

Hebei Shanghong Meters Technology Co., Ltd.

Add: Room 1501,Ximei Huajie building, Qiaoxi District, Shijiazhuang City,Hebei,China.

Skype :nancy.05310 Tel: 0086 319 3131898

Whats app / Wechat: 0086 13131984716

E-Mail: info@sh-mech.com info.shmech@gmail.com

URL: www.shmeters.com

# ELECTROMAGNETIC FLOWMETER



**SH METERS**

All for you service needs!

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## COMPANY PROFILE

As the China's leading manufacturer and distributor with more than 50 years experiences, we have developed a comprehensive water meter range for the Commercial Agriculture, Industrial and Domestic market. Moving with the changes in technology and precision metering has been the mission of the company since its genesis and we are adding metering that can support water sustainability using.

Since 2009, we start the export business to the whole world, and hope more and more countries and region people can save the water with us together. Nowadays, SH-MECH Meters have already become one of the most important exporter for water flow meters in China.

# OUR SERVICES

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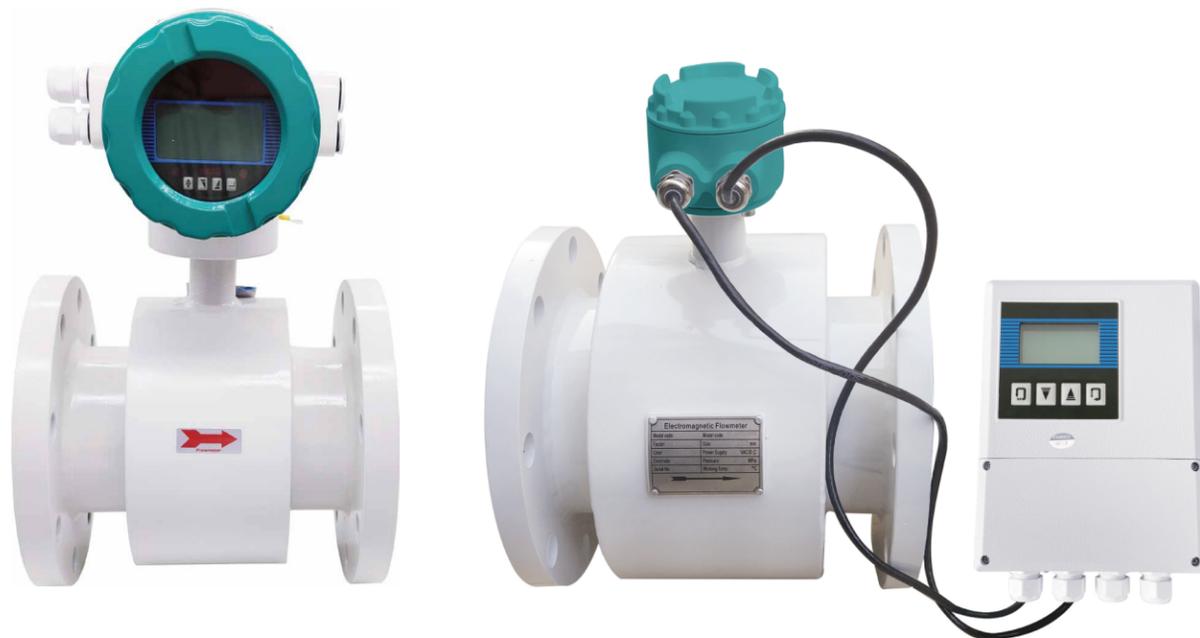


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# SH METERS Electromagnetic Flowmeter



## Overview

Intelligent electromagnetic flow meter is a kind of flow meter with high accuracy and reliability. It is used to measure the volume flow of liquid and slurry in closed pipelines, and is widely used in power, petroleum, chemical, coal, metallurgy, minerals, paper making, water supply and drainage, food, medicine and other industries.

## Scope of application

Chinese and English display intelligent converter adopts 16-bit embedded microprocessor. Full digital processing, with two-way flow measurement function, instantaneous flow and positive and reverse accumulation and difference accumulation, used to measure the volume of conductive medium such as fresh water, sewage, acid, alkali, salt solution or liquid-solid two-phase fluid flow.



## Features

- Flow measurement is not affected by changes in fluid density, viscosity, temperature, pressure and conductivity.
- There are no obstructing flow parts in the measuring tube, no pressure loss, and low requirements for the straight pipe section.
- The converter adopts LCD backlight display, which can make the degree easier under direct sunlight or in a darkroom.
- Set parameters by touching the infrared ray button, which can be safely set without opening the cover of the converter in harsh environments.
- The flow meter is a two-way measurement system with three integrators: forward total, reverse total and difference total; it can display forward and reverse flow and has multiple outputs: current, pulse, digital Communication, HART.
- The converter has self-diagnostic alarm output, no-load detection alarm output, flow upper and lower limit alarm output, batch processing control and other functions.
- Not only can be used for general process detection, but also suitable for the measurement of ore pulp, paper pulp, and paste liquid.
- The high-pressure electromagnetic flowmeter sensor adopts PFA meshing lining technology, which is resistant to high pressure and negative pressure, and is specially used in petrochemical and mineral industries.
- Explosion-proof instruments can be used in corresponding explosion-proof places.



## Measuring principle

The measuring principle (see Figure 1) is based on Faraday's law of electromagnetic induction. That is: when the conductive liquid cuts the magnetic induction line in the magnetic field, the induced electromotive force is generated in the conductor, and E is:

$$E=KBVD$$

K: instrument constant

B: Magnetic induction intensity

V: the average flow velocity in the measuring tube section

D: Measuring tube inner diameter

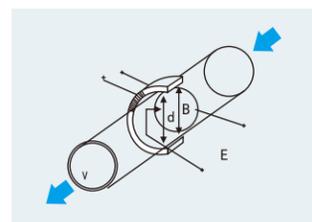


Figure 1

When measuring flow, the fluid passes through a magnetic field perpendicular to the direction of flow. The flow of the conductive liquid induces a voltage signal proportional to the average flow rate (ie volume flow). The induced voltage signal is detected by two motors that are in direct contact with the liquid, and transmitted to the amplifier through the cable, and then converted into a unified current output signal.

## Product parameters

Nominal diameter: DN3-DN3000

Nominal pressure: 0.6-4.0MPA (special pressure can be customized)

Accuracy:  $\pm 0.5\%$  of the indicated value

Lining material: polyurethane rubber / chloroprene rubber / polytetrafluoroethylene / silicone lining

Electrode form: standard type / scraper type / replaceable type

Electrode material: 316L / Haz alloy B / Haz alloy C / titanium / tantalum / platinum

Medium temperature:

- Integrated type:  $-20\text{ }^{\circ}\text{C} \sim +70\text{ }^{\circ}\text{C}$

- Split type: 1. Polyurethane rubber, neoprene, PTFE, silicon-fluorine lining

2. PTFE lining / PFA lining / F46 lining

Ambient temperature:  $-25\text{ }^{\circ}\text{C} \sim +40\text{ }^{\circ}\text{C}$

Ambient humidity: 5 ~ 100% RH (relative humidity)

Dielectric conductivity:  $\geq 20$

Measuring range: 1500: 1 Flow setting  $< 15\text{m} / \text{s}$

Structure: integrated / split / immersion / explosion proof

Protection grade: IP65 / IP67 / IP68 optional

Explosion-proof grade: Exmd II CT4

Product standard: JB / T9248-1999 electromagnetic flowmeter

## Technical performance parameters

Power Supply	AC220V 50Hz /DC24V/3.6V	
Power consumption	<15W (Supporting power consumption with sensors)	
Display and buttons	Display in Chinese and English, can display instantaneous flow, cumulative flow and alarm display (excitation open circuit alarm, empty pipe alarm, flow limit alarm). 4 membrane touch switches for data setting.	
Counter	Forward total, reverse total	
Output signal	Analog output	Two-way two-way, fully isolated 0~10mA/4~20mA Load resistance: 0 ~ 1.5k $\Omega$ when 0 ~ 10mA; 0 ~ 750 $\Omega$ when 4 ~ 20mA
	Frequency output	Forward and reverse flow output, the upper limit of output frequency can be set within 1 ~ 5000Hz. Open collector bidirectional output of transistor with photoelectric isolation. External power supply is not greater than 35V, the maximum current of the collector when conducting is 50mA.
	Alarm Output	Two open-collector alarm outputs with photoelectric isolation transistors. The external power supply is not greater than 35V, and the maximum current of the collector when it is turned on is 250mA. Alarm status: fluid empty pipe, excitation disconnection, flow overrun.
	Pulse output	Forward and reverse flow output, the upper limit of output pulse can reach 5000CP / S. The pulse equivalent is 0.0001 ~ 1.0m <sup>3</sup> / P. The pulse width is automatically set to 20ms or square wave. Open collector output of transistor with photoelectric isolation. External power supply is not greater than 35V, the maximum current of the collector when conducting is 50mA.
Matching accuracy	$\pm 0.5\%$ of market value, optional 1% of indicated value	
Damping time constant	Continuous variable from 0 ~ 100s (90%) time grading optional	
Communication	Optional RS232C or RS485 serial communication interface, HART communication protocol, with anti-lightning protection	
Loss of power	The internal design of the instrument has a power-off clock, which can store 16 drop-out records (10 years)	
Protection level	IP65	
Explosion-proof mark	Exs[ia]ia cT5	

## Selecting flowmeter type

### ● Integral type and split type

Both integral type and split type have their own advantages, and basic principals for selection are as follows: the split type is usually used in situations inconvenient for one-site maintenance and numerical reading when debugging is difficult or the flowmeter is often immersed in water and with other functions, It is also used in poor application situations, such as high temperature fluid, a position with vibration source and explosive environment. In most cases, both the integral type and the split type can meet use requirements.

### ● General type and explosion-proof type

Users shall confirm to select a general type or an explosion-proof type according to application environment of the flowmeter.

### ● The diameter of the sensor and that of technological pipeline.

Generally, It is suggested not to select reducing pipe for the sake of convenient installation, provided that the use flow in the flowmeter pipe shall be within the range of 0.3m/s~10m/s. This kind of selection is usually applicable to a newly-designed project for which current work situation is not only considered when choosing a flow speed, but also a situation of running at full load of the device in the future shall also be considered. For the relationships among the flux, velocity and diameter, see curve graph. However, sometimes we also choose a sensor with a different diameter with the connectotechnological pipeline diameter, for example:

1. The flow speed in the pipeline is low and the process flow is stable,in order to meet the demand of instrument to flow range, to improve flow speed at local of the flowmeter, select a sensor with smaller diameter than the diameter of the technological pipeline, and additionally connect a reducing pipe at front and rear part of the sensor.
2. In terms of large diameter electromagnetic flowmeter, the diameter is larger,the price is higher, as for the situations with low flow speed in the pipeline and stable technological parameter, small diameter flowmeter maybe chosen, this not only runs the flowmeter under good working state, but also reduces investment cost at the same time.

### ● Selection of grounding ring material

Grounding ring material can be the same as the electrode material, generally material with the same corrosion resistance as the pipeline material is selectable.

### ● Selection of lining material

Lining material should be selected according to the type and working temperature of measured fluid. PFA is a fluorinated plastic, has good corrosion resistance to strong acid, strong alkali, at the same time has good high temperature resistance, does not deform at high temperature. Insulation resistance is not reduced.99.9%high purity alumina is used for making ceramic lining so that the instrument can measure the flow with high precision. In comparison with traditional high polymer material, ceramics can not create high temperature, high pressure deformation, and have good wear resistance.

### ● Selection of protection grade

Degrees of protection provided by enclosure are as follows according to GB4208-84, International Electrotechnical Commission(IEC) standards(IEC529-76);

IP65 is an anti-spray type, i.e.a water faucet is allowed to spray water to the instrument in any directio. The pressure of spray water is 30KPa(0.3bar). Water yield is 12.5 liters/minute. The distance between spray water and the instrument is 3m, IP67 is an anti-immersing type, i.e.theinstrument can be totally immersed in the water in a short time. The highest point is 150cm below the water during test. The duration time is 30minIP68 is a submerged type, which can work in the water for a long period. The maximum depth immersed is negotiated by manufacturers and users.

The selection principles of protection grade are determined by the abovementioned requirements and actual working conditions of the instrument. If the instrument is installed underground and often immersed under water, it"s suggested to select IP68. If the instrument is installedabove the ground and the environment is not wet, choose IP65.

Because the voltage of sensing signals of the electromagnetic flowmeter is small, it is easily affected by the noise. The reference potential must bethe same as the measured fluid. So the reference potential (terminal potential) of the sensor, the reference potentials of coverter and amplifier are the same as the measured fluid. And the fluid potential should be the same as the ground potential. The electromagnetic flowmeter is equipped with a grounding ring , which plays a role in establishment of fluid ground by contacting the fluid, at the same time, protecting the lining.

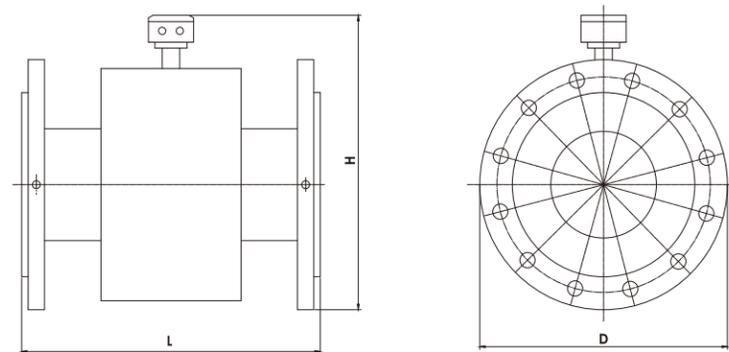
## Lining material

Material	Main performance
Polyurethane rubber	<ol style="list-style-type: none"> <li>1. Very good wear resistance, like coal slurry, mud, ore slurry, etc.</li> <li>2. Not resistant to acid, alkaline and other corrosive or high temperature media.</li> <li>3. There must be no negative pressure in the pipeline.</li> </ol>
Neoprene	<ol style="list-style-type: none"> <li>1. Very good elasticity and wear resistance.</li> <li>2. Capable of measuring domestic sewage, non-corrosive industrial sewage PH value: in the range of 6/7/8, temperature below 80 ℃ liquid.</li> <li>3. There must be no negative pressure in the pipeline.</li> </ol>
Teflon F-4 PTFE	<ol style="list-style-type: none"> <li>1. Boiling-resistant hydrochloric acid, sulfuric acid, nitric acid, aqua regia, concentrated alkali and various organic solutions.</li> <li>2. Strong abrasion resistance and poor bonding performance.</li> <li>3. There must be no negative pressure in the pipeline.</li> </ol>
Perchloroethylene propylene F-46(PTFE)	<ol style="list-style-type: none"> <li>1. On the basis of all functions of PTFE, the temperature of non-corrosive liquid can be increased within 140 degrees.</li> <li>2. Not resistant to fuming nitric acid, butyl lithium.</li> <li>3. There must be no negative pressure in the pipeline.</li> </ol>
Silicone fluoride lining	Temperature resistance: 70 degrees, mainly high temperature. It can be used to measure hot water in heating systems, and is not resistant to corrosion.

## Electromagnetic flowmeter electrode material

Material	Corrosion performance
316L electrode	Application: domestic / industrial water, sewage. PH value: within 6/7/8 Not applicable: corrosive media such as hydrofluoric acid / hydrochloric acid / chlorine / iodine.
HB	Application: certain concentration of hydrofluoric acid and other oxidizing acids and non-oxidizing hydrochloric acid, alkali solution with a concentration of not less than 70% sodium hydroxide. PH value: within 5/6/7/8 Not applicable: Oxidizing acids such as nitric acid.
HC	Application: corrosion resistance to oxidizing salts or environments containing other oxidants, especially to seawater. PH value is within: 6/7/8/9 Not applicable: hydrochloric acid, dilute sulfuric acid, phosphoric acid and other reducing acids and chlorides.
T1	Application: chloride, hypochlorite, sea water, oxidizing acid. PH value: within the range of 6/7/8/9/10 Not applicable: hydrochloric acid, sulfuric acid and other acidic media.
Ta	Application: concentrated hydrochloric acid, nitric acid, sulfuric acid and other acid liquids, including boiling hydrochloric acid and nitric acid. PH value: within 3/4/5/6 Not applicable: alkali, hydrofluoric acid, fuming sulfuric acid.
Pt	Various acids, bases, salts. Not included: Royal Water.

## Converter dimensions



3~3000mm Flange sensor outline drawing

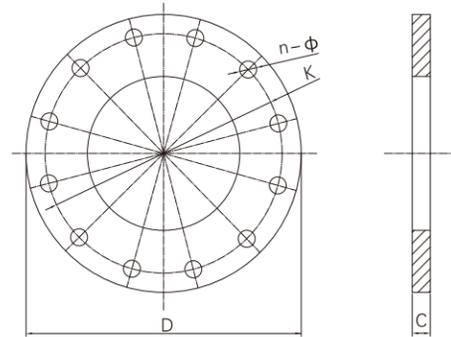
## Appearance and installation dimensions

Nominal diameter (mm)	Nominal pressure (Mpa)	Dimensions			Weight(kg)
		L (including lining)	D	H	
6	4.0	200	90	220	6
10		200	90	220	6
15		200	95	220	8
20		200	105	220	10
25		200	115	223	12
32		200	140	240	13
40		200	150	250	14
50		200	165	263	15
65	1.6	250	185	283	18
80		250	200	290	20
100		250	235	318	25
125		250	270	350	28
150		300	300	380	30
200		350	340	430	50
250		450	405	495	70
300		500	460	547	95
350	1.0	550	520	602	120
400		600	580	665	140
450		600	640	720	160
500		600	715	783	200
600		600	840	897	280
700		700	895	982	350
800		800	1015	1092	400
900		900	1115	1192	480
1000	0.6	1000	1230	1299	550
1200		1200	1405	1488	660
1400		1400	1630	1700	750
1600		1600	1830	1924	850
1800		1800	2045	2134	980
2000		2000	2265	2344	1200
2200		2200	2475	2549	1600
2400		2400	2685	2754	2000
2600	2600	2905	2964	2400	
2800	2800	2905	3169	2700	
3000	3000	3315	3369	2900	

## Flange size table

Execution standard for connecting flange:

4.0MPa (DN6mm~DN50mm)	GB/T9119-2000
1.6MPa (DN65mm~DN250mm)	JB/T81-94
1.0MPa (DN300mm~DN1000mm)	JB/T81-94
0.6MPa (DN1200mm~DN3000mm)	JB/T81-94



Nominal diameter (mm)	Nominal pressure (Mpa)	D	K	Φ	n	C
4.0	6	90	60	14	4	14
	10	90	60	14	4	14
	15	95	65	14	4	16
	20	105	75	14	4	16
	25	115	85	14	4	16
	32	135	100	18	4	18
	40	145	110	18	4	18
	50	160	125	18	4	20
1.6	65	180	145	18	4	24
	80	195	160	18	8	24
	100	215	180	18	8	26
	125	245	210	18	8	28
	150	280	240	23	8	28
	200	335	295	23	12	30
	250	405	355	25	12	32
1.0	300	440	400	23	12	28
	350	500	460	23	16	28
	400	565	515	25	16	30
	450	615	565	25	20	30
	500	670	620	25	20	32
	600	780	725	30	20	36
	700	895	840	30	24	36
	800	1010	950	34	24	38
	900	1110	1050	34	28	42
	1000	1220	1160	34	28	44

Nominal diameter (mm)	Nominal pressure (Mpa)	D	K	Φ	n	C
0.6	1200	1400	1340	33	32	32
	1400	1630	1560	36	36	32
	1600	1830	1760	36	40	34
	1800	2045	1970	39	44	36
	2000	2265	2180	42	48	38
	2200	2475	2390	42	52	42
	2400	2685	2600	42	56	44
	2600	2905	2810	48	60	46
	2800	3115	3020	48	64	48
	3000	3315	3220	48	68	50

## Daily maintenance

Make the direct inspection for the electromagnetic flow meters, check the surrounding, clean the dust and dirt, make sure no water inside and others, and check the line is connected, check if have the electromagnetic equipment or the new electric wire across the meters. If the medium easy pollute the electrode or deposit, scaling on the inside of tube, it should be clean on time.

## Notice

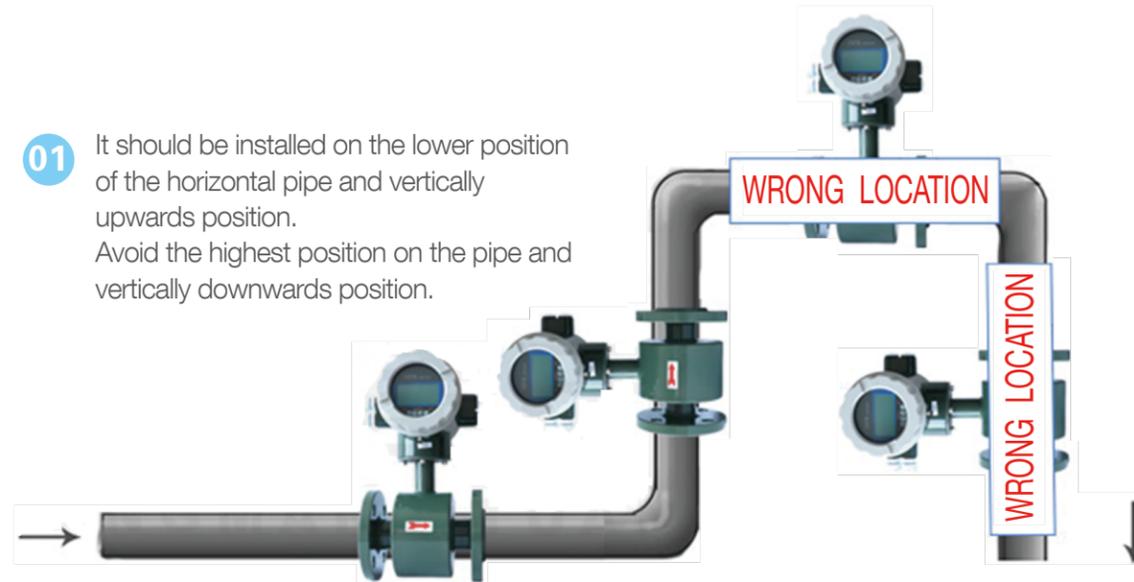
1. It should be avoid the electromagnetic equipment to avoid the sensor send the signal.
2. It should be install in dry and ventilate place, avoid the sunshine and rain, the temperature should be  $-20 \sim +6^{\circ}\text{C}$ , relative humidity should be less 85%. If the humidity more bigger, it should be dampproof to avoid the humidity into the line box.
3. When install the electromagnetic flow meters, it should be guarantee the surrounding have enough space to install and repair.

## Requirement for the Surrounding

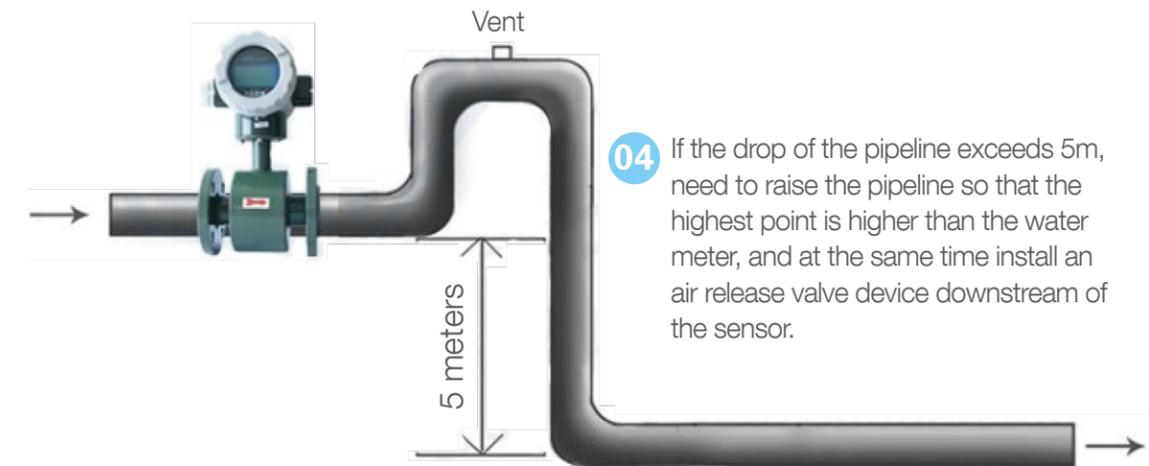
1. The electromagnetic flow meters should not install the place where the temperature change a lot, or the place been high-temperature radiation.
2. The installation place for the electromagnetic flow meters more better if inside of house, if must be install outside, it should be avoid the rain and heavy water, and sunshine, it should have dampproof and sunscreen.
3. The electromagnetic flow meters should be avoid to install the place where is have corrosivity air, if can't avoid the corrosivity air, it should have ventilate solution.
4. When install the electromagnetic flow meters, it should be guarantee the surrounding have enough space to install and repair.
5. The install place for the electromagnetic flow meters should be avoid the magnetic field and heavy vibration, if the pipeline have the heavy vibration, it request install the support equipment to steady the meters.

**Product installation**

**01** It should be installed on the lower position of the horizontal pipe and vertically upwards position. Avoid the highest position on the pipe and vertically downwards position.



**03** For U-shaped pipeline installation, it should be installed in the lower position of the pipeline.



**05** The sensor must not be installed at the water inlet position of the pump, it should be installed at the water outlet position of the pump.



**06** There should be at least 10 \* D (D is the inside diameter of the flowmeter) straight pipe section in front of the flowmeter, and 5 \* D length straight pipe section in the rear.



**Partial dielectric electrode and lining corrosion-resistant material selection list**

Name	Density	Temperature	316L	HC	Ti	Ta	Pt	PTFE	PFA	PU	PCP
Acetic acid Acetic acid	5~10	R~S	A	A	A	A	A	A	A	N	A
	50以上	R~S	N	A	A	A	A	A	A	N	N
	S	R~S	N	A	A	X	A	A	A		N
Aluminum chloride	10	100以下	N	N	A	B	A	A			A(M)
	25~100	100以下	N	N	N	B	A	A			A(M)
Ammonia	10	R	A	A	A	X	A	A			
	10~100	S以下	B	A	A	N	A	A	A		A(M)
Brine		R~S	B	A	A	X	A	A		N	A(M)
Citric acid	5~25	R~S	A	A	A	X	A	A			A(M)
	50	R	A	A	A	X	A	A			A
	50	S	A	A	B	X	A	A			A(M)
Copper sulfate	5~50	R~S	B	B	B	A	A	A		A(M)	A(M)
	50~Sat	R~S	B	B	B	X	A	A		A(M)	A(M)
Fatty acid	100	R	A	A	A	X	A	A			B
	100	S	B	A	A	X	A	A			N
	100	135	A	A	A	X	A	A			B(M)
	100	315	A	B	A	X	A	A			
hydrochloric acid HB	0.5~5	R	N	X	A	A	A	A	A		B
	10~20	R	N	B	A	A	X	A	A		B
	37	R	B	N	N	A	X	A	A		B
	10	50	N	B	N	A	A	A	A		B
	5	60	N	N	A	A	A	A	A		B
	0.5~5	S	N	N	A	X	A	A	A		N
Glucose syrup	10~37	S	N	N	N	X	X	A	A		N
	100		N	N		N	A	A	A		
Nitric acid	7~65	R	X	X	X	A	A	A	A		B
	7~65	S	X	N	X	A	A	A	A		N
	100	R	N		X	A	A	A	A		N
	100	50~S			A	A	A	A	A		N
Phosphoric acid	1~30	R	X	X	B	A	A	A	A		A
	45~Sat	R	B	X	N	A	A	A	A		A
	80~Sat	140~150	N	N		A	A	A	A		A(M)
Potassium hydroxide	10~20	R	A	X	N	N	A	A	A		A
	20~50	R	B	X		N	A	A	A		A
	10~50	S	B	X	A	N	A	A	A		A

**Explanation of symbols:** A-applicable; B-available, short life; N-unavailable; X-corrosion resistant, but not recommended; blank-no data; R-room temperature; S-boiling point; Sat-saturation; Highest temperature resistance in the lining.

**Flow rate-flow rate comparison table**

Flow m <sup>3</sup> /h DN mm	0.5	1	2	3	4	5	10
10	0.1414	0.2827	0.5654	0.8482	1.1309	1.4137	2.8271
15	0.3181	0.6362	1.2723	1.9085	2.5447	3.1809	6.3625
20	0.5655	1.1310	2.2619	3.3929	4.5239	5.6549	11.3103
25	0.8836	1.7671	3.5343	5.3014	7.0686	8.8357	17.6714
32	1.4476	2.8953	5.7906	8.6859	11.5812	14.4765	28.9533
40	2.2619	4.5238	9.0478	13.5717	18.0956	22.6195	45.2384
50	3.5343	7.0686	14.1372	21.2058	28.2743	35.3429	70.6862
65	5.9730	11.9459	23.8918	35.8377	47.7836	59.7295	119.4591
80	9.0478	18.0956	36.1911	54.2867	72.3823	92.4779	180.9563
100	14.1372	28.2743	56.5487	84.8230	113.0973	141.3717	282.7432
125	22.0893	44.1786	88.3573	132.5359	176.7146	220.8932	441.7861
150	31.8086	63.6173	127.2345	190.8518	254.4690	318.0863	636.1733
200	56.5487	113.0973	226.1947	339.2920	452.3893	565.4867	1130.9735
250	88.3573	176.7146	353.4292	530.1438	706.8583	883.5729	1767.1464
300	127.2345	254.4690	508.9380	763.4070	1017.8760	1272.3450	2544.6901
350	173.1803	346.3606	692.7212	1039.0818	1385.4424	1731.8030	3463.6063
400	226.1947	452.3893	904.7787	1357.1680	1809.5574	2261.9467	4523.8932
450	286.2776	572.5553	1145.1105	1717.6658	2290.2210	2862.7763	5725.5533
500	353.4292	706.8583	1413.7167	2120.5750	2827.4334	3534.2917	7068.5835
600	508.9380	1017.8760	2035.7520	3053.6281	4071.5041	5089.3801	10178.7601
700	692.7212	1385.4424	2770.8847	4156.3271	5541.7694	6927.2118	13854.4242
800	904.7787	1809.5574	3619.1147	5428.6721	7238.2295	9047.7868	18095.5741
900	1145.1105	2290.2210	4580.4421	6870.6631	9047.7868	11451.1052	22902.2102
1000	1413.7167	2827.4334	5654.8668	8482.3002	11309.7336	14137.1669	28274.3344
1200	2035.7520	4071.5041	8143.0082	12214.5122	16286.0163	20357.5204	40715.0412
1400	2770.8847	5541.7694	11083.5389	16625.3083	22167.0778	27708.8472	55417.6941
1600	3619.1147	7238.2295	14476.4589	21714.6884	28952.9179	36191.1474	72382.2951
1800	4580.4420	9160.8842	18321.7684	27482.6526	36643.5367	45804.4209	91608.8423
2000	5654.8667	11309.7336	22619.4671	33929.2007	45238.9342	56548.6678	113097.3363
2200	6842.3887	13684.7776	27369.5552	41054.3328	54739.1104	68423.8880	136847.7763
2400	8143.0080	16286.0163	32572.0326	48858.0490	65144.0653	81430.0816	162860.1631
2600	9556.7247	19113.4268	38226.8536	57340.2804	76453.7072	95567.1340	191134.2683
2800	11083.5387	22167.0774	44334.1548	66501.2322	88668.3095	110835.3869	221670.7741
3000	12723.4500	25446.9001	50893.8001	76340.7002	101787.6002	127234.5003	254469.0011



















