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DATASHEET
Doc. DS-0007 · Rev. A

KEY FIGURES

0,1–12 m/s
Flow velocity range

DN15–1200
Nominal diameter

IP67
Degree of protection (IP68 optional)

20 µS/cm
Min. conductivity of the liquid

RANGE OF APPLICATIONS

- Water management
- Sewage treatment
- Drinking water
- Hot service water and condensate
- Chemical industry
- Food industry

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MODEL FMM-3000

Magnetic Flowmeter FMM-3000

Compact or Remote model · DN15 – DN1200 · Wide range of outputs





Converter:
display and keyboard module V1, plug-in modules for outputs and interfaces



Sensor:
flanged version (DIN, ANSI, ASA), non-conductive lining

Description

Magnetic flowmeter FMM-3000 is a volume flow rate meter for conductive fluids in pipelines. It allows measurement of flow rates in both directions, with high accuracy and in wide range of flow rates (0,1 – 12 m/s). The microprocessor controlled transmitter offers a wide variety of binary, analog and digital inputs and outputs suitable for all applications. Absence of moving parts and digital calibration ensures long-term accuracy and stability.

The main benefit of FMM-3000 type series instruments is their versatility. As a standard, the flowmeter transmitter includes a power supply and basic circuits enabling its measuring functions. All other inputs, outputs and display units can be added as plug-in modules. Thus, the customer only pays for the function actually required. This design also permits various inputs and outputs according to the specific needs of the customer.

The display and keyboard gives a wide variety of displayable operating data on a readable two-line display with large characters. Also all adjustable parameters can be comfortably changed during operation, using a four-key keyboard.

Transmitter can be integral part of the sensor (compact version) or it is connected with the sensor with a cable (remote version).

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FMM-3000

Magnetic Flowmeter
Compact or Remote model

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Principle of Measurement

An magnetic flowmeter is used for volume flow measurement of electrically conductive liquids. Measurement principle is based on Faraday law on electromagnetic induction. A sensor consists of a non-magnetic tube with non-conductive lining, measuring electrodes and two coils generating electromagnetic field. Flowing liquid forms a conductor. Magnetic field induces voltage **U** in this conductor that is proportional to magnetic induction **B**, distance between electrodes **d** and flow velocity **v**.

U = B x d x v

As magnetic induction and distance between electrodes are constant, induced voltage is proportional to velocity of liquid flow in the tube. Volume flow rate is product of flow velocity and tube cross section.

Q = v x S

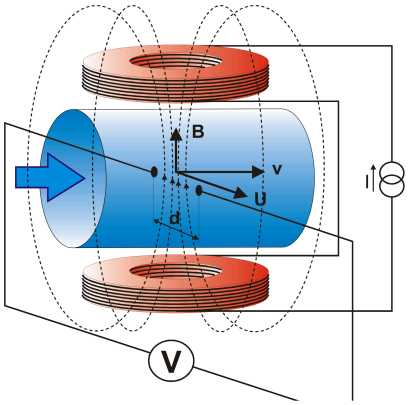


Fig.1 - Principle of measurement

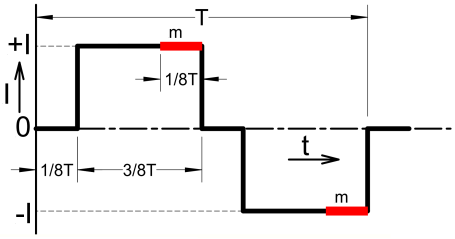


Fig. 2 - Excitation pulse form

Technical Solution

The magnetic flowmeter itself consists of two basic parts – a flow sensor and a converter. The converter can be either an integral part of the sensor (compact version) or separated, connected with the sensor using a cable (remote version).

The sensor consists of a non-magnetic tube with non-conductive lining, measuring electrodes, excitation coils and cables. There are various sensor versions available enabling connection to adjacent tubes with flanges (type **P**) and fittings (gas fitting type **G** or food industry fitting type **V**) or wafer which are installed between flanges using clamps (type **B**). Non-conductive lining can be made of technical rubber (types **TG**, **MG** or **NG**) or Teflon (type **T**).

The converter is used for generating excitation current in coils, processing of signal from measuring electrodes, displaying of measured data and generating output signals. Current in excitation coils has constant value 250 mA or 125 mA and is pulse generated with alternating polarity to avoid permanent magnetization of the sensor. Excitation pulse frequency can be chosen from six values – 25 Hz, 12,5 Hz, 8,33 Hz, 6,25 Hz, 3,125 Hz and 1,56 Hz. Excitation current of 250 mA with excitation frequency 3,125 Hz is suitable for all standard applications. Other settings can be used for specific applications. Excitation current and frequency are factory set before sensor calibration and their later modifications are not allowed.

Voltage induced in measuring electrodes is measured always on the end of excitation pulse when magnetic field is steady. Each excitation pulse is followed by refreshing period. Signal processing and parameter setting are performed digitally and the converter contains no setting controls or other moving parts what ensures its high reliability and long-term stability.

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Technical Data

TRANSMITTER

Power supply	85..240VAC, 10..36VDC, 24VAC
Consumption	5...8VA
Analog output	Optional: **A5** - 0(4)..20mA (16bit) – active, **A6**- 4..20mA (16bit) – active **A7** - 4..20mA (16bit) – passive All galvanically isolated. Modules A6 and A7 are HART compatible (with module H1)
Binary output	Optional: **B1** - 0..1kHz passive, **B2** - 0..10kHz passive, **B3** - 0..12kHz active (5 V), **B4** - 0..12kHz active (24 V), **B5** – relay All galvanically isolated
Interface	Optional: **C1**- RS232, **D1** - RS485 (MODBUS), **D2** - 0/20mA loop, **D3** - M-Bus **G1** - GSM modem, **H1** – HART modem (only with module A6 or A7) All galvanically isolated
Display	Optional: **V1** - LCD and keyboard module – 2×16 charcters (9,6 mm height)
Electrode cleaning and pipeline full indication	Optional: **F1** - electrochemical electrode cleaning module, **F2** - pipeline full indication module, **F3** = F1+F2
Protection	IP67
Min conductivity of the liquid	20µS/cm (for some liquids from 5µS/cm)

SENSOR

Nominal diameter	DN15...DN1200
Nominal pressure	PN6, PN10, PN16, PN25, (PN40, PN64), 150lb, 300lb, 600lb
Flanges	**P** - Flanged (DIN, ANSI, ASA)
Electrode material	Stainless steel, Hastelloy C-276, Pt, Ti
Lining	Hard rubber (TG) Soft rubber (MG), Special rubber (NG), PTFE (T)
Liquid temperature	0 - 80°C (TG, MG), 0 - 90°C (NG), 0 - 150°C (T)
Protection	IP67, IP68 (optional)
Installation	Compact or remote version

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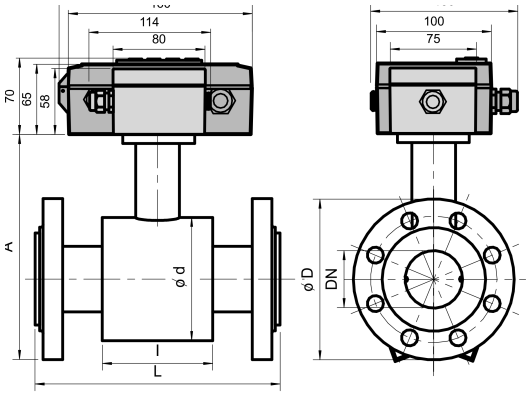
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Dimensions – Flanged Versions “P”, “PDIN” and “PANSI”



Protection: compact version **IP66**, remote version **IP67** (optionally **IP68**)

Electrodes: **Ss** – stainless steel AISI316Ti, **Ha** - Hastelloy C22, **Ti** - Titanium, **Pt** – platinum

Lining: **TG** – hard rubber, **MG** – soft rubber, **NG** – resistant rubber, **PTFE** – Teflon

Accessories: optional for a surcharge – grounding rings or grounding electrodes for nonconductive tube

DN [mm]	DN [inches]	PN [Bar]	D [mm]	D [mm]	A [mm]	L* ISO 13359 EN 14154 [mm]	L* Optional [mm]	L [mm]	WEIGHT** [kg]
15	1/2	16	95	62	164	200	138	66	3.5
20	3/4	16	105	62	170	200	138	66	3.5
25	1	16	115	72	180	200	215	96	3.5
32	1 1/4	16	135	82	199	200	215	96	6
40	1 1/2	16	145	92	209	200	215	96	7
50	2	16	160	107	223	200	215	96	8
65	2 1/2	16	180	127	244	200	215	96	10
80	3	16	195	142	260	200	215	96	12
100	4	16	215	162	280	250	215	96	16
125	5	16	245	192	310	250	305	126	21
150	6	16	280	218	340	300	305	126	28
200	8	16	335	274	398	350	380	211	35
250	10	10	405	370	480	400	380	211	42.5
300	12	10	440	420	535	500	515	320	55
350	14	10	500	480	584	550	515	320	65
400	16	10	565	530	642	600	515	320	94
450	18	10	565	530	642	600	515	320	94
500	20	10	670	640	752	600	515	320	122
600	24	10	780	760	870	600	615	320	158
700	28	10	895	880	990	700	715	420	230
800	32	6	1010	980	1100	800	815	420	325
900	36	6	1115	1040	1185	900	815	520	420
1000	40	6	1220	1140	1290	1000	1015	520	510
1200	48	6	1455	1340	1510	1200	1015	520	680

* Standard construction length meets ISO 13359, different construction lengths should be indicated, e.g. “l=215”. Construction length tolerance for DN≤200: +0/-2 mm, DN≥200: +0/-3 mm

** Weight of PDIN sensor without converter and terminal box – weight of terminal box has to be added for remote version – 0.25 kg; weight of converter has to be added for compact version – 0.9 kg

FLANGE TYPES

PDIN · DN 15..1200	PN 2.5, 6, 10, 16, 25, 40, 63 · Flange dimensions meet EN 1092-1, BS 4504
PANSI · DN 1/2"..40"	150lb, 300lb · Flange dimensions meet ASA / ANSI B 16.5

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