CHONGQING CHUANYI AUTOMATION CO.,LTD.



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QR code of Chuanyi Flowmeter

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ELECTROMAGNETIC FLOWMETER

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CHONGQING CHUANYI AUTOMATION CO., LTD. FLOWMETER BRANCH

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Part I Pipeline Electromagnetic Flowmeter

1. Product Overview

1.1 Product background

MF electromagnetic flowmeter is a high-performance flowmeter developed by Chongqing Chuanyi Automation Co., Ltd. by integrating the world's advanced forward design concept and automatic intelligent manufacturing technology. With more than 300,000 sets of production and more than 20 years of application experience, high-reliability electronic modular design, more than 20 core invention patents and 8 international certifications, and calibration by the calibration laboratory (CNAS L6467) recognized by China National Accreditation Service for Conformity Assessment and intelligent manufacturing technology, the high precision, high stability and consistency of the product are ensured. The product has complete intelligent diagnosis, simulation, monitoring, local configuration and various communication functions, complete specifications of wetted part materials, special signal processing modes for different working conditions, and high-index electromagnetic compatibility characteristics, etc., and has been widely used in electric power, metallurgy, chemical industry, coal chemical industry, petroleum, petrochemical industry, municipal administration, environmental protection, food processing, medicine, building materials, light industry and other industries.





Intelligent flow meter production line L01



Intelligent flow meter production line L02



Intelligent flow meter production line L03



国际国内认证

THE INTERNATIONAL AND **DOMESTIC** CERTIFICATION

- CE EU Certification
- 3A Hygienic Certification
- SIL Safety Certification
- IEC Explosion-proof Certification
- HART Certification
- Profibus Certification
- ASME Welding Certification
- CSA Safety Certification
- Kazakhstan Certification
- CU-TR Certification
- TS Pressure Pipeline Certification
- CNAS Laboratory Certification
- Measurement Management System Certification

1.2 Scope of application

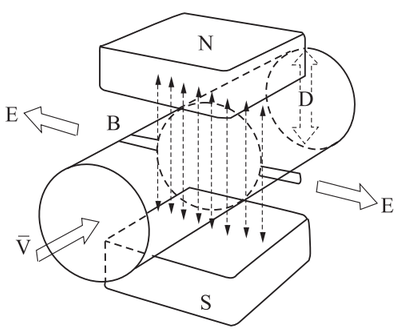
Electromagnetic flowmeter is composed of sensor and converter, and works based on Faraday's law of electromagnetic induction. The product has almost no pressure loss, and the measurement is not affected by the changes of fluid density, viscosity, temperature, pressure and conductivity, and the range ratio is large. Therefore, it is the most ideal instrument for measuring the volume flow of conductive liquid.

1.3 Working principle

The measurement principle of electromagnetic flowmeter sensor is based on the Faraday's law of electromagnetic induction. One pair of detection electrodes are installed on the tube walls perpendicular to the axis of the measuring tube and the line of the magnetic field. When the conductive liquid moves along the axis of the measuring tube, the induced potential is generated as the conductive liquid cuts the magnetic line. The induced potential is detected by two electrodes on the measuring tube. The potential value is:

$$E=KB\overline{V}D$$

Where: E - Induced potential
K - Instrument constant
B - Magnetic induction intensity
$\overline{V}$- Average flow velocity in the cross section of measuring tube
D - Inside diameter of measuring tube



During flow measurement, the fluid will flow through the magnetic field perpendicular to the flow direction. The flowing of conductive fluid inducts a potential directly proportional to the average flow velocity. Therefore, the measured flowing liquid is required to have the conductivity above the minimum limit. The induced voltage signal is detected by two electrodes and sent to the converter through a cable. After signal processing and related operation, the cumulative flow and instantaneous flow are shown on the display of the converter.

1.4 Instrument Characteristics

1) There is no choked flow and moving parts in the measuring tube, so no additional energy loss and blockage will be caused, and the energy-saving effect is remarkable, especially suitable for the measurement of liquid-solid two-phase flow such as sewage, mud, ore pulp, coal water slurry and pulp.

2) Only the lining and electrode are in contact with the measured medium. As long as the lining and electrode materials are reasonably selected, good corrosion resistance and wear resistance can be achieved. Therefore, various chemical solutions such as strong acid and strong alkali can be measured.

3) The installation requirements are low, with only 5D for the front straight pipe section and 2D for the rear straight pipe section (D is the internal diameter of the selected instrument).

4) The measurement accuracy is high, up to ±0.2% of the indicated value, and the flow in the forward/reverse directions can be measured.

5) The instrument has a variety of excitation modes, is not easily disturbed by power frequency and fluid noise, and works stably and reliably.

6) The power consumption of the instrument is small, less than 15VA.

7) The converter has good interchangeability, and the accuracy can be achieved without re-calibrating the real flow.

8) The measuring range is wide, up to 1500: 1.

9) The electrode has a unique double sealing mode of conical surface seal and line seal to ensure no leakage.

10) The EMC (electromagnetic compatibility) index of flowmeter meets the requirements of IEC61326-1 standard.

11) The input impedance of the converter is greater than 10^{12} ohms, to effectively prevent the influence of scaling on the sensor and suitable for measuring conductivity media ≥2μS/cm.

12) The functions of self-diagnosis, alarm and output, such as empty pipe detection, excitation drive alarm and storage error, are provided.

13) Explosion-proof mark: Exia/db eb IIc T4~T6 Ga/Gb

1.5 Notes for Ordering

Please read this document before ordering, understand the model and coding regulations of this product, and determine the model and specifications as needed. If necessary, the following requirements are also indicated:

1) Parameters required to be set before the product leaves the factory, such as the upper limit of flow range or the corresponding upper limit of flow rate;

2) Pipeline size (outer diameter/wall thickness of pipeline) is provided if a companion flange is required;

3) Protection grade of IP68 should be considered when immersion for use is required

4) For plastic or plastic-lined pipes, grounding ring or grounding electrode must be selected (the medium or pipeline is prohibited from being charged);

5) Products with protection grade above IP65 should be selected for outdoor installation without protective box;

6) Other special requirements.

2. Composition of Pipeline

2.1 Conventional application series of MF electromagnetic flowmeter



Application of MFC type in general occasions



Application of MFE type I
n process control occasions

2.2 Special application series of MF electromagnetic flowmeter



Application of MFD
type in slurry measurement



Application of MFB type in
occasions without power supply



Application of MFS
type in sanitary occasions



Application of MFL type in
occasionswith low power consumption
and high reliability requirements

3. Table of Parameter Performance

FlowMaster MFC electro magnetic flowmeter		
	Integrated type	Split type
Accuracy grade	Class 0.5	
Diameter (mm)	DN2~DN1200	
Flange	GB/T9119 JIS B2220 ASME/ANSI B16.5 HG/T20592, etc.	
Pressure grade	4.0MPa, 2.5MPa, 1.6MPa, 1.0MPa, ANSI 150 (flange type), ANSI 300 (flange type), ANSI 600 (flange type), ANSI 900 (flange type), ANSI 1500 (flange type), JIS 10K (flange type), JIS 16K (flange type), JIS 20K (flange type), etc. For details, please refer to the selection table, and negotiate with the company for special pressure	
Lining material	ETFE、PTFE、PFA、 F46、polyurethane rubber、natural rubber、and chloroprene rubber	
Conductivity	⩾5μS/cm (the conductivity of deionized water is greater than or equal to 20μS/cm)	
Electrode material	316L, Hastelloy, titanium, tantalum, platinum-iridium alloy, tungsten carbide clad, and platinum	
IP code	Ip65	IP65 (IP68 optional for sensor)
Medium temperature	–25°C ~ 180°C	
Ambient temperature	−40°C~65℃ the display unit may not work normally if less than -20℃	
Influence of ambient temperature	< ± 0.25%/10°C	
Reproductivity and repeatability	⩽ ± 0.16%	
Analog output error	⩽ ± 0.02mA	
Flow rate within measuring range	≤10m/s	
Possible to be buried	————	⩽5m (limited to Ip68)
Electrical connection	M20*1.5 sealing sleeve, G1/2, NPT1/2	
Sensor cable	————	＜100m (If you want to order a super-long type, please consult with us)
Output interface*	Standard output (pulse+4mA ~ 20mA single current output), RS485, HART	

Note *: The 4mA-20mA analog output is an active output.

FlowMaster MFE-S electromagnetic flowmeter		
	Split type	Integrated type
Accuracy grade	Class 0.2, 0.3 and0. 5	
Diameter (mm)	DN2~DN2400	
Explosion-proof grade	Exia/db eb IIc T4 Ga/Gb (ambient temperature ≤60°Cand medium temperature ≤130°C) Exia/db eb IIc T5 Ga/Gb (ambient temperature ≤60°Cand medium temperature ≤90°C) Exia/db eb IIc T6 Ga/Gb (ambient temperature ≤60°Cand medium temperature ≤80°C)	
Flange standard	GB/T9 119 JIS B2220 ASME/ANSI B16.5 HG/T20592, etc.	
Pressure grade	4.0MPa, 2.5MPa, 1.6MPa, 1.0MPa, ANSI 150 (flange type), ANSI 300 (flange type), ANSI 600 (flange type), ANSI 900 (flange type), ANSI 1500 (flange type), JIS 10K (flange type), JIS 16K (flange type), JIS 20K (flange type), etc. For details, please refer to the selection table, and negotiate with the company for special pressure	
Lining material	ETFE, PTFE, PFA, F46, polyurethane rubber, natural rubber, and chloroprene rubber	
Conductivity	⩾5μS/cm (the conductivity of deionized water is greater than or equal to 20μS/cm)	
Electrode material	316L, Hastelloy, titanium, tantalum, platinum-iridium alloy, tungsten carbide clad, and platinum	
IP code	IP65/IP67 (IP68 optional for sensor)	IP65/IP67
Medium temperature	−25℃~180℃ (non-explosion-proof) -25℃~130℃ (explosion-proof)	−25°C~80°C
Ambient temperature	−40°C~65°C the display unit may not work normally if less than -20°C	
Influence of ambient temperature	＜±0.1%/10°C, <±0.1.5%/10°C, ＜±0.25%/10°C	
Reproductivity and repeatability	⩽±0.06%; ≤±0.1%; ≤±0.16%	
Flow rate within measuring range	⩽10m/s	
Possible to be buried	⩽5m (limited to Ip68)	————
Sensor cable	＜100m (If you want to order a super-long type, please consult with us)	————
Electrical connection	M20*1.5 sealing sleeve, G1/2, NPT1/2	
Output interface	Standard output (pulse+4 mA~20mA single current output), dual current output, RS485, HART, Profibus-PA, Profibus-DP and FF	

Note *: 4mA-20mA analog output is active output, and pulse is passive pulse output.

FlowMaster MFD slurry electromagnetic flowmeter		
	Split type	Integrated type
Accuracy grade	Class0.5	
Diameter (mm)	DN25~DN600	
Explosion-proof grade	Exia/db eb IIc T4 Ga/Gb (ambient temperature ≤60℃and medium temperature ≤130℃) Exia/db eb IIc T5 Ga/Gb (ambient temperature ≤60℃and medium temperature ≤90℃) Exia/db eb IIc T6 Ga/Gb (ambient temperature ≤60℃and medium temperature ≤80℃)	
Flange standard	GB/T9119 JIS B2220 ASME/ANSI B16.5 HG/T20592, etc.	
Pressure grade	4.0MPa, 2.5MPa, 1.6MPa, 1.0MPa, ANSI 150 (flange type), ANSI 300 (flange type), ANSI 600 (flange type), ANSI 900 (flange type), ANSI 1500 (flange type), JIS 10K (flange type), JIS 16K (flange type), JIS 20K (flange type), etc. For details, please refer to the selection table, and negotiate with the company for special pressure	
Lining material	ETFE, PTFE, PFA, F46, polyurethane rubber, natural rubber, and chloroprene rubber	
Conductivity	⩾2μS/cm (the conductivity of deionized water is greater than or equal to 20μS/cm)	
Electrode material	316L, Hastelloy, titanium, tantalum, platinum-iridium alloy, tungsten carbide clad, and platinum	
IP code	IP65/IP67 (IP68 optional for sensor)	IP65/IP67
Medium temperature	-25℃~180℃(non-explosion-proof) -25℃~130℃ (explosion-proof)	-25℃~80℃
Ambient temperature	−40℃~65℃ the display unit may not work normally if less than -20℃	
Influence of ambient temperature	＜±0.25%/10℃	
Reproductivity and repeatability	⩽±0.16%	
Flow rate within measuring range	⩽5m/s (slurry), ≤10m/s (single medium)	
Possible to be buried	⩽5m (limited to Ip68)	————
Sensor cable	<100m (If you want to order a super-long type, please consult with us)	————
Electrical connection	M20*1.5 sealing sleeve, G1/2, NPT1/2	
Output interface	Standard output (pulse+4 mA~20mA single current output), dual current output, RS485, HART, Profibus-PA, Profibus-DP and FF	

Note *: The 4mA-20mA analog output is an active output.

FlowMaster MFS electromagnetic flowmeter		
	Integrated type	Split type
Accuracy grade	Class 0.2 and 0.5	
Diameter (mm)	DN25~DN150	
Flange standard	DIND32676 or ISO2852	
Pressure grade	1.0MPa	
Lining material	PFA	
Conductivity	⩾10μS/cm (the conductivity of deionized water is greater than or equal to 20μS/cm)	
Electrode material	316L, Hastelloy, titanium, tantalum, platinum-iridium alloy, tungsten carbide clad, and platinum	
IP code	IP65/IP67	IP65/IP67 (IP68 optional for sensor)
Medium temperature	−25~℃140℃	
Ambient temperature	-40℃~65℃ the display unit may not work normally if less than -20℃	
Influence of ambient temperature	＜±0. 1.5%/10℃；＜±0.25%/10℃	
Reproductivity and repeatability	⩽±0.06%℃≤ ±0.16%	
Flow rate within measuring range	≤10m/s	
Possible to be buried	————	⩽5m (limited to Ip68)
Electrical connection	M20*1.5 sealing sleeve, G1/2, NPT1/2	
Sensor cable	————	＜100m (If you want to order a super-long type, please consult with us)
Output interface	Standard output (pulse+4 mA~20mA single current output), dual current output, Rs485, HART, Profibus-PA, Profibus-DP and FF	

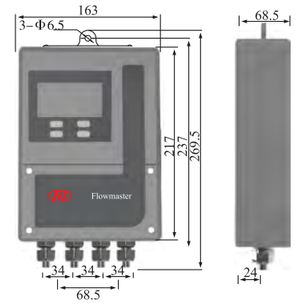
FlowMaster MFL electromagnetic flowmeter		
	Split type	Integrated type
Accuracy grade	Class0.5	
Diameter (mm)	DN2.5~DN600	
Explosion-proof class	Exia/db eb IIc T4 Ga/Gb (ambient temperature ≤60℃and medium temperature ≤130℃) Exia/db eb IIc T5 Ga/Gb (ambient temperature ≤60℃and medium temperature ≤90℃) Exia/db eb IIc T6 Ga/Gb (ambient temperature ≤60℃and medium temperature ≤80℃)	
Flange standard	GB/T9119 JIS B2220 ASME/ANSI B16.5 HG/T20592, etc.	
Pressure grade	4.0MPa, 2.5MPa, 1.6MPa, 1.0MPa, ANSI 150 (flange type), ANSI 300 (flange type), ANSI 600 (flange type), ANSI 900 (flange type), ANSI 1500 (flange type), JIS 10K (flange type), JIS 16K (flange type), JIS 20K (flange type), etc. For details, please refer to the selection table, and negotiate with the company for special pressure	
Lining material	ETFE, PTFE, PFA, F46, polyurethane rubber, natural rubber, and chloroprene rubber	
Conductivity	⩾10μS/cm (the conductivity of deionized water is greater than or equal to 20μS/cm)	
Electrode material	316L, Hastelloy, titanium, tantalum, platinum-iridium alloy, tungsten carbide clad, and platinum	
IP code	Ip65, IP67	IP65 (IP68 optional for sensor), IP67
Medium temperature	−25℃~80℃	
Ambient temperature	-40℃~65℃	
Influence of ambient temperature	＜ ±0.25%/10℃	
Reproductivity and repeatability	⩽ ±0.16%	
Flow rate within measuring range	⩽10m/s	
Possible to be buried	————	⩽5m (limited to Ip68)
Electrical connection	M20*1.5 sealing sleeve, G1/2, NPT1/2	
Sensor cable	————	⩽20m (If you want to order a super-long type, please consult with us)
Output interface	(4mA~20mA) Two-wire system /HART protocol	

FlowMaster MFB electromagnetic flowmeter		
	Split type	Integrated type
Accuracy grade	Class 0.5	
Diameter (mm)	DN2.5~DN800	
Flange standard	GB/T9119 JIS B2220 ASME/ANSI B16.5 HG/T20592, etc.	
Pressure grade	4.0MPa, 2.5MPa, 1.6MPa, 1.0MPa, ANSI 150 (flange type), ANSI 300 (flange type), ANSI 600 (flange type), ANSI 900 (flange type), ANSI 1500 (flange type), JIS 10K (flange type), JIS 16K (flange type), JIS 20K (flange type), etc. For details, please refer to the selection table, and negotiate with the company for special pressure	
Lining material	ETFE, PTFE, PFA, F46, polyurethane rubber, natural rubber, and chloroprene rubber	
Conductivity	≥5μS/cm (the conductivity of deionized water is greater than or equal to 20μS/cm)	
Electrode material	316L, Hastelloy, titanium, tantalum, platinum-iridium alloy, tungsten carbide clad, and platinum	
IP code	IP67/IP68	IP67/IP68
Medium temperature	−25℃ ~ 80℃	
Ambient temperature	−40℃~65℃ the display unit may not work normally if exceeding the temperature range of -20℃~+60℃	
Influence of ambient temperature	＜±0.25%/10℃	
Reproductivity and repeatability	≤±0.16%	
Flow rate within measuring range	≤10m/s	
Possible to be buried	≤5m (limited to Ip68)	————
Sensor cable	＜15m (If you want to order a super-long type, please consult with us)	————
Electrical connection	High-protection aviation connector and stainless steel connector (M20x1.5)	
Output interface	Pulse, RS485, NB-Iot (China Telecom), NB-Iot (China Mobile)	
Power supply	3.6V lithium battery, 220VAC+3.6V lithium battery, 24VDC+3.6V lithium battery	
Battery life	More than 6 years (battery powered only)	

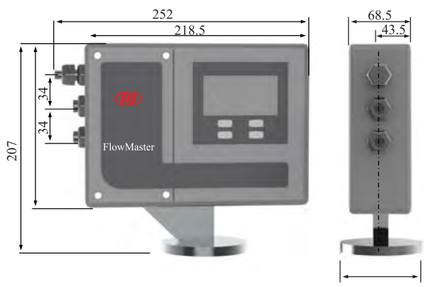
4. Overall Dimensions of Product

4.1 Converter size

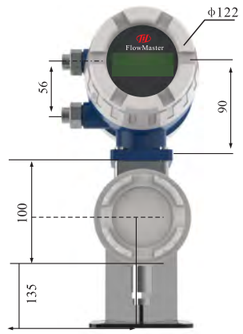
4.1.1 IP65 converter size



Split type



Integrated (mounted on sensor)



Split-type converter

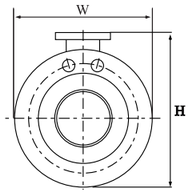


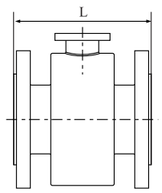
Type L

（the split-type converter is equipped with a mounting bracket, and the standard material of the bracket is 304. Please note when ordering other materials)

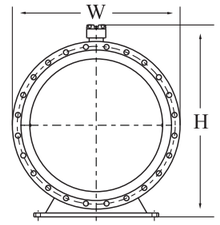
4.2 Sensor size

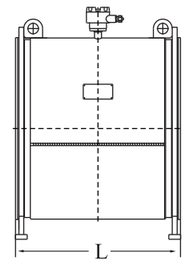
4.2.1 Sensor size (pipeline type)





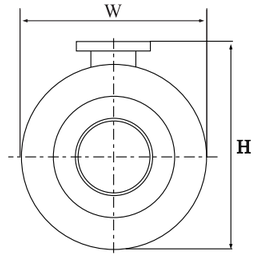
Diameter (mm)	Size (mm)			Weight (kg)			
	L	W	H	1.0MPa	1.6MPa	2.5MPa	4.0MPa
2.5	134	90	153	3	3	3	3
5	134	90	153	3	3	3	3
10	134	90	153	3.5	3.5	3.5	3.5
15	134	95	156	4	4	4	4
20	200	105	161	4	4	4	4.5
25	200	115	171	5	5	5	5.5
32	200	140	188	7	7	7	8
40	200	150	198	7.5	7.5	8	8.5
50	200	165	216	9	9	9.5	10
65	200	185	238	11	11	12	14
80	200	200	251	14	14	15	19
100	250	220	271	19	19	20	24
125	250	250	306	24	24	25	30
150	300	285	338	32	32	35	42
200	350	340	391	41	41	46	56.5
250	450	405	443	68	68	73	85
300	500	460	496	89	89	97	113
350	550	520	529	97	97	124	-
400	600	580	583	122	122	157	-
450	600	640	641	161	161	200	-
500	600	715	706	180	180	243	-
600	600	840	817	241	241	285	-

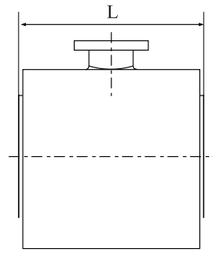




Diameter (mm)	L	W	H	Weight (kg) 0.6MPa
700	700	860	944	420
800	800	975	1055	541
900	900	1075	1155	668
1000	1000	1175	1255	858
1200	1200	1405	1470	990
1400	1400	1630	1690	1362
1600	1600	1830	1890	1754
1800	1800	2045	2100	1890
2000	2000	2265	2310	2105
2200	2200	2475	2364	3210
2400	2400	2685	2564	3910

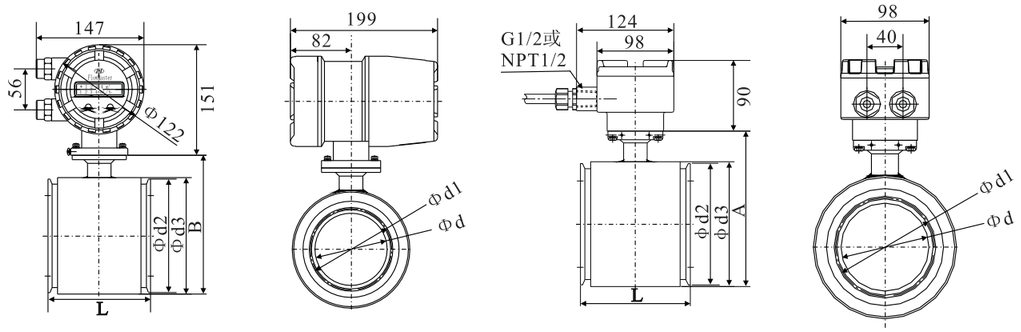
4.2.2 Sensor size (clamping type)



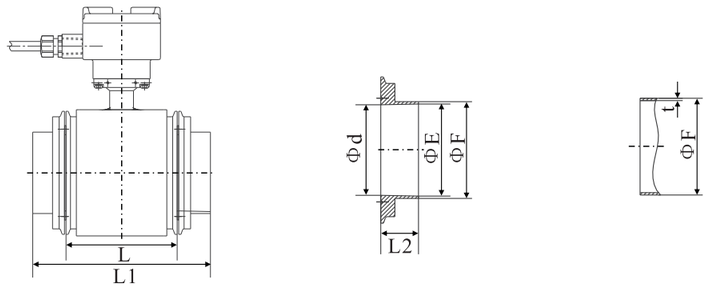


Diameter (mm)	L	W	H	Applicable pressure (Mpa)
25	100	70	130	≤4.0
32	100	80	140	≤4.0
40	100	91	151	≤4.0
50	100	100	160	≤4.0
65	100	119	179	≤1.6
80	120	130	190	≤1.6
100	150	155	215	≤1.6
125	200	183	243	≤1.6
150	200	212	272	≤1.6
200	250	262	322	≤1.0
250	300	320	380	≤1.0
300	350	370	430	≤1.0

4.2.3 Sanitary type size



Caliber	DN25	DN32	DN40	DN50	DN65	DN80	DN 100
L Sensor length	92				95	115	144
B (Height of integrated shell)	107	117	128	137	156	167	192
A (Height of split shell)	113	123	134	143	162	173	198
d3 (Shell diameter)	74	84	95	104	123	134	159
d2 (Outer diameter of chuck)	77.5		91		119	130	155
d1 (Center of sealing groove)	43.5			56.5	75	83.5	110
d (Inner diameter of sensor)	22.6	31.3	35.6	48.6	63	72.9	96



Caliber	DN25	DN32	DN40	DN50	DN65	DN80	DN100
L1 (Installation length)	156				159	199	228
L (Sensor length)	92				95	115	144
L2 (Connector length)	30						40
F (Outer diameter of connecting pipe)	77.5		91		119	130	155
E (Inner diameter of DIN32676 connector)	26	32	38	50	66	81	100
E (Inner diameter of ISO2852 connector)	22.6	31.3	35.6	48.6	63	72.9	97.6
d (Inner diameter of connector)	22.6	31.3	35.6	48.6	63	72.9	96

5. Selection of Electromagnetic

5.1 Selection of instrument diameter

5.1.1 Selection of sensor diameter

The selected instrument diameter is not necessarily the same as the diameter of the connecting pipe, but should be determined according to the flow rate of the pipeline.

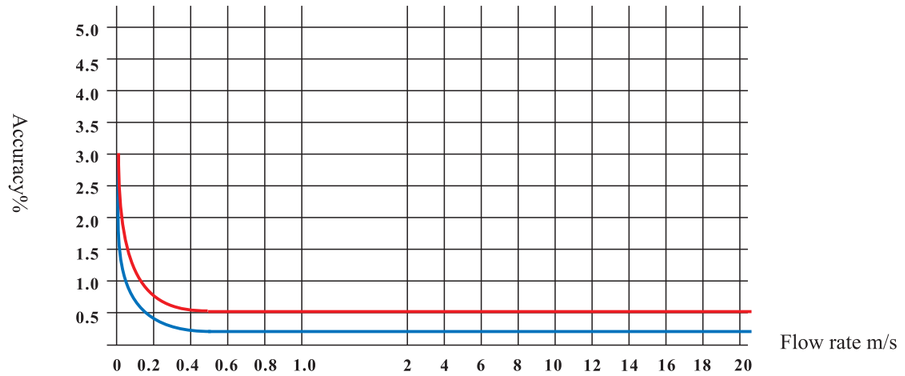
Generally speaking, the pipeline flow rate of 0.5m/s ~ 5m/s is the economic flow rate, and the sensor diameter is the same as the pipe diameter. Unless the medium is less abrasive and made of wear-resistant materials, it is recommended that the long-term working flow rate should not exceed 7m/s.

For fluids containing substances that are easy to adhere, precipitate and scale, it is suggested that the common flow rate should be not less than 2m/s, and it is better to increase it to 3m/s ~ 4m/s or above, so as to play the role of self-cleaning and preventing adhesion and precipitation.

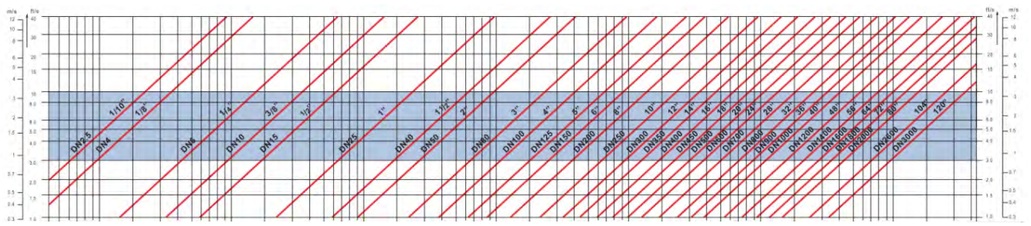
For fluids with strong abrasion such as ore pulp, the common flow rate should be lower than 3m/s to reduce the abrasion to the lining and electrode.

When measuring low conductivity medium with conductivity of 2μS/cm~10μS/cm, low flow rate (0.5 m/s ~ 1 m/s) should be selected as much as possible, because the flow noise will increase with the increase of flow rate, and the output will shake.

(1) The instrument diameter is ≤300, and the accuracy class can reach 0.2;
Diameter is > 300, and accuracy class is 0.5 (if better than 0.5, please negotiate with the company to order)



(2) For the selection of instrument diameter, please refer to the Flow Range Table below and the Diameter, Flow Rate and Flow Comparison Table in the appendix.



5.1.2 The diameter of the selected sensor is the same as that of the connected process pipeline

The diameter of the selected sensor is the same as that of the connected process pipeline, which is convenient to install.

5.1.3 The diameter of the selected sensor is different from that of the connected process pipeline

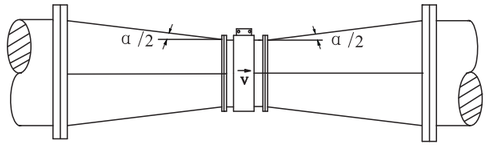
This option is applicable in the following situations:

A. The flow rate in the pipeline is low, and the process flow is relatively stable. In order to meet the requirements of the instrument for the flow rate range, the flow rate is locally increased in the instrument part, the diameter of the sensor is selected to be smaller than that of the process pipeline, and a reducer is added before and after the sensor.

B. Considering the price, for large-diameter electromagnetic flowmeter, the larger the diameter, the higher the price. When the flow rate in the pipeline is low and the process parameters are stable, the sensor with smaller diameter can be selected, which can not only make the instrument run in better working condition, but also reduce the purchase cost.

5.1.4 Precautions for installing reducer

In order not to affect the distribution of flow rate field too much and the measurement accuracy of the instrument, the central cone angle a of the reducer is not greater than 15°, so that the reducer can be regarded as a part of the straight pipe section.



5.1.5 Selection of diameter code

The expression of the diameter of MF electromagnetic flowmeter is three digits: the first and second digits of DN and the number of zeros following the first two digits (unit: mm).

For example, code 100 indicates a diameter of 10mm; code 101 indicates a diameter of 100mm; code 102 indicates a diameter of 1000 mm. DN2.5 diameter code is special, the expression is 025, and DN125 expression is 121.

5.2 Selection of lining materials

The lining material is selected according to the corrosiveness, abrasion and temperature of the medium to be tested. The applicable performance of common lining materials is shown in the following table:

Code	Lining material	Main performance	Scope of application
8	Chloroprene rubber (CR)	1. Oil resistance, solvent resistance, oxidation resistance, and corrosion resistance to common acids, alkalis, salts and other media. 2. Excellent elasticity and wear resistance, but poor cold resistance.	1. Non-strong acid, strong alkali and strong oxidizing medium at 0℃~ 80℃. 2. Measure sewage and mud.
	Nitrile rubber (NBR)	1. Excellent oil resistance, high wear resistance and good heat resistance, 2. Poor low temperature resistance and ozone resistance	1. Abrasive medium at 0℃~ 100℃ such as slag flushing water
3	Natural rubber (IR)	1. Good wear resistance, corrosion resistance, insulation and low temperature resistance. 2. Poor oil resistance, aging resistance and oxidation resistance.	Non-strong acid, strong alkali and strong oxidizing medium at -10℃~70℃, suitable for drinking water.
6	Polyurethane rubber (PU)	1. Excellent wear resistance and elasticity. 2. Poor acid and alkali resistance.	1.-25℃~60℃ 2. Neutral and abrasive ore pulp, coal slurry and mud
A	Teflon (PFA)	1. Good hydrophobicity and non-stickiness, and strong high temperature resistance. 2. Excellent corrosion resistance, resistant to strong acid, strong alkali, organic solvent and various salt solutions. 3. Good negative pressure resistance. When the negative pressure resistance requirement is high, a metal mesh can be added to improve the negative pressure resistance. 4. Poor wear resistance.	1. Non-strong wear medium at -25℃~ 180℃ 2. Hygienic media 3. If there is negative pressure, steel mesh should be added
7	Polytetrafluoroethylene (PTFE)	1. It is a material with the most stable chemical properties in plastics, resistant to boiling hydrochloric acid, sulfuric acid, nitric acid and aqua regia, strong alkali and various organic solvents, and not resistant to corrosion by chlorine trifluoride, high-temperature oxygen trifluoride, high-speed liquid fluorine, liquid oxygen and ozone. 2. Poor abrasion resistance. 3. The negative pressure resistance is poor, and the lining is prone to deformation or fracture, leading to electrode leakage.	1.-25℃~140℃ 2. Strong corrosive media such as strong acid and alkali 3. Hygienic media 4. Not suitable for negative pressure occasions
9	Fluorinated ethylene propylene FEP (F46)	1. Hydrophobic and non-sticky. 2. Corrosion resistance is second only to PFA. 3. When the negative pressure resistance requirement is high, a metal mesh can be added to improve the negative pressure resistance. 4. Poor wear resistance.	1. Non-strong wear medium at -25℃~ 100℃ 2. Hygienic media
5	ETFE	1. Excellent corrosion resistance, similar to that of PFA. 2. Excellent negative pressure resistance, suitable for all kinds of working conditions with negative pressure, which can make large-diameter products. 3. Excellent radiation resistance.	1. Medium at -40℃~ 120℃ 2. Strong corrosive media such as strong acid and alkali 3. Hygienic media 4. Hot water

Manufacturing standard		Process fluid temperature (℃)							
		Ambient temperature (°C)	Chloroprene rubber	Natural rubber	Polyurethane rubber	PFA (teflon)	PTFE (polyte trafluoro ethylene)	FEP (F46) ethylene propylene chloride	Nitrile rubber
Standard structure split type	Standard structure non-hazardous area	60	80	70	60	120	120	100	80
	High-temperature non-hazardous area	60	80	70	60	180	180	100	80
	Specific high-temperature non-hazardous area (sensor/converter)	120/60	80	70	60	180	180	100	80
	Approved standard temperature of hazardous area	60	60	60	60	120	120	80	60
	Approved high temperature of hazardous area	60	80	70	60	180	180	100	80
Standard structure integrated type	Standard structure integrated type	60	80	70	60	80	80	80	80
	Approved standard temperature of hazardous area	60	80	70	60	80	80	80	80

Note: If users have special requirements, please negotiate with the company to place an order.

5.3 Selection of electrode materials

The selection of electrode materials should be determined by the user according to the corrosiveness of the measured medium, and the user can refer to the relevant anti-corrosion manual.

No	Material	Corrosion resistance
1	316L	It is used for the measurement of water, sewage or slightly corrosive media of inorganic and organic acids.
2	Hastelloy (HC)	It is resistant to the corrosion of oxidizing acid, such as nitric acid, mixed acid, or mixed medium of chromic acid and sulfuric acid, and also to the corrosion of oxidizing salts such as Fe3+, Cu2+ or other oxidants. For example, hypochlorite solution above normal temperature and seawater corrosion.
3	Titanium (Ti)	It is resistant to seawater, various chlorides and hypochlorite, oxidizing acids (including fuming nitric acid), organic acids and alkali, etc., and not resistant to pure reducing acids (such as sulfuric acid and hydrochloric acid). However, if the acid contains oxidants (such as nitric acid, Fe3+, Cu2+), the corrosion will be greatly reduced.
4	Tantalum(Ta)	It has excellent corrosion resistance, similar to glass. Except hydrofluoric acid, fuming sulfuric acid, fuming nitric acid and alkali, it can resist the corrosion of almost all chemical media (including boiling hydrochloric acid, nitric acid and sulfuric acid below 175℃). It is not resistant to corrosion in alkali.
5	Platinum-titanium alloy	The corrosion resistance is better than that of platinum (Pt) electrode on the whole, and it is suitable for almost all acid, alkali and salt solutions (including fuming sulfuric acid and fuming nitric acid) or mixed solutions of various strong acids, alkalis and salts, but not aqua regia, iron salts and some halogen-containing solutions.
6	Tungsten carbide clad	It performs well in resisting wear, and can be used for the measurement of seriously worn media such as ore pulp. It can also be used for the measurement of reducing the noise influence of particle impact on electrode. Such as: Pulp
7	Platinum (Pt)	It has excellent corrosion resistance to various acids, alkali and various salts, not suitable for aqua regia and salt plating, poor corrosion resistance to some halogens, such as chlorine, bromine, iodine, hydrogen bromide, hydrogen chloride and hydrogen iodide, and no corrosion resistance when trace fluorine is contained in phosphoric acid

5.4 Selection of IP Grade

According to the national standard GB4208, the shell IP grade of instruments can be divided into the following categories:

IP65: Water spraying type allows the faucet to spray water on the instrument from any direction, with the water spraying pressure of 30kPa, the water output of 12.5L/Min and the nozzle distance of 3m from the instrument.

IP67: Immersed instrument can be completely immersed in water (1m underwater) in a short time, with duration of 30 min.

IP68: Submersible type can work underwater for a long time (5m underwater), and the maximum depth shall be negotiated with the manufacturer.

IP grade shall be selected according to the above requirements and actual conditions of instruments.

When outdoor protective box is not used, the measuring instrument with IP65 or above should be installed in the shade.

Avoid direct sunlight, and pay special attention when using in hot areas.

Avoid direct exposure to the climate.

If the instrument is installed under the ground and often flooded, or if the instrument is installed on the ground with high air humidity or exposed to steam, it is advisable to choose the split type, sensor IP68 and converter in the protective box or indoors.

5.5 Selection of Cable

The connecting cable between the sensor and the converter is a special multi-shielded cable. The cable length in the model & specification table refers to this cable, and its length is related to the conductivity of the medium. The maximum length is 5 times of the minimum conductivity, but generally does not exceed 100m (if the length is exceeded, it will be supplied after negotiation with the manufacturer). The connecting cable between the sensor and the converter generally requires iron pipe for protection when it is installed on site

Cable connection is not allowed. In case of accidental breakage or extension, please purchase a special junction box with sealant to extend the cable.

5.6 Selection of Flange

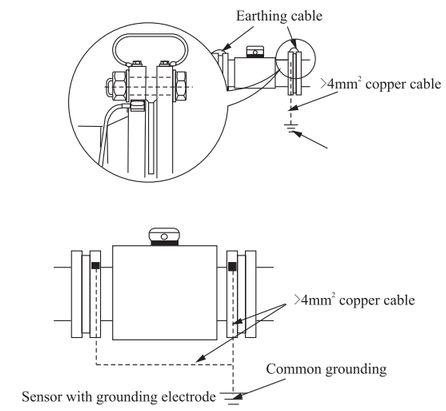
Except in special circumstances, metric flanges should be generally selected, and the companion flanges are also made in metric system. Flanges meet the national standard GB9119, and common **specifications can be found in Appendix 1. Special orders can be made for all special flanges and those exceeding the instrument pressure rating. When ordering, if companion flanges need to be installed, the instrument connecting pipe size (outer diameter * wall thickness) should be provided.**

5.7 Selection of junction box seal

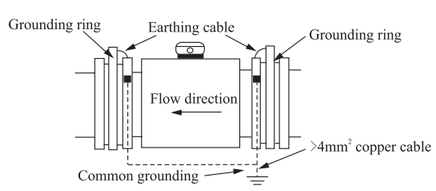
The outgoing line sealing method of junction box is M20*1.5 sealing sleeve to seal the cable. The commonly used M20*1.5 sealing sleeve has the same codes 1 and 5 in the selection table, but the difference is that code 1 requires the cable to be connected and filled with sealant before the product leaves the factory, while code 5 requires the user to complete these tasks.

5.8 Selection of earthing ring

As the induced signal voltage of electromagnetic flowmeter is very small and susceptible to external noise or other electromagnetic signals, an earthing ring is used. The function of the earthing ring is to form a space shielding the external interference by earthing the shell of the flowmeter and hence increase the measurement accuracy. (If users use non-metallic pipes, they must install earthing rings, which should be indicated when ordering, and the earthing ring option should be selected). Even for metal pipes, the instrument should be reliably and independently earthed with earthing resistance less than 10 ohms. The installation methods of the instrument under different conditions are shown as follows:



A. Earthing of metal pipe



B. Earthing of plastic pipe

5.9 Determination of Operating Environment

Working environment refers to the environment around the instrument, which can be divided into general workplaces and dangerous workplaces.

General workplace refers to a safe place where there is no combustible gas or explosive substances, and the working environment temperature is below 65℃, and the upper limit of medium temperature is divided into three types: 80℃, 140℃ and 180℃. The instrument can be integrated or split (if the medium temperature is higher than 80℃, the split type is recommended).

Dangerous place refers to a place where there are combustible gases and explosive substances. The working environment temperature should not be higher than 60℃, and the medium temperature should not be higher than 80 ~ 130℃ (depending on the explosion-proof temperature grade, see the type spectrum for details).

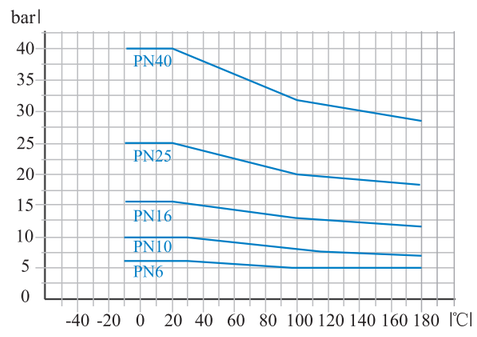
The working temperature of the converter should not be higher than 65℃.

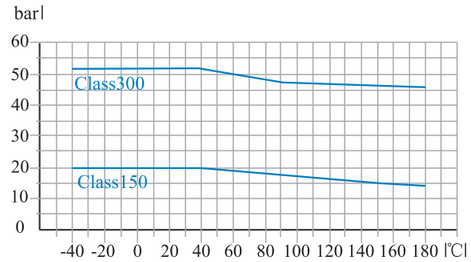
The shell and flange of the sensor body are welded integrally, which can meet the working environment mentioned above.

5.10 Pressure - temperature relationship

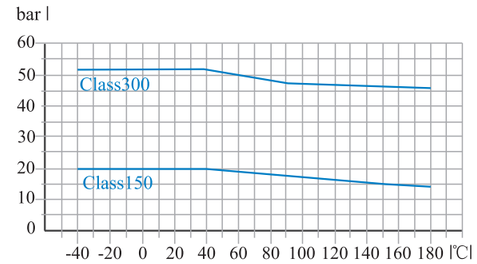
The following pressure/temperature curves are for all pressure-bearing parts of the instrument, not just for process connections.

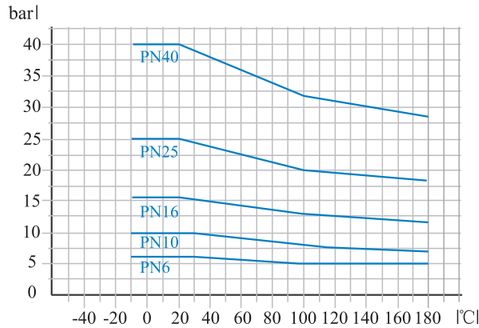
Process connection material: Carbon steel





Process connection material: 316L





6. MFC Converter Selection

6.1 Characteristics and scope of application

The sensor of MFC electromagnetic flowmeter adopts magnetic field equalization technology to reduce the requirement of straight pipe section, and the electrode has a unique double sealing mode of conical surface seal and line seal, and its design life is 30 years. The converter adopts low frequency excitation technology to ensure zero stability, high impedance circuit technology to ensure low conductivity measurement, DSP digital processing technology to achieve quick response, built-in empty pipe state monitoring to ensure empty pipe locking, and excitation drive monitoring to achieve self-diagnosis. It is very suitable for the measurement of single-phase conductive liquid media.

6.2 Brief introduction to MFC converter performance

▲ Display

Two-line display: LCD can realize digital or letter display of flow, total and alarm information, etc. The display content is optional, and some display contents can be switched by using magnetic buttons.

Three-line display: LCD can realize the digital or character display of flow, total and alarm information, as well as the display of percentage flow bar chart and alarm prompt symbol, and some display contents can be switched by using magnetic buttons or film buttons.

▲ Internal cumulative calculator

The total forward flow, the total reverse flow and the total net flow can be calculated by 9-bit accumulation.

▲ Programming

If data is provided to the company when ordering, these related data have been compiled in the converter before the product leaves the factory. If necessary, the converter can be reprogrammed by using the local manual terminal or instrument buttons (three-line display) without affecting the technical performance of the converter. Engineering units can be chosen very flexibly, such as suitable flow units and total units.

Programming options: PC, SIC handheld terminal, film button, magnetic button, and button programming without opening the cover.

▲ Power supply

AC (100 ~ 230) ±15%V, 47Hz~440Hz, maximum power consumption is 15VA;

DC11V~40V, maximum power consumption is 15VA;

▲ Output signal

1. Analog (standard output) active output (maximum load resistance is 500Ω, including cable resistance)

2. Dual analog active output (optional) is the same as 1, but there are separate outputs for forward flow and reverse flow, or it can be programmed as two paths of forward flow or reverse flow.

3. Double pulse (standard output) is 0 Hz ~ 800 Hz square wave. Parameters such as pulse frequency and cutoff frequency are safe and programmable. The frequency range can be set from 1 Hz to 800 Hz. When the transistor with pulse output is turned on, the current should be no more than 500mA and the open circuit voltage should be less than 50 V. (Note: The pulse needs to be connected with a current-limiting resistor, and it is a passive output)

4. Double alarm (standard output) can output alarm information such as abnormal excitation coil, forward/reverse flow, small signal excision, empty pipe, high/low flow limit, analog signal overrun and pulse signal overrun. When the transistor with alarm output is turned on, the current should be no more than 500mA and the open circuit voltage should be less than 50 V. (Note: Not isolated from pulse output)

5. RS232 communication can read and write some parameters through the super terminal or Chuanyi manual operator, and its interface is DB9 serial connector (male).

▲ Input signal

Contact input: The contact isolated from the outside is closed and the cumulative calculator is cleared. (Note: Not isolated from pulse output)

▲ Isolation

The isolation voltage between analog signal, pulse signal and alarm signal and ground is DC 500V.

▲ Protection

Integrated converter/sensor IP65/IP67, split converter/sensor IP65/IP67, sensor IP65/IP67/IP68.

▲ Ambient temperature

Working temperature: -40°C~ 65°CWhen the temperature is lower than -20°C, the display unit may not work normally

Storage temperature: -25°C~+60°C

▲ Configuration

The configuration is stored in a non-volatile memory (generally it can be saved for 10 years). The user's own preset value can be changed.

▲ Self-diagnosis

The converter can confirm whether the hardware is normal or not, and can diagnose faults, such as coil drive faults.

▲ Flow setting

It is equivalent to the measured flow corresponding to the maximum flow rate ≤10m/s, which can be changed by users according to their own needs.

▲ Interchangeability

The converter can be used with MFC sensors of various diameters.

The converter can be configured in the field. Replacing the converter will not

Affect the characteristics of the system.

▲ Outgoing line box seal

M20*1.5 sealing sleeve. Descriptions shall be provided when the user has special requirements.

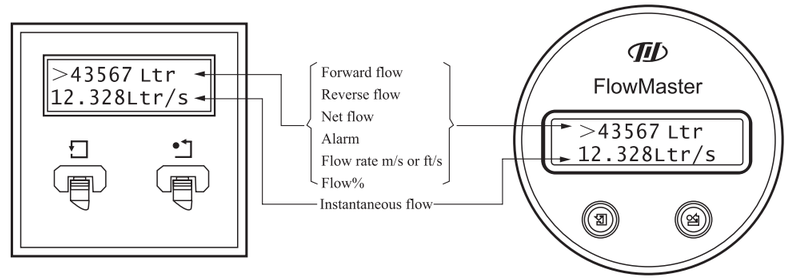
▲ Time constant

All programmable from 1 second to 120 seconds.

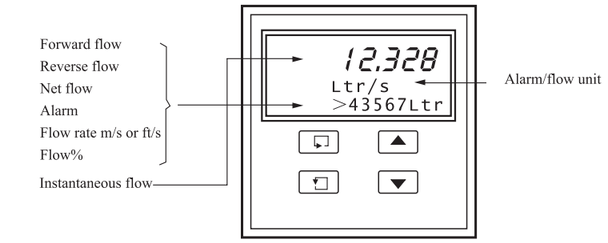
▲ Display direction

According to the field working conditions, the instrument can be more convenient to observe and use by selecting the display direction (that is, horizontal or vertical).

▲Display mode



Two-line display



Three-line display

▲ Function

Full configuration	Engineering units can be selected, such as flow percentage, flow unit, and all outputs
Empty pipe detection	Make sure that "0" is displayed for empty pipe
Interchangeability	The converter/sensor can be interchanged without affecting performance
Self-diagnosis	With excitation drive, and memory check and self-diagnosis, the converter and sensor can work normally
Test mode	Various output and display functions can be tested even when no sensor is connected

6.3 MFC Electromagnetic Flowmeter Selection Table

The MFC electromagnetic flowmeter consists of a sensor and a converter. Its model is designated as follows:

Sensor: MFC XXX X X X X X X XX

Converter: X XX X X X X X X X

Main Name

Nominal diameter DN2.5~DN1200
Expressed by three digits: The first two digits represent the significant figures of the diameter, and the third digit indicates the number of trailing zeros (unit: mm).

Nominal pressure
1: 1.6 MPa (flange-type)
2: 4.0 MPa (flange-type)
4: 2.5 MPa (flange-type)
5: 1.0 MPa (flange-type)
6: 0.6 MPa (DN700~DN1200) (flange-type)
7: 1.6 MPa (DN65~DN150 wafer-type)
8: 1.0 MPa (DN200~DN300 wafer-type)
9: 4.0 MPa (DN25~DN50 wafer-type)
D: ANSI 150 E: ANSI 300 F: ANSI 600
G: ANSI 900 H: ANSI 1500 J: ANSI 2500
K: 6.3Mpa L: 10.0Mpa M:16.0Mpa
P: JIS10K Q: JIS16K R: JIS20K
S: Special

Lining material
2: Nitrile rubber 3: Natural rubber 5: ETFE
6: Polyurethane rubber 7: PTFE 8: Neoprene
9: F46 A: PFA 4: F46+steel mesh
B: PFA+steel mesh S: Special

Electrode material
1:316L 2:Hastelloy C 3:Titanium Ti 4: Tantalum Ta
5: Platinum-iridium alloy 6: Tungsten carbide 7: Platinum Pt

Operating environment
1: General location, -40°C ≤ ambient temperature ≤ 70°C, fluid temperature ≤ 80°C
4: General location, -40°C ≤ ambient temperature ≤ 70°C, fluid temperature ≤ 180°C (remote type only)

Grounding device
0: Without grounding device 1: With grounding ring 3: With grounding electrode

Accuracy class
A: Class 0.5

Cable length
Split type: ≤100m; Integrated type: 00. Specify any special requirements when ordering.

Cable gland
1: 20mm plastic gland (pre-installed by the manufacturer)
2: G1/2
3: NPT1/2
5: 20mm plastic gland (for user cable installation or integrated type)

Type
EH: Integrated ER: Remote

Power supply
1:(100~230) ± 15%V AC 47Hz~440Hz 2:11V DC~40V DC

Display assembly
4: 3-line display with keypad

Output signal
0: Standard output 2: RS485 3: HART

Explosion-proof requirements
1: Non-explosion-proof, not for use with slurry. 2: Non-explosion-proof, for use with slurry concentrations up to 10%.

Display orientation
1: Standard 2: +90° 3: +180° 4: +270°

IP rating
1: Complete unit IP65 2: Complete unit IP67 3: Sensor IP67, Converter IP65
4: Sensor IP68, Converter IP65 5: Sensor IP68, Converter IP67

Nameplate
1: Factory standard

Note: The PTFE liner has poor resistance to vacuum (negative pressure). If the pipe is subject to vacuum, consider using a PFA or ETFE liner.

7. Selection of MFE-S Electromagnetic

7.1 Characteristics and scope of application

The MFE-S electromagnetic flowmeter converter adopts unique signal processing technology and high-performance microprocessor, which improves the data processing ability and complex communication ability while the system runs more stably and reliably. The unique sensor excitation mode and signal processing system can eliminate noise and other interference signals and ensure the accuracy and stability of measuring flow. It is very suitable for high-precision measurement and measurement under complex working conditions (pulsating flow, quick response, slight impurities, explosion-proof) and digital communication.

7.2 Brief introduction to the performance of MFE-S electromagnetic flowmeter converter

▲ Display (optional content)

Three-line display: LCD can realize the digital or character display of flow, total and alarm information, as well as the display of percentage flow bar chart and alarm prompt symbol, and some display contents can be switched by using magnetic buttons or film buttons.

▲ Internal cumulative calculator

The total forward flow, the total reverse flow and the total net flow can be calculated by 9-bit accumulation.

▲ Programming

If data is provided to the company when ordering, these related data have been compiled in the converter before the product leaves the factory. If necessary, the converter can be reprogrammed by using the local manual terminal or instrument buttons (three-line display) without affecting the technical performance of the converter. Engineering units can be chosen very flexibly, such as suitable flow units and total units.

Programming options:

1. Instrument buttons

1.RS232 communication (short-distance communication)

2. RS485 communication

3. HART communication

4. Profibus-PA communication

5. Profibus-DP communication

6. FF communication

▲ Power supply: There are two models to choose from

AC (100 ~ 230) ±15%V, 47Hz~440Hz, maximum power consumption is 15VA;

DC11V~40V, maximum power consumption is 15VA;

▲ Output

1. Analog (standard output) active output (maximum load resistance is 500Ω, including cable resistance)

2. Dual analog active output (optional) is the same as 1, but there are separate outputs for forward flow and reverse flow, or it can be programmed as two paths of forward flow or reverse flow.

3. Double pulse (standard output) is 0 Hz ~ 800 Hz square wave or fixed pulse width signal. Parameters such as pulse frequency and cutoff frequency are safe and programmable. The frequency range can be set from 1 Hz to 500 Hz. When the transistor with pulse output is turned on, the current should be no more than 150mA and the open circuit voltage should be less than 50 V. (Note: The pulse needs to be connected with a current-limiting resistor, and it is a passive output)

4. Double alarm (standard output) can output alarm information such as abnormal excitation coil, forward/reverse flow, small signal excision, empty pipe, high/low flow limit, analog signal overrun and pulse signal overrun. When the transistor with alarm output is turned on, the current should be no more than 500mA and the open circuit voltage should be less than 50 V. (Note: Not isolated from pulse output)

5. RS232 communication can read and write some parameters through the super terminal program or Chuanyi manual operator, and its interface is DB9 serial connector (male).

6. RS485 (optional) communication interface.

7. HART (optional) communication interface.

8. Profibus-PA (optional) communication interface.

8. Profibus-DP (optional) communication interface.

1 FF (optional) communication interface.

▲ Input

Contact input: The contact isolated from the outside is closed and the cumulative calculator is cleared. (Note: Not isolated from pulse and alarm)

▲ Isolation

The isolation voltage between analog signal, pulse signal and alarm signal and ground is DC 500V.

▲ Temperature

Working temperature: -40°C~+65°C. When the temperature is lower than -20°C, the display unit may not work normally

Storage temperature: -25°C~+60°C

▲ Protection

Integrated machine IP65/IP67, split converter IP65/IP67, sensor IP65/IP67/IP68.

▲ Configuration

The configuration is stored in a non-volatile memory (generally it can be saved for 10 years). The user's own preset value can be changed.

▲ Self-diagnosis

The converter can confirm whether the hardware is normal or not, and can diagnose faults, such as excitation drive and system storage fault.

▲ Flow rate setting

It is equivalent to the flow measurement range of the maximum flow rate ≤(10m/s) percentage, which can be changed.

▲ Interchangeability

The converter can be used with MFE-S sensors of various diameters.

The converter can be configured in the field. Replacing the converter will not affect the characteristics of the system.

▲ Outgoing line box seal

M20*1.5 sealing sleeve. Descriptions shall be provided when the user has special requirements.

▲ Time constant

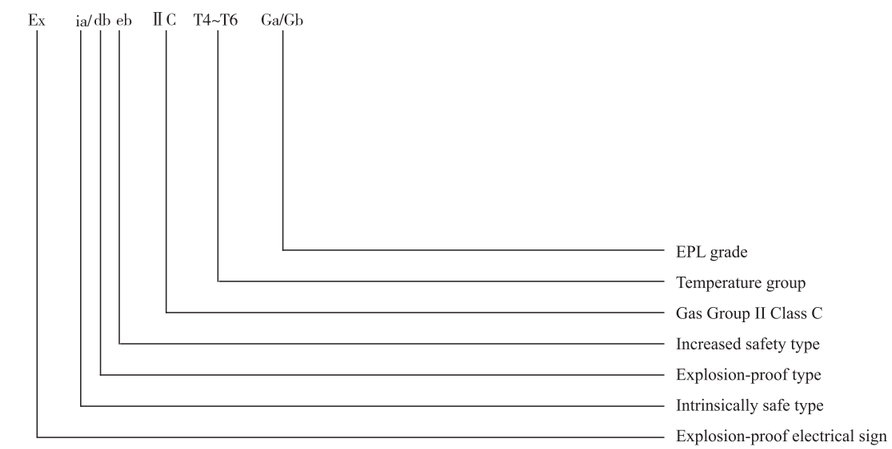
All programmable from 1 second to 120 seconds.

▲ Display direction

According to the field working conditions, the instrument can be more convenient to observe and use by selecting the display direction (that is, horizontal or vertical).

▲ Explosion-proof performance (please refer to GB3836.1 and GB 12476.1 for detailed explosion-proof parameters)

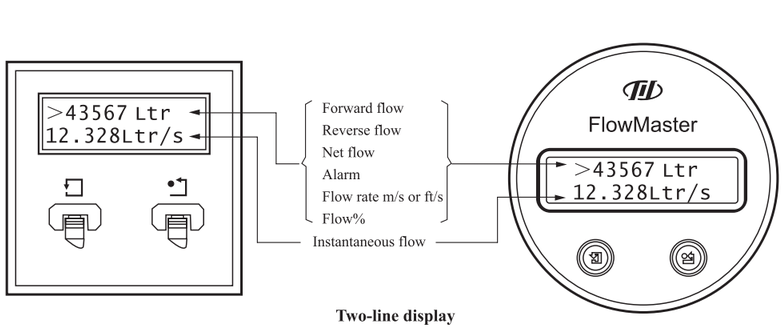
▲ Explosion-proof grade



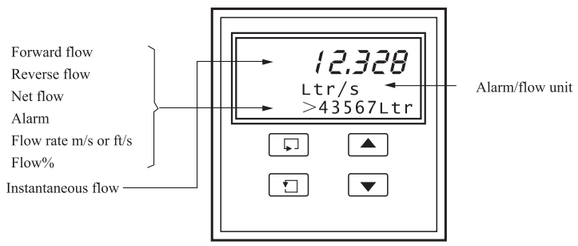
▲Function

Full configuration	Engineering units can be selected, such as flow percentage, flow unit, and all outputs
Empty pipe detection	Make sure that "0" is displayed for empty pipe
Interchangeability	The converter/sensor can be interchanged without affecting performance
Self-diagnosis	With excitation drive, and memory check and self-diagnosis, the converter and sensor can work normally
Test mode	Various output and display functions can be tested even when no sensor is connected

▲Display mode: Three-line display (circular and square three-line display)



Two-line display



Three-line display

7.3 Selection table of MFE-S electromagnetic flowmeter

The MFE-S electromagnetic flowmeter consists of a sensor and a converter, and its model is expressed as follows:

Sensor | Converter | optional certification and accessories

MFE XXX X X X X X X X X XX X X X X X / LXXX / FX / GX / RX / PX

Main name

CaliberDN2~DN2400
Three digits: the first and second digits of DN and the number of zeros following the first two digits (unit: mm)

Nominal pressure
1:16Mpa(DN2~DN600) 2:4.0Mpa(DN2-DN600)
4:2.5Mpa(DN2-DN600) 5:1.0Mpa 6:0.6Mpa
7:16MPa(DN65-DN150 clamping type)
8:1.0MPa(DN200-DN300 clamping type)
9:4.0MPa(DN25~DN50 clamping type)
D: ANSI150 E:ANSI300 F:ANSI600
G:ANSI900 H: ANSI1500 J: ANSI 2500
K:6.3Mpa L:10.0Mpa M: 16.0Mpa
P:JIS10K Q:JIS:6K R: JIS20K S:Special

Lining material
2: Nitrile butadiene rubber 3: Natural rubber 5:ETFE
6: Polyurethane rubber 7:PTFE*b 8: Polychloroprene rubber
9:F46 A:PFA 4:F46+steel mesh B: PFA+ steel mesh

Electrode materal
1:316L 2: Hastelloy 3:Titanium (Ti) 4:Tantalum (Ta)
5:Platinum-iridium alloy 6:Tungsten carbide 7: Platinum (Pt)

Operating environment
1:General place -40°C<ambient temperature<70°C and medium temperature<80°C
4:General place -40°C<ambient temperature<70°C and medium temperature<180°C(split type only)
6:General place -20°C<ambient temperature<60°C and mediu temperature <80°C(explosion-proof temperaturegroups:T6 and T85°C)
8:General place -20°C< ambient temperature<60°C and medium temperature<90°C(explosion-proof temperaturegroups:T5 and T95°C)
9:General place -20°C< ambient temperature<60°C and medium temperature<130°C(explosion-proof temperaturegroups:T4 and T130°C)

Grounding electrode
0:No grounding electrode3: Equipped with grounding electrode (made of the same material as the measuring electrode

Anticorosive measures
1: Sensor body carbon steel + standard protective paint
2: Sensor body carbon steel + high protective paint
3:Sensor flange 304 stainless steel + standard protective paint
4: Sensor flange 316L stainless steel + standard protective paint
5: Sensor body 304 stainless steel6: Sensor body 316L stainless steel

Accuracy grade
A:Class 0.5 B:Class 0.2(15≤DN≤600 C: Class 0.3(15≤DN≤600)

Outgoing line seal
1: 20 mm plastic seal (installed by the manufacturer when delivered)2:G1/2 3:NPT1/2
4: NPT3/4 (button display only) 5:20 mm plastic seal (for user-mounted or integrated cable)

Type
EH: Integrated type ER: Split type

Power supply
1:(100-230)±15%V AC47Hz-440Hz 2:11v DC-40V DC

Display assembly
4:3-line display with keyboard7: 3-line display with magnetic button

Output sienal
0: Standard output *d 1: Double current outputs 2:RS485 3:HART 4: profibus-PN 5:profbu-DP 6: IF protocol
7: Standard outout +button responsc 8:ES485 +quick response 9:HART +quick responsc

Explosion-proofrequirements
1: Non-explosion-proof5: Explosion-proof

Display direction
1: Standard direction 2:+903:+180 4:+270

IP code
1:IP65 for complete machine 2: IP67 for complete machine 3: IP67 for sensor;IP65 for convertel 4:IP68 for sensor,IP65 for converter 5:IP68 for sensor;IP67 for converter

Cable length (L)
LXXX (xxx is the three-digit cable length)

External flange (F)
F1:Flat welded external flange with carbon steel I series (British system)
F2: Flat welded external flange with 304 I series (British system)
F3:Flat welded external flange with 316L I series (British system)
F4: Flat welded external flange with carbon steel II series
F5:Flat welded external flange with 304 II series
F6: Flat welded external flange with 316 I series
F7:Butt-welded external flange with carbon steel I series (British system)
F8: Butt-welded external flange with 304 I series (British system)
F9:Butt-welded external flange with 316L I series (British system)
F10: Flat welded external flange with carbon steel II series
F11:Flat welded external flange with 304 II series
F12: Flat welded external flange with 316L II series
FS:Special requirements Note:Class series external flanges are I series(British system)external flanges.

Grounding ring(G)
G1:With 316L grounding ring G2:With HC grounding ring G3:With Ti grounding ring G7:With 304 grounding ring GS:Grounding ring of special material

Certification (R)
R1:TS certification R2: SIL certification R3:IEC certification

Other accessorles(P)
P1: With PTFE sealing gasket P2: With rubber sealing gasket P3: With independent ta P4:With surge protector P5:With instrument box P6:Specific factory information PS:Special accessories

Notes: a. DN25 model is indicated as “025”and Dn125 model is indicated as “121”.b. PTFE for lining is not resistant to negative pressure. If there is negative pressurein the pipeline,plase consider PFA+ steel mesh or ETFE.c. The converter shell is made of cast aluminum and standard protective paint.If other materials are needed,negotiation will be made.

8. Selection of MFD Electromagnetic Flowmeter

8.1 Characteristics and scope of application

MFD electromagnetic flowmeter is a special electromagnetic flowmeter for measuring pulp, mud, ore pulp, coal water slurry and other slurry media. The product adopts multi-frequency excitation mode, the response speed is ≥8S, the minimum conductivity is as high as 2μS/cm, and the damping coefficient is adaptive. The unique noise processing technology and digital filtering technology can filter the interference caused by dirt attached to pipes and electrodes, effectively improving the signal resistance of slurry noise, especially suitable for the measurement of liquid-solid two-phase flows, such as pulp, mud, ore pulp and coal water slurry. The mass concentration ratio of pulp can reach 10%, the solid content of ore pulp can reach 70%, and the change range is less than 5%.

8.2 Brief introduction to the performance of MFD electromagnetic flowmeter converter

▲ Display (optional content)

Two-line display: LCD can realize digital or letter display of flow, total and alarm information, etc. The display content is optional, and some display contents can be switched by using magnetic buttons or film buttons.

Three-line display: LCD can realize the digital or character display of flow, total and alarm information, as well as the display of percentage flow bar chart and alarm prompt symbol, and some display contents can be switched by using magnetic buttons or film buttons.

▲ Internal cumulative calculator

The total forward flow, the total reverse flow and the total net flow can be calculated by 9-bit accumulation.

▲ Programming

If data is provided to the company when ordering, these related data have been compiled in the converter before the product leaves the factory. If necessary, the converter can be reprogrammed by using the instrument buttons without affecting the technical performance of the converter. Engineering units can be chosen very flexibly, such as suitable flow units and total units.

Programming options:

1. Instrument buttons

1. RS232 communication (short-distance communication)

2. RS485 communication

3. HART communication

4. Profibus-PA communication

5. Profibus-DP communication

6. FF communication

▲ Power supply: There are two models to choose from

AC (100~ 230) ±15%V, 47Hz~440Hz, maximum power consumption is 15VA;

DC11V~40V, maximum power consumption is 15VA;

▲ Output

1. Analog (standard output) active output (maximum load resistance is 500Ω, including cable resistance)

2. The pulse (standard output) is a square wave signal with a fixed pulse width of 0 Hz to 800 Hz. Parameters such as pulse frequency and cutoff frequency are safe and programmable. When the transistor with pulse output is turned on, the current should be no more than 500mA and the open circuit voltage should be less than 50 V.

3. Alarm (standard output) can output alarm information such as abnormal excitation coil, forward/reverse flow, small signal excision, empty pipe, high/low flow limit, analog signal overrun and pulse signal overrun. When the transistor with alarm output is turned on, the current should be no more than 500mA and the open circuit voltage should be less than 50 V. (Note: Not isolated from pulse output)

4. RS485 (optional) communication interface.

5. HART (optional) communication interface.

6. Profibus-PA (optional) communication interface.

7. Profibus-DP (optional) communication interface.

8. FF (optional) communication interface.

▲ Input

Contact input: The contact isolated from the outside is closed and the cumulative calculator is cleared. (Note: Not isolated from pulse and alarm)

▲ Isolation

The isolation voltage between analog signal, pulse signal and alarm signal and ground is DC 500V.

▲ Temperature

Working temperature: -40°C~+65°C. When the temperature is lower than -20°C, the display unit may not work normally

Storage temperature: -25°C~+65°C

▲ Protection

Integrated machine IP65/IP67, split converter IP65/IP67, sensor IP65/IP67/IP68.

▲ Configuration

The configuration is stored in a non-volatile memory (generally it can be saved for 10 years).

The user's own preset value can be changed.

▲ Self-diagnosis

The converter can confirm whether the hardware is normal or not, and can diagnose faults. Such as coil drive faults.

▲ Flow rate setting

It is equivalent to the flow measurement range of the maximum flow rate ≤(10m/s) percentage, which can be changed.

▲ Interchangeability

The converter can be used with MFD sensors of various diameters.

The converter can be configured in the field. Replacing the converter will not affect the characteristics of the system.

▲ Outgoing line box is sealed with M20*1.5 sealing sleeve. Descriptions shall be provided when the user has special requirements.

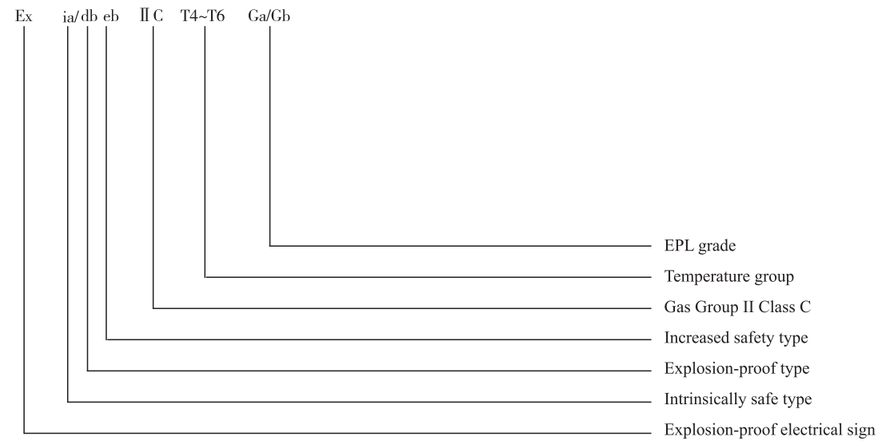
▲ Time constant

All programmable from 1 second to 120 seconds.

▲ Display direction

Integrated display direction: When the integrated electromagnetic flowmeter is selected, the display direction of the converter will be inconvenient to observe due to the pipeline direction, so it can be satisfied by selecting the display direction (i.e. horizontal or vertical).

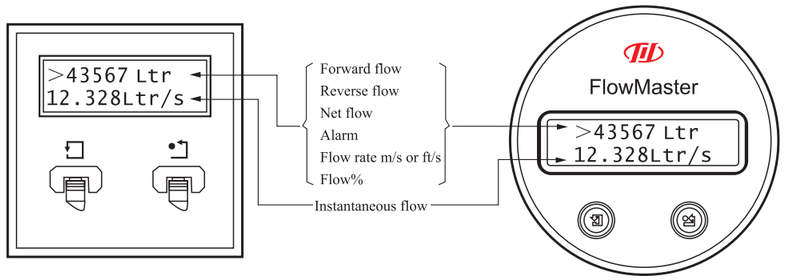
▲ Explosion-proof grade



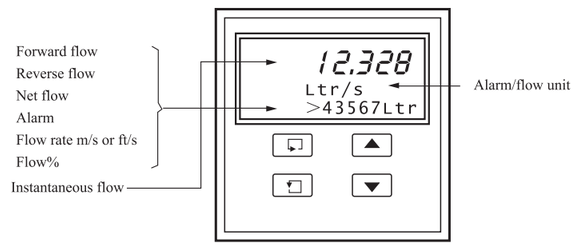
▲Function

Full configuration	Engineering units can be selected, such as flow percentage, flow unit, and all outputs
Empty pipe detection	Make sure that "0" is displayed for empty pipe
Interchangeability	The converter/sensor can be interchanged without affecting performance
Self-diagnosis	With excitation drive, and memory check and self-diagnosis, the converter and sensor can work normally
Test mode	Various output and display functions can be tested even when no sensor is connected

▲ Display mode: Two-line display and three-line display are optional. See the following diagram (square three-line and L-shaped two-line diagrams)



Two-line display



Three-line display

8.3 Selection table of MFD slurry electromagnetic flowmeter

The MFD slurry electromagnetic flowmeter consists of a sensor and a converter, and its model is expressed as follows:

Sensor | Converter | optional certification and accessories

MFD XXX X X X X X X X X XX X X X X X X/LXXX/FX/GX/RX/PX

Main name

Caliber DN2~DN1200
Three digits: the first and second digits of DN and the number of zeros following the first twodigits (unit: mm)

Nominal pressure
1:1.6Mpa 2:4.0Mpa 4: 2.5Mpa 5:1.0Mpa
7: 1.6 MPa(DN65-DN150 clamping type)
8:1.0MPa(DN200-DN300 clamping type)
9:40 MPa(DN25~DN50 clamping type) D: ANSI150
E:ANSI 300 F: ANSI 600 G: ANSI 900 H: ANSI 1500
J: ANSI 2500 K:6.3Mpa L:10.0Mpa M:16.0Mpa
P: JIS10K Q:JIS:6K R: JIS20K S:Special

Lining material
2: Nitrile butadiene rubber 3: Natural rubber 5:ETFE
6: Polyurethane rubber 7:PTFE*b 8:Polychloroprene rubber
A:PFA 4: F46+ steel mesh B: PFA+ steel mesh

Electrode material
1: 316L 2: Hastelloy 3: Tianium (T) 4: Tantalum (Ta)
5: Platinum-iridium alloy 6: Tungsten carbide 7: Platinum (Pt)

Operating environment
1:General place-40°C≤ambient temperature≤70°C and medium temperature ≤80°C
4:General place-40°C≤ambient temperature≤70°C and medium temperature ≤180°C(split type only)
6:General place-20°C≤ambient temperature≤60°C and medium temperature ≤80°C(explosion-proof temperature groups:T6 and T85°C)
8:General place-20°C≤ambient temperature≤60°C and medium temperature ≤90°C(explosion-proof temperature groups:T5 and T95°C)
9:General place-20°C≤ambient temperature≤60°C and medium temperature ≤130°C(explosion-proof temperature groups:T4 and T130°C)

Grounding electrode
0:No grounding electrode 3: Equipped with grounding electrode
(made of the same material as the measuring electrode)

Antcorrosive measures
1: Sensor body carbon steel + standard protective paint
2: Sensor body carbon steel + high protective paint
3: Sensor flange 304 stainless steel + standard protective paint
4: Sensor flange 316L stainless steel + standard protective paint
5: Sensor body 304 stainless steel6: Sensor body 316L stainless steel

Accuracy grade
A: Class 0.5 B: Class 0.2 C: Class 0.3

Outgoing line seal
1: 20 mm plastic seal (installed by the manufacturer when delivered) 2:G1/2 3:NPT1/2
4: NPT3/4 (button display only) 5: 20 mm plastic seal (for user-mounted or integrated cable)

Type
EH: Integrated type ER: Split type

Power supply
1:(100-230)±15%V AC 47Hz~440Hz 2:11V DC~40V DC

Display assembly
4:3-line display with keyboardt 7:3-line display with magnetic button

Output signal
0:Standard output*d 2:RS485 3:HART 4:Profbus-PA 5:Profibus-BP

Explosion-proofrequirements
2:Non-explosion-proof 6:Explosion-proof

Display direction
1: Standard direction 2:+90° 3:+180 4:+270

IP Code
1:IP65 for complete machine 2:IP67 for complete machine 3:IP67 for sensor,IP65 for converter
4:IP68 for sensor;IP65 for converter 5:IP68 for sensor;IP67 for converter

Cable Length(L)
LXXX(XXX is the three-digit cable length)

External Flange(F)
Fl: Flat welded external flange with carbon steel I series (British system)
F3: Flat welded external flange with 316L I series (British system)
F5: Flat welded external flange with 304 II series
F7: Butt-welded external flange with carbon steel I series (British system)
F9: Butt-welded external flange with 316L I series (British system)
F11: Flat welded external flange with 304 II series
FS: Special requirements Note: Class series external flanges are I series (British system) external flanges.
F2: Flat welded exlernul flange with 304 I series (Brilish syslem)
F4: Flat welded external flange with carbon steel II series
F6: Flat welderl exleral flange with 316 II series;
F8: Butt-welded external flange with 304 I series (British system)
F10: Flat wclded cxternal flange with carbon stecl I series
Fl2: Flat welded external flange witl 316L II series

Grounding ring(G)
G1: With 316L groundling ring G2: With HC grounding ring G3:With Ti grounding ring G4:With Ta grounding ring
G7:With 304 grounding ring GS:Grounding ring of special material

Certification (R)
R1:TS certification R2:SIL certification R3:IEC certification

Other accessories(p)
P1:With PTFE sealing gasket P2:With rubber sealing gasket P3:With independent tag P4:With surge protector P5:With instrument box P6:Specific factory information PS:Special accessories

Notes:a.DN125 model is indicated as “121”.b. PTFE for lining is not resistant to negative pressure.If there is negative pressure in the pipeline,please consider PFA+ steel mesh or ETFE.
c.The converter shell is made of cast aluminum and standard protective paint. If other materials are needed,negotiation will be made. d.The standard output is 4~20mA+ pulse output.

9. Selection of MFS Sanitary

9.1 Product characteristics and scope of application

Sanitary electromagnetic flowmeter is mainly used for flow measurement in food, beverage and pharmaceutical industries. The contact surface between MFS sanitary electromagnetic flowmeter and medium is made of materials that meet the sanitary design of EHEDG in Europe. The sensor is suitable for CIP/SIP cleaning, and its inner diameter matches the process pipeline, so that the sensor can be seamlessly connected with the process pipeline. It can be used for sanitary process connection of DIND32676 or ISO2852 standard. All stainless steel bodies are fully welded to prevent internal components and wiring from being damaged by high-pressure steam, water and sanitary chemicals.

9.2 Brief introduction to the performance of MFS sanitary electromagnetic flowmeter

▲ Sensor material:

Non-wetted part material: Shell: 304 stainless steel;

Junction box: Cast aluminum, coated with PQ0418 (optional 304 stainless steel). Wetted part material: Lining: PFA (Ra =0.8); Electrode 316L (Ra=0.4)

▲ Process connection materials

Process connection joint material: 316L; Joint sealing gasket material: Silicone rubber

▲ Diameter range: DN25~DN100

▲ Accuracy class: ±0.2% or ±0.5% of the indicated value

▲ Pressure grade: 1.0MPa

▲ Conductivity: ≥5 μ S/cm

▲ Medium temperature: -10°C~150°C

▲ Ambient temperature: -25°C~65°C

▲ Protection grade: IP68 (sensor)

▲ Ambient temperature impact: <±0.1%/10°Cor <±0.25/10°C

▲ Reproductivity and repeatability: ≤ ±0.1% or ≤ ±0.25

▲ Electrical connection (sensor): G1/2 or NPT1/2

9.3 Selection table of MFS sanitary electromagnetic flowmeter

The sanitary electromagnetic flowmeter consists of a sensor and a converter, and its model is expressed as follows:

Sensor | Converter | optional certification and accessories

MFS XXX X X X X 0 X X X XX X X X X X X / LXXX / FX / RX / PX

Main name

Caliber DN25~DN150
Three digits: the first and second digits ofDN and the number ofzeros following the first two digits (unit: mm)

Nominal pressure
5: 10 MPa (snap connection
s: Special

Lining material
A:PFA S: Special

Electrode materal
1:316L 2: Hastelloy 3: Titanium(Ti) 4: Tantalum (Ta)
5:Platinum-iridium alloy 6: Tungsten carbide 7: Platinum (Pt)

Operating environment
1: Sanitary place -40C< ambient temperature <70C and medium temperature <80'C
4: Sanitary place -40C< ambient temperature <70C and medium temperature <180C(split type only)

Anticorrosive measures*b
5: Sensor body 304 stainless steel 6: Sensor body 316L stainless steel

Accuracy grade
A: Class 0.5 B: Class 0.2 C:Class 0.3

Outgoing line seal
1: 20 mm plastic seal 4:NPT/2

Type
EH: Integrated type ER: Split type

Power supply
1:(100-230)±15%V AC47Hz~440Hz
5:IVDC-40V DC

Display assembly
4:3-line display with keyboard 7: 3-line display with magnetic button

Output signal
0: Standard outpul *c I: Double current outpuls 2. Bs485 3:HART 4:Profihns-PA 5:Profihas-DP

Explosion-proofrequirements
1: Non-explosion-proof

Display direction
1:Standard direction 2:+90° 3:+180° 4:+270°

IP code1
1:IP65 for complete machine 2:IP67 for complete achine 3:IP67 fr sensor; IP65 for coniverter
4: IP68 for sensor.IP65 for converter 5: IP68 for sensor; IP67 for converter

Cable length (L)
LXXX (XXX is the three-digit cable length)

External connector(F)
F3: With 316L butt-welded connector (DLN standard) F6: With 316L butt-welded conector (ISO standard) FS: Specal requirements

Certification (R)
R1:TS certification R2:SIL certification

Other accessories (P)
P3: With independent tag P4: With surge protector P5: With instrument box P6: Specific factory information PS: Special accessories

Notes: a. DN121 model is indicated as "121"
b. The convertcr shcll is madc of cast aluminum and standard protective paint. If othcr matcrials are ncedcd, ncgotiation will bc madc
c.The standard output is 4~20mA+ pulse output.

10.Selection of MFL Electromagnetic

10.1 Characteristics and scope of application

The MFL two-wire electromagnetic flowmeter is a kind of electromagnetic flowmeter with high reliability and low power consumption. The two-wire electromagnetic flowmeter with patented frequency conversion excitation technology and magnetic field processing technology can measure the medium with conductivity above 10 μ S/cm, and at the same time, the diameter range of measuring ability is widened to DN 2.5-DN 600 mm. The power consumption of this product is much less than that of ordinary electromagnetic flowmeters when the measuring ability is equivalent to that of four-wire system. The installation form of the product is also very simple, and the wiring requirements of power supply and cable tray are not high. The standard HART protocol can adjust the parameters remotely, which can greatly reduce the installation and maintenance costs for customers. It is a preferred flowmeter for measuring single-phase media with conventional flow rate.

10.2 Brief introduction to the performance of MFL electromagnetic flowmeter converter

▲ Display



Digital LCD, 128×64-point display screen.

▲ Internal cumulative calculator

The total can realize 9-bit cumulative calculation

▲ Programming

If you provide the data to our company when ordering, we will prepare the internal program for the instrument converter before it leaves the factory. If necessary, the converter can be programmed by using the local manual terminal on the site without affecting the technical performance of the converter. The converter can be programmed according to different engineering units. For example, the flow and total can be expressed according to different units.

Programming options: HART manual operator, magnetic button programming.

▲ Power supply

Voltage: 16.5~40VDC, minimum starting current 3.8mA, maximum power consumption 6W (24VDC)

1. The supply voltage indicates the required voltage between the power supply terminal and the electromagnetic flowmeter.

2. Connecting to the commercial AC power supply will damage the flowmeter. Please make sure to use the DC battery within the predetermined range.

3. It can be connected with almost all distribution boards, signal modulator cards and I/O modules except some equipment.

▲ Current output status (fuse) when the system gives an alarm

Upper limit: 110%≥21.6mA DC (standard)

Lower limit: -1.25%≤3.8mA DC

Empty pipe alarm ≤3.8mA DC system

Unified alarm ≥21.6mA DC

▲ Output signal

Current output: 4-20mA Dc, two-wire system

Output range: 3.8~21.6mA

Digital output: Open collector

Contact grade: 30VDC, 12mADC

Low level: 0-2VDC (Fig. 1)

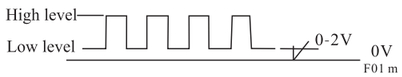


Fig. 1 High and Low Levels (Transistor Contact Output)

▲ Communication requirements

Communication signal:

HART communication protocol (loaded on 4-20mADC signal)

Communication line conditions:

Supply voltage: 21.5~40VDC

Load impedance: 250~600Ω （Fig. 2)

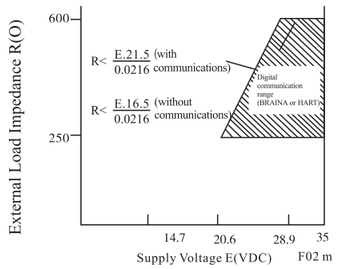


Fig. 2 Relationship between Supply Voltage and External Load Impedance

Calculation formula of resistance of power cable $R=\rho\frac{L}{S}$

The diameter and length of the power cable must meet the minimum working voltage requirements of the converter

▲ Data security in case of power down

With the power down storage function, data is preserved for 10 years

▲ Zero setting function

By using the parameter setting, zero setting is carried out to ensure that the output is 0% at zero flow. When the measuring tube is full of measuring fluid and the valve is closed to completely stop the fluid, zero setting is carried out.

▲ Cumulative value display function

According to the setting of the cumulative pulse ratio, the flow is accumulated according to the corresponding pulse. In the forward and reverse flow measurement function, the accumulated value in the flow direction (forward or reverse), the flow direction and its unit product are displayed on the display.

▲ Damping time constant

The time constant can be set to 1.0 s to 200 s. When the damping time is short, the output will fluctuate

▲ Pulse output

According to the setting of pulse rate, the calibrated pulses can be output one by one. Pulse width: 50% duty cycle output rate can be selected at a speed range of 001 to 200 Hz.

▲ Forward and reverse flow measurement functions

The forward and reverse flow can be measured. The reverse flow measurement can be confirmed on the display through the status output.

▲ Alarm selection function

Alarm is divided into system alarm (hardware failure), setting alarm and warning. Users can choose whether to give process alarms and set alarms for each item. The current output of the alarm can be selected from the following settings.

▲ Repeatability

±0.16%

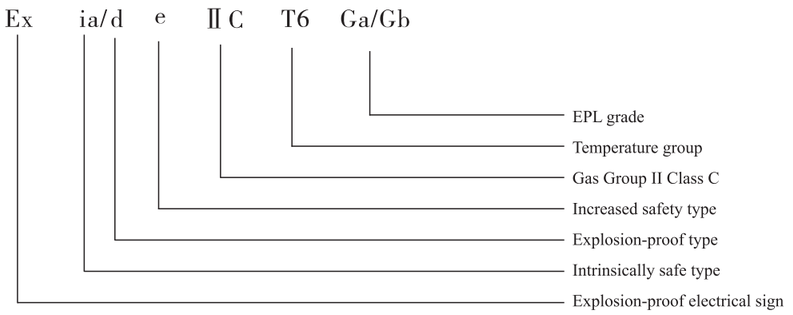
▲ Insulation resistance

Insulation impedance > 100MQ Test voltage 1000VDC

▲ Insulation strength

The test voltage is 1000VAC, and the test time is 1 min. Standard ≤20mA

▲ Explosion-proof grade



▲ Function

Full configuration	Engineering units can be selected, such as flow percentage, flow unit, and all outputs
Empty pipe detection	Make sure that "0" is displayed for empty pipe
Interchangeability	The converter/sensor can be interchanged without affecting performance
Self-diagnosis	With excitation drive, and memory check and self-diagnosis, the converter and sensor can work normally
Test mode	Various output and display functions can be tested even when no sensor is connected

10.3 Selection table of MFL electromagnetic flowmeter

The MFL electromagnetic flowmeter consists of a sensor and a converter, and its model is expressed as follows:

MFL XXX X X X X X X X X XX X X X X X X / LOXX / FX / GX / RX / PX

Caliber DN15~DN600
Three digits: the first and second digits of DN and the number of zeros following the first two digits (unit: mm) *a

Nominal pressure
1:1.6Mpa 2:4.0Mpa 4: 2.5Mpa 5:1.0Mpa
7: 16 MPa(DN65-DN150 clamping type)
8:10 MPa(DN200DN300 clamping type
9:4.0MPa(DN25-DN50 clamping type)
D: ANSI150 E: ANSI 300 F:ANSI600
G:ANSI900 H:ANSI1500 J: ANSI 2500
K:63MPa L:10.0MPa M:16.0MPa
P: JIS10K Q:JIS16K R: JIS20K S: Special

Lining material
2: Nitrile butadiene rubber 3:Natural rubber 5:EIFE
6: Polyurethane rubber 7:PTFE*b 8:Polychloroprene rubber
9:F46 APFA 4: F46+ steel mesh B: PFA+ steelmesh

Electrode material
1:316L 2: Hastelloy 3:Titanium (Ti) 4:Tantalum(Ta)
5:Platinum-iridium alloy 6:Tungsten carbide 7:Platnum(pt)

Operating environment
1: General place -40°C< ambient temperature <70°C and medium temperature <80°C
4: General place -40°C< ambient temperature <70°Cand medium temperature <180°C (split type only)
6: General place -20°C< ambient temperature <60°C and medium temperature <80°C (explosion-prooftemperature groups:T6)
8: General place -20°C ambient temperature <60°C and medium temperature <90°C (explosion-prooftemperature groups:T5)
9: General place -20°C< ambient temperature <60°C and medium temperature <130°C (explosion-prooftemperature groups: T4)

Grounding electrode
0: No grounding electrode
3:Equipped with grounding electrode (made of the same material as the mmeasuring electrode

Anticorrosive measures*c
1:Sensor body carbon steel + standard protective paint
2:Sensor body carbon steel + high protective paint
3:Sensor flange 304 stainless steel + standard protective paint
4:Sensor flange 316L stainless steel+standard protective paint
5:Sensor body 304 stainless steel6: Sensor body 316L stainless steel

Accuracy grade
A:Class 0.5

Outgoing line seal
1: 20 mm plastic seal (installed by the manufacturer when delivered) 2:G1/2 3:NPT1/2
4:NPT3/4(button display only) 5:20 mm plastic seal(for user-mounted or integrated cable)

Type
EH:Integrated type ER: Split type

Power supply
5:16.5V DC~407DC

Display assembly
7:3-line display with magnetic button

Output signal
0: Standard output*d 3:HART

Explosion-proof requirements
1:Non-explosion-proof 5:Explosion-proof

Display direction
1:Standard direction

IP code
2:IP67 for complete machinIP68 for sensorIP67 for converter

Cable length (L)
LoXX(XX is a two-digit cable length, 20m)

External flange (F)
F1: Flat welded external flange with carbon steelI series (British system)
F2:Flat welded external flange with 304 I series (British system)
F3: Flat welded external flange with 316L I series (British system)
F4: Flat welded external flange with carbon steel II series
F5:Flat welded external flange with 304 II series
F6: Flat welded external flange with 316 II series
F7: Butt-welded external flange with carbon steel I series (British system)
F8:Butt-welded external flange with 304 I series (British system)
F9: Butt-welded external flange with 316L I series (British system)
F10: Flat welded external flange with carbon steel II series
F11:Flat welded external flange with 304 II series
F12: Flat welded external flange with 316L II series
FS:Special requirements
Note:Class serice external flanges are I series(British system)external flanges.

Grounding ring(G)
G1:With 316L grounding ring G2:With HC grounding ring G3:With Ti grounding ring G4:With Ta grounding ring G7:With 304 grounding ring GS:Grounding ring of special material

Certification (R)
R1:TS certification R2:SIL certification

Other accessories(P)
P1: With PTFE sealing gasket P2:With rubber sealing gasket P3:With independen tag P4:With surge protector P5:With instrument box P6:Specific factory information PS:Special accessories

Notes: a.DN125 model is indicafed as "121". b. PTFE for lining is not resistant to negative pressure.If there is negative pressure in the pipeline,please consider PFA+stell mesh or ETFE.
c.The converter shell is made of cast aluminum and standard protective paint.If other materials are needed,negotiation will be made. d. The standard output is 4~20mA+pulse output.

11. Selection of MFB Electromagnetic Flowmeter

11.1 Characteristics and scope of application

MFB battery-powered electromagnetic flowmeter converter is powered by internal battery without external power supply, which is suitable for working conditions where the field power grid cannot reach and the power grid is difficult to lay, especially for monitoring, metering and settlement of tap water supply system. The MFB battery-powered electromagnetic flowmeter converter adopts ultra-low power consumption circuit technology to design efficient and reliable excitation and signal processing circuits to realize the measurement function, so as to ensure the high reliability and stability of the converter. At the same time, efficient system management technology is adopted to greatly reduce the system power consumption, save the power supply cost and realize accurate measurement.

11.2 Brief introduction to the performance of MFB battery-powered electromagnetic flowmeter converter

▲ Display

Three-line display: The display is a 120-segment display that can show flow rate, flow, total, temperature, pressure, alarm message, and battery level, etc. The display content can be switched by magnetic button switch without identity authentication.

▲ Internal cumulative calculator

The total forward flow, the total reverse flow and the total net flow can be calculated by 8-bit accumulation.

▲ Programming

If data is provided to the company when ordering, these related data have been compiled in the converter before the product leaves the factory. If necessary, the converter can be reprogrammed by using the instrument buttons without affecting the technical performance of the converter. Engineering units can be chosen very flexibly, such as suitable flow units and total units.

Programming options:

1. Instrument buttons
2. RS485 communication

▲ Power supply:

Standard configuration: 3.6V lithium battery

Optional configuration: 220VAC+3.6V lithium battery, 24VDC+3.6V lithium battery

▲ Battery life:

More than 6 years (battery powered only)

Note: In harsh environment, the battery life may be less than 6 years, and the reasons that affect the battery life include temperature, output settings, and status output, etc.

▲ Output:

1. The pulse output (standard output) is a square wave signal with a fixed pulse width of 0 Hz to 400 Hz. Parameters such as pulse frequency and cutoff frequency are safe and programmable. When the transistor with pulse output is turned on, the current should be no more than 150mA and the open circuit voltage should be less than 35 V.
2. RS485 (optional) communication interface.
3. NB-Iot (China Telecom)
4. NB-Iot (China Mobile)

▲ Temperature

Working temperature: -40°C~ 65°C. When the temperature exceeds -20-+60°C, the display unit may not work normally

Storage temperature: 0°C ~ 60°C

▲ Protection

Integrated machine IP67/IP68, split converter IP68, sensor IP65/IP67/IP68

▲ Configuration

Instrument parameters and measurement data are stored in non-volatile memory (generally, they can be kept for 10 years). For the use requirements of measurement settlement, the instrument has two devices, namely mechanical seal and electronic seal, which can effectively prevent the parameters that affect the determination of measurement results from being modified by unauthorized persons.

▲ Self-diagnosis

The converter can perform the following diagnostic functions: empty pipe, sensor failure (excitation open circuit) and battery power consumption.

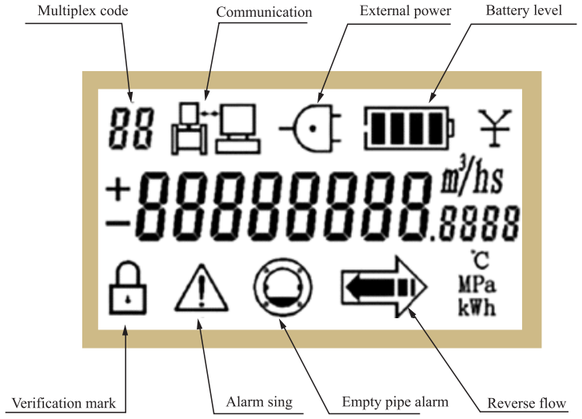
▲ Flow rate setting

It is equivalent to the flow measurement range of the maximum flow rate ≤(10m/s) percentage, which can be changed.

▲ Interchangeability

The converter can be used with MFB sensors of various diameters.

▲ Display mode



The converter can be configured in the field. Replacing the converter will not affect the characteristics of the system.

▲ Outgoing line seal

High-protection aviation connector and stainless steel connector (M20x1.5)

▲ Time constant

All programmable from 1 second to 120 seconds.

11.3 Selection table of MFB electromagnetic flowmeter

The MFB electromagnetic flowmeter consists of a sensor and a converter, and its model is expressed as follows:

MFB XXX X X X X X X / XX X X X X X X X X / LXXX / FX / GX / RX / PX

(Sensor: MFB XXX X X X X X X; Converter: XX X X X X X X X X; Optional certification and accessories: LXXX / FX / GX / RX / PX)

Main name

Caliber DN15~DN1200
Three digits: the first and second digits of DN and the number of zeros following the first two digits (unit: mm)

Nominal pressure
1:1.6Mpa(DN2-DN600) 2:4.0Mpa(DN2-DN600)
4:2.5MpaDN2~DN600) 5:1.0Mpa 6:0.6Ipa
7:16 MPa(1N65-DN150 clamping type)
8:10MPa(DN200-DN300 clamping type)
9:4.0MPa(DN25-DN50 clamping type)
D:ANSI 150 E: ANSI300 F:ANSI600
G:ANSI 900 H: ANSI1500 J: ANSI2500
K:6.3Mpu L:10.0Mpa M:16.0Mp
P:JIS10K Q:IS:6K R: JIS20K S:Special

Lining material
2: Nitrile butadiene rubber 3: Natural rubber 5:ETFE;
6: Polyurethane rubber 7:PTFE8: Polychloroprene rubber
9.F46 A:PFA 4: F46+ steel mesh B: PFA+ steel mesh

Electrode material
1: 316L 2: Hastelloy 3: Titanium (Ti4: Tantalum (Ta)
5: Platinum-iridium alloy6:Tungsten carbide7: Platinum (Pt)

Operating environment
1: General place -40°C ambient temperature <70°C and medium temperature <80°C
4: General place -40°C<ambient temperature <70°C and medium temperature <180°C (split type only)

Grounding electrode
0: No grounding electrode3: Equipped with grounding electrode (made of the same material as the mmeasuring electrode

Anticorrosive measures*c
1: Sensor body carbon steel + standard protective paint
2: Sensor body carbon steel + high protective paint
3: Sensor flange 304 stainless steel + standard protective paint
4: Sensor flange 316L stainless steel + standard protective paint
5: Sensor body 304 stainless steel6: Sensor body 316L stainless steel

Type
EH: Integrated type ER: Split type

Power supply
4: 3.6V high-energy lithium battery 5:36V high-energy lithium battery +24WDC

Accuracy grade
A: Class 0.5

Pressure measurement
1:0MPa~1.0MPa 2:0MPa-4.0MPa 0: Unavailable

Output signal
2: RS485 output (1.5m cable as standard) 5: Battery-powered NB-IOT wireless remote transmission (China Telecom)
8: Battery-powered KB-IOT wireless remote transmission (China Mobile) 9:Special customization

Antenna type
0: N/A 1: Built-in 2: Extetnal(3 m recommended) 4: External(10 m)

SIM card configuration mode
0:Unavailable1: Factory standard2: Provided by the client

Wireless communication cycle
0: hour for collection, 12 hours for uploading 1:30 minutes for collection 6:FF protocol
2: 10 minutes for collection, 6 hours for uploading 3: 5 minutes for collection, 4 hours for uploading: 9: Special customization

Data platform
0: Mamufactuer plationm l: Client platfom (first contact. nvolving protocol contact fees. and IP address and port mumtber are required

IP code
2: IP67 for complete mmachine 4: IP68 for sensor IP67 for converter6:IP68 for commplete iachine

Cable length (L)
LXXX(xxx is the three-digit cable length)

External flange(F)
F1: Flat welded external flange with carbon steel I series (British system)
F3: Flat welded external flange with 316L I series (British system)
F5: Flat welded external flange with 304 II series
F7: Butt-welded external flange with carbon steel I series (British system)
F9: Butt-welded external flange with 316L I series (British system)
F11: Flat welded external flange with 304 I series
FS:Special requier
F2: Flat welded external flange with 304 I series (British system)
F4: Flat welded external flange with carbon steel II series
F6: Flat welded external flange with 316 II series
F8: Butt-welded external flange wwith 304 I series (British system
F10: Flat welded external flange with carbon steel II series
F12: Flat welded external flange with 316L I series
Note:Class series external flanges are I series(British system)external

Grounding ring(G)
Gl: With 316L grounding ring G2:With HC grounding ring G3:With Ti grounding ring G4:With 304 grounding ring GS:Grounding ring made of special mateial

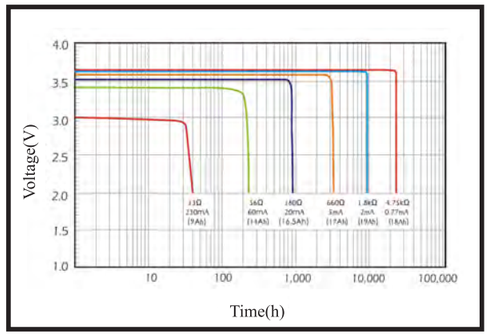
Certification (R)
R1:TS certification R2: SIL certification

Other accessones(p)
P1: With PTFE sealing gasket P2: With rubber sealing gasket P3: With independent tag P4:With surge protector P5:With instrument bo P6:Specific factory information PS:Special accessories

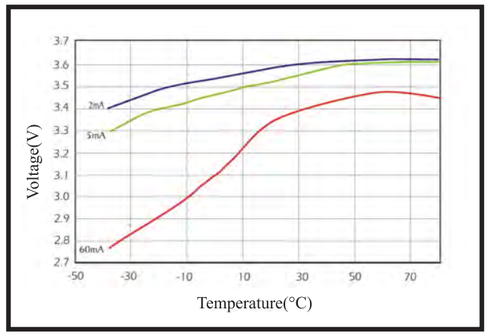
Notes: a. DN25 model is indicated as "121".b. PTFE for lining is not resistant to negative pressure. If there is negative pressurein the pipeline,plase consider PFA+ steel mesh or ETFE.
c. The converter shell is made of cast aluminum and standard protective paint.If other materials are needed,negotiation will be made.

11.4 Technical characteristics of battery

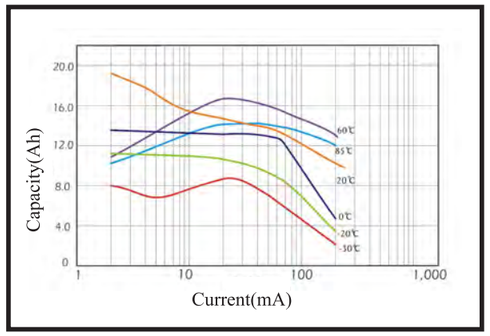
1. Typical discharge curve at +25°C (median value)



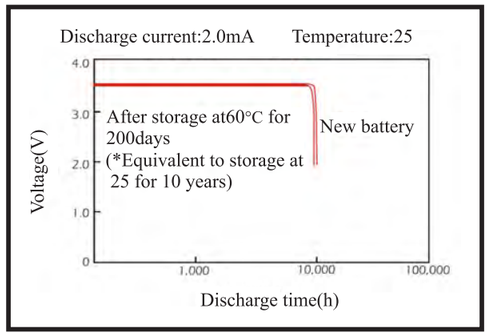
2. Steady voltage curves under different discharge current and temperature conditions (in the stable stage of discharge)



3. Capacity curves under different temperature and current conditions (cut-off voltage is 2.0V)



4. Storage characteristics



As can be seen from the above pictures, under the irradiation of sunlight, the battery life will be reduced, so try to reduce direct sunlight when installing

Instructions for battery use:

The service life of the battery is affected by the temperature. When the ambient temperature is 25°C, the service life of the MFB-S electromagnetic cold water meter can be guaranteed for more than 6 years, but in harsh environmental conditions (high temperature or low temperature), the battery capacity will be reduced and the service life will be less than 6 years.

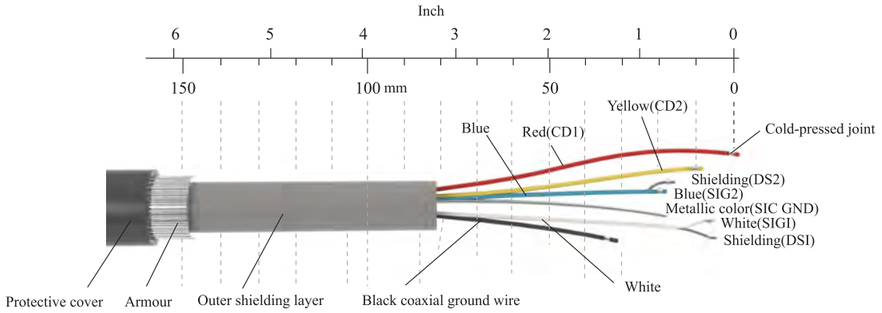
Description of battery level change:

	Battery level >75%
	Battery level >50%
	Battery level >25%
	The battery is running down, please replace it in time

Note: When the instrument displays the symbol "", it means that the battery level is insufficient and thebattery needs to be replaced; otherwise, the measurement data will be missing. The battery must bereplaced by a professional who has been instructed by the manufacturer, or the product will be sent backto the manufacturer for replacement After replacement of the battery, the "accumulated flow" and'accumulated effective running time" stored in the instrument will not be lost.

12.Converter Wiring Diagram

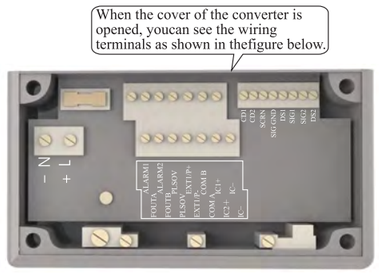
12.1 Guide diagram of converter cable conductor

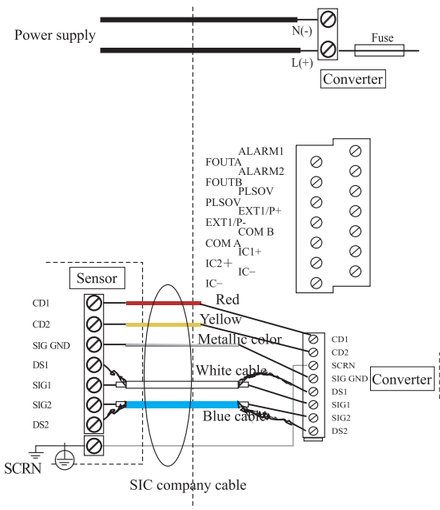


The cable diameter is 11.5mm±5mm

12.2 Electrical connection of MFC converter

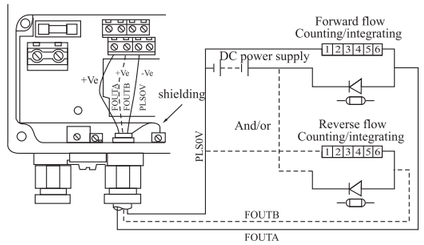




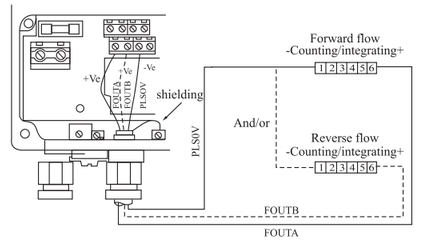


Precautions
During connection, the following contents shall be noted:
- The connection between the sensor and the converter must becorrect and reliable, ensuring good contact and no short circuit or opencircuit.
- In order to ensure the insulation in the sensor junction box andprevent poor insulation caused by humidity, cables shall not beconnected outdoors in rainy days.
- In order to ensure the tightness of the junction box, the screws onthe cable connector and junction box should be tightened after theconnection is completed.
- 4-20mA output is in active mode, so do not add other powersupplies.

A. Frequency output wiring

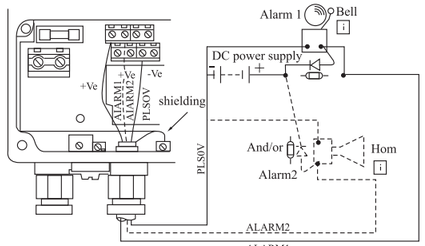


Electromagnetic counter connection

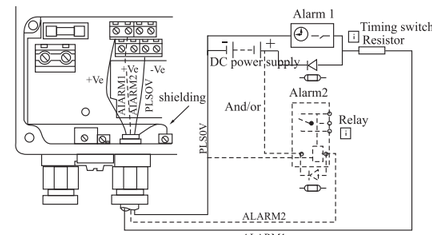


Telemetry, electronic counter, etc.

B. Alarm output wiring

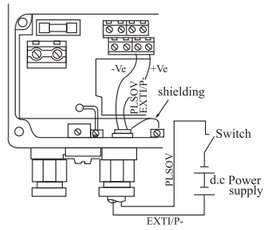


Alarm wiring 1

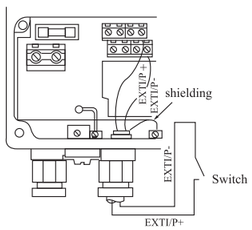


Alarm wiring 2

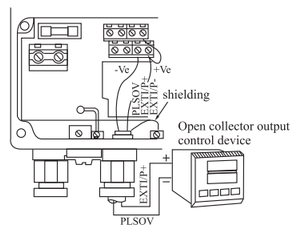
C. Contact input wiring



Voltage-free contact

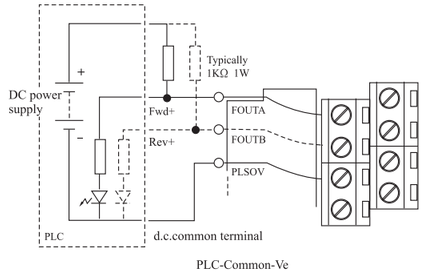


Voltage signal/logic signal

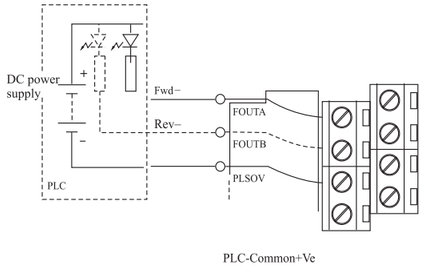


Open collector (ground contact)

D. Interface with PLC

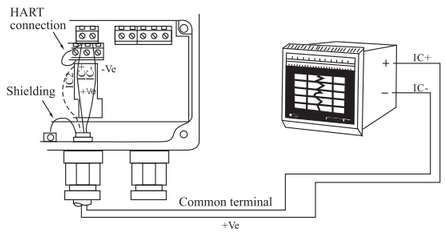


Schematic diagram of PLC interface (-Vc is common terminal)

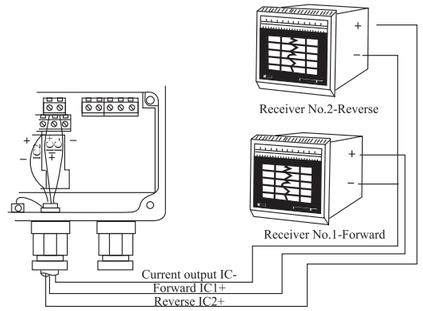


Schematic diagram of PLC interface (+Vc is common terminal)

E. Current output wiring

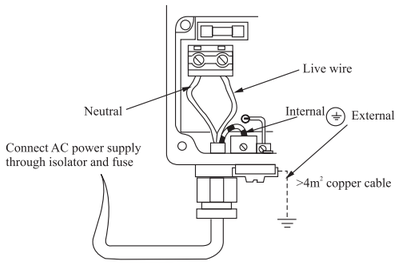


Standard current output wiring diagram



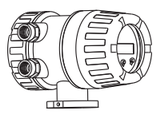
Double-current output wiring diagram

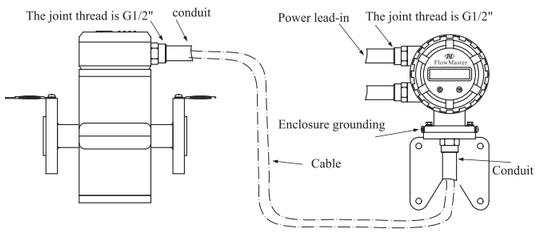
F. Power supply wiring



Connection diagram of AC power supply (AC220V)

12.3 Electrical connection of MFE circular converter



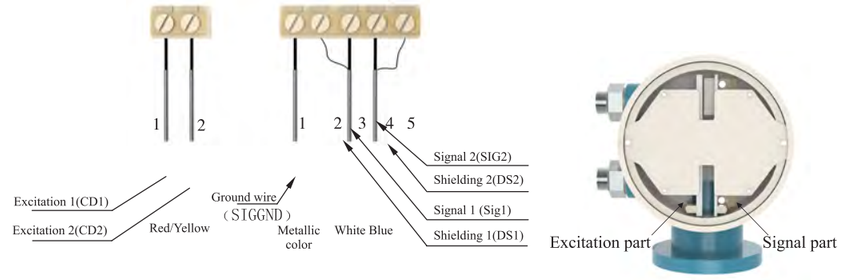


A. The cable connection between the integrated flowmeter sensor and the converter is completed by the manufacturer, and the cable between the split flowmeter sensor and the split converter is connected (the cable is provided by the manufacturer). The cable at the sensor has been connected and sealed when leaving the factory. See the figure below for the cable connection at the converter

B. The power cord and other output signal lines should be connected by rubber sleeve with an outer diameter of 105mm (provided by users)

C. The flowmeter cable guide diagram is shown on the right

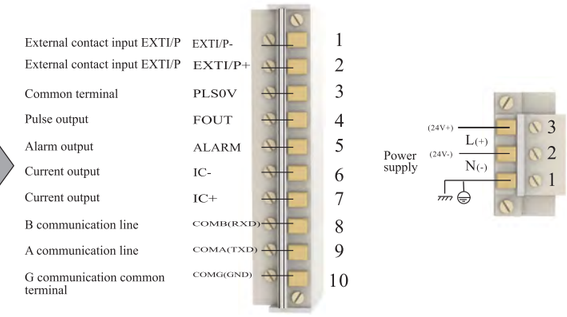
The conduit can be heavy-gauge threaded pipe, seamless steel pipe and welded steel pipe conforming to GB/T 14823.1, and the joint between the conduit and the connector should have at least 5 threads



Note: The number of the terminal block is printed on the motherboard, and the wiring can be operated with reference to this figure.

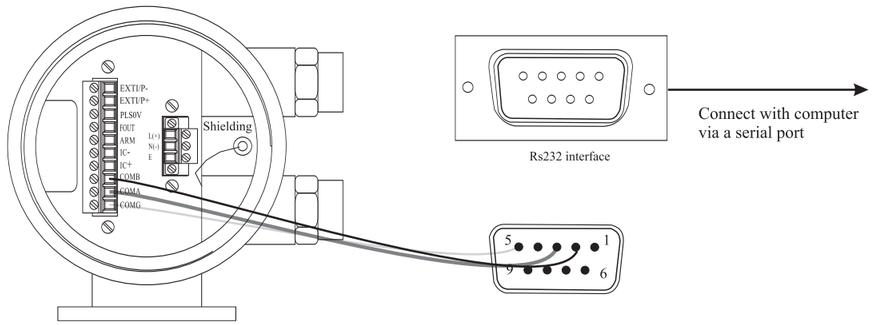
The hollow bolt, washer and sealing ring are put around the cable, and the cable will pass through the cable lead-in hole. The cable connection length is ensured, and the sealing ring and washer are put into the cable lead-in hole and the hollow nut is tightened. Explosion-proof converter cable needs to be fitted with explosion-proof conduit.



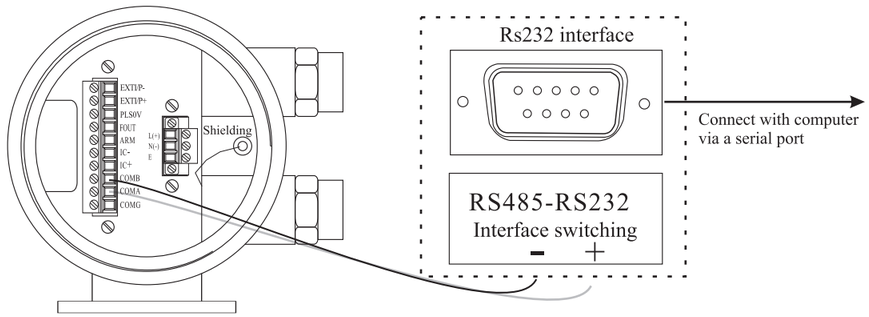


Note:Please power off when connecting in explosive gas atmospheres!

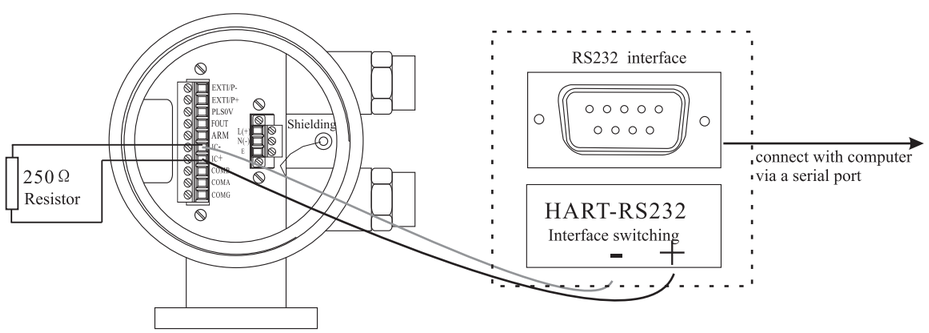
A. RS232 wiring

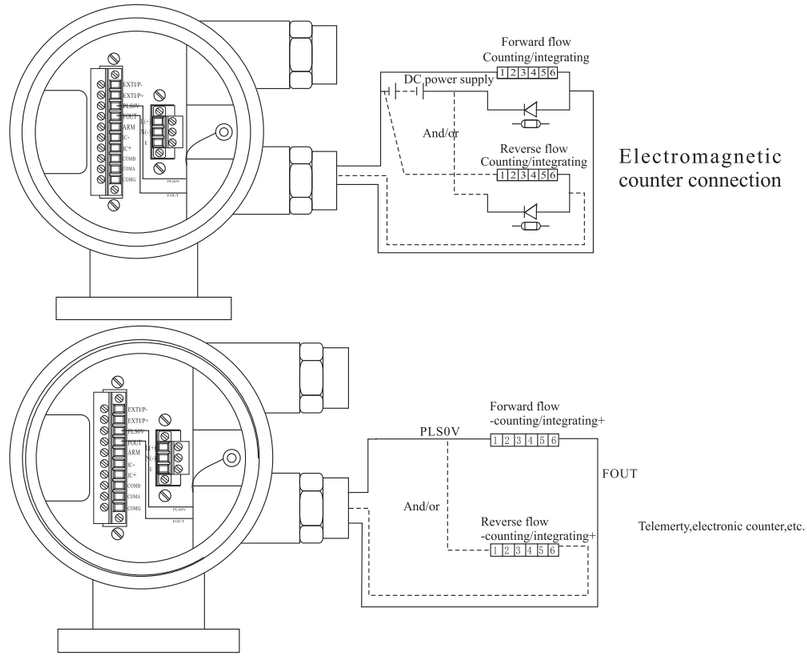


B. RS485 wiring

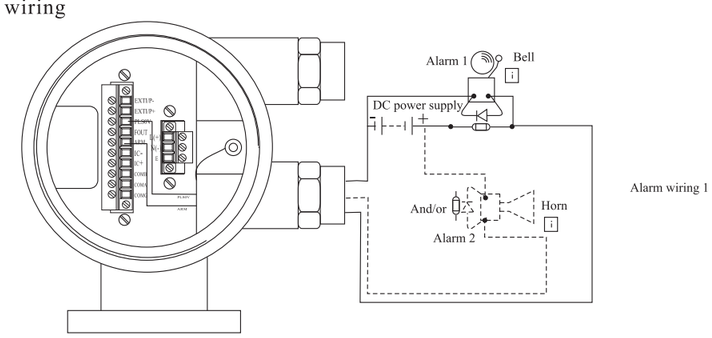


C. HART wiring

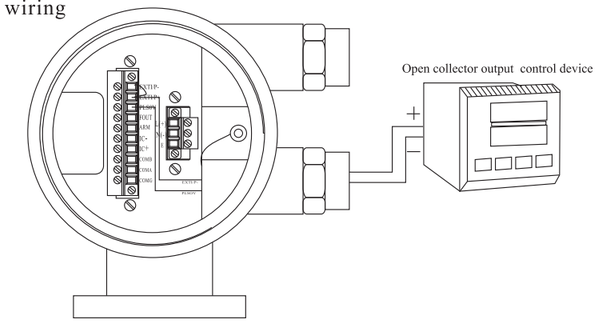




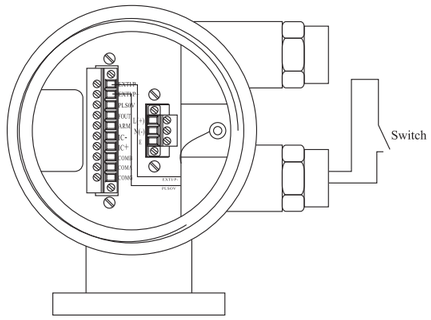
E. Alarm output wiring



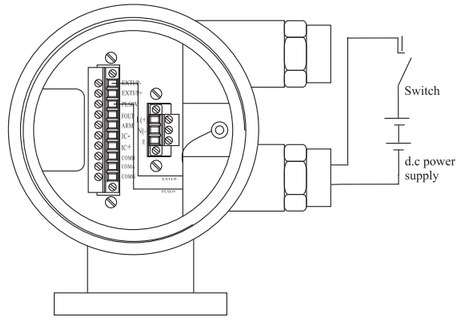
F. Contact input wiring



Open collector (or ground contact)

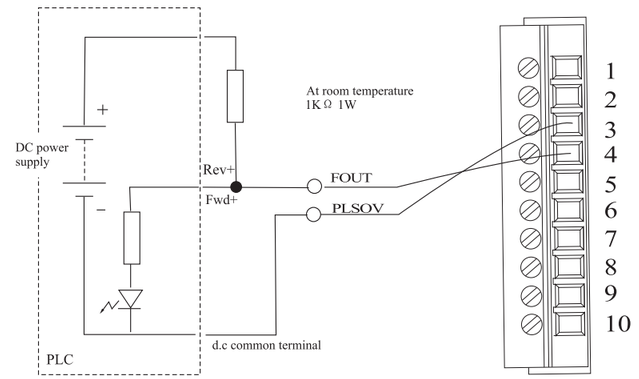


Voltage-free contact

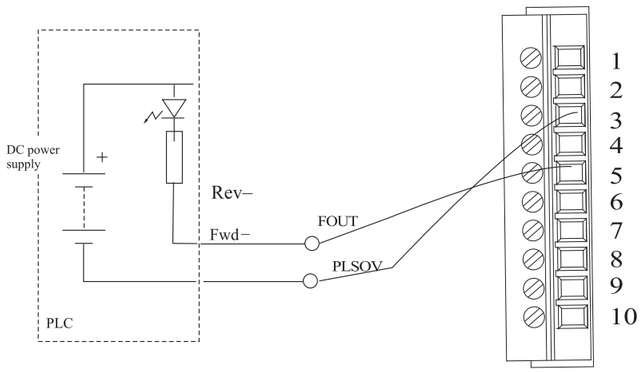


Voltage signal or logic signal

G. Interface with PLC

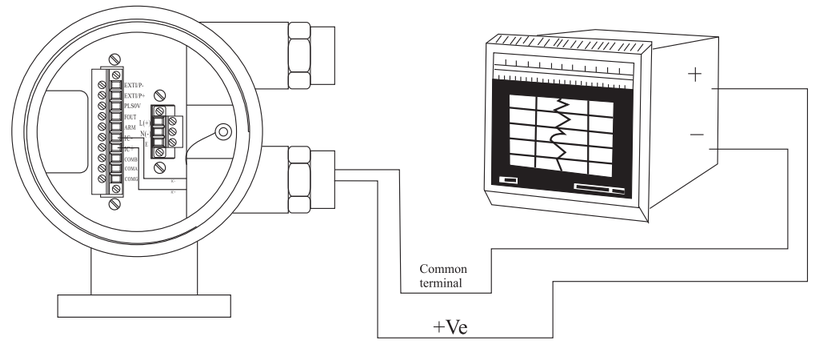


Schematic diagram of PLC interface
(-Ve is common terminal)



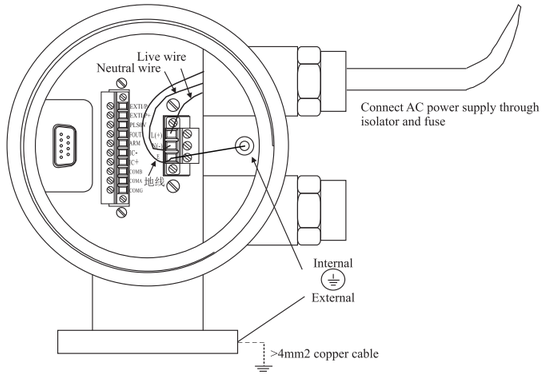
Schematic diagram of PLC interface
(+Ve is common terminal)

H. Current output wiring



Standard current output wiring diagram

I. Power supply wiring

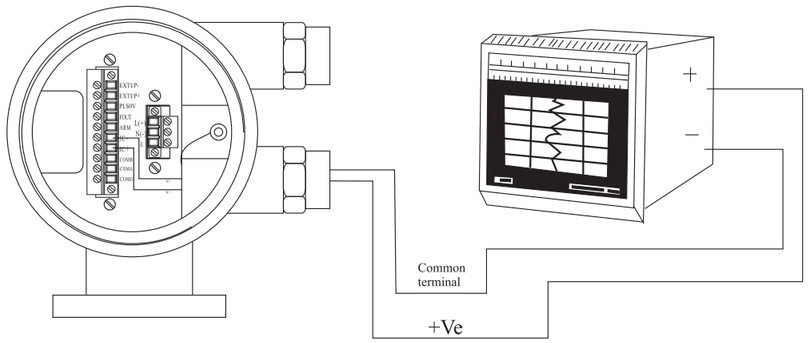


Connection diagram of AC power supply (AC220V)

12.4 Electrical connection of MFL converter

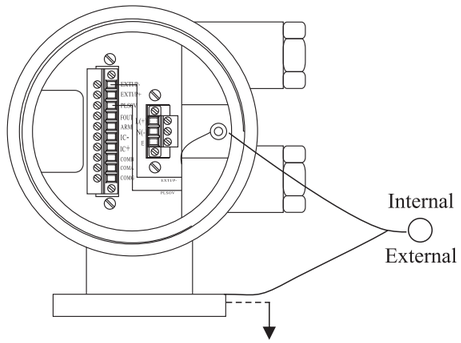
Current output wiring

★The enclosure must be effectively grounded

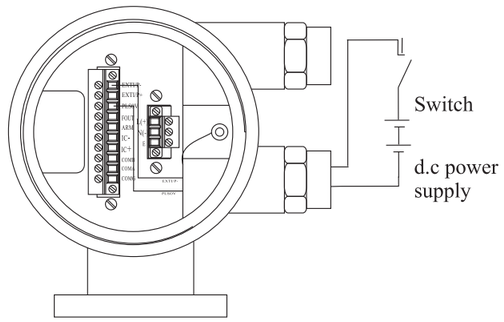


The enclosure must be effectively grounded

Power supply wiring



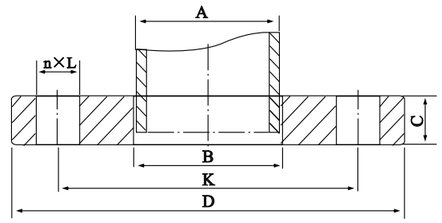
DC power supply connection diagram DC24V)



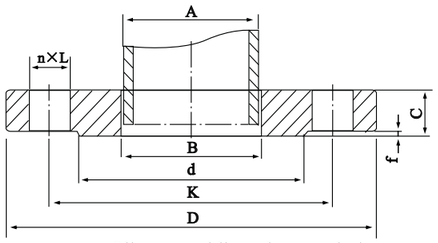
Voltage signal or logic signal

13. Flange Dimensions

The following flange dimensions meet the GB/T9119-2010 standard



Slip-on-welding plate steel pipe flanges with flat face (FF)



Slip-on-welding plate steel pipe flanges with raised face (RF)

Unit: mm

Pressure grade	Nominal diameter (DN)	Connection dimensions						Sealing face		Flange thickness C	Inner diameter of flange B
		Outer diameter of steel pipe A	Flange outer diameter D	Diameter of bolt hole center circle K	Bolt hole diameter L	Bolt		d	f		
						Quantity n	Thread specification				
PN1.0MPa	10	17.2	90	60	14	4	M12	41	2	14	18
	15	21.3	95	65	14	4	M12	46	2	14	22
	20	26.9	105	75	14	4	M12	56	2	16	27.5
	25	33.7	115	85	14	4	M12	65	2	16	34.5
	32	42.4	140	100	18	4	M16	76	2	18	43.5
	40	48.3	150	110	18	4	M16	84	2	18	49.5
	50	63	165	125	18	4	M16	99	2	20	61.5
	65	76.1	185	145	18	4	M16	118	2	20	77.5
	80	88.9	200	160	18	8	M16	132	2	20	95
	100	114.3	220	180	18	8	M16	156	2	22	116
	125	139.7	250	210	18	8	M16	184	2	22	141.5
	150	168.3	285	240	22	8	M20	211	2	24	175
	200	219.1	340	295	22	8	M20	266	2	24	221.5
	250	273	395	350	22	12	M20	319	2	26	276.5
	300	323.9	455	400	22	12	M20	370	2	28	327.5
	350	355.6	505	460	22	16	M20	429	2	30	359.5
	400	406.4	565	515	26	16	M24	480	2	32	411
	450	457	615	565	26	20	M24	530	2	35	462
	500	508	670	620	26	20	M24	582	2	38	513.5
	600	610	780	725	30	20	M27	682	2	42	616.5

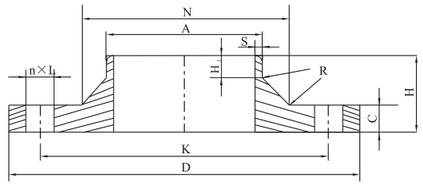
Unit: mm

Pressure grade	Nominal diameter (DN)	Connection dimensions						Sealing face		Flange thickness C	Inner diameter of flange B
		Outer diameter of steel pipe A	Flange outer diameter D	Diameter of bolt hole center circle K	Bolt hole diameter L	Bolt		d	f		
						Quantity n	Thread specification				
PN1.6MPa	10	17.2	90	60	14	4	M12	41	2	14	18
	15	21.3	95	65	14	4	M12	46	2	14	22
	20	26.9	105	75	14	4	M12	56	2	16	27.5
	25	33.7	115	85	14	4	M12	65	2	16	34.5
	32	42.4	140	100	18	4	M16	76	2	18	43.5
	40	48.3	150	110	18	4	M16	84	2	18	49.5
	50	60.3	165	125	18	4	M16	99	2	20	61.5
	65	76.1	185	145	18	4	M16	118	2	20	77.5
	80	88.9	200	160	18	8	M16	132	2	20	90.5
	100	114.3	220	180	18	8	M16	156	2	22	116
	125	139.7	250	210	18	8	M16	184	2	22	141.5
	150	168.3	285	240	22	8	M20	211	2	24	170.5
	200	219.1	340	295	22	12	M20	266	2	26	221.5
	250	273	405	355	26	12	M24	319	2	28	276.5
	300	323.9	460	410	26	12	M24	370	2	32	327.5
	350	355.6	520	470	26	16	M24	429	2	35	359.5
	400	406.4	580	525	30	16	M27	480	2	38	411
	450	457	640	585	30	20	M27	548	2	42	462
	500	508	715	650	33	20	M30	609	2	46	513.5
	600	610	840	770	36	20	M33	720	2	52	616.5
PN2.5MPa	10	17.2	90	60	14	4	M12	41	2	14	18
	15	21.3	95	65	14	4	M12	46	2	14	22
	20	26.9	105	75	14	4	M12	56	2	16	27.5
	25	33.7	115	85	14	4	M12	65	2	16	34.5
	32	42.4	140	100	18	4	M16	76	2	18	43.5
	40	48.3	150	110	18	4	M16	84	2	18	49.5
	50	60.3	165	125	18	4	M16	99	2	20	61.5
	65	76.1	185	145	18	8	M16	118	2	22	77.5
	80	88.9	200	160	18	8	M16	132	2	24	90.5
	100	114.3	235	190	22	8	M20	156	2	26	116
	125	139.7	270	220	26	8	M24	184	2	28	141.5
	150	168.3	300	250	26	8	M24	211	2	30	170.5
	200	219.1	360	310	26	12	M24	274	2	32	221.5
	250	273	425	370	30	12	M27	330	2	35	276.5
	300	323.9	485	430	30	16	M27	389	2	38	327.5
	350	355.6	555	490	33	16	M30	448	2	42	359.5
	400	406.4	620	550	36	16	M33	503	2	46	411
	450	457	670	600	36	20	M33	548	2	50	462
	500	508	730	660	36	20	M33	609	2	56	513.5
	600	610	845	770	39	20	M36	720	2	68	616.5

Unit: mm

Pressure grade	Nominal diameter (DN)	Connection dimensions						Sealing face		Flange thickness C	Inner diameter of flange B
		Outer diameter of steel pipe A	Flange outer diameter D	Diameter of bolt hole center circle K	Bolt hole diameter L	Bolt		d	f		
						Quantity n	Thread specification				
PN4.0MPa	10	17.2	90	60	14	4	M12	41	2	14	18
	15	21.3	95	65	14	4	M12	46	2	14	22
	20	26.9	105	75	14	4	M12	56	2	16	27.5
	25	33.7	115	85	14	4	M12	65	2	16	34.5
	32	42.4	140	100	18	4	M16	76	2	18	43.5
	40	48.3	150	110	18	4	M16	84	2	18	49.5
	50	60.3	165	125	18	4	M16	99	2	20	61.5
	65	76.1	185	145	18	8	M16	118	2	22	77.5
	80	88.9	200	160	18	8	M16	132	2	24	90.5
	100	114.3	235	190	22	8	M20	156	2	26	116
	125	139.7	270	220	26	8	M24	184	2	28	141.5
	150	168.3	300	250	26	8	M24	211	2	30	170.5
	200	219.1	375	320	30	12	M27	284	2	36	221.5
	250	273	450	385	33	12	M30	345	2	42	276.5
	300	323.9	515	450	33	16	M30	409	2	48	327.5
	350	355.6	580	510	36	16	M33	465	2	55	359.5
	400	406.4	660	585	39	16	M36	535	2	60	411
	450	457	685	610	39	20	M36	560	2	66	462
	500	508	755	670	42	20	M39	615	2	72	513.5
	600	610	890	795	48	20	M45	735	2	84	616.5

The following flanges conform to GB/T 9115.1V1-2000 standard



Unit: mm

Pressure grade	Nominal diameter (DN)	Outer diameter of steel pipe A	Connection dimensions					Sealing face		Flange thickness C	Flange height H	Flange neck			
			Flange outer diameter D	Diameter of bolt hole center circle K	Bolt hole diameter L	Bolt		d	f			N	S	H_1	R
						Quantity n	Thread specification								
PN0.6MPa	700	711	860	810	26	24	M24	772	5	26	70	740	Specified by the user	16	12
	800	813	975	920	30	24	M27	878	5	26	70	842		16	12
	900	914	1075	1020	30	24	M27	978	5	26	70	942		16	12
	1000	1016	1175	1120	30	28	M27	1078	5	26	70	1045		16	12
	1200	1220	1405	1340	33	32	M30	1295	5	28	90	1248		20	12
	1400	1420	1630	1560	36	36	M33	1510	5	32	90	1452		20	12
	1600	1620	1830	1760	36	40	M33	1710	5	34	90	1655		20	12
	1800	1820	2045	1970	39	44	M36	1918	5	36	100	1855		20	15
	2000	2020	2265	2180	42	48	M39	2125	5	38	110	2058		25	15
	2200	2220	2475	2390	42	52	M39	2335	6	42	115	2260		25	15
	2400	2420	2685	2600	42	56	M39	2545	6	44	125	2462		25	15

14. Diameter, Velocity and Flow

(Only 1 ~ 20m/s flow rate comparison table is provided, which can be as low as 2m/s, and special instructions are required.)

Flow (m^3/h) \ Diameter (mm) / Flow rate m/s		2.5	4	5	8	9	10	12	15	20	25	32	40	50
Flow range(m^3/h)	1	0.018	0.045	0.071	0.181	0.229	0.283	0.407	0.636	1.131	1.767	2.895	4.524	7.069
	2	0.035	0.090	0.141	0.362	0.458	0.565	0.814	1.272	2.262	3.534	5.791	9.048	14.137
	3	0.053	0.136	0.212	0.543	0.687	0.848	1.221	1.909	3.393	5.301	8.686	13.572	21.206
	4	0.071	0.181	0.283	0.724	0.916	1.131	1.629	2.545	4.524	7.069	11.581	18.096	28.274
	5	0.088	0.226	0.353	0.905	1.145	1.414	2.036	3.181	5.655	8.836	14.476	22.619	35.343
	6	0.106	0.271	0.424	1.086	1.374	1.696	2.443	3.817	6.786	10.603	17.372	27.143	42.412
	7	0.124	0.317	0.495	1.267	1.603	1.979	2.850	4.453	7.917	12.370	20.267	31.667	49.480
	8	0.141	0.362	0.565	1.448	1.832	2.262	3.257	5.089	9.048	14.137	23.162	36.191	56.549
	9	0.159	0.407	0.636	1.629	2.061	2.545	3.664	5.726	10.179	15.904	26.058	40.715	63.617
	10	0.177	0.452	0.707	1.810	2.290	2.827	4.072	6.362	11.310	17.671	28.953	45.239	70.686
	11	0.194	0.498	0.778	1.991	2.519	3.110	4.479	6.998	12.441	19.439	31.848	49.763	77.754
	12	0.212	0.543	0.848	2.171	2.748	3.393	4.886	7.634	13.572	21.206	34.744	54.287	84.823
	13	0.230	0.588	0.919	2.352	2.977	3.676	5.293	8.270	14.703	22.973	37.639	58.811	91.892
	14	0.247	0.633	0.990	2.533	3.206	3.958	5.700	8.906	15.834	24.740	40.534	63.335	98.960
	15	0.265	0.679	1.060	2.714	3.435	4.241	6.107	9.543	16.965	26.507	43.429	67.858	106.029
	16	0.283	0.724	1.131	2.895	3.664	4.524	6.514	10.179	18.096	28.274	46.325	72.382	113.097
	17	0.300	0.769	1.202	3.076	3.893	4.807	6.922	10.815	19.227	30.041	49.220	76.906	120.166
	18	0.318	0.814	1.272	3.257	4.122	5.089	7.329	11.451	20.358	31.809	52.115	81.430	127.235
	19	0.336	0.860	1.343	3.438	4.351	5.372	7.736	12.087	21.488	33.576	55.011	85.954	134.303
	20	0.353	0.905	1.414	3.619	4.580	5.655	8.143	12.723	22.619	35.343	57.906	90.478	141.372

Flow (m^3/h) \ Diameter (mm) / Flow rate m/s		65	80	100	125	150	200	250	300	350
Flow range(m^3/h)	1	11.946	18.096	28.274	44.179	63.617	113.097	176.715	254.469	346.361
	2	23.892	36.191	56.549	88.357	127.235	226.195	353.429	508.938	692.721
	3	35.838	54.287	84.823	132.536	190.852	339.292	530.144	763.407	1039.082
	4	47.784	72.382	113.097	176.715	254.469	452.389	706.858	1017.876	1385.442
	5	59.730	90.478	141.372	220.893	318.086	565.487	883.573	1272.345	1731.803
	6	71.675	108.573	169.646	265.072	381.704	678.584	1060.288	1526.814	2078.164
	7	83.621	126.669	197.920	309.251	445.321	791.681	1237.002	1781.283	2424.524
	8	95.567	144.765	226.195	353.429	508.938	904.779	1413.717	2035.752	2770.885
	9	107.513	162.860	254.469	397.608	572.555	1017.876	1590.431	2290.221	3117.245
	10	119.459	180.956	282.743	441.786	636.173	1130.973	1767.146	2544.690	3463.606
	11	131.405	199.051	311.018	485.965	699.790	1244.071	1943.860	2799.159	3809.966
	12	143.351	217.147	339.292	530.144	763.407	1357.168	2120.575	3053.628	4156.327
	13	155.297	235.242	367.566	574.322	827.024	1470.265	2297.290	3308.097	4502.688
	14	167.243	253.338	395.841	618.501	890.642	1583.363	2474.004	3562.566	4849.048
	15	179.189	271.434	424.115	662.680	954.259	1696.460	2650.719	3817.035	5195.409
	16	191.134	289.529	452.389	706.858	1017.876	1809.557	2827.433	4071.504	5541.769
	17	203.080	307.625	480.664	751.037	1081.493	1922.655	3004.148	4325.973	5888.130
	18	215.026	325.720	508.938	795.216	1145.111	2035.752	3180.863	4580.442	6234.491
	19	226.972	343.816	537.212	839.394	1208.728	2148.849	3357.577	4834.911	6580.851
	20	238.918	361.911	565.487	883.573	1272.345	2261.947	3534.292	5089.380	6927.212

Flow (m^3/h) / Diameter (mm) / Flow rate m/s		400	450	500	600	700	750	800	900
Flow range(m^3/h)	1	452.389	572.555	706.858	1017.876	1385.442	1590.431	1809.557	2290.221
	2	904.779	1145.111	1413.717	2035.752	2770.885	3180.863	3619.115	4580.442
	3	1357.168	1717.666	2120.575	3053.628	4156.327	4771.294	5428.672	6870.663
	4	1809.557	2290.221	2827.433	4071.504	5541.769	6361.725	7238.229	9160.884
	5	2261.947	2862.776	3534.292	5089.380	6927.212	7952.156	9047.787	11451.105
	6	2714.336	3435.332	4241.150	6107.256	8312.654	9542.588	10857.344	13741.326
	7	3166.725	4007.887	4948.008	7125.132	9698.096	11133.019	12666.901	16031.547
	8	3619.115	4580.442	5654.867	8143.008	11083.539	12723.450	14476.459	18321.768
	9	4071.504	5152.997	6361.725	9160.884	12468.981	14313.881	16286.016	20611.989
	10	4523.893	5725.553	7068.583	10178.760	13854.423	15904.313	18095.573	22902.210
	11	4976.283	6298.108	7775.442	11196.636	15239.866	17494.744	19905.131	25192.431
	12	5428.672	6870.663	8482.300	12214.512	16625.308	19085.175	21714.688	27482.652
	13	5881.061	7443.218	9189.158	13232.388	18010.750	20675.606	23524.245	29772.873
	14	6333.451	8015.774	9896.017	14250.264	19396.193	22266.038	25333.803	32063.094
	15	6785.840	8588.329	10602.875	15268.140	20781.635	23859.469	27143.360	34353.315
	16	7238.229	9160.884	11309.733	16286.016	22167.077	25446.900	28952.917	36643.536
	17	7690.619	9733.439	12016.592	17303.892	23552.520	27037.331	30762.475	38933.757
	18	8143.008	10305.995	12723.450	18321.768	24937.962	28627.763	32572.032	41223.978
	19	8595.397	10878.550	13430.308	19339.644	26323.404	30218.194	34381.589	43514.199
	20	9047.787	11451.105	14137.167	20357.520	27708.847	31808.625	36191.147	45804.420

Flow (m^3/h) / Diameter (mm) / Flow rate m/s		1000	1200	1400	1500	1600	1800	2000	2200	2400
Flow range(m^3/h)	1	2827.433	4071.504	5541.769	6361.725	7238.229	9160.884	11309.733	13684.777	16286.016
	2	5654.867	8143.008	11083.539	12723.450	14476.459	18321.768	22619.467	27369.555	32572.032
	3	8482.300	12214.512	16625.308	19085.175	21714.688	27482.652	33929.200	41054.332	48858.048
	4	11309.733	16286.016	22167.077	25446.900	28952.917	36643.536	45238.933	54739.109	65144.064
	5	14137.167	20357.520	27708.847	31808.625	36191.147	45804.420	56548.667	68423.887	81430.080
	6	16964.600	24429.024	33250.616	38170.350	43429.376	54965.304	67858.400	82108.664	97716.096
	7	19792.033	28500.528	38792.385	44532.075	50667.605	64126.188	79168.134	95793.442	114002.112
	8	22619.467	32572.032	44334.155	50893.800	57905.835	73287.072	90477.867	109478.219	130288.128
	9	25446.900	36643.536	49875.924	57255.525	65144.064	82447.956	101787.600	123162.996	146574.144
	10	28274.333	40715.040	55417.693	63617.250	72382.294	91608.840	113097.334	136847.774	162860.160
	11	31101.767	44786.544	60959.463	69978.975	79620.523	100769.724	124407.067	150532.551	1791463176
	12	33929.200	48858.048	66501.232	76340.700	86858.752	109930.608	135716.800	164217.328	195432.192
	13	36756.633	52929.552	72043.002	82702.425	94096.982	119091.492	147026.534	177902.106	211718.208
	14	39584.067	57001.056	77584.771	89064.150	101335.211	128252.376	158336.267	191586.883	228004.225
	15	42411.500	61072.560	83126.540	95425.875	108573.440	137413.260	169646.000	205271.660	244290.241
	16	45238.933	65144.064	88668.310	101787.600	115811.670	146574.144	180955.734	218956.438	260576.257
	17	48066.367	69215.568	94210.079	108149.325	123049.899	155735.028	192265.467	232641.215	276862.273
	18	50893.800	73287.072	99751.848	114511.050	130288.128	164895.912	203575.200	246325.993	293148.289
	19	53721.233	77358.576	105293.618	120872.775	137526.358	174056.796	214884.934	260010.770	309434.305
	20	56548.667	81430.080	110835.387	127234.500	144764.587	183217.680	226194.667	273695.547	325720.321

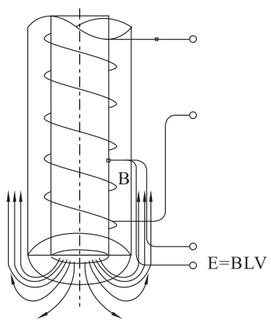
Part II Plug-in Electromagnetic Flowmeter

1. Product Overview

1.1 Product Introduction

The MFP plug-in electromagnetic flowmeter is a new type of fluid flowmeter developed on the basis of pipeline electromagnetic flowmeter. On the basis of retaining the advantages of the pipeline electromagnetic flowmeter, aiming at the disadvantages of the pipeline electromagnetic flowmeter, such as difficult installation on large pipeline and high cost, according to the principle of NIKURADS principle, the volume flow of the fluid is obtained by measuring the average flow rate of the fluid by electromagnetic method. Especially after adopting the technology of tapping under pressure and installation under pressure, the plug-in electromagnetic flowmeter can be installed without stopping (water), or on cast iron pipes and cement pipes. The successful development of plug-in electromagnetic flowmeter provides a new means for the detection of fluid flow.

Different from the general electromagnetic flowmeter, the sensor of the plug-in electromagnetic flowmeter forms an external emission magnetic field on the outside, and the measuring electrode is at the end or both sides of the sensor as shown in the following figure. It is worth noting that the induction signal of electromagnetic velocity sensor with external emission magnetic field is affected by the boundary layer thickness of fluid and magnetic field, which will reduce the linearity of measurement. For the MFP plug-in electromagnetic flowmeter, the conductive liquid in the pipeline is the conductor moving in the magnetic field, and the distance between the two electrodes is the length L of the conductor.



Its induced voltage is proportional to the average flow rate. At this time, the fluid flow in the pipeline can be obtained from: Formula (1)

$Q=\pi D^2U/4KBL$

D: Inner diameter of the measuring pipe U: Induced voltage

B: Magnetic induction intensity

K: Coefficient related to magnetic field distribution

1.2 Scope of application

Plug-in electromagnetic flowmeter is composed of sensor and converter, which is used to measure conductive liquid. The conductivity should be greater than 5μs/cm, and it can be used to measure water, sewage, acid, strong alkali and other media. It is mainly used to measure the instantaneous flow and volume flow of conductive liquid in large and medium-sized pipelines in tap water, petrochemical industry and other industries, and is especially suitable for flow measurement in metallurgy, paper making and sewage treatment industries.

1.3 Product composition

A complete set of MFP plug-in electromagnetic flowmeter consists of sensor and converter. According to different IP grades and parameter setting forms, there are two forms: integrated installation of sensor and converter and split installation of sensor and converter.

Integrated installation refers to connect the sensor and the converter internally to form a whole, and directly output the current signal or frequency signal which has a linear relationship with the flow. This method is completed at the factory, and all parameters have been adjusted according to the user's requirements.



Split installation refers to connect the sensor and the converter through an external shielded cable, and the two parts form a complete electromagnetic flowmeter, as shown in the figure. The parameters of the converter can be adjusted according to the user's requirements and process data, which is suitable for submerged and other occasions.



1.4 Service conditions

Ambient temperature: -40°C~ 65°C. When the temperature is lower than -20°C, the display unit may not work normally

AC (100 ~ 230) ±15%V, 47Hz~440Hz; DC11V~40V, maximum power consumption is 20VA;

Ambient humidity: 5%-95%

Maximum medium temperature: 60°C

1.5 Instrument Characteristics

1) Plug-in electromagnetic flowmeter is easy to install, does not need to cut off, and can open holes under pressure on site, which has absolute advantages in installation and price.

2) It is suitable for water, sewage, acid, strong alkali and other liquid flow detection with conductivity of

5us/cm or more, the change of conductivity does not affect the change of performance, and it is very adaptable to the complex changes of fluid. It is especially suitable for flow measurement of water supply and drainage pipelines.

3) The measurement accuracy class is Class 1 (under reference conditions), and the flow in both forward and reverse directions can be measured, which provides good means for accurate flow measurement.

4) The flow measurement is only related to the insertion depth, so the flowmeter has wide versatility and strong interchangeability. One model can meet the fluid measurement requirements of pipelines of various specifications.

5) The converter has good interchangeability, and the accuracy can be achieved without re-calibrating the real flow.

6) Small signal excision function. The user can set the lower limit voltage and lower limit flow through the display panel, so as to cut off the interfering small signal flow.

7) Converters and sensors have a variety of IP grades and installation methods, with IP68 rating suitable for submerged installation.

1.6 Notes for Ordering

Please read this document before ordering, understand the model and coding regulations of the product, and determine the model and specifications as needed. If necessary, the following requirements are also indicated:

1) Parameters required to be set before the product leaves the factory, such as the upper limit of flow range or the corresponding upper limit of flow rate.

2) Whether there are requirements for immersion use;

3) Other special requirements.

4) Installation under pressure is limited to normal temperature water below 2MPa.

2. Main Technical Parameters

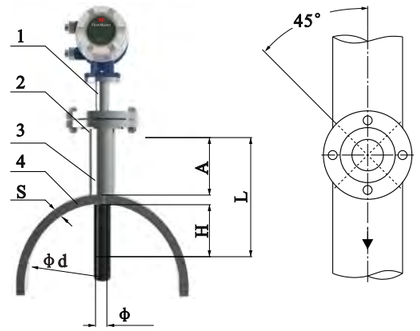
FlowMaster MFP plug-in electromagnetic flowmeter		
	Integrated type	Split type
Accuracy grade	Class 1	
Diameter (mm)	DN200~DN3000	
Explosion-proof grade	Exia/d e IIC T6 Ga/Gb EX tD A21 IP67 T85°C(ambient temperature ≤60°C, medium temperature ≤60°C)	
Flange standard	GB/T9119 JIS B2220 ASME/ANSI B16.5 HG/T20592, etc.	
Pressure grade	1.6MPa	
Lining material	PVDF	
Conductivity	≥5 μ S/cm (the conductivity of deionized water is greater than or equal to 20 μ S/cm)	
Electrode material	316L, Hastelloy, titanium, tantalum, platinum	
IP code	IP65/IP67	IP65/IP67 (IP68 optional for sensor)
Medium temperature	−25°C~60°C	
Ambient temperature	-40°C~65°C, the display unit may not work normally if less than -20°C	
Influence of ambient temperature	<±0.5%/10°C	
Reproductivity and repeatability	±0.3%	
Analog output error	≤±0.02mA	
Flow rate within measuring range	≤10m/s	
Possible to be buried	————	⩽5m (limited to IP68)
Electrical connection	M20*1.5 sealing sleeve, G1/2, NPT1/2	
Sensor cable	————	〈30m (If you want to order a super-long type, please consult with us)
Output interface	Standard output (pulse+4mA~20mA single current output), RS485, HART, Profibus-PA, Profibus-DP and FF	

3. Overall Dimensions

3.1 Sensor dimensions

The sensor is fixed by flange connection. Firstly, the length of the connecting pipe of the base is calculated according to the pipe diameter, and then the base is welded to the pipe opening. When welding, absolute attention should be paid to the correct orientation and correct insertion depth of the screw hole of the base flange to ensure that the direction of the sensor probe is perpendicular to the direction of the fluid. The connecting pipe of the base shall not exceed the inner wall of the pipeline to be measured, and can only be inserted and installed after burr removal.

See the figure for specific dimensions and material specifications.



(1) DN200mm, DN300mm, DN400mm (installed without pressure)

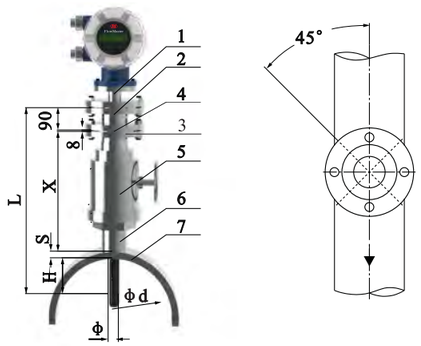
No.	Name\Diameter (mm)	DN200	DN300	DN400
1	Sensor (L×Φ)		182× Φ41	
2	Flange		DN40 1.6MPa	
3	Connecting pipe		Φ45	
4	Pipe		Φd×s	

Installation principle: Ensure the depth of the electrode inserted into the water pipe

H=(d-2s)×10%, namely A=182-(h+S)

(i.e. 10% of the inner diameter of the pipeline)

Note: If the production device is not allowed to be cut off, it can be installed under pressure. First, directly weld the base to the installation position of the pipeline to be measured, then install the root ball valve, and then open a hole with a diameter of Φ 42 mm ~ Φ 45 mm. After opening the hole, close the ball valve so that the fluid will not overflow, then connect the seal provided by the manufacturer, and then install the sensor. (Installation under pressure will not affect normal production). See the figure for specific dimensions and material specifications.



Installation principle: Ensure the depth of the electrode inserted into the water pipe as
H=(d-2S)×10%, so that X=L-90-8-S-(d-2S)×10%　　(i.e. 10% of the inner diameter of the pipeline)

(2) DN200mm, DN300mm, DN400mm (installation under pressure)

No.	Name\Diameter (mm)	DN200	DN300	DN400
1	Sensor (L×Φ)	182×Φ41		
2	Transition flange	DN40 1.6MPa		
3	Connecting flange	DN40		
4	Seal (provided by the manufacturer)	Φ45×3		
5	Ball valve	DN50		
6	Connecting pipe	Φ50		
7	Pipe	Φd×s		

(3) DN500mm~DN1200mm (installation under pressure)

Name \ Diameter (mm)	DN500	DN600	DN700	DN800	DN900	DN1000	DN1200
Sensor (L×Φ)	450×Φ41						
Transition flange	DN40 1.6MPa						
Connecting flange	DN40						
Seal (provided by the manufacturer)	Φ45×3						
Ball valve	DN50						
Connecting pipe	Φ50						
Pipe	Φd×s						

(4) DN1400mm, DN1600mm, DN1800mm (installation under pressure)

Name \ Diameter (mm)	DN1400	DN1600	DN1800
Sensor (L×Φ)	600×Φ41		
Transition flange	DN40 1.6MPa		
Connecting flange	DN40		
Seal (provided by the manufacturer)	Φ45×3		
Ball valve	DN50		
Connecting pipe	Φ50		
Pipe	Φd×s		

(5) DN2000mm~DN3000mm (installation under pressure)

Name \ Diameter (mm)	DN2000	DN2200	DN2400	DN2600	DN2800	DN3000
Sensor (L×Φ)	800×Φ41					
Transition flange	DN40 1.6MPa					
Connecting flange	DN40					
Seal (provided by the manufacturer)	Φ45×3					
Ball valve	DN50					
Connecting pipe	Φ50					
Pipe	Φd×s					

Note: All the above are steel pipe installation selection. If installed in cast iron and cement pipes, the fittings and models need to be customized.

3.2 Converter size

The MFP plug-in electromagnetic flowmeter converter is common to the pipeline converter of our company. Please refer to the introduction of specific dimensions of pipeline converter previously.

4. Selection of Sensors

4.1 Caliber

The plug-in type is related to the inner diameter of the pipeline, and the user needs to provide the data of the inner diameter of the pipeline so as to provide the corresponding piping. (Note: The inner diameter of the pipeline is DN200-DN3000). The plug-in electromagnetic flowmeter of our company has a minimum diameter of DN100, but compared with the pipeline electromagnetic flowmeter, it has no obvious advantage in price and accuracy, so it is suggested that the pipeline type be used.

4.2 Selection of structural materials

Code	Sensor material	Main performance	Scope of application
P	PVDF (polyvinylidene fluoride)	Excellent flame retardancy and heat resistance Very low permeability of gas and liquid Very high impact strength Stress cracking resistance Excellent dimensional stability Excellent mechanical properties Tough working conditions such as anti-corrosive chemicals and acidity	1. -25°C~60°C 2. Acidic, alkaline and other corrosive media

4.3 Selection of electrode materials

The selection of electrode materials should be determined by the user according to the corrosiveness of the measured medium, and the user can refer to the relevant anti-corrosion manual. This document is for reference only.

No.	Material	Corrosion resistance
1	316L	It is used for the measurement of water, sewage or slightly corrosive media of inorganic and organic acids.
2	Hastelloy C(HC)	It is resistant to the corrosion of oxidizing acid, such as nitric acid, mixed acid, or mixed medium of chromic acid and sulfuric acid, and the corrosion of oxidizing salts such as Fe+, Cu+ or other oxidants. For example, hypochlorite solution above normal temperature and seawater corrosion.
3	Titanium (Ti)	It is resistant to seawater, various chlorides and hypochlorite, oxidizing acids (including fuming nitric acid), organic acids and alkali, etc., and not resistant to pure reducing acids (such as sulfuric acid and hydrochloric acid). However, if the acid contains oxidants (such as nitric acid, Fe+, Cu+), the corrosion will be greatly reduced.
4	Tantalum (Ta)	It has excellent corrosion resistance, similar to glass. Except hydrofluoric acid, fuming sulfuric acid, fuming nitric acid and alkali, it can resist the corrosion of almost all chemical media (including boiling hydrochloric acid, nitric acid and sulfuric acid below 175°C,). It is not resistant to corrosion in alkali.
5	Platinum (Pt)	It has excellent corrosion resistance to various acids, alkali and various salts, not suitable for aqua regia and ammonium salts, poor corrosion resistance to some halogens, such as chlorine, bromine, iodine, hydrogen bromide, hydrogen chloride and hydrogen iodide, and no corrosion resistance when trace fluorine is contained in phosphoric acid.

4.4 Selection of IP grade

According to the national standard GB4208, the shell IP grade of instruments can be divided into the following categories:

Ip65: Water spraying type

It is allowed to spray water on the instrument from any direction with a faucet, with the water spraying pressure of 30kPa, the water output of 12.5L/Min and the nozzle distance of 3m from the instrument.

Ip67: Immersed type

The immersed instrument can be completely immersed in water (1m underwater) in a short time, with duration of 30 min.

Ip68: Submersible type

Submersible type can work underwater for a long time (5m underwater), and the maximum depth shall be negotiated with the manufacturer.

IP grade shall be selected according to the above requirements and actual conditions of instruments. If the instrument is installed under the ground and often flooded, or if the instrument is installed on the ground with high air humidity, it is advisable to choose the split type, sensor IP68 and converter in the protective box or indoors.

4.5 Selection of Cable

In principle, the distance between the sensor and the converter should be as short as possible, so that the converter is as close to the sensor as possible. The distance between the sensor and the converter is determined by the signal distribution capacitance and the conductivity of the liquid to be measured, and the measured medium must be a conductive liquid with a minimum conductivity of 5μs/cm. This is equivalent to the conductivity of deionized water. Generally, the conductivity of tap water and raw water is between 15 μs/cm and 500 μs/cm.

Note: The longest cable cannot exceed 30m.

4.6 Selection of junction box seal

The outgoing line sealing method of junction box is M20*1.5 sealing sleeve to seal the cable.

The commonly used M20*1.5 sealing sleeve has the same codes 1 and 5 in the selection table, but the difference is that code 1 requires the cable to be connected and filled with sealant before the product leaves the factory, while code 5 requires the user to complete these tasks.

4.7 System earthing

The electromagnetic flowmeter detects that the flow signal received by the electrode is very weak, so external interference has a great impact on it. Therefore, good earthing effect largely determines the measurement accuracy and stability of the flowmeter. The measured fluid acts as an electrolyte conductor and other unrelated electromagnetic interference must be excluded. Usually, the flowmeter is installed on a metal pipeline, which must be connected to the sensor for earthing.

4.8 Operating environment

Requirements of flowmeter for external environment

a. The flowmeter should be avoided to be installed in places with great temperature changes and exposed to high temperature radiation of equipment. If it must be installed, measures of heat insulation and ventilation should be taken.

b. The flowmeter should be installed indoors. If it must be installed outdoors, rain pouring, water flooding and sun exposure should be avoided, and moisture-proof and sun protection measures should be taken.

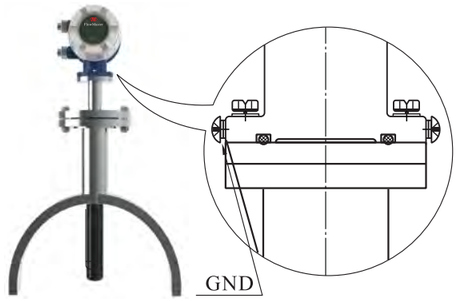
c. The flowmeter should be avoided to be installed in an environment containing corrosive gas, and ventilation measures should be taken when it must be installed.

d. There must be sufficient installation space around the flowmeter in order to facilitate installation and maintenance.

e. Strong magnetic fields and strong vibration sources should be avoided in the installation place of the flowmeter. If the pipeline vibrates greatly, there should be supports for fixing the pipeline on both sides of the flowmeter.

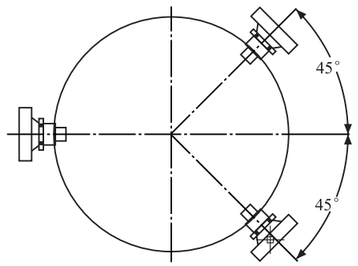
5. Selection of Sensor Installation Position

The sensor can be installed anywhere on the measured pipeline, but the pipeline must be completely filled with medium. The sensor can be installed on horizontal, inclined and vertical pipeline. If installed on a horizontal pipeline, it should be installed as shown in the following figure as far as possible. This installation method ensures that the electrode will always be immersed in the fluid and any bubbles will rise to the top. So that the electrodes are not insulated. When it is used for liquid which is easy to produce sediment, the sensor cannot be installed at the bottom of the horizontal pipeline to prevent sediment from covering the electrode.



Note
To be grounded, other electrical equipment should not beconnected to the same ground wire, and the groundingresistance should be less than 10 ohms

Correct position



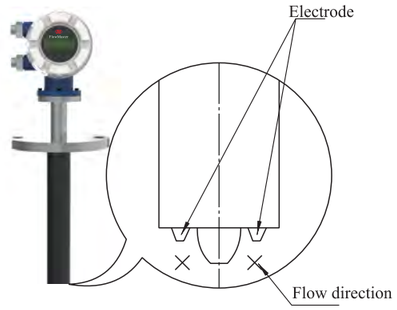
Optimum position: Horizontal or between -45° and +45°

During installation, the flow direction of fluid shall be ensured to be perpendicular to the drawing surface.

The sensor shall be installed on the pipeline full of medium, and there is always the possibility of swirling flow on the pipeline half full. It is also dangerous to install behind valves, elbows and tee joints. Because they are the root of the vortex. Therefore, the straight pipe section in front of the sensor is required to be at least > 10D, and the straight pipe section behind the sensor is > 5D. This avoids vortex and improves measurement accuracy. If the accuracy is required to be within ±0.5%, the straight pipe section in front of the sensor should be > 30D and the straight pipe section behind the sensor should be > 10D during installation.

6. Electrical Connection

The MFP plug-in electromagnetic flowmeter converter is common to the FlowMaster pipeline electromagnetic flowmeter converter of our company. Please refer to the introduction of the electrical connection of pipeline electromagnetic flowmeter converter previously.



7. Selection Table of MFP Plug-in

The MFP plug-in electromagnetic flowmeter consists of a sensor and a converter, and its model is expressed as follows:

Sensor | Converter | Optional certification and accessories

MFP XXX X X X X X X X X XX X X X X X X / L0XX / RX / PX

Main name

Caliber DN200-DN3200
Inner diameter of pipeline used on site
Three digits: the first and second digits of DN and the number of zeros following the first two digits (unit: mm)

Nominal pressure
5:1.6MPa S:ANSI 150

Lining material
P: PFA (polyvinylidene oxide)

Electrode material
1:316L 2: Hastelloy C 3:Titanium(Ti)
4: Tantalum (Ta) 5:Platinum(Pt)

Operating environment
1:General place -40°C< ambient temperature <70°Cand medium temperature <80°C
4:General place -40°C< ambient temperature <70°Cand medium temperature <180°C (split type only)
6:General place -20°C< ambient temperature <60°Cand medium temperature <80°C

Installation
0:Installation without pressure
1:Installation under pressure (recommended for >DN500)

Anticorrosive measures*a
1:Sensor body 304+ carbon steel mounting accessories
2:Sensor body 304+304 mounting accessories
3:Sensor body 304+ 316L mounting accessoriest
t4: Sensor body 316L+carbon steel mounting accessories
t5:Sensor body 316L + 304L mounting accessories
t6: Sensor body 316L+316 mounting accessories

Accuracy grade
C:Class 1.0(under reference conditions

Outgoing line seal
1:20 mm plastic seal (installed by the manufacturer when delivered)
2:GI/2 3:NPTI/2
4: NPT3/4 (button display only) 5:20 mm plastic seal (for user-mounted or integrate

Type
EH: Integrated type ER: Split type

Power supply
1:(100~230) +15%V AC47Hz~440Hz
2:11VDC~40V DC

Display assembly
4:With keyboard 3-line display 7:3-line display with magnetic button

Output signal
0: Standard output*b 1:Double current outputs 2:RS485
3:RART 4:Profibus-PA 5:Profibas-DP

Explosion-proofrequirements
1:Non-explosion-proof 5:Explosion-proof

Display direction
1:Standard direction 2:+90 3:+180 4:+270

IP code
1: IP65 for complete machine 2:IP67 for complete machine 3:IP67 for sensor;IP65 for converter
4:IP68 for sensor;IP65 for converter 5:IP68 for sensor;IP67 for converter

Cable length (L)
L0XX(XX is a two-digit cable length, <30m)

Certification (R)
R2:SIL certification

Other accessories(P)
P3:With independent tag P4:With surge protector P5:With instrument box P6:Specific factory information PS:Special accessories

Notes: a.The convcrtcr shell is made of cast aluminum and standard protctive paint. If other matcrials are needed, negotiation will be made.

Part III Specification and Selection of Accessories

1. FMS-1 Velocity Analog Signal Generator

1.1 Model and meanings



F M S－1
Design S/N
Simulator Simulator
Master Control
Flow Flow speed

1.2 Purpose and scope of application

FMS-1 is a kind of flow rate analog signal generator (hereinafter referred to as simulator), which can be used together with our products (converter). In the process of detecting and initializing the converter, this product can accurately and stably simulate the flow rate, and detect and modify the parameters of the converter. The main components of the simulator are CMOS integrated circuit and precision resistance, with the advantages of low power consumption, accuracy, large flow rate range and convenient use.

1.3 Main technical parameters

1) The simulator can work normally under the following conditions:

a) The ambient temperature is -25°C~ 65°C;

b) The air relative humidity is 5% ~ 85%;

c) The atmospheric pressure is 86kPa~108kPa;

d) The external magnetic field strength is not more than 400 A/M;

e) The mechanical vibration frequency is not more than 25Hz;

f) The mechanical vibration amplitude is not greater than 0.075mm;

g) The working voltage is 6V ~ 9VDC;

h) The ambient air does not contain any medium that corrodes nobelium and nickel coatings, nonferrous metals and their alloys, and inflammable and explosive substances.

2) The basic error limit of the flow rate simulator is ±0.5%;

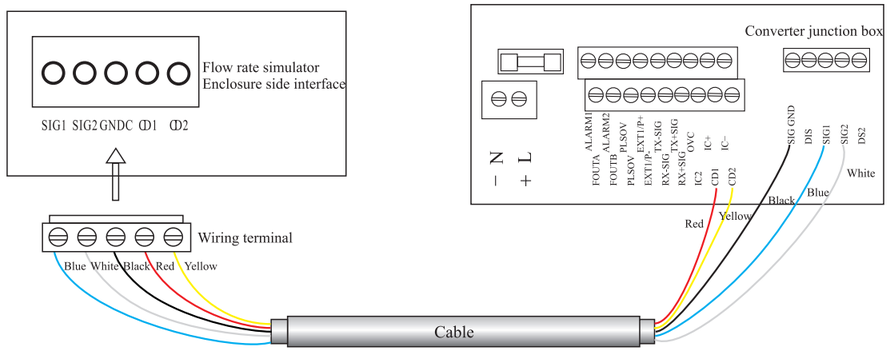
3) Flow rate direction: Positive (FWD) and negative (REV);

4) Flow rate range: 0.05 m/s ~ 20.0 m/s:

5) Working voltage: 9VDC.

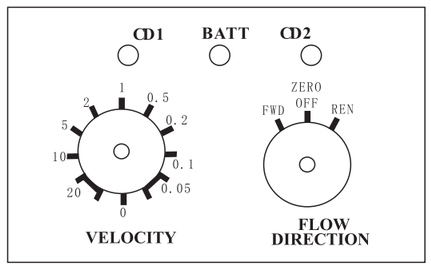
1.4 Usage and fault diagnosis

a) Connect the cable correctly to the simulator and the converter according to the following figure.



b) Turn on the super terminal of the computer to establish a connection between the computer and the converter.

c) Turn on the simulator and set it in FWD position (as shown below) to measure the forward flow rate; set it in REV position to measure the negative flow rate, and read and record the flow rate data after the flow rate at each point is stable.



d) Turn on the simulator. If CD1 and CD2 don't flash, first check whether the line connection is correct and reliable, especially the excitation line of the converter. If the line connection is correct, there is a problem with the internal circuit of the converter.

e) After recording the data, the LINEST function can be called to verify the D1 parameter of the converter and input the D1 value into the converter to complete the parameter setting of the converter.

f) Every 20 minutes or so, BATT will stop flashing, which is a normal timing function. If you want to continue to use it, you need to turn the knob to ZERO OFF and then to the positive and negative positions to restart the simulator. If the BATT stops flashing in less than 10 minutes, it proves that the battery voltage is not enough, and the battery needs to be replaced.

2. Measuring Range of MF Electromagnetic

Code	Diameter (mm)	Flow range (m^3/h)		Code	Diameter (mm)	Flow range (m^3/h)	
		Min.value	Max.value			Min.value	Max.value
030	2	0.013	0.509	301	300	127.235	5089.380
050	5	0.035	1.414	351	350	173.180	6927.212
060	6	0.051	2.036	401	400	226.195	9047.787
080	8	0.090	3.619	451	450	286.278	11451.105
090	9	0.115	4.580	501	500	353.429	14137.167
100	10	0.141	5.655	601	600	508.938	20357.520
120	12	0.204	8.143	701	700	692.721	27708.847
150	15	0.318	12.723	751	750	795.216	31808.625
200	20	0.565	22.619	801	800	904.779	36191.147
250	25	0.884	35.343	901	900	1145.111	45804.420
320	32	1.448	57.906	102	1000	1413.717	56548.667
400	40	2.262	90.478	112	1050	1558.623	62344.905
500	50	3.534	141.372	122	1200	2035.752	81430.080
650	65	5.973	238.918	142	1400	2770.885	110835.387
800	80	9.048	361.911	152	1500	3180.863	127234.500
101	100	14.137	565.487	162	1600	3619.115	144764.587
121	125	22.089	883.573	172	1700	4085.641	163425.647
151	150	31.809	1272.345	182	1800	4580.442	183217.680
201	200	56.549	2261.947	192	1900	5103.517	204140.687
251	250	88.357	3534.292	202	2000	5654.867	226194.667

Specification Sheet of Bolts for Electromagnetic Flowmeter Sensor (Flange Type)

Nominal diameter (mm)	Specification and quantity of single-head bolts, nuts and flat washers (sets)														
	6MPa			1.0MPa			1.6MPa			2.5MPa			4.0MPa		
DN2.5				M12	30	8	M12	30	8	M12	30	8	M12	30	8
DN5				M12	30	8	M12	30	8	M12	30	8	M12	30	8

Nominal diameter (mm)	Specification and quantity of stud bolts, nuts and flat washers (sets)														
	6MPa			1.0MPa			1.6MPa			2.5MPa			4.0MPa		
	Thread	Length	Quantity	Thread	Length	Quantity	Thread	Length	Quantity	Thread	Length	Quantity	Thread	Length	Quantity
DN10				M12	70	8	M12	70	8	M12	70	8	M12	70	8
DN15				M12	70	8	M12	70	8	Ml2	70	8	M12	70	8
DN20				M12	70	8	M12	70	8	M12	70	8	M12	70	8
DN25				M12	70	8	M12	70	8	M12	70	8	M12	70	8
DN32				M16	90	8	M16	90	8	M16	90	8	Ml6	90	8
DN40				M16	90	8	M16	90	8	M16	90	8	Ml6	90	8
DN50				M16	90	8	M16	90	8	M16	90	8	Ml6	90	8
DN65				M16	90	8	M16	90	8	M16	100	16	M16	100	16
DN80				M16	90	16	M16	90	16	M16	100	16	M16	100	16
DN100				M16	100	16	M16	100	16	M20	110	16	M20	120	16
DN125				M16	100	16	M16	100	16	M24	130	16	M24	130	16
DN150				M20	110	16	M20	110	16	M24	130	16	M24	150	16
DN200				M20	110	16	M20	110	24	M24	130	24	M27	150	24
DN250				M20	110	24	M24	130	24	M27	150	24	M30×2	170	24
DN300				M20	120	24	M24	130	24	M27	150	32	M30×2	180	32
DN350				M20	120	32	M24	150	32	M30×2	170	32	M33×2	200	32
DN400				M24	130	32	M27	150	32	M33×2	180	32	M36×3	230	32
DN450				M24	150	40	M27	170	40	M33×2	180	40	M36×3	230	40
DN500				M24	150	40	M30×2	170	40	M33×2	200	40	M39×3	250	40
DN600				M27	170	40	M33×2	180	40	M36×3	230	40	M45×3	280	40
DN700	M24	150	48	M27	170	48									
DN800	M27	170	48	M30×2	180	48									
DN900	M27	170	48	M30×2	200	56									
DN1000	M27	180	56	M33×2	220	56									
DN1200	M30×2	200	64	M36×3	230	64									
DN1400	M33×2	220	72	M39×3	220	72									
DN1600	M33×2	240	80	M45×3	260	80									
DN1800	M36×3	260	88	M45×3	260	88									
DN2000	M39×3	280	96	M45×3	260	96									

Note: Each set of DN2.5 and DN5 includes one single-head bolt and one flat washer:
Each set of DN10-DN2000 includes one stud bolt, two nuts and two flat washers. Flange standard: GB/T9119-2000

Code Table for High-end Intelligent Accessories

LS	Surge protector	
WS	Wireless transmission	
KS	Quick response	
DS	Three electrodes	
DS三电级	DS1	316L
	DS2	Hastelloy
	DS3	Titanium (Ti)
	DS4	Tantalum (Ta)
	DS5	Platinum-iridium alloy
	DS6	Tungsten carbide
	DS7	Platinum (Pt)
YS	Integrated IP68C lithium battery power supply < Dn800	

Reference Table for Anticorrosive Materials

Liquid			Electrode material						Lining material			
Name	Concentration (%)	Temperature (°C)	316L	HC	Titanium	Tantalum	Platinum	Platinum-iridium	PTFE	PFA	Polyurethane rubber	Chloroprene rubber
Sulfuric acid	2~5	R	N	A	N	A	A	A	A	A	N	A
Sulfuric acid	10	R	N	A	N	A	A	A	A	A	N	N
Sulfuric acid	25~60	R	N	A	N	A	A	A	A	A	N	N
Sulfuric acid	70~85	R	N	N	N	A	A	A	A	A	N	N
Sulfuric acid	90~96	R	N	N	N	A	A	A	A	A	N	N
Sulfuric acid	2~5	150	N	N	N	N	A	A	A	A	N	A
Sulfuric acid	5	180	N	N	N	N	A	A	A	A	N	N
Sulfuric acid	10~60	150~180	N	N	N	N	A	A	A	B	N	N
Sulfuric acid	77~80	150	N	N	N	N	A	A	A	A	N	N
Sulfuric acid	85~100	150	N	N	N	N	A	A	A	A	N	N
Nitric acid	7~65	R	A	A	A	A	A	A	A	A	N	N
Nitric acid	7~37	100~S	A	N	B	A	A	A	A	A	N	N
Nitric acid	50~100	50~S	N	N	B	A	A	A	A	A	N	N
Hydrochloric acid	0.5~10	R	N	B	A	A	A	A	A	A	N	B
Hydrochloric acid	15~30	R	B	B	A	A	A	A	A	A	N	B
Hydrochloric acid	37~Sat	R	B	B	N	A	A	A	A	A	N	B
Hydrochloric acid	5~10	50~60	N	N	B	A	A	A	A	A	N	B
Hydrochloric acid	0.5~5	150	N	N	A	A	A	A	A	A	N	N
Hydrochloric acid	37~Sat	150	N	N	N	A	B	B	A	A	N	N
Phosphoric acid	1~30	R	A	A	A	A	A	A	A	A	N	A
Phosphoric acid	45~90	R	A	A	B	A	A	A	A	A	N	A
Phosphoric acid	100	R	N	A	N	A	A	A	A	A	N	A
Phosphoric acid	1~10	140~S	A	A	N	A	A	A	A	A	N	A
Phosphoric acid	25~80	60~180	N	B	N	A	A	A	A	A	N	A
Phosphoric acid	90~Sat	150	N	N	N	A	A	A	A	A	N	A
Hydrofluoric acid	1~50	R~50	N	N	N	N	A	A	A	A	N	N
Hydrofluoric acid	50-70		N	N	N	N	A	A	A	A	N	N
Oxalic acid	5~10	R	A	A	A	A			A			A
Oxalic acid	25~50	R		A	A	A			A			A
Oxalic acid	Sat	R		N	B	A			A		N	N
Oxalic acid	5~Sat	S	N	N	N	A			A		N	N
Hydrobromic acid	~50	S	N	N		A	N	N	A	A		B

Liquid			Electrode material						Lining material			
Name	Concentration (%)	Temperature (°C)	316L	HC	Titanium	Tantalum	Platinum	Platinum-iridium	PTFE	PFA	Polyurethane rubber	Chloroprene rubber
Hypochloric acid	10~20		N	B		A	N	N	A	A		
Glacial acetic acid			N	A		A	A	A	A	A		
Fluosilicic acid	35		N	B		N	A	A	A			
Hydrocyanic acid	100		B	B	A	A	A	A	A	A	N	B
Sulphurous acid	10~Sat	R	N	N	N	A	A	A	A	A		N
Ammonium hydroxide	10~30	20~60	B	B	A	B	A	A	A	A	A	A
Barium hydroxide	Sat		B	N	N	N	A	A	A	A	A	A
Calcium hydroxide	25		N	B		A	A	A	A		A	A
Potassium hydroxide	10~50	R	B	A		A	A	A	A	A		A
Potassium hydroxide	10~50	S	B	A	N	N	A	A	A	A		A
Aluminum hydroxide	100		B	N		A	A	A	A	A		
Magnesium hydroxide	100		N	N		N	A	A		A		
Sodium hydroxide	~10	R	A	A	A	A	A	A	A	A		A
Sodium hydroxide	20~50	R	B	A	A	B	A	A	A	A		A
Sodium hydroxide	10~20	~150	A	A	A	A	A	A	A	A		A
Sodium hydroxide	30~50	70~150	N	A	B	N	A	A	A	A		
Sodium hydroxide	50	180	N	B	B	N	A	A	A	A		
Sodium hydroxide	60~100	~150	N	B	B	N	A	A	A	A		A
Ammonium sulfate	20~Sat		N	N	B	A	A	A	A	A	A	
Barium sulfate	100		N	N	B	A	A	A	A		A	B
Calcium sulfate	1~10	R~S	A	A	A	A	A	A	A			N
Chromic sulfate	100		N	B		A	A	A	A	A		N
Potassium sulfate	10~20	R~50	A	A	A	A	A	A	A			A
Potassium sulfate	100		B	N	B	A	A	A	A	A		
Aluminum sulfate	100		B	B	B	A	A	A	A	A	B	A
Aluminium potassium sulfate	100		B	N	A	A	A	A	A	A		
Magnesium sulfate	10~100	R~S	B	N	A	A	A	A	A	A		A
Magnesium sulfate	5~50	~100	B	A	A	A			A			A
Manganese sulfate	~Sat	R	A	A	A	A			A			A
Manganese sulfate		20~50	B	A	A	A	A	A	A			A
Manganese sulfate		S	B	B	B	A	A	A				
Sodium sulfate	~Sat	R~S	N	N	N	A	A	A	A	A		A
Nickel sulfate			N	N		A	A	A	A		A	A
Ammonium bisulfate	50以下		N	N		A	A	A	A	A		A

Liquid			Electrode material						Lining material			
Name	Concentration (%)	Temperature (°C)	316L	HC	Titanium	Tantalum	Platinum	Platinum-iridium	PTFE	PFA	Polyurethane rubber	Chloroprene rubber
Calcium bisulfate	100		N	B	A	A	A	A		A		
Sodium bisulfate	10~Sat	R~S	N	N		A	A	A	A	A		
Ferric sulfate			N	B		A	A	A	A			A
Copper sulfate	5~Sat	R~S	B	B	B	A	A	A	A		A	A
Zinc sulfate			B	B		A	A	A	A			A
Ferrous sulfate	10~40		N	N		A	A	A	A	A		
Sodium chloride	Sat	R~S	N	A	B	A	A	A	A	A		
Sodium chloride	30%		N	B	A	A	A	A	A	A		A
Ammonium chloride	Sat以下	R~S	N	B	B	A	A	A	A	A		A
Barium chloride	20~30	R~100	N	B	B	A	A	A	A	A	A	A
Calcium chloride	100		N	N		A	A	A	A		B	A
Mercury chloride			N	N		A	A	A	A			
Potassium chloride	10~Sat	R~S	B	N	A	A	A	A	A	A	A	A
Lithium chloride	100		N	B	A	A	A	A	A			
Magnesium chloride	10~42	R~S	N	B	B	A	A	A	A	A		A
Nickel chloride	10~20	R~60	N	B	A	A	A	A	A	A	A	A
Nickel chloride	30~80	95~S	N	N	A	A	A	A	A	A	A	A
Ferric chloride	10~Sat	R~S	N	A	A	A	N	N	A	A		B
Copper chloride (divalent)	20~Sat	R~S	N	N	B	A	N	N	A	A	A	A
Stannic chloride	~100	R	B	A	A	A			A	A		A
Stannic chloride	~100	150	N	A	A	A			A	A		A
Zinc chloride	10~60	R	B	A	A	A			A	A		A
Zinc chloride	10~20	S	B	A	A	A	A	A	A	A		A
Zinc chloride	50~60	S	B	B	B	A			A	A		A
Zinc chloride	100	S	N	B	N	A			A	A		A
Chlorosulfonate		R~S	N	A	N	A	A	A	A	A		N
Sodium sulfite	25~100	R~S	N	N		A	A	A	A	A		B
Aqua regia	100		N	N	B	A	N	N	A	A		N
Sea water		R	B	A	A	A	A	A	A			N
Ammonia	10	R	A	A	A	A	A	A	A			
Ammonia	10~100	S以下	B	A	A	N	A	A	A	A		A
Glucose syrup			A	A		A	A	A	A	A	A	A
Pulp		R~S	B	A	A	A	A	A	A			N
Papermaking green liquor			A	A		A	A	A	A	A		N

Liquid			Electrode material						Lining material			
Name	Concentration (%)	Temperature (°C)	316L	HC	Titanium	Tantalum	Platinum	Platinum-iridium	PTFE	PFA	Polyurethane rubber	Chloroprene rubber
Papermaking black liquor			B			A	A	A	A		N	N
Papermaking white liquor			N	N		A	A	A	A			B
Clay slurry			N	B		A	A	A	A		B	A
Well drilling mud	~100	R	A	A		A	A	A		N	A	N
Methanol	~100	S	A	A	A	A	A	A	A	A		A
Methanol	5~50		B	A	B	A	A	A	A	A		A
Hydrogen peroxide			B	B		A	A	A	A		N	
Alumina			A	A		A	A	A	A	A		N
Alumina slurry	10	100以下	A	A		A	A	A	B	A	A	B
Aluminium chloride	25~100	100以下	N	N	A	B	A	A	A			A
Aluminium chloride	100		N	N	N	B	A	A	A			A
Aluminum fluoride	100		N	N		N	A	A	A	A		
Aluminum chlorate			N	N		A	A	A		A		
Coal water slurry			A	A		A	A	A	B	A	A	A
Lime slurry			N	B		A	A	A	A		A	A
Limestone slurry	50		N	B		A	A	A	A		A	A
Urea			A	A			A	A	A			N
Dye	1.5~10	R	A	A		A	A	A	A		N	N
Lactic acid	1.5~10	S	A	A	A	A			A			B
Lactic acid	Sat	S	N	A	A	A			A			B
Lactic acid			N	N	A	A			A			B
Dairy products			A	A		A	A	A	B		N	N
Syrup			A	A		A	A	A		A	N	N
Mud			A	A	A	A	A	A	A		N	B
Sewage				A	A	A	A	A	A		A	A

Symbol description: A- Applicable; B- Available, short life; N- Can't be used; Blank- No data; R- Room temperature; S- Boiling point; Sat- Saturation

The above is for reference only. It is the customer's responsibility to select the materials with required specifications, especially the highly corrosive fluids.

Ordering Consultation Form

Ordering Consultation Form of Electromagnetic Flowmeter

Purchaser: _____ Address: _____

Contact _____

Tel: _____ Qty: _____

Model						
Outer diameter/wall thickness of pipeline			Pipe material			
Medium name		Operating temperature (°C)		Conductivity (us/cm)		
Operating pressure Mpa (G)		Electrode		Lining		
Sensor IP grade			Converter IP grade			
Nominal diameter (DN)		Flange standard/series	☐I Series ☐II series	Body material		
Connection type	☐Flange connection ☐Clamp connection ☐Joint connection		Pressure grade			
Flow range	m^3/h		Minimum			
			Normal			
			Maximum			
Working pressure	MPa(G)		Operating temperature	°C		
Installation method	☐Split ☐Integrated			Cable length		
Power supply mode	☐24V.DC ☐220V.AC ☐22V0V+3.6V ☐24V+3.6V ☐3.6V lithium battery					
Output signal	☐Standard output ☐Double current outputs☐RS485 HART☐PA☐DP☐FF					
Electrical interface size	☐20mm plastic seal ☐1/2G ☐1/2NPT					
Accuracy grade	☐Class 2 ☐Class 3 ☐ Class 5☐ Class 1 (plug-in type only) ☐ Class 2 (plug-in type only)					
Explosion-proof grade	☐E×ia/de IICT4 ☐E×ia/de ☐IICT5 ☐E×ia/de IICT6 ☐None ☐Others					
Required accessories	▫External flange ☐Grounding ring ☐Grounding electrode					
Others						