M-Zert
Zertifiziertes QM-System
DIN EN ISO 9001
Zertifikat-Nr. 01017

Coriolis Mass Flow Meter and Counter

KOBOLD

measuring
•
monitoring
•
analysing

- Measuring range: upto 70 t/h
- Measuring accuracy (mass flow):
  Liquids: ±0.35 % of measured value
  Gases: ±0.75 % of measured value
- p_{max} PN 40, t_{max} 125 °C
- Flange DN 8...50, DIN/ANSI
- Stainless steel 1.4404
- Analogue, frequency, switching and status output

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Model:
PMS

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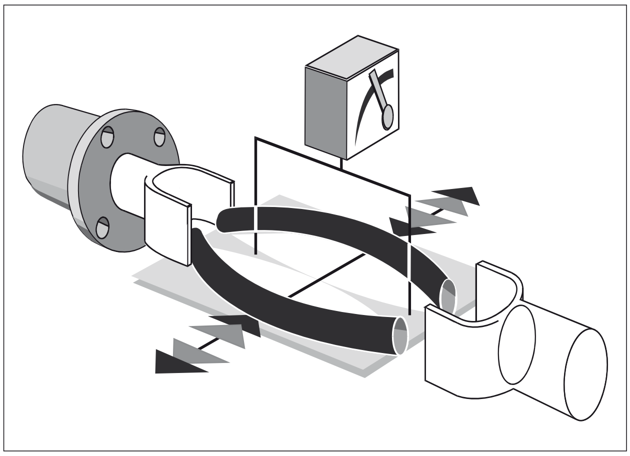
Description

Coriolis flow measurement is described as a direct or dynamic technique; it supplies a signal that is proportional to the mass flow, and practically independent of material properties, such as conductivity, pressure, viscosity, or temperature.
A Coriolis force occurs when linear motion and rotary motion are superimposed on one another. In industrial systems incorporating this principle, mechanical vibrations occur at the point of rotary motion. Fluid flowing through two tubes causes the tubes to resonate.



The mass flow alters the phase angle of the vibration, which produces a phase difference between the vibration at the tube inlet and that at the tube outlet. This phase difference is proportional to the mass rate of flow; it is amplified to form the output signal.
The resonance frequency of the measuring tube is a function of the resonating mass in the tube, and therefore a function of the medium density. (A regulating circuit ensures that the system is constantly resonating.) The resonance-frequency displacement, which arises from the thermal expansion of the material of the measuring tube, is compensated by temperature measurement. The measured temperature corresponds to the medium temperature.

Fields of application

For mass or volume flow measurement.
Application examples:

- Fluids and low conductivity solvents
- Deionized Water
- Fuel oil
- Food oil
- Conductive solvents
- Gases

Cavitation should be avoided, as it can effect the vibration of the measuring tubes. Media, whose properties are similar to water under normal conditions, have no special requirements. However, media that tend to boil easily, namely hydrocarbons, liquefied gases etc, or with suction conveyance, care should be taken not to exceed the liquid vapour pressure, and cause the liquid to boil.

Technical detals

Measuring range:	0...70 t/h (see also table)
Operable flow range:	1000:1

Measuring accuracy for pulse and frequency output (under reference conditions)

Reference conditions:	limits of error acc. to ISO/DIS 11631 20...30 °C; 2...4 bar Calibration systems as per national norms Zero-point adjusted under service conditions, and field density adjusted
Mass rate of flow (liquids):	±0.35 % of meas. value ±0.01 % f.s.
Mass rate of flow (gases):	±0.75 % of meas. value ±0.01 % f.s.
Volume rate of flow (liquids):	±0.45 % of meas. value ±0.01 % f.s.
Density (liquids):	±0.02 g/cm³
Temperature:	±0.5 °C ±0.005 x T (T = temp. of measured medium in °C)

Repeatability:

Mass rate of flow (liquids):	±0.15 % of meas. value ±0.005 % f.s.
Mass rate of flow (gases):	±0.35 % of meas. value ±0.005 % f.s.
Volume rate of flow (liquids):	±0.20 % of meas. value ±0.005 % f.s.
Density (liquids):	±0.0005 g/cm³
Temperature:	±0.25 °C ±0.0025 x T (T = temp. of measured medium in °C)

Temperature coefficient:	typically ±0.0002 % f.s./°C
Pressure coefficient:	-0.009 % of meas. value/bar (DN 50); 0 %/bar (DN 8...40)
Medium:	Liquids and gases
Installation position:	vertical (recommanded) and horizontal
Inlet/outlet:	not necessary
Operating conditions:	no cavitation
Temperature of measured medium:	-40...+125 °C
Ambient temperature:	-20...+60 °C

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Technical details (continued)

Ambient temperat.: -20...+60 °C

Max. pressure: PN 40, PN100, Cl150, Cl300

Materials

Flange: Stainless steel 1.4404

Measuring tube: Stainless steel 1.4539 (welded process connections without internal seals)

Sensor case: Stainless steel 1.4301 (not in contact with media)

Housing: varnished aluminium die casting, powder coated

Display: 2-line LCD-display each 16 digits; backlit different sizes of measured values and status configurable

Setting: via 3 buttons (–, +, E)

Languages: Western-Europe / America: English, German, Spanish, Italien, French, Netherlands

North-/East-Europe: English, German, Russian, Polish, Norwegian, Finnish, Swedish, Czech

South-/East-Asia: English, German, Japanese, Indonesian

Functions: Measurement of mass flow, densitiy, volume and temperature
Total volume
V/R flow direction
sound velocity,
Signal strength, Self-diagnosis,
single-stage dosing

Creep suppression: free adjustable

Current output: 0(4)-20 mA; active/passive

Load: max. 700 Ω with active switchings

Pulse/frequency output: Open Collector, max. 30 V_{DC}, 250 mA; passive
pulse width: 0.5...2000 ms, adjustable
End frequency: 2...1000 Hz

Status/switching output: Open Collector, max. 30 V_{DC}, 250 mA; passive,
V/R recognition, ceiling, error,
monitoring of measured medium

Status input: 3...30 V_{DC}, Ri = 5 kΩ,
configurable for:
totalizer reset,
measured-value suppression,
reset error messages,
zero point adjustment

Electr. connection: Cable gland M20x1.5
or
Thread ½ NPT, G ½, PG 13,5

Cable (isolated version:) 6 x 038 mm² PVC cable with common shield and individually shielded cores,
Conductor resistance: ≤ 50 Ω/km;
Capacitance: core/shield: ≤ 420 pF/m
Cable length: max. 20 m
Permanent operating temperature: +105 °C

Power supply: 85...260 V_{AC} (45...65 Hz)
20...55 V_{AC} (45...65 Hz)
16...62 V_{DC}

Power input: < 15 VA (AC); < 15 W (DC)

Switch-on current: max. 3 A (< 5 ms) at 260 V_{AC}
max. 13.5 A (< 50 ms) at 24 V_{DC}

Resistance to vibration: upto 1 g, 10...150 Hz

Protection: IP 67 or NEMA 4X

Weight (Compact version)

DN	Weight [kg]
8	8
15	8
25	10
40	15
50	22

Isolated version
Sensor:
Weight of the compact version minus 2 kg

Measuring range table (Liquids)

DN	Maximum end values	Recomand. end values
8	0...2000 kg/h	100...2000 kg/h
15	0...6500 kg/h	325...6500 kg/h
25	0...18000 kg/h	900...18000 kg/h
40	0...45000 kg/h	2250...45000 kg/h
50	0...70000 kg/h	3500...70000 kg/h

Ideally: 20...50 % of maximum end value;
Abrasive Media: v < 1 m/s

Measuring ranges for gases

$$\dot{m}_{max(G)} = \dot{m}_{max(F)} \cdot \frac{\rho_{(G)}}{225\ \mathrm{kg/m^3}}$$

$\dot{m}_{max(G)}$ = max. end value for gas [kg/h]

$\dot{m}_{max(F)}$ = max. end value for liquids [kg/h]

$\rho_{(G)}$ = Gas density in [kg/m³] at process conditions

Calulating example
PMS, DN 50, max. end value: 70 000 kg/h (liquids)
Gas: air, density: 60.3 kg/m³ (at 20 °C and 50 bar)

$$\dot{m}_{max(G)} = \frac{\dot{m}_{max(F)} \cdot \rho_{(G)}}{225\ \mathrm{kg/m^3}} = \frac{70000\ \mathrm{kg/h} \cdot 60.3\ \mathrm{kg/m^3}}{225\ \mathrm{kg/m^3}} = 18760\ \mathrm{kg/h}$$

Electrical connection

Terminal No.	Function
20 - 21	Status input
22 - 23	Status output
24 - 25	Frequency output
26 - 27	Current output

Order details (example: **PMS-ES15 F 00 A 0 A**)

Nominal size	Model	Connection form	Housing	Electrical connection	Power supply/ languages	Output
DN 8, ⅜"	**PMS-ES08**	**F** = DIN PN 40 **H** = DIN PN 100 **R** = ANSI Cl. 150 RF Sch. 40 **S** = ANSI Cl. 300 RF Sch. 40	**00** = Compact version **05** = Isolated version 10 m cable **07** = Isolated version 20 m cable	**F** = with threaded cable connection M20x1.5 **H** = Thread ½ NPT **C** = Thread G ½	**0** = 85...260 V_{AC} / West Europe **3** = 16...62 V_{DC} / West europe **5** = 85...260 V_{AC} / Asia **6** = 16...62 V_{DC} / Asia **8** = 85...260 V_{AC} / East Europe **9** = 16...62 V_{DC} / East Europe	**A** = 4-20 mA + pulse **D** = 4-20 mA + pulse + status
DN 15, ½"	**PMS-ES15**					
DN 25, 1"	**PMS-ES25**					
DN 40, 1½"	**PMS-ES40**					
DN 50, 2"	**PMS-ES50**					

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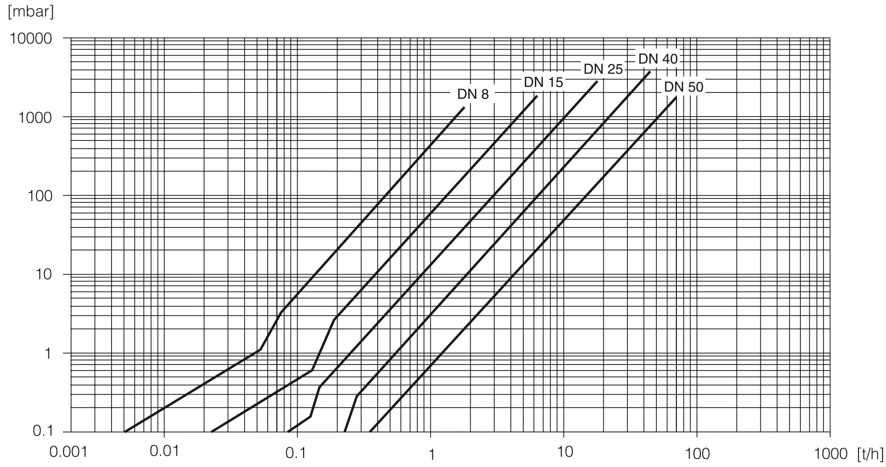
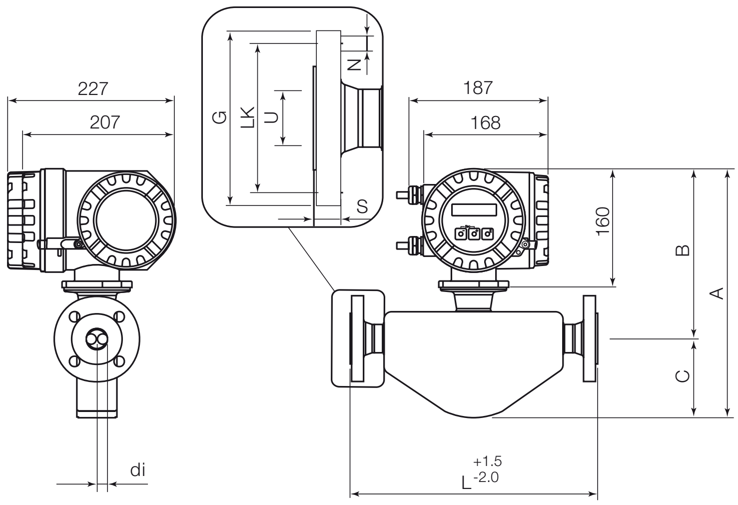
Pressure loss diagramm for water

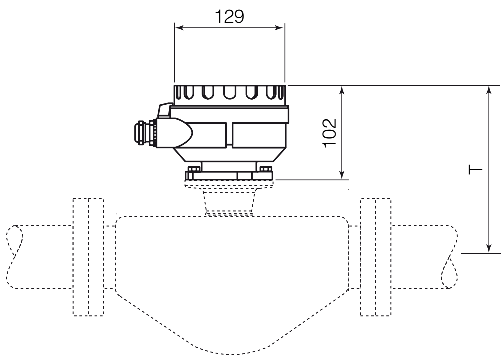


Dimensions

Compact version

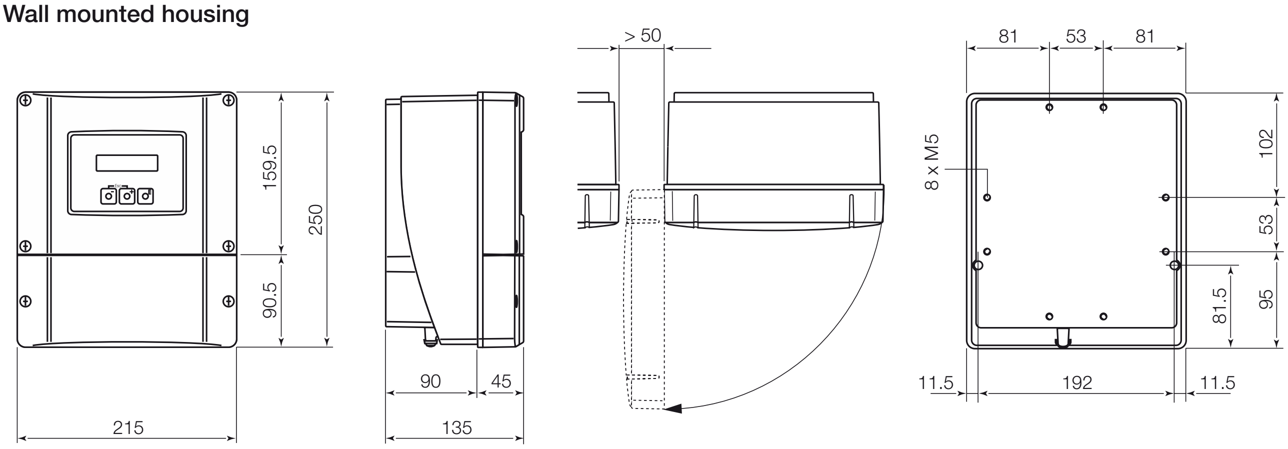


Isolated version Sensor



T = Dimensions B in the compact version minus 58 mm (with corresponding nominal size)

Wall mounted housing



Flange EN 1092-1 (DIN 2501) / PN 40

DN [mm]	A [mm]	B [mm]	C [mm]	G [mm]	L [mm]	N [mm]	S [mm]	LK [mm]	U [mm]	di [mm]
8	317	224	93	95	232	4 x Ø 14	16	65	17.3	5.35
15	331	226	105	95	279	4 x Ø 14	16	65	17.3	8.30
25	337	231	106	115	329	4 x Ø 14	18	85	28.5	12.00
40	358	237	121	150	445	4 x Ø 18	18	110	43.1	17.60
50	423	253	170	165	556	4 x Ø 18	20	125	54.5	26.00

Flange EN 1092-1 (DIN 2501) / PN 100

DN	A [mm]	B [mm]	C [mm]	G [mm]	L [mm]	N [mm]	S [mm]	LK [mm]	U [mm]	di [mm]
8	317	224	93	105	261	4 x Ø 14	20	75	17.3	5.35
15	331	226	105	105	295	4 x Ø 14	20	75	17.3	8.30
25	337	231	106	140	360	4 x Ø 18	24	100	28.5	12.00
40	358	237	121	170	486	4 x Ø 22	26	125	42.5	17.60
50	423	253	170	195	581	4 x Ø 26	28	145	53.9	26.00

Flange ANSI B16.5 / Cl 150

DN		A [mm]	B [mm]	C [mm]	G [mm]	L [mm]	N [mm]	S [mm]	LK [mm]	U [mm]	di [mm]
8	⅜"	317	224	93	88.9	232	4 x Ø 15.7	11.2	60.5	15.7	5.35
15	½"	331	226	105	88.9	279	4 x Ø 15.7	11.2	60.5	15.7	8.30
25	1"	337	231	106	108.0	329	4 x Ø 15.7	14.2	79.2	26.7	12.00
40	1 ½"	358	237	121	127.0	445	4 x Ø 15.7	17.5	98.6	40.9	17.60
50	2"	423	253	170	152.4	556	4 x Ø 15.7	19.1	120.7	52.6	26.00

Flange ANSI B16.5 / Cl 300

DN		A [mm]	B [mm]	C [mm]	G [mm]	L [mm]	N [mm]	S [mm]	LK [mm]	U [mm]	di [mm]
8	⅜"	317	224	93	95.2	232	4 x Ø 15.7	14.2	66.5	15.7	5.35
15	½"	331	226	105	95.2	279	4 x Ø 15.7	14.2	66.5	15.7	8.30
25	1"	337	231	106	123.9	329	4 x Ø 19.0	17.5	88.9	26.7	12.00
40	1 ½"	358	237	121	155.4	445	4 x Ø 22.3	20.6	114.3	40.9	17.60
50	2"	423	253	170	165.1	556	8 x Ø 19.0	22.3	127.0	52.6	26.00

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