Electro Magnetic Flowmeter

Model：PT124B-501A/B

Description

Electromagnetic flowmeter is composed of the sensor and smart converter, and the sensor consists of measuring tube, electrodes, excitation coils, iron core and shell and other components. After the traffic signal is amplified, processed and operated by convertor, you can see the instantaneous flow, cumulative flow, output pulse, analog current and other signals for the measurement and control of fluid flow. It is suitable for the conductive medium whose conductivity is more than 5us/cm, it possesses a variety of power supply and output signal , using the standard RS485 serial communication interface, supports the international standard MODBUS protocol and GPRS and other wireless or wired communication network methods, also has the accumulative pulse equivalent output. It has the measurement, display , remote data transmission, wireless remote control, alarm, remote wireless meter reading system (computer management software and databases) , and other functions.

Functional characteristics

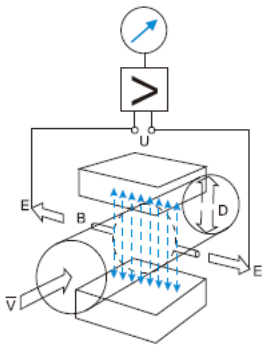
- ◆ Excellent measurement repeatability and linearity
- ◆ Good reliability and anti-interference performance
- ◆ Good pressure resistance sealing ability
- ◆ standard RS485 serial communication interface
- ◆ variety power supply and signal output
- ◆ supports standard MODBUS protocol and GPRS
- ◆ Low pressure loss measurement tube
- ◆ High intelligentization , Maintenance-free

Application

- ◆ petroleum, chemical engineering, steel,
- ◆ food, electricity, paper, water treatment,
- ◆ water supply, heat supply, environmental
- ◆ protection and other industries.

Working principle

The working principle is based on Faraday's law of electromagnetic induction. The two electromagnetic coils of upper and lower ends in the right figure generate a constant or alternating magnetic field, and the induced electromotive force can be detected by the space of flowmeter wall between two electrodes on the left and right when the conductive medium flows through the electromagnetic flowmeter. The induced electromotive force is proportional to the conductive medium velocity, the magnetic flux density of the magnetic field and the conductor width (flowmeter tube diameter), then the medium flow can be achieved through operation.



The induced electromotive force process parameters equation:

E= K B V D

E—induced electromotive force; D—measuring tube diameter;

B—magnetic induction intensity; V— average velocity;

K—it is a coefficient that relates to the field distribution and axial length;

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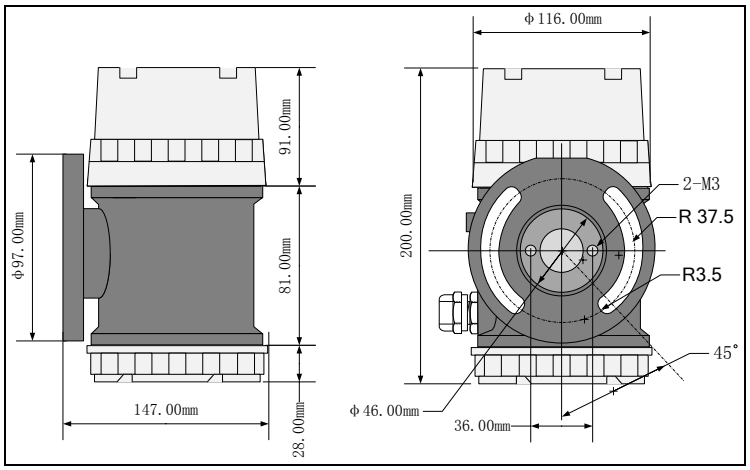
Performance parameter

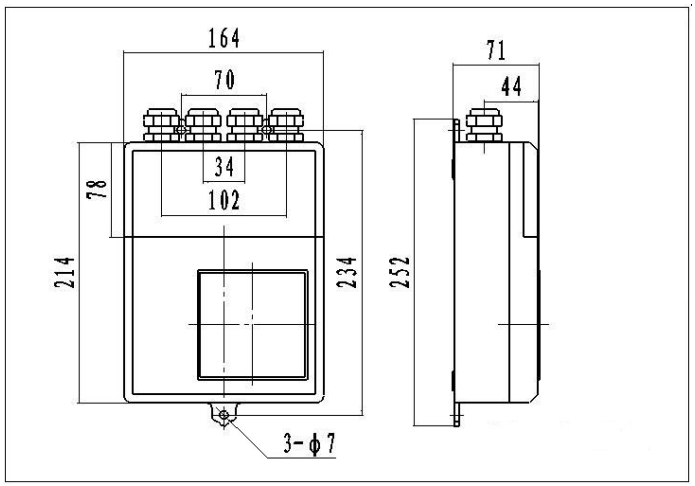
Nominal diameter	3-3000mm			
velocity range	0-10m/s			
Degree of accuracy	±0.5%R, ±1%R (< DN20)			
Medium conductivity	≥5μS/cm, Actual conductivity≥30μS/cm			
Nominal pressure	1.0MPa	1.6MPa	2.5MPa	4.0MPa
	DN15-DN800	DN15-DN800	DN15-DN600	DN15-DN50
Environment temperature	Sensor	0℃- +80℃ or -25℃- +120℃ or +70℃- +250℃		
	Incorporate type	-10℃- +55℃		
Highest medium temperature	Incorporate type	+80℃		
	Separate type	CR chloroprene rubber liner (CR)		+80℃
		Polytetrafluoroethylene lining (F4)		+120℃
		Polite lining (F46)		+120℃
		Teflon (PFA)		+180℃
		Fluorosilicone rubber (FVMQ)		+250℃
Output signal	4-20mA, Pulse/Frequency 2kHz(Default), 5KHz(Max)			
Cable entry size	M20*1.5 (Standard nylon waterproof connector, optional explosion-proof metal connector)			
Supply voltage	110/220VAC (100-240VAC), 50Hz/60Hz; 24VDC±10%			
Power dissipation	≤15VA			
Digital communication	RS-485, support standard Mudbus protocol; GPRS			
Signal / Ground electrode material	Stainless steel 316L, Hastelloy C, Hastelloy B, titanium, tantalum, platinum			
Form of electric pole	Interpolating, extrapolating electrode need to customize			
Number of electrodes	Standard configuration 3-4 electrodes(two measuring electrodes plus a grounding electrode),according to the caliber configuration			
Flange standard	Conform to the international GB9119(customize according to customer's demand)			
Flange material	Standard carbon steel and stainless steel are needed to be customized			
Grounding ring material	Stainless steel, and stainless steel that contains molybdenum, etc.			
	DN12-DN450	Stainless steel 1 Cr18Ni9Ti(Ordinary austenitic stainless steel SUS321)		
Housing material	Standard carbon steel and stainless steel are needed to be customized			
Level of protection	Separate body-type			IP68, IP65
	Incorporate type			IP65
Interval/wire length (separate body-style)	10m standard configuration connecting line, optional 15m, 20m, 25m, 30m			

Converter Demension

PT124B-501A

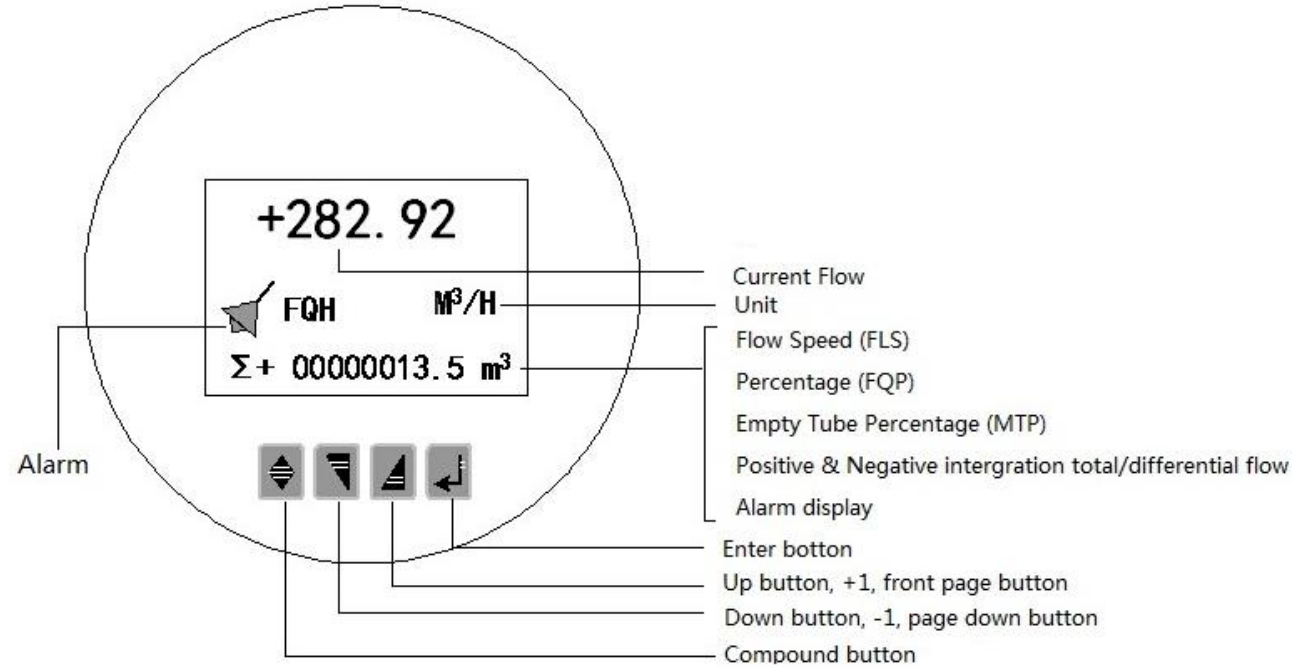


PT124B-501B

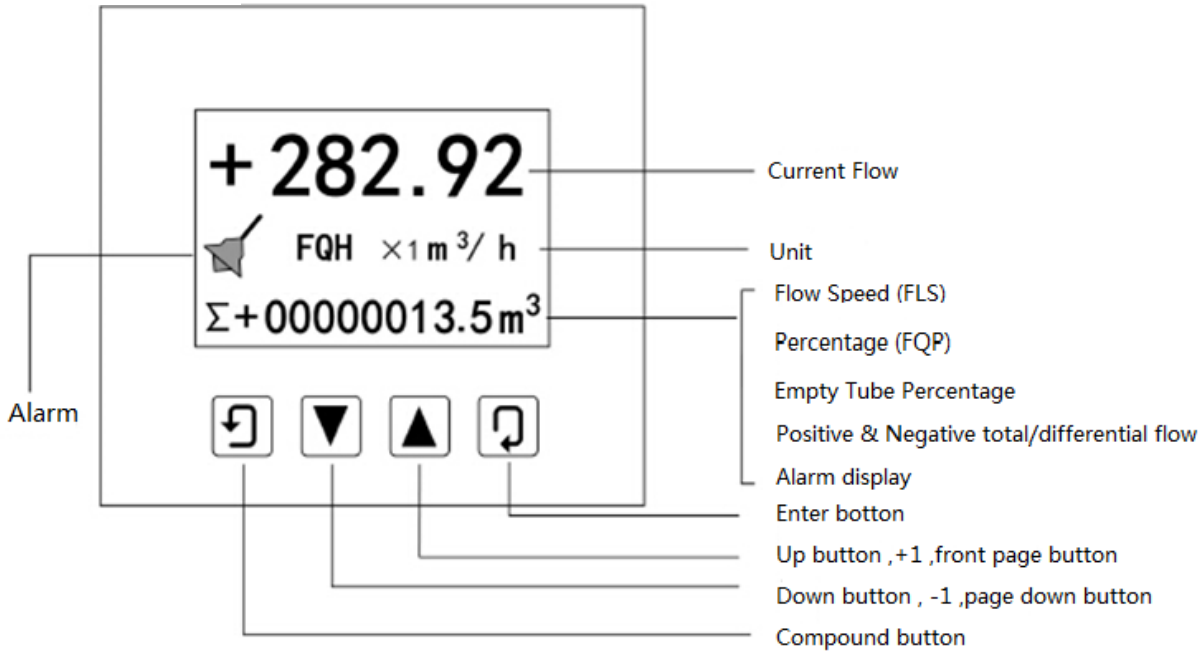


Converter menu structure and parameter settings

Incorporate type



Seperate type



Electro Magnetic Flowmeter

Pressure level

◆Pressure level means that the default pressure rating of sensor that can withstand is 1.0Mpa, this is adaptable to most electromagnetic flowmeters occasions. typically, pressure that loaded by sensors is determined by the applying pressure of medium inside the flow pipe through a device(such as a pump, etc.), the excess of the sensors rated pressure can cause a leak of electromagnetic flowmeter so that it cannot work properly and even damage the electromagnetic flowmeter.

◆Other pressure ratings such as 0.6MPa, 1.6MPa, 2.5MPa, 4.0MPa, ultra-high pressure levels and so on.

◆In the selection of pressure rating, it should leave a margin. for example, the working pressure of medium inside the pipe is 0.8Mpa, then 1.6Mpa at least is selected as the electromagnetic flowmeters pressure rating.

Installation form

◆ flange mounting , It needs to cooperate with the mounting way of flow pipe. Flange mounting need to install a flange interface on the flow pipe that is measured.

◆ The tube pipe that can be installed with electromagnetic flowmeters has a stainless steel, cast iron pipes and PE pipes, and different pipes need to select electromagnetic flowmeters that have different installation forms, and they need to be grounded when installation. PE pipe and other non-metallic pipes should pay a special attention during installation.

Caliber

Caliber of electromagnetic flowmeter should generally match the caliber of flow pipe that is measured, and selection of caliber should match flow rate of the medium, which can be seen the caliber selection table, and try to make the usual flow of the measured medium lies in the yellow font area of the table.

Caliber optional table

Caliber DN(mm)	Volume flow q_v (m^3/h)													
V(m/s)	0.57	0.7	0.9	1.1	1.4	1.7	2.3	2.8	3.4	4.5	5.7	6.8	9.1	
25	1.0	1.2	1.6	2.0	2.5	3.0	4.0	5.0	6.0	8.0	10	12	16	
32	1.6	2.0	2.5	3.0	4.0	5.0	6.0	8.0	10	12	16	20	25	
40	2.5	3.0	4.0	5.0	6.0	8.0	10	12	16	20	25	30	40	
50	4.0	5.0	6.0	8.0	10	12	16	20	25	30	40	50	60	
65	6.0	8.0	10	12	16	20	25	30	40	50	60	80	100	120
80	10	12	16	20	25	30	40	50	60	80	100	120	160	
100	16	20	25	30	40	50	60	80	100	120	160	200	250	
125	25	30	40	50	60	80	100	120	160	200	250	300	400	
150	40	50	60	80	100	120	160	200	250	300	400	500	600	
200	60	80	100	120	160	200	250	300	400	500	600	800	1000	
250	100	120	160	200	250	300	400	500	600	800	1000	1200		
300	160	200	250	300	400	500	600	800	1000	1200	1600	2000		
350	200	250	300	400	500	600	800	1000	1200	1600	2000	2500		
400	250	300	400	500	600	800	1000	1200	1600	2000	2500	3000		
450	300	400	500	600	800	1000	1200	1600	2000	2500	3000			

Note:

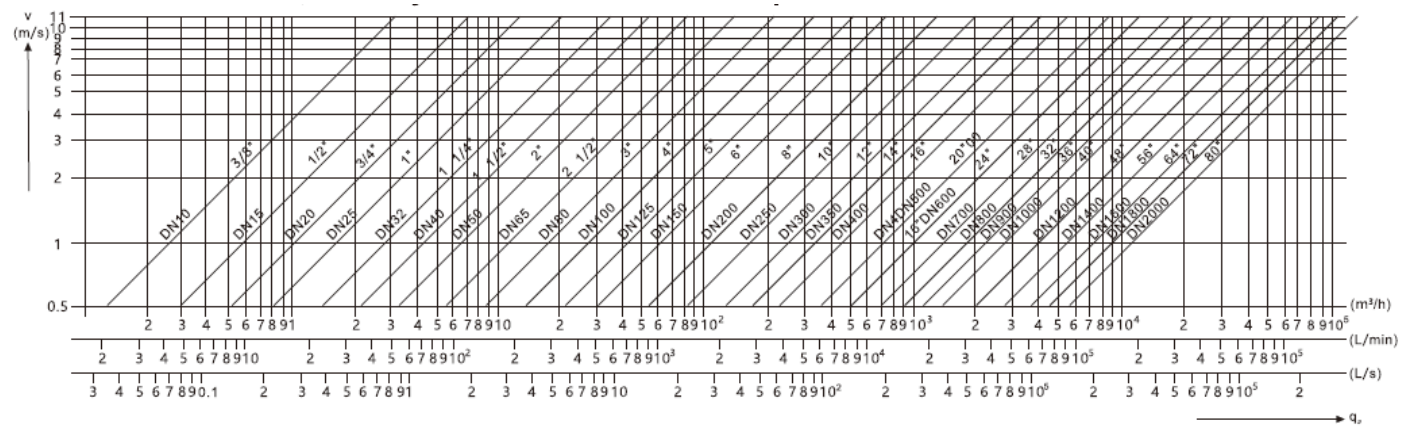
1. The flow/velocity data in table is the approximate value, the yellow area is the recommended flowmeter flow/velocity rate.
2. Other calibers can be customized.

The velocity and flow conversion formula: velocity V=354 ×flow q_v/D2;

qv-m3/h, v-m/s, D (DN)-mm;

Velocity range: 0.3-10m/s

Flowmeter diameter, velocity and flow rate relationship curve



The situation where caliber of option sensor is same with the connected technology pipe caliber

◆Usually, the option flowmeter caliber is the same with caliber of process piping, which not only meets the project needs, but also easily installs, as well as has no pressure loss, and the recommendation flow rate is within the range of 0.5-5m/s.

◆The new design project not only considers the current work but also consider the full load operation of the equipment in the future when choose the flow rate. when the new equipment is running, the flow rate is at a low state, the inner tube keeps a high flow rate state when normally generated.

◆In the premise of the correct selection, simply changing the settings of the instrument range can be adapted to different flow rates.

Electrode material

◆Electrode is used to obtain traffic signals, which will directly contact with the measured medium, so when chooses the electrode material, the suitability between the electrode material and measured medium is needed to be considered, namely that the corrosion resistance of the electrode material, passivation, water, and other factors are needed to considered.

◆You can choose a variety of electrode materials(including stainless steel 316L,Hastelloy B(HB), HastelloyC(HC), titanium(Ti), tantalum(Ta), platinum (Pt), etc.) to accommodate different measurement medium.

◆The selection of electrode materials should be determined according to the corrosive property of medium, and the corrosion resistance of the electrode material should be determined according to the corrosive property of medium, and the corrosion resistance of the electrode material can be seen in the table of electrode material corrosion resistance and use range, more detailed information can be found in the preservation manual.

The corrosion resistance and the use range table of the electrode material

Material	Corrosion Resistance
Stainless steel 316L	Application: 1. Domestic water , industrial water , raw water wells , urban pollution . 2. weak corrosive acid , alkali ,salt solution
Hastelloy B (HB)	Application: 1. Non-oxidizing acid , such as hydrochloric acid (concentration is less than 10%) 2. the alkali (part) , for example, sodium hydroxide (concentration is less than 50%), all concentrations of ammonium hydroxide solution 3. Acid (part),such as phosphoric acid and organic acid NA: nitric acid
Hastelloy C (HC)	Application: 1. mixed acid , for example: a mixed solution of chromic acid and sulfuric acid 2. oxidizing salts , such as Fe^{3+}, Cu^{2+}, sea water NA: Hydrochloric acid .
Titanium (Ti)	Application: 1.Salt (part) , for example : (1)Hydrogen chloride(chloride/magnesium/aluminum/calcium/ammonia/iron etc . (2) the sodium , potassium, hydroxide, ammonium hydroxide barium hydroxide alkaline solution which have a less than 50% concentration NA: hydrochloric acid , phosphoric acid, sulfuric acid , hydrofluoric acid and other reducing acids .
Tantalum (Ta)	Application: 1.strong acid ,such as hydrochloric acid (concentration is less than 40%),sulfuric acid and concentrated sulfuric acid (not including oleum) 2. chlorine dioxide ,ferric chloride, hypochlorous acid, sodium cyanide and lead acetate . 3. oxidizing acids such as nitric acid(including fuming nitric acid) and the aqua regia whose temperature is below $80^{o}C$. NA: alkali, hydrofluoric acid
Platinum	Application: 1.almost all acids , alkalis ,salt solutions (including fuming sulfuric acid ,fuming nitric acid) NA: aqua regia ,ammonium salt

Lining material

◆ Lining material is selected according to the corrosion, abrasion resistance and temperature of the measured medium, and the adaptability of lining material which is commonly used can be seen in the performance table for common lining material suitable.

◆ Rubber has the wear-resisting feature and is widely used for the measurement water, industrial water, waste water, sewage, pulp, mud fiber pulp and other mediums.

◆ PTFE lining has excellent resistance to acid and strong alkali, it also a reliable heat resistance and won't deform under a high temperature and reduce the performance of the insulation resistance, non-stick property, which isn't bonded with other material , surface smooth , a high measurement of viscosity or readily stuttering

medium , or corrosive medium , or the situation where high temperature medium or regularly flushing medium pipe using steam and the food which has the hygiene requirements .

Common lining materials application performance table

Inner Lining material	Name	Symbol	Performance	Maximum working temperature	application caliber
Rubber	CR	CR	1.Resistance to oil ,solvent, oxidation and general acid and alkali salt and other corrosive mediums. 2.It has excellent flexibility , abrasion resistance , but a poor resistance to cold .	1. 0°C~+80°C non-strong acid , alkali oxidizing mediums 2.Measurable sewage and mud	DN6-DN2200
Fluoro-plastics	PTFE	PTFE or F4	1.It is the material which has the most stable chemical properties among plastics and cab bear the boiling hydrochloric acid , sulfuric acid ,nitric acid and aqua regia, in addition , it can be also resistant to concentrated alkali and various organic solvents ,but not to chlorine trifluoride, high temperature trifluoride oxygen , high velocity fluid fluorine, oxygen and ozone corrosion . 2.poor wear resistance 3.Poor ability to resist negative pressure	1.-25°C~+120°C 2.Concentrated acid , alkali and other strong corrosive mediums. 3.Health category medium .	DN10-DN600
	Poly FEP	FEP or F46	1.-25°C~+120°C Non-strong grinding medium . 2.Health category medium .	1.-25°C~+120°C Non-strong grinding medium . 2.Health category medium	DN6-DN200
	Teflon	PFA	Performance is close to teflon	1.-10°C~+180°C Non-strong grinding medium 2.Health category medium .	need to customized

Highest Temperature

◆ Highest temperature is mainly determined by the temperature of the measured medium, the flow field conditions (velocity) and other conditions, and sometimes there also needs to consider the influence of the ambient temperature.

◆The temperature of the medium in the pipe flow is usually higher than the standstill condition. if the still temperature of measured medium is close to a certain selection range(for example, the maximum temperature A1 level 80℃), then select a higher level using temperature option. for example when the still temperature of the measured medium is 70℃ so that it recommended that users choose the highest temperature option A2 is less than or equals to 120℃.

◆ To obtain accurate measured medium temperature, it recommends that users install the temperature measurement instrument in the measured medium pipe.

Electro Magnetic Flowmeter

Flowmeter structure

Incorporate type (Model No.: PT124B-501A)

◆Under good environmental conditions of the site, generally choose the incorporate type, that is the combination of sensor and converter.

◆Sensors and intelligent are assembled together, prices and installation costs are more economical, and the visual display is more intuitional.

◆When installed in an inaccessible place, the maintenance is inconvenient.

◆Prevent the electronic component of smart converter from being influenced by pipe fluid temperature.

◆Avoid directly installing outdoor or using in harsh environment.

◆Default protection class of incorporate type is IP65.

Separate type (Model No.: PT124B-501B)

Select the separate body-type when use in the following cases:

◆Ambient temperature or converter surface temperature is greater than 55℃.

◆Piping vibration is larger or High humidity or corrosive gas.

◆The aluminum case of converters will be seriously corroded.

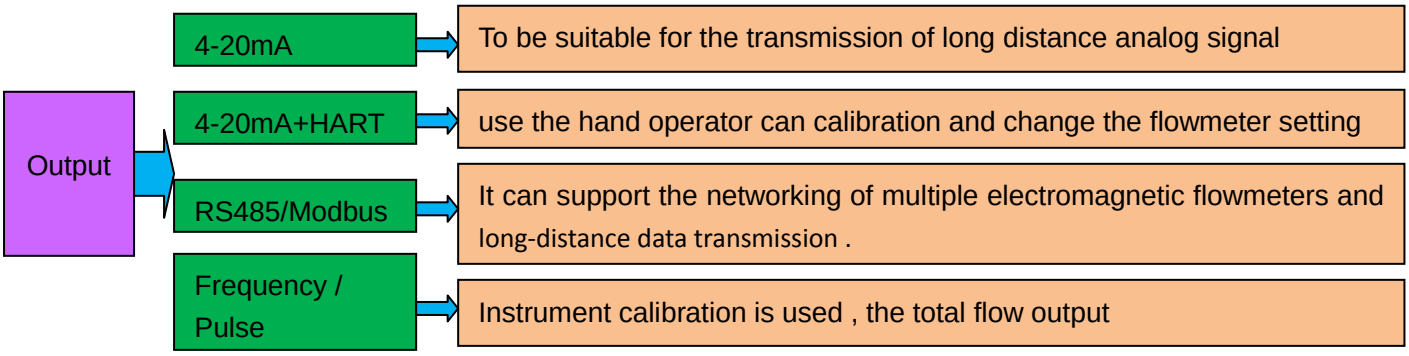
◆Flowmeter is installed at high altitude or underground debugging and other inconvenient occasions.

◆The default protection class of underground debugging and other inconvenient occasions.

◆The default protection class of separate body-type is IP68.when there is no need to immerse into water or other special conditions, we can choose the separate body-type electromagnetic flowmeter of IP65 protection class

Output signal

our electromagnetic flowmeter output signals are 4-20mA, 4-20mA+HART ,RS485/Modbus, Frequency / Pulse,Users need to select the output signal according to the actual situation and ancillary equipment.

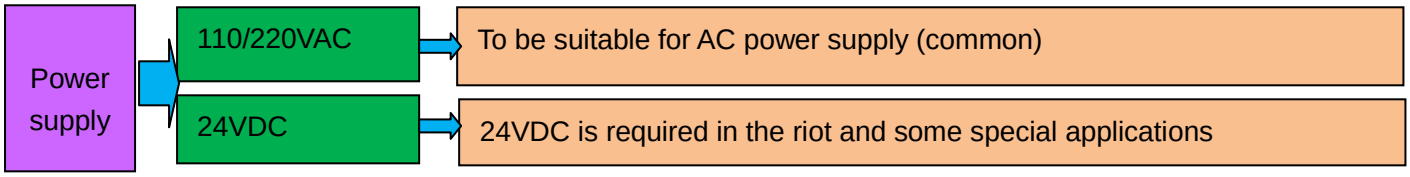


IP Grade

In accordance with the national standard GB 4208-48 or the IEC standards (IEC529-76) on shell protection grade , Protection class selection principles should be selected based on the actual conditions of instrumentation and the above requirements, if the meter is below ground and is often affected by flooding, so we should select IP68; if the meter is installed above ground and non-exposed environment, the choice is IP65.

Working power supply

The power supply of our electromagnetic flowmeter has AC 110/220V (100-240V), and DC24V.



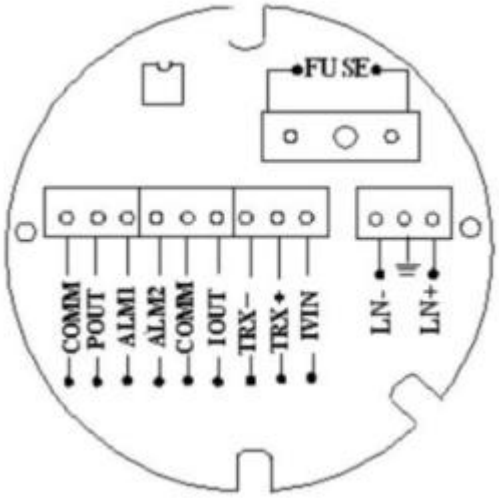
Grounding ring option

◆The grounding ring is used for non-conducting installation pipes to make it conductive to improve the stability of the electromagnetic flowmeter, and to increase the convenience and reliability of use, which is enough to achieve good grounding effect. . The grounding ring needs to be in contact with the measuring fluid, presenting the possibility of corrosion and wear. In general, the grounding ring should be replaced after a period of use.

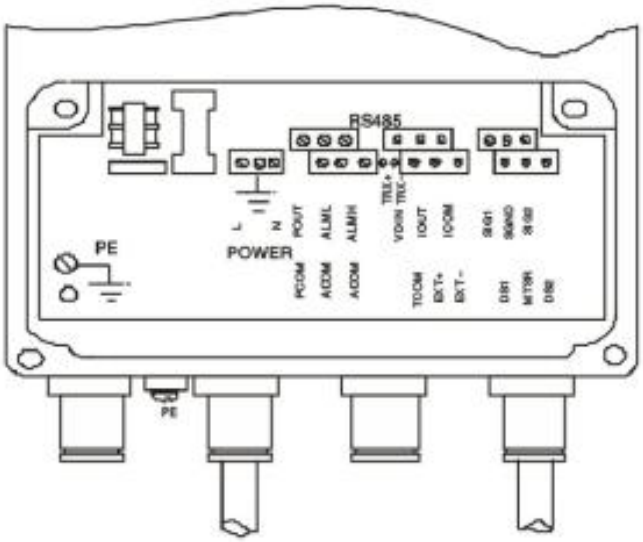
◆ Some small-caliber electromagnetic flowmeters have only two electrodes. The user can select a double grounding ring according to the needs of the site. When installing, place it in the correct position of the pipe to avoid measuring the fluidity of the process fluid.

Terminal wiring diagram

POUT:	Two-way flow frequency (pulse) output
ALM1:	Upper limit alarm output 1:
ALM2:	Lower limit alarm output 2:
COMM:	Frequency pulse current common (ground)
COMM:	Frequency pulse current common (ground)
IOUT:	Flow current output (two-wire current output)
IVIN:	Two-wire 24V voltage input
TRX+:	Communication input
TRX-:	Communication input
LN+:	220V power supply input
LN-:	220V power supply input

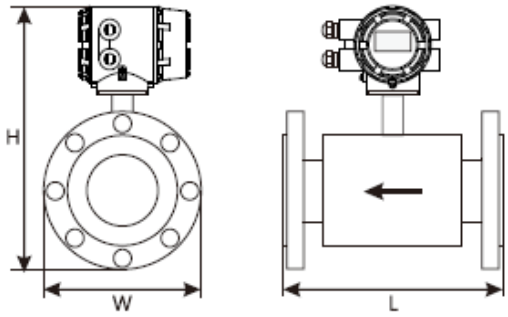


SING 1	Signal 1
SNGD	Signal ground
SING 2	Signal 2
DS1	Excitation Shielded 1
DS 2	Excitation Shielded 2
EXT+	Excitation current +
EXT-	Excitation current -
VDIN	Two-wire 24V voltage input
IOUT	Analog current output
ICOM	Analog current output ground
POUT	Flow frequency pulse output
PCOM	Flow frequency pulse output ground
ALMH	Upper limit alarm output 1:
ALML	Lower limit alarm output 2:
ACOM	Alarm output ground
TRX+	Communication input
TRX-	Communication input
TCOM	232 communication ground

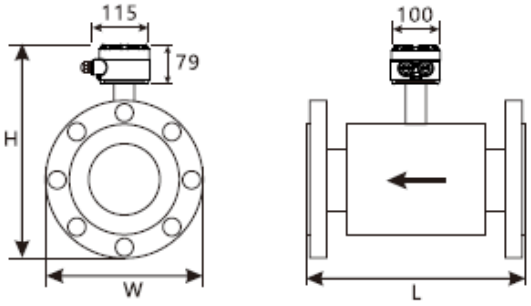


The overall and mounting dimension of our flowmeters

Flange type (incorporate type)



Flange (separate type)



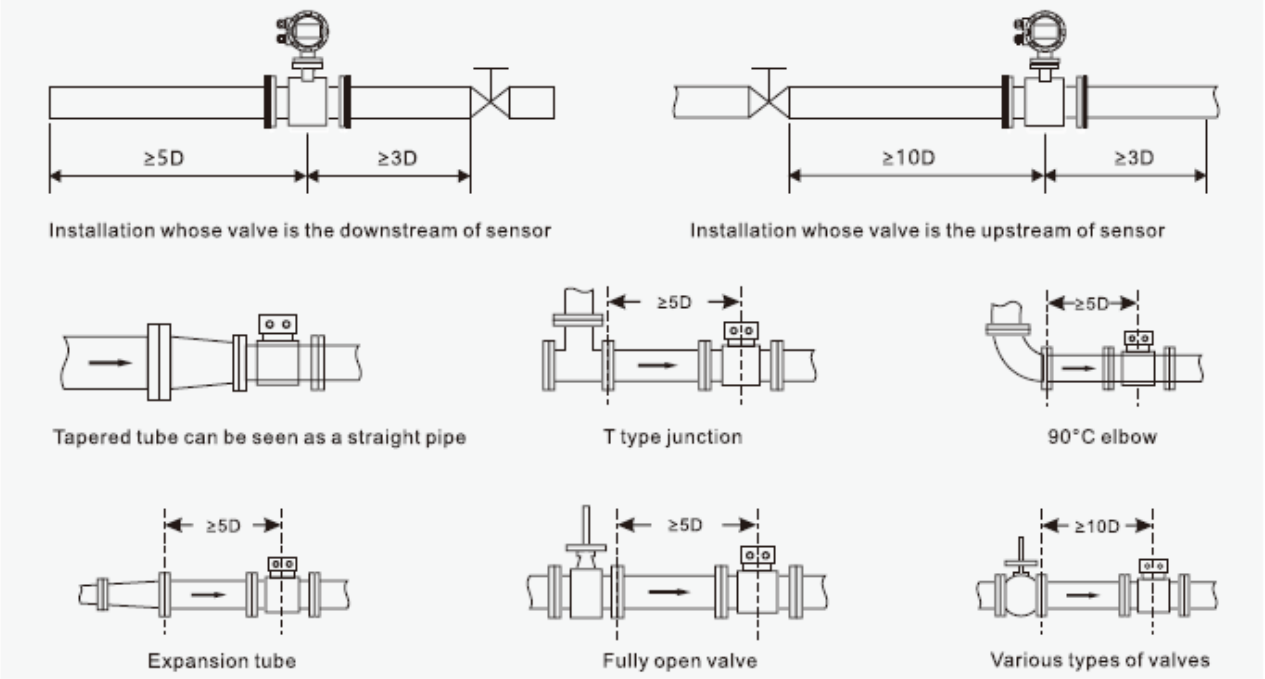
Incorporate type				
caliber (mm)	sixe			weight
	L	W	H	
10	200	90	290	6
15	200	95	315	6
20	200	105	315	6.5
25	200	115	315	6.8
32	200	140	315	7.1
40	200	150	315	7.6
50	200	165	320	9.9
65	200	185	350	10.6
80	200	200	365	12.3
100	250	220	380	14.7
125	250	250	410	17.9
150	300	285	440	24.6
200	350	340	495	32.7
250	450	395	560	43.5
300	500	445	600	58
350	550	505	670	78
400	600	565	720	97
450	600	615	765	110
500	600	670	820	122
600	600	780	930	161
700	700	860	1010	241
800	800	975	1110	420
900	900	1075	1210	541
1000	1000	1175	1310	668
1200	1200	1405	1540	858

Separate type				
caliber (mm)	sixe			weight
	L	W	H	
10	200	90	195	5.5
15	200	95	220	5.5
20	200	105	220	6
25	200	115	220	6.3
32	200	140	220	6.6
40	200	150	220	7.1
50	200	165	220	9.4
65	200	185	255	10.1
80	200	200	275	11.8
100	250	220	285	14.2
125	250	250	315	17.4
150	300	285	345	24.1
200	350	340	400	32.3
250	450	395	465	43
300	500	445	505	58
350	550	505	575	78
400	600	565	625	97
450	600	615	670	112
500	600	670	725	122
600	600	780	835	161
700	0	880	915	241
800	800	975	1015	420
900	900	1075	1115	541
1000	1000	1175	1215	668
1200	1200	1405	1445	858

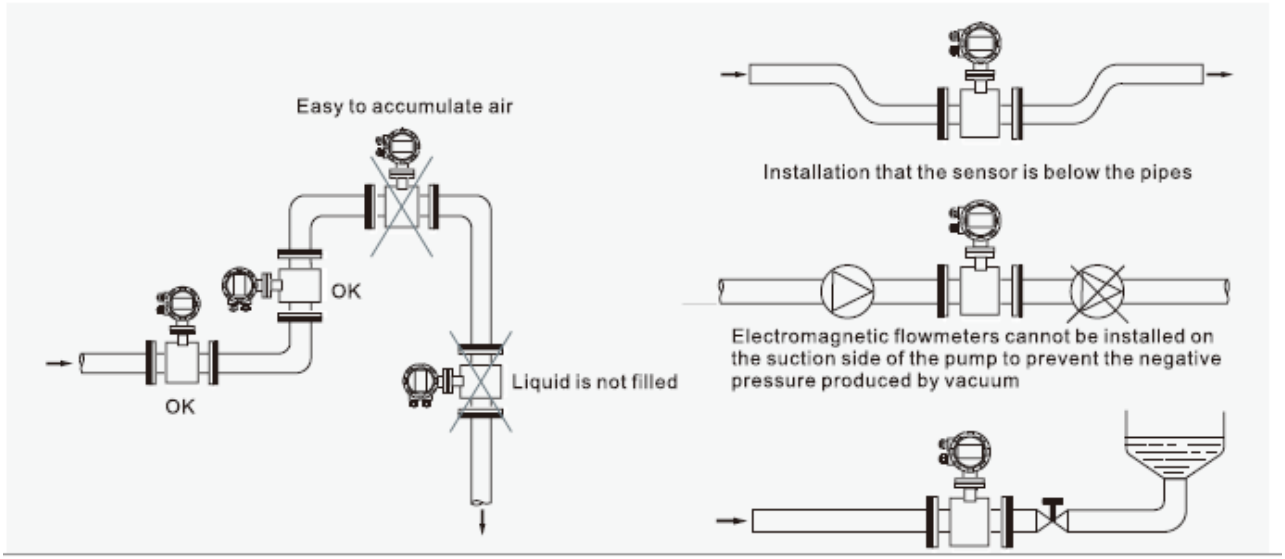
Note: Here the size and weight of electromagnetic flowmeter may differ from the product and it can be standardized according to actual object.

Installation

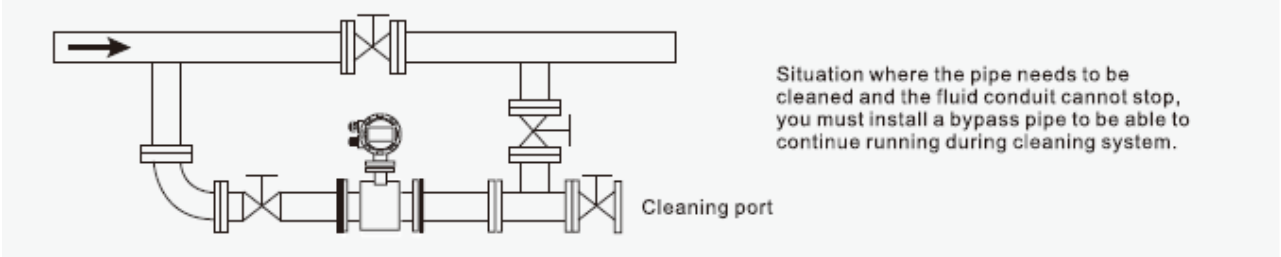
Straight pipe length requirements



Recommended mounting position



The connection which is easy to clean pipe

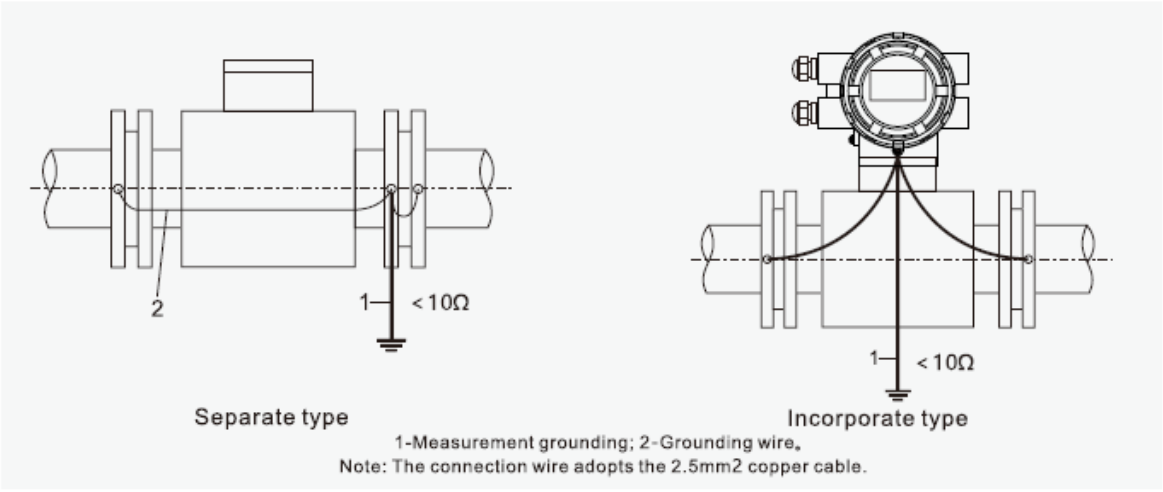


Grounding

Electromagnetic Flowmeter sensor should be well grounded, the measuring accuracy of flowmeter Depends on the grounding effect in a considerable extent.

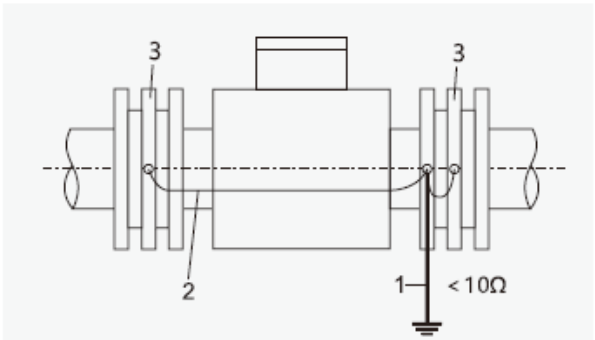
Sensor grounding at different installation situation

1, Grounding that sensor mounted on metal pipe.



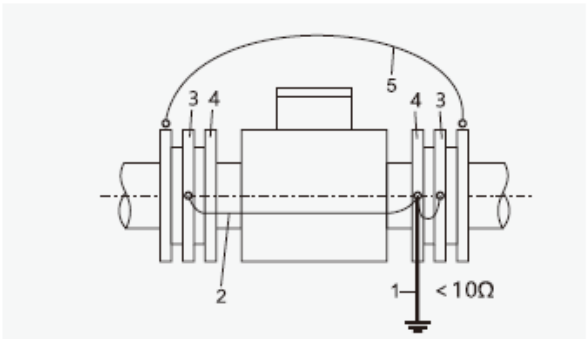
1-Measurement grounding; 2-Grounding wire。
Note: The connection wire adopts the 2.5mm2 copper cable.

1. Grounding that the sensor mounted on the insulating pipes.



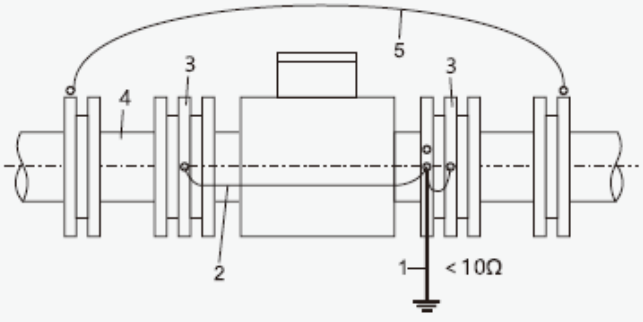
1-Measurement grounding; 2-Grounding wire;
3-Grounding ring.
Note: The connection wire adopts the 2.5mm2 copper cable.

3. Grounding that the sensor installed on the cathodic protection pipe.



1-Measurement grounding; 2-Grounding wire;
3-Grounding ring; 4-Bolt; 5-Connecting line.
Note: The connection wire adopts the 2.5mm2 copper cable.

4. The sensor is installed in the pipeline stray strong current place



1-Measurement grounding;
2-Grounding wire;
3-Grounding ring;
4-Insulated pipe;
5-Connecting line.
Note: The connection wire adopts the 16mm2 copper cable.

Order guiding

Type	Suffix Code										introduction
	□	□	□	□	□	□	□	□	□	□	
Model No.	M1										PT124B-501A
	M2										PT124B-501B
Caliber		DN									10~2000mm
Electrode material			E1								Stainless steel 316L
			E2								Hastalloy C (HC)
			E3								Titanium (Ti)
			E4								Tantalum (Ta)
			E5								Platinum (Pt)
			E0								Customized
Lining material				L1							Rubber (CR)
				L2							PTFE
				L3							Teflon PFA
				L4							Pu
				L5							F46
Flange material					C1						SS304
					C2						SS316
					C11						Carbon steel
Power supply						P1					110/220VAC
						P2					24VDC
Output							S1				4-20mA
							S2				4-20mA +HART
							S3				RS485/Modbus
							S4				Frequency /Pulse
							S0				Customized
Pressure level								Y1			1.6MPa
								Y2			2.5MPa
								Y3			4.0MPa
								Y0			Customized
Explosion proof grade									T4		CT4
									T6		CT6
Accuracy										J3	0.2%FS
										J4	0.5%FS

Ordering instruction

The following questions should be clear when selects the electromagnetic flowmeter:

1) The medium to be measured must be conductive fluid. And it isn't available to the gas, oil, organic solvents and the non-conductive medium.

2) When selects the model and specification, we should provide the measurement range of the electromagnetic flowmeter for the manufacturer, then the factory should make a demarcation within the scope of this measure in order to ensure accuracy of the instrument.

3) The users should provide manufacturers with the medium's process parameters, flow rate and temperature, pressure and other parameters of the selection table, then based on these parameters, flow rate and temperature, pressure and other parameters of the selection table, then based on these parameters, select the appropriate meter.

4) When selects the separate body-type electromagnetic flowmeter, the users should propose wiring length requirements to the factory according to the sensor distance away from installation location of converter.

5) If users need to install accessories, such as supporting flange, metal ring gasket, bolts, nuts, washers and other additional requirements, they can put them forward when ordering.

Notification of electromagnetic flowmeters

- ◆Reducing pipe installation should refer to Electromagnetic flowmeter installation reducing pipe technical description or Electromagnetic Flowmeter Maunal Instruction.
- ◆ Installation of electromagnetic flowmeters has the appropriate technical requirements which can be seen "Electromagnetic Flowmeter Installation Manual Instruction or Electromagnetic Flowmeter Manual Instruction".
- ◆The wiring way of electromagnetic flowmeter can be seen Electromagnetic Flowmeter Wiring Instructions or Electromagnetic Flowmeter Manual Instruction.
- ◆Other matters may consult the supplier.

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