FCI® FLUID COMPONENTS INTL
A Limited Liability Company

Company Headquarters: 1755 La Costa Meadows Dr., San Marcos, CA 92069-5187

Handbook

Coriolis Flow Meter
FlexCOR™ Model CMF Series

Doc 06EN003327 Rev. -

1. Product Introduction

1.0 Introduction

FlexCOR™ coriolis mass flowmeters measure flow in kilograms or pounds. The measurement is independent of changes in process conditions such as temperature, density, pressure, viscosity, conductivity and flow profile.

FCI FlexCOR™ mass flowmeters are for the direct measurement of:

- Mass flow rate
- Total mass
- Density
- Temperature
- Volumetric flowrate
- Total volume
- Fraction flow
- % fraction (e.g. °Brix)
- Total fraction

Typical applications are found in all industries. E.g.:

- Water industry: Dosing of chemicals for waste water treatment.
- Food industry: Dairy products, beer, wine, soft-drinks, fruit juices and pulps.
- Chemical industry: Detergents, pharmaceuticals, acids, alkalies.
- Automotive industry: Fuel injection nozzle testing, filling of a.c.units, ABS brake test.
- Other industry: Filling of gas bottles, furnace control for district heating, paper pulp.

FlexCOR™ mass flowmeters are characterised by simplicity:

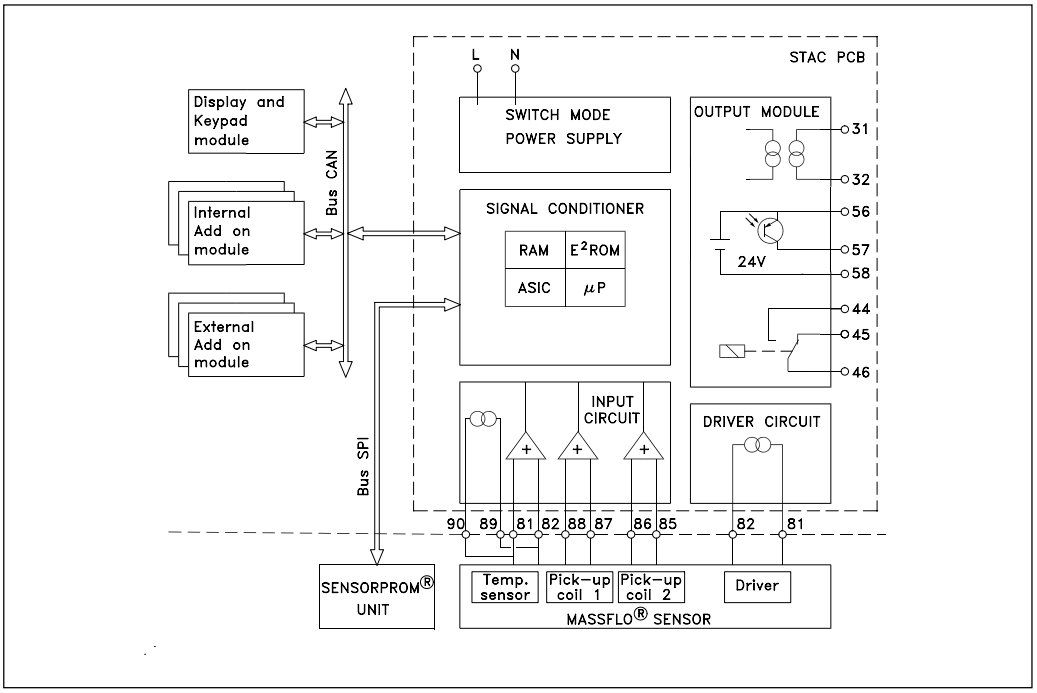
⇒ Simple to install
⇒ Simple to commission
⇒ Simple to operate
⇒ Simple to maintain

The unique **SENSORPROM® flow memory unit** contains sensor data and signal converter settings. The unit is located on the connection board for the signal converter. Immediately on starting, the signal converter uploads the calibration data and factory settings matching the sensor and commences measurement. All customer application settings are retained in the SENSORPROM® unit. If the signal converter is replaced, the new converter will upload all previous settings and resume measurement without any need for reprogramming.

⚠ Documentation needs to be consulted.

⚠ The user shall be made aware of that, if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

1.1 Mode of operation



The flow measuring principle is based on the Coriolis law of movement. The flowmeter consists of a sensor and a transmitter.

Sensor
The sensor is energized by the driver circuit which oscillates the pipe at its resonant frequency. Two pick-up's, 1 and 2 are placed symmetrically on either side of the driver. If liquid or gas flows through the sensor, the Coriolis force will act on the measuring pipe and cause a pipe deflection which can be measured as a phase shift on pick-up 1 and 2.

Transmitter
The transmitter consist of a number of function blocks which convert the sensor signals into flow readings.

Driver circuit
This module excitates the sensor at its resonant frequency. The amplitude of the driver signal is automatically regulated via a "Phase Locked Loop", to ensure a stable output from the 2 pick-up's.

Power supply
2 different types of power supplies are available. 12 - 24 V a.c./d.c. or a 115 - 230 V a.c. switch mode type.

Input circuit
The flow proportional signal from the 2 pick-up's is conditioned in this circuit to a digital signal for further signal processing. The temperature output from the sensor is measured with a current loop and an optional amplifier in a wheatston configuration. The temperature signal is also converted into a 32 bit digital format.

Digital signal processor
The signals from the 2 pick-up's, the temperature measurement and the driver frequency is converted into flow proportional signals used for calculation of mass flow, volume flow, fraction flow, temperature and density. Inaccuracies in the signal converter as a result of long-term drift and temperature drift are monitored and continously compensated for via the self-monitoring circuit. The analog to digital conversion takes place in an ultra low noise ASIC with 23 bit signal resolution. The dynamic range of the signal converter is thus unsurpassed, with a turn down ratio of min. 3000:1.

CAN communication. The signal converter operates internal via a internal CAN communication bus. Signals are transferred to/from a signal conditioner to the display module, internal/external option modules and the dialog module.

Dialog module. The display unit consist of a 3 line display and a 6 key keypad. The display will show a flowrate or a totalizer value as a primary reading.

The output module converts flow data to an analog, a digital and a relay output. The outputs are galvanically isolated and can be individually set to suit a particular application.

2. Technical data
2.1 CMF Series A Through F

Versions		CMF- A	CMF - B	CMF - C	CMF - D	CMF - E	CMF - F
 	*inch* *(N ominal)*	$^1/_{16}$	$^1/_8$	$^1/_4$	1/2	1	2
Inside pipe diameter (Sensor consists of one continuous pipe)	*mm*	1.5	3.0	6.0	14.0	29.7	43.1
Pipe wall thickness	*mm*	0.25	0.5	1.0	1.0	2.0	2.6
Mass flow measuring range	*lb/min*	0-2.4	0-9.2	0-37	0-206	0-921	0-1916
	(kg/h)	(0-65)	(0-250)	(0-1,000)	(0-5,600)	(0-25,000)	(0-52,000)
Density	*g/cm³*	0.1-2.9					
Fraction e.g.	*°Brix*	0-100					
Temperature °C		-58 to 257°F	-58 to 356°F				
Standard		(–50 to +125)	(–50 to +180)				
High temperature version		-58 to 356°F (–50 to +180)					
Liquid pressure measuring pipe [1]							
Stainless steel	*psi*	4292	4277	4741	2291	1957	1812
	(bar)	(296)	(310)	(345)	(165)	(135)	(125)
Hastelloy C-22	*psi*	6670	5655	6235	3016	2769	2508
	(bar)	(460)	(390)	(430)	(208)	(191)	(173)
Materials							
Measuring pipe, flange-,		1.4435 (316 Stainless steel)					
Thread connection as standard		2.4602 (Hastelloy C-22)					
Enclosure and enclosure material		IP 65 and 1.4301 (Stainless steel)					
Enclosure, burst pressure	*psi*	1015	2755	2755	2030	1305	725
	(bar)	(70)	(190)	(190)	(140)	(90)	(50)
Process connections [2]							
Flange							
ANSI B16.5, Class 150				$^1/_2$"	$^1/_2$"	1"	$1^1/_2$"
ANSI B16.5, Class 600 (Class 300)				$^1/_2$"	$^1/_2$"	1 "	$1^1/_2$"
Clamp (PN 16) [3]							
ISO 2852/BS 4825 part 3 (SMS3016)				1"	1"	1"	2"
Thread							
ANSI/ASME B1.20.1, PN 100		$^1/_4$" NPT	$^1/_4$" NPT	$^1/_2$" NPT	$^1/_4$" NPT	1" NPT	2" NPT
Cable connection		Multiple plug connection to sensor $5 \times 2 \times 0.35$ mm² twisted and screened in pairs, ext. ∅ 12 mm					
Ex-version [4]		EEx ia II C T3-T6					
Weight approx.	*lbs*	5.7	9	18	27	106	106
	(kg)	(2.6)	(4)	(8)	(12)	(48)	(48)

1) Max. at 20 °C, DIN 2413, DIN 17457
2) Other connections to order, see chapter 9, ordering
3) Material, 1.4401 or corresponding
4) Intrinsically safe approval: CENELEC and ASEV

2.2.1 Mass Flowmeter Compact IP 67

	**Mass Flowmeter Compact IP 67**	
Measurement of	Mass flow [lb/min / kg/s], volume flow [gpm / [l/s], fraction [%], °Brix, density [kg/m^3], temperature [°F,°C]	
Current output		
Current	0-20 mA or 4-20 mA	
Load	< 800 ohm	
Time constant	0-30 s adjustable	
Digital output		
Frequency	0-10 kHz, 50% duty cycle	
Time constant	0-30 s adjustable	
Active	24 V d.c., 30 mA, 1 KΩ ≤ R_{load} ≤ 10 KΩ, short-circuit-protected	
Passive	3-30 V d.c., max. 110 mA, 1 KΩ ≤ R_{load} ≤ 10 KΩ	
Relay		
Type	Change-over relay	
Load	42 V / 2 A peak	
Functions	Error level, error number, limit, direction	
Digital input	11-30 V d.c. Ri = 13.6 KΩ	
Functionality	Start/hold/continue batch, 0-point adjust, reset totalizer 1/2, force output, freeze output	
Galvanic isolation	All inputs and outputs are galvanically isolated, isolation voltage 500 volts	
Cut-off		
Low-flow	0-9.9% of maximum flow	
Limit function	Mass flow, volume flow, fraction, density, sensor temperature	
Totalizer	Two eight-digit counters for forward, net or reverse flow	
Display	Background illumination with alphanumerical text, 3 × 20 characters to indicate flow rate, totalized values, settings and faults.	
	Reverse flow indicated by negative sign	
0-point adjustment	Manual via keypad or remote via digital input	
Ambient temperature	Operation: –20 to +50°C, max. rel. humidity 80% to 31°C decreasing to 50% at 40°C according to UL 3101	
	During storage: –40 to +70°C (Humidity max. 95%)	
Communication	Prepared for client mounted add-on modules	
Enclosure		
Material	Fiber glass-reinforced polyamide	
Rating	IP 67 to IEC 529 and DIN 40050 (1 m w.g. for 30 min.)	
Mechanical load	18-1000 Hz random, 3.17G rms, in all directions, to IEC 68-2-36	
Supply voltage	***24 V version***	***230 V version***
Supply	24 V d.c./a.c., 50-60 Hz	115/230 V a.c., 50-60 Hz
Fluctuation	24 V d.c., –25 to 25%	+10 to -10%
	24 V a.c., –16 to 25%	
Power consumption	10 W	26 VA
Fuse	230 V version: T400 mA, T 250V (IEC 127) - Not to be changed by user	
	24 V version: T1A, T 250V (IEC 127) - Not to be changed by user	
EMC performance	Emission EN 50081-1 (Light industry)	
	Immunity EN 50082-2 (Industry)	
Namur	Within the value limits according to "Allgemeine Anforderung" with error criteria A in accordance with NE 21	
Evironment	Environmental conditions acc. to UL 3101: Indoor use Altitude up to 2000 m POLLUTION DEGREE 2	
Maintenance	The flowmeter has a built-in error log/pending menu which should be inspected on a regular basis	

2.2.2 Mass Flowmeter 19" IP 20

	**Mass Flowmeter 19" IP 20**	
Measurement of	Mass flow [lb/min / kg/s], volume flow [gpm, l/s], fraction [%], °Brix, density [kg/m^3], temperature [°F, °C]	
Current output		
Current	0-20 mA or 4-20 mA	
Load	< 800 ohm	
Time constant	0-30 s adjustable	
Digital output		
Frequency	0-10 kHz, 50% duty cycle	
Time constant	0-30 s adjustable	
Active	24 V d.c., 30 mA, 1 KΩ ≤ R_{load} ≤ 10 KΩ, short-circuit-protected	
Passive	3-30 V d.c., max. 110 mA, 1 KΩ ≤ R_{load} ≤ 10 KΩ	
Relay		
Type	Change-over relay	
Load	42 V / 2 A peak	
Functionality	Error level, error number, limit, direction	
Digital input	11-30 V d.c., Ri = 13.6 KΩ	
Functionality	Start/hold/continue batch, zero point adjust, reset totalizer 1/2, force output, freeze output	
Galvanic isolation	All inputs and outputs are galvanically isolated, isolation voltage 500 volts	
Cut-off		
Low-flow	0-9.9% of maximum flow	
Limit function	Mass flow, volume flow, fraction, density, sensor temperature	
Totalizer	Two eight-digit counters for forward, net or reverse flow	
Display	Background illumination with alphanumerical text, 3 × 20 characters to indicate flow rate, totalized values, settings and faults.	
	Operation: -4 to 122°F (–20 to +50°C), max. rel. humidity 80% to 87°F (31°C) decreasing to 50% at 104°F (40°C) according to UL 3101.	
	During storage: -40 to 158°F (-40 to +70°C) (Humidity max. 95%)	
Communication	Prepared for client mounted add-on modules	
Enclosure		
Material	Standard 19" insert of aluminium/steel (DIN 41494)	
Dimensions	Width: 21 TE	
	Height: 3 HE	
Rating	IP 20 to IEC 529 and DIN 40050	
Load	Version: 1 G, 1-800 Hz sinusoidal in all directions, to IEC 68-2-6	
EMC performance	Emission EN 50081-1 (Light industry)	
	Immunity EN 50082-2 (Industry)	
Namur	Within the value limits according to "Allgemeine Anforderung" with error criteria A in accordance with NE 21	
Supply voltage	***24 V version***	***230 V version***
Supply	24 V d.c./a.c., 50-60 Hz	115/230 V a.c., 50-60 Hz
Fluctation	24 V d.c., –25 to 25%	+10 to -10%
	24 V a.c., –16 to 25%	
Power consumption	10 W	26 VA
Fuse	230 V version: T400 mA, T 250V (IEC 127) - Not to be changed by user	
	24 V version: T1A, T 250V (IEC 127) - Not to be changed by user	
Evironment	Environmental conditions acc. to UL 3101: Indoor use Altitude up to 6500 FT. (2000 m) POLLUTION DEGREE 2	
Ex approval	[EEx ia] IIC, DEMKO Ex 99E.125729X	

2.2.3 Transmitter 19" IP 20 with extended outputs

Transmitter 19" insert version with extended outputs	The Transmitter is also available in the 19" version with outputs increased to 3 current outputs, 2 digital outputs, 2 relay outputs, 1 digital input
	Other data is identical to the above

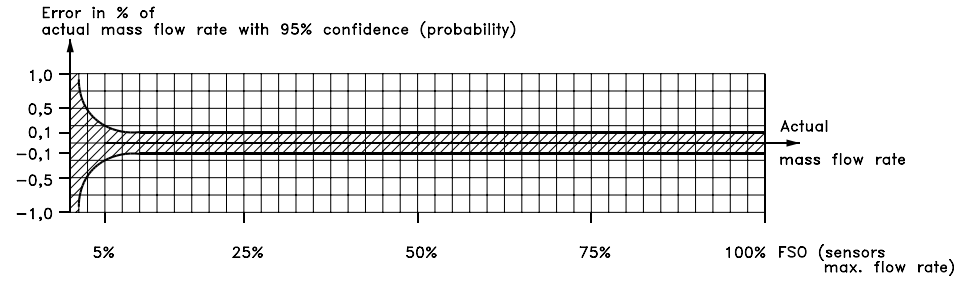
2.2.4 Transmitter Ex-d

	**Transmitter Ex-d**			
Measurement of	Mass flow [lb/min / kg/s], volume flow [gpm, l/s], fraction [%], °Brix, density [kg/m^3], temperature [°F, °C]			
Current output	Classified Ex ia, selectable as active or passive outputs. Default setting is passive mode			
Current	0-20 mA or 4-20 mA			
Load	< 350 ohm			
Time constant	0.1-30 s adjustable			
Output characteristics	***Active mode***		***Passive mode***	
(Terminals: 31-32)	U_o	24 V	U_i	30 V
	Io	115 mA	I_i	115 mA
	Po	0.7 W	P_i	0.7 W
	C_o	125 nF	C_i	52 nF
	L_o	2.5 mH	L_i	100 µH
Digital output				
Frequency	0-10 kHz, 50% duty cycle			
Time constant	0.1-30 s adjustable			
Passive	6-30 V d.c., max. 110 mA, 1 KΩ ≤ R_{load} ≤ 10 KΩ			
Output characteristics	***Active mode***		***Passive mode***	
(Terminals: 56-57-58)	Not available		U_i	30 V
			I_i	115 mA
			P_i	0.7 W
			C_i	52 nF
			L_i	100 µH
Relay				
(Terminals: 44-45-46)				
Type	Change-over relay			
Load	30 V / 100 mA			
Functionality	Error level, error number, limit, direction			
Output characteristics	U_i: 30 V, I_i: 100 mA, C_i: 0 nF, L_i: 0 mH			
Digital input				
(Terminals: 77-78)	11-30 V d.c., Ri = 13.6 KΩ			
Functionallity	Start/hold/continue batch, zero point adjust, reset totalizer 1/2, force output, freeze output			
Output characteristics	U_i: 30 V, I_i: 4.8 mA, P_i: 140 mW, C_i: 0 nf L_i: 0 mH			
Galvanic isolation	All inputs and outputs are galvanically isolated, isolation voltage 500 volts			
Cut-off				
Low-flow	0-9.9% of maximum flow			
Empty pipe	Detection of empty sensor			
Density	0 - 2.9 g/cm^3			
Totalizer	Two eight-digit counters for forward, net or reverse flow			
Display	Background illumination with alphanumerical text, 3 × 20 characters to indicate flow rate, totalized values, settings and faults.			
	Reverse flow indicated by negative sign			
Zero point adjustment	Manual via keypad or remote via digital input			
Ambient temperature	Operation: -4 to 122°F (–20 to +50°C)			
	During storage: -40 to 158°F (-40 to +70°C) (Humidity max. 95%)			
Communication	Prepared for client mounted add-on modules certified for Ex-use			
HART	***Active mode***		***Passive mode***	
(Terminals: 91-92)	U_o	6.51 V	Not available	
	Io	311 mA		
	Po	0.55 W		
	C_o	20 nF		
	L_o	100 µH		
PROFIBUS PA	***Active mode***		***Passive mode***	
(Terminals: 95-96)	Not available		U_i	17.5 V
			I_i	380 mA
			P_i	5.32 W
			C_i	5 nF
			L_i	10 µH

2.2.4 Transmitter Ex-d *(continued)*

Enclosure					
Material	Stainless steel AISI 316 W1.4435				
Rating	Compact mounted on sensor, IP 67 to IEC 529 and DIN 40050				
	Remote mounted, IP 65 to IEC 529 and DIN 40050				
Load	18 - 1000 Hz random, 1.14 G rms, in all directions, to IEC 68-2-36, Curve E				
EMC performance	Emission EN 50081-1 (Light industry)				
	Immunity EN 50082-2 (Industry)				
Namur	Within the value limits according to "Allgemeine Anforderung" with error criteria A in accordance with NE 21				
Supply voltage	***24 V a.c.***			***24 V d.c.***	
Range	20 to 30 V a.c.			18 to 30 V d.c.	
Power consumption	6 VA I_N = 250 mA, I_{ST} = 2A (30 msec.)			6 VA I_N = 250 mA, I_{ST} = 2A (30 msec.)	
Power supply	The power supply shall be from a safety isolating transformer. Maximal cable core is 2.5□			The power supply shall be from a safety isolating transformer. Maximal cable core is 2.5□	
Ex approval	EEx de [ia/ib] IIC T3-T6, DEMKO Ex 99E.124212X				
	Temperature class	T6	T5	T4	T3
	Process liquid temperature	T < 85°C T<185°F	85°C < T < 100°C 185°F < T < 275°F	100°C < T < 135°C 212°F < T < 275°F	135°C < T < 180°C 275°C < T <356°F

2.3 Meter uncertainty Display/frequency and pulse output



CMF - A	1.0	40	65 kg/h
CMF - B	12	125	250 kg/h
CMF - C	50	500	1000 kg/h
CMF - D	280	2800	5600 kg/h
CMF - E	1250	12500	25000 kg/h
CMF - F	2600	26000	52000 kg/h

- For flow > 5% of the sensors max. flow rate, the error can be read direct from the curve.
- For flow < 5% of the sensors max. flow rate, use the formula to calculate the error.
- The error curve is plotted from the formula:

$$E = \pm \sqrt{(0{,}10)^2 + \left(\frac{z \times 100}{qm}\right)^2}$$

E = Error [%]
Z = Zero point error [kg/h]
qm = Mass flow [kg/h]

Measuring pipe type	**TRANSMITTER**					
Measuring pipe version	CMF - A	CMF - B	CMF - C	CMF - D	CMF - E	CMF - F
Number of measuring pipes	1	1	1	1	1	1
Mass flow:						
• Linearity error % of rate	0.10	0.10	0.10	0.10	0.10	0.10
• Repeatability error % of rate	0.05	0.05	0.05	0.05	0.05	0.05
• Max. zero point error [kg/h]	0.002	0.03	0.15	0.66	3.0	6.0
Density:						
• Density error [g/cm³]	0.001	0.0015	0.0015	0.0005	0.0005	0.0005
• Repeatability error [g/cm³]	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001
Temperature:						
• Error [°C]	0.5	0.5	0.5	0.5	0.5	0.5
Brix:						
• Error [°Brix]	0.6	1.2	0.4	0.2	0.2	0.2

Reference conditions (ISO 9104 and DIN/EN 29104)

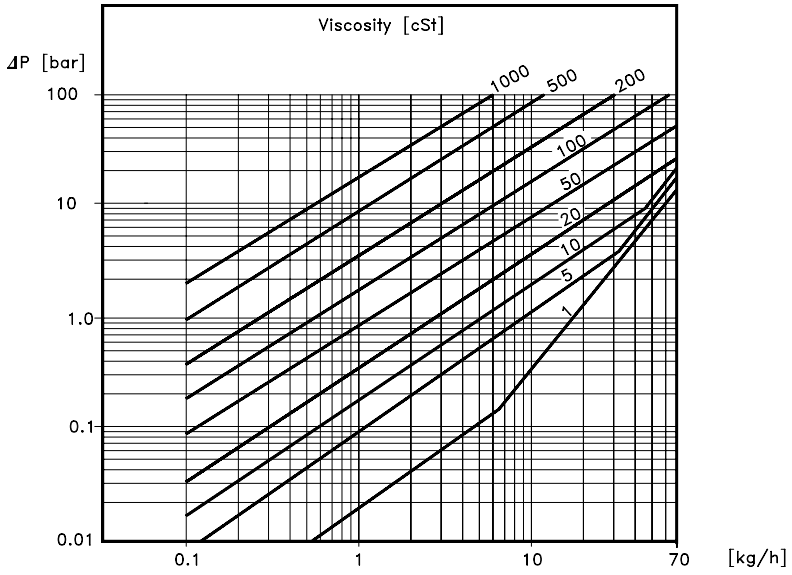
Flow conditions	Fully developed flow profile
Temperature of medium	-4°F (20°C) ± 2K
Ambient temperature	-4°F (20°C) ± 2K
Liquid pressure	2 ± 1 bar
Density	0.997 g/cm³
Brix	40 °Brix
Supply voltage	Un ±1%
Warming-up time	30 min.
Cable length	16.4 F (5 m) between converter and sensor

Additions in the event of deviations from reference conditions

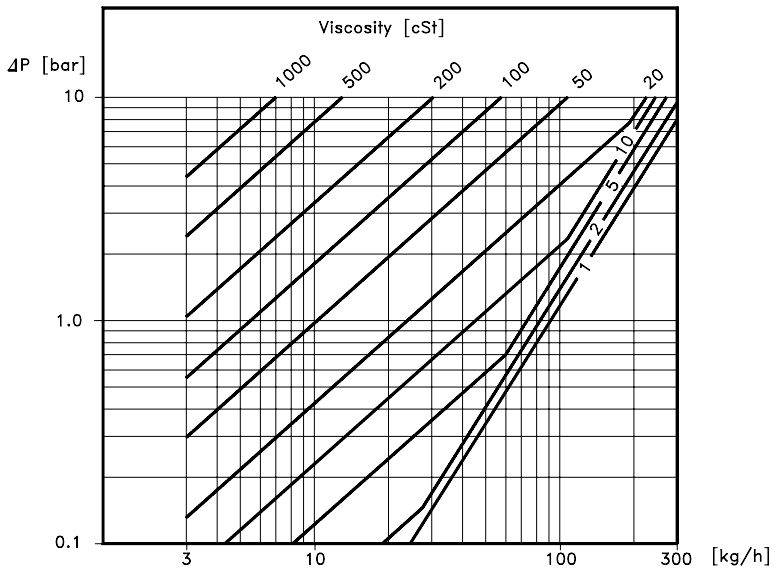
Current output	As pulse output ±(0.1% of actual flow +0.05% FSO)
Effect of ambient temperature	Display/frequency/pulse output: < ±0.003% / K act.
	Current output: < ±0.005% / K act.
Effect of supply voltage	< 0.005% of measuring value on 1% alteration

2.4 Pressure drop

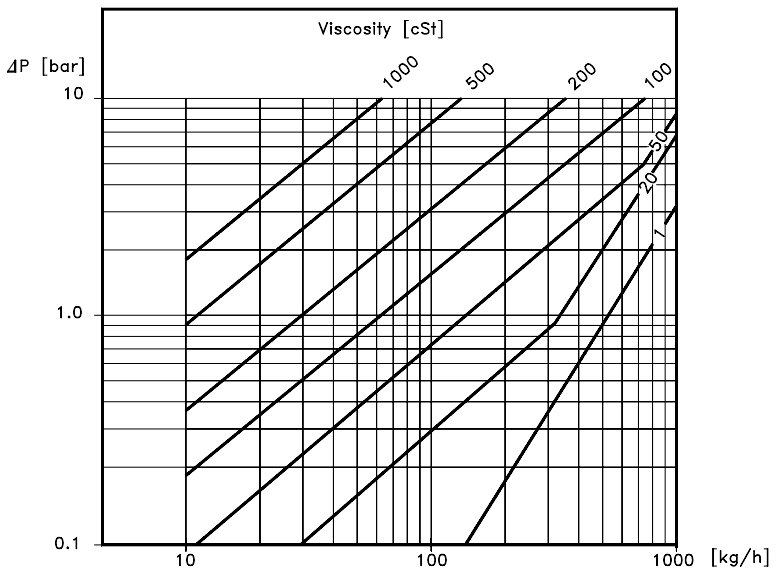
CMF - A



CMF - B

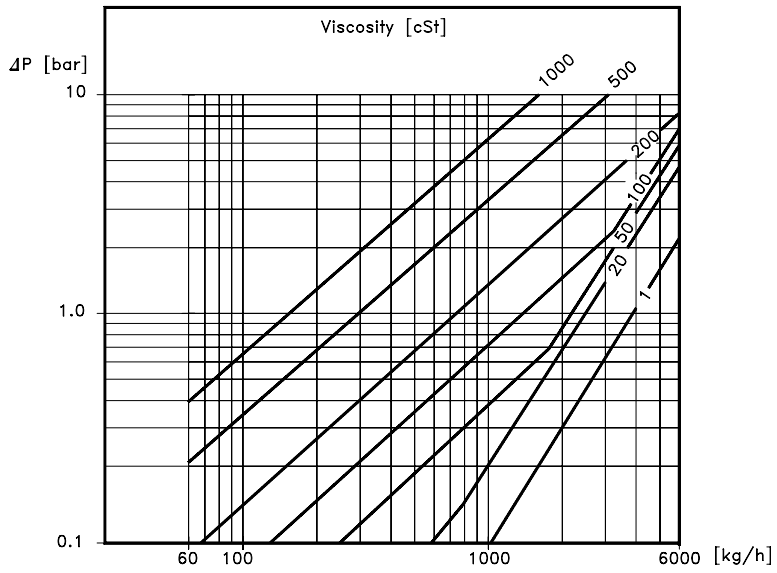


CMF - C

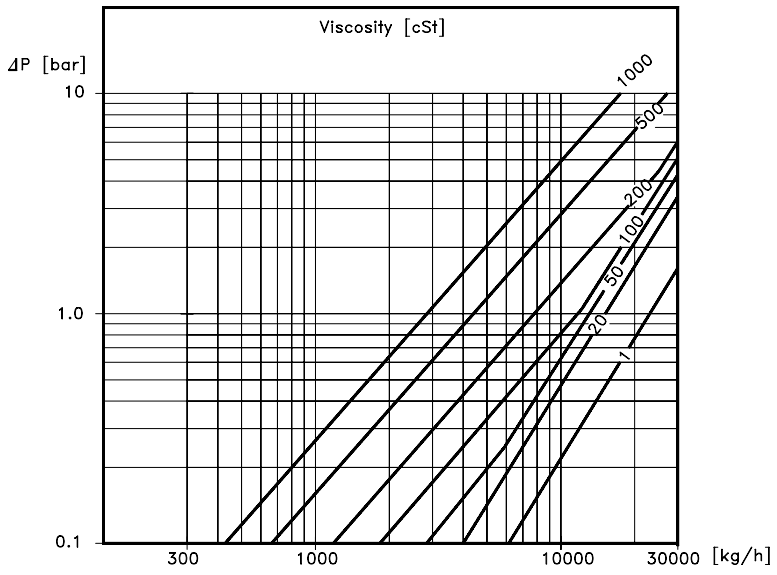


2.4 Pressure drop *(cont.)*

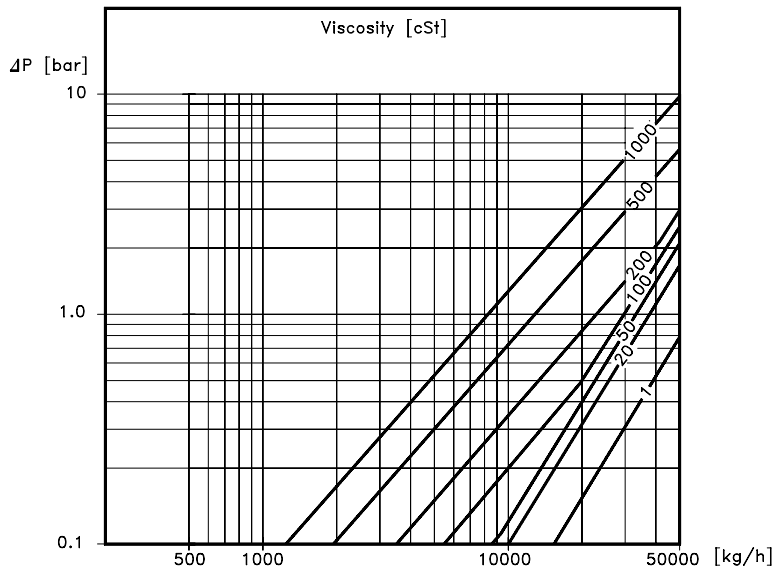
CMF - D



CMF - E



CMF - F



2.5 Sensor cable specification

Basic data	5 x 2 x 0.34 mm^2 twisted and screened in pairs
Diameter	Ø12 mm
Color	Blue
Length	Max. length between converter and sensor is 500 m
Capacitance	Max. 41 pf/m. Only requested for Ex-applications

2.6 HART® Communication Add-on module

Application	All TRANSMITTERS
Communication standard	Bell 202 frequency shift keying (f.s.k.) standard
Communication modes	• Single loop mode
	• Multi-drop mode, 14 slave devices
Communicator	Rosemount Hand held communicator type 275

Cable specification

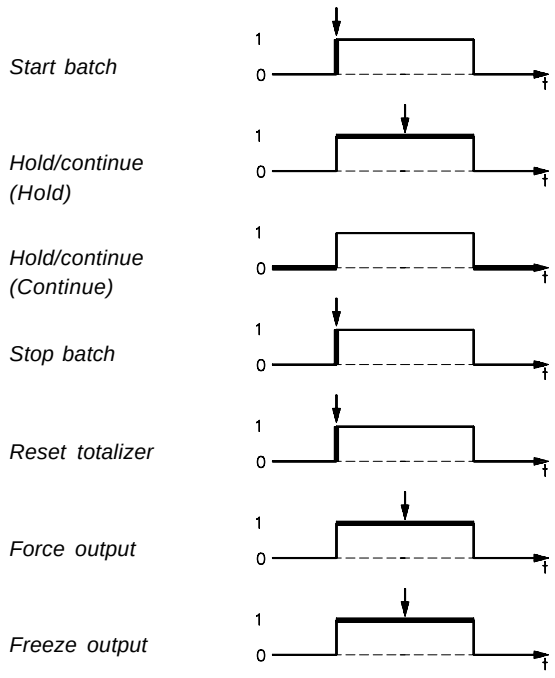
Basic data		
Q [mm^2] CU		≥ 0.2 mm^2/AWG 24
Screen		YES (Overall screen)
Loop resistance	*Min.*	230 Ω
	Max.	800 Ω
Cable capacity		≤ 400 μF/m
Cable length		1500 m
Twisted pair		YES

HART® is a registered trademark of the HART Communication Foundation.

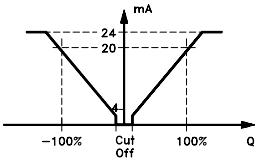
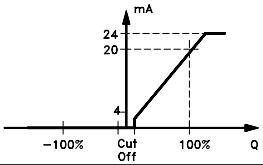
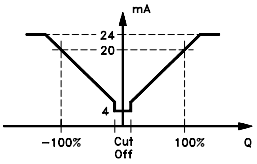
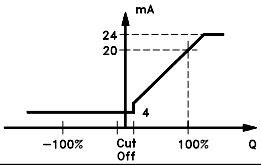
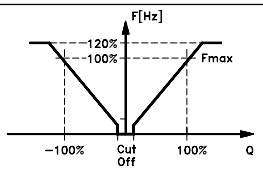
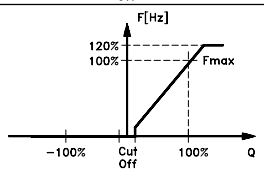
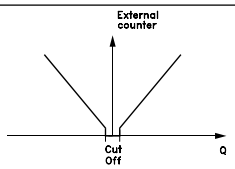
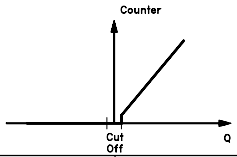
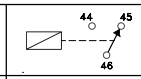
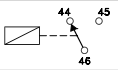
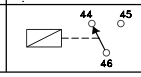
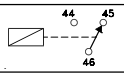
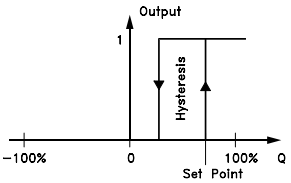
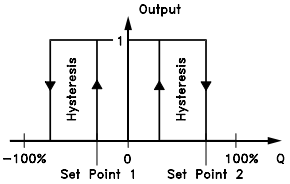
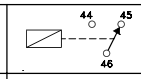
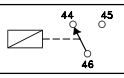
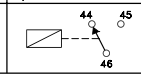
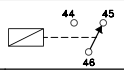
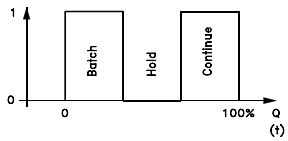
2.7 PROFIBUS® Communication Add-on module

General specification	
Profibus device profile	Class B, V2.0
Flow transducer block parameter sets supported	Class 03 Coriolis
Applicable standard	EN 50170, DIN 19245
Physical layer (transmission technology)	IEC 1158-2
Transmission speed	31.25 kbit/sec.
Number of stations	Up to 32 per line segment. Maximum total of 126
Cable	Two wire twisted pair
Bus termination	Passive line terminaton at both ends

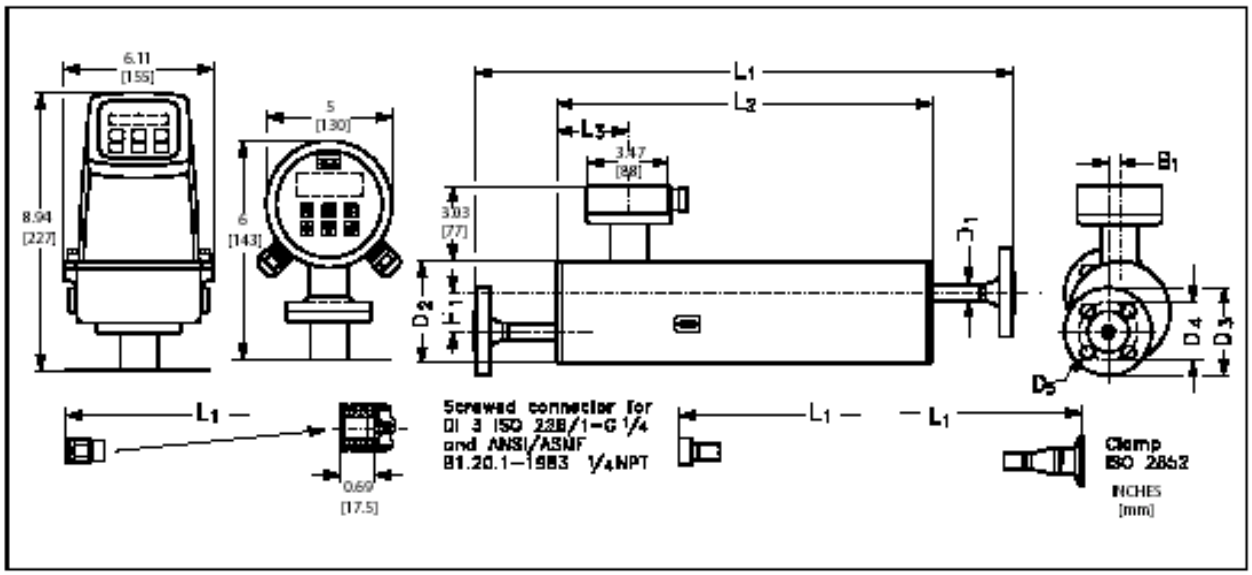
2.8 Input characteristics



2.9 Output characteristics

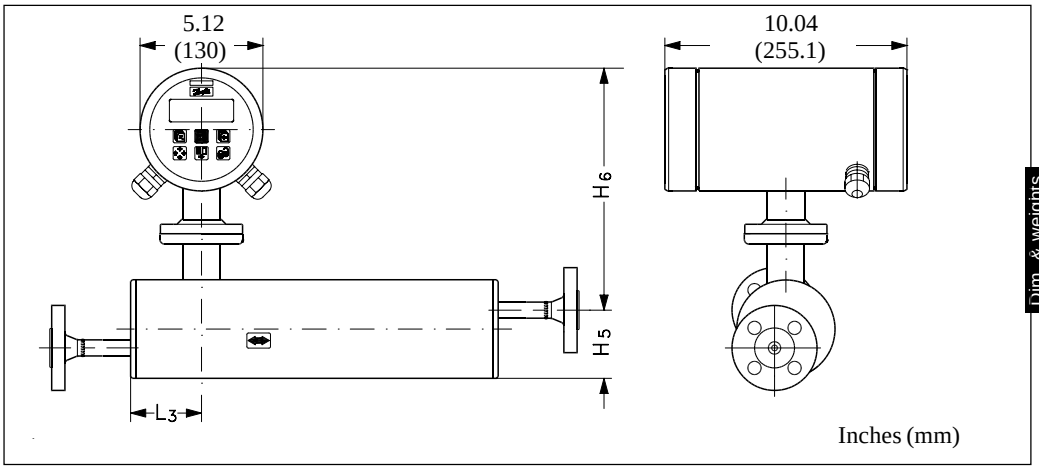
Output characteristics	Bidirectional mode	Unidirectional mode
0-20 mA		
4-20 mA		
Frequency		
Pulse output		
Relay	Power supply off 	Power supply on 
Error relay	No error 	Error 
Limit switch or direction switch *Limit parameters: Flow, density, temperature, fraction*	1 set point 	2 set points 
Example with flow selected as parameter	Low flow (Reverse flow) 	Intermediate flow 
	High flow (Forward flow) 	High flow/ Low flow 
Batch on digital output		

3. Dimensions and Weight
3.1 FlexCOR Series Instruments



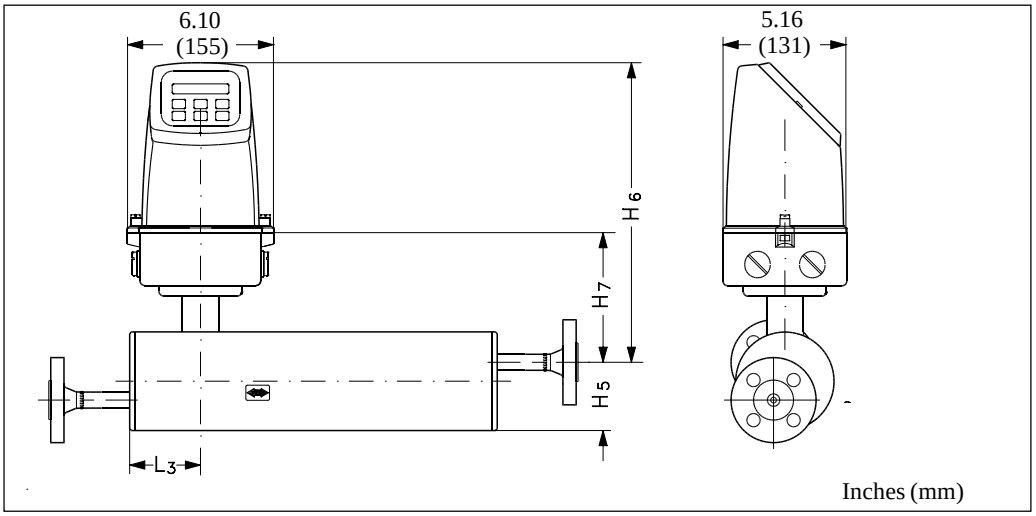
Model CMF -	Nominal Sensor Size	Connections Type	Pressure Rating	Size	L1 in. [mm]	L2 in. [mm]	L3 in. [mm]	H1 in. [mm]	B1 in. [mm]	D1 in. [mm]	D2 in. [mm]	D3 in. [mm]	D4 in. [mm]	D5 in. [mm]
B	1/8 in. 3 mm	Pipe thread ANSI/ASME B 1.20.1 - 1/4" NPT	PN 100	1/4"	15.7 [400]	11.0 [280]	3.0 [75.0]	2.4 [60]	0 [0]	0.8 [21.3]	4.0 [104]	- [-]	- [-]	- [-]
C	1/4 in. 6 mm	Flange ANSI B 16.5	CLASS 150	1/2"	24.6 [624]	15.4 [390]	2.4 [62.0]	1.6 [40]	0.5 [12]	0.7 [17.0]	4.0 [104]	3.5 [88.9]	2.4 [60.5]	0.6 [15.7]
		Flange ANSI B 16.5	CLASS 600	1/2"	23.9 [608]	15.4 [390]	2.4 [62.0]	1.6 [40]	0.5 [12]	0.7 [17.0]	4.0 [104]	3.8 [95.3]	2.6 [66.5]	0.6 [15.7]
		Screwed connection NPT		1/4"	20.9 [532]	15.4 [390]	2.4 [62.0]	1.6 [40]	0.5 [12]	0.7 [17.0]	4.0 [104]	- [-]	- [-]	- [-]
	Tri Clamp	ISO 2852	PN 16	1"	22.4 [570]	15.4 [390]	2.4 [62.0]	1.6 [40]	0.5 [12]	0.7 [17.0]	4.0 [104]	- [-]	- [-]	- [-]
D	1/2 in. 15 mm	Flange ANSI B 16.5	CLASS 150	1/2"	25.2 [639]	17.5 [444]	3.0 [75.0]	1.7 [44]	0.8 [20]	0.8 [21.3]	5.1 [129]	3.5 [88.9]	2.4 [60.5]	0.6 [15.7]
		Flange ANSI B 16.5	CLASS 600	1/2"	26.0 [660]	17.5 [444]	3.0 [75.0]	1.7 [44]	0.8 [20]	0.8 [21.3]	5.1 [129]	3.8 [95.3]	2.6 [66.5]	0.6 [15.7]
		Screwed connection NPT	PN 40	1/2"	23.0 [586]	17.5 [444]	3.0 [75.0]	1.7 [44]	0.8 [20]	0.8 [21.3]	5.1 [129]	- [-]	- [-]	- [-]
	Tri Clamp	ISO 2852	PN 16	1"	24.6 [624]	17.5 [444]	3.0 [75.0]	1.7 [44]	0.8 [20]	0.8 [21.3]	5.1 [129]	- [-]	- [-]	- [-]
E	1.0 in. 25 mm	Flange ANSI B 16.5	CLASS 150	1"	38.0 [967]	27.6 [700]	2.9 [74.5]	5.0 [126]	1.0 [25]	1.3 [33.7]	8.6 [219]	4.3 [108.0]	3.1 [79.2]	0.6 [15.7]
		Flange ANSI B 16.5	CLASS 600	1"	39.1 [992]	27.6 [700]	2.9 [74.5]	5.0 [126]	1.0 [25]	1.3 [33.7]	8.6 [219]	4.9 [124.0]	3.5 [88.9]	0.8 [19.1]
		Flange ANSI B 16.5	CLASS 150	1 1/2"	43.4 [1102]	27.6 [700]	2.9 [74.5]	5.0 [126]	1.0 [25]	1.3 [33.7]	8.6 [219]	6.1 [155.4]	3.5 [88.9]	0.8 [19.1]
		Flange ANSI B 16.5	CLASS 600	1 1/2"	44.4 [1130]	27.6 [700]	2.9 [74.5]	5.0 [126]	1.0 [25]	1.3 [33.7]	8.6 [219]	6.1 [155.4]	3.5 [88.9]	0.8 [19.1]
		Screwed connection NPT	PN 40	1"	36.3 [922]	27.6 [700]	2.9 [74.5]	5.0 [126]	1.0 [25]	1.3 [33.7]	8.6 [219]	- [-]	- [-]	- [-]
	Tri Clamp	ISO 2852	PN 16	1 1/2"	37.0 [940]	27.6 [700]	2.9 [74.5]	5.0 [126]	1.0 [25]	1.3 [33.7]	8.6 [219]	- [-]	- [-]	- [-]
F	2 in. 40 mm	Flange ANSI B 16.5	CLASS 150	1 1/2"	43.3 [1100]	33.5 [850]	2.8 [71.5]	7.1 [180]	0 [0]	1.9 [48.3]	10.7 [273]	5.0 [127.0]	3.9 [98.6]	0.6 [15.7]
		Flange ANSI B 16.5	CLASS 600	1 1/2"	44.4 [1128]	33.5 [850]	2.8 [71.5]	7.1 [180]	0 [0]	1.9 [48.3]	10.7 [273]	6.1 [155.4]	3.5 [88.9]	0.8 [19.1]
		Screwed connection NPT	PN 25	1 1/2"	42.9 [1090]	33.5 [850]	2.8 [71.5]	7.1 [180]	0 [0]	1.9 [48.3]	10.7 [273]	- [-]	- [-]	- [-]
	Tri Clamp	ISO 2852	PN 16	2"	41.8 [1062]	33.5 [850]	2.8 [71.5]	7.1 [180]	0 [0]	1.9 [48.3]	10.7 [273]	- [-]	- [-]	- [-]

3.2 Ex-d Compact version



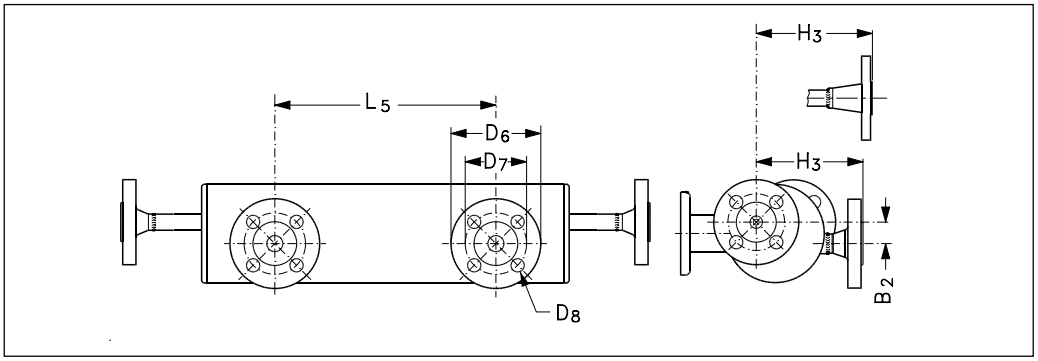
Sensor Size	L_3 in. (mm)	H_5 in. (mm)	H_6 in. (mm)	$H_5 + H_6$ in. (mm)
CMF-B	2.95 (75)	3.23 (82)	12.09 (307)	15.31 (389)
CMF-C	2.44 (62)	2.83 (72)	12.48 (317)	15.31 (389)
CMF-D	2.95 (75)	3.43 (87)	12.91 (328)	16.30 (414)
CMF-E	2.95 (75)	6.81 (173)	13.07 (332)	19.84 (504)
CMF-F	2.95 (75)	8.94 (227)	13.07 (332)	21.97 (558)

3.3 IP 67 Compact version



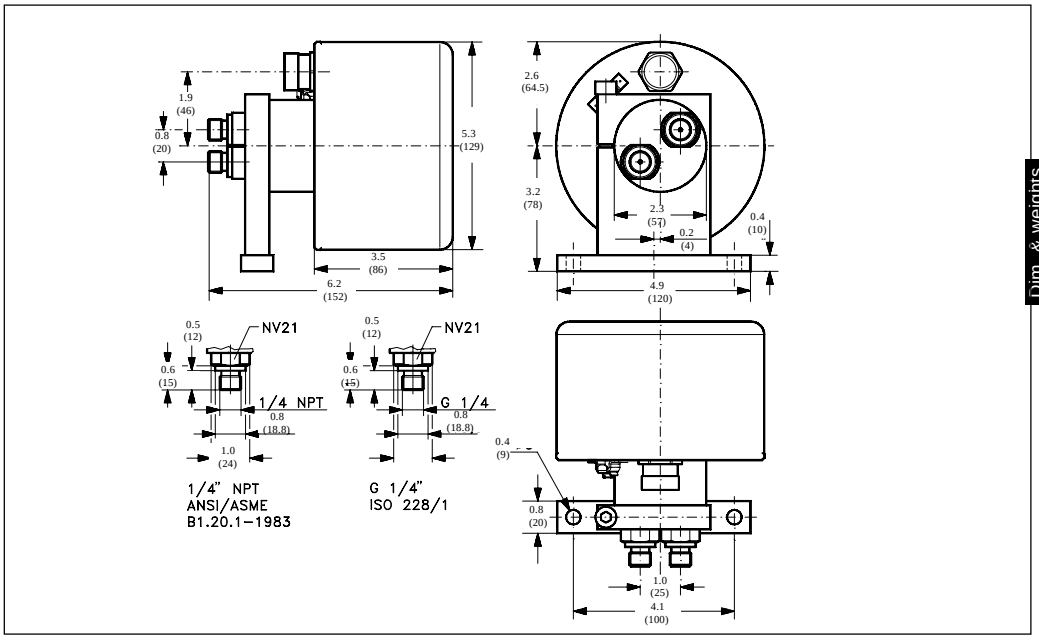
Sensor size	L_3 mm	H_5 mm	H_6 mm	$H_5 + H_6$ mm
CMF-B	2.95 (75)	3.23 (82)	9.69 (246)	12.91 (328)
CMF-C	2.44 (62)	2.83 (72)	10.08 (256)	12.91 (328)
CMF-D	2.95 (75)	3.43 (87)	10.51 (267)	13.90 (353)
CMF-E	2.95 (75)	6.81 (173)	10.67 (271)	17.44 (443)
CMF-F	2.95 (75)	8.94 (227)	10.67 (271)	21.97 (497)

3.4 Sensor with "heating jacket"

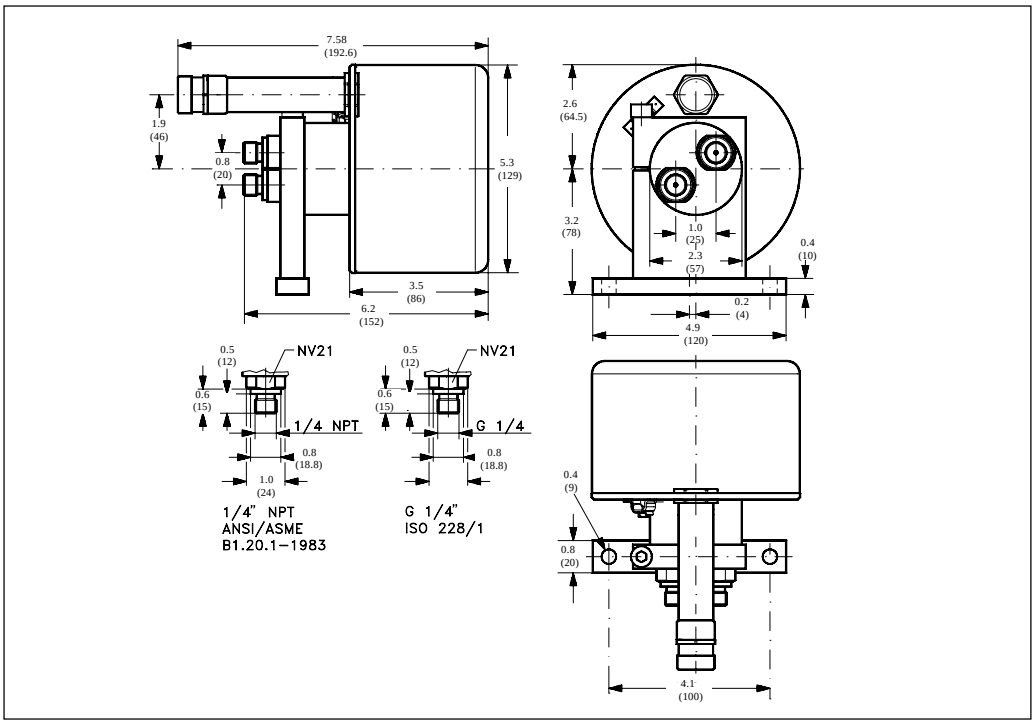


Model CMF-	Sensor size	Connections Heated			L5 in. [mm]	L3 in. [mm]	H3 in. [mm]	B2 in. [mm]	D6 in. [mm]	D7 in. [mm]	D8 in. [mm]
		Flange	Pressure rating	Size							
B	1/8" 3 mm	ANSI B16.5	CLASS 150	1/2"	9.2 [234]	3.0 [75.0]	5.2 [131.6]	0.9 [22.0]	3.5 [88.9]	2.4 [60.5]	0.6 [15.7]
C	1/4" 6 mm	ANSI B16.5	CLASS 150	1/2"	9.2 [234]	2.4 [62.0]	121.6 [121.6]	0.9 [22.7]	3.5 [88.9]	2.4 [60.5]	0.6 [15.7]
D	1/2" 15 mm	ANSI B16.5	CLASS 150	1/2"	9.2 [234]	3.0 [75.0]	136.1 [136.1]	1.2 [31.5]	3.5 [88.9]	2.4 [60.5]	0.6 [15.7]
E	1 " 25 mm	ANSI B16.5	CLASS 150	1/2"	16.5 [420]	2.9 [74.5]	223.2 [223.2]	2.4 [60]	3.5 [88.9]	2.4 [60.5]	0.6 [15.7]
F	2 " 40 mm	ANSI B16.5	CLASS 150	1/2"	19.7 [500]	2.8 [71.5]	277.1 [277.1]	1.7 [43]	3.5 [88.9]	2.4 [60.5]	0.6 [15.7]

3.5 CMF-A



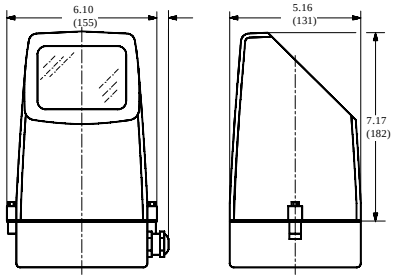
3.6 CMF - A High temperature version -40 to 356°F (-40°C to +180°C)



3.7 TRANSMITTER

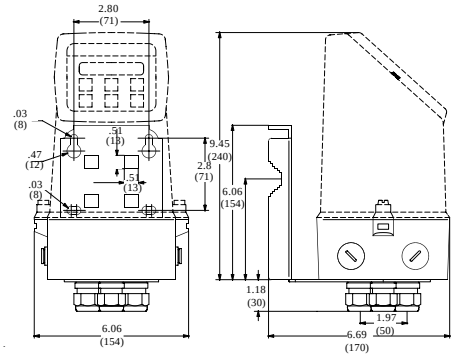
Compact polyamid

Transmitter installed in compact mode



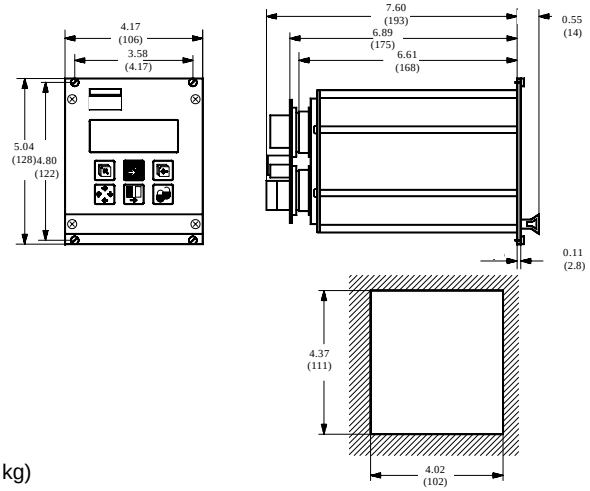
Weight: Transmitter: 1.65 lb (0.75 kg)

Transmitter installed in remote mode



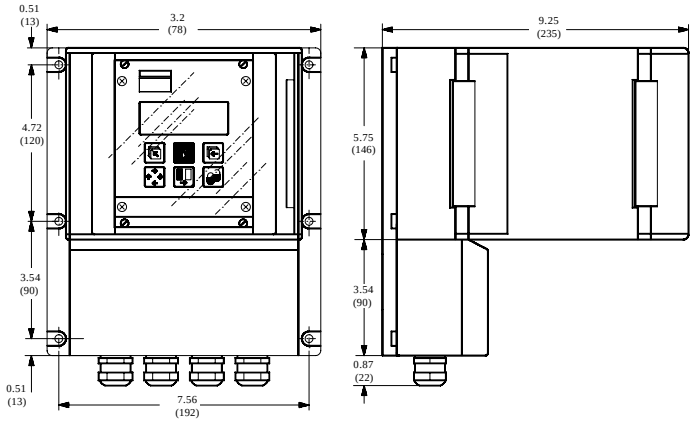
Weight: Wall bracket: 1.98 lb (0.9 kg)

19" insert, standard unit



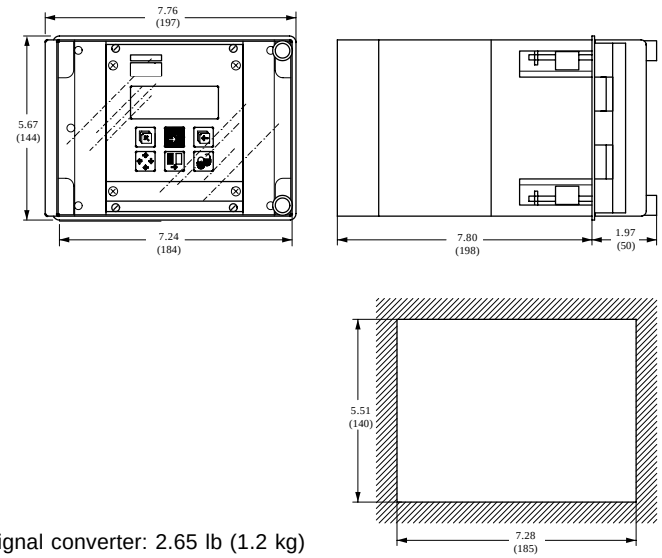
Weight: 1.76 lb (0.8 kg)

Wall mounting box 21 TE



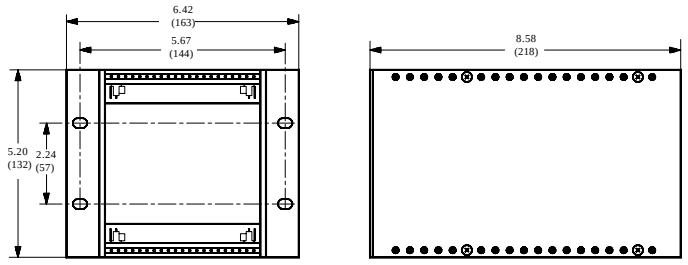
Weight excluding Transmitter: 5.07 lb (2.3 kg)

Panel front unit 21 TE



Weight excl. signal converter: 2.65 lb (1.2 kg)

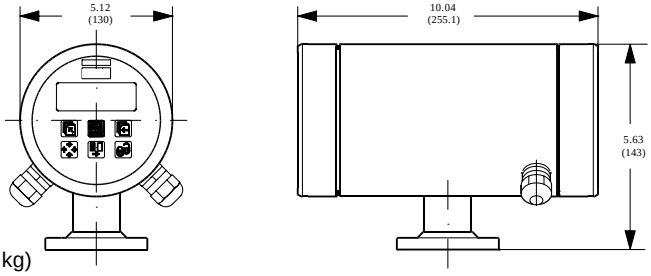
Back of panel unit 21 TE



Weight: 1.54 lb (0.7 kg)

3.8 Transmitter Ex-d

Compact version



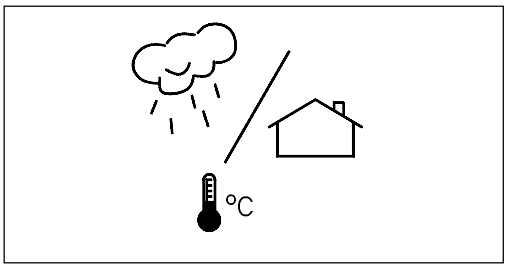
Weight: 5.73 lb (2.6 kg)

4. Installation of sensor

To ensure the optimum function of measuring equipment it is important that the installation instructions are followed closely, point by point.

4.1 Location

The flowmeter can be located both indoors and outdoors, but the following conditions must be observed:

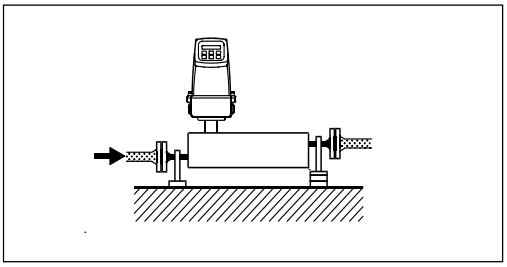


Liquid temperature: -58 to 356°F (-50 to +180°C). The grade of enclosure can be choosen from IP 20 up to IP 67.

When the temperature difference between a liquid and the surroundings is large, the sensor must be insulated to prevent 2-phase flow and thereby measuring inaccuracy. This applies especially in the case of low flow.

Important!
The sensor must **always** be completely filled with a homogeneous liquid or gas in single phase, otherwise measuring errors will occur.

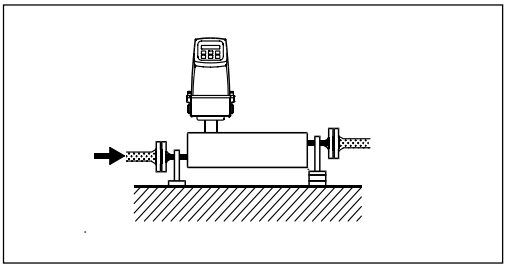
4.2 Cavitation



Avoid cavitation in the system, i.e. sucking in or releasing air into the system, because this may produce errors.

Static back pressure minimum 0.1 - 0.2 bar.

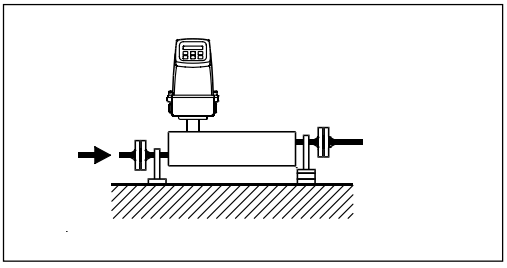
4.3 Air bubbles



Avoid large quantities of air collecting in the sensor because these will disturb measurement. Homogeneous mixtures of air and solids, however, will not disturb measurement. When there is air in the liquid, installation of an air trap ahead of the meter is recommended.

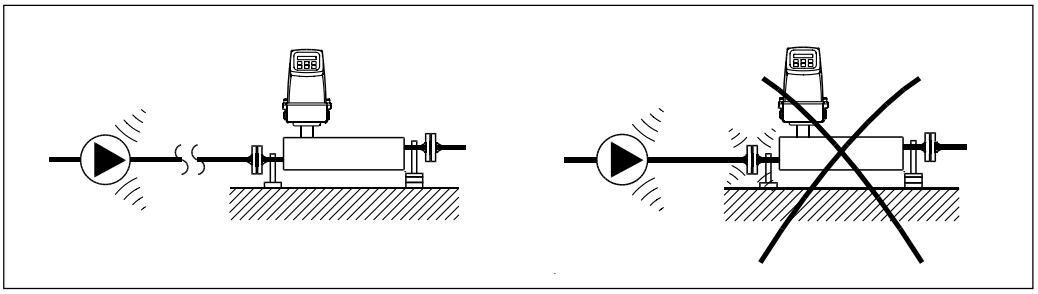
If there is air/gas in the liquid or liquids which are volatile, horizontal sensor mounting is recommended.

4.4 Mounting

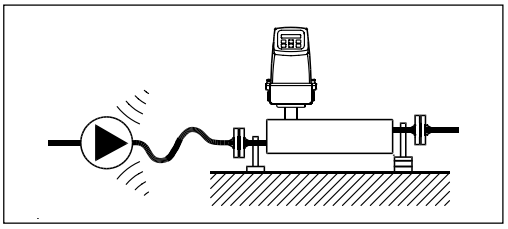


The unit must be mounted on a flat wall or steel frame (vibration-free).

4.5 Vibrations

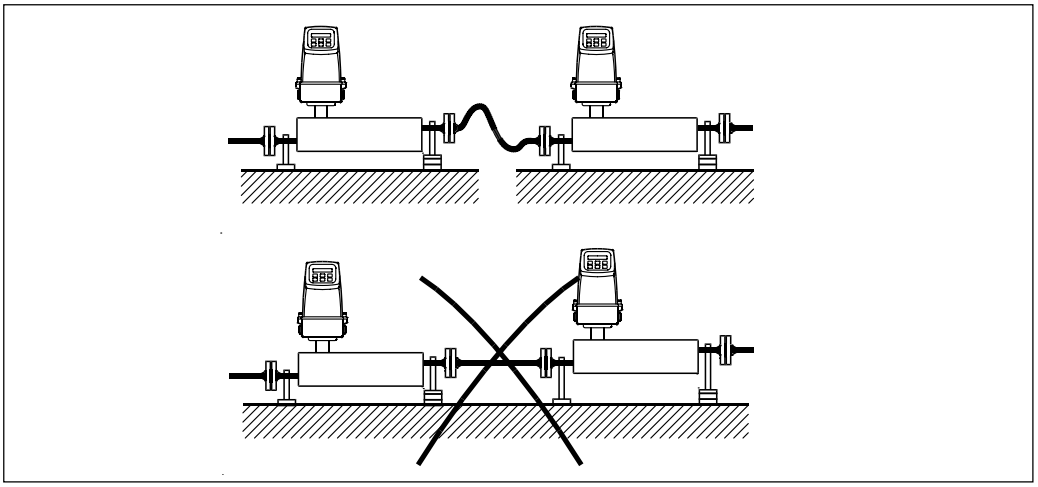


Locate the flowmeter as far away as possible from components that generate mechanical vibration in the piping.



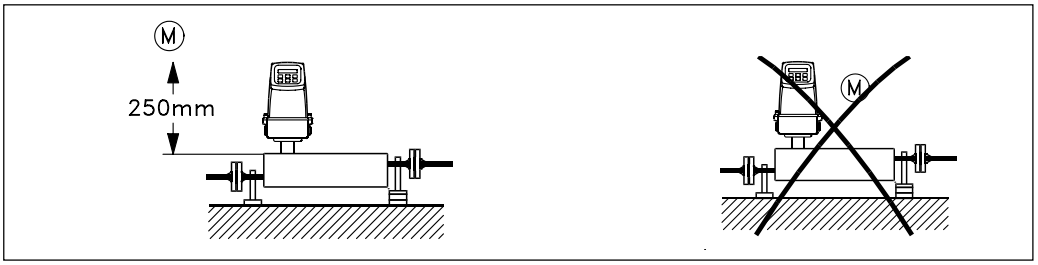
Or ensure that there is no direct connection with them e.g. by using flexible connections.
The flowmeter can also be located after a bend.

4.6 Cross-talk



If the flowmeters are located close to each other, e.g. in the same pipe section, the meters may disturb each other in measurement, especially with low flow. Locate the meters with a flexible connection instead of a permanent connection.
Avoid mounting the meter on the same steel frame. i.e. insulate the meters mechanically.

4.7 Magnetic fields

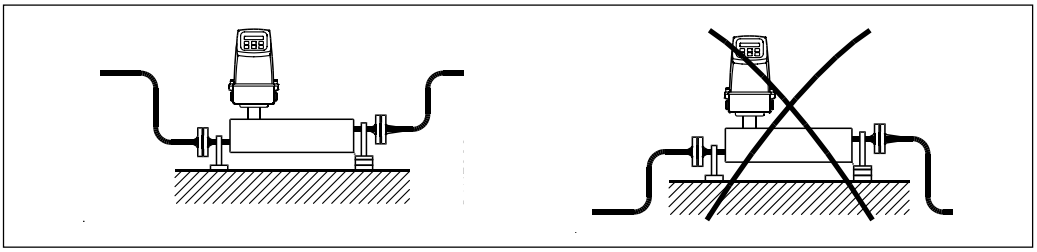


Locate the sensor a minimum of 10 inches (25 cm) from strong magnetic fields (motors, transformers, electrically operated valves, etc.).

4.8 Transportation/ storage

The sensor is a fragile piece of equipment and shall be placed in its storage carton when transported or stored. If this is not possible, the sensor must be packed so the packing enclosure can withstand the hazards from transportation or storage.

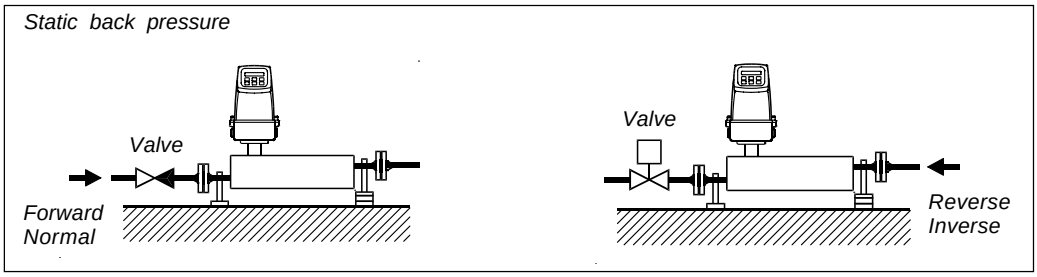
4.9 Horizontal mounting in pipe CMF B-F



Locate the sensor low in the pipe system in order to avoid low pressure in the sensor and consequent air separation in the liquid.

If the flowmeter is mounted horizontally it is self-emptying.
With low flow, horizontal mounting is recommended, any air bubbles are easier to remove.

Flow direction



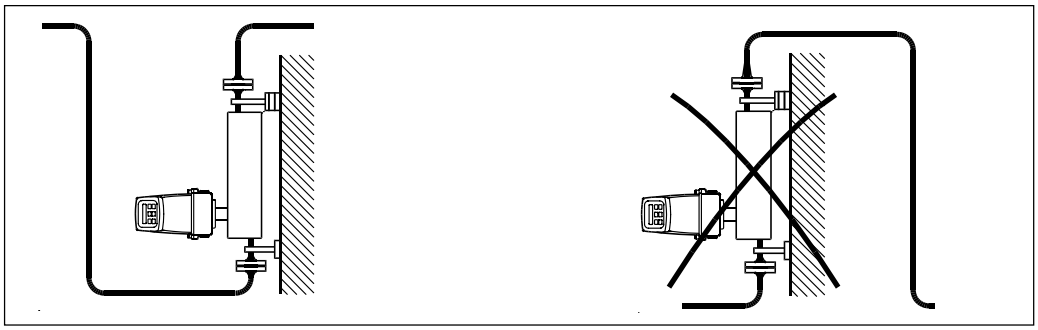
The arrow on the sensor indicates the direction of flow defined as “positive” (the meter is able to measure flow in both directions).
If possible, the liquid should flow in the forward direction to avoid partial emptying of the sensor, especially with low flow.
In addition there should be a valve (check/solenoid) that closes when the flow is zero so that the liquid does not flow back and causes partial emptying of the sensor.

0-point adjustment

To facilitate 0-point adjustment, a valve with a good shut-off should always be mounted near the sensor.

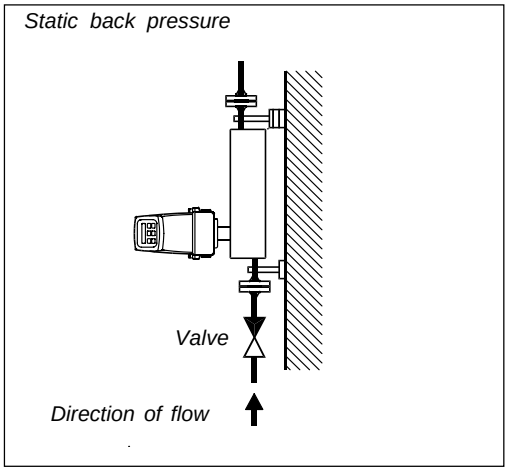
- The sensor should be completely filled with liquid.
- The valve must be closed.
- Wait a few minutes to let the flow stabilize at zero.
- Activate the 0-point adjustment, see Chapter 7 "Setting the 0-point".

4.10 Vertical mounting in pipe



Locate the unit low in the pipe system in order to avoid under pressure in the sensor and consequent air separation in the liquid.

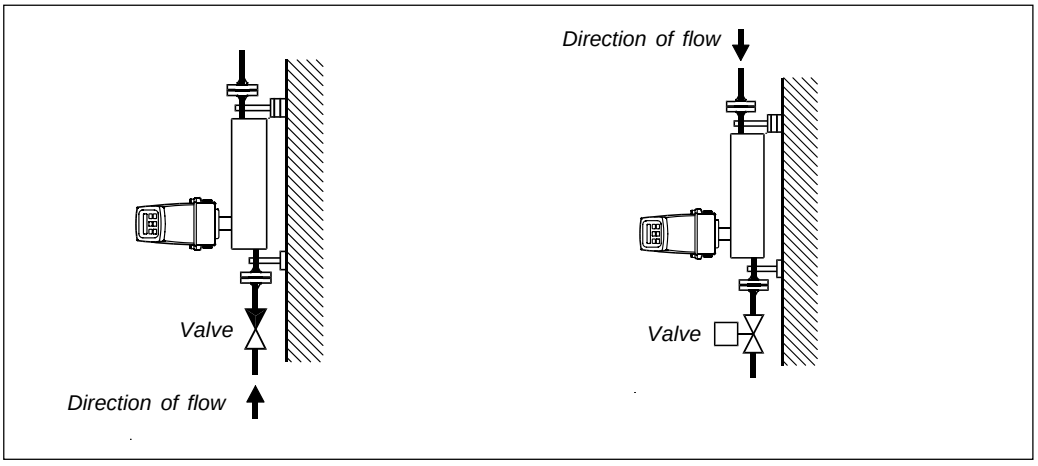
Flow direction



If possible, the liquid should flow up-wards to make bubble removal easier.
With vertical mounting, a check valve, which closes on zero flow, must always be installed so that the liquid cannot flow back and partially empty the sensor.

The arrow on the sensor indicates positive (forward) flow direction.

0-point adjustment



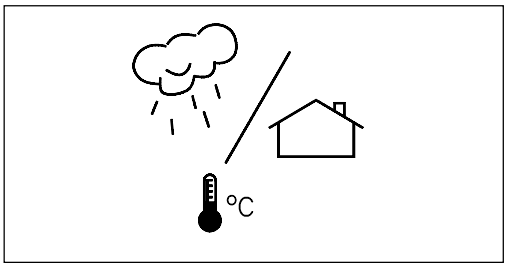
To facilitate 0-point adjustment, a valve with a good shut-off should always be mounted in line with the sensor.

- The sensor should be completely filled with liquid.
- The valve must be closed.
- Wait a few minutes to let the flow stabilize at zero.
- Activate the 0-point adjustment, see Chapter 7 "Setting the 0-point".

4.11 CMF - A

To ensure the optimum function of the measuring equipment it is important that the installation instructions are followed closely.

4.12 Location



The flowmeter can be located both indoors and outdoors, but the following conditions must be observed:

Liquid temperature
The CMF - A is available in 2 versions.
Standard version: -40 to 257 °F (-40 to +125°C).
High temperature version: -40 to 356°F (-40 to +180°C).

For the high temperature version the multiple plug is raised from the sensor housing by a pipe. It is possible to insulate the sensor and still having access to the plug.

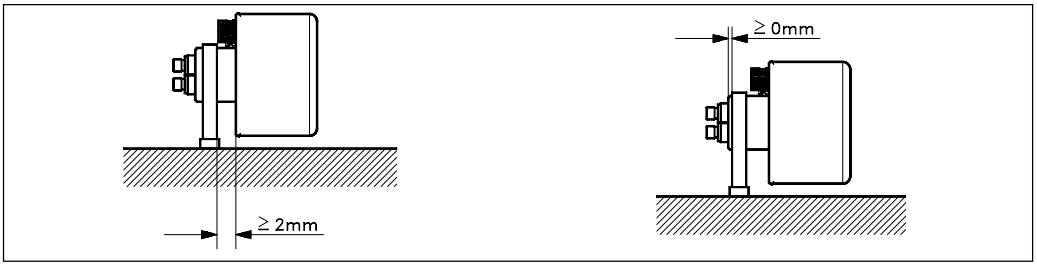
Important
When the temperature difference between a liquid and the surroundings is large, the sensor must be insulated to prevent 2-phase flow and the loss of measuring accuracy. This applies especially in the case of low flow.

The sensor must **always** be completely filled with a homogeneous liquid or gas in single phase, otherwise measuring errors will occur.

If there is air/gas in the liquid or liquids which are volatile, horizontal sensor mounting is recommended.

4.13 Mounting

The mounting bracket supplied with the unit must always be used. The bracket must be mounted on a wall or steel frame which is vibration free and mechanically stable.

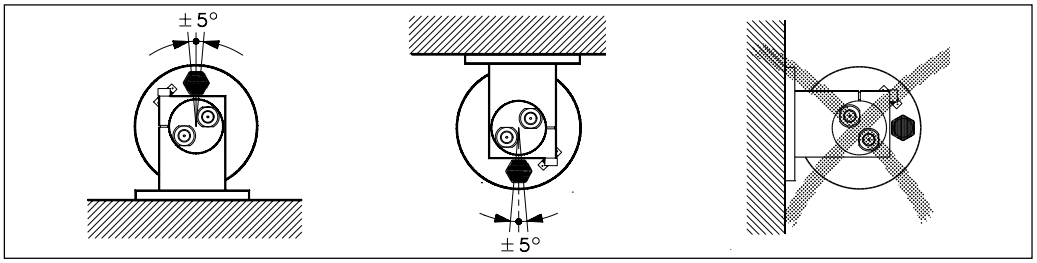


4.14 Horizontal mounting in pipe

Locate the sensor low in the pipe system in order to avoid low pressure in the sensor and consequent air separation in the liquid. Due to the capillary tube effect, the sensor is not self emptying.

When there is low flow, horizontal mounting is recommended, the air bubbles are easier to remove.
To avoid separation of air from the liquid, a back pressure of min. 0.1 - 0.2 bar is recommended.

Multiple plug orientation



To obtain the optimum performance, the multiple plug should be mounted as shown in the drawing. The multiple plug can be turned withing the angles stated.

Flow direction

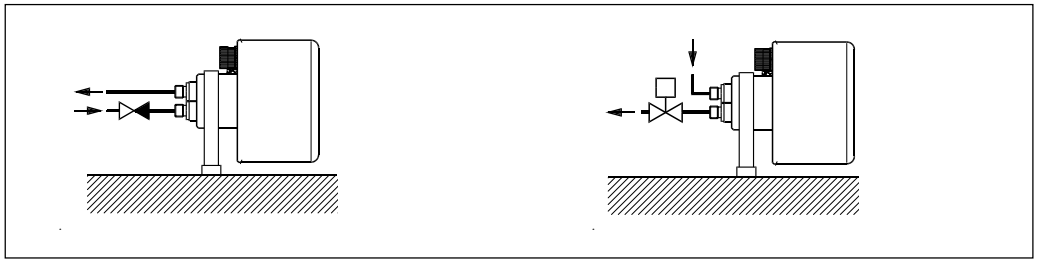
The arrow on the sensor indicates the direction of flow defined as "positive" (the meter is able to measure flow in both directions).

If possible, the liquid should flow in the direction of the arrow (on the sensor) to avoid partial emptying of the sensor, especially with low flow.

0-point adjustment

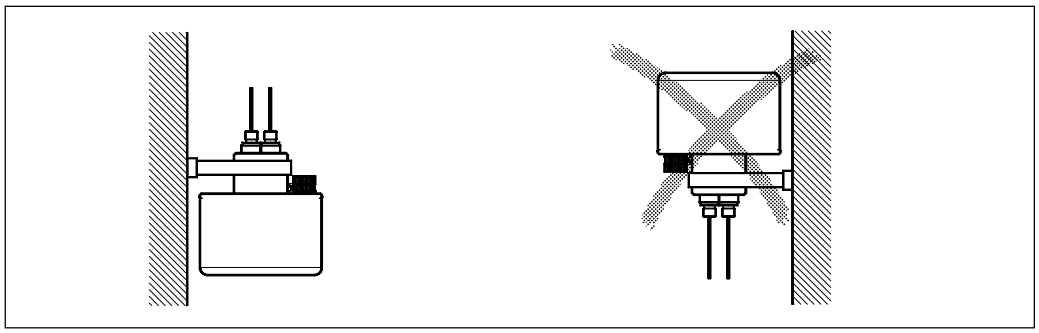
In addition there should be a valve (check/solenoid) that closes when the flow is zero so the liquid does not flow back to produce partial emptying of the sensor.

To facililate a good 0-point adjustment a valve should always be installed to ensure that 0-flow condition can be obtained.



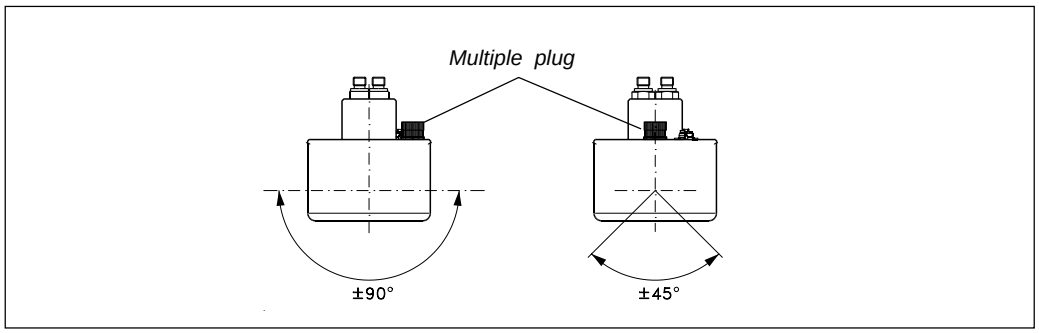
- The sensor should be completely filled with liquid.
- The valve must be closed.
- Wait a few minutes to let the flow stabilize at zero.
- Activate the 0-point adjustment, see Chapter 7 "Setting the 0-point".

4.15 Vertifical mounting in pipe



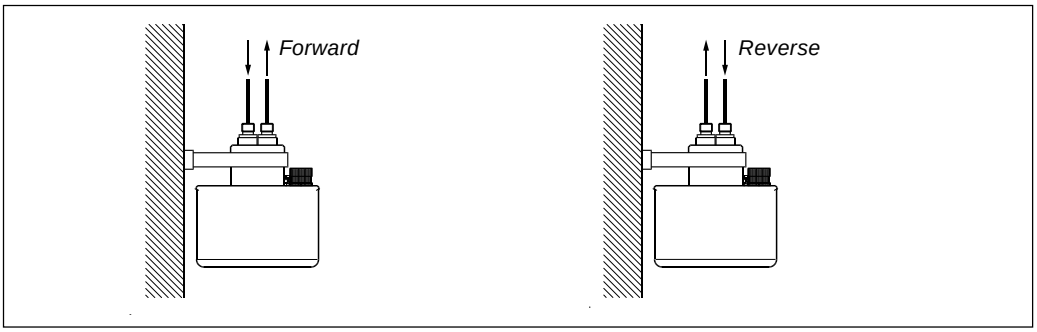
Locate the unit low in the pipe system in order to avoid low pressure in the sensor and consequent air separaton in the liquid.

Multiple plug orientation



When mounting vertically, the orientation of the terminal box is not important, rotation, however, is not allowed to exceed the stated angles of the sensor.

Flow direction



The arrow on the sensor indicates the direction of flow defined as "positive" (the meter is able to measure flow in both directions).

4.16 Before commissioning

Warning

Before installing the sensor read the maximum operating pressure (PN) on the sensor label. The operating pressure indicates the pressure to which the measuring pipe and connections have been designed for. The sensor has passed pressure tests of this value or greater. This, is not the case with the sensor enclosure (i.e. the enclosure covering the measuring pipe). If for some reason the measuring pipe fractures, a pressure will be generated in the enclosure.

The burst pressure for the CMF - B through F enclosure is approximately 725 psi (50 bar) and approximately 1000 psi (70 bar) forCMF - A.

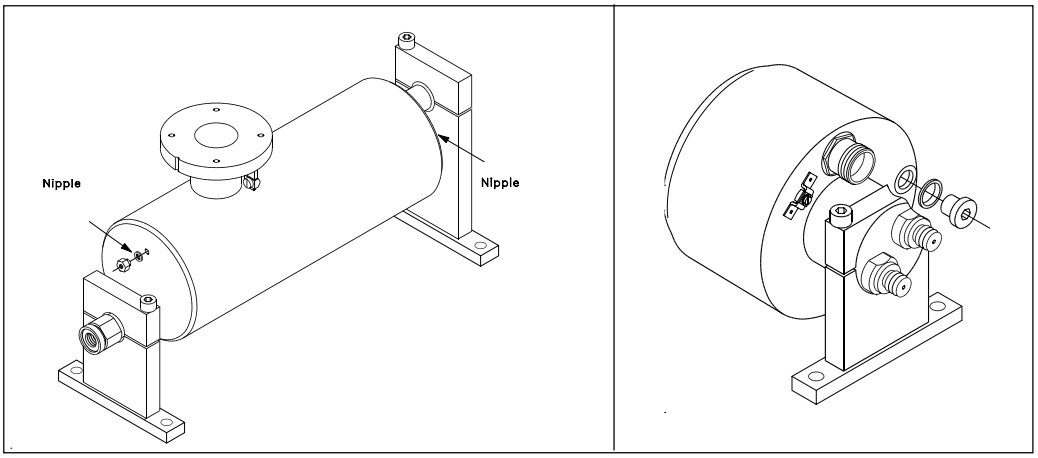
The pressure values are only approximate and therefore cannot be taken as an absolute value indicating when a possible fracture or leakage will occur.
When working with operating pressures/media which may cause pipe fractures and possible injuries to people, equipment or anything else, special precautions are recommended to be taken when building-in the sensor i.e. special placement, shielding, pressure release valve or similar.

The sensor enclosure is supplied with a 1/8" nipple. When the nipple is removed a pressure release valve can be connected to automatically shut off the flow to the sensor in case of leakage. For instructions on the mounting, please refer to the section "Mounting of pressure release valve".

4.17 Mounting of pressure release valve

Important
Before removing the nipple from the sensor enclosure, note the following:
Penetration of humidity, liquid or particles into the sensor must be avoided as it may influence the measurement and in worst case affect the measuring function. This, can be avoided when following the procedure below:

1. Place the sensor in a dry, clean place leaving it to settle until it reaches ambient temperature, approximately 68° F (20 °C).
2. Be careful when disconnecting the nipple and mounting the pressure release valve.
3. Check that the pressure release valve has been correctly mounted and thoroughly tightened so that the sealing ring fits tightly. Always replace old sealing rings with new ones after each removal.



4.18 Ex installations

Transmitters
The instrument can be used in a 19" rack version where the sensor can be installed in the ex-area. The transmitter must be installed in a safe area or as compact (integral) Ex-d version for installation in the ex-area.

For mounting in Ex areas
Approval EEx [ia] llC T4...T6. DEMKO No. 95D.117700X

19" Ex for mounting in safe areas
Approval EEx [ia/ib] m llB T4...T6. DEMKO No. 99E.125729X.

Ex-d system
Approval Ex de [ia] llC T4...T6. DEMKO No. 99E.124212X.

Marking
The marking has the following meaning according to European Norm EN 50014.

E: Certified to CENELEC standard.

Ex: Designates explosion proof material and indicates that the apparatus has been approved in accordance with a certificate issued.

i: "Intrinsic safety" is a protection ensuring that the energy in the electric circuit is too small to ignite the explosive atmosphere. There are two categories of intrinsic safety: "ia" and "ib".

- ia: In intrinsic safety category "ia", the circuit must remain safe, even in the event of two simultaneous errors occurring that are independent of one another.
- ib: In intrinsic safety category "ib" the circuit must remain safe if one error occurs.

d: The enclosure of the of the signal converter is so strong that it can resist an explosion inside the enclosure. The enclosure is dimensioned in a way so that an explosion will not effect the surroundings.

e: "Increased safety" is a constructional safeguard which ensures the apparatus does not contain normally arcing or sparking devices, or hot surfaces that will cause ignition.

ll: Designates that the apparatus may be used in all areas (except mining).

B: Indicates the gas group in which the unit may be used.

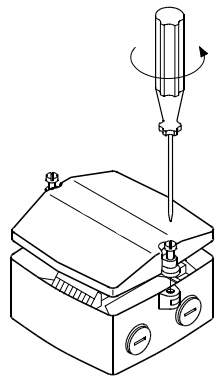
T4...T6 The temperature class describes the maximum temperature which any exposed surface of the equipment may reach. The sensor can have temperature class T3, T4, T5 or T6 depending on the temperature of the media. Please see technical data for the sensor.

- T3: Max. surface temperature 392°F (200 °C) => (Max. media temperature 356°F (180 °C))
- T4: Max. surface temperature 275°F (135 °C) => (Max. media temperature 248°F (120 °C))
- T5: Max. surface temperature 212°F (100 °C) => (Max. media temperature 194°F (90 °C))
- T6: Max. surface temperature 185°F (85 °C) => (Max. media temperature 167°F (75 °C))

5. Installation of Transmitter

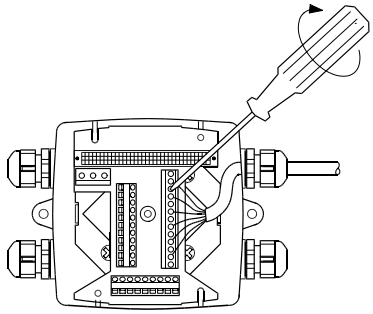
5.1 Compact (Integral) IP 67 version

1



Remove and discard the terminal box cover of the sensor.

2

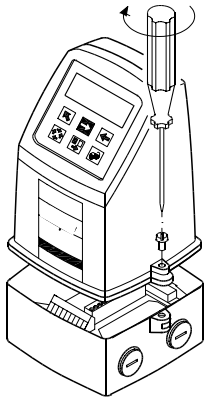


Fit the Pg 13.5 cable glands for the supply and output cables. (13.5 X 1/2 NPT adapters are supplied with each unit. FCI part number 017945-01).

Fit the supply and output cables respectively and tighten the cable glands to obtain optimum sealing.

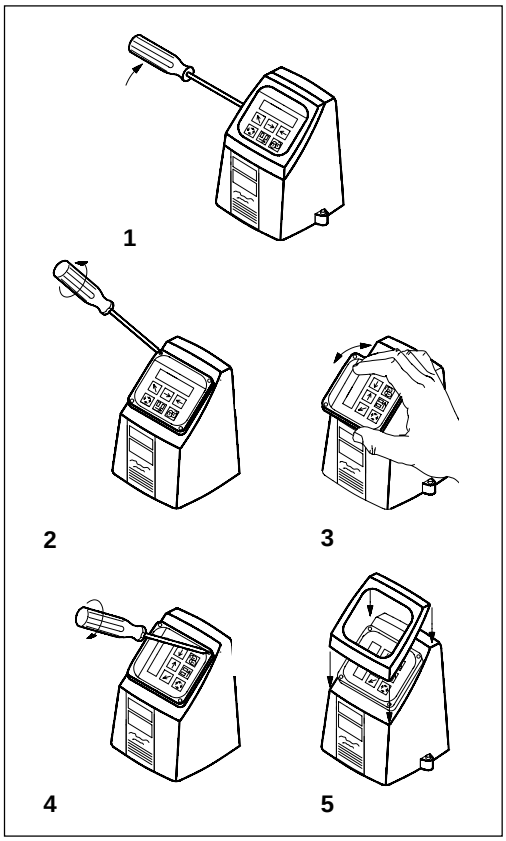
Please see the wiring diagram for the "Electrical connections".

3



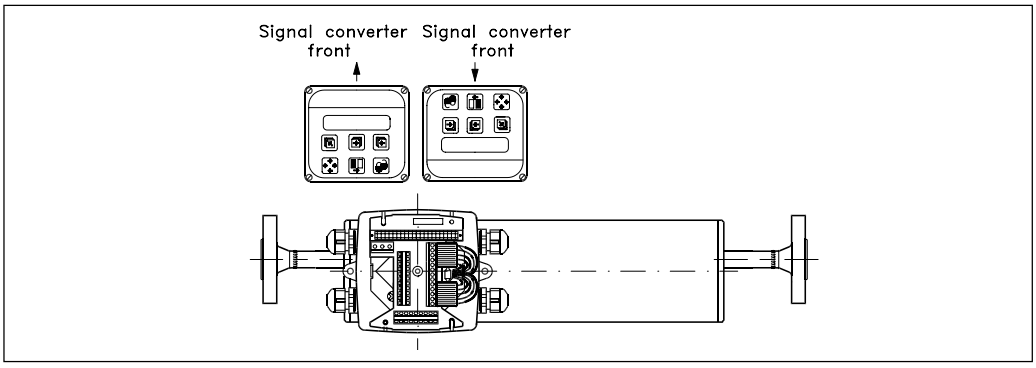
Mount the signal converter on the terminal box.

Turning the control pad

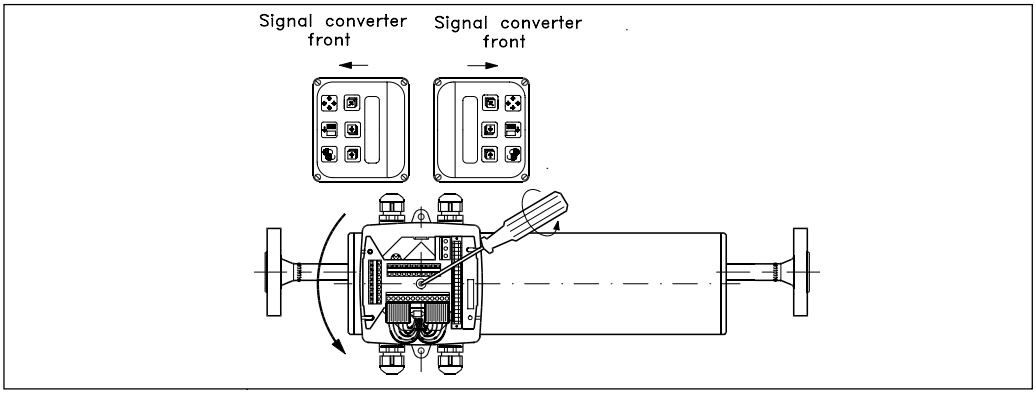


1. Remove the outer frame using a fingernail or a screwdriver.
2. Loosen the 4 screws retaining the control pad.
3. Withdraw the control pad and turn it to the required orientation.
4. Tighten the 4 screws until a mechanical stop is felt in order to obtain IP 67 enclosure rating.
5. Snap-lock the outer frame onto the control pad (click).

Turning the transmitter

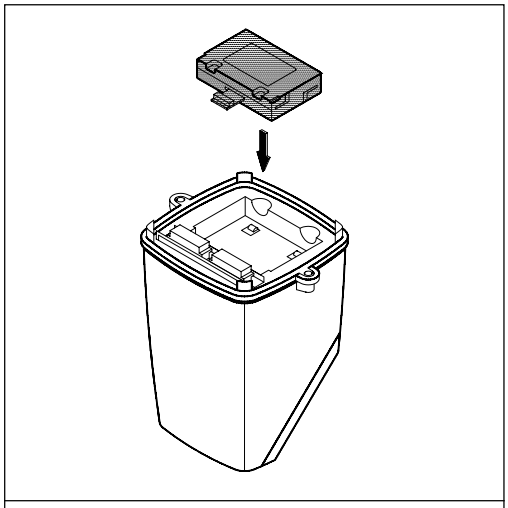


The transmitter can be mounted in either direction as the arrow indicates by turning the PCB but without turning the terminal box.

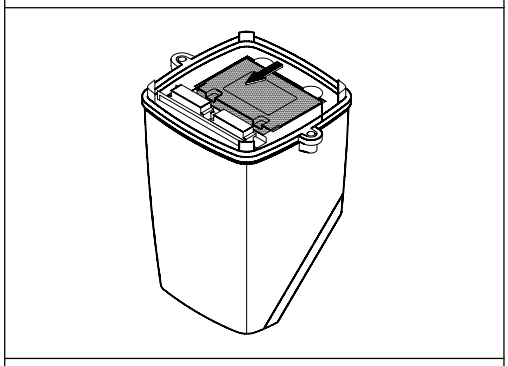


The terminal box can be rotated ±90° in order to optimize the viewing angle of the tramsmitter display/keypad:
Unscrew the four screws in the bottom of the terminal box. Turn the terminal box to the required position and re-tighten the screws firmly.

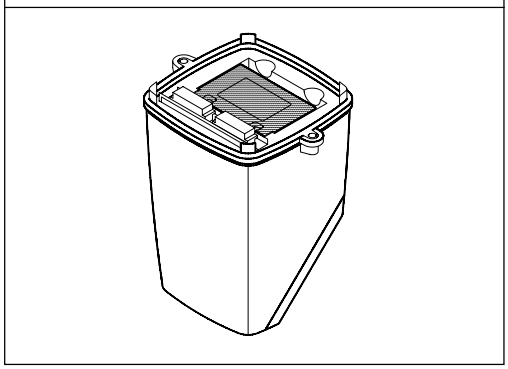
5.2.1 Add-on modules



Unpack the add-on modules and locate it in the bottom of the transmitter as shown.

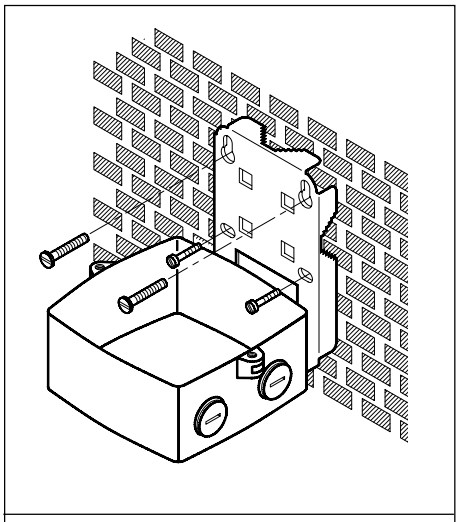


Press the add-on module forward as far as possible.

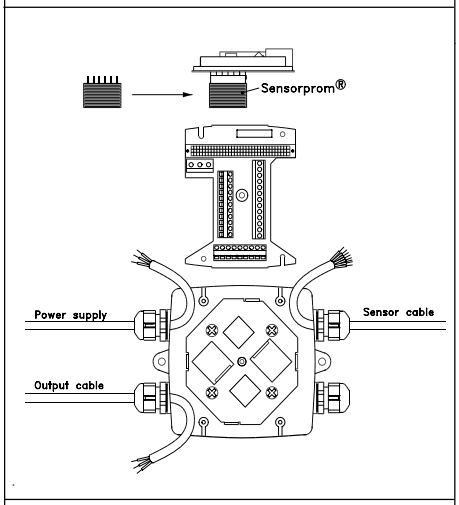


The add-on module has now been installed. The transmitter is ready to be installed on the terminal box.
Communication to the operator menu and electrical inputs and outputs are automatically established at power on.

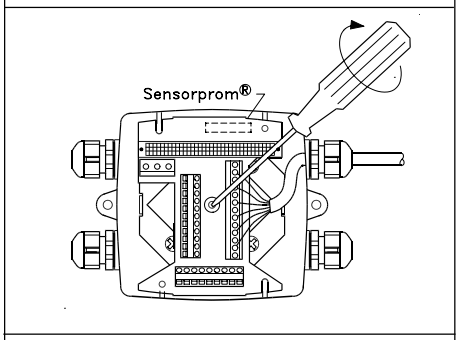
5.2.2 Remote installation Wall mounting Compact (Integral) IP 67 version



Mount the wall bracket on a wall, pipe or in the back of a panel.

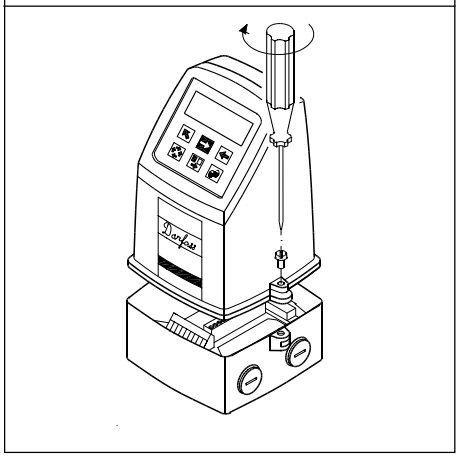


Take the SENSORPROM® unit from the sensor. Mount the SENSORPROM® unit in the wall mounting unit as shown.
The labelon the SENSORPROM® unit must face the wall bracket.



Mount the connection plate in the terminal box. Tighten the earth ground screw in the center of the connection box properly.

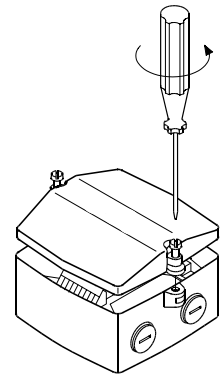
Fit the sensor, supply and output cables respectively and tighten the cable glands to obtain optimum sealing. See the wiring diagram for the "Electrical connections".



Mount the transmitter on the terminal box.

5.2.3 Compact(Integral) IP 67 Installation/ exchange of SENSORPROM® memory unit

1



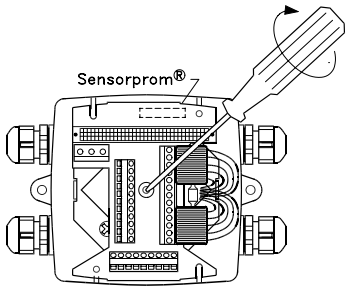
The SENSORPROM® unit is delivered mounted in the terminal box of the sensor as shown.

To remove the SENSORPROM® unit, the following procedure must be followed:

Remove the terminal box cover of the sensor, or remove the transmitter, if it has been installed.

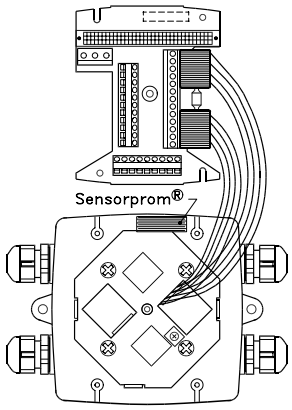
Remove the connection plate in the terminal box by unscrewing the earth grounding screw in the center as shown.

2



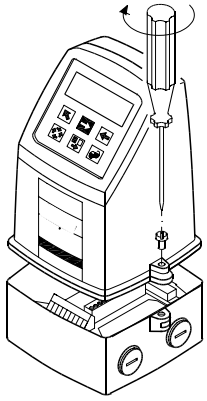
The SENSORPROM® unit is located in the bottom of the terminal box and can be removed. Note the orientation.
To re-assemble, mount the connection plate in the terminal box and tighten the earth grounding screw.
The label on the SENSORPROM® unit **must** face the wall bracket.

3

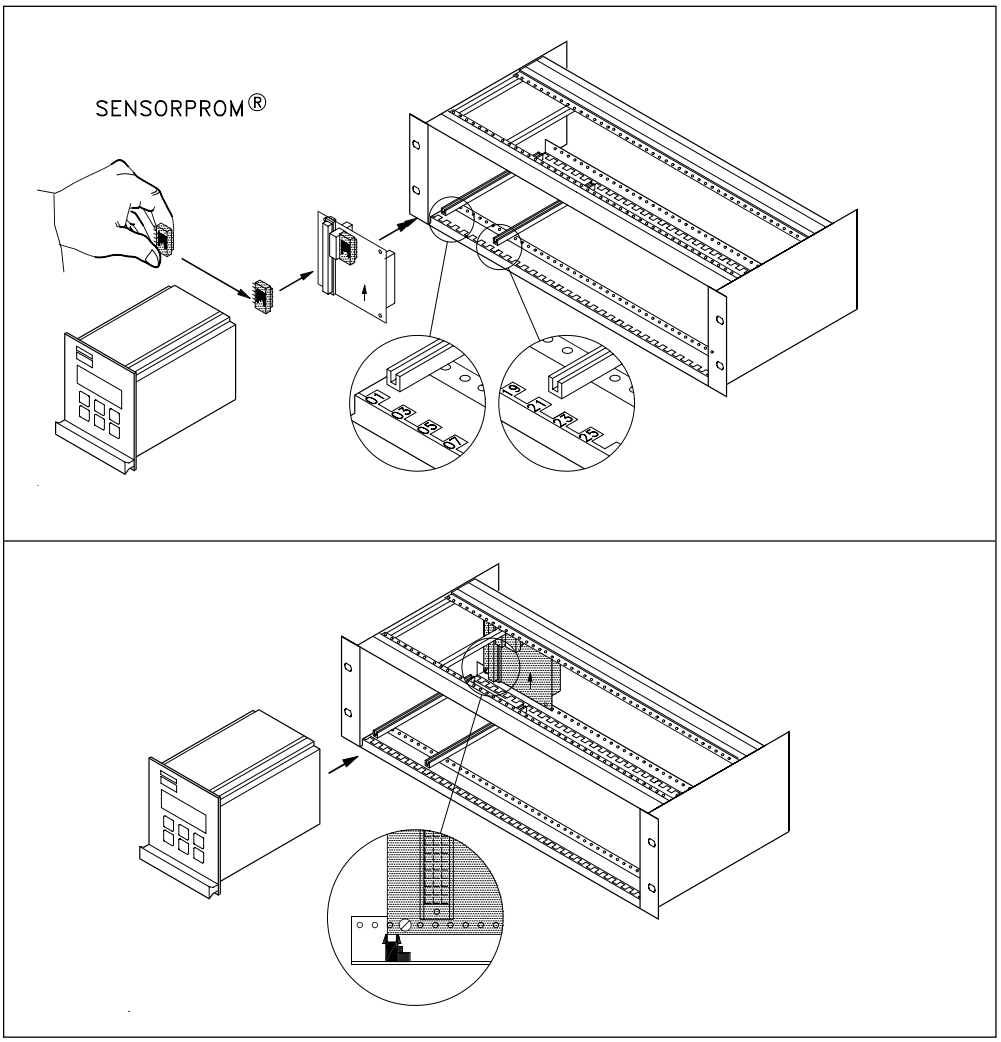


Mount the transmitter on the terminal box.

4

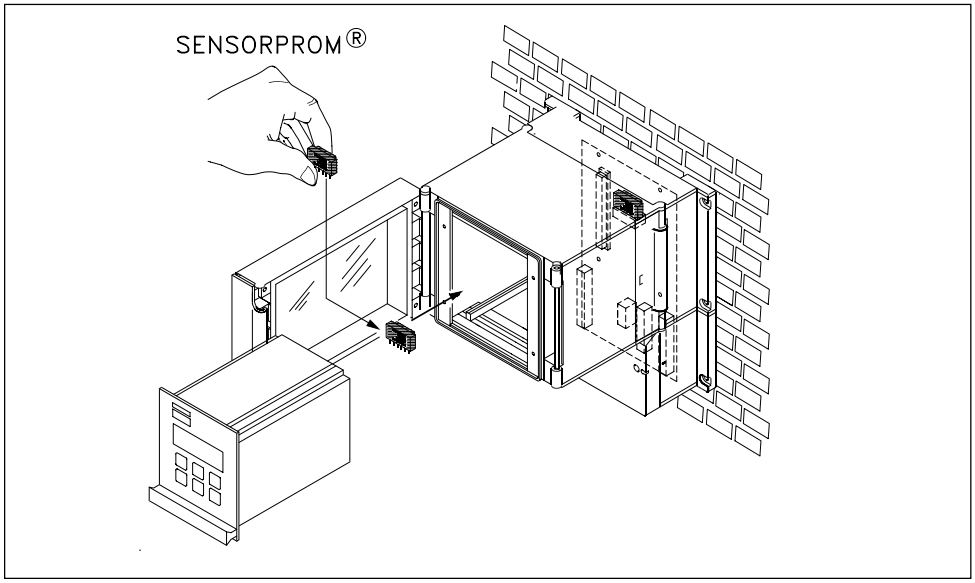


5.2.4 Remote installation Signal converter in 19" insert



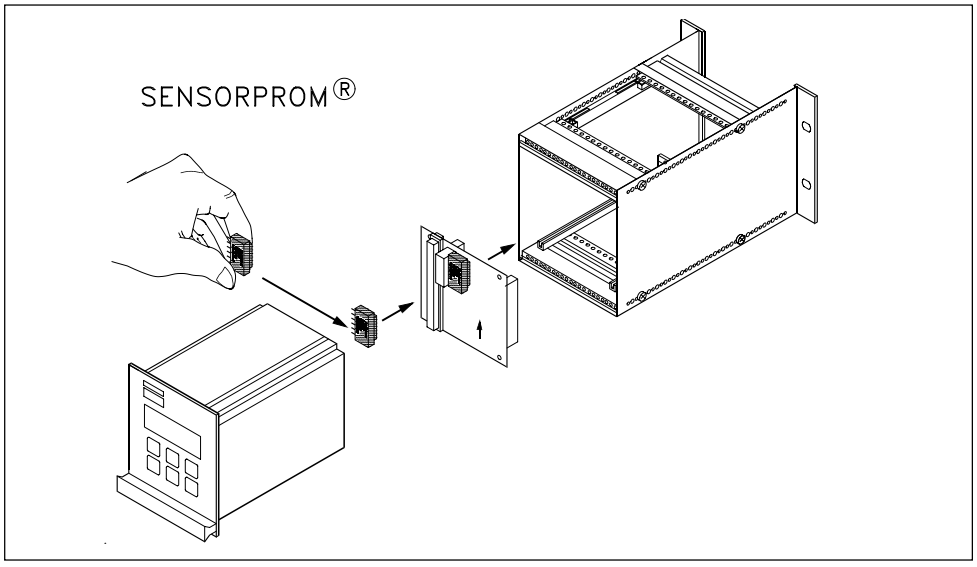
1. Fit the SENSORPROM® unit on the connection board supplied with the transmitter. The SENSORPROM® unit is supplied with the sensor.
2. Mount the guide rails in the rack system as shown. Distance between guide rails is 21 TE. Guide rails are supplied with the rack system and not with the transmitter.
3. Mount the connection board as shown. The mounting screw must be installed in line with the guide rails.
4. Connect the cables as shown under "Electrical connection".
5. Plug the transmitter into the rack system.

5.2.5 Installation in wall mounting enclosure



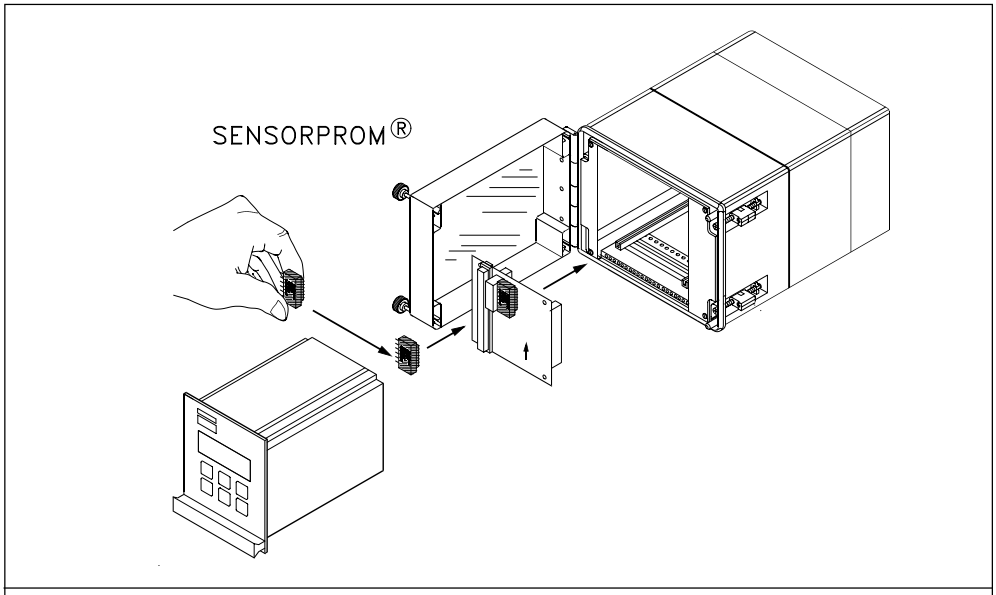
1. Mount the enclosure to the wall with four screws.
2. Mount the SENSORPROM® unit on the connection board as shown. The SENSORPROM® unit is supplied with the sensor in the terminal box. The connection board for IP 65 wall mounting boxes must be used.
3. Connect the cables to the terminals, see "Electrical connection".
4. Plug in the transmitter and close the cover.

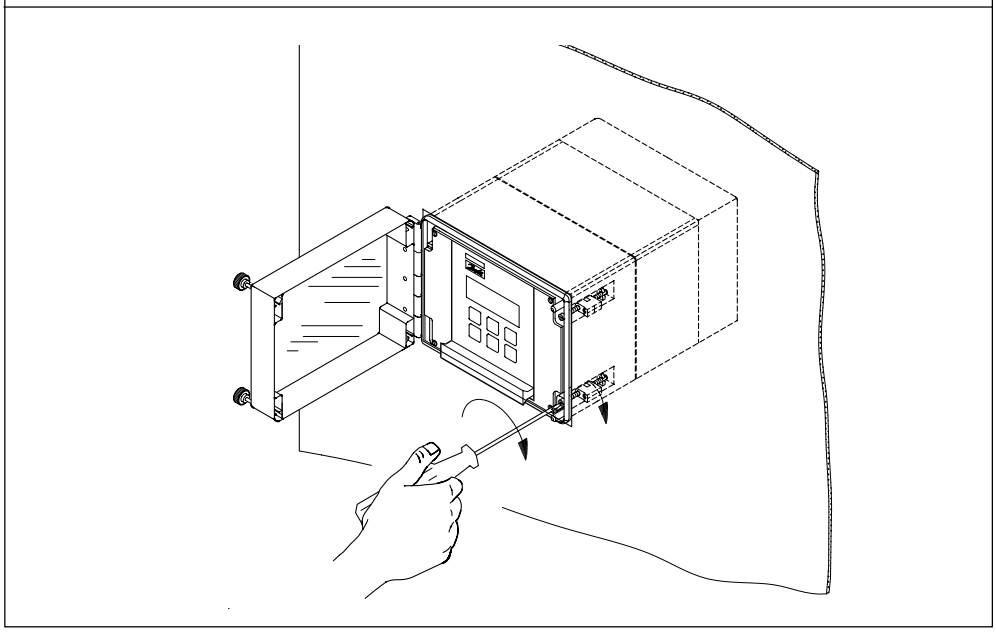
5.2.6 Installation in the back of a panel



1. Mount the SENSORPROM® unit on the connection board as shown. The SENSORPROM® unit is supplied with the sensor.
2. Mount the connection board in the back of the enclosure.
3. Connect the cables as shown under "Electrical connection".
4. Mount the enclosure in the back of a panel with four screws.
5. Plug in the transmitter.

5.2.7 Installation in panel mounting enclosure (front of panel)





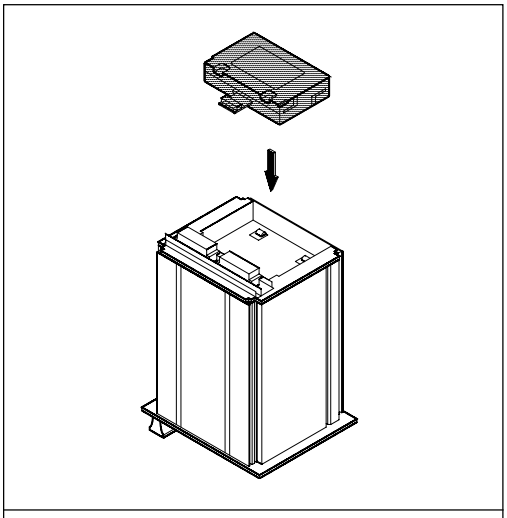
1. Mount the SENSORPROM® unit on the connection board as shown.
   The SENSORPROM® unit is supplied with the sensor.

2. Fit the enclosure in a cut out at the front of a panel. Fasten the four screws accessible at the front.

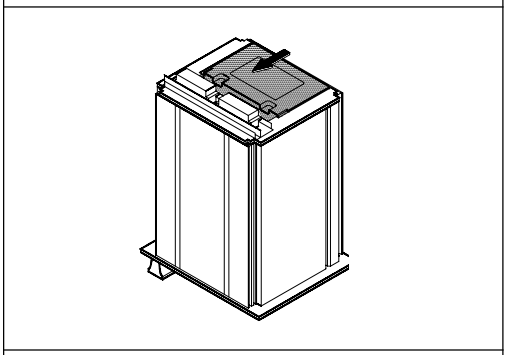
3. Connect the cables as shown under "Electrical connection".

4. Plug in the transmitter and close the cover.

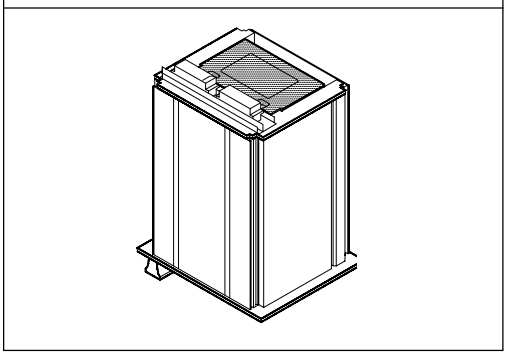
5.2.8 Add-on modules



Unpack the add-on module and locate it in the bottom of the transmitter as shown.

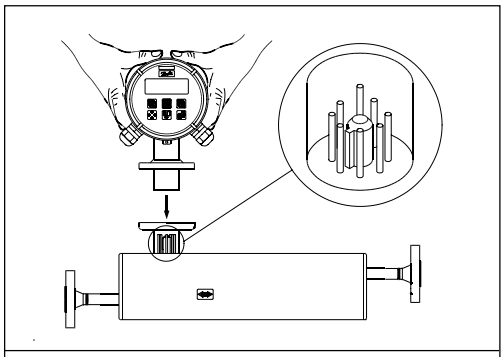


Press the add-on module forward as far as possible.

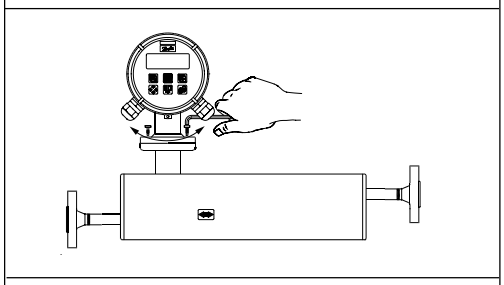


The add-on module has now been installed and the transmitter is ready to be installed on the terminal box.
Communication to the operator menu and electrical inputs and outputs are automatically established by power on.

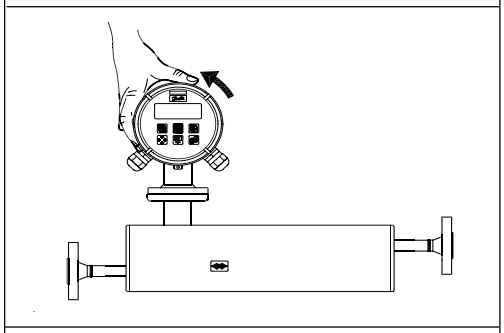
5.2.9 Compact Ex-d version



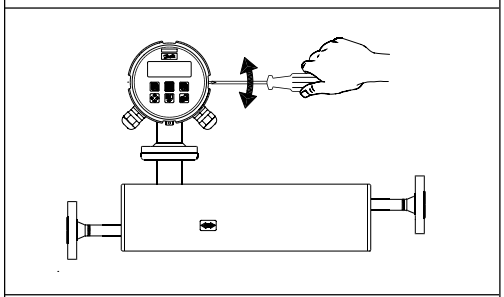
For compact (integral) installation mount the transmitter on top of the sensor interface. Make sure that it is correctly oriented (note the little tag).
After placement, it can be turned 0-360°.



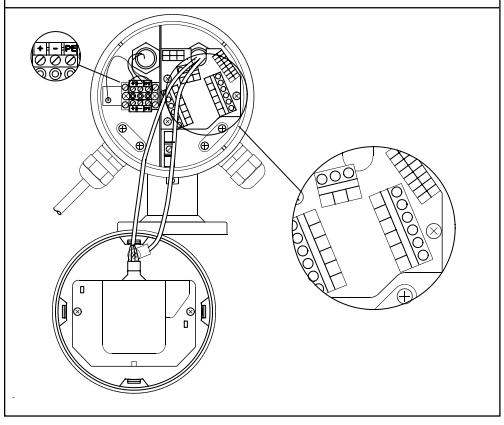
The transmitter is secured with 4 allen screws (allen key M4).



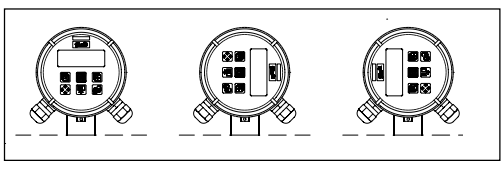
The terminals for inputs, outputs and power supply can be accessed by removing the front cover, turning it counter-clockwise.



The display can be lifted off (i.e. with the tip of a screwdriver or similar) and the terminals are accessible.

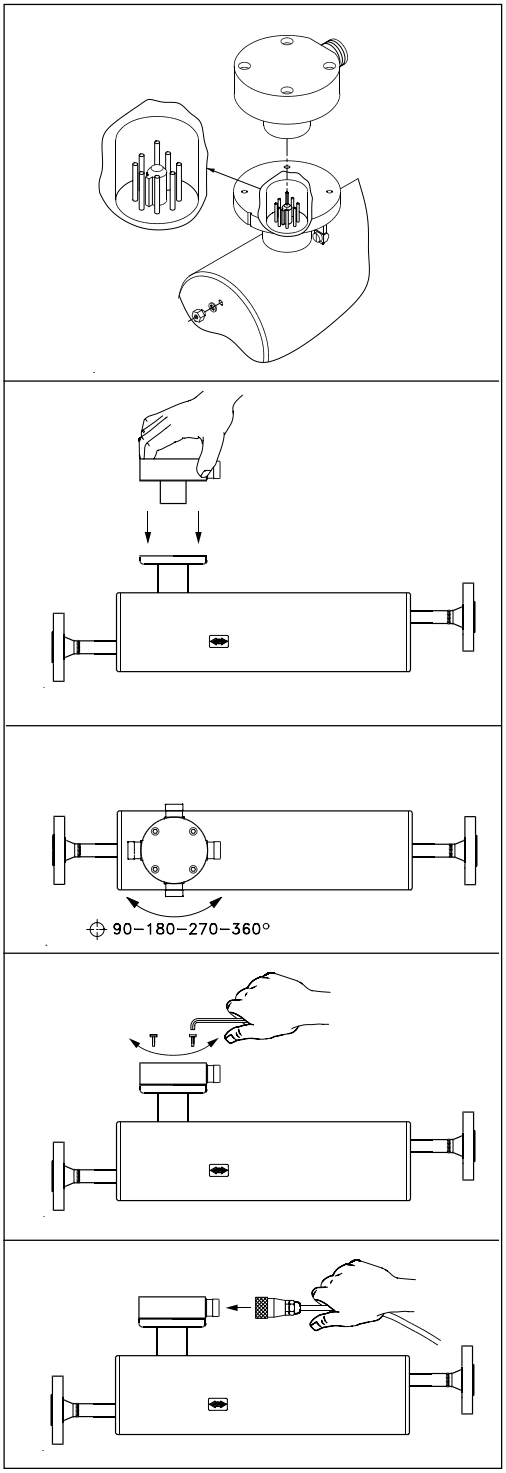


The intrinsic input and output cables must be secured by cable straps, so that they will remain in position should the terminal screws work loose.



The display/keypad can be rotated in steps of 90°. Please note the little tag on the back of the display frame which must correspond to the nut on the converter body when the display/ keypad is replaced. This is essential for obtaining optimum sealing.

5.2.10 Remote installation of multiple plug at the sensor



For remote installation mount the adaptor on top of the sensor interface. If not already mounted.
When fitting the multiple plug, please make sure that it is correctly oriented (note the little tap).

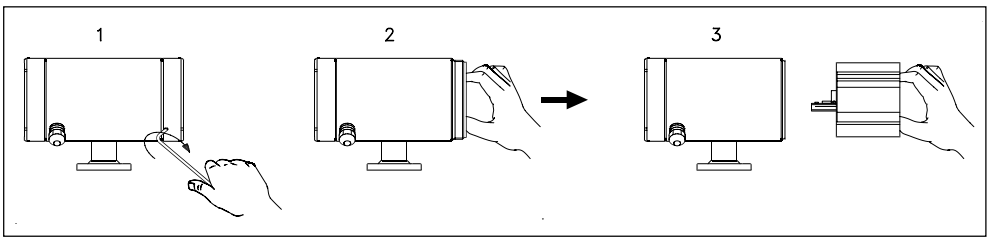
After placing, it can be turned 0 - 360°.

The adaptor can be oriented in 4 directions.
Tighten the 4 screws with a 4 mm allen key to secure the adaptor.
Mount the multiple plug in the adaptor and

tighten the glands on the plug to obtain optimum sealing.
Note the wire colors when connecting the instrument. Refer to the diagram for electrical wiring, see “Electrical connection”.

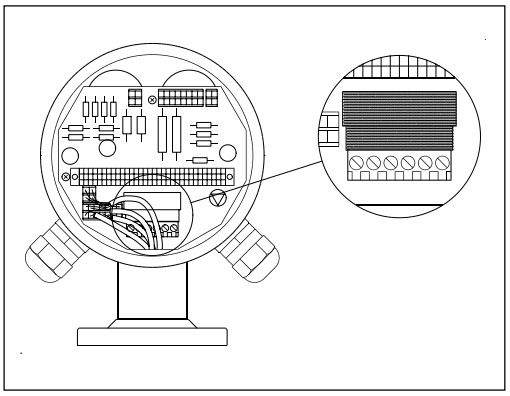
5.2.11 Compact (Integral) Ex-d version Location of the SENSORPROM® memory unit

The SENSORPROM® unit is normally factory-installed. To remove the SENSORPROM® unit, use the following procedure:



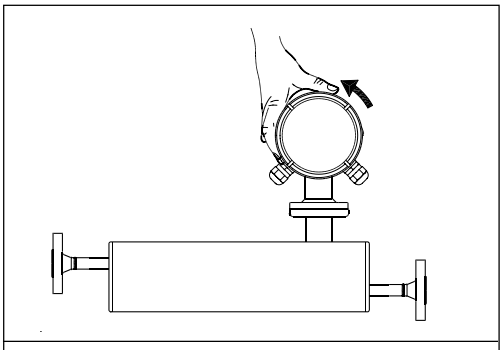
1. Remove the rear cover, by loosening the safety tap allen screw (M3), and turn the rear cover counter-clockwise.

2. Remove the electronics using the holes provided.

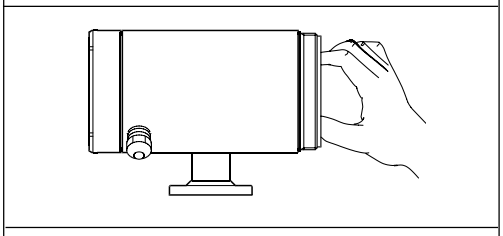


The SENSORPROM® unit is placed at the bottom of the housing.
The SENSORPROM® unit can be installed/removed by screwing/ unscrewing the 6 terminal screws connecting the SENSORPROM® unit.
The label on the SENSORPROM® unit must face outwards.

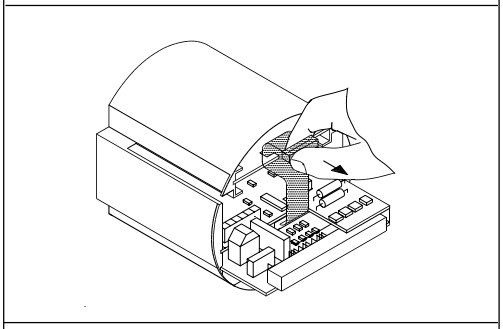
5.2.12 Compact (Integral) Ex-d version Installation of add-on module



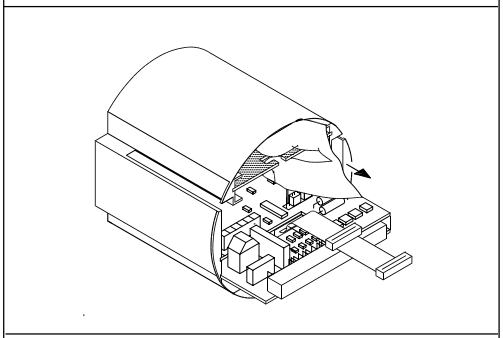
Remove the rear cover, by loosening the safety tap allen screw (M3) and turn the rear cover counter-clockwise.



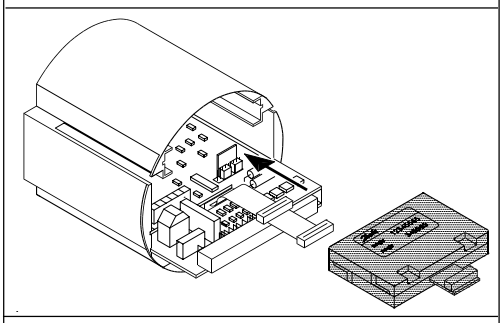
Remove the electronics using the holes provided.



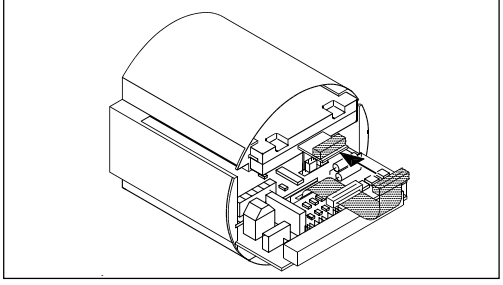
Remove the flat cable from the plate.



Remove the plate from the module bay.



The add-on module is fitted at the bottom of the converter insert as shown. The label text on the add-on module should face up as shown.
The add-on module is fitted with the connector facing out of the enclosure.



The add-on module can be pressed into position.
Connect the flat cable connector to the module and power up. The add-on module is automatically initialized. The menu's are now visable on the display/keypad of the Transmitter.

Warning

Ex-compliance of add-on module

When installing the add-on module in the Transmitter Ex-d, only Ex modules which have been approved can be used.

All modules, which can be used, have been clearly marked with the Ex-symbol and Ex-approval No.

Installation and wiring, instructions supplied with the module must be followed.

In case of service or installation of add-on module

If the electronics is to be replaced or an add-on module is to be installed, this can be done by dismantling the cover located in the back of the enclosure.
To reduce the risk of ignition of hazardous atmospheres, disconnect the equipment from the supply circuits before opening. Keep assembly tightly closed when in operation.