



Datasheet

Compact Electromagnetic Flowmeter

TPS-SUP-FMX400



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Electromagnetic Flowmeter

SUP-FMX400

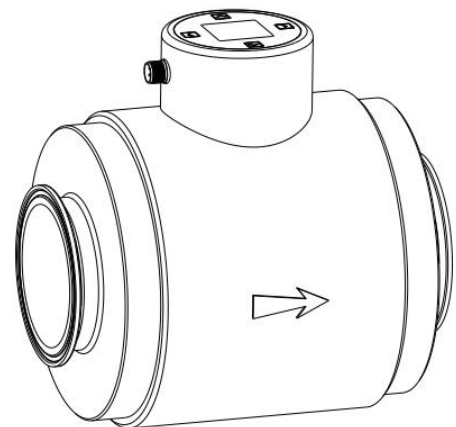
Based on the Faraday electromagnetic induction principle, the compact electromagnetic flowmeter is applied to directly measure the instantaneous flow rate of conductive liquids in closed pipelines, with a totalizing (flow accumulation) function. While providing onsite monitoring and display, the flowmeter outputs standard current / pulse / RS485 digital signals for recording, regulating, and control purposes, enabling automated monitoring and process control. It is widely used in industries such as municipal water supply, chemical processing, coal, environmental protection, light textile, metallurgy, and paper manufacturing.

The flowmeter parameters are normally factory-preset according to the ordering specifications. Therefore, users generally do not need to adjust parameters before operation. However, it is necessary for users to check that the parameters on the nameplate have been preset correctly and confirm that they are consistent with the actual operating conditions.

Furthermore, the liquid measurement shall take the online measured conductivity as the reference, as carbon dioxide and nitrogen oxides in the air dissolved into the medium can increase the measured conductivity and lead to higher readings.

Features

- Reliable and stable measurement with high accuracy.
- Integrated compact design with no moving parts, ensuring easy installation and virtually maintenance-free operation.
- RS485 communication interface supporting the Modbus RTU protocol.
- Bidirectional flow measurement, capable of accurately measuring both forward and reverse flow.
- Advanced low-frequency square-wave excitation provides excellent zero stability, strong immunity to interference, and reliable operation.
- Adjustable meter orientation and display interface for convenient reading in various installation positions.
- Built-in Chinese and English interface, with freely selectable language.



Electromagnetic Flowmeter

Principle

The electromagnetic flowmeter employs an advanced low-frequency square-wave excitation design, and its operating principle is based on Faraday's law of electromagnetic induction. As shown in Figure 1, two electromagnetic coils located at the upper and lower sides generate a constant or alternating magnetic field. When a conductive fluid flows through the flowmeter, an induced electromotive force (EMF) is generated between the two electrodes mounted on opposite sides of the meter tube wall.

The magnitude of this induced EMF is proportional to: the flow velocity of the conductive medium, the magnetic flux density of the magnetic field, and the effective conductor width (i.e., the inner diameter of the flowmeter measuring tube).

By processing this induced voltage signal, the flow rate of the medium can be calculated. The induced EMF can be expressed as:

(EMF: Induced electromotive force equation)

$$E=K \times B \times V \times D$$

Where: E—Induced electromotive force

K—Meter constant

B—Magnetic induction density

V—Average flow speed in the cross-section of the measuring tube

D—Inner diameter of measuring tube

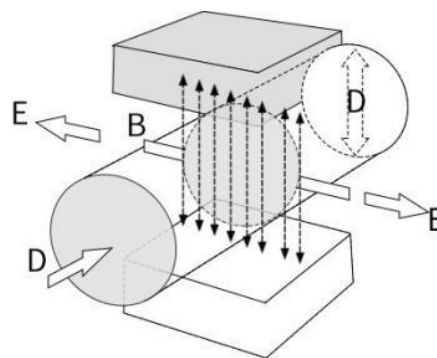
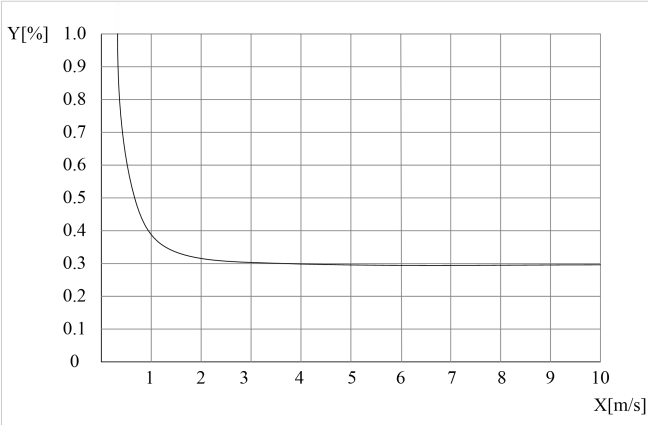


Fig.1

When measuring the flow, the fluid flows through a magnetic field that is perpendicular to the flow direction. The flow of conductive fluid induces a potential proportional to the average flow velocity, thus requiring the conductivity of the measured flowing liquid to be higher than the minimum conductivity. The induced voltage signal is detected by two electrodes and transmitted to the converter via a cable. After a series of analog and digital signal processing, the accumulated flow and real-time flow are displayed on the display of the converter.

Parameters

Input			
Measured variable	Direct measurement: Flow velocity Calculated value: Volume flow, mass flow.		
Flow velocity	Typically range of flow velocity: 0.5m/s~5m/s		
Nominal diameter	DN50~DN125		
Range ratio	10:1		
Output			
Current output	Function	Flow velocity, volumetric flow, or mass flow (Under the condition of constant medium density)	
	Range	Range	(4~20)mA
		Upper range limit	20mA
		Lower range limit	4mA
	Internal voltage	24VDC	
	Loading	≤750Ω	
Pulse output	Function	Set up pulse output	
	Pulse output	Basis	Output pulse width: 0.1ms ~2000ms (This value is lower than the maximum duty cycle, with a maximum duty cycle of 1:1) F _{max} ≤ 5000 cp/s
		Pulse coefficient	0.001~100000/unit
	Passive	U _{Outer} ≤ 30VDC	
Communications	RS485; MODBUS-RTU; Hart communication (optional)		
Power supply			
Supply voltage	18VDC~36VDC		
Power consumption	≤15W		
Terminals	Screw-type terminal block		
Cable entries	M20*1.5 Cable gland		
Signal cable	Applicable only to the remote version. Comes standard with a 10 m cable; other lengths are customizable.		
Performance			

Reference operating conditions	Medium: water Temperature: 20℃ Pressure: 0.1MPa Installation requirements: Inlet run≥10DN, Outlet run≥5DN
Accuracy	±0.5% of measured value; ±0.3% of measured value Note: Applicable to the flow velocity range of 0.5 m/s to 5 m/s
Repeatability	0.16%
Flow velocity-deviation characteristic curve	 ①X[m/s]: Flow Velocity ②Y[%]: Actual measured value deviation
Process	
Medium temperature	PTFE/F46 liner-10℃~120℃
Rated pressure (Customizable high-pressure applications)	for 1. 6MPa; High-pressure versions can be customized.
Conductivity	≥50μS/cm
Environment condition	
Ambient/ Storage temperature	-20℃~55℃
Protection level	IP65

Dimensions

(1) Structure

The electromagnetic flowmeters mainly consist of two parts: the sensor and the converter.

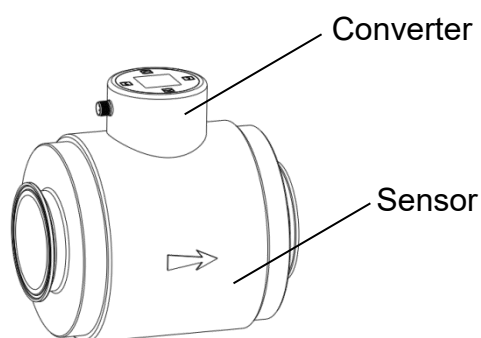


Fig.2 Structural diagram

(2) Dimensions

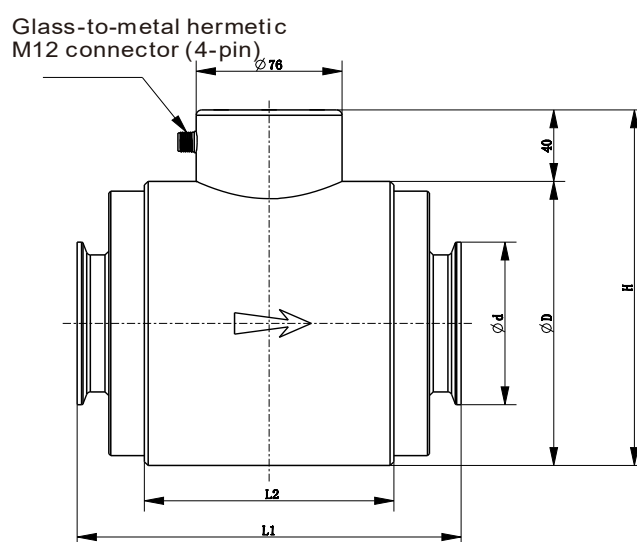


Fig.3 Dimensions

Table 1 Standard flange-connected VFM dimension (unit: mm)

DN	Total length L1	Housing length L2	Clamp diameter d	Body diameter D	Total height H	Bolts (n)
50	200	130	64	133	173	4
65	200	130	77.5	140	180	4
80	200	130	91	159	199	4
100	220	150	119	194	234	4
125	230	160	155	219	259	4

Note: Process Connection

Clamps: Compliant with ISO 2852 clamp standard

Electrical Connection

(1) Aviation Connector Definition

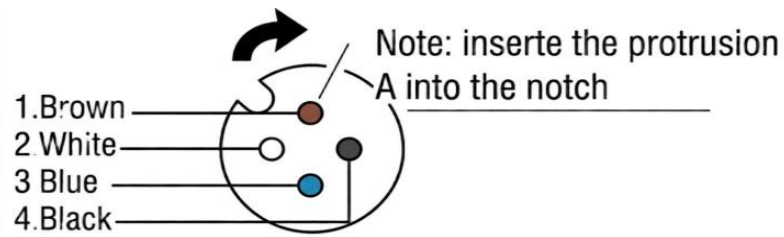


Fig 1 Wiring diagram

(2) (4-20)mA Output Wiring

Table 1 (4~20) mA output cable definition

Pin	Lead color	Description
1	brown	24 V DC positive supply
2	white	IO1: 4–20 mA output (+)
3	blue	GND: 24 V DC negative supply
4	black	IO2: 4–20 mA output (–)
Outer shielding layer		PE: Protective earth (ground)

(3) RS485 Communication Wiring

Table 2 RS485 communication cable definition

Pin	Lead color	Description
1	brown	24 V DC positive supply
2	white	IO1: RS485 A
3	blue	GND: 24 V negative supply
4	black	IO2:RS485 B
Outer shielding layer		PE: Protective earth (ground)

(4) Frequency Output

Table 3 Frequency output cable definition

Pin	Lead color	Description
1	brown	24 V DC positive supply
2	white	IO1: Pulse output is positive, requires an external pull-up resistor.
3	blue	GND: 24 V DC negative supply
4	black	IO2: negative pulse output
Outer shielding layer		PE: Protective earth (ground)

Note: Pins 2 and 4 of the signal output terminals can be configured as required via the menu.

Ordering code

SUP-FMX400										Description
Nominal diameter	50									DN50(2)
	65									DN65(2.5")
	80									DN80(3")
	1C									DN100(4")
	1E									DN125(5")
	1G									DN150(6")
	2C									DN200(8")
Process connection		J								JB/T 81 Flange
		D								GB/T9124 Flange
		I								ISO2852 clamps
		A								ANSI B16.5 flange
		X								others
Nominal pressure		A								PN6
		B								PN10
		C								PN16
		D								PN25
		E								PN40
		F								PN63
		G								Class 150
		X								others
Process connection material and body material			M1							304SS
Accuracy				K						Level 0.5
Output and power supply					CN					4-20mA/Pulse/ RS485, 24VDC
Electrode materials						M3				316LSS
Lining material							N6			PTFE

Electrical interfaces, housing material and protection level	FC				M12-4, aluminum alloy, IP65
Language		1			Chinese
		2			English
		3			Russian
		4			Spanish
		6			Korean
		X			others
Accessories			PB		Carbon steel CS matching flange
			PC		304SS matching flange
			PE		316LSS mating grounding ring