

Coriolis mass
flow meters
CMM



KRACHT®

FLUID TECHNOLOGY AND SYSTEMS

Content

Function / Applications	4
Technical data	5 – 6
General characteristics	6
Type key	7
Dimensions	8
Application examples	9

Description

I View – Coriolis mass flow meter and signal processors



I Function CMM

The Coriolis mass flow meter CMM contains oscillating measuring tubes which make use of the Coriolis force effect. The mass flow entering through the inlet of the flow meter is distributed by the flow-distributor to the measuring tubes bended parallelly and symmetricaly. The measured medium after flowing through the measuring tubes is collected in the outlet tube and is leaving the meter through the outlet.

Due to an electromagnetic oscillating coil the symmetrical constructed pair of measuring tube is oscillating continuously and symmetrically at its momentary resonance frequency. Two sensor coils are fixed at the pipes symmetrically, sensing the symmetry of the oscillation. In flowless condition the electric signal of the two coils are sine wave signals identical in amplitude and in phase. In case a mass flow is started through the pipes, the symmetry of the oscillation is disturbed. Due to this sine wave signal of the sensor at one side is shifted in time from the sine wave of the sensor at the other side. The value of the time shift is directly proportional to the mass flow.

With the signal processing units C-MASS-021 or C-MASS-021-D the signals of CMM are received and processed.

I Applications

- measurement of highly viscous fluids (no effect of viscosity)
- measurement of aggressive fluids
- measurement and control of concentration in quality control and mixing process
- measurement of mass custody transfer of liquefied gases (LPG, LNG)
- measurement of components in mixtures based on mass, density and temperature measurement (normalized volume of pure ethyl alcohol, API normal volume, oil water content)

As output signals frequency, current output or serial interface are available. Two ATEX version are available for operation in potentially explosive atmospheres:

1. Using C-MASS-21 signal processor in normal housing.

In this case a Zener Barrier Unit (ZBU) must be mounted between the CMM sensor and C-MASS-021 signal processor. The ZBU and C-MASS-021 must be in the safe area. The safety degree of this measuring circuit:

Ex II (2)G [Ex ib]

according to the standards
ATEX 94/9EC; MSZ EN 60079-0:2012; MSZ EN 60079-0:2013

2. Using C-MASS-021-D signal processor in Ex-d housing.

In this case the C-MASS-021-D signal processor and CMM mass flow sensors can be in the hazardous area, as the Zener Barrier Unit (ZBU) is built in the Ex-d housing of the signal processor unit. The safety degree of this measuring circuit:

Ex II (2)G Ex d [ib] IIB T6

according to the standards
ATEX 94/9EC; MSZ EN 60079-0:2013; MSZ EN 60079-1:2008; MSZ EN 60079-11:2012

Technical Data

I General characteristics CMM

Nominal sizes	0.15 · 0.5 · 1 · 3 · 6 · 14 · 40 · 80 · 160 · 300 (sizes indicate the maximum mass flow in t/h)
Type of connection	Pipe connection Flange connection (special connections on request)
Flow direction	Bi-directional (positive direction is indicated on the body of sensor)
Certified measurement accuracy	See page 5, 6
Maximum pressure	See table page 8
Ambient temperature	-40 ... 60 °C
Media temperature	-40 ... 200 °C
Material	Stainless steel (1.4404; 1.4541; 1.4301) Hastelloy

I Weight

Size	kg
0.15	8.5
0.5	6.8
1	7.5
3	11.0
6	14.0
14	18.0
40	35 – 48
80	85 – 112
160	120 – 155
300	145 – 250

I Pressure loss at max. flow rate (water at 20 °C)

Size	bar
0.15	2
0.5	1.9
1	1.7
3	1.5
6	1.9
14	1.0
40	1.3
80	0.9
160	1.8
300	2.1

In the case of fluids other than water, the expected pressure drop can be calculated by knowing the viscosity and density of the fluid to be measured. For the calculations ask the help of the manufacturer (info@kracht.eu).

I Mass measurement

	Measuring ranges CMM (MF_{min} ... MF_{max}) for certified accuracy classes									
	0.15	0.50	1.0	3.0	6.0	14.0	40.0	80.0	160.0	300.0
MF_{max} kg/h for all accuracy classes	150	500	1000	3000	6000	14 000	40 000	80 000	160 000	300 000
MF_{min} kg/h accuracy class: 0.3 %	11.6	38.5	77.0	231	462	1 078	3 080	6 160	12 320	23 100
MF_{min} kg/h accuracy class: 0.5 %	6.3	21.0	42.0	126	252	587	1 678	3 357	6 713	12 587
MF_{min} kg/h accuracy class: 1.0 %	3.0	10.1	20.2	61	121	283	810	1 619	3 239	6 072
Minimum measurable mass: MMQ_M kg	0.2	0.5	1	2.5	5	13	35	60	90	120

Technical Data

I Density measurement

Temperature range	-40 ... 200 °C
Density range	400 ... 1300 kg/m ³

CMM	Accuracy of density measurement (kg/m ³)
0.15	± 5
0.50	± 2
1.00	± 2
3.00	± 1
6.00	± 1
14.0 ... 300	± 0.8

I Temperature measurement

Media temperature range	Temperature tolerance
-40 ... 200 °C	± 1 °C

Note:

When installing in explosive atmospheres, the upper limit of the fluid and ambient temperature are determined by the temperature class of Ex protection.

I General characteristics signal processors – C-MASS-021 / C-MASS-021-D

Type selection	C-MASS-021 - Signal processor built in normal housing C-MASS-021-D - Signal processor and Zener Barrie unit built in Ex-d housing
Output signals	Frequency (max. 10 kHz) Current (max. 20 mA) Warning signal Serial interface RS 232 or RS 485/422 with MODBUS RTU
Ambient temperature	-20 ... 55 °C
Power supply	18 ... 30 VDC
Protection	IP 65
Humidity	30 ... 70 % (without condensation)

Type key

I Example

CMM	0.15	EN	S	NT	100	C	N
1	2	3	4	5	6	7	8

1 Product

2 Nominal sizes

0.15	0.5	1	3	6	14	40	80	160	300
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3 Pipe connection

EN	ANSI	R	E	X	
EN flanges	ANSI flanges	NPT	ERMETO	Special	

4 Material

S	X	
Stainless	Special	

5 Media temperature

NT	
-40 ... 200 °C	

6 Pressure rate (bar)

010	016	025	040	063	100	160	250	320	
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7 Cable connection

H	J	
Hirschmann	Junction box	

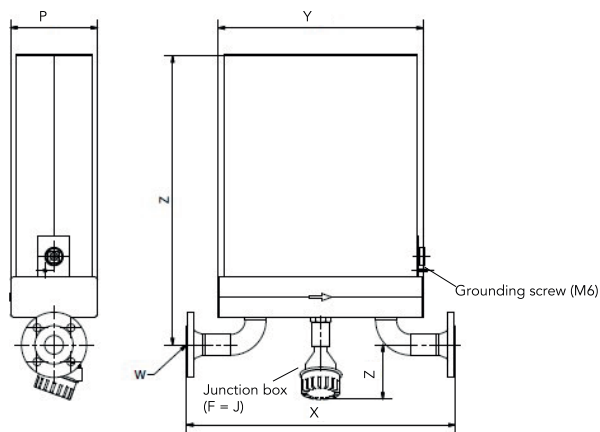
8 ATEX

N	EX	
No	with barrier unit	

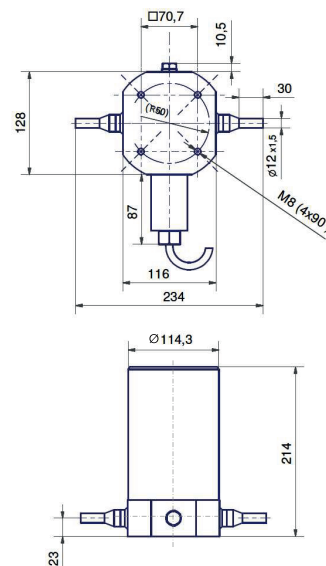
Dimensions

Size	X	Y	Z	Z'	P	Pipe connection (W)		max. pressure bar
						Threaded	Flanged	
0.15	See drawing below					NPT 1/2"	DN 15	250
0.5	346	280	310	300	102	NPT 1/2"	DN 15	250
1	406	320	357	300	102	NPT 1/2"	DN 15	320
3	470	384	382	280	102	NPT 1/2"	DN 15	250
6	470	384	387	250	128	NPT 1/2"	DN 15	220
14	590	426	704	230	160	NPT 1"	DN 25	160
40	670	500	750	150	150	NPT 1 1/2"	DN 40/50	160
80	1040	700	1072	100	189	-	DN 80/100	160
160	1185	860	1090	40	280	-	DN 100/150	160
300	1260	920	1350	10	364	-	DN 100/150	160

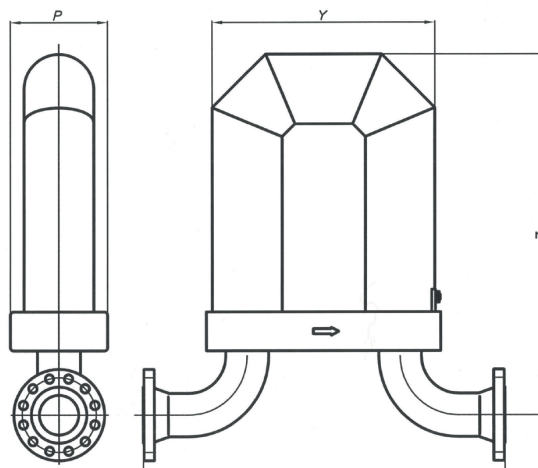
CMM 0.5 ... 80



CMM 0.15



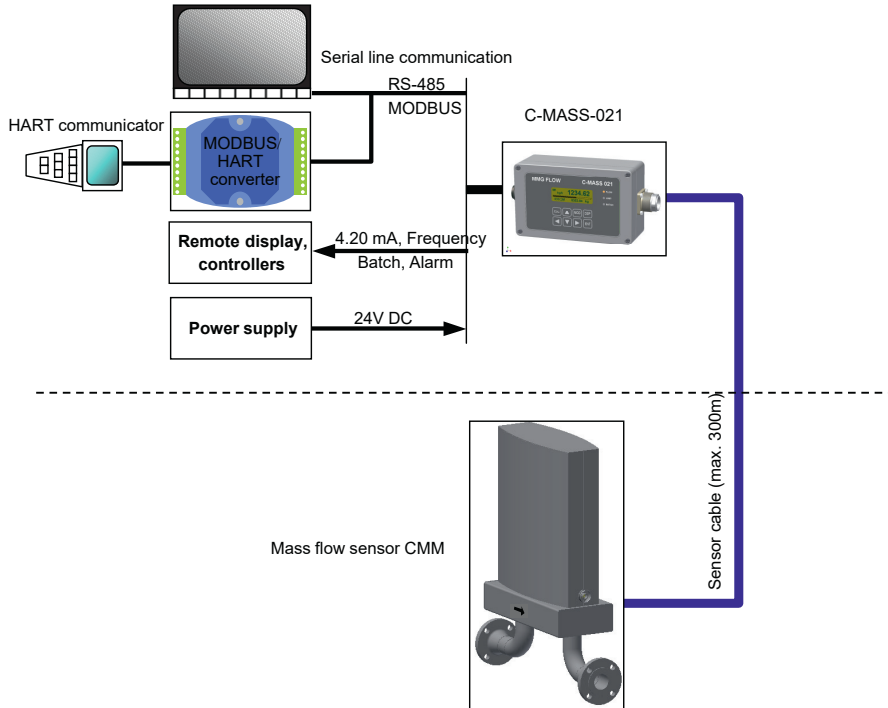
CMM 160 ... 300



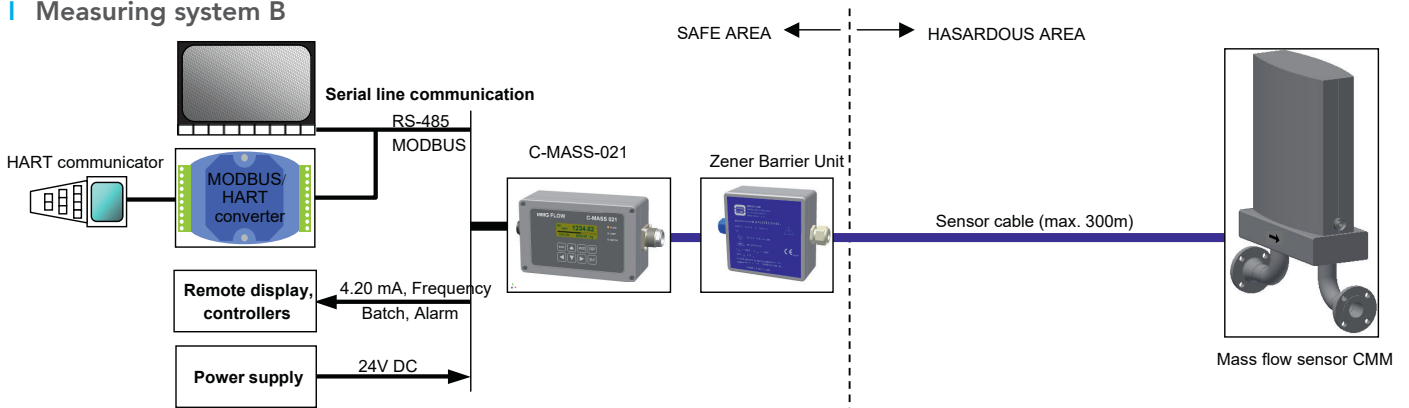
Application examples

I Measuring systems

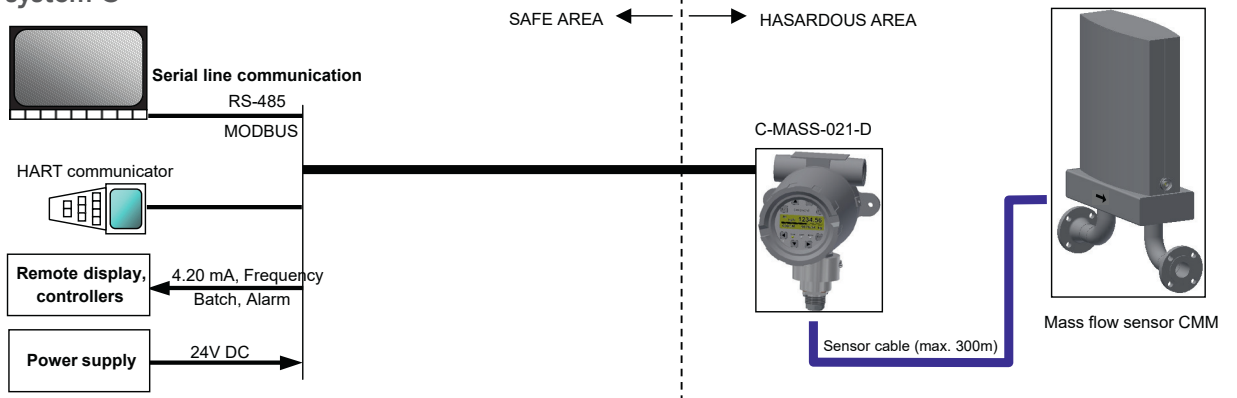
I Measuring system A



I Measuring system B

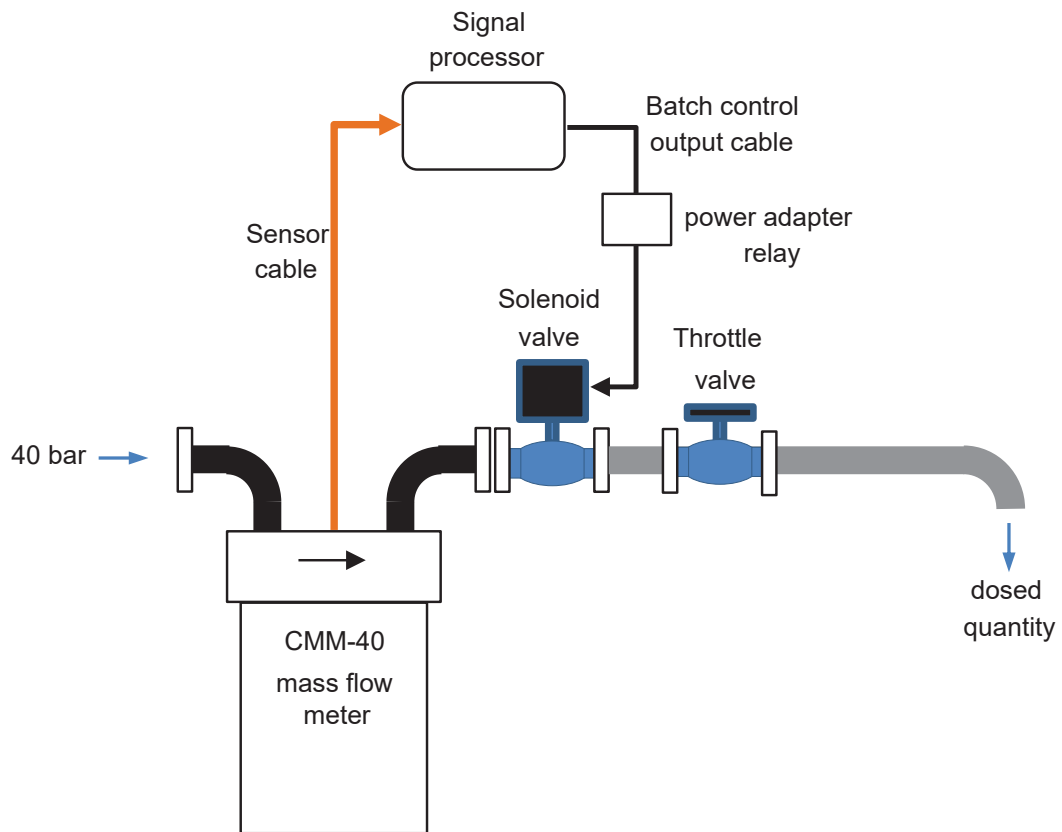


I Measuring system C



I Application examples

I Dosing plant



Notes

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