



SCL-9 Ultrasonic Flowmeter
Installation & User Guide

Huizhong Instrumentation Co., Ltd.

Dear Users and Friends,

Thank you for your choice of our company's ultrasonic flow measuring meters. Huizhong Instrumentation Co., Ltd. is currently China's R & D and manufacture base of series ultrasonic heat meters, water meters and flowmeters and related systems. It is also a new and high-tech and software enterprise of Hebei Province.

Huizhong owns all the proprietary intellectual property of all the products and it has always been in the leading edge of ultrasonic flow measuring field. Huizhong has also participated in industry/national standards, such as "Ultrasonic Flowmeter for Water Supply and Drainage Application (operating on the principle of propagation velocity difference)", "Regulations on Calibration of Ultrasonic Flowmeter", "Heat Meter" and "Drinking Cold Water and Hot Water Meter".

In 2008, Huizhong participated in the research of "Flow Sensor and System for Industrial Process Control"—the 863 Program assigned by the Ministry of Science and Technology, which has contributed to the independent R & D and industrialization of advanced sensors in China.

Incessant technical innovation lays a solid foundation which enables the company's products to maintain all along technologically a leading position and win the acclaim of numerous users both at home and abroad for their leading technology and superior quality. Among them, the series ultrasonic flowmeters and water meters have been sold in batch quantities to European, African, Australian, North American and South Asian countries and regions, and the products are well accepted by users.

Huizhong will innovate the ultrasonic flow measuring technology, to satisfy needs of users with world-class products and services, and make contributions to the development of global water and energy conservation course.

Quality Guaranty

The following are product's Standards and Certificates:

- Designed and manufactured in conformity to the Professional Standard of P.R.C. for Urban Construction CJ/T 3063-1997, 《Ultrasonic Flowmeter for Potable Water and Drain Water》 .
- Regulation of PRC JJG1030-2007, 《Ultrasonic Flowmeters》 .
- China Metrology Certification Hebei Province No.: 02000127.

Enterprise's certificates

- Quality Management System GB/T 19001-2008/ISO9001:2008.
- Environment Management System GB/T 24001-2004/ISO14001:2004.
- Measurement Management System GB/T 19022-2003/ISO10012:2003.
- Occupational Health and Safety Management System GB/T 45001-2020/ISO 45001:2018.

Important Notices

- Please do read the Installation & User Guide carefully prior to the use of the meter.
- Please keep this instruction manual for reference whenever necessary.
- Please operate the meter strictly in accordance with the instructions. Huizhong bears no responsibility for any consequence resulted from user's failure to follow the directives.
- All the diagrams shown in this instruction manual are illustrated instructions for operation, and do not serve as a basis for meter inspection. If there exists in the instruction manual any data that is inconsistent with that of the meter for use, take the meter actually used as the criterion, or consult with our company.
- The meter has been subjected to fine calibration before delivery. Huizhong bears no responsibility for any damage resulted from arbitrary disassemble of the meter by user.
- If the meter doesn't work and need to be repaired or maintained, please contact us or our authorized agencies.



Caution!

Please proceed with your meter installation and operation strictly in accordance with the instructions for a avoiding the loss of your interest.

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Safety Warning

Please proceed with following precautions and use the meter correctly for avoiding economic loss, personal injury and death.

1. The meter is a precise measuring instrument which should be operated by specialized personnel.
2. About AC power supply:
 - Disassembling of instrument outer casing is not allowed when under power-up state.
 - Power plug must be fully inserted.
 - Never touch power plug with wet hands for avoiding personal injury due to electric shock.
 - Please hold and pull out power plug when pulling out power plug. Do not hale the power cord.
 - Do not pulling, cutting or over bending the power. Do not put heavy objects on the power cord, either.
 - Knotting is not allowed for power cord.
 - Damaged insulation of power cord should not be used for avoiding personal injury.
 - Please disconnect power if instrument is stored for a long period of time without being used for avoiding fire resulted from thunder strike and heat.
 - Avoid as much as possible the use of a common power with large equipment. If inevitable, some measures to purify power supply must be done, or normal operation of instrument may be affected.
 - Arrester needs to be installed if thunder strike may happen in working environment.
3. Never change the length of transducer cable. Otherwise, the performance of the meter would be affected.
4. Keep any wires or cable of the meter away from heat source to avoid fire hazard or electric shock arising from deterioration of insulation layers due to deformation of cable under high heat.
5. Be careful not to let your skin get scratched by any exposed threaded parts.
6. Do not use any corrosive liquids and products to plot or cover the product, otherwise it will accelerate the aging of the product materials.

7. The meter is a precise measuring instrument. Take care and don't let it fall off or be subjected to knocking force.

1. Description

- SCL-9 ultrasonic flowmeter is based on “Transmission speed difference method”, mainly used for flow monitoring of hydropower stations and large-scale water transmission and supply projects, and also widely used for pipeline, culvert and pressure pipelines in various shapes. The flowmeter adopts the multi-channel transducer installation technology, and the flow rate area integral algorithm is used to calculate the flowrate, which effectively solves the technical problems such as fluid flow distribution, signal processing, site positioning and installation of the transducer with working pressure, and realizes the stable and accurate measurement of the large flowrate. With superior technical performance, SCL-9 multi-channel ultrasonic flowmeter has become an ideal choice for large flow metering and monitoring projects.
- The meter is composed of main measuring unit and transducer. The Insertion-type transducer can be installed directly on the pipe, or can be equipped with a special pipe section for installation.
- Designed and manufactured in conformity to the Professional Standard of P.R.C. for Urban Construction CJ/T 3063-1997, 《Ultrasonic Flowmeter for Potable Water and Drain Water》 .
- The ex-factory calibration is made in conformity to the National Metrological Calibration Regulation of PRC JJG1030-2007 《Ultrasonic Flowmeters》 .
- Please read the instruction manual carefully before using the product.

2. Main Measuring Unit Installation and Operating Instruction

2.1 Technical Parameters

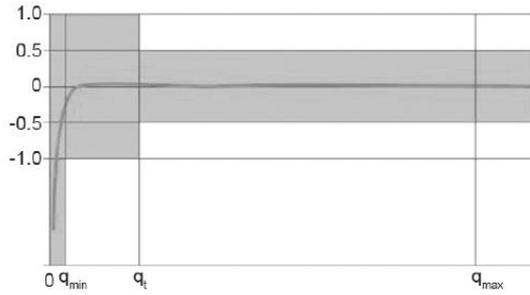
Table 2-1 Technical Parameters

Type Performance	SCL-90 Insertion-type Ultrasonic Flowmeter	SCL-92 Internal-mounted-type Ultrasonic Flowmeter
Material of pipeline	Material like steel, cast iron, cement, PE, and PVC etc, which pipeline can be drilled for mounting	Material like steel, cast iron, cement, PE, and PVC etc, which pipeline can install transducer
Nominal diameter	DN300~DN1500	DN1500~DN15000
Fluid measured	Water, sewage and other homogeneous fluids in full pipe flow, and the	

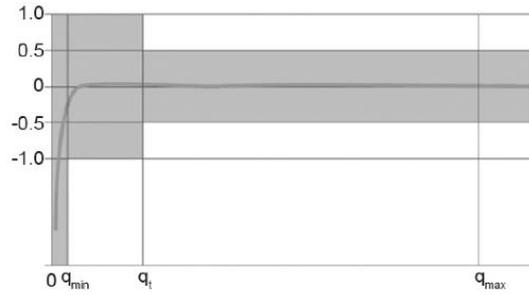
	suspended solid content shall be no more than 10g/L			
Flow velocity adaptable	0m/s~12.00m/s (Vt=0.3m/s)			
Accuracy class	Class 0.5			
Ambient temperature	-10°C~+45°C(Please specify on ordering if the range is exceeded)			
Ambient humidity	≤85%RH (Please specify on ordering if the range is exceeded)			
Power supply	AC220V±10%, 50Hz			
Power consumption	<5W			
Keypad	1×3 induction key			
Display	240×64 dot matrix LCD			
Data display	On screen display	Cumulative flowrate (m ³), instantaneous flowrate (m ³ /h), signal strength indication, working status indication, fault display		
	Key display	Positive cumulative flowrate (m ³), negative cumulative flowrate (m ³), instantaneous flowrate (m ³ /h), flowrate (m/s), running time (h), water temperature(°C), date (Y/M/D), time (H/M/S)		
Display range		Cumulative flowrate: -99999999.9~+99999999.9 m ³ Instantaneous flowrate: -9999999.99~+9999999.99 m ³ /h		
Output of main measuring unit	Digital	RS-485; Baud rate: 2400bps, 4800bps, 9600bps (Selectable), Default: 4800bps. Transmission distance≤1200m. Available with Huizhong and Modbus RTU protocols.		
	Analog	Optical isolation 4~20mA, 0~10mA, or 0~20mA. Load capacity: ≤600Ω		
	Accumulated switch quantity	Active output	Output voltage: DC24V; Output current: 20mA (Max.) (Default)	
		Passive output	Load voltage: DC30V (Max.); Load current: 20mA (Max.) (Please specify on ordering)	
Transmission distance≤500m				
Data storage		Cumulative flowrate, running time and different parameters can be stored, automatically stored of last 150 days' daily and last 60 months' monthly pervious data; data will be stored for 100 years even in case of a power failure. Data include below: date, positive cumulative flowrate, negative cumulative flowrate, algebraic sum of cumulative flowrate and corresponding running time.		
Protection class		Main unit: IP65, Transducer: IP68		
Number of sonic channels		4/8 channels		

2.1.1 Typical Error Curve

E% Flowrate(m³/h) E% Flowrate(m³/h)



SCL-90 Insertion-type Flowmeter



SCL-92 Internal-mounted-type Flowmeter

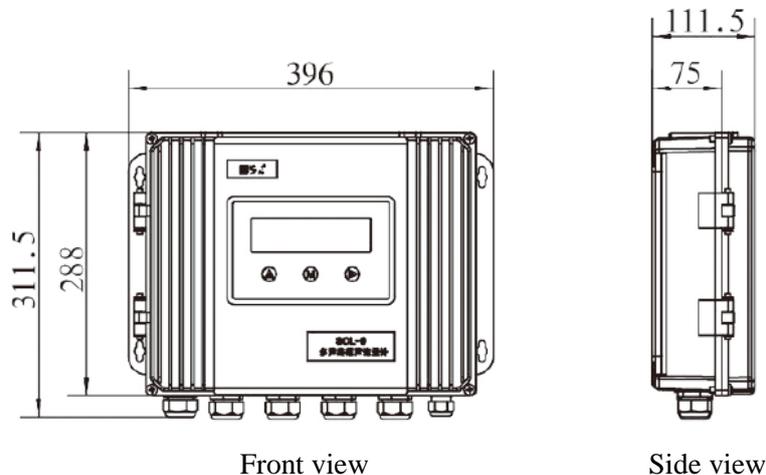
2.2 Main Measuring Unit Installation and Connection

2.2.1 Installation and connection requirements

- Do not install in strong vibration environment.
- Do not install in an environment with a large amount of corrosive gases.
- Do not install the main measuring unit outdoors, if necessary, install it in the instrument box to avoid rain and sunshine.
- The power supply should be stable and reliable, and add a voltage stabilizing equipment if necessary.
- Avoid sharing a power supply with the equipment that pollutes the power supply, such as frequency converter and welding machine, and install power purification equipment if necessary.
- Meters working in lightning prone areas must be installed with lightning arrester or take lightning protection measures. (The lightning arrester can be provided by customer or by Huizhong)

2.2.2 Dimensions and weight

- Dimensions (Unit: mm)



Front view

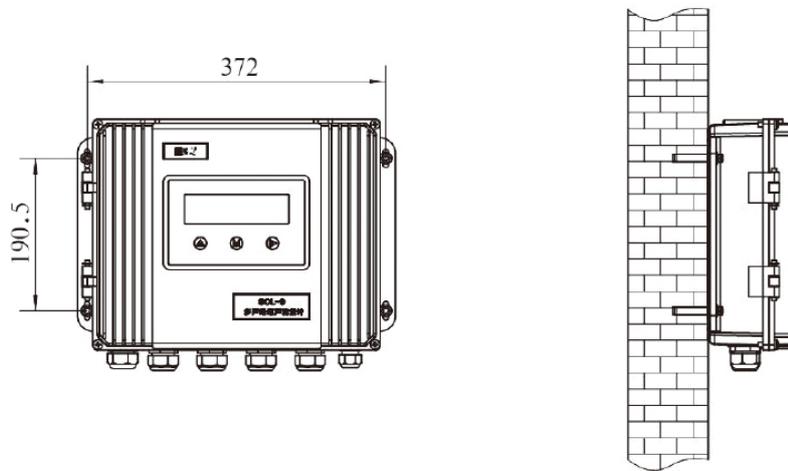
Side view

Picture 2-1 Dimensions of main measuring unit

- Weight: 6.1kg.

2.2.3 Main Measuring Unit Installation method

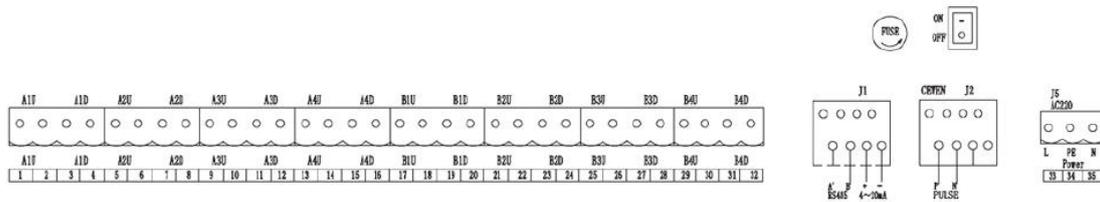
1. Determine the mounting position of main measuring unit. Then check accessories: 4 pieces of M6 steel expansion bolts and matched flat and spring washers.
2. Drill bottom holes of expansion bolt with a spacing of 372mm*190.5mm, and insert the expansion bolt.
3. Finally, install the measuring host on it and tighten the nut of the expansion bolt. Installation completed.



Picture 2-2 Installation diagram

2.2.4 Electrical Connection of the Main Measuring Unit Wiring Terminal

- Main Measuring Unit Wiring Terminal



Picture 2-3 Diagram of the main measuring unit wiring terminal

- Main Measuring Unit Wiring Terminal Description

Terminal A1U, A1D should be connected with upstream and downstream transducer of the 1st path;

Terminal A2U, A2D should be connected with upstream and downstream transducer of the 2nd path;

Terminal A3U, A3D should be connected with upstream and downstream transducer

of the 3rd path;

Terminal A4U, A4D should be connected with upstream and downstream transducer of the 4th path;

Terminal B1U, B1D should be connected with upstream and downstream transducer of the 5th path;

Terminal B2U, B2D should be connected with upstream and downstream transducer of the 6th path;

Terminal B3U, B3D should be connected with upstream and downstream transducer of the 7th path;

Terminal B4U, B4D should be connected with upstream and downstream transducer of the 8th path;

Terminal RS485 should be connected with digital quantity RS-485 output;

Terminal 4-20mA should be connected with analog output;

Terminal PULSE should be connected with cumulative pulse output;

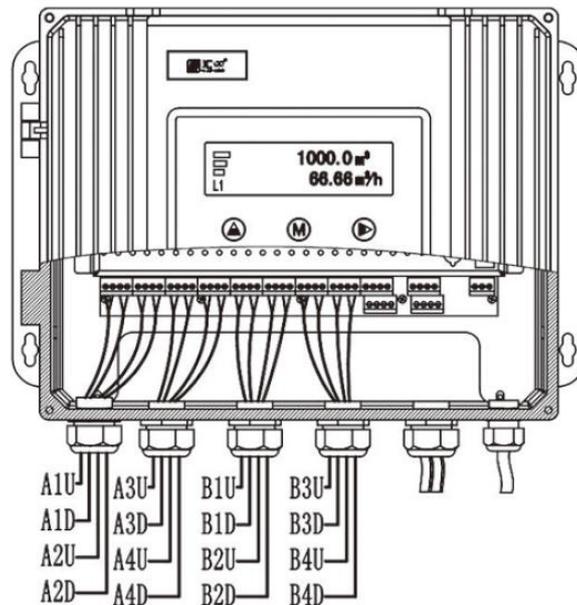
Terminal CEWEN for reservation;

FUSE is fuse;

ON and OFF are power switch;

Terminal POWER should be connected with power supply.

- Connection to transducer



Picture 2-4 Diagram of Connection to Transducer

Note:

The upstream core wire and shielding wire of 1st path with A1U label should be

connected with terminal 1 and 2 respectively;

The downstream core wire and shielding wire of 1st path with A1D label should be connected with terminal 4 and 3 respectively;

The upstream core wire and shielding wire of 2nd path with A2U label should be connected with terminal 5 and 6 respectively;

The downstream core wire and shielding wire of 2nd path with A2D label should be connected with terminal 8 and 7 respectively;

The upstream core wire and shielding wire of 3rd path with A3U label should be connected with terminal 9 and 10 respectively;

The downstream core wire and shielding wire of 3rd path with A3D label should be connected with terminal 12 and 11 respectively;

The upstream core wire and shielding wire of 4th path with A4U label should be connected with terminal 13 and 14 respectively;

The downstream core wire and shielding wire of 4th path with A4D label should be connected with terminal 16 and 15 respectively;

The upstream core wire and shielding wire of 5th path with A5U label should be connected with terminal 17 and 18 respectively;

The downstream core wire and shielding wire of 5th path with A5D label should be connected with terminal 20 and 19 respectively;

The upstream core wire and shielding wire of 6th path with A6U label should be connected with terminal 21 and 22 respectively;

The downstream core wire and shielding wire of 6th path with A6D label should be connected with terminal 24 and 23 respectively;

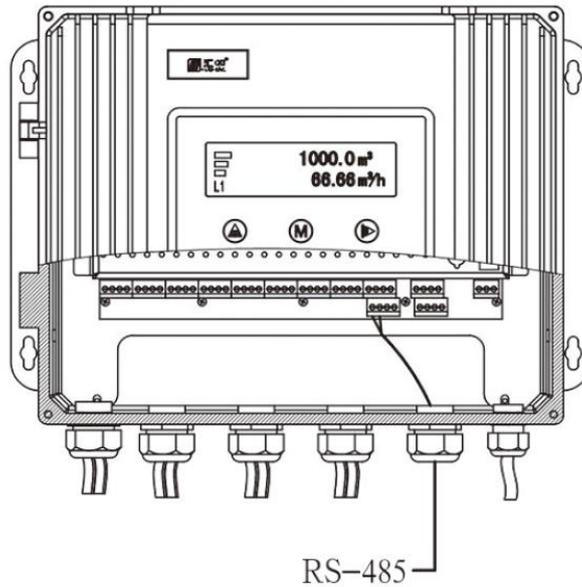
The upstream core wire and shielding wire of 7th path with A7U label should be connected with terminal 25 and 26 respectively;

The downstream core wire and shielding wire of 7th path with A7D label should be connected with terminal 28 and 27 respectively;

The upstream core wire and shielding wire of 8th path with A8U label should be connected with terminal 29 and 30 respectively;

The downstream core wire and shielding wire of 8th path with A8D label should be connected with terminal 32 and 31 respectively.

- Connection to digital output

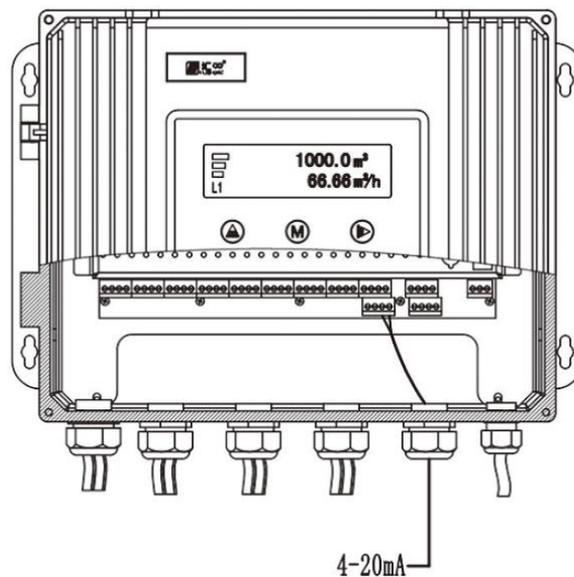


Picture 2-5 Diagram of Connection to Digital Output

Note:

- ① A+ and B- of RS-485 communication line of communication device should be respectively connected with terminals A and B of main unit.
 - ② Serial interface of PC should be connected with interface conversion module. A+ and B- of interface conversion module should be connected with terminals A and B of main unit.
- Connection to analog output

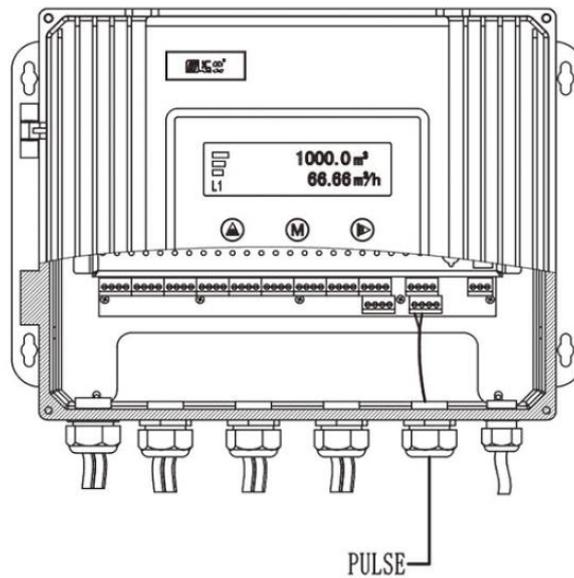
Diagram of connection to analog output and display instrument or record instrument (See Picture 2-6).



Picture 2-6 Diagram of Connection to Analog Output

Note:

- ①The sum of the transmission line resistance and the display meter (or recorder) input resistance is less than 600Ω ;
- ②The positive pole and negative pole of the display meter (or recorder) are respectively connected to the terminal + and - of the main unit (4-20mA);
- ③Analog output reflects the variation of instantaneous flowrate (positive value) of the meter. As the instantaneous flowrate (positive value) is greater than or equal to analog full scale, analog output is up to full-scale value.
- Connection to cumulative switch output

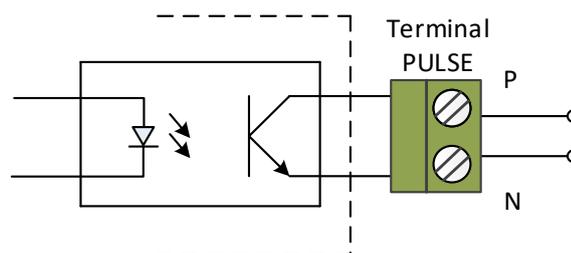


Picture 2-7 Diagram of Connection to Cumulative Switch Output

Note:

- ①The positive pole and negative pole of the secondary instrument should be connected with terminals P and N of the main unit.
- ②Cumulative switch output is divided into passive output and active output.
 - Passive output: DC power supply is outsourced.
 - Active output: DC power supply is provided by cumulative switch output.
- Cumulative switch output connection schematic diagram and pulse sequence chart

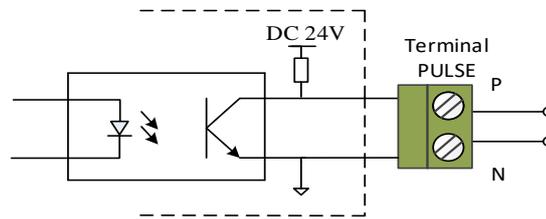
- ①Passive output of cumulative switch



Picture 2-8

Note: External power DC $\leq 30V$, $I \leq 20mA$.

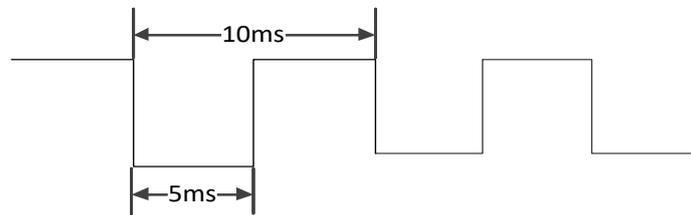
②Active output of cumulative switch



Picture 2-9

Note: Output voltage DC24V, output current $\leq 20mA$.

③Pulse sequence chart



Picture 2-10 Cumulative Pulse Sequence Chart

Note:

A pulse is outputted when algebraic sum of cumulative flowrate of the meter is up to cumulative pulse equivalent in a measurement cycle, according to the cumulative pulse equivalent selected by customer (Settings of cumulative pulse equivalent refers to “Cumulative pulse equivalent”).

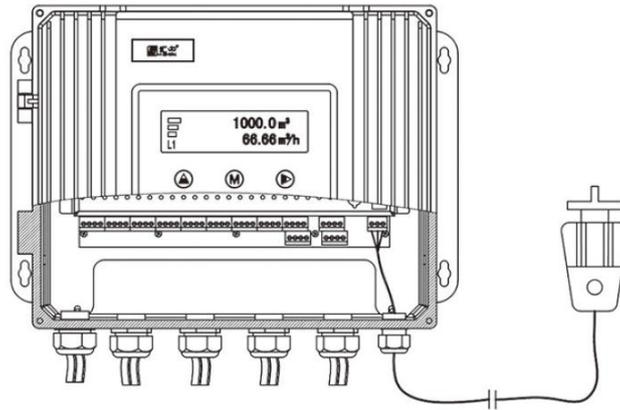
The pulse output width 5ms and cycle 10ms. The response speed of external secondary instrument should be greater than or equal to 150Hz.

For example, the cumulative pulse equivalent is $10.0m^3$ set by customer. A pulse can be outputted when algebraic sum of cumulative flowrate of the meter is up to $10.0m^3$.



Attention: A shielded transmission cable should be used. Do not lay the cable along with other power lines in the same ditch.

- Power connection



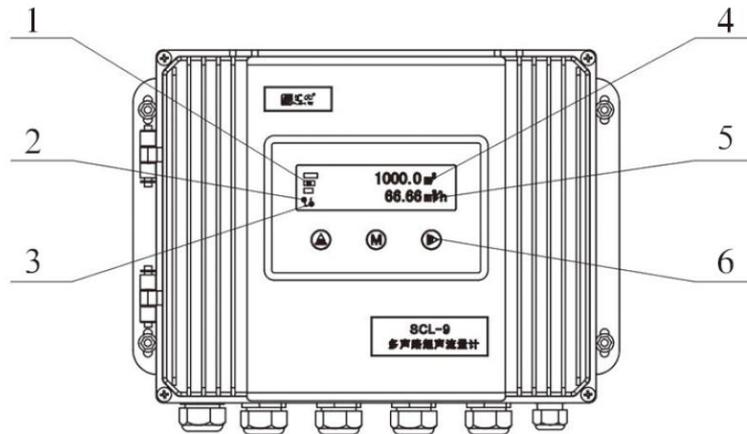
Picture 2-11 Diagram of power connection

Note:

Connect the power supply to terminal POWER of main measuring unit through knife switch and air switch. The live wire, ground wire and zero wire of power supply should be connected with terminals 33, 34 and 35 respectively.

3. Main Measuring Unit Display and Operating Instruction

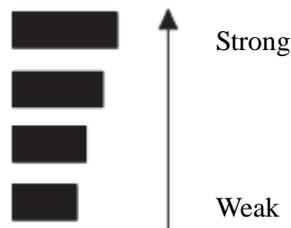
3.1 Panel annotation



Picture 3-1 Panel annotation of main unit

Note:

1. Signal intensity indication



2. Meter operating status indication, details refer to Appendix A.

- 1) "H"---Signal relatively strong
- 2) "L"--- Signal too weak
- 3) "*"---Signal unstable
- 4) ">"---Flowrate exceeded
- 5) "S"---Searching signal
- 6) "X"---Transducer fault
- 7) "E"---Processor fault

3. Fault sound circuit display

When a sound path cannot be measured normally, the sound path number is displayed.

During normal measurement, it is not displayed.

4. Display of cumulative flowrate

5. Display of instantaneous flowrate

6.1 × 3 induction key

Key function:



---①Switch to menu; ②Modify the value where cursor is positioned; ③Pages turning in the submenu of historical data.

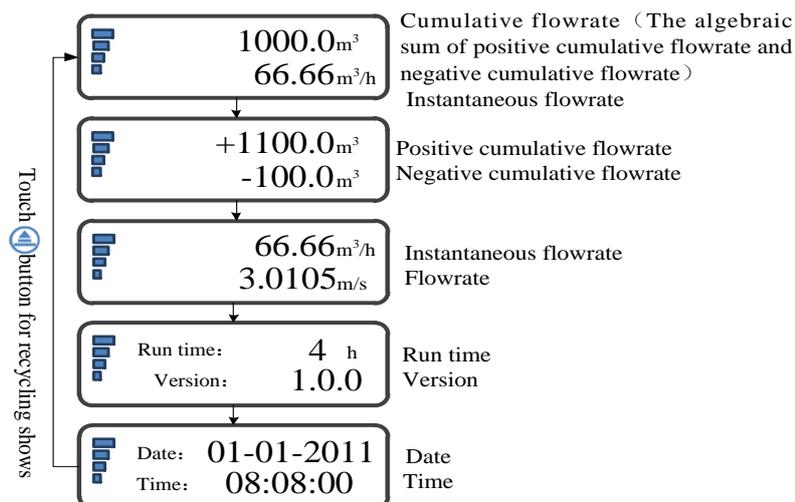


---①OK; ②Enter into menu; ③Switch to submenu in digital debugging menu.



---①Move cursor; ②Back.

3.2 Main Display



Picture 3-2 Main display

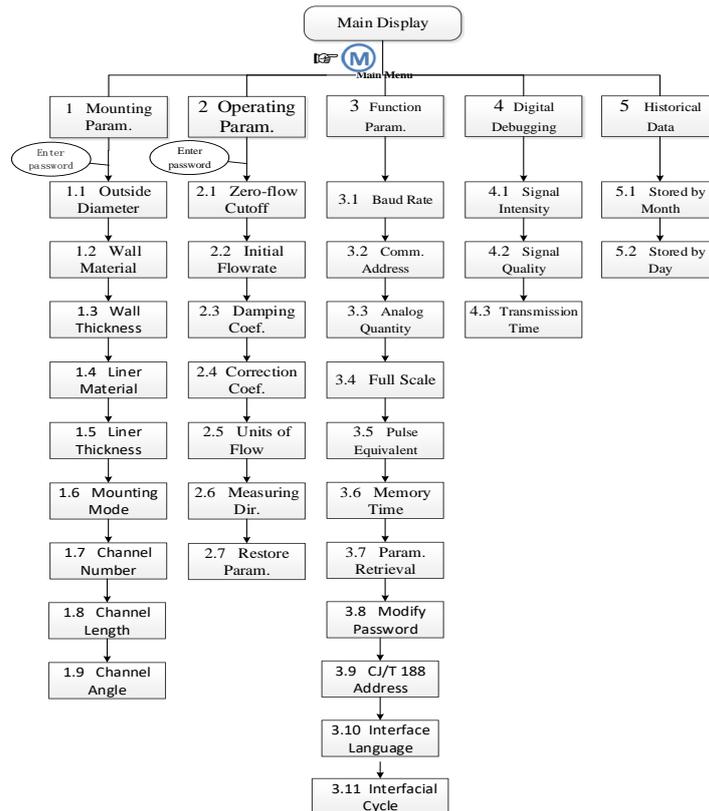
Note: When the instantaneous flowrate is greater than 999999.999m³/h, the instantaneous flowrate is displayed after two decimal places.

 Key function of main display:

Touch the  key for at least 3 seconds to enter the main menu.

The above screens can be displayed in a loop by touching the  key.

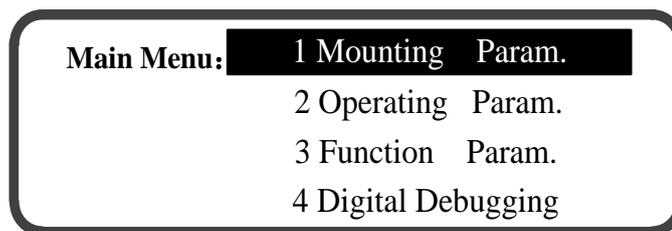
3.3 Menu Structure



Picture 3-3 Menu Structure

3.4 Main Menu

➤ In main display, touch the  key for at least 3 seconds to enter the main menu, as shown in picture 3-4.



Picture 3-4 Main Menu

➤ 5 main menus are available for the meter:

[[1 Mounting Param.]]

[[2 Operating Param.]]

[[3 Function Param.]]

[[4 Digital Debugging]]

[[5 Historical Data]]

 Key function of the main menu:

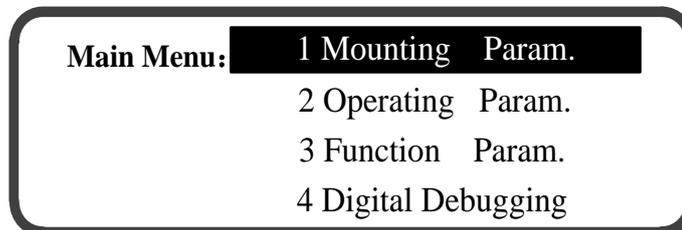
Touch the  key to display the main menu cycled.

Touch the  key to enter the main menu;

Touch the  key to return to main display.

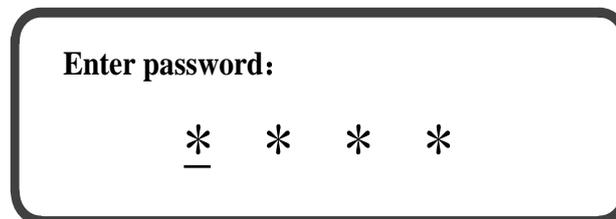
3.5 Mounting Parameters

In main menu, touch the  key to select [[1 Mounting Param.]], as shown in picture 3-5.



Picture 3-5

Enter the screen of “Enter password” by touching  key, display as shown in picture 3-6.



Picture 3-6

Ex-factory default password is “0000”. If password modification is needed, please refer to menu “Modify password”.

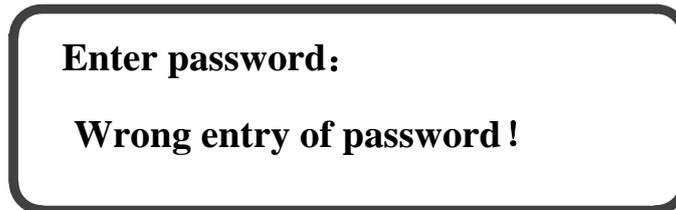
 Key function of enter password:

Touch  key to modify the value where cursor is positioned.

Touch  key to confirm.

Touch  key to move cursor.

If the password is wrong, it will return to main menu after the meter display as shown in picture 3-7.



Picture 3-7

 Attention: If forgotten password, restore factory defaults by the following steps.

Step: ① Power off; ② Touch  key immediately after turn on the power,, then password are reset to factory defaults.

Submenu instruction

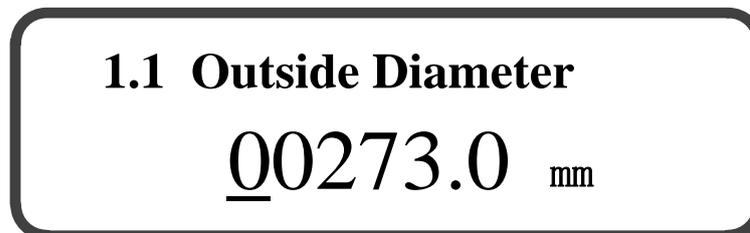
 Key function of the submenu:

Touch  key to modify the value where cursor is positioned.

Touch  key to confirm.

Touch  key to move cursor.

Outside Diameter



Picture 3-8

The valid setting range of the outside diameter of the pipeline is from 20.0mm to 20800.0mm. Factory default value is 320.0mm. If the outside diameter of the pipeline

is out of range, re-entry is required after meter display as shown in picture 3-9.

1.1 Outside Diameter
Out of range !

Picture 3-9

 Wall Material

1.2 Wall Material
Steel

Picture 3-10

4 options for pipe wall material: steel, cast iron, plastic and cuprum. Steel is as the factory default option.

 Wall Thickness

1.3 Wall Thickness
011.5 mm

Picture 3-11

The valid setting range of the pipe wall thickness is from 0.0mm to 200.0mm. Ex-factory default value is 10.0mm. If the pipe wall thickness is out of range, re-entry is required after meter display as shown in picture 3-12.

1.3 Wall Material
Out of range !

Picture 3-12

 Liner Material

1.4 Liner Material
None

Picture 3-13

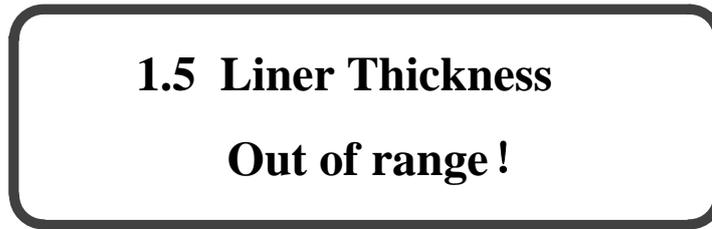
4 options for pipe liner material: None, Cement, Rubber and Plastic. Please select according to certain situation. None is as the ex-factory default. If “None” is selected, meter display directly goes to the menu “Mounting Mode”.

 Liner Thickness



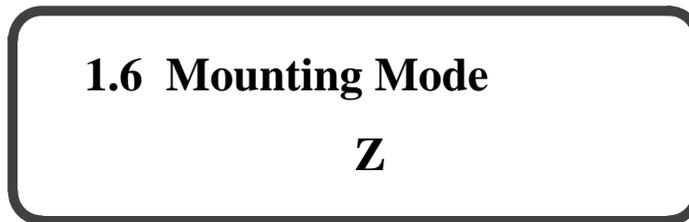
Picture 3-14

The valid setting range of the pipe liner thickness is from 0.0mm to 200.0mm. Factory default value is 0.0mm. If the pipe liner thickness is out of range, re-entry is required after meter display as shown in picture 3-15.



Picture 3-15

 Mounting Mode



Picture 3-16

2 options are available for transducer mounting mode, including mode Z and mode V. Ex-factory default is mode Z. Please refer to “Mounting Mode” for details.

 Attention: After setting **【1.6 Mounting Mode】**, if the setting “Outside Diameter-2×(Wall Thickness + Liner Thickness) < 20mm”, meter is automatically returned to the submenu of **【1.1 Outside Diameter】** and resetting of mounting parameter is required.

 Channel Number

1.7 Channel Number

8

Picture 3-17

The channel number is used to set the number of working channel number of the meter. 3 options are available for 4-channel meter, including 1 channel, 2-channel, and 4-channel. 4 options are available for 8-channel meter, including 1 channel, 2-channel, 4-channel, and 8-channel.

 Channel Length

1.8 Channel Length 1

461.7 mm

Picture 3-18

Input the length of each channel in turn according to the actual installation condition of the transducer.

 Channel Angel

1.9 Channel Angle 1

45.00 degrees

Picture 3-19

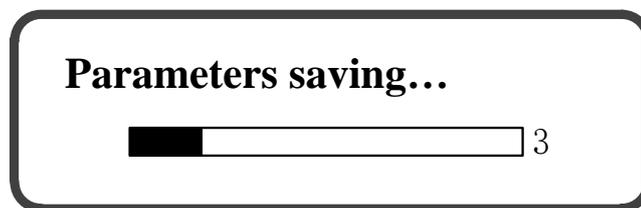
Input the angle of each channel in turn according to the actual installation condition of the transducer.

If the parameters set in Menu 1.1~1.9 are same as original parameters, meter should directly get back to main display. If not, the meter display is as shown in picture 3-20.



Picture 3-20

Touch  key to select “OK” or “Cancel”, and click  key for confirmation. For selection of “Cancel”, original parameters will not be modified and meter display will get back to main display. For “OK”, meter will save the set parameters, as shown in picture 3-21



Picture 3-21

If it is successfully saved, meter display is as shown in picture 3-22. After that, meter display gets back to main display.

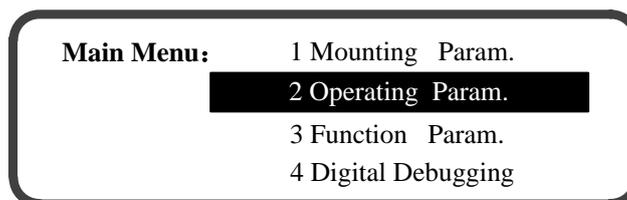


Picture 3-22

If failed to save, please refer to 6.1 “Remedy of common troubles”.

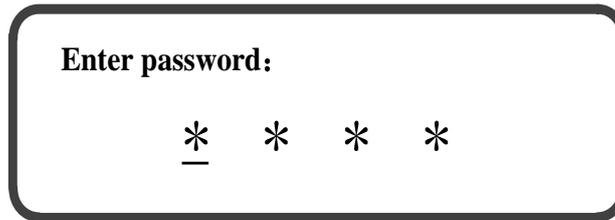
3.6 Operating Parameters

In main menu, touch  key to select **【2 Operating Param.】**, as shown in picture 3-23.



Picture 3-23

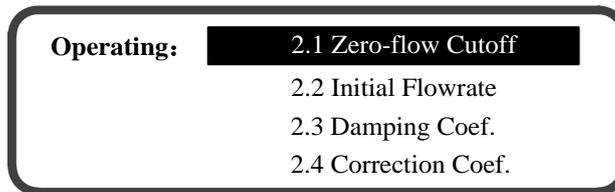
Touch  key to enter display of “Enter password” as shown in picture 3-24.



Picture 3-24

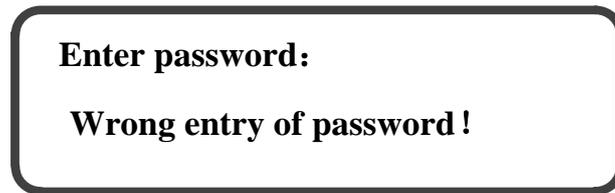
Ex-factory default password is “0000”. If password modification is needed, please refer to menu “Modify password”.

For right entry of password, meter will assess to the menu of operating parameters, as shown in picture 3-25.



Picture 3-25

For wrong entry of password, it will get back to main men after the meter display as shown in picture 3-26.



Picture 3-26



Key function of “Enter password”:

Touch  key to modify the value where cursor is positioned.

Touch  key to confirm.

Touch  key to move cursor.

➤ 7 submenus for operating parameters:

[[2.1 Zero-flow Cutoff]]

[[2.2 Initial Flowrate]]

[[2.3 Damping Coef.]]

[[2.4 Correction Coef.]]

[[2.5 Units of Flow]]

[[2.6 Measuring Dir.]]

[[2.7 Restore Param.]]

 Attention: If forgotten password, restore factory defaults by the following steps.

Step: ① Power off; ② Touch  key immediately after turn on the power, then password are reset to factory defaults.

 Submenu instruction

 Key function of the submenu:

Touch  key to modify the value where cursor is positioned.

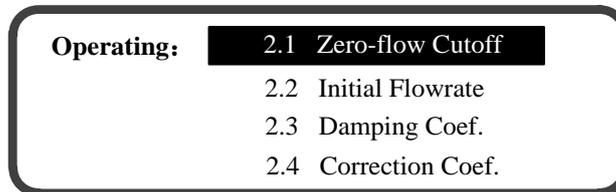
Touch  key to confirm.

Touch  key to move cursor.

 Zero-flow Cutoff

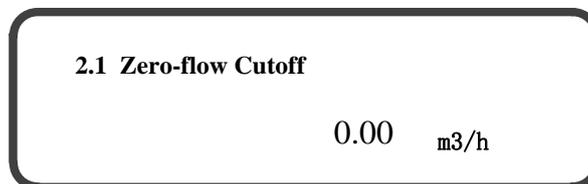
In the menu of operating parameters, select **【2.1 Zero-flow Cutoff】** by touching

 key , as shown in picture 3-27



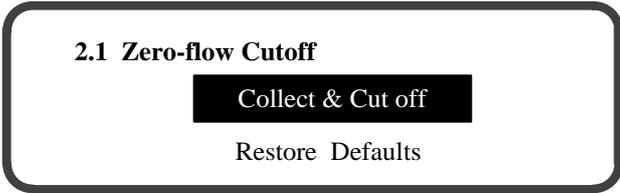
Picture 3-27

Touch  key to access to the submenu of “Zero-flow Cutoff”, as shown in picture 3-28.



Picture 3-28

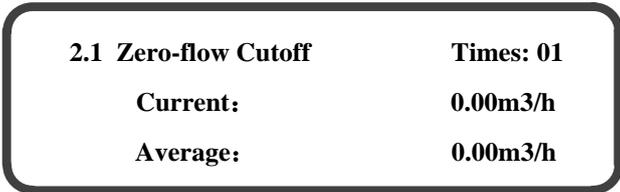
The display shown in Fig. 3-28 is the saved zero-flow value in the meter. Zero-flow cutoff range is $-200.000\text{m}^3/\text{h} \sim +200.000\text{m}^3/\text{h}$. After touching  key, the display is as shown in picture 3-29.



Picture 3-29

➤ Touch  key and select “Collect & Cut off”, as shown in picture 3-30. Collect instantaneous flowrate in static water for 180 times. No other operation can be done during acquisition process. Meter automatically calculates zero-flow value after acquisition completed and save meter’s zero-flow values to eliminate the effect of zero-flow on measuring accuracy.

 Attention: Before the operation of “Collect & Cut off”, **【2.2 Initial Flowrate】** should be set to 0.000m/s and **【2.6 Initial Flowrate】** should be set to “Two-way”. And then, the operation of “Collect & Cut off” can be done. After that, **【2.2 Initial Flowrate】** and **【2.6 Measuring Dir.】** must be restored to original parameters.

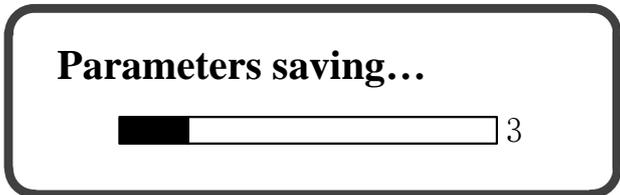


Picture 3-30

 Attention: At the time of collecting instantaneous flowrate values, the liquid in the pipe should keep static and be fully filled, and meter must access to stable measuring status for over 3 minutes.

Number of instantaneous flowrate acquisition times displays on the right side of the first line of the display screen. The second line displays current instantaneous flowrate. The third line displays average value of the instantaneous flowrate (Namely, zero-flow value).

Acquisition completes, meter automatically cuts off zero-flow and it displays “Parameters saving...” as shown in picture 3-31.



Picture 3-31

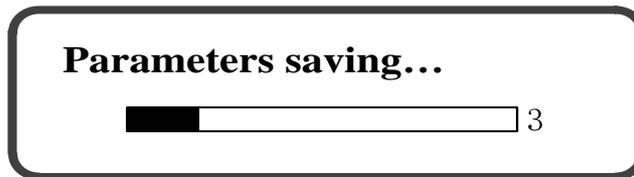
If successfully saved, the meter display is as shown in picture 3-32. After that, meter display gets back to the display as shown in picture 3-29.



Picture 3-32

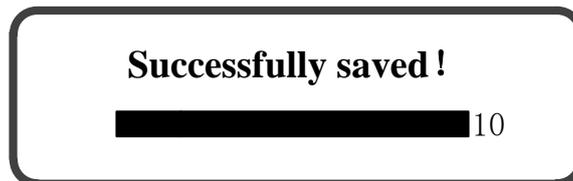
 Caution: Zero-flow cutoff cannot be freely operated in dynamic water, or measuring accuracy of the meter may be affected.

- After reinstallation of transducer or when original zero-flow value is cut off, please touch  key and select “Restore Defaults” to clear zero-flow to 0.000 m³/h, and begin to save parameters as shown in picture 3-33.



Picture 3-33

Successfully saved as shown in picture 3-34. Meter display gets back to the display screen as shown in picture 3-29.

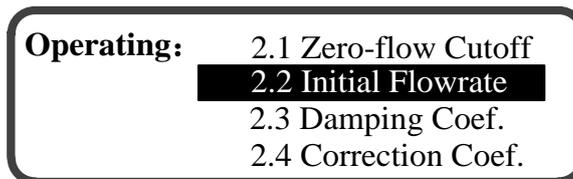


Picture 3-34

 Initial Flowrate

In the menu of operating parameters, select **【2.2 Initial Flowrate】** by touching

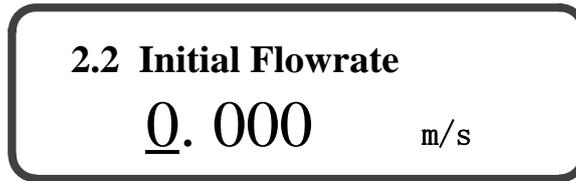
 key, as shown in picture 3-35.



Picture 3-35

Touch  key to access to the submenu of “Initial Flowrate”, as shown in picture

3-36.



Picture 3-36

Initial flowrate is the minimum flowrate that meter starts to measure, which is used for eliminating the fluctuating value of instantaneous flowrate in static water. When the absolute value of actual value is lower than initial flowrate, the instantaneous flowrate and flowrate value displayed in conversion unit is “0”.

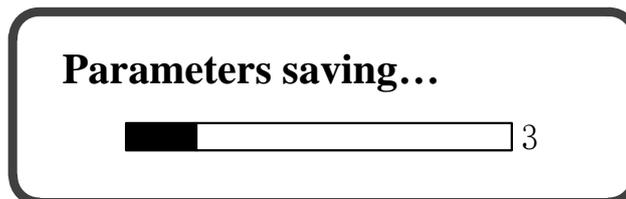
The range of initial flowrate is 0.000m/s ~ 1.000m/s and the ex-factory default value of initial flowrate is 0.000m/s. The setting of initial flowrate is determined in accordance with the fluctuating value of the flowrate (instantaneous flowrate) in static water. The initial flowrate to be set should be higher than the fluctuating value of the flowrate in static water.

If the set parameters are same with original parameters, meter display gets back to the menu of operating parameters after touching  key. If not, meter display is as shown in picture 3-37. Touch  key to select “OK” or “Cancel” and touch  key for confirmation.



Picture 3-37

Select “Cancel”, meter display gets back to the menu of operating parameters. Select “OK”, meter starts to save the set parameters as shown in picture 3-38.



Picture 3-38

If successfully saved, meter display gets back to the menu of operating parameters after meter display is as shown in picture 3-39.



Picture 3-39

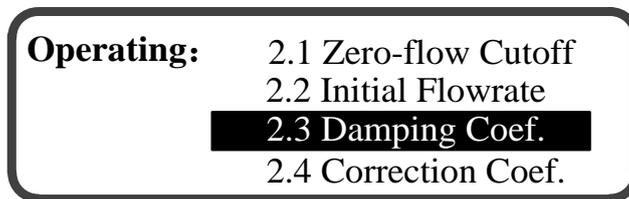
If the set parameter is out of range, re-entry is required after meter display as shown in picture 3-40.



Picture 3-40

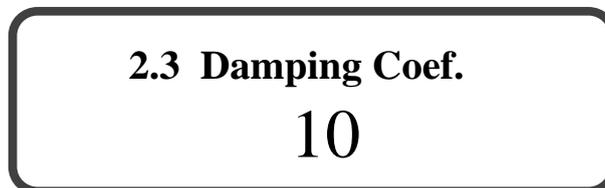
 Damping Coef.

In the menu of operating parameters, select **【2.3 Damping Coef.】** by touching  key , as shown in picture 3-41.



Picture 3-41

Touch  key to access to the submenu of “Damping Coef.”, as shown in picture 3-42.



Picture 3-42

Damping coefficient determines the tracking speed of instantaneous flowrate measured by meter to actual flowrate variation. When the flow regime stability of the measured liquid is weak, the value can restrain the fluctuation of instantaneous flowrate measured by meter. The lower the damping coefficient, the quicker the

tracking speed, and the higher the volatility of the displayed measuring value. Similarly, the higher the damping coefficient, the slower the tracking speed, and the lower the volatility of the displayed measuring value.

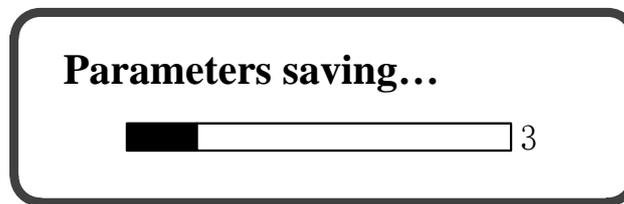
Damping coefficient includes 7 options: 1, 10 (Default), 20, 30, 40, 50 and 60.

If the set parameters are same with original parameters, meter display gets back to the menu of operating parameters after touching  key. If not, meter display is as shown in picture 3-43. Touch  key to select “OK” or “Cancel” and touch  key for confirmation.



Picture 3-43

Select “Cancel”, meter display gets back to the menu of operating parameters. Select “OK”, meter starts to save the set parameters as shown in picture 3-44.



Picture 3-44

If successfully saved, meter display gets back to the menu of operating parameters after meter display is as shown in picture 3-45.

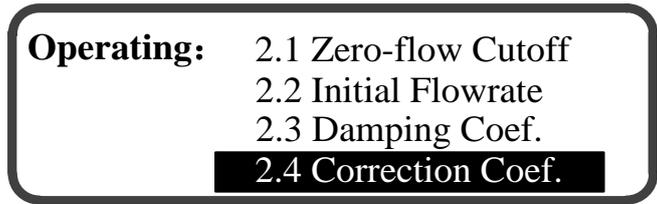


Picture 3-45

 Correction Coef.

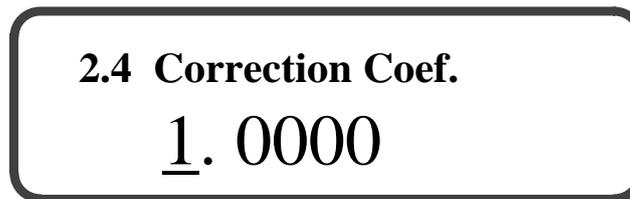
In the menu of operating parameters, select **【2.4 Correction Coef.】** by touching

 key, as shown in picture 3-46.



Picture 3-46

Touch  key to access to the submenu of “Correction Coef.”, as shown in picture 3-47.

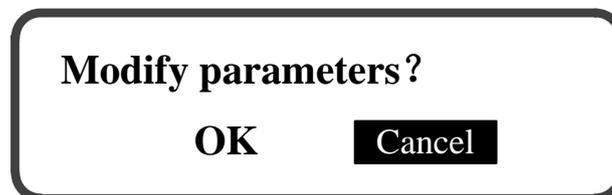


Picture 3-47

Correction Coef. is used for the correction of meter’s measuring accuracy. The range of Correction Coef. is 0.8000~1.3000. The correction of the coefficient’s ex-factory value is set in accordance with the result of each meter calibrated in real flow before ex-factory.

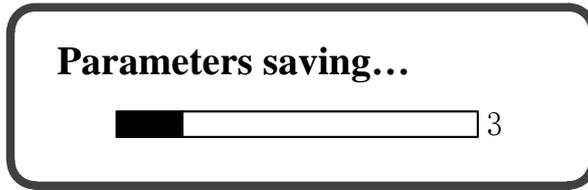
 **Caution:** Correction Coef. cannot be freely modified, or measuring accuracy of the meter may be affected.

If the set parameters are same with original parameters, meter display gets back to the menu of operating parameters after touching  key. If not, meter display is as shown in picture 3-48. Touch  key to select “OK” or “Cancel” and touch  key for confirmation.



Picture 3-48

Select “Cancel”, meter display gets back to the menu of operating parameters. Select “OK”, meter starts to save the set parameters as shown in picture 3-49.



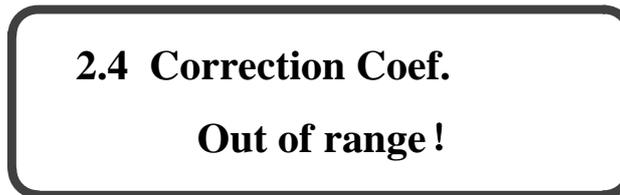
Picture 3-49

If successfully saved, meter display gets back to the menu of operating parameters after meter display is as shown in picture 3-50.



Picture 3-50

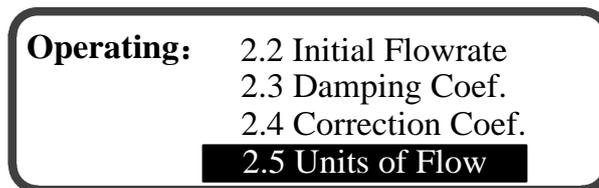
If the set parameter is out of range, re-entry is required after meter display as shown in picture 3-51.



Picture 3-51

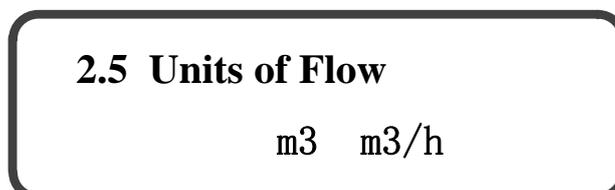
 Units of Flow

In the menu of operating parameters, select **【2.5 Units of Flow】** by touching  key, as shown in picture 3-52.



Picture 3-52

Touch  key to access to the submenu of “Units of Flow”, as shown in picture 3-53.



Picture 3-53

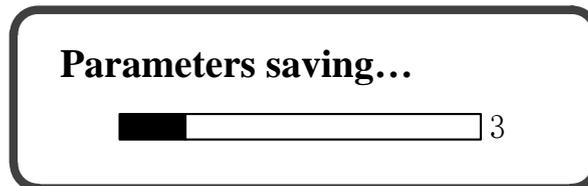
Units of flow are the units of meter's cumulative flowrate and instantaneous flowrate, including "m³, m³/h". The ex-factory default option is "m³, m³/h".

If the set parameters are same with original parameters, meter display gets back to the menu of operating parameters after touching  key. If not, meter display is as shown in picture 3-54. Touch  key to select "OK" or "Cancel" and touch  key for confirmation.



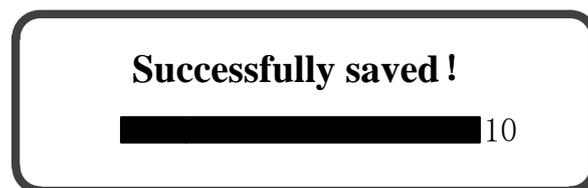
Picture 3-54

Select "Cancel", meter display gets back to the menu of operating parameters. Select "OK", meter starts to save the set parameters as shown in picture 3-55.



Picture 3-55

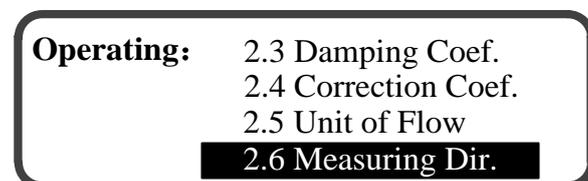
If successfully saved, meter display gets back to the menu of operating parameters after meter display is as shown in picture 3-56.



Picture 3-56

 Measuring Dir.

In the menu of operating parameters, touch  key to select **【2.6 Measuring Dir.】**, as shown in picture 3-57.



Picture 3-57

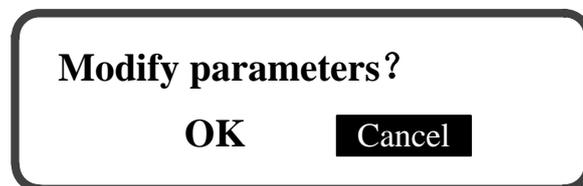
Touch  key to access to the submenu of “Measuring Dir.”, as shown in picture 3-58.



Picture 3-58

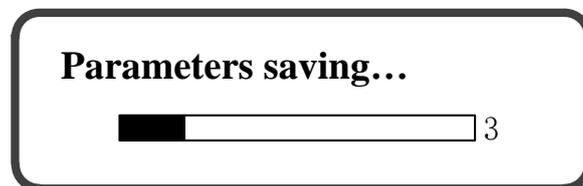
Meter’s measuring direction includes one-way and two-way. The factory default direction is two-way. For the condition of meter working in the mode of one-way, the instantaneous flowrate value less than “0” shall be dealt as “0” value, not included in cumulative flowrate (Algebraic sum of the positive and negative cumulative flowrates).

If the set parameters are same with original parameters, meter display gets back to the menu of operating parameters after touching  key. If not, meter display is as shown in picture 3-59. Touch  key to select “OK” or “Cancel” and touch  key for confirmation.



Picture 3-59

Select “Cancel”, meter display gets back to the menu of operating parameters. Select “OK”, meter starts to save the set parameters as shown in picture 3-60.



Picture 3-60

If successfully saved, meter display gets back to the menu of operating parameters after meter display is as shown in picture 3-61.



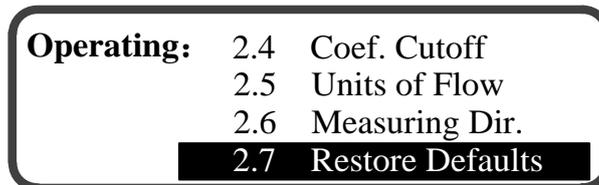
Picture 3-61

 Restore Param.

The meaning of “Restore Param.” is to restore the saved meter mounting parameters, which is saved in normal operation after debugging and mounting. The work of saving parameters is finished by the debugging personnel of Huizhong.

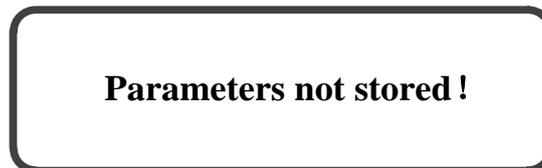
 Caution: The operation shall be made only when meter is in abnormal status.

In the menu of operating parameters, touch  key to select **【2.7 Restore Param.】**, as shown in picture 3-62.



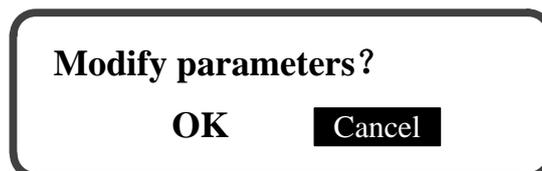
Picture 3-62

Touch  key, if meter does not save meter mounting parameters, meter display shall be as shown in picture 3-63.



Picture 3-63

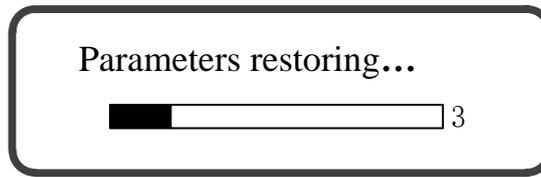
If meter has saved meter mounting parameters, meter display shall be as shown in picture 3-64.



Picture 3-64

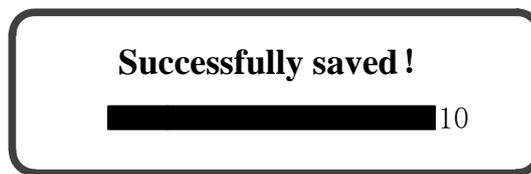
Select “Cancel”, meter display should get back to the display as shown in picture 3-62.

Select “OK”, meter should restore the saved mounting parameters, as shown in picture 3-65.



Picture 3-65

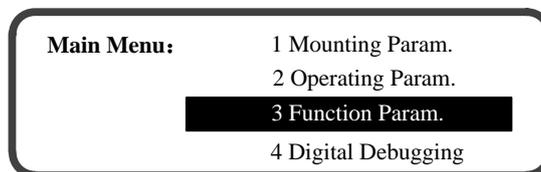
If successfully saved, meter display is as shown in picture 3-66, and then gets back to main display screen.



Picture 3-66

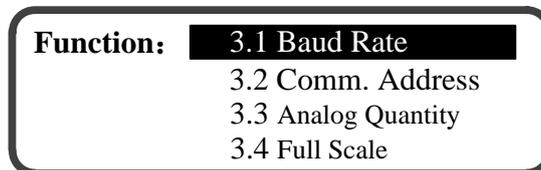
3.7 Function Parameters

In main menu, touch  key to select **【3 Function Param.】**, as shown in picture 3-67.



Picture 3-67

Touch  key to access to the menu of “Function Param.”, as shown in picture 3-68.



Picture 3-68

- 11 submenus are available for the menu of function parameters:
 - 【3.1 Baud Rate 】
 - 【3.2 Comm. Address 】
 - 【3.3 Analog Quantity 】

[[3.4 Full Scale of Analog Quantity]]

[[3.5 Cumulative Pulse Equivalent]]

[[3.6 Memory Time]]

[[3.7 Param. Retrieval]]

[[3.8 Modify Password]]

[[3.9 CJ/T 188 address]]

[[3.10 Interface Language]]

[[3.11 Interface Cycle]]

 Submenu instruction

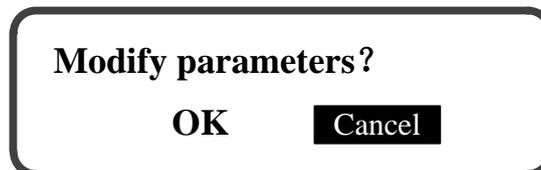
 Key function of the submenu:

Touch  key to modify the value where cursor is positioned.

Touch  key to confirm.

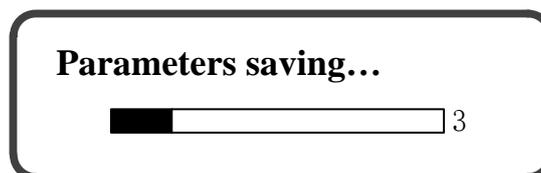
Touch  key to move cursor.

For below each function parameter submenu, after clicking  key for confirmation, if the set parameters are same with original parameters, meter display gets back to the menu of operating parameters after touching  key. If not, meter display is as shown in picture 3-69. Touch  key to select “OK” or “Cancel” and touch  key for confirmation.



Picture 3-69

Select “Cancel”, meter display gets back to the menu of operating parameters. Select “OK”, meter starts to save the set parameters as shown in picture 3-70.



Picture 3-70

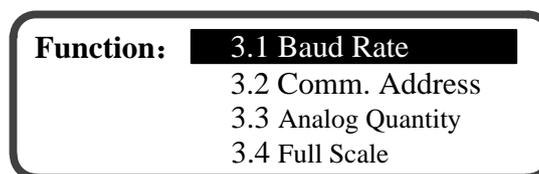
If successfully saved, meter display gets back to the menu of operating parameters after meter display is as shown in picture 3-71.



Picture 3-71

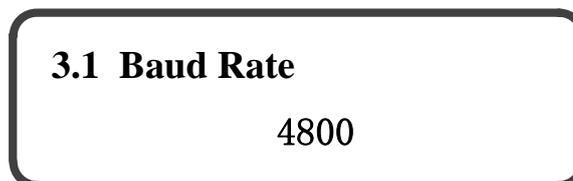
Baud Rate

In the menu of function parameters, select **【3.1 Baud Rate】** by touching  key, as shown in picture 3-72.



Picture 3-72

Touch  key to access to the submenu of “Baud Rate”, as shown in picture 3-73.

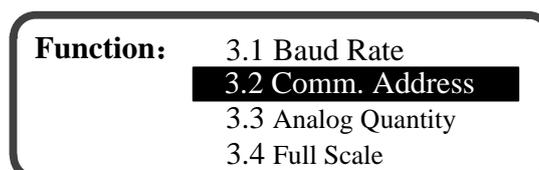


Picture 3-73

Baud rate is the number of bytes transferred per second from RS-485 interface when communicating. 3 options are available for baud rate, including 2400bps, 4800bps and 9600bps, and 2 options are available for check bit, including None and Even. The factory default baud rate is 4800bps, None.

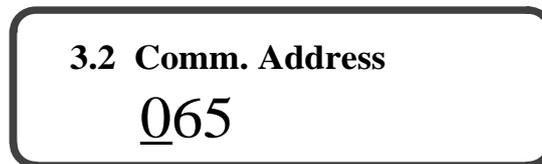
Comm. Address

In the menu of function parameters, touch  key to select **【3.2 Comm. Address】**, as shown in picture 3-74.



Picture 3-74

Touch  key to access to the submenu of “Comm. Address”, as shown in picture 3-75.

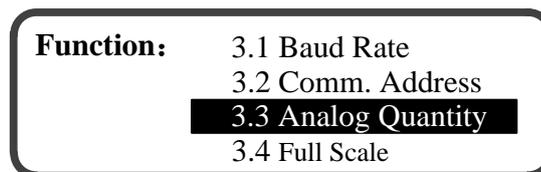


Picture 3-75

Communication address is the native address when using RS-485 interface for the multi-machine serial communication. Communication address range is 1~99. The factory default value is 65.

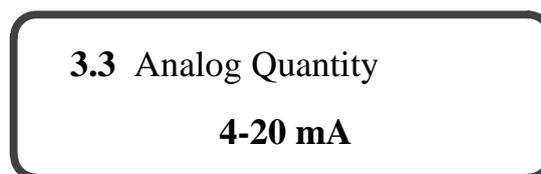
Analog Quantity

In the menu of function parameters, touch  key to select **【3.3 Analog Quantity】**, as shown in picture 3-76.



Picture 3-76

Touch  key to access to the submenu of “Analog Quantity”, as shown in picture 3-77.

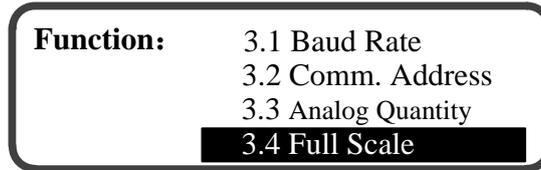


Picture 3-77

The selection of analog quantity is used for setting the type of output variable of the meter analog quantity. Analog quantity includes 4~20mA (Default), 0~20mA and 0~10mA. The proper scaling range is selected in line with the related parameters of the display meter or recorder that receives meter analog quantity output on site.

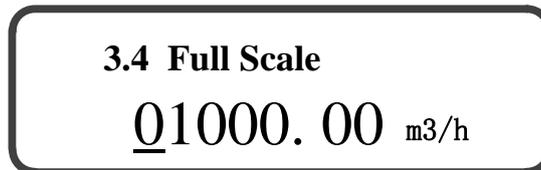
Full Scale of Analog Quantity

In the menu of function parameters, touch  key to select **【3.4 Full Scale】**, as shown in picture 3-78.



Picture 3-78

Touch  key to access to the submenu of “Full Scale”, as shown in picture 3-79.



Picture 3-79

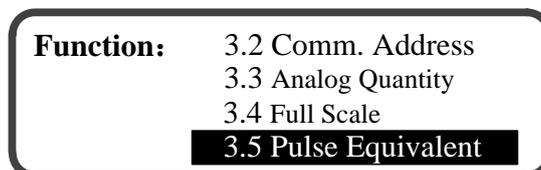
Full scale of analog quantity is the corresponding positive value of the instantaneous flowrate when setting output full scale (20mA or 10mA) of analog quantity. When the positive value of instantaneous flowrate is more than or equal to the set value of full scale of analog quantity, the current outputs full scale value. Full scale of analog quantity is set according to pipeline’s maximum flowrate.

The setting range of full scale of analog quantity is 1.0~999999.0 m³/h.

It is 1000 m³/h for the factory default of full scale of analog quantity. For example, the full scale of analog quantity is set to 1000 m³/h, meter’s analog quantity outputs full scale value when the positive value of meter’s instantaneous flowrate is 1000 m³/h.

 Cumulative Pulse Equivalent

In the menu of function parameters, touch  key to select **【3.5 Pulse Equivalent】**, as shown in picture 3-80.



Picture 3-80

Touch  key to access to the submenu of “Pulse Equivalent”, as shown in picture 3-81.

3.5 Pulse Equivalent
0.0 m³

Picture 3-81

Cumulative pulse equivalent is the algebraic sum of positive cumulative flowrate and negative cumulative flowrate represented by a pulse outputted in a measuring cycle.

8 options are available for cumulative pulse equivalent, including 0.0m³, 0.1m³, 0.5m³, 1.0m³, 5.0m³, 10.0m³, 50.0m³ and 100.0m³.

The factory default option of cumulative pulse equivalent is 0.0m³, represents that the cumulative pulse output is closed.

When cumulative pulse equivalent is selected, Q_s, the algebraic sum of cumulative flowrate increased per second, is calculated according to formula (1):

$$Q_s = \frac{Q_p}{3600} \dots\dots\dots (1)$$

Among which, Q_p is the permanent instantaneous flowrate of the measured liquid in pipeline (Unit: m³/h).

N, the numbers of cumulative pulses outputted in a measuring cycle (1 second), is calculated according to formula (2):

$$N = \frac{Q_s}{Q_d} \dots\dots\dots (2)$$

Among which, Q_d is the cumulative pulse equivalent selected by customer.

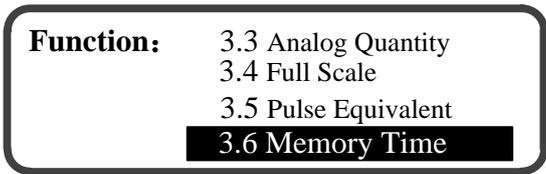
It is recommend to select N≈1. That is,

$$Q_d \approx Q_s.$$

For example, usually, Q_s, the algebraic sum of cumulative flowrate increased per second, is 0.9 m³; it is recommend to select 1.0m³ as cumulative pulse equivalent.

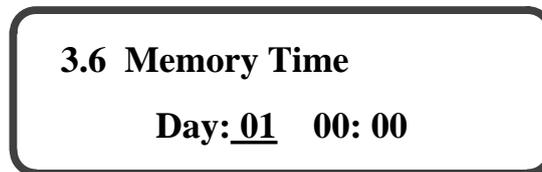
 **Memory Time**

In the menu of function parameters, select **【3.6 Memory Time】** by touching  key, as shown in picture 3-82.



Picture 3-82

Touch  key to access to the submenu of “Memory Time”, as shown in picture 3-83.



Picture 3-83

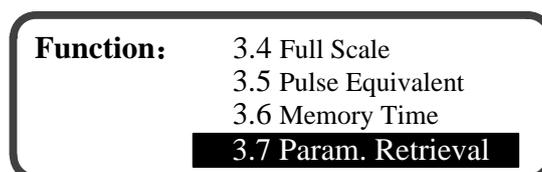
Memory time is the time took by meter to store cumulative flowrate. Cumulative flowrate is stored according to settings of day, hour and minute. Storage mode of meter includes “Stored by Month” and “Stored by Day”. The meter synchronizes historical data stored by day and by month. The stored historical cumulative flowrate can be accessed from the menu of “Historical Data”.

For “Stored by month”, the range of memory time is from 1st to 31th of each month, from 00:00 to 23:59. For “Stored by day”, the range of memory time is from 00:00 to 23:59 of each day. The default memory time stored by month is from 00:00 of 1st of each month. The default memory time stored by day is 00:00 of each day.

 Attention: If the set memory date exceeds the last day of current month, meter stores historical data at the last day of current month.

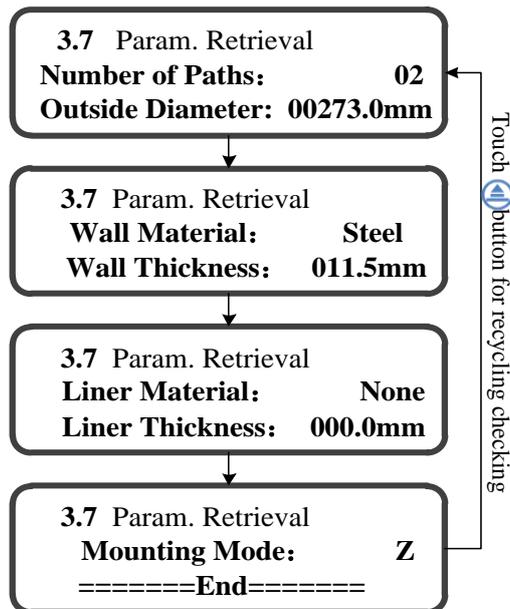
 Param. Retrieval

In the menu of “Function Param.”, select **【 3.7 Param. Retrieval 】** by touching  key , as shown in picture 3-84.



Picture 3-84

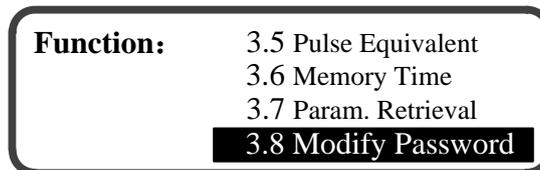
Touch  key to access to the submenu of “Param. Retrieval”, as shown in picture 3-85.



Picture 3-85

☰ Modify Password

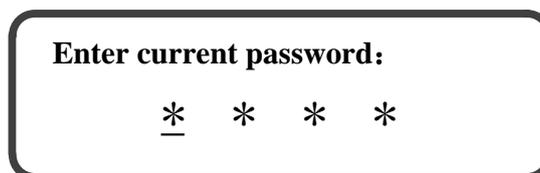
In the menu of “Function Param.”, select **【 3.8 Modify Password】** by touching  key, as shown in picture 3-86.



Picture 3-86

Modifying password is to modify the password accessing to the menus of “Mounting Param.” and “Operating Param.” Password consists of 4 characters, selected from "0~9" and "A~Z".

Touch  key to access to the submenu of “Modify Password”. First, original password must be entered, as shown in picture 3-87. After correct entry of original password, new password needs to be inputted, as shown in picture 3-88.

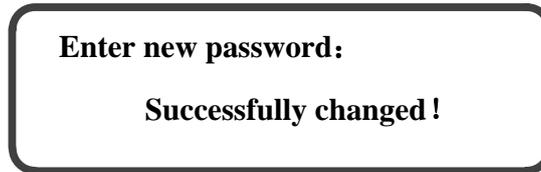


Picture 3-87



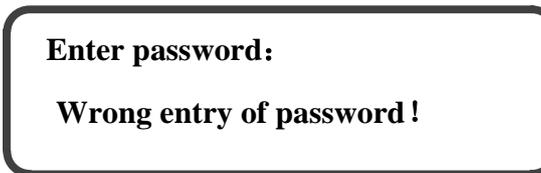
Picture 3-88

After inputting new password, touch  key for confirmation and meter display is as shown in picture 3-89. In the end, meter display is returned to the menu of “Function Param.”



Picture 3-89

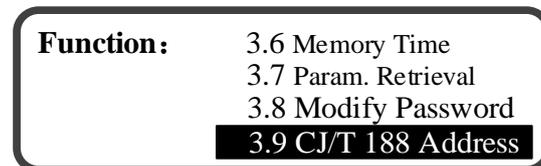
For wrong entry of password, meter display is as shown in picture 3-90 and returned to the menu of “Function Param.” later.



Picture 3-90

CJ/T 188 Address

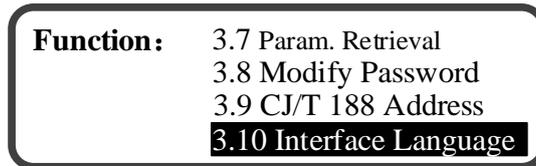
In the menu of “Function Param.”, select **【 3.9 CJ/T 188 Address 】** by touching  key, as shown in picture 3-91.



Picture 3-91

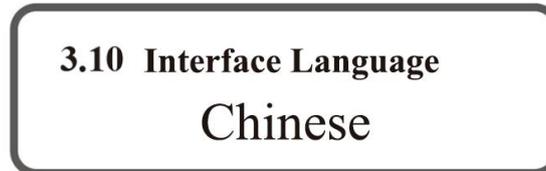
Interface Language

In the menu of “Function Param.”, select **【 3.10 Interface Language 】** by touching  key, as shown in picture 3-92.



Picture 3-92

Touch  key to access to the submenu of “Interface Language”, as shown in picture 3-93.

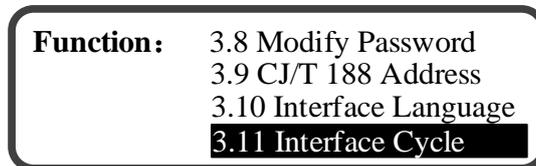


Picture 3-93

2 options are available for interface language, including Chinese and English. The factory default interface language is Chinese.

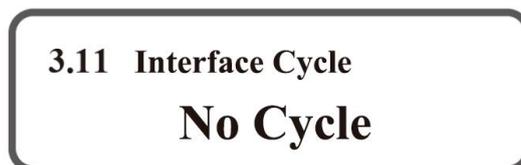
Interface Cycle

In the menu of “Function Param.”, select **【 3.11 Interface Cycle 】** by touching  key, as shown in picture 3-94.



Picture 3-94

Touch  key to access to the submenu of “Interface Cycle”, as shown in picture 3-95.



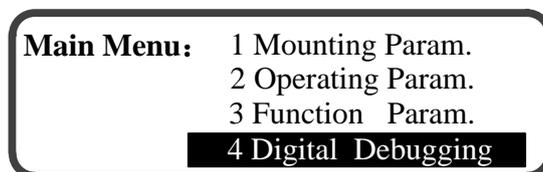
Picture 3-95

5 options are available for interface cycle, including no cycle, 5 seconds, 10 seconds, 30 seconds, 1 minute. The factory default interface cycle is no cycle.

The main interface of the meter is displayed automatically according to the set cycle. When choose “no cycle”, the main interface is displayed intelligently through key operation.

3.8 Digital Debugging

In main menu, select **【4 Digital Debugging】** by touching  key , as shown in picture 3-96.



Picture 3-96

Access to submenu of “Digital Debugging” by touching  key.

➤ 3 submenus for the menu of “Digital Debugging”:

〔4.1 Signal Intensity 〕

〔4.2 Signal Quality 〕

〔4.3 Transmission Time〕

☰ Submenu instruction

 Key function of the submenu:

Touch  key to switch between acoustic paths.

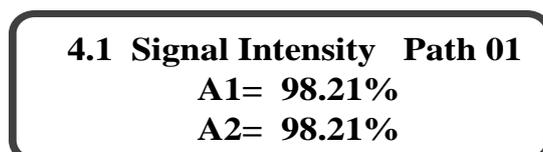
Touch  key to return to main menu.

Touch  key to switch submenu.

☰ Signal Intensity

For meter display of picture 3-96, access to submenu of “Digital Debugging” by touching  key , then submenu of **【4.1 Signal Intensity】**, as shown in picture 3-97.

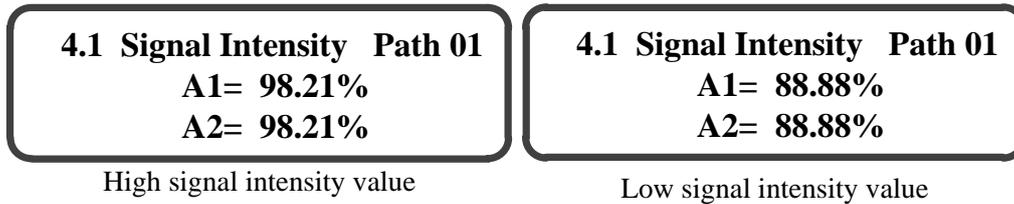
Switch acoustic path by touching  key.



Picture 3-97

A1 and A2 respectively indicate positive signal intensity value and reverse signal

intensity value.



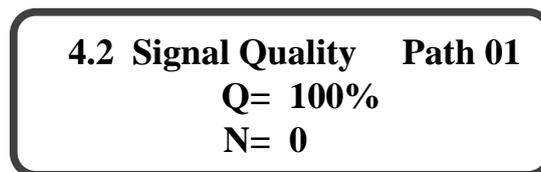
Picture 3-98

Note:

- Meter in normal measurement status: signal intensity value $\geq 80\%$, and the difference of positive signal intensity value and reverse signal intensity value $< 0.5\%$.
- Meter in the best measurement status: signal intensity value $\geq 96\%$, and the difference of positive signal intensity value and reverse signal intensity value $< 0.2\%$.

Signal Quality

For meter display of picture 3-96, access to submenu of “Digital Debugging” by touching  key, and select the submenu of **【 4.2 Signal Quality 】** by touching  key, as shown in picture 3-99. Switch acoustic path by touching  key.



Picture 3-99

“Q” represents the evaluation of signal quality.

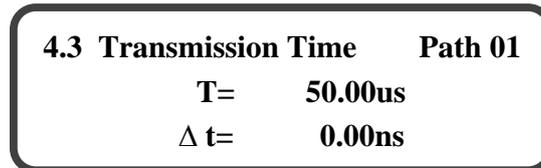
“N” represents the times of continuous invalid measurement.

Note:

- Meter in normal measurement status: $Q \geq 60\%$
- Meter in the best measurement status: $Q = 100\%$
- Meter in the best measurement status: $N = 0$
- Meter in abnormal measurement status: $N \geq 60$

Transmission Time

For meter display of picture 3-96, access to submenu of “Digital Debugging” by touching  key , and select the submenu of 【4.3 Transmission Time】 by touching  key , as shown in picture 3-100. Switch acoustic path by touching  key.



Picture 3-100

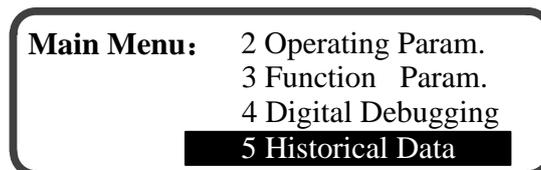
“T” represents the transmission time of ultrasonic wave in liquid.

“Δt” represents the positive and reverse transmission time differences.

3.9 Historical Data

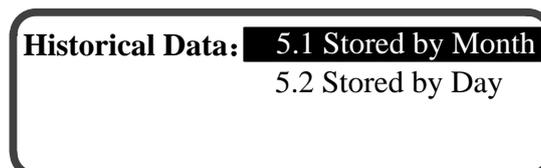
Historical data is the cumulative flowrate data stored according to memory time by meter. Setting of memory time of historical data refers to menu of “Memory Time”.

In main menu, select 【5 Historical Data】 by touching  key , as shown in picture 3-101.



Picture 3-101

Access to menu of “Historical Data” by touching  key, as shown in picture 3-102.



Picture 3-102

➤ 2 submenus for the menu of “Historical Data”:

[[5.1 Stored by Month]]

[[5.2 Stored by Day]]

 Key function:

Touch  key to switch menu;

Touch  key to enter main menu;

Touch  key to return to main menu.

 Submenu instruction

 Key function of the submenu:

Touch  key for page turning;

Touch  key to return to submenu.

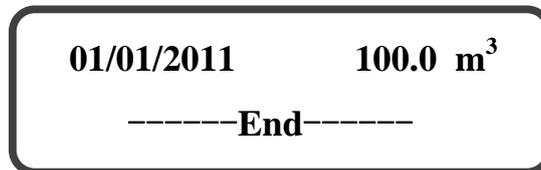
 Stored by Month

In the menu of “Historical Data”, select **【5.1 Stored by Month】** by touching  key , as shown in picture 3-103.



Picture 3-103

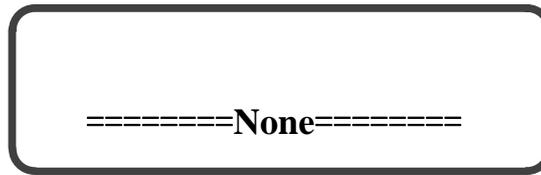
Access to submenu of “Stored by Month” by touching  key, as shown in picture 3-104.



Picture 3-104

The left side of display screen is the memory date of historical data, and the right side of that is the cumulative flowrate (unit: m³) store by month. Ranked according to memory time, historical data can be checked after page turning by touching  key. “-----End-----” indicates that it is the end of lists of historical data stored by month.

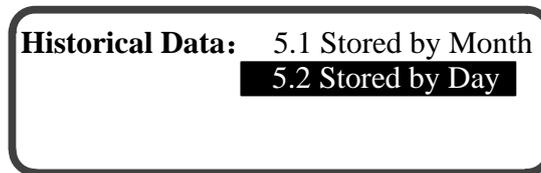
If historical data is not stored, display is as shown in picture 3-105.



Picture 3-105

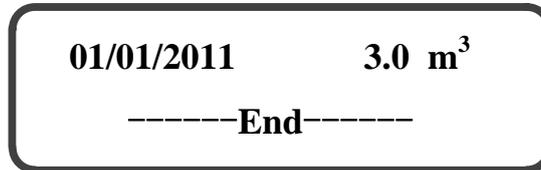
 Stored by Day

In the menu of “Historical Data”, select **【5.2 Stored by Day】** by touching  key , as shown in picture 3-106.



Picture 3-106

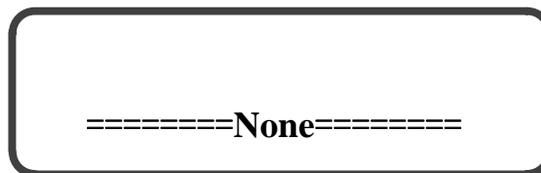
Access to submenu of “Stored by Day” by touching  key, as shown in picture 3-107.



Picture 3-107

The left side of display screen is the memory date of historical data, and the right side is the cumulative flowrate (unit: m^3) stored by day. The historical data is arranged according to the storage time, which can be viewed by touching  key. “——End——” indicates that it is the end of lists of historical data stored by day.

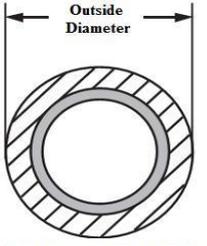
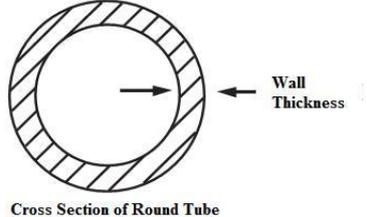
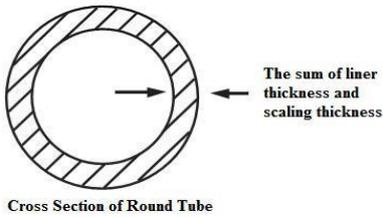
If historical data is not stored, display is as shown in picture 3-108.



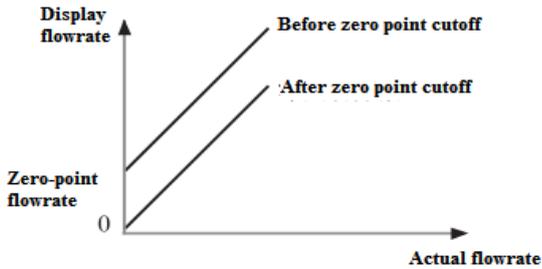
Picture 3-108

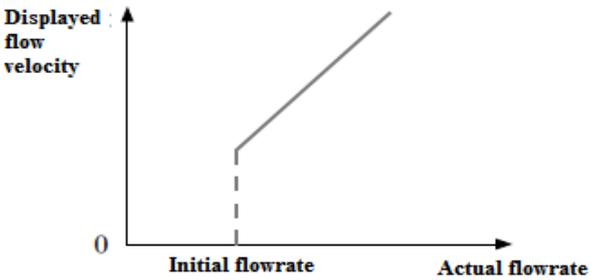
4. Parameter and Setting Instruction

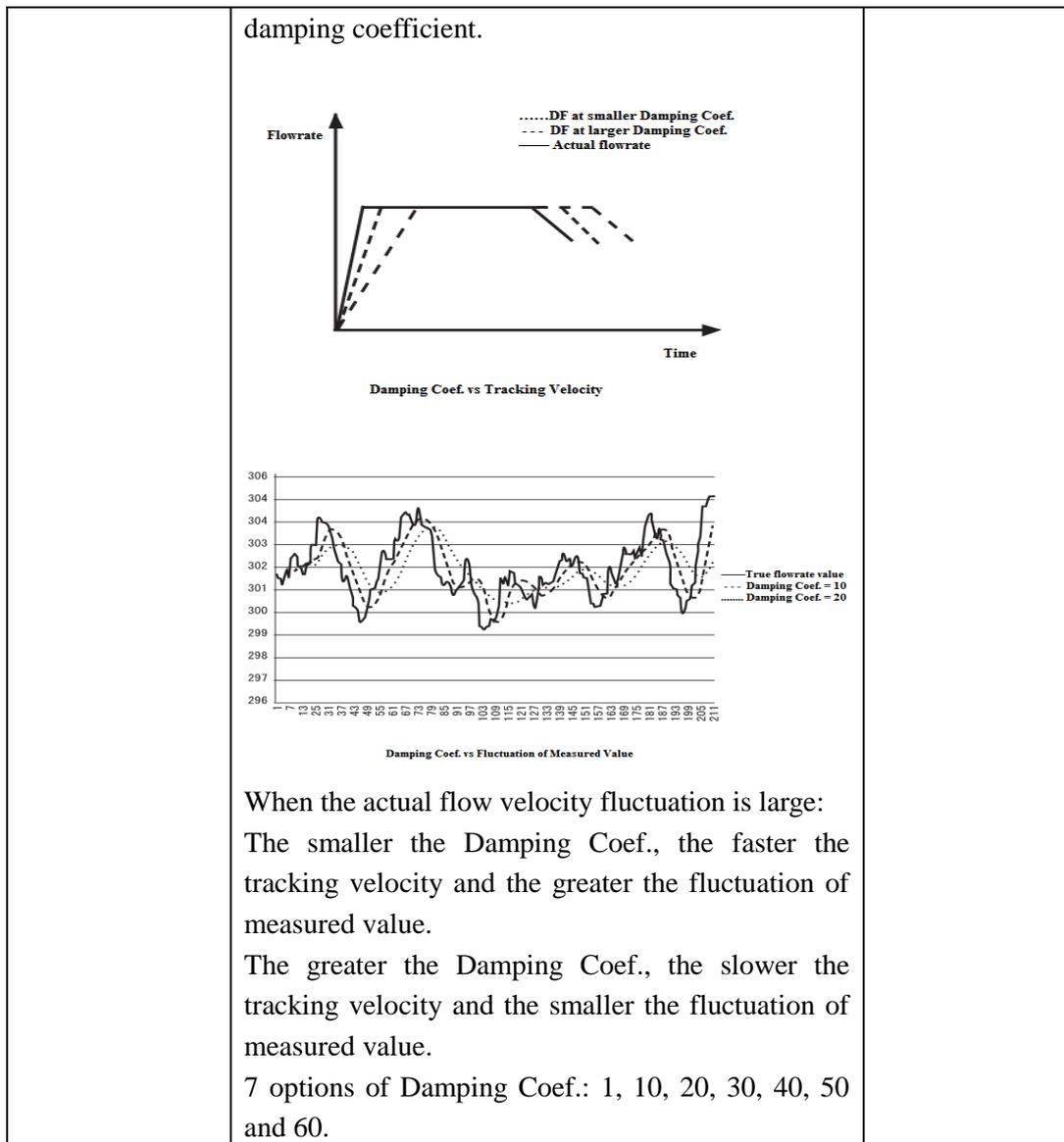
Table 4-1 Parameter and Setting Instruction

Parameter	Instruction	Factory-set value
Outside Diameter	 <p style="text-align: center;">Cross Section of Round Tube</p> <p style="text-align: center;">Setting range: 20.0mm~20800.0mm</p>	320.0mm
Wall Material	Wall material includes steel, cast iron, plastic and cuprum.	Steel
Wall Thickness	 <p style="text-align: center;">Cross Section of Round Tube</p> <p style="text-align: center;">Setting range: 0.0mm~200.0mm</p>	10.0mm
Liner Material	Liner material includes none, cement, rubber and plastic.	None
Liner Thickness	 <p style="text-align: center;">Cross Section of Round Tube</p> <p style="text-align: center;">Setting range: 0.0mm~200.0mm</p>	0.0mm
Mounting Mode	Mounting mode of transducer includes mode Z and mode V. Details of mounting mode refer to “Mounting Mode”.	Mode Z
Positive and Negative Cumulative Flowrates	It is the flowrates that respectively accumulates due to liquid’s different flow directions. When upstream transducer is mounted on the upstream of flow direction of measured liquid, the cumulative flowrate measured by meter is the positive cumulative flowrate. When downstream transducer is mounted on the downstream of flow direction of measured liquid, the cumulative flowrate measured	

	by meter is the negative cumulative flowrate.	
Cumulative Flowrate	Cumulative flowrate = Positive flowrate + Negative flowrate, namely the algebraic sum of positive and negative flowrates.	
Signal Intensity	Signal intensity is received by ultrasonic transducer. Higher the signal intensity value, more reliable the meter operation.	
Signal Quality	It indicates the extent of impact of the air bubbles or solid particles in the measured liquid on signal transmission of ultrasonic wave. More air bubbles or solid particles in liquid, worse signal quality. Meter in normal measurement status: $Q \geq 60\%$ Meter in the best measurement status: $Q = 100\%$	
RS-485 Communication Baud Rate	Baud rate is the number of bytes transferred per second from RS-485 interface when communicating. 3 options are available for baud rate, including 2400bps, 4800bps and 9600bps. 2 options are available for check bit, including None, and Even.	4800bps None
RS-485 Communication Address	Communication address is the native address when using RS-485 interface for the serial communication of multi-machine. Communication address range is 001~199.	65
Full Scale of Analog Quantity	Full scale of analog quantity is the corresponding positive value of the instantaneous flowrate when setting output full scale of analog quantity. That is to say, when the positive value of instantaneous flowrate is more than or equal to the set value of full scale of analog quantity, the current outputs full scale value. Full scale of analog quantity is set according to pipeline's maximum flowrate. The setting range of full scale of analog quantity is 1.0~999999.0 m ³ /h. The relation of current (I) and instantaneous flowrate (Q): $I = \frac{Q}{\text{Full Scale}} \times 164$ Among which, the unit of Q and "Full Scale" is m ³ /h. Unit of I is mA.	1000 m ³ /h
Cumulative	Cumulative pulse equivalent is the algebraic sum of positive cumulative flowrate and negative	0.0 m ³

Pulse Equivalent	<p>cumulative flowrate represented by a pulse outputted in a measuring cycle.</p> <p>8 options are available for cumulative pulse equivalent, including 0.0 m³, 0.1 m³, 0.5 m³, 1.0 m³, 5.0 m³, 10.0 m³, 50.0 m³ and 100.0 m³. 0.0m³ represents that the cumulative pulse output is closed.</p> <p>For details see menu “Cumulative Pulse Equivalent”.</p>	
Memory Time	<p>Memory time is the time took by meter to store cumulative flowrate. Cumulative flowrate is stored according to settings of day, hour and minute. Storage mode of meter includes “Stored by Month” and “Stored by Day”.</p> <p>For “Stored by month”, the range of memory time is from 1st to 31th of each month, from 00:00 to 23:59.</p> <p>For “Stored by day”, the range of memory time is from 00:00 to 23:59.</p>	<p>Stored by month: 00:00 of 1st of each month; Stored by day: 00:00 of each day.</p>
Measuring Direction	<p>Measuring direction includes one-way and two-way. Application: One-way type adaptable to flow measurement of unchangeable flow direction; two-way suitable for flow measurement of changeable flow direction.</p>	Two-way
Zero-point Flowrate	<p>When the pipe flow is stagnant, the instantaneous flowrate displayed at main measuring unit is termed “Zero-point flowrate”. If the zero-point flowrate is not zero, the flowrate value will be superimposed onto the meter measured value, causing measuring error. After the “zero-point flowrate” cutoff operation is performed, the “zero-point flowrate” will be stored by main measuring unit for eliminating measuring error.</p>  <p>The cutoff range of zero-point flowrate: -1000.000 m³/h ~+1000.000 m³/h</p>	0.000 m ³ /h

	<p> Attention: For the determination of instantaneous flowrate, the pipe flow should be full and in a stagnant status, and the meter has entered stable measuring status for over 3 minutes.</p>	
Correction Coef.	<p>Correction Coef. is used for the correction of meter's measuring accuracy. The range of Correction Coef. is 0.8000~1.3000.</p> <p>Calculation method: Correction Coef. = $\frac{\text{True value}}{\text{Apparent value}}$</p> <p>e.g. True value = 110.00 m³/h Apparent value = 100.00 m³/h Correction Coef. = $\frac{110.00}{100.00} = 1.1000$</p> <p>After setting the correction coef. to 1.1000, the instantaneous apparent value of the meter is 110.00 m³/h.</p> <p> Caution: Correction coef. cannot be freely modified, or the measuring accuracy of the meter may be affected.</p>	Set according to the result of real flow calibration before ex-factory.
Initial Flowrate	<p>Initial flowrate refers to the minimum flow velocity value at which the meter starts measurement. This is meant to reject the fluctuating instantaneous flowrate values under a static pipe flow condition. When the absolute value of the actual flow velocity is lower than initial flowrate value, main measuring unit displayed instantaneous flowrate and flow velocity are all "zero".</p>  <p>Setting range of initial flowrate: 0.000 ~1.000m/s</p>	0.000m/s
Damping Coef.	<p>The magnitude of damping coefficient determines the velocity with which the meter measured instantaneous flowrate follows the track of the variation of actual flowrate. When the flow stability of the measured liquid is poor, the fluctuation of meter-measured values can be suppressed using</p>	10



5. Transducer Installation and Operation Instruction

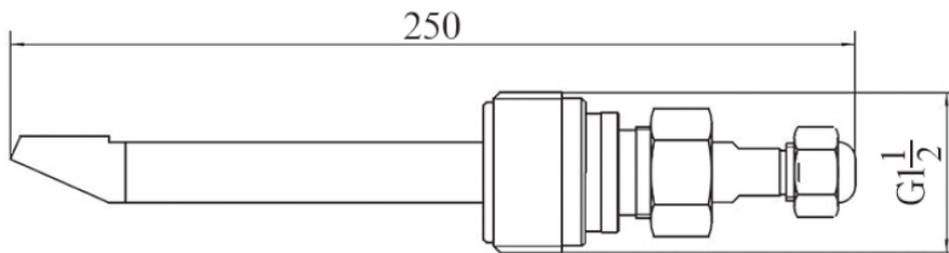
5.1 Technical Parameters of Transducer

Table 5-1 Technical Parameters of Transducer

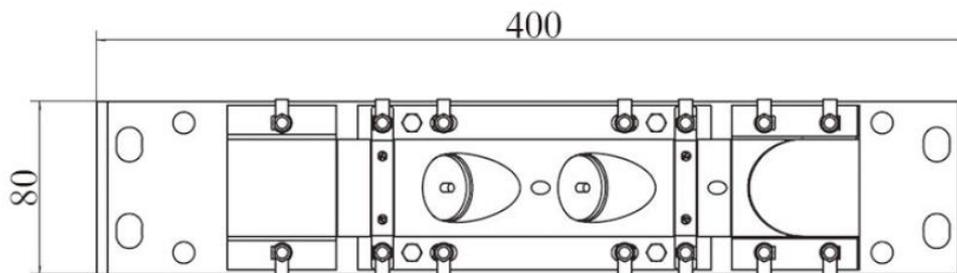
Transducer	Insertion-type	Internal-mounted-type
Performance		
Nominal diameter (mm)	DN300~DN1500	DN1500~DN15000
Material	304 (Stainless steel)	
Range of working pressure	≤2MPa (Please specify on ordering if the range is exceeded)	≤2MPa (Please specify on ordering if the range is exceeded)

Temperature of medium measured	Normal temperature version: 0°C~50°C High temperature version: 0°C~130°C	0°C~50°C
Temperature of working environment	-40°C~+70°C	-40°C~+70°C
Weight (One pair)	2kg (10m cables included)	3kg (10m cables included)
Protection class	IP68	
Cable length (Wiring distance)	10×nm, n: 1~30	10×nm, n: 1~30

5.2 Dimensions of Transducer



Picture 5-1 Insertion-type Transducer



Picture5-2 Internal-mounted-type Transducer

5.3 Model Selection of Transducer

5.3.1 Insertion-type transducer

Features: 1. Insertion-type transducers are in direct contact with the measured fluid, which can improve meter's reliability.

2. It can be mounted with water flow in pipe under pressure.

Applications: Adaptable to pipelines that can be drilled holes for mounting, such as steel, cast iron, cement, PE, PVC and etc.

5.3.2 Internal-mounted-type transducer

Features: 1.The transducer is installed on the inner wall of the pipeline, and it is unnecessary to excavate the outer wall of the pipeline.

2. It can effectively prevent the transducer from being man-made damaged.

Applications: Adaptable to pipelines that can mount transducers, such as steel, cast iron, cement, PE, PVC and etc.

5.4 Installation of Transducer

5.4.1 Mounting position of transducer

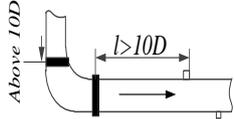
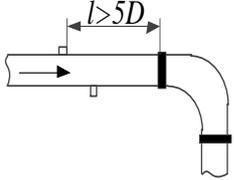
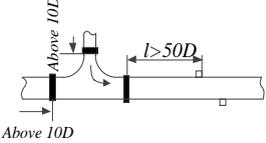
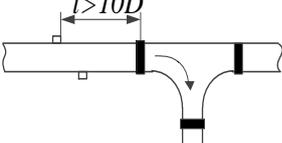
➤ Straight pipe section requirements

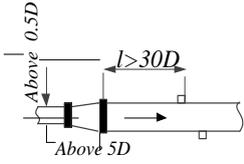
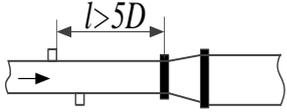
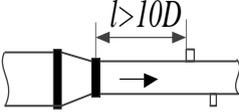
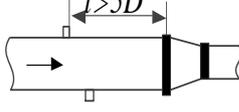
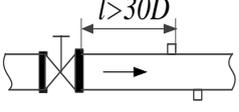
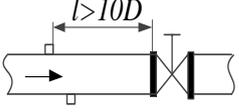
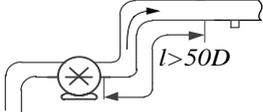
The transducer mounting position and the condition of the pipe where flow measurement are made all exert a great bearing on measuring accuracy. Therefore, for the transducer mounting position, the following conditions should be met:

(1) The length of the straight pipe section on the upstream side of the transducer is $10D$ and that on the downstream side is more than $5D$. In case of the presence of any pipe fittings, such as reducer, expansion joint or bend, a proper transducer mounting position should be determined by reference to table 5-2.

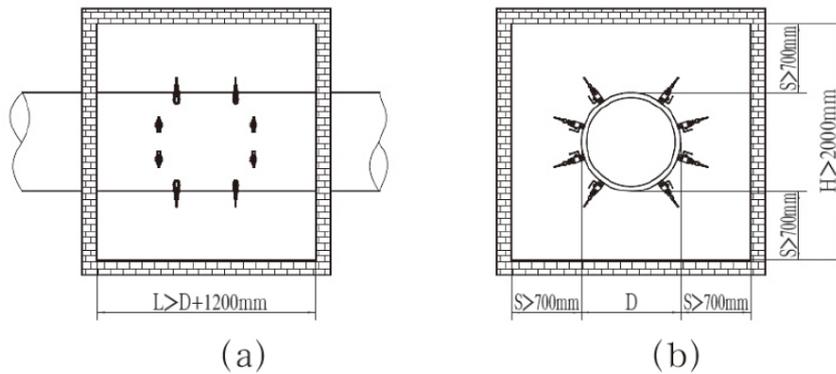
(2) Within the range of $30D$ on the upstream side, make sure there is no pipe flow disturbing objects like pump, valve, restriction orifice, see table 5-2. (Take the insertion-type transducer as an example)

Table 5-2 Length of shortest straight pipe section

Resistance part	Upstream side	Downstream side
90 Bend		
T-bend		

Expansion joint		
Reducer		
Valve	 Flow control valve on the upstream side	 Flow control valve on the downstream side
Pump		
Note: D is the inner diameter of the pipe, L is the distance between the transducer closest to the flange and the flange.		

(3) Enough space is required for the installation of insertion-type transducer, see picture 5-3. The size $L > 700\text{mm}$, see picture 5-3(b).



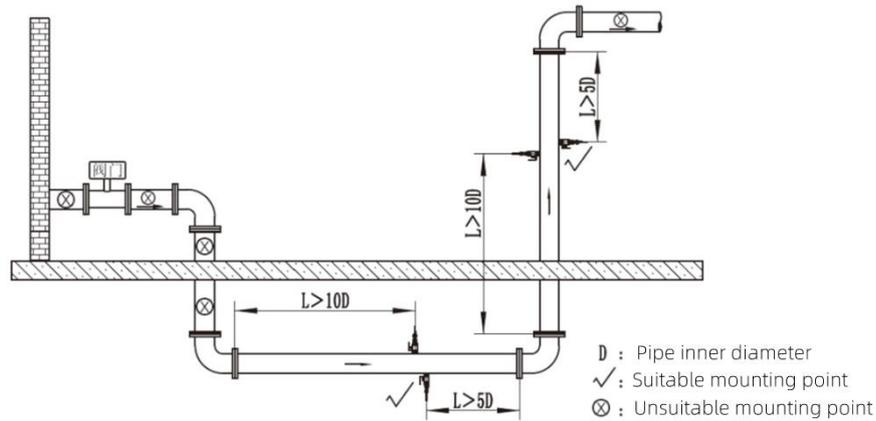
Picture 5-3 Transducer Mounting Space Illustration

➤ Recommended mounting position (As shown in picture 5-4)

(1) The measuring point should be preferably selected on an upright pipe with upward or inclined flow, or possibly on a horizontal pipe. Avoid use a down flowing or inclined down-flowing pipe as the latter may not be fully filled with fluid.

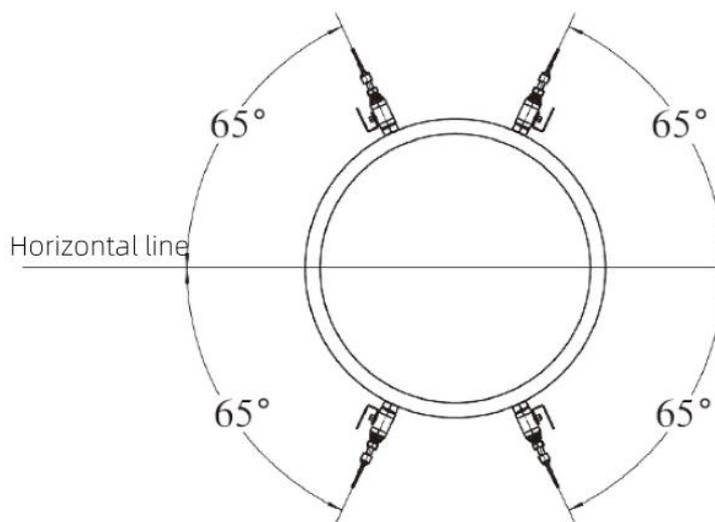
(2) Never mount a transducer at the highest flowing point of a pipe run as abnormalities in measurement may occur in this case due to possible accumulation of

air bubbles in pipe.



Picture 5-4 Transducer Mounting Position

(3) On a horizontal pipe, the transducer installation position should be within $\pm 65^\circ$ from the horizontal line, as shown in picture 5-5.



Picture 5-5

(4) Never install insertion-type transducer and internal-mounted-type transducer at the places where the pipe surface is uneven. Moreover, the mounting point needs to be polished for removal of dust, dirt and coating.

 Attention:

For the mounting of the insertion-type transducer, the pipeline pressure should be less than 1MPa, otherwise the pressure needs to be reduced.

5.4.2 Installation of insertion-type and internal-mounted-type transducers

5.4.2.1 Installation tools

Table 5-3 Installation Tools

Tape	Marking Pen (Separate order)	Paper Tape	Theodolite	Teflon Tape	Thickness Meter (Separate order)
					

Note: Above object photos are for reference only.

5.4.2.2 Determination of parameters and Installation mode

(1) Outside diameter (Use a tape to measure the pipe OD)



Attention: For a pipe with a corrosion resistant coating on its outer wall, the pipe's actual OD should be measured with the coating removed.

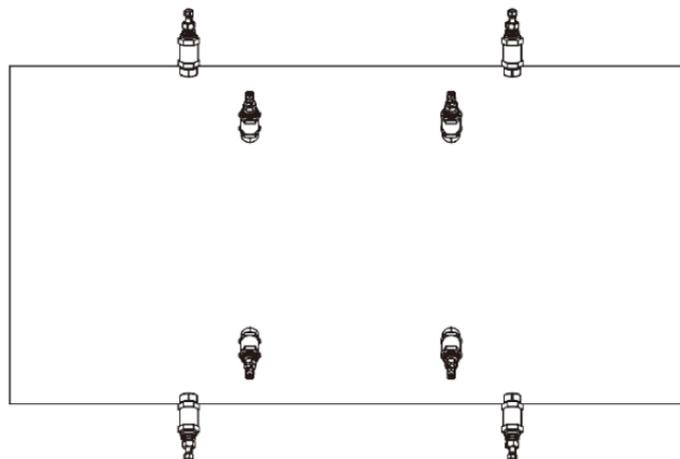
(2) Pipe wall thickness (Measure the wall thickness with a thickness meter; this parameter is not required for internal mount installation)

(3) Pipe wall material

(4) Liner thickness (The scale layer can be regarded as pipe lining)

(5) Liner material (The scale layer can be regarded as cement)

(6) Mounting mode: mode Z



Picture 5-6 Mode Z

In Z mode, the ultrasonic signal is transmitted directly between a pair of transducers without reflection and the signal attenuation is small.

5.4.2.3 Marking off

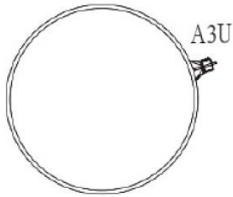
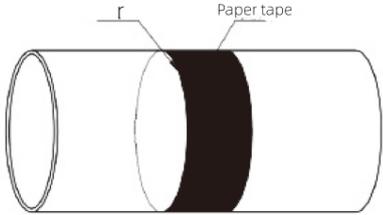
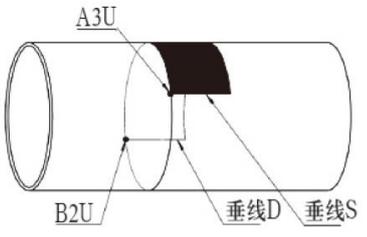
(1) After setting above mounting parameters in the main measuring unit, calculate the mounting distance between transducers and mark the transducer mounting line on pipe.

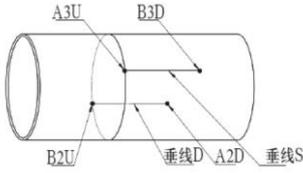
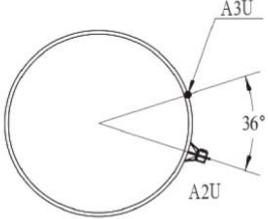
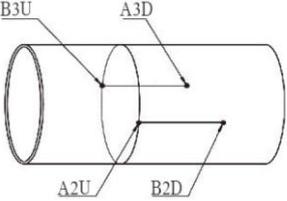
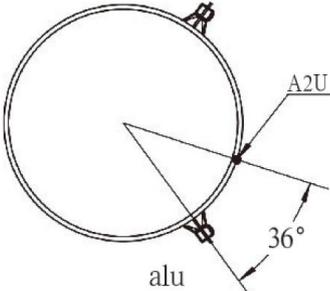
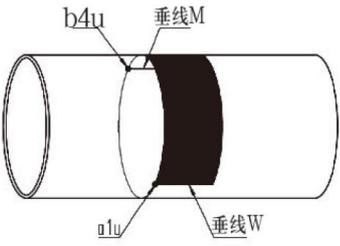
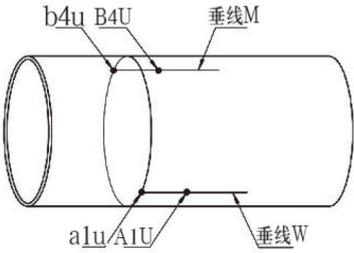
(2) Marking tools

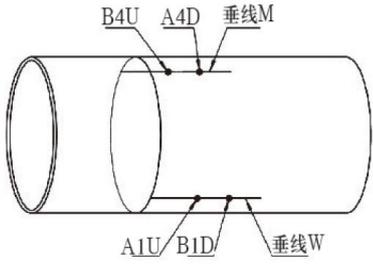
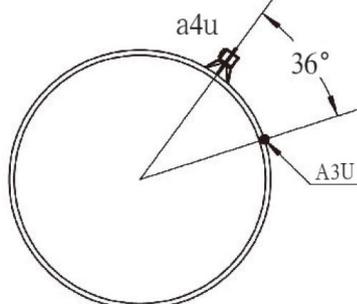
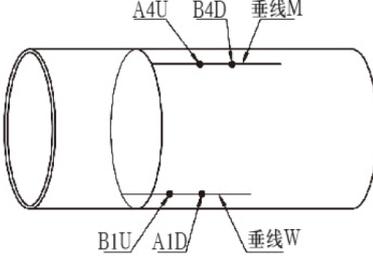
A paper tape with a length greater than pipe perimeter and a width of about 200mm (A piece of printing paper is okay), mark pen, measuring tape, and gradienter. (See Table 5-4).

(3) Marking method

Table 5-4 Marking Method

Mode Z	
<p>① Stick the gradienter to the outer wall of the pipe and slide the gradienter along the outer wall. When the reading of the gradienter is 18 degrees, mark this point A3U, which is the installation position of the first transducer (this step is not available for vertical installation).</p>	
<p>② Wrap the paper tape around the pipe one circuit. Make sure the two ends of the paper's overlapping part completely coincide with each other. Mark a circumferential line "r" on pipe along the edge of the starting point of the perimeter.</p>	
<p>③ Remove the paper tape. Fold the paper tape in two along the perimeter starting line to form a half perimeter. Take the paper tape A3U as the starting point, align the edge line with the arc line r, and wrap it around the pipe and coincide with the starting mark. Mark the intersection of the crease and the circumferential line r as B2U. Take A3U and B2U as starting points along the starting line and polyline of the paper tape, and make perpendicular lines S and D of the circumference line r.</p>	

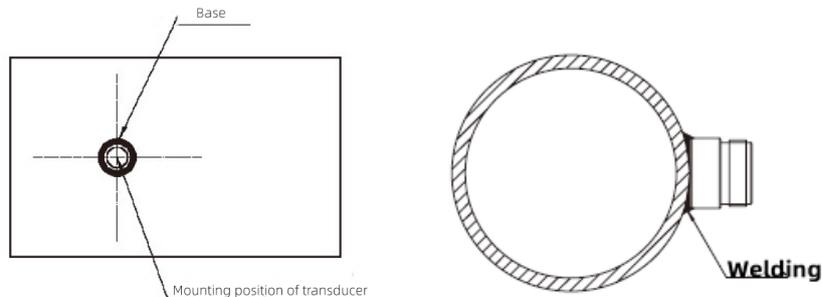
<p>④ Take point A3U and B2U as the starting points, the calculated installation distance is the length, and points B3D and A2D are determined along the vertical lines D and S.</p>	
<p>⑤ Use a gradienter, starting from point A3U, rotate 36° clockwise along the circumference line r, marking this point as A2U.</p>	
<p>⑥ Follow Steps 3 and 4 to determine the installation point B3U, B2D, A3D.</p>	
<p>⑦ Use a gradienter, starting from point A2U, rotate 36° clockwise along the circumference line r, marking this point as a1u.</p>	
<p>⑧ Take the paper tape a1u as the starting point, align the edge line with the arc line r, and wrap it around the pipe and coincide with the starting mark. Mark the intersection of the crease and the circumferential line r as b4u. Take a1u and b4u as starting points along the starting line and polyline of the paper tape, and make perpendicular lines W and M of the circumference line r.</p>	
<p>⑨ Take point a1u and b4u as starting points, move half of the difference between the installation distances of the two transducers along the vertical lines W and M to obtain point A1U and B4U.</p>	

<p>⑩ Take point A1U and B4U as the starting points, the calculated installation distance is the length, and points B1D and A4D are determined along the vertical lines W and M.</p>	
<p>⑪ Use a gradienter, starting from point A3U, rotate 36° anticlockwise along the circumference line r, marking this point as a4u.</p>	
<p>⑫ Follow Steps 8, 9, and 10 to determine the installation point A4U, B1U, B4D, A1D.</p>	
<p>⑬ According to the pipe wall thickness, insertion depth and other parameters, using Huizhong correction formula, to correct the installation position of each transducer.</p>	

5.4.2.4 Installation of insertion-type transducer

(1) Installation of base and valve

a. Weld the base provided by the manufacturer onto the pipe. Make sure that the cross line marked on the base coincides with that drawn on the pipe.

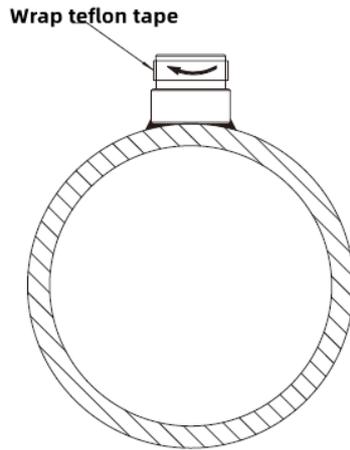


Picture 5-7

⚠ Attention:

① For welded base, make sure its secure connection and no weld defects such as inclusions and air cavities are allowed.

b. After installation of base, wrap the teflon tape clockwise around the base thread (See picture 5-8). Put the sealing lead-pad provided by Huizhong into the inner bottom of ball valve (See picture 5-9(b)) and screw ball valve on the base with spanner (See picture 5-10).

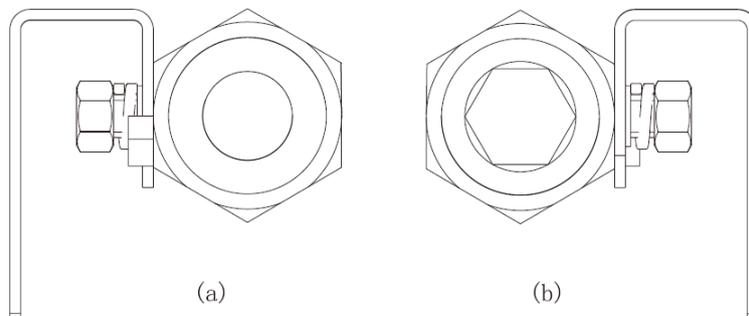


Picture 5-8

⚠ Attention:

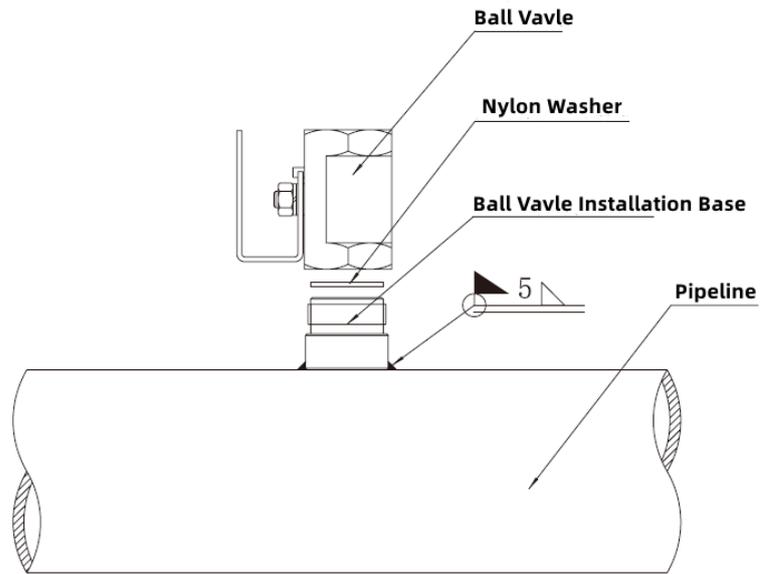
① Be sure to clockwise wrap the teflon tape around the base thread, and screw ball valve on the base with spanner for avoiding fluid leakage after drilling.

② The connection threads at both ends of the ball valve are slightly different, as shown in picture 5-9. One end of the ball valve with hexagonal socket nut (see picture 5-9 (b)) should be connected with base.



Picture 5-9 Ball Valve Connection Thread Diagram

c. After installation, the overall installation completion diagram is as shown in picture 5-10.

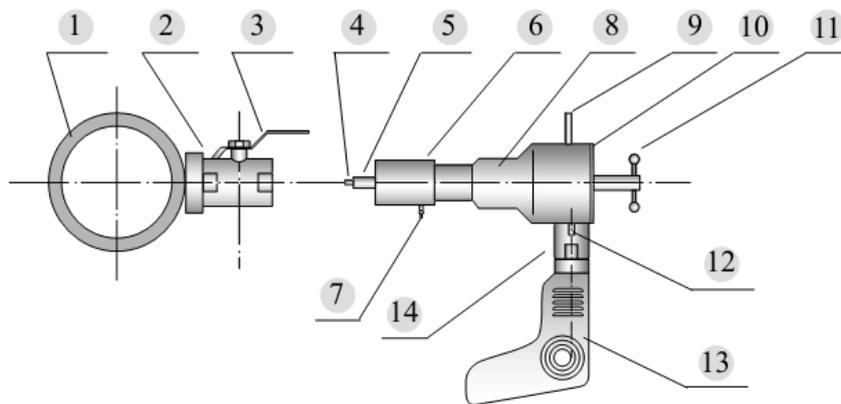


Picture 5-10 Installation Diagram

(2) Drilling

 Caution:

The drilling is made under the fluid pressure of the pipe system (permissible pressure < 1MPa), be sure to follow these steps to avoiding liquid leakage and accident.



- | | | | |
|---------------------------------|----------------------|---|--------------------|
| ① -Pipe | ② - Valve base | ③ -Ball valve | ④ -Twist bit |
| ⑤ -φ22mm reamer bit | ⑥ -connection piece | ⑦ - Iron-dust discharge and water drainage plug | ⑧ - Casing |
| ⑨ -Handle | ⑩ - Screw-rod nut | ⑪ -Bit travel control handle | ⑫ -Universal joint |
| ⑬ -Handle-held electrical drill | ⑭ -Connection sleeve | | |

Picture 5-11 Structure Diagram of Drilling Machine

Drilling steps:

- ① Open the ball valve ③ and screw the connecting piece ⑥ tightly onto the ball

valve ³.

② Turn the control handle ¹¹ in clockwise direction to make the drill close to pipe wall.

③ Open the iron-dust drain port ⁷.

④ Connect hand-held drill ¹³ and drill rig with connection sleeve ¹⁴. Secure universal joint ¹² with the clamp of the hand-held drill ¹³.

⑤ Turn on the power of hand-held drill ¹³.

⑥ One hand clenched the handle of the hand-held drill, press down the power switch of hand-held drill ¹³, turn the bit travel control handle ¹¹ slowly in clockwise direction to enable the bit to move toward the pipe wall for drilling operation, as shown in picture 5-12.



Picture 5-12 Schematic Diagram of Drilling Operation

⚠ Attention: Never push against the bit during drilling with excessive force for guarding against jamming of bit. If stuck, quickly turn the control handle ¹¹ in counter-clockwise direction.

⑦ After completion of drilling on the pipe wall, detach the drill ¹³, and turn the control handle ¹¹ in counter-clockwise direction to retract the drill bit.

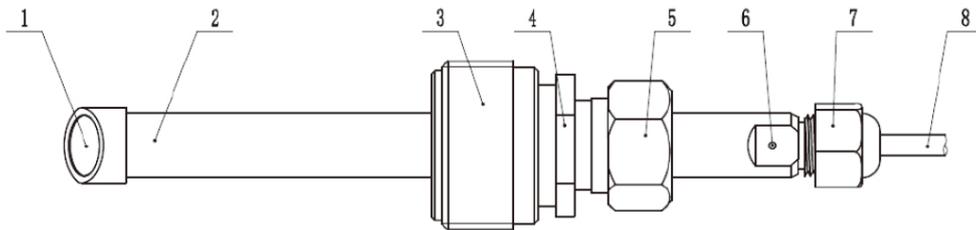
⑧ Loosen the screw-rod locking nut ¹⁰, and pull backward the bit travel control

handle 11 to allow the bit to retract into the threaded bush 6, and check the fluid leakage.

⑨ Close the ball valve, remove drilling machine, and finish the drilling.

⚠ Caution: Check for any fluid leakage in the seal between ball valve and base. In case of fluid leakage, stop immediately mounting of transducer and take remedial measures in time.

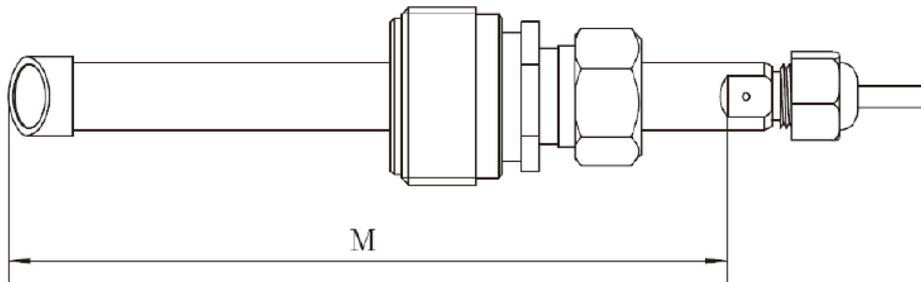
(3) Installation of transducer



Picture 5-13 Structure Diagram of Insertion-type Transducer

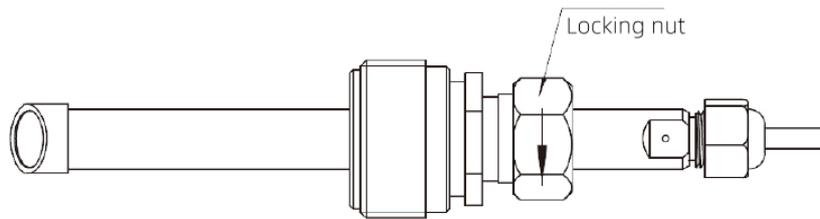
1. Transducer rod 2. Sonic wedge surface 3. Connection nut 4. Location notch
5. Locking nut 6. Marking point (A round point with concave surface and facing the sonic wedge surface 2)
7. Cable outlet nut 8. Signal cable

① Measure the M value of transducer for instruction of insertion depth, as shown in picture 5-14.



Picture 5-14

② Turn the locking nut 5 in counter-clockwise direction to loosen it, as shown in picture 5-15.



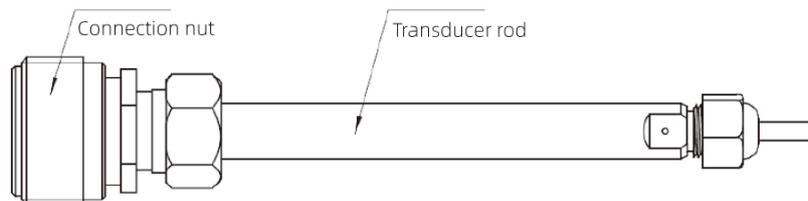
Picture 5-15

 Caution: When installing transducer, the operation personnel should stand on the vertical side of transducer and pipe (See picture 5-16).



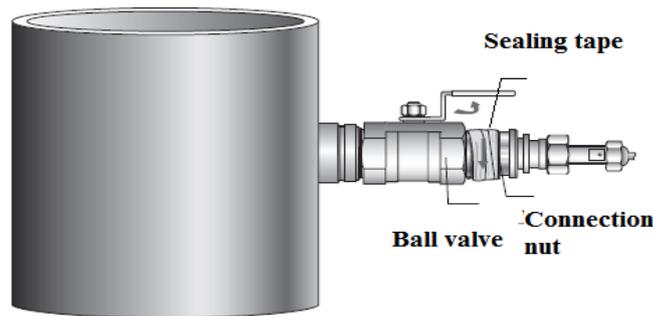
Picture 5-16

③ Retract the transducer rod 2 back into the connection nut 3 position, as shown in picture 5-17.



Picture 5-17

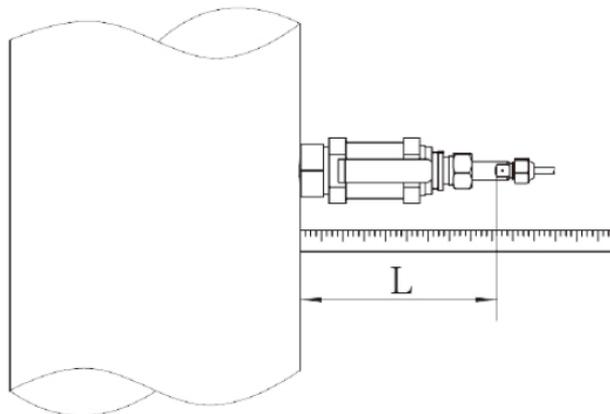
④ Wrap sealing tape onto the thread of connection nut 3 in counter-clockwise way, screw into ball valve a clockwise way and open valve slowly.



Picture 5-18

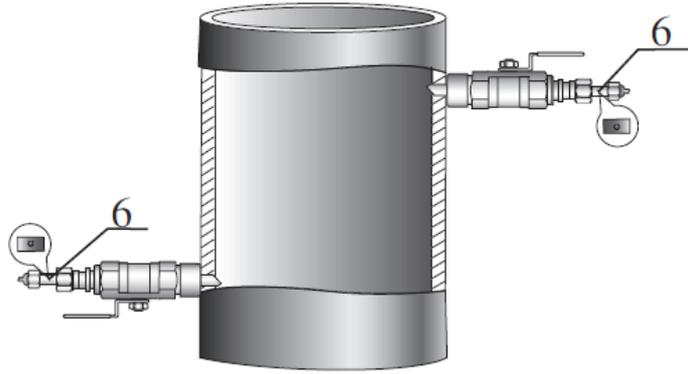
⚠ Caution: Check for any fluid leakage from the connection between the ball valve and connection nut. No fluid leakage, the above work is completed. In case of fluid leakage, close the ball valve and repeat the step ④.

⑤ Push transducer rod 2 into the pipeline, and measure the length of transducer outside the pipe to make transducer reach the required mounting depth: $L = M - t - 5$ (The “t” refers to the pipe wall thickness, liner included, Unit: mm). The measurement method is as shown in picture 5-19. If it does not meet the requirements, readjust the insertion depth of transducer, and lock with locking nut 5 at the end.



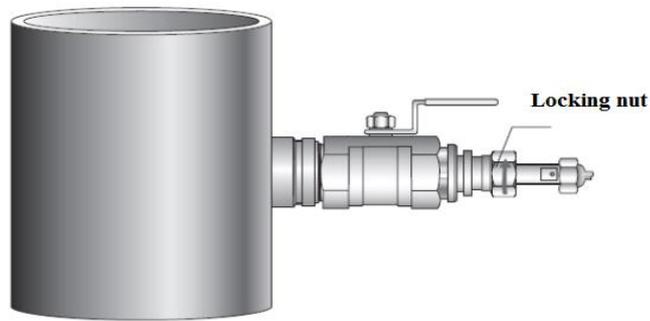
Picture 5-19

⑥ Make sure the two sonic wedge surface of transducer face to face (It refers to the two marking point 6 face to face).



Picture 5-20

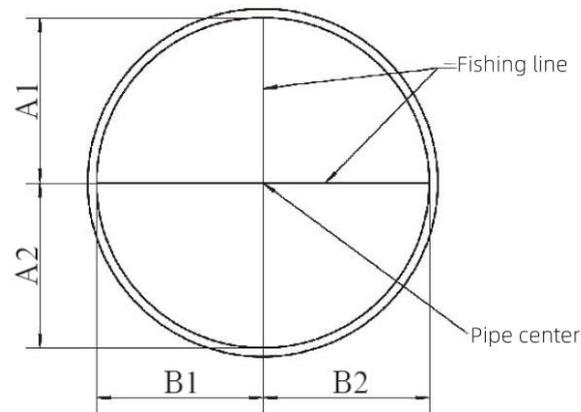
⑦ Hold the transducer and clockwise tight the screw nut 5. Then the installation is finished.



Picture 5-21

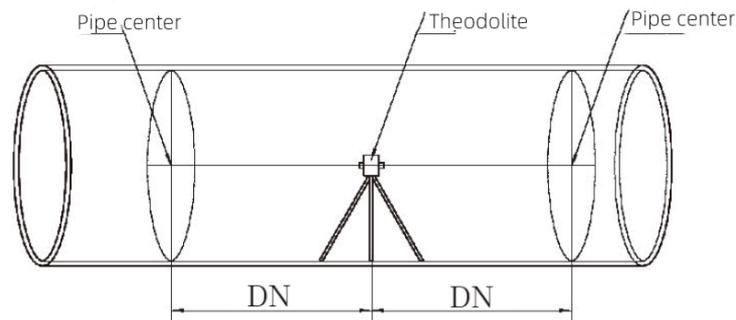
5.4.2.5 Installation of internal-mounted-type transducer

① Use the fishing line to fix the cross fishing line at the place about 1 times the pipe diameter upstream and downstream of the installation center. By adjusting the fixed position of one end of the fishing line, the length A1 and A2 of the same fishing line on both sides of the cross center are equal, and B1 and B2 are equal, as shown in picture 5-22.



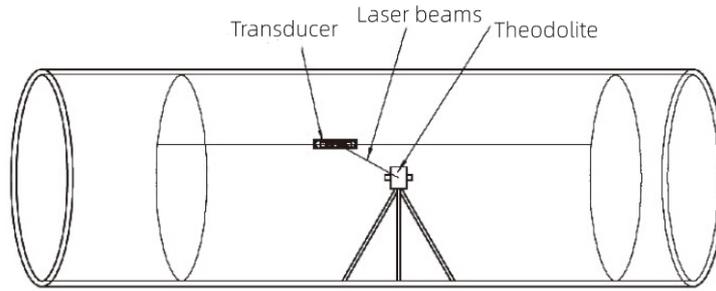
Picture 5-22

② Set up the theodolite in the pipeline, make the theodolite near the predetermined installation position, adjust the up, down, left and right positions of the theodolite, make the axis of the theodolite through the pipe center determined by the fishing line on both sides, as shown in picture 5-23.



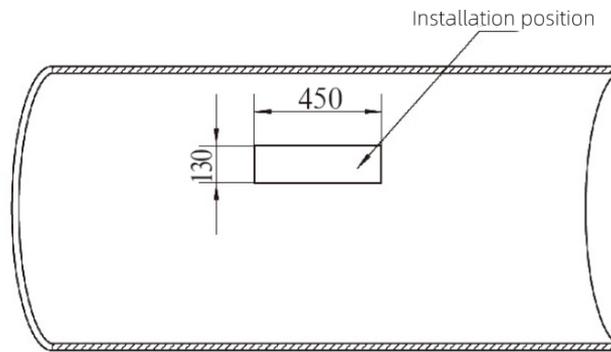
Picture 5-23

③ By rotating the angle of the theodolite objective lens, the positions of the upstream and downstream transducers of each acoustic path on the two ends are determined respectively. When the position of the transducer is determined, turn on the laser beam, make the laser point illuminates the central position of the transducer acoustic emission wafer, and mark the position of the transducer device on the tube wall, as shown in picture 5-24.



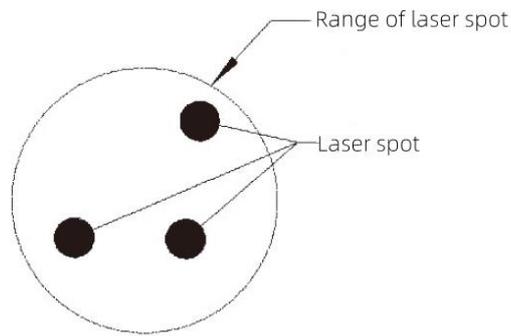
Picture 5-24

④ Use the hand grinding wheel and shovel to smooth the rust spots, dirt and concave and convex surfaces near the installation position on the inner wall of the pipeline, and the grinding size is larger than the size shown in the picture 5-25.



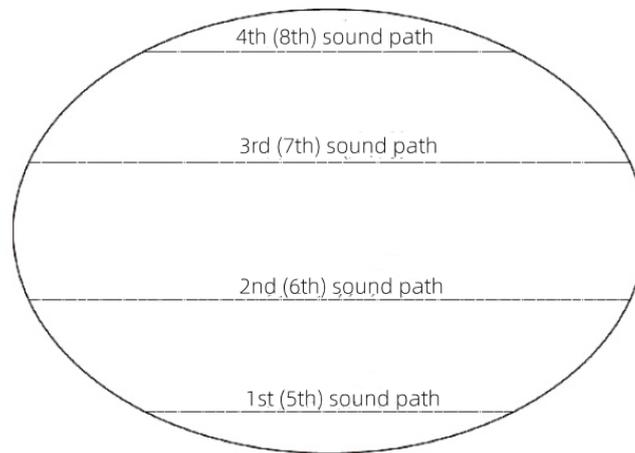
Picture 5-25

⑤ According to the position of each transducer determined by the theodolite, weld the transducer base plate (the cement pipe is fixed with expansion bolts) on the pipe, use the laser pen as the basis for position calibration, and adjust the position of the transducer through the height adjustment screw and the rotation adjustment hole on the base plate, until the two pairs of transducers are calibrated with the laser pen, and the projection range of the laser spot should fall in a circle with a diameter of 6mm and centered on the center, as shown in picture 5-26.



Picture 5-26

⑥ After the installation and verification of all sound path transducers, measure and record the length of each sound path with a box ruler, and input the parameters into the computing host, as shown in the picture 5-27.



Picture 5-27

5.5 Cable Laying

Cable layout can be divided into cable layout in pipeline and cable layout outside pipeline. During the overall cable layout, pay special attention not to damage the outer cover of the cable, to avoid cable from entering water and causing meter failure.

5.5.1 Cable Layout in pipeline

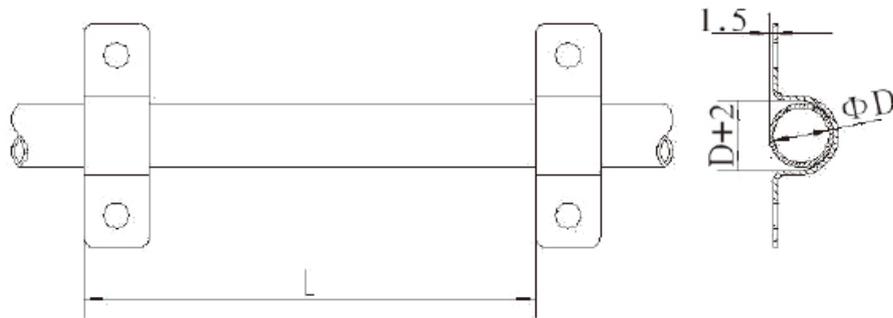
Pay attention to the following requirements when arranging cables in the pipeline:

- A. After the cables are arranged, all cables must be protected with protective pipes and can't be exposed.
- B. Special attention: the protection pipe orifice should be polished smooth or increase

the protective sleeve to avoid scratching the cable.

C. The cable protection pipe in the pipeline is best made of metal material, and has enough anti-scouring and anti-corrosion ability. Generally, 304 material protective pipe is recommended, and the wall thickness of the protective pipe with small diameter is not less than 1.2mm ($15\text{mm} \leq \text{DN} \leq 40\text{mm}$), and the wall thickness of the protective pipe with large diameter is not less than 2mm ($50\text{mm} \leq \text{DN} \leq 150\text{mm}$). Users can also use other materials according to the actual situation of the site, but must ensure its anti-scouring and anti-corrosion ability.

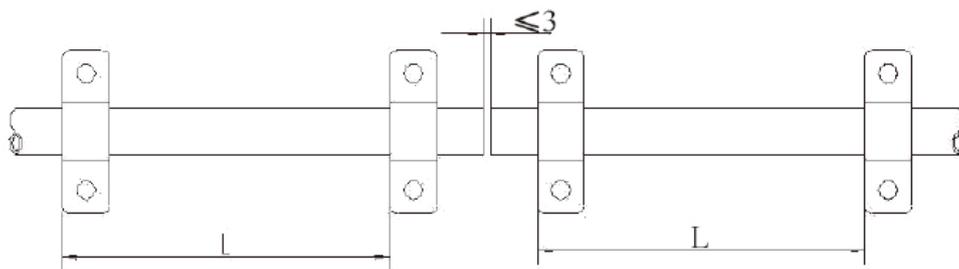
D. The protective pipe should be fixed firmly and reliably on the pipe wall, and it is recommended to use metal fixing clamp to fix it. The structure and spacing arrangement requirements of fixing clamps are shown in the picture 5-28.



When $15\text{mm} \leq \text{DN} \leq 40\text{mm}$, $L=1000\text{mm}$

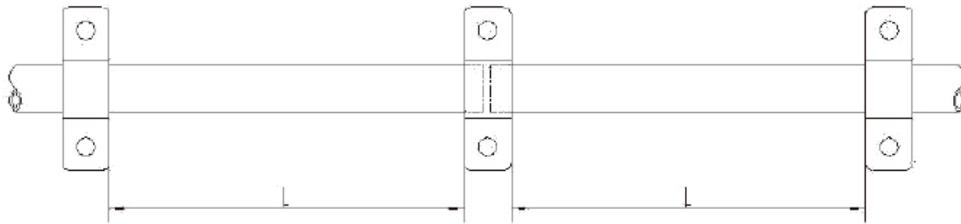
When $50\text{mm} \leq \text{DN} \leq 150\text{mm}$, $L=2000\text{mm}$

Picture 5-28a



Fixing method one of protection pipe interface fixing clip

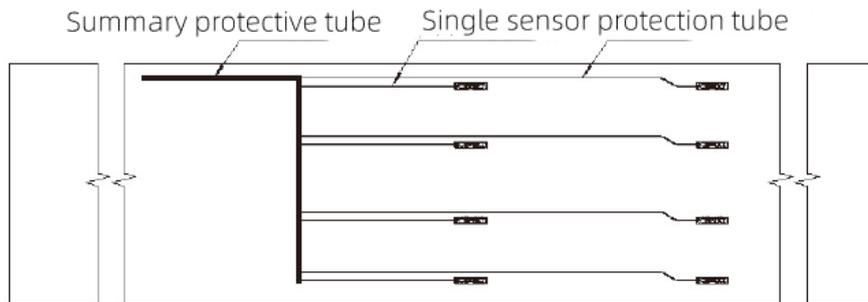
Picture 5-28b



Fixing method two of protection pipe interface fixing clip

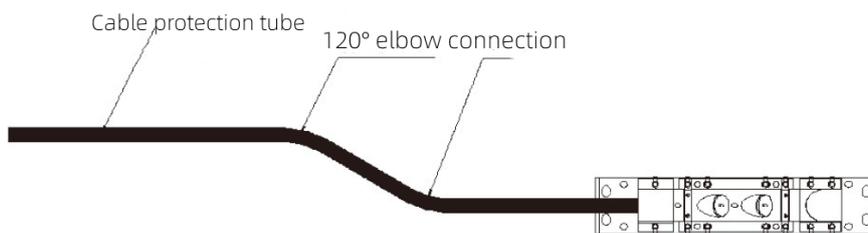
Picture 5-28c

E. The protection tube adopts the single transducer protection tube arrangement first, and then the overall summary arrangement, as shown in the picture 5-29.



Picture 5-29

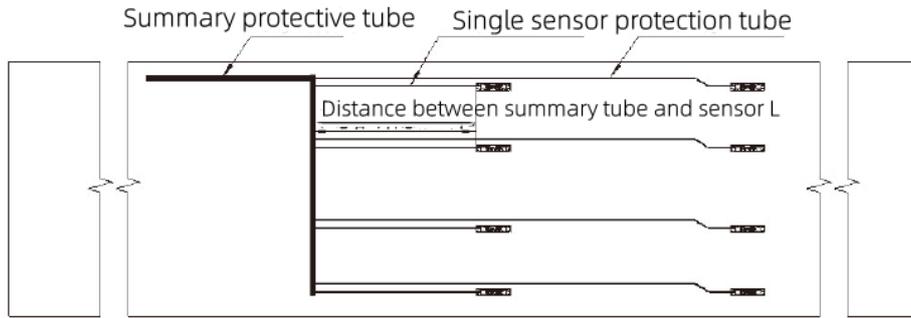
F. In order to facilitate cable threading, use as few elbows as possible for cable protection tubes. Even if elbows are used, try to connect cable with 120° elbows, as shown in the picture 5-30.



Picture 5-30

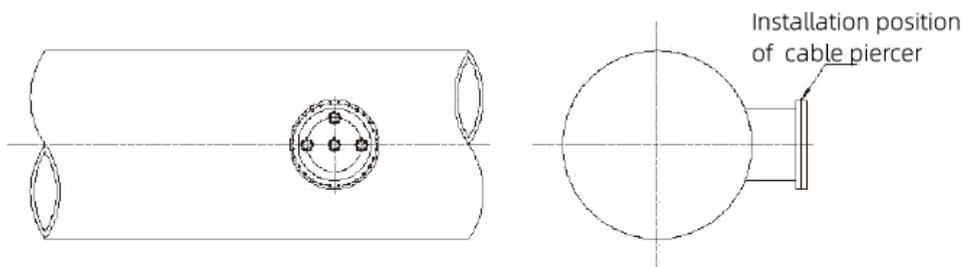
G. The ratio of the outer diameter of a single transducer protection pipe to the diameter of the installation pipe must be less than 1:100. If the ratio of the outer diameter of the summary cable protection pipe to the diameter of the installation pipe is less than or equal to 1:50, the summary pipe must be located at least 0.5 times the diameter of the installation pipe downstream from the transducer installation position. If the ratio between the two is greater than 1:50, the summary pipe must be located at

least 1.2 times the diameter of the installation pipe downstream from the transducer installation position, as shown in the picture 5-31.



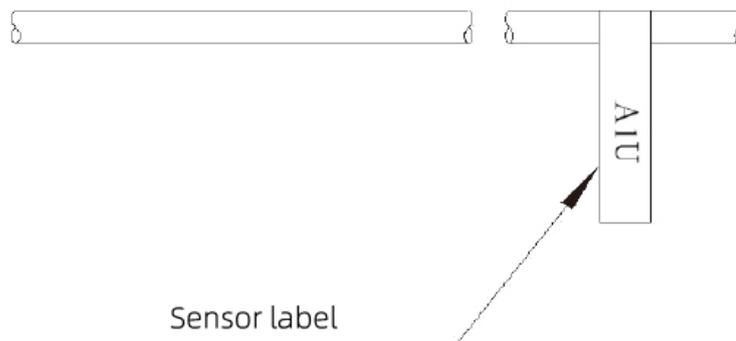
Picture 5-31

H. For pressure pipeline, cable piercer should be used when the cable leads out of the pipeline, as shown in the picture 5-32. For non-pressure pipeline, the cable can be directly led out of the pipeline in the form of embedded threading pipe.



Picture 5-32

I. During the entire cabling process, pay special attention to not damage the label on the cable, so as not to affect the subsequent wiring and maintenance work.



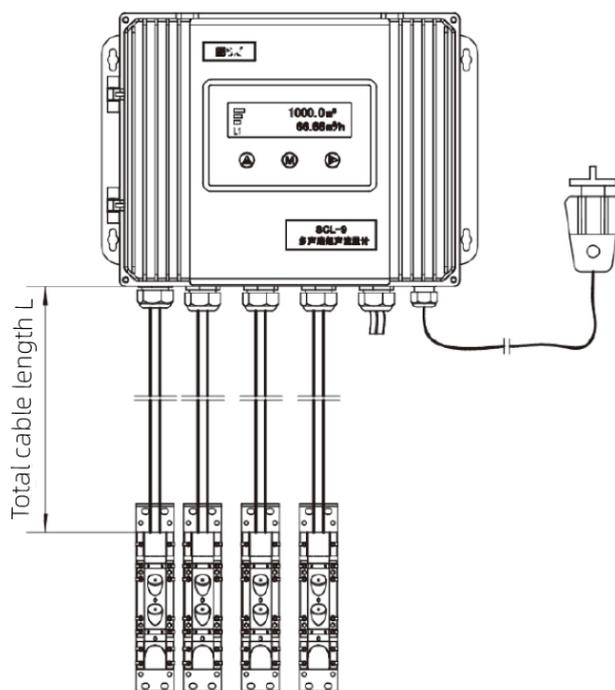
Picture 5-33

5.5.2 Cable Layout outside pipeline

Pay attention to the following requirements when arranging cables outside the

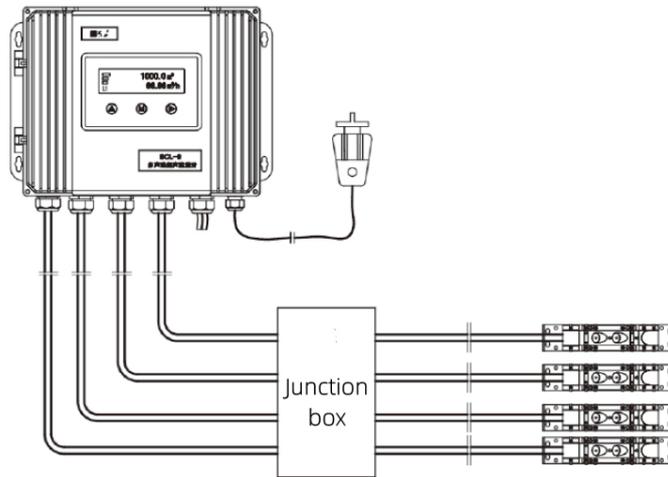
pipeline:

A. The total cable length L between the flow transducer and the main measuring unit should not be greater than 300m, otherwise it will seriously affect the measurement of the meter. For those exceed the range, it is necessary to communicate with technicians in advance and take relevant measures, as shown in the picture 5-34.



Picture 5-34

B. In order to facilitate the wiring of the flow transducer cable and subsequent maintenance work, a junction box can be set between the flow transducer and the main measuring unit. However, the junction box must be installed outside the measured pipeline. Ordinary junction boxes can be used for the junction box placed indoors, and rainproof junction boxes must be used for the junction box placed outdoors. All wiring terminals in junction boxes should be protected from moisture after wiring, as shown in the picture 5-35.



Picture 5-35

C. In order to avoid mechanical damage or rat damage, metal pipes should be used as protective pipes, and anti-corrosion measures should be taken before embedment of protective pipes.

6. Troubleshooting and After-sales Commitment

6.1 Common Troubleshooting

Table 6-1 List of Common Troubles

Trouble	Cause	Solutions
No display of characters and no back lighting	AC220V power not connected	Switch on the power
	Burning out of fuse tube	Check voltage grade and replace fuse tube
Instantaneous flowrate value is "0", but signal intensity indication is normal	1. Pump not working; 2. Valve(s) shut off; 3. Presence of local static water due to connection with other pipe	1. Start pump; 2. Open valve; 3. Vary local flowrate through regulating valve
	Flow velocity smaller than starting flowrate value	Check starting flowrate value for correct setting
	Current flowrate value is cut off as a zero-point value due to misoperation	Clear current zero-point flowrate value
Instantaneous flowrate value is "0". No signal intensity indication. The status symbol "S" keeps on display.	There is no pipe flow or no full flow	Let the pipe run with full flow
	There is a large discrepancy between the distance of transducer actually mounted and the meter-displayed distance value (>	Check meter mounting parameters and the actual mounting distance. Set the mounting parameters according to specific site conditions. If the

	$\pm 20\%$)	distance value displayed by main unit is inconsistent with the actual mounting distance, re-mount the transducers.
Signal too weak to be captured	Sonic wedge surfaces of transducer not facing each other	Adjust transducers' mounting direction: markings of insertion-type transducers facing to each other; the internal-mounted-type transducers aligns the sonic wedge
	Mounting depth of insertion-type transducer too large or too small	Adjust insertion depth of transducer, complying with mounting requirements of transducer
	Internal-mounted-type transducer: 1. The installation point is not polished smoothly; 2. The fastening is loose	1.Repolish mounting points; 2. Re-mount transducers
	Transmission of signal impeded due to the presence of thick scale deposit in pipe	Clean transducers sonic wedge surfaces
Large flow deviation	Incorrect entry of parameters (pipe size, wall thickness, correction coefficient, etc	Correct setting of pipe parameters
	Pipe ID becomes smaller due to scale deposit	1.Modify input value of wall thickness according to thickness of scale deposit for internal-mounted-type transducer; 2.Adjust transducer insertion depth for insertion-type transducer
Great fluctuation of displayed flowrate values. Status symbol * keeps flickering	Presence of air bubbles or solid particles in fluid (Judgment method: great fluctuation for A1 and A2 values)	1. Check the leakage point of pipe network system; 2.Fit air-venting valves on pipe; 3.Change mounting points
	The straight pipe section fails to meet the mounting conditions	Change mounting points
	1.Transmission of acoustic wave impeded due to the presence of thick scale deposit in pipe; 2.Presence of scale deposit in the sonic wedge surface of	1.Adjust insertion depth of insertion-type transducer or clean scale deposit in pipeline; 2.Pull out transducer, clean sonic wedge surface and re-mount

	insertion-type transducer; 3.Incorrect mounting of transducers; 4.The failure of transducer; 5. The transducer cable is not securely connected to the main unit; 6.Main unit trouble	transducer; 3.Correct mounting of transducer; 4.Replacement of transducer; 5.Re-connection; 6.Replace the PCB of main unit
Status symbol L keeps flickering	1. Sonic wedge surfaces of transducer not facing each other, and the transducer is inserted too deeply or too shallowly; 2. High gas content or no water in the pipe (horizontal pipe, concentrated in the top pipe) 3. The input pipe outside diameter does not match the actual pipe outside diameter	1. Adjust the transducer and clean the dirt for the sound path with weak signal; 2. Discharge the pipeline gas and adjust the transducer for the sound path with weak signal; 3. Modify the pipe outside diameter
Status symbol > keeps flickering	The flow rate exceeded 12m/s	Adjust the flow rate to the flow rate range
Status symbol X keeps flickering	Transducer failure, If X is the continuously displayed, the instantaneous flow rate is 0	1. Check the transducer cable and connection; 2. Check the Angle and depth of the transducer installation 3. Clean the transducer surface dirt or remount the transducer; 4. Replace the transducer
Unsuccessful setting of parameters. Details refer to the menu of “Mounting Distance”	Faulty memory	Contact Huizhong

6.2 After-sales commitment

Huizhong Instrumentation Co., Ltd. operates by adhering to the principle of “being user’s most trustworthy friend, providing users quality products and timely good after-sales service”. Our Specific commitments are as follows:

1. After receiving user’s call, we promise to make a response within 2 hours.
2. We promise to repair any meter within one year after its date of delivery free of charge without asking for the cost of labor and components.
3. “Free-charged” repair is only limited to the repair of the damaged main

measuring unit and key functional components like Transducers and Conversion Unit. Repair of damaged cables is outside the promised scope.

4. Repair of any meter beyond its guaranty period will be made on site, if required, with the travel expenses and cost of components covered by user.

5. The free repair provisions shall not cover any of the following damages:

- ① Damage of meter due to purely artificial reasons, such as mechanical impact.
- ② After-sales service rendered for the repair of any meter damage caused not by the failure of the meter itself, but for the shut-down or abnormal operation of system or user's failure to operate the meter according to the instruction.
- ③ Damage of meter caused by force of majeure, such as thunder strike.

6. If the user sends the meter's core part or the entire meter back to Huizhong for repair, both parties shall responsive bear the transportation expenses and the costs of replacing components should be borne by user.

Appendix A

Instruction of Instrument Working Status Indication Symbol

Status symbol	Meaning	Application notes	Solutions
None	Normal operation	Normal operation	
“H”	Signal intensity strong	Normal operation. Strengthened in anti-interference capacity.	
“L”	Signal intensity too weak	<ol style="list-style-type: none"> 1. Sonic wedge surface of transducer not facing to each other; presence of scale deposit on transducers; Transducer insertion depth too large or too small; 2. High gas content or no water in the pipe (horizontal pipe, concentrated in the top pipe) 3. The input pipe outside diameter does not match the actual pipe outside diameter 	<ol style="list-style-type: none"> 1. For the sound channel with weak signal, adjust the transducers and clean its dirt; 2. Discharge the pipeline gas and adjust the transducer for the sound path with weak signal; 3. Modify the pipe outside diameter
“*”	Unstable signal	<p>Occasional appearance of “*” do not affect the operation of meter.</p> <p>For frequent or long-term appearance of “*”, probably it is caused by the presence of air bubbles in liquid or</p>	<p>Interference of air bubbles:</p> <ol style="list-style-type: none"> 1. Select the mounting point with rare gas concentration; 2. Close air inlet or install air exhausting device. <p>Electromagnetic</p>

		<p>electromagnetic interference. Unstable meter measurement, large flow fluctuation, or even failed measurement may occur due to serious interference.</p>	<p>interference:</p> <ol style="list-style-type: none"> 1.Meter should be connected to ground (One of the power lines must be connected with earth wire); 2.Pay attention to the protection of transducer cable, and pull through a metal conduit when mounting transducer; 3.Add a power filter for power supply
“>”	Overrun of flow velocity	Flow velocity beyond 12m/s	Adjust flow velocity to be within flow velocity range
“S”	Signal capture	<p>“S” appears when power is on and disappears few minutes later, and then meter enters into measuring status. In case “S” fleets, it means a sound channel is in progress of signal capture. In case “S” keeps displaying for a long period of time, it means something is wrong with a sound channel.</p>	Refer to above “*”and “L” items to deal with
“X”	Failure of transducer	Failure of transducer, e.g. “X” continuously keeps display and instantaneous flow is 0.	<ol style="list-style-type: none"> 1. Check transducers’ cable and connection; 2. Check transducers’ mounting angle and insertion depth; 3. Clean the dirt on the surface of transducer or re-mount transducer; 4.Replace transducer
“E”	Failure of processor	<p>Failure of inner information transmission; Generally, this failure can be removed by auto power on.</p>	In case of the presence of long-time display of this symbol, together with repeat auto power on, try to disconnect meter power supply and then turn on the power.

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