ABB MEASUREMENT & ANALYTICS | DATA SHEET

SensyMaster FMT430, FMT450

Thermal mass flowmeter

ENGINEERED
TO OUTRUN



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

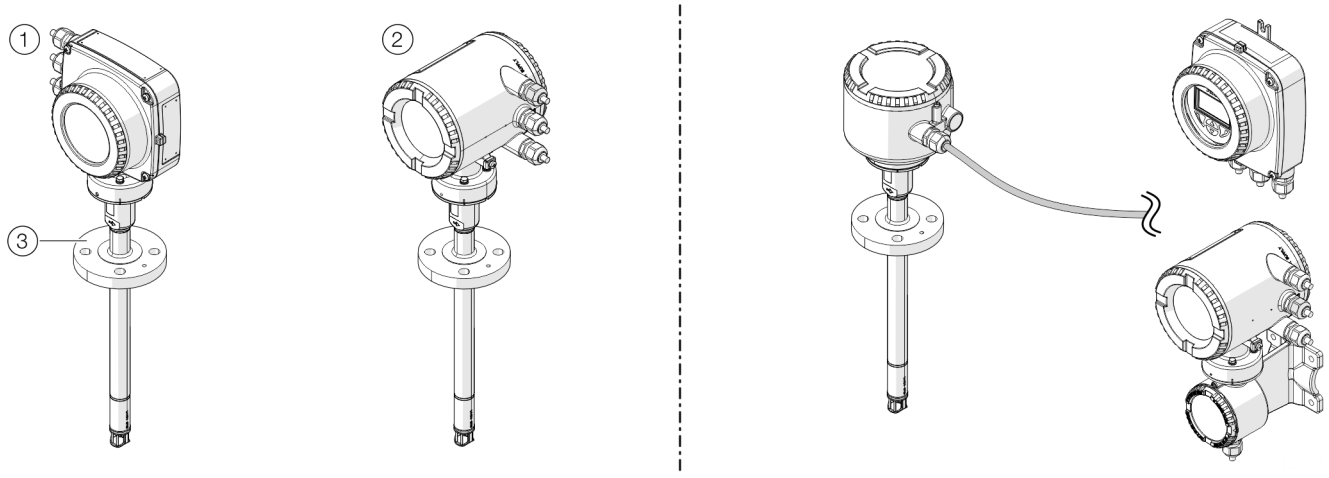
- Up to 8 configurable applications for top flexibility

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



Integral mount design **Remote mount design**

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 **Available gas types** on page 8	
Measuring accuracy for gases* Air	±1.2 % of Qm 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)	Standard design: −20 to 150 °C (−4 to 302 °F)
	Temperature information for high temperature**, cryogenic temperature and DVGW design, see **Measured medium temperature** on page 14.	
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	According to EN 60529: IP65 / IP67	
NEMA rating	In accordance with NEMA 4X	

Approvals and certificates	
Explosion protection ATEX/IECEx	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 www.abb.com/flow or by 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

… Sensor

Process connections

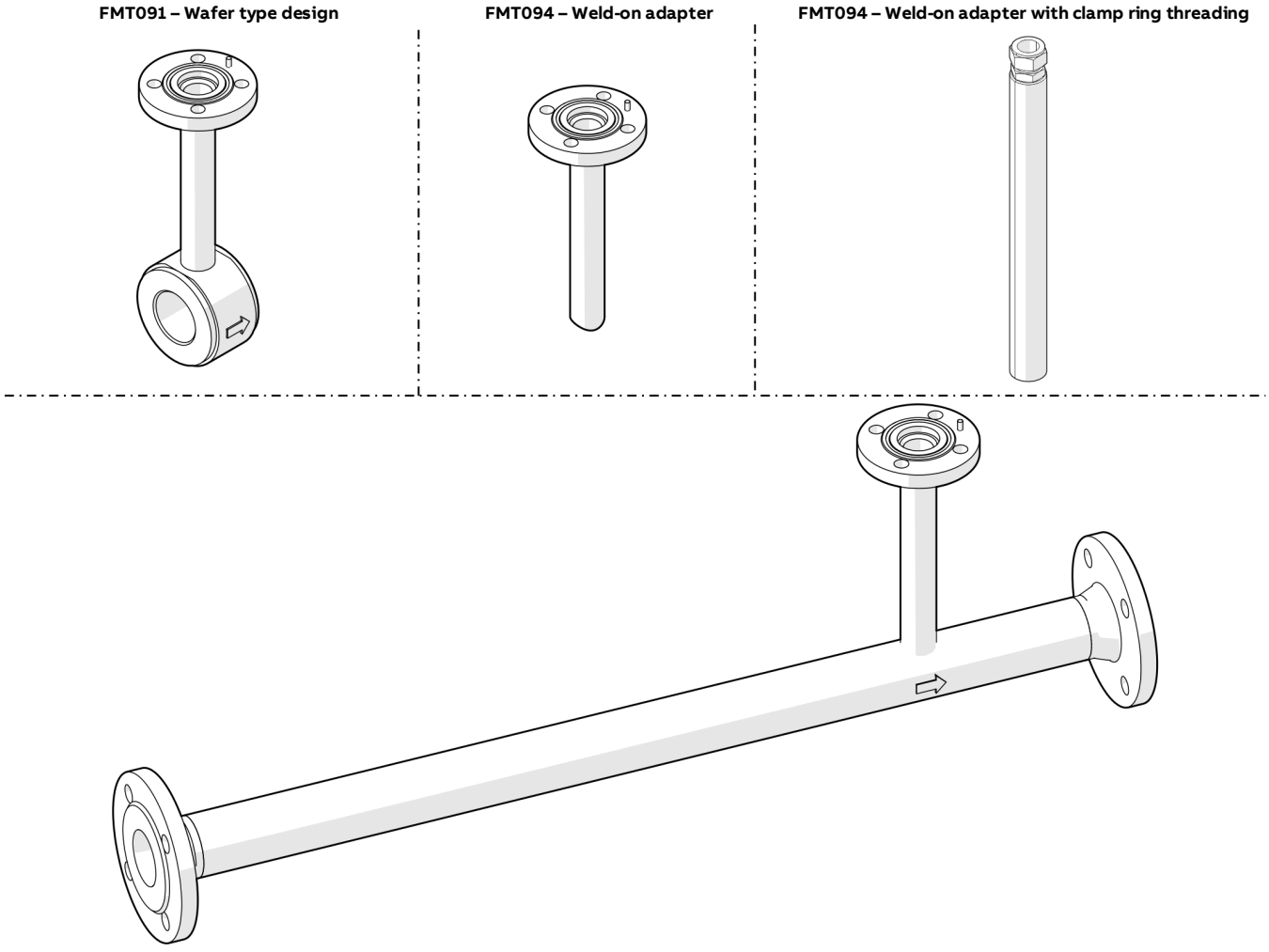


Figure 2: Pipe components (examples)

Pipe components	
FMT091 – Wafer type design	According to EN 1092-1: DN 40 to 200, PN 40
	According to ASME B16.5: 1½ to 8 in, CL 150 to 300
FMT092 – Partial measuring section	Flange according to EN 1092-1: DN 25 to 100 (larger nominal widths available by request), PN 10 to 40
	Flange according to 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 ≥ 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)
Explosion protection ATEX/IECEx	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_{medium}	Standard: −20 to 150 °C (−4 to 302 °F)
Ambient temperature $T_{amb.}$ for pipe components **without** 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 **ambient temperature range (TA3/TA9)** of the sensor and O-ring design.
Ambient temperature $T_{amb.}$ for pipe components with ball valve or integrated hot tap fitting (**Options for sensor connection: SCA, SCB, SCD**)	Standard: −20 to 70 °C (−4 to 158 °F)

… Overview – models

Transmitter

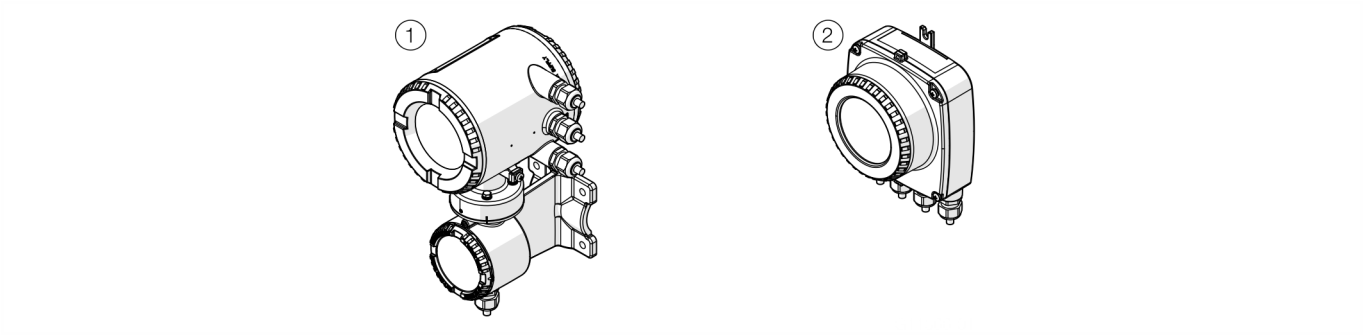


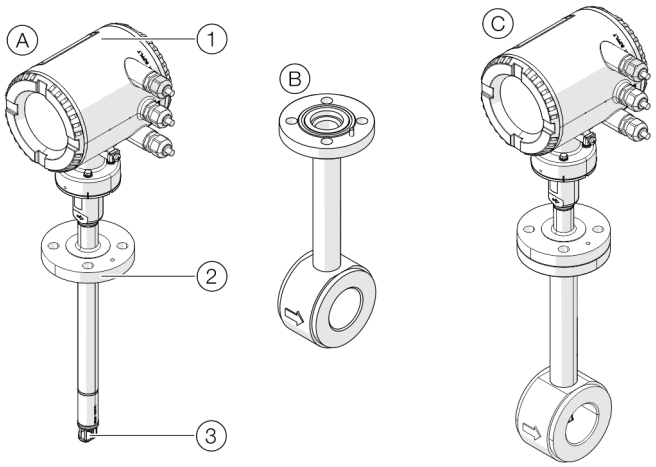
Figure 3: Transmitter with remote mount design

Model	FMT432	FMT452
Design	Integral mount design (see **Figure 1** on page 3), remote mount design; transmitter optionally in single-compartment housing (2) or dual-compartment housing (1)	
IP rating	According to EN 60529: IP65 / IP67	
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, ±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: • Current output (maximum two expansion cards simultaneously) • Digital output (maximum one expansion card) • Digital input (maximum two expansion cards) • 24 V DC power supply for active outputs (maximum one expansion card)	
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 www.abb.com/flow or by 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, FMT450is 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

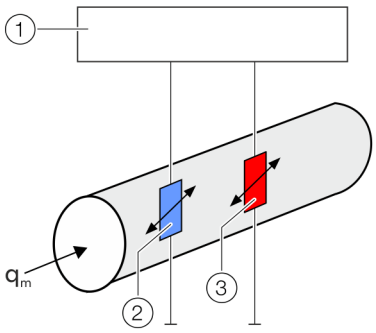
Figure 4: Sensor (example, wafer type design)

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

… Measuring principle

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_2CO
Nitrogen – N_2	Diketene – $C_4H_4O_2$
Oxygen – O_2	Ethane – C_2HO_6
Methane – CH_4	Ethanol – C_2H_5OH
Carbon dioxide – CO_2	Ethylene – C_2H_4
Hydrogen – H_2	Formaldehyde – CH_2O
Biogas Type 1*	Helium – He
Propane – C_3H_8	Hexane – C_6H_{14}
Argon – Ar	Hydrogen sulphide– H_2S
Natural gas Type 1*	Methanol – CH_3OH
Acetone – C_3H_6O	Neon – Ne
Acetylene – C_2H_2	Nitrogen oxide – NO
Ammonia – NH_3	Ozone – O_3
1.2-Butadiene – C_4H_6	Pentane – C_5H_{12}
1.3-Butadiene – C_4H_6	Propadiene – C_3H_8
Butane – C_4H_{10}	Propylene – C_3H_6
1 Butane – C_4H_8	Water vapor – H_2O
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_2 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 finger print 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.

SIL functional safety

Term	Value
DeviceType	SensyMaster FMT430, FMT450 with option "CS" (printed in the model number key on the name plate)
Type of Assessment	Verification in accordance with IEC 61508 2, route 1S/1H
SIL capability	SIL 2 (Low Demand Mode)
HFT	0
Component Type	B

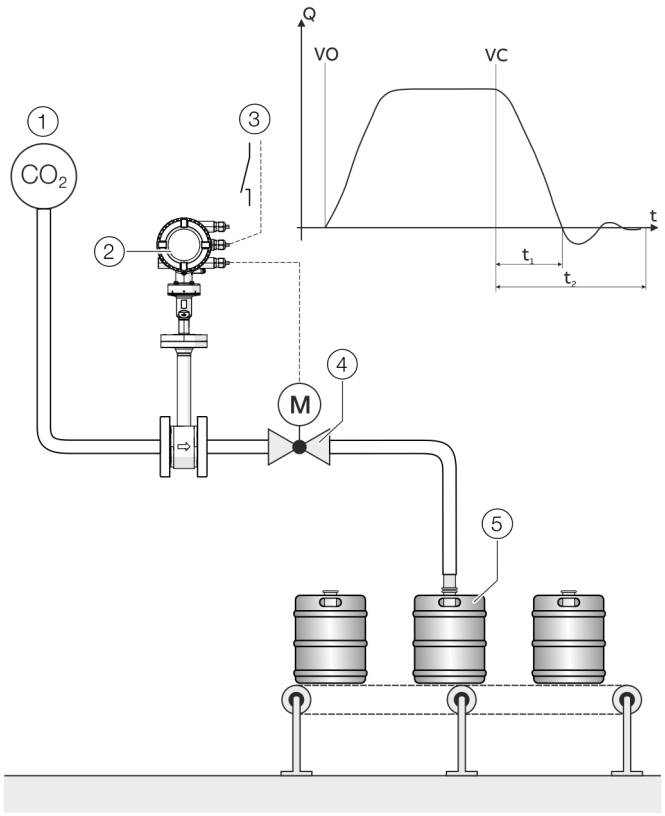
Failure Rates	Design	
	Integral mount design	Remote mount design
SFF	91,3 %	91,4 %
PFD_{AVG} after 1 year (MTTR 48 hours)	$1{,}12E^{-03}$	$1{,}16E^{-03}$
PFD_{AVG} after 2 years (MTTR 48 hours)	$2{,}14E^{-03}$	$2{,}21E^{-03}$
PFD_{AVG} after 4 years (MTTR 48 hours)	$4{,}18E^{-03}$	$4{,}31E^{-03}$
λ_S	376 FIT	376 FIT
λ_{Dd}	2075 FIT	2161 FIT
λ_{Du}	233 FIT	240 FIT

SAFETY INSTRUCTIONS
The listed failure rates λ_S, λ_{Dd}, λ_{Du} and PFD_{AVG} relate to the failure rates of Siemens Standard SN29500 at an average component temperature of 40 °C (104 °F). This corresponds to an average ambient temperature of 30 °C (86 °F).
For higher ambient temperatures up to 60 °C (140 °F), the failure rates and the PFDAVG value must be multiplied by a factor of 2.5.

… Overview – models

FillMass batch function

Only for FMT450



1 Gas pipeline (CO_2)
2 Sensor
3 Start / stop fill operation (via digital input)
4 Fill valve
5 Filling tank

Figure 6: FillMass filling function (example CO2 fill)

Diagram legend	
VO	Valve open (filling started)
VC	Valve closed (fill quantity reached)
t_1	Valve closing time
t_2	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.

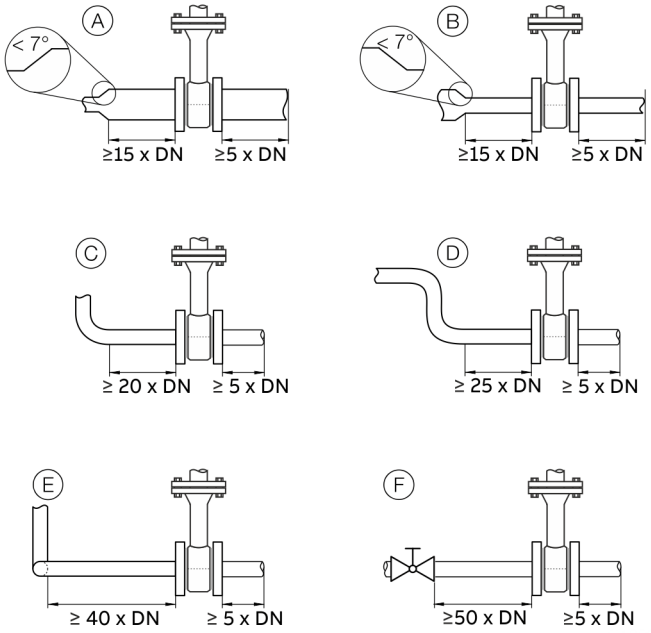


Figure 7: Inlet and outlet sections

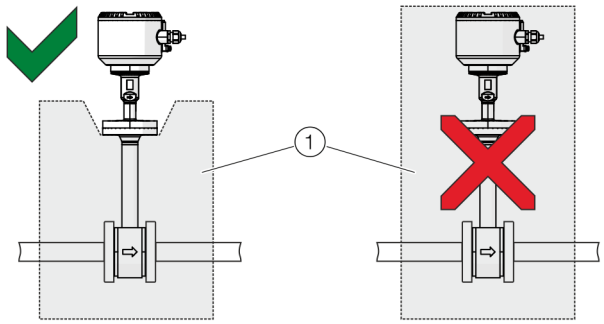
Installation	Inlet section	Outlet section
(A) Pipe extension	min. 15 × DN	min. 5 x DN
(B) Pipe reduction	min. 15 × DN	
(C) 90° Pipe elbow	min. 20 × DN	
(D) 2 × 90° pipe elbow in one level	min. 25 × DN	
(E) 2 × 90° pipe elbow in two levels	min. 40 × DN	
(F) Control Valve	min. 50 × DN	

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

In case of confined spaces at the installation site, the outlet section can be shortened to 3 × 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 alignment is necessary for individual cases.
The specified inlet and outlet sections must be doubled for gases with a very low density (hydrogen, helium) and a flow straightener should be used.

Sensor insulation



(1) Insulation

Figure 8: Isolation of the sensor

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

… Flowmeter sensor

… Installation conditions

Installation at high ambient temperatures

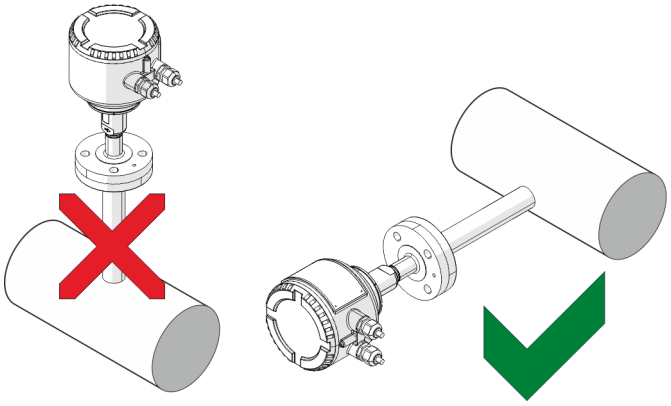


Figure 9: Mounting position at high ambient temperatures

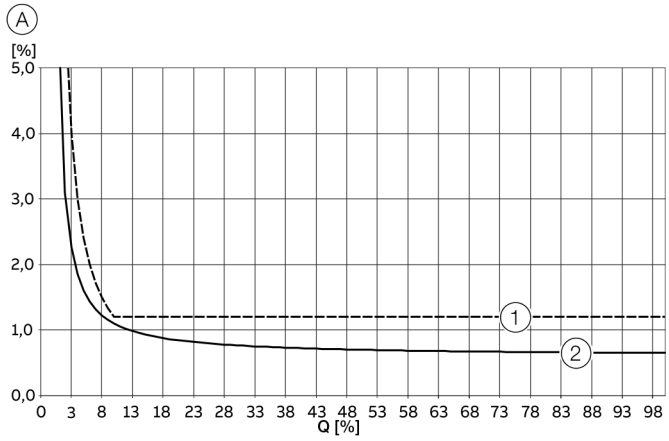
Under high but permissible ambient temperatures, avoid additional thermal stress from heat convection or radiation, since these sources of heat may exceed the permissible ambient temperature on the equipment surface.

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.

Measuring accuracy

Measured error

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



A Measured error in %
1 FMT430
2 FMT450

Figure 10: Measured error under reference conditions

Measured medium	FMT430	FMT450
Air	• ±1.2 % of the measured value in the range of 10 to 100 % of the measuring range • ±0.12 % of the measuring range end value 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 measuring range end value possible in the nominal diameter
Other gases (with optional operating gas calibration)	—	±1.6 % of the measured value ±0.1 % of the measuring range end value possible in the nominal diameter

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_2) and carbon dioxide (CO_2), 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_{63} = 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

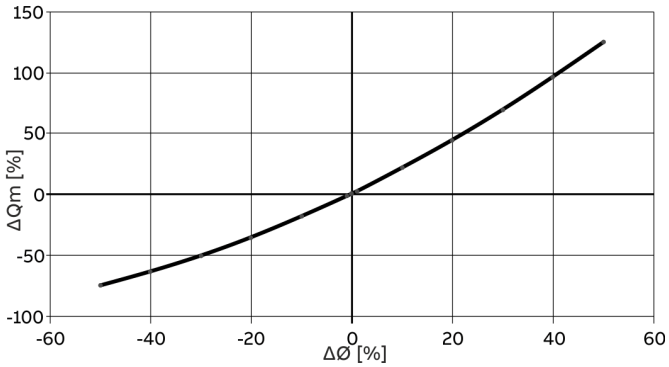
< 0.1 % of the measured value per 100 kPa (1 bar) (depending on the gas type)

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 49!

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

According to EN 60529: IP65/IP67

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

… Flowmeter sensor

Process conditions

Note
When using the device in potentially explosive atmospheres, note the additional temperature data in **Temperature data** on page 49!

Measured medium temperature

Devices with ceramic sensor element and flanged connection:

Design	T_{medium}
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_{medium} also depends on the selected sensor connection and the design of the pipe components.
The following temperature specifications apply:

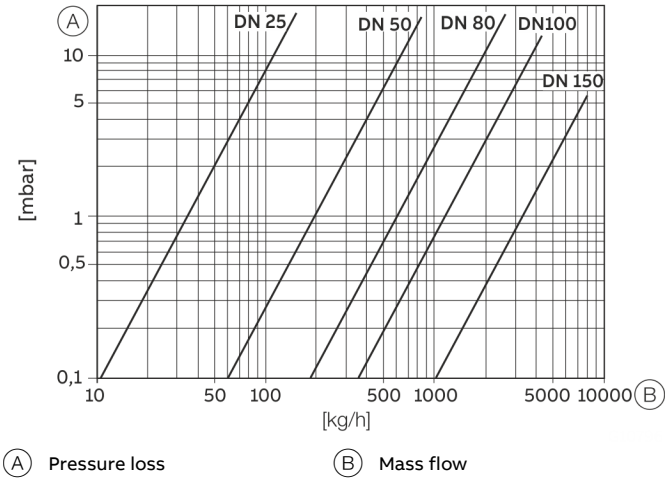
Sensor connection	T_{medium}
Flange DN25	−40 to maximum 300 °C (−40 to maximum 508 °F)
Threaded connection DIN 11851	−20 to 140 °C (−4 to 284 °F)
Clamp ring fitting	−40 to 150 °C (−40 to 302 °F)
Pipe components with ball valve	Maximum 150 °C (302 °F)
Integrated hot tap fitting	−20 to 150 °C (−4 to 302 °F)

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 **Integrated hot tap fitting** on page 31

Pressure loss



A Pressure loss B Mass flow

Figure 12: Pressure loss in logarithmic representation

ensor mounting length

The sensor is available in various lengths (order option “**ensor mounting length / Material**”). See **Sensor** on page 33.

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)	• Viton® (standard) • Kalrez® 4079 / Kalrez® 1050 (for high temperature design) • Kalrez® 1050 (for oxygen) • Kalrez® Spectrum 6375 (for ammonia) • EPDM (DIN 11851) • FKM® (for low temperature design) • HNBR® (for DVGW design)

… Flowmeter sensor

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

	Standard measuring range		Extended measuring range	
Nominal diameter	**Q_{max} [kg/h]**	**Q_{max} [Nm^3/h]****	**Q_{max} [kg/h]**	**Q_{max} [Nm^3/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

	Standard measuring range		Extended measuring range	
Nominal diameter	**Q_{max} [lbs/h]**	**Q_{max} [ft/h]*****	**Q_{max} [lbs/h]**	**Q_{max} [ft/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)

Zone 0 / Zone 1 / Division 1

Devices with process connections in accordance with EN 1029-1		
Nominal diameter	**Q_{max} [kg/h]**	**Q_{max} [Nm^3/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_{max} [lbs/h]**	**Q_{max} [ft^3/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

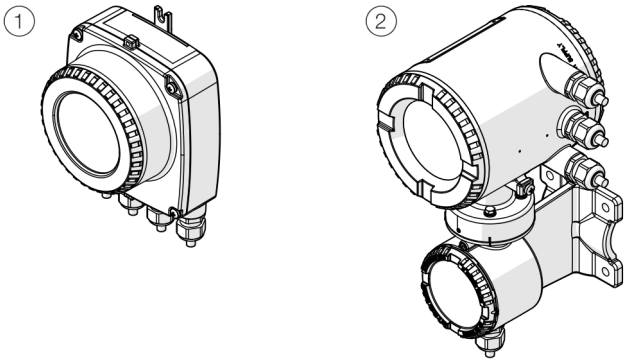
** Applies for air at 0 °C (32 °F) / 1013.25 hPa (14.696 psia)

*** 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.

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 τ).
- 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.

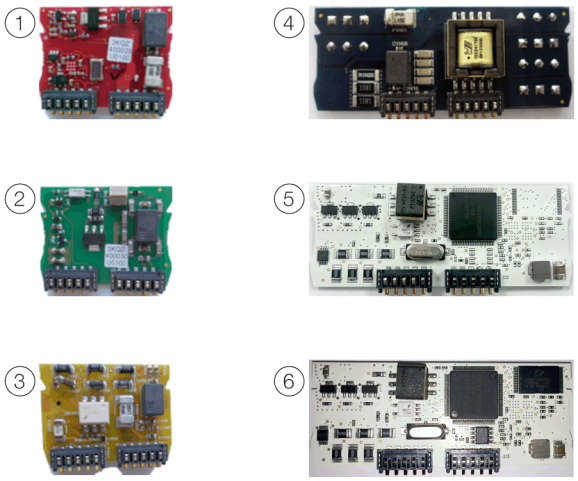


Figure 14: Plug-in cards

Plug-in card		Quantity *
①	Current output, 4 to 20 mA passive (red) Order number: 3KQZ400029U0100	2
②	Passive digital output (green) Order number: 3KQZ400030U0100	1
③	Passive digital input (yellow) Order number: 3KQZ400032U0100	1
④	24 V DC voltage supply (blue) Order number: 3KQZ400031U0100	1
⑤	Modbus RTU® RS485 (white) Order number: 3KQZ400028U0100	1
⑥	PROFIBUS DP® (white) Order number: 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 57.

IP rating

According to EN 60529: IP65 / IP67, 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	
Chassis	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	
Chassis	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^2 (AWG 24)	25 m (82 ft)
0.34 mm^2 (AWG 22)	40 m (131 ft)
0.5 mm^2 (AWG 20)	65 m (213 ft)
0.75 mm^2 (AWG 19)	100 m (328 ft)

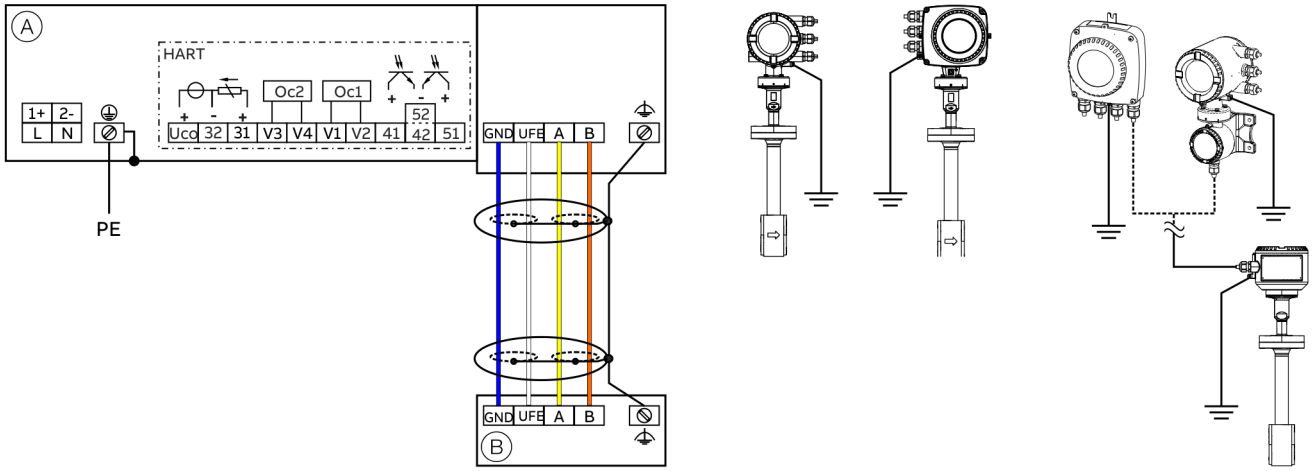
Recommended cables

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 °C (176 °F).

… Transmitter

Electrical connections

Electrical connection (HART protocol)



Ⓐ Transmitter

Ⓑ 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_{FE}	Sensor power supply
GND	Ground
A	Data line
B	Data line
⏚	Functional earth / Shielding

Connections for inputs and outputs

Terminal	**Function / comments**
Uco / 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 18.

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 44!

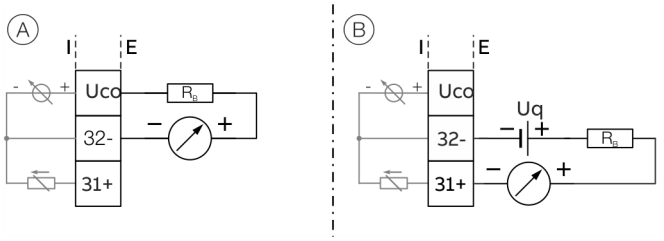
Power supply L / N, 1+ / 2–

AC voltage	
Terminals	L / N
Operating voltage	100 to 240 V AC, –15 % / +10 %, 50 / 60 Hz
Power consumption	< 20 VA

DC voltage	
Terminals	1+ / 2–
Operating voltage	11 to 30 V DC
Power consumption	< 20 W

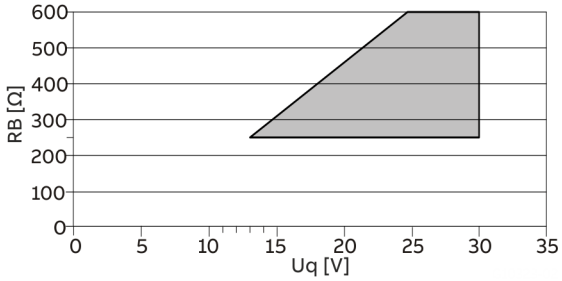
Current output 32 / Uco, 31 / 32 (basic device)

Can be configured via software on-site for the output of mass flow, volume flow and temperature.



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

Figure 16: (I = Internal, E = External, R_B = Load)



Permissible source voltage U_q for passive outputs in relation to load resistance R_B where I_{max} = 22 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 Ω ≤ R_B ≤ 300 Ω	250 Ω ≤ R_B ≤ 600 Ω
Source voltage U_q*	—	13 V ≤ U_q ≤ 30 V
Measuring error	< 0.1 % of measured value	
Resolution	0.4 µA per digit	

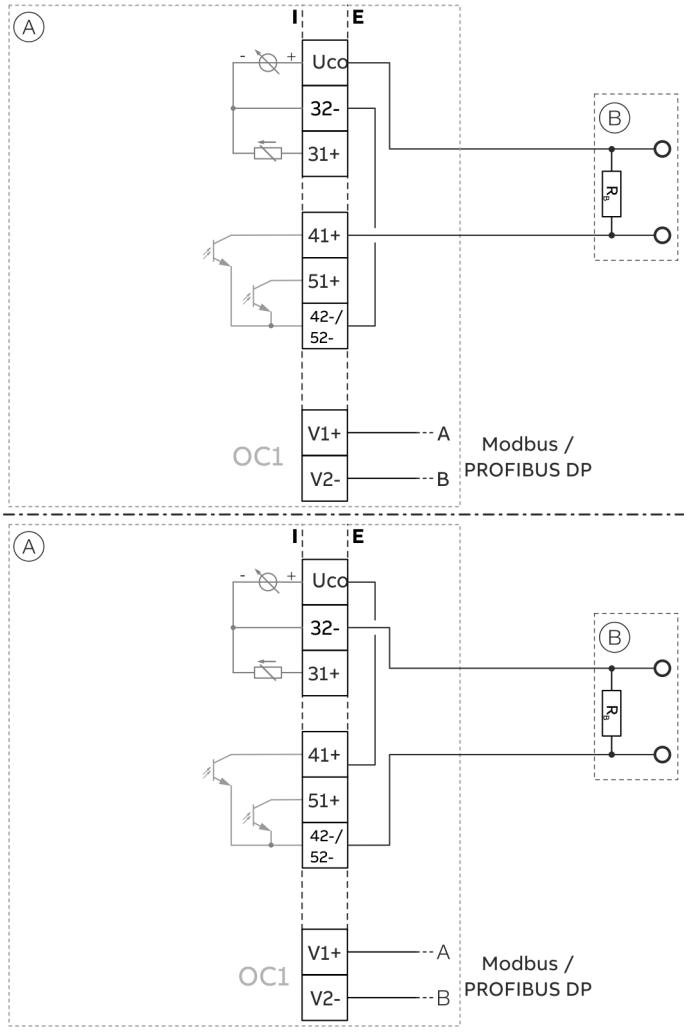
* The source voltage U_q is dependent of the load R_B and must be placed in an additional area.

For information on communication via the HART protocol, refer to .

… Transmitter

… Electrical data for inputs and outputs

Current output Uco / 32 as loop power supply for digital output 41 / 42 or 51 / 52



Ⓐ Transmitter FCx400
Ⓑ Customer wiring
OC1 Modbus / PROFIBUS DP plug-in card
R_B Load resistance

Figure 18: Current output Uco / 32 in power mode

In the case of digital communication via Modbus / PROFIBUS DP, the current output Uco / 32 can be switched to the 'Power Mode' operating mode through the software.
The current output 31/32/Uco 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 pperating mode	
Terminals	Uco / 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 Uco / 32 in power mode

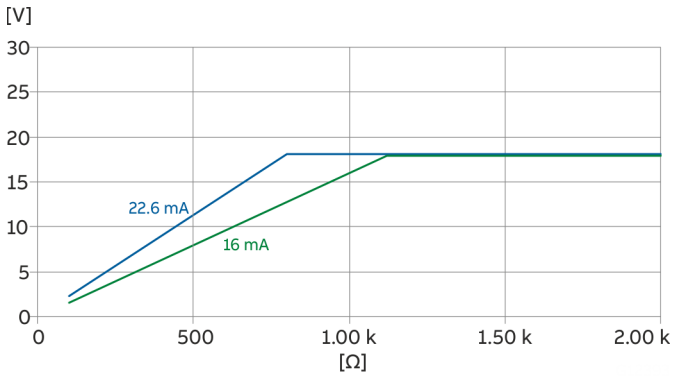
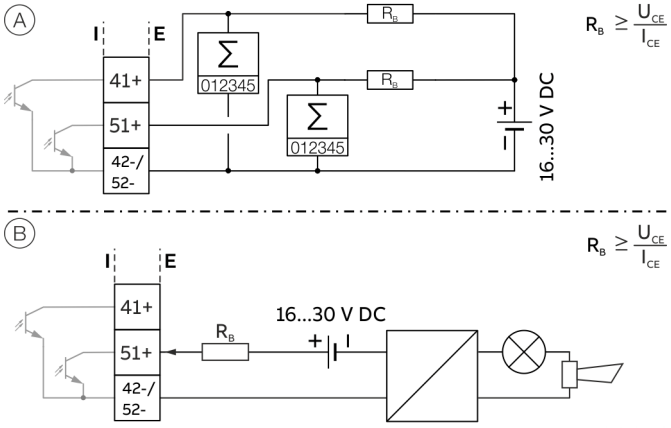


Figure 19: Output voltage dependent on load resistance

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_B = load)

Pulse / frequency output (passive)	
Terminals	41 / 42, 51 / 52
Output 'closed'	0 V ≤ U_{CEL} ≤ 3 V
	For f < 2.5 kHz: 2 mA < I_{CEL} < 30 mA
	For f > 2.5 kHz: 10 mA < I_{CEL} < 30 mA
Output 'open'	16 V ≤ U_{CEH} ≤ 30 V DC
	0 mA ≤ I_{CEH} ≤ 0.2 mA
f_{max}	10.5 kHz
Pulse width	0.05 to 2000 ms

Binary output (passive)	
Terminals	41 / 42, 51 / 52
Output 'closed'	0 V ≤ U_{CEL} ≤ 3 V
	2 mA ≤ I_{CEL} ≤ 30 mA
Output 'open'	16 V ≤ U_{CEH} ≤ 3 V DC
	0 mA ≤ I_{CEH} ≤ 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_{max} ≤ 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.

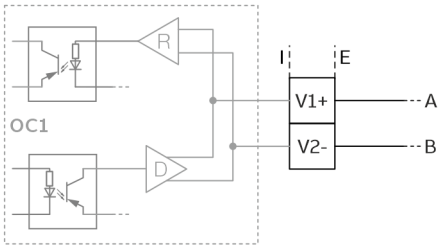


Figure 21: Plug-in card as a Modbus / PROFIBUS DP interface (I = internal, E = external)

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

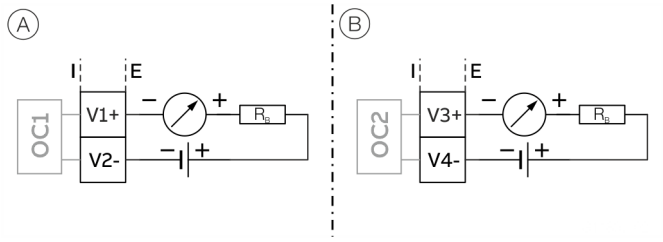
For information on communication through the Modbus or PROFIBUS DP protocols, refer to chapters **Modbus® communication** on page 28 and **PROFIBUS DP® communication** on page 29.

… Transmitter

… Electrical data for inputs and outputs

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

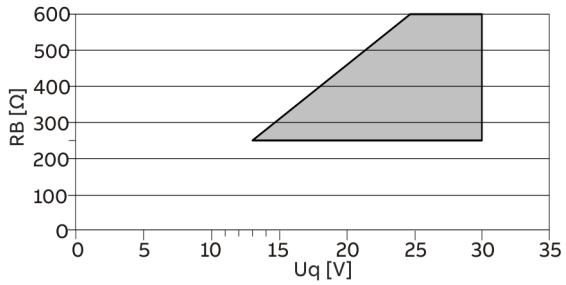
Up to two additional plug-in modules can be implemented via the 'Passive current output (red)' option module.
Can be configured for outputting mass flow, volume flow, density and temperature via on-site software.



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

Figure 22: (I = internal, E = external, R_B = 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 Imax = 22 mA. ▒▒▒ = Permissible range

Figure 23: Source voltage for passive outputs

Passive current output	
Terminals	V1 / V2, V3 / V4
Output signal	4 to 20 mA
Load R_B	250 Ω ≤ R_B ≤ 600 Ω
Source voltage U_q*	13 V ≤ U_q ≤ 30 V
Measuring error	< 0.1 % of measured value
Resolution	0.4 µA 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.

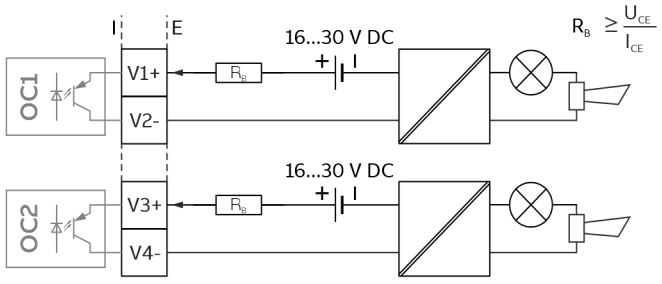


Figure 24: Plug-in card as binary output (I = internal, E = external, R_B = load)

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

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

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.

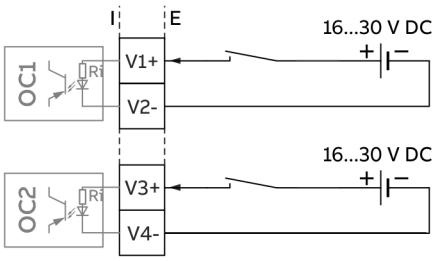


Figure 25: Plug-in card as digital input (I = internal, E = external)

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

Digital input	
Terminals	V1 / V2, V3 / V4
Input 'On'	16 V ≤ U_{KL} ≤ 30 V
Input 'Off'	0 V ≤ U_{KL} ≤ 3 V
Internal resistance R_i	6.5 kΩ
Function	Can be configured using software.

24 V DC loop power supply (plug-in card)

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 26.

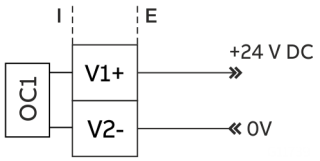


Figure 26: (I = Internal, E = External)

The plug-in card 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!

… Transmitter

… Electrical data for inputs and outputs

Connection examples

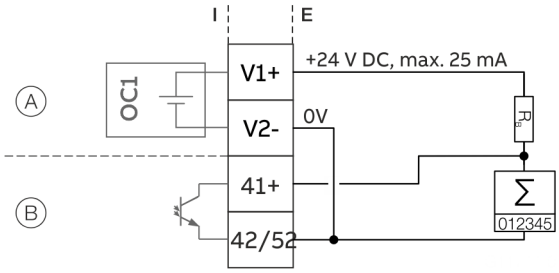
Input and output functions are configured via the device software in accordance with the desired application.

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

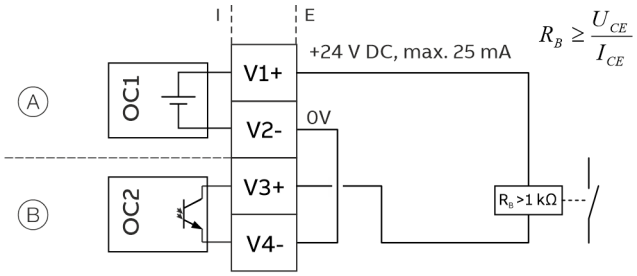
Each 'loop power supply (blue)' plug-in card must only power one output.
It must not be connected to two outputs (for example digital output 41 / 42 and 51 / 52)!



(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)

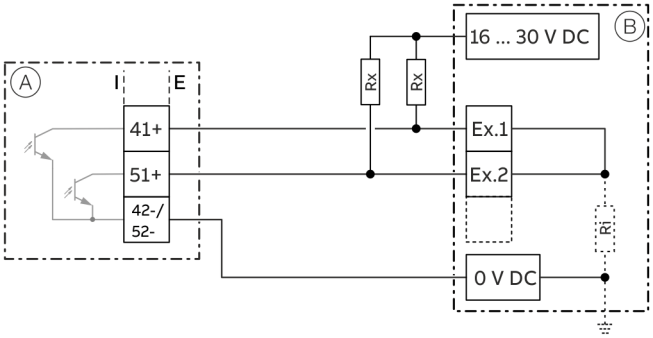
The connection example shows usage for digital output 41 / 42; the same applies to usage for digital output 51 / 52.



(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



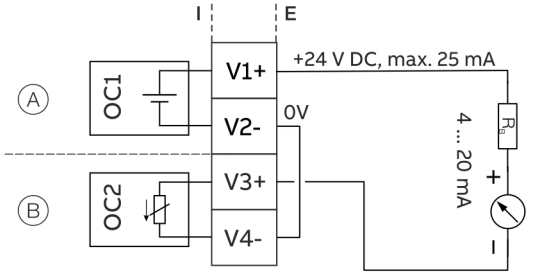
(A) Transmitter
(B) Distributed control system / Memory programmable controller
Ex. 1 Input 1
Ex. 2 Input 2
R_X Resistor for current limitation
R_I Distributed control system internal resistance

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

The R_X 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_X 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.

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.



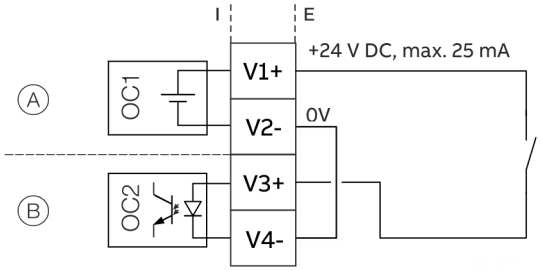
Ⓐ 'Loop power supply (blue)' plug-in card in slot 1

Ⓑ '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.



Ⓐ 'Loop power supply (blue)' plug-in card in slot 1

Ⓑ '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.

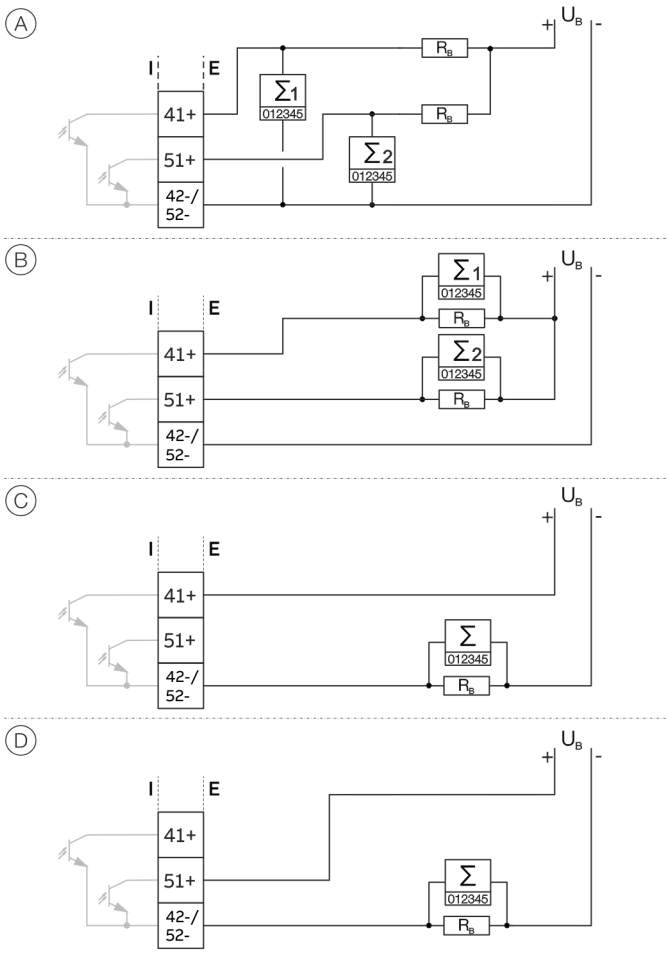


Figure 32: Connection versions digital output 41 / 42 and 51 / 52

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

… Transmitter

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 (in terms of IT and cyber security), as such the intended application should be assessed to ensure that this protocol is 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.

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 (in terms of IT and cyber security), as such the intended application should be assessed to ensure that this protocol is 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/).
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 (LSB first), Big endian (MSB first) Factory setting: Big endian Big Endian -> MSB first (default) Little Endian -> LSB first
Typical response time	< 100 ms
Response delay time	0 to 200 ms Factory setting: 10 ms

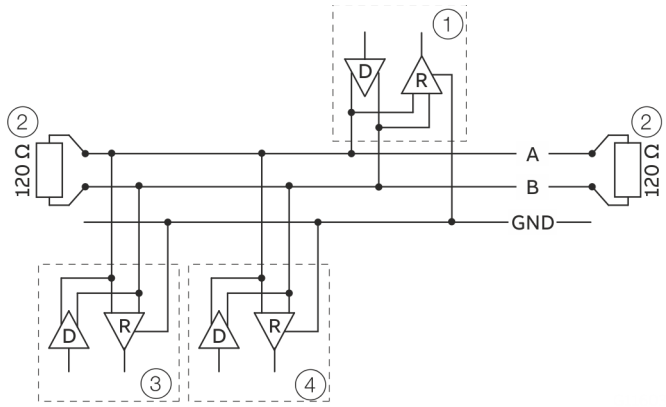


Figure 33: Communication via Modbus protocol

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^2 (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 (in terms of IT and cyber security), as such the intended application should be assessed to ensure that this protocol is 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.

The files required for operation can also be downloaded from 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.

… Transmitter

… Digital communication

Limits and rules when using ABB fieldbus accessories

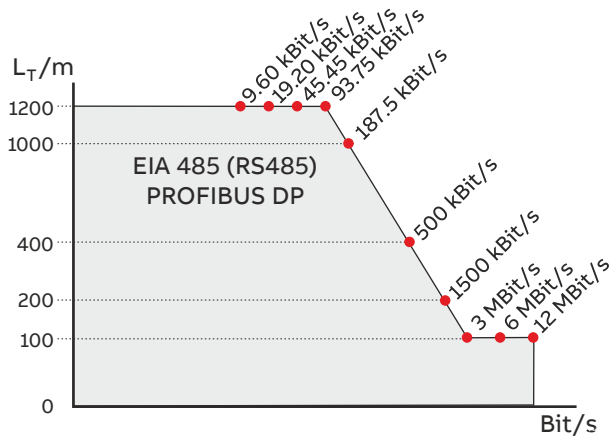


Figure 34: Bus cable length depends on the transmission rate

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 ≤ 126 (addresses 0 to 125)

Per PROFIBUS DP segment

- Number of DP nodes ≤ 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 ≥ 1500 kBit/s!
- Spur cable length (L_S), at ≤ 1500 kBit/s: LS ≤ 0.25 m, at > 1500 kBit/s: LS = 0.00 m!
- At 1500 kBit/s and ABB DP cable type A:
  - Sum of all spur cable lengths (L_S) ≤ 6.60 m, trunk cable length (L_T) > 6.60 m,
    total length = L_T+ (Σ L_S) ≤ 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	**Wafer type design** • DN 25 to 200, PN 40 in accordance with EN 1092-1 • 1 to 8 in, CL 150 / CL 300 in accordance with ASME B 16.5
FMT092	**Partial measuring section** (optional with flow straightener) • DN 25 to 100, PN 40, flange in accordance with EN 1092-1 • 1 to 8 in, CL 150 / CL 300, flange in accordance with ASME B 16.5 • DN 25 to 80, PN 10, flange in accordance with EN1092-1 B1 • DN 25 to 80, PN 10, male thread R1 to 3 in
FMT094	**Weld-on adapter** 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 Zone 2 and cFMus Div. 2 respectively.
- The integrated hot tap fitting is approved for use in ATEX/IECEx Zone 1, Zone 2 (not Zone 0) and cFMus Div. 1 and Div. 2 respectively.
- For information on measuring medium temperature, see **Measured medium temperature** on page 14.

Keep the sensor mounting length in mind when choosing the pipe component!

Materials

Wetted materials for the pipe components

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

Material loads for process connections

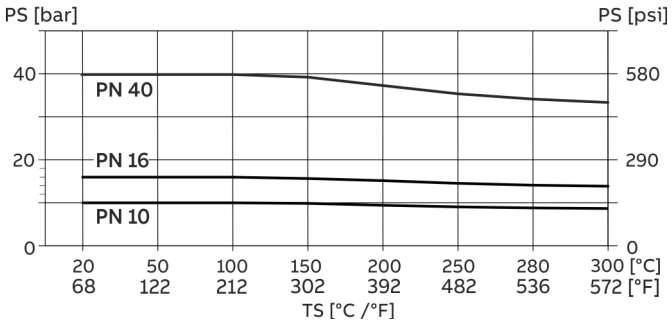


Figure 35: DIN flange process connection

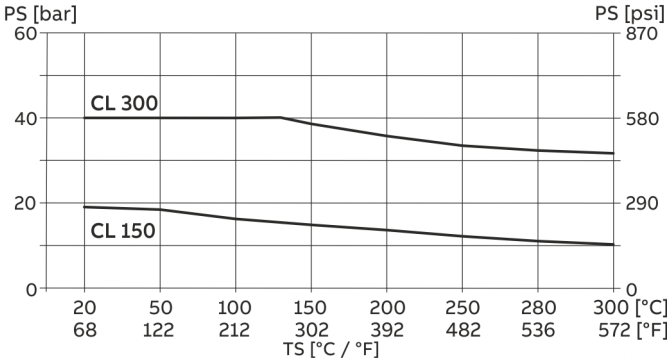


Figure 36: ASME flange process connection

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

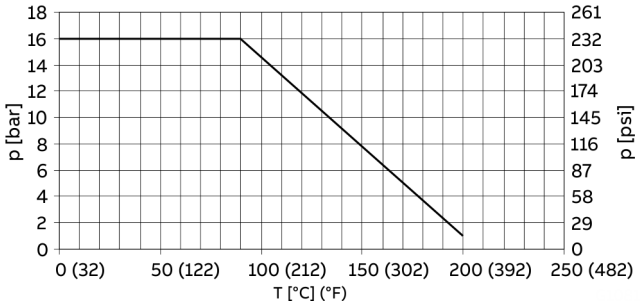
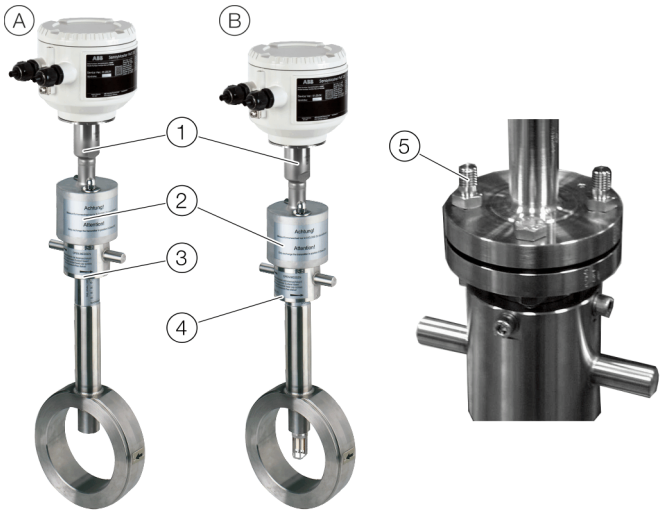


Figure 37: Maximum pressure/temperature values for integrated hot tap fitting

Integrated hot tap fitting



- (A) Integrated hot tap fitting in disassembly position
- (B) Integrated hot tap fitting in measurement position
- (1) Sensor
- (2) Protection cap
- (3) Union nut in disassembly position
- (4) Union nut in measurement position
- (5) Special screws for protection cap

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.

… Pipe components

… Integrated hot tap fitting

Explosion protection approval
The integrated hot tap fitting is approved for use in potentially-explosive areas of ATEX/IECEx Zone 1 and Zone 2 or cFMus Div. 1 and Div. 2 respectively.
Use in Zone 0 is not permitted!

Measured medium temperature
See **Measured medium temperature** on page 14.

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, Cl 150.

Dimensions

Sensor

Integral mount design

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

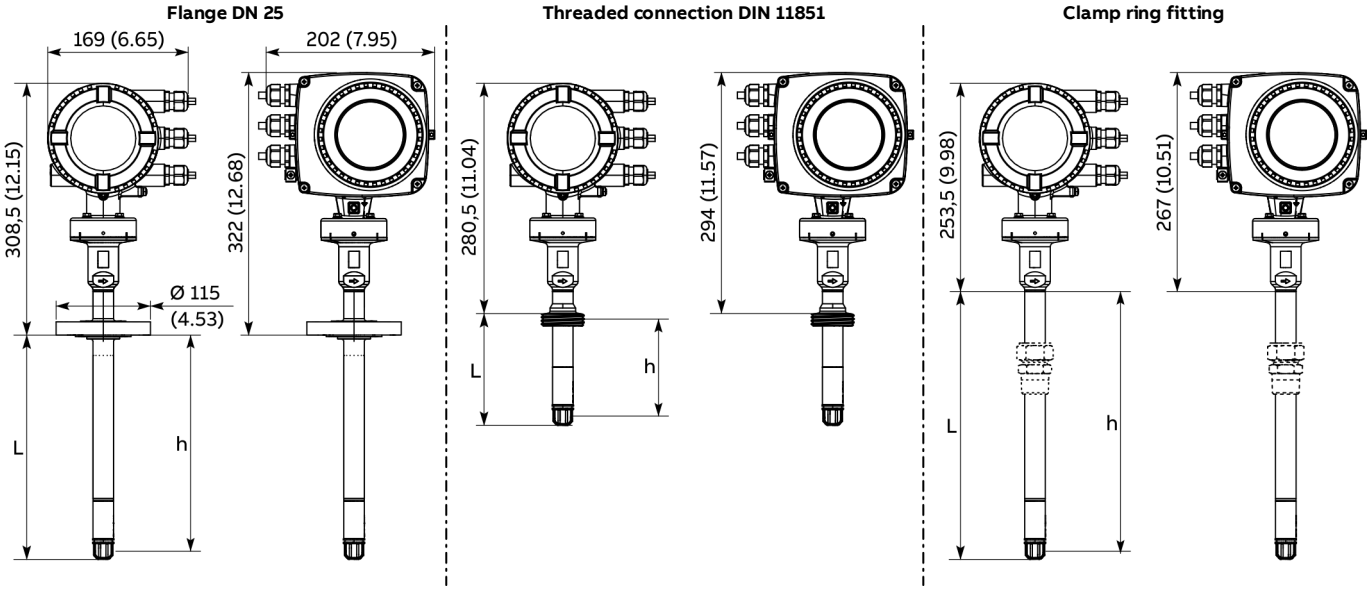


Figure 39: Sensor

Sensor connection	For nominal piping diameter	L mm (in)	h (sensor mounting length) mm (in)	Approximate weight Kg (lb)
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.

… Dimensions

… Sensor

Remote mount design

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

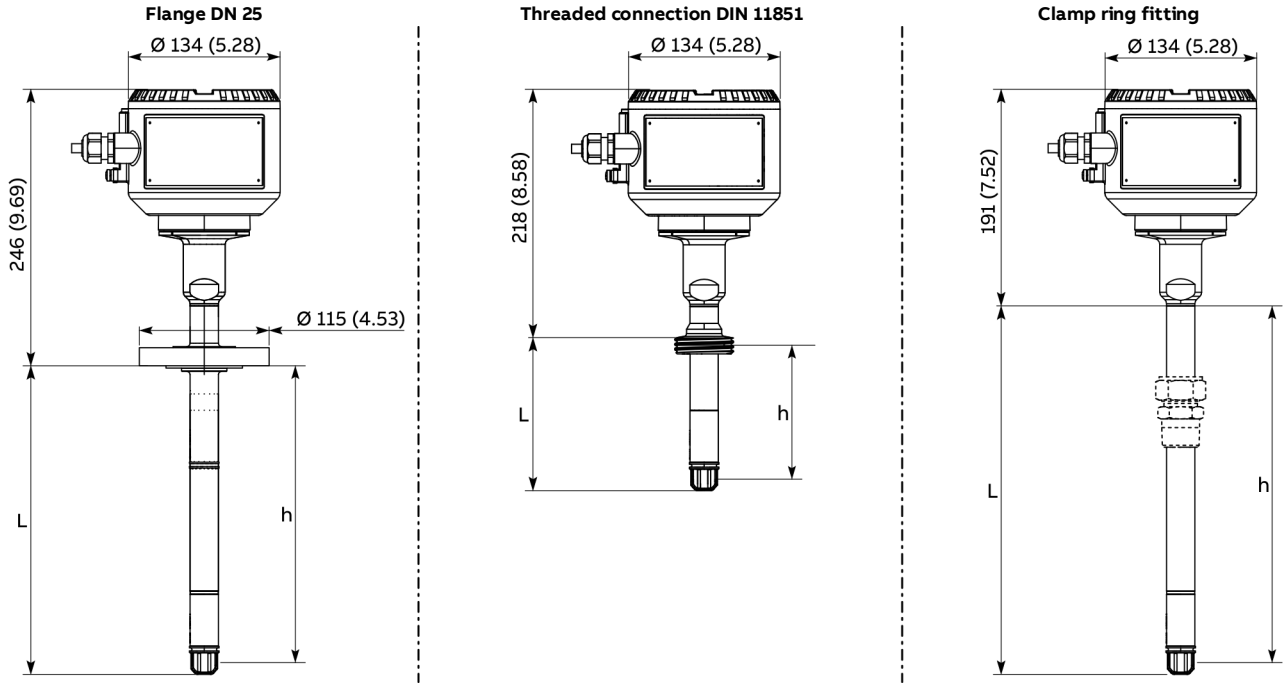


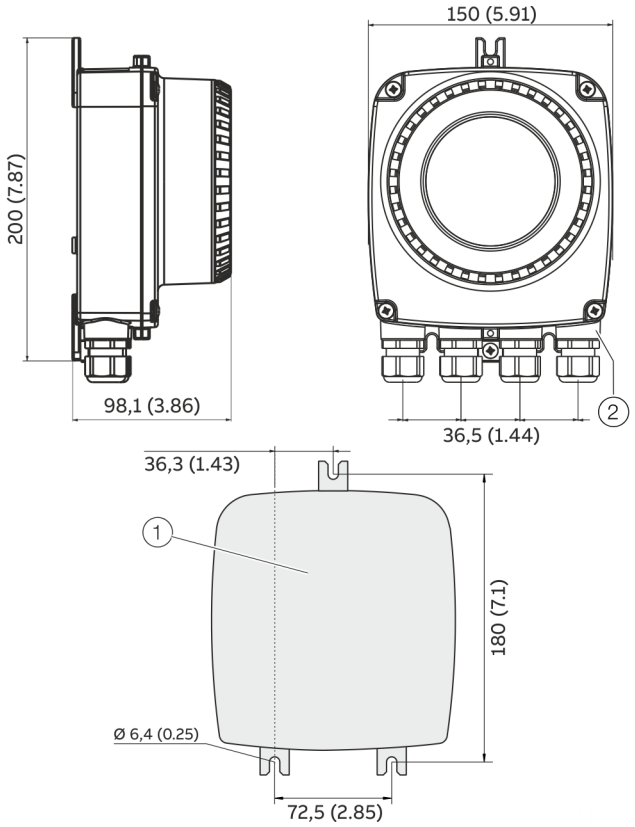
Figure 40: Sensor

Sensor connection	For nominal piping diameter	L	h (sensor mounting 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

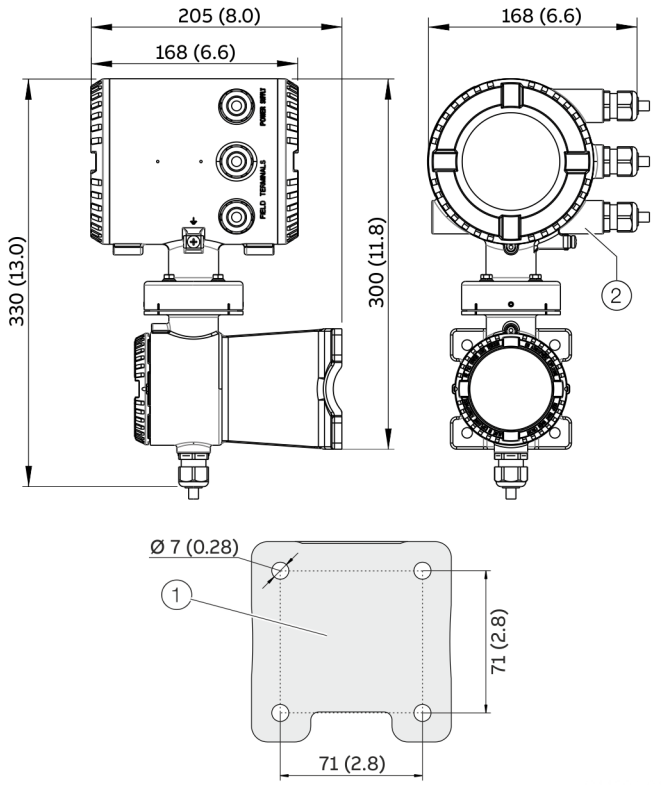
The specified nominal piping diameters apply for the use of the sensor with pipe components without ball valves or hot tap fittings.

Transmitter



1. Hole pattern for mounting holes
2. Female thread (either ½ in NPT or M20 × 1.5), see model coding. In the case of a ½ 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 ½ in NPT or M20 × 1.5), see model coding. In the case of a ½ in NPT, there is a plug instead of a cable gland.

Figure 42: Mounting dimensions dual-compartment housing

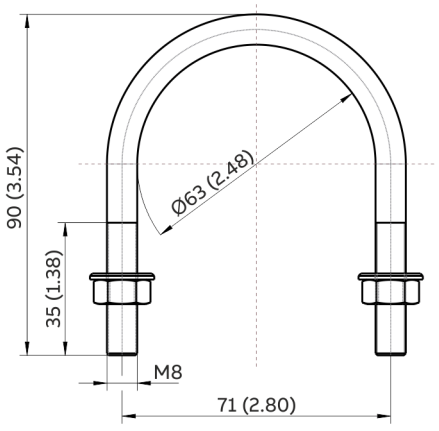
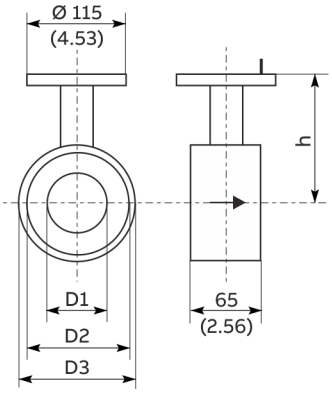


Figure 43: Assembly set for 2 in pipe mounting

… Dimensions

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)	—

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

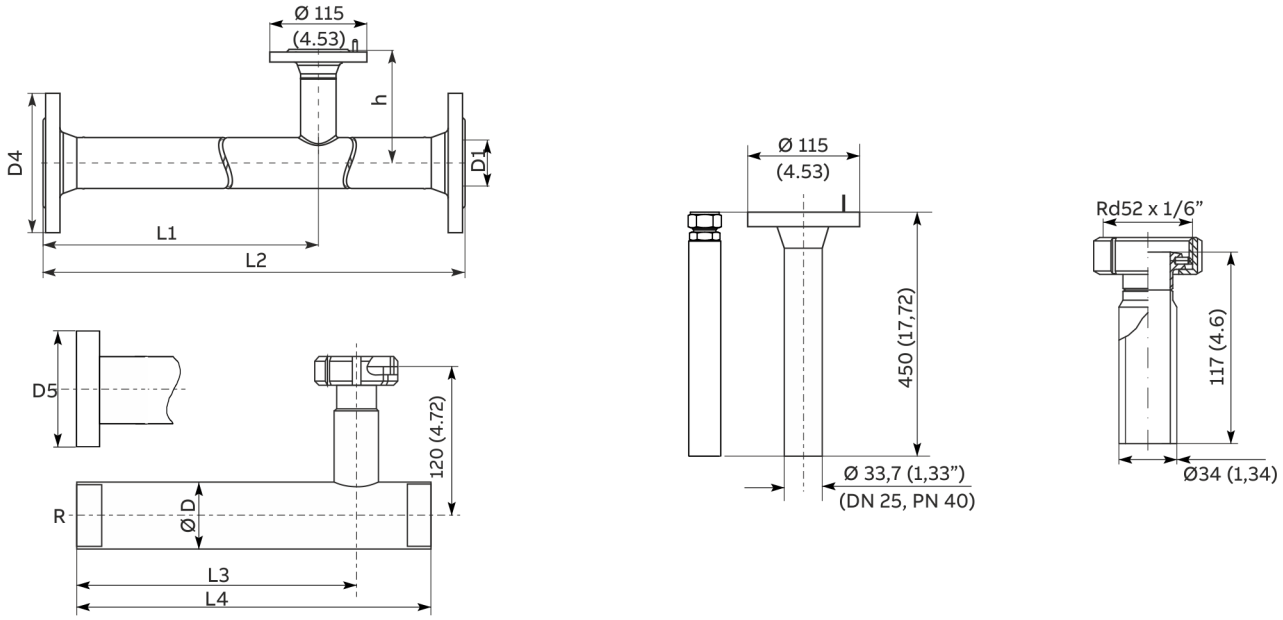


Figure 45:

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)	–

… Dimensions

… Pipe components

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

FMT092 – Partial measuring section with flange in accordance with ASME B 16.5, CL 150 – Sensor connection: flange DN 25

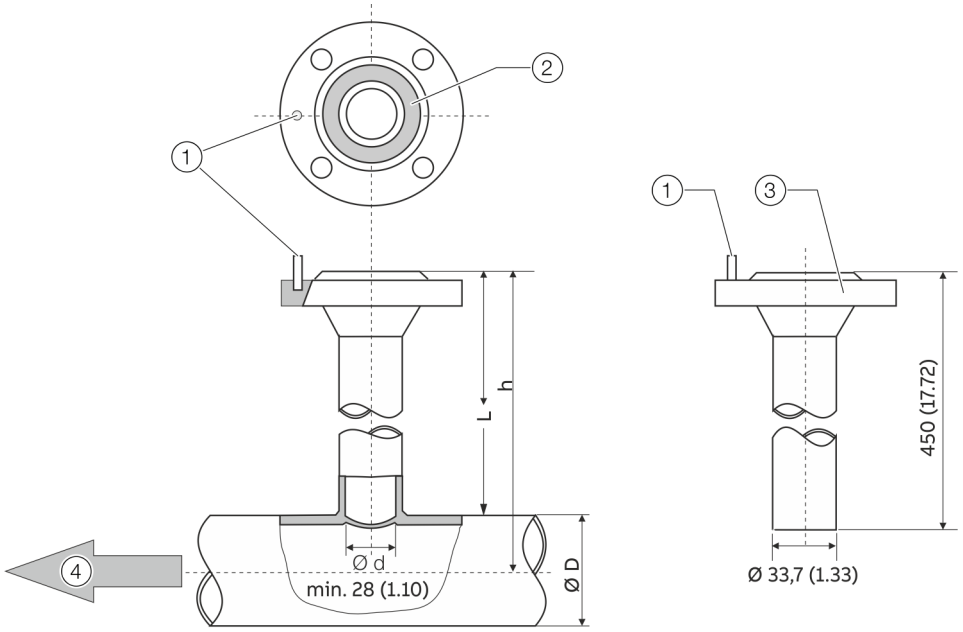
Nominal diameter	h	D1	D4	L1	L2	Weight
1 in	263 (10.35)	26.6 (1.05)	108 (4.25)	454 (17.87)	560 (22.05)	5.1 (11)
1½ in		40.9 (1.61)	127 (5.00)	741 (29.17)	864 (34.02)	7.6 (16.5)
2 in		52.6 (2.07)	154 (6.06)	846 (33.31)	1003 (39.49)	12.3 (26.8)
3 in		78.0 (3.07)	–	–	–	21.3 (46)
4 in		102.4 (4.03)	–	–	–	32.5 (71)

FMT092 – Partial measuring section with flange in accordance with ASME B 16.5, CL 300 – Sensor connection: flange DN 25

Nominal diameter	h	d1	D4	L4	L3	Weight
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)	–	–	–	–

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)

h (sensor mounting length)	Ø D (pipe outer diameter)
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:

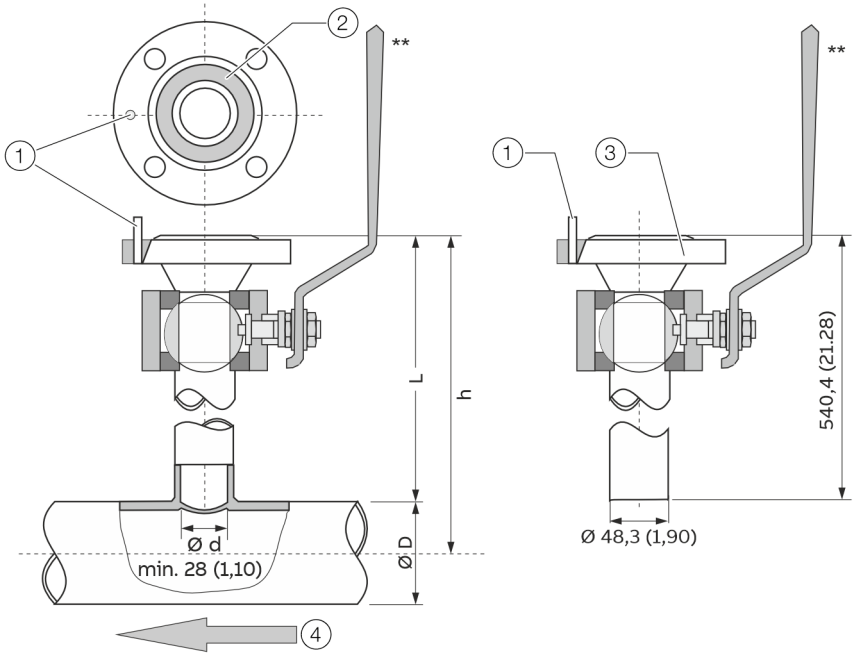
- The welding adapters must be shortened to the dimension L before installation, in accordance with: L = h —(1/2 x Ø D).
- The distance h from the upper edge of the flange to the pipe central axis must be within a tolerance of ± 2 mm (± 0.08“).
- Maintain the right angle to the pipe axis (max. tolerance ± 2°).
- The adapter centering pin must be aligned with the pipe axis in the flow direction (outflow side, behind the measuring point).

… Dimensions

… Pipe components

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 mounting length)	Ø D (pipe outer 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_{medium}: max. 150 °C (302 °F), Explosion protection approval for use in ATEX/IECEx Zone 2 or cFMus Div. 2 respectively.

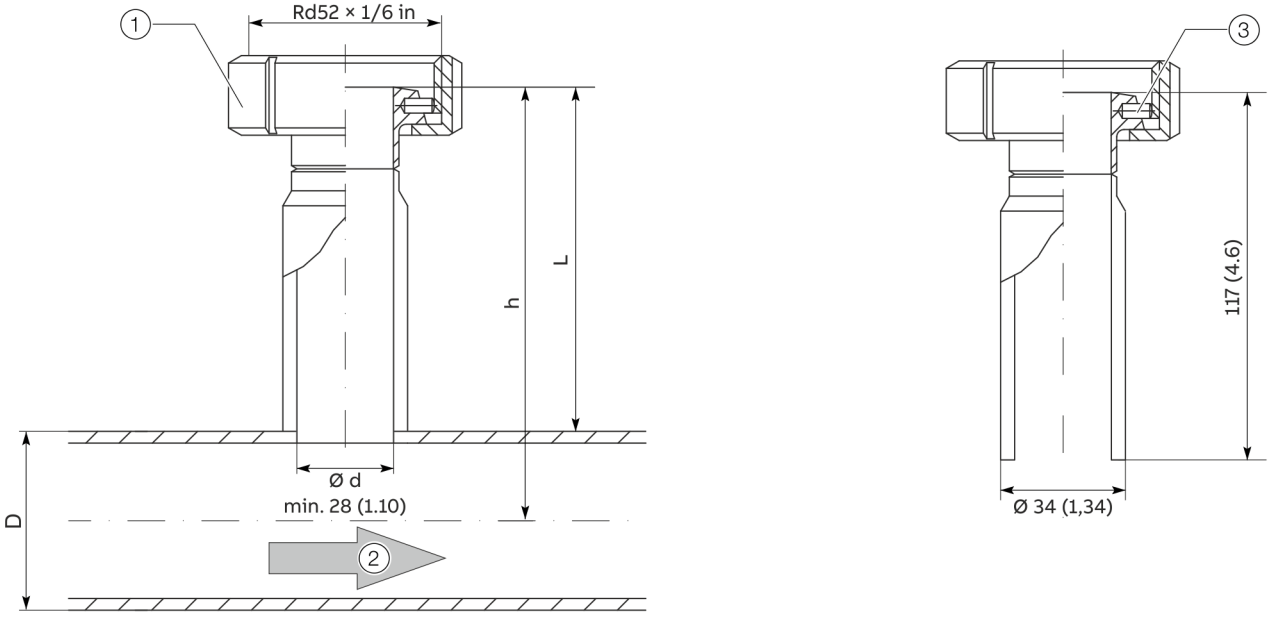
Note

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 x Ø D).
- The distance h from the upper edge of the flange to the pipe central axis must be within a tolerance of ± 2 mm (± 0.08“).
- Maintain the right angle to the pipe axis (max. tolerance ± 2°).
- The adapter centering pin must be aligned with the pipe axis in the flow direction (outflow side, behind the measuring point).

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:

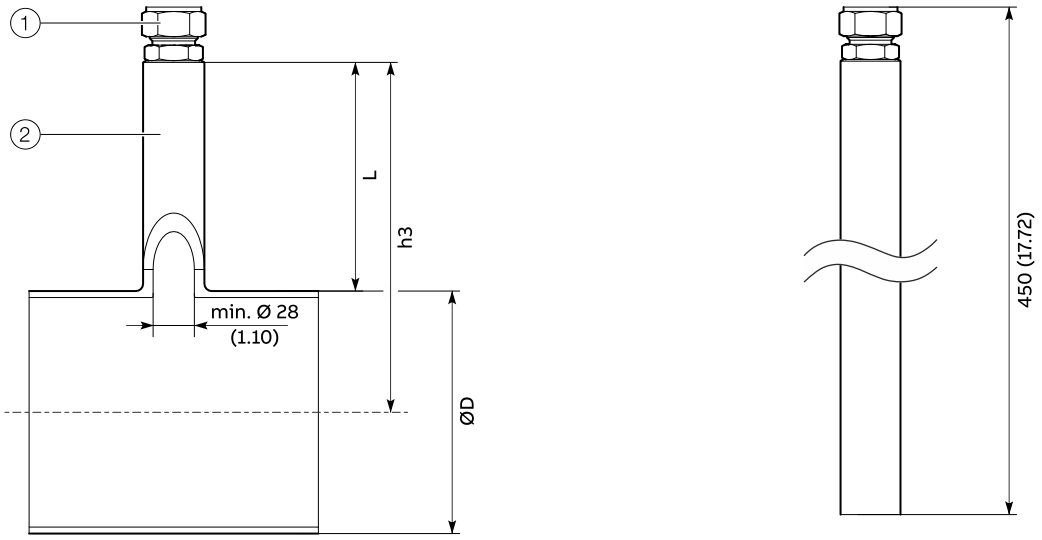
- Always mount the weld-on adapter together with the union nut on the piping. Mounting it at a later time is not possible.
- The welding adapters must be shortened to the dimension L before installation, in accordance with: L = h —(1/2 x Ø D).
- The distance h from the upper edge of the adapter to the pipe central axis must be within a tolerance of ± 2 mm (± 0.08 inch).
- Maintain the right angle to the pipe axis (max. tolerance ± 2°).
- 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)

… Dimensions

… Pipe components

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

h (sensor mounting length)	h3*	L = h3 –(½ × ØD)	ø D (pipe outer diameter**)
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 3: Dimensions of the weld-on adapter with clamp ring threading

* The dimension **h3** is related to the sensor installation length **h** and is used to calculate the length **L** the weld-on adapter.

** The limitation of the maximum pipe diameter only applies to installations with the thermal measuring element 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.

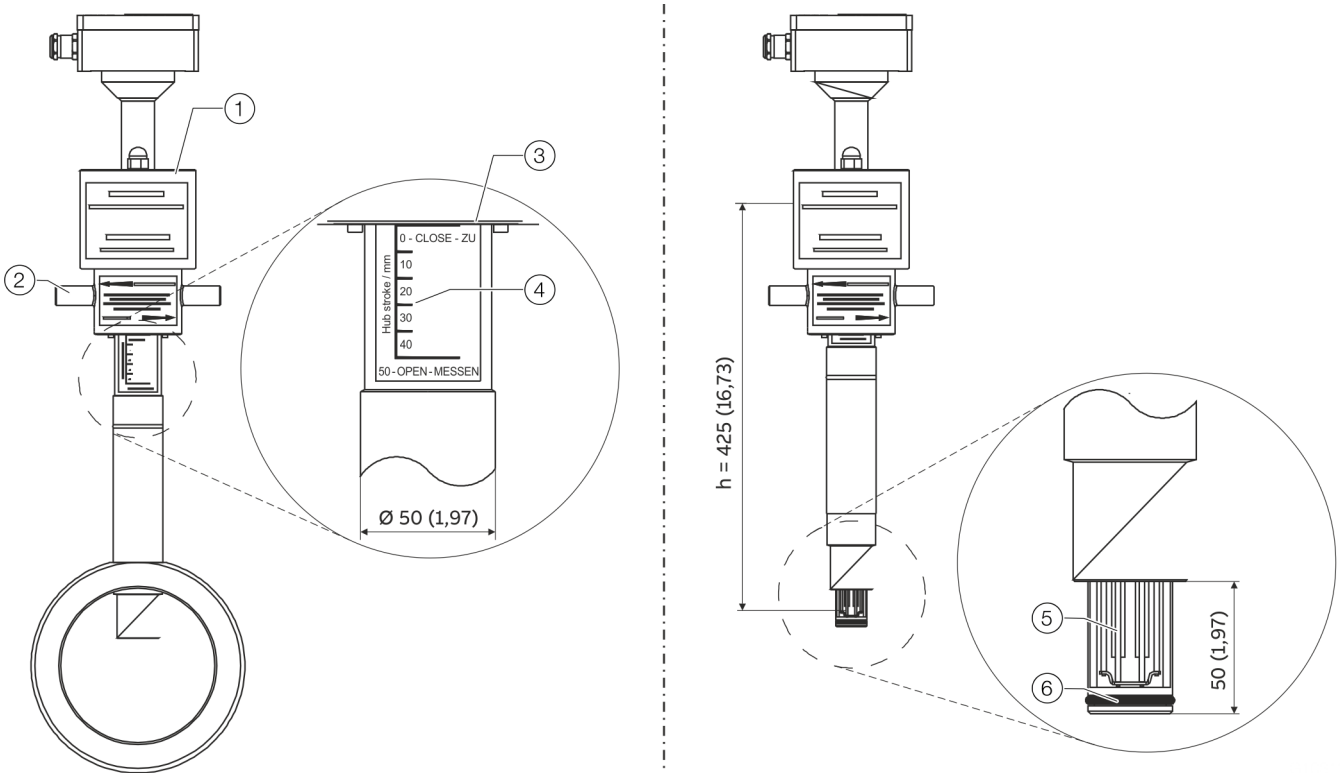
Note

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 –(½ × 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 if at least Ø28 mm (1.10 in).

Integrated hot tap fitting

Dimensions in mm (in)



Wafer type design

Welding adapter design

1. Cover plate for flange DN 25 (1 in)
2. Union nut
3. Lower edge of union nut
4. Display sensor element position, stroke 50 mm (1.97 in)
5. Sensor element
6. O-ring

Figure 50: Hot tap fitting

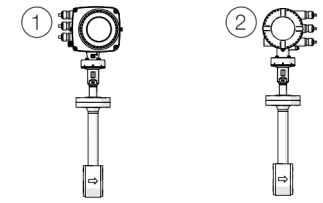
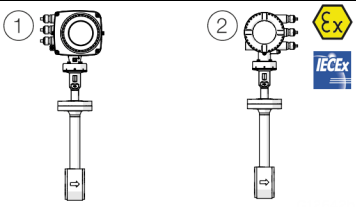
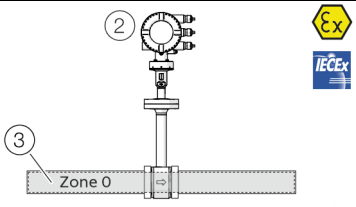
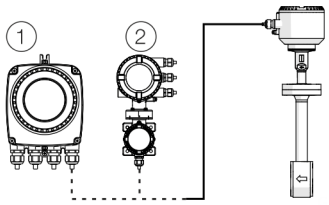
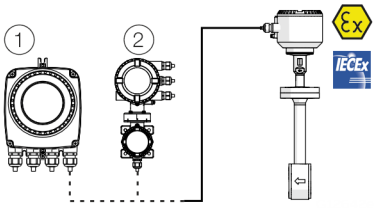
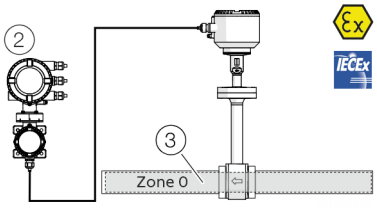
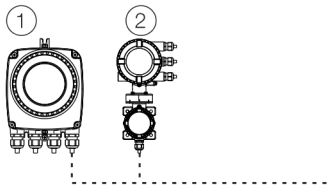
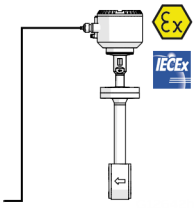
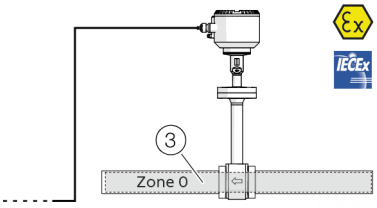
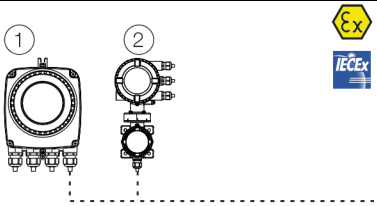
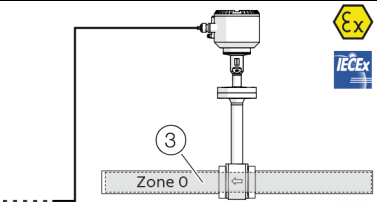
Nominal diameter	h – sensor length	
	Wafer type design	Welding design
DN 50, DN 65, DN 80 (2 in, 3 in)	263 mm (10.35 in)	425 mm (16.73 in) from nominal diameter DN 80
DN 100, DN 125, DN 150, DN 200 (4 in, 6 in, 8 in)	425 mm (16.73 in)	

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 .

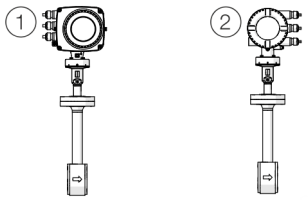
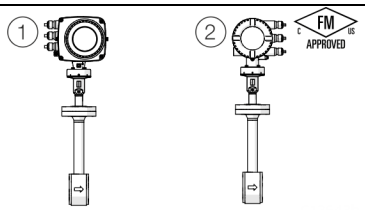
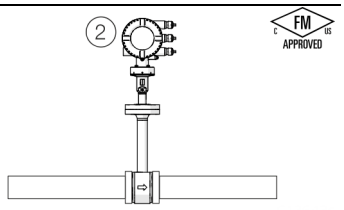
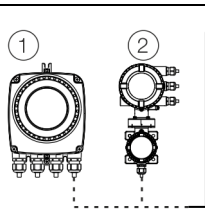
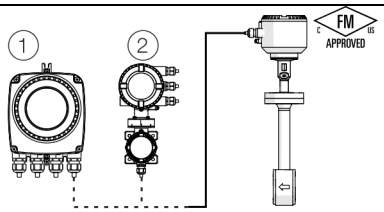
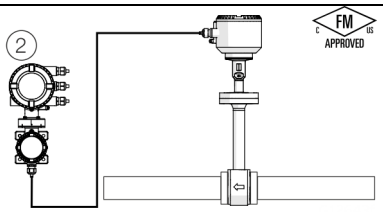
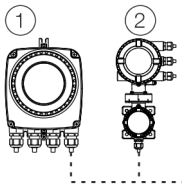
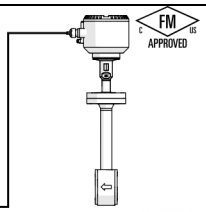
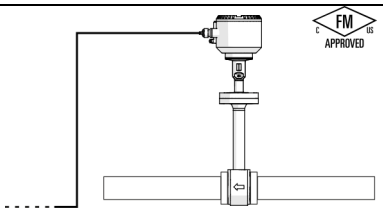
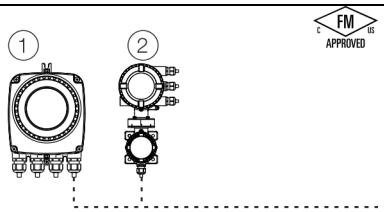
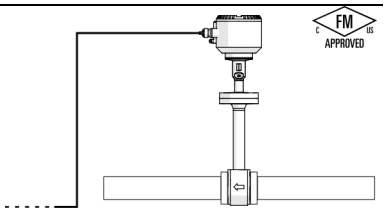
Device overview

ATEX / IECEx

	Standard / no explosion protection		Zones 2, 22		Zone 1, 21 (Zone 0)	
Model number	**FMT4x0 Y0**		**FMT4x0 A2**		**FMT4x0 A1**	
Integral mount design • Standard • Zone 2, 22 • Zone 1, 21 • Zone 0						
Model number	**FMT4x2 Y0**	**FMT4x0 Y0**	**FMT4x2 A2**	**FMT4x0 A2**	**FMT4x2 A1**	**FMT4x0 A1**
Remote mount design Transmitter and flowmeter sensor • Standard • Zone 2, 22 • Zone 1, 21 • Zone 0						
Model number	**FMT4x2 Y0**		**FMT4x0 A2**		**FMT4x0 A1**	
Remote mount design Transmitter • Standard • Zone 2, 22 Sensor • Zone 1, 21 • Zone 0						
Model number	—		**FMT4x2 A2**		**FMT4x0 A1**	
Remote mount design Transmitter • Zone 2, 22 Sensor • Zone 1, 21 • Zone 0	—					

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

cFMus

	Standard / No explosion protection		Class I Div. 2 / Zone 2		Class I Div. 1 / Zone 1 (Zone 0)	
Model number	**FMT4x0 Y0**		**FMT4x0 F2**		**FMT4x0 F1**	
Integral mount design • Standard • Div. 2 / Zone 2 • Div. 1 / Zone 1						
Model number	**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						
Model number	**FMT4x2 Y0**		**FMT4x0 F2**		**FMT4x0 F1**	
Remote mount design Transmitter • Standard Sensor • Div. 2 / Zone 2 • Div. 1 / Zone 1						
Model number	**—**		**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

… Use in potentially explosive atmospheres

Ex marking sensor and transmitter

ATEX / IECEx

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 structure*: FMTabcdefghijkl.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
FMT4x0 – A2 (i=D..,Y..,S..) Sensor in integral mount design or remote mount design with single-compartment or dual-compartment housing	II 3G Ex ec IIC T6...T1 Gc II 3D Ex tc IIIC T80°C...T_{medium} Dc	**ATEX:** FM19ATEX0178X **IECEx:** IECEx FMG 19.0025X
FMT4x2 – A2 (i=W..,R..) Sensor in remote mount design with single-compartment housing	II 3G Ex ec IIC T6 Gc II 3D Ex tc IIIC T80°C Dc	

Model number for use in Zone 0/1, 21	Ex marking	Certificate
FMT4x0 – A1 (i=D1...D8) Sensor in integral mount design with dual-compartment housing	II 2 G Ex db eb ib mb IIC T6...T1 Gb II 2 G Ex ia IIC T6...T1 Gb II 2 D Ex ia tb IIIC T80°C...T_{medium} Db IN-/OUTPUTS: Urated=30V	**ATEX:** FM19ATEX0177X **IECEx:** IECEx FMG 19.0025X
FMT4x0 – A3 (i=D1...D8) Sensor in integral mount design with dual-compartment housing (Zone 0 in meter tube)	II 1/2 G Ex db eb ia mb IIC T6...T1 Gb/Ga II 1 G Ex ia IIC T6...T1 Ga II 2 D Ex ia tb IIIC T80°C...T_{medium} Db IN-/OUTPUTS: Urated=30V	
FMT4x0 – A1 (i=Y0) Sensor in remote mount design with dual-compartment housing	II 2 G Ex eb ib mb IIC T6...T1 Gb II 2 G Ex ia IIC T6...T1 Gb II 2 D Ex tb IIIC T80°C...T_{medium} Db IN-/OUTPUTS: Urated=30V	
FMT4x0 – A3 (i=Y0) Sensor in remote mount design with dual-compartment housing (Zone 0 in meter tube)	II 1/2 G Ex eb ia ib mb IIC T6...T1 Gb/Ga II 1 G Ex ia IIC T6...T1 Ga II 2 D Ex tb IIIC T80°C...T_{medium} Db IN-/OUTPUTS: Urated=30V	
FMT4x0 – A1 (i=R1...R4) Transmitter in remote mount design with dual-compartment housing	II 2 G Ex db eb ia mb IIB+H2 T6 Gb II 2 D Ex ia tb IIIC T80°C Db IN-/OUTPUTS: Urated=30V	
FMT4x0 – A1 (i=R5...R8) Transmitter in remote mount design with dual-compartment housing (flameproof enclosure 'Ex d')	II 2 G Ex db ia IIB+H2 T6 Gb 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*: FMTabcdefghijkl.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**	
FMT4x0 - F2 (i=D..,Y..,S..) Sensor in integral mount design with single-compartment or dual-compartment housing. Design in accordance with ANSI / ISA 12.27.01 as 'Dual Seal Device'.	**USA:** 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	**Canada:** 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
FMT4x2 - F2 (i=W..,R..) Transmitter in remote mount design with single-compartment or dual-compartment housing.	**USA:** 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	**Canada:** 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**	
FMT4x0 – F1 (i=D1...D8) Sensor in integral mount design or remote mount design with dual-compartment housing. Design in accordance with ANSI / ISA 12.27.01 as 'Dual Seal Device'.	**USA:** 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	**Canada:** 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
FMT4x0 – F1 (i=Y0) Sensor in remote mount design. Design in accordance with ANSI / ISA 12.27.01 as 'Dual Seal Device'.	**USA:** 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	**Canada:** 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
FMT4x2 – F1 (i=R1...R8) Transmitter in remote mount design with dual-compartment housing	**USA:** 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	**Canada:** 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

… Use in potentially explosive atmospheres

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

Model number for use in Zone 2, 22	Ex marking	Certificate
FMT091_ (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	**ATEX:** FM19ATEX0178X **IECEx:** IECEx FMG 19.0025X
FMT092_ (j=SCA, SCB, SCC) SensyMaster FMT092 pipe component type 2, partial measuring section Optional with ball valve or integrated hot tap fitting		
FMT094_ (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
FMT091_ (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	**ATEX:** FM19ATEX0177X
FMT092_ (j=SCA, SCB, SCC) SensyMaster FMT092 pipe component type 2, partial measuring section		**IECEx:** IECEx FMG 19.0025X
FMT094_ (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_{medium} and the ambient temperature $T_{amb.}$.

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

$T_{amb.}$	Temperature resistance for the connecting cable
≤ 50 °C (≤ 122 °F)	≥ 70 °C (≥ 158 °F)
≤ 60 °C (≤ 140 °F)	≥ 80 °C (≥ 176 °F)
≤ 70 °C (≤ 158 °F)	≥ 90 °C (≥ 194 °F)

From an ambient temperature of $T_{amb.}$ ≥ 60 °C (≥ 140 °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 ≤ 80 °C (≤ 176 °F).

Environmental and process conditions for model FMT4xx...

Ambient temperature $T_{amb.}$	−20 to 70 °C (−4 to 158 °F) −40 to 70 °C (−40 to 158 °F)*
Measuring medium temperature T_{medium}	−20 to 150 °C (−4 to 302 °F) −40 to 150 °C (−40 to 302 °F)*
IP rating / NEMA rating	IP65, IP67 / NEMA 4X,Type 4X

* Cryogenic temperature design (optional)

… Use in potentially explosive atmospheres

… Temperature data

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 49 must not be up-scaled!

	Temperature class					
Ambient temperature $T_{amb.}$	**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 49 must not be up-scaled!

	Temperature class					
Ambient temperature $T_{amb.}$	**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)	—	—

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 49 must not be up-scaled!

	Temperature class					
Ambient temperature $T_{amb.}$	**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 49 must not be up-scaled!

	Temperature class					
Ambient temperature $T_{amb.}$	**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 ignitible 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.

… Use in potentially explosive atmospheres

… Temperature data

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

Measuring medium temperature T_{medium}	Standard: –20 to 150 °C (–4 to 302 °F)
Ambient temperature $T_{amb.}$ for pipe components **without** 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 **ambient temperature range (TA3/TA9)** of the sensor and O-ring design.
Ambient temperature $T_{amb.}$ for pipe components with ball valve or integrated hot tap fitting (**Sensor connection options: SCA, SCB, SCD**)	Standard: –20 to 70 °C (–4 to 158 °F)

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!

		Temperature class			
Ambient temperature $T_{amb.}$	**Options**	**T3**	**T4**	**T5**	**T6**
–20 °C to 70 °C (–4 °F to 158 °F)	Pipe component **without** 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 **without** 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 **with** ball valve or integrated hot tap fitting	150 °C (302 °F)	135 °C (275 °F)	100 °C (212 °F)	85 °C (185 °F)

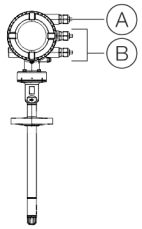
Integrated hot tap fitting – maximum surface temperature

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.

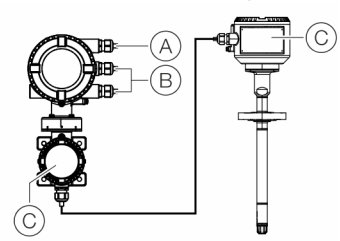
Electrical data

Overview

Integral mount design



Remote mount design



Ⓐ Power supply

Ⓑ Inputs / outputs, communication

Ⓒ Signal cable (remote mount design only)

Figure 51: Overview of electrical connections

Zones 2, 22	**Division 2 and Zone 2**
ATEX/IECEx: II 3 G & II 3 D	**USA:** DIV2 & ZN2 **Canada:** DIV2 & ZN2

Activating the inputs and outputs

Ⓐ Power supply	Ⓑ Inputs / outputs, communication	Ⓒ Signal cable (remote mount design only)
• Type of ignition protection ATEX/IECEx: Non-sparking “Ex ec” • Flameproof enclosure type of protection USA / Canada: ‘non IS’ • Maximum 250 Vrms • Terminals: 1+, 2-, L, N, ⏚	• Type of ignition protection ATEX/IECEx: Non-sparking “Ex ec” • Flameproof enclosure type of protection USA / Canada: Non-incendive “NI” • Terminals: 31, 32, Uco, V1, V2, V3, V4, 41, 42, 51, 52	• Type of ignition protection ATEX/IECEx: Non-sparking “Ex ec” • Flameproof enclosure type of protection USA / Canada: Non-incendive “NI” • Terminals: A, B, UFE, GRN

Zones 1, 21	**Division 1 and Zone 1**
ATEX/IECEx: II 2 G & II 2 D II 1/2 G & II 1 G & II 2 D	**USA:** DIV1 & ZN1 **Canada:** DIV1 & ZN1

Activating the inputs and outputs

Ⓐ Power supply	Ⓑ Inputs / outputs, communication	Ⓒ Signal cable (remote mount design only)
• Type of ignition protection ATEX/IECEx: Non-sparking “Ex eb” • Flameproof enclosure type of protection USA / Canada: ‘non IS’ • Maximum 250 Vrms • Terminals: 1+, 2-, L, N, ⏚	• Type of ignition protection ATEX/IECEx: Non-sparking “Ex ec” • Flameproof enclosure type of protection USA / Canada: Non-incendive “NI” • When installing in ‘Ex ia’, suited intrinsically safe isolation amplifiers must be used for the connection. • Terminals: 31, 32, Uco, V1, V2, V3, V4, 41, 42, 51, 52	• Type of ignition protection ATEX/IECEx: Non-sparking “Ex eb” • Flameproof enclosure type of protection USA / Canada: Explosion-proof “XP” • Terminals: A, B, UFE, GRN

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!

… Use in potentially explosive atmospheres

… Electrical data

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

Type of protection	**'e' / 'XP'**		**'ia' / 'IS'**											
Outputs on basic device	**U_M** [V]	**I_M** [A]	**U_O** [V]	**U_I** [V]	**I_O** [mA]	**I_I** [mA]	**P_O** [mW]	**P_I** [mW]	**C_O** [nF]	**C_I** [nF]	**C_{OPA}** [nF]	**C_{IPA}** [nF]	**L_O** [mH]	**L_I** [mH]
Current / HART output 31 / U_{CO}, active Terminals 31 / U_{CO}	30	0.2	30	30	115	115	815	815	10	10	5	5	0.08	0.08
Current / HART output 31 / 32, passive Terminals 31 / 32	30	0.2	—	30	—	115	—	815	—	27	—	5	0.08	0.08
Digital output 41 / 42, active* Terminals 41 / 42 and V1 / V2*	30	0.1	27.8	30	119	30	826	225	20	20	29	29	0.22	0.22
Digital output 41 / 42, active** Terminals 41 / 42 and U_{CO} / 32**	30	0.1	30	30	115	115	826	225	16	16	10	10	0.08	0.08
Digital output 41 / 42, passive Terminals 41 / 42	30	0.1	—	30	—	30	—	225	—	27	—	5	—	0.08
Digital output 51 / 52, active* Terminals 51 / 52 and V1 / V2*	30	0.1	27.8	30	119	30	826	225	20	20	29	29	0.22	0.22
Digital output 51 / 52, passive 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_{CO} / 32 in 'power mode', see **Current output Uco / 32 as loop power supply for digital output 41 / 42 or 51 / 52** on page 22.

Type of protection	**'e' / 'XP'**		**'ia' / 'IS'**											
Inputs and outputs with optional plug-in cards	**U_M** [V]	**I_M** [A]	**U_O** [V]	**U_I** [V]	**I_O** [mA]	**I_I** [mA]	**P_O** [mW]	**P_I** [mW]	**C_O** [nF]	**C_I** [nF]	**C_{OPA}** [nF]	**C_{IPA}** [nF]	**L_O** [mH]	**L_I** [mH]
Current output V3 / V4, active* Terminals V3 / V4 and V1 / V2*	30	0.1	27.8	30	119	30	826	225	29	29	117	117	0.4	0.4
Current output V1 / V2, passive** **Current output V3 / V4, passive**** Terminals V1 / V2** or V3 / V4**	30	0.1	—	30	—	68	—	510	—	45	—	59	—	0.27
Digital output V3 / V4, active* Terminals V3 / V4 and V1 / V2*	30	0.1	27.8	30	119	68	826	225	17	17	31	31	0.4	0.4
Digital output V1 / V2, passive** **Digital output V3 / V4, passive**** Terminals V1 / V2** or V3 / V4**	30	0.1	—	30	—	30	—	225	—	13	—	16	—	0.27
Digital input V3 / V4, active* 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
Digital input V1 / V2, passive* **Digital input V3 / V4, passive*** Terminals V1 / V2** or V3 / V4**	30	0.1	—	30	—	3.45	—	25.8	—	13	—	16	—	0.27
Modbus® / PROFIBUS DP® 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 26.

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

Outputs on basic device	Operating values (general)		Type of protection 'ec' / 'NI'	
	U_N	I_N	U_N	I_N
Current / HART output 31 / U_{CO}, active Terminals 31 / U_{CO}	30 V	30 mA	30 V	30 mA
Current / HART output 31 / 32, passive Terminals 31 / 32	30 V	30 mA	30 V	30 mA
Digital output 41 / 42, active* Terminals 41 / 42 and V1 / V2*	30 V	30 mA	30 V	30 mA
Digital output 41 / 42, active** Terminals 41 / 42 and U_{CO} / 32**	30 V	30 mA	30 V	30 mA
Digital output 41 / 42, passive Terminals 41 / 42	30 V	30 mA	30 V	30 mA
Digital output 51 / 52, active* Terminals 51 / 52 and V1 / V2*	30 V	30 mA	30 V	30 mA
Digital output 51 / 52, passive 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_{CO} / 32 in 'Powermode', see **Current output Uco / 32 as loop power supply for digital output 41 / 42 or 51 / 52** on page 22.

Inputs and outputs with optional plug-in cards	Operating values (general)		Type of protection 'ec' / 'NI'	
	U_N	I_N	U_N	I_N
Current output V3 / V4, active* Terminals V3 / V4 and V1 / V2*	30 V	30 mA	30 V	30 mA
Current output V1 / V2, passive** **Current output V3 / V4, passive**** Terminals V1 / V2** or V3 / V4**	30 V	30 mA	30 V	30 mA
Digital output V3 / V4, active* Terminals V3 / V4 and V1 / V2*	30 V	30 mA	30 V	30 mA
Digital output V1 / V2, passive** **Digital output V3 / V4, passive**** Terminals V1 / V2** or V3 / V4**	30 V	30 mA	30 V	30 mA
Digital input V3 / V4, active* Terminals V3 / V4 and V1 / V2	30 V	3,45 mA	30 V	3,45 mA
Digital input V1 / V2, passive* **Digital input V3 / V4, passive*** Terminals V1 / V2** or V3 / V4**	30 V	3,45 mA	30 V	3,45 mA
Modbus® / PROFIBUS DP® 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 26.

… Use in potentially explosive atmospheres

… Electrical data

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 V.
- Intrinsic safety is preserved If the rated voltage U_M = 30 V is not up-scaled when connections are established to non-intrinsically safe external circuits.
- Once output circuits are connected and have been operated for a while, a change of the protection (instrinsically safe and vice versa) is not permitted.

- The information in **Changing the type of protection** in the operating instruction on page 73 must be observed when changing the type of protection.

Devices connected to the relevant equipment must not be operated at over 250 V_{rms} 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 53 must be observed.

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.

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)

… Ordering Information

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										
Explosion Protection Certification										
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)		F2								
cFMus (Class 1 Div. 1 / Zone 1)		F1								
Measuring Medium										
Air or other clean gas (One gas component only)			C1							
Gas mixtures with max. 23.5 Vol% O_2 (eg. Natural gas or Biogas)			C2							
Oxygen / gas mixtures > 23.5 Vol% O_2, oil and grease-free,										
with O_2 certificate (max. 150 °C / 302 °F)			P1							
Ammonia			H3							
Sensor Element Type / Temperature Range of Measuring Medium										
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						
Mounting Length / Flowmeter Sensor Material										
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*					
Sensor Connection										
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				
Connection Design / Transmitter Housing Type / Transmitter Housing Material / Cable Glands										
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			
Connection Design / Sensor Housing Type / Sensor Housing Material / Cable Glands										
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	**FMT430**	XX	XX	X	X	XX	XX	XX	**XX**	**X**
SensyMaster FMT430 Thermal Mass Flowmeter										
Outputs										
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), digitial output 1 & 2 (passive), HART, MODBUS									M1	
Current output 1 (active or passive), digitial output 1 & 2 (passive), HART, PROFIBUS DP									D1	
Without (Remote TX or replacement Sensor)									Y0	
Power Supply										
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					
Material Certificates					
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				
Others	CZ				
Additional Calibration Certificates					
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			
Other Usage Certifications					
DVGW Certificate (T_{amb}: −20 to 100 °C)			CGW		
Additional Output 1					
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	
Additional Output 2					
1 × Digital input					DSN
1 × Digital output					DSG
1 × Analog output passive (4 to 20 mA)					DSA

Continued on next page...

… Ordering Information

… SensyMaster FMT430

Additional ordering information	**XX**	**XX**	**XX**	**XXX**	**XX**	**XX**	**XXX**	**XX**	**X**
SensyMaster FMT430 Thermal Mass Flowmeter									
Integrated Digital Display (LCD)									
No Display, with Blind Cover	L0								
With Push Buttons and Display (TTG) and Glass Cover	L2								
Functional Safety									
SIL2 Certificate		CS							
Documentation Language									
German			M1						
English			M5						
Western Europe Scandinavia			MW						
Eastern Europe			ME						
Configuration Type									
Parameters set to factory default				NC1					
Parameters set customer specific (e.g. function of the outputs, etc.)				NCC					
Application 2 configurable				NC3					
Calibration Type									
5-point calibration, standard measuring range, incl. factory certificate					R3				
5-point calibration, extended measuring range, incl. factory certificate (non Ex version only)					R4				
Device Identification Plate									
Stainless steel plate with TAG no.						T1			
Adhesive label with TAG no.						TC			
Ambient Temperature Range									
Extended −40 to 70 °C (−40 to 158 °F) (in preparation)							TA9		
Extended Diagnostic Options									
VeriMass SensorCheck function								V2	
Number of Applications									
1 Application									1
2 Applications									2

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										
Explosion Protection Certification										
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								
Measuring Medium										
Air or other clean gas (One gas component only)			C1							
Gas mixtures with max. 23.5 Vol% O_2 (e. g. Natural gas or Biogas)			C2							
Oxygen / gas mixtures > 23.5 Vol% O_2, oil and grease-free,										
with O_2 certificate (max. 150 °C / 302 °F)			P1							
Ammonia			H3							
Sensor Element Type / Temperature Range of Measuring Medium										
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						
Mounting Length / Flowmeter Sensor Material										
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*					
Sensor Connection										
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				
Connection Design / Transmitter Housing Type / Transmitter Housing Material / Cable Glands										
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			
Connection Design / Sensor Housing Type / Sensor Housing Material / Cable Glands										
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

… SensyMaster FMT450

Base model	**FMT450**	XX	XX	X	X	XX	XX	XX	**XX**	**X**
SensyMaster FMT450 Thermal Mass Flowmeter										
Outputs										
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), digitial output 1 & 2 (passive), HART, MODBUS									M1	
Current output 1 (active or passive), digitial output 1 & 2 (passive), HART, PROFIBUS DP									D1	
Without (Remote TX or replacement Sensor)									Y0	
Power Supply										
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					
Material Certificates					
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				
Others	CZ				
Additional Calibration Certificates					
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			
Other Usage Certifications					
DVGW Certificate (T_{amb}: -20 to 100°C)			CGW		
Additional Output 1					
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	
Additional Output 2					
1 × Digital input					DSN
1 × Digital output					DSG
1 × Analog output passive (4 to 20 mA)					DSA

Continued on next page…

Additional ordering information	**XX**	**XX**	**XX**	**XXX**	**XX**	**XX**	**XX**	**XXX**	**XX**	**X**
SensyMaster FMT450 Thermal Mass Flowmeter										
Integrated Digital Display (LCD)										
No Display, with Blind Cover	L0									
With Push Buttons and Display (TTG) and Glass Cover	L2									
Functional Safety										
SIL2 Certificate		CS								
Documentation Language										
German			M1							
English			M5							
Western Europe Scandinavia			MW							
Eastern Europe			ME							
Configuration Type										
Parameters set to factory default				NC1						
Parameters set customer specific (e.g. function of the outputs, etc.)				NCC						
Special Applications										
Filling application					PT					
Calibration Type										
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				
Device Identification Plate										
Stainless steel plate with TAG no.							T1			
Adhesive label with TAG no.							TC			
Ambient Temperature Range										
Extended −40 to 70 °C (−40 to 158 °F) (in preparation)								TA9		
Extended Diagnostic Options										
VeriMass SensorCheck function									V2	
Number of Applications										
1 Application										1
2 Applications										2
3 Applications										3
4 Applications										4

… Ordering Information

SensyMaster FMT432 / FMT452

Remote Transmitter for Thermal Mass Flowmeter FMT430

Base model					
SensyMaster FMT432 Thermal Mass Flowmeter Transmitter	**FMT432**	**XX**	**XX**	**XX**	**XX**
SensyMaster FMT452 Thermal Mass Flowmeter Transmitter	**FMT452**	**XX**	**XX**	**XX**	**XX**
Explosion Protection Certification					
Without		Y0			
ATEX / IECEx (Zone 2 / 22)		A2			
ATEX / IECEx (Zone 1 / 21)		A1			
cFMus (Class 1 Div. 2)		F2			
cFMus (Class 1 Div. 1 / Zone 1)		F1			
Connection Design / Transmitter Housing Type / Transmitter Housing Material / Cable Glands					
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		
Outputs					
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	
Power Supply					
100 to 240 V AC, 50 / 60 Hz					A
24 V DC, +/- 20 %					B

Additional ordering information

Additional ordering information				
SensyMaster FMT432 Thermal Mass Flowmeter Transmitter	**XX**	**XXX**	**XXX**
SensyMaster FMT452 Thermal Mass Flowmeter Transmitter	**XX**	**XXX**	**XXX**
Mounting Bracket Shape / Material			
For 2 in. pipe mounting / Carbon steel, electrogalvanized	B1		
Additional Output 1			
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	
Additional Output 2			
1 x Digital input			DSN
1 x Digital output			DSG
1 x Analog output passive (4 to 20 mA)			DSA

Continued on next page…

Additional ordering information								
SensyMaster FMT432 Thermal Mass Flowmeter Transmitter	**XX**	**XX**	**XX**	**– –**	**XXX**	**XX**	**XXX**	**XX**
SensyMaster FMT452 Thermal Mass Flowmeter Transmitter	**XX**	**XX**	**XX**	**XX**	**XXX**	**XX**	**XXX**	**XX**
Integrated Digital Display (LCD)								
No Display, with Blind Cover	L0							
With Push Buttons and Display (TTG) and Glass Cover	L2							
Functional Safety								
SIL2 Certificate		CS						
Documentation Language								
German			M1					
English			M5					
Language package Western Europe Scandinavia			MW					
Language package Eastern Europe			ME					
Special Applications								
Filling application				PT*				
Signal Cable Length								
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			
Device Identification Plate								
Stainless steel plate with TAG no.						T1		
Adhesive label with TAG no.						TC		
Ambient Temperature Range								
Extended −40 to 70 °C (−40 to 158 °F)							TA9	
Extended Diagnostic Options								
VeriMass SensorCheck function								V2

* Only with FMT452

… Ordering Information

SensyMaster FMT091 Pipe component / Wafer Design (Type 1)

Base model	**FMT091**	**X**	**XXX**	**XX**	**XX**	**XX**	**XX**	**XX**
SensyMaster FMT091 Pipe component / Wafer Design (Type 1)								
Design								
Standard		S						
Nominal Diameter								
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					
Process Connection								
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				
Sensor Connection								
Flange DN 25, nominal pressure 4 MPa (40 bar, 580 psi) with centering pin					D3			
Measuring Medium								
Air or other clean gas (only one gas type)						C1		
Gas mixtures with max. 23.5 Vol% O_2 (e.g. natural gas or biogas)						C2		
Oxygen / gas mixtures > 23.5 Vol% O_2, oil and grease-free, with O2 certificate (max. 150 °C / 302 °F)						P1		
Ammonia						H3		
Pipe Material								
Stainless steel AISI 316Ti (1.4571)							S2	
Mounting Length of the Sensor								
263 mm (10.4 in)								L2
425 mm (17 in)								L3

Continued on next page…

Additional ordering information

Additional ordering information	**XXX**	**XXX**	**XX**	**XXX**
SensyMaster FMT091 Pipe component / Wafer Design (Type 1)				
Sensor Connection Options				
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***			
Sensor Connection Accessories				
DN 25 blind flange to close flowmeter sensor connection, material stainless steel AISI 316Ti (1.4571)		SBA		
Certificates				
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	
Other Usage Certifications				
DVGW Certificate (T_{amb}: −20 to 100°C)				CGW

* 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.

… Ordering Information

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)								
Design								
Standard		S						
Integrated flow straighteners		F						
Nominal Diameter								
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					
Process Connection								
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				
Sensor Connection								
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			
Measuring Medium								
Air or other clean gas (only one type of gas)						C1		
Gas mixtures with max. 23.5 Vol% O_2 (e.g. natural gas or biogas)						C2		
Oxygen / gas mixtures > 23.5 Vol% O_2, oil and grease-free, with O_2 certificate (max. 150 °C / 302 °F)						P1		
Ammonia						H3		
Pipe Material								
Stainless steel AISI 316Ti (1.4571)							S2	
Steel S 235 (1.0037) galvanized							S3	
Mounting Length of the Sensor								
120 mm (4.7 in)								L1
263 mm (10.4 in)								L2

Continued on next page…

Additional ordering information

Additional ordering information	**XXX**	**XXX**	**XX**	**XXX**
SensyMaster FMT092 Pipe component, partial measuring section (type 2)				
Sensor Connection Options				
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***			
Sensor Connection Accessories				
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		
Certificates				
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	
Other Usage Certifications				
DVGW Certificate (T_{amb}: −20 to 100°C)				CGW

* 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.

… Ordering Information

SensyMaster FMT094 Pipe component, weld-on adapter

Base model	**FMT094**	**X**	**XXX**	**XX**	**XX**	**XX**	**XX**	**XX**
SensyMaster FMT094 Pipe component, weld-on adapter								
Design								
Standard		S						
Nominal Diameter								
Selection for weld-on adapter			000					
Process Connection								
Selection for weld-on adapter				W2				
Sensor Connection								
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			
Measuring Medium								
Air or other clean gas (only one gas type)						C1		
Gas mixtures with max. 23.5 Vol% O_2 (e.g. natural gas or biogas)						C2		
Oxygen / gas mixtures > 23.5 Vol% O_2, oil and grease-free, with O_2 certificate (max. 150 °C / 302 °F)						P1		
Ammonia						H3		
Pipe Material								
Stainless steel AISI 316Ti (1.4571)							S2	
Carbon steel S 235 (1.0037)							C1	
Mounting Length of the Sensor								
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…

Additional ordering information SensyMaster FMT094

Additional ordering information	**XXX**	**XXX**	**XX**	**XXX**
SensyMaster FMT094 Pipe component, weld-on adapter				
Sensor Connection Options				
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***			
Sensor Connection Accessories				
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		
Certificates				
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	
Other Usage Certifications				
DVGW Certificate (T_{amb}: -20 to 100°C)				CGW

* 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

Customer:	**Date:**
Ms. / Mr.:	**Department:**
Telephone:	**Email:**

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^3/h, other]
_____

Normal conditions (in volume flow)
☐ 0°C, 1013mbar ☐ other _____
☐ 20°C, 1013mbar

Gas data:

Gas type (pure gas):
_____

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

Transmitter design

Design:
☐ Integral mount design ☐ Single-compartment housing
☐ Remote mount design ☐ Dual-compartment housing

Signal cable length (remote mount design)
☐ 5 m ☐ 25 m
☐ 15 m

Communication:
☐ current output / HART
☐ 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_4 90 %, C_2H_6 5 %, N_2 3 %, C_3H_8 1 %, Co_2 1 %

Note

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

Trademarks

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Notes

ABB Measurement & Analytics

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www.abb.com/contacts

For more product information, visit:
www.abb.com/flow

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