



Magnetic Flow Meter

SERIES: FTM45

INTRODUCTION

Indumart *FTM45 Series* of Magnetic Flow Transmitters with 4-20 or 0-10 mA and frequency/pulse output signals, proportional to the flow rate of fluids passing through, and lower and upper limit alarm outputs are ideal for very highly accurate measurement of electrically-conductive fluids' flowrate and their total flow.

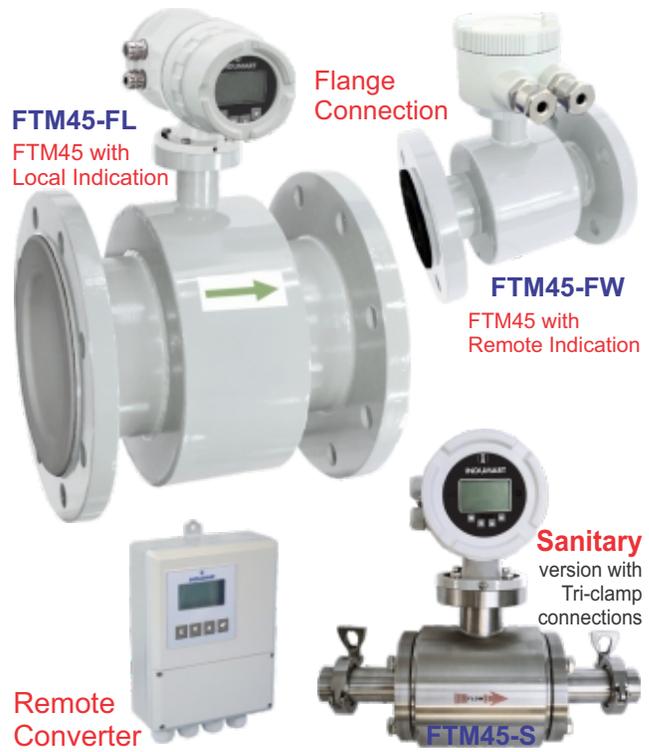
Measurement accuracy of the *FTM45 Series* is not subject to variation of the fluid density, viscosity, temperature, pressure and conductivity. These flowmeters can measure bi-directional (positive / negative) flowrate, which will provide a very good means for precise measurement of flowrate / total flow.

The *FTM45 Series* is suitable for flow measurement of homogeneous (2-phase included) and electrically conductive fluids with conductivity greater than 5 microSiemens/cm. Ground or tap water, wastewater, dairy, brewery, beverages, liquid foods, pharmaceuticals, slurries, cement, fly ash, pulps in mining, and concentrated pulp and paper are some of the prevalent media used for flow measurement applications of *FTM45 Series*. But these magnetic flowmeters are not applied for distilled water, hydrocarbons and generally non-conductive fluids.

Designed from 1/8" to 118" in size with a flow velocity of 0.3 to 12 m/sec (1 to 40 ft/sec), these meters are factory-configured and calibrated to international standards to provide the user with assurance of both quality and performance of the meter. A calibration certificate is included with each flowmeter shipped to the users.

An advantage of *FTM45 Series* is that, in most installation, it only needs a minimum of 3 pipe diameters of run upstream and 2 diameters downstream to operate (see the instruction manual or inquire for exceptions).

Due to the materials and technology used in construction of these flow instruments with fully welded and maintenance-free sensors, the *FTM45 series* is excellent in reliability and resistance to corrosion against a majority of chemically aggressive media. For special applications, the electrode and liner materials can be specified as other materials specified by the user to stand corrosion.



Generally, there are two classes of *FTM45 Series*; The model "F" as a flange connection meter (1/8" to 120" - DN3 to DN3000) and the FTM45-S is a Tri-clamp sanitary connection type meter (1/2" to 4"). There are also two models available for field indication; the FTM45-□ L for local indication, and FTM45-□ W for remote indication of the flow parameters. Optionally, the sensor part of the these remote meters can be buriable and inherently submersible (IP68), thus ensuring suitability for installation in chambers and metering pits, which are liable to flooding.

Sensor grounding may be ordered as ring or electrode. If the channel which contains the meter is insulated, the meter needs to be installed with ground ring and where the medium is abrasive, the ground ring with neck is recommended to protect and prolong the service life of the meter. The ground ring with neck is also used for mediums, such as mud, ore pulp, coal water slurries, etc.

Power supply to the flowmeter can be ordered as the city power line (110...240 AC), 24 VDC, battery-powered or dual power (24 VDC and battery). The battery-life of a battery powered meter, depending on the measurement cycle time and excitation current and power frequency, may last up to 5 years (see manual).

The converter is equipped with a flowmeter fault diagnostic system. Alarms are classified into the System Alarms (hard failures), Process Alarms (Empty Pipe) and Setting Alarms (Flow Upper/Lower Limit Alarms). The information code along with showing a bell sign is displayed on the left side of the screen.

MODBUS RS485, HART and radio communication options are available for the *FTM45 series*. As an advantage, optionally, the *FTM45 Series* flow meters can be equipped with GPRS (General Packet Radio Service) can wirelessly communicate with a base station as far as 1 km and the base station via GPRS or CDMA (Code Division Multiple Access) mobile communication network can communicate with a supervisory computer.

An optional infrared interface may be ordered which can read from and write all parameters to the converter without opening its front cover.

MEASURING PRINCIPLES

The measuring principles of magnetic flow transmitters are based on electromagnetic induction (Faraday's law) of the electrically conductive fluids. A transverse magnetic field produced by an electromagnet is applied to the metering tube, which results in a potential difference to a pair of electrodes, mounted at diametrically opposed points on the tube, proportional to the flow velocity of the fluid perpendicular to the flux lines. This potential difference is measured and stated as the flowrate of fluid passing through the tube. Both ends of the conductor will be induced by a certain force, and the fluid's flowrate changes can be calculated by detecting the value of this force. Magnetic flowmeters require a conducting liquid like tap or ground water, which contains ions, and an electrical insulating pipe surface, i.e., a rubber-lined steel tube.

To avoid spurious voltages arising from stray couplings between the electromagnetic and the loop constituted by the electrodes and the fluid extending there between; causing polarization of the electrodes, the electromagnet is energized by square waves. Square wave field excitation improves measurement stability in bad environments and reduces power consumption.

WHAT TO CONSIDER WHEN ORDERING

Eventhough the velocity of liquid flow through the electromagnetic flow meter can be as high as 12 m/s, but under normal condition, the optimum flow velocity should be 2 to 4 m/s. If water is the medium, usually the normal flow velocity is around 3 m/s. For abrasive fluids, flow velocity of less than 3 m/s is recommended. If liquids with adhering to the tube wall is used, flow velocity should be greater than 2 m/s; i.e., when measuring paper pulp, flow velocity above 4 m/s is recommended; so that it can assist in automatically removing the fibers, which attach to the electrodes.

Selection of the lining material should be based on corrosiveness, wearability and temperature of the measured medium. Hard rubber is an excellent material for most applications (-5...+60°C), but does not resist acids and alkalis corrosion. PTFE can resist majority of strong acids and alkalis. The medium

temperature can reach up to 120°C. But it does not have very good wear resistance. F46 has chemical and temperature resistance of PTFE, but is more resistant to abrasion. Polypropylene can stand temperature up to 90°C

When using PTFE or F46 lining in measuring flow of negative pressure medium, an appropriate PTFE or PFA lining suitable for negative pressure must be ordered.

Tube Diameter (mm)	Nominal Size (inch)	Rated Pressure (MPa)	Minimum / Maximum Flow (m ³ /h)	
4	1/8"	4.0	0.013	0.54
6	1/4"	4.0	0.031	1.22
10	3/8"	4.0	0.085	3.39
15	1/2"	4.0	0.19	7.63
20	3/4"	4.0	0.34	13.6
25	1"	4.0	0.53	21.2
32	1 1/4"	4.0	0.87	34.7
40	1 1/2"	4.0	1.36	54.3
50	2"	4.0	2.12	84.8
65	2 1/2"	1.6	3.60	143
80	3"	1.6	5.43	217
100	4"	1.6	8.50	339
125	5"	1.6	13.3	530
150	6"	1.6	19.1	763
200	8"	1.0	34.0	1360
250	10"	1.0	53.0	2120
300	12"	1.0	76.4	3050
350	14"	1.0	92.4	3700
400	16"	1.0	136	5430
450	18"	1.0	172	6870
500	20"	1.0	212	8480
600	24"	1.0	305	12200
700	28"	1.0	416	16600
800	32"	1.0	543	21700
900	36"	1.0	663	26500
1000	40"	1.0	850	33900
1200	48"	0.6	1220	48800
1400	56"	0.6	1660	66500
1600	64"	0.6	2170	86800
1800	72"	0.6	2750	110000
2000	80"	0.6	3400	135000
2200	88"	0.25	4100	164000
2400	96"	0.25	4900	195000
2600	102"	0.25	5740	229000
2800	110"	0.25	6650	266000
3000	118"	0.25	7630	305000

SPECIFICATIONS

Accuracy	0.2%, 0.5%
Medium	Electrically conductive fluid with conductivity of greater than 5 $\mu\text{S/cm}$ and less than 70% solid content (by volume),
Flow Velocity Range	0.3 to 12 m/s (1 to 40 ft/s), positive or negative flow
Flow Unit	liter, m^3 , metric Ton or USG per second, minute or hour (the user must specify the required flow unit while ordering); also percent of the measurement range may be displayed
Display	Flow rate, integrated flow, flow percentage, alarms, etc.
Total Flow Display	9 bits and the maximum figure is 999,999,999
Sensor	Fully welded and maintenance-free sensor, flanged version with full bore flow tube
Remote Connection	Includes a remote sensor attached to a connection box, a wall-mounting box converter and 10 meters of cable as standard connecting the sensor to the converter
Process Connection	Can be ANSI 150#, 300# or 300#; DIN PN6, PN10, PN16 or PN25; Sanitary type with Tri-clamp 1/2" to 4" (body and connections of sanitary type are st. st.)
Sensor Housing	Polyurethane coated steel (for flange type); Stainless steel (for sanitary type)
Converter	Local converter and the connection box (for the remote version) are made from polyurethane coated cast aluminum; hard plastic for the remote converter
Flanges	Polyurethane coated carbon steel; other materials also available per request
Measuring Tube	Austenitic stainless steel
Measuring Electrodes	316L stainless steel (std.); Hastelloy C, Titanium or tantalum (option); other on request
Grounding Rings	Stainless steel;
Grounding Electrode	This is an optional feature and the material is the same as the measuring electrodes
Min. Upstream Length	3 x pipe diameter straight run (it must be larger in special cases, see the manual)
Min. Downstream Length	2 x pipe diameter straight run (it must be larger in special cases, see the manual)
Infrared Remote Control	Infrared hand-held operational key board within 1 m distance (optional feature)
Outputs	4...20 mA or 0...10 mA, frequency/pulse, Low and High Alarms
Current Output	One current output, can be selected between two systems: 0...10 mA or 4...20 mA
Output Error (mA)	0.1% \pm 10 μA
Load Resistance	<1.5 k Ω for 0...10 mA output; <750 Ω for 4...20 mA output
Frequency Output	1...5000 Hz, 36 VDC max. & 250 mA max.
Pulse Output Eq. Wt.	0.001~1.000 m^3/p , 0.001~1.000 l/p, 0.001~1.000 US gal/p, 0.001~1.000 Ton/p
Pulse Output	100 p/s max., 36 VDC & 250 mA max.
Pulse Output Width	Can be set by the user
Alarm Outputs	High & Low limits, Transistor output, maximum 250 mA @ 36 VDC When high and low limits are reached a bell-like icon will be displayed on the screen of the converter. Also empty pipe alarm is displayed.
Communication (option)	MODBUS interface (RTU format) RS485 interface, HART protocol, GPRS radio communication
Electrical Isolation	Photoelectric isolation > 1000 V for output, MODBUS & Rs485.
Baud Rate	600, 1200, 2400, 4800, 9600, 14400
Excitation Mode	Square-wave exciting frequency 1/16, 1/20 or 1/25 power frequency;
Power Supply	85...250 VAC with 45...63 Hz frequency, 20...36 VDC (24 VDC nominal), battery-powered or dual power (battery and 24 VDC)
Environ. Protection	IP65 for the indication part; IP65 or IP68 for the sensor;
Ambient Temperature	-10...+60°C; also for the models with local converters which carry a fluid with temperature higher than 60°C or ambient temperature of higher than 55°C, appropriate measures must be taken to keep the converter's temperature below 60°C. -20...+50°C for battery-powered;

ORDER CODES

Model: FTM45- - -

PROCESS CONNECTION

Flange
Sanitary

F
S

CONVERTER / INDICATOR

Local Indication*
Wall-mounting Box Converter / Indicator

L
W

ELECTRODE

316L Stainless Steel
Hastelloy "C"
Titanium
Tantalum
Other

S
C
T
N
X

LINING MATERIAL

Hard Rubber (<60°C)
Polyurethane (<90°C)
PTFE (<120°C for positive pressure only)
PTFE (<120°C withstands negative pressure)
F46 (<120°C for positive pressure only)
F46 (<120°C withstands negative pressure)

1
2
3
4
5
6

ACCURACY

0.5%
0.2% (not available for over 8" tube diameter)

1
2

OUTPUT

Not Required
4...20 mA, Frequency/Pulse

0
1

DIGITAL COMMUNICATION

No Communication
Rs485
HART
GPRS

0
1
2
3

POWER SUPPLY

85...250 VAC
20...36 VDC (24 VDC nominal)
Battery-powered
Dual Power (battery and 24 VDC)

A
D
B
Z

EARTH RING

Not Required
General Earth Ring
Grounding Electrode

0
1
2

PROTECTION GRADE (Sensor Section)

IP65 (standard)
IP68 (sensor part for the remote model)

0
1

INFRARED REMOTE CONTROL

Not Required
Required

0
1

FLANGE OR TRI-CLAMP SIZE, TYPE AND PRESSURE CLASS (RATING)

Please Specify

Please specify the followings in your order:

- Medium and its Temperature - Low, High and Normal Flow and the Flow Unit - Normal and Maximum Pressure

* **Note:** The internal temperature of the converter must not exceed 60°C, thus the ambient temperature must be below 60°C. This is important for the local converter, when the fluid temperature is above 60°C. Therefore measures should be taken by the user to cool the converter and/or insulate the conveying tube from heating up the converter.