MFE600-C Insertion Electromagnetic Flowmeter

Features

- Easy to install and remove under low-pressure, uninterrupted flow, ideal for existing pipeline measurements and maintenance
- Low-frequency square wave excitation ensures zero stability, strong interference resistance, and reliable operation
- Accuracy is unaffected by temperature, pressure, density, or conductivity (>20 μS/cm)
- Lower manufacturing and installation costs than traditional electromagnetic flowmeters
- EEPROM protects settings and total flow during power loss
- Transmitter with low-power single-chip microcomputer data processing ensures stable performance, high accuracy, and displays key specifications
- Bidirectional flow measurement with low-frequency excitation for stable low-flow performance and low power consumption

Introduction

MFE600-C Insertion Electromagnetic Flowmeter (the insertion electromagnetic flowmeter) is a smart metering instrument developed and manufactured using advanced international technology. It features high accuracy, reliability, stability, and long service life. The insertion electromagnetic flowmeter is a compact version of the inline electromagnetic flowmeter, retaining its benefits while overcoming installation challenges and high costs in large-diameter pipelines. With pressurized tapping and installation, it enables flow measurement without interruption. This solution is widely used in industries such as chemicals, water supply, and wastewater treatment.

Operating Principle

The insertion electromagnetic flowmeters operate based on Faraday's law of electromagnetic induction. The sensor probe is inserted into the specified position of the pipeline. When the conductive fluid flows perpendicularly through the sensor' s magnetic field, it cuts the magnetic flux lines, generating an induced voltage detected by two electrodes on the probe.

The induced electromotive force is given by the formula:

$U = K \times B \times V \times D$, where:

U: Induced electromotive force K: Instrument constant
B: Magnetic flux density V: Average velocity
D: Inner diameter of the meter tube

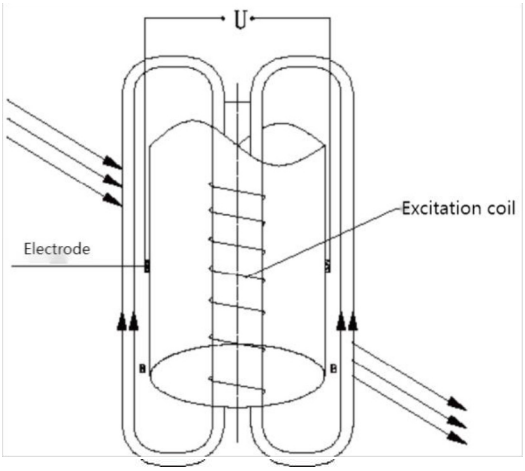

Figure 1 Flow Meter Operating Principle

Specifications

Diameter	DN150 ~ DN2400
Accuracy	Class 2.5 (1.5 optional)
Electrode type	Standard fixed electrode
Construction types	Integral, remote (remote cable spacing ≤ 99 m)
Explosion-proof mark	Ex db ib mb IICT6 Gb (Integral)
Rated pressure	1.6 MPa
Electrode	316L
Probe	ABS
Flange and body	304 SS
Ball valve	304 SS
Indicator	Cast aluminum
Power supply	220 VAC
	12V DC, 24V DC
Output signal	4mA ~ 20mA DC (load resistance 0Ω ~ 750 Ω, active output)
	Hart
	Frequency, pulse (active output)
	Upper and lower limit alarm output
	RS485 output (ModBus protocol), RS232
	Profi bus- DP, Profi bus- PA
Electrical connection	M20×1.5 (Female), NPT 1/2 (Female)
IP rating	IP65: Dust proof, protected against water jets IP67: Dust proof, protected against temporary immersion IP68: Protected against continuous immersion (sensor part only, converter IP65), suitable for installation in instrument wells
Ambient temperature	-20℃~ 60℃
Storage temperature	-40℃~ 60℃
Relative humidity	5% ~ 90%

Outline Construction

Integral dimensions

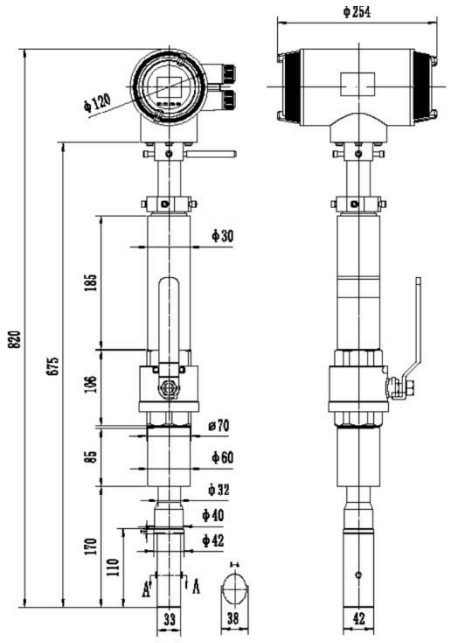

Figure 2 Integral Outline Dimensions

Remote transmitter dimensions

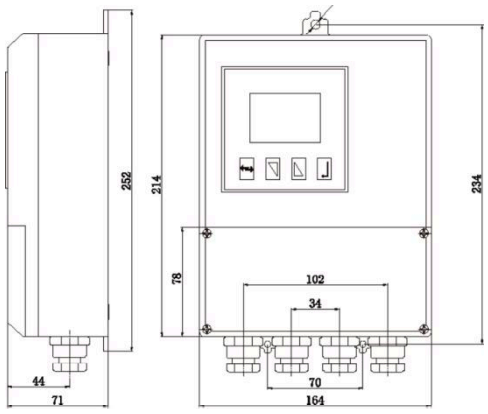

Figure 3 Remote transmitter dimensions

Remote dimensions

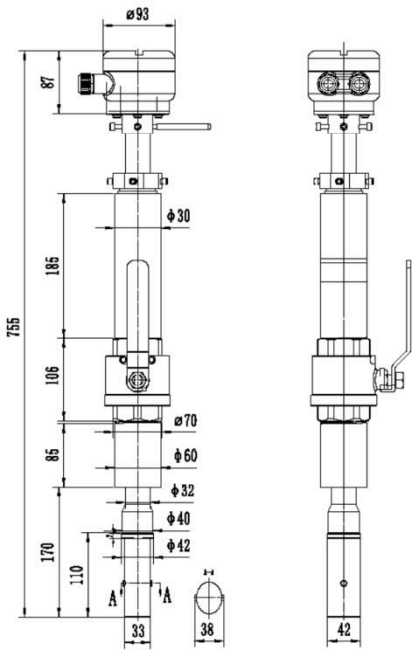

Figure 4 Remote Outline Dimensions

The remote type is ideal for challenging maintenance, debugging, and harsh conditions, such as high-temperature fluids or vibrations. In most cases, both remote and integral types meet the requirements.

For diameters ≥ 500mm, the remote type is recommended for easier maintenance. For underground installation, a remote type with IP68 should be chosen. For pump outlet installation, a remote type should also be chosen.

Electrical Connection

The electromagnetic flowmeter transmitter is available in integral and remote types. See Figures 5 and 6 for wiring diagrams.Wiring precautions:

a) Use a two-wire twisted-pair shielded cable for RS485 communication;

b) Power and 4mA–20mA signal cables must be connected separately.

Integral wiring

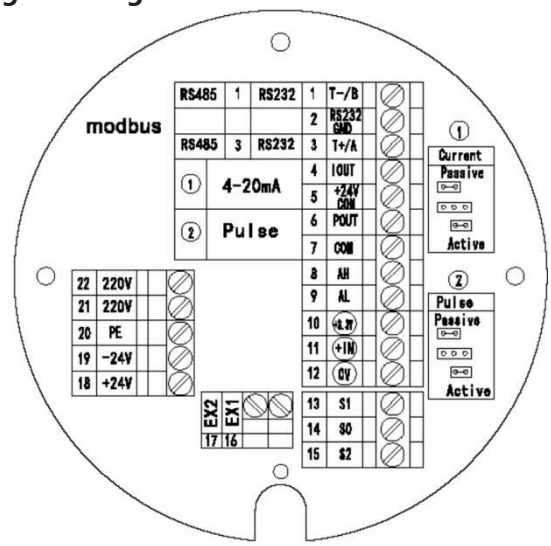

Figure 5 Integral Wiring

Select the correct power terminal per specs and connect the signal cable as needed. See Table 2 for terminal definitions.

Table 2 Integral Terminal Definitions

Terminal Symbol		Description
1	T-/B	RS485/RS232 communication output
2	RS232 GND	RS232 grounding wire
3	T+/A	RS485/RS232 communication input
4	IOUT	4mA ~ 20mA DC output
5	+24V DC COM	4mA ~ 20mA DC output common ground
6	POUT	Pulse/frequency output
7	COM	Pulse/frequency output common ground
8	AH	Alarm output for Upper Limit of flow
9	AL	Alarm output for Lower Limit of flow
10	+3.3V	Pressure transmitter power supply +
11	+IN	Pressure transmitter output
12	0V	Pressure transmitter common ground
13	S1	Electrode wire
14	S0	Signal grounding wire
15	S2	Electrode wire
16	EX1	Excitation current
17	EX2	
18	+24V	24V DC (12V DC) power supply input
19	-24V	
20	PE	Power grounding wire
21	220V	220V AC input
22	220V	
Jumper	Passive	Current① or pulse② output is passive
	Active	Current① or pulse② output is active

Remote wiring

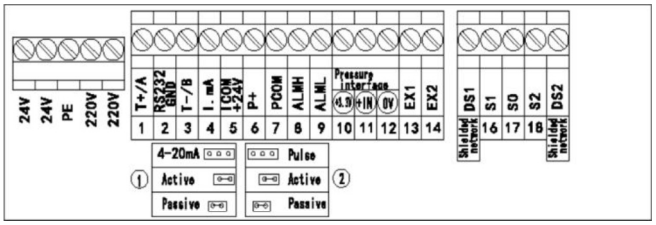

Figure 6 Remote Wiring

Select the correct power terminal per specs and connect the signal cable as needed. See Table 3 for terminal definitions.

Table 3 Remote Terminal Definitions

Terminal Symbol		Description
1	T-/A	RS485/RS232 communication output
2	RS232 GND	RS232 grounding wire
3	T+/B	RS485/RS232 communication output
4	I.mA	4mA ~ 20mA DC output
5	Icom +24V	Current output grounding wire
6	P+	2-way flow pulse output / frequency output
7	Pcom	Pulse output grounding wire
8	ALMH	Alarm output for Upper Limit of flow
9	ALML	Alarm output for Lower Limit of flow
10	+3.3V	Pressure transmitter power supply +
11	+IN	Pressure transmitter output
12	0V	Pressure transmitter common ground
13	EX1	Excitation current
14	EX2	
Shielding network	DS1	
16	S1	Electrode wire
17	S0	Signal grounding wire
18	S2	Electrode wire
Shielding network	DS2	
220V	220V	220V AC power supply input
220V	220V	
24V	24V	24V DC power supply input
24V	24V	
Jumper	Passive	Current① or pulse② output is passive
	Active	Current① or pulse② output is active

Installation

The electromagnetic flowmeter must operate under full pipe conditions and cannot function if the pipe is not full or is empty.

Installation Direction

The liquid flow direction should match the flow arrow on the sensor, with sufficient space for installation and maintenance.

For insertion electromagnetic flowmeters, install them horizontally or at a 30° to 45° angle to avoid gas accumulation at the top of the pipe, as shown in Figure 7.

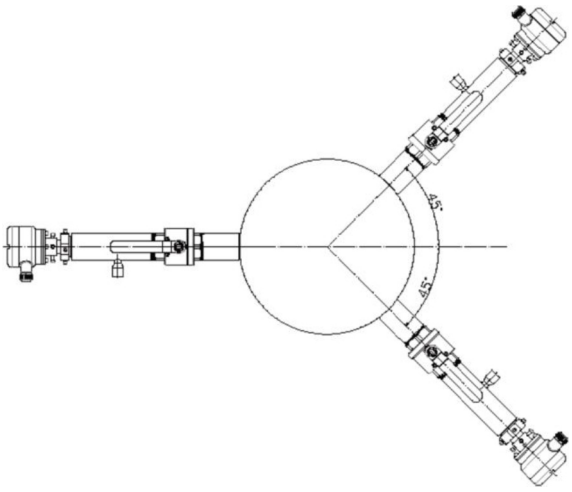

Figure 7

To ensure the pipeline is filled with liquid, the flowmeter should not be installed at the high point of the pipeline, as shown in Figure 8.

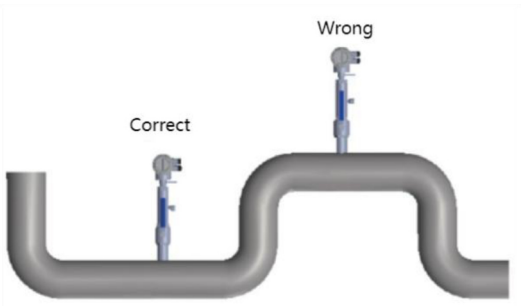

Figure 8

Upstream and downstream straight pipe

To ensure high accuracy for the flowmeter, the installation method shown below is recommended.

When valves are present upstream and downstream of the flowmeter, the minimum straight pipe sections must be 10D upstream and 5D downstream, with the valves fully opened, as shown in Figure 9.

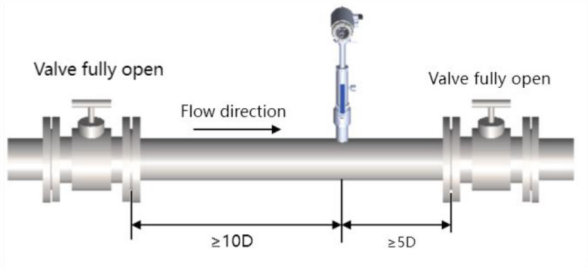

Figure 9

When installed at the downstream of a T-pipe, the flowmeter must have a minimum straight pipe section of 20D upstream and 10D downstream from the T-pipe, as shown in Figure 10.

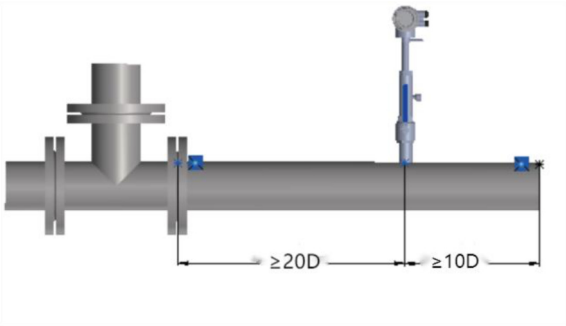

Figure 10

When installed at the downstream of a 90° elbow, the flowmeter must have a minimum straight pipe section of 10D upstream and 5D downstream from the elbow, as shown in Figure 11.

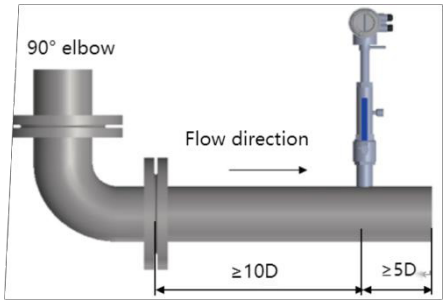

Figure 11

When installed at the downstream of a partially opened valve, the flowmeter must have a minimum straight pipe section of 20D from the valve, as shown in Figure 12.

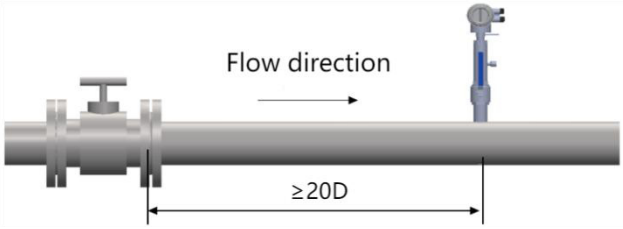

图 12

Order Guide

Types	Items	Code	Description
Composition		MFE600-C- Sensor Specifications - Construction Types - Transmitter Specifications - Options	
	Model	MFE600	Electromagnetic Flowmeter
	Series	C	Insertion
Sensor specifications	Types	C	Standard
		P	With pressure port
		X	Explosion-proof (integral)
	Diameter	150	DN150
		200	DN200
		250	DN250
		300	DN300
		350	DN350
		400	DN400
		450	DN450
		500	DN500
		600	DN600
		700	DN700
		800	DN800
		900	DN900
		10H	DN1000
		12H	DN1200
		14H	DN1400
		16H	DN1600
		18H	DN1800
		20H	DN2000
		22H	DN2000
		24H	DN2400
	Rated pressure	P2	1.6MPa
	Probe rod	2	304 SS
	Electrode	1	316L SS
	Probe lining	1	ABS
	Process Connection	A	online, pluggable installation (with ball valve)
		B	Fixed flange-mounted
	Medium temperature	1	≤ 60℃
		2	≤ 80℃
	IP rating	1	IP65
		2	IP67 (Only for Integral)
		3	IP68 (Sensor IP68/ converter IP65 for Remote)
Construction types		1	
		2	Remote
Transmitter specifications	Accuracy	E	Class 2.5
		D	Class 1.5
	Transmitter housing	1	Cast aluminum
		2	304 SS
	Electrical connection	M	M20×1.5 Female
		T	NPT1/2
		N	None
	Output signal	N	No output (Battery-powered)
		1	4-20mA/ frequency pulse
		2	4-20mA/ frequency pulse + relay output
		3	4-20mA/ frequency pulse +HART
		4	4-20mA/ frequency pulse +RS485 (MODBUS protocol)
		5	4-20mA/ frequency pulse +Profibus-DP
		6	4-20mA/ frequency pulse +Profibus-PA

	Power supply	1	220VAC
		2	12V DC
		3	24V DC
		4	3.6V DC (Battery-powered)
Options	Options (multiple available)	/N	None
		/S	Third-party inspection report
		/Y	With pressure transmitter ①
		/J2	Electrical connection: 304 SS
		/E	Labels, Operation Manual, Certificate of Conformity
		/L10	Cable Length: L10, with a default 10m remote cable (excitation & signal wires, 10m each), maximum 99m. If it exceeds 99 m, please contact the MICROSENSOR. ②

※For items not covered in the order guide, please contact the MICROSENSOR.

Notes:
① M20×1.5 Female , 304 SS ball valve (default)
②Cable length is available in 5 m increments (L10, L15, L20...L99)

Example: MFE600-C-P200P2211A11-1-E1M11-N

Description: MFE600 Insertion Electromagnetic Flowmeter, with pressure port, DN200, rated pressure 1.6MPa, probe rod 304 SS, electrode 316L , probe lining ABS, process connection: online, pluggable installation (with ball valve), medium temperature ≤60℃, IP65, integral, accuracy class 2.5, converter housing cast aluminum, electrical connection M20×1.5 Female, 4mA-20mA/frequency pulse output, 220V AC power supply, no options.

The selection of an electromagnetic flowmeter should be made by technical personnel familiar with on-site conditions, using the flow rate table to choose the appropriate diameter, lining material, and electrode. The end user familiar with the process should make the final choice.

Notes

According to statistics from leading authorities, one-third of flowmeter failures are due to product quality issues, while two-thirds are caused by improper selection and non-compliant installation. When selecting an electromagnetic flowmeter, consider the following specifications:

a) Process data:
   1) Measured fluid and chemical composition
   2) Max, min, and typical flow rates
   3) Max operating pressure
   4) Max and min temperatures
b) Fluid conductivity: Must be >20 μS/cm
c) Max and min flow rate must meet the specified range in Table 4
d) When selecting a flow meter, a typical flow velocity in the pipeline should be 1 m/s ~ 3 m/s.The operating pressure must not exceed the rated pressure.
e) Max and min temperatures must meet specifications.

Table 4 Flow Velocity-to-Flow Rate

Flow rate m³/h / Diameter mm \ Flow Velocity m/s	0.5	1	2	3	4	5	7
150	31.8086	63.6173	127.2345	190.8518	254.4690	318.0863	445.3208
200	56.5487	113.0973	226.1947	339.2920	452.3893	565.4867	791.6813
250	88.3573	176.7146	353.4292	530.1438	706.8583	883.5729	1237.0021
300	127.2345	254.4690	508.9380	763.4070	1017.8760	1272.3450	1781.2830
350	173.1803	346.3606	692.7212	1039.0818	1385.4424	1731.8030	2424.5241
400	226.1947	452.3893	904.7787	1357.1680	1809.5574	2261.9467	3166.7253
450	286.2776	572.5553	1145.1105	1717.6658	2290.2210	2862.7763	4007.8868
500	353.4292	706.8583	1413.7167	2120.5750	2827.4334	3534.2917	4948.0083
600	508.9380	1017.8760	2035.7520	3053.6281	4071.5041	5089.3801	7125.1320
700	692.7212	1385.4424	2770.8847	4156.3271	5541.7694	6927.2118	9698.0964
800	904.7787	1809.5574	3619.1147	5428.6721	7238.2295	9047.7868	12666.9014
900	1145.1105	2290.2210	4580.4421	6870.6631	9160.8842	11451.1052	16031.5470
1000	1413.7167	2827.4334	5654.8668	8482.3002	11309.7336	14137.1669	19792.0334
1200	2035.7520	4071.5041	8143.0082	12214.512	16286.0163	20357.5204	28500.5281
1400	2770.8847	5541.7694	11083.538	16625.308	22167.0778	27708.8472	38792.3854
1600	3619.1147	7238.2295	14476.458	21714.459	28952.9179	36191.1474	50667.6055
1800	4580.4420	9160.8840	18321.7680	27482.6520	36643.5360	45804.4201	64126.1881
2000	5654.8666	11309.7333	22619.4667	33929.20008	45238.9334	56548.6668	79168.1335
2200	6842.3886	13684.7773	27369.5547	41054.3320	54739.1094	68423.8868	95793.4415
2400	8143.0080	16286.0160	32572.0320	48858.0481	65144.0641	81430.0801	114002.1122

Dtsinstruments.com
Carrer Narcís Monturiol 11, Pol. Ind. Bufalvent
08243 - Manresa (Barcelona, España)
info@dtsinstruments.com
Tel. 931 31 31 06