



Technical data

2. Technical data
2.1 CMF Series A Through F

Versions		CMF - A 1/16	CMF - B 1/8	CMF - C 1/4	CMF - D 1/2	CMF - E 1	CMF - F 2
	<i>inch</i> (Nominal)						
Inside pipe diameter (Sensor consists of one continuous pipe)	<i>mm</i>	1.5	3.0	6.0	14.0	29.7	43.1
Pipe wall thickness	<i>mm</i>	0.25	0.5	1.0	1.0	2.0	2.6
Mass flow measuring range	<i>lb/min</i> <i>(kg/h)</i>	0-2.4 (0-65)	0-9.2 (0-250)	0-37 (0-1,000)	0-206 (0-5,600)	0-921 (0-25,000)	0-1916 (0-52,000)
Density	<i>g/cm³</i>	0.1-2.9					
Fraction e.g.	<i>°Brix</i>	0-100					
Temperature °C		-58 to 257°F (-50 to +125)		-58 to 356°F (-50 to +180)			
Standard							
High temperature version		-58 to 356°F (-50 to +180)					
Liquid pressure measuring pipe 1)							
Stainless steel	<i>psi</i> <i>(bar)</i>	4292 (296)	4277 (310)	4741 (345)	2291 (165)	1957 (135)	1812 (125)
Hastelloy C-22	<i>psi</i> <i>(bar)</i>	6670 (460)	5655 (390)	6235 (430)	3016 (208)	2769 (191)	2508 (173)
Materials		1.4435 (316 Stainless steel) 2.4602 (Hastelloy C-22)					
Measuring pipe, flange-, Thread connection as standard		IP 65 and 1.4301, (Stainless steel)					
Enclosure and enclosure material		IP 65 and 1.4301, (Stainless steel)					
Enclosure, burst pressure	<i>psi</i> <i>(bar)</i>	1015 (70)	2755 (190)	2755 (190)	2030 (140)	1305 (90)	725 (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 × 2 × 0.35 mm ² twisted and screened in pairs, ext. Ø 12 mm					
Ex-version 4)		EEx ia II C T3-T6					
Weight approx.	<i>lbs</i> <i>(kg)</i>	5.7 (2.6)	9 (4)	18 (8)	27 (12)	106 (48)	106 (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 ASEP

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		
<i>Current</i>	0-20 mA or 4-20 mA	
<i>Load</i>	< 800 ohm	
<i>Time constant</i>	0-30 s adjustable	
Digital output		
<i>Frequency</i>	0-10 kHz, 50% duty cycle	
<i>Time constant</i>	0-30 s adjustable	
<i>Active</i>	24 V d.c., 30 mA, 1 K Ω \leq R _{load} \leq 10 K Ω , short-circuit-protected	
<i>Passive</i>	3-30 V d.c., max. 110 mA, 1 K Ω \leq R _{load} \leq 10 K Ω	
Relay		
<i>Type</i>	Change-over relay	
<i>Load</i>	42 V / 2 A peak	
<i>Functions</i>	Error level, error number, limit, direction	
Digital input	11-30 V d.c. Ri = 13.6 K Ω	
<i>Functionality</i>	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		
<i>Low-flow</i>	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 alphanumeric 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		
<i>Material</i>	Fiber glass-reinforced polyamide	
<i>Rating</i>	IP 67 to IEC 529 and DIN 40050 (1 m w.g. for 30 min.)	
<i>Mechanical load</i>	18-1000 Hz random, 3.17G rms, in all directions, to IEC 68-2-36	
Supply voltage	24 V version	230 V version
<i>Supply</i>	24 V d.c./a.c., 50-60 Hz	115/230 V a.c., 50-60 Hz
<i>Fluctuation</i>	24 V d.c., -25 to 25%	+10 to -10%
	24 V a.c., -16 to 25%	
<i>Power consumption</i>	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	
Environment	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	

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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		
<i>Current</i>	0-20 mA or 4-20 mA	
<i>Load</i>	< 800 ohm	
<i>Time constant</i>	0-30 s adjustable	
Digital output		
<i>Frequency</i>	0-10 kHz, 50% duty cycle	
<i>Time constant</i>	0-30 s adjustable	
<i>Active</i>	24 V d.c., 30 mA, 1 KΩ ≤ R _{load} ≤ 10 KΩ, short-circuit-protected	
<i>Passive</i>	3-30 V d.c., max. 110 mA, 1 KΩ ≤ R _{load} ≤ 10 KΩ	
Relay		
<i>Type</i>	Change-over relay	
<i>Load</i>	42 V / 2 A peak	
<i>Functionality</i>	Error level, error number, limit, direction	
Digital input	11-30 V d.c., Ri = 13.6 KΩ	
<i>Functionality</i>	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		
<i>Low-flow</i>	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		
<i>Material</i>	Standard 19" insert of aluminium/steel (DIN 41494)	
<i>Dimensions</i>	Width: 21 TE	
	Height: 3 HE	
<i>Rating</i>	IP 20 to IEC 529 and DIN 40050	
<i>Load</i>	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
<i>Supply</i>	24 V d.c./a.c., 50-60 Hz	115/230 V a.c., 50-60 Hz
<i>Fluctuation</i>	24 V d.c., -25 to 25%	+10 to -10%
	24 V a.c., -16 to 25%	
<i>Power consumption</i>	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	
Environment	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

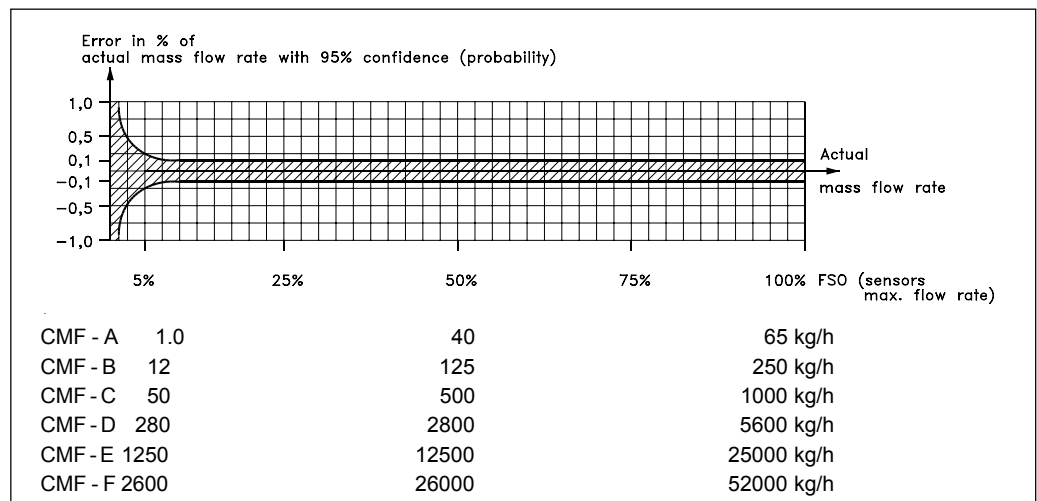
	Transmitter Ex-d			
Measurement of	Mass flow [lb/min / kg/s], volume flow [gpm, l/s], fraction [%], °Brix, density [kg/m ³], temperature [°F, °C]			
Current output	Classified Ex ia, selectable as active or passive outputs. Default setting is passive mode			
<i>Current</i>	0-20 mA or 4-20 mA			
<i>Load</i>	< 350 ohm			
<i>Time constant</i>	0.1-30 s adjustable			
Output characteristics (Terminals: 31-32)	Active mode		Passive mode	
	U _o	24 V	U _i	30 V
	I _o	115 mA	I _i	115 mA
	P _o	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	0-10 kHz, 50% duty cycle			
<i>Frequency</i>	0.1-30 s adjustable			
<i>Time constant</i>	6-30 V d.c., max. 110 mA, 1 KΩ ≤ R _{load} ≤ 10 KΩ			
<i>Passive</i>				
Output characteristics (Terminals: 56-57-58)	Active mode		Passive mode	
	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)	Change-over relay			
<i>Type</i>	30 V / 100 mA			
<i>Load</i>	Error level, error number, limit, direction			
<i>Functionality</i>	U _i : 30 V, I _i : 100 mA, C _i : 0 nF, L _i : 0 mH			
<i>Output characteristics</i>				
Digital input (Terminals: 77-78)	11-30 V d.c., R _i = 13.6 KΩ			
<i>Functionality</i>	Start/hold/continue batch, zero point adjust, reset totalizer 1/2, force output, freeze output			
<i>Output characteristics</i>	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	0-9.9% of maximum flow			
<i>Low-flow</i>	Detection of empty sensor			
<i>Empty pipe</i>	0 - 2.9 g/cm ³			
<i>Density</i>				
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 (Terminals: 91-92)	Active mode		Passive mode	
	U _o	6.51 V	Not available	
	I _o	311 mA		
	P _o	0.55 W		
	C _o	20 nF		
	L _o	100 μH		
PROFIBUSPA (Terminals: 95-96)	Active mode		Passive mode	
	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)

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Enclosure	<i>Material</i>	Stainless steel AISI 316 W1.4435			
	<i>Rating</i>	Compact mounted on sensor, IP 67 to IEC 529 and DIN 40050			
		Remote mounted, IP 65 to IEC 529 and DIN 40050			
<i>Load</i>	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.			
	<i>Range</i>	20 to 30 V a.c.			
<i>Power consumption</i>	6 VA I _N = 250 mA, I _{ST} = 2A (30 msec.)			18 to 30 V d.c.	
<i>Power supply</i>	6 VA I _N = 250 mA, I _{ST} = 2A (30 msec.)			6 VA I _N = 250 mA, I _{ST} = 2A (30 msec.)	
Ex approval	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 [□]				
	EEx de [ia/ib] IIC T3-T6, DEMKO Ex 99E.124212X				
	<i>Temperature class</i>	T6	T5	T4	T3
	<i>Process liquid temperature</i>	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**



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- 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					
	CMF - A	CMF - B	CMF - C	CMF - D	CMF - E	CMF - F
Measuring pipe version						
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/cm ³]	0.001	0.0015	0.0015	0.0005	0.0005	0.0005
• Repeatability error [g/cm ³]	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/cm ³
Brix	40 °Brix
Supply voltage	Un ±1%
Warming-up time	30 min.
Cable length	16.4 F (5 m) between converter and sensor

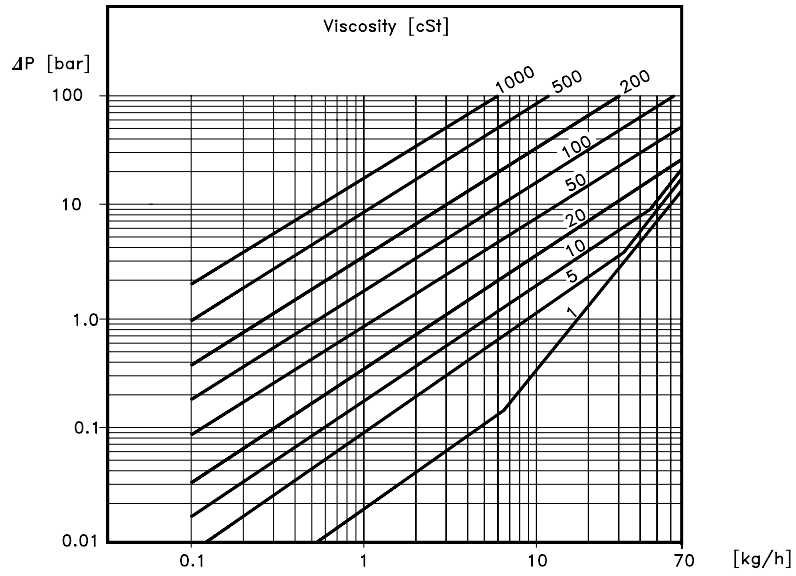
Additions in the event of deviations from reference conditions

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

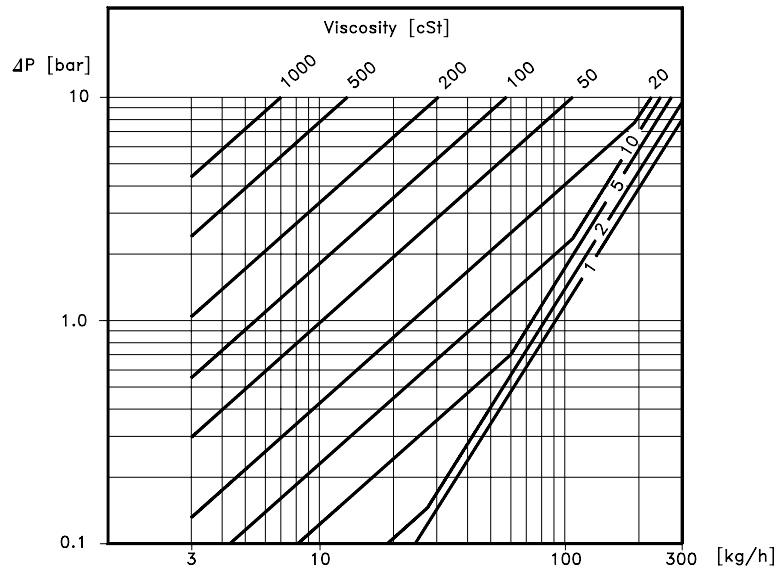
2.4 Pressure drop

Technical data

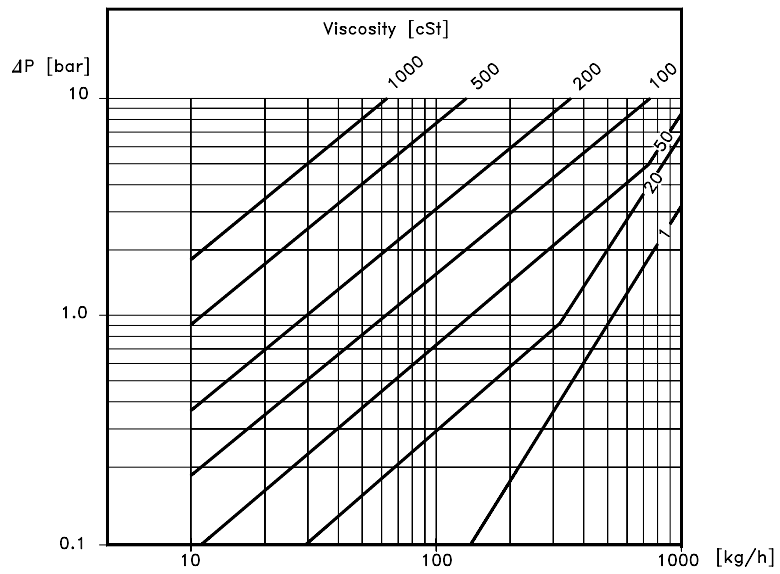
CMF - A



CMF - B

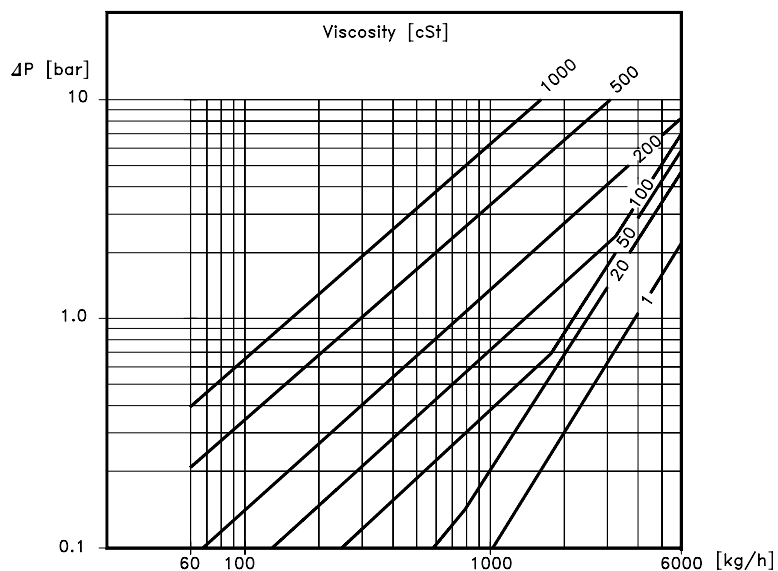


CMF - C

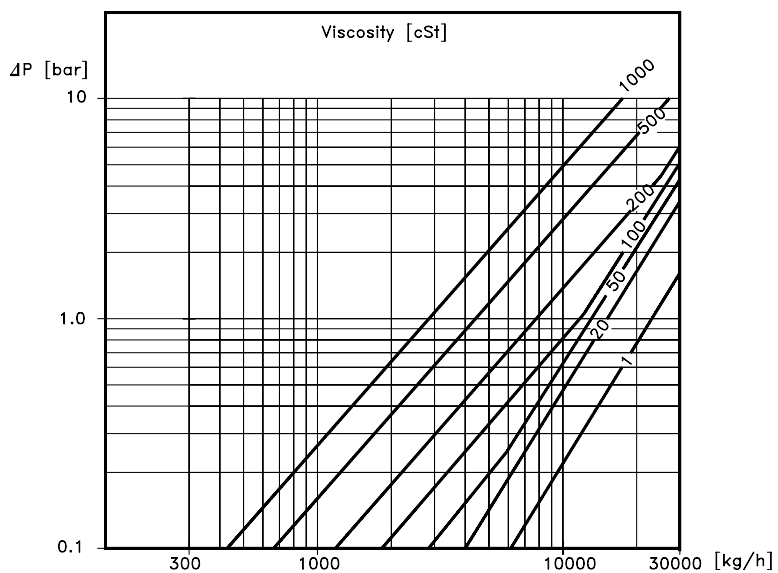


2.4 Pressure drop (cont.)

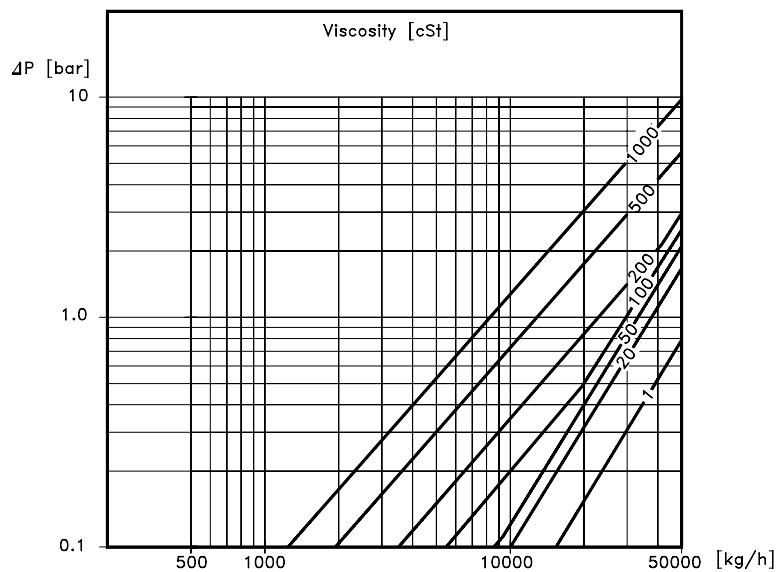
CMF - D



CMF - E



CMF - F



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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	<ul style="list-style-type: none"> • Single loop mode • Multi-drop mode, 14 slave devices
Communicator	Rosemount Hand held communicator type 275

Cable specification

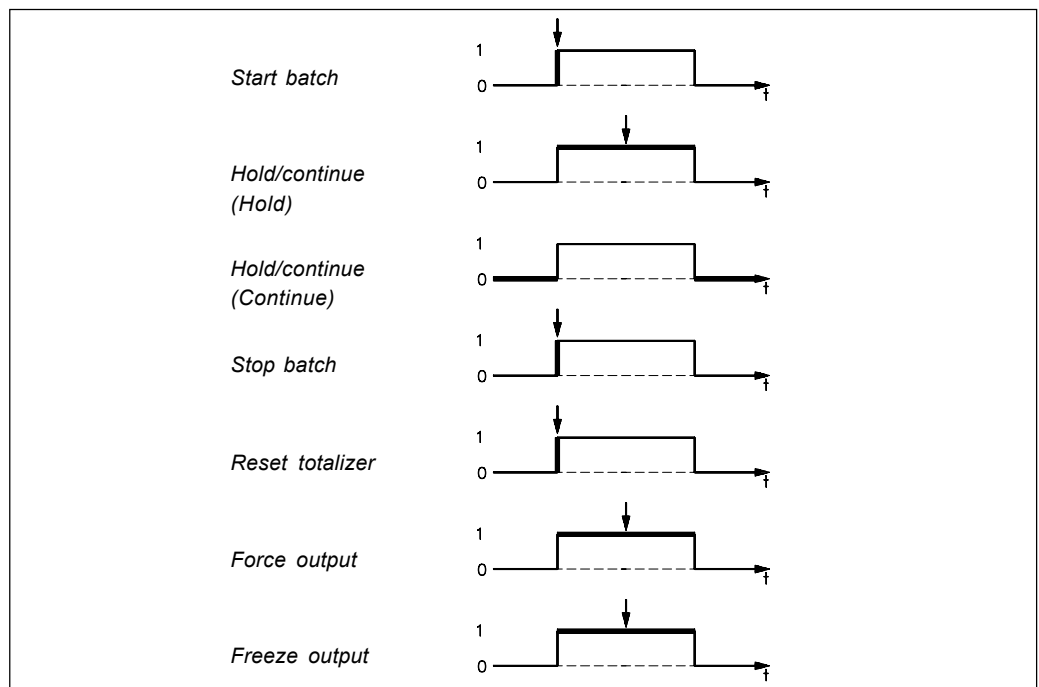
Basic data					
Q [mm ²] CU	≥ 0.2 mm ² /AWG 24				
Screen	YES (Overall screen)				
Loop resistance	<table border="0"> <tr> <td style="padding-right: 10px;"><i>Min.</i></td> <td>230 Ω</td> </tr> <tr> <td style="padding-right: 10px;"><i>Max.</i></td> <td>800 Ω</td> </tr> </table>	<i>Min.</i>	230 Ω	<i>Max.</i>	800 Ω
<i>Min.</i>	230 Ω				
<i>Max.</i>	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 terminator at both ends

2.8 Input characteristics



2.9 Output characteristics

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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 <i>Limit parameters: Flow, density, temperature, fraction</i>	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				