pipe diameters DN 100 to 3000.

The pipe components are available optionally with ball valve or integrated hot tap fitting.

- The pipe components with ball valve are approved for use in ATEX/IECEX/UKEX Zone 2 or cFMus Div. 2.
- The integrated hot tap fitting is approved for use in ATEX/IECEX/UKEX Zone 1, Zone 2 (not Zone 0) or cFMus Div. 1 and Div. 2.
- For information on measuring medium temperature, see **Measured medium temperature** on page 13.

The installation length of the sensor must be taken into account when selecting the pipe component!

## Materials

### Wetted materials for the pipe components

Type	Material
FMT091	Stainless steel 1.4571 (AISI 316 Ti)
Wafer type design	
FMT092	Stainless steel 1.4571 (AISI 316 Ti) or stainless steel 1.4301 (AISI 304)
Partial measuring section	
Partial measuring section with male thread	Steel, galvanized
FMT094	Stainless steel 1.4571 (AISI 316 Ti) optional: carbon steel 1.0037 (S 235)
Weld-on adapter	

## ... Pipe components

### Material loads for process connections

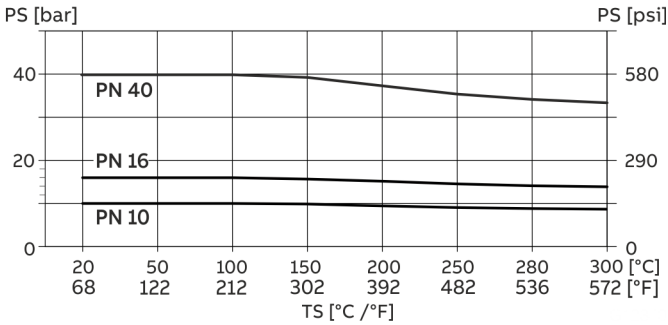


Figure 35: DIN flange process connection

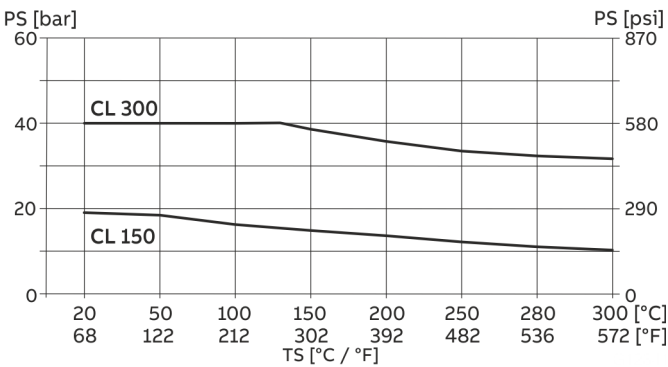


Figure 36: ASME flange process connection

The maximum approved operating pressure for CL 300 is limited to 40 bar (580 psi).

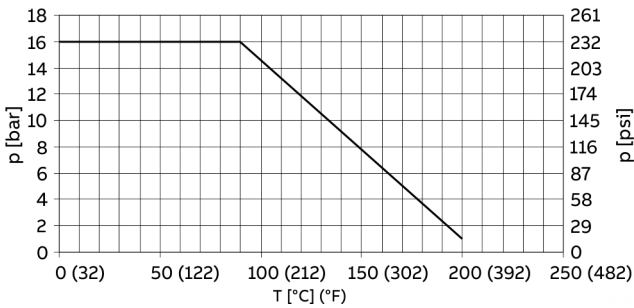


Figure 37: Maximum pressure/temperature values for integrated hot tap fitting

### Integrated hot tap fitting

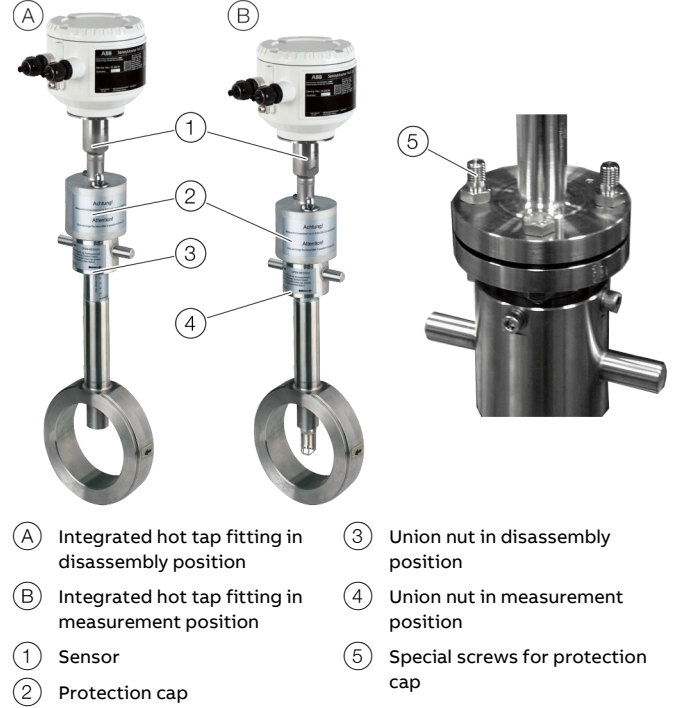


Figure 38: Integrated hot tap fitting (example)

The integrated hot tap fitting is used in conjunction with the previously described pipe components and weld-on adapters if it should be possible to remove the sensor during running operation.

The hot tap fitting is recommended for measurements in main lines (for example pressurized air supply) or at measuring points that need to be rinsed before the sensor is disassembled.

In general, a hot tap fitting should be used in case of measurements that make shutting-off device parts necessary to remove the sensor.

**Explosion protection approval**

The integrated hot tap fitting is approved for use in potentially explosive atmospheres of ATEX/IECEX/UKEX Zone 1 and Zone 2 or cFMus Div. 1 and Div. 2.

**Use in Zone 0 is not permitted!**

**Measuring medium temperature**

Refer to **Measured medium temperature** on page 13.

**Process connection**

The integrated hot tap fitting is available in wafer type or welding design.

Connection flanges PN 16 with four screw holes must be used in the integrated hot tap fitting in wafer type design DN 65.

Wafer type designs 2 to 8 in only for connection flanges in accordance with ASME B16.5, CI 150.

## Dimensions

### Sensor

#### Integral mount design

All dimensions and weights are specified in mm (inch) or kg (lb).

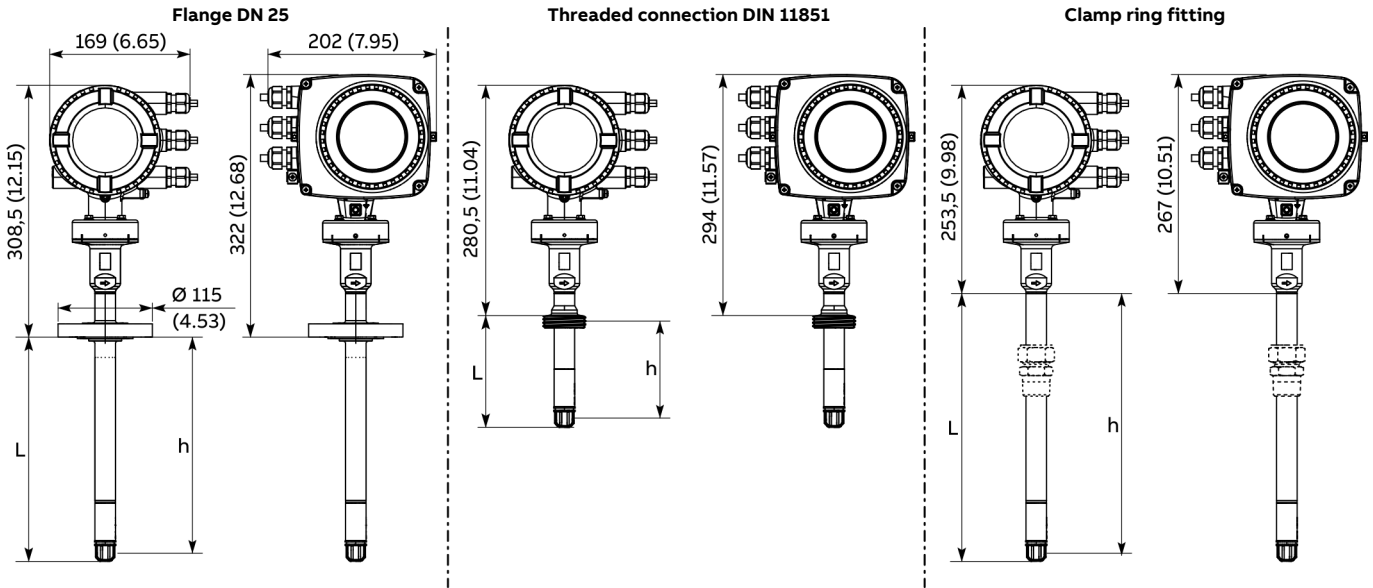


Figure 39: Sensor

Sensor connection	For nominal piping diameter	L	h (installation length)	Approximate weight
		mm (in)	mm (in)	
Flange DN 25	DN 25 to 350 (1 to 14 in)	271 (10.64)	263 (10.35)	6.5 (14.3)
	> DN 350 to 700 (> 14 to 28 in)	433 (17.05)	425 (16.73)	7 (15.4)
	> DN 700 (> 28 in)	783 (30.83)	775 (30.51)	7.5 (16.5)
Clamp ring fitting	DN 25 to 350 (1 to 14 in)	326 (12.83)	318 (12.52)	5.5 (12.1)
	> DN 350 to 700 (> 14 to 28 in)	488 (19.21)	480 (18.90)	6 (13.2)
	> DN 700 (> 28 in)	838 (32.99)	830 (32.68)	7 (15.4)
Threaded connection DIN 11851	DN 25 to 80 (1 to 3 in)	136 (5.53)	120 (4.72)	4.7 (10.4)

#### Note

The specified nominal piping diameters apply for the use of the sensor with pipe components without ball valves or hot tap fittings.



**Remote mount design**

All dimensions and weights are specified in mm (in) or kg (lb).

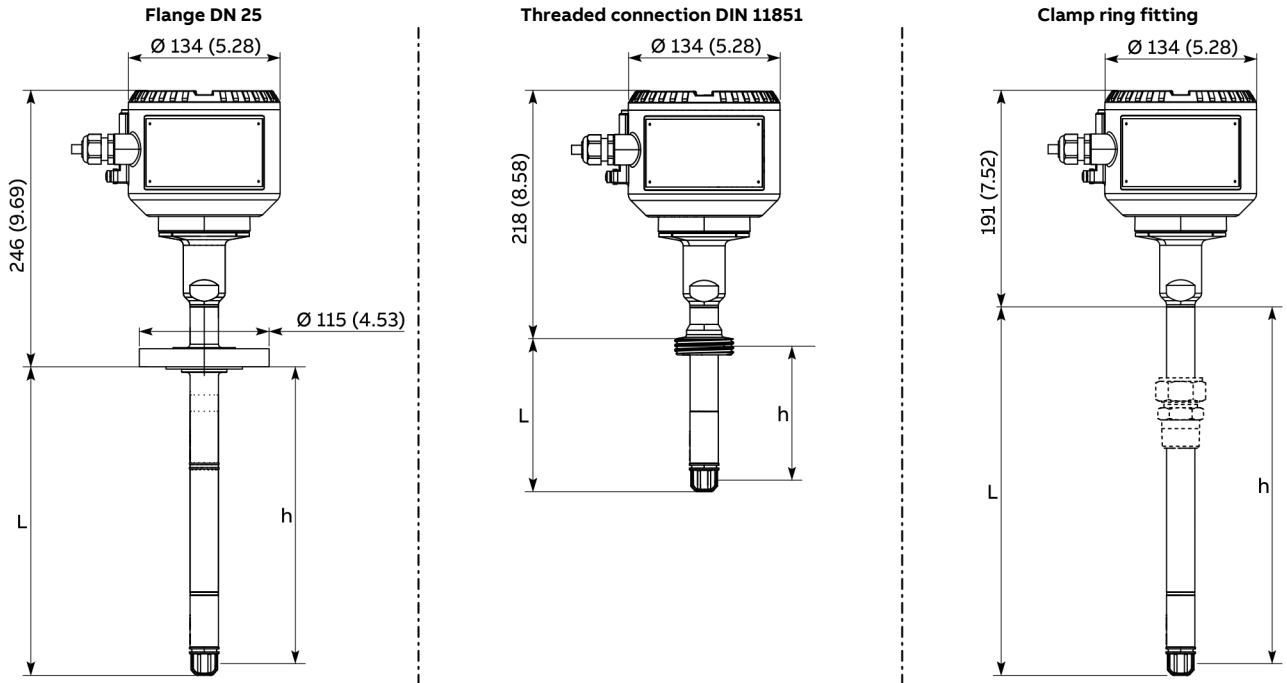


Figure 40: Sensor

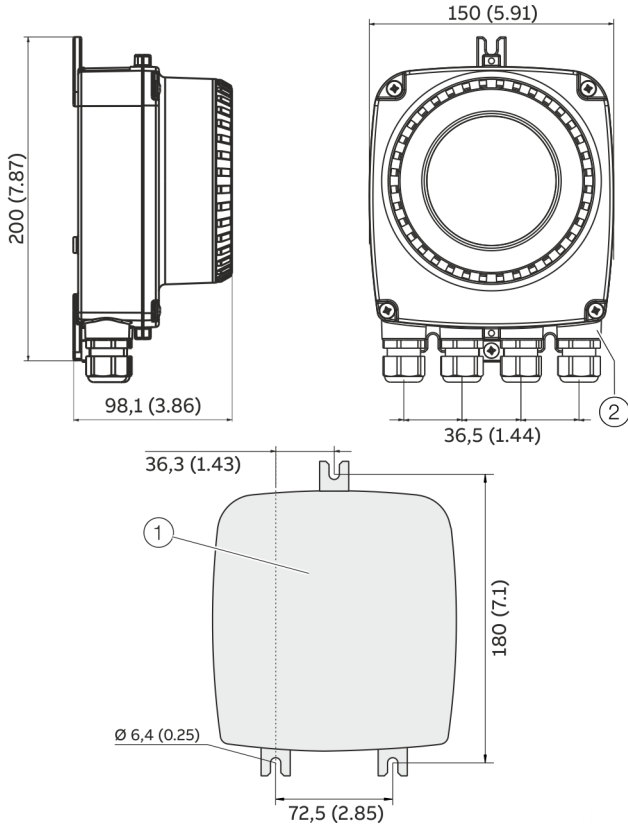
Sensor connection	For nominal piping diameter	L	h (installation length)	Approximate weight
		mm (in)	mm (in)	Kg (lb)
Flange DN 25	DN 25 to 350 (1 to 14 in)	271 (10.64)	263 (10.35)	5 (11)
	> DN 350 to 700 (> 14 to 28 in)	433 (17.05)	425 (16.73)	5.5 (12)
	> DN 700 (> 28 in)	783 (30.83)	775 (30.51)	6 (13)
Clamp ring fitting	DN 25 to 350 (1 to 14 in)	326 (12.83)	318 (12.52)	4 (8.8)
	> DN 350 to 700 (> 14 to 28 in)	488 (19.21)	480 (18.90)	4.5 (9.9)
	> DN 700 (> 28 in)	838 (32.99)	830 (32.68)	5.5 (12)
Threaded connection DIN 11851	DN 25 to 80 (1 to 3 in)	136 (5.53)	120 (4.72)	3.2 (7)

**Note**

The specified nominal piping diameters apply for the use of the sensor with pipe components without ball valves or hot tap fittings.

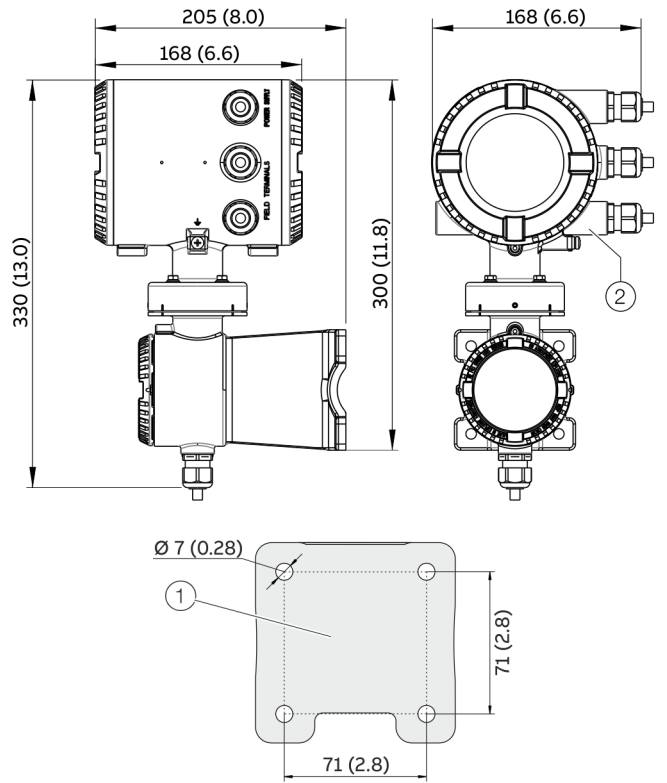
... Dimensions

Transmitter



- ① Hole pattern for mounting holes
- ② Female thread (either 1/2 in NPT or M20 x 1.5), see model coding. In the case of a 1/2 in NPT, there is a plug instead of a cable gland.

Figure 41: Mounting dimensions single-compartment housing



- ① Hole pattern for mounting holes
- ② Female thread (either 1/2 in NPT or M20 x 1.5), see model coding. In the case of a 1/2 in NPT, there is a plug instead of a cable gland.

Figure 42: Mounting dimensions dual-compartment housing

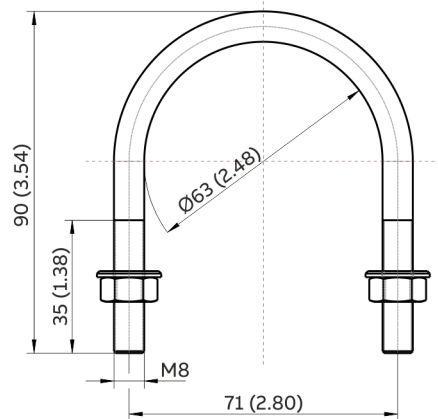
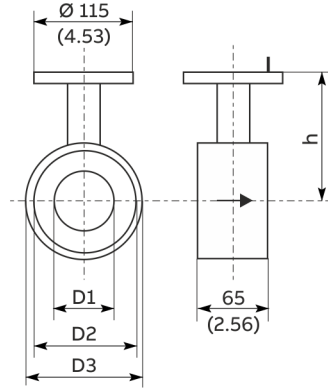


Figure 43: Assembly set for 2" pipe mounting

## Pipe components

All dimensions and weights are specified in mm (in) or kg (lb).



FMT091 – Wafer type design

Figure 44: Wafer type design dimensions

### FMT091 – Wafer type design in accordance with EN 1092-1, PN 40 – Sensor connection: flange DN 25

Nominal diameter	h	D1	D2	D3	Weight
DN 40	263 (10.35)	43.1 (1.70)	88 (3.46)	94 (3.70)	4.5 (10)
DN 50		54.5 (2.15)	102 (4.02)	109 (4.29)	5.0 (11)
DN 65		70.3 (2.77)	122 (4.80)	129 (5.08)	—
DN 80		82.5 (3.25)	138 (5.43)	144 (5.67)	7.0 (15.5)
DN 100		107.1 (4.22)	162 (6.38)	170 (6.69)	8.5 (18.7)
DN 125		131.7 (5.19)	188 (7.40)	196 (7.72)	—
DN 150		159.3 (6.27)	218 (8.58)	226 (8.90)	11.5 (25.5)
DN 200		206.5 (8.13)	285 (11.22)	293 (11.54)	—

### FMT091 – Wafer type design in accordance with ASME B 16.5, CL 150 – Sensor connection: flange DN 25

Nominal diameter	h	D1	D2	D3	Weight
1½ in	263 (10.35)	40.9 (1.61)	73 (2.87)	85 (3.35)	—
2 in		52.6 (2.07)	92 (3.62)	103 (4.06)	—
3 in		78.0 (3.07)	127 (5.00)	135 (5.31)	—
4 in		102.4 (4.03)	157 (6.18)	173 (6.81)	—
6 in		154.2 (6.07)	216 (8.50)	221 (8.70)	—
8 in		202.7 (7.98)	270 (10.63)	278 (10.94)	—

### FMT091 – Wafer type design in accordance with ASME B 16.5, CL 300 – Sensor connection: flange DN 25

Nominal diameter	h	D1	D2	D3	Weight
1½ in	263 (10.35)	40.9 (1.61)	73 (2.87)	94 (3.70)	—
2 in		52.6 (2.07)	92 (3.62)	110 (4.33)	—
3 in		78.0 (3.07)	127 (5.00)	148 (5.83)	—
4 in		102.4 (4.03)	157 (6.18)	180 (7.09)	—
6 in		154.2 (6.07)	216 (8.50)	249 (9.80)	—
8 in		202.7 (7.98)	270 (10.63)	307 (12.09)	—

## ... Dimensions

All dimensions and weights are specified in mm (in) or kg (lb).

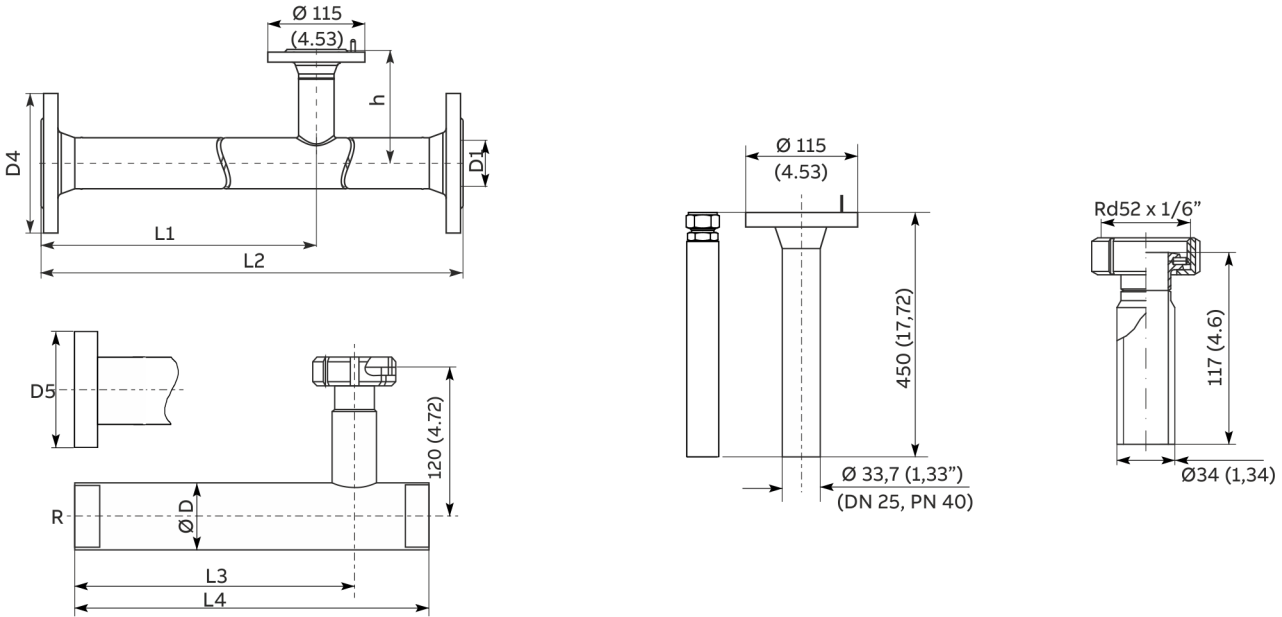


Figure 45:

### FMT092 – Partial measuring section with flange in accordance with EN 1092-1, Form B1, PN 40 – Sensor connection: flange DN 25

Nominal diameter	h	D1	D4	L1	L2	Weight
DN 25	263 (10.35)	28.5 (1.12)	115 (4.53)	486 (19.13)	600 (23.62)	5.5 (12.0)
DN 40		43.1 (1.70)	150 (5.91)	731 (28.78)	860 (33.86)	8.0 (17.5)
DN 50		54.5 (2.15)	165 (6.50)	837 (32.95)	1000 (39.37)	11 (24.3)
DN 65		70.3 (2.77)	185 (7.28)	1190 (46.85)	1400 (55.12)	16.5 (36)
DN 80		82.5 (3.25)	200 (7.87)	1450 (57.09)	1700 (66.93)	22.5 (49)
DN 100		107.1 (4.22)	235 (9.25)	1870 (73.62)	2200 (86.61)	34 (74)

### FMT092 – Partial measuring section with flange in accordance with EN 1092-1, Form B1, PN 10 – Sensor connection: threaded connection DIN 11851

Nominal diameter	ØD inside	D5	L3	L4	Weight
DN 25	27.3 (1.07)	115 (4.53)	410 (16.14)	550 (21.65)	–
DN 40	41.9 (1.65)	150 (5.91)	615 (24.21)	820 (32.28)	–
DN 50	53.9 (2.12)	165 (6.50)	810 (31.89)	1080 (42.52)	–
DN 80	79.9 (3.15)	200 (7.87)	1200 (47.24)	1600 (62.99)	–

### FMT092 – Partial measuring section with male thread, PN 10 – sensor connection: threaded connection DIN 11851

Nominal diameter	ØD inside	R male thread	L3	L4	Weight
DN 25	27.3 (1.07)	R1" – 33.7 x 1.2	410 (16.14)	550 (21.65)	–
DN 40	41.9 (1.65)	R1 1/2" – 48.3 x 3.2	615 (24.21)	820 (32.28)	–
DN 50	53.9 (2.12)	R2" – 60.3 x 3.2	810 (31.89)	1080 (42.52)	–
DN 80	79.9 (3.15)	R3" – 88.9 x 4.5	1200 (47.24)	1600 (62.99)	–

All dimensions and weights are specified in mm (in) or kg (lb).

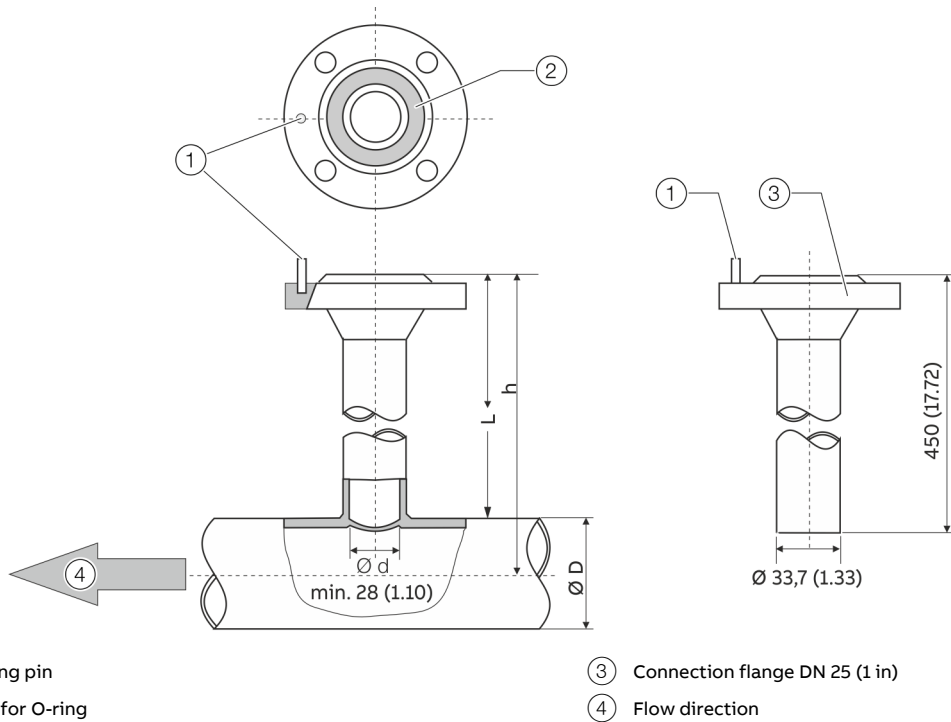
<b>FMT092 – Partial measuring section with flange in accordance with ASME B 16.5, CL 150 – Sensor connection: flange DN 25</b>						
<b>Nominal diameter</b>	<b>h</b>	<b>D1</b>	<b>D4</b>	<b>L1</b>	<b>L2</b>	<b>Weight</b>
1 in	263 (10.35)	26.6 (1.05)	108 (4.25)	454 (17.87)	560 (22.05)	5.1 (11)
1½ in		40.9 (1.61)	127 (5.00)	741 (29.17)	864 (34.02)	7.6 (16.5)
2 in		52.6 (2.07)	154 (6.06)	846 (33.31)	1003 (39.49)	12.3 (26.8)
3 in		78.0 (3.07)	–	–	–	21.3 (46)
4 in		102.4 (4.03)	–	–	–	32.5 (71)

<b>FMT092 – Partial measuring section with flange in accordance with ASME B 16.5, CL 300 – Sensor connection: flange DN 25</b>						
<b>Nominal diameter</b>	<b>h</b>	<b>d1</b>	<b>D4</b>	<b>L4</b>	<b>L3</b>	<b>Weight</b>
1 in	263 (10.35)	26.6 (1.05)	123.9 (4.88)	454 (17.87)	560 (22.05)	–
1½ in		40.9 (1.61)	155.4 (6.12)	741 (29.17)	864 (34.02)	–
2 in		52.6 (2.07)	165.1 (6.50)	846 (33.31)	1003 (39.49)	–
3 in		78.0 (3.07)	–	–	–	–
4 in		102.4 (4.03)	–	–	–	–

## ... Dimensions

### Welding adapter

Dimensions in mm (in)



① Centering pin

② Groove for O-ring

③ Connection flange DN 25 (1 in)

④ Flow direction

Figure 46: Dimensions in mm (in)

<b>h – sensor length</b>	<b>Ø D – outer pipe diameter</b>
263 (10.35)	80 to 350 (3.24 to 13.78)
425 (16.73)	> 350 to 700 (> 13.78 to 27.56)
775 (30.51)	> 700 to 1400 (> 27.56 to 55.12)*

\* The limitation of the maximum pipe diameter only applies for installations with a sensor element in the middle of the pipe. In case of larger or non-round cross-sections, a non-centered position of the measuring element in the piping is considered in the calibration.

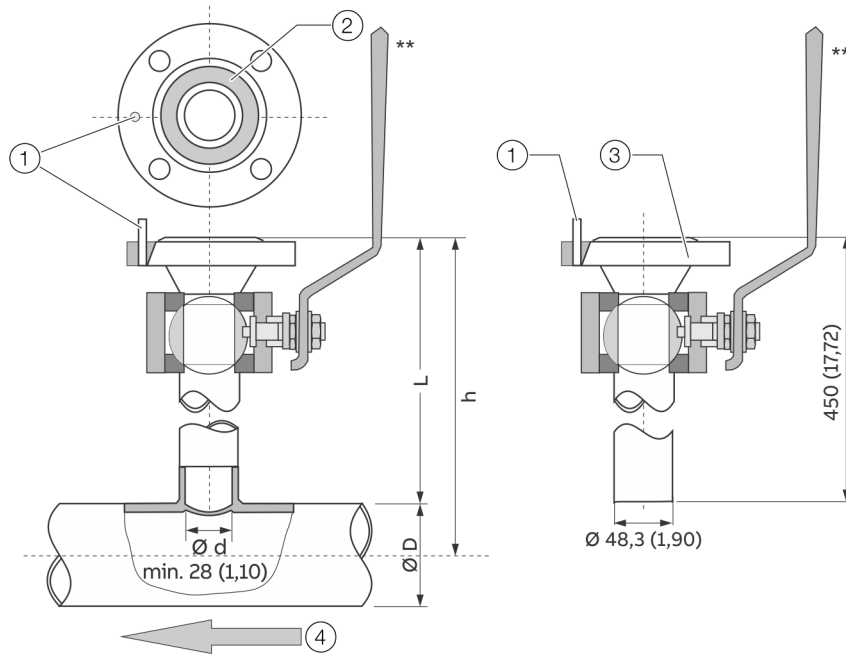
### Note

When mounting the weld-on adapter, observe the following points:

- The welding adapters must be shortened to the dimension L before installation, in accordance with:  $L = h - (1/2 \times \text{Ø D})$ .
- The distance h from the upper edge of the flange to the pipe central axis must be within a tolerance of  $\pm 2 \text{ mm}$  ( $\pm 0.08''$ ).
- Maintain the right angle to the pipe axis (max. tolerance  $\pm 2^\circ$ ).
- The adapter centering pin must be aligned with the pipe axis in the flow direction (outflow side, behind the measuring point).

**Weld-on adapter with ball valve**

Dimensions in mm (in)



- ① Centering pin
- ② Groove for O-ring
- ③ Connection flange DN 25 (1 in)
- ④ Flow direction

Figure 47: Dimensions in mm (in)

h – sensor length	Ø D - outer pipe diameter
263 (10.35)	80 to 150 (3.24 to 5.91)
425 (16.73)	> 150 to 500 (> 5.91 to 19.69)
775 (30.51)	> 500 to 1150 (> 19.69 to 45.28)*

\* The limitation of the maximum pipe diameter only applies for installations with a sensor element in the middle of the pipe. In case of larger or non-round cross-sections, a non-centered position of the measuring element in the piping is considered in the calibration.

\*\* Ball valve T<sub>medium</sub>: maximum 150 °C (302 °F), explosion protection approval for use in ATEX/IECEX/UKEX Zone 2 or cFMus Div. 2.

**Note**

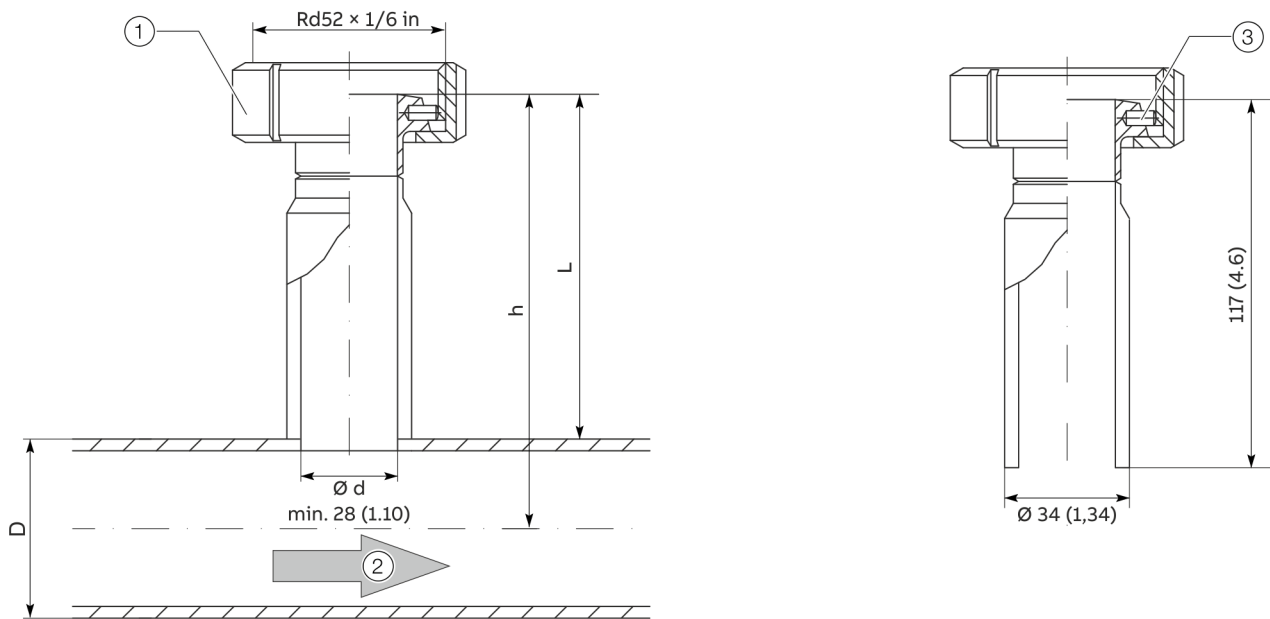
When mounting the weld-on adapter, observe the following points:

- The welding adapters must be shortened to the dimension L before installation, in accordance with:  $L = h - (1/2 \times \text{Ø } D)$ .
- The distance h from the upper edge of the flange to the pipe central axis must be within a tolerance of  $\pm 2 \text{ mm } (\pm 0.08\text{'})$ .
- Maintain the right angle to the pipe axis (max. tolerance  $\pm 2^\circ$ ).
- The adapter centering pin must be aligned with the pipe axis in the flow direction (outflow side, behind the measuring point).

## ... Dimensions

### Welding adapter with threaded connection in accordance with DIN 11851

Dimensions in mm (in)



① Union nut

② Flow direction

③ Centering pin

Figure 48: Dimensions in mm (in)

### Note

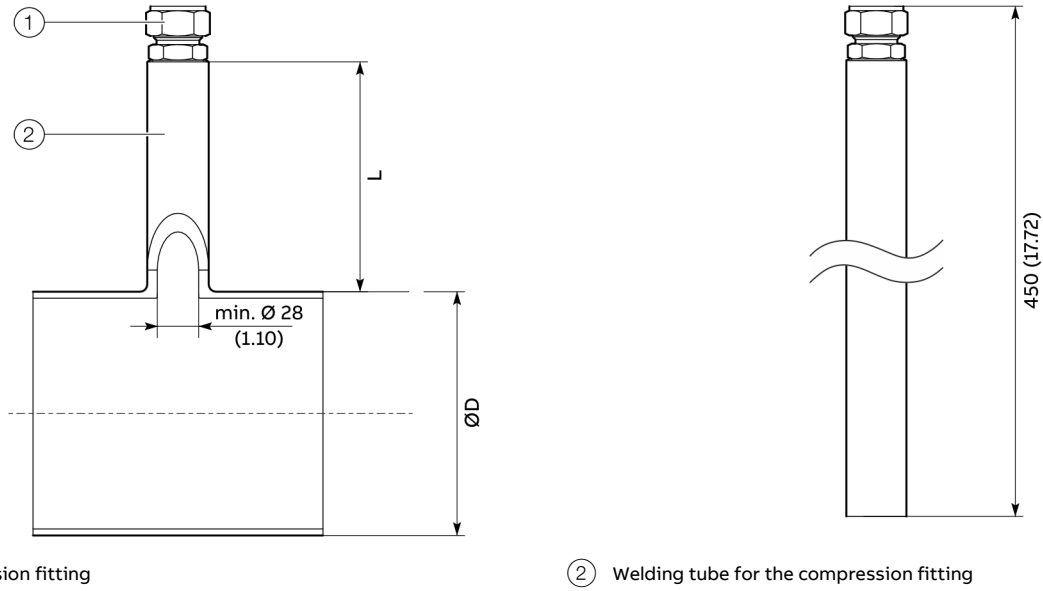
When mounting the weld-on adapter, observe the following points:

- Always mount the weld-on adapter together with the union nut on the piping. Mounting it at a later time is not possible.
- The welding adapters must be shortened to the dimension L before installation, in accordance with:  $L = h - (1/2 \times \text{Ø } D)$ .
- The distance h from the upper edge of the adapter to the pipe central axis must be within a tolerance of  $\pm 2$  mm ( $\pm 0.08$  inch).
- Maintain the right angle to the pipe axis (max. tolerance  $\pm 2^\circ$ ).
- Observe the thickness of pipeline wall and the degree of shrinkage when welding on.
- The adapter centering pin must be aligned with the pipe axis in the flow direction (outflow side, behind the measuring point).
- Once welding is complete, there must be a passage of at least 28 mm (1.10 inch) free for the purpose of mounting the sensor (drill to create if necessary)



**Welding adapter with compression fitting**

All dimensions in mm (in)



① Compression fitting

② Welding tube for the compression fitting

Figure 49: Welding adapter with compression fitting

<b>h – sensor length</b>	<b>h3 – installation length</b>	<b><math>L = h3 - (\frac{1}{2} \times \text{ØD})</math></b>	<b>Ø D – outer pipe diameter*</b>
263 (10.35)	244 (9.61)	to be calculated	≥ 80 to 350 (≥ 3.24 to 13.78)
425 (16.73)	406 (15.98)		> 350 to 700 (> 13.78 to 27.56)
775 (30.51)	756 (29.76)		> 700 to 1400 (> 27.56 to 55.12)

Table 4: Dimensions of welding adapter with compression fitting

\* The limitation of the maximum pipe diameter only applies for installations with thermal sensor elements in the middle of the pipe. In case of larger or non-round cross-sections, a non-centered position of the thermal sensor elements in the piping is considered in the calibration.

**Note**

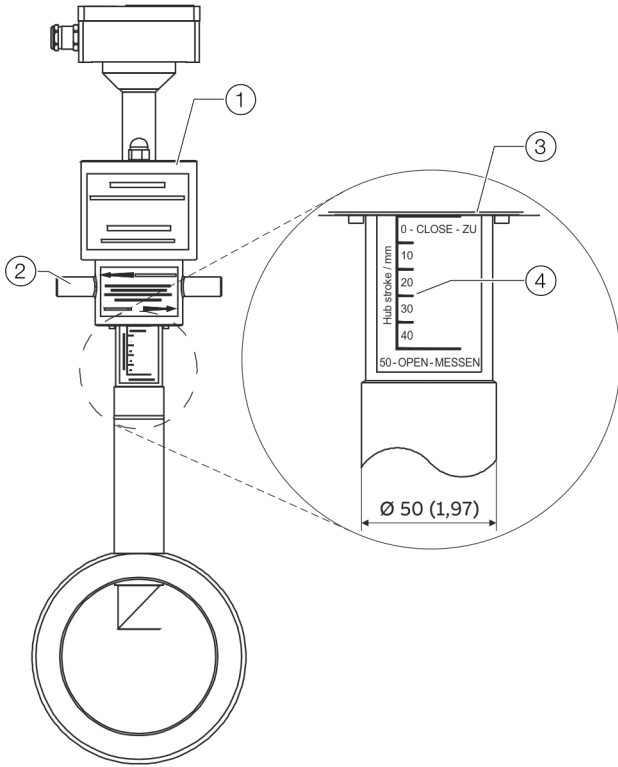
When installing the adapter tubes for compression fittings, observe the following points:

- The welding adapter tubes should be shortened to dimension L before installation, in accordance with:  $L = h3 - (\frac{1}{2} \times \text{ØD})$
- It is imperative that you maintain a right angle to the longitudinal and transversal axes of the meter tube (maximum tolerance ±2°).
- Make sure that after welding the free opening of the adapter tube is at least Ø28 mm (1.10 in).

## ... Dimensions

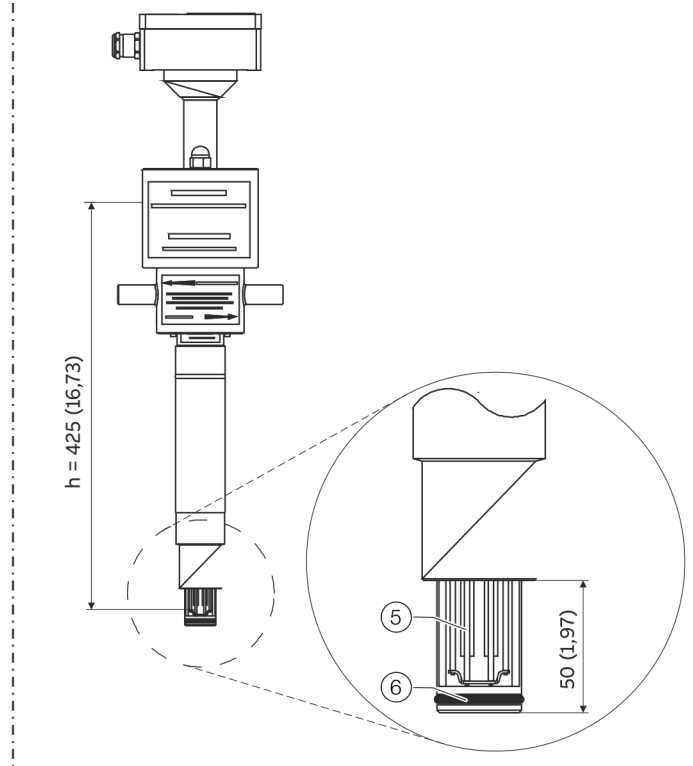
### Integrated hot tap fitting

Dimensions in mm (in)



**Wafer type design**

- ① Cover plate for flange DN 25 (1 in)
- ② Union nut
- ③ Lower edge of union nut



**Welding adapter design**

- ④ Display sensor element position, stroke 50 mm (1.97 in)
- ⑤ Sensor element
- ⑥ O-ring

Figure 50: Hot tap fitting

Nominal diameter	h – sensor length	
	Wafer type design	Welding design
DN 50, DN 65, DN 80 (2 in, 3 in)	263 mm (10.35 in)	425 mm (16.73 in) from nominal diameter DN 80
DN 100, DN 125, DN 150, DN 200 (4 in, 6 in, 8 in)	425 mm (16.73 in)	

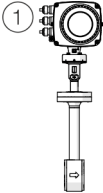
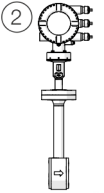
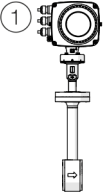
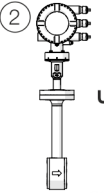
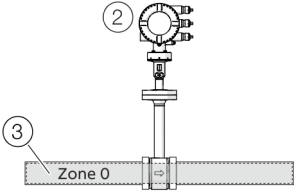
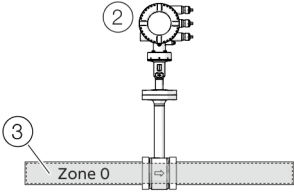





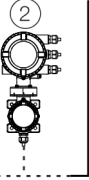

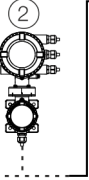
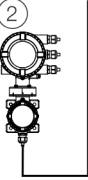






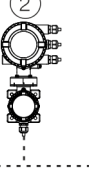

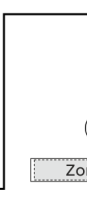
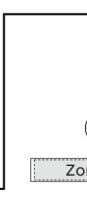
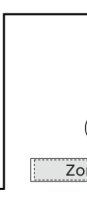





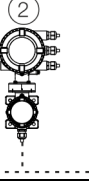
## Use in potentially explosive atmospheres

### Note

Further information on the Ex-Approval of devices can be found in the type examination certificates or the relevant certificates at [www.abb.com/flow](http://www.abb.com/flow).

### Device overview

#### ATEX, IECEx and UKEX

	Standard / No explosion protection		Zones 2, 22		Zone 1, 21 (Zone 0)	
Model number	FMT4x0 Y0		FMT4x0 A2, U2		FMT4x0 A1, U1, U4	
Integral mount design						
<ul style="list-style-type: none"> <li>Standard</li> <li>Zone 2, 22</li> <li>Zone 1, 21</li> <li>Zone 0</li> </ul>						
Model number	FMT4x2 Y0	FCx4x0 Y0	FMT4x2 A2, U2	FCx4x0 A2, U2	FMT4x2 A1, U1, U4	FCx4x0 A1, U1, U4
Remote mount design						
Transmitter and flowmeter sensor <ul style="list-style-type: none"> <li>Standard</li> <li>Zone 2, 22</li> <li>Zone 1, 21</li> <li>Zone 0</li> </ul>						
Model number	FMT4x2 Y0		FMT4x0 A2, U2		FCx4x0 A1, U1, U4	
Remote mount design						
Transmitter <ul style="list-style-type: none"> <li>Standard</li> <li>Zone 2, 22</li> </ul>						
Sensor <ul style="list-style-type: none"> <li>Zone 1, 21</li> <li>Zone 0</li> </ul>						
Model number	—		FMT4x2 A2, U2		FCx4x0 A1, U1, U4	
Remote mount design	—					
Transmitter <ul style="list-style-type: none"> <li>Zone 2, 22</li> </ul>						
Sensor <ul style="list-style-type: none"> <li>Zone 1, 21</li> <li>Zone 0</li> </ul>						

- ① Single-compartment housing
- ② Dual-compartment housing
- ③ Zone 0 within the meter tube

## ... Use in potentially explosive atmospheres

### cFMus

	Standard / No explosion protection		Class I Div. 2 / Zone 2		Class I Div. 1 / Zone 1 (Zone 0)	
<b>Model number</b>	FMT4x0 Y0		FMT4x0 F2		FMT4x0 F1	
Integral mount design						
• Standard						
• Div. 2 / Zone 2						
• Div. 1 / Zone 1						
<b>Model number</b>	FMT4x2 Y0	FMT4x0 Y0	FMT4x2 F2	FMT4x0 F2	FMT4x2 F1	FMT4x0 F1
Remote mount design						
Transmitter and flowmeter sensor						
• Div. 2 / Zone 2						
• Div. 1 / Zone 1						
<b>Model number</b>	FCT4x2 Y0		FCT4x0 F2		FMT4x0 F1	
Remote mount design						
Transmitter						
• Standard						
Sensor						
• Div. 2 / Zone 2						
• Div. 1 / Zone 1						
<b>Model number</b>	—		FMT4x2 F2		FMT4x0 F1	
Remote mount design						
Transmitter						
• Div. 2 / Zone 2						
Sensor						
• Div. 1 / Zone 1						

① Single-compartment housing

② Dual-compartment housing

## Ex marking sensor and transmitter

### ATEX, IECEx and UKEX

#### Note

- A specific marking applies, depending on the design.
- ABB reserves the right to modify the Ex-marking. Refer to the name plate for the exact marking.

Model number design\*: FMTabcdehijkl.m.n.o.p

\* For detailed information on the design of the model number, see the ordering information in the data sheet

Model number for use in Zone 2, 22	Ex marking	Certificate
<b>FMT4x0 – A2, U2</b> (i=D...,Y...,S...)	II 3G Ex ec IIC T6...T1 Gc	<b>ATEX:</b> FM19ATEX0178X
Sensor in integral mount design or remote mount design with single-compartment or dual-compartment housing	II 3D Ex tc IIIC T80°C...T <sub>medium</sub> Dc	<b>IECEx:</b> IECEx FMG 19.0025X
<b>FMT4x2 – A2, U2</b> (i=W...,R...)	II 3G Ex ec IIC T6 Gc	<b>UKEX:</b> FM21UKEX0136X
Sensor in remote mount design with single-compartment housing	II 3D Ex tc IIIC T80°C Dc	

Model number for use in Zone 0/1, 21	Ex marking	Certificate
<b>FMT4x0 – A1, U1</b> (i=D1...D8)	II 2 G Ex db eb ib mb IIC T6...T1 Gb	<b>ATEX:</b> FM19ATEX0177X
Sensor in integral mount design with dual-compartment housing	II 2 G Ex ia IIC T6...T1 Gb II 2 D Ex ia tb IIIC T80°C...T <sub>medium</sub> Db IN-/OUTPUTS: Urated=30V	<b>IECEx:</b> IECEx FMG 19.0025X
<b>FMT4x0 – A3, U4</b> (i=D1...D8)	II 1/2 G Ex db eb ia mb IIC T6...T1 Gb/Ga	<b>UKEX:</b> FM21UKEX0135X
Sensor in integral mount design with dual-compartment housing (Zone 0 in meter tube)	II 1 G Ex ia IIC T6...T1 Ga II 2 D Ex ia tb IIIC T80°C...T <sub>medium</sub> Db IN-/OUTPUTS: Urated=30V	
<b>FMT4x0 – A1, U1</b> (i=Y0)	II 2 G Ex eb ib mb IIC T6...T1 Gb	
Sensor in remote mount design with dual-compartment housing	II 2 G Ex ia IIC T6...T1 Gb II 2 D Ex tb IIIC T80°C...T <sub>medium</sub> Db IN-/OUTPUTS: Urated=30V	
<b>FMT4x0 – A3, U4</b> (i=Y0)	II 1/2 G Ex eb ia ib mb IIC T6...T1 Gb/Ga	
Sensor in remote mount design with dual-compartment housing (Zone 0 in meter tube)	II 1 G Ex ia IIC T6...T1 Ga II 2 D Ex tb IIIC T80°C...T <sub>medium</sub> Db IN-/OUTPUTS: Urated=30V	
<b>FMT4x0 – A1, U1</b> (i=R1...R4)	II 2 G Ex db eb ia mb IIB+H2 T6 Gb	
Transmitter in remote mount design with dual-compartment housing	II 2 D Ex ia tb IIIC T80°C Db IN-/OUTPUTS: Urated=30V	
<b>FMT4x0 – A1, U1</b> (i=R5...R8)	II 2 G Ex db ia IIB+H2 T6 Gb	
Transmitter in remote mount design with dual-compartment housing (flameproof enclosure 'Ex d')	II 2 D Ex ia tb IIIC T80°C Db IN-/OUTPUTS: Urated=30V	

**cFMus****Note**

- A specific marking applies, depending on the design.
- ABB reserves the right to modify the Ex-marking. Refer to the name plate for the exact marking.

Model number design\*: FMTabcdehijkl.m.n.o.p

\* For detailed information on the design of the model number, see the ordering information in the data sheet

Model number for use in Division 2	Ex marking		
<b>FMT4x0 - F2</b> (i=D...,Y...,S...)	<b>USA:</b> Certificate: FM19US0110X NI: CL I, Div 2, GPS ABCD T6...T1 DIP: CL II,III, Div 2, GPS EFG T6...T3B CL I, ZN 2, AEx ec IIC T6...T1 Gc ZN 21, AEx tb IIIC T80°C...T165°C Db See handbook for temperature class information	<b>Canada:</b> Certificate: FM19CA0055X NI: CL I, Div 2, GPS ABCD T6...T1 DIP: CL II,III, Div 2, GPS EFG T6...T3B CL I, ZN 2, Ex ec IIC T6...T1 Gc Ex tb IIIC T80°C...T165°C Db ANSI/ISA 12.27.01: Dual Seal	
<b>FMT4x2 - F2</b> (i=W...,R...)	<b>USA:</b> Certificate: FM19US0110X NI: CL I, Div 2, GPS ABCD T6 DIP: CL II,III, Div 2, GPS EFG T6 CL I, ZN 2, AEx ec IIC T6 Gc ZN 21, AEx tb IIIC T80°C Db See handbook for temperature class information	<b>Canada:</b> Certificate: FM19CA0055X NI: CL I, Div 2, GPS ABCD T6 DIP: CL II,III, Div 2, GPS EFG T6 CL I, ZN 2, Ex ec IIC T6 Gc Ex tb IIIC T80°C Db	
Model number for use in Division 1	Ex marking		
<b>FMT4x0 - F1</b> (i=D1...D8)	<b>USA:</b> Certificate: FM19US0110X S-XP-IS: CL I, Div 1, GPS ABCD T6...T1 DIP: CL II,III, Div 1, GPS EFG T6...T3B CL I, ZN 1, AEx db eb ia mb IIB+H2 T6...T1 Gb ZN 21, AEx ia tb IIIC T80°C...T165°C Db See handbook for temperature class information and installation drawing 3kxf000094G0009	<b>Canada:</b> Certificate: FM19CA0055X S-XP-IS: CL I, Div 1, GPS BCD T6...T1 DIP: CL II,III, Div 1, GPS EFG T6...T3B CL I, ZN 1, AEx db eb ia mb IIB+H2 T6...T1 Gb Ex ia tb IIIC T80°C...T165°C Db IN-/OUTPUTS: Urated=30V ANSI/ISA 12.27.01: Dual Seal	
<b>FMT4x0 - F1</b> (i=Y0)	<b>USA:</b> Certificate: FM19US0110X S-XP: CL I, Div 1, GPS ABCD T6...T1 DIP: CL II,III, Div 1, GPS EFG T6...T3B CL I, ZN 1, AEx db eb mb IIB+H2 T6...T1 Gb ZN 21, AEx tb IIIC T80°C...T165°C Db See handbook for temperature class information and installation drawing 3kxf000094G0009	<b>Canada:</b> Certificate: FM19CA0055X S-XP: CL I, Div 1, GPS BCD T6...T1 DIP: CL II,III, Div 1, GPS EFG T6...T3B CL I, ZN 1, Ex db eb mb IIB+H2 T6...T1 Gb Ex tb IIIC T80°C...T165°C Db ANSI/ISA 12.27.01: Dual Seal	
<b>FMT4x2 - F1</b> (i=R1...R8)	<b>USA:</b> Certificate: FM19US0110X XP-IS: CL I, Div 1, GPS BCD T6 DIP: CL II,III, Div 1, GPS EFG T6 CL I, ZN 1, AEx db ia IIB+H2 T6 Gb ZN 21, AEx ia tb IIIC T80°C Db See handbook for temperature class information and installation drawing 3kxf000094G0009	<b>Canada:</b> Certificate: FM19CA0055X XP-IS: CL I, Div 1, GPS BCD T6 DIP: CL II,III, Div 1, GPS EFG T6 CL I, ZN 1, Ex db ia IIB+H2 T6 Gb Ex ia tb IIIC T80°C Db IN-/OUTPUTS: Urated=30V	

## Ex marking pipe components and integrated hot tap fitting

### Note

- A specific marking applies, depending on the design.
- ABB reserves the right to modify the Ex-marking. Refer to the name plate for the exact marking.

### ATEX, IECEx and UKEX

Model number for use in Zone 2, 22	Ex marking	Certificate
<b>FMT091_</b> (j=SCA, SCB, SCC) SensyMaster FMT091 pipe component type 1, wafer type Optional with ball valve or integrated hot tap fitting	II 3 G Ex h IIC T6...T3 Gc II 3 D Ex h IIIC T85°C ... T150°C Dc	<b>ATEX:</b> FM19ATEX0178X <b>IECEx:</b> IECEx FMG 19.0025X
<b>FMT092_</b> (j=SCA, SCB, SCC) SensyMaster FMT092 pipe component type 2, partial measuring section Optional with ball valve or integrated hot tap fitting		<b>UKEX:</b> FM21UKEX0136X
<b>FMT094_</b> (j=SCA, SCD) SensyMaster FMT094 pipe component type 4, partial measuring section Optional with ball valve or integrated hot tap fitting		

Model number for use in Zone 0/1, 21	Ex marking	Certificate
<b>FMT091_</b> (j=SCA, SCB, SCC) SensyMaster FMT091 pipe component type 1, wafer type	II 2 G Ex h IIC T6...T3 Gb II 2 D Ex h IIIC T85°C ... T150°C Db	<b>ATEX:</b> FM19ATEX0177X <b>IECEx:</b> IECEx FMG 19.0025X
<b>FMT092_</b> (j=SCA, SCB, SCC) SensyMaster FMT092 pipe component type 2, partial measuring section		<b>UKEX:</b> FM21UKEX0135X
<b>FMT094_</b> (j=SCA, SCD) SensyMaster FMT094 pipe component type 4, partial measuring section Optional with ball valve or integrated hot tap fitting		

### Notice regarding the integrated hot tap fitting

The integrated hot tap fitting has been designed in accordance with the DIN EN 80079-36 and DIN EN 80079-37 standards and the 'c – constructional safety' type of protection.

### cFMus

The pipe components do not have any marking in accordance with cFMus. The pipe components can be used in accordance with cFMus in the following areas:

- Div. 1
- Div. 2, Zone 1, 2, 21

## Temperature data

### Temperature resistance for the connecting cable

The temperature at the cable entries of the device is dependent on the measuring medium temperature  $T_{\text{medium}}$  and the ambient temperature  $T_{\text{amb}}$ .

For the electrical connection of the device, use only cables with sufficient temperature resistance in accordance with the following table.

$T_{\text{amb}}$	Temperature resistance for the connecting cable
$\leq 50\text{ °C}$ ( $\leq 122\text{ °F}$ )	$\geq 70\text{ °C}$ ( $\geq 158\text{ °F}$ )
$\leq 60\text{ °C}$ ( $\leq 140\text{ °F}$ )	$\geq 80\text{ °C}$ ( $\geq 176\text{ °F}$ )
$\leq 70\text{ °C}$ ( $\leq 158\text{ °F}$ )	$\geq 90\text{ °C}$ ( $\geq 194\text{ °F}$ )

From an ambient temperature of  $T_{\text{amb}} \geq 60\text{ °C}$  ( $\geq 140\text{ °F}$ ), the wires in the connection boxes with the enclosed silicone hoses need to be additionally insulated.

### Note

The signal cable supplied by ABB can be used without restrictions up to an ambient temperature of  $\leq 80\text{ °C}$  ( $\leq 176\text{ °F}$ ).

### Environmental and process conditions for model FMT4xx...

Ambient temperature $T_{\text{amb}}$	-20 to 70 °C (-4 to 158 °F) -40 to 70 °C (-40 to 158 °F)*
Measuring medium temperature $T_{\text{medium}}$	-20 to 150 °C (-4 to 302 °F) -40 to 150 °C (-40 to 302 °F)*
IP rating / NEMA rating	IP 65, IP 67 / NEMA 4X, Type 4X

\* Low temperature design (optional)



**Measuring medium temperature (Ex data) for model FMT4x0-A1... in Zone 1, Zone 21**

The table shows the maximum permissible measuring medium temperature as a function of ambient temperature and temperature class. The permissible measuring medium temperature specified in **Environmental and process conditions for model FMT4xx...** on page 48 must not be up-scaled!

Ambient temperature $T_{amb.}$	Temperature class					
	T1	T2	T3	T4	T5	T6
-40 °C to 50 °C (-40 °F to 122 °F)	280 °C (536 °F)	185 °C (365 °F)	90 °C (194 °F)	90 °C (194 °F)	—	—
-40 °C to 60 °C (-40 °F to 140 °F)	280 °C (536 °F)	185 °C (365 °F)	90 °C (194 °F)	90 °C (194 °F)	—	—
-40 °C to 70 °C (-40 °F to 158 °F)	280 °C (536 °F)	185 °C (365 °F)	90 °C (194 °F)	90 °C (194 °F)	—	—

**Measuring medium temperature (Ex data) for model FMT4x0-A2... in Zone 2, Zone 22**

The table shows the maximum permissible measuring medium temperature as a function of ambient temperature and temperature class. The permissible measuring medium temperature specified in **Environmental and process conditions for model FMT4xx...** on page 48 must not be up-scaled!

Ambient temperature $T_{amb.}$	Temperature class					
	T1	T2	T3	T4	T5	T6
-40 °C to 40 °C (-40 °F to 104 °F)	300 °C (572 °F)	290 °C (554 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)
-40 °C to 50 °C (-40 °F to 122 °F)	300 °C (572 °F)	290 °C (554 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	—
-40 °C to 60 °C (-40 °F to 140 °F)	300 °C (572 °F)	290 °C (554 °F)	195 °C (383 °F)	130 °C (266 °F)	—	—
-40 °C to 70 °C (-40 °F to 158 °F)	300 °C (572 °F)	290 °C (554 °F)	195 °C (383 °F)	130 °C (266 °F)	—	—

## ... Use in potentially explosive atmospheres

### Measuring medium temperature (Ex data) for model FMT4x0-F1... in Class I Division 1 and Class II Division 1

The table shows the maximum permissible measuring medium temperature as a function of ambient temperature and temperature class. The permissible measuring medium temperature specified in **Environmental and process conditions for model FMT4xx...** on page 48 must not be up-scaled!

Ambient temperature T <sub>amb.</sub>	Temperature class					
	T1	T2	T3	T4	T5	T6
-40 °C to 50 °C (-40 °F to 122 °F)	280 °C (536 °F)	185 °C (365 °F)	90 °C (194 °F)	90 °C (194 °F)	—	—
-40 °C to 60 °C (-40 °F to 140 °F)	280 °C (536 °F)	185 °C (365 °F)	90 °C (194 °F)	90 °C (194 °F)	—	—
-40 °C to 70 °C (-40 °F to 158 °F)	280 °C (536 °F)	185 °C (365 °F)	90 °C (194 °F)	90 °C (194 °F)	—	—

### Measuring medium temperature (Ex data) for model FMT4x0-F1... in Class I Division 2 and Class II Division 2

The table shows the maximum permissible measuring medium temperature as a function of ambient temperature and temperature class. The permissible measuring medium temperature specified in **Environmental and process conditions for model FMT4xx...** on page 48 must not be up-scaled!

Ambient temperature T <sub>amb.</sub>	Temperature class					
	T1	T2	T3	T4	T5	T6
-40 °C to 40 °C (-40 °F to 104 °F)	300 °C (572 °F)	290 °C (554 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	80 °C (176 °F)
-40 °C to 50 °C (-40 °F to 122 °F)	300 °C (572 °F)	290 °C (554 °F)	195 °C (383 °F)	130 °C (266 °F)	95 °C (203 °F)	—
-40 °C to 60 °C (-40 °F to 140 °F)	300 °C (572 °F)	290 °C (554 °F)	195 °C (383 °F)	130 °C (266 °F)	—	—
-40 °C to 70 °C (-40 °F to 158 °F)	300 °C (572 °F)	290 °C (554 °F)	195 °C (383 °F)	130 °C (266 °F)	—	—

### Notice on dust-ignition protection for USA and Canada in accordance with NEC

The surface temperature of the device must not under any circumstances up-scale 85 °C (185 °F) if there is there carbonaceous dust or dust which can carbonate.

Attention, T-Class for Dust US and Canada information according NEC/CEC:

The maximum temperature cannot exceed 165 °C under any circumstances where a carbonaceous dust or dust likely to carbonize is present.

- For combustible dusts, less than the lower of either the layer or cloud ignition temperature of the specific combustible dust. For organic dusts that may dehydrate or carbonize, the temperature marking shall not exceed the lower of either the ignition temperature or 165 °C (329 °F).
- For ignitable fibers/flyings, less than 165 °C (329 °F) for equipment that is not subject to overloading, or 120 °C (248 °F) for equipment (such as motors or power transformers) that may be overloaded.

### Ambient and process conditions for pipe components and integrated hot tap fitting

Measuring medium temperature $T_{\text{medium}}$	Standard: -20 to 150 °C (-4 to 302 °F)
Ambient temperature $T_{\text{amb}}$ , for pipe components <b>without</b> ball valve or integrated hot tap fitting.	Standard: -20 to 70 °C (-4 to 158 °F), optional: -40 to 70 °C (-40 to 158 °F) Depending on the selected <b>ambient temperature range (TA3/TA9)</b> of the sensor and O-ring design.
Ambient temperature $T_{\text{amb}}$ , for pipe components with ball valve or integrated hot tap fitting	Standard: -20 to 70 °C (-4 to 158 °F)

**(Sensor connection options: SCA, SCB, SCD)**

### Measuring medium temperature (Ex data) for pipe components and integrated hot tap fitting

The table shows the maximum permissible measuring medium temperature as a function of ambient temperature and temperature class. The permissible measuring medium temperature specified in the table above must not be up-scaled!

Ambient temperature $T_{\text{amb}}$	Options	Temperature class			
		T3	T4	T5	T6
-20 °C to 70 °C (-4 °F to 158 °F)	Pipe component <b>without</b> ball valve or integrated hot tap fitting	150 °C (302 °F)	135 °C (275 °F)	100 °C (212 °F)	85 °C (185 °F)
-40 °C to 70 °C (-40 °F to 158 °F)	Pipe component <b>without</b> ball valve or integrated hot tap fitting	150 °C (302 °F)	135 °C (275 °F)	100 °C (212 °F)	85 °C (185 °F)
-20 °C to 70 °C (-4 °F to 158 °F)	Pipe component <b>with</b> ball valve or integrated hot tap fitting	150 °C (302 °F)	135 °C (275 °F)	100 °C (212 °F)	85 °C (185 °F)

### Integrated hot tap fitting – maximum surface temperature

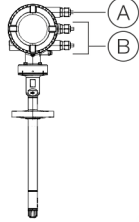
The maximum surface temperature of the integrated hot tap fitting is 85 °C to 150 °C (185 °F to 302 °F) depending on the measuring medium temperature.

## ... Use in potentially explosive atmospheres

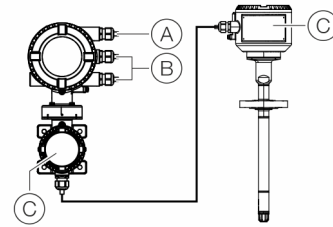
### Electrical data

#### Overview

Integral mount design



Remote mount design



(A) Power supply

(B) Inputs / outputs, communication

(C) Signal cable (remote mount design only)

Figure 51: Electrical connections overview

Zones 2, 22	Division 2 and Zone 2
<b>ATEX/IECEX/UKEX:</b> II 3 G & II 3 D	<b>USA:</b> DIV2 & ZN2 <b>Canada:</b> DIV2 & ZN2

#### Activating the inputs and outputs

(A) Power supply	(B) Inputs / outputs, communication	(C) Signal cable (remote mount design only)
<ul style="list-style-type: none"> <li>ATEX/IECEX/UKEX type of protection: non-sparking 'Ex ec'</li> <li>Type of protection USA / Canada: 'non IS'</li> <li>Maximum 250 Vrms</li> <li>Terminals: 1+, 2-, L, N, </li> </ul>	<ul style="list-style-type: none"> <li>ATEX/IECEX/UKEX type of protection: non-sparking 'Ex ec'</li> <li>Type of protection USA / Canada: Non-Incendive 'NI'</li> <li>Terminals: 31, 32, Uco, V1, V2, V3, V4, 41, 42, 51, 52</li> </ul>	<ul style="list-style-type: none"> <li>ATEX/IECEX/UKEX type of protection: non-sparking 'Ex ec'</li> <li>Type of protection USA / Canada: Non-Incendive 'NI'</li> <li>Terminals: A, B, UFE, GRN</li> </ul>

Zones 1, 21	Division 1 and Zone 1
<b>ATEX/IECEX/UKEX:</b> II 2 G & II 2 D II 1/2 G & II 1 G & II 2 D	<b>USA:</b> DIV1 & ZN1 <b>Canada:</b> DIV1 & ZN1

#### Activating the inputs and outputs

(A) Power supply	(B) Inputs / outputs, communication	(C) Signal cable (remote mount design only)
<ul style="list-style-type: none"> <li>ATEX/IECEX/UKEX type of protection: non-sparking 'Ex eb'</li> <li>Type of protection USA / Canada: 'non IS'</li> <li>Maximum 250 Vrms</li> <li>Terminals: 1+, 2-, L, N, </li> </ul>	<ul style="list-style-type: none"> <li>ATEX/IECEX/UKEX type of protection: non-sparking 'Ex ec'</li> <li>Type of protection USA / Canada: Non-Incendive 'NI'</li> <li>When installing in 'Ex ia', suited intrinsically safe isolation amplifiers must be used for the connection.</li> <li>Terminals: 31, 32, Uco, V1, V2, V3, V4, 41, 42, 51, 52</li> </ul>	<ul style="list-style-type: none"> <li>ATEX/IECEX/UKEX type of protection: non-sparking 'Ex eb'</li> <li>Type of protection USA / Canada: explosionproof 'XP'</li> <li>Terminals: A, B, UFE, GRN</li> </ul>

#### Note

When installing in 'Ex ia' or 'IS' type of protection, the type of protection is determined by the type of electrical connection. The information in Changing the type of protection in the operating instruction must be observed when changing the type of protection!

## Zone 0, 1, 21 and Division 1 – Model: FMT4xx-A1, FMT4xx-F1

Type of protection	'e' / 'XP'		'ia' / 'IS'											
	U <sub>M</sub> [V]	I <sub>M</sub> [A]	U <sub>O</sub> [V]	U <sub>I</sub> [V]	I <sub>O</sub> [mA]	I <sub>I</sub> [mA]	P <sub>O</sub> [mW]	P <sub>I</sub> [mW]	C <sub>O</sub> [nF]	C <sub>I</sub> [nF]	C <sub>OPA</sub> [nF]	C <sub>IPA</sub> [nF]	L <sub>O</sub> [mH]	L <sub>I</sub> [mH]
<b>Outputs on basic device</b>														
<b>Current / HART output 31 / U<sub>CO</sub>, active</b> Terminals 31 / U <sub>CO</sub>	30	0.2	30	30	115	115	815	815	10	10	5	5	0.08	0.08
<b>Current / HART output 31 / 32, passive</b> Terminals 31 / 32	30	0.2	—	30	—	115	—	815	—	27	—	5	0.08	0.08
<b>Digital output 41 / 42, active*</b> Terminals 41 / 42 and V1 / V2*	30	0.1	27.8	30	119	30	826	225	20	20	29	29	0.22	0.22
<b>Digital output 41 / 42, active**</b> Terminals 41 / 42 and U <sub>CO</sub> / 32**	30	0.1	30	30	115	115	826	225	16	16	10	10	0.08	0.08
<b>Digital output 41 / 42, passive</b> Terminals 41 / 42	30	0.1	—	30	—	30	—	225	—	27	—	5	—	0.08
<b>Digital output 51 / 52, active*</b> Terminals 51 / 52 and V1 / V2*	30	0.1	27.8	30	119	30	826	225	20	20	29	29	0.22	0.22
<b>Digital output 51 / 52, passive</b> Terminals 51 / 52	30	0.1	—	30	—	30	—	225	—	27	—	5	—	0.08

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

Digital outputs 41 / 42 and 51 / 52 are not electrically isolated from each other. Terminals 42 / 52 have the same potential.

\* Only in conjunction with additional '24 V DC loop power supply (blue)' plug-in card in slot OC1.

\*\* Only in conjunction with current output U<sub>CO</sub> / 32 in 'power mode', see **Current output U<sub>CO</sub> / 32 as loop power supply for digital output 41 / 42 or 51 / 52** on page 21.

Type of protection	'e' / 'XP'		'ia' / 'IS'											
	U <sub>M</sub> [V]	I <sub>M</sub> [A]	U <sub>O</sub> [V]	U <sub>I</sub> [V]	I <sub>O</sub> [mA]	I <sub>I</sub> [mA]	P <sub>O</sub> [mW]	P <sub>I</sub> [mW]	C <sub>O</sub> [nF]	C <sub>I</sub> [nF]	C <sub>OPA</sub> [nF]	C <sub>IPA</sub> [nF]	L <sub>O</sub> [mH]	L <sub>I</sub> [mH]
<b>Inputs and outputs with optional plug-in cards</b>														
<b>Current output V3 / V4, active*</b> Terminals V3 / V4 and V1 / V2*	30	0.1	27.8	30	119	30	826	225	29	29	117	117	0.4	0.4
<b>Current output V1 / V2, passive**</b> <b>Current output V3 / V4, passive**</b> Terminals V1 / V2** or V3 / V4**	30	0.1	—	30	—	68	—	510	—	45	—	59	—	0.27
<b>Digital output V3 / V4, active*</b> Terminals V3 / V4 and V1 / V2*	30	0.1	27.8	30	119	68	826	225	17	17	31	31	0.4	0.4
<b>Digital output V1 / V2, passive**</b> <b>Digital output V3 / V4, passive**</b> Terminals V1 / V2** or V3 / V4**	30	0.1	—	30	—	30	—	225	—	13	—	16	—	0.27
<b>Digital input V3 / V4, active*</b> Terminals V3 / V4 and V1 / V2	30	0.1	27.8	30	119	3.45	826	25.8	17	17	31	31	0.4	0.4
<b>Digital input V1 / V2, passive*</b> <b>Digital input V3 / V4, passive*</b> Terminals V1 / V2** or V3 / V4**	30	0.1	—	30	—	3.45	—	25.8	—	13	—	16	—	0.27
<b>Modbus® / PROFIBUS DP®</b> Terminals V1 / V2	30	0.1	4.2	4.2	150	150	150	150	5300	5300	0.06	0.06	0.09	0.09

\* Only in conjunction with additional '24 V DC loop power supply (blue)' plug-in card in slot OC1.

\*\* The terminal assignment depends on the model number or the slot assignments. For connection examples, see **Connection examples** on page 25.

## ... Use in potentially explosive atmospheres

### Zone 2, 22 and Division 2 – Model: FMT4xx-A2, FMT4xx-F2

Outputs on basic device	Operating values (general)		Type of protection 'ec' / 'NI'	
	U <sub>N</sub>	I <sub>N</sub>	U <sub>N</sub>	I <sub>N</sub>
<b>Current / HART output 31 / U<sub>CO</sub>, active</b> Terminals 31 / U <sub>CO</sub>	30 V	30 mA	30 V	30 mA
<b>Current / HART output 31 / 32, passive</b> Terminals 31 / 32	30 V	30 mA	30 V	30 mA
<b>Digital output 41 / 42, active*</b> Terminals 41 / 42 and V1 / V2*	30 V	30 mA	30 V	30 mA
<b>Digital output 41 / 42, active**</b> Terminals 41 / 42 and U <sub>CO</sub> / 32**	30 V	30 mA	30 V	30 mA
<b>Digital output 41 / 42, passive</b> Terminals 41 / 42	30 V	30 mA	30 V	30 mA
<b>Digital output 51 / 52, active*</b> Terminals 51 / 52 and V1 / V2*	30 V	30 mA	30 V	30 mA
<b>Digital output 51 / 52, passive</b> Terminals 51 / 52	30 V	30 mA	30 V	30 mA

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

Digital outputs 41 / 42 and 51 / 52 are not electrically isolated from each other. Terminals 42 / 52 have the same potential.

\* Only in conjunction with additional '24 V DC loop power supply (blue)' plug-in card in slot OC1.

\*\* Only in conjunction with current output U<sub>CO</sub> / 32 in 'Powermode', see **Current output U<sub>CO</sub> / 32 as loop power supply for digital output 41 / 42 or 51 / 52** on page 21.

Inputs and outputs with optional plug-in cards	Operating values (general)		Type of protection 'ec' / 'NI'	
	U <sub>N</sub>	I <sub>N</sub>	U <sub>N</sub>	I <sub>N</sub>
<b>Current output V3 / V4, active*</b> Terminals V3 / V4 and V1 / V2*	30 V	30 mA	30 V	30 mA
<b>Current output V1 / V2, passive**</b>	30 V	30 mA	30 V	30 mA
<b>Current output V3 / V4, passive**</b> Terminals V1 / V2** or V3 / V4**				
<b>Digital output V3 / V4, active*</b> Terminals V3 / V4 and V1 / V2*	30 V	30 mA	30 V	30 mA
<b>Digital output V1 / V2, passive**</b>	30 V	30 mA	30 V	30 mA
<b>Digital output V3 / V4, passive**</b> Terminals V1 / V2** or V3 / V4**				
<b>Digital input V3 / V4, active*</b> Terminals V3 / V4 and V1 / V2	30 V	3,45 mA	30 V	3,45 mA
<b>Digital input V1 / V2, passive*</b>	30 V	3,45 mA	30 V	3,45 mA
<b>Digital input V3 / V4, passive*</b> Terminals V1 / V2** or V3 / V4**				
<b>Modbus® / PROFIBUS DP®</b> Terminals V1 / V2	30 V	30 mA	30 V	30 mA

\* Only in conjunction with additional '24 V DC loop power supply (blue)' plug-in card in slot OC1.

\*\* The terminal assignment depends on the model number or the slot assignments. For connection examples, see **Connection examples** on page 25.

### Special connection conditions

#### Note

The AS plug-in card (24 V DC loop power supply) may only be used to power the internal inputs and outputs on the device. It must not be used to power external circuits!

#### Note

If the protective earth (PE) is connected in the flowmeter's terminal box, you must ensure that no dangerous potential difference can arise between the protective earth (PE) and the potential equalization (PA) in areas with explosion risk.

#### Note

- For devices with a power supply of 11 to 30 V DC, on-site external overvoltage protection must be provided.
- You must make sure that the overvoltage is limited to 140 % (= 42 V DC) of the maximum operating voltage.

#### Note

The safety requirements for intrinsically safe circuits in the EC type examination certificate of the device must be complied with.

The output circuits are designed so that they can be connected to both intrinsically-safe and non-intrinsically-safe circuits.

- Combining intrinsically safe and non-intrinsically safe circuits is not permitted.
- On intrinsically safe circuits, potential equalization should be established along the entire length of the cable used for the signal outputs.
- The rated voltage of the non-intrinsically safe circuits is  $U_M = 30 \text{ V}$ .
- Intrinsic safety is preserved If the rated voltage  $U_M = 30 \text{ V}$  is not up-scaled when connections are established to non-intrinsically safe external circuits.
- The information in **Changing the type of protection** in the operating instruction on page 72 must be observed when changing the type of protection.

Devices connected to the relevant equipment must not be operated at over 250 V<sub>rms</sub> AC or 250 V DC to ground.

Installation in accordance with ATEX or IECEx must comply with the applicable national and international standards and directives.

Installation in the USA or Canada must comply with ANSI / ISA RP 12.6, 'Installation of intrinsically safe systems for hazardous (classified) locations', the 'National Electrical Code (ANSI / NFPA 70), sections 504, 505' and the 'Canadian electrical code (C22.1-02)'.

Apparatus connected to the flowmeter must have appropriate explosion protection approval in accordance with the Entity concept.

The apparatus must have intrinsically safe circuits.

The apparatus must be installed and connected in accordance with the relevant manufacturer documentation.

The electrical specifications in **Electrical data** on page 52 must be observed.

## Use in hazardous areas in accordance with EAC TR-CU-012

### Note

- An additional document with information on EAC-Ex certification is available for measuring systems that are used in potentially explosive atmospheres in accordance with EAC TR-CU-012.
- The information on EAC-Ex certification is an integral part of this instruction. As a result, it is crucial that the installation guidelines and connection values it lists are also observed.

The icon on the name plate indicates the following:



Information on EAC-Ex certification is available for free download at the following link. Alternatively simply scan the QR code.



[INF/FMT200/FMT400/EAC-Ex-X8](https://www.abb.com/inf/fmt200/fmt400/eac-ex-x8)

## Ordering Information

### Note

For additional information on dependencies and restrictions, and for help on product selection, please refer to the Online Product Selection Assistant (PSA) at [www.abb.us/flow-selector](http://www.abb.us/flow-selector).

The following table provides an overview of the possible combinations of plug-in card combinations that can be selected when ordering the device.

Main ordering information (outputs)	Additional ordering information		Slot OC1	Slot OC2
	Additional output 1	Additional output 2	Terminals V1 / V2	Terminals V3 / V4
G0	—	—	—	—
G1	—	—	24 V DC power supply (blue)	—
G2	—	—	—	Passive current output (red)
G3	—	—	Passive current output, 4 ... 20 mA (red)	Passive current output, 4 ... 20 mA (red)
G4	—	—	24 V DC power supply (blue)	Passive current output (red)
G0	DRT	—	24 V DC power supply (blue)	—
G0	DRT	DSN	24 V DC power supply (blue)	Passive digital input (yellow)
G0	DRT	DSG	24 V DC power supply (blue)	Passive digital output (green)
G0	DRT	DSA	24 V DC power supply (blue)	Passive current output, 4 ... 20 mA (red)
G0	DRN	—	Passive digital input (yellow)	—
G0	DRN	DSG	Passive digital input (yellow)	Passive digital output (green)
G0	DRN	DSA	Passive digital input (yellow)	Passive current output, 4 ... 20 mA (red)
G0	DRG	DSN	Passive digital output (green)	Passive digital input (yellow)
G0	DRG	DSA	Passive digital output (green)	Passive current output, 4 ... 20 mA (red)
G0	DRA	DSA	Passive current output, 4 ... 20 mA (red)	Passive current output, 4 ... 20 mA (red)
G0	DRA	DSG	Passive current output, 4 ... 20 mA (red)	Passive digital output (green)
G0	DRA	DSN	Passive current output, 4 ... 20 mA (red)	Passive digital input (yellow)



## SensyMaster FMT430

Thermal Mass Flowmeter, for standard applications, compact and clever

Base model	FMT430	XX	XX	X	X	XX	XX	XX	XX	X
SensyMaster FMT430 Thermal Mass Flowmeter										
<b>Explosion Protection Certification</b>										
Without		Y0								
ATEX / IECEx (Zone 2 / 21)		A2								
ATEX / IECEx (Zone 1 / 21)		A1								
ATEX / IECEx (Zone (0) 1 / 21)		A3								
cFMus (Class 1 Div. 2 / Zone 2)		F2								
cFMus (Class 1 Div. 1 / Zone 1)		F1								
UKEX Zone 2 / 22		U2								
UKEX Zone 1 / 21		U1								
UKEX Zone (0) 1 / 21		U4								
<b>Measuring Medium</b>										
Air or other clean gas (One gas component only)		C1								
Gas mixtures with max. 23.5 Vol% O <sub>2</sub> (eg. Natural gas or Biogas)		C2								
Oxygen / gas mixtures > 23.5 Vol% O <sub>2</sub> , oil and grease-free, with O <sub>2</sub> certificate (max. 150 °C / 302 °F)		P1								
Ammonia		H3								
<b>Sensor Element Type / Temperature Range of Measuring Medium</b>										
Ceramic sensor elements / Standard temperature range -20 to 150 °C (-4 to 302 °F)						A				
Ceramic sensor elements / High temperature range -20 to 300 °C (-4 to 572 °F)						B				
Ceramic sensor elements / Low temperature range -40 to 150°C (-40 to 302°F)						E				
<b>Mounting Length / Flowmeter Sensor Material</b>										
120 mm (4.7 in) / AISI 316Ti SST (1.4571) (DN 25 to DN 125 [1 to 5 in])										1*
263 mm (10.4 in) / AISI 316Ti SST (1.4571) (DN 25 to DN 350 [1 to 14 in])										2*
425 mm (17 in) / AISI 316Ti SST (1.4571) (> DN 350 to DN 700 [> 14 to 28 in])										3*
775 mm (31 in) / AISI 316Ti SST (1.4571) (> DN 700 [> 28in])										4*
<b>Sensor Connection</b>										
Flange DN 25, nominal pressure 4 MPa (40 bar, 580 psi)										D3
Compression fitting, stainless steel, nominal pressure 2 MPa (20 bar, 290 psi) (-40 to 150 °C (-40 to 302 °F)) (≥ DN80 (≥ 3 in))										G2
Thread DIN 11851 (PN 10), nominal pressure 1.6 MPa (16 bar, 232 psi) (-20 to 140 °C (-4 to 284 °F))										F1
<b>Connection Design / Transmitter Housing Type / Transmitter Housing Material / Cable Glands</b>										
Integral / Single compartment / Aluminium / 3 × M20 × 1.5										S1
Integral / Single compartment / Aluminium / 3 × NPT ½ in										S2
Integral / Dual compartment / Aluminium / 3 × M20 × 1.5										D1
Integral / Dual compartment / Aluminium / 3 × NPT ½ in										D2
Integral / Dual compartment / Aluminium / 3 × NPT ½ in (Exd, XP)										D5
Integral / Dual compartment / Aluminium / 3 × M20 × 1.5 (Exd, XP)										D6
Remote (Selection for remote transmitter)										Y0
Without Transmitter										Y5
<b>Connection Design / Sensor Housing Type / Sensor Housing Material / Cable Glands</b>										
Remote / Single compartment / Aluminium / 1 × M20 × 1.5										A1
Remote / Single compartment / Aluminium / 1 × NPT ½ in										A2
Remote / Single compartment / Stainless Steel / 1 × M20 × 1.5										U1
Remote / Single compartment / Stainless Steel / 1 × NPT ½ in										U2
Without										Y0

\* Nominal size ranges when using flanged pipe components or weld-on adapters without ball valve

Continued on next page...

## ... Ordering Information

Base model	FMT430	XX	XX	X	X	XX	XX	XX	XX	X
SensyMaster FMT430 Thermal Mass Flowmeter										
<b>Outputs</b>										
Current output 1 (active or passive), digital output 1 & 2 (passive), HART										G0
Current output 1 (active or passive), digital output 1 & 2 (passive), current output 2 (passive), HART										G2
Current output 1 (active or passive), digital output 1 & 2 (passive), digital Input (passive), HART										G8
Current output 1 (active or passive), digital output 1 & 2 (passive), HART, MODBUS										M1
Current output 1 (active or passive), digital output 1 & 2 (passive), HART, PROFIBUS DP										D1
Without (Remote TX or replacement Sensor)										Y0
<b>Power Supply</b>										
100 to 240 V AC, 50 / 60 Hz										A
24 V DC, +/- 20 %										B
Without (Remote TX or replacement Sensor)										Y

### Additional ordering information

Additional ordering information	XX	XX	XXX	XXX	XXX
SensyMaster FMT430 Thermal Mass Flowmeter					
<b>Material Certificates</b>					
Material monitoring with inspection certificate 3.1 acc. EN 10204	C2				
Declaration of compliance with the order 2.1 acc. EN 10204	C4				
Inspection certificate 3.1 acc. EN 10204 for visual, dimensional and functional test	C6				
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI	CA				
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI with material analysis	C5				
<b>Additional Calibration Certificates</b>					
Certificate of DAkkS calibration, 10 points, traceable acc. ISO / IEC 17025 (Former DKD certificate, based on reference conditions with air)		CH			
Declaration of compliance for calibration 2.1 acc. EN 10204		CM			
<b>Other Usage Certifications</b>					
DVGW Certificate (T <sub>amb</sub> : -20 to 100 °C)			CGW		
UKCA conformity			CU1		
<b>Additional Output 1</b>					
1 × Digital input					DRN
1 × Digital output					DRG
1 × Analog output passive (4 to 20 mA)					DRA
24 V DC transmitter loop power supply					DRT
MODBUS					DRM
PROFIBUS DP					DRD
<b>Additional Output 2</b>					
1 × Digital input					DSN
1 × Digital output					DSG
1 × Analog output passive (4 to 20 mA)					DSA

Continued on next page...

<b>Additional ordering information</b>	<b>XX</b>	<b>XX</b>	<b>XXX</b>	<b>XX</b>	<b>XX</b>	<b>XXX</b>	<b>XX</b>
SensyMaster FMT430 Thermal Mass Flowmeter							
<b>Integrated Digital Display (LCD)</b>							
No Display, with Blind Cover	L0						
With Push Buttons and Display (TTG) and Glass Cover	L2						
<b>Documentation Language</b>							
German		M1					
English		M5					
Western Europe Scandinavia		MW					
Eastern Europe		ME					
<b>Configuration Type</b>							
Parameters set to factory default			NC1				
Parameters set customer specific (e.g. function of the outputs, etc.)			NCC				
<b>Calibration Type</b>							
5-point calibration, standard measuring range, incl. factory certificate				R3			
5-point calibration, extended measuring range, incl. factory certificate (non Ex version only)				R4			
<b>Device Identification Plate</b>							
Stainless steel plate with TAG no.					T1		
Adhesive label with TAG no.					TC		
<b>Ambient Temperature Range</b>							
Extended -40 to 70 °C (-40 to 158 °F) (in preparation)						TA9	
<b>Extended Diagnostic Options</b>							
VeriMass SensorCheck function							

## SensyMaster FMT450

Thermal Mass Flowmeter for advanced applications

Base model	FMT450	XX	XX	X	X	XX	XX	XX	XX	X
SensyMaster FMT450 Thermal Mass Flowmeter										
<b>Explosion Protection Certification</b>										
Without		Y0								
ATEX / IECEx (Zone 2 / 21)		A2								
ATEX / IECEx (Zone 1 / 21)		A1								
ATEX / IECEx (Zone (0) 1 / 21)		A3								
cFMus (Class 1 Div. 2 / Zone 2)		F2								
cFMus (Class 1 Div. 1 / Zone 1)		F1								
UKEX Zone 2 / 22		U2								
UKEX Zone 1 / 21		U1								
UKEX Zone (0) 1 / 21		U4								
<b>Measuring Medium</b>										
Air or other clean gas (One gas component only)		C1								
Gas mixtures with max. 23.5 Vol% O <sub>2</sub> (e. g. Natural gas or Biogas)		C2								
Oxygen / gas mixtures > 23.5 Vol% O <sub>2</sub> , oil and grease-free, with O <sub>2</sub> certificate (max. 150 °C / 302 °F)		P1								
Ammonia		H3								
<b>Sensor Element Type / Temperature Range of Measuring Medium</b>										
Ceramic sensor elements / Standard temperature range -20 to 150 °C (-4 to 302 °F)		A								
Ceramic sensor elements / High temperature range -20 to 300 °C (-4 to 572 °F)		B								
Ceramic sensor elements / Low temperature range -40 to 150°C (-40 to 302°F)		E								
<b>Mounting Length / Flowmeter Sensor Material</b>										
120 mm (4.7 in) / AISI 316Ti SST (1.4571) (DN 25 to DN 125 [1 to 5 in])										1*
263 mm (10.4 in) / AISI 316Ti SST (1.4571) (DN 25 to DN 350 [1 to 14 in])										2*
425 mm (17 in) / AISI 316Ti SST (1.4571) (> DN 350 to DN 700 [> 14 to 28 in])										3*
775 mm (31 in) / AISI 316Ti SST (1.4571) (> DN 700 [> 28in])										4*
<b>Sensor Connection</b>										
Flange DN 25, nominal pressure 4 MPa (40 bar, 580 psi)										D3
Compression fitting, stainless steel, nominal pressure 2 MPa (20 bar, 290 psi) (-40 to 150 °C (-40 to 302 °F)) (≥ DN80 (≥ 3 in))										G2
Thread DIN 11851 (PN10), nominal pressure 1.6 MPa (16 bar, 232 psi) (-20 to 140 °C (-4 to 284 °F))										F1
<b>Connection Design / Transmitter Housing Type / Transmitter Housing Material / Cable Glands</b>										
Integral / Single compartment / Aluminium / 3 × M20 × 1.5										S1
Integral / Single compartment / Aluminium / 3 × NPT ½ in										S2
Integral / Dual compartment / Aluminium / 3 × M20 × 1.5										D1
Integral / Dual compartment / Aluminium / 3 × NPT ½ in										D2
Integral / Dual compartment / Aluminium / 3 × NPT ½ in (Exd, XP)										D5
Integral / Dual compartment / Aluminium / 3 × M20 × 1.5 (Exd, XP)										D6
Remote (Selection for remote transmitter)										Y0
Without Transmitter										Y5
<b>Connection Design / Sensor Housing Type / Sensor Housing Material / Cable Glands</b>										
Remote / Single compartment / Aluminium / 1 × M20 × 1.5										A1
Remote / Single compartment / Aluminium / 1 × NPT ½ in										A2
Remote / Single compartment / Stainless Steel / 1 × M20 × 1.5										U1
Remote / Single compartment / Stainless Steel / 1 × NPT ½ in										U2
Without										Y0

\* Nominal size ranges when using flanged pipe components or weld-on adapters without ball valve

Continued on next page...

Base model	FMT450	XX	XX	X	X	XX	XX	XX	XX	X
SensyMaster FMT450 Thermal Mass Flowmeter										
<b>Outputs</b>										
Current output 1 (active or passive), digital output 1 & 2 (passive), HART										G0
Current output 1 (active or passive), digital output 1 & 2 (passive), current output 2 (passive), HART										G2
Current output 1 (active or passive), digital output 1 & 2 (passive), digital Input (passive), HART										G8
Current output 1 (active or passive), digital output 1 & 2 (passive), HART, MODBUS										M1
Current output 1 (active or passive), digital output 1 & 2 (passive), HART, PROFIBUS DP										D1
Without (Remote TX or replacement Sensor)										Y0
<b>Power Supply</b>										
100 to 240 V AC, 50 / 60 Hz										A
24 V DC, +/- 20 %										B
Without (Remote TX or replacement Sensor)										Y

### Additional ordering information SensyMaster FMT450

Additional ordering information	XX	XX	XXX	XXX	XXX
SensyMaster FMT450 Thermal Mass Flowmeter					
<b>Material Certificates</b>					
Material monitoring with inspection certificate 3.1 acc. EN 10204	C2				
Declaration of compliance with the order 2.1 acc. EN 10204	C4				
Inspection certificate 3.1 acc. EN 10204 for visual, dimensional and functional test	C6				
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI	CA				
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI with material analysis	C5				
<b>Additional Calibration Certificates</b>					
Certificate of DAKkS calibration, 10 points, traceable acc. ISO / IEC 17025 (Former DKD certificate, based on reference conditions with air)		CH			
Declaration of compliance for calibration 2.1 acc. EN 10204		CM			
<b>Other Usage Certifications</b>					
DVGW Certificate (T <sub>amb</sub> : -20 to 100°C)				CGW	
UKCA conformity				CU1	
<b>Additional Output 1</b>					
1 × Digital input					DRN
1 × Digital output					DRG
1 × Analog output passive (4 to 20 mA)					DRA
24 V DC transmitter loop power supply					DRT
MODBUS					DRM
PROFIBUS DP					DRD
<b>Additional Output 2</b>					
1 × Digital input					DSN
1 × Digital output					DSG
1 × Analog output passive (4 to 20 mA)					DSA

Continued on next page...

## ... Ordering Information

Additional ordering information	XX	XX	XXX	XX	XX	XX	XXX	XX
SensyMaster FMT450 Thermal Mass Flowmeter								
<b>Integrated Digital Display (LCD)</b>								
No Display, with Blind Cover	L0							
With Push Buttons and Display (TTG) and Glass Cover	L2							
<b>Documentation Language</b>								
German		M1						
English		M5						
Western Europe Scandinavia		MW						
Eastern Europe		ME						
<b>Configuration Type</b>								
Parameters set to factory default			NC1					
Parameters set customer specific (e.g. function of the outputs, etc.)			NCC					
<b>Special Applications</b>								
Filling application				PT				
<b>Calibration Type</b>								
7-point calibration, standard measuring range, incl. factory certificate						R2		
7-point calibration, extended measuring range, incl. factory certificate (non Ex version only)						R4		
Process gas calibration, up to two gas components, incl. factory certificate (depending on gas type, check availability)						RP		
Process gas calibration, gas mixtures with more than two gas components, incl. factory certificate (depending on gas type, check availability)						RM		
<b>Device Identification Plate</b>								
Stainless steel plate with TAG no.							T1	
Adhesive label with TAG no.							TC	
<b>Ambient Temperature Range</b>								
Extended -40 to 70 °C (-40 to 158 °F) (in preparation)								TA9
<b>Extended Diagnostic Options</b>								
VeriMass SensorCheck function								

## SensyMaster FMT432 / FMT452

### Remote Transmitter for Thermal Mass Flowmeter FMT430

<b>Base model</b>					
SensyMaster FMT432 Thermal Mass Flowmeter Transmitter	<b>FMT432</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>
SensyMaster FMT452 Thermal Mass Flowmeter Transmitter	<b>FMT452</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>
<b>Explosion Protection Certification</b>					
Without		Y0			
ATEX / IECEx (Zone 2 / 22)		A2			
ATEX / IECEx (Zone 1 / 21)		A1			
ATEX / IECEx (Zone (0) 1 / 21)		A3			
cFMus (Class 1 Div. 2 / Zone 2)		F2			
cFMus (Class 1 Div. 1 / Zone 1)		F1			
UKEX Zone 2 / 22		U2			
UKEX Zone 1 / 21		U1			
UKEX Zone (0) 1 / 21		U4			
<b>Connection Design / Transmitter Housing Type / Transmitter Housing Material / Cable Glands</b>					
Remote / Single compartment, wall mounted / Aluminum / 4 x M20 x 1.5				W1	
Remote / Single compartment, wall mounted / Aluminum / 4 x NPT 1/2 in.				W2	
Remote / Dual compartment, wall mounted / Aluminum / 4 x M20 x 1.5				R1	
Remote / Dual compartment, wall mounted / Aluminum / 4 x NPT 1/2 in.				R2	
Remote / Dual compartment, wall mounted / Aluminum / 4 x M20 x 1.5 (Exd, XP)				R5	
Remote / Dual compartment, wall mounted / Aluminum / 4 x NPT 1/2 in. (Exd, XP)				R6	
<b>Outputs</b>					
Current output 1 (active or passive), digital output 1 & 2 (passive), HART				G0	
Current output 1 (active or passive), digital output 1 & 2 (passive), current output 2 (passive), HART				G2	
Current output 1 (active or passive), digital output 1 & 2 (passive), digital Input (passive), HART				G8	
Current output 1 (active or passive), digital output 1 & 2 (passive), HART, MODBUS				M1	
Current output 1 (active or passive), digital output 1 & 2 (passive), HART, PROFIBUS DP				D1	
<b>Power Supply</b>					
100 to 240 V AC, 50 / 60 Hz					A
24 V DC, +/- 20 %					B

### Additional ordering information

<b>Additional ordering information</b>					
SensyMaster FMT432 Thermal Mass Flowmeter Transmitter		<b>XX</b>	<b>XXX</b>	<b>XXX</b>	<b>XXX</b>
SensyMaster FMT452 Thermal Mass Flowmeter Transmitter		<b>XX</b>	<b>XXX</b>	<b>XXX</b>	<b>XXX</b>
<b>Mounting Bracket Shape / Material</b>					
For 2 in. pipe mounting / Carbon steel, electrogalvanized		B1			
<b>Additional Output 1</b>					
1 x Digital input				DRN	
1 x Digital output				DRG	
1 x Analog output passive (4 to 20 mA)				DRA	
24 V DC transmitter loop power supply				DRT	
MODBUS				DRM	
PROFIBUS DP				DRD	
<b>Additional Output 2</b>					
1 x Digital input					DSN
1 x Digital output					DSG
1 x Analog output passive (4 to 20 mA)					DSA
<b>Other Usage Certifications</b>					
UKCA conformity					CU1

Continued on next page...

## ... Ordering Information

Additional ordering information								
SensyMaster FMT432 Thermal Mass Flowmeter Transmitter	XX	XX	XXX	--	XXX	XX	XXX	XX
SensyMaster FMT452 Thermal Mass Flowmeter Transmitter	XX	XX	XXX	XX	XXX	XX	XXX	XX
<b>Integrated Digital Display (LCD)</b>								
No Display, with Blind Cover	L0							
With Push Buttons and Display (TTG) and Glass Cover	L2							
<b>Documentation Language</b>								
German		M1						
English		M5						
Language package Western Europe Scandinavia		MW						
Language package Eastern Europe		ME						
<b>Configuration Type</b>								
Parameters set to factory default			NC1					
Parameters set customer specific (e.g. function of the outputs, etc.)			NCC					
<b>Special Applications</b>								
Filling application				PT*				
<b>Signal Cable Length</b>								
Without signal cable					SC0			
5 m (approx. 15 ft)					SC1			
10 m (approx. 30 ft)					SC2			
20 m (approx. 66 ft)					SC4			
30 m (approx. 98 ft)					SC6			
50 m (approx. 164 ft)					SCA			
<b>Device Identification Plate</b>								
Stainless steel plate with TAG no.						T1		
Adhesive label with TAG no.						TC		
<b>Ambient Temperature Range</b>								
Extended -40 to 70 °C (-40 to 158 °F)							TA9	
<b>Extended Diagnostic Options</b>								
VeriMass SensorCheck function								

\* Only with FMT452



### SensyMaster FMT091 Pipe component / Wafer Design (Type 1)

<b>Base model</b>	FMT091	X	XXX	XX	XX	XX	XX	XX
SensyMaster FMT091 Pipe component / Wafer Design (Type 1)								
<b>Design</b>								
Standard		S						
<b>Nominal Diameter</b>								
DN 40 (1½ in)			040					
DN 50 (2 in)			050					
DN 65 (2½ in)			065					
DN 80 (3 in)			080					
DN 100 (4 in)			100					
DN 125 (5 in)			125					
DN 150 (6 in)			150					
DN 200 (8 in)			200					
<b>Process Connection</b>								
Flanges DIN PN 40						D4		
Flanges ANSI / ASME B16.5 Class 150, Schedule 40 S						A1		
Flanges ANSI / ASME B16.5 Class 300, Schedule 40 S						A3		
<b>Sensor Connection</b>								
Flange DN 25, nominal pressure 4 MPa (40 bar, 580 psi) with centering pin							D3	
<b>Measuring Medium</b>								
Air or other clean gas (only one gas type)								C1
Gas mixtures with max. 23.5 Vol% O <sub>2</sub> (e.g. natural gas or biogas)								C2
Oxygen / gas mixtures > 23.5 Vol% O <sub>2</sub> , oil and grease-free, with O2 certificate (max. 150 °C / 302 °F)								P1
Ammonia								H3
<b>Pipe Material</b>								
Stainless steel AISI 316Ti (1.4571)								S2
<b>Mounting Length of the Sensor</b>								
263 mm (10.4 in)								L2
425 mm (17 in)								L3

Continued on next page...

## ... Ordering Information

### Additional ordering information

Additional ordering information	XXX	XXX	XX
SensyMaster FMT091 Pipe component / Wafer Design (Type 1)			
<b>Sensor Connection Options</b>			
With ball valve (max. 150 °C / 302 °F)	SCA* **		
With integrated hot-tap fitting, for pipe component DN 50 to DN 80 (-20 to 150°C / -4 to 302°F)	SCB***		
With integrated hot-tap fitting, for pipe component DN 100 to DN 200 (-20 to 150°C / -4 to 302°F)	SCC***		
<b>Sensor Connection Accessories</b>			
DN 25 blind flange to close flowmeter sensor connection, material stainless steel AISI 316Ti (1.4571)		SBA	
<b>Certificates</b>			
Material monitoring with inspection certificate 3.1 acc. EN 10204			C2
Declaration of compliance with the order 2.1 acc. EN 10204			C4
Inspection certificate 3.1 acc. EN 10204 for visual, dimensional and functional test			C6
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI			CA
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI with material analysis			C5
Pressure test acc. AD2000			CB
<b>Other Usage Certifications</b>			
DVGW Certificate (T <sub>amb</sub> : -20 to 100°C)			CGW
UKCA conformity			CU1

\* Correct sensor length: For pipe component DN 40 to DN 100: h = 263 mm, from DN 125: h = 425 mm.

\*\* Suitable for use in Zone 2 / Div. 2.

\*\*\* Suitable for use in Zone 1, Zone 2 (not Zone 0) / Div. 1, Div. 2.

## SensyMaster FMT092 Pipe component, partial measuring section (type 2)

Max. 1,6 MPa (16 bar, 232 psi)

Base model	FMT092	X	XXX	XX	XX	XX	XX	XX
SensyMaster FMT092 Pipe component, partial measuring section (type 2)								
<b>Design</b>								
Standard		S						
Integrated flow straighteners		F						
<b>Nominal Diameter</b>								
DN 25 (1 in)			025					
DN 40 (1½ in)			040					
DN 50 (2 in)			050					
DN 65 (2½ in)			065					
DN 80 (3 in)			080					
DN 100 (4 in)			100					
DN 125 (5 in)			125					
DN 150 (6 in)			150					
DN 200 (8 in)			200					
<b>Process Connection</b>								
Flanges DIN PN 40						D4		
Flanges ANSI / ASME B16.5 Class 150, Schedule 40 S						A1		
Flanges ANSI / ASME B16.5 Class 300, Schedule 40 S						A3		
R-External thread 1.6 MPa (16 bar, 232 psi)						N6		
<b>Sensor Connection</b>								
Flange DN 25, nominal pressure 4 MPa (40 bar, 580 psi) with centering pin							D3	
Thread DIN 11851, nominal pressure 1.6 MPa (16 bar, 232 psi) with centering pin							F1	
<b>Measuring Medium</b>								
Air or other clean gas (only one type of gas)								C1
Gas mixtures with max. 23.5 Vol% O <sub>2</sub> (e.g. natural gas or biogas)								C2
Oxygen / gas mixtures > 23.5 Vol% O <sub>2</sub> , oil and grease-free, with O <sub>2</sub> certificate (max. 150 °C / 302 °F)								P1
Ammonia								H3
<b>Pipe Material</b>								
Stainless steel AISI 316Ti (1.4571)								S2
Steel S 235 (1.0037) galvanized								S3
<b>Mounting Length of the Sensor</b>								
120 mm (4.7 in)								L1
263 mm (10.4 in)								L2

Continued on next page...

## ... Ordering Information

### Additional ordering information

Additional ordering information	XXX	XXX	XX
SensyMaster FMT092 Pipe component, partial measuring section (type 2)			
<b>Sensor Connection Options</b>			
With ball valve (max. 150 °C / 302 °F)	SCA* **		
With integrated hot-tap fitting, for pipe component DN 50 to DN 80 (–20 to 150°C / –4 to 302°F)	SCB***		
<b>Sensor Connection Accessories</b>			
DN 25 blind flange to close flowmeter sensor connection, material stainless steel AISI 316Ti (1.4571)		SBA	
Blind screw connection for Thread DIN 11851, to close flowmeter sensor connection, material stainless steel AISI 304 (1.4301)		SBB	
<b>Certificates</b>			
Material monitoring with inspection certificate 3.1 acc. EN 10204			C2
Declaration of compliance with the order 2.1 acc. EN 10204			C4
Inspection certificate 3.1 acc. EN 10204 for visual, dimensional and functional test			C6
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI			CA
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI with material analysis			C5
<b>Other Usage Certifications</b>			
DVGW Certificate (T <sub>amb</sub> : –20 to 100°C)			CGW
UKCA conformity			CU1

\* Correct sensor length: For pipe component DN 50 to DN 100: h = 263 mm, from DN 125: h = 425 mm.

\*\* Suitable for use in Zone 2 / Div. 2.

\*\*\* Suitable for use in Zone 1, Zone 2 (not Zone 0) / Div. 1, Div. 2.

### SensyMaster FMT094 Pipe component, weld-on adapter

<b>Base model</b>	FMT094	X	XXX	XX	XX	XX	XX	XX
SensyMaster FMT094 Pipe component, weld-on adapter								
<b>Design</b>		S						
Standard								
<b>Nominal Diameter</b>								
Selection for weld-on adapter			000					
<b>Process Connection</b>								
Selection for weld-on adapter				W2				
<b>Sensor Connection</b>								
Flange DN 25, nominal pressure 4 MPa (40 bar, 580 psi) with centering pin						D3		
Compression fitting, stainless steel, nominal pressure 2 MPa (20 bar, 290 psi)						G2		
Thread DIN 11851, nominal pressure 1.6 MPa (16 bar, 232 psi) with centering pin						F1		
<b>Measuring Medium</b>								
Air or other clean gas (only one gas type)							C1	
Gas mixtures with max. 23.5 Vol% O <sub>2</sub> (e.g. natural gas or biogas)							C2	
Oxygen / gas mixtures > 23.5 Vol% O <sub>2</sub> , oil and grease-free, with O <sub>2</sub> certificate (max. 150 °C / 302 °F)							P1	
Ammonia							H3	
<b>Pipe Material</b>								
Stainless steel AISI 316Ti (1.4571)								S2
Carbon steel S 235 (1.0037)								C1
<b>Mounting Length of the Sensor</b>								
120 mm (4.7 in)								L1
263 mm (10.4 in)								L2
425 mm (17 in)								L3
775 mm (31 in)								L4

Continued on next page...

## ... Ordering Information

### Additional ordering information SensyMaster FMT094

Additional ordering information	XXX	XXX	XX
SensyMaster FMT094 Pipe component, weld-on adapter			
<b>Sensor Connection Options</b>			
With ball valve (max. 150 °C / 302 °F)	SCA* **		
With integrated hot-tap fitting, with weld on adapter for diameter DN 100 to DN 300 (4 to 12 in) (-20 bis 150°C / -4 bis 302°F)	SCD***		
<b>Sensor Connection Accessories</b>			
DN 25 blind flange to close flowmeter sensor connection, material stainless steel AISI 316Ti (1.4571)		SBA	
Blind screw connection for Thread DIN 11851, to close flowmeter sensor connection, material stainless steel AISI 304 (1.4301)		SBB	
<b>Certificates</b>			
Material monitoring with inspection certificate 3.1 acc. EN 10204			C2
Declaration of compliance with the order 2.1 acc. EN 10204			C4
Inspection certificate 3.1 acc. EN 10204 for visual, dimensional and functional test			C6
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI			CA
Inspection certificate 3.1 acc. EN 10204 for positive material identification PMI with material analysis			C5
<b>Other Usage Certifications</b>			
DVGW Certificate (T <sub>amb</sub> : -20 to 100°C)			CGW
UKCA conformity			CU1

\* Correct sensor length: For pipe component DN 50 ... DN 100: h = 263 mm, from DN 125: h = 425 mm.  
For weld-on adapter up to 150 mm: h = 263 mm, up to 500 mm: h = 425 mm, > 500 mm: h = 775 mm

\*\* Suitable for use in Zone 2 / Div. 2.

\*\*\* Suitable for use in Zone 1, Zone 2 (not Zone 0) / Div. 1, Div. 2.

## Questionnaire

<b>Customer:</b>	<b>Date:</b>
<b>Ms. / Mr.:</b>	<b>Department:</b>
<b>Telephone:</b>	<b>Email:</b>

**Model:**

FMT230       FMT430       Not determined  
 FMT250       FMT450

**Application data:**

Operating pressure min. / norm. / max. [bar abs, psi, other]      Temperature min. / norm. / max. [°C, °F]

---

Flow rate min. / norm. / max. [kg/h, lbs/h, Nm<sup>3</sup>/h, other]      Normal conditions (in volume flow)

0°C, 1013mbar       other  
 20°C, 1013mbar

**Gas data:**

Gas type (pure gas):

---

Gas mixture (name, vol. %) <sup>1</sup>	Component 1	Component 2	Component 3	Component 4	Component 5
_____	_____	_____	_____	_____	_____

**Transmitter design**

Design:

<input type="checkbox"/> Integral mount design	<input type="checkbox"/> Single-compartment housing	Signal cable length (remote mount design)	Communication:
<input type="checkbox"/> Remote mount design	<input type="checkbox"/> Dual-compartment housing	<input type="checkbox"/> 5 m <input type="checkbox"/> 25 m	<input type="checkbox"/> current output / HART
		<input type="checkbox"/> 15 m	<input type="checkbox"/> Modbus RTU

**Piping / pipe component**

Nominal diameter / pressure rating [DIN / ASME]      Inside diameter [mm]

---

**Pipe component design**

wafer type FMT091  
 Partial measuring section FMT092  
 Welding adapter FMT094

\* In case of mixed gases the composition must be specified by stating the components: CH<sub>4</sub> 90 %, C<sub>2</sub>H<sub>6</sub> 5 %, N<sub>2</sub> 3 %, C<sub>3</sub>H<sub>8</sub> 1 %, Co<sub>2</sub> 1 %

### Note

The order can only be confirmed and a delivery date specified once full technical clearance has been obtained!

---

## Trademarks

HART is a registered trademark of FieldComm Group, Austin, Texas, USA

Modbus is a registered trademark of Schneider Automation Inc.

PROFIBUS and PROFIBUS DP are registered trademarks of PROFIBUS & PROFINET International (PI)

Kalrez and Kalrez Spectrum are registered trademarks of DuPont Performance Elastomers.

Viton is a DuPont de Nemours trademark

### **Operating instruction**

Changing the type of protection **in the operating instruction**

Sales



Service





---

## Notes

---

## Notes





---

## **ABB Measurement & Analytics**

For your local ABB contact, visit:  
**[www.abb.com/contacts](http://www.abb.com/contacts)**

For more product information, visit:  
**[www.abb.com/flow](http://www.abb.com/flow)**

---

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB.