FlowMaster

Electromagnetic Flowmeter

Operation Instructions



Chongqing Chuanyi Automation Co., Ltd. Flowmeter Branch

An Open Letter to Users of Flowmeter Branch

Dear users,

Thanks for your continued support to Chongqing Chuanyi!

Chongqing Chuanyi has fully implemented GB/T24001 standard. We are looking forward to your support to and cooperation in our environmental protection activities. We advise you that:

1. Understand the Operation Instructions before use. Install and use the instrument in strict accordance with the Instructions to avoid safety accidents.

2. Ensure that the instrument installation, transportation, operation, storage, repair and scrapping meet applicable requirements of laws, regulations and environmental protection.

3. Properly keep combustible, explosive or poisonous dangerous goods, and take corresponding precautions during storage and transportation to prevent fire, explosion or spillage & leakage accidents that cause environmental pollution.

4. During construction, give priority to pollution-free or less-pollution construction equipment and advanced construction methods rather than those prohibited by national or local authority, take necessary measures to reduce the noise pollution, and dispose of wastes on the construction site properly.

5. Give active cooperation during operations, which may affect you in terms of environmental protection, by our service personnel in strict accordance with rules and regulations of the Company as well as relevant requirements.

Let us work together to protect the environment and the Earth!

Dear users,

Welcome to use our products. Before use, please read the Instruction carefully to have a good understanding of correct installation and operation methods of products, thus ensuring the correct installation and operation and the best performance of the flowmeter.

We always insist on the service tenet of "SIC accompanies customers and customers in the heart of SIC". If you encounter any problem during use of the instrument, please contact us. We will assume no liability for performance degradation or damage of the instrument due to repair or replacement of components without authorization.

Customer service center: 023-67032695

When the instrument is sent for verification, attention shall be paid to the following:

1. After installation, the instrument shall be powered on and supplied with water for warmup for more than half an hour before verification.

2. The recommended verification flow velocity range shall be 0.5 m/s - 5 m/s;

3. It is recommended to use pulse signals as verification signals and set pulse equivalents based on the requirements of different diameters (the number of pulses generated by flow rate per unit volume, and the total amount is set in L). The pulse frequency shall be recommended to be 200 - 500 Hz, with a maximum of 800 Hz.

Table of Contents

Production Introduction **1**
Model and Specifications **1**
Check the Packing List **2**
Precautions for Storage **2**
Part I: Pipeline Electromagnetic Flowmeter **3**
I. Introduction **3**
1. Measurement Principles 3
2. Main Technical Parameters of Electromagnetic Flowmeter 4
II. Installation **8**
1. Pipeline Design 8
2. Installation Requirements 8
3. Mechanical Installation 10
4. Overall Dimensions 12
5. Electrical Wiring 16
III. Parameter Setting **25**
1. Converter Structure 25
2. Parameter Description 26
3. Parameter Settings 41
Part II: Plug-in Electromagnetic Flowmeter **68**
I. Introduction **68**
1. Product Introduction 68
2. Scope of Application 69
3. Product Composition 69
4. Service Conditions 69
5. Main Technical Parameters 70
II. Installation **71**
1. Overall Dimensions 71
2. Structure and Installation 73
3. Installation Requirements 75
4. Distance between Sensor and Converter 77
5. System Earthing 78
6. Electrical Connection 78
III. Parameter Setting **78**
Instrument Testing and Maintenance **79**
Appendix 1 Selection Table of FlowMaster Series Electromagnetic Flowmeters **83**
Appendix 2 Measuring Range of FlowMaster Electromagnetic Flowmeter **89**
Appendix 3 Applicable Performance of FlowMaster Electromagnetic Flowmeter Lining Material **90**
Appendix 4 Applicable Performance of FlowMaster Electromagnetic Flowmeter Electrode **91**
Appendix 5 Specification Sheet of Bolts for Electromagnetic Flowmeter Sensor (Flange Type) **92**

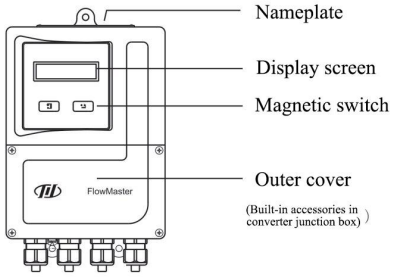
Production Introduction

- **FlowMaster series electromagnetic flowmeters must pass strict inspection before delivery.**
- **After receiving the flowmeter, please be sure to check its appearance to confirm whether the flowmeter is damaged during transportation.**
- **Please check the instrument accessories against this Chapter.**

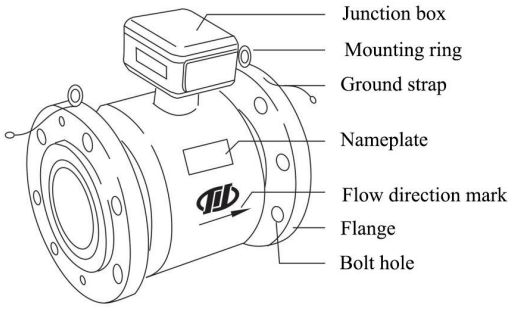
* According to *Article 13 of the Metrology Law of the People's Republic of China* and the relevant provisions in *Rules for Implementation of the Metrology Law of the People's Republic of China*, the Company applied to Chongqing Administration of Technology Regulation for type tests of electromagnetic flowmeters. Those flowmeters have passed the examination and obtained the type approval certificates (Nos.: XPY [2014] No. 004 for DN600 and below and XPY [2009] No. 014 for DN700 and above).

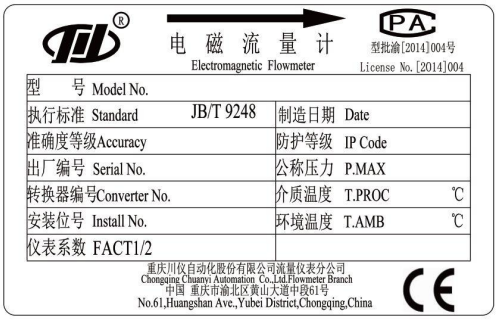
Model and Specifications

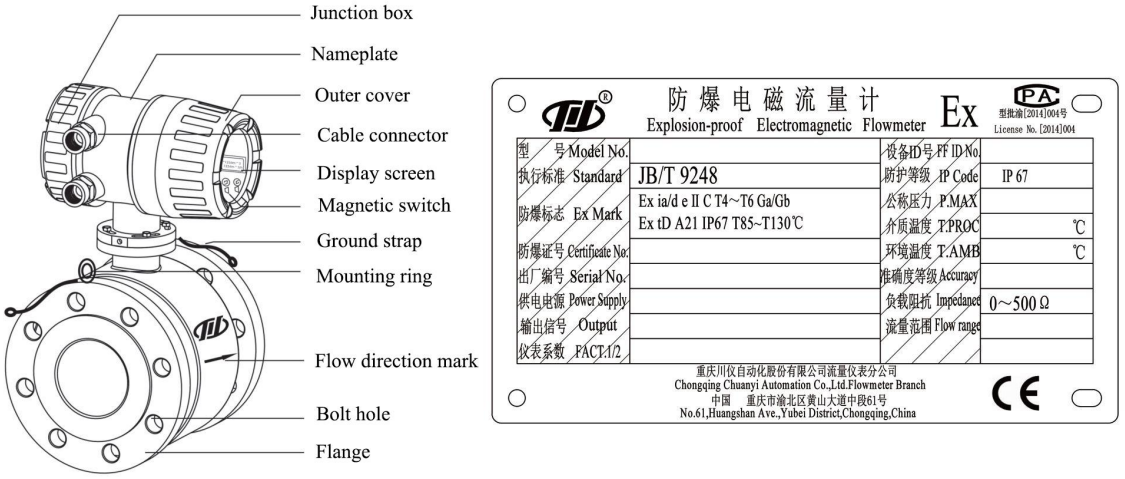
The model and technical specifications can be found on the nameplate and delivery inspection sheet of the electromagnetic flowmeter. The model and technical specifications of the instrument shall be checked to see if they are consistent with those of the ordered instrument.











In case of any product quality problem or any problem encountered in the use of the instrument, please contact the Company, and specify the model, specification and number of the instrument, so as to solve the problem.

Check the Packing List

When the flowmeter arrive, it shall be confirmed whether the following items are packed:

- Sensor (one set) (when the selected instrument is integrated, the sensor and converter are integrated)
- Converter (one set) (when the selected instrument is integrated, the sensor and converter are integrated)
- Operation Instructions (one copy)
- Checklist (one copy)
- Quality Certificate (one copy)
- Cable (split type only, with length ordered by user)
- External flange (provided when required by the user)
- Bolts and nuts (provided when required by the user)
- Sealant (one set, used for sealing the split junction box)

Precautions for Storage

After arrival, if the instrument needs to be stored for a long time, special attention shall be paid to the following matters:

1. The instrument shall be packed in the original packing box, and shall be kept in the same state as that before delivery as far as possible.
2. The storage location shall be selected for the following conditions:
   - No exposure to weather;
   - No exposure to vibration or impact;
   - The sensor junction box cover of the instrument shall not be opened to prevent moisture from affecting the normal operation of the instrument;
   - The ambient temperature, humidity and atmospheric pressure shall be as follows:
     Ambient temperature: -25°C ~ +60°C
     Relative humidity: 5%~90%
     Atmospheric pressure: 86~106kPa

Part I: Pipeline Electromagnetic Flowmeter

I. Introduction

1. Measurement Principles

The measurement principle of electromagnetic flowmeter sensor is based on the Faraday's law of electromagnetic induction. One pair of detection electrodes are installed on the tube walls perpendicular to the axis of the measuring tube and the line of the magnetic field. When the conductive liquid moves along the axis of the measuring tube, the induced potential is generated as the conductive liquid cuts the magnetic line. The induced potential is detected by two electrodes on the measuring tube. The potential value is:

$$E=KB\overline{V}D$$

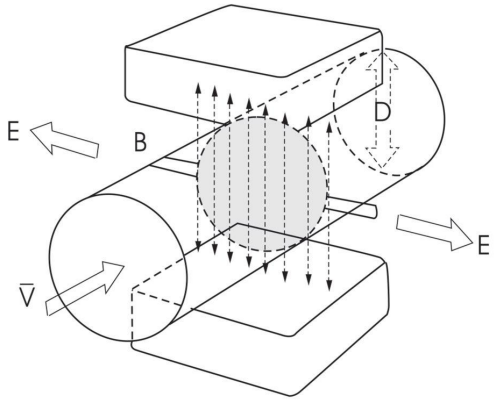
Where: E – Inductive potential;

K – Instrument constant;

B – Magnetic induction intensity;

$\overline{V}$ – Average flow velocity in the cross section of measurement tube;

D – Inside diameter of measurement tube.



During flow measurement, the fluid will flow through the magnetic field perpendicular to the flow direction. The flowing of conductive fluid inducts a potential directly proportional to the average flow velocity. Therefore, the measured flowing liquid is required to have the conductivity above the minimum limit. The inductive voltage signal is detected by two electrodes and sent to the converter through a cable. After a series of digital processing, the cumulative flow rate and instantaneous flow rate are shown on the display of the converter.

2. Main Technical Parameters of Electromagnetic Flowmeter

FlowMaster MFC Electromagnetic flowmeter		
	Integrated type	Split type
Accuracy Class	Class 0.5	
Diameter (mm)	DN2~DN1200	
Flange	GB/T9119 JIS B2220 ASME/ANSI B16.5 HG/T20592, etc.	
Pressure grade	4.0MPa, 2.5MPa, 1.6MPa, 1.0MPa, ANSI 150 (flange type), ANSI 300 (flange type), ANSI 600 (flange type), ANSI 900 (flange type), ANSI 1500 (flange type), JIS 10K (flange type), JIS 16K (flange type), JIS 20K (flange type), etc. For details, please refer to the selection table, and negotiate with the company for special pressure	
Lining material	ETFE, PTFE, PFA, F46, polyurethane rubber, natural rubber, and chloroprene rubber	
Conductivity	≥ 5 μS/cm (the conductivity of deionized water is greater than or equal to 20 μS/cm)	
Electrode material	316L, Hastelloy, titanium, tantalum, platinum-iridium alloy, tungsten carbide clad, and platinum	
IP rating	IP65	IP65 (IP68 is optional for sensor)
Medium temperature	-25°C ~ 180°C	
Ambient temperature	-40°C ~65°C The display unit may not work normally if the temperature is less than -20°C.	
Influence of ambient temperature	< ± 0.25%/10°C	
Reproductivity and repeatability	≤ ±0.16%	
Analog output error	≤ ± 0.02mA	
Flow rate within measuring range	≤ 10m/s	
Possible to be buried	----	≤ 5m (limited to IP68)
Electrical connection	M20*1.5 sealing sleeve, G1/2, NPT1/2	
Sensor cable	----	< 100m (for extra long cables, please negotiate with the Company for ordering)
Output interface*	Standard output (pulse +4 mA ~ 20 mA single current output), RS485, HART	

Note *: The 4mA-20mA analog output is an active output.

FlowMaster MFE-S Electromagnetic flowmeter		
	Split type	Integrated type
Accuracy Class	Class 0.2, 0.3 and 0.5	
Diameter (mm)	DN2 ~ DN2400	
Explosion-proof grade	Exia/db eb II c T4 Ga/Gb (ambient temperature ≤ 60°C medium temperature ≤ 130°C) Exia/db eb II c T5 Ga/Gb (ambient temperature ≤ 60°C medium temperature ≤ 90°C) Exia/db eb II c T6 Ga/Gb (ambient temperature ≤ 60°C medium temperature ≤ 80°C)	
Flange standard	GB/T9 119 JIS B2220 ASME/ANSI B16.5 HG/T20592, etc.	
Pressure grade	4.0MPa, 2.5MPa, 1.6MPa, 1.0MPa, ANSI 150 (flange type), ANSI 300 (flange type), ANSI 600 (flange type), ANSI 900 (flange type), ANSI 1500 (flange type), JIS 10K (flange type), JIS 16K (flange type), JIS 20K (flange type), etc. For details, please refer to the selection table, and negotiate with the company for special pressure	
Lining material	ETFE, PTFE, PFA, F46, polyurethane rubber, natural rubber, and chloroprene rubber	
Conductivity	≥ 5 μS/cm (the conductivity of deionized water is greater than or equal to 20 μS/cm)	
Electrode material	316L, Hastelloy, titanium, tantalum, platinum-iridium alloy, tungsten carbide clad, and platinum	
IP rating	IP65/IP67 (IP68 is optional for sensor)	IP65/IP67
Medium temperature	-25°C ~ 180°C (non-explosion-proof) -25°C ~ 130°C (explosion-proof)	-25°C ~80°C
Ambient temperature	-40°C ~65°C The display unit may not work normally if the temperature is less than -20°C.	
Influence of ambient temperature	<±0.1%/10°C, < ±0.1.5%/10°C, < ±0.25%/10°C	
Reproductivity and repeatability	≤±0.06%; ≤±0.1%; ≤±0.16%	
Flow rate within measuring range	≤ 10m/s	
Possible to be buried	≤ 5m (limited to IP68)	----
Sensor cable	<100m (for extra long cables, please negotiate with the Company for ordering)	----
Electrical connection	M20*1.5 sealing sleeve, G1/2, NPT1/2	
Output interface	Standard output (pulse +4 mA~20 mA single current output), dual current output, RS485, HART, Profibus-PA, Profibus-DP and FF	

Note *: 4mA-20mA analog output is active output, and pulse is passive pulse output.

FlowMaster MFS Electromagnetic flowmeter		
	Integrated type	Split type
Accuracy Class	Class 0.2; Class 0.5	
Diameter (mm)	DN25 ~ DN150	
Flange standard	DIND32676 or ISO2852	
Pressure grade	1.0MPa	
Lining material	PFA	
Conductivity	≥10 μS/cm (the conductivity of deionized water is greater than or equal to 20 μS/cm)	
Electrode material	316L, Hastelloy, titanium, tantalum, platinum-iridium alloy, tungsten carbide clad, and platinum	
IP rating	IP65/IP67	IP65/IP67 (IP68 is optional for sensor)
Medium temperature	-25°C ~ 140°C	
Ambient temperature	-40°C ~ 65°C The display unit may not work normally if the temperature is less than -20°C.	
Influence of ambient temperature	< ±0.1.5%/10°C; < ±0.25%/10°C	
Reproductivity and repeatability	≤±0.06%; ≤±0.16%	
Flow rate within measuring range	≤ 10m/s	
Possible to be buried	----	≤ 5m (limited to IP68)
Electrical connection	M20*1.5 sealing sleeve, G1/2, NPT1/2	
Sensor cable	----	<100m (for extra long cables, please negotiate with the Company for ordering)
OUTPUT INTERFACE	Standard output (pulse +4 mA~20 mA single current output), dual current output, RS485, HART, Profibus-PA, Profibus-DP and FF	

FlowMaster MFD slurry type Electromagnetic flowmeter		
	Split type	Integrated type
Accuracy Class	Class 0.5	
Diameter (mm)	DN25 ~ DN600	
Explosion-proof grade	Exia/db eb II c T4 Ga/Gb (ambient temperature ≤ 60°C medium temperature ≤ 130°C) Exia/db eb II c T5 Ga/Gb (ambient temperature ≤ 60°C medium temperature ≤ 90°C) Exia/db eb II c T6 Ga/Gb (ambient temperature ≤ 60°C medium temperature ≤ 80°C)	
Flange standard	GB/T9119 JIS B2220 ASME/ANSI B16.5 HG/T20592, etc.	
Pressure grade	4.0MPa, 2.5MPa, 1.6MPa, 1.0MPa, ANSI 150 (flange type), ANSI 300 (flange type), ANSI 600 (flange type), ANSI 900 (flange type), ANSI 1500 (flange type), JIS 10K (flange type), JIS 16K (flange type), JIS 20K (flange type), etc. For details, please refer to the selection table, and negotiate with the company for special pressure	
Lining material	ETFE, PTFE, PFA, F46, polyurethane rubber, natural rubber, and chloroprene rubber	
Conductivity	≥ 2 μS/cm (the conductivity of deionized water is greater than or equal to 20 μS/cm)	
Electrode material	316L, Hastelloy, titanium, tantalum, platinum-iridium alloy, tungsten carbide clad, and platinum	
IP rating	IP65/IP67 (IP68 is optional for sensor)	IP65/IP67
Medium temperature	-25°C ~ 180°C (non-explosion-proof) -25°C ~ 130°C (explosion-proof)	-25°C ~80°C
Ambient temperature	-40°C ~65°C The display unit may not work normally if the temperature is less than -20°C.	
Influence of ambient temperature	< ±0.25%/10°C	
Reproductivity and repeatability	≤ ±0.16%	
Flow rate within measuring range	≤ 5 m/s (slurry), ≤ 10 m/s (single medium)	
Possible to be buried	≤ 5m (limited to IP68)	----
Sensor cable	<100m (for extra long cables, please negotiate with the Company for ordering)	----
Electrical connection	M20*1.5 sealing sleeve, G1/2, NPT1/2	
Output interface	Standard output (pulse +4 mA~20mA single current output), dual current output, RS485, HART, Profibus-PA, Profibus-DP and FF	

Note *: The 4mA-20mA analog output is an active output.

II. Installation

1. Pipeline Design

In the pipeline design, the followings shall be considered:

(1) Position

The flowmeter shall be installed in a place where great temperature change and direct exposure to sunlight can be avoided and the ambient temperature ranges from -25°C to +60°C.If the installation position is subject to thermal radiation from a heat source, please provide thermal isolation or ventilation facilities. The places where the atmosphere is strongly corrosive and an explosive gas exists shall be avoided (for non-explosion-proof instruments). Instruments with IP rating of IP67 (1 m underwater, immersed for a short time) and IP68 (5 m underwater) can be placed in water; instruments with IP rating of IP65 shall not be immersed in water.

(2) Avoidance of magnetic field interference

No electromagnetic flowmeter shall be installed near any motor, transformer or other power source that is easy to cause electromagnetic interference.

(3) Straight tube length

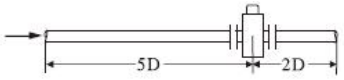
To ensure the measuring precision of the flowmeter, it shall be ensured that the length of upstream straight pipe section of sensor is at least 5 times the pipe diameter (5D) and the length of downstream straight pipe section of sensor is at least 2 times the pipe diameter (2D).

(4) Maintenance space

The flowmeter shall be installed in a position with sufficient space for maintenance.

(5) Use of shutoff valve and bypass valve

Shutoff valves and bypass valves are convenient for maintenance and zeroing.



(6) Support of flowmeter

A flowmeter shall have a mounting base to fix the measurement tube, instead of being installed separately on a free-vibrating pipeline. Where it is necessary to install a flowmeter underground, supports shall be provided for the pipelines at the inlet and outlet and a metal protection plate shall be installed above the flowmeter.

2. Installation Requirements

(1) Environment requirements for installation

Requirements of flowmeter for external environment

a. The flowmeter should be avoided to be installed in places with great temperature changes and exposed to high temperature radiation of equipment. If it must be installed, measures of heat insulation and ventilation should be taken.

b. The flowmeter should be installed indoors. If it must be installed outdoors, rain pouring, water flooding and sun exposure should be avoided, and moisture-proof and sun protection measures should be taken.

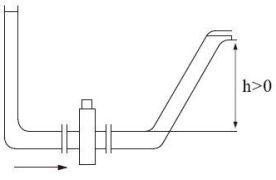
c. The flowmeter should be avoided to be installed in an environment containing corrosive gas, and ventilation measures should be taken when it must be installed.

d. There must be sufficient installation space around the flowmeter in order to facilitate installation and maintenance.

e. Strong magnetic fields and strong vibration sources should be avoided in the installation place of the flowmeter. If the pipeline vibrates greatly, there should be supports for fixing the pipeline on both sides of the flowmeter.

(2) Flow direction

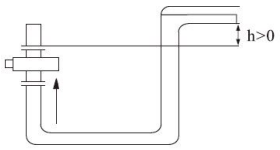
This flowmeter can automatically detect the forward and reverse flow direction. The flow direction arrow on the sensor shell points to the forward flow direction specified by the manufacturer. When installing a flowmeter, you shall ensure this flow direction arrow is towards the field process flow direction.



Horizontal Installation

(3) Installation direction of the flowmeter and installation position of sensor electrode

Sensors can be installed horizontally or vertically.



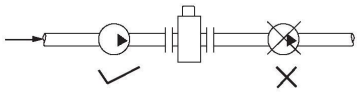
Vertical installation

(4) The pipeline shall always be full of liquid.

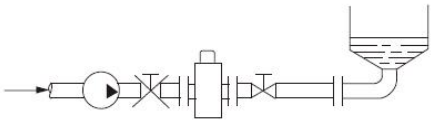
Pipeline structure shall ensure the measurement tube of the Flowmeter is always full of liquid.

For the liquid or slurry containing solid particles, it is recommended to install the electromagnetic flowmeter vertically. The flow direction is from bottom to top, because impurities are prone to precipitate at the bottom of the measuring tube.

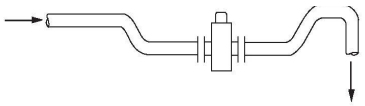
(5) No electromagnetic flowmeter shall be installed on the suction side of the pump.



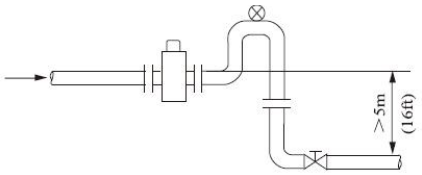
(6) For a long pipeline, a conventional practice is to install the control valve downstream of the flowmeter.



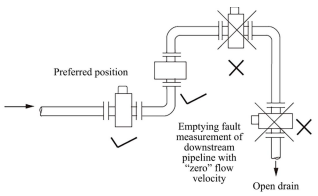
(7) For an open drainage pipeline, the flowmeter shall be installed in the bottom section.



(8) Where the drop of the pipeline is larger than 5m, the air valve shall be installed downstream of the flowmeter.



(9) The measuring error arising from carried gas and the lining damage resultant from vacuum shall be avoided.

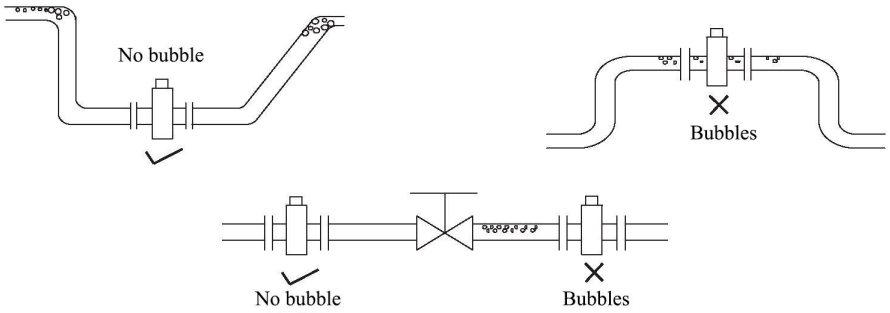


(10) No bubble shall appear in the pipeline.

The pipeline design shall prevent the separation of gas from liquid.

Flowmeters shall be installed upstream of valves. Under the action of valves, the pressure inside pipelines may drop and bubbles may come into being.

Meters shall also be installed in low sections to reduce the impact of bubbles entrained in the fluid on measurement.



(11) Electric conductivity of liquid

Electromagnetic flowmeters shall not be installed in the places with uneven electric conductivity of liquid. The injection of chemical substances upstream of flowmeters can lead to uneven electric conductivity of liquid. This could cause severe interference with flow indication. In this case, our recommendation is to inject chemical substances downstream of flowmeters. If it is necessary to inject chemical substances upstream of flowmeters, the length of upstream straight section must be at least 5 times the tube diameter, in order to ensure the thorough mixing of liquid.

(12) GND

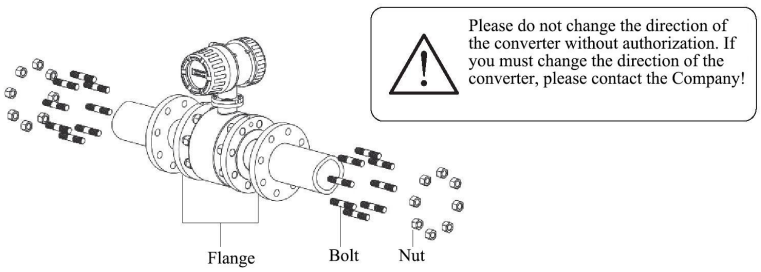
As the inductive signal voltage of electromagnetic flowmeter is very small and susceptible to external noise or other electromagnetic signals, you need to install an earthing ring where a non-metallic pipeline is used. The function of the earthing ring is to form a space shielding the external interference by earthing the shell of the flowmeter and hence increase the measuring precision. If you need to order earthing rings, please tell us in the order.

3. Mechanical Installation

3.1. Installation of flowmeter pipeline

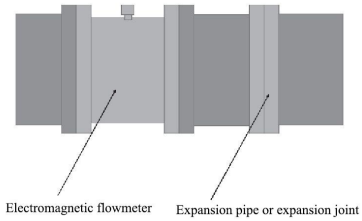
(1) Before installing the flowmeter, the pipeline shall be calibrated to ensure that the diameter of the meter has good coaxiality with the user's pipe.

(2) There are usually foreign matters (such as welding slag) in newly installed pipes. Before installation of the flowmeter, the sundries shall be washed away, which can not only prevent the lining from being damaged but also prevent the measurement error caused by foreign matters passing through the measuring pipe during the measurement.

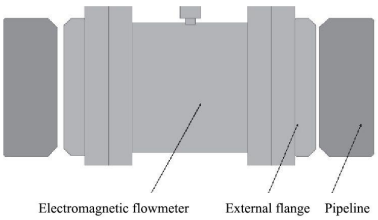


3.2. Large-aperture installation

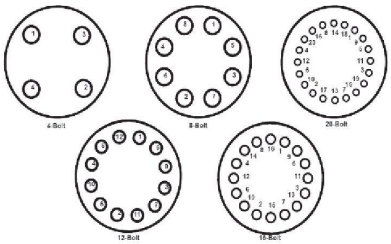
(1) The downstream side of the pipe where the sensor is installed shall be equipped with a flexible expansion pipe or expansion joint.



(2) To prevent leakage caused by non parallelism between the external flange and the body flange, sufficient parallelism should be ensured between the external flange and the body flange of electromagnetic flowmeter. It is recommended to fully tighten the external flange and electromagnetic flowmeter body with bolts before welding the external flange with the pipeline to complete the installation.



(3) Bolts shall be tightened according to the following installation process sequence and the tightening torque shall be uniform.



3.3 Precautions

Operation instructions:

(1) Be careful not to damage the instrument when unpacking. It is best not to unpack before transportation to the installation site to avoid damage to the instrument. Use a mounting ring to lift the instrument, and do not use a rod or rope to pass through the sensor measuring tube to lift the instrument.

(2) Prevent the instrument from vibration.

Prevent the instrument from heavy falling and heavy pressure, especially the flange surface from being stressed (which may damage the lining and make the instrument unable to work normally).

(3) Flange surface protection

After unpacking the instrument, pay attention to the protection of the flange, and do not place the flange on the ground without a gasket or other uneven plates at will.

(4) Junction box

Do not open the junction box cover before electrical wiring. After wiring, please pour the special junction box sealant prepared by the Company into the junction box as soon as possible, cover the junction box cover, and tighten the screws to ensure its tightness.

(5) Not in use for a long time

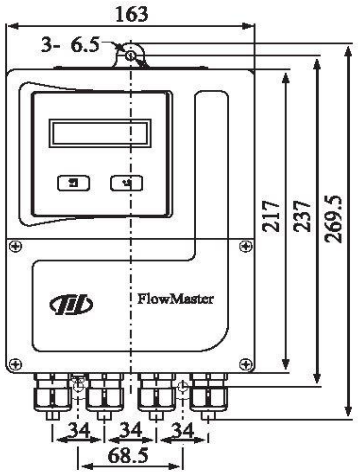
After the instrument is installed, it is best not to use it for a long time. If the instrument is not used for a long period of time, the following measures must be taken:

A. Check the end cover and wire socket for tightness to ensure that moisture and water do not enter the instrument.

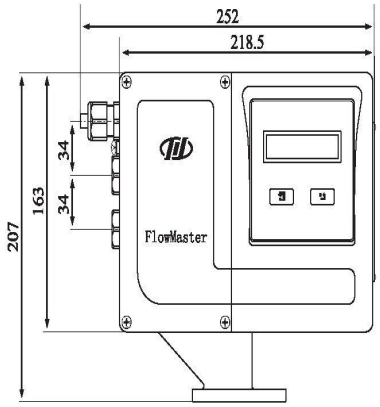
B. Conduct inspection regularly. Check the above measures and the conditions in the junction box at least once a year. However, check the instrument immediately, if water is suspected to be immersed in the instrument (such as after a heavy rain).

4. Overall Dimensions

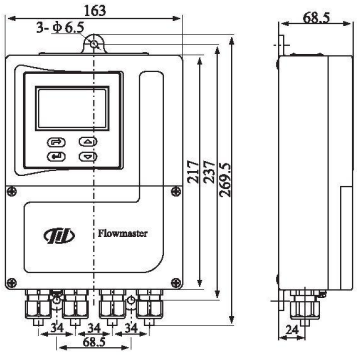
4.1. Outline dimensions of converter



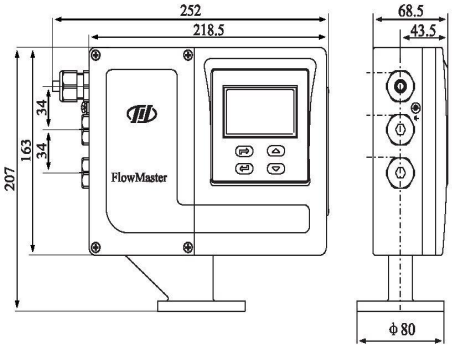
Split converter



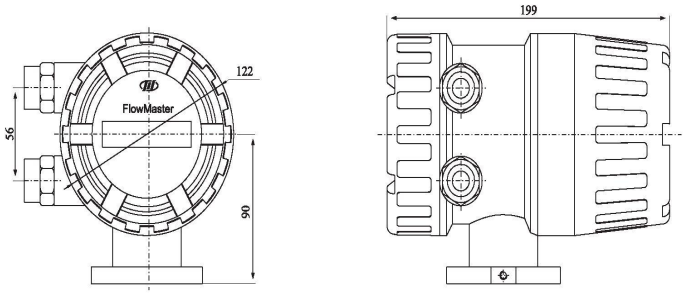
Integral converter (installed on sensor)



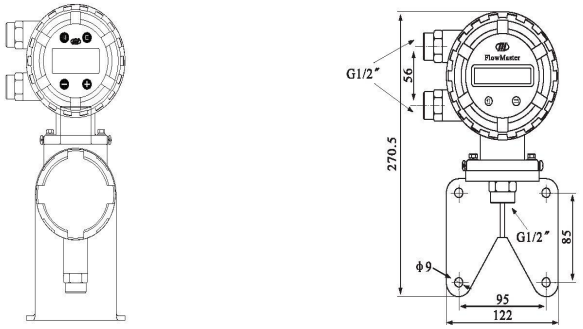
Split type



Integrated (mounted on sensor)



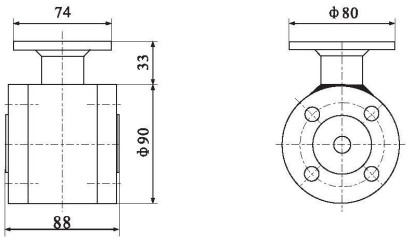
Integral converter (installed on sensor)



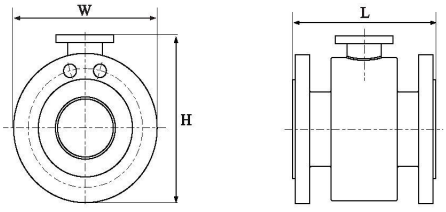
Split converter

4.2. Outline dimensions of sensor

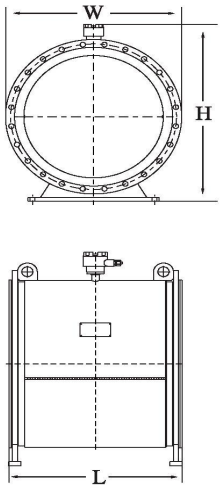
4.2.1 Sensor size (pipeline type)



Diameter (mm)	Dimension (mm)			Weight (kg)			
	L	W	H	1.0MPa	1.6MPa	2.5MPa	4.0MPa
2.5	88	90	123	3	3	3	3
5	88	90	123	3	3	3	3

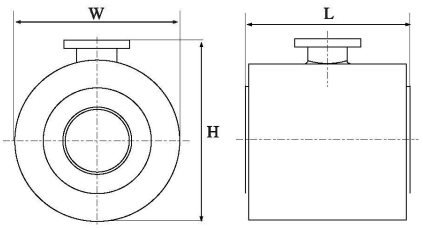


Diameter (mm)	Dimension (mm)			Weight (kg)			
	L	w	H	1.0MPa	1.6MPa	2.5MPa	4.0MPa
10	134	90	123	3.5	3.5	3.5	3.5
15	134	95	126	4	4	4	4
20	200	128	137	4	4	4	4.5
25	200	128	147	5	5	5	5.5
32	200	128	155	7	7	7	8
40	200	128	165	7.5	7.5	8	8.5
50	200	165	187	9	9	9.5	10
65	200	185	202	11	11	12	14
80	200	200	223	14	14	15	19
100	250	220	249	19	19	20	24
125	250	250	278	24	24	25	30
150	300	285	303	32	32	35	42
200	350	340	358	41	41	46	56.5
250	450	405	418	68	68	73	85
300	500	460	468	89	89	97	113
350	550	562	560	97	97	124	-
400	600	596	614	122	122	157	-
450	600	640	656	161	161	200	-
500	600	715	715	180	180	243	-
600	600	810	810	241	241	285	-



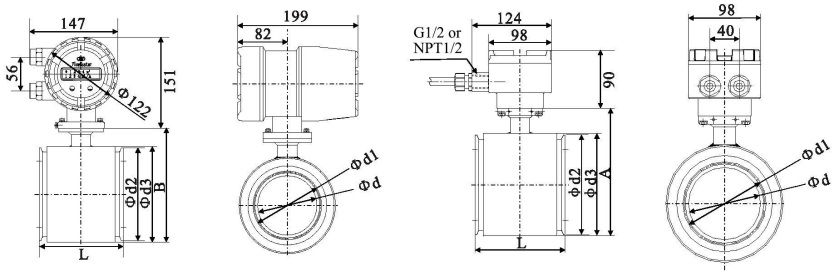
Diameter (mm)	L	W	H	Weight (kg): 0.6 MPa
700	700	895	995	420
800	800	1015	1115	541
900	900	1115	1215	668
1000	1000	1230	1350	858
1200	1200	1405	1505	990
1400	1400	1630	1730	1362
1600	1600	1830	1930	1754
1800	1800	2045	2145	1890
2000	2000	2266	2365	2105
2200	2200	2475	2364	3210
2400	2400	2685	2564	3910

4.2.2. Sensor size (clamping type)

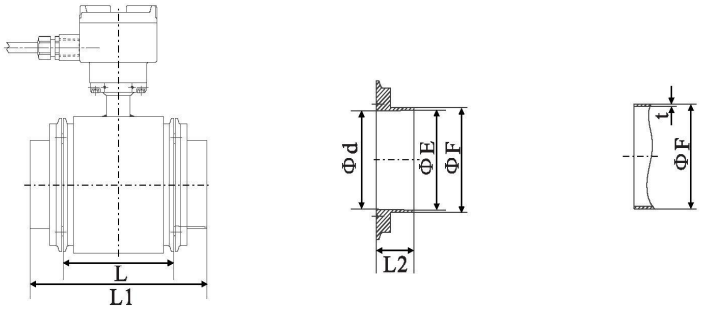


Diameter (mm)	L	W	H	Applicable pressure (MPa)
25	100	70	100	≤4.0
32	100	80	110	≤4.0
40	100	91	121	≤4.0
50	100	100	130	≤4.0
65	100	119	149	≤1.6
80	120	130	160	≤1.6
100	150	155	185	≤1.6
125	200	183	213	≤1.6
150	200	212	242	≤1.6
200	250	262	292	≤1.0
250	300	320	350	≤1.0
300	350	370	400	≤1.0

4.2.3. Sanitary type size



Caliber	DN25	DN32	DN40	DN50	DN65	DN80	DN100
L Sensor length	92				95	115	144
B (Height of integrated shell)	107	117	128	137	156	167	192
A (Height of split shell)	113	123	134	143	162	173	198
d3 (Shell diameter)	74	84	95	104	123	134	159
d2 (Outer diameter of chuck)	77.5		91		119	130	155
d1 (Center of sealing groove)	43.5			56.5	70.5	83.5	110
d (Inner diameter of sensor)	22.6	31.3	35.6	48.6	603	72.9	96



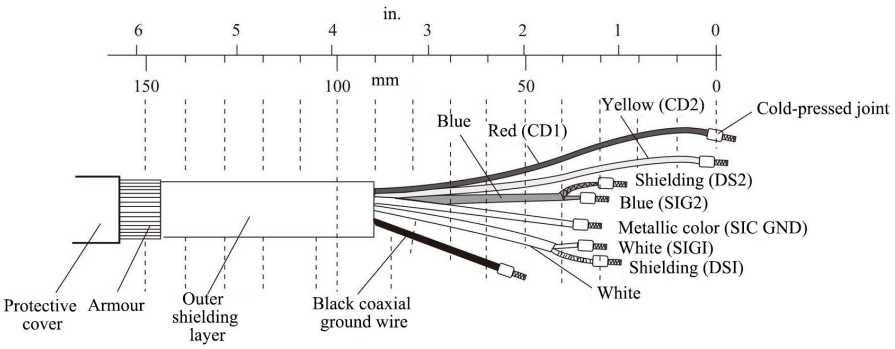
Caliber	DN25	DN32	DN40	DN50	DN65	DN80	DN100
L1 (Installation length)	156				159	199	228
L (Sensor length)	92				95	115	144
L2 (Connector length)	30						40
F (Outer diameter of connecting pipe)	77.5			91	119	130	155
E (Inner diameter of DIN32676 connector)	26	32	38	50	66	81	100
E (Inner diameter of ISO2852 connector)	22.6	31.3	35.6	48.6	60.3	72.9	97.6
d (Inner diameter of connector)	22.6	31.3	35.6	48.6	60.3	72.9	96

5. Electrical Wiring

5.1. Cable

(1) Operating temperature: -25°C ~ 70°C

(2) Cable specification and color are as follows:



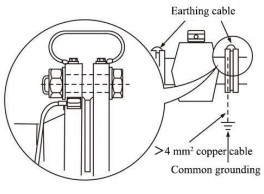
(3) The cable diameter is 11.5 mm ± 0.5 mm.

5.2. Earthing of instrument

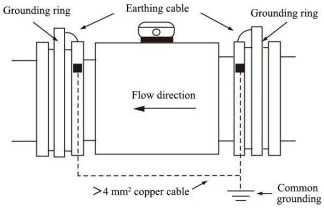
(1) Earthing of sensor

The sensor induction medium flowing signal of instrument is very weak, so interference prevention is very important. The best method is to **ensure good earthing**!

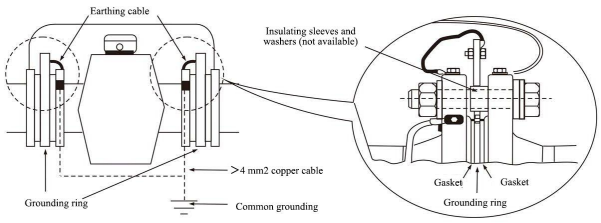
The following is the method for earthing of sensor under different conditions.



A. Earthing of metal pipe



B. Earthing of plastic pipe

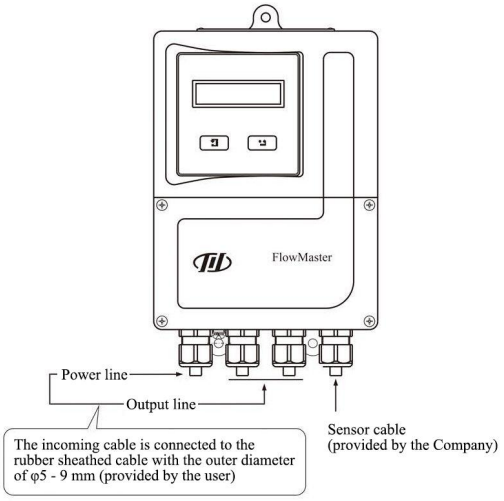


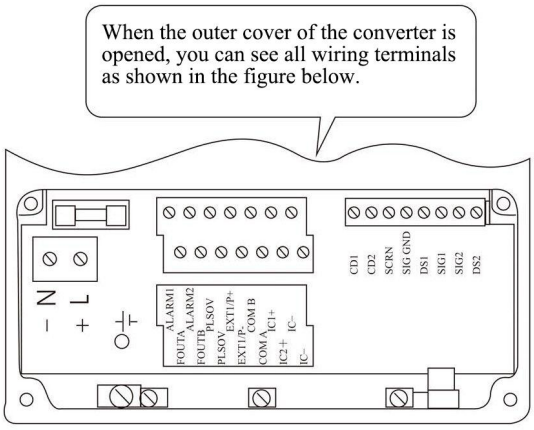
C. Earthing of pipe with cathodic protection

(2) Earthing of converter

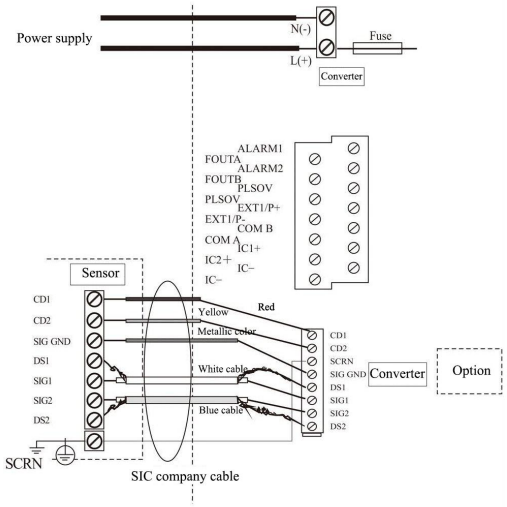
The converter for instrument has been considered in the design. You only need to earth the converter shell. This is enough to ensure the good earthing of converter.

5.3 Converter connection (I)





The wiring between the integrated flowmeter sensor and the converter is completed by the manufacturer, and the wiring between the split converter and the sensor is shown in the following figure:



Precautions

During wiring, attention shall be paid to the following:

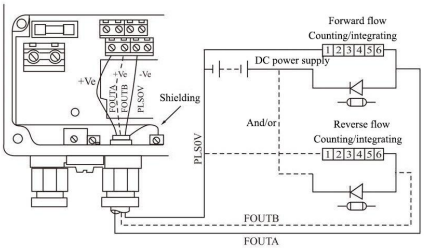
(1) The wiring between the sensor and the converter must be correct and reliable, ensuring good contact without short circuit or open circuit.

(2) To ensure the insulation in the sensor junction box and prevent poor insulation caused by humidity, cables shall not be connected outdoors in rainy days.

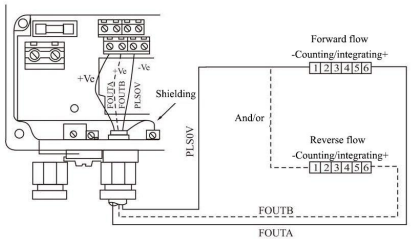
(3) To ensure the tightness of the junction box, the screws on the cable connector and junction box shall be tightened after wiring.

(4) 4~20 mA output is in active mode, so do not add other power supplies.

A. Frequency output wiring

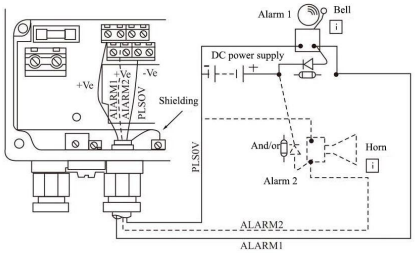


Electromagnetic counter connection

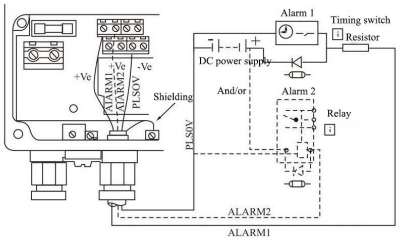


Telemetry, electronic counter, etc.

B. Alarm output wiring

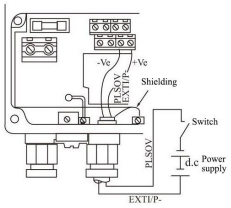


Alarm wiring 1

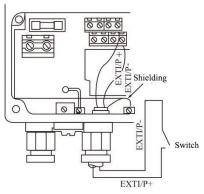


Alarm wiring 2

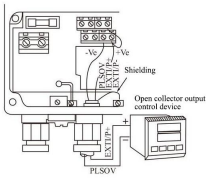
C. Contact input wiring



Voltage-free contact

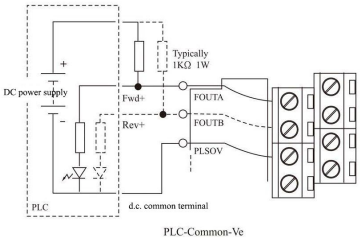


Voltage signal/logic signal

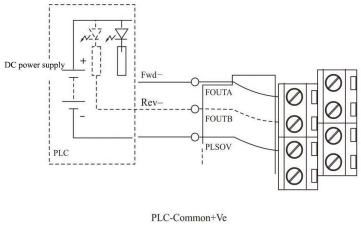


Open collector (ground contact)

D. Interface with PLC

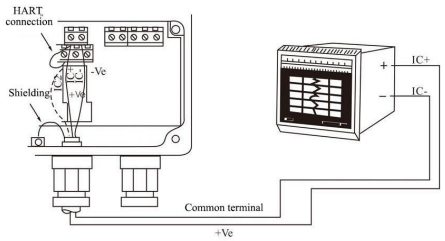


Schematic diagram of PLC interface (-Ve is common terminal)

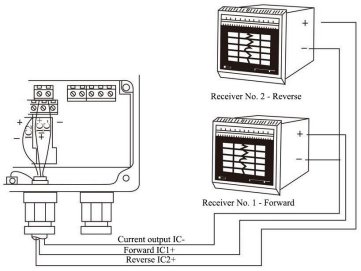


Schematic diagram of PLC interface (+Ve is common terminal)

E. Current output wiring

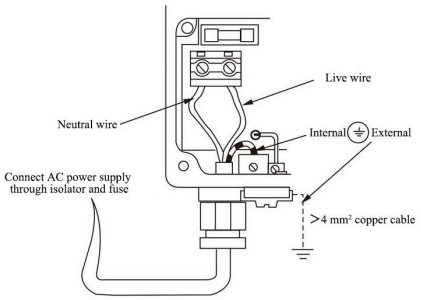


Standard current output wiring diagram



Double-current output wiring diagram

F. Power supply wiring



Connection diagram of AC power supply (AC220V)

5.4 Converter connection (II)

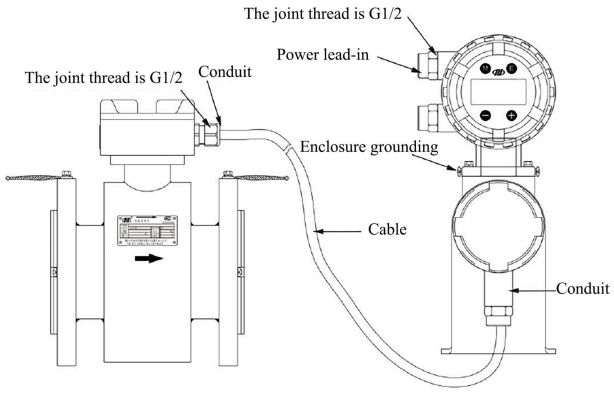
Converter connection

A. The cable connection between the integrated flowmeter sensor and the converter is completed by the manufacturer, and the cable between the split flowmeter sensor and the split converter is connected (the cable is provided by the manufacturer). The cable at the sensor has been connected and sealed when leaving the factory. See the figure below for the cable connection at the converter.

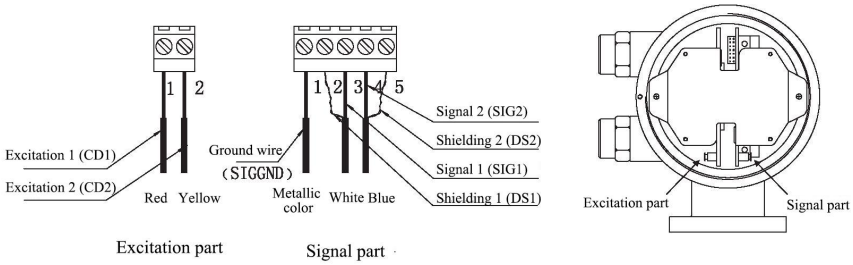
B1. The incoming cable of explosion-proof converter shall be connected to the rubber sheathed cable with the outer diameter of φ10 + 0.5 mm (provided by the user);

B2. The incoming cable of non-explosion-proof converter shall be connected to the rubber sheathed cable with the outer diameter of φ5 - 9 mm (provided by the user);

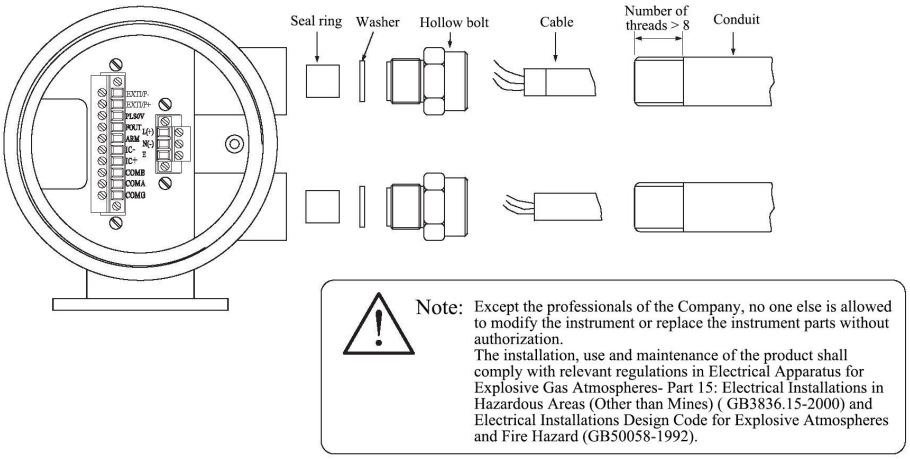
C. Flowmeter cable guide diagram



The conduit can be heavy-gauge threaded pipe, seamless steel pipe and welded steel pipe conforming to GB/T 14823.1, and the joint between the conduit and the connector should have at least 5 threads.

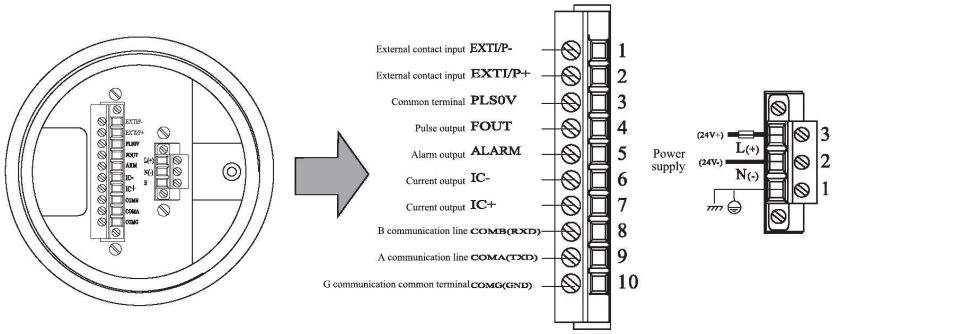


Note: The number of the terminal block is printed on the motherboard, and the wiring can be operated with reference to this figure.



Note: Except the professionals of the Company, no one else is allowed to modify the instrument or replace the instrument parts without authorization.
The installation, use and maintenance of the product shall comply with relevant regulations in Electrical Apparatus for Explosive Gas Atmospheres- Part 15: Electrical Installations in Hazardous Areas (Other than Mines) (GB3836.15-2000) and Electrical Installations Design Code for Explosive Atmospheres and Fire Hazard (GB50058-1992).

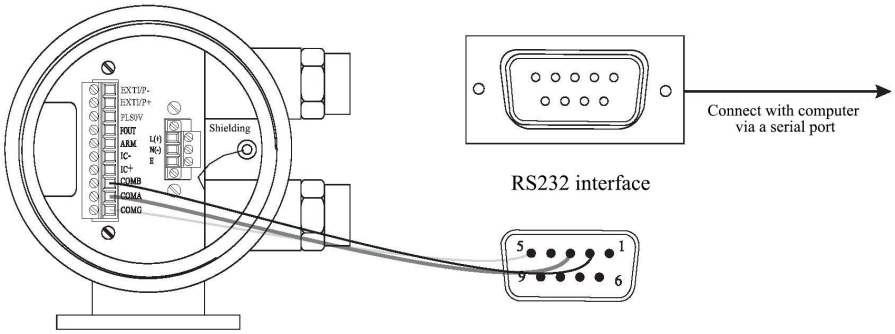
The hollow bolt, washer and sealing ring are put around the cable, and the cable will pass through the cable lead-in hole. The cable connection length is ensured, and the sealing ring and washer are put into the cable lead-in hole and the hollow nut is tightened. **Explosion-proof converter cable needs to be fitted with explosion-proof conduit.**



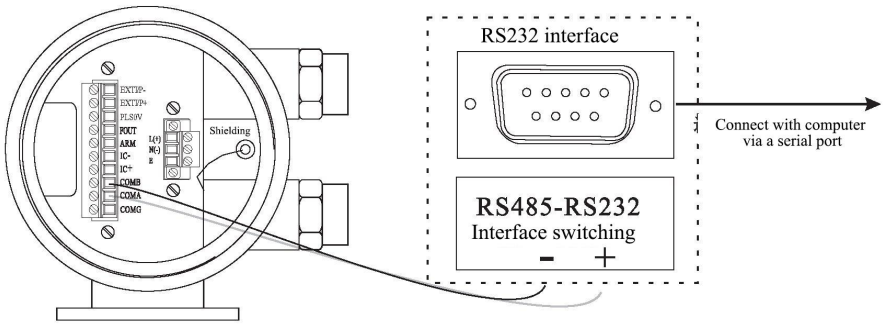
Note: Please power off when wiring in explosive gas atmospheres!

Converter wiring

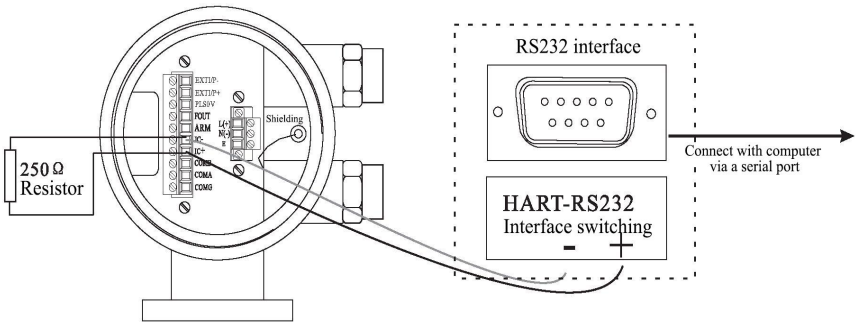
A. RS232 wiring



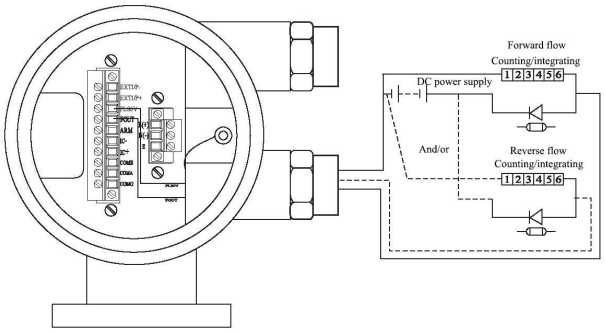
B. RS485 wiring



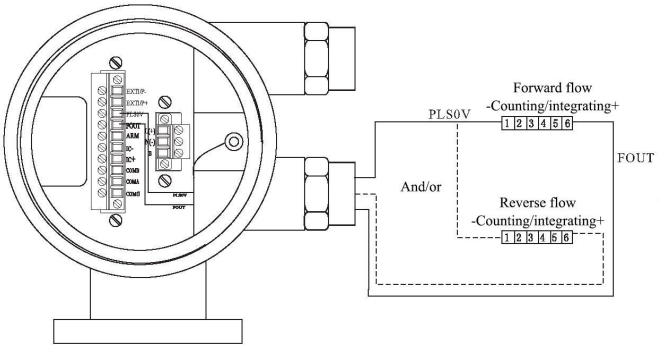
C. HART wiring



D. Frequency output wiring

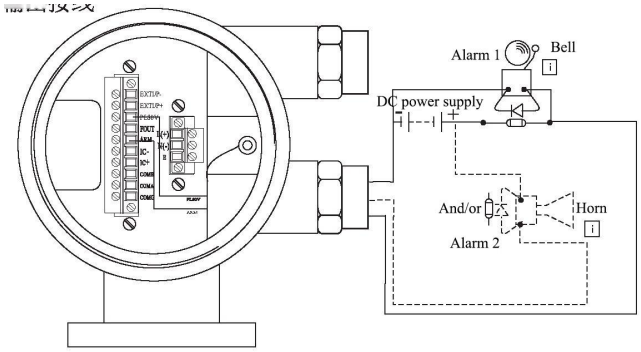


Electromagnetic counter connection



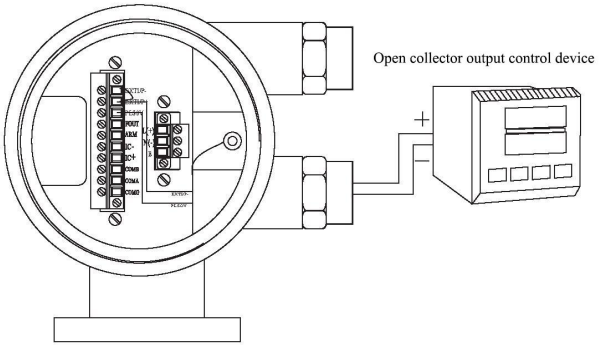
Telemetry, electronic counter, etc.

E. Alarm output wiring

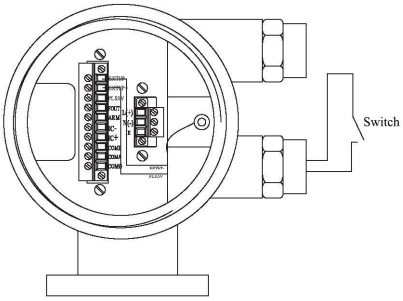


Alarm wiring 1

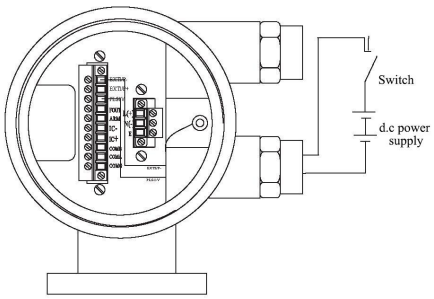
F. Contact input wiring



Open collector (or ground contact)

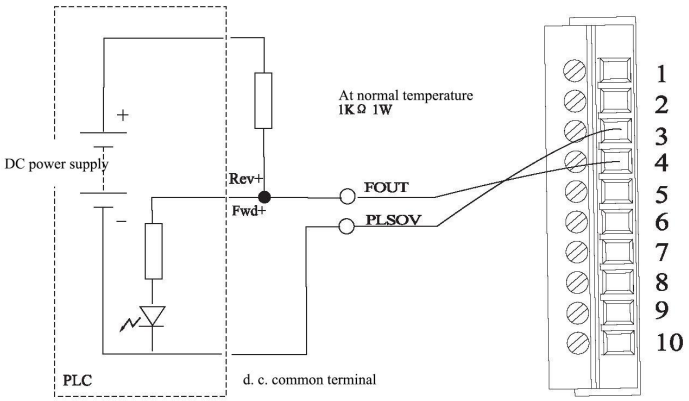


Voltage-free contact



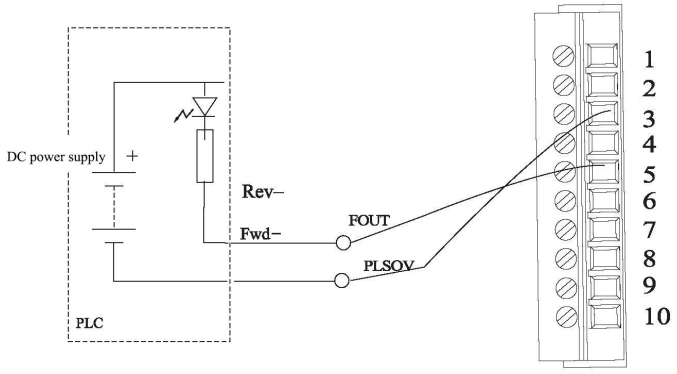
Voltage signal or logic signal

G. Interface with PLC



Schematic diagram of PLC interface

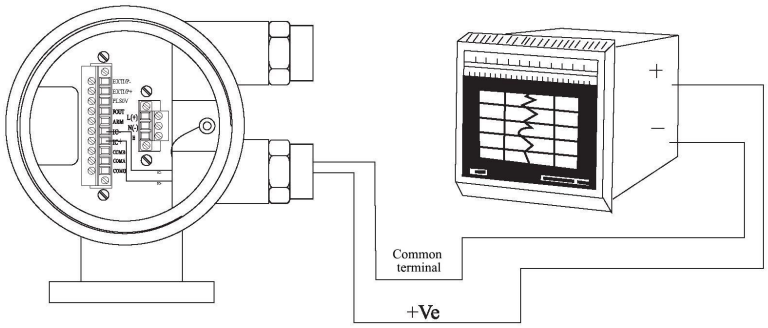
(-Ve is common terminal)



Schematic diagram of PLC interface

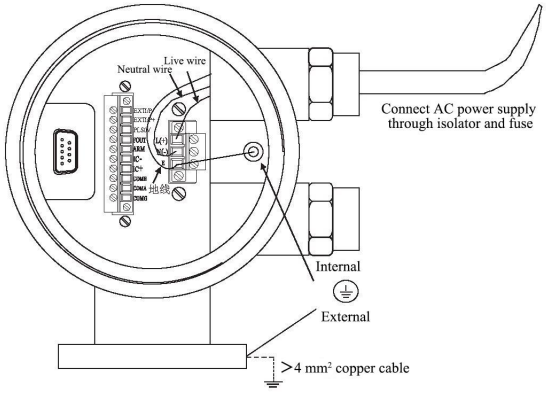
(+Ve is common terminal)

H. Current output wiring



Standard current output wiring diagram

(I) Power supply wiring



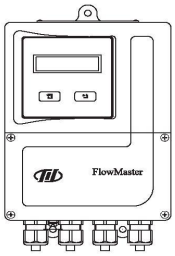
Connection diagram of AC power supply (AC220V)

III. Parameter Setting

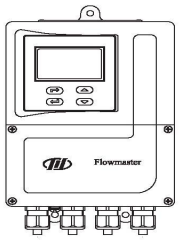
1. Converter Structure

1.1. Converter structure (I)

The square electromagnetic flowmeter converter has two-line LCD display mode with double magnetic buttons and three-line LCD display mode with four ordinary buttons. The user may view the various measurement parameters of the instrument by operating the buttons. The user may open the outer cover of the converter, and use the SIC manual operator or PC to view and modify various measurement parameters and operating parameters of the converter through its RS232 serial port.



Two-line LCD display

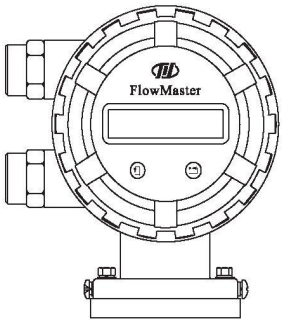


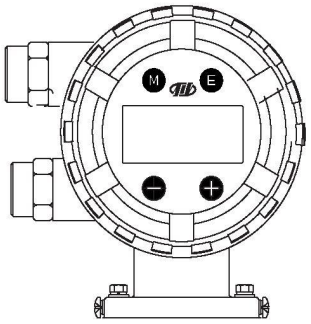
Three-line LCD display

The instrument can be powered on after the electrical wiring is completed and the correct connection is confirmed!

1.2. Converter structure (II)

The circular electromagnetic flowmeter converter has two-line LCD display mode with double magnetic buttons and three-line LCD display mode with four ordinary buttons. The user may view the various measurement parameters of the instrument by operating the buttons. The user may open the outer cover of the converter, and use the SIC manual operator or PC to view and modify various measurement parameters and operating parameters of the converter through its RS232 serial port.





Before the explosion-proof converter is installed in an explosion-proof environment, the user may use the SIC manual operator or PC to view and modify various measurement parameters and operating parameters of the converter through its RS232 serial port!

Do not use the serial port after installing the converter in an explosion-proof environment!

2. Parameter Description

2.1 Operating parameters of converter (taking the RS232 communication converter as an example)

When the menu of electromagnetic flowmeter converter is modified by the SIC manual operator or PC, the level I secret password set in the menu is "user", allowing users to enter to view and modify the basic operating parameters; and the level II secret password is "engineer", allowing engineering technicians to enter to adjust all operating parameters. In general, it is not recommended for users to change the password at will, because once the user forgets the changed password, they will not be able to operate the parameters of the flowmeter.

The following menus are the converter operating parameters.

Level I	Level II	Level III	Function	Default value
Read				
1 Read Read menu	1 Read flow	-	Flow rate	-
	2 Read%	-	Percentage flow	-
	3 Read Fwd	-	Forward cumulative flow	-
	4 Read Rev	-	Reverse cumulative flow	-
	5 Read Net	-	Net flow (Difference between forward total and reverse total)	-
	6 Read Alm	-	Alarm	-
	7 Read Vel	-	Flow speed	-
	q Read quit	-	Exit, and return to the main menu	-
Display options				
2 Disp Display menu	1 Disp Mode	-	Unused	2
	2 Disp Res	-	Number of decimal places when displaying flow	3
	q Disp quit	-	Exit, and return to the main menu	-
Passwords				
3 Login Password menu	1 Login Login	-	Allow the engineer level user to operate in case of conformity	engineer
	2 Login SetKey	-	Enter the engineer user's level I password	-
	3 Login LogOut	-	Logout	-

Level I	Level II	Level III	Function	Default value
FLOW MEASUREMENT				
4 Flow Flow menu	1 Flow Rng	-	Range (the upper limits corresponding to 4~20 mA)	100
	2 Flow Unit	1 Flow Unit Ltr	liter	0
		2 Flow Unit m^3	cubic meter	1
		q Flow Unit quit	Exit, and return to Level 1 submenu	-
	3 Flow Mult	1 Flow Mult m	×0.001	0
		2 Flow Mult c	×0.01	0
		3 Flow Mult	×1	1
		4 Flow Mult h	×100	0
		5 Flow Mult k	×1000	0
		6 Flow Mult M	×1000000	0
		q Flow Mult quit	Exit, and return to Level 1 submenu	-
	4 Flow Time	1 Flow Time s	Second	0
		2 Flow Time Min	Minute	0
		3 Flow Time Hr	Hour	1
		4 Flow Time Dy	Day	0
		5 Flow Time Wk	Week	0
		q Flow Time quit	Exit, and return to Level 1 submenu	-
	5 Flow Rspns	1 Flow Rspns Rspns 1	Filtering constant	3
		2 Flow Rspns Rspns2	Response coefficient	0
		3 Flow Rspns Threes	Response threshold	30
		4 Flow Rspns Value	Display the response value	-
		5 Flow Slow Time	Insensitive time	1
		6 Flow Wry Limit	Change rate limit	30
		7 Flow Step Value	Unused	-
		Q Flow Rspns quit	Exit, and return to Level 1 submenu	-
	6 Flow Probe	1 Flow Probe Ins	Unused	-
		2 Flow Probe Prof	Unused	-
		q Flow Probe quit	Exit, and return to Level 1 submenu	-
	7 Flow%	-	Display the current percentage flow	-
	8 Flow Cutoff	-	Small signal excision (mm/s)	5
	q Flow quit	-	Exit, and return to the main menu	-

Level I	Level II	Level III	Function	1 default value
ANALOG OUTPUT				
5 Anlg Analog menu	1 Anlg Fsd	-	Current value corresponding to the upper limit of flow output	20
	2 Anlg Zero	-	Current value corresponding to the lower limit of flow output	4
	3 Anlg Dir	1 Anlg Dir Fwd	Set the flow direction as positive	1
		2 Anlg Dir Rev	Set the flow direction as negative	0
		q Anlg Dir quit	Exit, and return to Level 1 submenu	-
	4 Anlg No2	-	Percentage of 2nd range to 1st range (not used)	100
	5 Anlg mA	-	Current value	-
	6 Anlg mANo1	1 Anlg mA No 1 Dir	Corresponding flow direction for 1-channel current output	1
		2 Anlg mA No 1 Fsd	Full-degree correction for 1-channel current output	0
		3 Anlg mA No 1 Zero	Zero-point correction for 1-channel current output	0
		q Anlg mA No 1 quit	Exit, and return to Level 1 submenu	-
	7 Anlg mANo2	1 Anlg mA No2 Dir	Corresponding flow direction for 2-channel current output	1
		2 Anlg mA No2 Fsd	Full-degree correction for 2-channel current output	0
		3 Anlg mA No2 Zero	Zero-point correction for 2-channel current output	0
		q Anlg mA No2 quit	Exit, and return to Level 1 submenu	-
	q Anlg quit	-	Exit, and return to the main menu	-
PULSE OUTPUT				
6 Pls Pulse menu	1 Pls Fact	-	Number of pulse generated by flow of per unit volume	1
	2 Pls Cutoff	-	Small signal excision (mm/s)	5
	3 Pls Max	-	Upper limit of output pulse frequency (HZ)	800
	4 Pls Hz	-	Current output frequency (Hz)	-
	5 Pls Idle	-	State at the time of no output	0
	6 Pls Size	-	Width of output pulse (ms) (square wave at 0)	0
	q Pls quit	-	Exit, and return to the main menu	-
TOTALIZER				
7 Tot Total amount menu	1 Tot Unit	1 Tot Unit Ur	liter	0
		2 Tot Unit m^3	cubic meter	1
		q Tot Unit quit	Exit, and return to Level 1 submenu	-
	2 Tot Mult	1 Tot Mult m	×0.001	0
		2 Tot Mult c	×0.01	0
		3 Tot Mult	×1	1
		4 Tot Mult h	×100	0
		5 Tot Mult k	×1000	0
		6 Tot Mult M	×1000000	0
		q Tot Mult quit	Exit, and return to Level 1 submenu	-
	3 Tot ClrEn	-	Set the panel key and implement the zero clearing for total quantity	0
	q Tot quit	-	Exit, and return to the main menu	-

Level I	Level II	Level III	Function	Default value
ALARMS				
8 Ahn Alarm menu	1 Ahn No1	1 Ahn No1 Idle	Status while idling	1
		2 Alm No1 En	Alarm output allowing	1
		3 Alm No1 Coil	Field coil alarm	1
		4 Alm No1 Fwd	Forward flow	0
		5 Alm No1 Rev	Reverse flow	0
		6 Alm No1 Cutoff	Small signal excision	0
		7 Alm No1 Mtsnsr	Empty pipe	1
		8 Alm No1 Hi	The flow is higher than upper limit	0
		9 Alm No1 Lo	The flow is lower than lower limit	0
		A Alm No1 Anlg	Overlimit alarm of analog signal	0
		B Alm No1 Pls	Overlimit alarm of pulse signal	0
		q Alm No1 quit	Exit, and return to Level 1 submenu	-
	2 Alm No2	1 Alm No2 Idle	Status while idling	1
		2 Alm No2 En	Alarm output allowing	1
		3 Alm No2 Cofl	Field coil alarm	1
		4 Alm No2 Fwd	Forward flow	0
		5 Alm No2 Rev	Reverse flow	0
		6 Alm No2 Cutoff	Small signal excision	0
		7 Alm No2 Mtsnsr	Empty pipe	1
		8 Alm No2 Hi	The flow is higher than upper limit	0
		9 Alm No2 Lo	The flow is lower than lower limit	0
		A Alm No2 Anlg	Overlimit alarm of analog signal	0
		B Alm No2 Pls	Overlimit alarm of pulse signal	0
		q Alm No2 quit	Exit, and return to Level 1 submenu	-
	3 Ahn Trip	1 Alm Trip Hi	Upper limit alarm point (percent relative to range)	110
		2 Alm Trip Lo	Lower limit alarm point (percent relative to range)	0
		3 Alm Trip Hyst	Unused	-
		q Alm Trip quit	Exit, and return to Level 1 submenu	-
	4 Ahn Scr	-	Alarm	1
	q Alm quit	-	Exit, and return to the main menu	-
INPUT CONTACT				
9 Inpt Input menu	1 Inpt Anlg	-	Switch to second measuring range	1
	2 Inpt Clr	-	Total quantity resetting	0
	3 Inpt Hid	-	Maintain current flow	0
	4 Inpt Zero	-	Make current flow zero	0
	5 InPt Idle	---	Set external control status	0 (EXTI/P+, EXTI/P- short circuit works)
				1 (EXTI/P+, EXTI/P- open circuit works)
	q Inpt quit	-	Exit, and return to the main menu	-

Level I	Level II	Level III	Function	Default value
EMPTY PIPE DETECTION				
A Mtsnsr Empty pipe menu	1 Mtsnsr Trip	-	Unused	50
	2 Mtsnsr mv	-	Unused	-
	3 Mtsnsr Empty	-	Setting value of empty pipe	3000
	4 Mtsnsr EmVal	-	Display the empty pipe value	-
	5 Mtsnsr Intvl	-	Detection time for empty pipe (min)	5
	q Mtsnsr quit	-	Exit, and return to the main menu	-
SENSOR DATA AND CALIBRATION				
B Snsr Sensor menu	1 Snsr No	-	Instrument No.	According to user needs
	2 Snsr Tag	-	Pos. No.	0
	3 Snsr Size	-	Diameter (mm)	According to user needs
	4 Snsr Vel	-	Current flow speed	-
	5 Snsr Fact	1 Snsr Fact LOut	Magnification	Calibration parameter 1
		2 Snsr Fact Offset	Zero drift (mm/s)	Calibration parameter 2
		3 Snsr Fact Wave	Excitation waveform	0
		4 Snsr Fact Pro	Unused	1
		q Snsr Fact quit	Exit, and return to Level 1 submenu	-
	q Snsr quit	-	Exit, and return to the main menu	-
SYSTEM TEST				
C Test Test menu	1 Test Mode	-	While being 1, allow entering the analog state	0
	2 Test DataOut	-	Digital output	0
	3 Test Flow	-	Flow value inputted by analog user	100
	4 Test %	-	Display the percentage flow	-
	5 Test Hz	-	Display the pulse output frequency	-
	6 Test mA	-	Display the current output value	-
	7 Test Vel	-	Display the flow speed	-
	8 Test Alm	-	Displaying the alarm content	-
	9 Test Txv	-	Unused	-
	q Test quit	-	Exit, and return to the main menu	-

Notes: 1. "----------" ="N/A".

2. When the value is set to "1", indicating that this item is selected; when the value is set to "0", indicating that this item is not selected.

3. When Read menu operation is performed on the converter panel, it is necessary to use the matching magnetic buttons to cycle in the place indicated on the converter panel.

4. The numbers or letters corresponding to each level of menu items are keywords. According to the distribution of keywords in the above table, users can enter them level by level to enter the corresponding menu items.

5. The shaded part in the table above shows the parameter setting of the slurry type electromagnetic flowmeter converter which is partially different from other converters. Attention shall be paid on the part, when the slurry type converter is selected.

Automatic zero calibration methods:

For V1.32, V1.37 (count), V1.75, V1.38 (plug), V2.86, V3.85, V2.92 electromagnetic flowmeter converters, the automatic zero calibration methods are as follows:

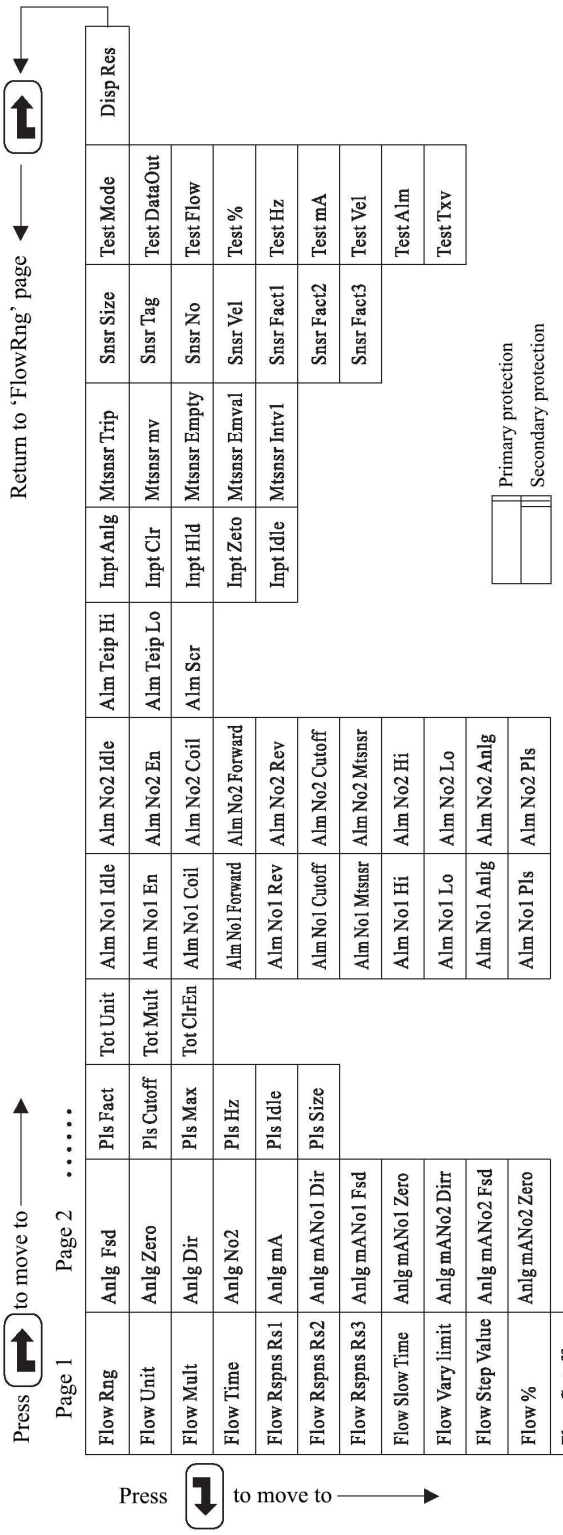
I: Automatic zero correction method for panel operation: (applicable to all versions above)

1. Complete parameter setting before calibration;
2. Open the valve to fill the pipeline with medium, exhaust the air, and keep the water in the pipeline static;
3. Under the "Snsr No" menu, look for the "Auto Zero" submenu item and set the Auto Zero menu item to 1. After pressing the "Confirm" button, wait for 1 minute (it is forbidden to modify other parameters during this period), and the Auto Zero menu value is reset from 1 to 0, indicating that the zero correction is complete.

II: Automatic zero correction operation method for serial port operation: (applicable to converters of versions other than V3.85 and V2.92)

1. Complete parameter setting before calibration;
2. Open the valve to fill the pipeline with medium, exhaust the air, and keep the water in the pipeline static;
3. Enter the command "b54" in the HyperTerminal, set the "Auto Zero" menu value to 1, wait for 1 minute (it is prohibited to modify other parameters during this period), and pop up the "Velocity zero clear" sign, indicating the zero calibration is complete;

2.2. Operating parameters of three-line display (panel operation) converter



Security setting

Note: The protected parameters can't be accessed without correct password. In case of failure to login with the password, the resetting can only be made by the engineer.
Two-level security password is a 5-bit unmodifiable Arabic number.
User login password: 02041.
The parameters that can be viewed and modified by this password are both primary and non-protected for the user to perform the necessary parameter adjustment.
Engineer login password: 04121
All parameters may be visible while logging in by this password, and the constant parameters can be modified.
General user is not suggested to use this password.

Password input:

After entering the login interface, press the [→] key to move the cursor and move it below the number to be modified, and then press the [▼] or [▲] key to modify the number; when the password digit setting is completed, press the [↵] key to confirm the password input.
If the password is correct, the login success information is prompted, and then the modify parameter interface will be entered. If the password input is incorrect, the password error message is prompted, and you will return to the initial interface.

Description of new parameters of three-line LCD&RS232 electromagnetic flowmeter

Flow Rng	Anlg Fsd	Pls Fact	Tot Unit Ltr	Alm No1 Idle	Alm No2 Idle	Alm Trip Hi	Inpt Anlg	Mtsnsr Trip	Snsr No	Test Mode	Trm Vf	Disp Res	Reset!
Flow Unit Ltr	Anlg Zero	Pls Cutoff	Tot Mult m	Alm No1 En	Alm No2 En	Alm Trip Lo	Inpt Clr	Mtsnsr Empty	Snsr Tag	Test DataOut	Trm Vz		
Flow Mult m	Anlg Dir Fwd	Pls Max	Tot ClrEn	Alm No1 Coil	Alm No2 Coil	Alm Trip Hyst	Inpt Hld	Mtsnsr Em Val	Snsr Size	Test Flow			
Flow Time S	Anlg No2	Pls Hz	Tot Pass Word	Alm No1 Fwd	Alm No2 Fwd	Alm Scr	Inpt Zero	Mtsnsr Intvl	Snsr Vel	Test %			
Flow Rspns 1	Anlg mA	Pls Idle		Alm No1 Rev	Alm No2 Rev		Inpt Idle	Mtsnsr Vel	Snsr Fact L Out	Test Hz			
Flow Rspns2	Anlg mA No 1 DIr	Pls Size		Alm No1 Cutoff	Alm No2 Cutoff				Snsr Fact Oft	Test mA			
Flow Rspns Thr	Anlg mA No 1 Fsd	Pls Count		Alm No1 Mtsnsr	Alm No2 Mtsnsr				Snsr Fact Wav	Test Vel			
Flow Rspns Val	Anlg mA No 1 Zer			Alm No1 Hi	Alm No2 Hi				Auto zero	Test Alm			
Flow Slow Time	Anlg mA No 2 Dir			Alm No1 Lo	Alm No2 Lo				Fact Cpy				
Flow Vary Lim	Anlg mA No 2 Fsd			Alm No1 Anlg	Alm No2 Anlg								
Flow %	Anlg mA No 2 Zer			Alm No1 Pls	Alm No2 Pls								
Flow Cutoff	Current Alm												

Item	R/W	Data range	Unit	Default value	Explain
Tot Password (corresponding to the menu 741)	W		m/s	0	After 12345 is set, the menus (Tot Fwd Lng -- 742), (Tot Fwd Fit -- 743), (Tot Rev Lng -- 744) and (Tot Rev Fit -- 745) will be added below the menu to modify the integer part of forward total, decimal part of forward total, integer part of reverse total and decimal part of reverse total, respectively;
Mtsnsr Vel (corresponding to the menu A6)	W			20	As for the noise limit of empty pipe, when the flow speed measured by the meter exceeds the value, it is considered as an interference signal, and meanwhile, the meter is enabled to keep the output zero;
Mtsnsr Trip (corresponding to the menu A1)	W			0	1: Cancel the reverse flow of the instrument;
Auto zero (corresponding to the menu B54)	W			0	1: Automatic zero setting for one minute; 2: Remove the original zero point value; (the parameter automatically sets to zero after the instrument completes the zero setting)
Fact Cpy (corresponding to the menu B6)	W			0	19: Instrument performs parameter backup

Description of new parameters of three-line LCD&RS485 electromagnetic flowmeter

Flow Rng	Anlg Fsd	Pls Fact	Tot Unit Ltr	Alm No1 Idle	Alm No2 Idle	Alm Trip Hi	Inpt Anlg	Mtsnsr Empty	Snsr No	Test Mode	TrmVf	Disp Res	Meter No	Baud Rate
Flow Unit Ltr	Anlg Zero	Pls Max	Tot Mult m	Alm No1 En	Alm No2 En	Alm Trip Lo	Inpt Clr	Mtsnsr Em Val	Snsr Tag	Test DataOut				
Flow Mult m	Anlg Dir Fwd	Pls Hz	Tot ClrEn	Alm No1 Coil	Alm No2 Coil	Alm Trip Hyst	Inpt Hid	Mtsnsr Intvl	Snsr Size	Test Flow				
Flow Time S	Anlg No2	Pls Idle	Tot Password	Alm No1 Fwd	Alm No2 Fwd	Alm Scr	Inpt Zero	Mtsnsr Vel	Snsr Vel	Test %				
Flow Rspns1	Anlg mA	Pls Size		Alm No1 Rev	Alm No2 Rev		Inpt Idle		Snsr Fact LOut	Test Hz				
Flow Rspns2	Anlg mANo1 DIr			Alm No1 Cutoff	Alm No2 Cutoff				Snsr Fact Offset	Test mA				
Flow Rspns Thr	Anlg mANo1 Fsd			Alm No1 Mtsnsr	Alm No2 Mtsnsr				Snsr Fact Wav	Test Vel				
Flow Rspns Val	Anlg mA No1 Zero			Alm No1 Hi	Alm No2 Hi				Auto zero	Test Alm				
Flow Slow Time	Anlg mA No2 Dir			Alm No1 Lo	Alm No2 Lo				Snsr Pnt1					
Flow Vary Limit	Anlg mA No2 Fsd			Alm No1 Anlg	Alm No2 Anlg				Snsr PntV 1					
Flow Step Value	Anlg mA No2 Zero			Alm No1 Pls	Alm No2 Pls				Snsr Pnt2					
Flow %	Current Alm								Snsr PntV2					
Flow Cutoff									Snsr Pnt3					
									Snsr PntV3					
									Snsr Pnt4					
									Snsr PntV4					
									Fact Cpy					

Item	R/W	Data range	Unit	Default value	Explain
Snsr Tag	W			0	1: Cancel the reverse flow of the instrument;
Auto zero	W			0	1: Automatic zero setting for one minute; 2: Remove the original zero point value; (the parameter automatically sets to zero after the instrument completes the zero setting)
Fact Cpy	W			0	19: Instrument performs parameter backup
Snsr Pnt1 ~Snsr Pnt4	w		m/s	0	The numbers from 1 to 4 correspond to the data of 4 measuring points with actual flow velocities from high to low, respectively;
Snsr PntV1 ~Snsr PntV4	w		m/s	0	The numbers from 1 to 4 correspond to the data of 4 measuring points with tested flow velocities from high to low, respectively;
Meter No	w			1	Network address
Baud Rate	w		bps	1	Communication Rate

Description of new parameters of three-line LCD&HART electromagnetic flowmeter

Flow Rng	Anlg Fsd	Pls Fact	Tot Unit Ltr	Alm No1 Idle	Alm No2 Idle	Alm Trip Hi	Inpt Anlg	Mtsnsr Empty	Snsr No	Test Mode	Trm Vf	Disp Res	Reset!
Flow Unit Ltr/S	Anlg Zero	Pls Cutoff	Tot ClrEn	Alm No1 En	Alm No2 En	Alm Trip Lo	Inpt Clr	Mtsnsr EmVal	Snsr Tag	Test Data Out	Trm Vz	Write Protect	
Flow Rspns1	Anlg Dir Fwd	Pls Max	Tot Pass Word	Alm No1 Coil	Alm No2 Coil	Alm Trip Hyst	Inpt Hid	Mtsnsr Intvl	Snsr Size	Test Flow		Header Num	
Flow Rspns2	Anlg No2	Pls Hz		Alm No1 Fwd	Alm No2 Fwd	Alm Scr	Inpt Zero	Mtsnsr Vel	Snsr Vel	Test %		Net Address	
Flow Rspns Thr	Anlg mA	Pls Idle		Alm No1 Rev	Alm No2 Rev		Inpt Idle		Snsr Fact LOut	Test Hz			
Flow Rspns Vai	Anlg mA No1 DIr	Pls Size		Alm No1 Cutoff	Alm No2 Cutoff				Snsr Fact Offst	Test mA			
Flow Slow Time	Anlg mA No1 Fsd			Alm No1 Mtsnsr	Alm No2 Mtsnsr				Snsr Fact Wav	Test Vel			
Flow Vary Limit	Anlg mA No1 Zero			Alm No1 Hi	Alm No2 Hi				Auto zero	Test Alm			
Flow %	Anlg mA No2 Dir			Alm No1 Lo	Alm No2 Lo				Fact Cpy				
Flow Cutoff	Anlg mA No2 Fsd			Alm No1 Anlg	Alm No2 Anlg								
	Anlg mA No2 Zero			Alm No1 Pls	Alm No2 Pls								

Item	R/W	Data range	Unit	Default value	Explain
Snsr Tag	W			0	1: Cancel the reverse flow of the instrument;
Write Protect	W			0	Write protection
Header Num	W			5	Quantity of lead code
Net Address	W			0	Short frame address

Description of new parameters of three-line LCD&DP/PA/FF electromagnetic flowmeter

Flow Rng	Anlg Fsd	Pls Fact	Tot Unit mM^3	Alm No 1 Idle	Alm No2 Idle	Alm Trip Hi	Inpt Anlg	Mtsnsr Empty	Snsr No	Test Mode	TrmVf	Disp Res	Meter No	Baud Rate
Flow Unit m M^3/S	Anlg Zero	Pls Max	Tot ClrEn	Alm No1 En	Alm No2 En	Alm Trip Lo	Inpt Clr	Mtsnsr EmVal	Snsr Tag	Test DataOut	TrmVz			
Flow Rspns1	Anlg Dir Fwd	Pls Hz	Tot Pass Word	Alm No1 Coil	Alm No2 Coil	Alm Trip Hyst	Inpt Hid	Mtsnsr Intvl	Snsr Size	Test Flow				
Flow Rspns2	Anlg No2	Pls Idle		Alm No1 Fwd	Alm No2 Fwd	Alm Scr	Inpt Zero	Mtsnsr Vel	Snsr Vel	Test %				
Flow Rspns Thr	Anlg mA	Pls Size		Alm No1 Rev	Alm No2 Rev		Inpt Idle		Snsr Fact Lout	Test Hz				
Flow Rspns Val	Anlg mANo 1 DIr			Alm No1 Cutoff	Alm No2 Cutoff				Snsr Fact Offset	Test mA				
Flow Slow Time	Anlg mANo 1 Fsd			Alm No1 Mtsnsr	Alm No2 Mtsnsr				Snsr Fact Wav	Test Vel				
Flow Vary Limit	Anlg mANo 1 Zero			Alm No1 Hi	Alm No2 Hi				Fact Cpy	Test Alm				
Flow %	Anlg mANo 2 Dir			Alm No1 Lo	Alm No2 Lo				Auto zero					
Flow Cutoff	Anlg mANo 2 Fsd			Alm No1 Anlg	Alm No2 Anlg									
	Anlg mANo 2 Zero			Alm No1 Pls	Alm No2 Pls									
	Current Alm													

Parameter description of slurry type electromagnetic flowmeter

Flow Rng	Anlg Fsd	Pls Fact	Tot Unit mLtr	Alm No1 Idle	Alm No2 Idle	Alm Trip Hi	Inpt Anlg	Mtsnsr Empty	Snsr No	Comm Mode	Test Mode	TrmVf	Disp Res	Reset!
Flow Unit mLtr/S	Anlg Zero	Pls Cutoff	Tot ClrEn	Alm No1 En	Alm No2 En	Alm Trip Lo	Inpt Clr	Mtsnsr Em Val	Snsr Coil	Device Code	Test DataOut	TrmVz	Status Code1	
Filter Switch	Anlg Dir Fwd	Pls Max	Tot Pass Word	Alm No1 Coil	Alm No2 Coil	Alm Trip Hyst	Inpt Hid	Mtsnsr Intvl	Snsr Size	Baud Rate/ Addr	Test Flow		Status Code2	
Flow Rspns1	Anlg No2	Pls Hz		Alm No1 Fwd	Alm No2 Fwd	Alm Scr	Inpt Zero	Mtsnsr VelH	Snsr Vel	Write Protect	Test %		Status Code3	
Flow Rspns2	Anlg mA	Pls Idle		Alm No1 Rev	Alm No2 Rev		Inpt Idle	Mtsnsr VelL	Snsr Fact LOut	Header Num	Test Hz		Status Code4	
Flow Rspns Thr	Anlg mA No 1 DIr	Pls Size		Alm No 1 Cutoff	Alm No2 Cutoff			Mtsnsr Vel	Snsr Fact Offst		Test mA		Status Code5	
Flow Rspns Val	Anlg mA No 1 Fsd			Alm No1 Mtsnsr	Alm No2 Mtsnsr				Snsr Fact Wav		Test Vel		Status Code6	
Flow Slow Time	Anlg mA No 1 Zero			Alm No1 Hi	Alm No2 Hi				Auto Vel Zero		Test Alm		Status Code7	
Flow Vary Limit				Alm No1 Lo	Alm No2 Lo				Fact Cpy					
Flow Step Value				Alm No1 Anlg	Alm No2 Anlg				Snsr Vel Pnt1					
Flow%				Alm No1 Pls	Alm No2 Pls				Snsr Vel Fact1					
Flow Cutoff									Snsr Vel Pnt2					
									Snsr Vel Fact2					
									Snsr Vel Pnt3					
									Snsr Vel Fact3					

Item	**R/W**	Data range	Unit	Default value	Explain
Filter Switch	W			0	Reserved
Mtsnsr Vel	w		M/s	20	As for the noise limit of empty pipe, when the flow speed measured by the meter exceeds the value, it is considered as an interference signal, and meanwhile, the meter is enabled to keep the output zero;
Mtsnsr VelH	w			2.5	Upper limit of empty pipe measurement
Mtsnsr VelL	w			0.6	Lower limit of empty pipe measurement
Auto zero	w			0	1: Automatic zero setting for one minute; 2: Remove the original zero point value; (the parameter automatically sets to zero after the instrument completes the zero setting)
Fact Cpy	w			0	19: Instrument performs parameter backup
Comm Mode	w			2	0: RS232; 1: RS485; 2: HART
Device Code	w			1	Internet address of RS485/ Equipment ID of HART
Baud Rate/Addr	w			0	Communication rate of RS485/Short frame address of HART
Write Protect	w			0	Write protection
Header Num	w			5	Quantity of lead code
Status Code 17	R				Reserved

3. Parameter Settings

Before the electromagnetic flowmeter is used, its operating parameters shall be set. The operating parameters have been set during the actual flow calibration before delivery, and shall be modified with the changes in actual service conditions.

The methods for setting the operating parameters of the instrument are described as follows:

3.1. Functions of main keys for PC and SIC manual operators:

Before introducing the use of PC and SIC manual operators to set instrument parameters, the specific usage and operation of some operation keys of PC and SIC manual operators in setting instrument operating parameters will be introduced first.

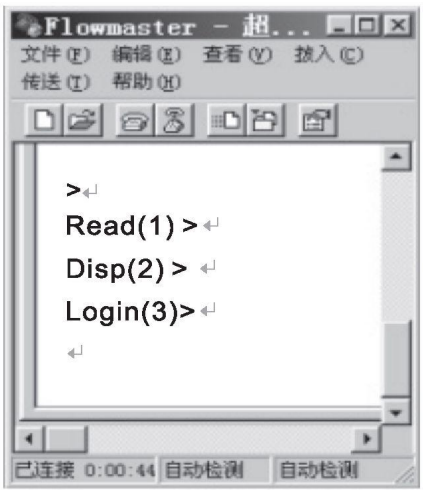
(1) Function of ENTER key (or entry, execution, etc.) Enter↵

A. Scroll through the HyperTerminal window to display the main menu or submenu.

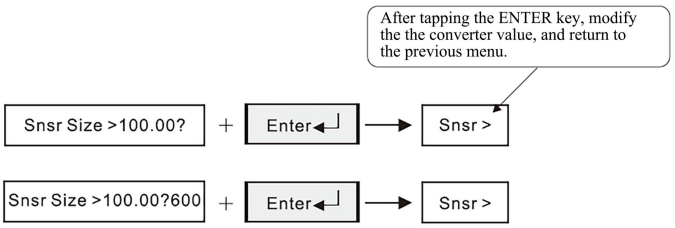
(Repeatedly tap the ENTER key to display the items under the menu)

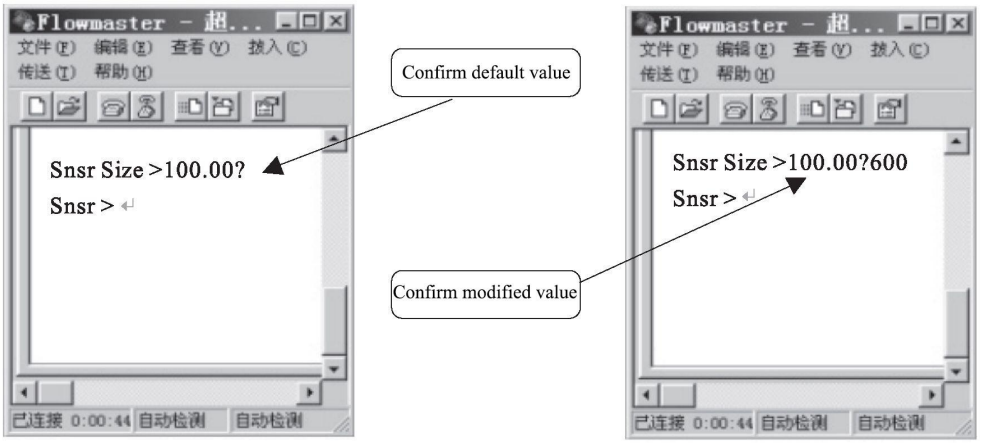






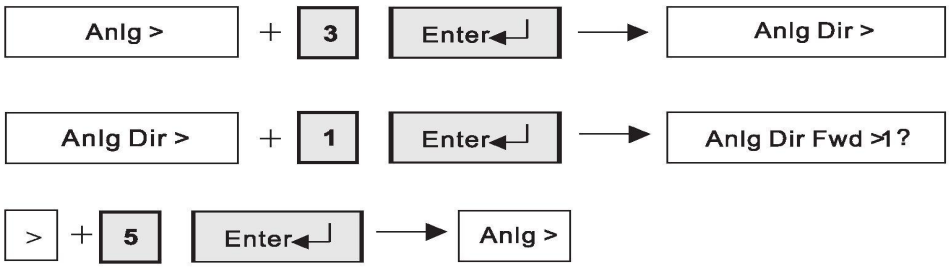
B. Determination after modifying operating parameters

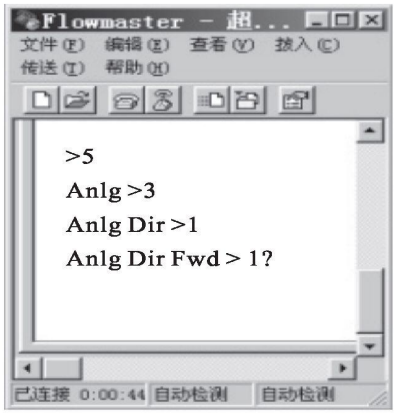




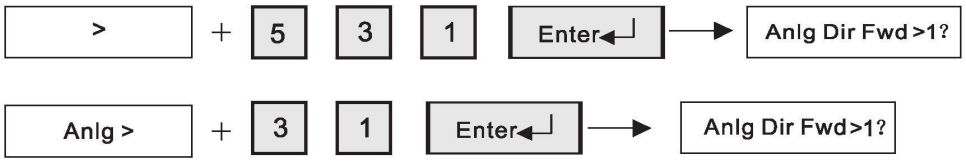
(2) Numeric key or letter key + ENTER key [1] [Enter↵]

A. Type the keywords (letters or numbers) corresponding to each menu item name and enter its next level menu.





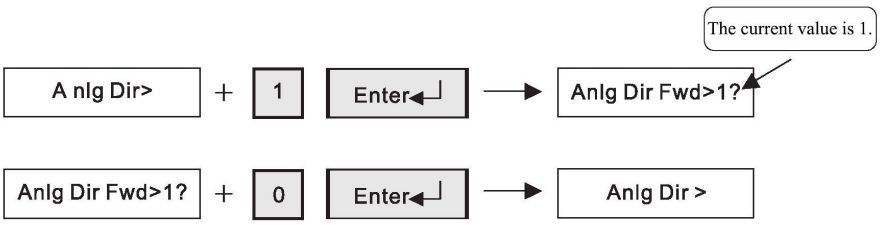
B. Type a combination of keywords in the menu at all levels as a shortcut.

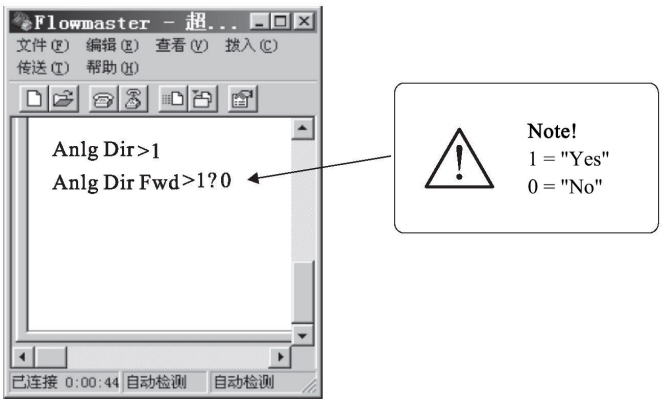






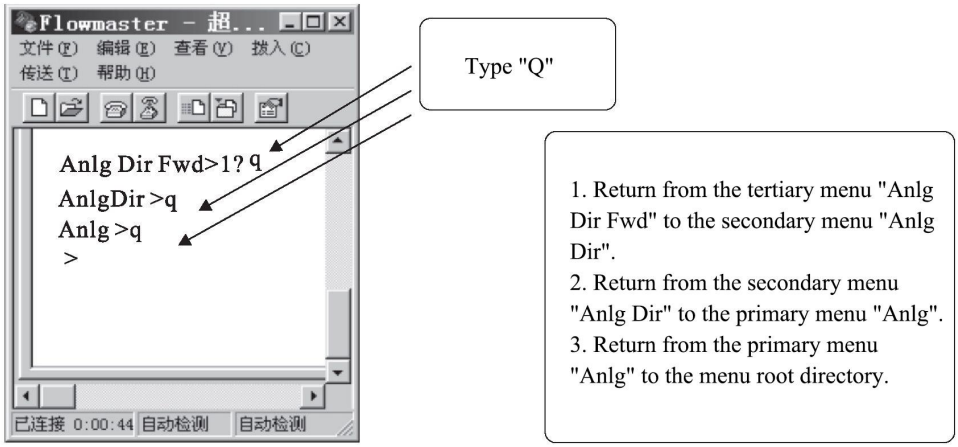
C. Execute the command item and display the current value. "?" indicates that the current value can be modified; and type the desired value behind "?".





(3) Q key + ENTER key [Q] [Enter] (return from the current menu to the previous menu)

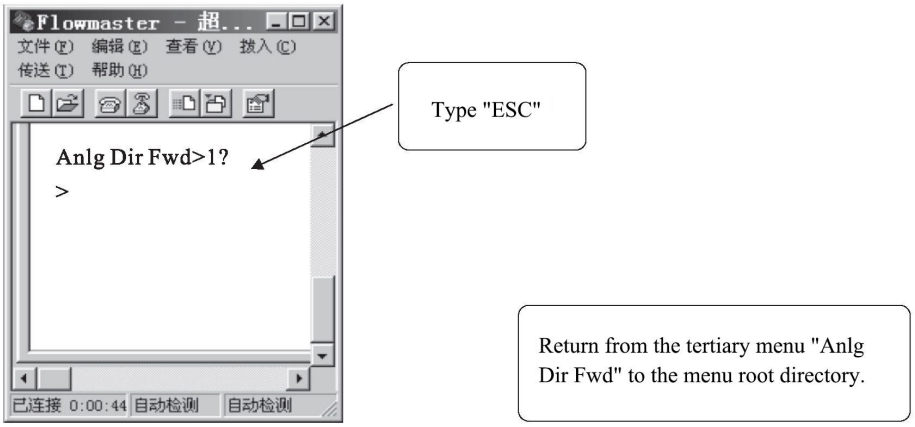




(4) Exit button

A. Return to the command window from any level of menu.

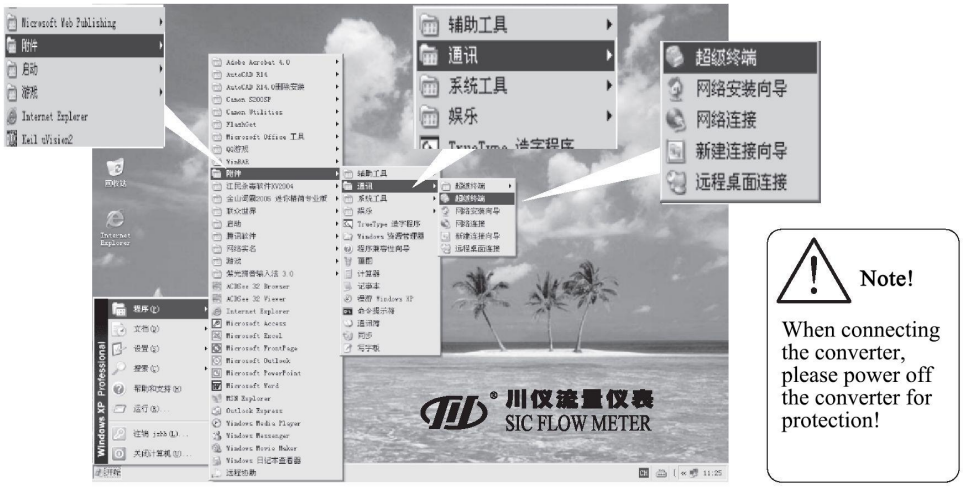




3.2. Usage of PC HyperTerminal

After the converter, sensor and power supply are connected, the converter port shall be connected to the PC port by a 9-pin serial cable. (The necessary setup of the communication protocol is also required for the smooth transmission of data. The method is as follows:)

(1) Click "Start" and find "HyperTerminal" in the menu.

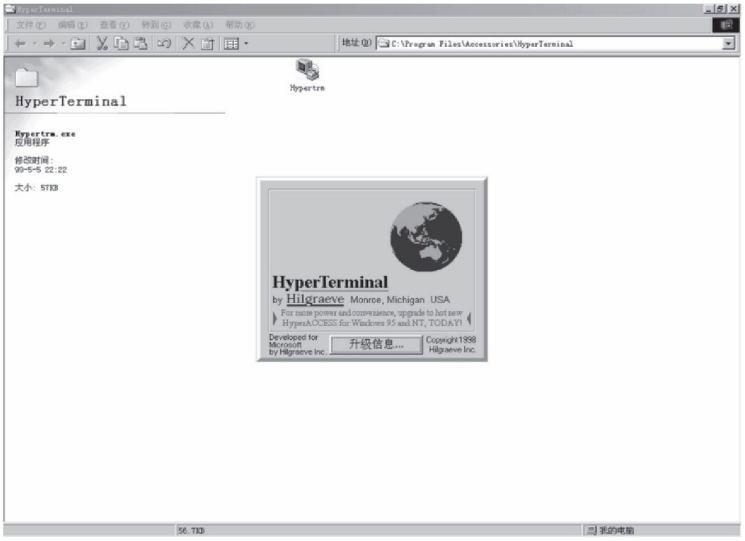


Note!

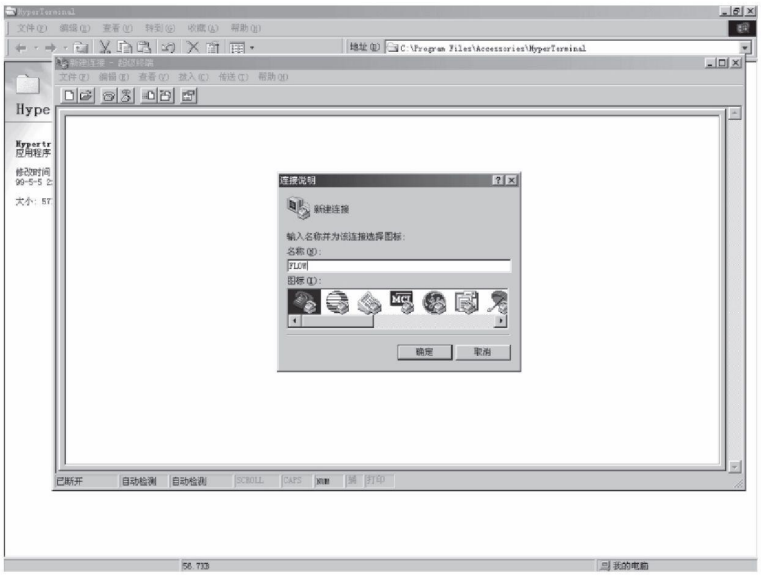
When connecting the converter, please power off the converter for protection!



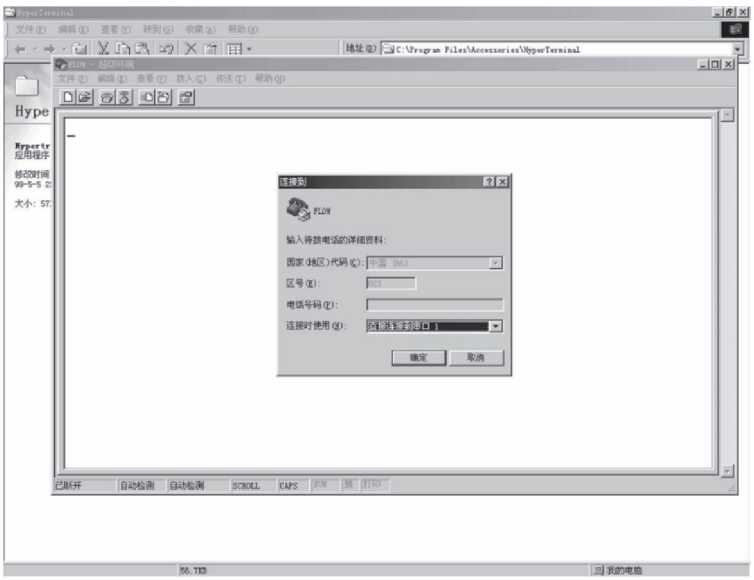
(2) Open the "HyperTerminal".



(3) Enter the name of new connection.

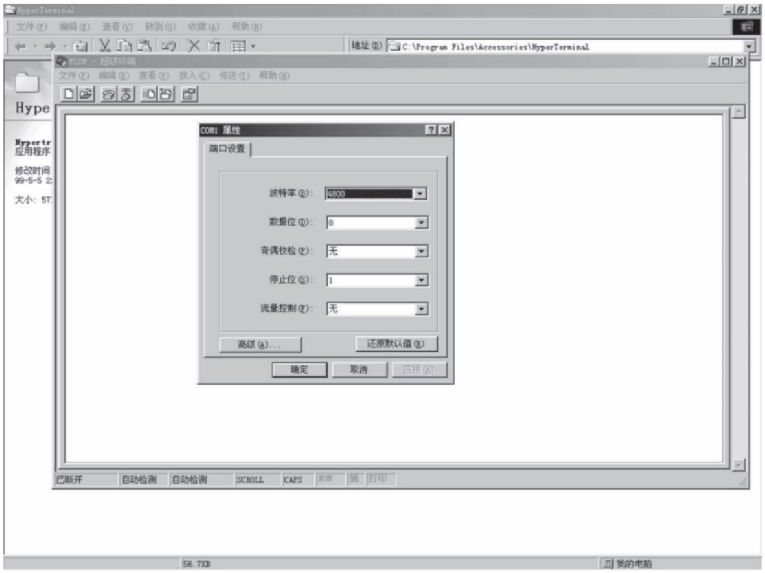


(4) Select the serial port (COM1, COM2) used for connection.



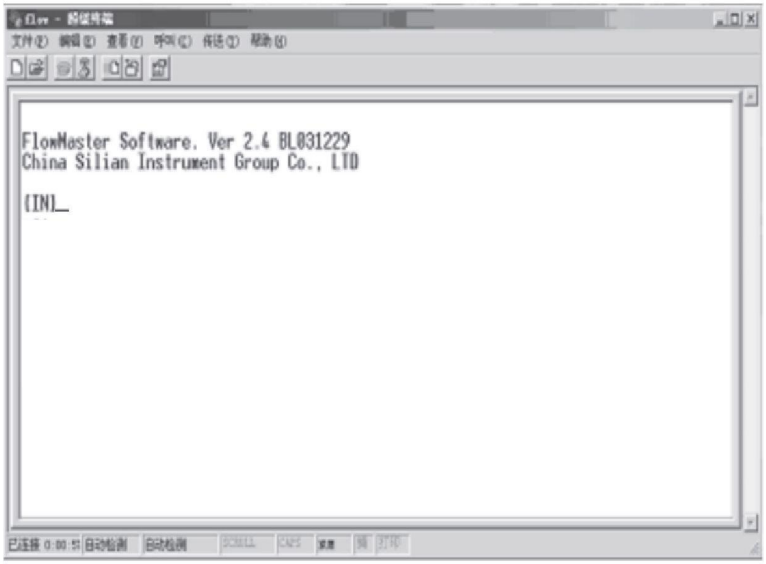
Note:
There are generally 2 serial ports behind the PC chassis, and only when the selected serial port matches the serial port connected to the converter can the normal communication state be entered.

(5) Set port properties



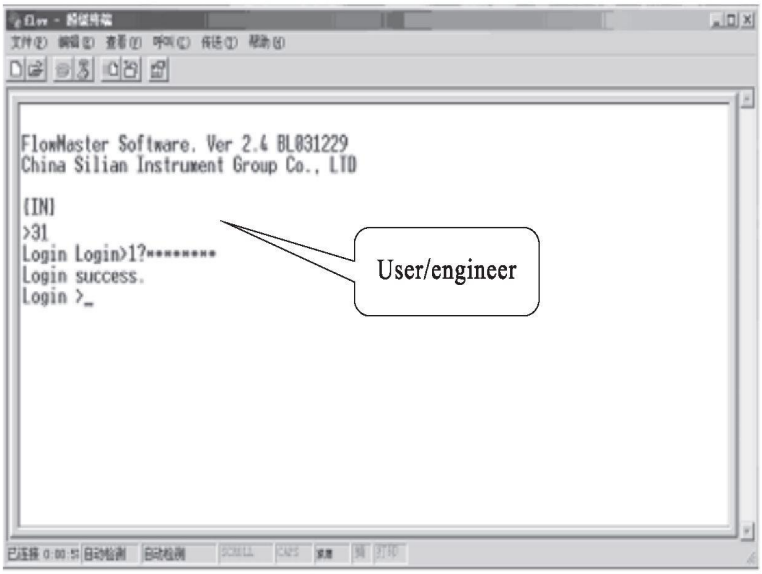
Baud rate: 4800 bps, 8 data bits, no parity check, 1 stop bit, no data flow control

(6) Enter the normal connection state



After connecting each data cable, turn on the power supply of the converter, and the PC terminal will automatically search for the port. Wait for a moment, and when the PC discovers the device, the Flowmaster logo will appear on the terminal window. Later, the cursor will stay behind {IN}.

(7) Log in, and enter the normal communication state.

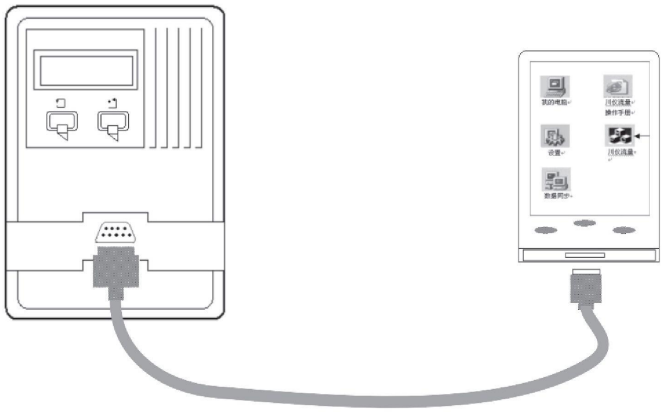


Esc key → Enter 31 → Enter key → Enter user/engineer → Enter key

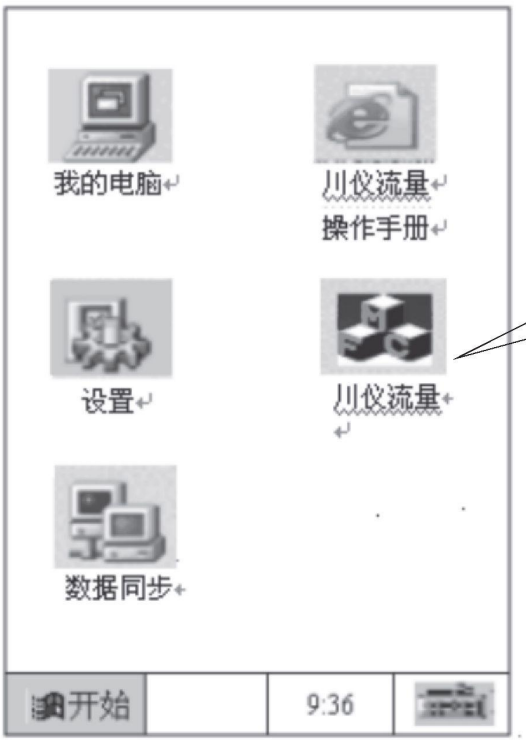
At this time, press ESC key, when ">" appears in the window, log in.

The interface after correct login is shown in the above figure. Press "ESC" to enter parameters according to the command in the above chapter "Operating Parameters".

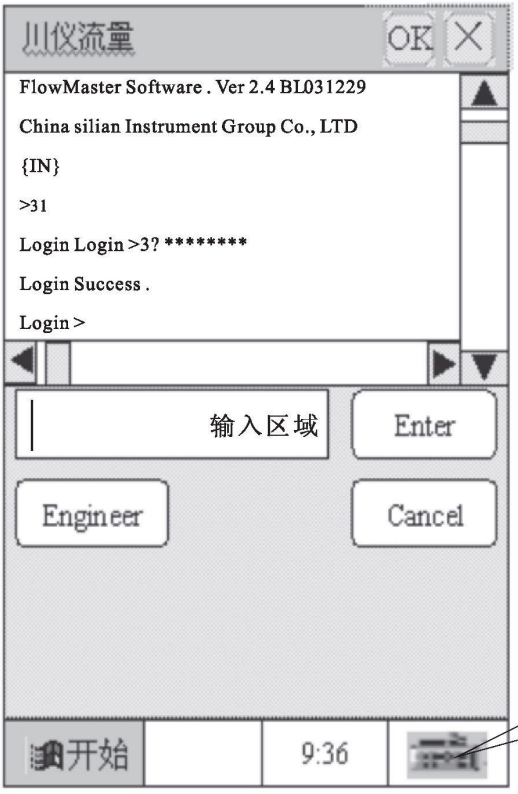
3.3. Login of manual operator



Connect the RS-232 interface on the converter to the manual operator interface by using the data cable provided on the manual operator.



Turn on the power supply of the manual operator, and the screen on the left will appear. Click the icon of "Chuanyi Flowmeter" on the screen with an electronic pen equipped on the manual operator.

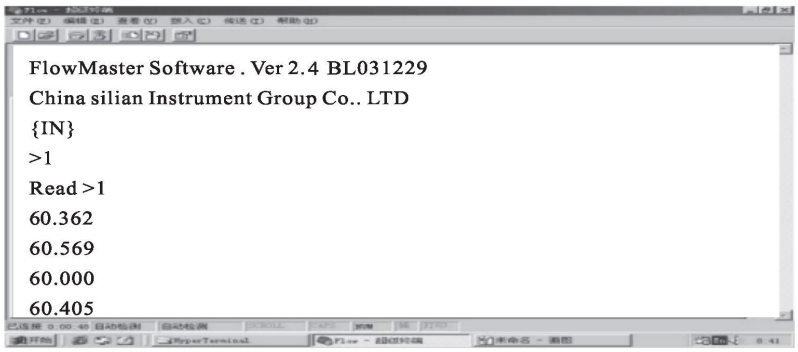


After entering the program, the manual operator will automatically search for the port. When the device is discovered, the "FlowMaster…" logo will appear on the terminal window. Later, the cursor will stay behind {IN}. At this point, you can follow the PC login method and enter "user/engineer" to log in.

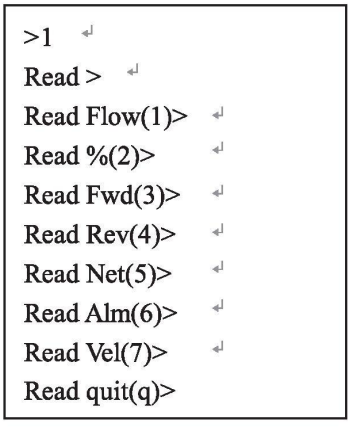
Click on the small icon in the bottom right corner of the window interface to pop up the keyboard.

Examples of common commands:

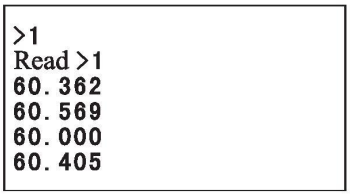
(1) Display the instantaneous flow with the PC or manual operator.



The above figure shows the instantaneous flow of the measured fluid displayed on the PC or manual operator. If users want to view the instantaneous flow of the measured fluid, they can follow the following steps:



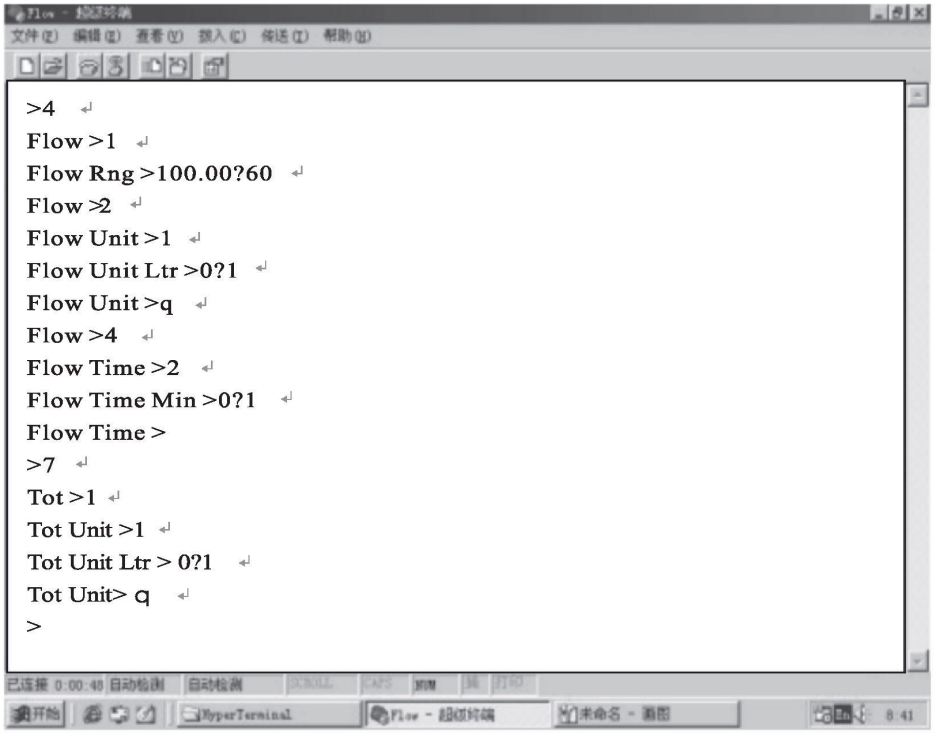
• The cursor will stay behind {IN}. At this time, tap the ESC key, and ">" will appear in the window.
• Type the command word "1" behind ">" and press the "ENTER" key to enter the primary menu "Read>"..
• Repeatedly tap the "ENTER" key to scroll through the secondary menu under the primary menu "Read>".



• Type "1" in the menu root directory and press "ENTER" .
• On the flow display interface in the left figure, the following operations can be performed:
1. The size of the window on the PC terminal can be adjusted at will to facilitate users to read flow data.
2. Users can tap the ENTER key at any time to exit data collection and return to the current menu.

(2) Use the PC or manual operator to check or modify the flow range and its unit (instantaneous flow unit/total flow unit).

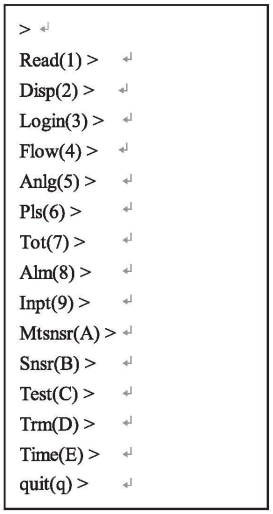
For example, set the flow range to 60 Ltr/Min (default unit: m^3/h).

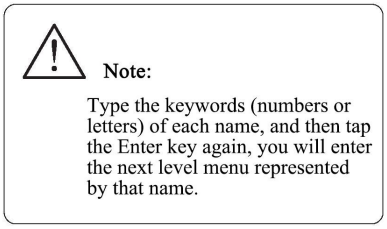


Log In:

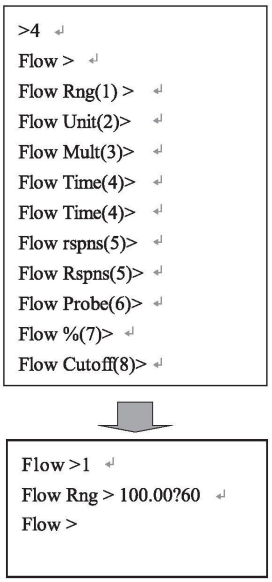
```
FlowMaster Software .Ver 2.4BL031229
Chinasilian Instrument Group Co.. LTD
{IN}
>31
Login Login >1?****
Login >
>
```

After connecting each data cable, turn on the power supply, and the PC terminal will automatically search for the port. Wait for a moment, and when the PC discovers the device, the Flowmaster logo will appear on the terminal window. Later, the cursor will stay behind {IN}. At this point, you can tap the ESC key and log in when ">" appears in the window (as shown in the left figure).





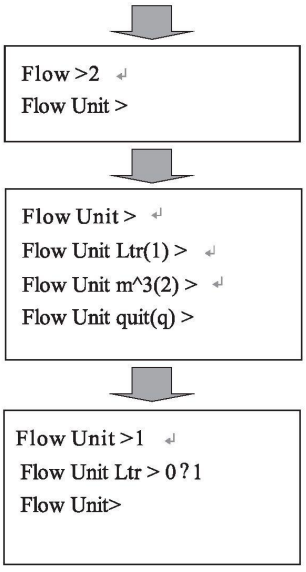
Range setting:



The range setting is complete. Users can press the "ESC" to return to the menu root directory, or follow the following steps to set the flow unit.

Flow unit setting:

Volume:

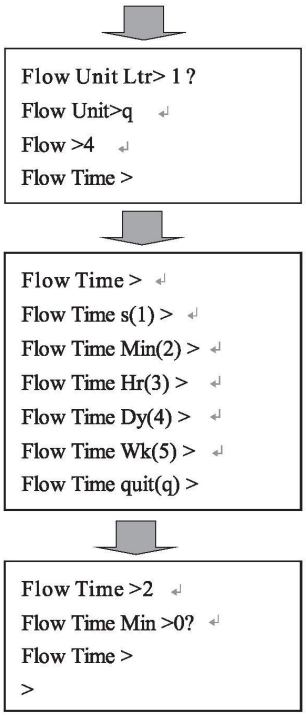


Type "2" behind the primary menu and press the "ENTER" key.

Type "1" and tap the "ENTER" key to enter the tertiary menu "Flow Unit Ltr>0?".

Type "2" behind the primary menu "Flow Unit Ltr>0?" and press the "ENTER" key to set the volume unit set to L, and return to the secondary menu "FlowUnit>"; type "0" and press the "ENTER" key to indicate that the volume unit L is still m^3 without modification, and return to the secondary menu "Flow Unit>".

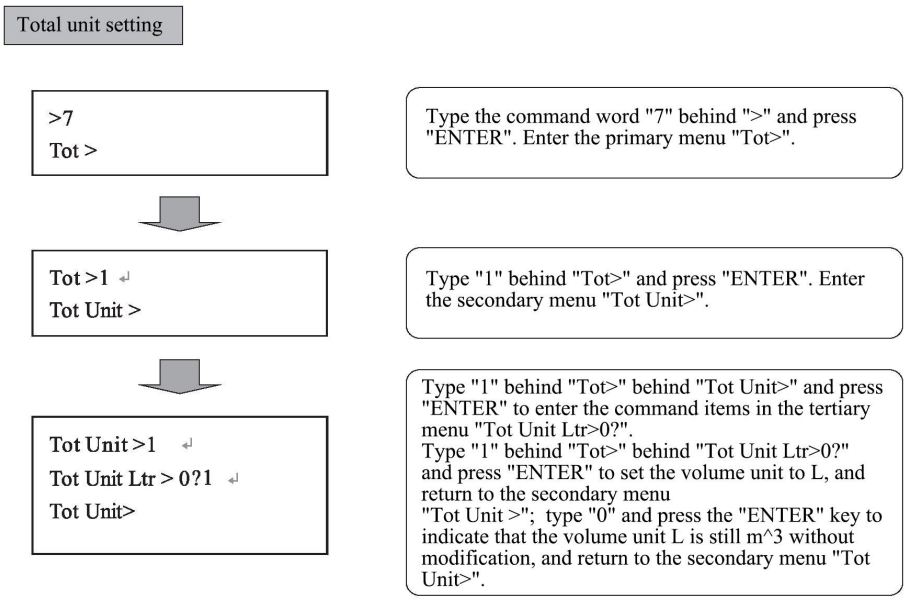
Time:



Type "q" behind the secondary menu "Flow Unit>" and press "ENTER" to return to the primary menu "Flow>". Then, type "4" and press the "ENTER" key to enter the secondary menu "Flow Time>".

You can use the "ENTER" key to view menu items and keywords, or directly enter keywords and press the "ENTER" key to enter the desired menu item.

Type "2" behind the secondary menu "Flow Time>" and press "ENTER" to enter the tertiary menu "Flow Time Min>0?". Type "1" and press "ENTER" to confirm. The system will automatically modify its time unit to Min and return to the secondary menu "Flow Time>". At this point, you can press the "ESC" key to return to the root state. The time setting is complete. The range is set to 60 L/Min.



3.4 Operation of MODBUS (RS485) communication protocol

Flow Master electromagnetic flowmeter provides remote microcomputer (PC, IPC and PLC) to realize the system programming, data acquisition and field monitoring of flowmeter via RS-485 digital interface.

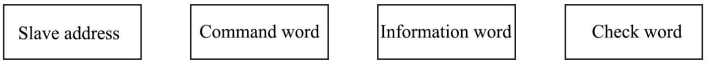
Including instantaneous flow rate, forward total, reverse total, net total, flow rate percentage, current, frequency, alarm, etc. Its features are as follows:

- RS-485 digital interface (differential, half-duplex)
- Electric power pulse output, open-collector optocoupler output
- Settable communication parameters (address, baud rate and data format)

3.4.1 Analysis of MODBUS communication protocol:

MODBUS protocol is a master-slave point-to-point communication protocol. It is divided into RTU protocol and ASCII protocol. ModBus RTU communication protocol is applied to several kinds of our instruments because it allows the data communication between one master and several slaves; in the communication system, the mater is microcomputer (PC, IPC or PLC) and slaves are Flow Master electromagnetic flowmeters. In the decentralized communication system, the system is allowed to connect up to 128 instruments and the communication distance is 1.2KM. The communication mode is that a slave responds to the request of a master, that is to say, a master makes a command request and a slave receives and analyzes the data in response to the request. If the data meets the requirement of the communication protocol, the slave makes a data response.

Every data frame sent by the master-slave communication host contains the following information (hex system):



Slave address (1 byte): Slave device number. The master identifies the slave device for communication from the slave address. This indicates the slave with user-set address will receive the message sent by the master. Every slave must have unique address code, and only the slave corresponding to the address code can send back a response.

Command word (1 byte): The function code sent by the master tells the slave which task has to be executed.

Information word (N bytes): Including data addresses, data length and data information used in communication between two devices.

Check code (2 bytes): Cyclic redundancy code (CRC16) used for detecting the data communication error.

Note: A data address/length has 2 bytes, and data information has N bytes.

The read point (holding register) can be operated by way of communication command. The holding register is a 16-bit (2 bytes, i.e., 1 word) value, with the lower bit preceded by the higher one. In this way, the data area in the register is expressed by word address. The master must send a command to the register in the form of word (via WORD address). The Modbus communication system is predominated by word communication. Refer to examples. This meter supports word address rather than byte address.

3.4.2 Application of digital interfaces

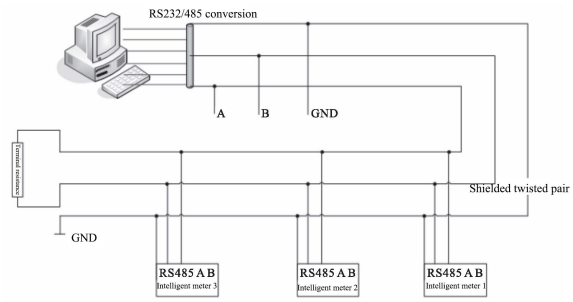
(1). Setting of communication parameter: The following communication parameters can be set from the programmable keyboard on the instrument.

Instrument address: Set the slave (instrument) address number in the communication network to 1~247. (Default 1)

Communication speed: Set the communication speed in the communication network to 4800/9600/14400 /19200/38400/57600bps (baud rate, optional) (default 9600).

Data format: The data format in the communication network is fixed to 1 start bit, 8 data bits, 1 stop bit and 0 check bit.

(2). Network connection: Connect the communication lines (RS485: A+, B-) on the instrument



Note: It is recommended to use shielded twisted-pair cables as connecting lines. Every twisted-pair cable shall be earthed from both ends to reduce the field interference. The reflective interference can be reduced by increasing the terminal resistance (Z0=120Ω). It is recommended to connect the lines when the communication speed is fast (>9600) or the communication distance is far (>700m).

(3). Communication test using communication test software

Communication (including instrument programming and data acquisition) can be realized after connecting communication interfaces (RS232/485), communication lines and meter, running the test software ModScan / Modbus Poll, and setting the parameters correctly.

(4). Packet format description

Command 03H: Read N bytes.

Master's request: Address command, data address, data length, check code

Slave's response: Address command, data length, data information, check code

(5). Example:

Problem 1: Read 2 data, flow velocity and flow rate, from the flowmeter with Address No. 2.

Solution: Select correct communication parameters according to data address list and command 3. Application of word communication mode:

Master's request: 02H 03H 00H 00H 00H 04H 44H 3AH

Slave's response: 02H 03H 08H BYTE1 BYTE2 BYTE3 BYTE4 BYTE5…CRC16

Note: From data address list, it is known that the WORD address of current parameter is 0, i.e., 0000H. The data to be read is 4×2 BYTE data, meaning that the data length is 0004H. 44H3AH is CRC16 code.

The data sent back is 8-byte data, including flow rate (BYTE1, BYTE2, BYTE3 and BYTE4) and flow (BYTE5, BYTE6, BYTE7 and BYTE8). Its meaning meets the requirement of the data specification for float-point number format in IEEE-754.

Problem 2: Set the range of the meter with Address No. 1.

Solution: Calculate the range = 200.000 (43H 48H 00H 00H) and select the parameter according to the address list:

Master's request: 01H 10H 00H 14H 00H 02H 04H 00H 00H 43H 48H F0H C5H

Slave's response: 01H 10H 00H 14H 00H 02H 01H CCH

Note: From data address list, it is known that the range address is 0014H, the total WORD length of data is 0002H (BYTE length: 04H) and the content of input data is 43480000H. F0H C5H is CRC16 code.

(6). Description of IEEE-754 data format:

Float is consistent with IEEE-754. It has 7 significant figures in the decimal system. Float type data occupies four bytes (32-bit binary number). Such data in the memory are stored in the following form:

Byte address	+0	+ 1	+2	+3
Content of float-point number	S EEEEEEE	E MMMMMMM	MMMMMMMM	MMMMMMMM

Where: S: sign bit, 0: +, 1: -. E is a level code. It occupies an 8-bit binary number. It is stored in two bytes. Note: The value of level code E is the exponent of 2 plus an offset (127). The purpose is to avoid a negative value of level code, but the exponent can be either positive or negative. The normal range of level code E is 1~254, but the actual range is -126~+127. M is the decimal part of mantissa represented by 23-bit binary number which is stored in three bytes. The integral part of mantissa is 1 forever. It is not stored but indeed exists. The decimal point follows the implicit integer bit “1”. The range of one float-point number is (-1) S×2E-127×(1.M).

For example, when the master reads flow velocity data, it can be known from the address table that flow velocity address is 0

(0000H), with a length of 2 (0002H).

Master: 01H 03H 00 00H 00 02H C4 0BH

Slave: 01H 03H 04H 00 00 C1 48H ABH 95H

Among them, 00 00 C1 48 is the communication format of current flow rate data, and the size is -12.5

(According to IEEE754 format, it should be C1 48 00 00H). ABH and 95H are the low bit and high bit of check code CRC16 respectively.

(7). Introduction to check code algorithm:

The cyclic redundancy code CRC16 can be calculated according to the following algorithm flow chart. BYTE is the data code of each frame from beginning to end (Note: The high bit of CRC16 is preceded by low bit).

Example:

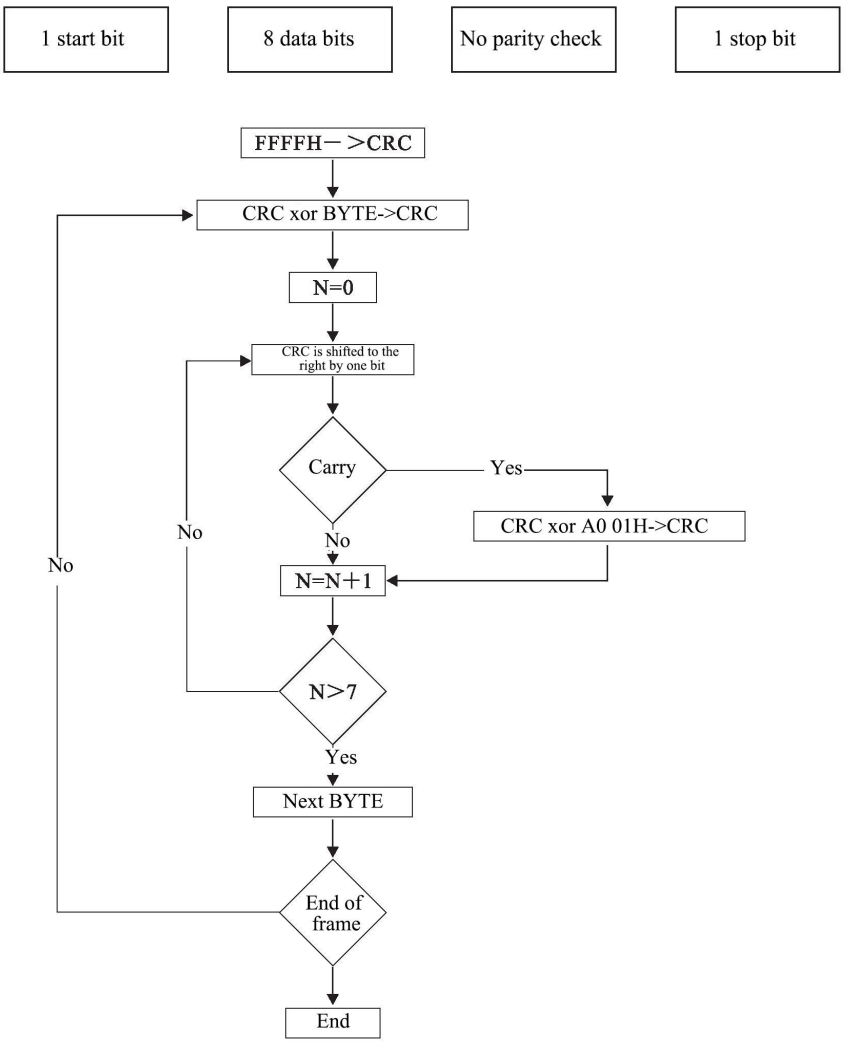
The master requests 01H 03H 00 00H 00 02H C4 0BH

The slave answers 01H 03H 04H 00 00 C1 48HABH 95H

Meaning: Read the next four bytes of data with instrument number 1 and flow rate address starting from 0, that is, flow rate data. The check code of the transmitted information frame is C4H 0BH, and the address, command, data length and information code sent back by the slave are

00 00C1 48H. After the high and low register positions are exchanged, the known flow rate is calculated by IEEE-754 = -12.5.

(8). Introduction to character transmission:



Appendix: Address list

Flow Meter (MODBUS)					
SIC Protocol Address		Name of variable	Operation	Property	Functions
40001	0x0000	Read Vel	c,r	Floating point	Flow speed
40003	0x0004	Read Flow	c,r	Floating point	Flow rate
40005	0x0008	Read Fwd_F	c, r, w	Floating point	Decimal part of forward total
40007	0x000C	Read Fwd_L	c, r, w	Long integer	Long integer part of forward total
40009	0x0010	Read Rev_F	c,r, w	Floating point	Decimal part of reverse total
40011	0x0014	Read Rev_L	c, r, w	Long integer	Long integer part of reverse total
40013	0x0018	Read Net_F	c,r	Floating point	Decimal part of net total
40015	0x001C	Read Net_L	c,r	Long integer	Long integer part of net total
40017	0x0020	Read Per	c,r	Floating point	Flow percentage
40019	0x0024	Read Cur	c,r	Floating point	Current
40021	0x0028	Read Pul	c,r	Floating point	Frequency
40023	0x002C	Read MtEm	c,r	Floating point	Resistance value
40025	0x0030	Read Rspn	c,r	Floating point	Rate of change
40027	0x0034	Start address of changed parameter	c,r	(U) integer	Initial address of the modified parameter
40028	0x0036	Length of changed parameter	c,r	(U) integer	Length of the modified parameter
40029	0x0038	Read Ahn	c,r	(U) integer	Alarm
40030	0x003A	Snsr Status	c,r ,w	(U) integer	Meter status
40031	0x003C	Flow Rng	r/w	Floating point	Range
40033	0x0040	Anlg No2	r/w	Floating point	Second range
40035	0x0044	Test Flow	r/w	Floating point	Test flow value
40037	0x0048	Anlg Fsd	r/w	Floating point	Current output full-scale value
40039	0x004C	Anlg Zero	r/w	Floating point	Current output zero value
40041	0x0050	Pls Fact	r/w	Floating point	Frequency coefficient
40043	0x0054	Pls Max	r/w	Floating point	Frequency upper limit
40045	0x0058	Snsr Fact Lout	r/w	Floating point	Coefficient 1
40047	0x005C	Snsr Fact offset	r/w	Floating point	Coefficient 2
40049	0x0060	Flow Probe Ins	r/w	Floating point	Insertion coefficient
40051	0x0064	Flow Probe Prof	r/w	Floating point	Insertion coefficient
40053	0x0068	Trm Vf	r/w	Floating point	Magnification
40055	0x006C	Tnn Vz	r/w	Floating point	Zero drift

40057	0x0070	Flow Rspns Thr	r/w	(U) integer	Damping threshold of flow rate
40058	0x0072	Flow Vary Limit	r/w	(U) integer	Change rate threshold of flow rate
40059	0x0074	Flow Step Value	r/w	(U) integer	Step value
40060	0x0076	Snsr Size	r/w	(U) integer	Sensor diameter
40061	0x0078	Pls Size	r/w	(U) integer	Frequency width
40062	0x007A	Alm Trip Hi	r/w	(U) integer	Upper limit alarm point
40063	0x007C	Alm Trip Lo	r/w	(U) integer	Lower limit alarm point
40064	0x007E	Alm Hyst	r/w	(U) integer	Space for acknowledgement of receipt
40065	0x0080	Mtsnsr Empty	r/w	(U) integer	Setting value of empty pipe
40066	0x0082	Coil Save	r/w	(U) integer	Excitation protection
40067	0x0084	Password	w	(U) integer	Password
40068	0x0086	Anlg mANo1 Fsd	r/w	Integer	1-channel current full-scale correction
40069	0x0088	Anlg mANo1 Zero	r/w	Integer	1-channel current zero correction
40070	0x008A	Anlg mANo2 Fsd	r/w	Integer	2-channel current full-scale correction
40071	0x008C	Anlg mANo2 Zero	r/w	Integer	2-channel current zero correction
40072	0x008E	Snsr No	r/w	String	Instrument No.
40077	0x0098	Disp Res	r/w	Byte	Bit of decimal point
	0x0099	FlowRspnsRspns1	r/w	Byte	Damping coefficient 1
40078	0x009A	FlowRspnsRspns2	r/w	Byte	Damping coefficient 2
	0x009B	Flow Cutoff	r/w	Byte	Small signal excision
40079	0x009C	Mtsnsr Intvl	r/w	Byte	Empty pipe detection interval
	0x009D	Snsr Tag	r/w	Byte	Pos. No.
40080	0x009E	Snsr Fact Wave	r/w	Byte	Waveform selection
	0x009F	Flow Slow Time	r/w	Byte	Flow rate response time
40081	0x00A0	Net Meter No	r/w	Byte	Network No.
	0x00A1	Baud Rate	r/w	Byte	Baud rate
40082	0x00A2	Current Alm	r/w	Byte	4-20mA alarm output
	0x00A3	Time Set H	r/w	Byte	Unused
40083	0x00A4	Time Set M	r/w	Byte	Unused
	0x00A5	BitBlock1	r/w	Byte	Bit block 1
40084	0x00A6	BitBlock2	r/w	Byte	Bit block 2
	0x00A7	BitBlock3	r/w	Byte	Bit block 3
40085	0x00A8	BitBlock4	r/w	Byte	Bit block 4
	0x00A9	BitBlock5	r/w	Byte	Bit block 5
40086	0x00AA	BitBlock6	r/w	Byte	Bit block 6
	0x00AB	BitBlock7	r/w	Byte	Bit block 7
40087	0x00AC	BitBlock8	r/w	Byte	Bit block 8

Snsr Status (meter status)

LSB.O	Port Flag	c,r	Bit	Port status
LSB.1	RESET Flag	c,r	Bit	Program reset identification
LSB.2	Ram Flag	c,r	Bit	Memory status identification
LSB.3	EEPROM Flag	c,r	Bit	EEPROM status identification
LSB.4	AD7715_SigErrFlag	c,r	Bit	AD7715 status identification
LSB.5	Mtsnsr Crl Flag	c,r	Bit	Empty pipe control identification
LSB.6	Debug Reset	r/w	Bit	Parameter reset
LSB.7	Test Data Out	r/w	Bit	Digital output test
MSB.0	Tot Clr	r/w	Bit	Total quantity resetting
MSB.1	LOCAL OP ENA	r/w	Bit	Local enable

Read Alm (alarm status)

LSB.0	Mtsnsr Alm	c,r	Bit	Empty pipe alarm
LSB.1	Fwd Alm	c,r	Bit	Forward alarm
LSB.2	Rev Alm	c,r	Bit	Reverse alarm
LSB.3	Cut Alm	c,r	Bit	Small signal excision alarm
LSB.4	Hi Alm	c,r	Bit	Flow upper limit alarm
LSB.5	Lo Alm	c,r	Bit	Flow lower limit alarm
LSB.6	Anlg Alm	c,r	Bit	Current over-limit alarm
LSB.7	Pls Alm	c,r	Bit	Frequency over-limit alarm
MSB.0	Coil Alm	c,r	Bit	Excitation alarm

BitBlock1				
Position 0	Flow Unit Ltr	r/w	Bit	liter
1-bit	Flow Unit M3	r/w	Bit	cubic meter
2-bit	Flow Unit Igal	r/w	Bit	Unused
3-bit	Flow Unit Ugal	r/w	Bit	Unused
4-bit	Flow Unit ft3	r/w	Bit	Unused
5-bit	Flow Mult m	r/w	Bit	×0.001
6-bit	Flow Mult c	r/w	Bit	×0.01
7-bit	Flow Mult	r/w	Bit	×1
BitBlock2				
Position 0	Flow Mult h	r/w	Bit	×100
1-bit	Flow Mult k	r/w	Bit	×1000
2-bit	Flow Mult M1	r/w	Bit	×1000000
3-bit	Flow Time S	r/w	Bit	Second
4-bit	Flow Time Min	r/w	Bit	Minute
5-bit	Flow Time Hr	r/w	Bit	Hour
6-bit	Flow Time Dy	r/w	Bit	Day
7-bit	Flow Time Wk	r/w	Bit	Week

BitBlock3				
Position 0	Anlg Dir Fwd	r/w	Bit	The calculated current direction is the same as the reference direction
1-bit	Anlg Dir Rev	r/w	Bit	The calculated current direction is opposite to the reference direction
2-bit	Anlg mANol Dir	r/w	Bit	Unused
3-bit	Anlg mANo2 Dir	r/w	Bit	Unused
4-bit	Pls Idle	r/w	Bit	Frequency output idle status
5-bit	Tot Unit Ltr	r/w	Bit	liter
6-bit	Tot Unit M3	r/w	Bit	cubic meter
7-bit	Tot Unit Igal	r/w	Bit	Unused
BitBlock4				
Position 0	Tot Unit Ugal	r/w	Bit	Unused
1-bit	Tot Unit ft3	r/w	Bit	Unused
2-bit	Tot Mult m	r/w	Bit	×0.001
3-bit	Tot Mult c	r/w	Bit	×0.01
4-bit	Tot Mult	r/w	Bit	×1
5-bit	Tot Mult h	r/ w	Bit	×100
6-bit	Tot Mult k	r/w	Bit	×1000
7-bit	Tot Mult M1	r/w	Bit	×1000000
BitBlock5				
Position 0	Tot Clr En	r/w	Bit	Enable total quantity resetting
1-bit	Alm Nol Idle	r/w	Bit	Status while idling
2-bit	Alm Nol En	r/w	Bit	Alarm output allowing
3-bit	AhnNol Coil	r/w	Bit	Field coil alarm
4-bit	Alm Nol Fwd	r/w	Bit	Forward flow
5-bit	Alm Nol Rev	r/w	Bit	Reverse flow
6-bit	Alm Nol Cutoff	r/w	Bit	Small signal excision
7-bit	Alm Nol Mtsnsr	r/w	Bit	Empty pipe
BitBlock6				
Position 0	Alm Nol Hi	r/w	Bit	The flow is higher than upper limit
1-bit	Alm Nol Lo	r/ w	Bit	The flow is lower than lower limit
2-bit	Alm Nol Anlg	r/w	Bit	Overlimit alarm of analog signal
3-bit	Alm Nol Pls	r/w	Bit	Overlimit alarm of pulse signal
4-bit	Alm No2 Idle	r/w	Bit	Status while idling
5-bit	Alm No2 En	r/ w	Bit	Alarm output allowing
6-bit	Alm No2 Coil	r/w	Bit	Field coil alarm
7-bit	Alm No2 Fwd	r/w	Bit	Forward flow
BitBlock7				
Position 0	Alm No2 Rev	r/w	Bit	Reverse flow
1-bit	Ahn No2 Cutoff	r/w	Bit	Small signal excision
2-bit	Alm No2 Mtsnsr	r/w	Bit	Empty pipe
3-bit	Ahn No2 Hi	r/w	Bit	The flow is higher than upper limit

4-bit	Alm No2 Lo	r/w	Bit	The flow is lower than lower limit
5-bit	Alm No2 Anlg	r/w	Bit	Overlimit alarm of analog signal
6-bit	Alm No2 Pls	r/w	Bit	Overlimit alarm of pulse signal
7-bit	Alm Scr	r/w	Bit	Alarm display
BitBlock8				
Position 0	Inpt Anlg	r/w	Bit	Range switching
1-bit	Inpt Clr	r/w	Bit	Total quantity resetting
2-bit	Inpt Hid	r/w	Bit	Flow rate maintenance
3-bit	Inpt Zero	r/w	Bit	Flow rate is zero
4-bit	Inpt Idle	r/w	Bit	Unused
5-bit	Test Mode	r/w	Bit	Test mode
6-bit	Current Alm	r/w	Bit	Alarm output

Notes:

1) The information in the address information list is classified into two types. One type is readable and rewritable (r/w) and programmable, while the other type is readable only (c, r) and acquirable.
2) The data length WORD accessed simultaneously does not exceed 122 (i.e. the byte length does not exceed 244Bytes).
   In order to facilitate access to a large amount of data, the save register addresses are allocated by data type.
   Note: A parameter shall be modified to consider its address, length and value.
3) Communication control & Communication parameter settings (address: 40081 MSB)

Communication control	Communication parameter settings
1 ~4	Baud rate selection 4800 9600 19200 38400

Note: The default baud rate is 4800bps.

Appendix:

The operation of "three-line display & Modbus (485) communication" is roughly the same as that of "three-line display & RS232 communication". Please refer to the user manual (three-line display & RS232 communication section) for related operations. The differences between the two are listed in the table.

Three-line display & Modbus (485) communication	Three-line display & RS232 communication
The "Meter No" menu item is used to set the network address of the current meter (default 1).	None
The "Baud Rate" menu item is used for baud rate setting	None
To exit the parameter modification interface: First press and hold the lower left button, and then press the upper right button to return to the main interface.	To exit the parameter modification interface: Press and hold the lower left button for 5m to return to the main interface.
The "Debug Reset" menu item is used to reset the mainboard parameters: If the "Debug Reset" menu item is set to 1, all parameters will be lost	None
"Local OPENA" is used as the local enable bit. When it is set to "1", the panel operation is invalid, and when it is set to "0", the panel operation is valid. To ensure data consistency, it is recommended to set the local enable bit to "1" during communication.	None

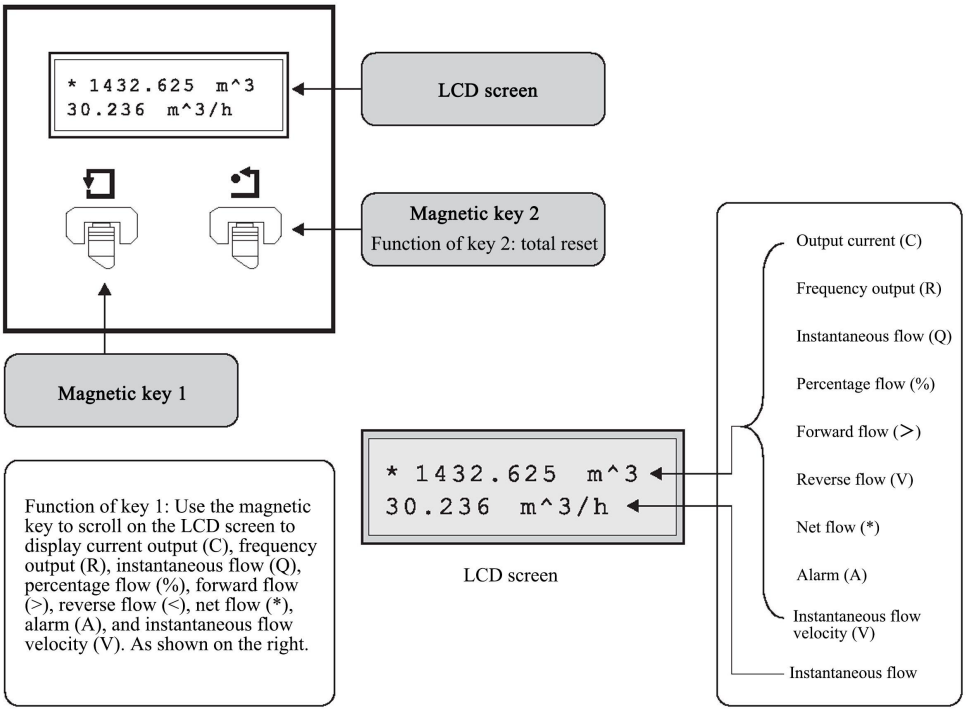
Password: It exists in the form of two levels of passwords: "02041" and "04121" (the above two levels are used by users).

"Baud Rate" exists under both passwords.

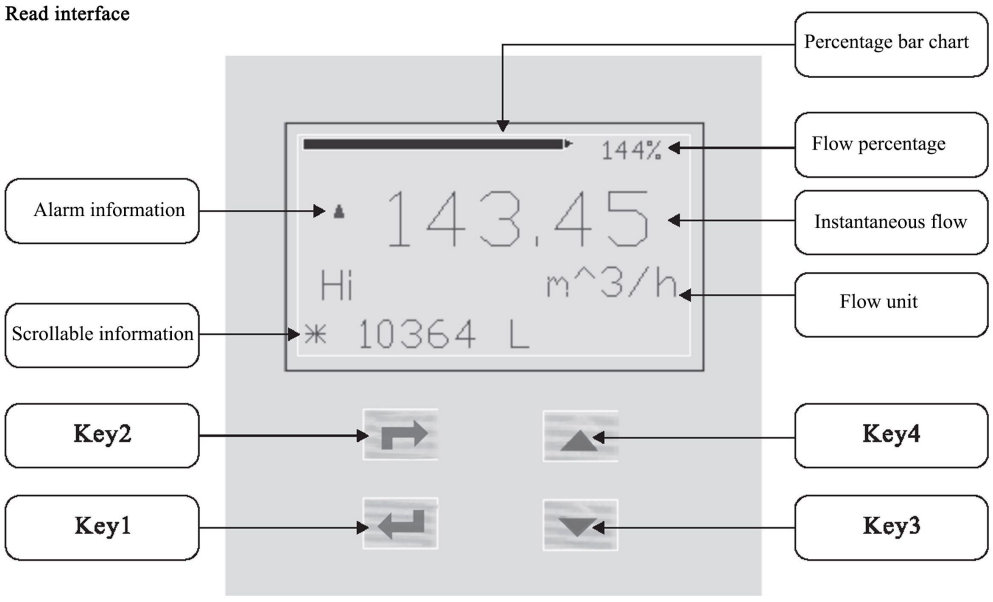
"Reset!" and "Meter No" only exist under "04121".

3.5 Operation for magnetic keys of the liquid crystal display screen of the converter

3.5.1 Instructions for two-line display



3.5.2 Instructions for three-line display



Through pressing ↵ key, following items may be displayed via rolling at the lowest side of screen:

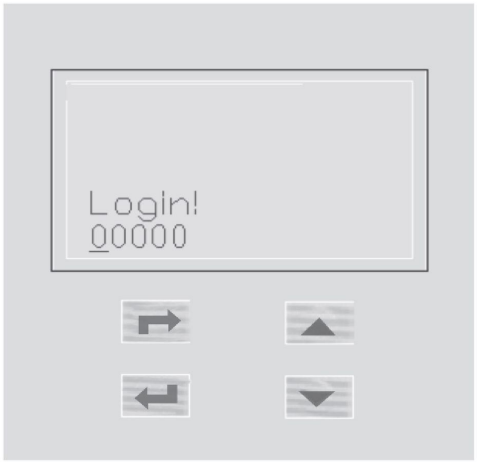
- ＞ Total forward flow
- < Total reverse flow
- *Net total quantity
- A: dynamic alarm information

  (If there are several alarm messages at the same time, all alarm messages will be displayed in succession. While normal, display 'None'.)
- V: flow rate
- Flow percentage (%)

Press the ▼ key to realize total quantity resetting

Note: The zero clearing condition is that the parameter 'TotClrEn' must be set as 1. (Parameter modification section will be interpreted later)

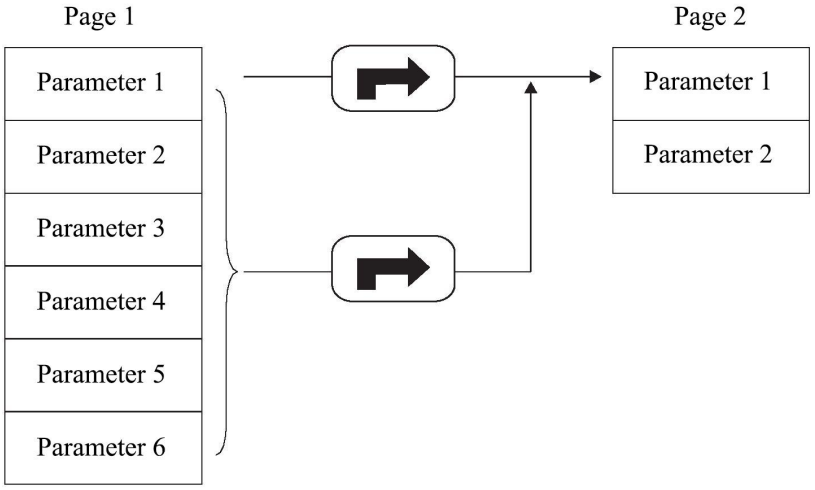
Press the ↵ key and switch to login interface (as shown in the figure below)



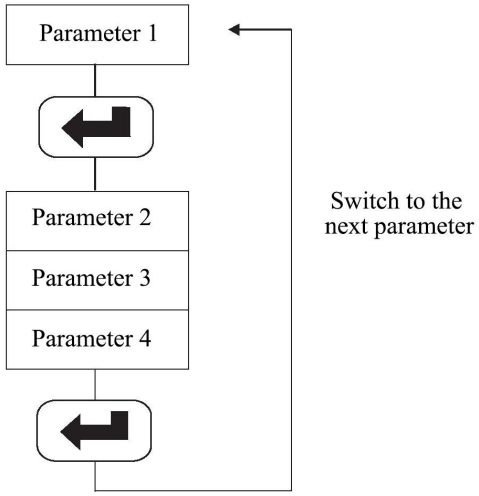
The user is required to input correct password here so as to enter the setting of parameter modifying on "Parameter Interface". If the input is incorrect, the display interface will switch back to original state (the problem on password setting is listed later)

Use method of keys

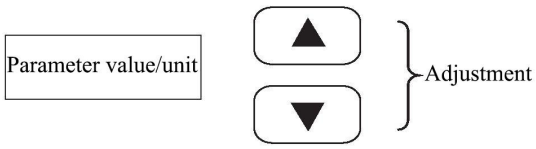
1) Display parameters on the next page:



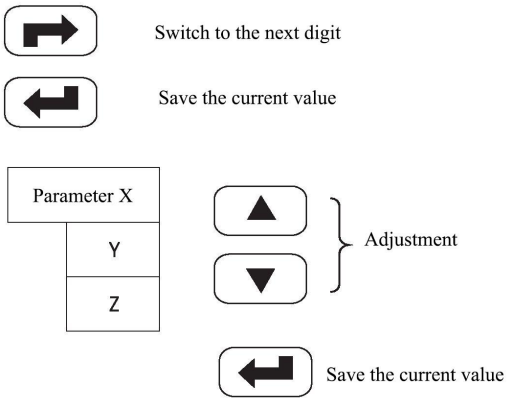
2) Switch between two parameters on the same page



3) Adjust and save the parameter value



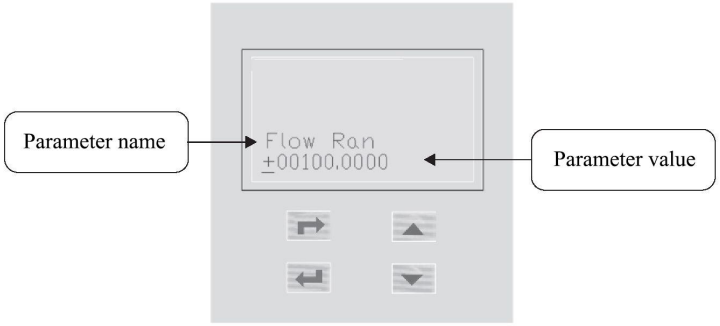
4) Select and save the parameter options





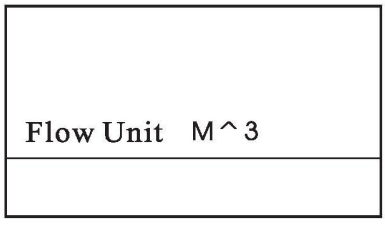
Press and hold ↵ first and then press ▲ simultaneously to exit the menu system and return to normal operation mode.

Parameter Settings



1) When certain parameter is selected and this parameter has one or several options,

(For example: the parameters of "Flow Unit" are Ltr, M^3)



"Flow Unit" M^3 parameter is selected

Press ▲ or ▼ to select unit.

> ⚠ Note: while ▲ or ▼ is pressed, the current unit symbol will flash.

Press ↵ to confirm the selected unit.

The selection for all parameter units is similar to this.

2) Modification for parameter value

(For example: "Flow Rng" value)

Flow Rng
+100.000

While positioning at "Flow Rng" location and pressing ▲ or ▼ key for first time, the flashing cursor may appear below the first-digit figure / symbol, which means that this digit may be modified. Use ▲ or ▼ to change the value of the current bit. Use → to make the cursor rotated right one digit to enable the next location become the revisable value. After the values on all locations are modified, press ↵ to confirm, and complete the modification.

3.5.3 Operation instructions for three-line magnetic key panel

The operation method of the **three-line magnetic key** panel is basically the same as that of ordinary three-line key, and the detailed setting method can be understood through the user manual. The differences between the two are illustrated below.



The function of M is the same as that of the ordinary three-line → key

The function of E is the same as that of the ordinary three-line ↵ key

The function of + is the same as that of ▲ key.

The function of − is the same as that of ▼ key.

To exit the menu: When the parameters are successfully set and it is necessary to exit the menu, press and hold Ⓔ for more than 5 seconds with a magnetic lock to exit the menu and return to the initial interface.

Part II: Plug-in Electromagnetic Flowmeter

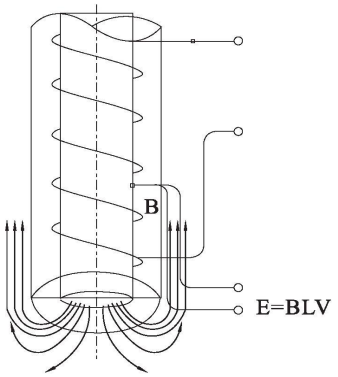
I. Introduction

1. Product Introduction

The MFP plug-in electromagnetic flowmeter is a new type of fluid flowmeter developed on the basis of pipeline electromagnetic flowmeter. On the basis of retaining the advantages of the pipeline electromagnetic flowmeter, aiming at the disadvantages of the pipeline electromagnetic flowmeter, such as difficult installation on large pipeline and high cost, according to the principle of NIKURADS principle, the volume flow of the fluid is obtained by measuring the average flow rate of the fluid by electromagnetic method. Especially after adopting the technology of tapping under pressure and installation under pressure, the plug-in electromagnetic flowmeter can be installed without stopping (water), or on cast iron pipes and cement pipes. The successful development of plug-in electromagnetic flowmeter provides a new means for the detection of fluid flow.

Different from the general electromagnetic flowmeter, the sensor of the plug-in electromagnetic flowmeter forms an external emission magnetic field on the outside, and the measuring electrode is at the end or both sides of the sensor as shown in the following figure. It is worth noting that the induction signal of electromagnetic velocity sensor with external emission magnetic field is affected by the boundary layer thickness of fluid and magnetic field, which will reduce the linearity of measurement.

For the MFP plug-in electromagnetic flowmeter, the conductive liquid in the pipeline is the conductor moving in the magnetic field, and the distance between the two electrodes is the length L of the conductor.



Its induced voltage is proportional to the average flow rate. At this time, the fluid flow in the pipeline can be obtained from: Formula (1)

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

D: inner diameter of the measuring pipe U: induced voltage

B: magnetic induction intensity K: coefficient related to magnetic field distribution

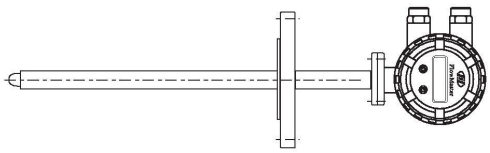
2. Scope of Application

Plug-in electromagnetic flowmeter is composed of sensor and converter, which is used to measure conductive liquid. The conductivity should be greater than 5μs/cm, and it can be used to measure water, sewage, acid, strong alkali and other media. It is mainly used to measure the instantaneous flow and volume flow of conductive liquid in large and medium-sized pipelines in tap water, petrochemical industry and other industries, and is especially suitable for flow measurement in metallurgy, paper making and sewage treatment industries.

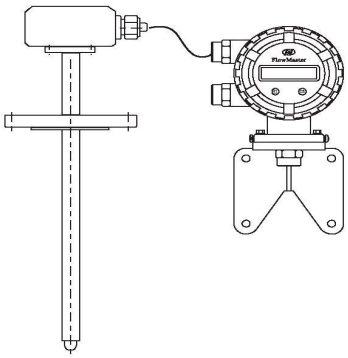
3. Product Composition

A complete set of MFP plug-in electromagnetic flowmeter consists of sensor and converter. According to different IP grades and parameter setting forms, there are two forms: integrated installation of sensor and converter and split installation of sensor and converter.

Integrated installation refers to connect the sensor and the converter internally to form a whole, and directly output the current signal or frequency signal which has a linear relationship with the flow. This method is completed at the factory, and all parameters have been adjusted according to the user's requirements.



Split installation refers to connect the sensor and the converter through an external shielded cable, and the two parts form a complete electromagnetic flowmeter, as shown in the figure. The parameters of the converter can be adjusted according to the user's requirements and process data, which is suitable for submerged and other occasions.



4. Service Conditions

Ambient temperature	-25°C ~+60°C
Power supply	AC (100 ~230)V
Working power	<20W
Relative humidity	5% ~95%

Maximum medium temperature: 80°C (integrated), 120°C (split)

5. Main Technical Parameters

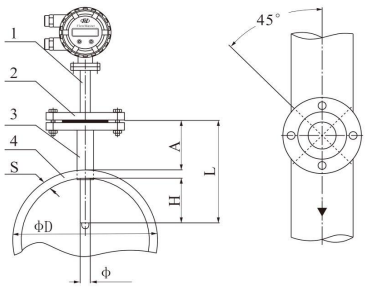
FlowMaster MFP plug-in electromagnetic flowmeter		
	Integrated type	Split type
Accuracy Class	Class 0.2 or 0.5 (under reference conditions)	
Diameter (mm)	DN200~DN3000	DN200~DN3000
Explosion-proof grade	Exia/d e ⅡC T6 Ga/Gb EX tD A21 IP67 T85℃ (ambient temperature ≤60℃, medium temperature ≤60℃)	
Flange	Comply with GB9119 standard, stainless steel	
Pressure grade	1.6MPa	
Converter shell material	Die-cast aluminum alloy	
Sensor shell material	Stainless steel	
Sensor structure material	Stainless steel / PVDF	
Conductivity	≥5 μS/cm (for below 5μS/cm, please negotiate with the Company for ordering)	
Electrode	316L, Hastelloy, titanium, tantalum, platinum, gold	
IP rating	IP65/IP67	IP65/IP67 (IP68 is optional for sensor)
Medium temperature	-25 °C ~ 80 °C	-25°C ~120°C
Ambient temperature	-25°C ~60°C	
Influence of ambient temperature	< ± 0.1%/10°C or < ± 0.25%/10°C	
Maximum allowable error	±0.5% or ±1.0%	
Analog output error	≤ ±0.02mA	
Flow rate within measuring range	≤10m/s	
Possible to be buried	----	≤ 5m (limited to IP68)
Electrical connection	M20*1.5 sealing sleeve, G1/2, NPT1/2	
Sensor cable	----	<30 m (for extra long cables, please negotiate with the Company for ordering)

II. Installation

1. Overall Dimensions

1.1 Sensor dimensions

The sensor is fixed by flange connection. Firstly, the length of the connecting pipe of the base is calculated according to the pipe diameter, and then the base is welded to the pipe opening. When welding, absolute attention should be paid to the correct orientation and correct insertion depth of the screw hole of the base flange to ensure that the direction of the sensor probe is perpendicular to the direction of the fluid. The connecting pipe of the base shall not exceed the inner wall of the pipeline to be measured, and ensure that the inner wall of the outer pipeline is smooth. See the figure for specific dimensions and material specifications.



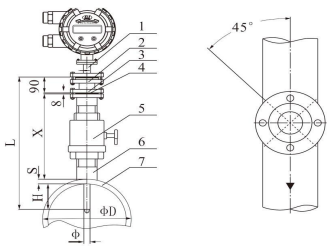
(1) DN200mm, DN300mm, DN400mm (installed without pressure)

No.	Name \ Diameter	DN200mm	DN300mm	DN400mm
1	Sensor (L× Φ)	182×Φ 41		
2	Flange	DN40 1.6MPa		
3	Connecting pipe	Φ 45		
4	Pipeline	Φ D×S		

Installation principle: Ensure that the depth of electrode insertion into the water pipeline is 1/10 of the inner diameter of the pipeline

That is: H=(D-2S) × 10%, i.e. A=182-(H+S)

Note: If the production device is not allowed to be cut off, it can be installed under pressure. First, directly weld the base to the installation position of the pipeline to be measured, then install the root ball valve, and then open a hole with a diameter of Φ 42 mm ~ Φ 45 mm (the Company can provide a dedicated pipeline tapping machine, which is optional, or other methods can be used). After opening the hole, close the ball valve so that the fluid will not overflow, then connect the seal provided by the manufacturer, and then install the sensor. (Installation under pressure will not affect normal production). See the figure for specific dimensions and material specifications.



Principle of installation under pressure: Ensure that the depth of electrode insertion into the water pipeline is 1/10 of the inner diameter of the pipeline

That is: H=(D-2S) × 10%, i.e. A=182-(H+S)

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

No.	Name \ Diameter	DN200mm	DN300mm	DN400mm
1	Sensor (L× Φ)	400×Φ 41		
2	Transition flange	DN40 1.6MPa		
3	Connecting flange	DN40- Φ 50		
4	Seal (provided by the manufacturer)	Φ 45×3		
5	Ball valve	DN50		
6	Connecting pipe	Φ 50		
7	Pipeline	Φ D×S		

(3) DN500mm~DN1200mm (installation under pressure)

Name \ Diameter	DN500 mm	DN600 mm	DN700 mm	DN800 mm	DN900 mm	DN1000 mm	DN1200 mm
Sensor (L× Φ)	450×Φ 41						
Seal (provided by the manufacturer)	Φ 45×3						
Transition flange	DN40 1.6MPa						
Ball valve	DN50						
Connecting pipe	Φ 50						
Pipeline	Φ D×S						

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

Name \ Diameter	DN1400 mm	DN1600 mm	DN1800 mm
Sensor (L× Φ)	600×Φ 41		
Seal (provided by the manufacturer)	Φ 45×3		
Transition flange	DN40 1.6MPa		
Ball valve	DN50		
Connecting pipe	Φ 50		
Pipeline	Φ D×S		

(5) DN2000mm~DN3000mm (installation under pressure)

Name \ Diameter	DN2000 mm	DN2200 mm	DN2400 mm	DN2600 mm	DN2800 mm	DN3000 mm
Sensor (L× Φ)	800× Φ 41					
Seal (provided by the manufacturer)	Φ 45×3					
Transition flange	DN40 1.6MPa					
Ball valve	DN50					
Connecting pipe	Φ 50					
Pipeline	Φ D×S					

Note: All the above are steel pipe installation selection. If installed in cast iron and cement pipes, the fittings and models need to be customized.

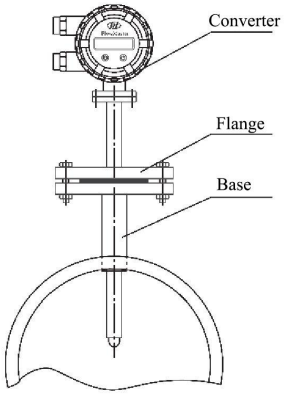
1.2 Converter size

The MFP plug-in electromagnetic flowmeter converter is common to the pipeline converter of our company. Please refer to the introduction of specific dimensions of pipeline converter previously.

2. Structure and Installation

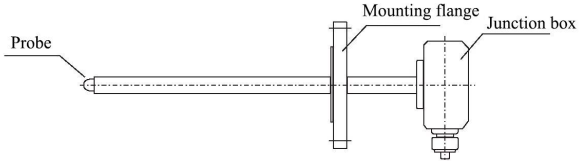
2.1 Converter structure

It is an intelligent secondary meter that amplifies the flow signal and displays the flow rate and accumulate amount calculated by the single chip microcomputer, and outputs signals such as pulses and analog currents for measuring or controlling fluid flow. The converter adopts a small integrated optimization design and is installed in an aluminum shell.



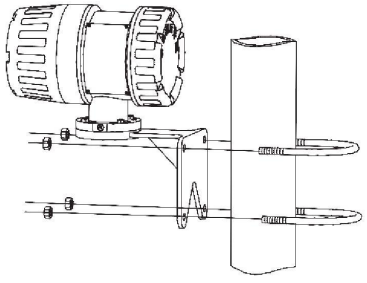
2.2 Sensor structure

The sensor is mainly composed of detection probe, mounting flange and junction box (for split installation). The sensor is cylindrical in shape and equipped with two mounting flanges, and the cylinder cavity is equipped with an excitation coil for exciting the electromagnetic field, a magnetic core and two electrodes in contact with the fluid.

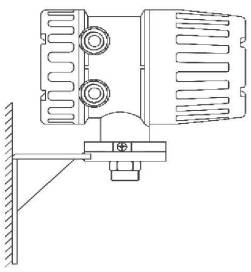


2.3 Installation of converter

MFP electromagnetic flowmeter converter is installed in two forms, namely integrated with the sensor and split. During integrated installation, because the converter is fixed on the sensor, so it is only required to install the sensor. See the sensor installation part for details. The installation of the split-type converter is divided into two types: bracket tube installation and bracket type installation.



Bracket tube installation



Bracket type installation

2.4 Sensor installation

Sensors are divided into two categories and four forms, namely:

① Integrated with the converter;

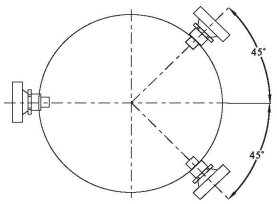
② Split with the converter;

③ Submersible type;

④ Disassembly and assembly under pressure.

2.5 Selection of sensor installation position

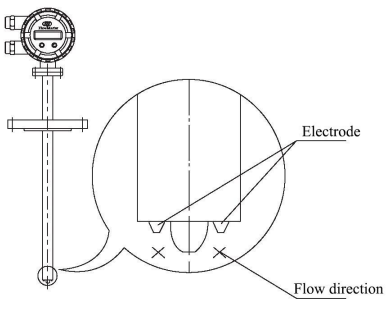
The sensor can be installed anywhere on the measured pipeline, but the pipeline must be completely filled with medium. The sensor can be installed on horizontal, inclined and vertical pipeline. If installed on a horizontal pipeline, it should be installed as shown in the following figure as far as possible. This installation method ensures that the electrode will always be immersed in the fluid and any bubbles will rise to the top, so that the electrodes are not insulated. When it is used for liquid which is easy to produce sediment, the sensor cannot be installed at the bottom of the horizontal pipeline to prevent sediment from covering the electrode.



Correct position

⚠	Optimum position, horizontal or between -45° and +45°

During installation, the flow direction of fluid shall be ensured to be perpendicular to the drawing surface.



The sensor shall be installed on the pipeline full of medium, and there is always a danger of swirling flow on the pipeline half full. It is also dangerous to install behind valves, elbows and tee joints, because they are the root of the vortex. Therefore, the straight pipe section in front of the sensor is required to be at least > 10D, and the straight pipe section behind the sensor is > 5D. This avoids vortex and improves measurement accuracy. If the accuracy is required to be within ±0.5%, the straight pipe section in front of the sensor should be > 30D and the straight pipe section behind the sensor should be > 10D during installation.

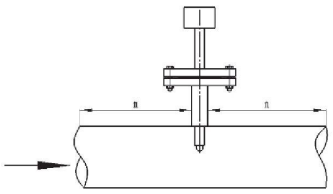
3. Installation Requirements

3.1 Requirements for straight pipe section

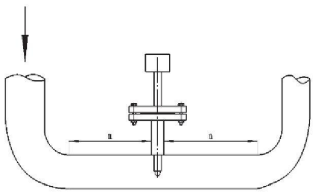
See the following table for specific requirements of straight pipe section:

Type of pipe installation	Installation diagram No.	Front straight pipe section	Rear straight pipe section
Horizontal pipe	1	10D	5D
Elbow	2	20D	5D
Flared pipe	3	20D	10D
Downstream of valve	4	20D	5D
Shrinkage pipe	5	10D	10D
Downstream of pump	6	30D	10D
Mixed liquid	7	30D	5D

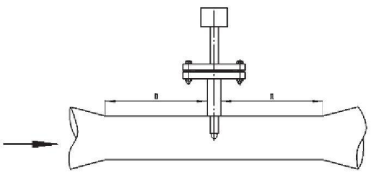
Schematic diagram of straight pipe sections before and after installation of flowmeter



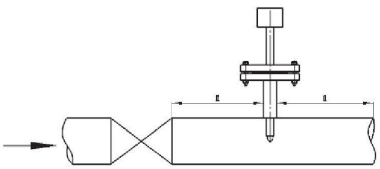
1. Installation of horizontal pipe



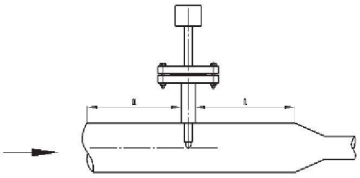
2. Installation of bend



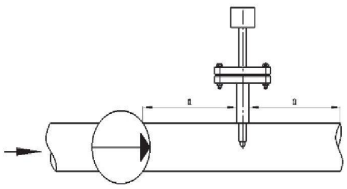
3. Installation of flared pipe



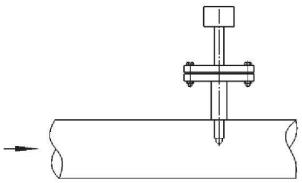
4. Installation of valve downstream



5. Installation of shrinkage pipe



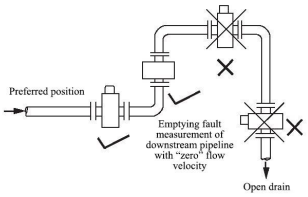
6. Installation of pump downstream



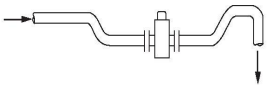
7. Installation of mixed liquid

3.2 Pipeline design requirements

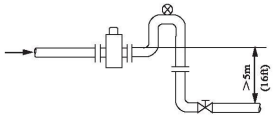
a. This avoids measurement errors caused by incidental gases.



b. For an open drainage pipeline, the flowmeter shall be installed in the low section.



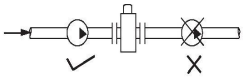
c. Where the drop of the pipeline is larger than 5m, the air valve (vacuum) shall be installed downstream of the flowmeter.



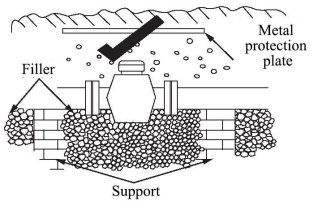
d. For a long pipeline, a conventional practice is to install the control valve downstream of the flowmeter.



e. No flowmeter shall be installed on the suction side of the pump.



f. The sensor shall be installed underground.



g. It shall not be installed on any free vibrating pipe.

3.3 Work environment requirements

Requirements of flowmeter for external environment

a. The flowmeter should be avoided to be installed in places with great temperature changes and exposed to high temperature radiation of equipment. If it must be installed, measures of heat insulation and ventilation should be taken.

b. The flowmeter should be installed indoors. If it must be installed outdoors, rain pouring, water flooding and sun exposure should be avoided, and moisture-proof and sun protection measures should be taken.

c. The flowmeter should be avoided to be installed in an environment containing corrosive gas, and ventilation measures should be taken when it must be installed.

d. There must be sufficient installation space around the flowmeter in order to facilitate installation and maintenance.

e. Strong magnetic fields and strong vibration sources should be avoided in the installation place of the flowmeter. If the pipeline vibrates greatly, there should be supports for fixing the pipeline on both sides of the flowmeter.

4. Distance between Sensor and Converter

In principle, the distance between the sensor and the converter should be as short as possible, so that the converter is as close to the sensor as possible. The distance between the sensor and the converter is determined by the signal distribution capacitance and the conductivity of the liquid to be measured, and the measured medium must be a conductive liquid with a minimum conductivity of 5μs/cm. This is equivalent to the conductivity of deionized water. The conductivity of ordinary tap water and raw water is 15-500μs/cm. The following table shows the conductivity of some liquid media at 20°C.

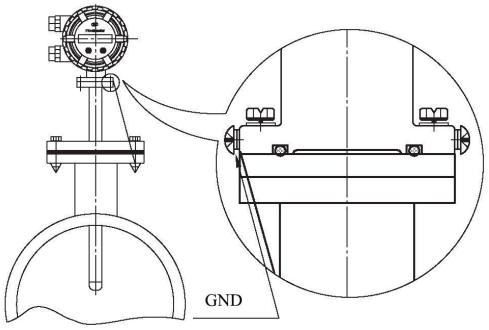
Note: The longest cable cannot exceed 30m.

The following table shows the conductivity of some liquid media at 20°C.

Name of liquid	Conductivity (s/cm)	Name of liquid	Conductivity (s/cm)
Petroleum	3×10^{-13}	Sulfuric acid (5%)	20.85×10^{-2}
Kerosene	$<1.7\times10^{-8}$	Hydrochloric acid (40%)	5×10^{-1}
Acetone	6×10^{-8}	Hydrochloric acid (10%)	4×10^{-2}
Distilled water	4×10^{-8}	Nitric acid (31%)	78.19×10^{-2}
Tap water	0.05	Nitric acid (6.2%)	31.23×10^{-2}
Sea water	53	Ammonia (30%)	1.93×10^{-4}
Glycerin	6.4×10^{-8}	Ammonia (0.1%)	2.51×10^{-4}
Acetic acid	5.0×10^{-9}	Sodium hydroxide (50%)	82×10^{-3}
Ethanol	1.35×10^{-9}	Sodium hydroxide (2%)	46.5×10^{-2}
Acetaldehyde	1.7×10^{-6}	Salt water (saturated)	2×10^{-1}
Sulfuric acid (99.4%)	8.5×10^{-3}	Benzene	7.6×10^{-8}
Sulfuric acid (97%)	98.5×10^{-3}	Methylbenzene	$<1.0\times10^{-14}$

5. System Earthing

The electromagnetic flowmeter detects that the flow signal received by the electrode is mv level, so external interference has a great impact on it. Therefore, good earthing effect largely determines the measurement accuracy and stability of the flowmeter. The measured fluid acts as an electrolyte conductor and other unrelated electromagnetic interference must be excluded. Usually, the flowmeter is installed on a metal pipeline, which must be connected to the sensor for earthing.



Note: To be grounded, other electrical equipment shall not be connected to the same ground wire, and the grounding resistance shall be less than 10 ohms.

6. Electrical Connection

The MFP plug-in electromagnetic flowmeter converter is common to the FlowMaster pipeline electromagnetic flowmeter converter of our company. Please refer to the introduction of the electrical connection of pipeline electromagnetic flowmeter converter previously.

III. Parameter Setting

The MFP plug-in electromagnetic flowmeter converter is common to the FlowMaster pipeline electromagnetic flowmeter converter of our company. Please refer to the introduction of the parameter settings of the pipeline electromagnetic flowmeter converter previously.

Instrument Testing and Maintenance

The electromagnetic flowmeter is a kind of high-precision flow meter, so we suggest that users regularly protect some simple components after using the flowmeter for a period of time, such as checking the wiring, and cleaning the liner and the electrode. For those technical requirements that involve flowmeter performance and you don't understand, please read this document carefully and carry out routine maintenance on the basis of understanding. If it is necessary to carry out in-depth maintenance or replace parts, please consult our customer service center, and we will provide you with the most thoughtful and comprehensive technical support.

The electromagnetic flowmeter can give corresponding alarm information through its own self-diagnosis function for faults in general application. See the table below for details.

Common fault diagnosis table

Fault symptom	Inspection item
No display of instrument	① Check whether the cable is connected; ② Check whether the fuse is in good condition; ③ Check whether the cable is properly connected.
Inaccurate flow measurement	① Check whether the pipe is full of medium. ② Check whether the signal line is connected correctly and reliably; ③ Check whether the following parameters are consistent with the content of the sensor label; [B3] = sensor diameter [B51] = instrument coefficient 1 [B52] = instrument coefficient 2 ④ If the reading jumps, check whether the signal line and the ground wire are properly connected.
Excitation drive fault	① Check whether the excitation drive connected to CD1 and CD2 is open-circuited; or whether the excitation drive connected to ground is open-circuited; ② Check whether the resistance of the excitation coil of the sensor is less than 20 ohms.
Empty pipe fault	① Check whether the medium in the measuring pipeline is full; ② Short-circuit converters SIG1 and SIG2 to SIG GND. Can that be ruled out? ③ Check whether the signal wiring is correct; ④ Check whether the electrode is contaminated; ⑤ When the flow is zero, the value of the parameter MtSnsr Emvel shall be greater than 300; ⑥ In case that the medium is water and there is a flow, check whether the resistance of SIG1 or SIG2 to the ground is less than 50K ohms.
Analog fault	① If the analog output exceeds the range, the value of the parameter Flow Rng shall be adjusted; ② Disconnect the current output cable, check the value of parameter Anlg mA, and meanwhile measure the value between the current output terminals IC+ and IC-, which shall be consistent with it; ③ If the flow reaches the full range and the current output value reaches the full degree, check whether the current output circuit resistance is less than 750 ohms.
Pulse frequency fault	① If the frequency output exceeds the range, the value of the parameter Pls Fact shall be adjusted; ② If the pulse frequency output is incorrect, use the Test function to test the output frequency to troubleshoot the output wiring.
Other faults	In case of forced system reset (for example, a power failure), the relevant factory parameters will be restored.

Self-diagnosis alarm information table

Mtsnsr	Empty sensor pipe	Cutoff	Small signal excision
Coil	Excitation coil fault	Anlg	Analog signal output overrun
Fault	Self-test error	Pls	Pulse signal output overrun
Hi	The flow exceeds the set upper limit.	Fwd	Forward flow
Lo	The flow exceeds the set lower limit.	Rev	Reverse flow

The above alarm signals need to be set through the menu to achieve the alarm function. During delivery, we only set the empty pipe alarm function, you can set it according to your own needs or tell us when you order the product, and we will set the alarm function you need for you.

Although electromagnetic flowmeters are rarely repaired, they can fail due to improper use. The information displayed on the instrument helps you analyze the fault of the instrument. The following introduces several common faults.

(1) Replacement of parts of explosion-proof converter:

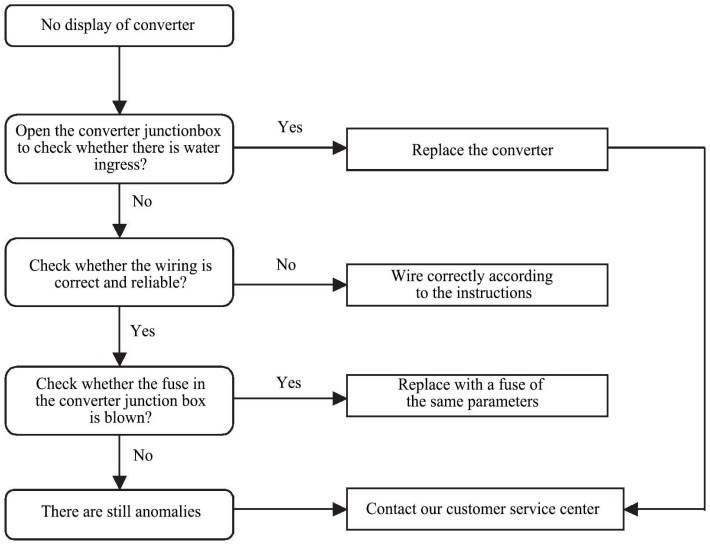
If the explosion-proof converter display window glass is damaged, the user shall not replace it by himself and must contact our company to replace it; if the user needs to seal the cable with the sealing ring, please contact our company; please do protect the spigot of the explosion-proof converter.

Explosion-proof surface and thread explosion-proof surface.

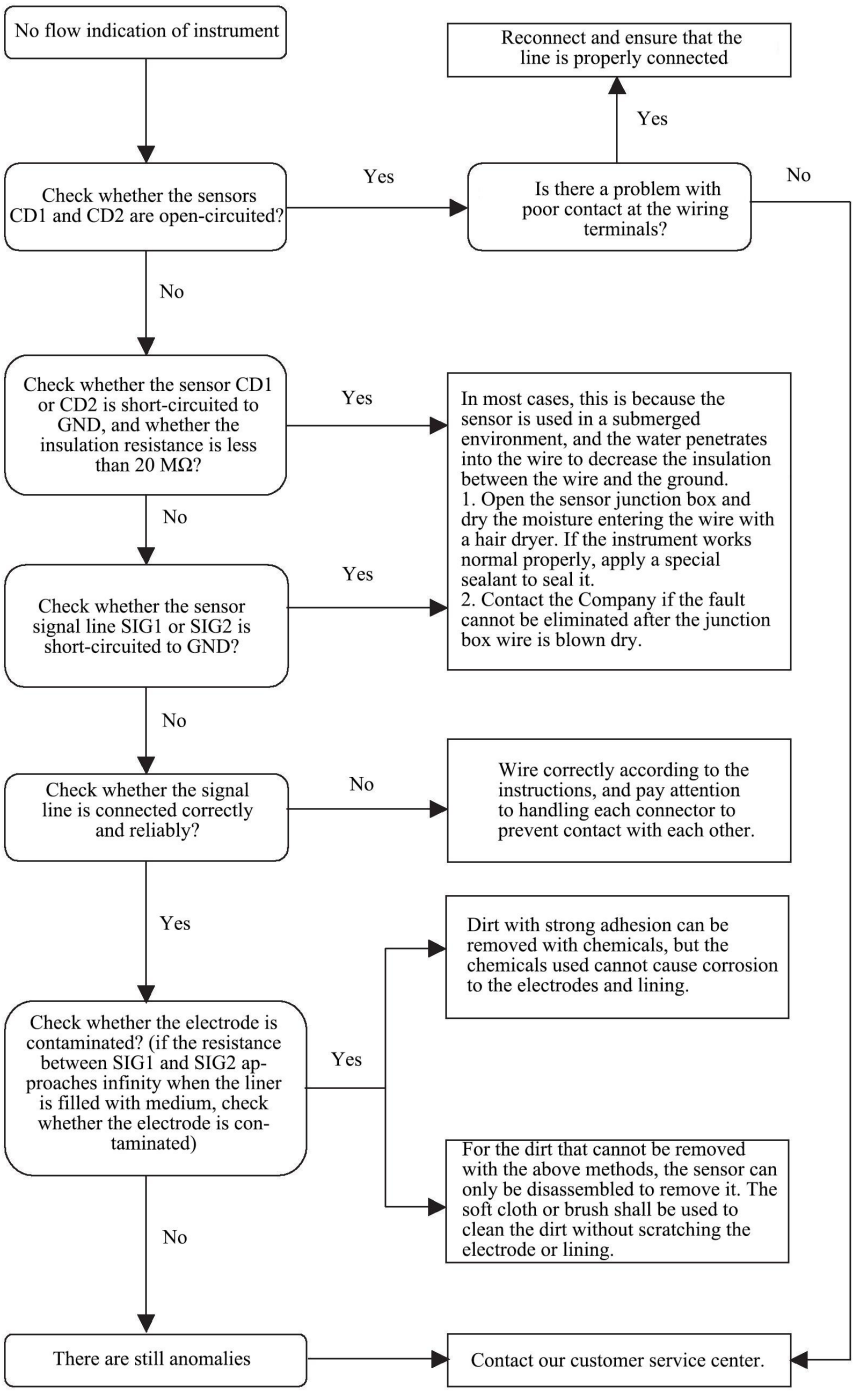


Non-professional personnel must not operate it!

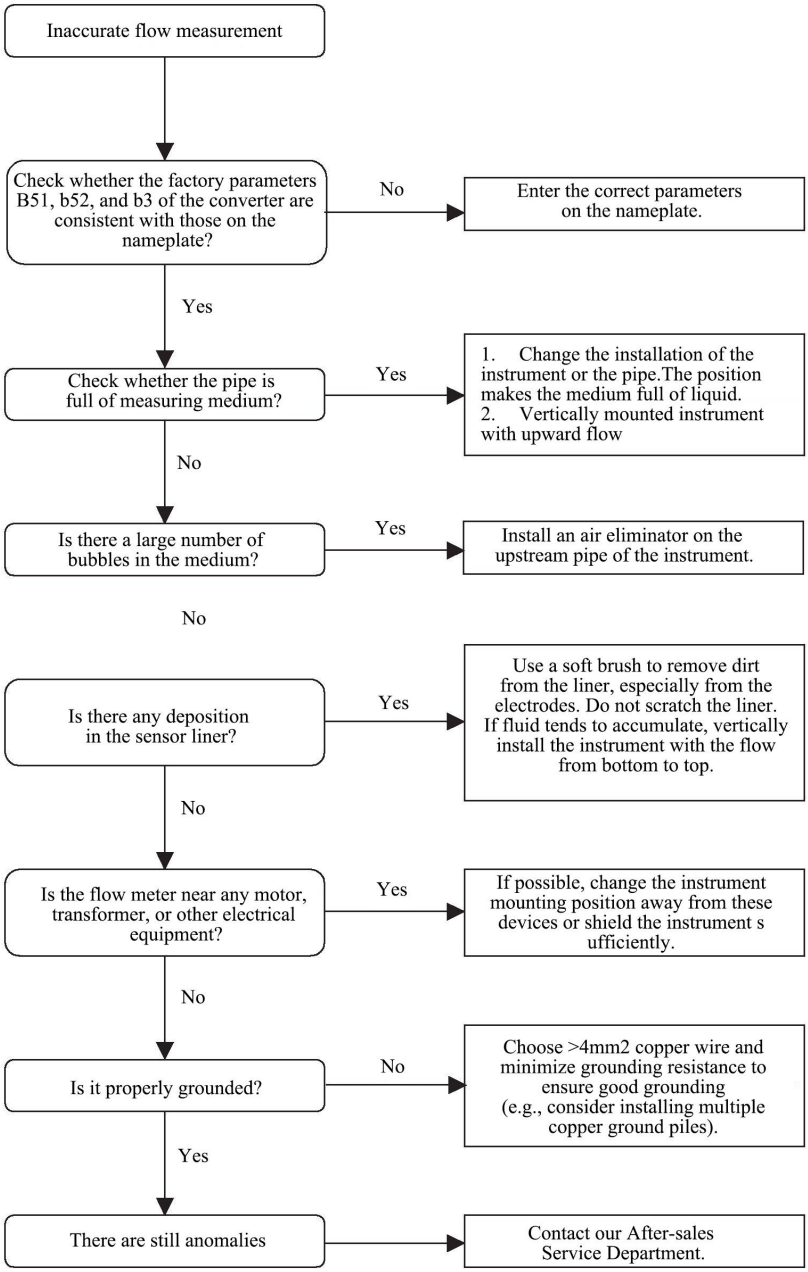
(2) No display of converter:



(3) No flow indication of instrument:



(4) Inaccurate flow measurement:

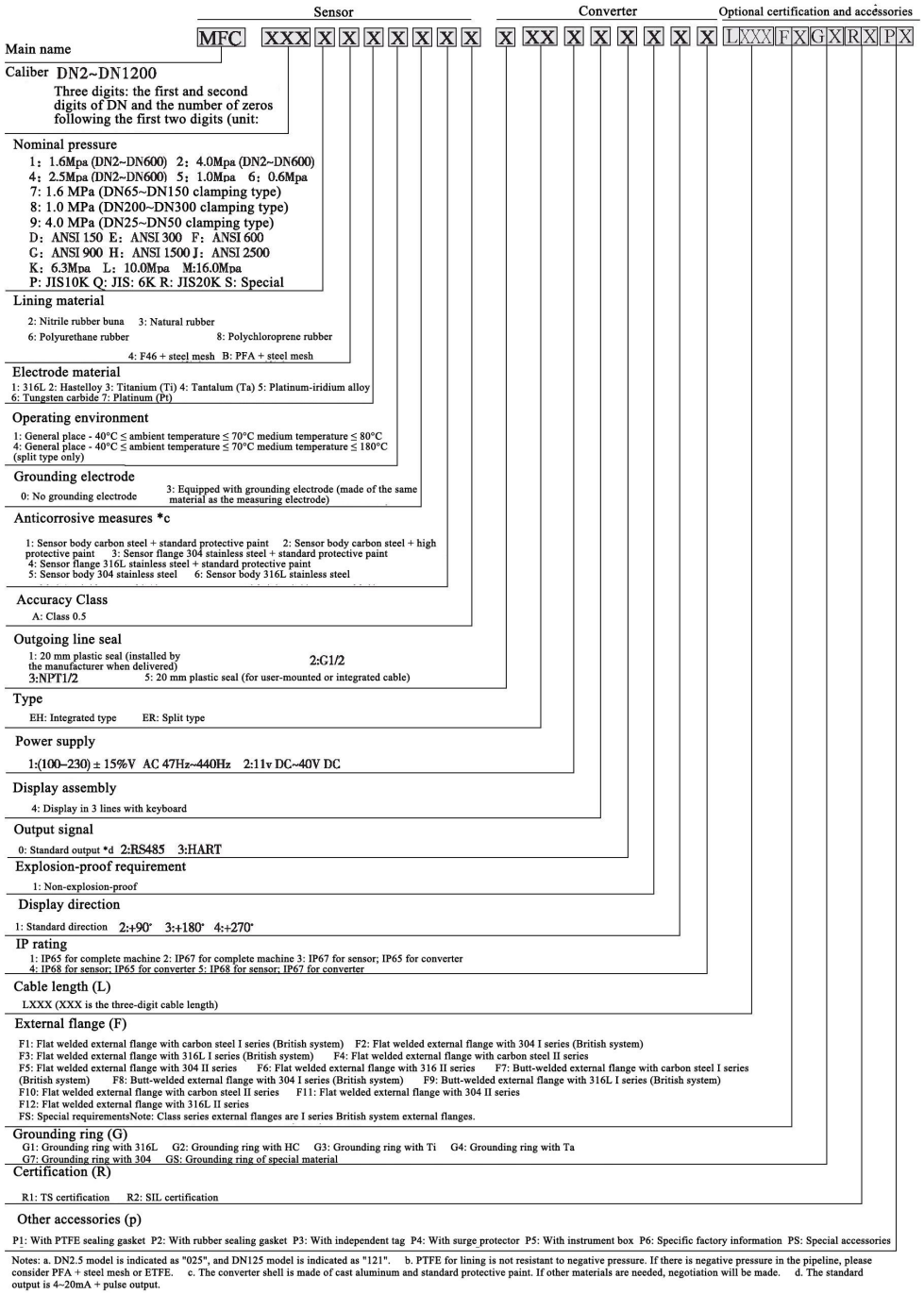


The electromagnetic flowmeter converter adopts the surface installation technology, for users, it is not maintainable, so users are strictly prohibited to open the converter without permission. If users confirm the fault of the converter, please contact our After-sales Service Department.

Appendix 1 Selection Table of FlowMaster Series Electromagnetic Flowmeters

I. Selection table of MFC electromagnetic flowmeter

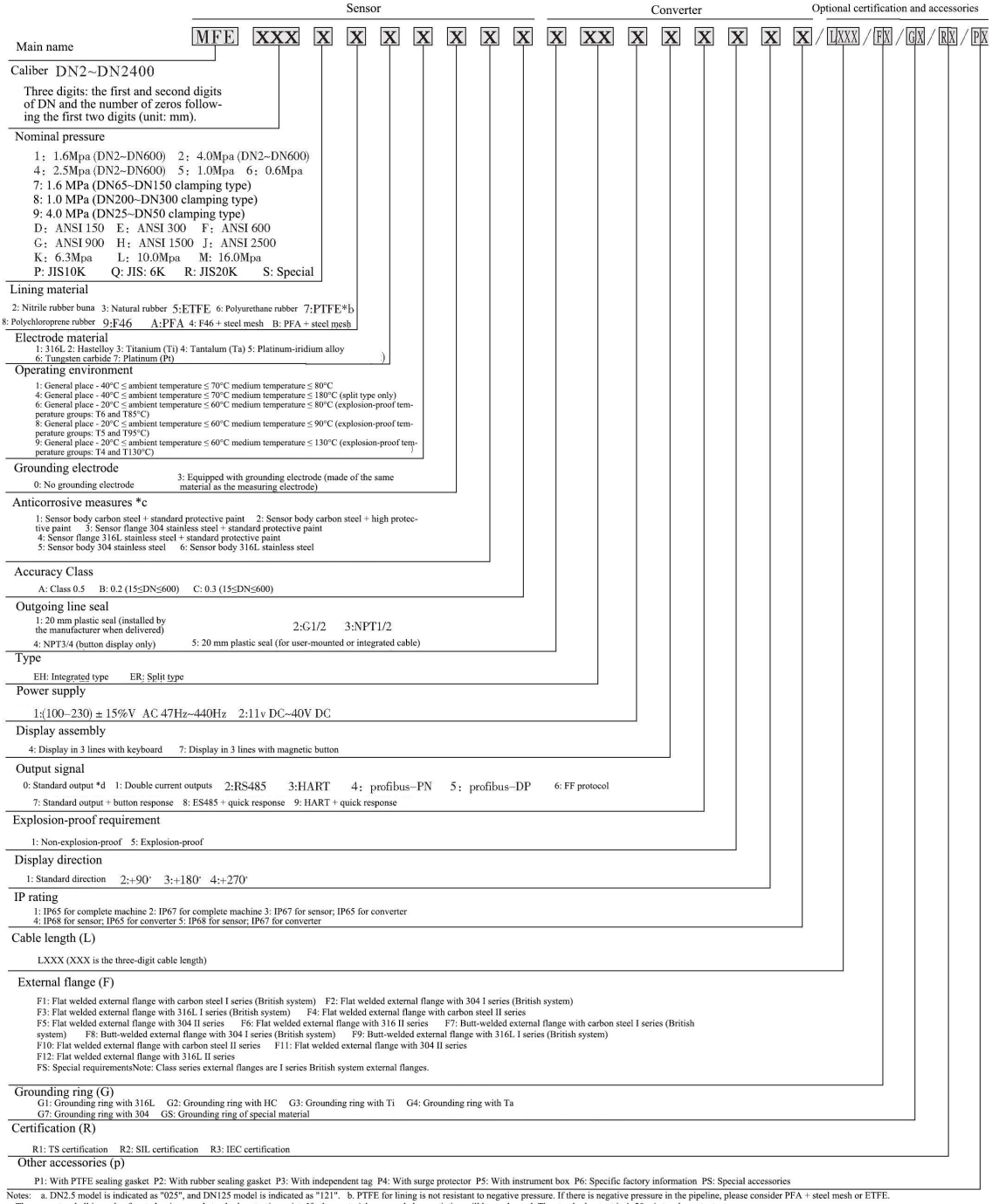
The MFC electromagnetic flowmeter consists of a sensor and a converter, and its model is expressed as follows:



Notes: a. DN2.5 model is indicated as "025", and DN125 model is indicated as "121". b. PTFE for lining is not resistant to negative pressure. If there is negative pressure in the pipeline, please consider PFA + steel mesh or ETFE. c. The converter shell is made of cast aluminum and standard protective paint. If other materials are needed, negotiation will be made. d. The standard output is 4~20mA + pulse output.

II. Selection table of MFE-S electromagnetic flowmeter

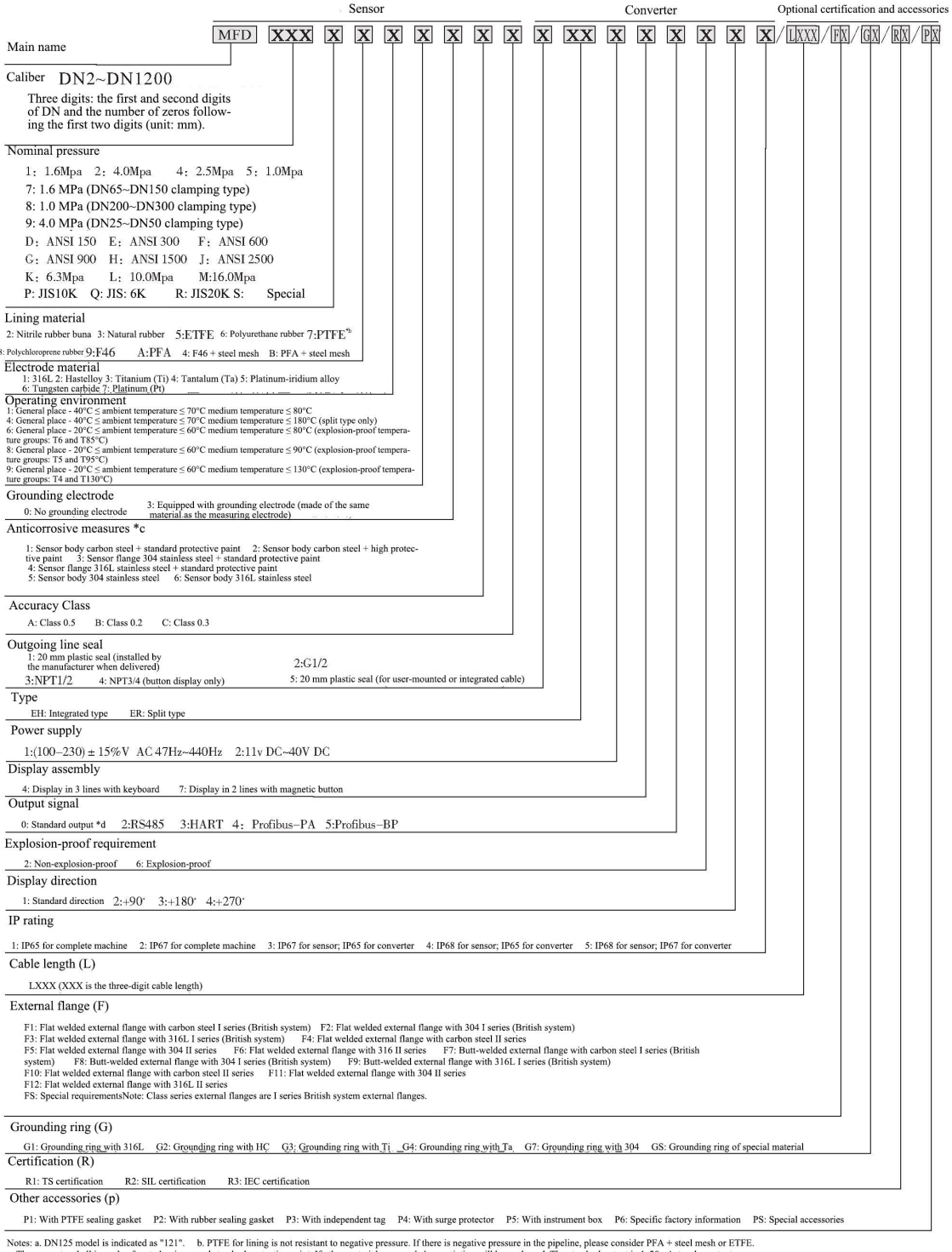
The MFE-S electromagnetic flowmeter consists of a sensor and a converter, and its model is expressed as follows:



Notes: a. DN2.5 model is indicated as "025", and DN125 model is indicated as "121". b. PTFE for lining is not resistant to negative pressure. If there is negative pressure in the pipeline, please consider PFA + steel mesh or ETFE.
c. The converter shell is made of cast aluminum and standard protective paint. If other materials are needed, negotiation will be made. d. The standard output is 4~20mA + pulse output.

III. Selection table of MFD slurry type electromagnetic flowmeter

The MFD slurry electromagnetic flowmeter consists of a sensor and a converter, and its model is expressed as follows:

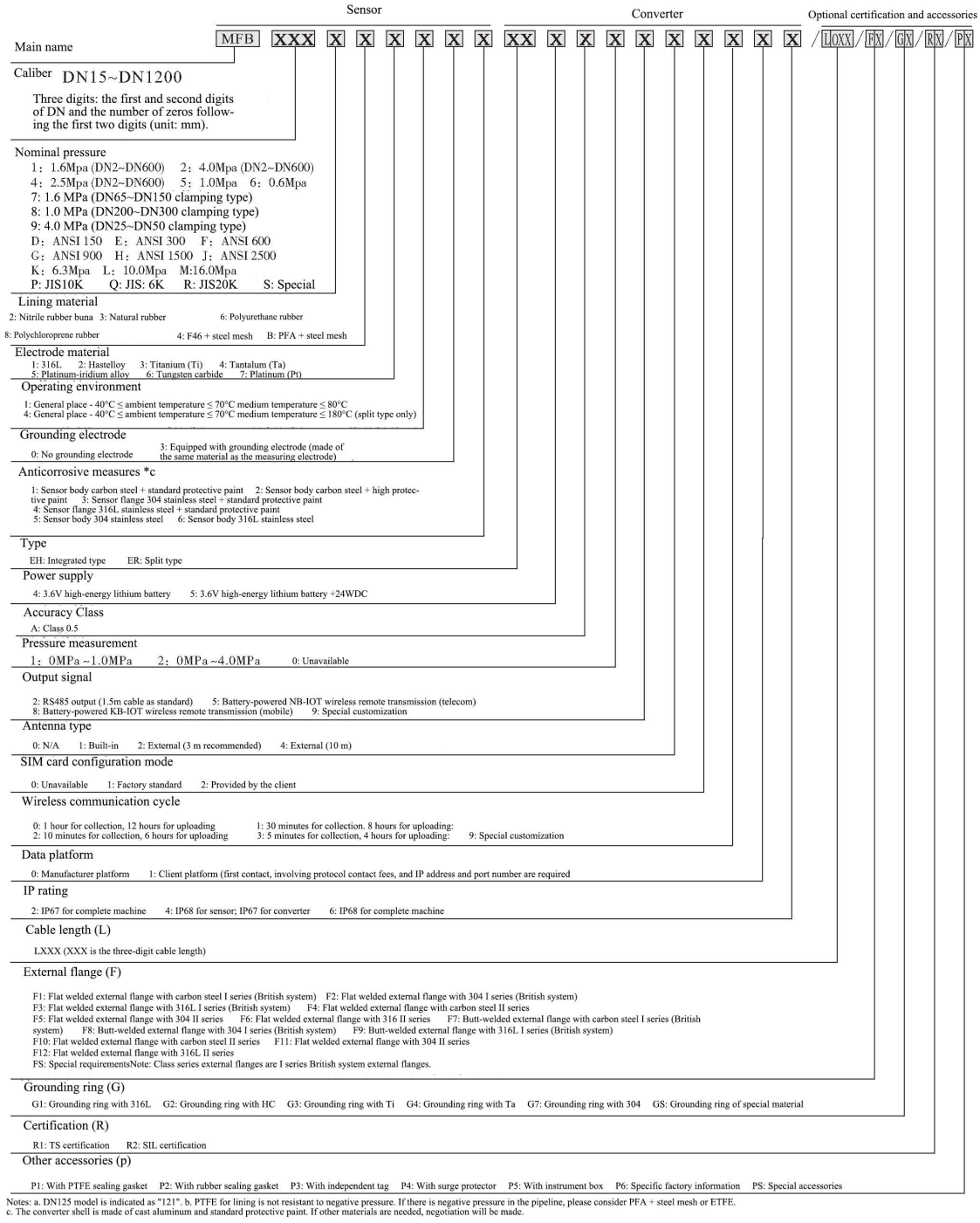


Notes: a. DN125 model is indicated as "121". b. PTFE for lining is not resistant to negative pressure. If there is negative pressure in the pipeline, please consider PFA + steel mesh or ETFE.
c. The converter shell is made of cast aluminum and standard protective paint. If other materials are needed, negotiation will be made. d. The standard output is 4–20mA + pulse output.

85

IV. Selection table of MFB battery-powered electromagnetic flowmeter

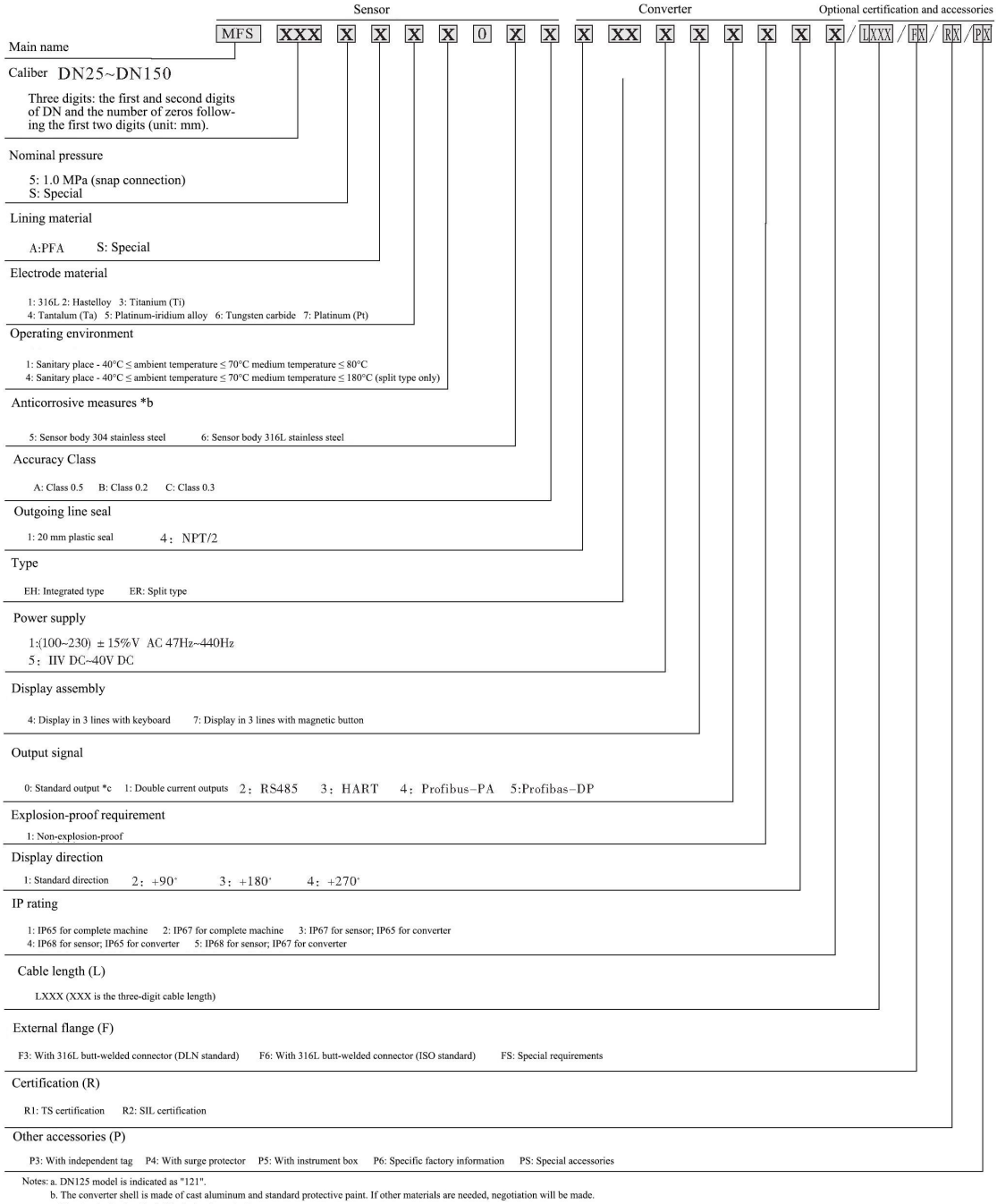
The battery-powered electromagnetic flowmeter consists of a sensor and a converter, and its model is expressed as follows:



Notes: a. DN125 model is indicated as "121". b. PTFE for lining is not resistant to negative pressure. If there is negative pressure in the pipeline, please consider PFA + steel mesh or ETFE.
c. The converter shell is made of cast aluminum and standard protective paint. If other materials are needed, negotiation will be made.

V. Selection table of MFS sanitary electromagnetic flowmeter

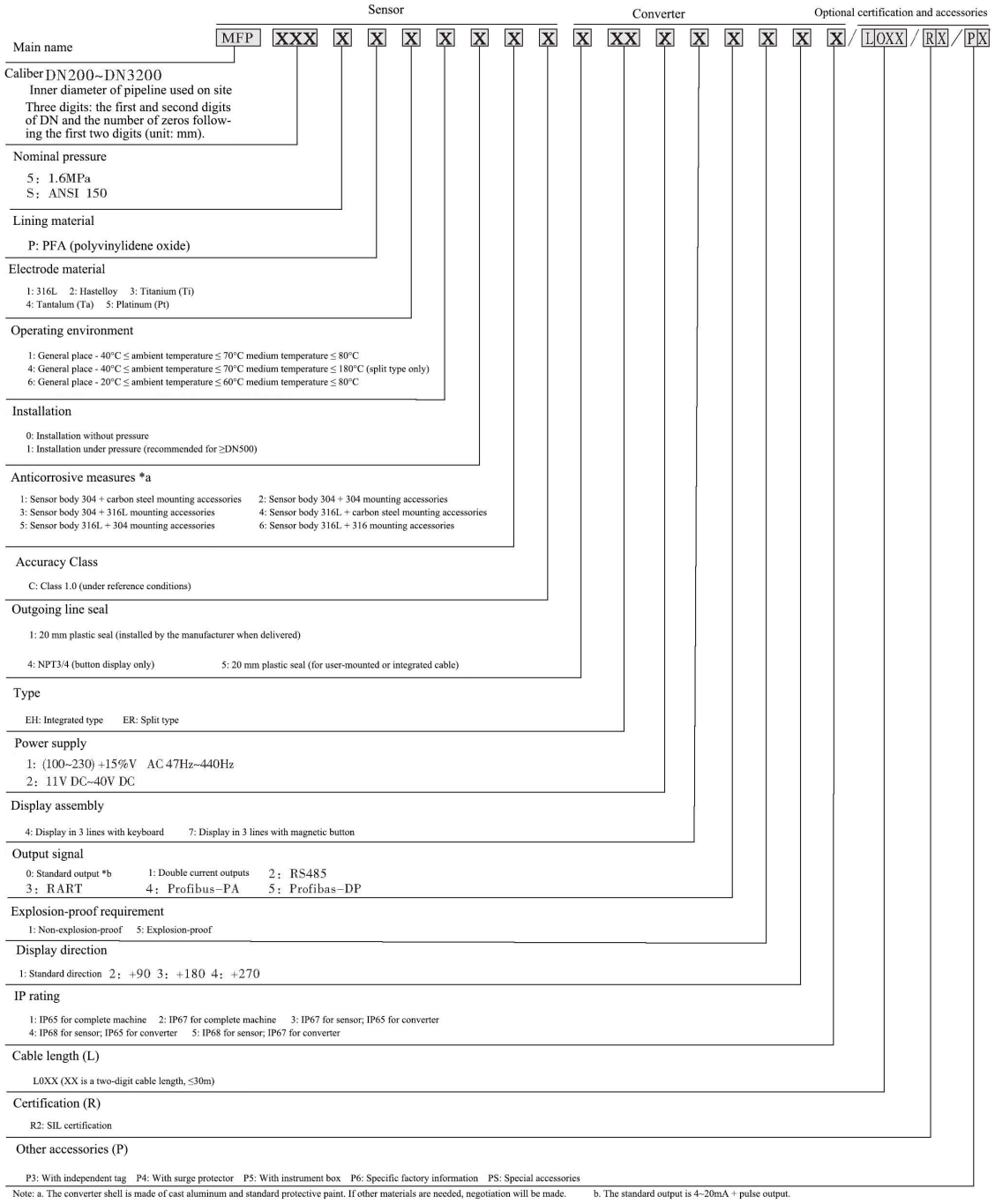
The sanitary electromagnetic flowmeter consists of a sensor and a converter, and its model is expressed as follows:



Notes: a. DN125 model is indicated as "121".
b. The converter shell is made of cast aluminum and standard protective paint. If other materials are needed, negotiation will be made.
c. The standard output is 4–20mA + pulse output.

VI. Selection table of MFP plug-in electromagnetic flowmeter

The MFP plug-in electromagnetic flowmeter consists of a sensor and a converter, and its model is expressed as follows:



Note: a. The converter shell is made of cast aluminum and standard protective paint. If other materials are needed, negotiation will be made. b. The standard output is 4~20mA + pulse output.

Appendix 2 Measuring Range of FlowMaster Electromagnetic Flowmeter

Code	Diameter (mm)	Flow range (m^3/h)		Code	Diameter (mm)	Flow range (m^3/h)	
		Min. value	Max. value			Min. value	Max. value
030	3	0.013	0.509	301	300	127.235	5089.380
050	5	0.035	1.414	351	350	173.180	6927.212
060	6	0.051	2.036	401	400	226.195	9047.787
080	8	0.090	3.619	451	450	286.278	11451.105
090	9	0.115	4.580	501	500	353.429	14137.167
100	10	0.141	5.655	601	600	508.938	20357.520
120	12	0.204	8.143	701	700	692.721	27708.847
150	15	0.318	12.723	751	750	795.216	31808.625
200	20	0.565	22.619	801	800	904.779	36191.147
250	25	0.884	35.343	901	900	1145.111	45804.420
320	32	1.448	57.906	102	1000	1413.717	56548.667
400	40	2.262	90.478	112	1050	1558.623	62344.905
500	50	3.534	141.372	122	1200	2035.752	81430.080
650	65	5.973	238.918	142	1400	2770.885	110835.387
800	80	9.048	361.911	152	1500	3180.863	127234.500
101	100	14.137	565.487	162	1600	3619.115	144764.587
121	125	22.089	883.573	172	1700	4085.641	163425.647
151	150	31.809	1272.345	182	1800	4580.442	183217.680
201	200	56.549	2261.947	192	1900	5103.517	204140.687
251	250	88.357	3534.292	202	2000	5654.867	226194.667

Appendix 3 Applicable Performance of FlowMaster Electromagnetic Flowmeter Lining Material

The lining material is selected according to the corrosiveness, abrasion and temperature of the medium to be tested. The applicable performance of common lining materials is shown in the following table:

No.	Lining material	Main performance	Scope of application	Storage temperature
8	Chloroprene rubber (CR)	1. Oil resistance, solvent resistance, oxidation resistance, and corrosion resistance to common acids, alkalis, salts and other media. 2. Excellent elasticity and wear resistance, but poor cold resistance.	1. Non-strong acid, strong alkali and strong oxidizing medium at 0°C~80°C. 2. Measure sewage and mud.	≥0°C
3	Natural rubber (IR)	1. Good wear resistance, corrosion resistance, insulation and low temperature resistance. 2. Poor oil resistance, aging resistance and oxidation resistance.	Non-strong acid, strong alkali and strong oxidizing medium at -10°C~70°C, suitable for drinking water.	
6	Polyurethane rubber (PU)	1. Excellent wear resistance and elasticity. 2. Poor acid and alkali resistance.	1. -25°C~60°C 2. Neutral and abrasive ore pulp, coal slurry and mud	
A	Teflon (PFA)	1. Good hydrophobicity and non-stickiness, and strong high temperature resistance. 2. Excellent corrosion resistance, resistant to strong acid, strong alkali, organic solvent and various salt solutions. 3. Good negative pressure resistance. When the negative pressure resistance requirement is high, a metal mesh can be added to improve the negative pressure resistance. 4. Poor wear resistance.	1. Non-abrasive media at -25°C~140°C 2. Hygienic media	
7	Polytetrafluoroethylene (PTFE)	1. It is a material with the most stable chemical properties in plastics, resistant to boiling hydrochloric acid, sulfuric acid, nitric acid and aqua regia, strong alkali and various organic solvents, and not resistant to corrosion by chlorine trifluoride, high-temperature oxygen trifluoride, high-speed liquid fluorine, liquid oxygen and ozone. 2. Poor abrasion resistance. 3. The negative pressure resistance is poor, and the lining is prone to deformation or fracture, leading to electrode leakage.	1. -25°C ~140°C 2. Strong corrosive media such as strong acid and alkali 3. Hygienic media	
9	Fluorinated ethylene propylene FEP (F46)	1. Hydrophobic and non-sticky. 2. Corrosion resistance is second only to PFA. 3. When the negative pressure resistance requirement is high, a metal mesh can be added to improve the negative pressure resistance. 4. Poor wear resistance.	1. Non-abrasive media at -25°C~100°C 2. Hygienic media	
5	ETFE	1. Excellent corrosion resistance, similar to that of PFA. 2. Excellent negative pressure resistance, suitable for all kinds of working conditions with negative pressure, which can make large-diameter products. 3. Excellent radiation resistance.	1. Non-abrasive media at -40°C~140°C 2. Strong corrosive media such as strong acid and alkali 3. Hygienic media	

Manufacturing standard		Ambient temperature (°C)	Process fluid temperature (°C)						
			Chloroprene rubber	Natural rubber	Polyurethane rubber	PFA Teflon	PTFE PTFE	FEP (F46) Ethylene propylene chloride	Nitrile rubber buna
Standard structure split type	Standard structure non-dangerous area	60	80	70	60	120	120	100	80
	High-temperature non-dangerous area	60	80	70	60	140	140	100	80
	Specific high-temperature non-dangerous area (Sensor/converter)	120/60	80	70	60	140	140	100	80
	Approved standard temperature of hazardous area	60	60	60	60	120	120	80	60
	Approved high temperature of hazardous area	60	80	70	60	140	140	100	80
Standard structure integrated type	Standard structure integrated type	60	80	70	60	80	80	80	80
	Approved standard temperature of hazardous area	60	80	70	60	80	80	80	80

Note: If users have special requirements, please negotiate with the company for ordering.

Appendix 4 Applicable Performance of FlowMaster Electromagnetic Flowmeter Electrode

The selection of electrode materials should be determined by the user according to the corrosiveness of the measured medium, and the user can refer to the relevant anti-corrosion manual. This document is for reference only.

No.	Material	Corrosion resistance	Remarks
1	316L	It is used for the measurement of water, sewage or slightly corrosive media of inorganic and organic acids.	
2	Hastelloy C (HC)	It is resistant to the corrosion of oxidizing acid, such as nitric acid, mixed acid, or mixed medium of chromic acid and sulfuric acid, and the corrosion of oxidizing salts such as Fe^{+++}, Cu^{++} or other oxidants. For example, hypochlorite solution above normal temperature and seawater corrosion.	
3	Titanium (Ti)	It is resistant to seawater, various chlorides and hypochlorite, oxidizing acids (including fuming nitric acid), organic acids and alkali, etc., and not resistant to pure reducing acids (such as sulfuric acid and hydrochloric acid). However, if the acid contains oxidants (such as nitric acid, Fe++++, Cu++), the corrosion will be greatly reduced.	
4	Tantalum (Ta)	It has excellent corrosion resistance, similar to glass. Except hydrofluoric acid, fuming sulfuric acid, fuming nitric acid and alkali, it can resist the corrosion of almost all chemical media (including boiling hydrochloric acid, nitric acid and sulfuric acid below 175℃). It is not resistant to corrosion in alkali.	
5	Platinum-titanium alloy	It performs well in resisting all acids, and is resistant to alkali and various salts, but not to aqua regia.	Only applicable to pipe type
6	Platinum (Pt)	Applicable to almost all acids, bases, salt solutions (including fuming sulfuric acid and fuming nitric acid), not applicable to aqua regia and ammonium salt.	Only applicable to plug-in type
7	Aurum (Au)	Applicable to inorganic acids (such as hydrochloric acid, nitric acid and sulfuric acid), inapplicable to mixed acids such as aqua regia (three parts hydrochloric acid and one part nitric acid) and cyanide solutions	Only applicable to plug-in type

Appendix 5 Specification Sheet of Bolts for Electromagnetic Flowmeter Sensor (Flange Type)

Nominal diameter (mm)	Specification and quantity of single-head bolts, nuts and flat washers (sets)														
	0.6MPa			1.0MPa			1.6MPa			2.5MPa			4.0MPa		
	Thread	Length	Quantity	Thread	Length	Quantity	Thread	Length	Quantity	Thread	Length	Quantity	Thread	Length	Quantity
DN2.5				M12	30	8	M12	30	8	M12	30	8	M12	30	8
DN5				M12	30	8	M12	30	8	M12	30	8	M12	30	8

Nominal diameter (mm)	Specification and quantity of stud bolts, nuts and flat washers (sets)														
	0.6MPa			1.0MPa			1.6MPa			2.5MPa			4.0MPa		
	Thread	Length	Quantity	Thread	Length	Quantity	Thread	Length	Quantity	Thread	Length	Quantity	Thread	Length	Quantity
DN10				M12	70	8	M12	70	8	M12	70	8	M12	70	8
DN15				M12	70	8	M12	70	8	M12	70	8	M12	70	8
DN20				M12	70	8	M12	70	8	M12	70	8	M12	70	8
DN25				M12	70	8	M12	70	8	M12	70	8	M12	70	8
DN32				M16	90	8	M16	90	8	M16	90	8	M16	90	8
DN40				M16	90	8	M16	90	8	M16	90	8	M16	90	8
DN50				M16	90	8	M16	90	8	M16	90	8	M16	90	8
DN65				M16	90	8	M16	90	8	M16	100	16	M16	100	16
DN80				M16	90	16	M16	90	16	M16	100	16	M16	100	16
DN100				M16	100	16	M16	100	16	M20	110	16	M20	120	16
DN125				M16	100	16	M16	100	16	M24	130	16	M24	130	16
DN150				M20	110	16	M20	110	16	M24	130	16	M24	150	16
DN200				M20	110	16	M20	110	24	M24	130	24	M27	150	24
DN250				M20	110	24	M24	130	24	M27	150	24	M30×2	170	24
DN300				M20	120	24	M24	130	24	M27	150	32	M30×2	180	32
DN350				M20	120	32	M24	150	32	M30×2	170	32	M33×2	200	32
DN400				M24	130	32	M27	150	32	M33×2	180	32	M36×3	230	32
DN450				M24	150	40	M27	170	40	M33×2	180	40	M36×3	230	40
DN500				M24	150	40	M30×2	170	40	M33×2	200	40	M39×3	250	40
DN600				M27	170	40	M33×2	180	40	M36×3	230	40	M45×3	280	40
DN700	M24	150	48	M27	170	48									
DN800	M27	170	48	M30×2	180	48									
DN900	M27	170	48	M30×2	200	56									
DN1000	M27	180	56	M33×2	220	56									
DN1200	M30×2	200	64	M36×3	230	64									
DN1400	M33×2	220	72	M39×3	220	72									
DN1600	M33×2	240	80	M45×3	260	80									
DN1800	M36×3	260	88	M45×3	260	88									
DN2000	M39×3	280	96	M45×3	260	96									

Note: Each set of DN2.5 and DN5 includes one single-head bolt and one flat washer;
Each set of DN10-2000 includes one stud bolt, two nuts and two flat washers.
Flange standard: GB/T9119-2000

April 2023, First Edition

Address: No. 61, Middle Section of Huangshan Avenue, Liangjiang New Area, Chongqing, China
Sales hotline: 023-67032678 Company Tel.: 023-67032666 Fax: 023-67032676
Technical support: 023-67032695 023-67032667
Http: //www.cqcy.com E-mail: flowmaster@sicflow.com.cn

Production development is subject to change of technical indexes without notice.
The Company shall be responsible for interpreting any printing error of this document.

Safety precautions:

⚠ For correct and safe use of our products, be sure to read the Operation Instructions before use.