Dear users:

Welcome to use Darhor magnetic flowmeter product. Please read the manual carefully before using, to understand and master the proper installation and usage methods of the products, so as to ensure proper installation and usage and achieve the highest performance of the instrument.

Our company always adheres to the principle of "First-class quality, first-class service and first-class technical support". Please contact us if there are any problems in the process of using the instrument. Our company will not take any responsibility for performance damage of the instrument resulting from unauthorized repair or replacement of parts.

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I. Introduction

The performance of electromagnetic flowmeter is in line with the JB/T9248-1999 industry standards. It is subject to strict inspection as per several technical indicators before it leaves the factory. Please be sure to check the appearance after arrival of the flowmeter to confirm whether there are any damages to the instrument during transport. For instrument accessories inspection, please refer to this chapter.

1.1. Model and specification inspection

Model and technical specification are available from the nameplate and factory calibration list of the electromagnetic flowmeter, for confirming whether they are consistent with those of the ordered one.

If it is needed to contact our Company in case of quality problems or if you encounter some problems in the process of usage, please specify the instrument specification and model for us to solve the problems.

1.2. Packing list

Please check whether the following items have been packed after arrival of the flowmeter:

Sensor (one)

Converter (one) (split type only)

Instruction manual (one)

Calibration list (one)

Certificate (one)

Cable (split type only, with the length ordered by the user)

Exterior flange (to be provided when ordering)

Bolt & nut (to be provided when ordering)

Sealant (provided when field sealing is required; in general it is sealed before

leaving the factory)

Explosion-proof certificate (explosion-proof products only)

1.3. Storage precautions

Please pay particular attention to the following if the instrument needs to be stored for a longer period of time after arrival:

1. The flowmeter shall be packed with the original packing box in the same manner as before shipment.
2. Choose a location with reference to the following conditions:

   Do not place in the rain;

   Do not put in a place where shock and vibration exist;

   Do not open the sensor junction box lid of the instrument, to avoid dampness which will affect the normal operation of the instrument;

   Ambient temperature, temperature and atmospheric pressure shall be:

Ambient temperature: -20℃~+60℃;

Relative humidity: 5%~90%;

Atmospheric pressure: 86~106KPa

1.4. Precautions for installation location

Installation locations shall be selected according to the following conditions, to ensure long-term stable operation of the instrument.

Ambient temperature: large temperature changes and direct sunlight shall be avoided; if there is heat radiation from a heat source in the installation location, thermal isolation or ventilation shall be provided.

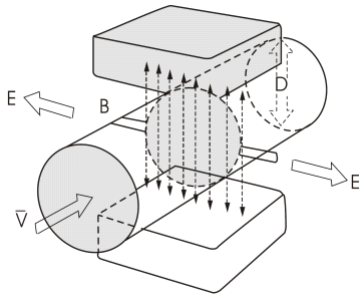
Atmospheric environment: places with highly corrosive atmospheric environment or which contain explosive gases shall be avoided (for non-explosion-proof instruments).

1.5. Changing the direction of the converter

Please do not change the direction of the converter arbitrarily. Please contact us if

you do change it.

1.6. Measurement principle



The measurement principle of the sensor of electromagnetic flowmeter is based on Faraday's law of electromagnetic induction. A pair of detection electrodes are installed on the tube wall where the measuring tube axis is perpendicular to the magnetic field magnetic line. When the conductive fluid moves along the measuring tube axis, its movement of cutting a magnetic line will generate induction electric potential, which will be detected by the two electrodes on the measuring tube wall. Its value is : E=KBVD

Where: E - induction electric potential;

K - instrument constant;

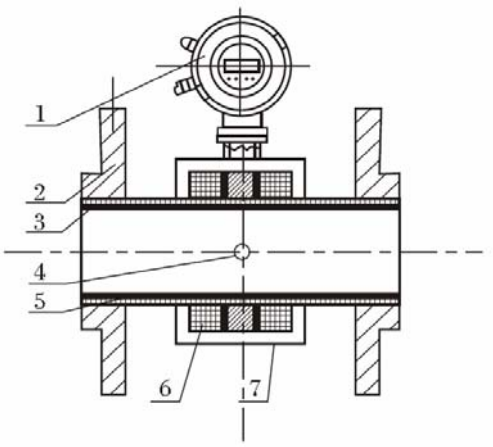
B - magnetic induction intensity ;

V - average velocity within the measuring pipe section;

D - inner diameter of the measuring tube.

During flow measurement, fluid will flow through the magnetic field perpendicular to the flow direction, the flow of conductive fluid will induce electric potential which is directly proportional to the average velocity, so it is required that the conductivity of measured fluid is above the minimum conductivity. The induced voltage signal is detected by the two electrodes and transmitted via cable to the converter, which will display the cumulative flow and instantaneous flow in the converter's display through a series of digital processing .

1.7. Structure of electromagnetic flowmeter



1 - converter; 2 - flange; 3 - insulation lining; 4 - electrode; 5 - measuring tube; 6 - excitation coil; 7 - housing

It is mainly composed of the following components as shown in the figure:

(1) Converter: to provide a stable excitation current to the sensor, and amplify the induced electric potential of the sensor and convert into standard current signals or frequency signals, for display, control and regulation of flow.

(2) Lining: is a complete layer of insulated & corrosion resistant materials at the inside of the measuring tube and on the sealing surface of flange to prevent short-circuiting of the flow signal.

(3) Electrode: a pair of electrodes are installed on the measuring tube wall which is perpendicular to the magnetic line; they are used to detect the flow signal, their materials can be selected based on the corrosiveness of the measured medium.

(4) Measuring tube: used to measure the medium flowing within the measuring tube, manufactured from non-magnetic stainless steel and flange through welding, equipped with insulation lining inside.

(5) Excitation coil: there is a group of coils on the top and bottom of the measuring tube outside for generating the working magnetic field.

(6) Housing: can play the role of instrument protection and sealing.

1.8. Main technical parameters of the electromagnetic flowmeter

Models		
	Integrated type	Split type
Precision	±0.5%	
Diameter (mm)	DN6～DN800	DN6～DN2000
Flange	Meets GB9119 standard, carbon steel (stainless steel is optional)	
Pressure level	DN6～DN250 PN≤4.0MPa	DN6～DN250 PN≤4.0MPa
	DN300～DN800 PN≤1.6MPa	DN300～DN800 PN≤1.6MPa
		DN900～DN2000 PN≤0.6MPa
Lining material	PTFE, neoprene, polyurethane, PE, F46	
Conductivity	≥5 μS / cm	
Electrode	316L, molybdenum 2 titanium, Hastelloy, titanium, tantalum, platinum-iridium alloy	
Protection degree	IP65	IP65 (IP68 is optional for sensor)
Medium temperature	-40℃～80℃	-40℃～140℃
Ambient temperature	-25℃～60℃	
Influence of ambient temperature	<±0.1% / 10℃	
Repeatability and reproducibility	±0.25%	
Analog output error	≤±0.02mA	
Flow rate measurement range	≤20m / s	
Electrical connection	20mm seal sleeve	
Buriable		≤5m (only IP68)
Sensor cable		<30m (consultation with our Company is needed when too long)

II. Installation

The performance of our electromagnetic flowmeter is in line with the JB/T9248-1999 industry standards. It is subject to strict inspection as per several technical indicators before it leaves the factory. Please be sure to check the appearance after arrival of the flowmeter to confirm whether there are damages to the instrument during transport.

2.1. Pipeline design

The following items shall be considered during pipeline design:

(1) Location

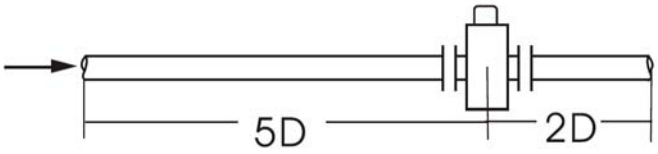
- ◆ The flowmeter shall be installed in dry ventilated places. Places where water accumulates easily shall not be selected as the installation locations.
- ◆ The flowmeter shall avoid sunshine and rain. In case of outdoor installation, there shall be rainwater protection facilities. Ambient temperature shall be between －25℃~+60℃.
- ◆ Strong vibration of the flowmeter installation site shall be avoided as much as possible.
- ◆ Instruments with a protection degree of IP68 (3 meters underwater) can be placed in water; those with a protection degree of IP65 cannot be immersed in water.

(2) Magnetic interference shall be avoided

The flowmeter shall not be installed at places near motors, transformers or other power supplies that are prone to produce electromagnetic interference.

(3) Length of straight pipe

To ensure the measurement accuracy of the flowmeter, it is necessary to guarantee that the length of the straight pipe upstream of the sensor shall be at least 5 times the pipe's diameter (5D), and that of the straight pipe downstream of the sensor shall be 2 times the pipe's diameter (2D).



(4) Maintenance space

The flowmeter shall be installed at places that have sufficient repair space.

(5) Shut-off valve and bypass valve shall be adopted

Shut-off valve and bypass valve can be used for easy maintenance and zero adjustment.

(6) Supports for the flowmeter

Do not install the flowmeter on pipes that can vibrate freely, a mounting base shall be used to fix the measuring tube.

When underground installation is needed, supports shall be set for both inlet and outlet pipes, and metal protection plate shall be installed above the flowmeter.

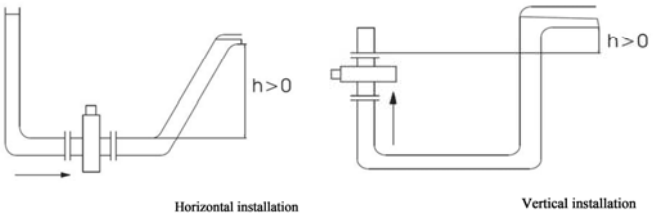
2.2. Installation requirements

(1) Flow direction

The flowmeter can automatically detect forward and reverse flow direction. The flow direction arrow on the sensor housing is the forward direction specified by the manufacturers. During flowmeter installation, the users shall make the flow direction arrow consistent with the on-site process flow direction.

(2) Installation orientation of sensor electrode and installation direction

Sensor can be installed horizontally or vertically.



In case of horizontal installation, the electrodes shall be in horizontal positions, so that, once there are air bubbles or sediments in the medium, the air bubbles will not be adsorbed in the vicinity of electrodes, which avoids open circuit at the signal terminals of converter; and the sediments will not cover the electrodes, which avoids zero drift and so on.

(3) Tubes shall always be filled with liquid

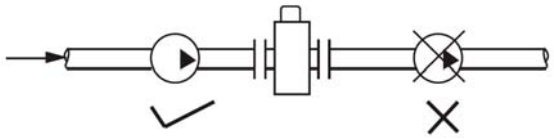
Pipeline structure shall ensure that the instrument measuring tube is

always filled with liquid.

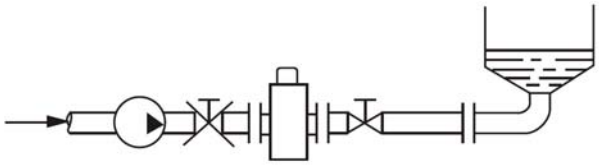
For liquid or slurry containing solid particles, vertical mounting of electromagnetic flowmeter is recommended. There are three reasons for it: first, this can prevent phase separation of the measured medium; second, it can result in more uniform wear of the sensor lining; third, impurities do not precipitate at the bottom of the measuring tube.

The flow is from bottom to the top, ensuring that the sensor measuring tube is always filled with the medium.

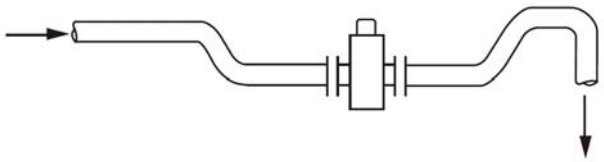
(4) The flowmeter cannot be installed at the suction side of pumps.



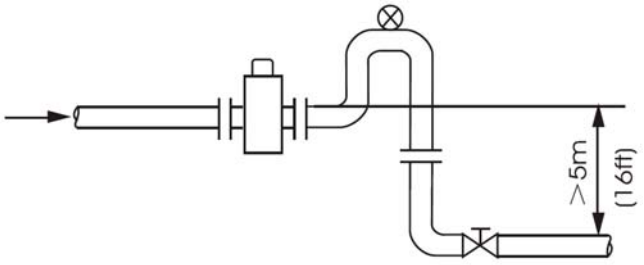
(5) For a long pipeline, control valve is usually installed downstream of the flowmeter .



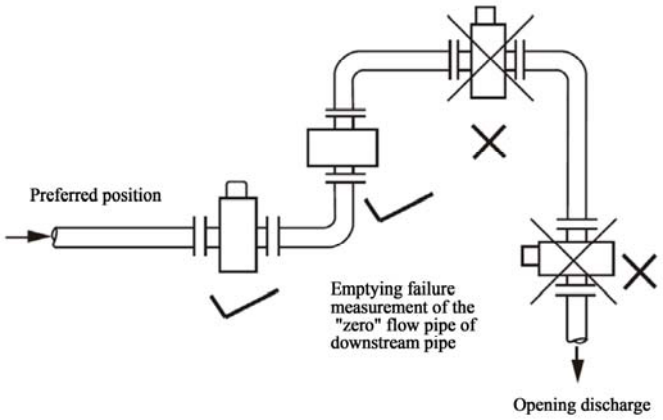
(6) For pipes with opening discharge, the flowmeter shall be installed in the bottom section.



(7) For places where the pipe fall is more than 5 meters, air valve shall be installed downstream of the flowmeter.



(8) Measurement error caused by accompanying gas and lining damage arising from vacuum shall be avoided.

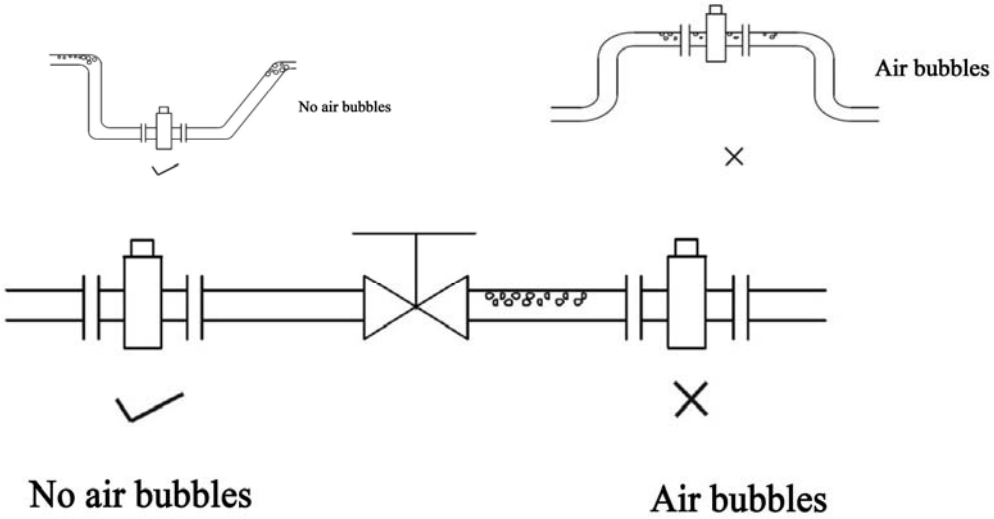


(9) There shall be no air bubbles in the pipes.

Pipeline design shall ensure that there are no gases separated out of the liquid.

The flowmeter shall be installed upstream of the valve. Due to the action of valve, the pressure in the pipe will be reduced, resulting in air bubbles.

Instruments shall also be installed in the low sections, to reduce the impact of air bubbles entrained in the fluid during measurement.



(10) Liquid conductivity

Do not install the electromagnetic flowmeter at places where the liquid conductivity is very uneven.

Injection of chemicals upstream of the instrument will easily lead to uneven

fluid conductivity, causing serious interference with the flow indication of the instrument. We recommend to inject chemicals from downstream of the instrument; if chemicals must be injected from upstream, it is required to ensure that the length of upstream straight pipe is at least 5 times the pipe's diameter, to guarantee thorough mixing of the liquid.

(11) Grounding

Since the induced voltage signal of electromagnetic flowmeter is very small, making it vulnerable to external noise or other electromagnetic signals, on special occasions, the electromagnetic flowmeter shall be grounded, to form a space that can shield the outside interference through grounding of the flowmeter housing, so as to improve measurement accuracy.

2.3. Mechanical installation

2.3.1. Installation of flowmeter pipes

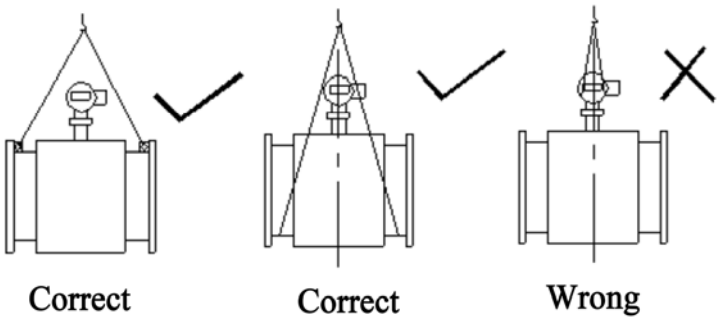
(1) The pipelines shall be corrected prior to installation of flowmeter, to ensure the instrument diameter has better concentricity with the pipes of users. The axis height deviation shall not exceed 1.5mm for sensors with a nominal diameter below 50mm; it shall not exceed 2mm for sensors with a nominal diameter of 65~300mm; and it shall not exceed 4mm for sensors with a nominal diameter of 350mm and above.

(2) The newly installed pipes generally have foreign matters (such as welding slag). Foreign matters shall be flushed away before installation of the flowmeter. This will not only prevent damage of the lining, but also prevent measurement error caused by foreign matters flowing through the measuring tube during measurement.

2.3.2. Precautions

Notes on operation:

(1) Be careful not to damage the instrument when unpacking. It is best not to unpack before transporting to the installation site, to avoid instrument damage. Erection ring shall be used when lifting, do not hoist the instrument by putting rod or rope through the sensor measuring tube.



(See the old sample chart)

(2) Vibration shall be prevented for the instrument

Do not throw or press the instrument heavily. It is important to avoid applying force on the flange surface (which may damage the lining, resulting in abnormal operation).

(3) Flange face protection

Flange protection shall be paid attention to when unpacking the instrument. Putting flange on ground without pads or on uneven board is not allowed.

(4) Junction Box

Do not open the junction box before connecting to electric power. After wiring is complete, please pour our special sealant into the junction box as soon as possible, close the junction box lid, and tighten the screws to ensure the tightness.

(5) No usage for a long time

Not using for a long time is not recommended after installation.

If the instrument is not used for a long period of time, the following measures shall be taken:

A. Check the tightness of end cap and connection, to ensure that moisture and water will not enter the instrument.

B. Periodic inspection. Check the above-mentioned measures and the inside of the junction box at least once a year. However, if it is suspected that water has entered the instrument (such as after heavy rain, etc.), it shall be checked immediately.

2.3.3. Installation of flowmeter

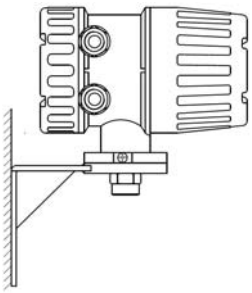
(1) Installation direction

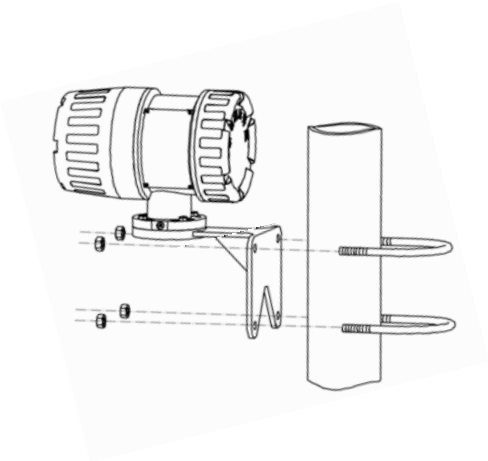
The flow direction of the measured fluid shall be consistent with the flow mark of flowmeter.

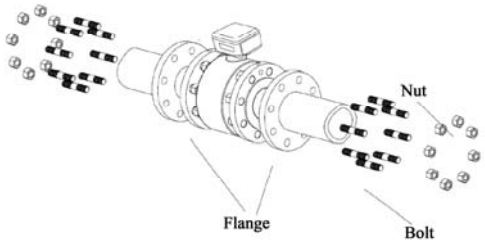
(2) The flange gasket between the flanges shall have good corrosion resistance, it shall not extend into the inside of pipes.

(3) When welding or flame cutting is done for pipes adjacent to the sensor, separation measures shall be taken to avoid the lining being heated. If the instrument is installed in concealed wells or immersed in water, sealant shall be used to pot the sensor junction box after installation and commissioning of the system.

(4) The flange on the sensor shall be bolted with that on the pipe when site installation. Bolts and nuts on the instrument shall be tightened, with thread in intact and well-lubricated conditions. Torque spanner shall be used to tighten the bolts according to the sizes of flanges and torque. Bolts shall be tightened on a regular basis in daily use, to avoid their loosening.

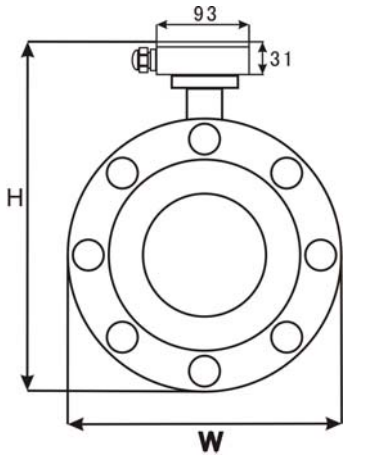


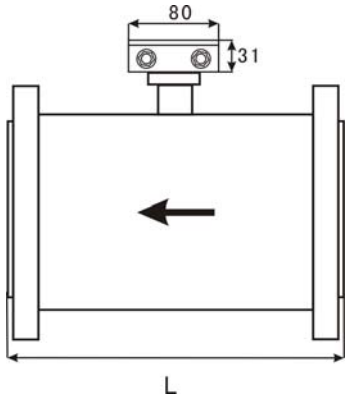




2.4. Overall dimensions

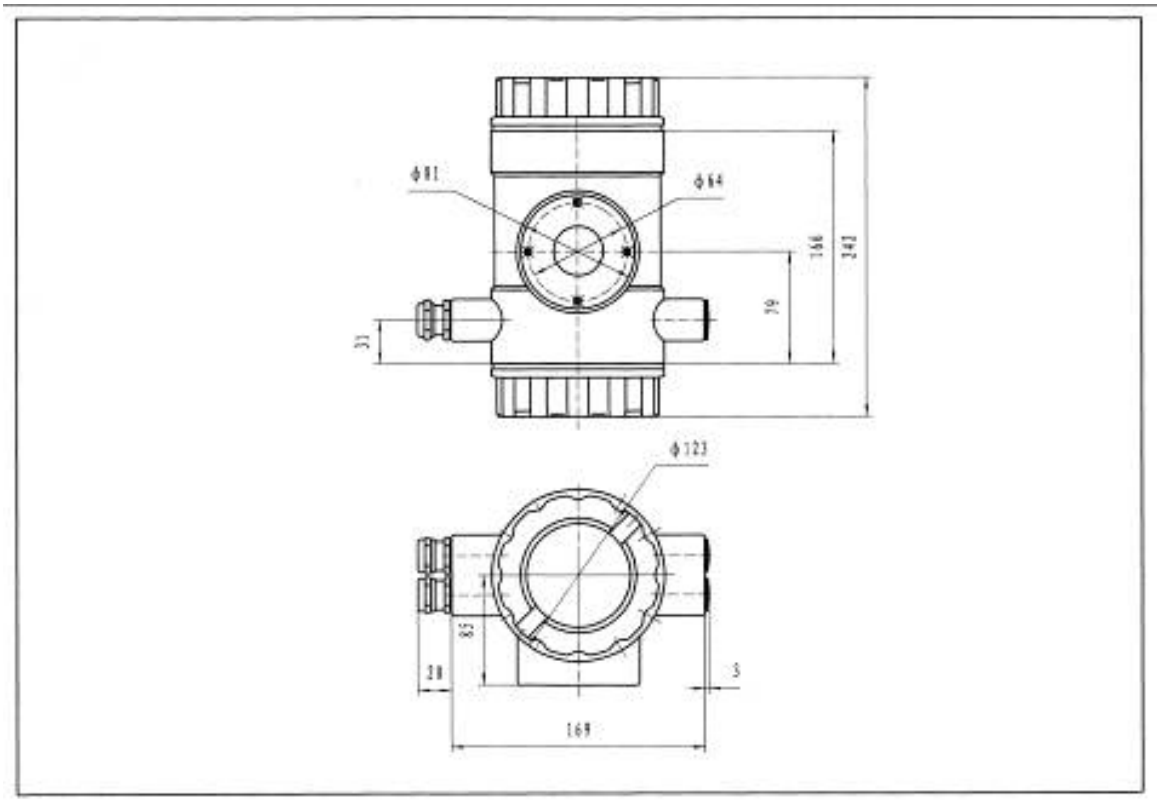
2.4.1 Overall dimensions of sensor



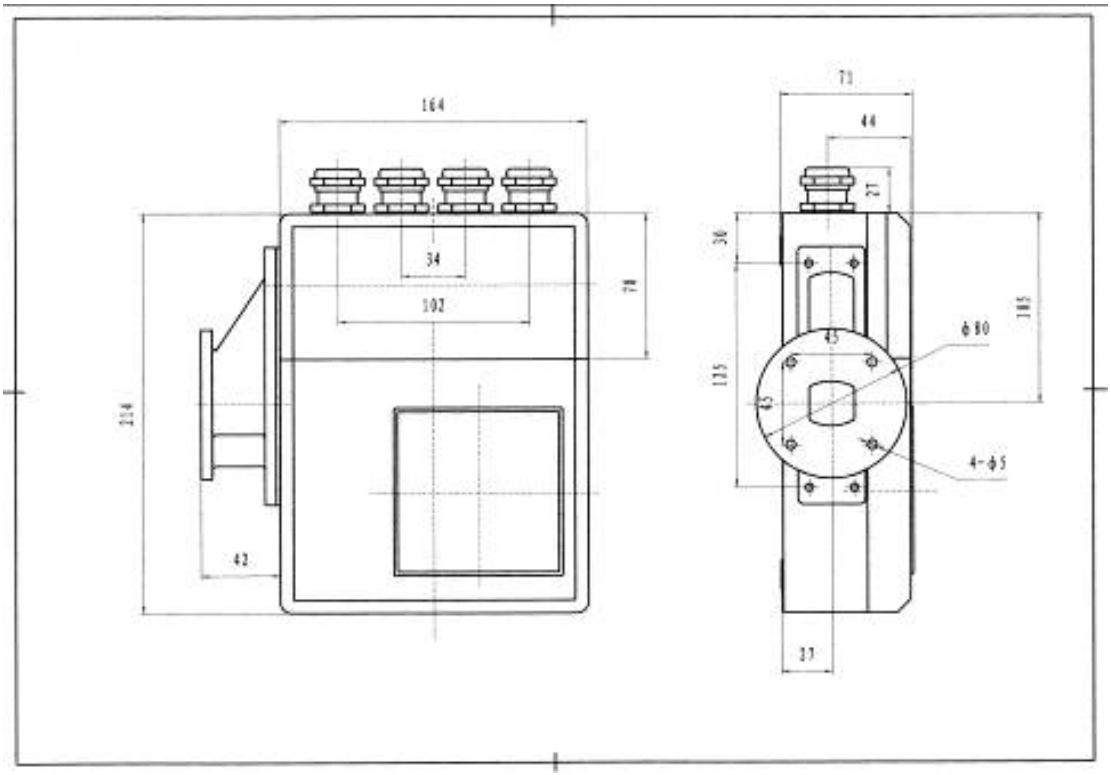


Diameter (mm)	Dimensions			Weight (kg)
	L	W	H	
10	150	170	165	
15	150	170	190	
20	150	170	190	6.4
25	150	170	190	
32	150	170	190	
40	200	170	190	7.6
50	200	170	195	9.9
65	200	185	225	
80	200	200	245	12.3
100	200	220	255	14.7
125	250	250	285	17.9
150	250	285	315	24.6
200	300	340	370	32.7
250	350	395	435	
300	400	445	475	
350	400	505	545	
400	450	565	595	
500	500	670	695	
600	600	780	805	
700	700	860	885	
800	800	975	985	
900	900	1075	1085	
1000	1000	1175	1185	
1200	1200	1405	1415	

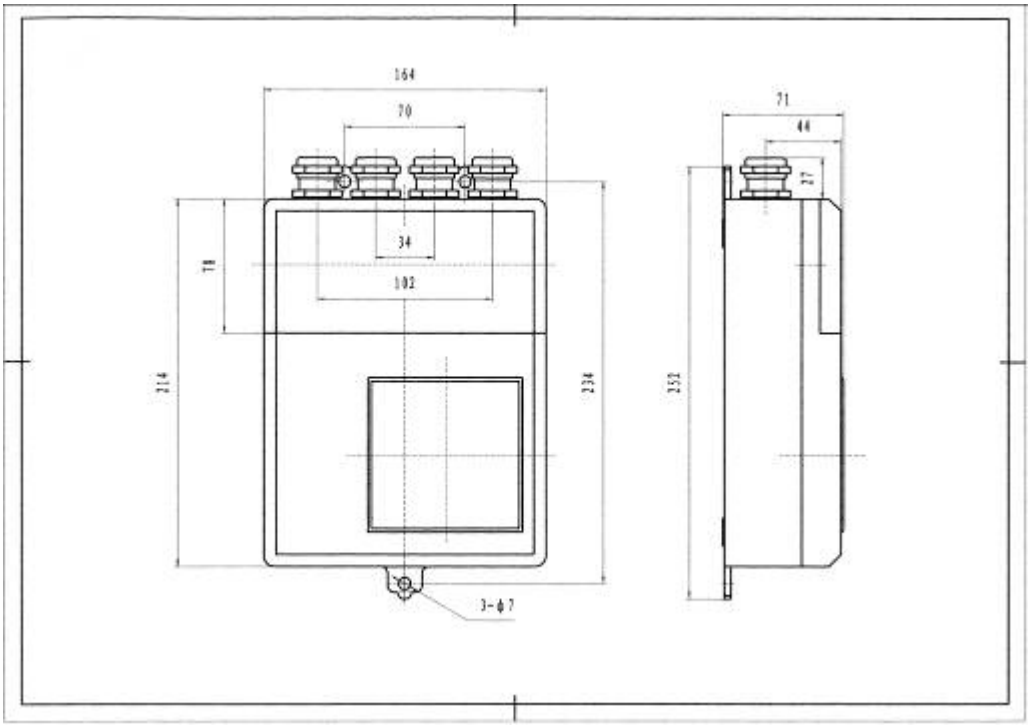
2.4.2 Plot of Converter



Exterior size of the integrated circinal shells



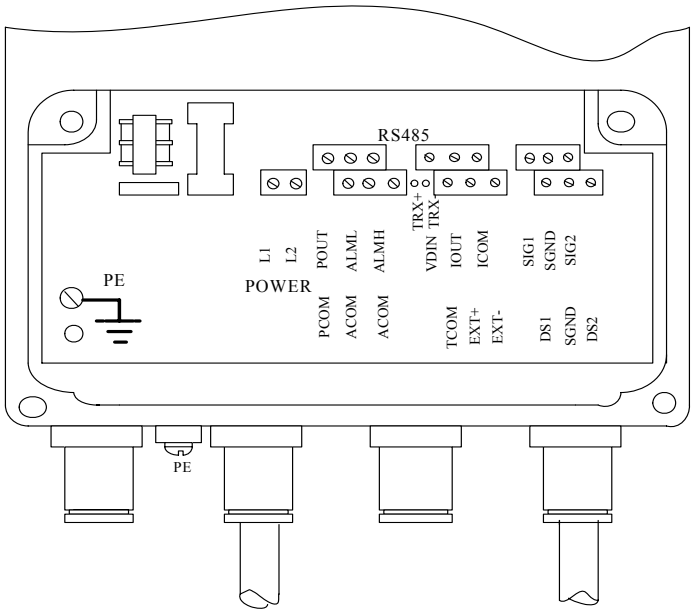
Exterior size of the integrated squared shells



Exterior size of the split squared shells

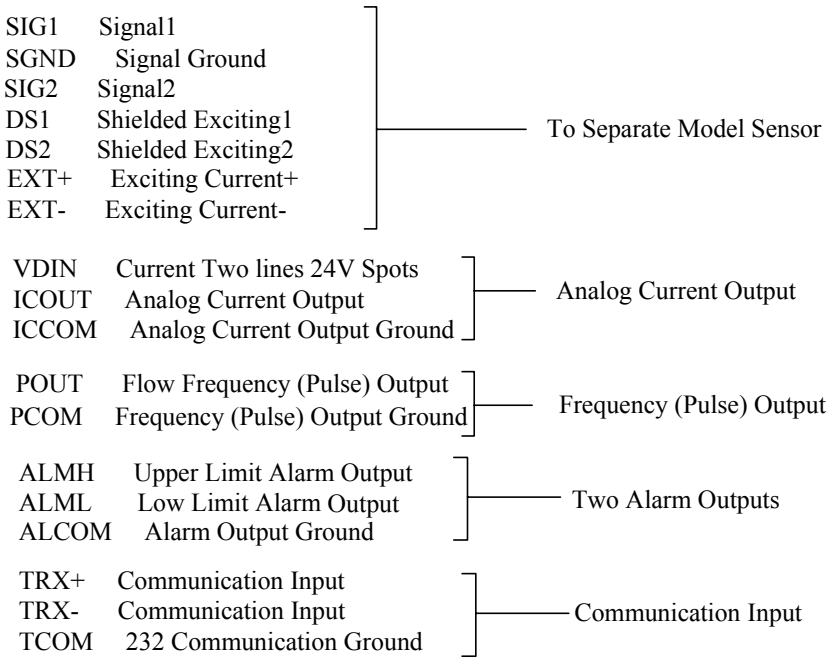
2.5. Connections of Connectors

2.5.1 Connectors and labels for the squared

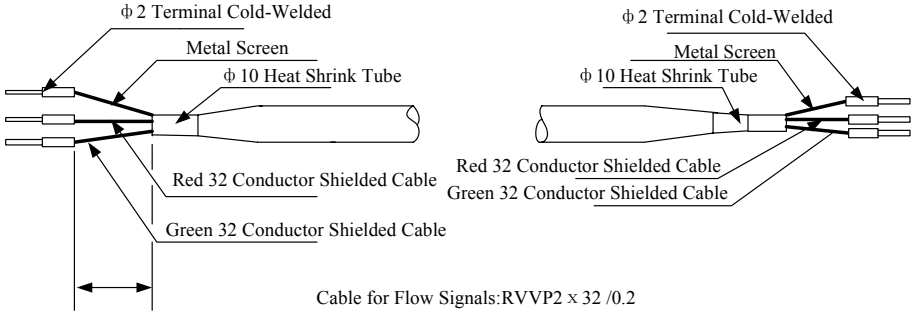


Connectors for 211B

Labels of connectors in squared model

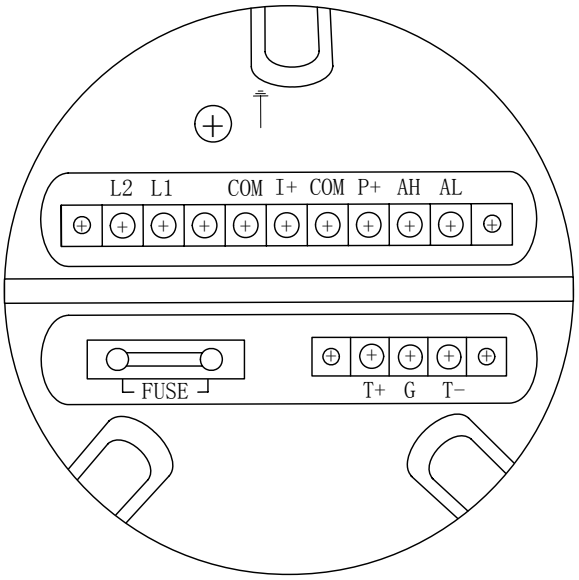


2.5.2 Signal lines and labels in squared model



Connection and labels of signal lines in squad model

2.5.3 Links and labels of connectors in Circinal Model

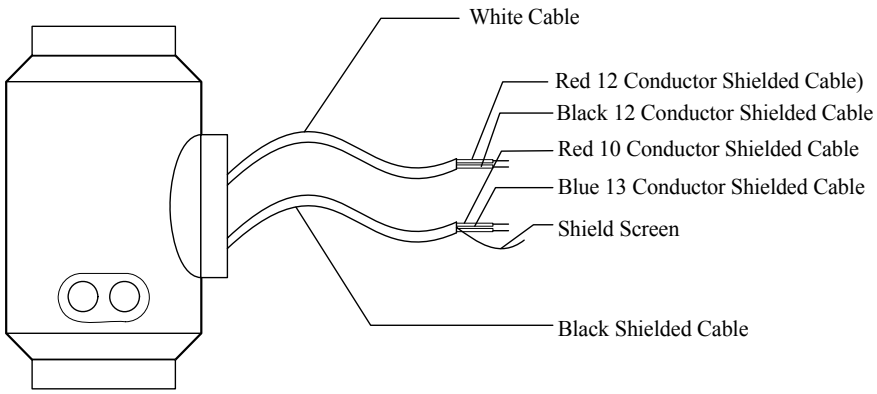


Connectors in circinal model

Symbols and Description of Connectors in Circinal Pane

I+：	Output Current for Flow Measurement
COM：	Output Current (Ground) for Flow Measurement
P+：	Frequency(Pulse) Output for Bi-directional Flow
COM：	Frequency (Pulse) Output (Ground)
AL：	Alarm Output for Low Limit
AH：	Alarm Output for Upper Limit
COM：	Alarm Output (Ground)
FUSE：	Fuse for Power Supply
T＋：	+Communication Input Signal
T－：	-Communication Input Signal
G	RS232 Communication Ground
L_1：	220V（24V）Power Supply
L_2：	220V（24V）Power Supply

2.5.4 Labels and connection of signal lines in circinal model



Labels and connection of signal lines in circinal model

Signal lines labels in circinal model:

White twisted-pair cable(for exciting current): 12 Conductors (Red)

12 Conductors (Black)

Black shielded twisted-pair cable:10 Conductors (Red) connected to “Signals 1”

13 Conductors (Blue) connected to “Signals 2”

Shielded Conductor connected to “Signal Ground”

2.6. Characteristic and connection of cable

2.6.1 Flux signal line

When separated models of converters are assembled with sensors for measuring flow of fluid which conductivity is larger than 50μS/cm,RVVP2×32/0.2 model cable (metal shielded signal cable covered with PVC) can be used as communication cable for flow signals. The length of signal cable should be less than 100 m.. Signal cables have to be connected to sensors that were assembled by producers. Connections of signal cables are shown in Fig.4.3(b) for squire-shaped models and Fig.4.3(d) for circle-shaped models, respectively.

The converter can output equivalent level of shielded exciting signal voltage so that interference to flow measurement signals can reduced by means of lowering the distributed capacitance of communication cable. When measured conductivity is less than 50μS/cm or signals are transferred in remote distances, double-conductor and double-shielded signal cable at equivalent level of voltage can be used. For example,

special STT3200 cable or BTS model signal cable (triple-shielded) can be used for signal communication.

2.6.2 Exciting current cable

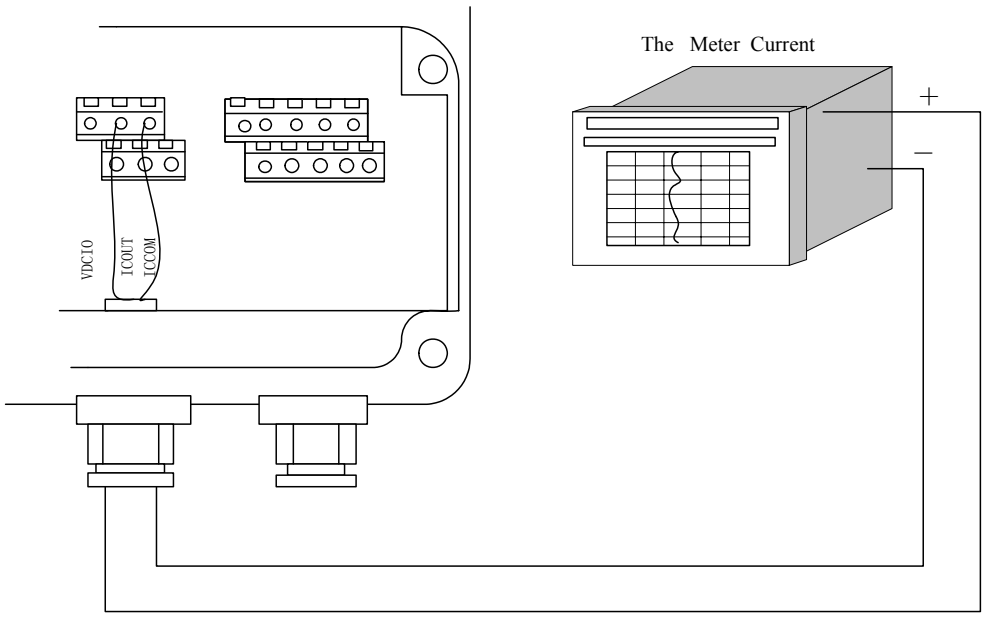
Two conductor and insulating rubber- covered cables can be used as exciting current cables. Suggested model is YHZ-2×1mm^2. Length of exciting current cable should be equal to that of signal cable. When the model STT3200 cables are used for exciting current and signals, two cables can be put together as one cable.

2.6.3 Output and power line

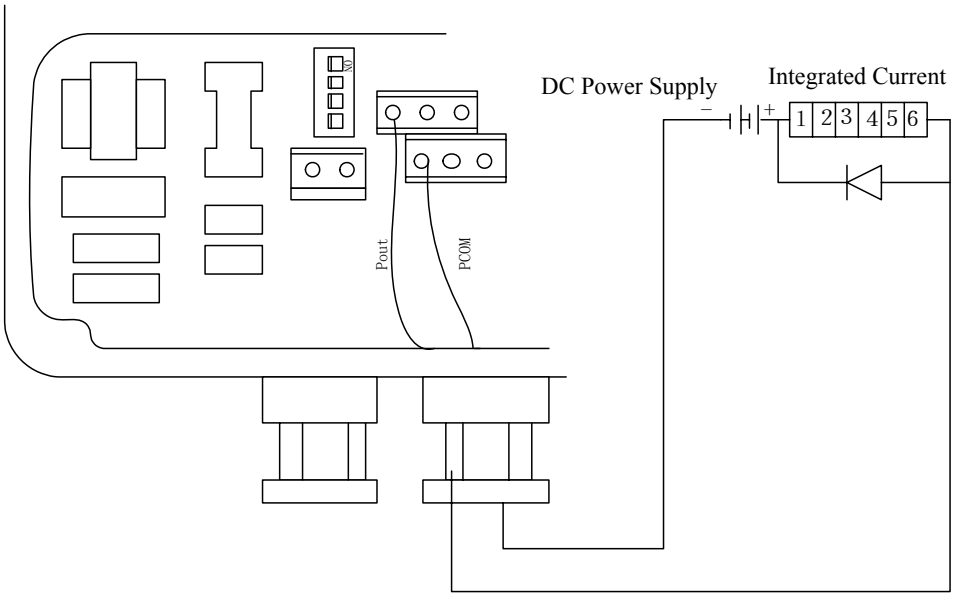
All cables for signals transferring and power supply have to be prepared by users. However, it should be careful to choose the cables that meet the upper limit load of consuming current.

Note: When DIP switch next to terminal is set to ON places, the converter from its inside can provide +28Vpower supply and up-pull 10kΩresistance to output Frequencies (PUL) to isolated OC gate, Alarm Output (ALMH.ALML), and Status Control（INSW）.Therefore, when converter has frequency output and works with sensor together, DIP switch can be set as ON getting frequency signals from POUT and PCOM terminals.

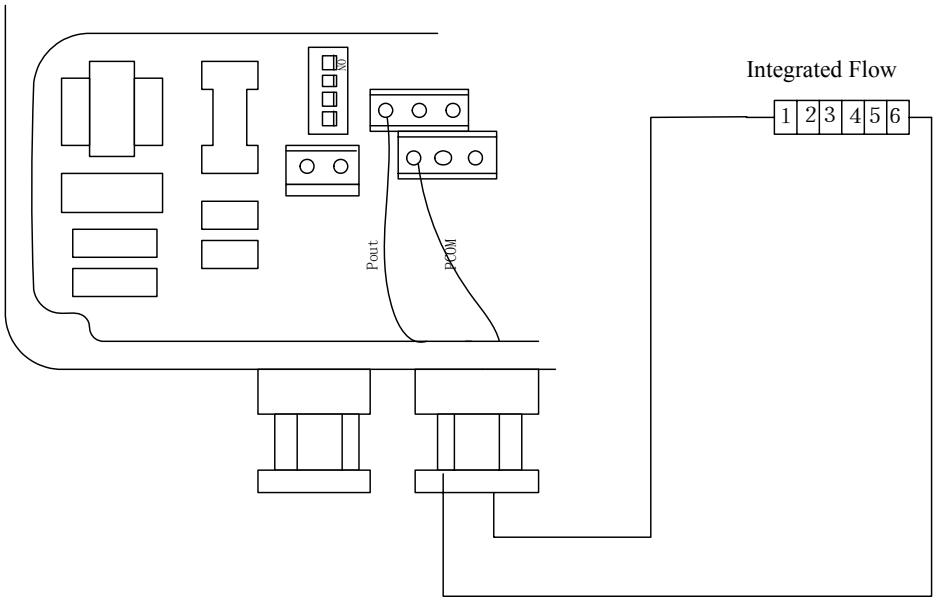
Pulse current output, alarm current output and external power supply can be seen in Fig.4.4(a). When inductive load is connected to converter, diode should be used as in Fig.4.4(b).



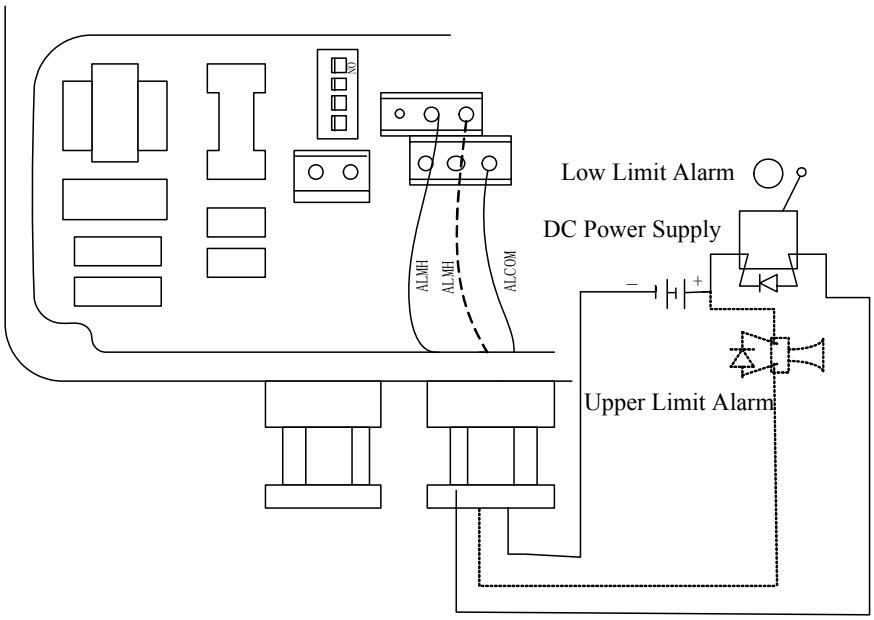
Output current circuit



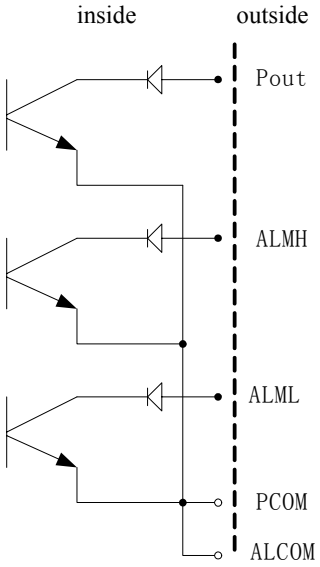
Connection of electro-magnet counter



Connection of electronic counter



Connection of alarm output



Connection of OC gate

2.6.4 Grounding

Contact area of copper Connector PE on Converter Cabinet for grounding should be larger than 1.6mm^2.Contact resistance should be less than 10Ω.

2.7. Digital output and calculate

Digital output means frequency output and pulse output, and both of them use

the same output point, so user can choose only one type of them but not both.

2.7.1 Frequency output

Frequency output range is 0～5000HZ, and corresponding the percent of flux.

F= frequency range

$$\frac{\text{Measure value}}{\text{Full scale value}} \bullet$$

The up limit of frequency output can be adjusted. It can be chosen from 0 ~ 5000HZ, and also can be chosen low frequency: such as 0 ~ 1000HZ or 0 ~ 5000HZ. Frequency output mode general can be used in control application, because it responses the percent flux. Users can choose pulse output when the equipment is applied to count.

2.7.2 Pulse output mode:

Pulse output mainly applies in count mode. A pulse output delegates a unit flux, such as 1L or $1M^3$ etc. Pulse output unit divide into 0.001L, 0.01L, 0.1L, 1L, $0.001M^3$, $0.01M^3$, $0.1M^3$, 1 M^3. When users choose the pulse unit, they should notice the match of the flux range of flowmeter and pulse unit. For volume flux, count formula as follows:

$Q_L=0.0007854\times D^2\times V$ (L/S)

Or $Q_M=0.0007854\times D^2\times V\times 10^{-3}$ (M^3/S)

Note: D-nozzle (mm)

V-velocity of flow (m/s)

The oversize flux and too small pulse unit will be made the pulse output over the up limit. Generally, pulse output should be controlled below 2000P/S. However, the too small flux and too large pulse unit will be made the instrument exports a pulse long time.

Otherwise, pulse output is different from frequency output. When pulse output cumulates a pulse unit, it exports a pulse. Therefore, pulse output is not equality. Generally, measure pulse output should choose to count instrument, but not frequent instrument.

2.7.3 The connection of digital output

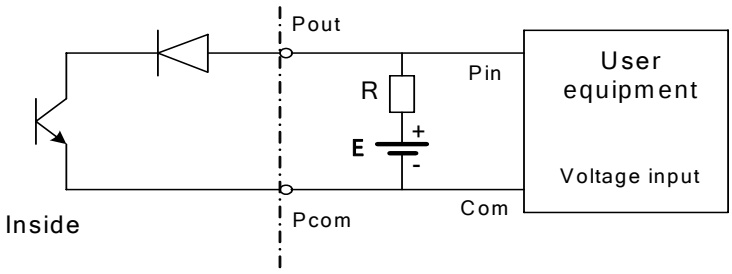
Digital output has tow connected points: digital output connected point, digital ground point, and symbol as follows:

POUT ----- digital output point;

PCOM ----- digital ground point;

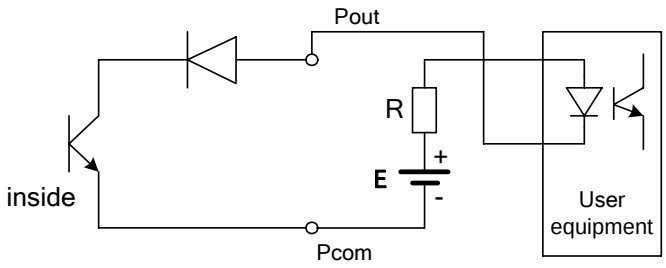
POUT is collector plough output, user may refer to next circuit to connect.

2.7.4 The connection of digital voltage output



The connection of digital voltage output

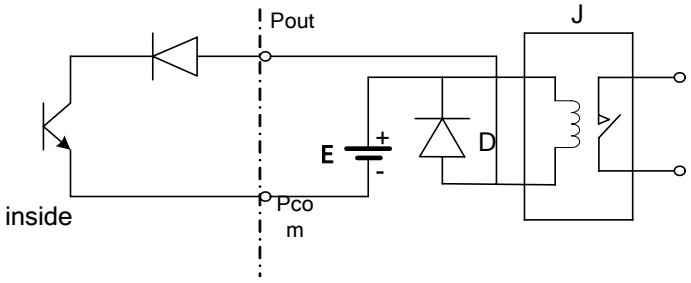
2.7.5 Digital output connect photoelectricity coupling (PLC etc.)



Digital output connect photoelectricity coupling

Commonly user's photoelectricity coupling current is about 10mA, so about E/R=10mA, E=5～24V.

2.7.6 Digital output connect relay



Digital output connect relay

Commonly relay needs E as 12V or 24V. D is extend diode, now most middle relays has this diode inside. If not have, user can connect one outside.

Table of digital output parameter:

POUT

Parameter	Test condition	Mini	Typical	Max	Unit
Voltage	IC=100 mA	3	24	36	V
Current	Vol≤1.4V	0	300	350	mA
Frequency	IC=100mA Vcc=24V	0	5000	7500	HZ
High voltage	IC=100mA	Vcc	Vcc	Vcc	V
Low voltage	IC=100mA	0.9	1.0	1.4	V

2.8. Simulation signal output and calculate

2.8.1 Simulation signal output

There are two signal system: 0～10mA and 4～20mA, user can select from parameter setting.

Simulation signal output inner is 24V under0~20mA, it can drive 750Ω resistance.

The percent flux of simulation signal output:

$$I_0 = \frac{\text{Measure value}}{\text{Full scale value}} \bullet \text{the scale of current} + \text{the zero point of current}$$

The current zero is 0 when 0~10mA, and the current zero is 4mA when 4~20mA.

It can be advanced simulation signal output distinguish. User can select the range of measure.

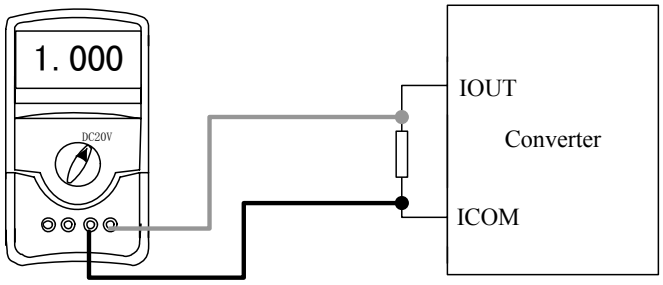
The manufacture's parameter have been adjusted, it can't need adjust. If have abnormity, it can consult 4.6.2.

2.8.2 Simulation Signal Output Adjust

(1)The Converter adjust preparative

When the converter is running 15 minutes, the inner of converter becomes

stabilization. Preparative 0.1% amperemeter or 250Ω、 0.1% voltage instrument.



(2)Current zero correct

When the converter getting into parameter setting, selecting to "Analog Zero" and enter to it. The standard of signal fountain getting to "0".Adjust parameter make amperemeter is 4mA（±0.004mA).

(3)The full scale current correct

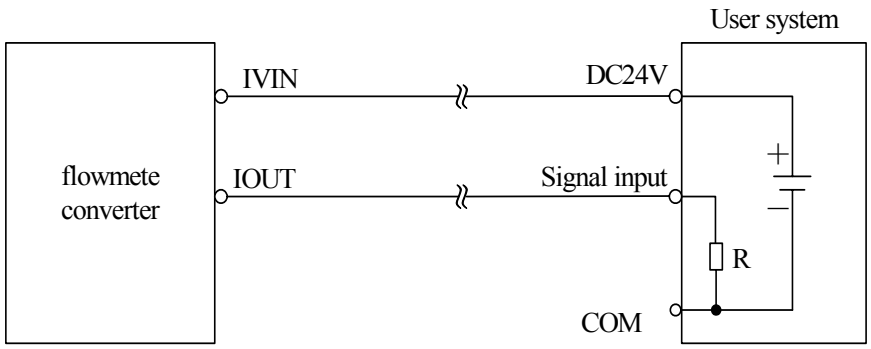
To select "Anlg Range" to enter.Adjust the converter parameter make amperemeter is 20mA(±0.004mA)

Adjust the current zero and the full range, the current function of the converter reached exactness.The line degree of current output of conversion should be controlled within the scope of 0.1%

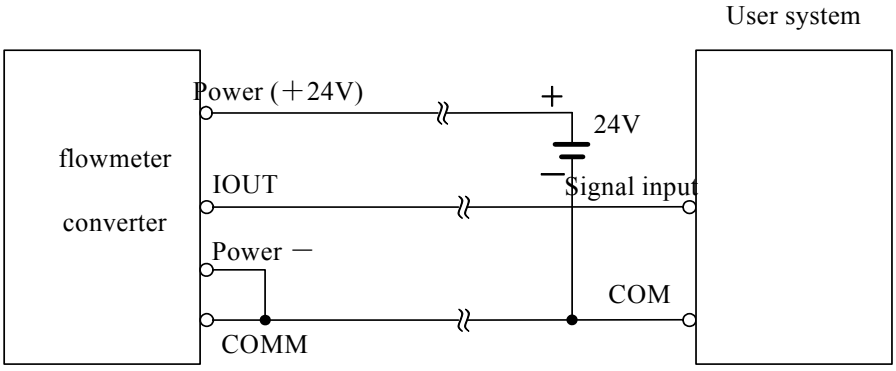
(4) Current line degree checking

You can place the standard signal source in 75%、50%、25%,and check the line degree of current output

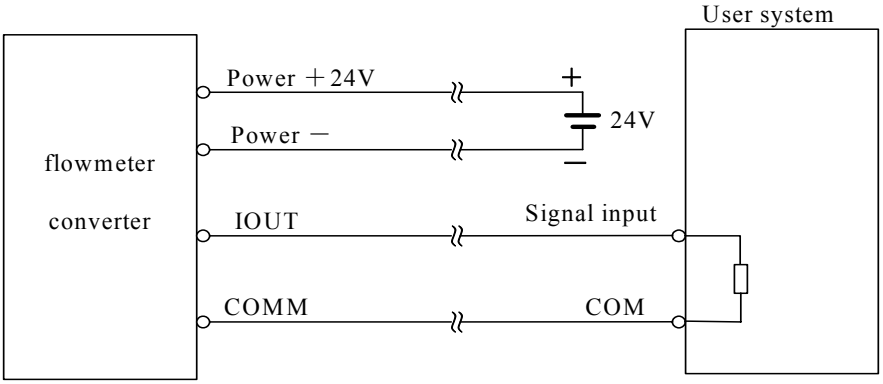
2.8.3 Electromagnetic flowmeter converter's connection of current output:



two connection



three connection(power supply and current output are not insulated)



four connection(power supply and current output are insulated)

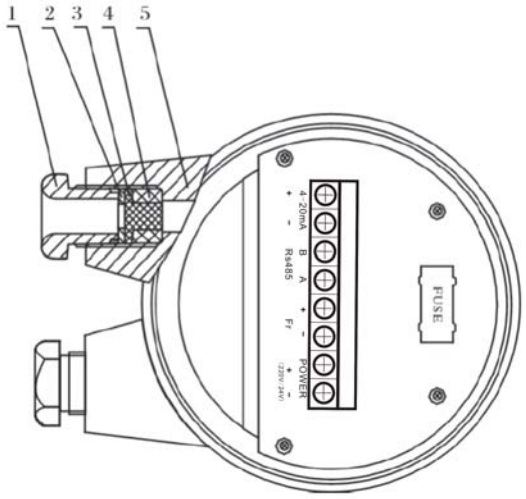
2.9. Installation and usage precautions for explosion-proof type

2.9.1 Notes that shall be paid attention to before installation and usage of explosion-proof electromagnetic flow converter

(1) The explosion-proof signs shall be clearly marked with "Ex" sign and words "Please open the lid after turning the power off". Check whether the explosive gas mixtures existing in dangerous places meet the described range.

(2) When explosion-proof electromagnetic flow converter is used in dangerous places, the shell cover of the converter must be tightened. To ensure safety, safety regulations shall be strictly followed. Do not open the converter cover when the power is on!

(3) During installation of explosion-proof electromagnetic flow converter, the cable outlet shall have good sealing. See Figure 11 for the structure:



First, loosen the converter wire outlet, and remove the thread joint (1), and then remove the large washer (2), sealing plug (3) and sealing gasket (4) in order. Put the cable through the holes of (4) and (2), and put (4) and (2) into the cable interfaces in order. The sealing gasket (4) shall be kept flat. It will be deformed due to compression after tightening of thread joint, so as to clamp the cable. Cable connection must be reliable, and the insulation resistance to housing shall not be less than 50MΩ. YHZ type two-core rubber cable $2\times1.0\,mm^2$ (Φ6.5) shall be adopted.

(4) The converter housing must be well grounded.

2.9.2 The following provisions shall be fully followed when using explosion-proof converter:

(1) The explosion-proof structure of explosion-proof converter must be inspected rigorously before leaving the factory. Therefore, the user must not scratch the joint faces or form burrs on it when servicing. None of the explosion-proof parts shall be self-manufactured or obtained from other manufactures, it shall be ordered from its manufacturer according to explosion-proofing specifications.

(2) The installation, usage and maintenance of explosion-proof electromagnetic flow converter must also comply with GB3836.15-200 and GB50058-92.

(3) Users are not allowed to replace the product parts without authorization.

2.10 Grounding

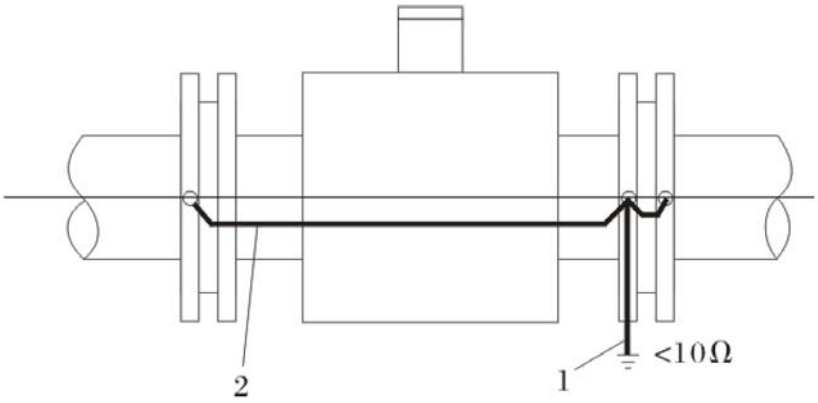
The flow signals generated by the sensor are very weak. It is only several millivolt at the full range. Therefore, the grounding of the sensor shall be good, and the grounding wire must be connected as per the following figures.

The grounding of the electromagnetic flowmeter is based on the following two aspects:

(1) Analyzed form the working principles of the electromagnetic flowmeter and the return circuit of the flow induction signal current, the grounding terminal shall have the same electric potential as the measured medium.

(2) The earth is used as the zero potential. This can reduce the external interferences. Generally, the process pipes are all the metal tubes, which have already been grounded. This requirement is easy to meet. However, when the outside electromagnetic field interference is relatively strong, the electromagnetic flowmeter shall be equipped with additional grounding device. The grounding wire shall be stranded copper wire with a total area of cross section larger than 4mm^2. The grounding wire of the sensor shall never be connected to the public grounding wire of the motor or other equipment, and the grounding resistance shall be less than 10Ω.

◆ When the sensor is installed on the metal tube, and there is no insulation coating on the inner wall of the metal tube, the grounding shall be according to the following figure.



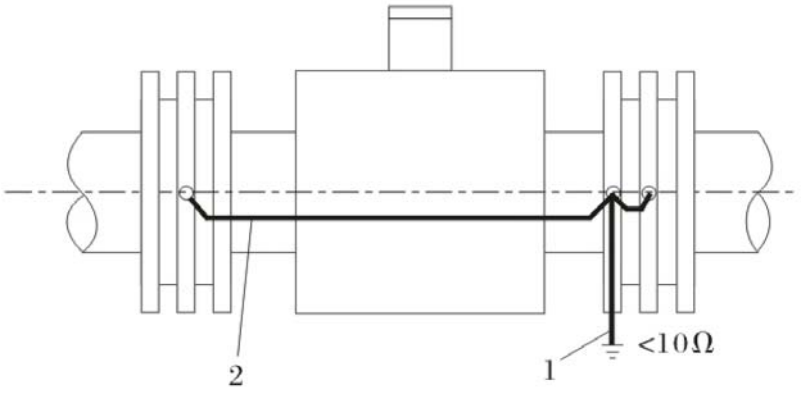
Grounding Schematic Diagram when Sensor is Installed on Metal Tube

1 ---- grounding device wire (installed when external interference is strong);

2 ---- instrument grounding wire

◆ When the sensor is installed on the plastic pipe, or on the pipe with

insulation coating, paint or lining, both ends of the sensor shall be equipped with grounding rings or grounding flanges so as to ground the measured medium flowing in the pipe and achieve the zero potential. Otherwise, the electromagnetic flowmeter cannot work properly.

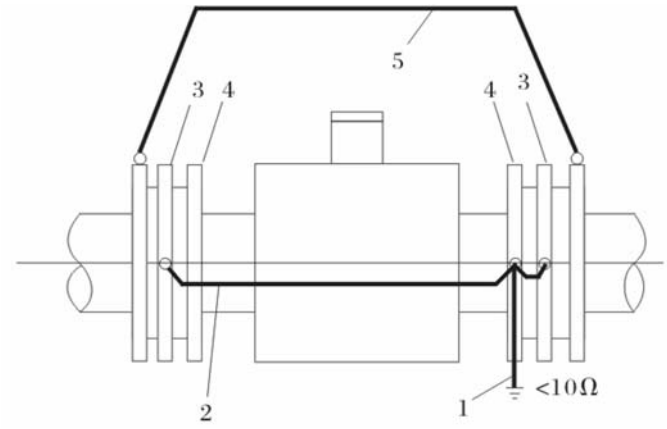


Grounding Schematic Diagram when Sensor is Installed on Plastic Pipe, or on Pipe with Insulation Lining

1 ---- grounding device wire (installed when external interference is strong); 2 ---- instrument grounding wire

3 ---- grounding flanges or grounding rings

◆ The inner wall and outer wall of the pipe resistant to electrolytic corrosion are generally insulated, so the measured medium has no ground potential. Therefore, the sensor must be grounded with the grounding rings when it is installed on the cathode protection pipe.



Grounding Schematic Diagram when Sensor is Installed on Cathode

Protection Pipe

1 ---- grounding device wire (installed when external interference is strong); 2 ---- instrument grounding wire

3 ----grounding flanges or grounding rings (they must be insulated to the flanges of the connection pipe)

4 ---- connecting lead, the sectional area of the copper core $\geq 6mm^2$, which will isolate the cathode protection potential from the sensor.

III. Preparations Before Operation

After the instrument is installed and wired, and before it is put into normal operation, the validity of installation and grounding shall be strictly checked.

It must be pointed out that since the instrument is subject to strict adjustment and real flow calibration in the manufactory, and is inspected one by one to be acceptable before leaving the manufactory, so generally it can be put into operation without any adjustment. Therefore, any problem occurring in the initial operation shall be checked, analyzed and solved carefully according to all the aspects in the Manual. It is strictly forbidden to adjust and move the instrument without any specific purpose, since this may disorder or even damage the complete set of instruments that was previously adjusted.

When put into operation, the instrument shall be operated according to the following steps:

(1) First, open the rear and front valves of the sensor to completely fill the measuring tube of sensor with medium;

(2) Switch the power on. Check, by using an electroprobe, whether the power-supply wiring of the converter meets the requirements of the wiring diagram. Since there is a flow in the tube, the digital display of the converter shall indicate a certain value.

(3) Adjust the zero position. After the instrument is supplied with power for one hour, first firmly close the downstream valve of the sensor, and then close the upstream valve. This can stop the flow in the tube, and there will be no leakage. The flow is zero. Measure the output signal of the converter with an ampere meter, and the current shall be 4 ± 0.04 mA. If the current is too high or too low, readjust the zero position of the current output so as to make the current of the output signal within the above mentioned range.

Ⅳ. Setting parameters

4.1. Keys and display

4.1.1 Squared define keys and LCD screen display

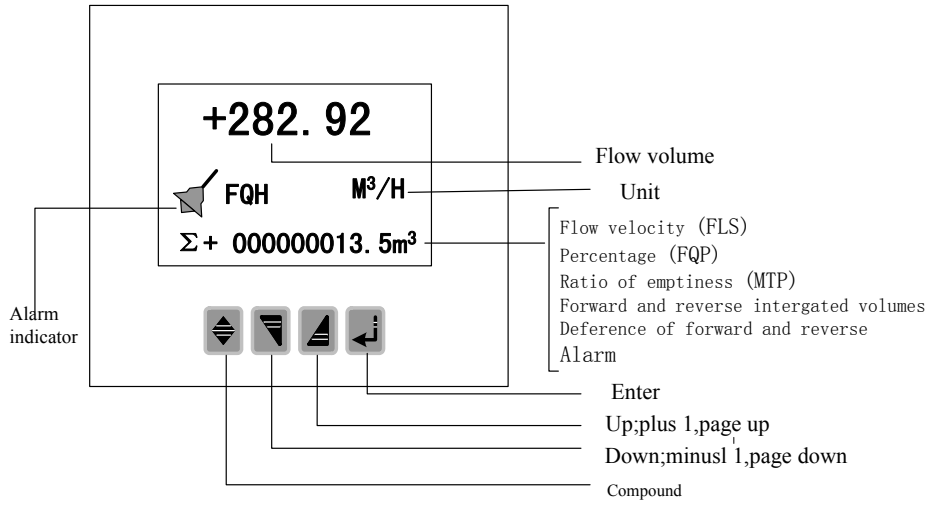


Fig. 4.1 Keys on squared panel

Note: When measuring, pushing down “Compound Key + Enter” will appear password of changing state, base on distinction of secrecy, and change the password as we provide. Then pushing “Compound Key + Enter” again, and you can inter the state of setting parameter. If want to return to the running state, push “Enter” for several seconds.

4.1.2 Rotundity define keys and LCD screen display

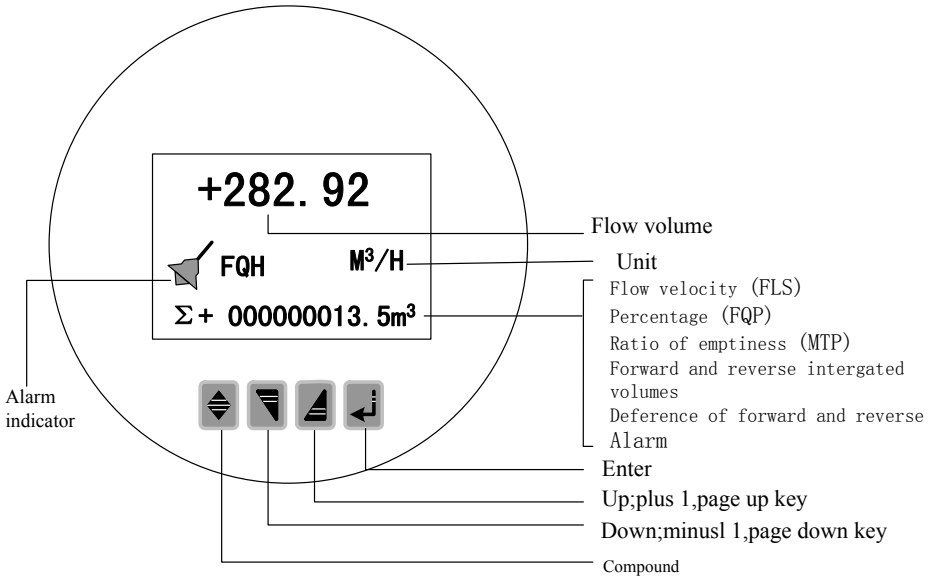


Fig. 4.1 (c)Keys on circinal panel and big LCD display

Note: When measuring, pushing down “Compound Key + Enter” will appear password of changing state, base on distinction of secrecy, and change the password as we provide. Then pushing “Compound Key + Enter” again, and you can inter the state of setting parameter. If want to return to the running state, push “Enter” for several seconds.

4.2. Keys function instruction

a) Keys’ function in self- testing way

“Up” key: Selecting displayed data on lower line in turn;

“Compound” key + “Enter” key: Come into parameter setting

“Enter” key: Press it to come into the picture of select function.

Under the measure, adjust of the LCD contract is used “Compound” key + “Up” key or “Compound” key + “Down” key for several seconds;

b) Function keys for parameters setting

“Down” key: Subtract 1 from the number at cursor area;

“Up” key: Plus 1 to the number at cursor area;

"Compound" key + "Down" key: Cursor turns left;

"Compound" key + "Up" key: Cursor turns right;

"Enter" key: In/Out submenu;

"Enter" key: Press for two seconds under any state and will return to automate measure way.

Note:

(1) When use "Compound" key, you should press "Compound" key and "Up" or "Down" both;

(2) It will return to the measure way automatically after 3 minutes when under the parameter setting way;

(3) Direct select of zero correction about the flow, you can move the cursor to the left + or - , and use "Down" or "Up" to switch;

4.3. Function keys for setting parameters

To set or correct working parameters, the converter should be running in parameters setting way instead of measuring status. In measuring status, push "Compound"+"Enter" keys getting to the select of parameter and transfer password (0000), and then correct the password with one of the new passwords that are provided by manufacturer. Finally, push the "Compound"+"Enter" keys to work in Parameters Setting Way.

There are 6 Passwords in design and among them 4 for deferent operators in secret and 2 are fixed passwords for system operation.

4.3.1、Functions select menu

Push "Compound"+"Enter" keys to the functions select menu, push "Up" or "Down" keys to select, there are tow functions:

Code	Functions	Notes
1	Parameters Set	Select this function, It can be enter the picture of parameter.
2	Clr Total Rec	Select this function，It can be gross reset operation.

4.3.2、 Parameters Set

Press "Enter" key, It displays "Parameters Set" function. Input password. Press

“movie” key, Movie cursor on the “Enter” key, Press it getting to Parameters Setting status.

4.3.3、Clr Total Rec

To push “Compound”+“Enter” keys getting to the select of parameter, then push “Up” key to “Clr Total Rec”, input the passwords. When the passwords becomes “00000”, this function is done, the gross is 0 in the instrument.

4.4. Setting Parameters in Menu

There are 52 parameters of flowmeter, user can set every parameter. The List of Parameters is shown below:

Setting Parameters in Menu

	Parameter words	**Setting Way**	**Grades**	**Range**
	Language	Select	2	Chinese/English
	Comm Addres	Set count	2	0～99
	Baud Rate	Select	2	600～14400
	Snsr Size	Select	2	3～3000
	Flow Unit	Select	2	L/h,L/m,L/s,m^3/h, m^3/m,m^3/s ,UKG,USG
6	Flow Range	Set count	2	0～99999
7	Flow Rspns	Select	2	1～50
8	Flow Direct	Select	2	Plus/ Reverse
9	Flow Zero	Set count	2	0～±9999
10	Flow Cutoff	Set count	2	0～599.99%
11	Cutoff Ena	Select	2	Enable/Disable
12	Total Unit	Select	2	0.001m^3～1m^3,0.001L～1L,0.001UKG～1UKG,0.001USG

				～1USG
13	SegmaN Ena	Select	2	Enable/Disable
14	Analog Type	Select	2	0～10mA /4～20mA
15	Pulse Type	Select	2	Freque / Pulse
16	Pulse Fact	Select	2	0.001L～1m^3, 0.001L～1L,0.001UKG～1UKG,0.001USG～1USG
17	Pulse Width	Select	2	4～400ms
18	Freque Max	Select	2	1～ 5999 HZ
19	Mtsnsr Ena	Select	2	Enable/Disable
20	Mtsnsr Trip	Set count	2	599.99 %
21	Mtsnsr Crc	Set count	2	0.0000～5.9999
22	Alm Hi Ena	Select	2	Enable/Disable
23	Alm Hi Val	Set count	2	000.0～ 599.99 %
24	Alm Lo Ena	Select	2	Enable/Disable
25	Alm Lo Val	Set count	2	000.0～599.99 %
26	Sys Alm Ena	Select	2	Enable/Disable
27	Clr Sum Key	Set count	3	0～99999
28	Snsr Code1	User set	4	Finished Y M
29	Snsr Code2	User set	4	Product number
30	Field Type	Select	4	Type1,2,3
31	Sensor Fact	Set count	4	0.0000～5.9999
32	Mult Factor	Set count	4	0.0000～5.9999
33	FwdTotal Lo	Correctable	4	00000～99999
34	FwdTotal Hi	Correctable	4	00000～9999
35	RevTotal Lo	Correctable	4	00000～99999
36	RevTotal Hi	Correctable	4	00000～9999
37	Year	User correct	4	00～99
38	Month	User correct	4	00～99
39	Day	User correct	4	00～99
40	Hour	User correct	4	00～99

41	Minute	User correct	4	00～99
42	Second	User correct	4	00～99
43	PlsntLmtEna	Select	4	Enable/Disable
44	PlsntLmtVal	Select	4	0.010～0.800m/s
45	Plsnt Delay	Select	4	400～2500ms
46	Pass Word 1	User correct	5	00000～99999
47	Pass Word 2	User correct	5	00000～99999
48	Pass Word 3	User correct	5	00000～99999
49	Pass Word 4	User correct	5	00000～99999
50	Analog Zero	Set count	5	0.0000～1.9999
51	Anlg Range	Set count	5	0.0000～3.9999
52	Meter Fact	Set count	5	0.0000～5.9999
53	MeterCode 1	Factory set	6	Finished Y /M
54	MeterCode 2	Factory set	6	Product Serial No

4.5. Converters parameters

Parameters of converters can decide the running status, process and output ways as well as state of output. Correct option and setting of parameters can keep the converters running optimally and get higher accuracies of output bother in display and in measurement.

There are 6 grades of passwords for setting parameters function. Grades 1 to grade 5 of passwords are for users and grade 6 of password is for manufacturer. Users can reset their passwords of grades 1~4 in grade 5.

Users can check converters parameters in any grade of password. However, if users want to change parameters pf converters, deferent grade of parameters have to be used by the users.

Grade 1 of password (set by manufacturer as 0521): users can only read parameter.

Grade 2 of password (set by manufacturer as 3210): users can change 1~26 parameters.

Grade 3 of password (set by manufacturer as 6108): users can change 1~27parameters.

Grade 4 of password (set by manufacturer as 7206): users can change 1~45parameters.

Grade 5 of password (Fixed): users can change 1~52 parameters.

Password Grade 5 can be set by skilled users. Grade 4 is mainly used for resetting total volume in password. Grades 1~3 can be set by any one who can be chosen by users.

- **Language**

There are 2 languages for flowmeter converter operation. They can be set by users according to the users needs.

- **Comm Addres**

It means this instrument's address when communicates with many, and has 01~99 , holding the 0.

- **Baud Rate**

600, 1200, 2400, 4800, 9600, 19200,38400 baud rate.

- **Snsr Size**

flowmeter converters can be equipped with some deferent sensors that have deferent diameter of measuring pipes. The pipes in deferent diameters from 3mm to 3000mm can be chosen in relative table.

- **Flow unit**

The flow unit can choose form the parameters (L/s、L/m、L/h、m^3/s、m^3/m、m^3/h、UKG、USG),and the user can choose the proper unit according to the technological requirement and using habit.

Notice: Using 5 valid to show the value of the flow, with the volume unit following the last valid. The microprocessor can remind the users of the set mistakes leading to the upper limit and lower limit overflow causing by unsuitable choosing the volume unit. For example, when caliber is 200mm and choose l/h as the display volume unit, if the speed of the volume is 1m/s and the volume is 113097 L/h, the figures is more than 5 valid and cause upper limit overflow, and "unit too large" is showed on the panel. So now the volume unit can be chosen from m^3/s、m^3/min and m^3/h.While caliber is 3mm,choose m^3/s as the volume unit and the volume is 0.00000707m^3/s,it is impossible to show the valid using 5 valid and causing lower limit overflow, and "unit too large" is showed on the panel. So now

the volume unit can be chose from L/s、L/min or L/h.

■ **Flow range**

Flow range means upper limit value, and lower limit value is set "0" automatically. So, it makes the range, and makes the relation of percent display, frequency output and current output with flow:

percent display = (flow measure / measure range) ＊ 100 %;

frequency output = (flow measure / measure range) ＊ frequency full;

current output = (flow measure / measure range) ∗ current full + base point;

pulse output will not affect.

■ **Flow Rspns**

It means time of filter measure value. The long one can enhance the stability of flow display and output digital, and fits for gross add up of pulse flow; the short one means fast respond rate, and fits for production control. It is set by select.

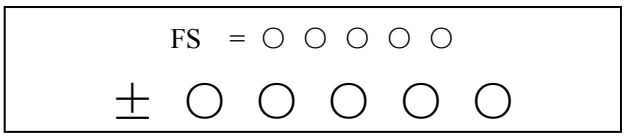
■ **Flow Direct**

If users think the direct and design are different, just change the direct parameter is OK, but not change exciting or signal.

■ **Flow zero**

Make sure the sensor is full of flow, and the flow is stillness. Flow zero is shown as velocity of flow, mm/s.

Converter's zero-flow correction displays like this:



Upper small words: FS means measure value of zero;

Lower large words: correction value of zero.

When FS is not "0", make FS = 0. Note: if change the value on next line and FS increases, please change the "+, -" to correct FS to zero.

Flow zero is the compound value of the sensor, and should be recorded in sensor list and band. The unit will be mm/s, and the sign will be opposite with correction value.

■ **Flow cutoff**

Flow cutoff is set in percentage of Upper Limit Range of flow, and users can delete all Negligible Small Signals of flow volume, velocity and percentage out of displaying and outputting them. Sometimes user can delete output of current output signal and frequency (pulse) output signal only to have flow, velocity and percentage being displayed.

5.2.3.11 Total Unit

Converter display is counter with 9 bits, and the max is 999999999.

Integrator units are L, m^3, UKG and USG (liter, stere, English gallon, American gallon).

Flow integrator value: 0.001L、 0.010L、 0.100L、 1.000L
0.001m^3、 0.010m^3、 0.100m^3、 1.000m^3;
0.001UKG、0.010UKG、0.100UKG、1.000UKG,
0.001USG、0.010USG、 0.100USG、1.000USG.

■ **SegmaN Ena**

When “SegmaN Ena” is “enable”, if the flow flows, the sensor will export pulse and current, cumulate the gross at the same time. When it is “disable”, the sensor will export pulse as “0” and current as “0”(4mA or 0mA) for the flow flows reversals.

■ **Analog Type**

Output current types can be chosen by users as 0~10mA or 4~20mA practically.

■ **Pulse Type**

Two kinds of Pulse Outputs are can be chosen: Frequency Output and Pulse Output. Frequency Output is continuous square waveform and Pulse output is a serial wave of square wave. Frequency output is mainly used for instant flow and total integrated flow in short time measurement. Frequency output can be chosen in equivalent frequency unit and volume of integrated flow can be displayed. Frequency Output can be used in long time measurement for total integrated flow with volume units.

Frequency output and pulse output are usually from OC gates so that DC power supplies and load resistors have to be required (See Part 4.5).

■ **Pulse Fact**

Equivalent pulse Unit is referred to one pulse for value of flow. The range of pulse equivalent can be chosen:

Pulse Equivalent	Flow	Pulse Equivalent	Flow
1	0.001L/cp	9	0.001USG/cp
2	0.01L/cp	10	0.01 USG /cp
3	0.1L/cp	11	0.1 USG /cp
4	1.0L/cp	12	1.0 USG /cp
5	0.001m^3/cp	13	0.001UKG/cp
6	0.01m^3/cp	14	0.01 UKG /cp
7	0.1m^3/cp	15	0.1 UKG /cp
8	1.0m^3/cp	16	1.0 UKG /cp

Under the same flow, the smaller pulse, the higher frequency output, and the smaller error will be. The highest pulse output is 100cp/s, and mechanism electromagnetic counter can get 25 frequency/s.

■ **Pulse Width**

Frequency output range is as the upper limit of flow measure, just the percent flow 100%. Frequency output upper limit can be selected between 1～5000Hz.

Max = 020p/s

40ms

■ **Freque Max**

Frequency output range is as the upper limit of flow measure, just the percent flow 100%. Frequency output upper limit can be selected between 1～5000Hz.

The state of empty pipe can be detected with the function of converter. In the case of Empty Pipe Alarm, if the pipe was empty, the signals of analog output and digital output would be zero and displayed flow would be zero, too.

- **Mtsnsr Ena**

The state of empty pipe can be detected with the function of converter. In the case of Empty Pipe Alarm, if the pipe was empty, the signals of analog output and digital output would be zero and displayed flow would be zero, too.

- **Mtsnsr Trip**

flowmeter sensor use flow resist rate to judge whether full of pipe, so empty pipe value is a continuum value. Even though different flow has different resist rate, when the flow is full, the resist rate is steady.

flowmter use relative resist rate to calculate empty measure value, define the full pipe resist rate 100%, as empty pipe alarm to adjust to 100%, when flow surface is lower than the electrode, the electrode touches the air and the rate will be higher, so the instrument displays empty pipe alarm.

For fact use, when the flow is full of pipe after adjusting empty pipe to 100% and the surface is lower than the electrode completely, flowmeter empty pipe value will get 1000% all more. So empty pipe alarm set at about 900% and can alarm empty state correctly.

When the surface drops from full to empty, it will hang some liquid on the wall, and this will lead the empty pipe measure not to get the max immediately but needs some time. So if want empty alarm reacts quickly, make the threshold smaller as 500%.

- **Mtsnsr Crc**

Correction of empty pipe range is for testing relative conductivities. When the testing fluid full of the pipe of sensor, revising coefficient makes the conductivity is constant value. For example, water has 100μS/cm of conductivity, approximately, and then it can be revised as 100%. When conductivity of a tested fluid is5μS/cm, the relative conductivity may be nearly 2000%.If the conductivity of water is revised to 10% as test fluid and conductivity of measured fluid is 5μS/cm, then relative conductivity will be 200%.

- **Alm Hi Ena**

Users can choose “Enable” or “Disable”.

- **Alm Hi Val**

The parameter of upper limit alarm is percentage of flow range and can be set in the way of setting one numerical value between 0%~199.9%.When the value of flow percentage is larger than the value of setting value, the converter outputs the alarm signal.

- **Alm Lo**

The same as upper Alm Hi.

- **Sys Alm Ena**

Selecting Enable will have the function, and selecting Disable will cancel the function.

- **Clr Sum Key**

User use more than 3 byte code to enter ,Then set this password in Clr Total Rec.

- **Snsr Code1、2**

It is referred to the produced date of sensor and the serial number of product that can keep the sensors coefficient right and accurate.

- **Field Type**

FLOWMETER affords three exciting frequency types: 1/10 frequency (type 1), 1/16 frequency (type 2), 1/25 frequency (type 3)。 The small-bore one should use 1/10 frequency, and large-bore one should use 1/16 or 1/25 frequency. When using, please select type 1 first, if the zero of velocity is too high, select the type 2 or type 3.

Note: Demarcate on which exciting type, working on it only.

- **Sensor fact**

“Sensor fact” is printed on the Label of the sensor when it is made in factory. The “sensor fact “ has to be set into Sensor Coefficient Parameter when it runs with converter.

- **MultFactor**

This is used to bright dyke diving measure, such as one sensor is compounded with two like caliber pipes, then the factor is 3.0000.

■ **FwdTotal Hi、Lo**

Positive total volume high byte and low byte can change forthcoming and reverse total value, and be used to maintenance and instead.

User use 5 byte code to enter, and can modify the positive accumulating volume (∑+). Usually, it is unsuitable to exceed the maximum the counter set（999999999）.

■ **RevTotal Hi、Lo**

User use 5 byte code to enter, and can modify the negative accumulating volume (∑-). Usually, it is unsuitable to exceed the minimum the counter set（999999999）.

■ **Date (Year, Month, Day) and Time (Hour, Minute and Second)**

Users can set the date (Year, month, and day) and Time (hour, minute and second in Password 5.

■ **PlsntLmtEn**

For paper pulp, slurry and other serosity, the flow measure will have "cuspidal disturb", because the solide grain friction or concussion the measure electrode. flowmeter converters use variation restrain arithmetic to conquer the disturbing by designing three parameters to select disturb character.

Set it "enable", start variation restrain arithmetic; set it "disable", close variation restrain arithmetic.

■ **PlsntLmtVl**

This coefficient can disturb the variation of cuspidal disturb, and calculate as percent of flow velocity, thus ten grades: 0.010m/s, 0.020m/s, 0030m/s, 0.050m/s, 0.080m/s, 0.100m/s, 0.200m/s, 0.300m/s, 0.500m/s, 0.800m/s, and the smaller percent, the higher delicacy of cuspidal restrain.

Note: when using it, must test for select by the fact, and sometimes it is not the higher delicacy is good.

■ **PlsntDelay**

This coefficient can select the width of time of restrain cuspidal disturb and the unit is ms. If the duration is shorter than flow change in some time, flowmeter will think it is cuspidal disturb, and if it is longer, PMFB will think it is natural. It also needs to select parameter in fact.

- **User's password 1~4**

Users can use 5 grades of passwords to correct these passwords.

- **Analog Zero**

When the converters are made in the factory, output current has been calibrated to zero scale, that is, accurate 0mA or 4mA output.

- **Anlg Range**

When the converters is made in the factory, output current have been calibrated to full scale, that is, accurate 10mA or 20mA output.

- **Meter fact**

This fact is the special one of sensor-made-factory and the factory use this fact to unite FLOWMETER electromagnetic flowmeters converters to make sure all the instruments can interchange by 0.1%.

- **MeterCode 11 and 2**

Converter code records the date of manufacturing and serial number of converter.

V. Inspection and Maintenance of Instrument

5.1 Troubleshooting of instrument

Electromagnetic flowmeter is a kind of flowmeter of high precision. Therefore, we suggest the user regularly perform maintenance for some ordinary parts after a certain period of operation, such as checking the wiring, liner tube, electrode descaling, etc. For these aspects related to the flowmeter properties and unknown technologies, please carefully read the Manual, and perform the routine maintenance on the basis of understanding. If further maintenance or replacement of parts is required, please consult the personnel at our customer service center. We will provide you with the most considerate and comprehensive technical support.
As for the common faults occurring in the general application of the electromagnetic flowmeter, the customer can perform the conventional diagnostics according to the following table.

Failure	Possible causes	Inspection and Troubleshooting
Liquid is flowing, but there is no indication on the instrument, or there is no signal output	1. The power supply wires are not properly connected, or there is some problem in the return circuit of the power supply.	Check whether the power supply is on, or whether the return circuit of the power supply is in good condition with a multimeter
	2. The connecting terminals of signal circuit or excitation circuit is wrongly connected	Switch the connecting terminals of signal circuit (A terminal and B terminal) or excitation circuit (X terminal and Y terminal)
	3. The sensor is damp, or the signal circuit is damaged, and as a result, short circuit to the ground exists	Check whether the insulation of the signal circuit is in good condition with a multimeter
	4. The output signal circuit is not properly connected, or the internal wires are loose	Check, by using a multimeter, whether the signals can be accessed
	5. The excitation return circuit is open	Check whether the excitation return circuit is in good condition with a multimeter

	6. The grounding is not complete	It shall be ensured that the flowmeter, the measurement tube, and the measured medium are connected and reliably grounded
	7. The medium is not smooth or the tube is not filled up with medium	Fill up the tube with the medium and ensure the full filling state of the tube
	8. The electrode surface is oxidized or covered with attachments	Remove the flowmeter and clean the electrode surface
	8. The converter malfunctions	Fuse or other reasons
The flow is changing, but the indication of the instrument is out of range	1. One signal circuit has short circuit to the ground, or open circuit	Check the resistance to the ground of the signal circuit. When the tube is full of medium, measure the resistance to the ground of the electrode with a multimeter. Generally, the value shall be several thousand ohms
	2. The measurement tube of the sensor is not completely full with the measured medium	Check whether the signal circuit is in properly connected with a multimeter, and improve the installation pattern
	3. The grounding is not good	Check the signal shielding layer and the grounding point resistance, and reinstall the grounding device
The indication of the instrument is not in conformity with the actual flow	1. The zero position causes the measurement error	The grounding is not good, or the electrode is contaminated. After inspection and troubleshooting, restore the zero position
	2. The calibration coefficient of the converter range is wrong	Adjust according to the value of range calibration coefficient
	3. The installation position of the sensor is not proper. The measurement tube is not completely filled with the measured medium, or there are bubbles in the medium	Check the process flow and improve the installation pattern
	4. There is scale formation on the electrode or the inner wall	Remove the scale formation
	5. The lengths of the upstream and downstream straight pipe sections of the sensor are not enough, or there is a just partly open valve	

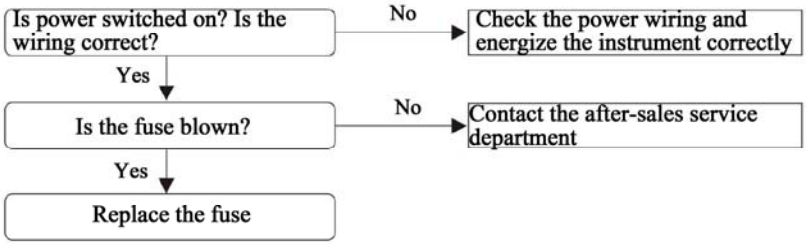
	6. There are some unknown branch pipes in the measuring system	
	5. The real flow measurement method, which is used as a comparison for the electromagnetic flowmeter, has some internal error	Use a standard flowmeter for comparison

Analysis of other possible problems

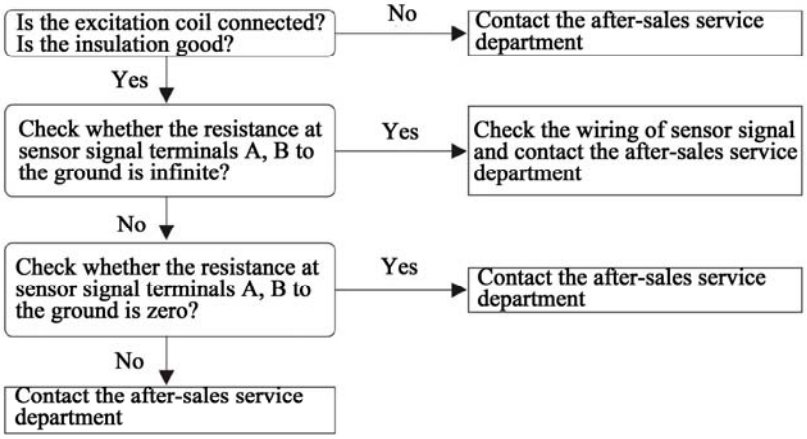
Failure	Failure Analysis
The output is not stable	The measured medium itself is fluctuating or pulsating. In fact, there is no failure with the electromagnetic flowmeter. It is the actual reflection of the flow conditions. If the length of the straight pipe section is not enough, or the installation point of the flowmeter is too close to the pump, the output will be unstable.
	The tube is not completely filled with the liquid, or there are bubbles in the liquid
	There is electric and magnetic interference from outside stray current.
	The conductivity of the liquid is uneven or too low, containing too many particles and fibers.
	The electrode material dose not match the liquid, causing the contamination or corrosion of the electrode.
	The grounding is not complete. It shall be ensured that the flowmeter, the measurement tube, and the measured medium are connected and reliably grounded.
Zero point is unstable	The tube is not completely filled with the liquid, or there are bubbles in the liquid.
	The grounding is not complete. There is electric and magnetic interference from outside stray current.
	It is subjectively assumed that there is no flow of the liquid in the tube. But in fact, there is a small flow. Actually, this is not a failure of the flowmeter. On the contrary, it is the actual reflection of the flow conditions.
	The conductivity of the liquid is uneven or too low, or the electrode material dose not match the liquid, causing the contamination or corrosion of the electrode.
	The insulation of the signal return circuit decreases.

5.2 Process flow of common failures

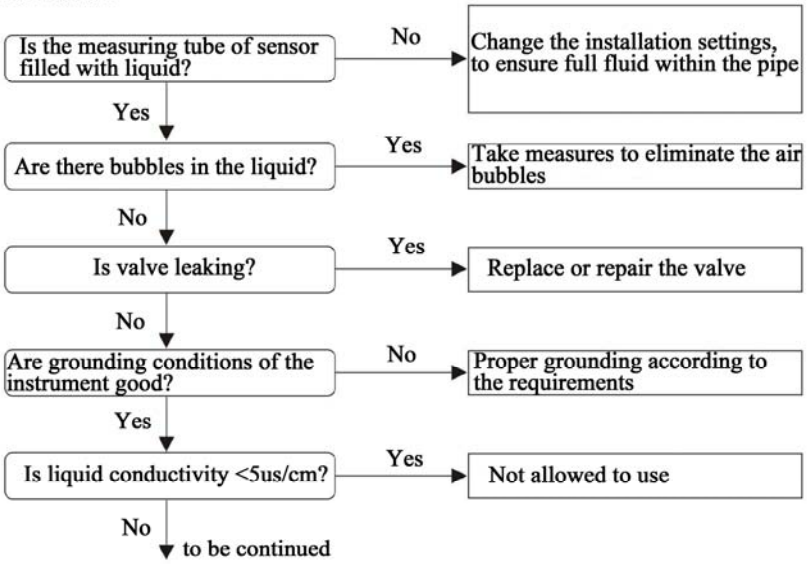
A. No indication

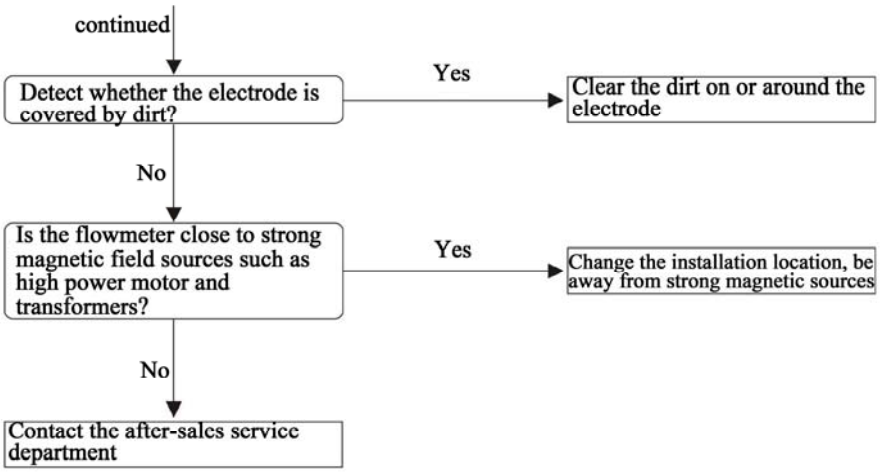


B. Instantaneous flow is indicated as zero



C. Zero point is unstable





D. The measured flow rate is inconsistent with the actual one