BOPP & REUTHER MESSTECHNIK

CORIOLIS DOSING MASS FLOW METER SERIES FMD

1. IDENTIFICATION

Manufacturer Bopp & Reuther Messtechnik
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Product type Mass flow meter

Product name FMD series

2. AREA OF APPLICATION

The area of application for all FMD mass flow meters includes the measurement and dosage of liquids.
The devices have been designed for operation in filling plants. They can be used for dosing liquids with varying properties. The measurement of non-conductive liquids as well as liquids with a low level of gas or solid content should be particularly emphasized in this respect. The mass flow meters are suitable for measuring oils, distilled water or alkanes. Together with magnetic-inductive flow meters and dosing oval wheel meters, they complete the range of measuring instruments delivered by Bopp & Reuther Messtechnik GmbH.

Thanks to the measuring principle, it is possible to measure the filled mass directly.
Even with very short filling times, the FMD dosing mass flow meters ensure the highest level of quality for dosing tasks due to their high-degree of measuring accuracy.
The FMD series is available in the nominal widths DN10 and DN15.
Depending on the type of process connection, they can be used up to PN 40; the maximum permissible operating temperature is 90°C. The devices can be subjected to SIP processes up to 140°C for cleaning and sterilization.

3. PRINCIPLE OF OPERATION AND SYSTEM DESIGN

3.1 System design

Dosing mass flow meters based on the Coriolis principle are immediate flow meters. They consist of two measuring tubes, one excitation unit and two sensors.
During operation, excitation causes both measuring tubes to vibrate in anti-phase. Without a flow rate, the sides of the measuring tubes vibrate equally and the sensors deliver in-phase signals.
If a liquid flows through the measuring tubes, the occurring Coriolis effect slows down the input side of the tubes and accelerates the output side. This results in a phase difference in the sensor signals that is proportional to the mass flow.

3.2 System design

The FMD dosing mass flow meter features a compact design and consists of the following components:

Sensor:
The sensor basically consists of two parallel measuring tubes. An exciter causes the measuring tubes to vibrate. The vibration of the tubes is monitored by sensors. A built-in temperature sensor is an additional feature. Flow dividers that distribute the medium equally to the measuring tubes are located in the input and output.

Evaluation electronics:
The evaluation electronics is permanently connected to the sensor. The electronics receives the signals provided by the sensor and calculates the measured variables. Pulses are generated according to the flow and sent to the controller.

4. INPUTS

4.1 Measured value

Mass and mass flow rate

4.2 Measuring range

The measured value sensors are designed to guarantee that there is a pressure loss of ~1 bar at a nominal flow rate (with 20°C water). The devices can be easily operated at higher flow rates; it must, however, be ensured that cavitation does not occur.

DN	Type	Flow rate max.	pulse factor
		[kg/min]	[Imp/g]
10	FMD06	20	63.660
15	FMD08	40	28.293

5. OUTPUT

5.1 Output signal

Active pulse output (max. 20 mA, external pull-down resistor is required, is already provided by most PLCs)

Pulse output is idle high. The pulse-pause ratio is 1:1.
The voltage of the pulses corresponds to the supply voltage.

6. CHARACTERISTIC PARAMETER

6.1 Reference conditions

Pressure: approx. 0.5 - 1 bar
Temperature: 20 - 25°C
Medium: water without trapped gas

6.1 Accuracy

±0.3% ±0.01% x nominal flow rate/actual flow rate.

6.3 Repeatability

DN10 - 20: >250 ms: ±0.5%; >1.5s ±0.1%; >5s ±0.05%

The repeatability of the dosing / filling process in the plant also depends on other factors (e.g. dosing valve, valve outlet, mechanical design of the plant ...).

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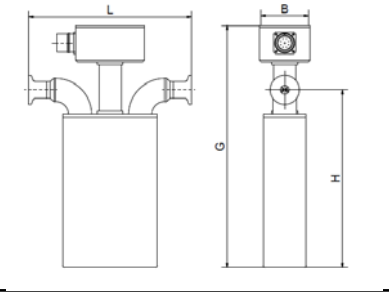
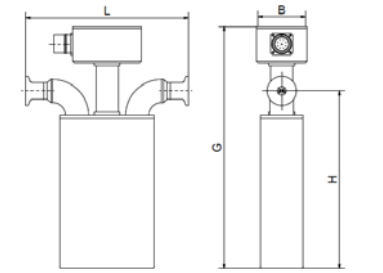
7. CONSTRUCTIVE DESIGN

7.1 Design / dimensions / weights



Type: Tri-Clamp DIN 32676 Nominal width		DN 10	DN 15
Dimensions (mm)	L	190	220
	G	275	320
	B	60	60
	H	205	240
Weight (kg)		2.0	3.0



Type: Flange DIN EN 1092 Nominal width		DN 10	DN 15
Dimensions (mm)	L		265
	G		320
	B		60
	H		240
Weight (kg)			5.5

7.2 Material

	DN 10	DN 15
Process connection Flow divider Measuring tubes Transducer enclosure	Stainless steel	Stainless steel

Other materials upon request

8. OPERATING CONDITIONS

8.1 Ingress protection

IP67
Ingress protection for enclosure as per IEC 529 / EN 60529

8.2 Ambient temperature / Humidity

Ambient temperature: 0 to +50°C
Ambient humidity: < 75% annual average, condensation permitted

8.3 Material temperature

For measuring: 0 to +90°C, for cleaning +140°C

8.4 Process pressure / Process connection

Tri-Clamp: PN 16
Flange: PN 40

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8.5 Measuring cable

Maximum length: 250m
Cable type: LIY-2CY-LIYCY

The devices must be connected with a shielded cable to ensure trouble-free operation. A device connector is available at the dosing mass flow meter. The matching cable connector is type RC-09S1N12T004 from Phoenix Contact. Matching connection cables are also offered as accessories.

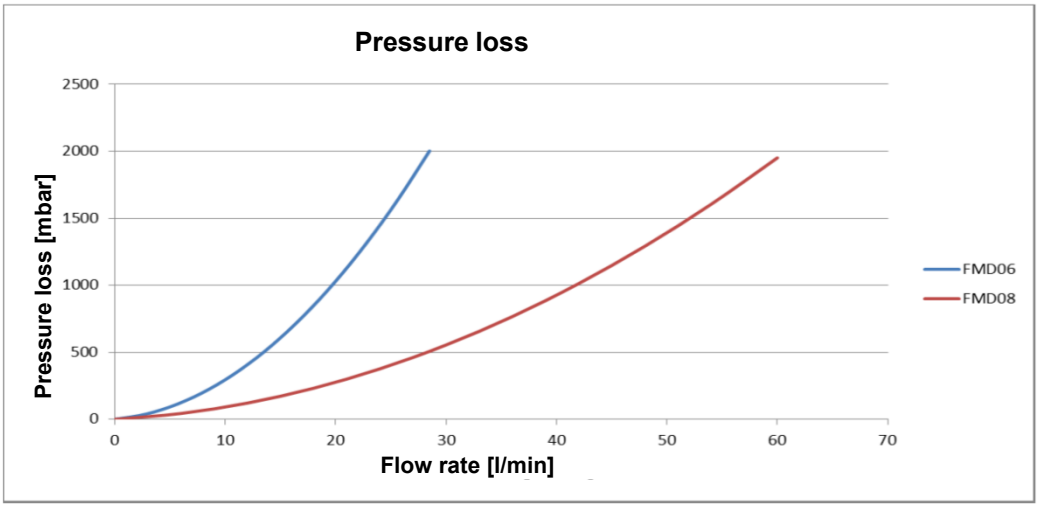
8.6 Supply voltage

24VDC (12VDC - 30VDC);
1.5 W ~ 60mA @24VDC, start-up current 0.5A

8.7 Valve status

Valve status input 24VDC / 2mA (12 - 36VDC)
without status signal no pulses will be appear at the output

8.7 Pressure loss



9. CERTIFICATES AND APPROVALS

EC Declaration of Conformity (Bopp & Reuther Messtechnik GmbH)

Directive 2014/30/EU (EMC Directive)

- **EN 61000-6-2**: Generic standards – Immunity for industrial environments
- **EN 61000-6-3**: Generic standards – Emission standard for residential, commercial and light-industrial environments

EN 60529 types of protection via enclosure (IP code)

Directive 2011/65/EU on the restriction of the use of certain hazardous substances

Directive 2014/68/EU (Pressure Equipment Directive)

- DIN EN 023
- AD leaflets

10. DOCUMENTATION

Operating Manuals
A-EN-05809 Operating Manual - Coriolis Dosing Mass Flow Meter Series FMD