

Sensyflow FMT400-VTS, FMT400-VTCS Thermal Mass Flowmeter



Direct mass flow measurement of gases

- No additional pressure and temperature compensation

Wide measuring range up to 1:100

- Factory calibration with optional DAkkS / ILAC certificate
- Process gas calibration with clean gases and gas mixtures (optional)

High measuring accuracy

Quick response time ≤ 0.5 s

- Optimized for advanced control systems

Negligible pressure loss

No moving parts, no wear, maintenance-free

Defined and reproducible mounting position in the middle of the pipeline

- Pipe components for DN 25 ... DN 200 (1 ... 8")
- Weld-on adapters for larger diameters and rectangular ducts
- Reliable and convenient hot tap fittings

Versions designed for optimum practicality in applications

- FMT400-VTS process version (sturdy and flexible)
- FMT400-VTCS for the food and beverage industry
- Hygienic version, CIP- and SIP-enabled

Approvals for explosion protection

- ATEX zone 2 / 22 version: -20 ... 130 °C (-4 ... 266 °F)

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1 General information

1.1 Principle of operation and construction

The devices of the Sensyflow FMT400-series operate according to the thermal measuring principle of a hot film anemometer. This measuring method determines the gas mass flow directly. Taking the standard density of the gases into consideration, the standard volume flow rate can be displayed without additional pressure and temperature compensation.

Sensyflow FMT400-VTS is used in the field of process engineering and Sensyflow FMT400-VTCS in the food and beverage industry for flow measurement of gases and gas mixtures.

The measuring systems of the FMT400 series are made up of a transmitter, flowmeter sensor and a pipe component. The transmitter directly delivers an electrically isolated 0/4 ... 20 mA output signal. The flowmeter sensor is designed as flange-mounted and is installed in the pipe component in a defined way.

The pipe component is available in nominal diameters ranging from DN 25 ... DN 200 (1 ... 8") and in various designs. It is also possible to install the flowmeter sensor in square ducts or pipes of any diameter by using a weld-on adapter.

Physics of measurement

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 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 1:150, an accuracy smaller than 1 % of the measuring value is achieved.

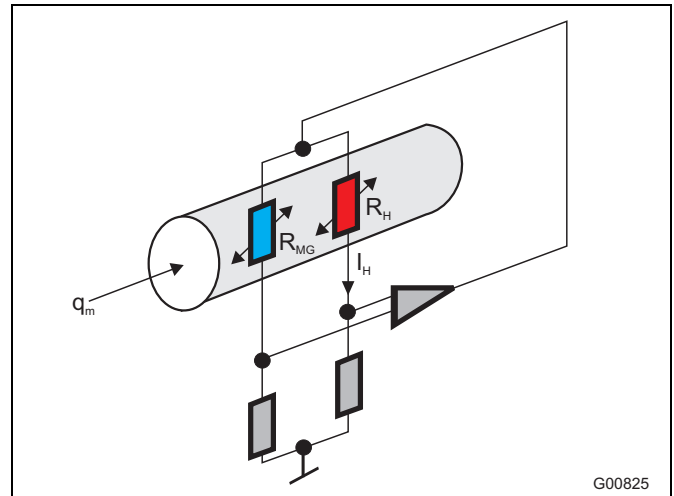


Fig. 1: Analog measuring principle

q_m	Gas mass-flow
R_{MG}	Gas temperature measuring resistor
R_H	Heating resistor
I_H	Actual value of heater

The gas stream flows past two temperature-sensitive resistors R_H and R_{MG} which are part of an electrical bridge circuit. Due to the chosen resistance ratio $R_H < R_{MG}$, R_H is heated by the current I_H , and R_{MG} adopts the same temperature as the gas. The current I_H is preset by the electronic control circuit to produce a constant temperature difference between the heated resistor R_H and the temperature of the gas.

The electrical power generated with resistor R_H exactly compensates its loss of heat to the gas flow. As this loss of heat is dependent on the number of particles which collide with the surface of resistor R_H , I_H represents a measure of the mass flow rate.

Typical applications

- Gas flow measurement in the chemical and processing industries,
- Compressed air balances,
- Gas burner control,
- Gas measurement for air separation systems,
- Activation air measurement in sewage plants,
- Hydrogen measurement in processes.

1.2 Type overview

Type	FMT400-VTS	FMT400-VTCS Hygienic version
Application	Process engineering	Food and beverage industry
Measured gases	Flow rate of gases and gas mixtures with known composition	Flow rate of air, N ₂ , CO ₂ , O ₂
Explosion protection	Manufacturer's Declaration zone 2 / 22 II 3G EEx nA ib II T4; II 3D T 135°C IP 65	
Design / Dimensions / Weight	dependent on nominal size	
Material (standard)	1.4571, Ceramics	Stainless steel e. g. 1.4301
Process connection (standard)	Flange acc. to EN1092-1 form B1, PN 40 (DIN 2635 form C) or ASME B 16.5 Cl. 150 / 300	Pipe fitting S acc. to DIN 11851 or FG flange
System components	Transmitter Flowmeter sensor Pipe component, design 1 or 2 or weld-on adapter	Transmitter Flowmeter sensor Pipe component
Standard nominal pipe sizes	Pipe component design 1: wafer flange DN 40, 50, 65, 80, 100, 125, 150, 200 – ASME 1 1/2", 2", 3", 4", 6", 8" Pipe component design 2: partial measuring section DN 25, 40, 50, 65, 80 – ASME 1", 1 1/2", 2" Weld-on adapter for square ducts or pipe diameters ≥ DN 100 (4")	Pipe component hygienic version: partial measuring section DN 25, 40, 50, 80
Degree of protection	IP 65 / NEMA 4X	

1.3 Overview Sensyflow FMT400-VTS, version for process engineering

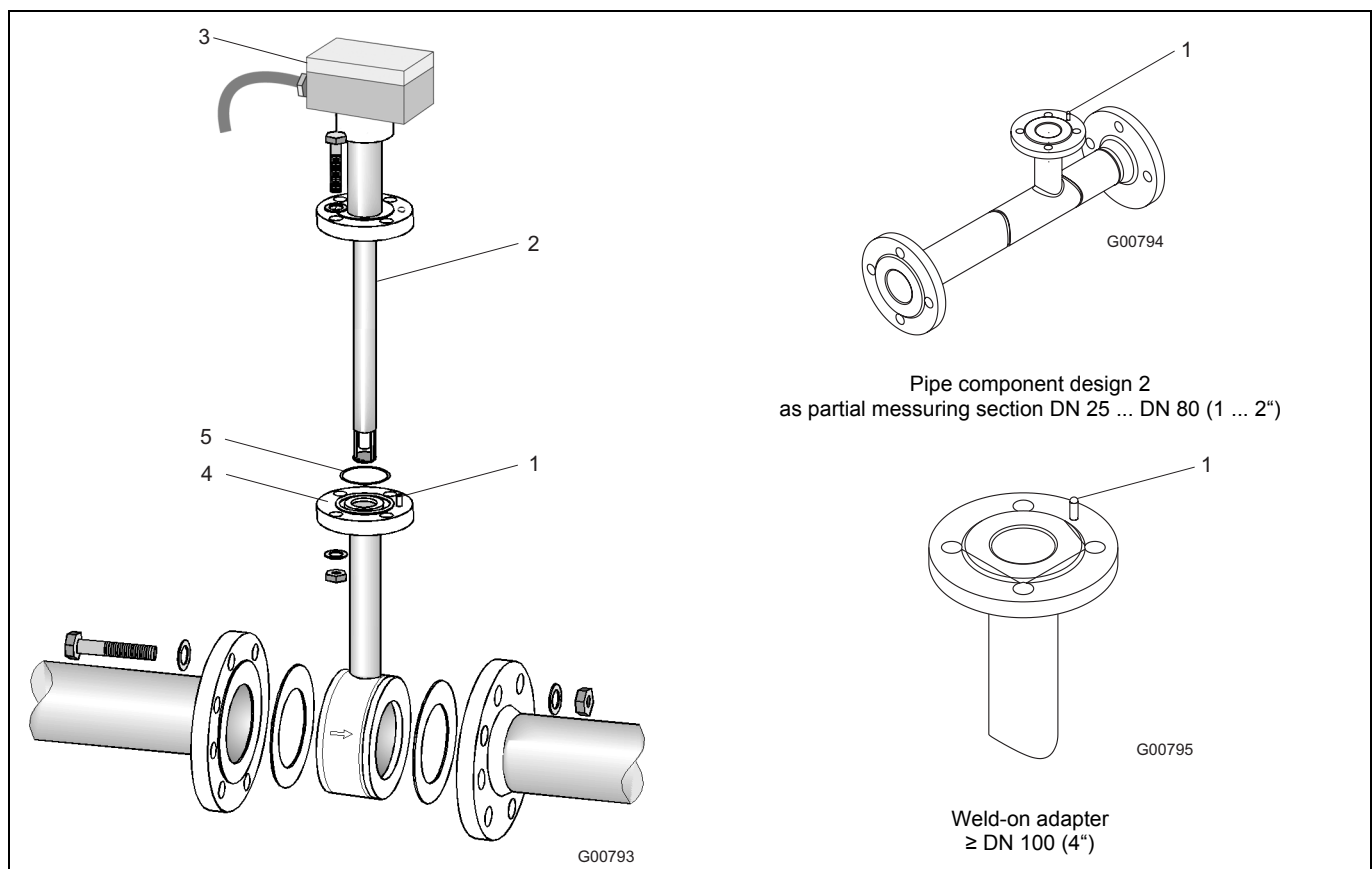


Fig. 2

- 1 Centering pin on outlet side
- 2 Flowmeter sensor FMT400-VTS
- 3 Transmitter
- 4 Pipe component design 1 in wafer flange design DN 40 ... DN 200 (1 1/2 ... 8")
- 5 Sealing ring

1.4 Overview Sensyflow FMT400-VTCS, hygienic version

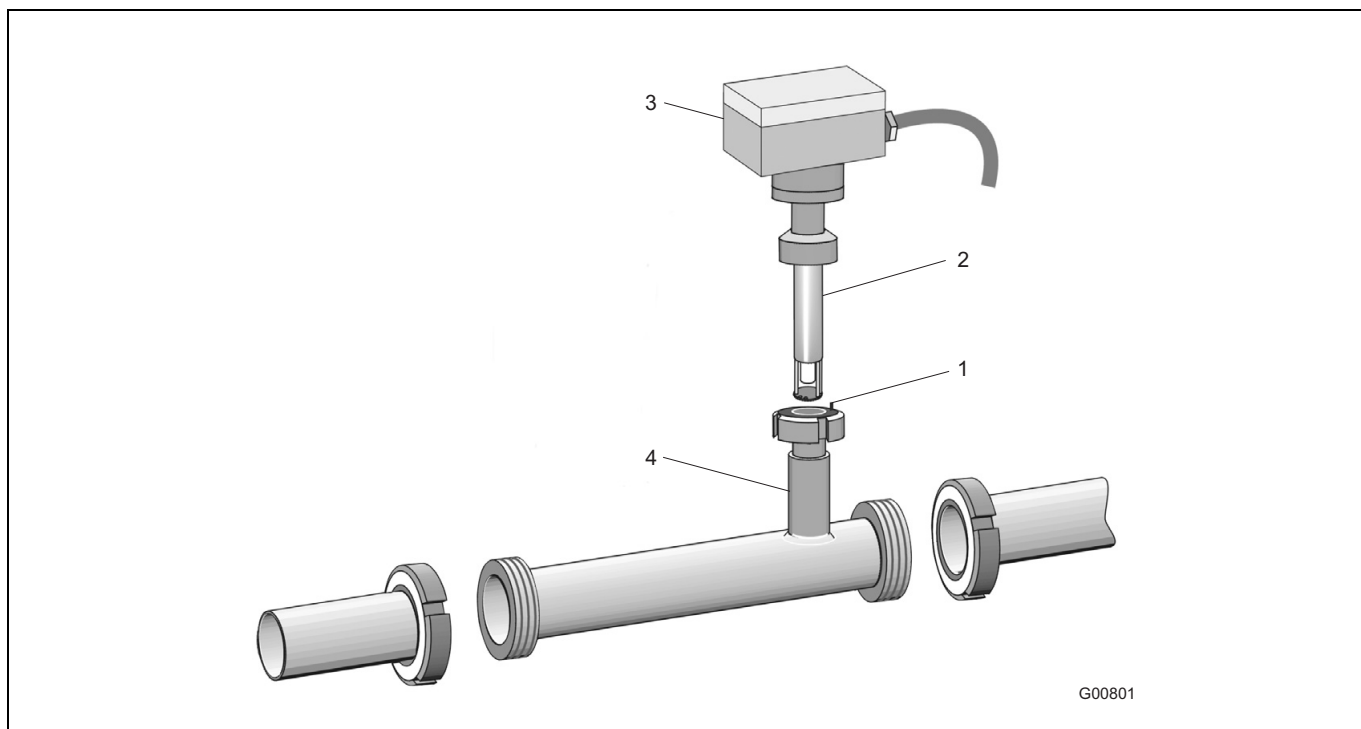


Fig. 3: Process connections with pipe fitting S acc. to DIN 11851. Flowmeter sensor and pipe component also available with FG flanges.
FG flanges on the pipe component are always plain on both sides (without groove).

- 1 Centering pin on outlet side
- 2 Flowmeter sensor FMT400-VTCS
- 3 Transmitter
- 4 Pipe component

2 Specifications

Type	FMT400-VTS				FMT400-VTCS Hygienic version			
Measured variable (measured gases)	Flow of gases and gas mixtures with known composition				Flow of air, N ₂ , CO ₂ , O ₂			
Measuring ranges Nominal diameters (DN)	q_{min} kg/h	q_{max} kg/h	q_{min} Nm ³ /h	q_{max} Nm ³ /h	q_{min} kg/h	q_{max} kg/h	q_{min} Nm ³ /h	q_{max} Nm ³ /h
	For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)				For 0 °C (32 °F) / 1013.25 hPa (14.696 psia)			
DN 25	0 ...	160	0 ...	120	0 ...	160	0 ...	120
DN 40	0 ...	430	0 ...	330	0 ...	430	0 ...	330
DN 50	0 ...	700	0 ...	540	0 ...	700	0 ...	540
DN 65	0 ...	1,200	0 ...	940				
DN 80	0 ...	1,700	0 ...	1,300	0 ...	1,700	0 ...	1,300
DN 100	0 ...	3,000	0 ...	2,300				
DN 125	0 ...	5,100	0 ...	3,900				
DN 150	0 ...	8,000	0 ...	6,200				
DN 200	0 ...	13,000	0 ...	10,000				
Up to 3000 mm	0 ...	2,700,000	0 ...	2,100,000				
(rectangular ducts and larger diameters on request)								
Measuring ranges Nominal diameters (inch)	q_{min} lbs/h	q_{max} lbs/h	q_{min} SCFM	q_{max} SCFM				
	For 15 °C (59 °F) / 1013.25 hPa (14.696 psia)							
1,0	0 ...	310	0 ...	65				
1,5	0 ...	840	0 ...	180				
2,0	0 ...	1,400	0 ...	310				
3,0	0 ...	3,500	0 ...	760				
4,0	0 ...	6,000	0 ...	1,300				
6,0	0 ...	16,500	0 ...	3,600				
8,0	0 ...	28,500	0 ...	6,200				
120,0	0 ...	6,000,000	0 ...	1,300,000				
(rectangular ducts and larger diameters on request)								
Notes regarding measuring ranges	<p>The above values are reference values for applications involving air or nitrogen under atmospheric conditions (other gases available upon request).</p> <p>The values for q_{max} can be increased by approx. 10 % upon request (with lower accuracy in the extended range).</p> <p>With hydrogen and helium, the lower range limit is typically approx. 10 % of the upper range limit.</p>							
Measuring errors Air, nitrogen	<p>Under calibration conditions in specified measuring range</p> <p>≤ ± 0.9 % of the measured value ± 0.05 % of the possible end value in this nominal diameter (see measuring ranges)</p>							
other gases	<p>≤ ± 1.8 % of the measured value ± 0.10 % of the possible end value in this nominal diameter (see measuring ranges)</p> <p>Special calibration on request</p>							
Reproducibility	< 0.25 % of the measured value, t _{meas} = 10 s							
Effect of the temperature of the measured medium	< 0.05 % / K of the measured value (depending on the type of gas)							
Effect of the pressure of the measured medium	< 0.2 % / 100 kPa (/ bar) of the measured value (depending on the type of gas)							
Response time	T ₆₃ = 0.5 s				T ₆₃ = 2 s			

Type	FMT400-VTS	FMT400-VTCS Hygienic version
Operating conditions		
Recommended steadying lengths	According to DIN EN ISO 5167-1 Min. inflow 15 x D, outflow 5 x D	
Ambient conditions		
Transmitter ambient temperature	-25 ... 70 °C (-13 ... 158 °F) Zone 2/22 version: -20 ... 50 °C (-4 ... 122 °F)	
CIP/SIP cleaning	-	With device switched off
Storage temperature	-25 ... 85 °C (-13 ... 185 °F)	
Process conditions		
Operating temperature of measured medium (flowmeter sensor)	Standard range: -25 ... 150 °C (-13 ... 302 °F) Extended range: -25 ... 300 °C (-13 ... 572 °F) Zone 2/22 version: -20 ... 130 °C (-4 ... 266 °F)	-25 ... 150 °C (-13 ... 302 °F)
Operating pressure	4 x 10 ⁶ Pa (40 bar [580 psi])	1.6 x 10 ⁵ Pa (16 bar [232 psi]) threaded pipe connection S (for DN 80: 10 x 10 ⁵ Pa (10 bar [145 psi])) 10 x 10 ⁵ Pa (10 bar [145 psi]) FG flange
Pressure drop (logarithmic representation)	<p>< 1.0 kPa (10 mbar), typical value 0.1 kPa (1 mbar)</p> <p style="text-align: right;">G00796</p>	
Power supply		
Voltage	24 V DC ± 25 %; 24 V AC ± 25 %, 48 ... 62 Hz	
Power consumption	< 15 W, current consumption < 600 mA, minimum fuse protection 2 A time-lag	
Cable entry	M20 x 1.5	
Output		
Analog output	0/4 ... 20 mA, load < 750 Ω, electrically isolated, failure message < 3.5 or > 22 mA	
Degree of protection	IP 65, NEMA 4X	

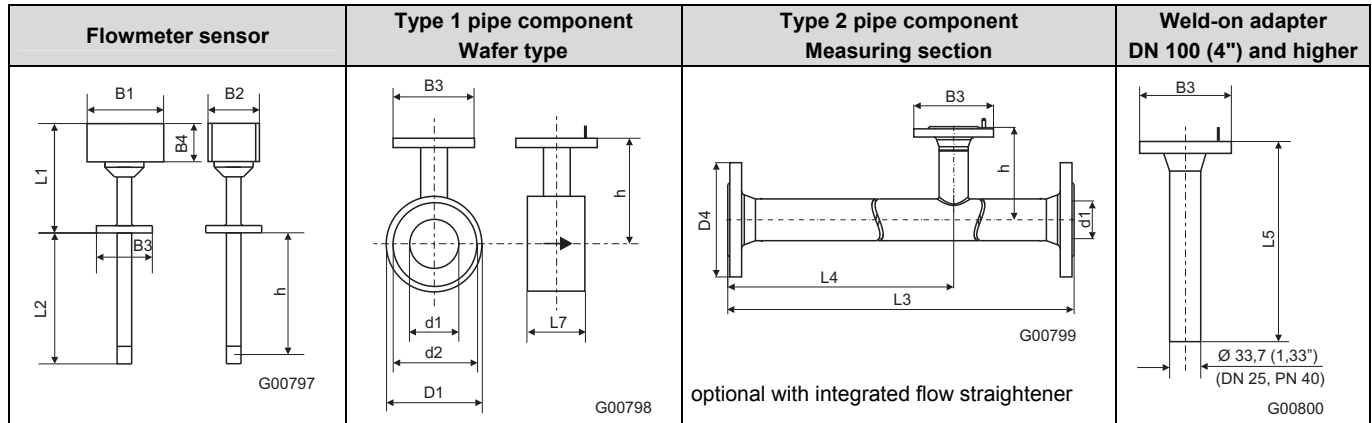
2.1 Parameterization

The output signal range of the FMT400-VTS / VTCS flowmeters can be set to either 0 ... 20 mA or 4 ... 20 mA. Additionally, the measuring range window can be extended such that a smaller span corresponds to a 20 mA current signal. Alarm signalling is possible at < 3.5 mA or > 22 mA (selectable).

The measuring instrument parameters can be set via the LCI-adaptor. A standard PC allows you to change the used output signal and to adjust the measuring range.

3 Sensyflow FMT400-VTS, version for process engineering

3.1 Dimensions



EN 1092-1 form B1, PN 40									
Nominal diameter		L2	h	D1	d1	d2	D4	L3	L4
DN 25		269 (10.59)	263 (10.35)	-	28.5 (1.12)	-	115 (4.53)	600 (23.62)	486 (19.13)
DN 40	B1 = 125 (4.92)			94 (3.70)	43.1 (1.70)	88 (3.46)	150 (5.91)	860 (33.86)	731 (28.78)
DN 50	B2 = 80 (3.15)			109 (4.29)	54.5 (2.15)	102 (4.02)	165 (6.50)	1000 (39.37)	837 (32.95)
DN 65	B3 = Ø115 (4.53)			129 (5.08)	70.3 (2.77)	122 (4.80)	185 (7.28)	1400 (55.12)	1190 (46.85)
DN 80	B4 = 58 (2.28)			144 (5.67)	82.5 (3.25)	138 (5.43)	200 (7.87)	1700 (66.93)	1450 (57.09)
DN 100				170 (6.69)	107.1 (4.22)	162 (6.38)	235 (9.25)	2200 (86.61)	1870 (73.62)
DN 125	L1 = 188 (7.40)			196 (7.72)	131.7 (5.19)	188 (7.40)	270 (10.63)	2700 (106.3)	2300 (90.55)
DN 150	L5 = 450 (17.72)			226 (8.90)	159.3 (6.27)	218 (8.58)	300 (11.81)	3200 (125.98)	2720 (107.09)
DN 200	L7 = 65 (2.56)			293 (11.54)	206.5 (8.13)	285 (11.22)	375 (14.76)	4200 (165.35)	3580 (140.94)
> 350		431 (16.97)	425 (16.73)						
> 700		781 (30.75)	775 (30.51)						
ASME B 16.5, Cl. 150 (ANSI), Sch 40 S									
1"		269 (10.59)	263 (10.35)	-	26.6 (1.05)	-	108 (4.25)	560 (22.05)	454 (17.87)
1 1/2"	B1 = 125 (4.92)			85 (3.35)	40.9 (1.61)	73 (2.87)	127 (5.00)	864 (34.02)	741 (29.17)
2"	B2 = 80 (3.15)			103 (4.06)	52.6 (2.07)	92 (3.62)	154 (6.06)	1003 (39.49)	846 (33.31)
3"	B3 = Ø115 (4.53)			35 (5.31)	78.0 (3.07)	127 (5.00)	-	-	-
4"	B4 = 58 (2.28)			173 (6.81)	102.4 (4.03)	157 (6.18)	-	-	-
6"	L1 = 188 (7.40)			221 (8.70)	154.2 (6.07)	216 (8.50)	-	-	-
8"	L5 = 450 (17.72)			278 (10.94)	202.7 (7.98)	270 (10.63)	-	-	-
> 14"	L7 = 65 (2.56)	431 (16.97)	425 (16.73)						
> 28"		781 (30.75)	775 (30.51)						
ASME B 16.5, Cl. 300 (ANSI), Sch 40 S									
1"		269 (10.59)	263 (10.35)	-	26.6 (1.05)	-	123.9 (4.88)	560 (22.05)	454 (17.87)
1 1/2"	B1 = 125 (4.92)			94 (3.70)	40.9 (1.61)	73 (2.87)	155.4 (6.12)	864 (34.02)	741 (29.17)
2"	B2 = 80 (3.15)			110 (4.33)	52.6 (2.07)	92 (3.62)	165.1 (6.50)	1003 (39.49)	846 (33.31)
3"	B3 = Ø115 (4.53)			148 (5.83)	78.0 (3.07)	127 (5.00)	-	-	-
4"	B4 = 58 (2.28)			180 (7.09)	102.4 (4.03)	157 (6.18)	-	-	-
6"	L1 = 188 (7.40)			249 (9.80)	154.2 (6.07)	216 (8.50)	-	-	-
8"	L5 = 450 (17.72)			307 (12.09)	202.7 (7.98)	270 (10.63)	-	-	-
> 14"	L7 = 65 (2.56)	431 (16.97)	425 (16.73)						
> 28"		781 (30.75)	775 (30.51)						

Dimensions in mm (inch)

3.2 Installation instructions

3.2.1 Weld-on adapter for Sensyflow FMT400-VTS

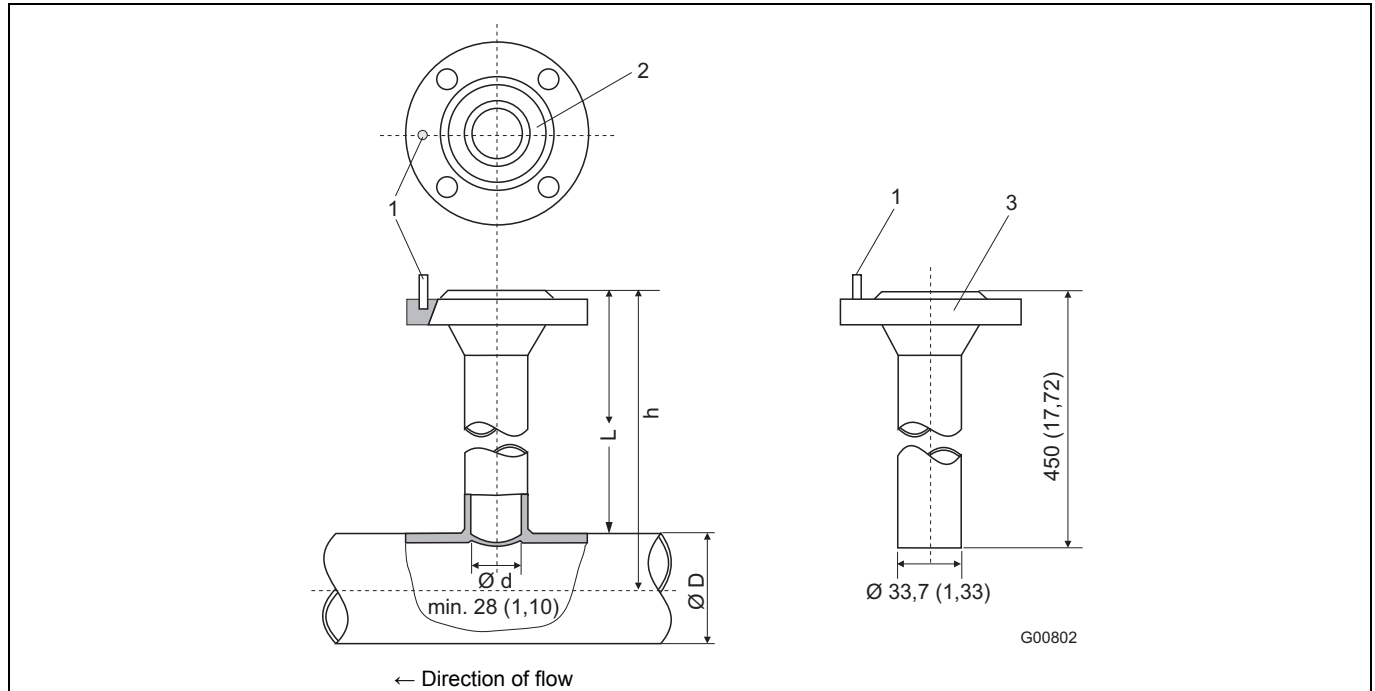


Fig. 4: Dimensions in mm (inch)

- | | |
|-----------------------|--------------------------------|
| 1 Centering pin | 3 Connection flange DN 25 (1") |
| 2 Sealing ring groove | D Outer pipe diameter |

Flowmeter sensor length h in mm (inch)	Outer pipe diameter min. / max. in mm (inch)
263 (10.35)	100 ... 350 (3.94 ... 13.78)
425 (16.73)	> 350 ... 700 (13.78 ... 27.56)
775 (30.51)	> 700 ... 1400 (27.56 ... 55.12) ¹⁾

¹⁾ This maximum pipe diameter specification is only valid when installing the sensor unit centrally in the pipe. For larger diameters or angular ducts a non-centric sensor position is taken into account for calibration.



IMPORTANT (NOTE)

Prior to mounting the weld-on adapters must be shortened to length: $L = h - 1/2 D_{\text{outer}}$

The distance h between the upper flange edge and the pipe center line must be within a tolerance of $\pm 2 \text{ mm}$ (0.08").

The right angle to the pipe center line must be observed (max. tolerance $\pm 2^\circ$).

The centering pin of the adapter must be aligned centrally with the pipe center line in flow direction (on outlet run side, downstream of the measuring point).

3.2.2 Weld-on adapter with ball valve for Sensyflow FMT400-VTS

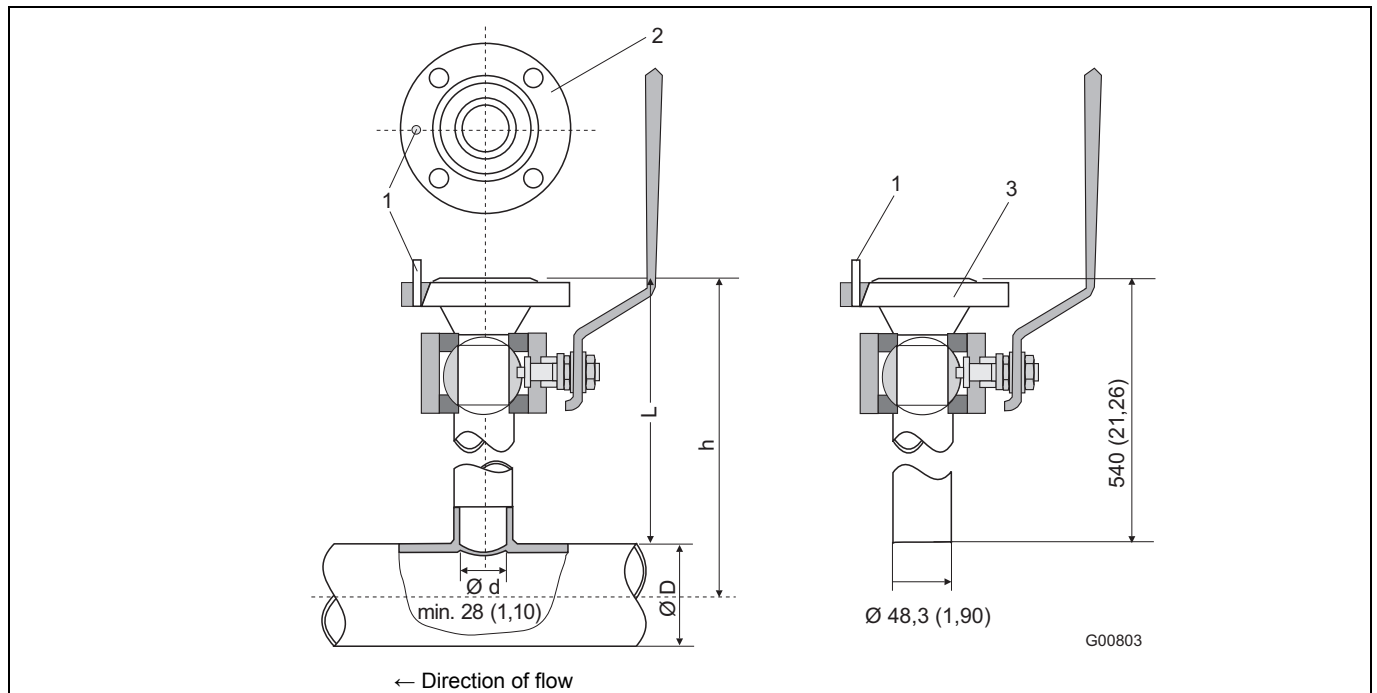


Fig. 5: Dimensions in mm (inch)

- 1 Centering pin
- 2 Sealing ring groove
- 3 Connection flange DN 25 (1")
- D Outer pipe diameter

Flowmeter sensor length h in mm (inch)	Outer pipe diameter min. / max. in mm (inch)
263 (10.35)	100 ... 150 (3.94 ... 5.91)
425 (16.73)	> 150 ... 500 (5.91 ... 19.69)
775 (30.51)	> 500 ... 1150 (19.69 ... 45.28) ¹⁾

¹⁾ This maximum pipe diameter specification is only valid when installing the sensor unit centrally in the pipe.
For larger diameters or angular ducts a non-centric sensor position is taken into account for calibration.



IMPORTANT (NOTE)

Prior to mounting the weld-on adapters must be shortened to length: $L = h - 1/2 D_{\text{outer}}$

The distance h between the upper flange edge and the pipe center line must be within a tolerance of $\pm 2 \text{ mm}$ (0.08").

The right angle to the pipe center line must be observed (max. tolerance $\pm 2^\circ$).

The centering pin of the adapter must be aligned centrally with the pipe center line in flow direction (on outlet run side, downstream of the measuring point).

3.2.3 Integrated hot tap fitting for Sensyflow FMT400-VTS

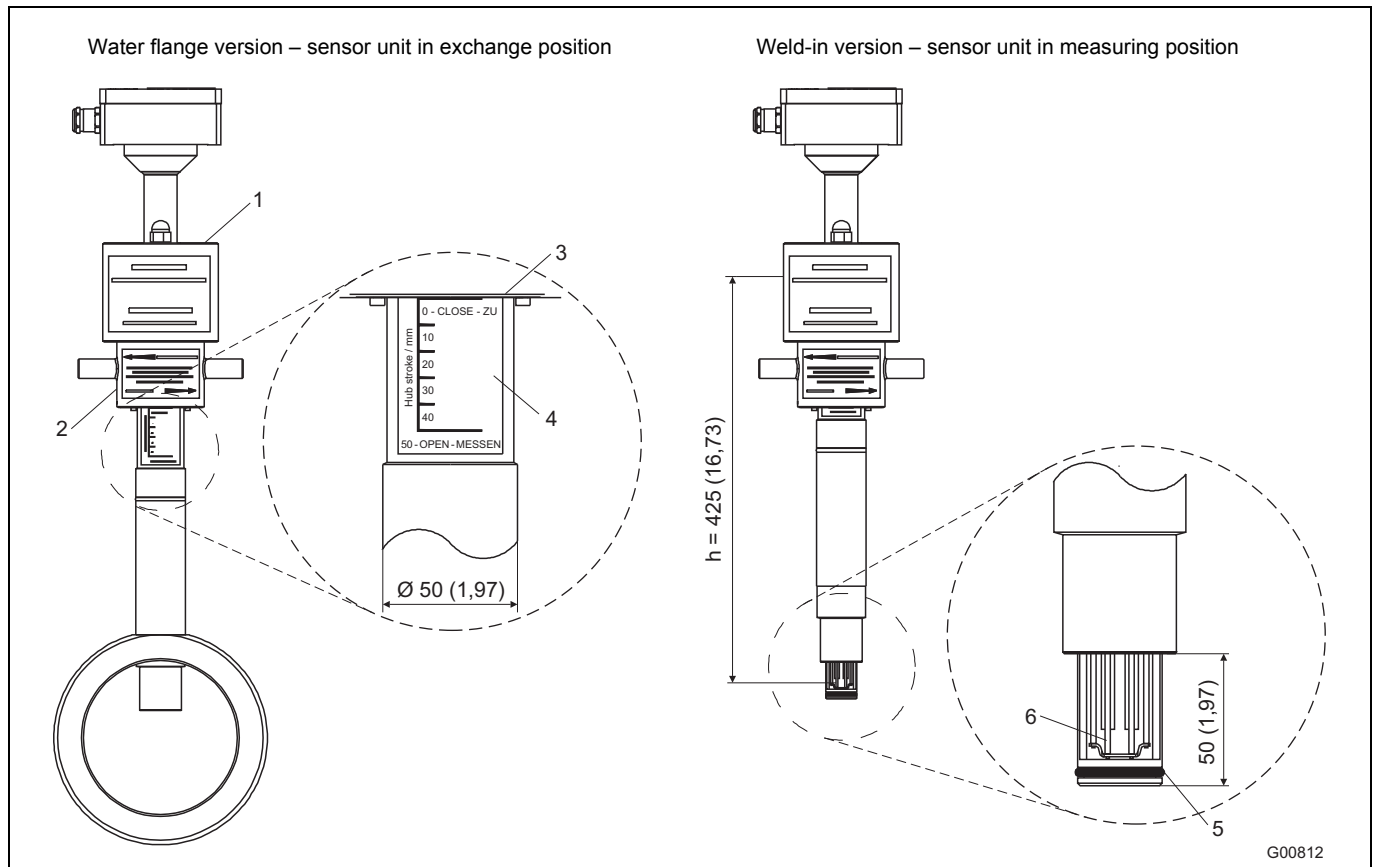


Fig. 6: Dimensions in mm (inch)

- | | |
|-----------------------------|---|
| 1 Covers for DN 25 flange | 4 Display of sensor unit position, 50 mm (1,97") stroke |
| 2 Spigot nut | 5 Sealing ring |
| 3 Bottom edge of spigot nut | 6 Sensor elements |

Flowmeter sensor length h	
Water flange version	Weld-in version
h = 263 mm (10.35") for DN 50, DN 65 and DN 80 / 2", 3" h = 425 mm (16.73") for DN 100, DN 125, DN 150 and DN 200 / 4", 6", 8"	h = always 425 mm (16.73")

The integrated hot tap fitting is used instead of the pipe component and weld-on adapter assembly described above if the flowmeter sensor must be exchangeable during operation with virtually no gas escaping from the system.

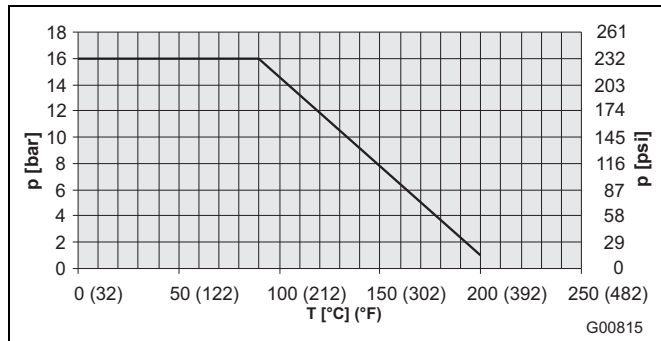


Fig. 7: Maximum pressure/temperature values for the integrated hot tap fitting

It is recommended to use the hot tap fitting for measurements in main conduits (e.g. compressed air systems) or for measuring points which otherwise require rinsing prior to removing the flowmeter sensor. As a rule, hot tap fittings should be preferred for all systems where, otherwise, the entire system or parts of it must be switched off to replace a flowmeter sensor.

Handling:

The flowmeter sensor is screwed to the hot tap fitting through the DN 25 flange. Then the cover is put on. The sensor unit is set from the exchange position to the measuring position by turning the spigot nut. The bottom edge of the spigot nut indicates the current sensor unit position (see Detail A, sensor unit is in exchange position). Only when the measuring position 50 – OPEN - MESSEN (lower stop of the spigot nut) is reached, the sensor elements are placed exactly in the center of the pipe and exact measurement is ensured.

i IMPORTANT (NOTE)

For integrated hot tap fitting in wafer flange design DN 65, use connection flange PN16 with 4 screw holes on the process side. Wafer flange versions 2 ... 8" only for connection flange ASME B16.5 Cl.150.

3.3 Ordering information

	Main order number										Add. order no.					
	Version number	1 - 6	7	8	9	10	11	12	13	14		15				
Sensyflow FMT400-VTS Thermal Mass Flowmeter, for process engineering, for gases, integral mount design	V14222		X	X	X	X	X	X	X	X						XXX
Sensor unit																
Ceramic sensor			0													
Version																
VTS, process engineering					1											
VTS, process engineering, ATEX Zone 2 / 22					2											
Operating Temperature																
Standard range					1)	1										
Extended range -25 ... 300 °C (-15 ... 572 °F) (not with Ex-Version)						2										
Measuring Medium																
Gases, gas mixtures and natural gas (with max. 23.5 Vol% O2 each)						2)	0									
Oxygen / gas mixtures > 23.5 Vol% O2, oil and grease-free, with O2 certificate (max. 150 °C / 302 °F)							1									
Natural gas, with DVGW certificate (max. 80 °C / 176 °F)							2									
Hydrogen, Helium (max. 8 bar / 0.8 MPa / 116 psi, always with process gas calibration)						3)	3									
Ammonia Application							4									
Mounting Length / Material																
263 mm (10.4 in.) / AISI 316Ti SST (1.4571) (DN 25 ... DN 350 [1 ... 14 in.])							4)	1	0							
425 mm (17 in.) / AISI 316Ti SST (1.4571) (> DN 350 ... DN 700 [> 14 ... 28 in.])							4)	2	0							
775 mm (31 in.) / AISI 316Ti SST (1.4571) (> DN 700 [> 28 in.])							4)	3	0							
Analog Output																
4 ... 20 mA, alarm < 3.5 mA									5)	1						
4 ... 20 mA, alarm > 22 mA									5)	2						
0 ... 20 mA									5)	3						
Number of Characteristic Curves																
1 characteristic curve																1
Certificates: Calibration																
Factory certificate																0
DAkKS certificate of calibration with air (not for process gas calibration)																6) 1
Certificates and Material Traceability																
Material certificate 3.1 acc. EN 10204																CBB
Declaration of compliance with the order 2.1 acc. EN 10204																CF3
Certificates: GOST																
GOST Russia - metrological approval																CG1
GOST Kazakhstan - metrological approval																CG2
Adapter																
LCI adapter																GL
Language of documentation																
German																M1
English																M5
Russian																MB
Western Europe / Scandinavia language package (languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)																MW
Eastern Europe language package (languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)																ME
Accessories																
FMT Power supply unit, housing for rail mounting 62.5 mm x 75 mm x 139 mm, input 230 V AC, output 24 V DC / 2.5 A																7962800
FMT400-VTS / FMT400-VTCS Blind Cover Threat DN25 / 1 inch with seal, to close flowmeter sensor connection																3KXF003016U0200
FMT400-VTS / FMT400-VTCS Blind Cover, threat DN 25 / 1 in., with seal, to close flowmeter sensor connection																3KXF421400L0001
FMT400-VTS / FMT400-VTCS Commissioning Instruction, English																3KXF421002R4401
FMT400-VTS / FMT400-VTCS Commissioning Instruction, German																3KXF421002R4403
FMT400-VTS / FMT400-VTCS Commissioning instruction, Language package Eastern Europe																3KXF421002R4494
FMT400-VTS / FMT400-VTCS Commissioning Instruction, Language package Western Europe / Scandinavia																3KXF421002R4493
FMT400-VTS / FMT400-VTCS Operating Instruction, Russian																3KXF421002R4222

- 1) Non-Ex version: -25 ... 150 °C (-15 ... 302 °F), ATEX Zone 2 / 22 version: -20 ... 130 °C (-4 ... 266 °F).
- 2) Not for pure oxygen.
- 3) With measuring medium H2 or He, lower measuring range limit typical 10% of upper limit, in nominal size DN 25 ... DN 50 (1 ... 2 in.):
Please use pipe component design 2 with flow straightener.
- 4) Nominal size ranges when using pipe components or weld-on adapters without ball valve.
- 5) Changeable via LCI adapter.
- 6) DAkKS- / ILAC-accredited calibration equipment D-K-15081-01-00.

	Main order number										Add. order no.
	Version number	1 - 6	7-9	10	11	12	13	14	15		
FMT081 pipe component / weld-on adapter, for Sensyflow FMT500-IG and FMT400-VTS	FMT081	XXX	X	X	X	X	X	X	X		XXX
Mounting Length of the Sensor											
263 mm (10.4 in.)		263									
425 mm (17 in.)		425									
775 mm (31 in.)		775									
Measuring Medium											
Gases, gas mixtures, and natural gas (each max. 23.5 vol% O ₂)				A							
Oxygen / gas mixtures > 23.5 Vol% O ₂ , oil and grease-free, with O ₂ certificate (max. 150 °C / 302 °F)				B							
Natural gas, with DVGW certificate (max. 80 °C / 176 °F)				C							
Hydrogen, Helium				1) D							
Design											
Pipe component 1 in wafer flange version					1						
Pipe component design 2 as partial measuring section					2						
Pipe component design 2 as partial measuring section with integrated flow straighteners					3						
Weld-on adapter				2)	4						
Other					9						
Nominal Diameter											
Selection for weld-on adapter								Y			
DN 25 (1 in.)					3)	A					
DN 40 (1-1/2 in.)					4)	C					
DN 50 (2 in.)						D					
DN 65 (2-1/2 in.)					5)	E					
DN 80 (3 in.)					6)	F					
DN 100 (4 in.)					6)	G					
DN 125 (5 in.)					6)	H					
DN 150 (6 in.)					6)	J					
DN 200 (8 in.)					6)	L					
Other					7)	Z					
Flange Style and Pressure Rating											
Selection for weld-on adapter									0		
DIN PN 40, nominal pressure 40 bar (4 MPa / 580 psi)									1		
ANSI / ASME CL 150, Schedule 40 S									2		
ANSI / ASME CL 300, Schedule 40 S								4)	3		
Other									9		
Process Connection for Flowmeter Sensor											
Standard Sensyflow flange with centering pin								8)	A		
With ball valve, max. 150 °C (302 °F) and 16 bar (1.6 MPa / 232 psi)								9)	G		
With integrated hot tap fitting for max. DN 125 (5 in.). Allows gas-tight flowmeter sensor removal / insertion up to 16 bar (1.6 MPa / 232 psi) or 200 °C (392 °F). For DN 65, use connection flanges PN 16 with 4 screw holes (For pipe component DN 50 ... DN 80, apply Sensor Length h = 263 mm, from DN 100 and for weld-on adapter, apply Sensor Length h = 425 mm)								10)	H		
With integrated hot tap fitting above DN 125 (5 in.) to max. DN 200 (8 in.) / DN 300 (12 in.) with weld-on adapter. Allows gas-tight flowmeter sensor removal / insertion up to 16 bar (1.6 MPa / 232 psi) or 200 °C (392 °F) (Please apply the correct sensor length)								11)	J		
Material											
Stainless steel AISI 316Ti (1.4571)											3
Carbon steel S 235 (1.0037)									12)	1	
Plastics PE-HD (Polyethylene high-density)									12)	7	
Blind Flange											
DN 25 blind flange to close flowmeter sensor connection, material stainless steel AISI 316Ti (1.4571)											F3
Certificates and Material Traceability											
Material certificate 3.1 acc. EN 10204											CBB
Declaration of compliance with the order 2.1 acc. EN 10204											CF3

Footnotes see next page

- 1) Max. 8 bar / 0.8 MPa / 116 psi. With DN 25 ... DN 50 (1 ... 2 in.): Please use pipe component 2 with flow straightener.
- 2) From DN 100 (4 in.).
- 3) Not available with pipe component 1 in wafer flange version.
- 4) Not available with hot-tap-fitting.
- 5) Not available with flange style ANSI / ASME.
- 6) Not available with pipe component 2 in combination with flange style ANSI / ASME.
- 7) Please specify exact inner pipe diameter.
- 8) Correct sensor length: For pipe component 1 and 2 without ball valve / hot tap fitting: h = 263 mm. For weld-on adapter and pipe diameter up to 350 mm: h = 263 mm, up to 700 mm: h = 425 mm, > 700 mm: h = 775 mm
- 9) Not available with DVGW certificate. 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
- 10) Not available with DVGW certificate. Correct sensor length: For pipe component DN 50 ... DN 80: h = 263 mm, for pipe component from DN 100 and weld-on adapter: h = 425 mm.
- 11) Not available with DVGW certificate. Please apply the correct sensor length.
- 12) Only for weld-on adapter without ball-valve. Only without certificates.

3.4 Additional ordering information for calibration

FMT400-VTS, FMT400-VTCS		
Gas component 1	Vol. %	(clear text)
Gas component 2	Vol. %	(clear text)
Gas component 3	Vol. %	(clear text)
Gas component 4	Vol. %	(clear text)
Gas component 5	Vol. %	(clear text)
Gas component 6	Vol. %	(clear text)
Gas component 7	Vol. %	(clear text)
Gas component 8	Vol. %	(clear text)
Gas component 9	Vol. %	(clear text)
Gas component 10	Vol. %	(clear text)
		Sum 100 %
Operating temperature		(clear text)
Operating pressure		(clear text)
Nominal diameter, Pipe inner diameter (mm)		(clear text)
Measuring range		(clear text)
Unit		(clear text)
Standard state (e.g. 0 °C, 1013 mbar)		(clear text)
Adjusted measuring range		(clear text)

4 Sensyflow FMT400-VTCS, hygienic version

4.1 Dimensions

Pipe fitting S according to DIN 11851

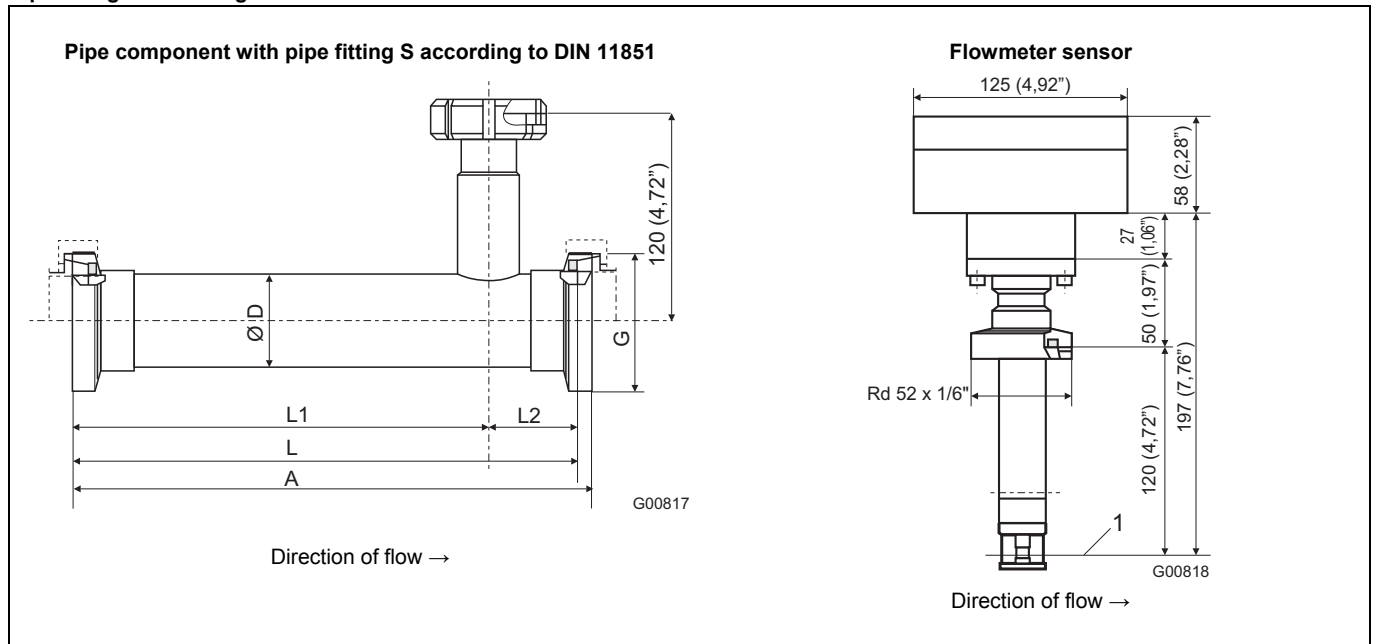


Fig. 8: Nominal pressure PN16 for DN 25, DN 40, DN50; PN10 for DN 80

1 Centre of pipe component

DN	A	L	L1	L2	Ø D	G
25 (1")	196 (7.72)	182 (7.17)	140 (5.51)	42 (1.65)	28 x 1 (1.10 x 0.04)	Rd52 x 1/6"
40 (1.5")	284 (11.18)	270 (10.63)	205 (8.07)	65 (2.56)	40 x 1 (1.57 x 0.04)	Rd62 x 1/6"
50 (2")	344 (13.54)	330 (12.99)	265 (10.43)	65 (2.56)	52 x 1 (2.04 x 0.04)	Rd78 x 1/6"
80 (3")	526 (20.71)	510 (20.08)	425 (16.73)	85 (3.35)	85 x 2 (3.35 x 0.08)	Rd110 x 1/4"

Dimensions in mm (inch)

FG flange

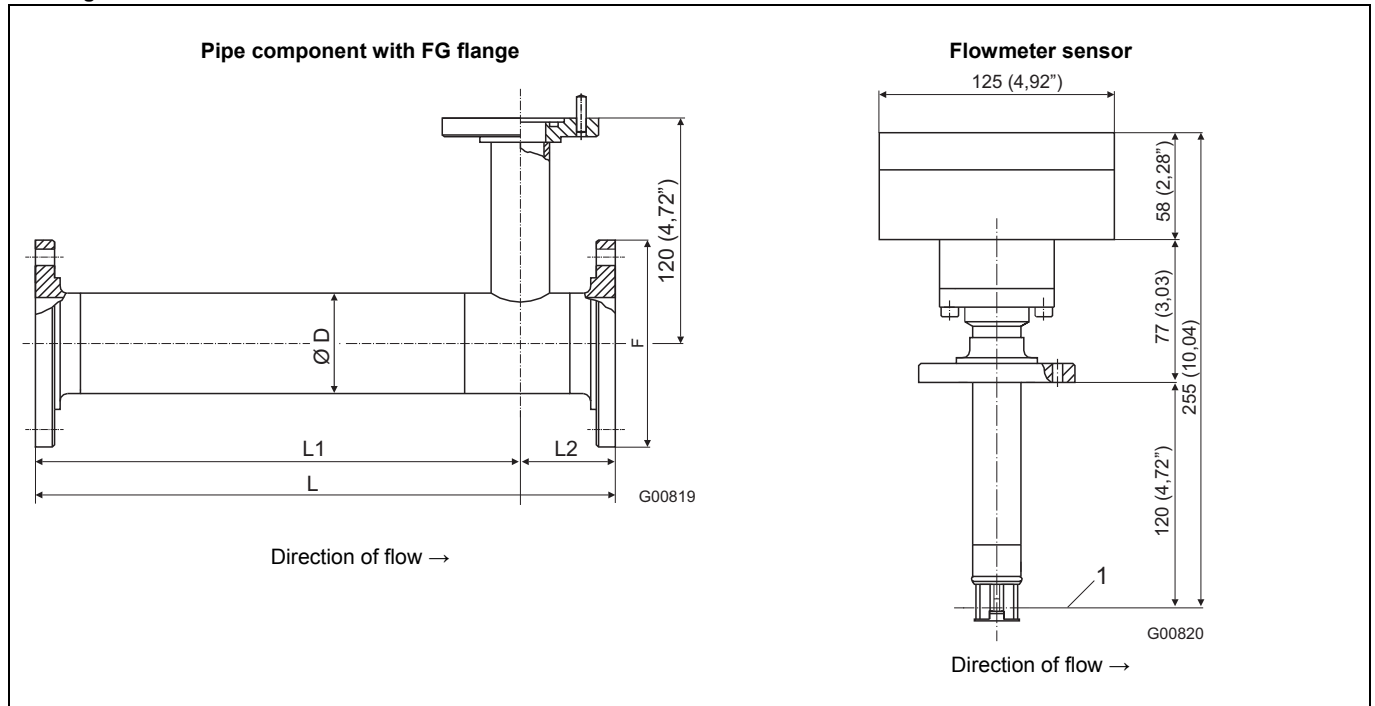


Fig. 9: FG1, PN10

1 Centre of pipe component

DN	L	L1	L2	Ø D	F
25 (1")	175 (6.89)	133 (5.24)	42 (1.65)	29 x 1.5 (1.14 x 0.06)	83 (3.27)
40 (1.5")	270 (10.63)	205 (8.07)	65 (2.56)	42 x 2 (1.65 x 0.08)	100 (3.94)
50 (2")	330 (12.99)	265 (10.43)	65 (2.56)	54 x 2 (2.12 x 0.08)	110 (4.33)

The FG flanges on the pipe component's process side are always smooth (without groove).

Dimensions in mm (inch)

4.2 Measuring ranges at atmospheric pressure

Type of gas		Air, nitrogen, oxygen -25 ... 150 °C (-13 ... 302 °F)											
Nominal diameter		q_{min} kg/h		q_{max} kg/h		q_{min} Nm ³ /h		q_{max} Nm ³ /h		q_{min} lbs/h		q_{max} lbs/h	
mm	inch	for 0 °C (32 °F) / 1013.25 hPa (14.696 psia)											
DN 25	1	0	...	160	0	...	120	0	...	350	0	...	350
DN 40	1.5	0	...	430	0	...	330	0	...	950	0	...	950
DN 50	2	0	...	700	0	...	540	0	...	1500	0	...	1500
DN 80	3	0	...	1700	0	...	1300	0	...	3700	0	...	3700

Type of gas		Carbon dioxide -25 ... 150 °C (-13 ... 302 °F)											
Nominal diameter		q_{min} kg/h		q_{max} kg/h		q_{min} Nm ³ /h		q_{max} Nm ³ /h		q_{min} lbs/h		q_{max} lbs/h	
mm	inch	for 0 °C (32 °F) / 1013.25 hPa (14.696 psia)											
DN 25	1	0	...	180	0	...	90	0	...	400	0	...	400
DN 40	1.5	0	...	440	0	...	220	0	...	970	0	...	970
DN 50	2	0	...	730	0	...	370	0	...	1600	0	...	1600
DN 80	3	0	...	1900	0	...	900	0	...	4200	0	...	4200

4.3 Ordering information

	Main order number											Add. order no.				
	Version number	1 - 6	7	8	9	10	11	12	13	14	15					
Sensyflow FMT400-VTCS Thermal Mass Flowmeter, hygienic version, for gases, integral mount design	V14222		X	X	X	X	X	X	X	X	X				XXX	
Sensor Unit Metal sensor, stainless steel	1)		1													
Version VTCS, Hygienic version, pipe screw connection S acc. DIN 11851, nominal pressure PN 16 (16 bar / 1.6 MPa / 232 psi)					6											
VTCS, Hygienic version, FG flange, nominal pressure PN 10 (10 bar / 1 MPa / 145 psi)					8											
Operating Temperature Standard range -25 ... 150 °C (-13 ... 302 °F), hygienic version									0							
Measuring Medium Gases, gas mixtures and natural gas (with max. 23.5 Vol% O2 each)								2)	0							
Oxygen / gas mixtures > 23.5 Vol% O2, oil and grease-free, with O2 certificate (max. 150 °C / 302 °F)								3)	1							
Mounting Length / Material 120 mm (4.8 in.) / Stainless steel										4	0					
Analog Output 4 ... 20 mA, alarm < 3.5 mA													4)	1		
4 ... 20 mA, alarm > 22 mA													4)	2		
0 ... 20 mA													4)	3		
Number of Characteristic Curves 1 characteristic curve															1	
Certificates: Calibration Factory certificate																0
DAkKS certificate of calibration with air (not for process gas calibration)														5)	1	
Certificates and Material Traceability Material certificate 3.1 acc. EN 10204																CBB
Declaration of compliance with the order 2.1 acc. EN 10204																CF3
Certificates: GOST GOST Russia - metrological approval																CG1
GOST Kazakhstan - metrological approval																CG2
Adapter LCI adapter																GL
Language of documentation German																M1
English																M5
Russian																MB
Western Europe / Scandinavia language package (languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)																MW
Eastern Europe language package (languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)																ME

Accessories	Order number
FMT Power supply unit, housing for rail mounting 62.5 mm x 75 mm x 139 mm, input 230 V AC, output 24 V DC / 2.5 A	7962800
FMT400-VTS / FMT400-VTCS Blind Cover Threat DN25 / 1 inch with seal, to close flowmeter sensor connection	3KXF003016U0200
FMT400-VTS / FMT400-VTCS Blind Cover, threat DN 25 / 1 in., with seal, to close flowmeter sensor connection	3KXF421400L0001
FMT400-VTS / FMT400-VTCS Commissioning Instruction, English	3KXF421002R4401
FMT400-VTS / FMT400-VTCS Commissioning Instruction, German	3KXF421002R4403
FMT400-VTS / FMT400-VTCS Commissioning Instruction, Language package Eastern Europe	3KXF421002R4494
FMT400-VTS / FMT400-VTCS Commissioning Instruction, Language package Western Europe / Scandinavia	3KXF421002R4493
FMT400-VTS / FMT400-VTCS Operating Instruction, Russian	3KXF421002R4222

- 1) Only for FMT400-VTCS, Hygienic version.
- 2) Not for pure oxygen.
- 3) Not for flange FG.
- 4) Changeable via LCI adapter.
- 5) DAkKS- / ILAC-accredited calibration equipment D-K-15081-01-00

		Main order number								Add. order no.
Version number		7-9	10	11	12	13	14	15		
FMT082 pipe component, for Sensyflow FMT400-VTCS		FMT082	XXX	X	X	X	X	X	X	XXX
Mounting Length of the Sensor 120 mm (4.8 in.)		120								
Measuring Medium Gases, gas mixtures and natural gas (each max. 23.5 Vol% O ₂) Oxygen / gas mixtures > 23.5 Vol% O ₂ , oil and grease-free, with O ₂ certificate (max. 150 °C / 302 °F)			A							
Design Pipe component for Sensyflow FMT400-VTCS		0								
Nominal diameter DN 25 (1 in.) DN 40 (1-1/2 in.) DN 50 (2 in.) DN 80 (3 in.)					A	C	D	F		
Flange Style and Pressure Rating Pipe screw connection S acc. DIN 11851, nominal pressure PN 16 (16 bar / 1.6 MPa / 232 psi) FG flange, nominal pressure PN 10 (10 bar / 1 MPa / 145 psi)						6	1)	8		
Process Connection for Flowmeter Sensor Standard Sensyflow flange with centering pin								A		
Material Stainless steel AISI 304 (1.4301), only with pipe screw connection S / nominal pressure PN 16 Stainless steel AISI 316L (1.4404), only with FG flange / nominal pressure PN 10									4	5
Certificates and Material Traceability Material certificate 3.1 acc. EN 10204 Declaration of compliance with the order 2.1 acc. EN 10204										CBB CF3

1) Not available with oxygen measurement

4.4 Additional ordering information for calibration

FMT400-VTS, FMT400-VTCS		
Gas component 1	Vol. %	(clear text)
Gas component 2	Vol. %	(clear text)
Gas component 3	Vol. %	(clear text)
Gas component 4	Vol. %	(clear text)
Gas component 5	Vol. %	(clear text)
Gas component 6	Vol. %	(clear text)
Gas component 7	Vol. %	(clear text)
Gas component 8	Vol. %	(clear text)
Gas component 9	Vol. %	(clear text)
Gas component 10	Vol. %	(clear text)
		Sum 100 %
Operating temperature		(clear text)
Operating pressure		(clear text)
Nominal diameter, Pipe inner diameter (mm)		(clear text)
Measuring range		(clear text)
Unit		(clear text)
Standard state (e.g. 0 °C, 1013 mbar)		(clear text)
Adjusted measuring range		(clear text)

5 Electrical connections

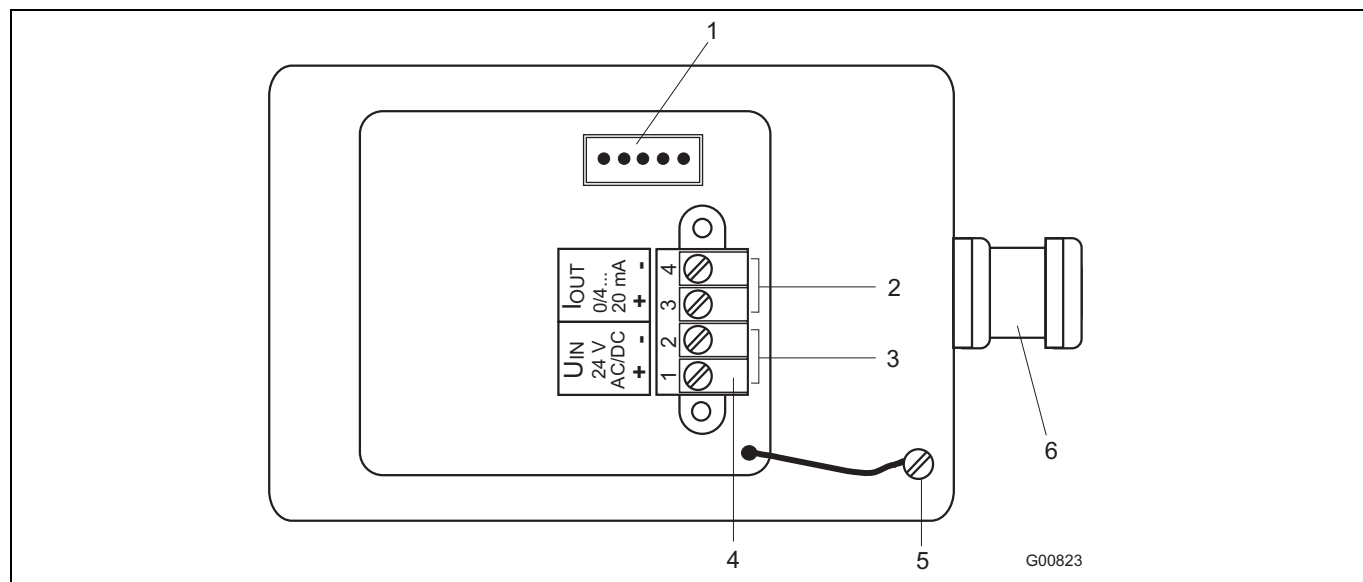
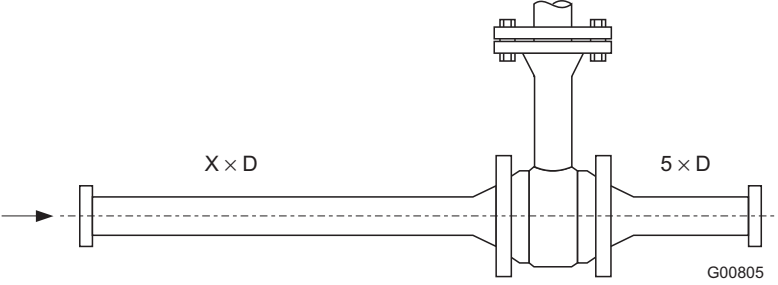
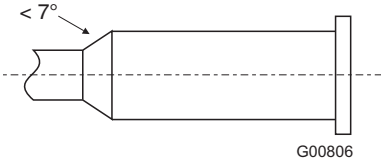
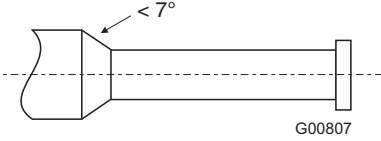
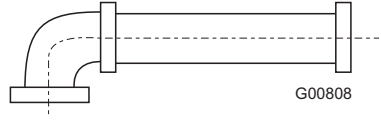
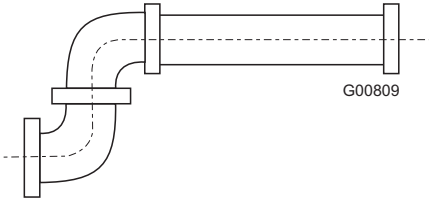
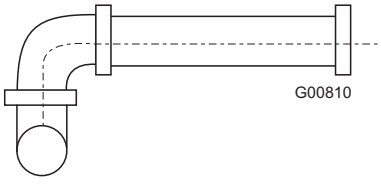
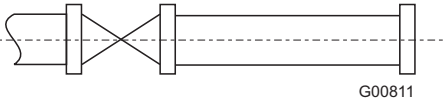


Fig. 10

- 1 Socket for LCI adapter
- 2 Analog output 0/4 ... 20 mA (electrically isolated)
- 3 Power supply 24 V AC/DC
- 4 Terminals
- 5 Ground
- 6 Cable entry

6 Recommended steadying lengths according to DIN EN ISO 5167-1

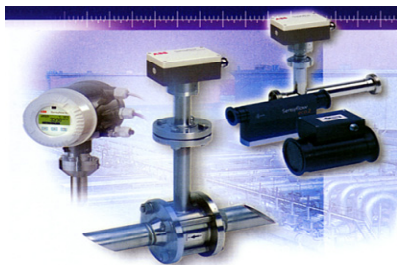
	
	<p>Expansion X = 15</p>
	<p>Reducer X = 15</p>
	<p>90° elbow X = 20</p>
	<p>Two 90° elbow in one level X = 25</p>
	<p>Two 90° elbow in two levels X = 40</p>
	<p>Valve / slide X = 50</p>

To achieve the stated measuring accuracy, the steadying lengths seen above must be provided. For combinations of inlet run disturbances, e. g. valve and reducer, you must always consider the longer inlet run length. In confined spaces at the mounting location the outlet run length can be shortened to $3 \times D$. The reduction of the minimum inlet run length, however, will impact on the achievable accuracy.

High repeatability of the measuring value is still provided. Under certain circumstances, special calibration can be performed for insufficient steadying lengths. For this purpose and in individual cases consulting is necessary.

For gases with extremely low density (hydrogen, helium) the steadying lengths must be doubled.

7 Questionnaire



Questionnaire
Thermal Mass Flowmeter
Sensyflow FMT

Customer address: _____
 Company: _____
 Zip code and location: _____ Date: _____
 Cust. no.: _____ Telephone: _____
 Contact person: _____ E-mail: _____

Media data for gaseous, pure media:

Description of media: _____ Mixed gas, gas composition in vol.%¹⁾

Type of gas (no mixtures): _____ Component 1/name/vol. %: _____
 Operating pressure (bar abs.) _____ Component 2/name/vol. %: _____
 Min./norm./max., approx. _____ Component 3/name/vol. %: _____
 Operating temperature (°C) _____ Component 4/name/vol. %: _____
 Min./norm./max., approx. _____ Component 5/name/vol. %: _____

Flowrate²⁾ Min.: _____ Norm.: _____ Max.: _____ **Pipeline/pipe component**³⁾

Flow unit:

	<i>Standard volume</i>	<i>Mass flow units</i>	DN/PN: _____
Nm ³ /h	<input type="checkbox"/>	kg/h	<input type="checkbox"/>
Nm ³ /min	<input type="checkbox"/>	kg/min	<input type="checkbox"/>
NI/min	<input type="checkbox"/>	g/min	<input type="checkbox"/>
SCFM	<input type="checkbox"/>	t/h	<input type="checkbox"/>
Other _____		Other _____	

ANSI/lbs _____
 Diameter [mm] _____
 Inside diameter specified in mm
 Wafer flange form 1
 Partial meas. section form 2
 Weld-on adapter
 Other _____

*Standard condition, e.g., 0°C/1,013 mbar or _____

Required device designs:

FMT500-IG <input type="checkbox"/>	FMT700-P ⁴⁾ <input type="checkbox"/>	Integral mount design <input type="checkbox"/>
FMT400-VTS <input type="checkbox"/>	FMT200-ECO2 <input type="checkbox"/>	Remote design with
FMT400-VTCS <input type="checkbox"/>	FMT200-D <input type="checkbox"/>	Cable length 5 m <input type="checkbox"/>
		Cable length 15 m <input type="checkbox"/>
		Cable length 25 m <input type="checkbox"/>

Output signal: 0/4...20 mA 4...20 mA/HART PROFIBUS DP-V1

Ex protection class: None ATEX Zone 1/21 ATEX Zone 0/21

Design: Zone 2/22 GOST FM/CSA 24 V 110 V 230 V

Comments:

1) Please specify the composition of mixed gases (e.g., North Sea natural gas: 1) CH₄ 90%, 2) C₂H₆ 5%, 3) N₂ 3%, 4) C₃H₈, 1%, 5) CO₂ 1%).
 2) Calibration is performed at the max. possible flow in the nominal size specified.
 3) Please observe/determine the minimum inflow and outflow sections.
 4) Output signal: 0...10 V as standard

Note: An order can only be confirmed and a delivery date specified once full technical clearance has been obtained.

Notes

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Sales



Service