Serie KF 730S-H Medidor Electromagnético de Inserción

MEDICIÓN | CONTROL | TELEMETRÍA | AUTOMATIZACIÓN

Manual de Instalación

Dear User,

Welcome to using electromagnetic meters. Please read the manual carefully before using the products to understand and master the proper installation and use, ensuring optimal performance. Our first-class company adheres to the "principles of first-class service and technical support". Please contact us if you encounter any problems while using the instrument. Our company is not responsible for performance damages caused by unauthorized repairs or replacement of any parts.

Contents

I. Product Overview

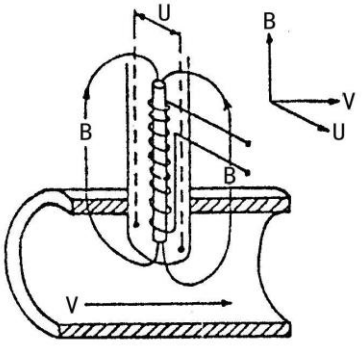
1.1 Brief introduction

Product performance of KF730S-H series electromagnetic flowmeters conforms to the industrial standard of JB/T9248-1999. Flowmeters must pass strict inspection with multiple indexes before leaving the factory. After arrival of flowmeters, please inspect the appearance carefully to confirm whether flowmeters are damaged during transportation. Please refer to this section to inspect corresponding accessories.

KF730S-H insertion electromagnetic flowmeter is a new fluid flowmeter developed based on pipe-type electromagnetic flowmeter. Besides preserving the merits of pipe-type electromagnetic flowmeter and considering such defects of pipe-type electromagnetic flowmeter as difficult installation on large pipes and high cost, KF730S-H flowmeter measures mean fluid flow rate in electromagnetic method according to NIKURADS principle, so as to obtain the fluid volume flow. In particular, after technologies of hot tapping and installation under pressure are applied, the insertion electromagnetic flowmeter can be installed without conducting shutdown or cutting off water supply as well as on cast iron pipe or cement pipe. The successful development of insertion electromagnetic flowmeter provides a new means for inspection of fluid flow.

Compared to ordinary electromagnetic flowmeter, sensor of insertion electromagnetic flowmeter generates external emission magnetic field on outer side. The measuring electrodes are at the ends or on both sides of the sensor. Principle of electromagnetic flowmeter is shown in the figure below. It is noteworthy that in external emission magnetic field, the induction signal of electromagnetic flow sensor will reduce the linearity of measurement in case of being affected by fluid and thickness of the magnetic field's boundary layer.

In terms of KF730S-H insertion electromagnetic flowmeter, conducting liquid in pipeline is the conductor moving in magnetic field and distance between two electrodes is the length (L) of conductor.



When the induction voltage is directly proportional to mean flow rate, fluid flow in pipe can be obtained from:

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

D: Internal diameter of measured pipe U: Induction voltage

B: Magnetic induction K: Coefficientrelated to magnetic field distribution

1.2 Model and specification inspection

Model and technical specifications can be found on nameplate and check sheet for leaving the factory of electromagnetic flowmeter. Check whether such model and technical specifications is in line with that of flowmeter ordered.

If product quality problems occur or you need to contact with us because of encountering some problems in the course of use, please provide us with the instrument model, specifications and No. for settlement.

1.3 Packing list

After arrival of flowmeter, confirm whether the following items shall be packed:

Sensor (1 set)

Converter (1 set) (only remote type)

Instruction manual (1 copy)

Check sheet (1 copy)

Certificate of conformity (1 copy)

Cable (only remote type, with length defined by user)

Flange provided externally (provided while ordering by user)

Bolts and nuts (provided while ordering by user)

Sealant (provided for site seal if needed by user; generally sealed at the time of leaving the factory)

Anti-explosion certificate (only explosion-proof products)

1.4 Storage precautions

After arrival, the instruments needs to be stored for a relatively lone period and particular attention shall be paid to the following:

1). Use original packing box to pack the instruments and try to keep the instruments in the same state before leaving the factory.

2). Select storage position by considering the following conditions:

Do not expose instruments to wind and rain;

Do not place instruments at positions with vibration and shock;

Do not open the cover of sensor junction box of instrument, to prevent normal operation from being affected by damp; Ambient temperature, humidity and air pressure shall be:

Ambient temperature: -20℃~+60℃

Relative humidity: 5%~90%

Air pressure: 86~106KPa

1.5 Precautions for installation position

Select proper installation positions according to the following conditions, so as to ensure long-term stable operation of instruments.

Ambient temperature: avoid big temperature changes and direct sunlight. If the installation position will withstand heat radiation of heat source, please provide insulation or ventilation facilities.

Atmospheric environment: avoid atmospheric environment with high corrosiveness and places with explosive gases (non-explosion-proof instrument).

1.6 Change of converter direction

Please do not change the direction of converter without being authorized. If it has to be changed, please contact with us.

1.7 Application scope of product

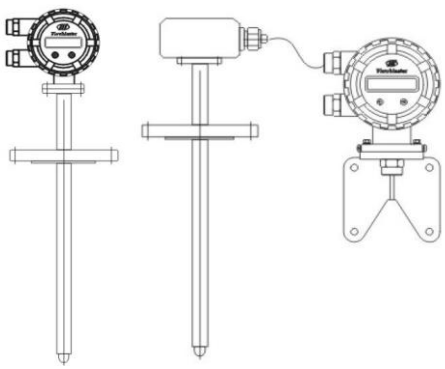
The insertion electromagnetic flowmeter consists of sensor and converter and is used to measure conducting liquid. Electrical conductivity is required to be more than 5μs/cm, the flowmeter can measure such media as water, sewage, acid and strong base. It is mainly used by large and medium pipes of industries related to tap water and petrochemical industry, available for measurement of instantaneous flow and volume flow of conducting liquid. It is particularly applicable to flow measurement of industries related to metallurgy, paper making and sewage treatment.

1.8 Product composition

A complete set of KF730S-H insertion electromagnetic flowmeter consists of sensor and converter. There are two types of installation: compact installation and remote type installation of sensor and converter based on different protection grades and parameter setting forms.

Compact installation means that the sensor and converter are externally connected to form a whole and can directly output current signal or frequency signal being linear with flow. This type of installation is finished before leaving the factory and various parameters have been adjusted based on user requirements.

Remote type installation means that the sensor and converter are connected via external shielded cable to form a complete set of electromagnetic flowmeter, as shown in the figure below. Various parameters of converter can be adjusted based on user requirements and process data. This type of installation is applicable to such occasions as diving.



1.9 Main technical parameters of insertion electromagnetic flowmeter

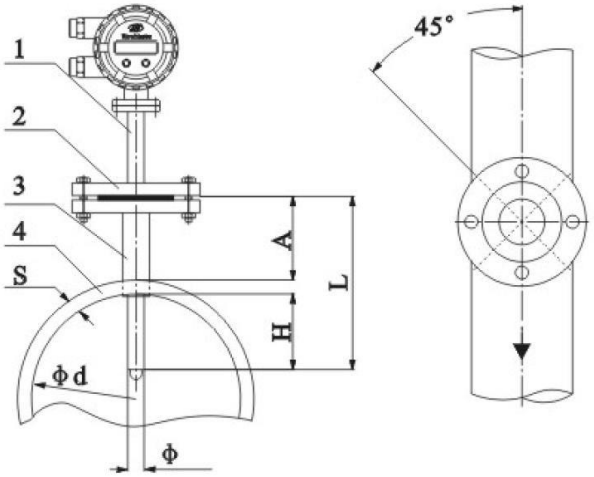
Model		
	Compact type	Remote type
Accuracy	±1.5% (under reference conditions)	
Caliber (mm)	DN200~DN3000	DN200~DN3000
Flange	Conforming to GB9119, stainless steel	
Pressure rating	1.6 MPa	
Material of converter housing	Die-cast aluminum alloy	
Material of sensor housing	Stainless steel	
Material of sensor structure	Stainless steel/PVDF	
Weight	6 kg	
Electrical conductivity	≥5μs/cm (negotiate with us for ordering in case of less than 5μs/cm)	
Electrode	316L, hastelloy, titanium, tantalum and platinum	
Protection grade	IP65	IP65/IP67(IP68 is optional to sensor)
Medium temperature	-25℃~80℃	-25℃~120℃
Ambient temperature	-25℃~60℃	
Effect of ambient temperature	<±0.1%/10℃ or <±0.25%/10℃	
Repetitiveness	≤±0.01% or ≤±0.25%	
Analog output error	≤±0.02mA	
Flow rate within measuring range	≤10m/s	
Available to be buried	—	≤5m (only IP68)
Electrical connection	M20*1.5 seal, G1/2 and NPT1/2	
Sensor cable		<30M (negotiate with us for ordering in case of over length)

II Installation

2.1 External dimensions

2.1.1 Sensor dimension

The sensor is fixed via flange connection. Calculate the length of base connecting pipe according to the diameter. Tap the pipe and weld the base to pipe tapping. While welding, absolute attention shall be paid to correct orientation and penetration depth of base flange screw, ensuring that direction of sensor probe is perpendicular to fluid direction. Base connecting pipe shall not go beyond the inner wall of measured pipe, ensuring smoothness of such inner wall. See the figure below for specific dimensions and material specifications and models.

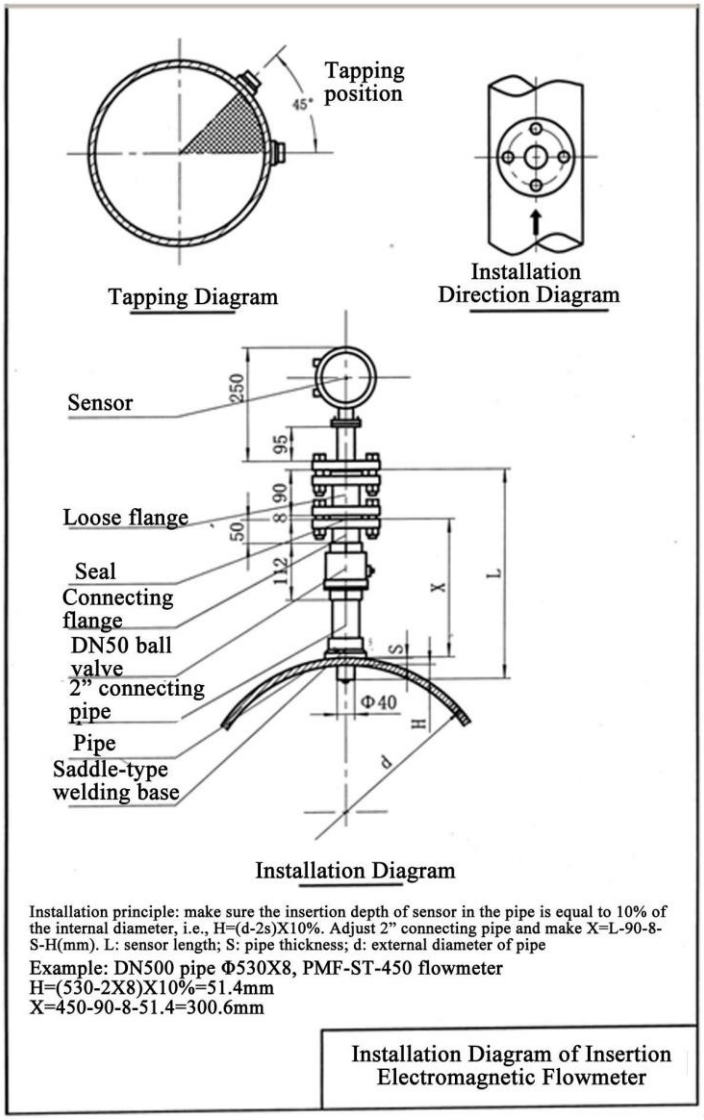


(1) DN200mm, DN300mm and DN400mm (installation under no pressure)

No.	Name/caliber	DN200mm	DN300mm	DN400mm
1	Sensor (L×Φ)	182×Φ38		
2	Flange	DN(40) 1.6MPa		
3	Nipple	Φ45		
4	Pipe	Φd×S		

Installation principle: make sure the insertion depth (H) of electrode in water pipe is equal to (d-2s)10%, i.e., A=182-(H+S).

Notes: If no cut-off is allowed by production plant, it is optional to apply installation under pressure. At first, weld the base directly to the installation position of measured pipe and install the root ball valve. Perform hot tapping by using our special tapping machine. After tapping, close such ball valve to avoid fluid overflow. Then, get connected with seal provided by manufacturer and install the sensor. (Installation under pressure will not affect normal production), see the figure below for specific dimensions and material specifications and models.



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

Name/caliber	DN200mm	DN300mm	DN400mm
Sensor (L×Φ)	400×Φ38		
Seal (provided by manufacturer)	Φ45×3		
Intermediate flange	DN40 1.6Mpa		
Ball valve	DN50		
Connecting pipe	Φ50		

Pipe	Φd×S

(3) DN500mm~DN1200 (installation under pressure)

Name/caliber	DN500mm	DN600mm	DN700mm	DN800mm	DN900mm	DN1000mm	DN1200mm
Sensor (L×Φ)	450×Φ38						
Seal (provided by manufacturer)	Φ45×3						
Intermediate flange	DN40 1.6Mpa						
Ball valve	DN50						
Connecting pipe	Φ50						
Pipe	Φd×S						

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

Name/caliber	DN1400mm	DN1600mm	DN1800mm
Sensor (L×Φ)	600×Φ38		
Seal (provided by manufacturer)	Φ45×3		
Intermediate flange	DN40 1.6Mpa		
Ball valve	DN50		
Connecting pipe	Φ50		
Pipe	Φd×S		

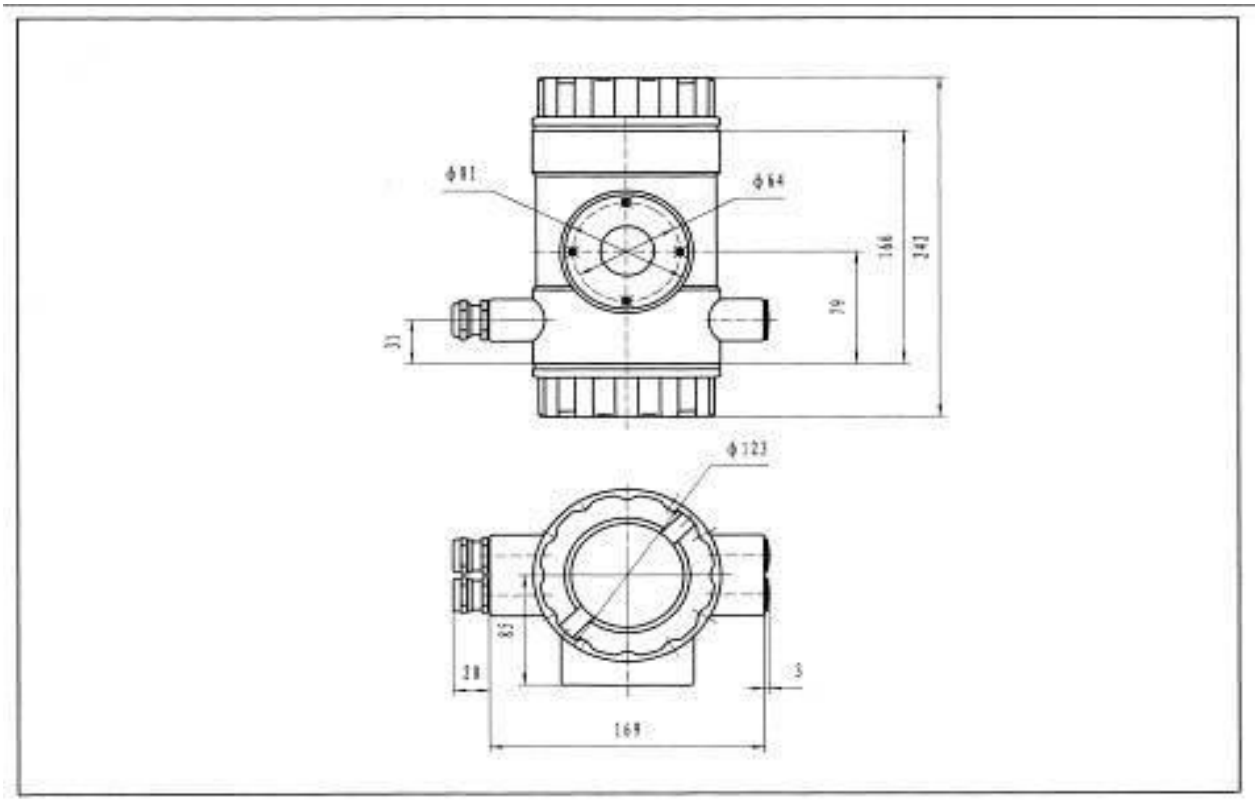
(5) DN2000mm~DN3000mm (installation under pressure)

Name/caliber	DN2000mm	DN2200mm	DN2400mm	DN2600mm	DN2800mm	DN3000mm

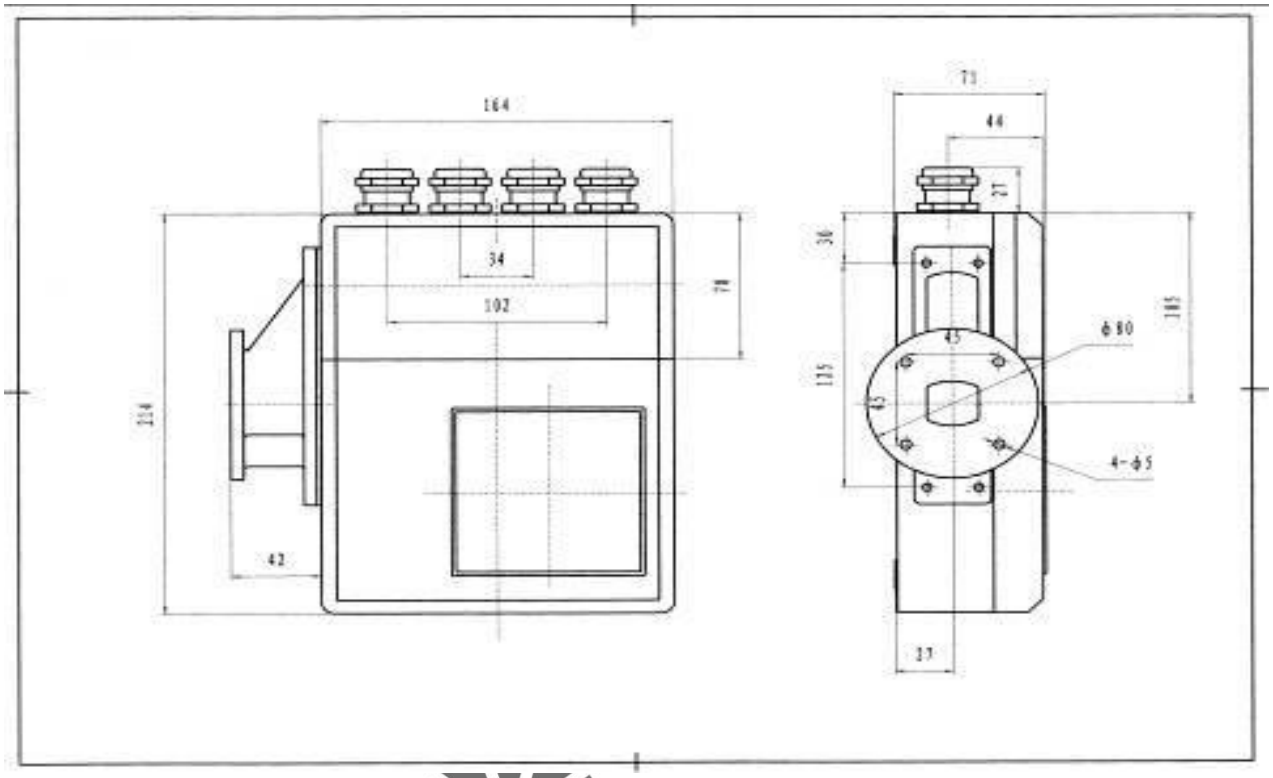
Sensor (L×Φ)	800×Φ38
Seal (provided by manufacturer)	Φ45×3
Intermediate flange	DN40 1.6Mpa
Ball valve	DN50
Connecting pipe	Φ50
Pipe	Φd×S

Notes: The above is for steel pipe installation. Accessories and corresponding models need to be customized in terms of installation of cast iron and cement pipes.

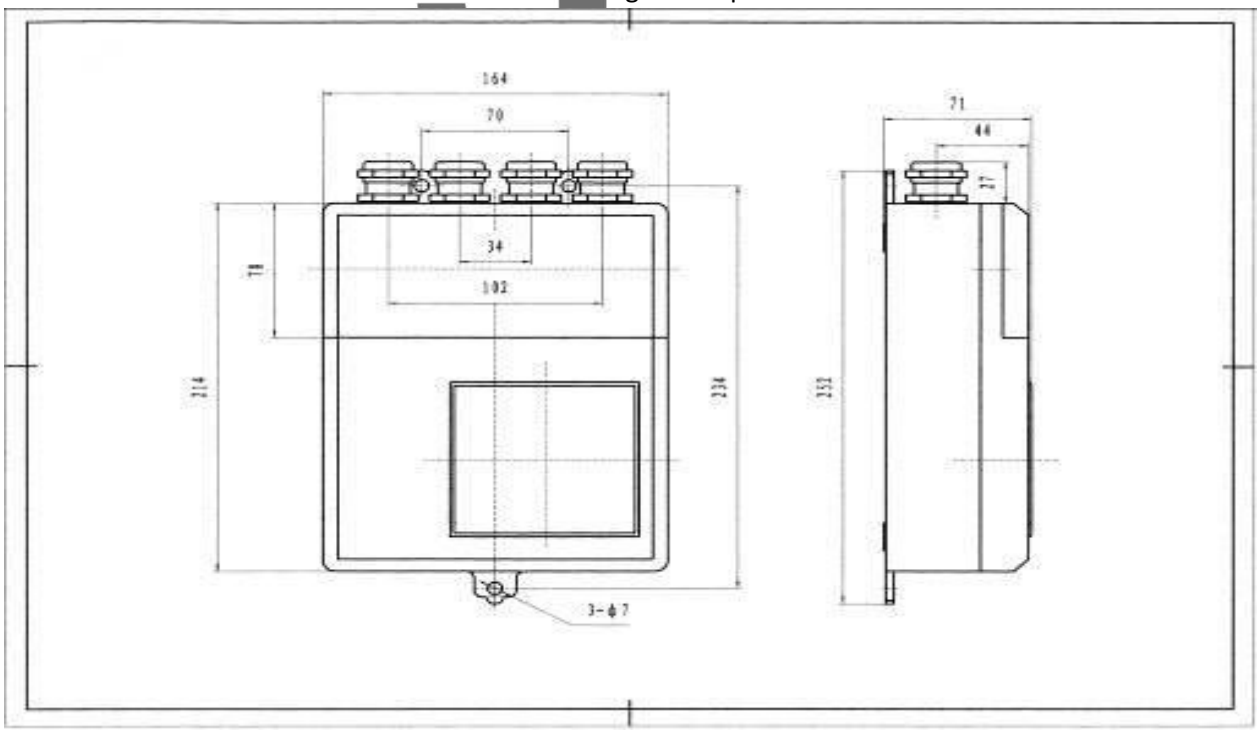
2.1.2 Converter dimension



Exterior size of the integrated circinal shells



Exterior size of the integrated squared shells

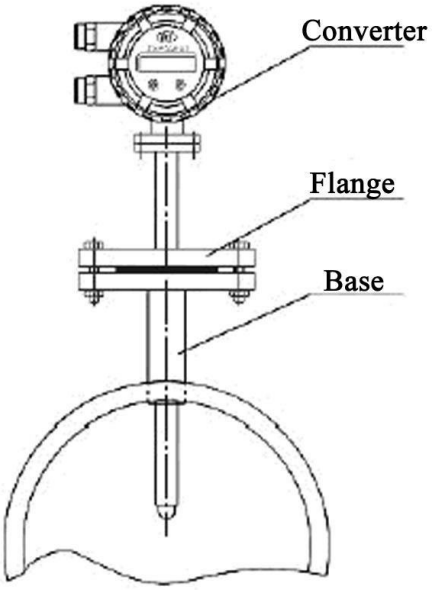


Exterior size of the split squared shells

2.2 Structure and installation

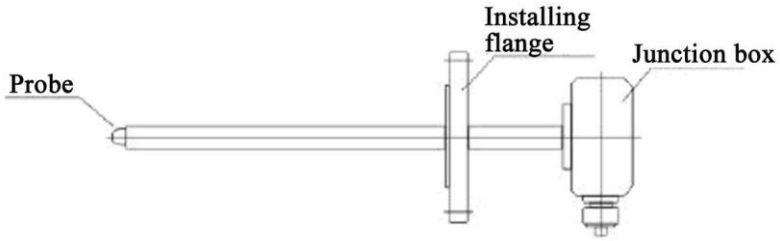
2.2.1 Converter structure

As a smart secondary instrument, it will enlarge flow signal, display the flow after SCM calculation, accumulate the flows, output impulse, analog current, etc. It is used for measurement or control of fluid flow. Optimum design of small integration is adopted for converter which is placed in the aluminum housing with protection grade of IP65.



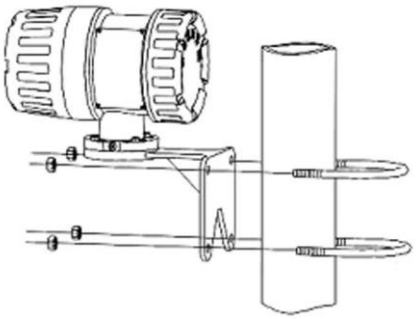
2.2.2 Sensor structure

The sensor mainly consists of detection probe, installing flange and junction box (for split-type installation), etc. The sensor is a cylinder with installing flange in shape. Excitation coil for electric magnetization, magnetic coil and two electrodes contacting with fluid of magnetic iron core are placed in such cylinder.

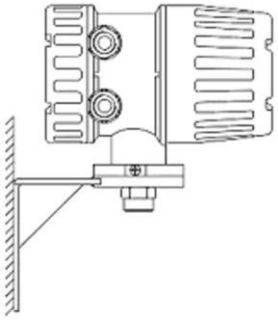


2.2.3 Converter installation

Installation of converter of KF730S-H electromagnetic flowmeter has two types: compact type and remote type. As for compact installation, since the converter is fixed on the sensor, it is only necessary to complete sensor installation. See the part of sensor installation for details. As for remote installation, there are three kinds: wall-mounted, support pipe and support-type installation.



Support pipe installation



Support-type installation

2.2.4 Sensor installation

There are two categories and four types of installation, i.e.:

① Compact type

② Remote type

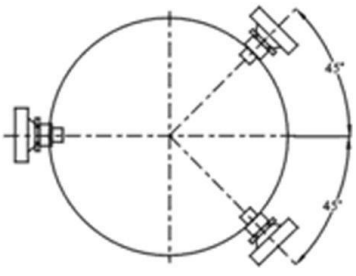
③ Diving type

④ Disassembly and assembly type (under pressure)

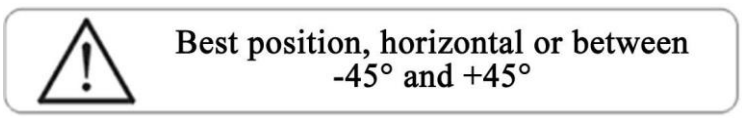
2.2.5 Selection of sensor's installation position

The sensor can be installed in any position on measured pipe in which medium shall be fully filled. The sensor can be installed on horizontal, tilted or vertical pipe. If the pipe is horizontal, the sensor shall be installed as per the figure below as far as possible, so as to ensure that electrodes will always be immersed in fluid and any bubble will rise to the top. Hence, there will be no insulation between electrodes. If used for liquid with sediment generated easily, the sensor shall not be placed at the bottom of horizontal pipe, so as to prevent such sediment from covering the electrodes.

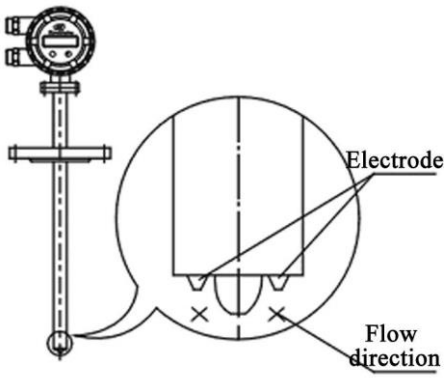
Correct position



Correct position



Maintain fluid flow direction while installation. Such flow direction shall be perpendicular to drawing.



Since swirling will occur on half-full pipe, the sensor must be installed on pipe fully filled with medium. Hazards also exist if the sensor is installed after valve, elbow and tee-joint. The reason is that swirling always occurs in such positions. Accordingly, length of straight pipe section before sensor shall at least exceed 10D and that after sensor shall at least exceed 5D. In this case, vortex and swirling can be avoided and measurement accuracy can be improved. If accuracy is required to be ±1.5%, length of straight pipe section before sensor shall at least exceed 30D and that after sensor shall at least exceed 10D while installation.

2.3 Installation requirements

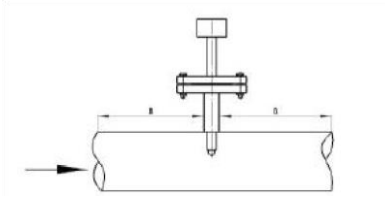
2.3.1 Requirements for straight pipe section

See the table below for specific requirements for straight pipe section:

Pipe installation type	No. of installation diagram	Straight pipe section before sensor	Straight pipe section after sensor
Horizontal pipe	1	10D	5D
Bent pipe	2	20D	5D
Flared pipe	3	20D	10D
Valve downstream	4	20D	5D
Contraction pipe	5	10D	10D
Pump downstream	6	30D	10D
Mixture	7	30D	5D

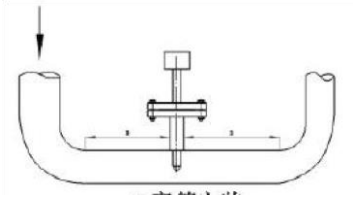
Diagrams of Straight Pipe Section before and after Flowmeter Installation

1. Horizontal pipe installation



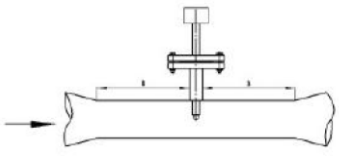
1. Horizontal pipe installation

2. Bent pipe installation



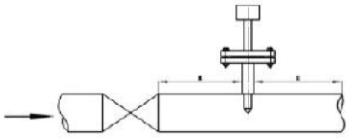
2. Bent pipe installation

3. Flared pipe installation



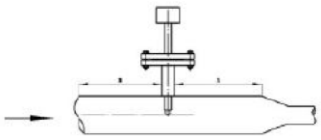
3. Flared pipe installation

4. Valve downstream installation



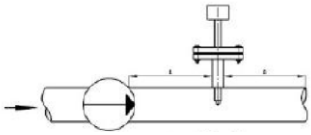
4. Valve downstream installation

5. Contraction pipe installation



5. Contraction pipe installation

6. Pump downstream installation



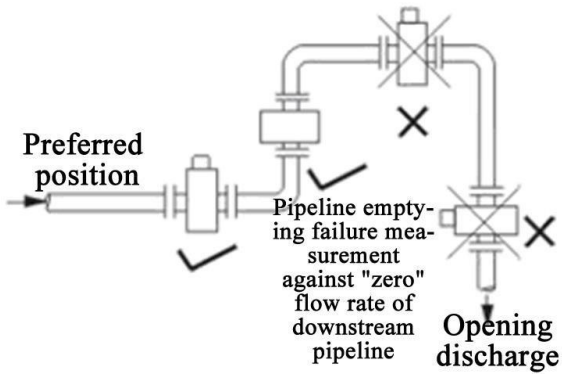
6. Pump downstream installation

7. Mixture installation

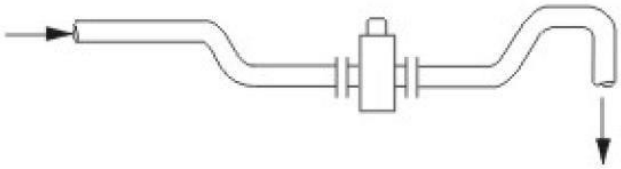
7. Mixture installation

2.3.2 Requirements for pipeline design

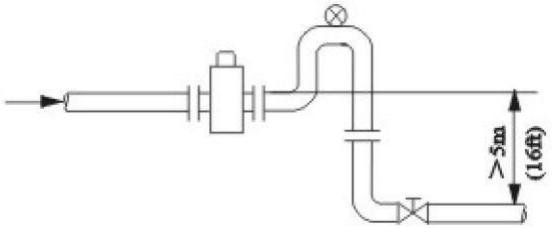
a. Avoid any measurement error caused by consequent gases.



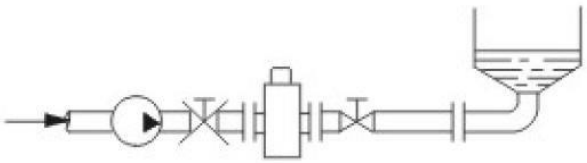
b. As for open pipe for discharge, the flowmeter shall be installed in lower section.



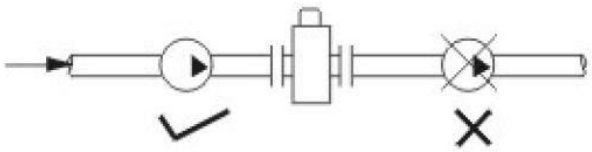
c. As for positions with pipe fall exceeding 5m, air valve (vacuum) shall be installed at the downstream of flowmeter.



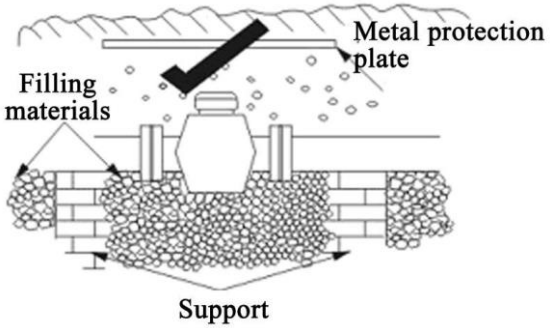
d. As for long pipeline, the control valve is usually installed at the downstream of flowmeter.



e. Flowmeter cannot be installed at pumping side.



f. Sensor shall be installed underground.



g. Do not install on pipe capable of free vibration.

2.3.3 Requirements for working environment Requirements of flowmeter for external environment

a. The flowmeter shall not be installed in places with big temperature changes or withstanding high temperature and radiation of equipment. If installation is considered necessary, heat insulation and ventilation measures shall be taken.

b. It is the best choice to install the flowmeter indoor. If the flowmeter has to be installed outdoor, damp-proof and sun-proof measures shall be taken to avoid being affected by rain, accumulated water and over-exposure to the sunlight.

c. The flowmeter shall not be installed in corrosive atmosphere. If installation is considered necessary, ventilation measures shall be taken.

d. In order to facilitate the installation and maintenance, sufficient installation space needs to be reserved around the flowmeter.

e. Installation place of flowmeter shall be free of magnetic field and strong vibration source. If pipe vibration is strong, support for fixing pipe shall be provided on both sides of flowmeter.

2.4 Distance between sensor and converter

The distance between sensor and converter shall be as short as possible in principle, so as to get the converter as close as possible to the sensor. Such distance is determined by signal distributed capacitance and electrical conductivity of measured liquid. The measured medium must be conducting liquid, with minimum electrical conductivity of 5μs/cm which is equal to that of de-ionized water. Electrical conductivities of ordinary tap water and raw water are within 15-500μs/cm. Electrical conductivities of some liquid medium at 20¡æ are shown in the table below.

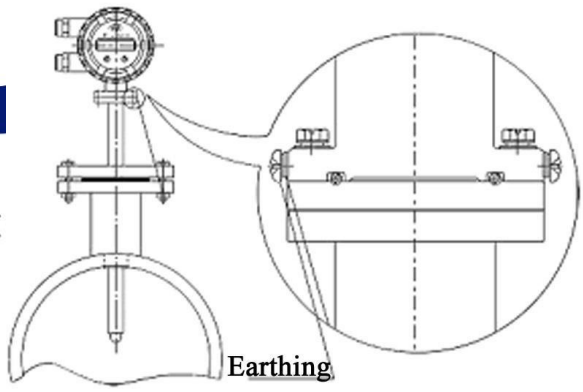
Note: Cable length shall not exceed 30m.

Liquid name	Electrical conductivity (μs/cm)	Liquid name	Electrical conductivity (μs/cm)
Petroleum	5×10-11	Sulphuric acid (10%)	6×105
Olive oil	2×10-9	Hydrochloric acid (40%)	5×105
Acetone	2×10-2	Hydrochloric acid (10%)	6×105
Distilled water	1~10	Nitric acid (26%)	5×105
Tap water	100	Nitric acid (6.2%)	3×105
Seawater	4×104	Ammonia water (30%)	200
Glycerin	6×10-2	Ammonia water (4%)	1000

Hydrochloric acid (99.7%)	4×104	Sodium hydroxide (50%)	8×104
Hydrochloric acid (40%)	1×103	Sodium hydroxide (2%)	8.6×104
Hydrochloric acid (0.3%)	3×104	Mud	1.2×104
Sulphuric acid (99.4%)	8.5×103	Saline solution (25%)	2×105
Sulphuric acid (97%)	8×104	Saline solution (3.6%)	4×104
Sulphuric acid (40%)	5×105	Saline solution (0.65%)	1×104

2.5 System earthing

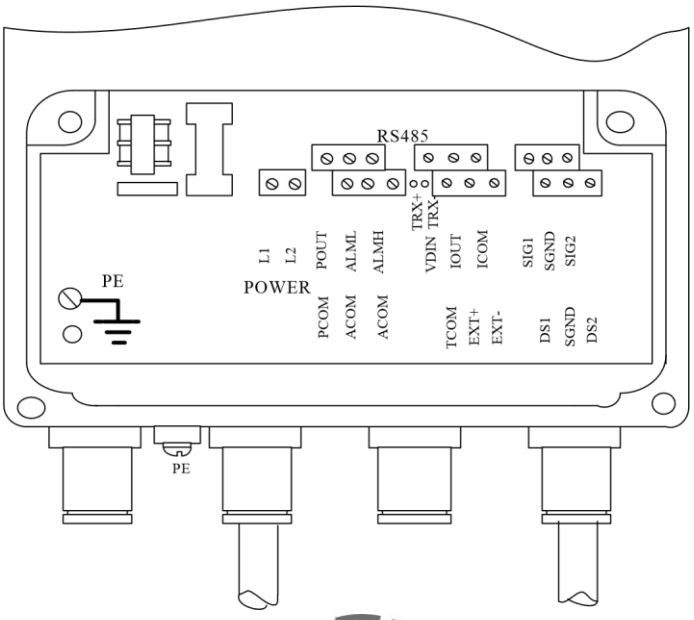
Since flow receiving signal of detecting electrodes of electromagnetic flowmeter is at MV class, it will be largely affected by outside interference. Hence, good earthing mostly determines the stability of flowmeter's measurement accuracy. Measured fluid itself acts as electrolyte conductor and any other irrelevant electromagnetic interference must be removed. Generally, flowmeter is installed on metal pipe which must be connected to sensor and get earthed.



Attention: It shall be one-point earthing. Other electrical equipment shall not be connected to the same wire, with earth resistance less than 10 ohms.

2.6 Electrical connection

2.6.1 Connectors and labels for the squared



Connectors for 211B **Labels**

of connectors in squared model

SIG1 Signal1
SGND Signal Ground
SIG2 Signal2
DS1 Shielded Exciting1To
DS2 Shielded Exciting2
EXT+ Exciting Current+
EXT- Exciting Current-

Separate Model Sensor

VDIN Current Two lines 24V Spots
ICOUT Analog Current Output
Output ICCOM Analog Current

Analog Current Output Ground

POUT Flow Frequency (Pulse) Output
PCOM Frequency (Pulse) Output Ground

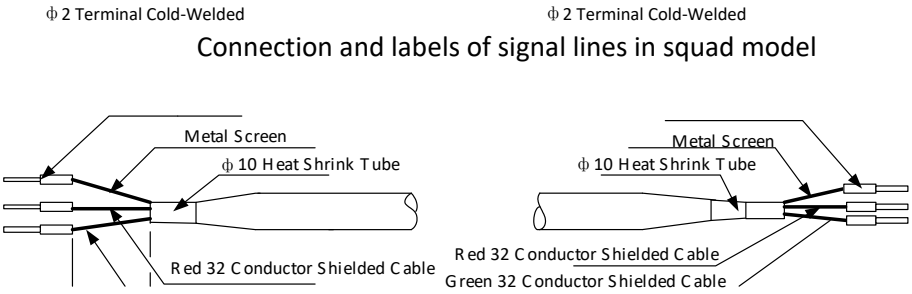
Frequency (Pulse) Output

ALMH Upper Limit Alarm Output
ALML Low Limit Alarm OutputTwo
ALCOM Alarm Output Ground

Alarm Outputs

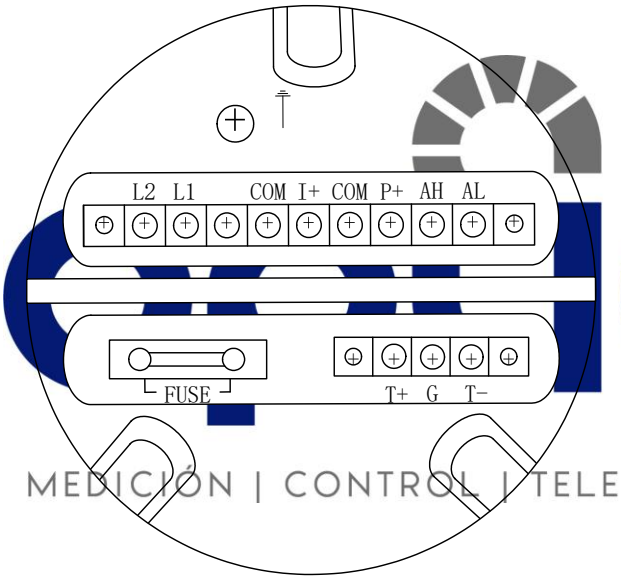
TRX+ Communication Input
TRX- Communication InputCommunication Input

2.6.2 SignalTCOM **lines**232**and** Communication Ground**labels in squared model**



Connection and labels of signal lines in squad model

2.6.3 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

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

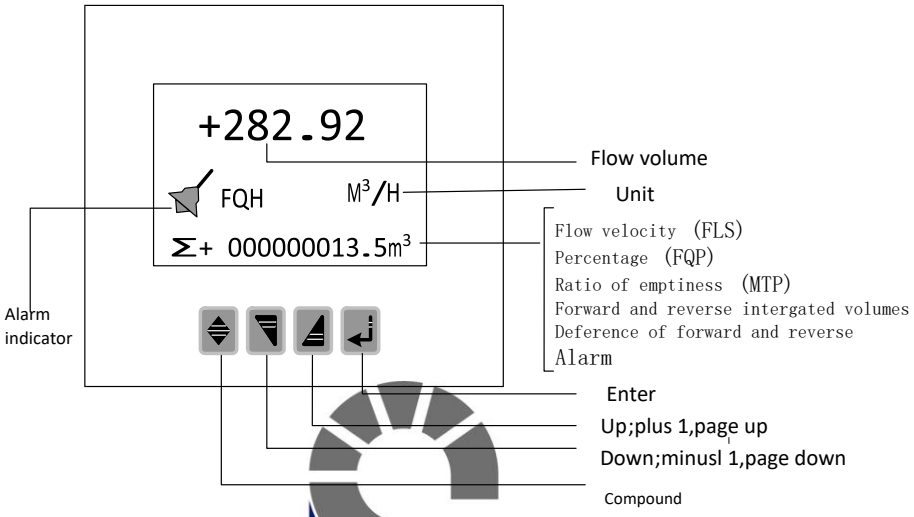


Fig. 4.1 Keys on squared panel

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

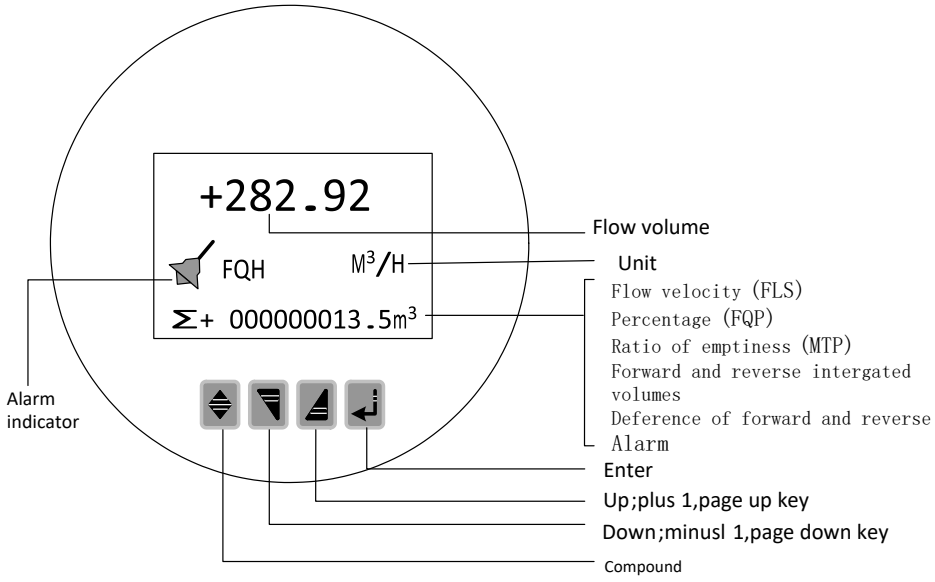


Fig. 4.1 (c)Keys on circinal panel and big LCD display

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.

■ **Sensor 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.

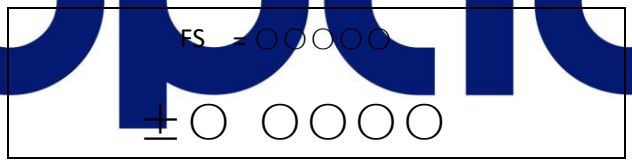
■ **Flow Direct**

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	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

is out of range	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

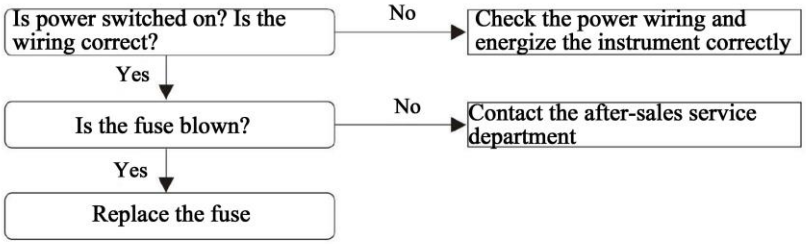
Failure	Failure Analysis
The output is not stable	The measured medium itself is fluctuating or pulsating. In fact, there is no failure with the electromagnetic flowmeter. It is the actual reflection of the flow conditions. If the length of the straight pipe section is not enough, or the installation 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

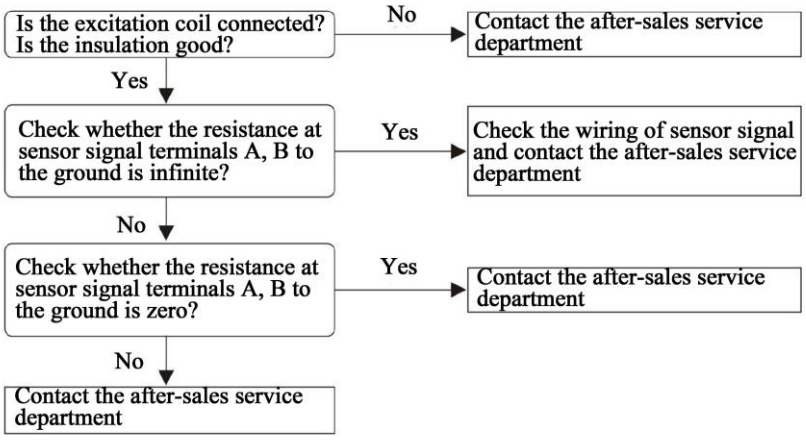
	The tube is not completely filled with the liquid, or there are bubbles in the liquid.
	The grounding is not complete. There is electric and magnetic interference from outside stray current.
Zero point is unstable	It is subjectively assumed that there is no flow of the liquid in the tube. But in fact, 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

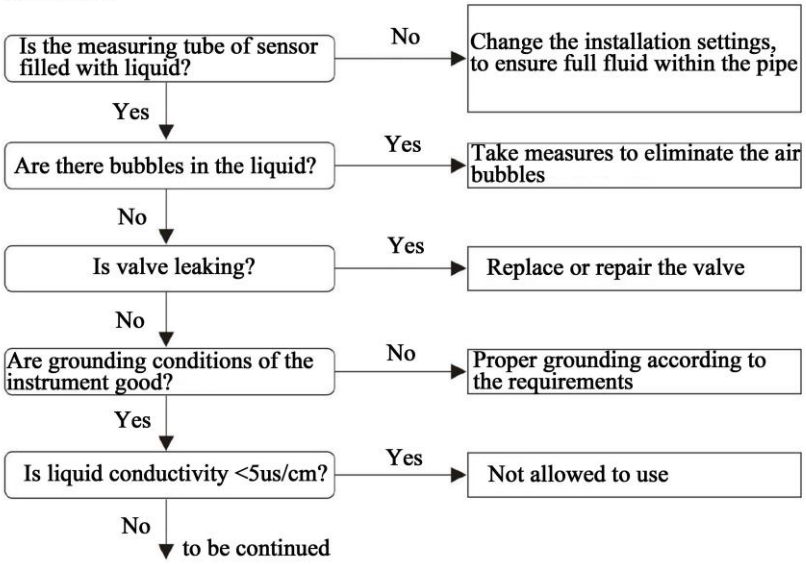
A. No indication

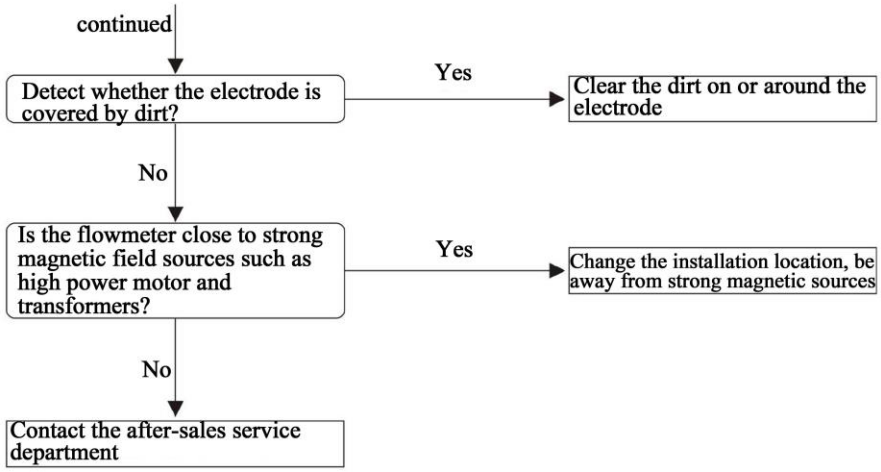


B. Instantaneous flow is indicated as zero



C. Zero point is unstable





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