User's Manual

Supmea

Electromagnetic flowmeter

Supmea

Headquarters
5th floor,Building 4,Singapore Hangzhou Science Technology Park,No. 6 street, Hangzhou Economic Development Area,Hangzhou 310018,China

Singapore
2 Venture Drive #11-30 Vision Exchange Singapore

info@supmea.com

www.supmea.com

Supmea Automation Co.,Ltd.

U-LDG-SUP-C-EN1

Preface

- Thank you for purchasing our product.
- This manual is about the various functions of the product, wiring methods, setting methods, operating methods, troubleshooting methods, etc.
- Please read this manual carefully before operation, use this product correctly to avoid unnecessary losses due to incorrect operation.
- After you finish reading, please keep it in a place where it can be easily accessed at any time for reference during operation.

Note

- Modification of this manual's contents will not be notified as a result of some factors, such as function upgrading.
- We try our best to guarantee that the manual content is accurate, if you find something wrong or incorrect, please contact us.
- The content of this manual is strictly prohibited from reprinting or copying.

Version

U-LDG-SUP-C-EN1

Confirm the contents of the package

Please confirm the product and accessories after unpacking. Once the product is wrong, the quantity is wrong or there is a problem in appearance, please contact our company.

Product List

Serial number	Item Name	Quantity
1	Electromagnetic flowmeter	1
2	Manual	1
3	Certificate	1

Precautions

Users are expected to keep the "Product Qualification Certificate" properly and do not lose it.

Contents

Chapter 1 Overview of products..... 1

1.1 Measuring principle of electromagnetic flowmeter..... 1

1.2 Electromagnetic flowmeter structure.....2

Chapter 2 Safety guidance..... 3

2.1 Manufacturer's safety instructions..... 3

2.2 Copyright and data protection..... 3

2.3 Exemption ordinance..... 3

2.4 Warning and symbol..... 4

2.5 User guidance..... 4

Chapter 3 Instructions for operation.....6

3.1 Checking models and specifications..... 6

3.2 Install accessories..... 6

3.3 Storage instructions..... 6

3.4 Instructions for installation site..... 6

Chapter 4 Installation.....8

4.1 Installation condition.....8

4.2 Installation specification..... 9

4.3 Installation..... 11

Chapter 5 Wiring..... 15

5.1 Wiring instructions..... 15

5.2 Remote cable..... 15

5.4 Wiring..... 21

5.5 Earthing grounding.....25

Chapter 6 Basic operating steps (introduction of display unit).....27

6.1 Panel.....27

6.2 Set the operation of the key..... 27

6.3 Display interface and content....28
6.4 Display mode to setup mode....29
6.4.1 Menu structure....29
Chapter 7 Description of parameters....36
7.1 Parameters....36
7.2 Parameter list overview....36
Chapter 8 Practical operation....47
8.1 Zero setting before operation....47
8.2 Batch canning function....48
Chapter 9 Communications....50
9.1 RS485 Modbus communication....50
9.2 Electromagnetic flowmeter uses Modbus RTU communication protocol....51
9.3 HART....53
Chapter 10 Overview....59
10.1 Standard technical specification....59
10.2 Performance....62
10.3 Normal operating environment....64
10.4 Measurement range....64
Chapter 11 Use, maintenance and fault diagnosis....66
11.1 Daily maintenance....66
11.2 Fault diagnosis....66
Chapter 12 Warranty and after-sales service....67

Chapter 1 Overview of products

1.1 Measuring principle of electromagnetic flowmeter

The working principle of electromagnetic flowmeter mainly applies Faraday's law of electromagnetic induction. As can be seen in figure 1.1.1, the two electromagnetic coils at the upper and lower ends can detect the induced electromotive force between the left and right electrodes on the flowmeter tube wall by generating a constant or alternating magnetic field in which the conductive medium flows through the electromagnetic flowmeter. The magnitude of the electromotive force is proportional to the velocity of the conductive medium, the magnetic induction intensity of the magnetic field and the width of the conductor (the inner diameter of the tube measured by the flowmeter), and then the medium flow is calculated mathematically. The equation of induction electromotive force is: E=K×B×V×D

Where:

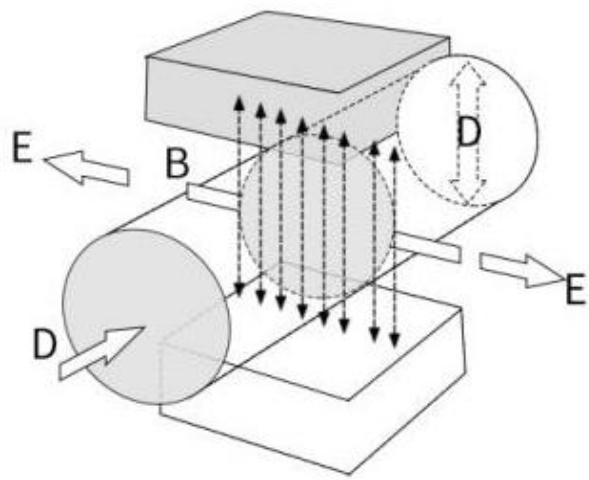
E-induction electromotive force.

K-instrument constant.

B-magnetic induction intensity.

V-measuring the average velocity in the cross section of the tube.

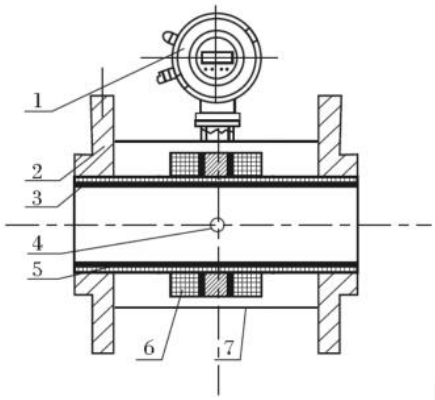
D-measure the inner diameter of the tube.



Through the flow measurement, it is found that in the process of flow, the fluid will pass through the magnetic field perpendicular to the flow direction, and the flow of the conductive fluid will produce an electric potential proportional to the average velocity. Therefore, the measured conductivity of flowing liquid is higher than the minimum conductivity of 5us/cm. The induced voltage signal is detected by two electrodes and transmitted to the converter together with the cable. After a series of analog and digital signal processing, the cumulative flow and instantaneous flow are displayed on the display screen of the frequency converter.

1.2 Electromagnetic flowmeter structure

Figure 1.2.1 it can be seen that the electromagnetic flowmeter mainly consists of the following parts:



1-converter; 2-flange; 3-insulating lining.
4-electrode; 5-measuring tube;
6-excitation coil. 7-shell

Figure 1.2.1

The two main components of electromagnetic flowmeter are sensor and converter. The sensor includes a flange, a lining, an electrode, a measuring tube, an excitation coil and a sensor housing; the converter includes an internal circuit board and a converter housing.

(1) Inverter: provides a stable excitation current for the sensor, amplifies the induced electromotive force generated by the sensor and converts it into a standard electrical signal or frequency signal.

In this process, the flow and parameters are displayed in real time in order to display, control and adjust the flow.

(2) Flange: connect with the process pipeline.

(3) Lining: apply a complete layer of electrical insulation and anticorrosive material on the inside of the measuring tube and the flange cover.

(4) Electrode: a pair of electrodes are installed on the wall of the measuring tube perpendicular to the magnetic force line to detect the flow signal. The electrode material can be selected according to the corrosion performance of the tested medium. In addition, 1 to 2 grounding electrodes can be installed for grounding and anti-interference of flow signal measurement.

(5) Measuring tube: the tested medium flows through the measuring tube. The parts of the measuring tube are non-magnetic stainless steel and flanges lined with insulating lining.

(6) Excitation coil: a set of coils are installed on the upper and lower sides of the measuring tube to generate the working magnetic field.

(7) Shell: both protect and seal the instrument.

Chapter 2 Safety guidance

2.1 Manufacturer's safety instructions

Before leaving the factory, the instrument has been fully debugged and conforms to the verification regulation of JJG 1033 electromagnetic flowmeter.
In order to ensure the normal use of the instrument, please read this manual carefully before use and fully understand how to use the instrument before operation.

2.2 Copyright and data protection

All the contents of this document have been carefully examined but are not fully guaranteed to be in line with the latest version. The content and work of this document are protected by copyright in China, and third-party contributions are marked. If there is any reproduction, processing, dissemination and any use beyond the scope of the copyright license, it is necessary to obtain the written permission of the author or the manufacturer.
Manufacturers have always respected the copyright of others and try their best to use their own works or works that do not need to be licensed.
Personal data (such as name, address, or e-mail address) involved and used in the manufacturer's documentation, and collected as much as possible on a voluntary basis by the author. At the same time, the use of products and services is carried out as far as possible without the need to provide personal data.
We need to remind you that security vulnerabilities may occur at any time in the process of data transfer based on the Internet, such as when communicating by e-mail, and there is no complete guarantee that the data will not be accessed by third parties. Therefore, we need to issue a publication note that explicitly prohibits contact materials provided within the scope of the use of copyright notice obligations, and requires the sending of unsolicited advertising and information materials.

2.3 Exemption ordinance

The manufacturer is not responsible for any form of loss caused by the use of the product, and these losses not only include direct, indirect, accidental or resulting in penalty losses and indirect losses.
The exemption clause is invalid if the manufacturer's behavior is intentional or gross negligence.
Depending on the legal circumstances of the use, it is not allowed to limit the implied warranties of the products, or exemptions from liability or restrictions on certain types of compensation are not allowed, and these rights may apply to these regulations, in which case, the above exemptions or restrictions may not apply to you in part or at all.
For each product you purchase, the corresponding product documentation and the terms

of sale provided by the manufacturer shall apply.
For all the contents of the document, including this disclaimer, the manufacturer needs to reserve the following rights.
The content of this right is in any way, time or reason, without prior notice, but can be modified directly, and does not bear any form of responsibility for the consequences that may be brought about by any form of change.

2.4 Warning and symbol

⚠ Warning	The warning sign means that there is a danger, and attention must be paid to the operating steps, procedures and related conditions in this process, otherwise it may cause injury or death.
⚠ Notice	Note that the sign means that there is danger, and attention must be paid to the operation steps, operation process and conditions in this process, otherwise it may cause local or overall damage or damage to the product.
Important	An important sign means to attract people's attention to avoid damage to the instrument or equipment.
⚠ Annotation	The comment mark means the information necessary for the operation and characteristics of the instrument.
⏚ Grounding terminal	The grounding sign means that it must be grounded here.

2.5 User guidance

Warning

1）Installation.

- The installation of the electromagnetic flowmeter must be completed by a professional engineer or technician, and non-professionals are not allowed to perform the installation-related steps in the process.
- The electromagnetic flowmeter is heavy, so the staff must prevent the electromagnetic flowmeter from falling to the ground or exerting excessive pressure so as not to damage the instrument.
- When using electromagnetic flowmeter to measure thermal fluid, due to the high surface temperature of the instrument, care should be taken in the process of use to prevent scald.
- When the tested thermal fluid is toxic, care should be taken to avoid contact with the fluid or inhalation of residual gas during the removal of the instrument from the pipe.

- Do not exert too much weight on the instrument in the course of use.
- All steps related to installation must comply with the current national electrical operating rules.

2) Wiring.

●The wiring of the electromagnetic flowmeter must be completed by a professional engineer or technician, and non-professionals are not allowed to perform steps related to the wiring.

- The shell cover is not allowed to be removed until the power is turned off for at least 10 minutes.
- In the process of power cord wiring, it is necessary to first check whether the power supply voltage is within the voltage range required by the instrument.
- Before wiring, the signal line and excitation line should ensure that the power supply is disconnected.
- The protective grounding terminal must be safely connected to the marked terminal.

3) Maintenance.

- Maintenance electromagnetic flowmeters must be completed by professional engineers or technicians, and non-professionals are not allowed to perform maintenance-related steps.
- Technicians are required to strictly follow the maintenance steps listed in the instructions.
- If you have any request, please contact our company.
- Pay attention to avoid the accumulation of dirt and dust on the display panel glass or data panel. If the panel becomes dirty, clean it with a soft dry cloth.

Chapter 3 Instructions for operation

The instrument has been carefully checked before leaving the factory. During delivery, the instrument needs to be carefully checked for damage in the course of transportation.
If you have any questions, please contact our sales department immediately.

3.1 Checking models and specifications

Whether the nameplate on the surface of the instrument shell matches the order information, please tell us the product model and number when contacting our company.

3.2 Install accessories

Check whether the package contains the following components: 1 hexagonal wrench (specification: 4mm) for anti-loosening screw in and out of front cover and side cover when disassembling and disassembling.

3.3 Storage instructions

If the instrument needs to be stored for a long time after delivery, the following points must be observed:

- The instrument must be stored in the original seal.
- The storage location must meet the following conditions:

1) Should not be exposed to Rain Water.

2) Minimum vibration and shock.

3) The levels of temperature and humidity are as follows:

Temperature:-30 ℃ ~ 70 ℃.

Humidity: relative humidity 5% to 80% (no condensation), the preferred ambient temperature is 25 ℃, and the relative humidity is 65%.

- At the same time, if the converter has been left vacant at the installation site for a long time before installation, the performance of the converter may be affected by infiltration such as Rain Water. Therefore, the converter needs to be installed and connected as soon as possible after it is shipped to the installation site.

3.4 Instructions for installation site

In order to ensure the long-term stable operation of the instrument, the following terms need to be carefully considered when selecting the installation site.

- Ambient temperature:

It is necessary to avoid installing the instrument in a location where the temperature changes frequently, and thermal isolation must be used if the installation site is exposed to thermal radiation from the heat source in the workshop.

- Air environment:

Prevent the instrument from being installed in corrosive air.

- To vibrate or strike:

Prevent the instrument from being installed in a place where it will be subjected to vibration or impact.

Chapter 4 Installation

Warning

The installation of the electromagnetic flowmeter must be completed by a professional engineer or technician. Non-professionals are not allowed to perform installation-related steps.

4.1 Installation condition

The main results are as follows: 1) avoid the direct sunlight or the surrounding places where the temperature is too high, in order to prevent the insulation performance of the excitation coil from being damaged due to the high ambient temperature.
2) Need to stay away from strong magnetic equipment such as large motors, large transformers and electric welders.
3) Avoid the interference of strong vibration as much as possible.
4) It is necessary to stay away from the corrosive air such as ammonia and acid fog as far as possible, and if the on-site environmental conditions can not be met, it needs to be put forward when the user orders, then the company will try to solve it.
5) During the installation of the flowmeter, the leakage current is not allowed, and both ends of the sensor and the connecting pipe should be reliably connected and grounded at the same time, and the grounding resistance should not be more than 10 Ω.
6) The fluid flow direction is consistent with the flow direction of the flowmeter.
7) The installed pipe needs to ensure that the measuring pipe is always filled with the tested medium to prevent the pipe from being left empty.
8) Electromagnetic flowmeters that are not lined with PFA/F46 should not be installed in the pipeline section with negative pressure as far as possible, in order to prevent the lining material from falling off.
9) If the requirement on the upstream side of the flowmeter is not less than 5D (pipe inner diameter) (figure 4.1.1), for example, if the upstream side is not fully open gate valve or regulating valve, the length of the upstream straight section of the flowmeter should not be less than 10D (figure 4.1.2); at the same time, the requirement for the straight section on the downstream side of the flowmeter is not high, as long as the data is greater than 3D.

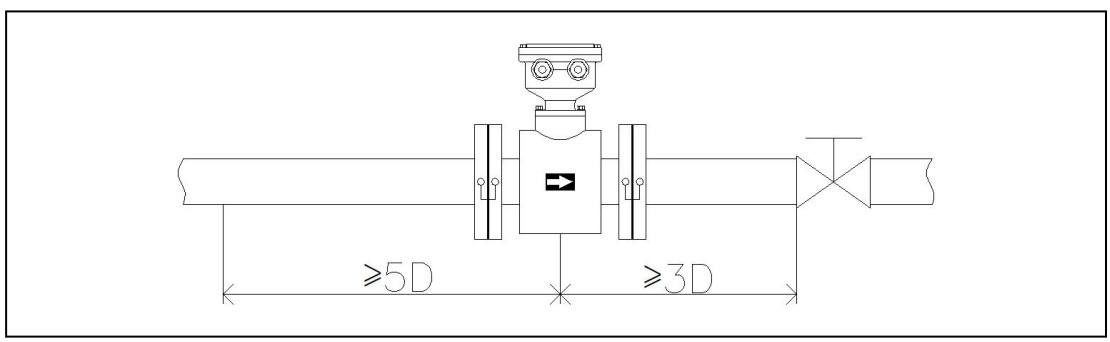


Figure 4.1.1 Requirements for upstream straight pipe segment

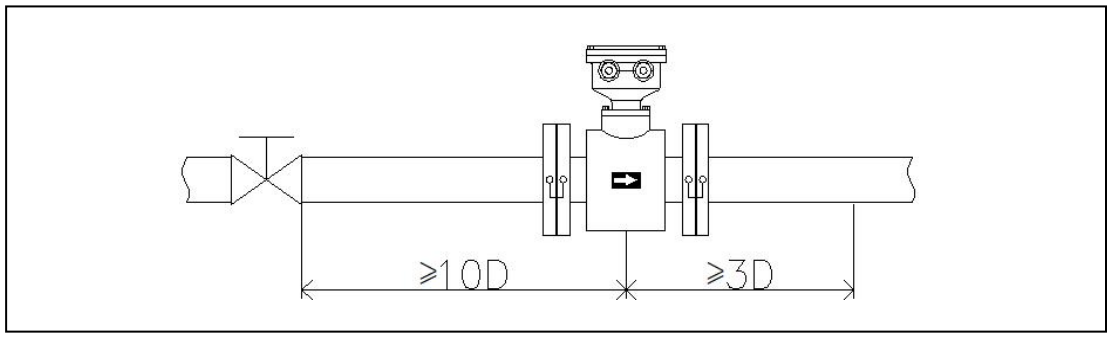


Figure 4.1.2 There is a gate valve or regulating valve on the upstream side that is not fully open.

4.2 Installation specification

To ensure the normal operation of the instrument, the installation of the instrument must comply with the following points:

1)In order to prevent negative pressure, the elevation of the flowmeter should be slightly lower than that of the pipe, or a certain back pressure should be guaranteed on the downstream side of the flowmeter. As shown in figure 4.2.1:

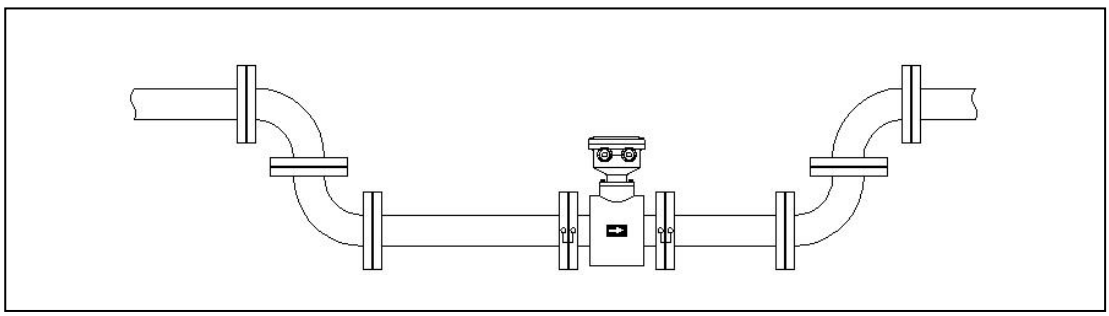


Figure 4.2.1 Anti-negative pressure installation.

2) The measured inner diameter of the flowmeter should be consistent with the inner diameter of the pipe, and if the inner diameter is inconsistent, the inner diameter of the pipe should be larger than the inner diameter of the flowmeter.

At the same time, a tapered tube or diffuser tube with a cone angle of less than 15 °is installed in the flowmeter, as shown in figure 4.2.2:

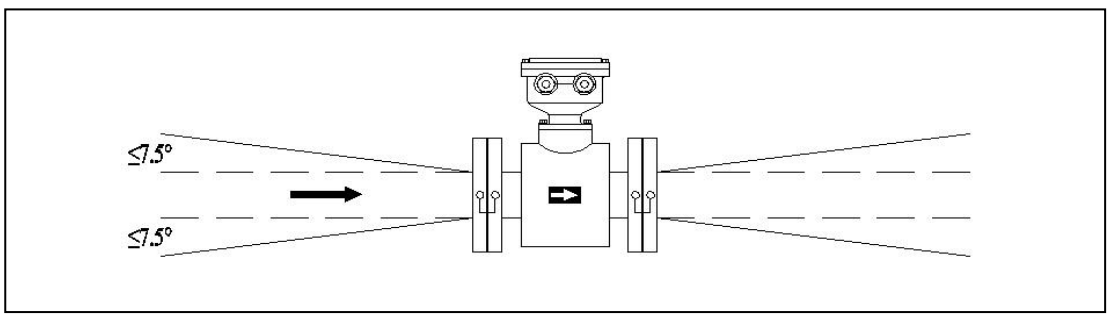


Figure 4.2.2 Installation when the measured inner diameter is inconsistent with the inner diameter of the pipe

3) If the flowmeter is tilted or vertically installed, the flow direction of the flowmeter should be bottom-up, as shown in figure 4.2.3:

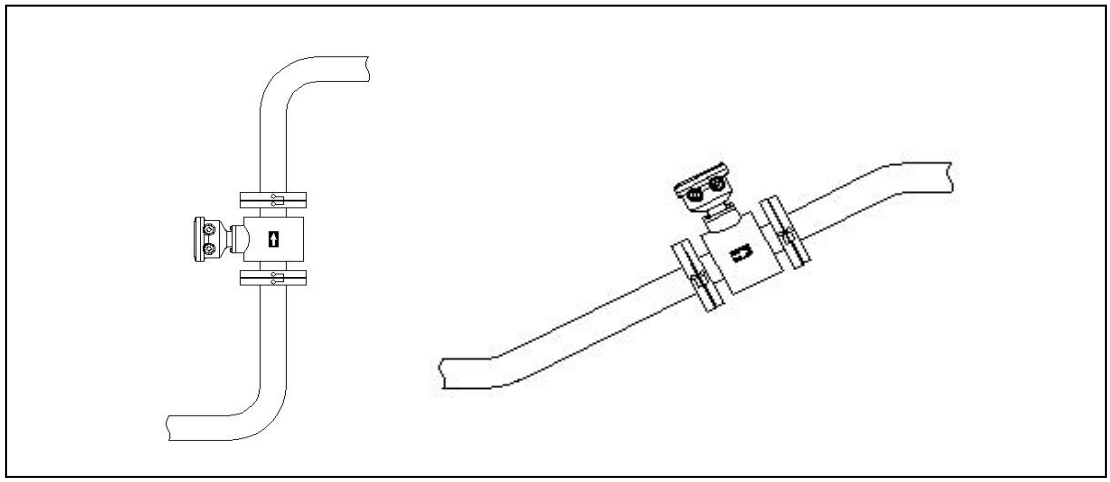


Figure 4.2.3 Inclined or vertical installation.

4) For pipes where flow interruption is not allowed in the process, at the same time, bypass pipes and cleaning ports need to be added next to the installation of flow timing. Figure 4.2.4 this device needs to ensure that the equipment system can work continuously when the flowmeter is out of use.

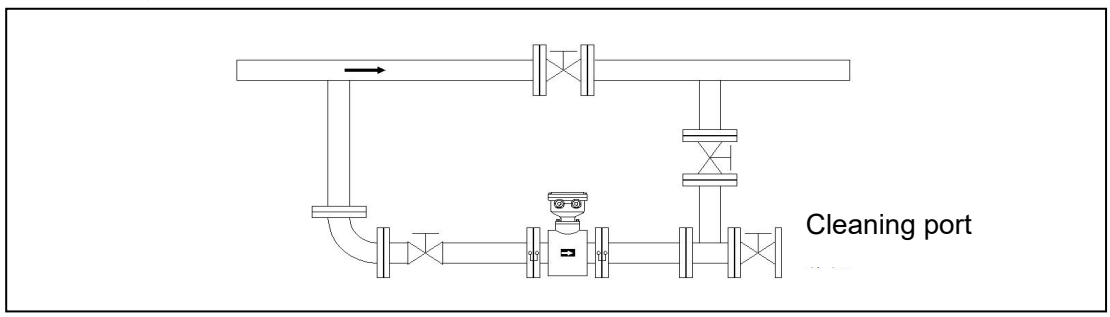


Figure 4.2.4 Installation that causes flow disruption is not allowed in the pipe.

1) The small diameter flowmeter can be directly supported on the pipe, while the large diameter flowmeter must be installed on the foot, and the foot needs to bear the weight of the flowmeter through the foundation.

The connection of the downstream pipe of the flowmeter should be able to install expansion joints.

2) The flowmeter should prohibit the use of pipe rods or ropes to prevent it from being transported and hoisted through the measuring tube to prevent damage to the village.

3) It is forbidden to grasp the converter directly by hand.

4) The connection bolt between the flowmeter flange and the pipe flange must be tightened to ensure that the thickness of the sealing gasket is uniform, so that the flowmeter and the pipe are connected tightly and without leakage. At the same time, the inner diameter of the sealing gasket is not less than the inner diameter of the lining, and the concentricity should be maintained.

4.3 Installation

4.3.1 Installation of integrated electromagnetic flowmeter

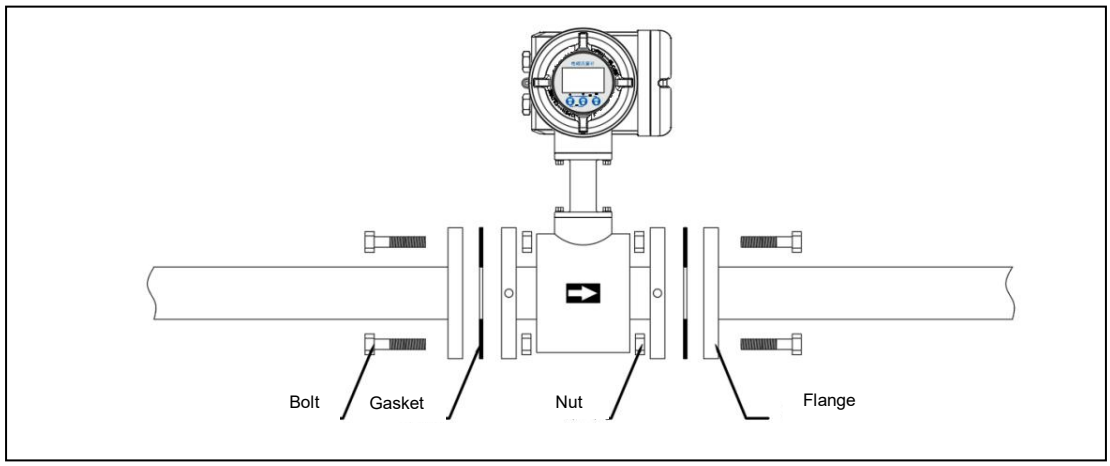


Figure 4.3.1 Installation of integrated electromagnetic flowmeter

Note:

1) A sealing gasket needs to be placed between the pipe flange and the flowmeter flange.

2) Figure 4.3.1 shows that the bolt is inserted from one side of the pipe flange, while the other side is fixed and tightened with a nut.

4.3.2 Installation of remote electromagnetic flowmeter

4.3.2.1 Installation of remote electromagnetic flowmeter

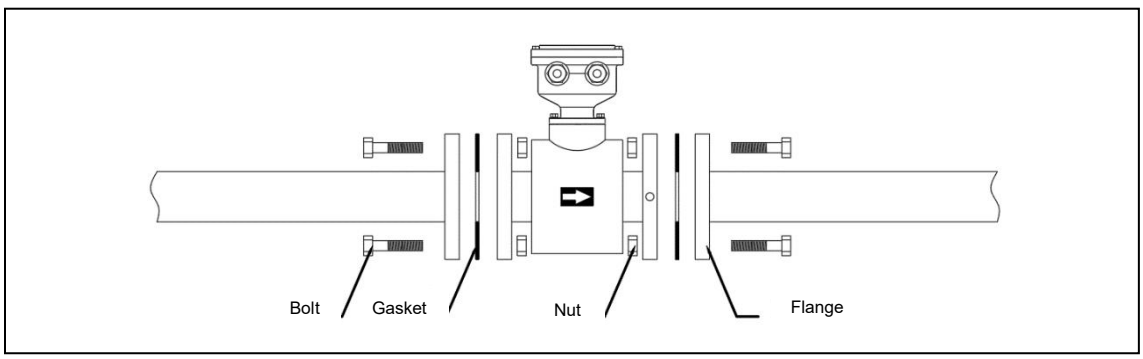


Figure 4.3.2 Installation of remote electromagnetic flowmeter

Note:

1) Place a sealing gasket between the pipe flange and the flowmeter flange.

2) Figure 4.3.2 shows that the bolt is inserted from one side of the pipe flange and fastened and tightened with a nut on the other side.

4.3.2.2 Install remote converter

- Fix the converter to the steel pipe

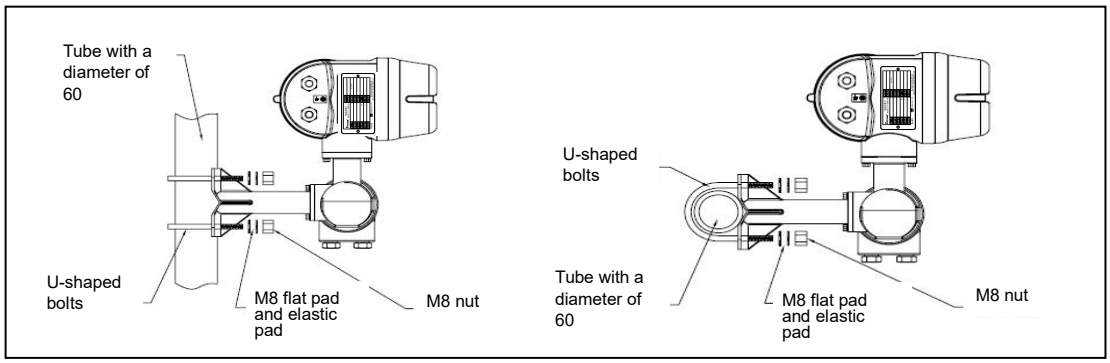


Figure4.3.3 Install a separation converter on a steel pipe

Note:

1) Use 4 screws to secure the instrument to the mounting bracket.

2) U-shaped bolts can install the mounting bracket and the instrument together on the pipe with a diameter ≤ 60mm.

3) If the installation line is non-conductive, the converter needs to be grounded separately.

- Fix the converter on the wall

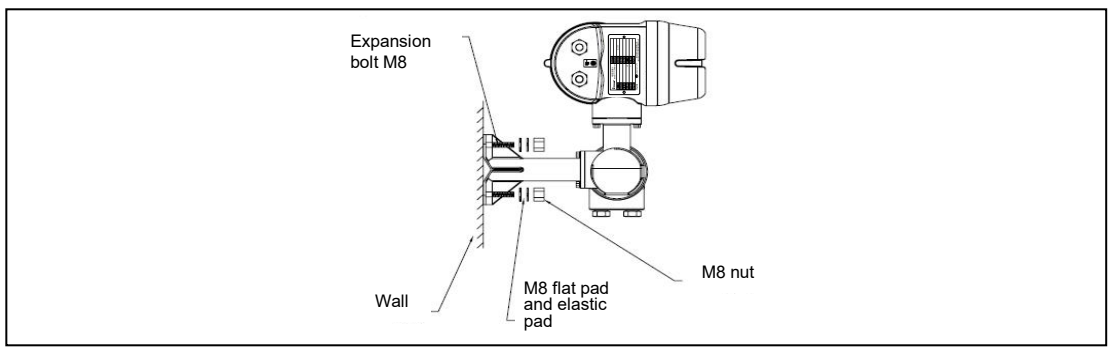


Figure 4.3.4 Install a separation converter on the wall

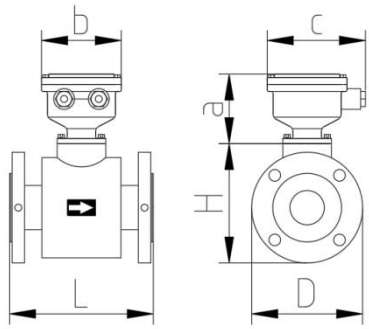
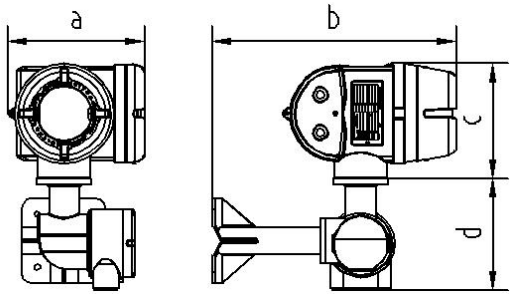
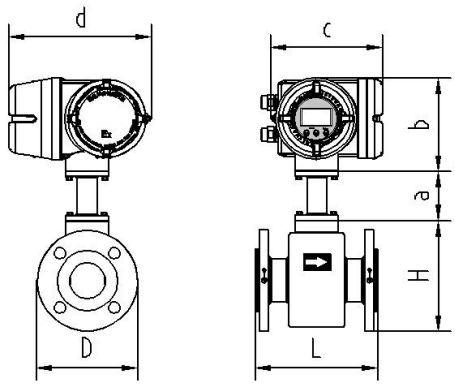
Note:

1) 4 screws can secure the instrument to the mounting bracket.

2) Screws can install the mounting bracket and the instrument on the wall together.

4.3.3 External dimension

The external dimensions of the electromagnetic flowmeter are shown in the following table:

Remote sensor		a=102mm b=115mm c=145mm① Total height =H+a
Remote sensor		a=183mm b=325mm c=152mm d=148mm
Integrated flowmeter		a=80mm② b=152mm c=183mm① d=233mm Total height =H+a+b

Note:

1) The size varies depending on the cable connector.

2) When the temperature of the medium is higher than 100C, the size is 160mm.

Caliber -DN （mm)	Nominal pressure （MPa）	Nominal pressure			Reference weight. (kg)
		L (mm)	H (mm)	D (mm)	
8	4.0	150	108	90	5
10	4.0	150	108	90	5
15	4.0	200	114	95	8

20	4.0	200	126	105	9
25	4.0	200	141	115	9
32	4.0	200	154	140	10
40	4.0	200	166	150	11
50	4.0	200	179	165	12
65	1.6	200	196	185	16
80	1.6	200	210	200	18
100	1.6	250	230	220	22
125	1.6	250	264	250	25
150	1.6	300	301	285	31
200	1.6	300	346	340	41
250	1.0	300	405	395	65
300	1.0	350	452	445	66
350	1.0	350	508	505	83
400	1.0	450	563	565	112
450	1.0	450	613	615	120
500	1.0	500	671	670	163
600	1.0	600	792	780	255
700	0.6	600	888	895	249
800	0.6	700	1001	1015	340
900	0.6	800	1103	1115	450
1000	0.6	900	1199	1230	500
1200	0.6	1000	1420	1400	590
1400	0.25	1200	1555	1620	680
1600	0.25	1600	1763	1820	980
1800	0.25	1800	1963	2045	1000
2000	0.25	2000	2168	2265	1100
2200	0.25	2200	2267	2400	1400
2400	0.25	2400	2572	2600	1500
2600	0.25	2600	2810	2800	1600
2800	0.25	2800	3040	3030	1750
3000	0.25	3000	3240	3230	1900

Chapter 5 Wiring

⚠Warning

The wiring of the electromagnetic flowmeter needs to be completed by a professional engineer or technician, and non-professionals are not allowed to perform steps related to the wiring.

⚠Attention

When all wiring is completed, all interfaces need to be checked before being powered on, and incorrect wiring or wiring can cause failure or damage to the parts.

5.1 Wiring instructions

Please observe the following instructions during the wiring process:

- If the ambient temperature is ≥ 50 ℃ (122 degrees Fahrenheit), an external heat-resistant wire with a maximum heating temperature ≥ 70 ℃ (158 degrees Fahrenheit) is required.
- At the same time, in order to protect the insulation and prevent damage caused by condensation, do not connect the cable outdoors on rainy days.
- The standard cable is used correctly for the whole connection, and the cable cannot be continued.
- Ground the sensor and the converter respectively.
- Before removing the shell cover, you need to make sure that the power supply has been cut off for more than 10 minutes.
- At the same time, make sure the cover is tight before you can turn on the power supply.
- Explosion-proof products need to be wired according to specific requirements (as well as national laws and regulations) in order to ensure explosion-proof performance.

5.2 Remote cable

5.2.1 Standard cable A

If there is no strong electromagnetic interference in general applications, the length of the separation cable is less than or equal to 30 meters, then the standard cable An is used to connect the sensor and the converter.

The type of cable is shown in figure 5.2.1:

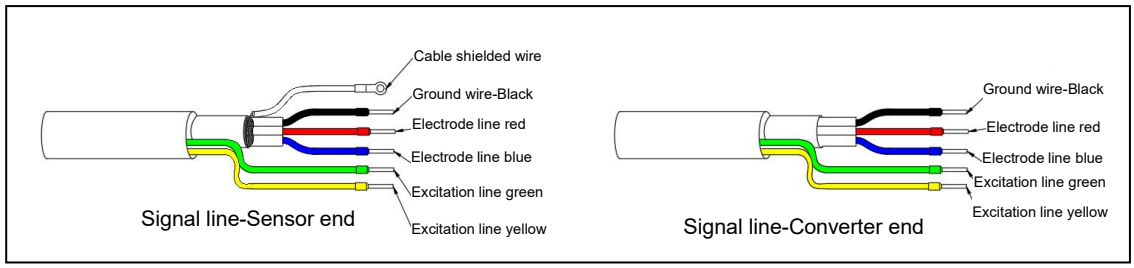


Figure 5.2.1 Schematic diagram of standard cable

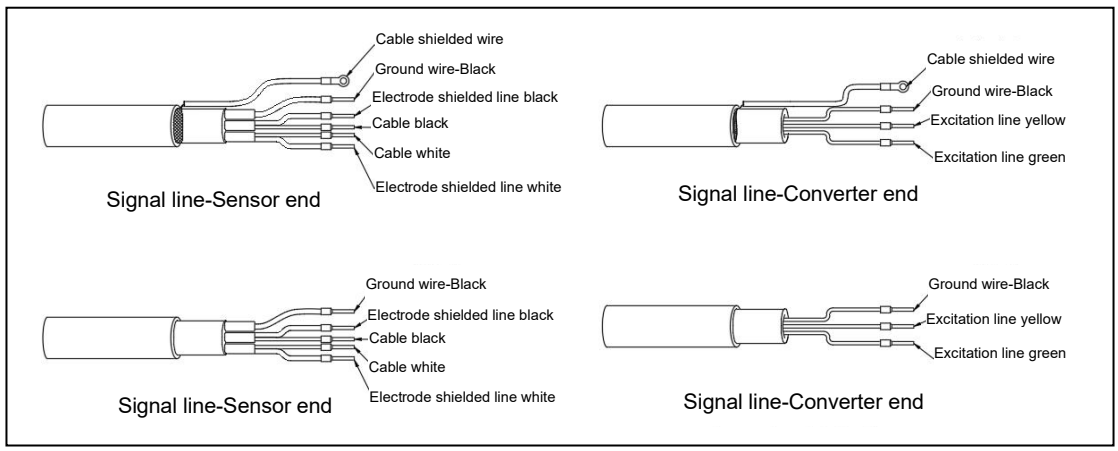
Note:

1) The diameter of the cable 10.5mm.

2) Insulation sheath material: polyethylene.

5.2.2 Standard cable B

In special applications, if there is strong electromagnetic interference, the length of the separation cable is more than 30 meters, and the standard cable B can be used to connect the sensor and the converter, and the cable type is shown in figure 5.2.2:



Note:

1) Cable diameter 10.5mm.

2) Insulation sheath material: polyethylene.

Attention

If the cable is too long, you need to cut off the excess instead of winding it up. The wire terminals have been disposed of before they leave the factory. In this process, avoid using the intermediate connecting plate to extend the cable, otherwise it will destroy the shielding function.

5.3 Terminal

5.3.1 Electrical interface

The instrument has waterproof and sealing performance, and the wiring process should be installed according to the following instructions when leaving the factory:

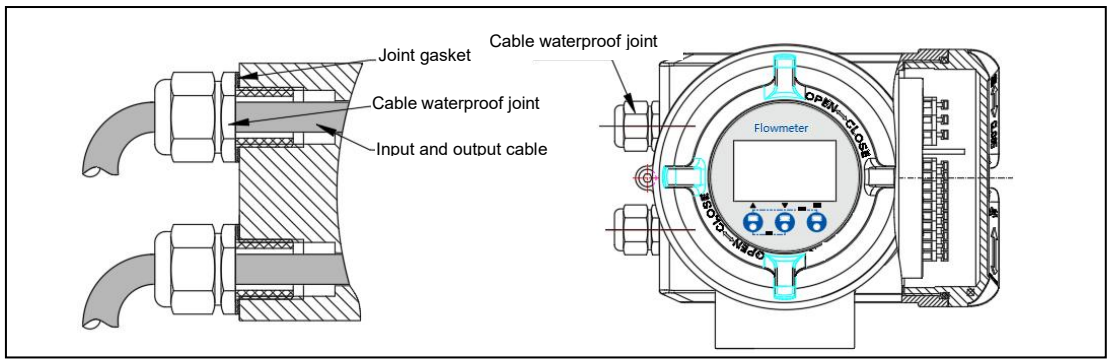


Figure 5.3.1 Schematic diagram of electrical interface.

Note:

1) In the input and output cable, the diameter 8~10mm should be selected to install, so as to Ensure the waterproof joint to lock the cable normally.

2) The cable waterproof joint needs to use non-metallic joint.

5.3.2 Terminal

- Power terminal / input, output terminal

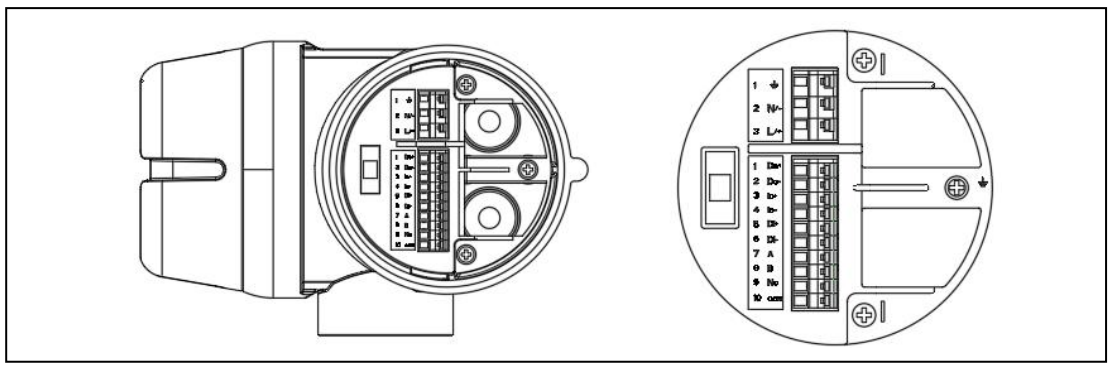


Figure 5.3.2 Schematic diagram of input and output terminals

Terminal Typ	Identification	Description
Power cord.	1-⏚	Power ground
	2-N/-	220V or 24V-
	3-L/+	220V or 24V+
Input and output lines	1-Do+	Pulse output +
	2-Do-	Pulse output-
	3-Io+	(4~20) mA output +
	4-Io-	(4~20) mA output-
	5-DI+	Contact input +
	6-DI-	Contact input-
	7-A	RS485-A.
	8-B	RS485-B.
	9-NC	Relay output.
	10-COM	Relay output-ground

●Remote terminal

1）Remote sensor terminal

●Applied to standard cable type A

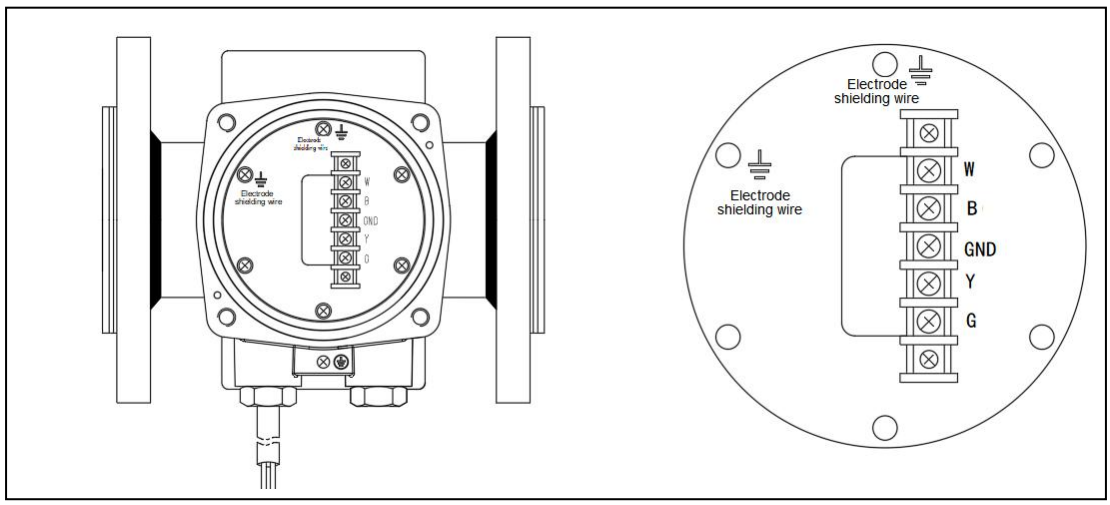


Figure 5.3.3 Schematic diagram of the terminal of the separation sensor (standard cable A)

Terminal Type	Identification	Description
Excitation line.	G	Coil excitation line-green.
	Y	Coil excitation line-yellow.
	GND	Sensor ground wire.
Signal line.	W	Electrode 1 signal line-red.
	B	Electrode 2 signal line-blue.
Shielded wire ground	Electrode shielding wire (ground).	The two electrode shielding wires drawn by the sensor can be connected to the ground.
	Cable shielded wire (ground)	The shielded wire of standard cable An is connected to the ground.

●Can be used for standard cable type B

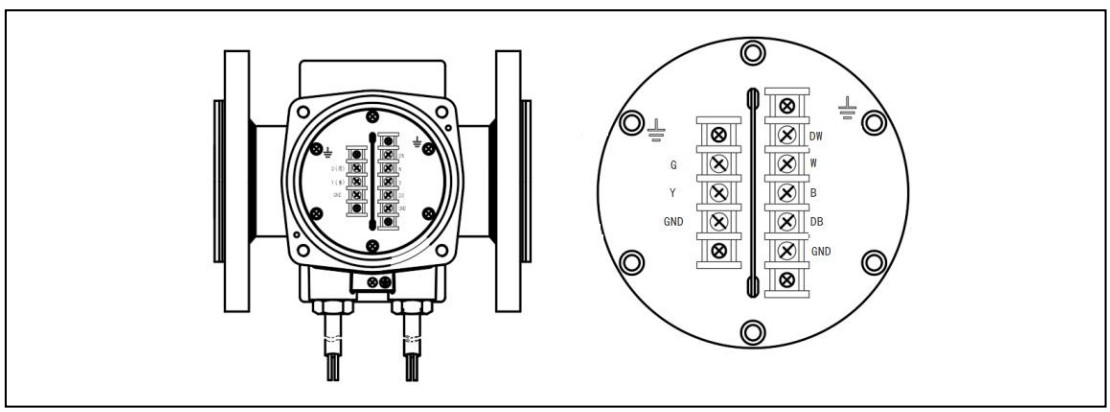


Figure 5.3.4 Schematic diagram of the terminal of the separation sensor

2) Remote converter terminal.

●Apply to standard cable A

Terminal Type	Identification	Description
Excitation line.	G	Coil excitation line-green.
	Y	Coil excitation line-yellow.
	GND.	Excitation cable ground wire-black.
Signal line.	DW	Electrode 1 signal line shielding layer-white.
	W	Electrode 1 signal line-white.
	B	Electrode 2 signal line-black.
	DB	Electrode 2 signal line shielding layer-black.
	GND	Signal cable ground wire-black.
Cable shielded wire	⏚	Cable shield

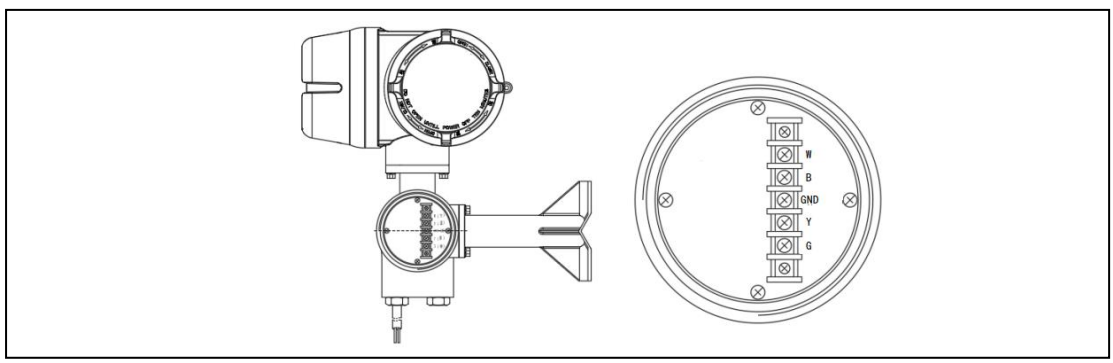


Figure 5.3.5 Schematic diagram of the terminal of the separation converter (standard cable A)

Terminal Type	Identification	Description
Excitation line.	G	Coil excitation line-green.
	Y	Coil excitation line-yellow.
	GND	Sensor ground wire.
Signal line.	W	Electrode 1 signal line-red.
	B	Electrode 2 signal line-blue

●Apply to standard cable B

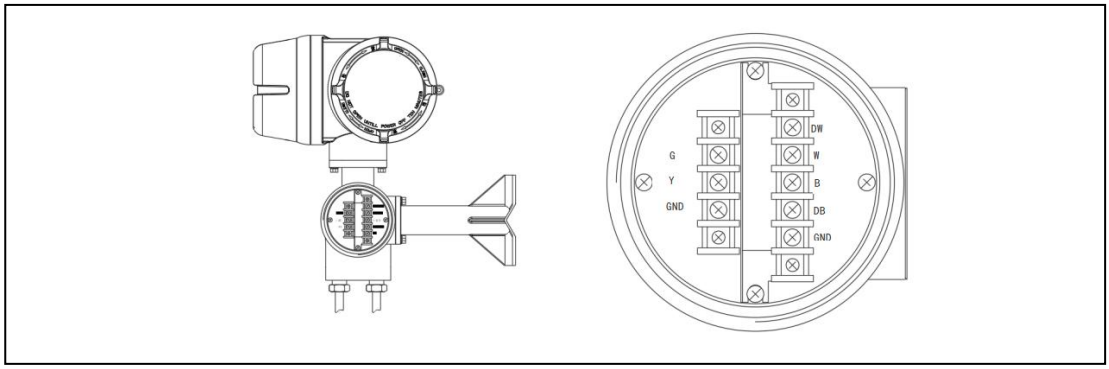


Figure 5.3.6 Schematic diagram of the terminal of the separation converter

Terminal Type	Identification	Description
Excitation line	G	Coil excitation line-green.
	Y	Coil excitation line-yellow.
	GND.	Excitation cable ground wire-black.
Signal line	DW	Electrode 1 signal line shielding layer-white.
	W	Electrode 1 signal line-white
	B	Electrode 2 signal line-black.
	DB	Electrode 2 signal line shielding layer-black.
	GND	Signal cable ground wire-black

⚠ Attention

Terminals, W, B, DW, DB and GND, have different potentials and need to avoid contact with each other in order to insulate them.

At the same time, in order to prevent the mutual contact between the shielding layers or the contact between the shielding layer and the shell, each shielding layer should be covered with vinyl resin pipe or wrapped with polyethylene tape.

Note

There is a signal at the W and B transmission electrodes of the wire, while the GND has the potential of the liquid itself (the signal shares the terminal). The shielding layer DW and DB keep the same potential as other electrodes. At the same time, in order to reduce the influence of cable distributed capacitance in the case of long cable. In this process, we need to pay attention to that the signals of each electrode can be transformed in the interior of the converter, so the use of these wires to contact with any other devices may cause errors. In short, be extra careful when dealing with cable terminals.

5.4 Wiring

5.4.1 Remote electromagnetic flowmeter with sensor wiring

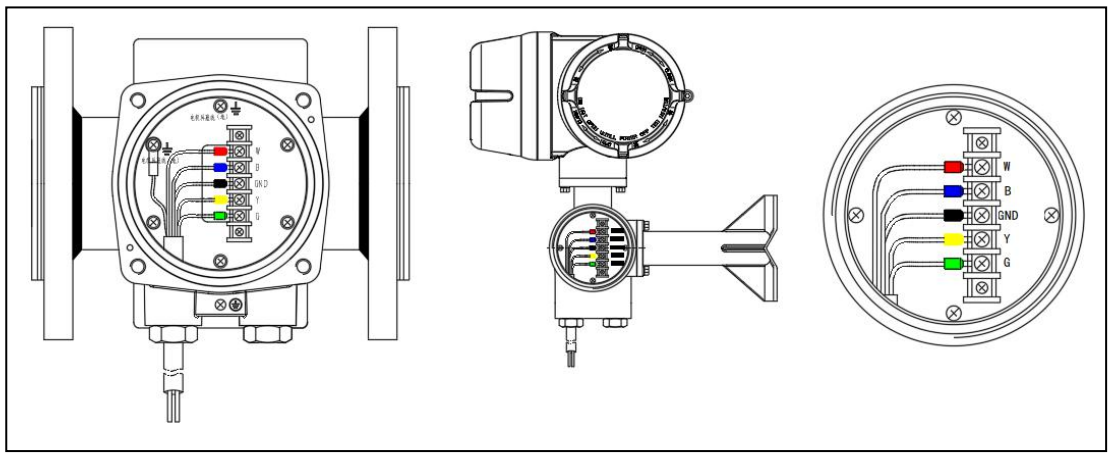


Fig. 5.4.1 Schematic diagram of sensor wiring of remote electromagnetic flowmeter

●Standard cable B connection

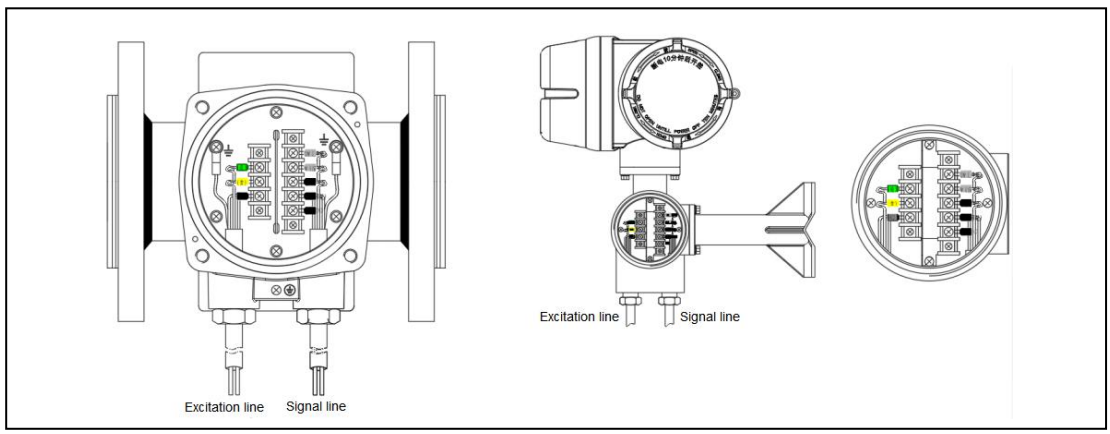


Fig. 5.4.2 Wiring diagram of remote electromagnetic flowmeter sensor

5.4.2 Power cord connection

When connecting the power cable, you must observe the following points, if you violate these warnings, it will cause damage to the instrument.

Warning

●Make sure the power supply is cut off to prevent electric shock.

●Pay attention to the power supply mode of the instrument.

●Before turning on the power supply, you need to make sure that the ground terminal of the power supply is grounded.

Important

●When supplying power through the DC power supply, ensure that the voltage of the power supply should be between 18V and 30V. However, the input voltage of the

converter may drop due to cable resistance and must be used within the following range.

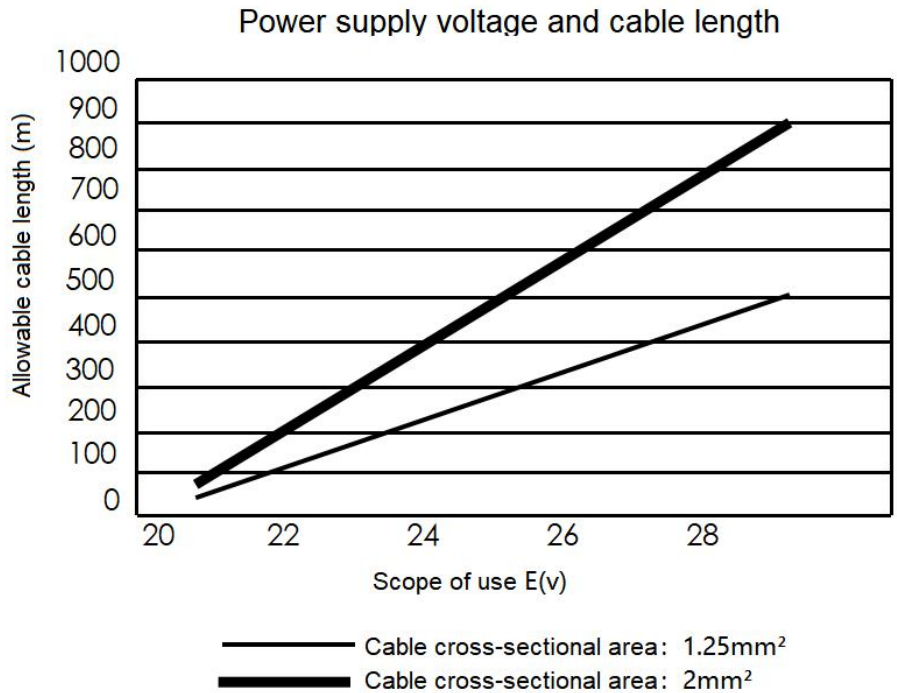


Figure 5.4.3 DC power supply voltage and cable length

5.4.3 Connect external instruments

Warning

Before wiring the external instrument, make sure that the power of the converter and other external instruments is turned off. At the same time, when the terminal of the flowmeter is connected to the external instrument, there are the following types:

- （4～20) mA Output

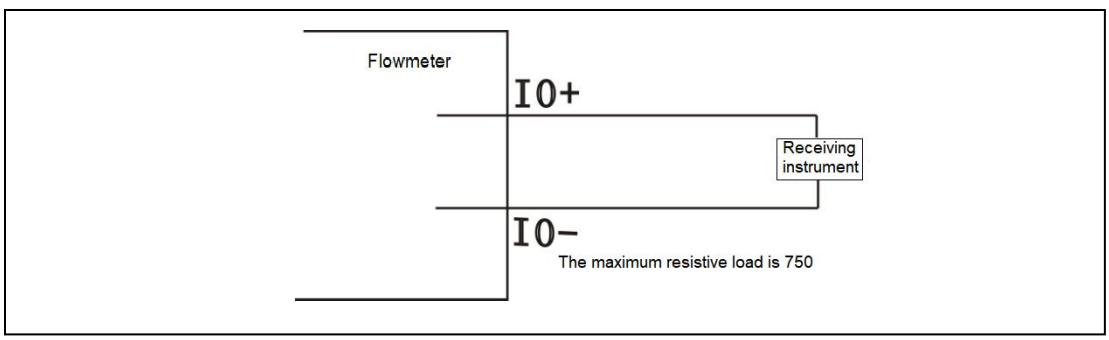


Figure 5.4.4 Current (4~20) mA output connection

● Frequency (pulse) output.

1) Passive pulse output

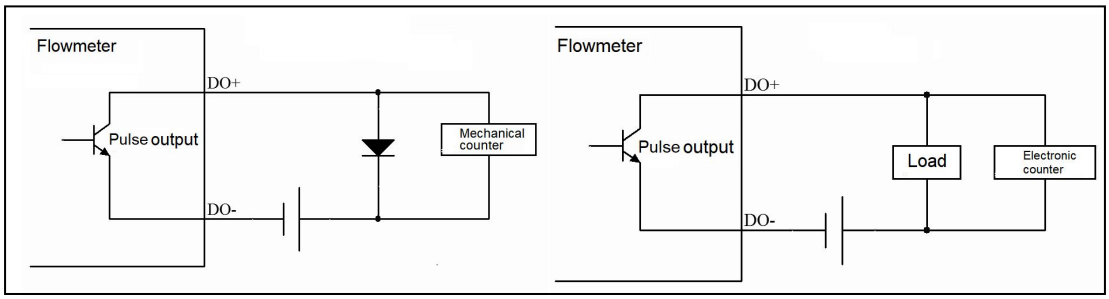


Figure 5.4.5 Passive pulse output connection

Important

Please pay attention to the polarity of the electrode when wiring.

●The input filter constant of the electronic counter is larger than the pulse width, which can weaken the signal, resulting in inaccurate counting.

●The maximum DC voltage is 30V and the maximum current is 0.2A.

2) Active pulse output

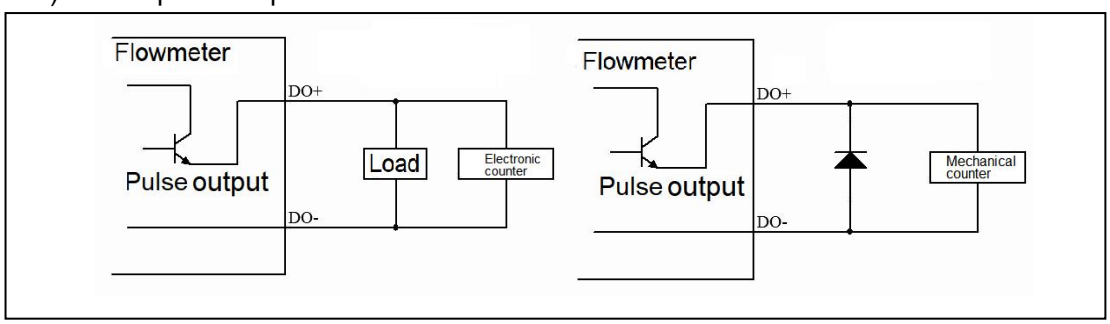


Figure 5.4.6 Active pulse output connection

Important

●Output voltage: 30V. DC ±20%.

●Current: ≤ 150mA.

●Pulse frequency: 0.0001~10000Hz.

●Pulse width: 50% duty cycle、0.05ms、0.1ms、1ms、20ms、50ms、100ms

●Status output / alarm output

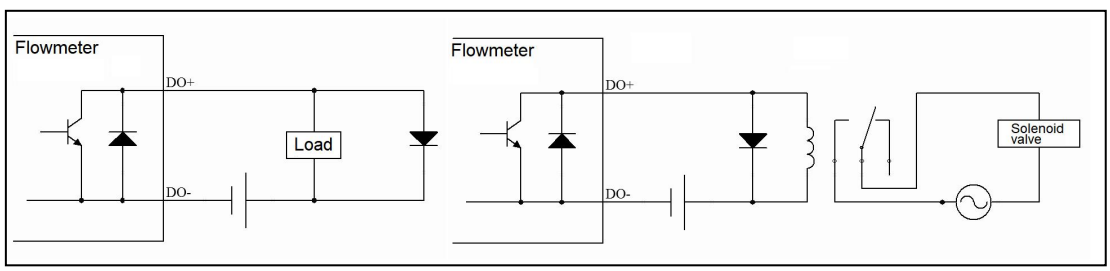


Figure 5.4.7 Status output / alarm output connection

Important

Attention should be paid to the voltage and electrode polarity when wiring, in which the

maximum DC voltage is 30V and the maximum current is 0.2A. At the same time, if the input filter constant of the electronic counter is larger than the pulse width, the signal is weakened and the counting is inaccurate. The output signal cannot be switched to an AC load, so to switch to an AC load, an intermediate relay must be connected.

●Status input

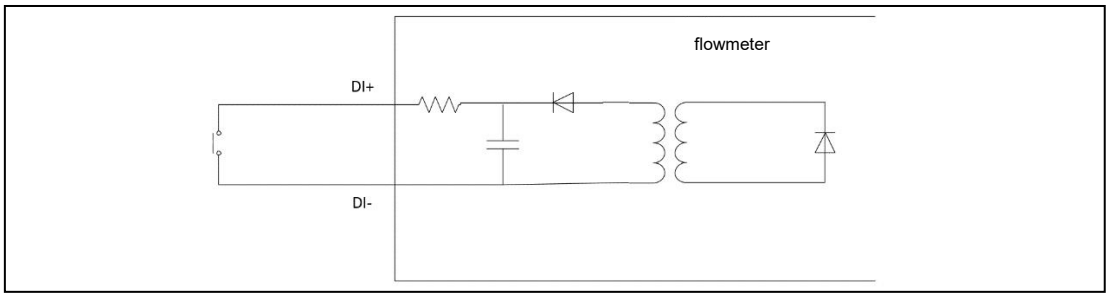


Figure 5.4.8 Status input connection

Important

Note that this state cannot be connected to any signal source with voltage, otherwise the input line will be damaged.

● Relay output

This instrument has a built-in relay with a specification of 250V. Ac _ hand 3A, 30V. DC _ hand, 3A. Be careful not to exceed the load of the relay in this process. Among them, if you need to drive a larger current or voltage, you must connect to the intermediate relay.

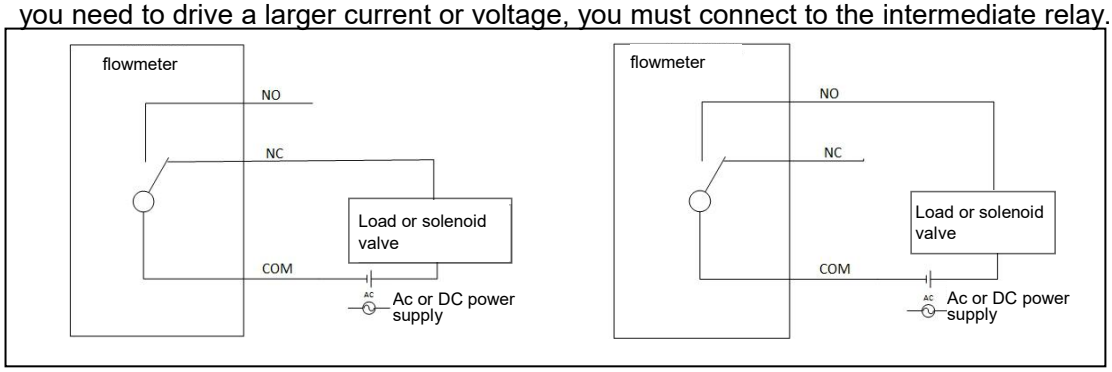


Figure 5.4.9 Relay output connection (left-normally closed, right-normally open)

5.4.4 Conduit tube cable

After completing the connection of the power cord and the external connection cable, it is necessary to carry out the lead arrangement of the wire outside the converter in order to prevent Rain Water from extending the wire into the inside of the converter, and the low-lying points of the lead should be added as recommended in figure 5.4.10.

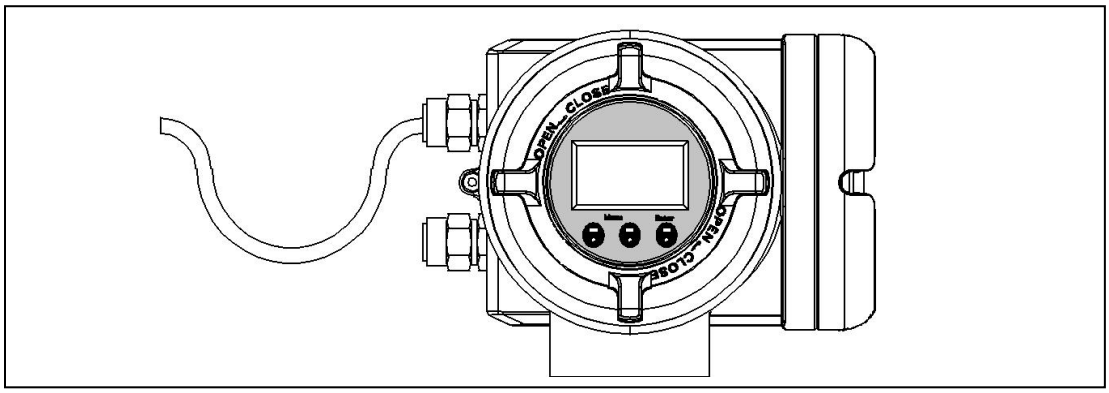


Figure 5.4.10 External wiring

5.5 Earthing grounding

5.5.1 Converter grounding

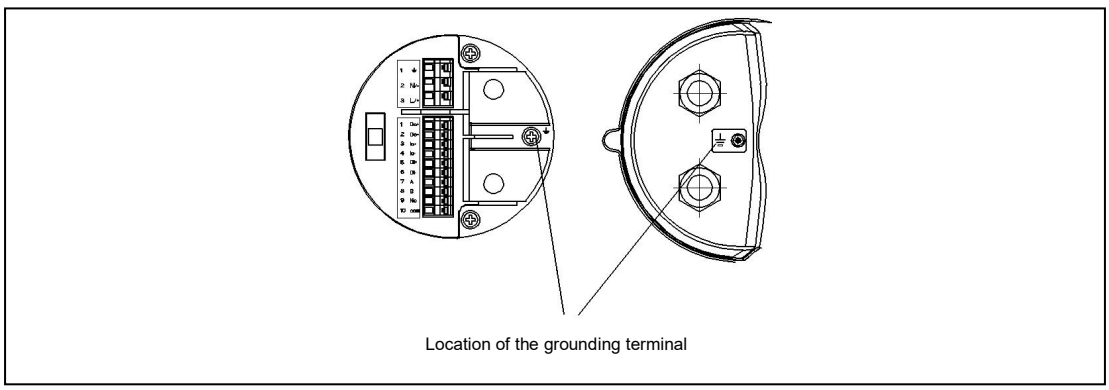


Figure 5.5.1 Converter grounding

5.5.2 Sensor grounding

1）Installation grounding on metal pipes

The medium in the metal pipe can have a good electrical connection with the earth, and the sensor can be reliably connected with the metal pipe. As can be seen in figure 5.5.2, the sensor has higher requirements for grounding, and a separate grounding device is required if the environment has strong electromagnetic interference. The grounding device is buried in wet soil greater than 1 meter in depth and the grounding wire requires strands of copper wire with a cross-sectional area of not less than 4mm ².

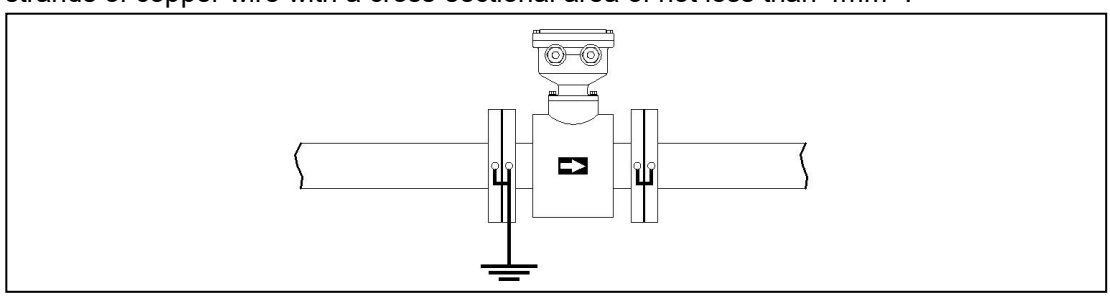


Figure 5.5.2 Installation grounding on metal pipes.

2) Installation grounding on insulated pipes.

Figure 5.5.3 you can see that the flowmeter is in contact with the measuring medium through a grounding electrode or grounding ring, and the grounding device can be connected using the grounding bus at both ends of the flowmeter flange.

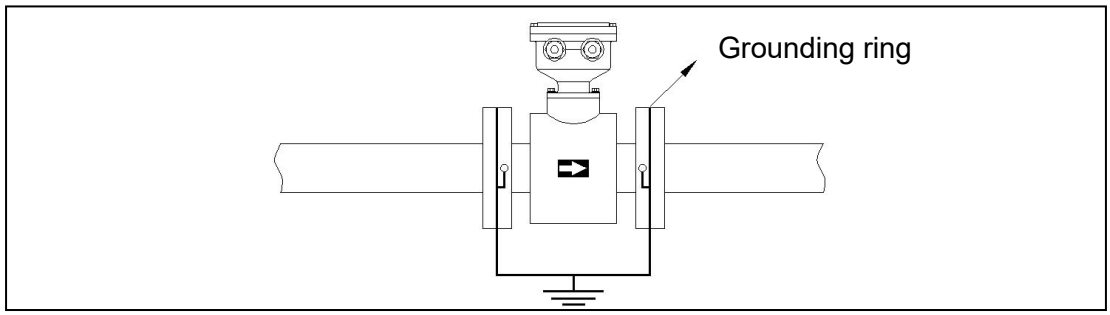


Figure 5.5.3 Installation grounding on insulated pipes.

3) There is strong stray current in the pipeline.

When there is a strong stray current in the pipeline, it is necessary to block the stray current through the flowmeter. At the same time, when installing the pipe, it is necessary to install an insulated short pipe between the pipe and the flowmeter, and grounding according to the grounding method of installing the flowmeter on the insulated pipe. Pipes that have been electrically remote by short insulated pipes need to be connected by copper wires with a cross-sectional area of not less than 4mm ². As shown in figure 5.5.4, the leakage current in such pipes will be shunted from the copper wire instead of passing through the flowmeter, reducing the interference introduced by the tested liquid.

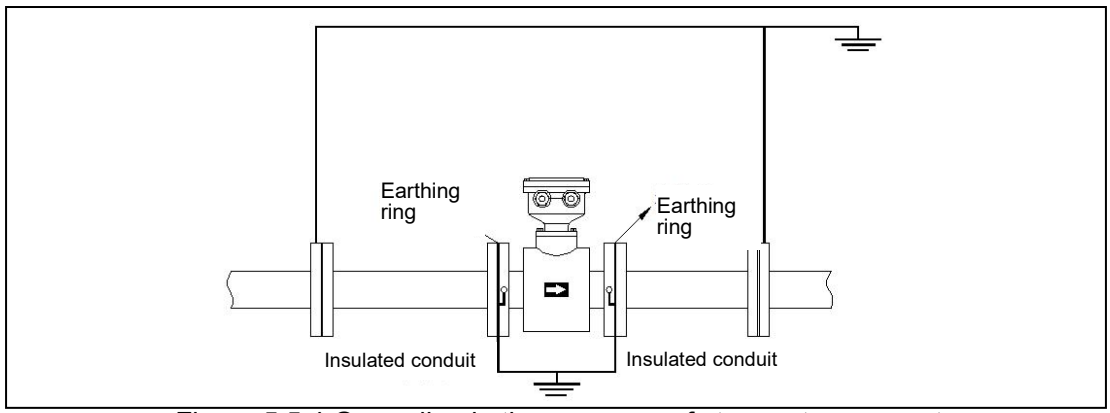


Figure 5.5.4 Grounding in the presence of strong stray current

Chapter 6 Basic operating steps (introduction of display unit)

The correction of the data setting in the display unit is realized by the three setting keys: ▲ ▼ and ENT. This chapter introduces in detail the structure and usage of the basic data of the setting key.

6.1 Panel

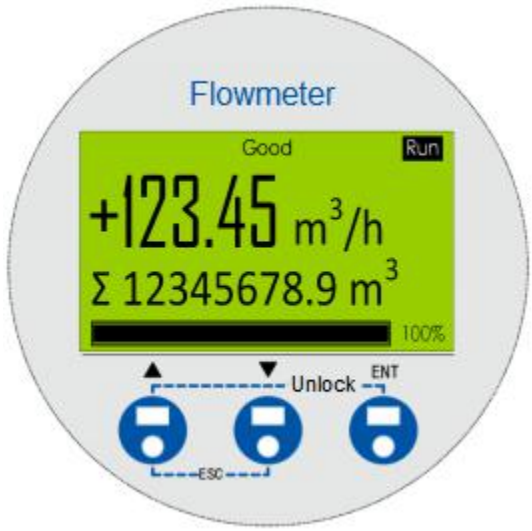


Figure 6.1.1 Panel

6.2 Set the operation of the key

Press the key	Main interface	First-level menu	Second-level menu	Parameter modification menu function
ESC (BACK+NEXT)	Go to the first level menu.	Return to the main interface.	Return to the first-level menu.	Cancel modification.
ENT	Entry alarm State interface	Go to the second level menu	Enter the parameter modification interface	Move the cursor to the right to modify the data, and confirm the change after moving to the rightmost position
▲	Switch to the contents of a display unit on the menu at this level.			Increase the cursor bit value or move the option up.
▼	Switch to the next display unit content of the menu at this level			The cursor bit value decreases or the option moves down.
BACK+ ENT	Unlock the button	/	/	/

Press the BACK key and enter key at the same time, you can unlock the ESC key and the ENT key, and then press ESC (key combination BACK+NEXT) to enter the password interface, and after verification, you can browse and modify the parameters (write

protection needs to be turned off in the system parameters).
If there is no valid key after 5 minutes, relock the button and return to the main interface while turning on write protection.

important

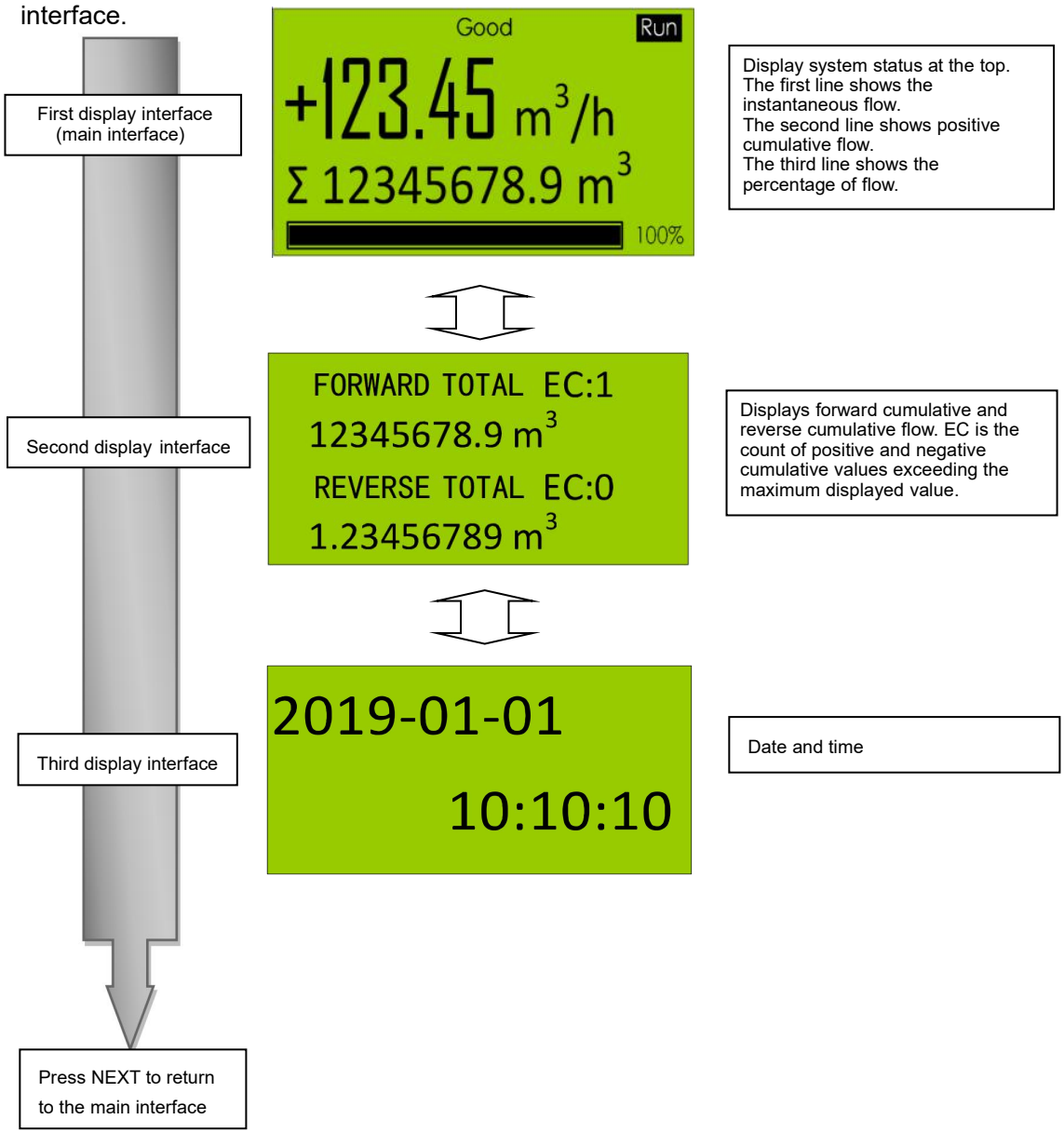
The keystrokes are illustrated as follows:

▲ ▼

BACK NEXT ENT

6.3 Display interface and content

There are four display interfaces in the display mode. At present, you can use BACK or next key to make a choice based on the first display interface to the fourth display interface.

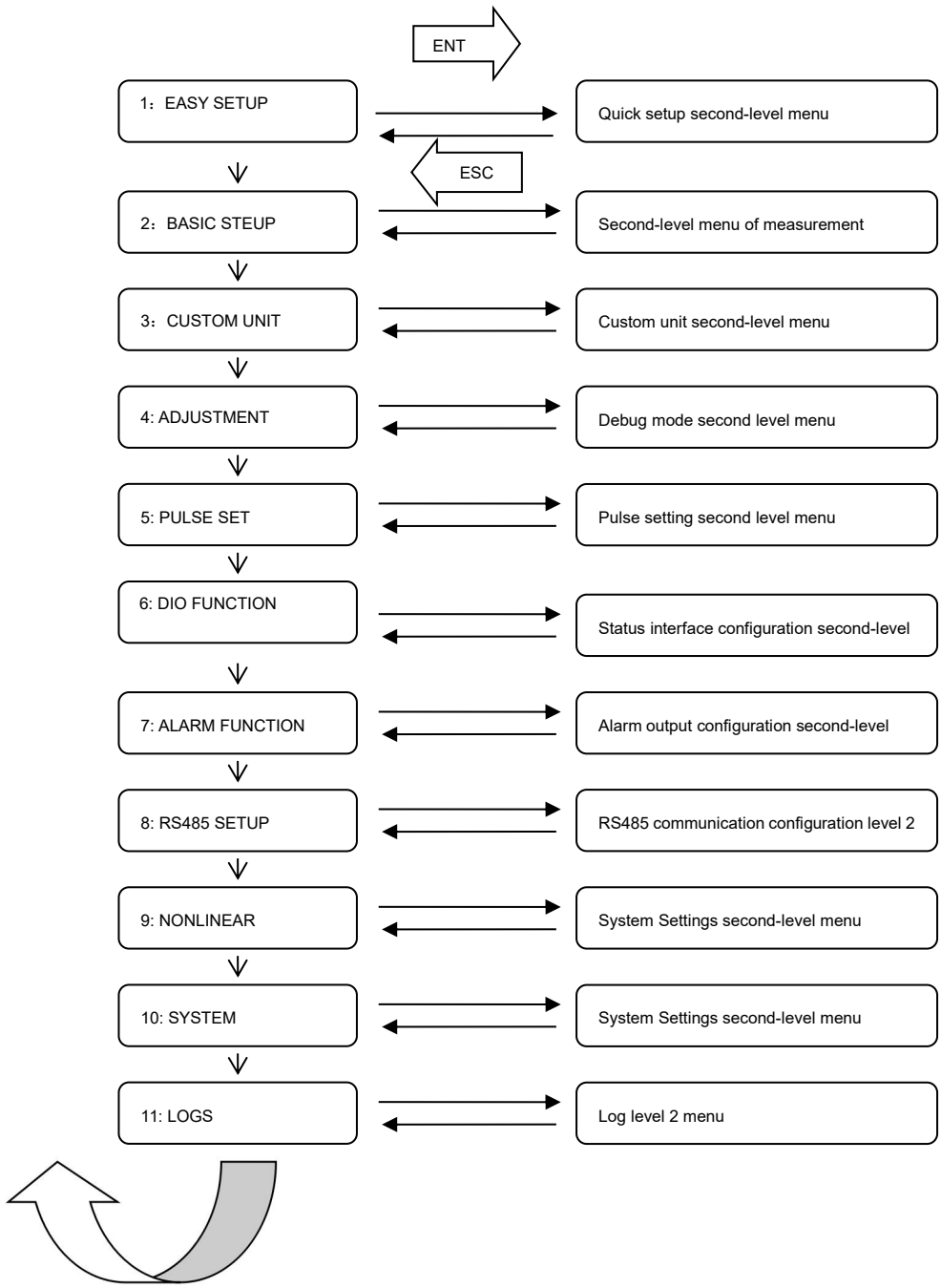


6.4 Display mode to setup mode

6.4.1 Menu structure

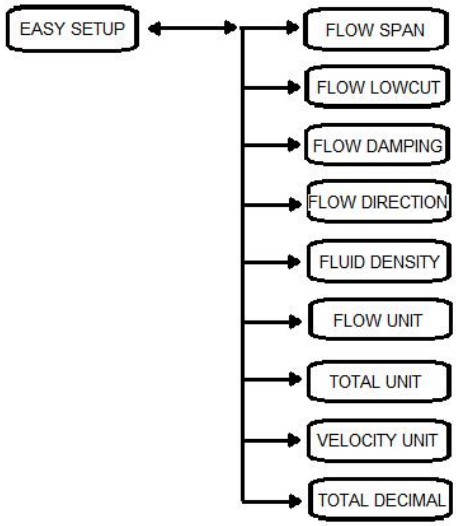
The menu is divided into two levels

●First-level menu structure

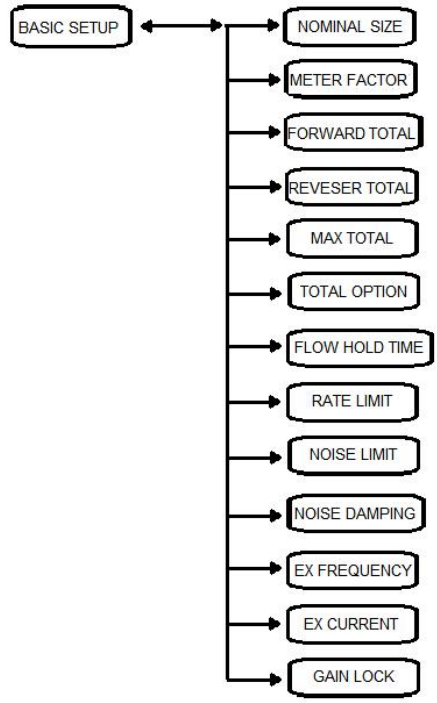


●Second-level menu structure

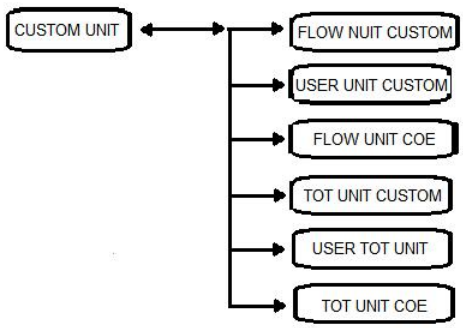
1.



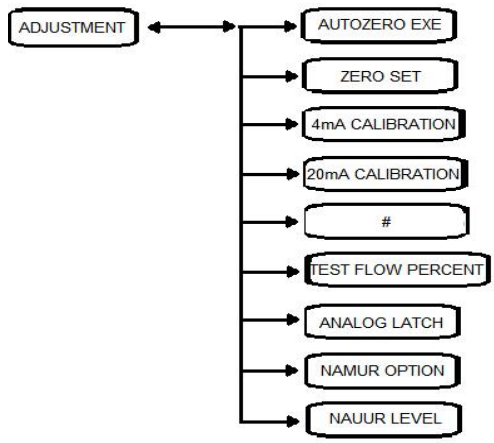
2.



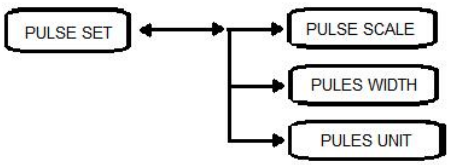
3.



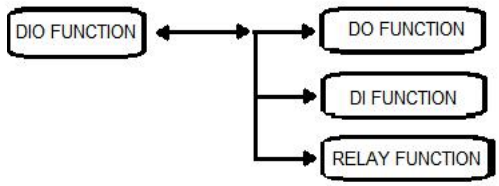
4.



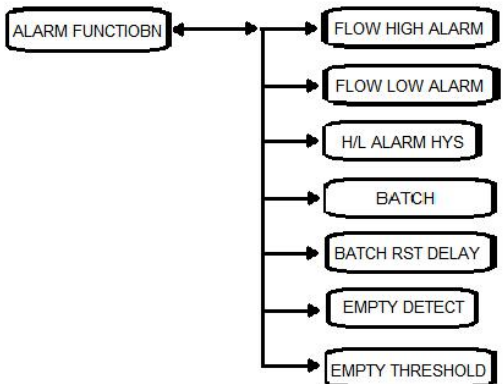
5.



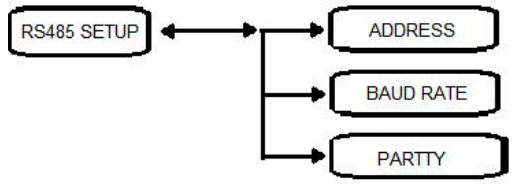
6.



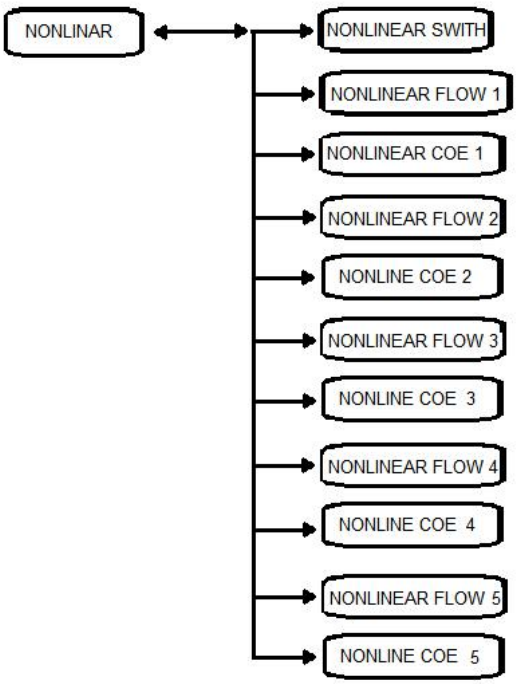
7.


ALARM FUNCTIOBN
FLOW HIGH ALARM
FLOW LOW ALARM
H/L ALARM HYS
BATCH
BATCH RST DELAY
EMPTY DETECT
EMPTY THRESHOLD

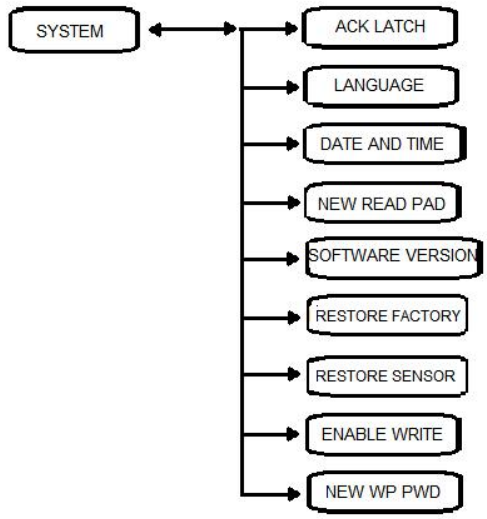
8.


RS485 SETUP
ADDRESS
BAUD RATE
PARTTY

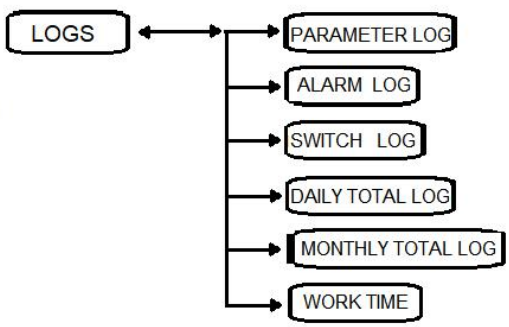
9.


NONLINAR
NONLINEAR SWITH
NONLINEAR FLOW 1
NONLINEAR COE 1
NONLINEAR FLOW 2
NONLINE COE 2
NONLINEAR FLOW 3
NONLINE COE 3
NONLINEAR FLOW 4
NONLINE COE 4
NONLINEAR FLOW 5
NONLINE COE 5

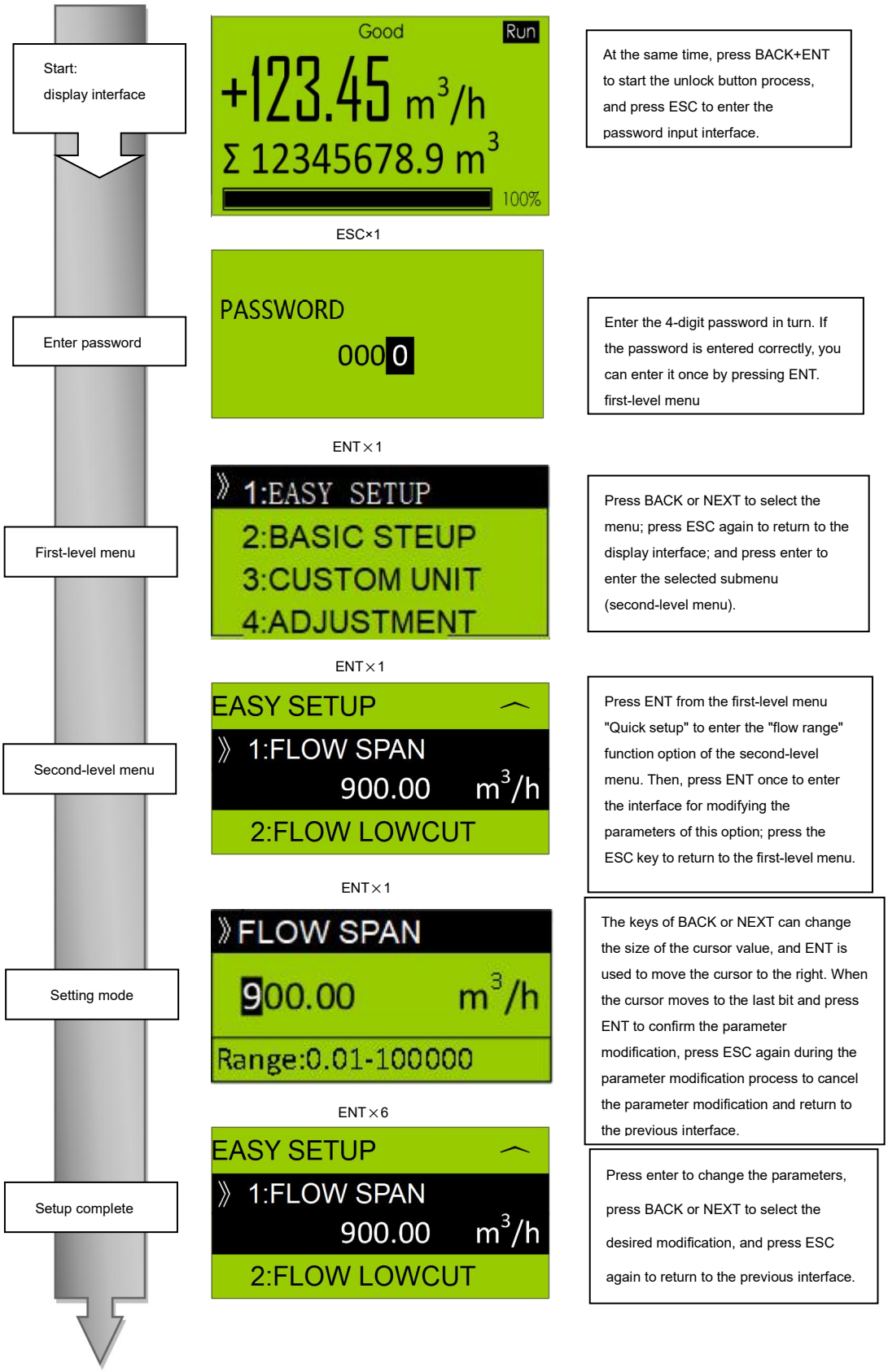
10.


SYSTEM
ACK LATCH
LANGUAGE
DATE AND TIME
NEW READ PAD
SOFTWARE VERSION
RESTORE FACTORY
RESTORE SENSOR
ENABLE WRITE
NEW WP PWD

11.


LOGS
PARAMETER LOG
ALARM LOG
SWITCH LOG
DAILY TOTAL LOG
MONTHLY TOTAL LOG
WORK TIME

6.4.2 Display example: to display the interface to the parameter setting mode



6.4.3 Parameter setting mode

If you activate the parameter setting mode by following the steps described above, you can then select the parameter you want to set.

If there is no operation within about 5 minutes after entering this mode, the system will automatically return to the main interface, and the keystroke and password status will be re-locked.

Parameter data format:

Depending on the type of parameter, the data can be in the following two formats:

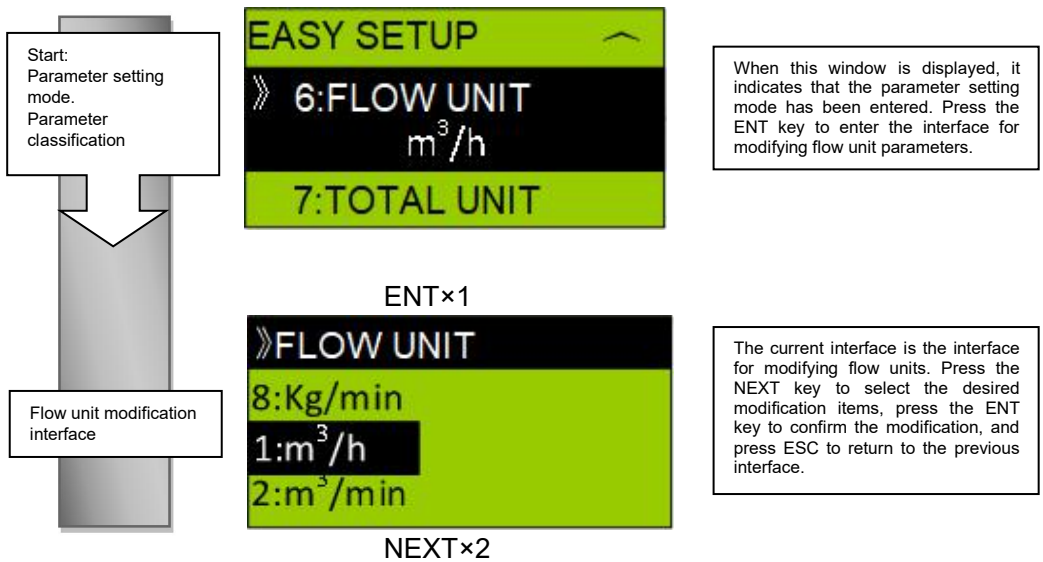
Format.	Typical display	Display option.	Content.
1) Discrete selection.	》FLOW UNIT 1:m³/h 2:m³/min 3:L/h	M ³/ h, m ³/ min, L _ max h, L/min, etc.	Select the desired data from the predetermined options.
2) Numerical type	》FLOW SPAN 900.00 m³/h Range:0.01-100000	The values are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.	The data consists of numbers, decimal points, and symbols.

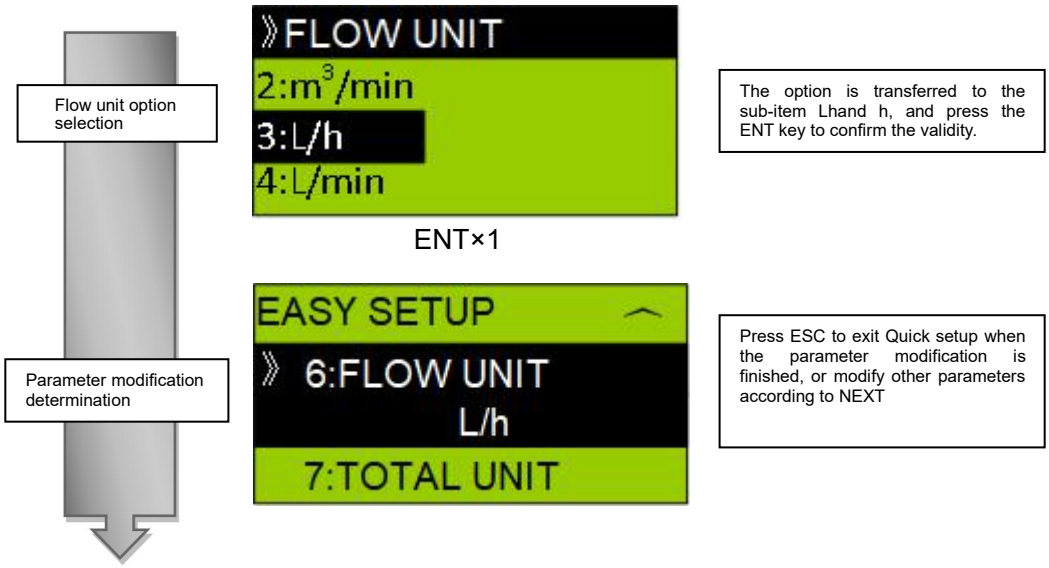
6.5 Parameter setting steps instantaneous flow unit

The example mainly introduces the discrete selective parameters: 1: quickly set the setting of flow units, from the default "m ³/ h" to "Lbinh".

When the system is in the parameter setting menu, select the parameters to be set, and the commonly used parameters are integrated in the whole parameter setting mode. This section mainly introduces the operation steps of flow unit setting and range setting.

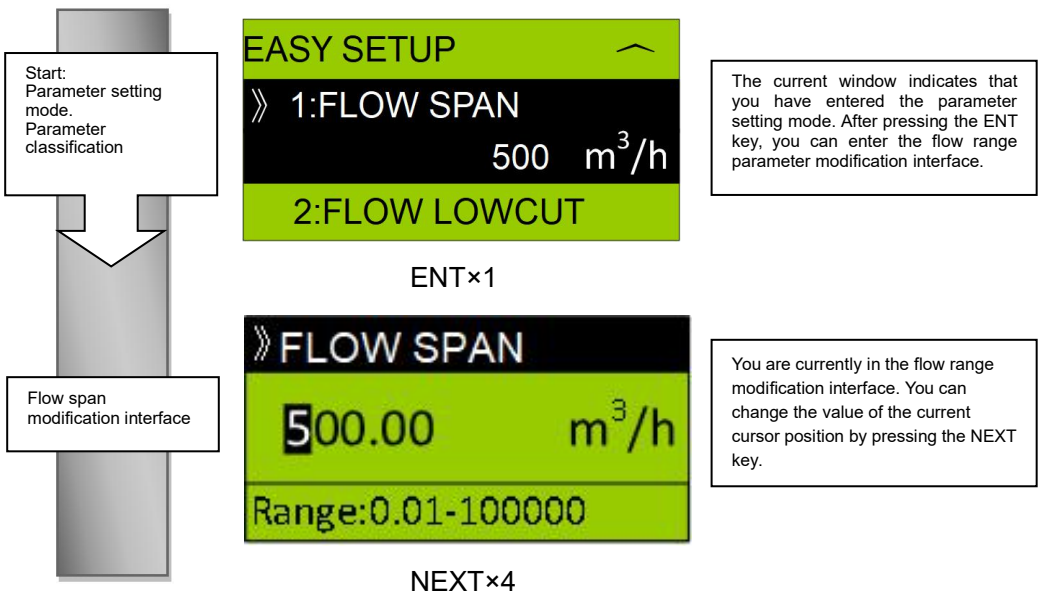
6.5.1 Example of discrete selection setting

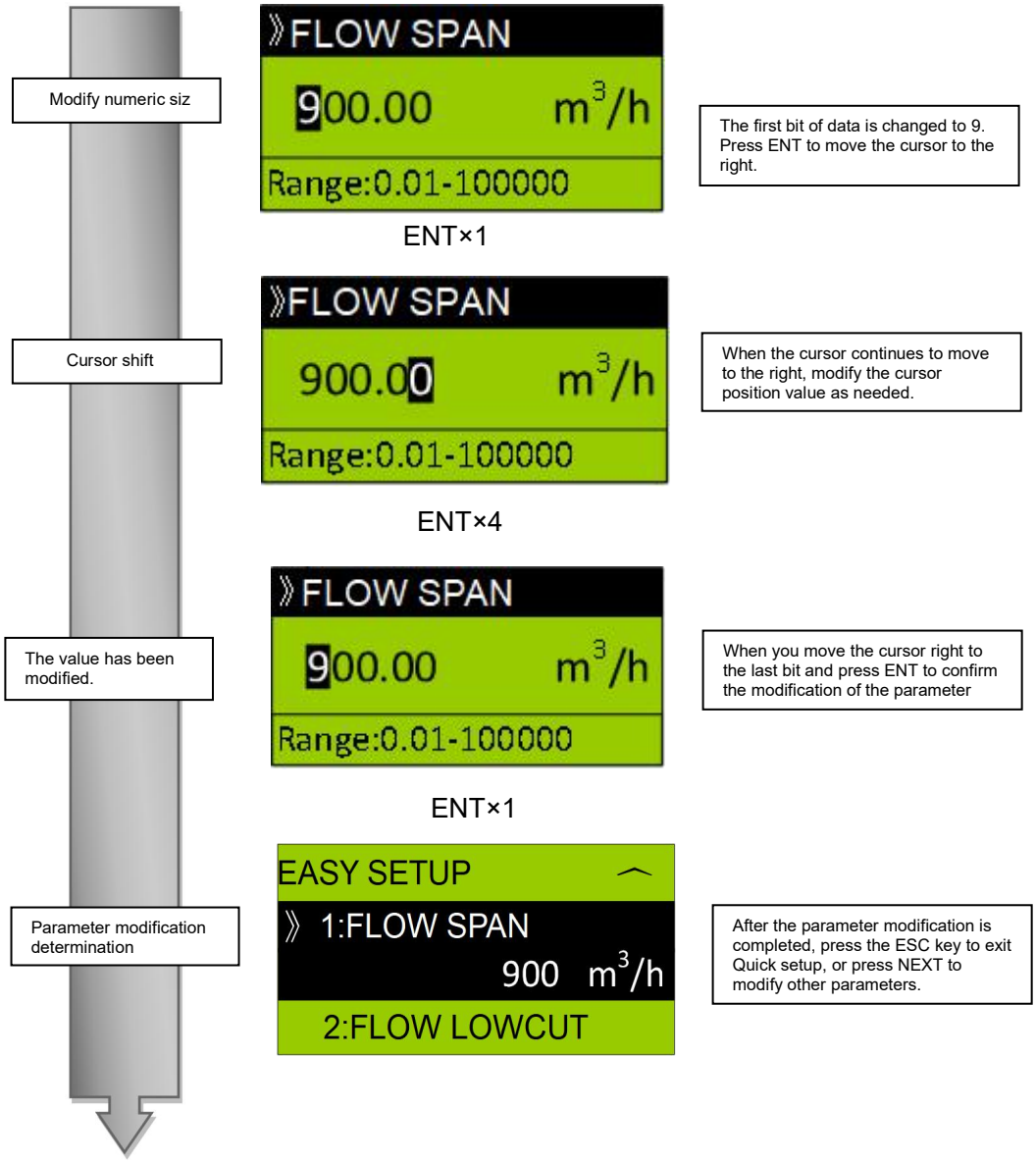




6.5.2 Example of setting up numeric data: flow range

The example introduces the numerical parameters: 1: quickly set the setting of the flux range from the default "500.00" to "900.00".




Modify numeric siz
》FLOW SPAN
900.00 m³/h
Range:0.01-100000
The first bit of data is changed to 9. Press ENT to move the cursor to the right.
ENT×1
Cursor shift
》FLOW SPAN
900.00 m³/h
Range:0.01-100000
When the cursor continues to move to the right, modify the cursor position value as needed.
ENT×4
The value has been modified.
》FLOW SPAN
900.00 m³/h
Range:0.01-100000
When you move the cursor right to the last bit and press ENT to confirm the modification of the parameter
ENT×1
Parameter modification determination
EASY SETUP
》1:FLOW SPAN
900 m³/h
2:FLOW LOWCUT
After the parameter modification is completed, press the ESC key to exit Quick setup, or press NEXT to modify other parameters.

Chapter 7 Description of parameters

7.1 Parameters

Except for the parameters specifically required by the user when ordering, all other internal parameters are initialized to the default values.

Important

Ensure that the power supply is stable during the setup process, and that the power supply needs to be turned off immediately after completing the parameter setting, then the setting parameters may go wrong.

Note

If the converter is booked separately, the instrument coefficient needs to be set to the default value, so the user must change the instrument coefficient setting according to the sensor nameplate

7.2 Parameter list overview

The items in the parameter list refer to the 6.4.1 menu bar structure.

1）EASY SETUP

Project	Name. Show.	R/W	Data range	Unit	Default value	Content description.
1-1	FLOW SPAN	W	Data range: 0.1 to 100000.	/	500.00	If the upper limit flow of the corresponding current output, the unit is associated with 1-6
1-2	FLOW LOWCUT	W	(floating point).	m/s	0.0000	When the absolute value of the velocity is lower than the cut value, the value is assigned to 0.
1-3	FLOW DANMPING	W	0.010.	s	3.0	The response time of the flow can restrain the fluctuation and smooth the flow curve. The smaller the damping time is, the faster the response is, and the larger the flow is, the more stable the flow is.
1-4	FLOW DIRECTION	W	(floating point).	/	Two-way forward	One-way: positive measurement only. Two-way: forward and reverse measurement. Positive direction: it is positive in accordance with the direction of the flow direction of the sensor. Reverse: it is positive

						opposite to the direction of the flow direction of the sensor.
1-5	FLUID DENSITY	W	0.1 to 200.	t/m3	1.0	When calculating the mass flow rate, you need to enter the density value of the current fluid.
1-6	FLOW UNIT.	W	(floating point).	/	m^3/h	Display the units corresponding to the instantaneous flow in the interface
1-7	TOTAL UNIT	W	One-way forward, one-way reverse, two-way forward, two-way reverse.	/	m^3	Displays the units corresponding to the cumulative flow in the interface.
1-8	VELOCITY UNIT	W	0.1 to 10.	/	m/s	Display the units corresponding to the flow velocity in the interface.
1-9	TOTAL DECIMAL	W	(floating point).	/	/	The number of decimal places is selected by the value of flow resolution, and the number of decimal places decreases automatically when the accumulation is large.

2）BASIC SETUP

2-1	NOMINAL SIZE	W	8 -3000 (floating point).	mm	150.00	Nominal aperture of electromagnetic sensor used for measurement.
2-2	METER FACTOR	W	0.1 to 1000 (floating point).	/	1.0000	After the electromagnetic sensor is calibrated with the converter, the factory flow coefficient is formed, which is proportional to the instantaneous flow rate.
2-3	FORWARD TOTAL	W	099999999 (floating point).	m^3	0	Preset or zero for positive cumulative flow values
2-4	REVERSE TOTAL	W	099999999 (floating point).	m^3	0	Preset or zero for negative cumulative flow values
2-5	MAX TOTAL	W	1099999999 (floating point).	m^3	0	The maximum cumulative display value of the interface display.
2-6	TOTAL OPTION	W	Off, on, forward cumulative zero, reverse cumulative zero.	/	open	The accumulator can be turned on or off, or the accumulative volume can be cleared, and the zero option is not saved.

2-7	FLOW HOLD TIME	W	0.0115.0 (floating point).	s	3.0	The flow changes greatly, and if the timing does not reach this time, the flowmeter will not respond to the sudden flow immediately.
2-8	RATE LIMIT	W	0floating 10.0 (floating point).	%	10.0	Correlation 2-7 flow response time, when the flow change exceeds a certain proportion of the flow range, it will be a sudden change. At present, the ratio value can be set according to the fluctuation of working conditions.
2-9	NOISE LIMIT	W	0.0510.0 (floating point).	%	5.0	If there is a small fluctuation in the flow rate, and the value is lower than the noise limit, it is noise. The flowmeter can restrain it.
2-10	NOISE DAMPING	W	1: 10.	/	3.0	Associated noise limit, the noise value will attenuate proportionally, 1-no attenuation, 10-attenuation to 1max 10
2-11	EX FREQUENCY	W	1.5625 、 3.125 、 6.25 、 12.5 、 25.	Hz	6.25	The excitation frequency of the electromagnetic flowmeter can be selected according to the sensor type and working condition, which is usually set by the factory.
2-12	EX CURRENT	W	Low, high.	/	low	The excitation frequency of the electromagnetic flowmeter can be selected according to the sensor type and working condition, which is usually set by the factory.
2-13	GAIN LOCK	W	Off, on	/	off	When the signal circuit is turned on, the gain of the sampled signal is locked to a small gain, and the anti-interference ability is enhanced. When the circuit is closed, it is a large gain and the measurement accuracy is improved.

3）CUSTOM UNIT

3-1	FLOW UNIT CUSTOM	W	Off, on	/	off	When turned on, the instantaneous unit of measurement uses a custom unit.
3-2	USER FLOW UNIT	W	Combination of 8-bit characters and numbers.	/	0.0	Sets custom unit characters.
3-3	FLOW UNIT COE	W	0.001mm 1000.	/	1	A coefficient in which a custom instantaneous unit of measurement is equal to a unit of flow.
3-4	TOT UNIT CUSTOM	W	Off, on.	/	Off	Cumulative units when on, using custom units.
3-5	USER TOT UNIT	W	Combination of 6-digit characters and numbers	/	/	Set custom unit character.
3-6	TOT UNIT COE	W	0.001～1000	/	1	A coefficient in which a custom cumulant unit is equal to a cumulant unit.

4）ADJUSTMENT

4-1	AUTOZRRO EXE	W	/	/	/	Zero setting operation can be carried out when the flowmeter is full and the fluid is not flowing, and the setting time is 180 seconds.
4-2	ZERO SET	W	-500～500（Floating point）	m^3/h	0.0	Manually set the zero value of the current flowmeter, when the flowmeter is full and the fluid is not flowing, carefully observe the average value of the flow, and then enter the average value
4-3	4mA Calibration	W	3.8～4.2（Floating point）	mA	4.0000	Manually calibrate the current output 4mA, you can connect the ammeter to the current output interface when calibrating the interface, and input the current ammeter reading to complete the calibration.
4-4	20mA Calibration	W	19.5～20.5（Floating point）	mA	20.000	Manually calibrate the current output 20mA, you can connect the ammeter to the current output interface when calibrating the interface, and input the current ammeter reading to complete the

						calibration.
4-5	CURRENT DAMPING	W	0.1～30（Floating point）	s	3.0	The response time of the output current can restrain the fluctuation and ensure the stable output of the current, and the smaller the damping time is, the faster the response is, the more stable the response is.
4-6	TEST FLOW PERECENT	W	-120～120（Integer number）	%	0	The current and pulse output can be debugged, and the output value is equal to the full range flow multiplied by the percentage of analog flow.
4-7	ANALOG LATCH	W	Off, on	/	Close.	When a latch condition is enabled in the converter and a serious error occurs, the analog output must enter the fault protection condition.
4-8	NAMUR OPTION	W	Off, on	/	open.	The user needs to confirm the latch failure or power restart through the DD or monitor to make the converter return to normal. Enables or closes Namur.
4-9	NAMUR LEVEL	W	High current and low current	/	High current	Alarm level: default High (maximum output 21.5mA), Low (minimum output 3.58mA)

5）PULSE SET

5-1	PULSE SCALE	W	1～1000（Floating point）	/	1.00	The cumulative value of each pulse is associated with a 5-3 pulse unit.
5-2	PULSE WIDTH	W	50% duty cycle、0.05、0.1、1、20、50、100	ms	50% duty cycle	The high level width of each pulse output, and its 50% duty cycle, the pulse width is determined by the pulse frequency.
5-3	PULSE UNIT		u TotalUnit/P、m TotalUnit/P、TotalUnit/P、k TotalUnit/P	/	u	The unit of pulse equivalent is related to the cumulative flow unit, which represents 0.000001, 0.001, 1, and 1000 times the cumulative flow unit.

6）DIO FUNCTION

6-1	DO FUNCTION	W	Pulse output. Upper and lower limit flow alarm. Batch control output. Air flow control alarm. Fault alarm	/	Pulse output.	Pulse output: configure the DO interface as pulse output, correlating 5-1 and 5-2. Upper and lower limit flow alarm: output alarm signal when instantaneous flow is greater than upper limit flow alarm value, correlation 7-1; output alarm signal when instantaneous flow is less than lower limit flow alarm value, correlation 7-2. Batch control output: when the batch control is turned on, if the cumulative amount exceeds the batch alarm value, the alarm signal is output, which is associated with 7-4 and 7-5. Air flow control alarm: when the flowmeter is in the air flow control state, it outputs the alarm signal and correlates 7-6 and 7-7. Fault alarm: output alarm when there is any fault in the flowmeter
6-2	DI FUNCTION	W	None. Batch zero clearance. Cumulative zero clearance. Zero setting	/	None.	None: no contact input function. Batch zeroing: when DO is configured to batch control output, clear this accumulation and accumulate for the next batch. Cumulative zero: zero the cumulative flow of the instrument. Zero setting: set the zero flow at this time to ensure that the pipe is full and the fluid is static

6-3	Relay FUNCTION	W	Upper and lower limit flow alarm. Batch control output. Air flow control alarm. Fault alarm	/	Fault alarm	Upper and lower limit flow alarm: when the instantaneous flow is greater than the upper limit flow alarm value, the alarm signal is output and associated with 7-1; when the instantaneous flow is less than the lower limit flow alarm value, the alarm signal is output and associated with 7-2. Batch control output: when batch control is enabled, if it is found that the cumulative amount exceeds the batch alarm value, the alarm signal is output, associated with 7-4 and 7-5. Air flow control alarm: when the flowmeter is in the air flow control state, it outputs the alarm signal and correlates 7-6 and 7-7 at the same time. Fault alarm: if there is any fault in the flowmeter, the data will be output to alarm.

7）ALARM FUCTION

7-1	FLOW HIGH ALARM	W	-200% less than 200% (floating point).	%	90	Set the alarm value of the upper limit of the instantaneous flow, and when the upper limit flow alarm is enabled in the DO interface or the relay output interface, and when the instantaneous flow is greater than the upper limit alarm percentage multiplied by the measuring range, the alarm signal is output.
7-2	FLOW LOW ALARM	W	-200% less than 200% (floating point).	%	20	Set the alarm value of the lower limit of instantaneous flow, and enable the alarm of the lower limit of flow in the DO interface or relay output interface. When the instantaneous flow is less than the lower limit alarm percentage multiplied by the measuring range, the alarm signal is output.

7-3	H/L ALARM HYS		0.09 10.0%.	%	5	In the case of upper and lower limit alarm, if the flow value leaves the alarm area, it will not alarm immediately, but add a lag interval to prevent the alarm state from being switched frequently.
7-4	BATCH	W	0.010000.0 (floating point).	m^3	0.0000	Batch control alarm is enabled if DO interface or relay output interface.
7-5	BATCH RST DELAY	W	1 to 30 integers.	s	30	If the cumulative flow is greater than the batch alarm value, the alarm signal is output.
7-6	EMPTY DETECT	W	On, off	/	On	Turn on or off the air flow control alarm function. By detecting the air flow control alarm function, you can detect whether the pipeline is in the state of empty flow control or whether the electrical conductivity is too low.
7-7	EMPTY THRESGOLD	W	0~3	/	0.2	Define the air flow control state, and the sampled air flow control signal value is considered as the empty flow control in the pipeline when it is higher than the threshold value.

8）RS45 STEUP

8-1	ADDRESS	W	1~255	/	1	When communicating with RS485, the address used by the host to query the local information.
8-2	BAUD RATE	W	2400、4800、9600	/	2400	Data can be transmitted at a rate when communicating with RS485.
8-3	PARITY	W	None, odd check, even check	/	none	A check method for verifying whether a single byte is transmitted incorrectly when communicating with RS485

9）NONLINEAR

9-1	NONLINEAR SWITCH	W	Off,on	/	on	Set the switch of the flow nonlinear correction function, if you choose to turn off the switch, the correction coefficients of the following five correction points have no effect.
9-2	NONLINEAR FLOW 1	W	0.01～100000	m³/h	1.0000	The first correction point.
9-3	NONLINEAR COE 2	W	0.5～1.5	/	1.0000	First correction point coefficient.
9-4	NONLINEAR FLOW 2	W	0.01～100000	m³/h	1.0000	The second correction point.
9-5	NONLINEAR COE 2	W	0.5～1.5	/	1.0000	Second correction point coefficient.
9-6	NONLINEAR FLOW 3	W	0.01～100000	m³/h	1.0000	The third correction point.
9-7	NONLINEAR COE 3	W	0.5～1.5	/	1.0000	The third correction point coefficient.
9-8	NONLINEAR FLOW 4	W	0.01～100000	m³/h	1.0000	The fourth correction point.
9-9	NONLINEAR COE 4	W	0.5～1.5	/	1.0000	The fourth correction point coefficient.
9-10	NONLINEAR FLOW 5	W	0.01～100000	m³/h	1.0000	The fifth correction point.
9-11	NONLINEAR COE 5	W	0.5～1.5	/	1.0000	The fifth correction point coefficient

10）SYSTEM

10-1	ACK LATCH	W	/	/	/	A failure can result in an analog current lock that can be used to confirm and restore the output.
10-2	LANGUAGE	W	Chinese. English	/	Chinese.	Set the language presented by the LCD interface.
10-3	DATE AND TIME	W	/	/	/	Set up the flowmeter to display the current time and date.
10-4	NEW READ PWD	W	/	/	/	Password modification.
10-5	SOFTWARE VERSION	R	/	/	/	Built-in software version number of flowmeter.
10-6	RESTORE FACTORY SET	W	/	/	/	Restore the default parameters of the system, clear all factory configuration parameters and user setting parameters.
10-7	RESTORE SENSOR SET	W	/	/	/	All parameter configurations are restored to the factory default configuration, and further prompt whether to continue the recovery.

10-8	ENABLE WRITE	W	/	/	/	Sensor configuration (caliber, calibration parameters) is restored to the factory default configuration, and further prompt whether to continue to restore.
10-9	NEW WP PWD	W	/	/	/	The parameters are saved as the factory default configuration, and you need to be further prompted whether to continue saving (currently only implemented in DD).

11）LOGS

11-1	PARAMETER LOG	R	/	/	/	Record the time of parameter modification and the data before and after modification.
11-2	ALARM LOG	R	/	/	/	Record the alarm time and alarm content of the instrument.
11-3	SWITCH LOG	R	/	/	/	Record each boot time and downtime.
11-4	DAILY TOTAL LOG	R	/	/	/	Record the daily accumulation over the past 31 days.
11-5	MONTHLY TOTAL LOG	R	/	/	/	Record the monthly accumulation over the past 24 months
11-6	WORK TIME	R	0～4294967295 s	/	/	As soon as the converter is powered on, it begins to accumulate running time, and the power outage stops.

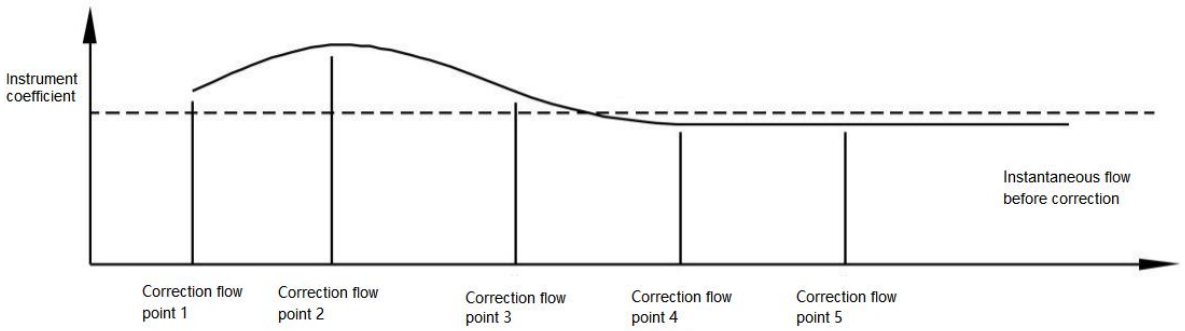
Important

Explanation on nonlinear correction.

● The value of the instrument correction point (1-5) is the flow before the instrument is not corrected, and it is the instantaneous flow with a correction coefficient of 1.

● When calibrating the instrument, first select the calibration point and input each calibration flow input, and then: F standard / F measurement flow correction coefficient unit.

● A line segment is used to represent the correction process, as shown in the following figure



There are two ways to determine the correction coefficient:

1) The main results are as follows: 1) the correction coefficient C of each point can be calculated by instantaneous flow rate, and the formula is: C= F standard / F measurement.

2) The corresponding instrument coefficient of each flow point has been calibrated, in which the corresponding correction point and correction coefficient are input.

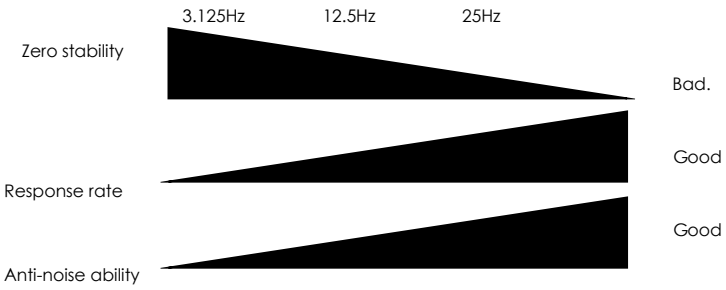
●The ex-factory calibration of the circuit board has been set up before leaving the factory, and the operation process is not allowed to be changed, otherwise it will directly affect the measurement accuracy of the instrument, and if it is serious, the instrument will not be displayed.

Important

Explanation of excitation frequency.

This parameter is used to set the frequency of the excitation drive in the excitation drive module.

Excitation frequency	Application description
3.125 Hz	The lower the excitation frequency is, the higher the zero stability is, and on the contrary, the stronger the anti-interference ability of the instrument is. At the same time, high frequency excitation should be selected when measuring slurry.
6.25 Hz	
12.5 Hz	
25 Hz	



Chapter 8 Practical operation

The user installs the sensor into the working pipeline to complete the input / output terminal wiring. Then set the required parameters and complete the zero adjustment before operation. After the fluid measurement begins, the counting electromagnetic Flowmeter terminal outputs an accurate flow signal. This chapter describes the zeroing operation and the corresponding process.

8.1 Zero setting before operation

Zero setting ensures that when the pipe is full of zero flow, the flow indication value is zero and the output current is (4~20) mA,4mA. The factory zeroing is carried out before the instrument is delivered, but in order to match the electromagnetic flowmeter with the working environment, the zeroing must be carried out again after the pipeline is installed in place. This section will describe how to set zeros automatically and manually. At the same time, one of the methods should be selected to complete the zero adjustment.

Important

●Zeroing is carried out before the actual operation of the instrument. It should be noted that during the automatic zeroing period (180 seconds), the user cannot automatically set and update the function.

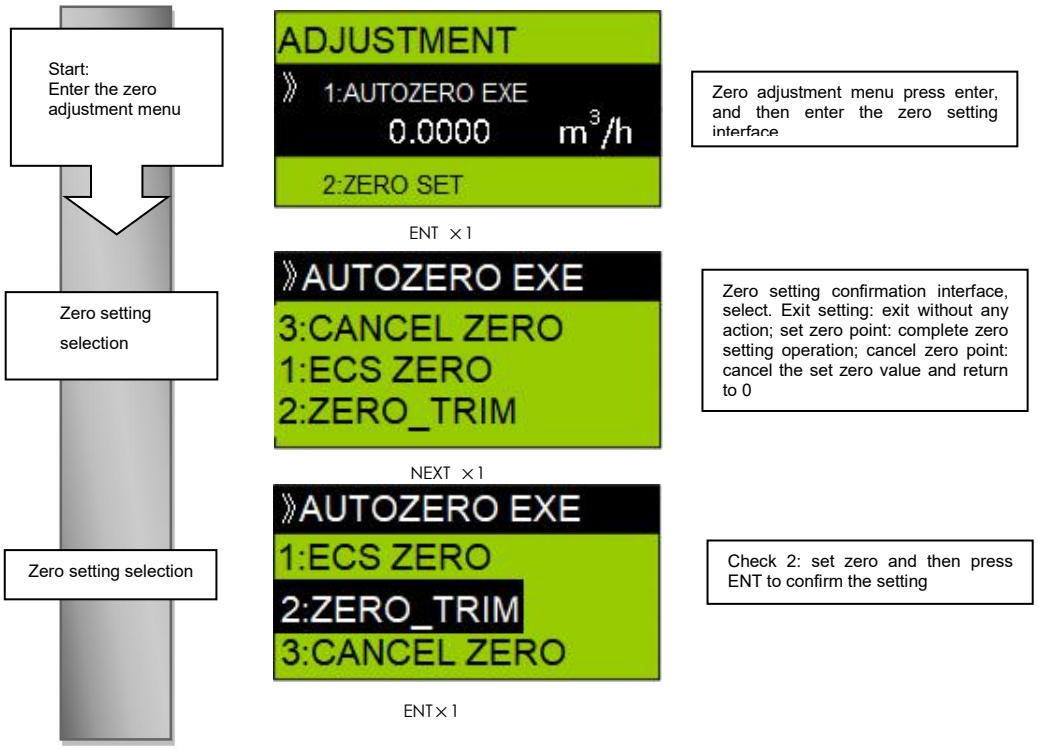
●The user can fill the sensor with liquid (that is, the full tube state) and zero when the fluid velocity is 00:00.

●When the user changes the type of fluid measured, the instrument needs to be re-zeroed immediately.

●Adjust 00:00 to make sure that the ground is in good condition.

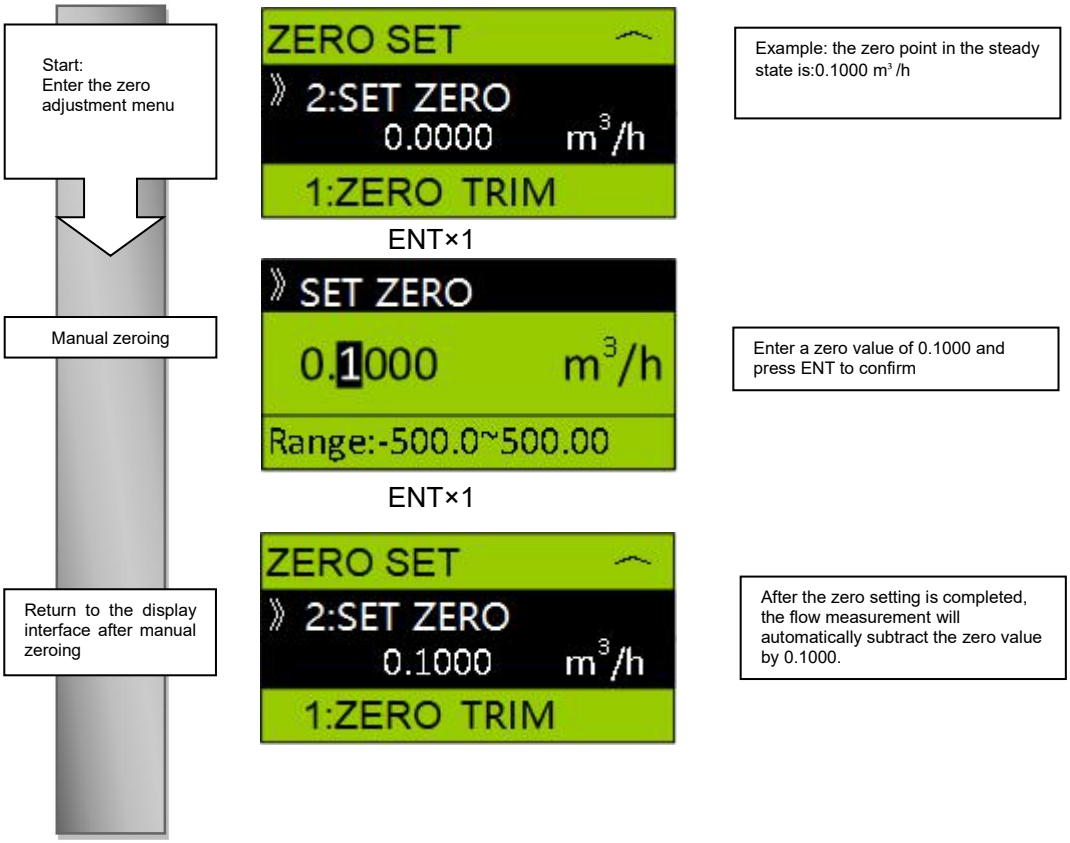
8.1.1 Use the automatic zeroing function

This section describes how to use the automatic zeroing function for zeroing operations.



8.1.2 Zero operation by manual input

This chapter describes in detail the steps of manual input for zeroing operation, the specific steps are as follows:



8.2 Batch canning function

Electromagnetic flowmeter has the function of batch canning, which is characterized by fast response and high precision, so it is suitable for most canning occasions. The specific operations are as follows:

8.2.1 Wiring

Follow the wiring diagram to connect the relay output terminal to the controller or solenoid valve. If it is a batch external start-up, you need to connect the external switch and the contact input

terminal at the same time.

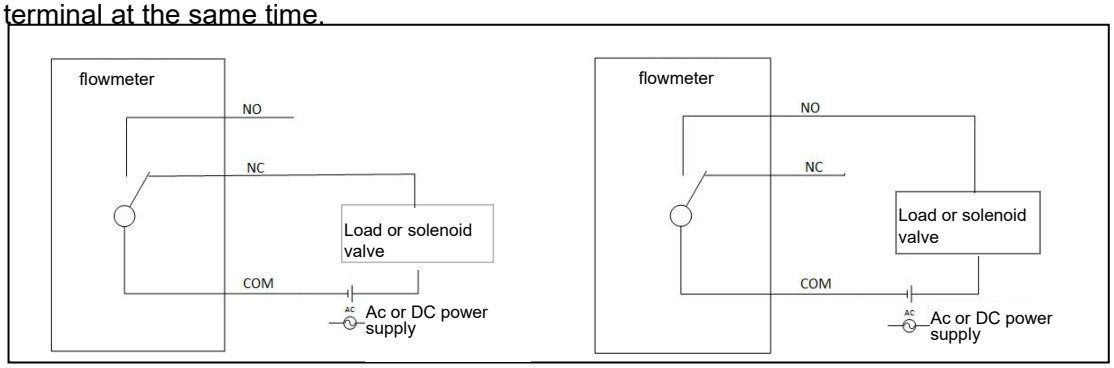


Figure 8.2.1 status output / alarm output connection

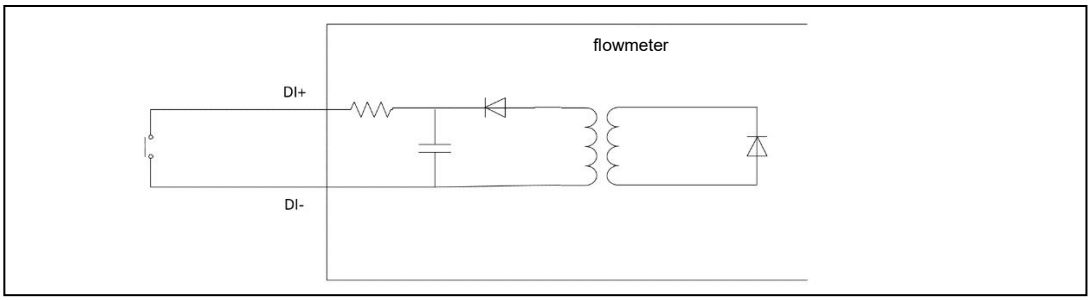


Figure 8.2.2 status input connection

8.2.2 Parameter setting

1) Set [Relay output] to batch control output, and turn on batch canning function at the same time.

2) Set the [batch alarm value] volume to the volume that needs to be canned.

3) When the [DI configuration] value is set to batch zero, and the [valve opening delay setting] is 0, batch external startup is enabled.

4) If the [DI configuration] value is not batch zero, and the [valve opening delay setting] is greater than 0, enable batch delay startup.

8.2.3 Work procedure

1) Finish setting the parameters and start canning.

2) When the tank volume reaches the set value, the relay outputs and closes the valve.

3) If it is a batch external start, contact input is required to clear the tank volume, then you can reset the relay and start the next canning; if the start batch delay, after the time set in the [Open Valve delay setting] menu, the canning volume will be cleared, the relay will be reset and the next canning will be started.

Chapter 9 Communications

9.1 RS485 Modbus communication

When the network is connected, the communication between multiple electromagnetic flowmeters and computers can be completed through a communication bus.
Then the electromagnetic flowmeter is used to convert the measured flow signals into digital signals to be sent. Using MODBUS protocol, a total of 255instruments can be connected on the network.
The use of multipoint communication needs to take into account the update rate of data and the distance between transmissions.
The advantage of communication between multiple points is that it is safe and reliable, and it can still run reliably in those situations with high security requirements.
The communication between the computer and the flowmeter needs to use the RS232/RS485 interface converter, and each flowmeter has a unique address for communication and addressing.
Figure 9.1.1 mainly shows a typical network connection diagram, this diagram is not an installation diagram, if you have any other questions, please call us.

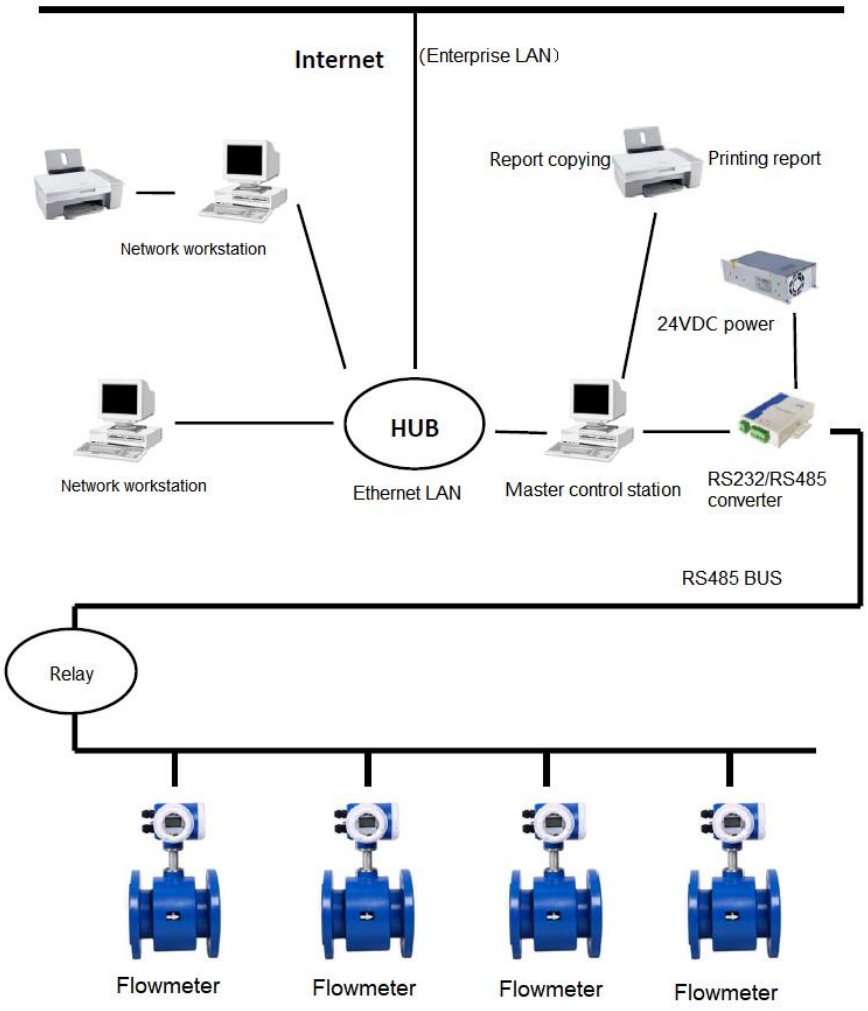


Figure 9.1.1 typical network connection

9.2 Electromagnetic flowmeter uses Modbus RTU communication protocol

For more information, please refer to "Modicon Modbus Protocol Reference Guide".

9.2.1 Query

●Send frame structure when computer query

Byte serial number	Command byte example	Notes
1	01	Instrument number, mailing address of slave, single byte.
2	03	03H in function code indicates query operation.
3	00	The high-order byte of the starting address of the query parameter
4	00	The low byte of the starting address of the query parameter.
5	00	High-order bytes of the number of query parameters.
6	02	The low byte of the number of query parameters.
7	C4	The high-order byte of the CRC check code (16 bits) of this frame.
8	0B	The low byte of the CRC parity check code of this frame

Example: query the net cumulative flow value, and then the computer sends the following frame

01 03 00 00 00 02 C4 0B

●Response frame structure of instrument

Byte serial number	Command byte example	Notes
1	01	Instrument number, that is, slave communication address.
2	03	Function code.
3	04	Data byte count.
4	AF	Data high order H0.
5	D5	Data low L0.
6	00	Data high bit H1.
7	1E	Data low L1.
8	4A	CRC check high bit.
9	D7	CRC check low bit

Example: the accumulated flow value of the meter is: 2011093 m ³.

The floating-point number 2011093 is expressed in the instrument as:

0x00mem0x1Ere0xAFre0xD5.

Corresponding to H1 L1 H0 L0.

For the transmission order, see the reply frame structure, where the specific data for transmission is as follows:

01 03 04 AF D5 00 1E 4A D7.

Communication format: baud rate 9600, 1 start bit, 8 data bits, no parity, 1 stop bit.

●CRC Cyclic redundancy check

The cyclic redundancy check CRC area is 2 bytes, which contains a 16-bit binary data. The CRC value is calculated by the sending device, and then the calculated value is attached to the information. The device needs to recalculate the CRC value when receiving the information, and then compares the calculated value with the actual value in the received CRC area. If the two are not the same, an error is generated.

CRC starts by setting all 16 bits of the register to "1" and putting two adjacent 8-bit bytes of data into the current register. The 8-bit data of each character is used as the CRC start bit, and the stop bit and parity bit are not added to the CRC. During the generation of CRC, every 8 bits of data is XOR with the value in the register, the result is moved one bit to the right (toward LSB), and fill in "MSB" with "0".

Then the LSB is detected if the LSB is "1", it is XOR with the preset fixed value, and if the LSB is "0", no XOR is performed. The above process is then repeated until the shift is 8 times, and after all the shifts are completed, the next 8-bit data is carried on. XOR with the current value of the register, after all the information has been processed, the final value in the register is the CRC value.

The process of generating CRC:

Set the 16-bit CRC register to 0xFFFF.

1) The first 8-bit data is XOR with the lower 8 bits of the CRC register, and then the result is put into the CRC register.

2) Move the CRC register one bit to the right, fill in the MSB zero, and check the LSB.

4) (If LSB is 0): repeat 3 and move one bit to the right.

(If LSB is 1): the CRC register performs XOR operations with 0xA001H.

5) Repeat 3 and 4 until 8 shifts, 8-bit bytes are processed.

6) Repeat 2 to 5 to process the next 8-bit data until all bytes have been processed.

7) The final value of the CRC register is the CRC value.

8) When the CRC value is put into the information, the high 8 bits and the low 8 bits are placed separately.

9.2.2 Correspondence address table for each parameter

Unit name	Mailing address	Data type	Length (bytes)	Storage format	Unit
Net cumulative flow	00	Floating point type.	4	H1,L1,H0,L0	m^3
Forward cumulative flow.	02	Floating point type.	4	H1,L1,H0,L0	m^3
Reverse cumulative flow	04	Floating point type.	4	H1,L1,H0,L0	m^3
Instantaneous flow	06	Floating point type	4	H1,L1,H0,L0	/

9.3 HART

9.3.1 HART communication

HART is a registered trademark of the HART Communications Foundation, and then according to the specifications for the use of HART, refer to the corresponding version of technical materials issued by the HART Foundation.

Then, to connect the flowmeter using the HART configuration tool, you need to verify that the DD of the electromagnetic flowmeter is correctly installed in the configuration tool.

For cases where DD has not been installed correctly, the device may not be recognized.

Therefore, general instruction parameters are required to communicate normally, while special instructions cannot be supported.

Can not use most of the functions of the instrument, the equipment DD file can be downloaded from the official HART website, and then contact our company for updated information.

The electromagnetic flowmeter supports HART7.

Verify that the flowmeter matches the DD version of the configuration tool on site and install the following actions:

●Confirm the DD version of the electromagnetic flowmeter:

Connect the electromagnetic flowmeter with the configuration tool, and operate the configuration tool Device Setup- > Field Device- > Revision- > Field Device Rev to obtain the equipment version information.

●HART configuration tool device version confirmation:

Open the configuration tool without connecting the device and confirm according to the procedure of the configuration tool to check the DD version of the device.

To confirm that the built-in DD version matches, please refer to the operation manual of the appropriate configuration tool. The HART configuration tool can be connected to the flowmeter in the control room, to the flowmeter site, or to any other terminal in the circuit.

When connecting with the HART configuration tool, the current output circuit must be equipped with a load resistance of 250 Ω ~ 600 Ω, and the configuration tool is connected in parallel with the instrument, and the connection mode is non-polar. Multipoint mode can be used when multiple field instruments need to be connected. To enable multipoint mode, the field instrument address needs to be set to any value between 1 and 63, but cannot be repeated. In multipoint mode, the (4~20) mA analog output is fixed at 4 mA.

9.3.2 Parameter configuration

The parameter structure of HART is tree structure, which is detailed in 9.3.3.

Affected by software version updates, the data displayed in the menu tree may not be completely consistent with the display parameters of the monitor.

For HART configuration, the parameter display language is English only, even if the language option is set to a non-English option, but only English is displayed in the HART configuration tool.

It should be noted that the communication process of the HART configuration tool avoids setting parameters of the display screen and buttons.

When using HART to configure basic and detailed settings, please refer carefully to Chapter 6 parameters instructions.

●Calibrate 4 mA and 20 mA analog output:

The calibration ammeter that meets the accuracy requirements is configured with tool settings->

diagnosis / service-> adjustment-> DAC_TRIM, and the 4 mA and 20 mA calibrated ammeter readings are input successively to complete the analog output calibration.

●Set the flowmeter to zero:

Ensure that the flowmeter is in full-tube state, the actual flow is 0, configure the tool device setting-> diagnosis / service-> adjustment-> zero adjustment, wait for the display setting countdown to end, complete the zero setting; according to the use experience, the flowmeter zero point is known, configure tool device setting-> diagnosis / service-> adjustment-> PV zero, enter the zero value, complete the zero adjustment.

●Device write protection:

The flowmeter can be write-protected or released by the HART tool.

The configuration tool Device Setup- > Diag/Service- > Write Protect- > lock_unlock_device can be locked or unlocked.

Write protection status can be viewed through WP status.

After write protection is unprotected, display browse and modify permissions are temporarily turned on.

After the HART tool configuration is complete, it is recommended that the flowmeter be locked.

flowmeter analog and digital input and output can be tested by HART configuration tool.

●Current output test:

The analog output is connected to the ammeter and the configuration tool Device Setup (device Settings)-> Diag/Service (Diagnostics / Services)-> Output Test (output Test).

TRANSPONER_LOOP_TEST, set the test current value and observe whether the ammeter display value is consistent.

●Status input and output test:

First of all, you need to open the test mode, configure the tool device settings-> Diagnostics / Services-> output Test-> Test mode. After enabling the test mode, select DO in the device Settings-> detailed Settings-> function-> status function-> DO function to output the pulse, and set the test pulse to an appropriate value (less than 10 KHz, pulse width is required).

The frequency meter or oscilloscope is used on the DO interface to monitor whether the output pulse frequency is correct.

Configure the DO as the state output, set the test DO and the test relay output to high and low levels respectively, and measure the level state changes or switches on the DO interface and the relay interface, respectively.

9.3.3 DD menu

The HART communication parameters of the electromagnetic flowmeter completely cover almost all the contents of the liquid crystal display. Subsequently, it is easier to browse or modify the flowmeter parameters by using the HART configuration tool.

OnLine Rootmenu					
1.Device setup	Device Settin.				
2.PV	Master variable: instantaneous flow.				
3.PV.AO	Current output value of principal variable.				
4.PV Span	Principal variable range				

1.Device setup	1.Process Varibles	Process variable.			
	2.Diag/Service	Diagnosis and adjustment.			
	3.Basic Setup	Basic settings.			
	4.Detailed Setup	Detailed settings.			
	5.Review	Review			
	1.Process Varibles	1 PV	Master variable: instantaneous flow.		
		2 PV % Range	Principal variable range ratio.		
		3 PV.AO	Current output value.		
		4 FLow Velocity	Velocity of flow.		
		5 Total	Positive cumulant.		
		6 Pos_OverflowCount	Positive cumulative spillover times.		
		7 Reverse Total	Reverse cumulant.		
		8 Rev_OverflowCount	Reverse cumulative overflow times		
	2.Diag/Service	1.Status	1 Status0	System alarm status.	
			2 Status1	Process alarm status.	
			3 Status2	General alarm status.	
			4 Device Status	Equipment status.	
			5 Extended_fld_device_status	Extend device statu.	
		2.Adjustment	1 DAC_trim	(420) mA calibration.	
			2 Zero_trim	Zero setting.	
			3 PV Zero	Zero setting.	
		3.Output Test	1Loop_current_mode	Loop current mode	
			2 Transmitter_loop_test	Current test.	
			3 AO_Damping	Current output damping.	
			4 Test Mode	Test mode switch.	
			5 Test DO	DO test.	
			6 Test Relay	Relay test.	
			7 Test Pulse	Pulse test	
		4.SelfTest	1 Selftest	Device self-test.	
			2 Sevice_reset	Device restart.	
		5.Save and restore	1 Reset_totalizer	Reset accumulator.	
			2 reset corrects sensor	Restore sensor settings.	

			3 Save factory	Save factory settings.	
			4 Restore factory	Restore factory settings.	
		6.Write Protect	1 WP Status	Write protection statu.	
			2 lock_unlock_device	Lock / unlock.	
			3 New Read Password	Browse password.	
			4 New Set Password	Write a protection password	
		applied_rerange	Range upper and lower limit setting.		
		acknowledge_latch	Fault latc confirmation		
	3.Basic Setup	1 Tag			
		2 Long Tag			
		3 Language	Language.		
		4 PV Span	Flow range.		
		5 Flow Low Cut	Low flow rate resection.		
		6 PV Damping	Damping time.		
		7 Flow Direction	Fluid direction.		
		8 Fluid Density	Fluid density.		
		9 Flow Unit	Flow unit.		
		10 Total Unit	Cumulative unit.		
		11 Velocity Unit	Flow rate unit.		
		12 Total Decimal	Cumulative number of decimal places.		
		13 VolMax	Maximum cumulative value		
		14 Totalizer ON/OFF	Accumulator option		
		15 CUSTOM Unit	1 Cust Flow Unit Sel	Custom flow unit.	
			2 Cust Flow Unit	User flow unit	
			3 CustFlowUnitCOE	Flow unit coefficient.	
			4 CustTotUnitSel	Custom cumulative unit.	
			5 CustTotUnit	User cumulative unit.	
			6 CustTotUnitCOE	Cumulative unit coefficient.	
	4.Detailed Setup	1.Measurement	1 Nominal Size	Nominal caliber.	
			2 Meter Factor	Instrument coefficient.	
			3 Total	Positive cumulant.	
			4 Reverse Total	Reverse cumulant.	
			5 Flow Hold Time	flow response time.	
			6 Rate Limit	Flow fluctuation limit.	
			7 Noise Limit	Noise limitation	

		1.Measurement	8 Noise Damping	Noise suppression rate.	
			9 Excit Frequency	Excitation frequency.	
			10 Excit Current	Excitation current.	
			11 Gain Lock	Small gain locking.	
			12 Nonlinear correction	1 Nonlinear Option.	Nonlinear correction switch.
				2 Nonlinear Flow 1.	Nonlinear modified flow 1.
				···	Nonlinear modified flow 5.
				10 Nonlinear Flow 5.	Nonlinear correction coefficient 5.
				11 Nonlinear COE 5.	DO configuration.
		2.Pulse	1 Pulse Unit	Pulse unit.	DI configuration.
			2 Pulse Scale	Pulse equivalent.	Relay output.
			3 Pulse Width	Pulse width	Upper limit alarm value.
		3.Function	1 Status Function	1 DO Function	Lower limit alarm value.
				2 DI Function	Upper and lower limit alarm lag.
				3 Relay Function	Batch alarm value.
			2 Alarm	1 High Alarm	Valve opening delay setting.
				2 Low Alarm	Air flow control alarm switch.
				3 H/L ALARM HYS	Air flow control threshold.
				4 Batch Alarm	NAMUR option.
				5 Batch Reset Delay	NAMUR alarm level.
				6 Empty Alarm	Fault latch.
				7 Empty Threshold	Mailing address.
				8 NamurEN	Baud rate.
				9 NamurSel Level	Check bit.
				10 Latch Option	Alarm message serial number.
			3 RS485	1 ComAdress	Alarm status.
				2 BaudRate	Alarm time.
				3 Parity	Parameter modification sequence number.
			4 Alarm record	1 WarningNO	Parameters.
				2 WarningStatus	Modification time.
				3 WarningDate	Pre-modified value.
			5 Parm record	1 RecordNO	Modified value
				2 RecordCode	Nonlinear correction switch.
				3 RecordDate	Nonlinear modified flow 1.
				4 ParmOld	Nonlinear modified flow 5.
				5 ParmNew	Nonlinear correction coefficient 5.

		4.Hart	1 Polling Addr		
			2 Num Req Preams		
		5.Field Device	1 Manufacturer		
			2 private_label_distributor		
			3 Device Type		
			4 Device ID		
			5 Tag		
			6 longTag		
			7 Date		
			8 Descriptor		
			9 Message		
			10 final_assembly_number		
			11 Revision	1 Universal Rev	
				2 Field Device Rev	
				3 Software Rev	
				4 hardware Rev	
	5.Review	1 workHours	Instrument working time.		
		2 PowerReset CNT	Start and stop count		
		3 Device Type			
		4 private_label_distributor			
		5 Device ID			
		6 config_change_counter			
		7 Tag			
		8 Long Tag			
		9 Description			
		10 Message			
		11 Date			
		12 final_assembly_number			
		13 universal_revision			
		14 transmitter_revision			
		15 software_revision			
		16 polling_address			
		17 loop_current_mode			
		18 request_preambles			

Chapter 10 Overview

10.1 Standard technical specification

●Converter

Category		Technical parameters	Remarks
Excitation mode	Excitation frequency	Users need to choose excitation frequency and excitation current according to different media	Users need to choose excitation frequency and excitation current according to different media
	Excitation current.	125mA、200mA	
Input signal	Unidirectional input.	Passive dry contact.	
	Load resistance.	Less than or equal to 750 Ω (ON), greater than or equal to 100K Ω (OFF)	
Output signal	Current output.	DC current (4 to 20) mA (load resistance: 0,750 Ω, including cable resistance)	
	Pulse frequency output.	Voltage 30V, pulse output rate 0.0001mm 10000 pps / s, short circuit protection	
	Relay output	250V.AC/3A，30V.DC/3A	
RS485 communication		Communication distance is less than 1km	
Power failure, data security		Data (such as parameters, cumulative values, etc.) are stored by non-volatile FRAM	
Display device		Lattice LCD screen: 128 × 64, yellow and green backlight	
Converter protection level		IP67	
Shell material		Aluminum alloy	
Shell coating		Anticorrosive polyurethane, blue / white	
Electrical interface		M20 × 1.5 internal thread, φ 10 cable hole, other connection forms customized	
Ambient temperature		-20 ℃ ~ 70 ℃	
Grounding requirement		Grounding resistance ≤ 10 Ω	

●Sensor

Category		Technical parameters	Note
Electrode material		316L, HC, HB, Ti, Ta, Pt, tungsten carbide, etc.	
Lining material		PFA/F46, PTFE, neoprene	
Flange standard	DN8~DN50	GB/T9119 PN40	Other standards and pressure grades are customized
	DN65~DN200	GB/T9119 PN16	
	DN250~DN600	GB/T9119 PN10	
	DN700~DN1200	JB/T81 PN6	
	DN1400~DN2000	JB/T81 PN2.5	
	DN2200~DN3000	GB/T9115 PN2.5	
Medium working pressure		No more than the flange, that is, the pressure level.	
Medium temperature.	PTFE	-35℃~120℃	Allow high temperature steam to purge for 40 minutes, and the temperature is not higher than 150 ℃
	PFA/F46	-35℃~140℃	
	Neoprene rubber	-5℃~65℃	
Protection grade	Integrated installation	IP67	
	remote installation	IP67、IP68	IP68 (under water less than 5 meters) is limited to neoprene
Body material		Carbon steel, stainless steel	

Note:

1) the sensor is used with the converter.

2) when the type of the converter changes, the instrument coefficient needs to be redetermined.

●Function

Function	Function description	Note
Parameter setting	The user sets the parameters through three infrared buttons without opening the cover.	
Display language	Support for display modes in both Chinese and English.	
LCD	Instantaneous flow, flow percentage and flow progress bar, forward and reverse accumulation, signal quality, running status, flow rate, time and	

	date, etc.	
Damping	The damping time can be set between 0.1s and 200s.	
Unit setting	Support cumulative units m ³, L, t, kg, gal, lb, ft3, time units s, min, h, day. flow units can be any combination of the above units.	
Pulse output	Pulse width: 50% duty cycle, 0. 05, 0. 1, 0. 1, 20, 50, 100 Ms. Pulse equivalent: 1: 1000. Pulse rate: 0.0001~10000pps	
Communication Settings	The communication setting function can select baud rate, parity bit and data format. Baud rate: 2400, 4800, 9600. Parity bits: none, odd parity, even parity	
Two-way measurement	Both forward and reverse flow can be measured.	
Batch canning	When the accumulation reaches the preset value, the alarm will be given through digital output or relay output.	
Preset cumulative value	The parameter setting or status input function requires that the cumulative amount be preset to a set value or zero.	
Alarm selection function	Alarm is divided into system alarm, process alarm (such as "empty tube", "off excitation"), setting alarm and warning. The user independently chooses whether or not to alarm each item.	
Alarm output	The alarm items selected by the alarm selection function will output the status if there is a fault.	
Self-diagnosis	When an alarm appears, the alarm content will be displayed.	
High/low flow alarm	Alarm can be given when the flow is greater than or less than the set value. In addition, set an upper limit and a lower limit. When the flow is greater than the upper limit or less than the lower limit, the alarm is output.	
Signal quality diagnosis function	This function allows you to monitor the degree of stickiness of electrodes and insulating materials, depending on the state of stickiness. At the same time, the alarm is carried out in the state output, and the electrode is cleaned at the same time.	
Slurry measurement function	Setting the excitation frequency 25Hz, it can measure slurry, coal slurry, slurry, mortar, paper pulp and so on.	
Low conductivity measurement function	The liquid whose conductivity is as low as 5 μ S / cm can be measured by setting the excitation frequency 25Hz.	

10.2 Performance

●Standard working condition

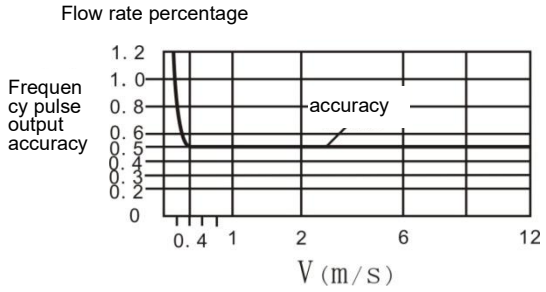
Reference standard	Measurement of Conductive liquid flow in GB/T 18659 closed Pipeline and performance Evaluation method of electromagnetic flowmeter.	Preheating time	30 minutes.
	Measurement of Conductive liquid flow in GB/T 18660 closed Pipeline and use of electromagnetic flowmeter	Straight pipe section	Upstream > 10D, downstream > 5D.
Fluid temperature	20℃±10℃	Grounding requirement	Correct grounding.
Ambient temperature	25℃±5℃	Installation requirements	Determining the center

●Accuracy level (refer to standard operating conditions).

●Standard accuracy level (pulse output):

Standard accuracy grade: 0.5

Caliber mm	Velocity of flow V(m/s)	Indication error
8～3000	V＜0.4	±0.5%±1mm/s
	0.4≤V≤12	±0.5%

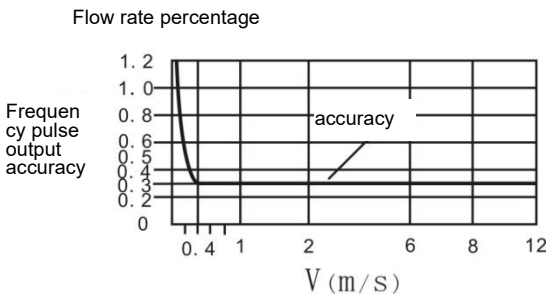


Note: the current output corresponds to the accuracy, that is, the pulse output accuracy plus 0.05% of the flow rate.

●Extended accuracy level (pulse output):

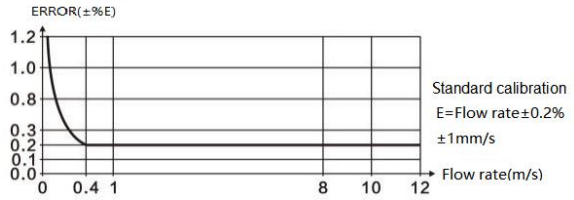
Extended accuracy level: 0.3

Caliber mm	Velocity of flow V(m/s)	Indication error
8～300	V＜0.4	±0.3%±1mm/s
	0.4≤V≤12	±0.3%



Extended accuracy level: 0.2

Caliber mm	Velocity of flow V(m/s)	Indication error
20～200	V＜0.4	±0.2%±1mm/s
	0.4≤V≤12	±0.2%



Note: the current output corresponds to the accuracy, that is, the pulse output accuracy plus 0.05% of the flow rate.

●Measurable velocity range:-12m/s~12 mhand s.

●Maximum power consumption: 30VA.

●Insulation resistance.

The resistance between the power terminal and the grounding terminal is greater than 100m Ω / 500V DC.

The resistance between the power terminal and each input / output / excitation terminal is greater than 100m Ω / 500V DC.

The resistance between the ground terminal and each input / output / excitation terminal is greater than 20m Ω / 100V DC.

●The resistance between each input / output / excitation terminal is greater than 20m Ω / 100VDC.

Insulation strength

If the flowmeter does not work, it can withstand the sinusoidal AC test voltage specified in the following table. The voltage frequency is 50Hz, the leakage alarm is 10mA, and the insulation strength test of 1min takes place, and there are no phenomena such as breakdown and flying arc.

Types	Test terminal	Test voltage (RMS)	
		Ac power supply: 220V 50Hz	DC power supply：18~30V
Sensor.	Excitation terminal and housing.	500V	500V
	Electrode terminal and housing.		
	Electrode terminal and housing.		
Converter	Power terminal and housing	1500V	500V

⚠ Note

The following precautions should be followed when conducting insulation resistance tests or voltage withstand tests:

●When the relevant test is completed, the power supply needs to be cut off for more than 10 minutes before the cover can be removed.

●All wires on the terminal need to be removed before testing.

●After the test, use the discharge resistance to discharge, and then put all wires and short-circuit rods back to the correct position.

●Tighten the cover anti-loosening screw with a torque of 1.18N m.

●The power supply can not be supplied until the watch cover is closed.

10.3 Normal operating environment

<table>
<tr><td colspan="2">Ambient temperature</td><td>-20℃～70℃</td><td>Rated AC voltage</td><td>85V. 265V. Ac 50 Hz (operating voltage range: 85~265V.AC).</td></tr>
<tr><td colspan="2">Operating temperature range of the monitor</td><td>-20℃～80℃</td><td>Rated DC voltage</td><td>24V.DC (operating voltage range: 18~30V.DC).</td></tr>
<tr><td rowspan="3">Medium temperature</td><td>PTFE</td><td>Vibration condition</td><td rowspan="4">The vibration level should conform to IEC60068-2-6 (SAMA31.1) ≤ 1G (frequency ≤ 500Hz).</td><td rowspan="4">The vibration level should conform to IEC60068-2-6 (SAMA31.1) ≤ 1G (frequency ≤ 500Hz). Note: do not install the equipment on the ground with large vibration (vibration frequency ≥ 500Hz), otherwise the equipment will be damaged.</td></tr>
<tr><td>PFA/F46</td><td>-35℃~140℃</td></tr>
<tr><td>Neoprene rubber.</td><td>-5℃~65℃</td></tr>
<tr><td colspan="2">Ambient humidity</td><td>0 ～ 100%RH.Do not place this meter in an environment where the relative humidity is greater than 95%.</td></tr>
</table>

10.4 Measurement range

Caliber (mm)	Precision flow range （m³/h）		Measurable flow range （m³/h）	
8	0.07	2.17	0.004	2.17
10	0.1	3.4	0.01	3.4
15	0.3	7.6	0.01	7.6
20	0.5	14	0.02	14
25	0.7	21	0.04	21
32	1.2	35	0.06	35
40	1.8	54	0.09	54
50	2.8	85	0.14	85
65	4.8	143	0.2	143
80	7	217	0.4	217
100	11	339	0.6	339
125	18	530	0.9	530
150	25	763	1.3	763
200	45	1357	2.3	1357
250	71	2121	3.5	2121
300	102	3054	5.1	3054
350	139	4156	6.9	4156
400	181	5429	9.0	5429
450	229	6871	11	6871
500	283	8482	14	8482

600	407	12215	20	12215
700	554	16625	28	16625
800	724	21715	36	21715
900	916	27483	46	27483
1000	1131	33929	57	33929
1200	1629	48858	81	48858
1400	2217	66501	111	66501
1500	2545	76341	127	76341
1600	2895	86859	145	86859
1800	3664	109931	183	109931
2000	4524	135717	226	135717
2200	5474	164217	274	164217
2400	6514	195432	326	195432
2600	7645	229361	382	229361
2800	8867	266005	443	266005
3000	10179	305363	509	305363

Chapter 11 Use, maintenance and fault diagnosis

11.1 Daily maintenance

Check periodically to keep the environment around the instrument clean and tidy to prevent water from entering the lead end of the instrument.
Check whether the instrument wiring is good.
1) check whether there is a strong magnetic field near the instrument.
2) regularly clean and descale the measuring tube to prevent the measuring medium from fouling the electrode and the measuring tube.

11.2 Fault diagnosis

The electromagnetic flowmeter seldom breaks down under normal working conditions. However, improper installation of instruments or pipes may cause flowmeter failure. First of all, it is necessary to check whether the external condition of the flowmeter is damaged, whether the cable connection is intact, whether the grid voltage is normal, whether the pipeline is leaking or is not full, and whether the insulation between the sensor excitation coil and the housing is good. Do not remove the flowmeter blindly.
The failure of electromagnetic flowmeter will be handled by professional maintenance personnel. in case of failure, please contact our company.

Chapter 12 Warranty and after-sales service

We promise to the customer that the hardware accessories provided during the supply of the instrument have no defects in material and manufacturing process.
From the date of the purchase, if the user's notice of such defects is received during the warranty period, the company will unconditionally maintain or replace the defective products without charge, and all non customized products are guaranteed to be returned and replaced within 7 days.

Disclaimers:
- During the warranty period, product faults caused by the following reasons are not in the scope of Three Guarantees service
- Product faults caused by improper use by customers.
- Product faults caused by disassembling, repairing and refitting the product.

After-sales service commitment:
- We promise to deal with the customer's technical questions within 2 hours.
- For the instruments returned to the factory for maintenance, we promise to issue the test results within 3 working days and the maintenance results within 7 working days after receiving them.