



SCL-60/62 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 Flow Meter for Water Supply & Drainage>.
- The ex-factory calibration is made in conformity to the National Metrological Calibration Regulation of PRC JJG1030-2007, <Ultrasonic flow meter>.
- 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.

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.

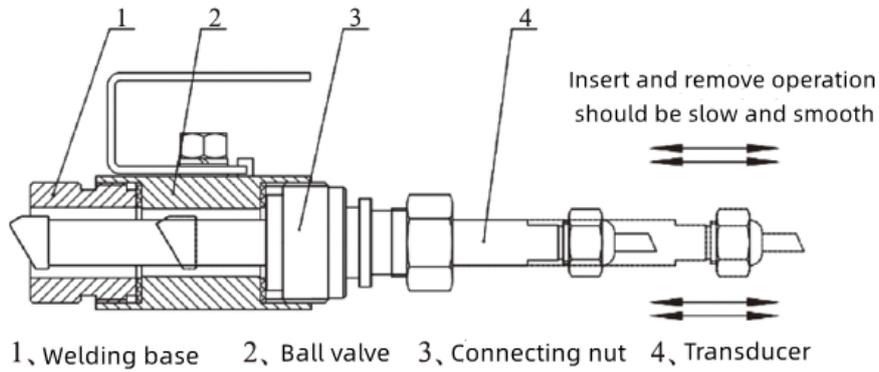
Shockproof requirements:



Warning:

In the process of disassembly and installation of the insertion transducer, the collision and vibration caused by pipeline pressure or other external forces are easy to cause damage to the transducer.

The transducer should be inserted into or taken out of the pipeline slow and smooth.



Indicative icons

Before using, please know the meaning of icons in the Instruction.



Warning—situation that users or others may get hurt.



Caution—situation that will damage the meter or other equipment.



Please note—Annotation, Usage Tips and Additional Information.



Caution!

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

Version No.: Ver 1.01

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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 unit. Take care and don't let it fall off or be subjected to knocking force.
8. Before confirming the location of the installation point, read and understand the installation requirements and precautions for the "Technical parameters" of the instrument in detail. If exceed the range of "Technical parameters", unforeseeable consequences may occur, including the abnormal operation of the instrument.

1. Description

- SCL-60 insertion-type ultrasonic flowmeter and SCL-62 clamp-on-type ultrasonic flowmeters are used for measuring liquid flow in a closed round pipes with the “velocity difference” methods as its operating principle. The meter uses advanced multi-pulse, DSP and error correction techniques, and an internally integrated HZ-USP ultrasonic signal processing functional module (Patent Name: A Ultrasonic Signal Processing Functional Module. Patent No.: 200920306467.3), and the advanced ultrasonic flow transducer, the flowmeters are high in measuring accuracy, reliability and anti-interference capacity and adaptable to different flow regimes, and can find widespread applications in oil, chemical, metallurgical, power, and water supply and drainage sectors.
- 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 Flow Meter for Water Supply & Drainage>.
- The ex-factory calibration is made in conformity to the National Metrological Calibration Regulation of PRC JJG1030-2007 <Ultrasonic flow meter>.
- Please read the instruction manual carefully before using the product.

2. Main Measuring Unit Installation and Operating Instruction

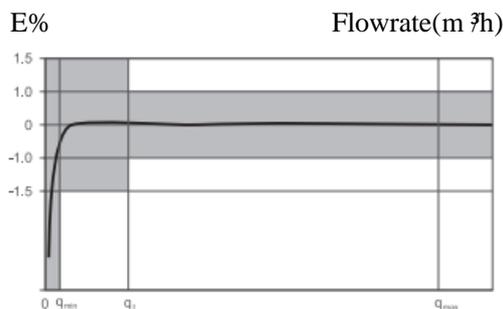
2.1 Technical Parameters

Table 2-1 Technical Parameters

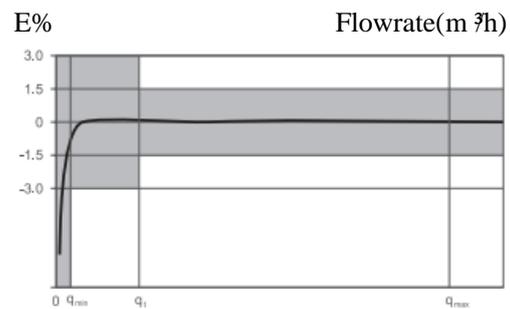
Transducer type Performance	SCL-60 Insertion-type Ultrasonic Flowmeter	SCL-62 Clamp-on-type Ultrasonic Flowmeter
Material of pipeline	Material like steel, cast iron, cement, PE, and PVC etc, which pipeline can be drilled for mounting	Material like steel, cast iron, PE, and PVC etc, which pipeline can be penetrated by ultrasonic wave
Nominal diameter	DN80~DN2000	
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 (qt=0.3m/s)		
Accuracy class	1.0	1.5	
Ambient temperature	-10°C~+45°C(Please specify on ordering if exceeds mentioned range)		
Ambient humidity	≤85%RH (Please specify on ordering if exceeds mentioned range)		
Power supply	AC220V ±10%, 50Hz		
	AC110V ±10%, 60Hz (Please specify on ordering)		
	DC12V~DC36V, 1A (Please specify on ordering)		
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), version number, date (Y/M/D), time (H/M/S)	
Display range	Cumulative flowrate: -99999999.9~+99999999.9 m ³ Instantaneous flowrate: -999999.99~+999999.99 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-isolated 4~20mA, 0~10mA, or 0~20mA. Load capacity: ≤600Ω	
	Switch	Active output	Output voltage: DC24V (Max.); Output current: 20mA (Max.)
		Passive output	Load voltage: DC30V (Max.); Load current: 20mA (Max.)
		Transmission distance≤500m	
Data storage	Storage of cumulative flowrate, running time and different setting parameters, 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	IP65		

2.1.1 Typical Error Curve



SCL-60 Insertion-type Flowmeter (Class 1.0)



SCL-62 Clamp-on-type Flowmeter (Class 1.5)

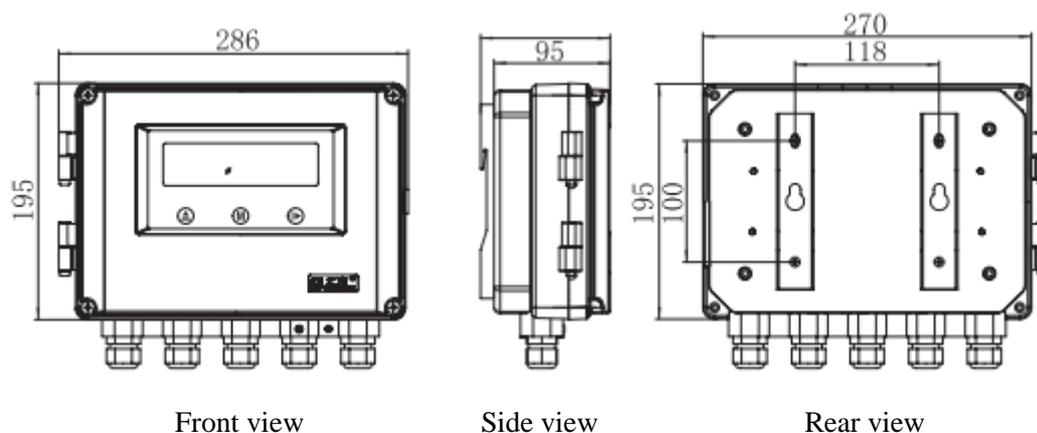
2.2 Main Measuring Unit Installation and Connection

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

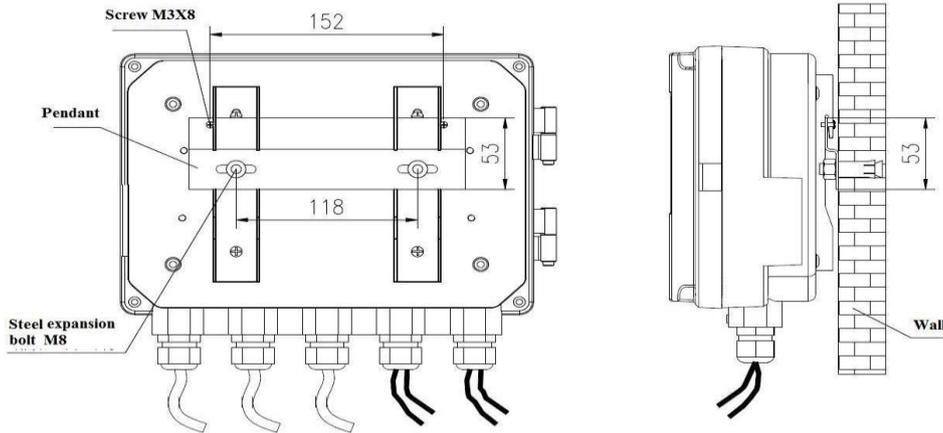
- Dimensions (Unit: mm)



Picture 2-1 Dimensions of main measuring unit

- Weight: 1.6kg

2.2.3 Main Measuring Unit Installation method

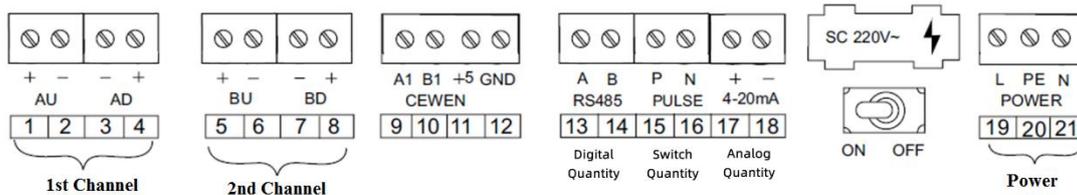


Picture 2-2 Installation diagram

- Installation instruction

1. First, determine the mounting position of main measuring unit. Then check whether following accessories are available: 1 piece of pendant, 2 pieces of M8 steel expansion bolts and matched flat and spring washers, and 2 pieces of M3×8 cross recess head screws.
2. Screw 2 pieces of M3×8 screws into the depth of 4mm of the pendant's screw holes.
3. Drill bottom holes of expansion bolt with a hole spacing of 118mm on the wall. Secure pendant with expansion bolt and screw up it.
4. The main measuring unit should be hung on the pendants at last. Installation completed.

2.2.4 Electrical Connection of the Main Measuring Unit Wiring Terminal



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

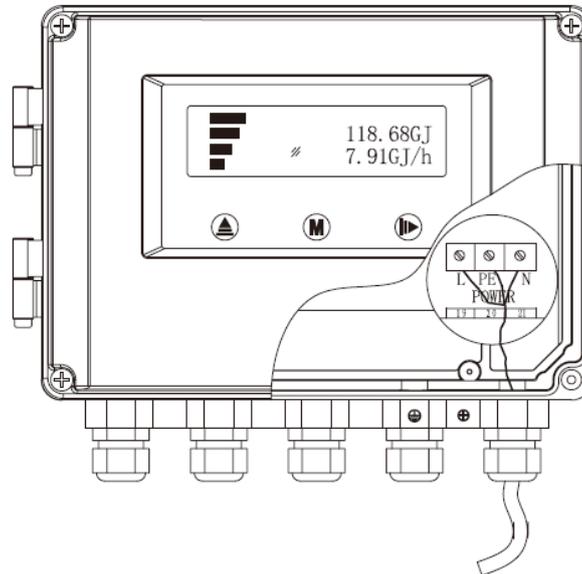
- Terminal AU should be connected with upstream transducer;
- Terminal AD should be connected with downstream transducer;
- Terminal BU, BD, CEWEN for reservation;
- Terminal RS485 should be connected with digital quantity RS485 output;
- Terminal PULSE should be connected with cumulative pulse output;
- Terminal 4-20mA should be connected with analog output;
- SC 220V~ is fuse base;

ON and OFF are power switch;

Terminal POWER should be connected with power supply.

- Power connection

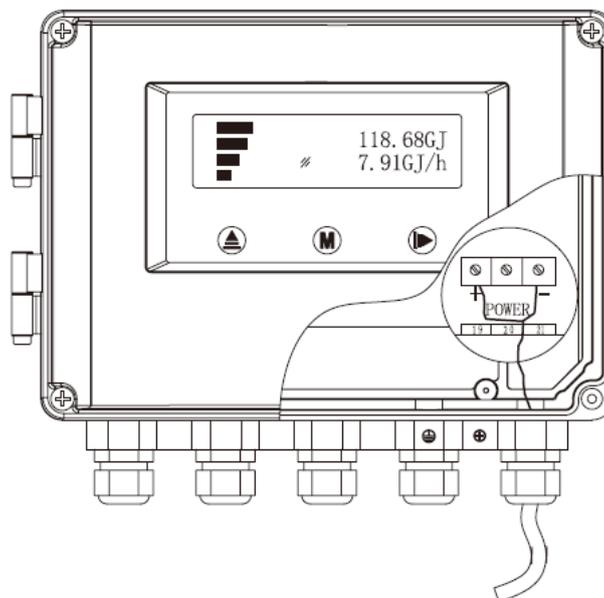
① Connection to the AC power supply



Picture 2-4 Diagram of connection to AC power supply

Note: Power supply is connected via knife switch and air switch to terminal POWER of conversion unit. Live wire, ground wire and zero wire should be connected with terminals 19, 20 and 21 respectively.

② Connection to DC power supply

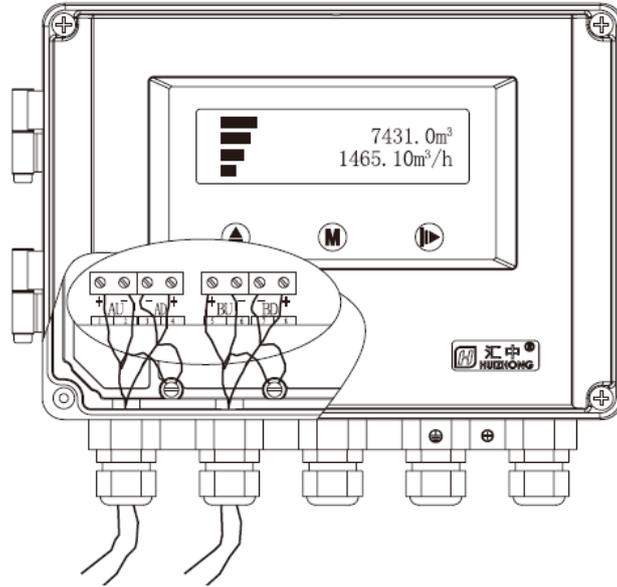


Picture 2-5 Diagram of Connection to DC power supply

Note: Connect the DC power supply to the DC24V terminal of main measuring unit,

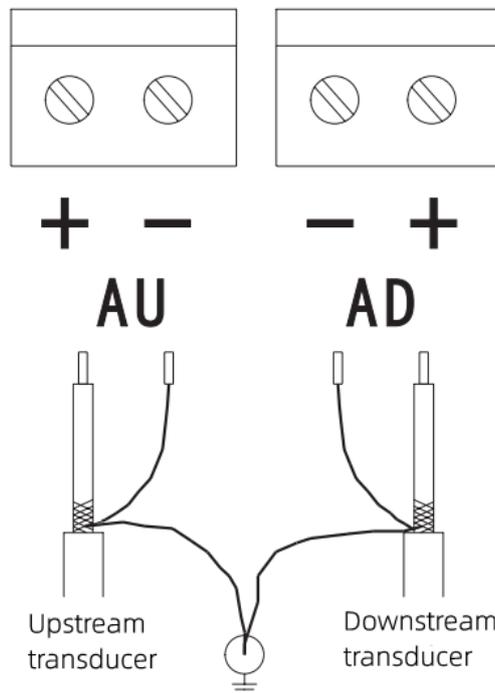
connect “+” and “-” of the DC power supply to the terminals 19 and 21.

- Connection to transducer



Picture 2-6 Diagram of Connection to Transducer

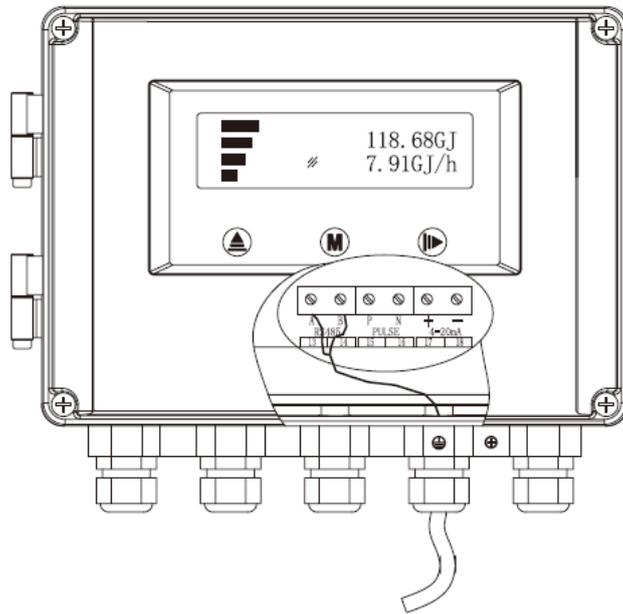
Note: Upstream and downstream transducer cables should be connected with terminal AU and AD respectively.



Picture 2-7 Diagram of Connection to Transducer Cable

Note: Core wire (red cap) of transducer cable should be connected with terminal “+”.
Shielded wire (white cap) should be connected with terminal “-”.

- Connection to digital output

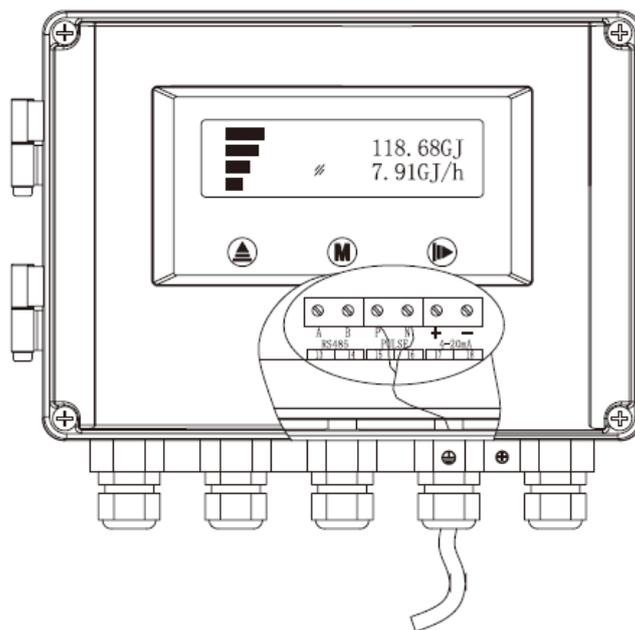


Picture 2-8 Diagram of Connection to Digital Output

Note: ① A+ and B- of RS-485 interface of data communication device should be respectively connected with terminals 13 and 14 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 13 and 14 of main unit.

- Connection to cumulative switch output



Picture 2-9 Diagram of Connection to Cumulative Switch Output and Secondary Instrument

Note: ①The positive pole and negative pole of the secondary instrument should be connected with terminals 15 and 16 of the main unit.

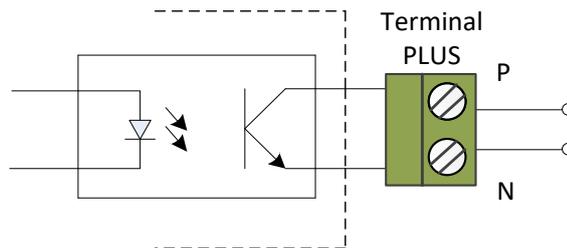
②Cumulative switch output is divided into passive output and active output.

Passive output: DC power supply is outsourced.

Active output: DC power supply is provided by cumulative switch output.

- Schematic diagram of connection to cumulative switch output and pulse sequence chart:

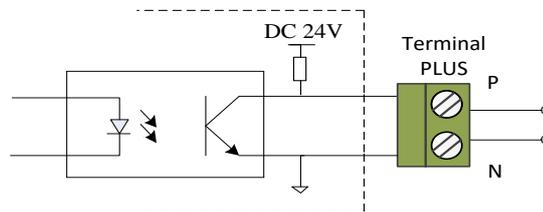
①Passive output of cumulative switch



Picture 2-10

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

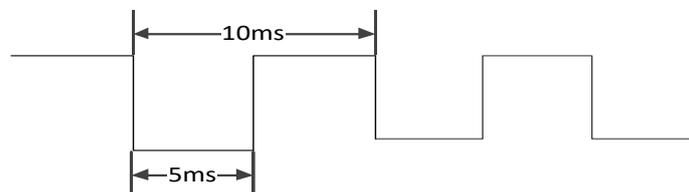
②Active output of cumulative switch



Picture 2-11

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

③Pulse sequence chart



Picture 2-12 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.

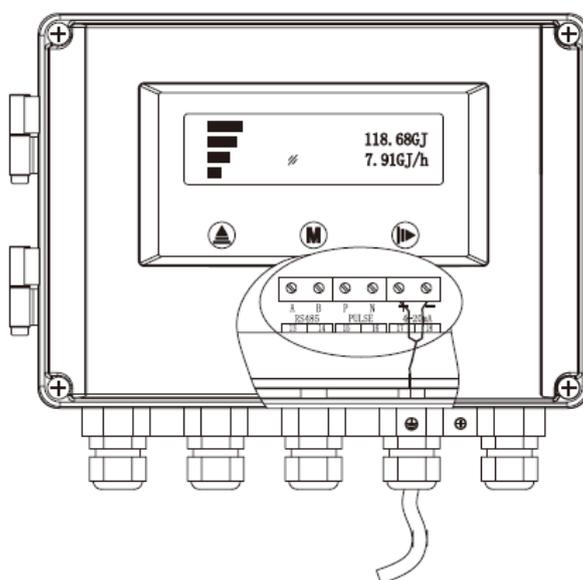
For example, the cumulative pulse equivalent is 10.0m³ set by customer. A pulse can be outputted when algebraic sum of cumulative flowrate of the meter is up to 10.0m³.



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

- Connection to analog output

Diagram of connection to analog output and display instrument or record instrument (See Picture 2-13).



Picture 2-13 Diagram of Connection to Analog Output

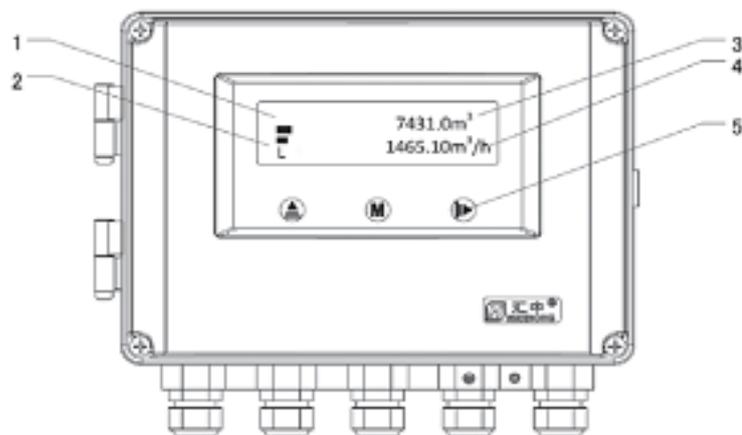
Note: ①The sum of the resistance of transmission line and the input resistance of display or recording unit should be less than 600Ω.

②The positive pole and negative pole of the display/recording unit are respectively connected to the terminals 17 and 18 of the main unit.

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.

3. Main Measuring Unit Display and Operating Instruction

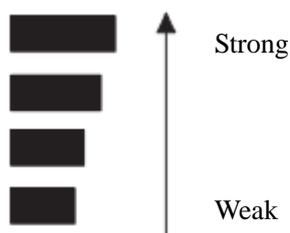
3.1 Panel annotation



Picture 3-1 Panel annotation of main unit

Note:

1. Signal intensity indication



2. Signal 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
- 8) “F”---Display of overflow

3. Display of cumulative flowrate

4. Display of instantaneous flowrate

5.1 × 3 induction key

Key function:



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

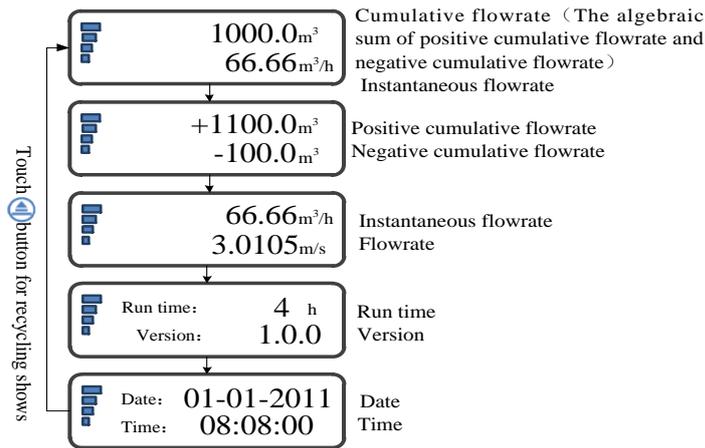


---①OK; ②Enter into menu; ③Switch to submenu in digital debugging menu.



---①Move cursor; ②Back.

3.2 Main Display



Picture 3-2 Main Display

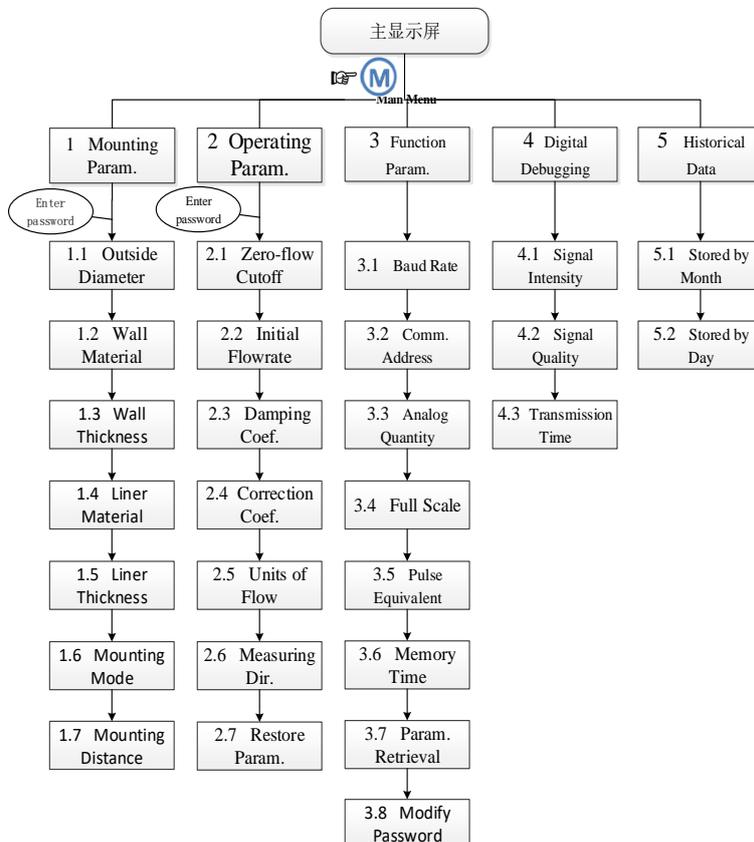
Note: When the inner diameter of the meter pipe is less than 300m, the instantaneous flowrate is displayed after three decimal places.

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.

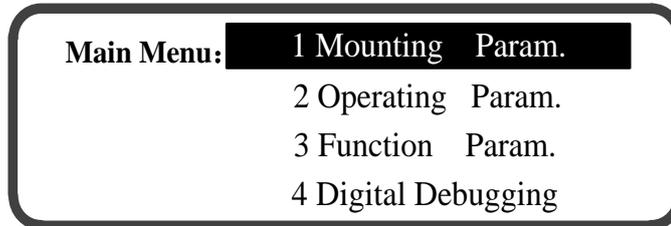
3.3 Menu Structure



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:

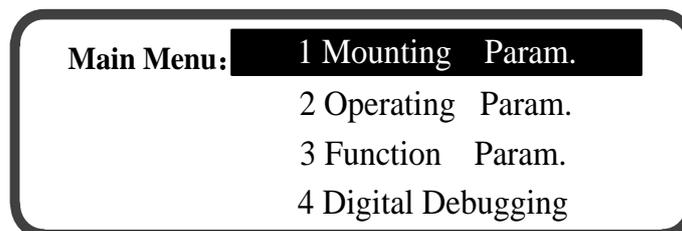
Touch the  key to display the main menu cycled.

Touch the  key to enter the main menu;

Touch the  key to go back to main display.

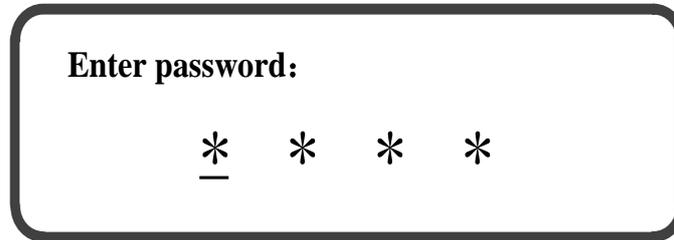
3.5 Mounting Parameters

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



Picture 3-5

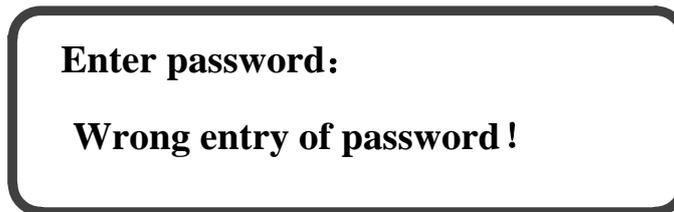
Enter the screen of “Enter password” by touching  key, display as shown in picture 3-6.



Picture 3-6

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

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



Picture 3-7

Touch  key to modify the value where cursor is positioned.

Touch  key to confirm.

Touch  key to move cursor.

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

Procedure: ① Power off; ② Touch  key, and turn on the meter meanwhile, then password are reset to factory defaults.

 Submenu instruction

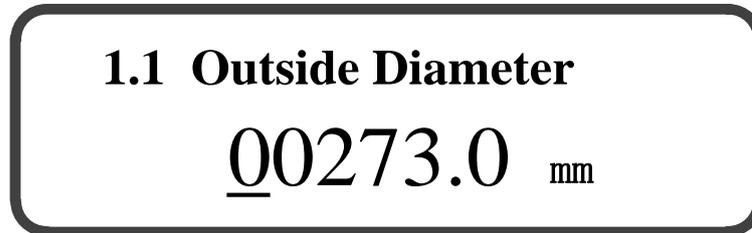
 Key function of the submenu:

Touch  key to modify the value where cursor is positioned.

Touch  key to confirm.

Touch  key to move cursor.

 Outside Diameter



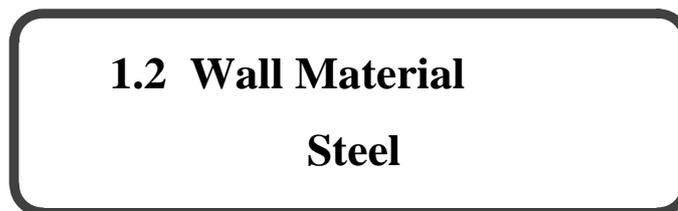
Picture 3-8

The valid setting range of the outside diameter of the pipeline is from 20.0mm to 2600.0mm. Factory default value is 273.0mm. If the outside diameter of the pipeline is out of range, re-entry is required after meter display as shown in picture 3-9.



Picture 3-9

 Wall Material



Picture 3-10

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

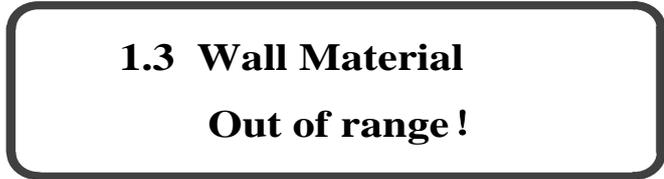
 Wall Thickness



Picture 3-11

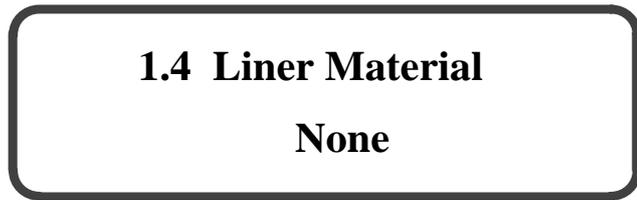
The valid setting range of the pipe wall thickness is from 0.0mm to 200.0mm.

Ex-factory default value is 11.5mm. If the pipe wall thickness is out of range, re-entry is required after meter display as shown in picture 3-12.



Picture 3-12

 Liner Material



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

1.6 Mounting Mode

Z

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.

 Mounting Distance

1.7 Mounting Distance

00147.8 mm

Picture 3-17

If above parameter setting is finished, meter displays transducer’s mounting distance as shown in picture 3-17.

Transducer is mounted in accordance with the displayed mounting distance. Touch

 key to confirm after installation completed. If the parameters set in Menu 1.1~1.6 are same as original parameters, meter should directly get back to main display. If not, the meter display is as shown in picture 3-18.

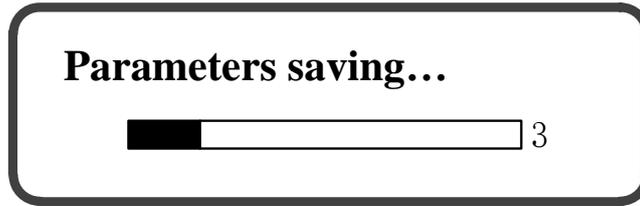
Modify parameters?

OK

Cancel

Picture 3-18

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 3-19.



Picture 3-19

If it is successfully saved, meter display is as shown in picture 3-20. After that, meter display gets back to main display.

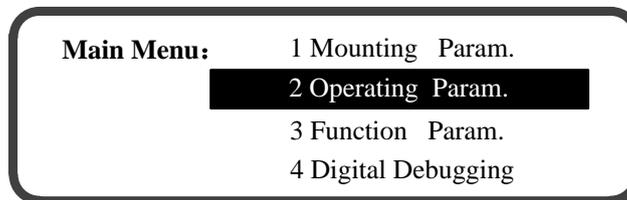


Picture 3-20

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

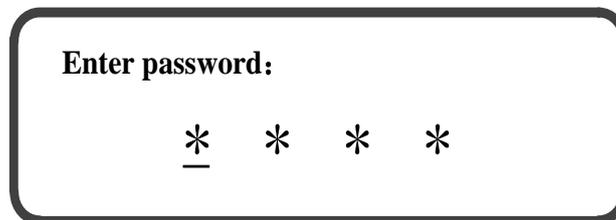
3.6 Operating Parameters

In main menu, touch  key to select **【2 Operating Param.】**, as shown in picture 3-21.



Picture 3-21

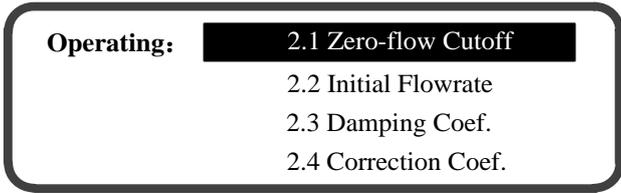
Touch  key to enter display of “Enter password” as shown in picture 3-22.



Picture 3-22

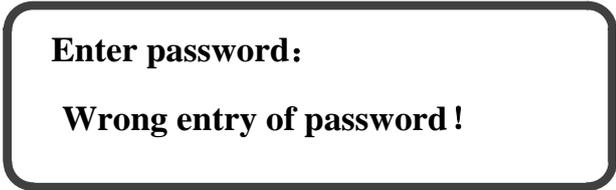
Ex-factory default password is “0000”. If password modification is needed, please refer to menu “Modify password”.

For right entry of password, meter will assess to the menu of operating parameters, as shown in picture 3-23.



Picture 3-23

For wrong entry of password, it will get back to main men after the meter display as shown in picture 3-24.



Picture 3-24



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 procedure.

Procedure: ① Power off; ② Touch  key , and turn on meanwhile, then password are reset to factory defaults.



Submenu instruction



Key function of the submenu:

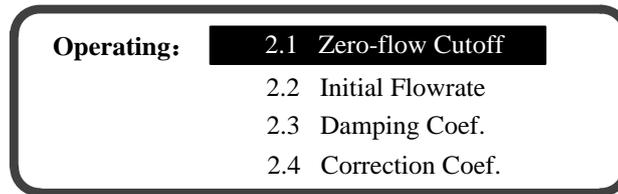
Touch  key to modify the value where cursor is positioned.

Touch  key to confirm.

Touch  key to move cursor.

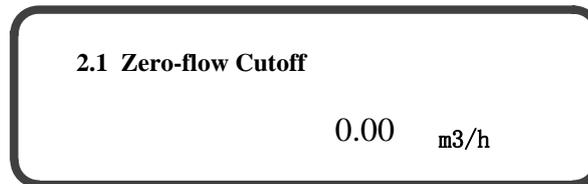
Zero-flow Cutoff

In the menu of operating parameters, select **【2.1 Zero-flow Cutoff】** by touching  key , as shown in picture 3-25.



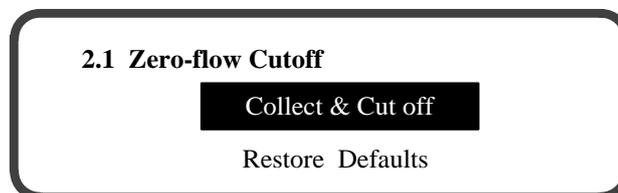
Picture 3-25

Touch  key to access to the submenu of “Zero-flow Cutoff”, as shown in picture 3-26.



Picture 3-26

The display shown in Fig. 3-26 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 3-27.



Picture 3-27

➤ Touch  key and select “Collect & Cut off”, as shown in picture 3-28. Collect instantaneous flowrate in static water for 30 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.

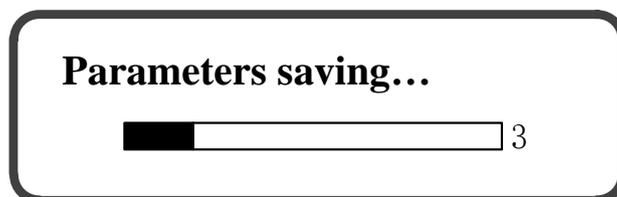
2.1 Zero-flow Cutoff	Times: 01
Current:	0.00m3/h
Average:	0.00m3/h

Picture 3-28

 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.

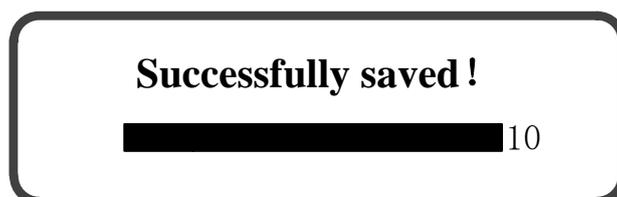
Number of instantaneous flowrate acquisition times displays on the right side of the first line of the display screen. The second line displays current instantaneous flowrate. The third line displays average value of the instantaneous flowrate (Namely, zero-flow value).

Acquisition completes, meter automatically cuts off zero-flow and it displays “Parameters saving...” as shown in picture 3-29.



Picture 3-29

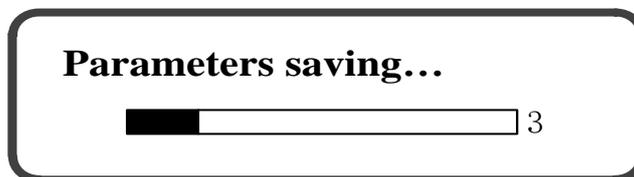
If successfully saved, the meter display is as shown in picture 3-30. After that, meter display gets back to the display as shown in picture 3-27.



Picture 3-30

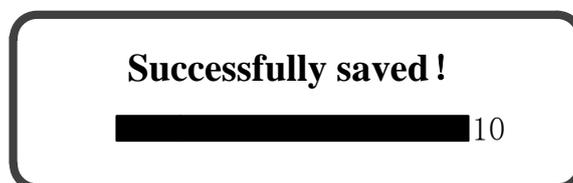
 Caution: Zero-flow cutoff cannot be freely operated in dynamic water, or

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 3-31.



Picture 3-31

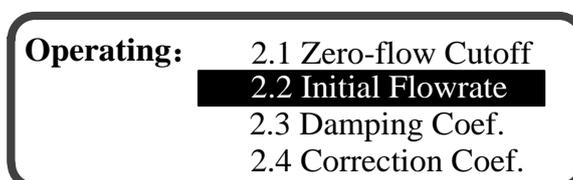
Successfully saved as shown in picture 3-32. Meter display gets back to the display screen as shown in picture 3-27.



Picture 3-32

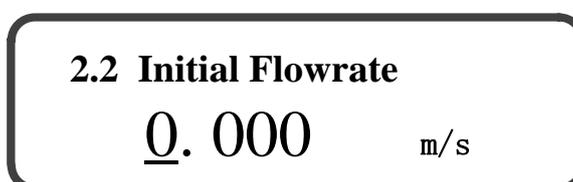
Initial Flowrate

In the menu of operating parameters, select **【2.2 Initial Flowrate】** by touching  key, as shown in picture 3-33.



Picture 3-33

Touch  key to access to the submenu of “Initial Flowrate”, as shown in picture 3-34.



Picture 3-34

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”.

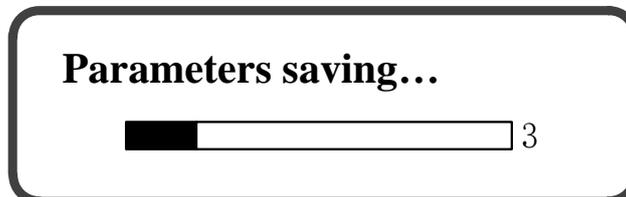
The range of initial flowrate is 0.000m/s ~ 1.000m/s and the ex-factory default value of initial flowrate is 0.050m/s. The setting of initial flowrate is determined in accordance with the fluctuating value of the flowrate (instantaneous flowrate) in static water. The initial flowrate to be set should 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 3-35. Touch  key to select “OK” or “Cancel” and touch  key for confirmation.



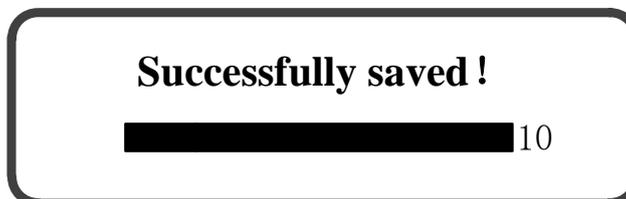
Picture 3-35

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 3-36.



Picture 3-36

If successfully saved, meter display gets back to the menu of operating parameters after meter display is as shown in picture 3-37.



Picture 3-37

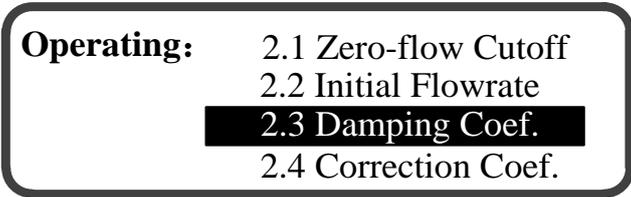
If the set parameter is out of range, re-entry is required after meter display as shown in picture 3-38.



Picture 3-38

 Damping Coef.

In the menu of operating parameters, select **【2.3 Damping Coef.】** by touching  key, as shown in picture 3-39.



Picture 3-39

Touch  key to access to the submenu of “Damping Coef.”, as shown in picture 3-40.



Picture 3-40

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 items: 1, 10 (Default), 20, 30, 40, 50 and 60.

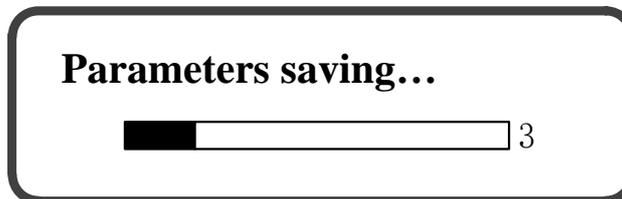
If the set parameters are same with original parameters, meter display gets back to the menu of operating parameters after touching  key. If not, meter display is as

shown in picture 3-41. Touch  key to select “OK” or “Cancel” and touch  key for confirmation.



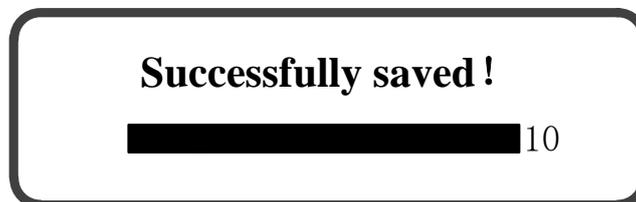
Picture 3-41

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 3-42.



Picture 3-42

If successfully saved, meter display gets back to the menu of operating parameters after meter display is as shown in picture 3-43.

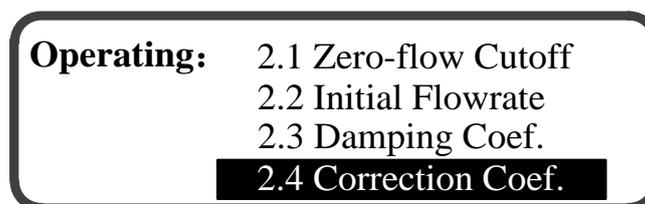


Picture 3-43

 Correction Coef.

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

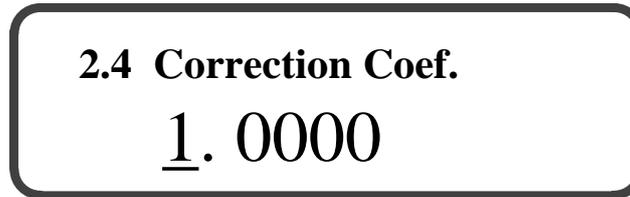
 key, as shown in picture 3-44.



Picture 3-44

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

3-45.

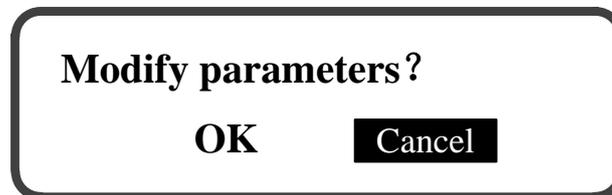


Picture 3-45

Correction Coef. is used for the correction of meter's measuring accuracy. The range of Correction Coef. is 0.9000~1.1000. 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.

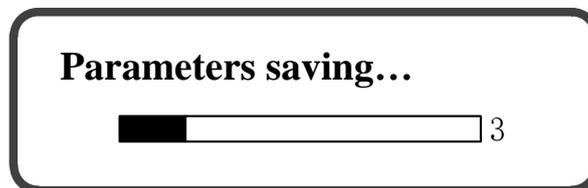
 Caution: Correction Coef. cannot be freely modified, or measuring accuracy of the meter may be affected.

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 3-46. Touch  key to select "OK" or "Cancel" and touch  key for confirmation.



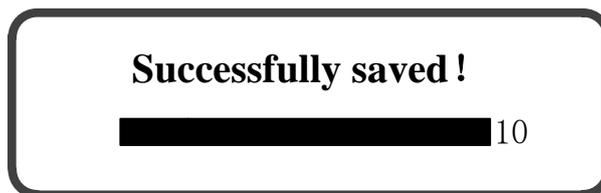
Picture 3-46

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 3-47.



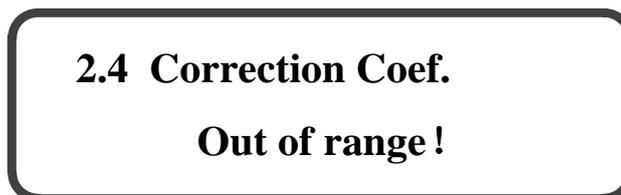
Picture 3-47

If successfully saved, meter display gets back to the menu of operating parameters after meter display is as shown in picture 3-48.



Picture 3-48

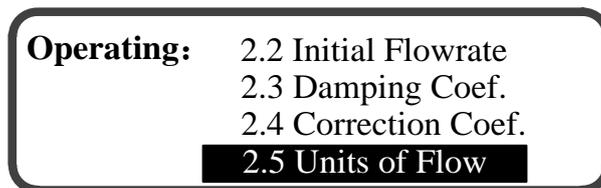
If the set parameter is out of range, re-entry is required after meter display as shown in picture 3-49.



Picture 3-49

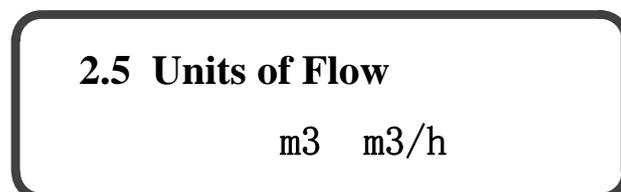
 Units of Flow

In the menu of operating parameters, select **【2.5 Units of Flow】** by touching  key, as shown in picture 3-50.



Picture 3-50

Touch  key to access to the submenu of “Units of Flow”, as shown in picture 3-51.



Picture 3-51

Units of flow are the units of meter’s cumulative flowrate and instantaneous flowrate, including “m³, m³/h” and “L, L/s”. 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

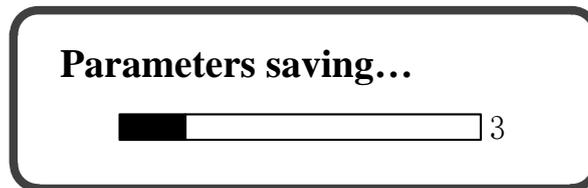
shown in picture 3-52. Touch  key to select “OK” or “Cancel” and touch

 key for confirmation.



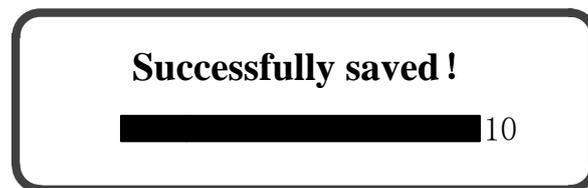
Picture 3-52

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 3-53.



Picture 3-53

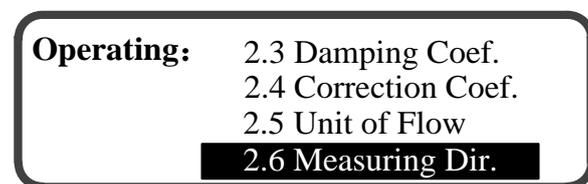
If successfully saved, meter display gets back to the menu of operating parameters after meter display is as shown in picture 3-54.



Picture 3-54

 Measuring Dir.

In the menu of operating parameters, touch  key to select **【2.6 Measuring Dir.】**, as shown in picture 3-55.



Picture 3-55

Touch  key to access to the submenu of “Measuring Dir.”, as shown in picture 3-56.

2.6 Measuring Dir.

Two-way

Picture 3-56

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 3-57. Touch  key to select "OK" or "Cancel" and touch  key for confirmation.

Modify parameters?

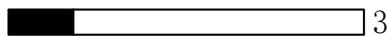
OK

Cancel

Picture 3-57

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 3-58.

Parameters saving...



Picture 3-58

If successfully saved, meter display gets back to the menu of operating parameters after meter display is as shown in picture 3-59.

Successfully saved !



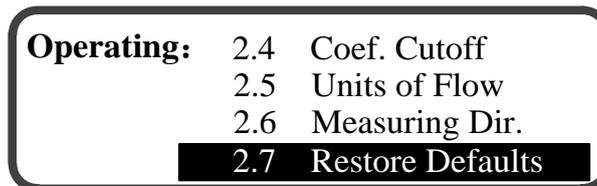
Picture 3-59

 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 our company.

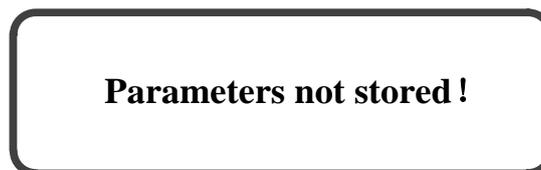
 Caution: The operation shall be made only when meter is in abnormal status.

In the menu of operating parameters, touch  key to select **【2.7 Restore Param.】**, as shown in picture 3-60.



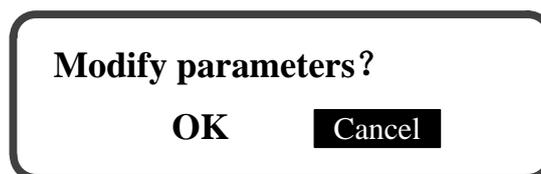
Picture 3-60

Touch  key, if meter does not save meter mounting parameters, meter display shall be as shown in picture 3-61.



Picture 3-61

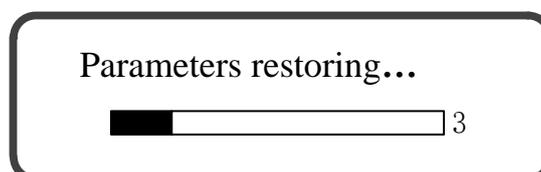
If meter has saved meter mounting parameters, meter display shall be as shown in picture 3-62.



Picture 3-62

Select “Cancel”, meter display should get back to the display as shown in picture 3-60.

Select “OK”, meter should restore the saved mounting parameters, as shown in picture 3-63.



Picture 3-63

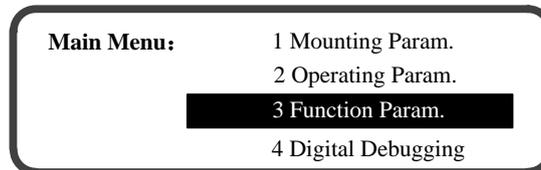
If successfully saved, meter display is as shown in picture 3-64, and then gets back to main display screen.



Picture 3-64

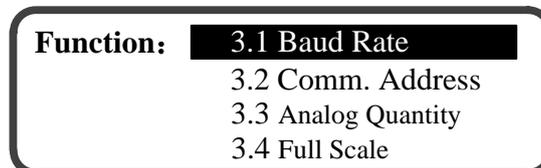
3.7 Function Parameters

In main menu, touch  key to select **【3 Function Param.】**, as shown in picture 3-65.



Picture 3-65

Touch  key to access to the menu of "Function Param.", as shown in picture 3-66.



Picture 3-66

➤ 8 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]]

☰ Submenu instruction

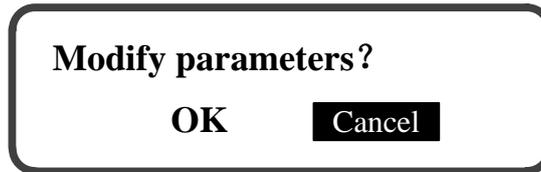
☞ Key function of the submenu:

Touch  key to modify the value where cursor is positioned.

Touch  key to confirm.

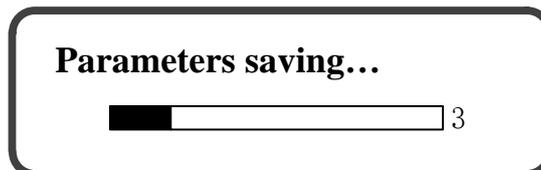
Touch  key to move cursor.

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 3-67. Touch  key to select “OK” or “Cancel” and touch  key for confirmation.



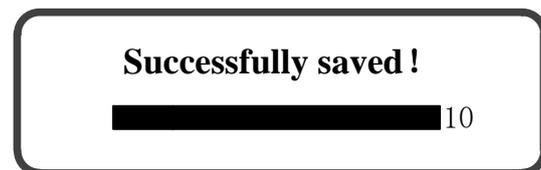
Picture 3-67

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 3-68.



Picture 3-68

If successfully saved, meter display gets back to the menu of operating parameters after meter display is as shown in picture 3-69.

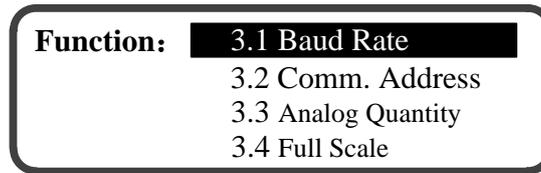


Picture 3-69

☰ Baud Rate

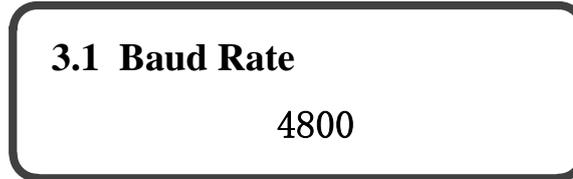
In the menu of function parameters, select **【3.1 Baud Rate】** by touching  key , as

shown in picture 3-70.



Picture 3-70

Touch  key to access to the submenu of “Baud Rate”, as shown in picture 3-71.

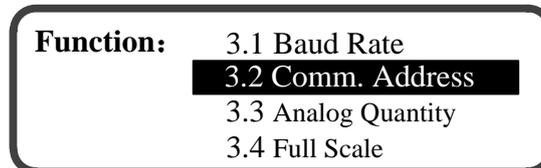


Picture 3-71

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. The factory default baud rate is 4800bps.

 Comm. Address

In the menu of function parameters, touch  key to select **【3.2 Comm. Address】**, as shown in picture 3-72.



Picture 3-72

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

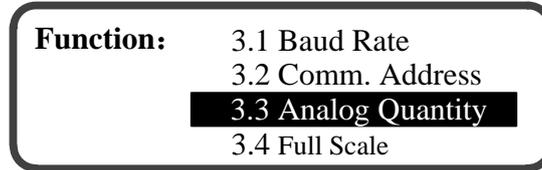


Picture 3-73

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.

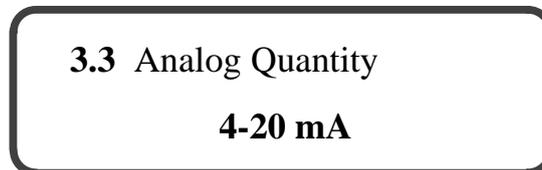
Analog Quantity

In the menu of function parameters, touch  key to select **【3.3 Analog Quantity】**, as shown in picture 3-74.



Picture 3-74

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

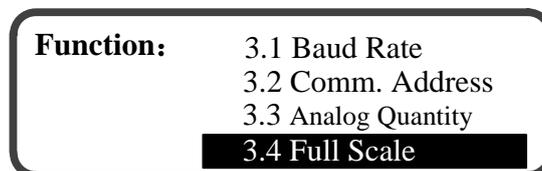


Picture 3-75

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 or recoding unit that receives meter analog quantity output on site.

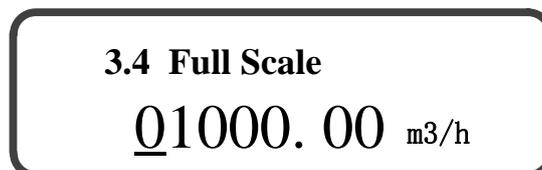
Full Scale of Analog Quantity

In the menu of function parameters, touch  key to select **【3.4 Full Scale】**, as shown in picture 3-76.



Picture 3-76

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



Picture 3-77

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. 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.

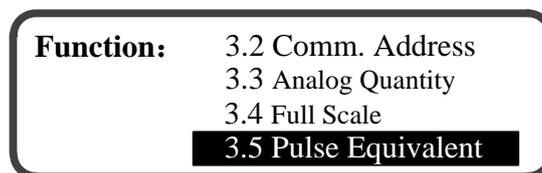
When the unit settings are m^3 and m^3/h for meter's current cumulative and instantaneous flowrates (For details, please refer to the menu of "Units of Flow"), the setting range of full scale of analog quantity is 1.00~99999.00 m^3/h .

When the unit settings are L and L/s for meter's current cumulative and instantaneous flowrates (For details, please refer to the menu of "Units of Flow"), the setting range of full scale of analog quantity is 0.28~27777.50 L/s.

It is 1000 m^3/h for the factory default of full scale of analog quantity. For example, the full scale of analog quantity is set to 1000 m^3/h , meter's analog quantity outputs full scale value when the positive value of meter's instantaneous flowrate is 1000 m^3/h .

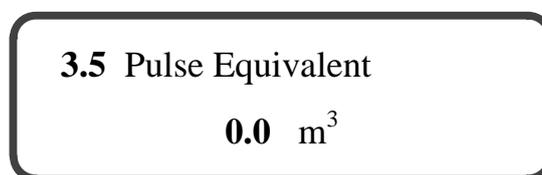
Cumulative Pulse Equivalent

In the menu of function parameters, touch  key to select **【3.5 Pulse Equivalent】**, as shown in picture 3-78.



Picture 3-78

Touch  key to access to the submenu of "Pulse Equivalent", as shown in picture 3-79.



Picture 3-79

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

When the unit settings are m^3 and m^3/h for meter's current cumulative and instantaneous flowrates (For details, please refer to the menu of "Units of Flow" in

Page 24), 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.

When the unit settings are L and L/s for meter's current cumulative and instantaneous flowrates (For details, please refer to the menu of "Units of Flow"), 8 options are available for cumulative pulse equivalent, including 0.0L, 100.0L, 500.0L, 1000.0L, 5000.0L, 10000.0L, 50000.0L and 100000.0L.

The factory default option of cumulative pulse equivalent is 0.0m³. 0.0m³ and 0.0L 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):

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

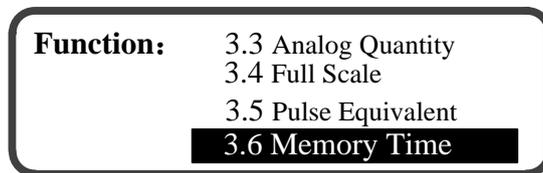
Among which, Q_d is the cumulative pulse equivalent selected by customer.

It is recommend to select N≈1. That is, Q_d≈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 3-80.



Picture 3-80

Touch  key to access to the submenu of "Memory Time", as shown in picture 3-81.

3.6 Memory Time

Day: 01 00: 00

Picture 3-81

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. 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.

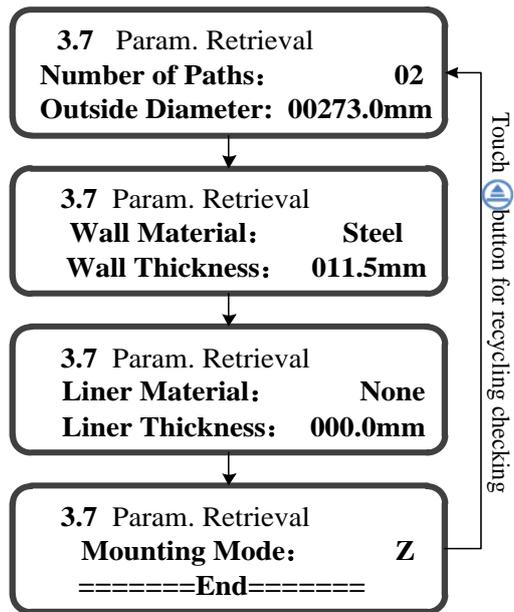
Param. Retrieval

Parameter Retrieval is to check meter’s mounting parameters. In the menu of “Function Param.”, select **【3.7 Param. Retrieval】** by touching  key , as shown in picture 3-82.

Function:	3.4 Full Scale
	3.5 Pulse Equivalent
	3.6 Memory Time
	3.7 Param. Retrieval

Picture 3-82

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

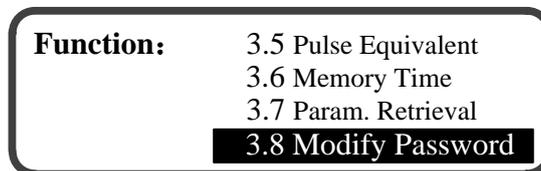


Picture 3-83

Modify Password

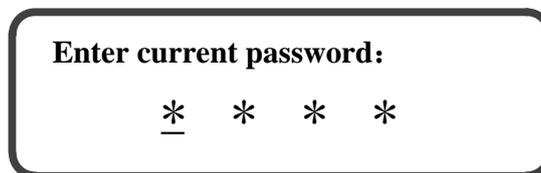
Modifying password is to modify the password accessing to the menus of “Mounting Param.” and “Operating Param.” Password consists of 4 characters, selected from "0~9" and "A~Z". In the menu of “Function Param.”, select **【3.8 Modify Password】**

by touching  key, as shown in picture 3-84.



Picture 3-84

Touch  key to access to the submenu of “Modify Password”. First, original password must be entered, as shown in picture 3-85. After correct entry of original password, new password needs to be inputted, as shown in picture 3-86.

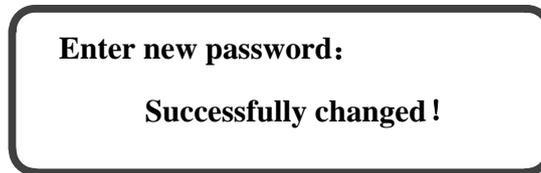


Picture 3-85



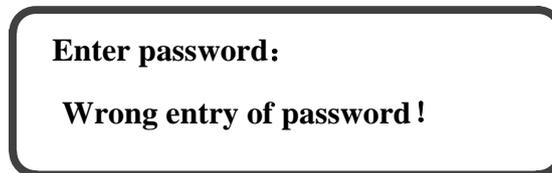
Picture 3-86

After inputting new password, touch  key for confirmation and meter display is as shown in picture 3-87. In the end, meter display is returned to the menu of “Function Param.”



Picture 3-87

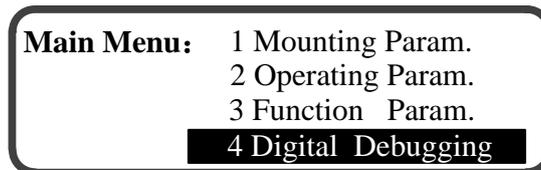
For wrong entry of password, meter display is as shown in picture 3-88 and returned to the menu of “Function Param.” later.



Picture 3-88

3.8 Digital Debugging

In main menu, select **【4 Digital Debugging】** by touching  key , as shown in picture 3-89.



Picture 3-89

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:

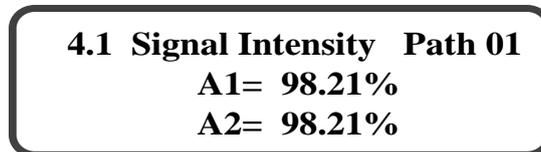
Touch  key to switch acoustic path.

Touch  key to return to main menu.

Touch  key to switch submenu.

Signal Intensity

For meter display of picture 3-89, access to submenu of “Digital Debugging” by touching  key, then submenu of **【4.1 Signal Intensity】**, as shown in picture 3-90.



Picture 3-90

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



Picture 3-91

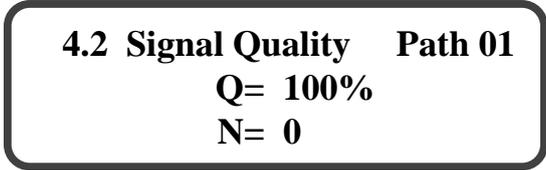
Note:

- 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 3-89, 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 3-92. Switch acoustic path by touching  key.



Picture 3-92

“Q” represents the evaluation of signal quality.

“N” represents the times of continuous invalid measurement.

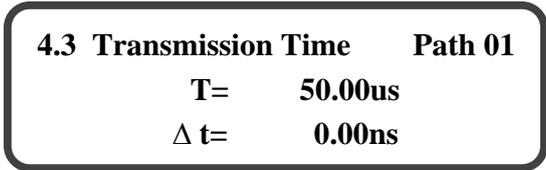
Note:

- 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 3-89, 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 3-93.



Picture 3-93

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

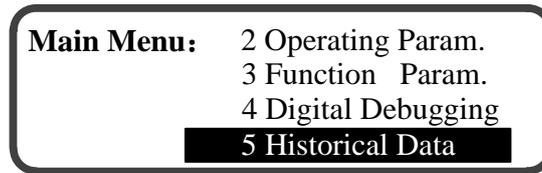
“ Δt ” represents the positive and reverse transmission time differences.

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”.

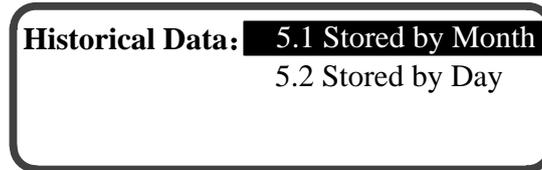
In main menu, select **【5 Historical Data】** by touching  key , as shown in picture

3-94.



Picture 3-94

Access to menu of “Historical Data” by touching  key, as shown in picture 3-95.



Picture 3-95

➤ 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

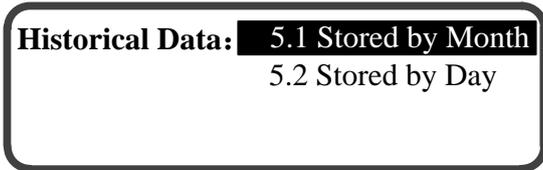
 Key function of the submenu:

Touch  key for page turning;

Touch  key to return to submenu.

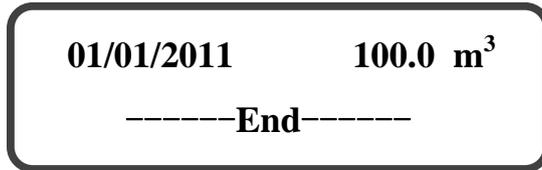
 Stored by Month

In the menu of “Historical Data”, select **【5.1 Stored by Month】** by touching  key, as shown in picture 3-96.



Picture 3-96

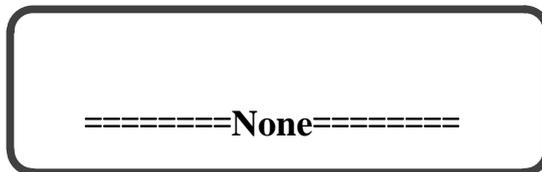
Access to submenu of “Stored by Month” by touching  key, as shown in picture 3-97.



Picture 3-97

The left side of display screen is the memory date of historical data, and the right side is the cumulative flowrate (Unit: m^3) 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.

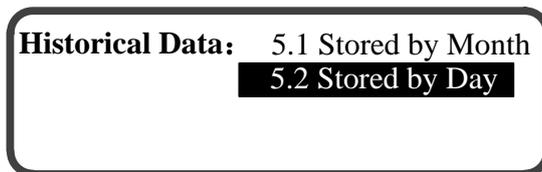
If historical data is not stored, display is as shown in picture 3-98.



Picture 3-98

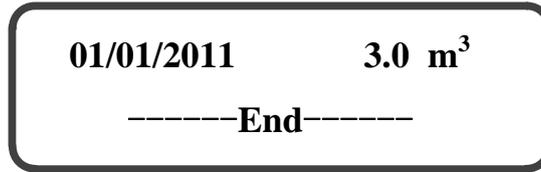
 Stored by Day

In the menu of “Historical Data”, select **【5.2 Stored by Day】** by touching  key , as shown in picture 3-99.



Picture 3-99

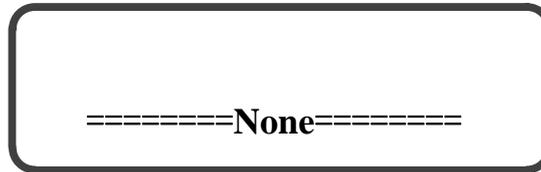
Access to submenu of “Stored by Day” by touching  key, as shown in picture 3-100.



Picture 3-100

The left side of display screen is the memory date of historical data, and the right side is the cumulative flowrate (Unit: m³) 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.

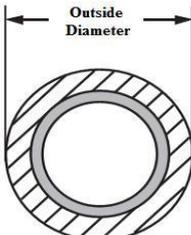
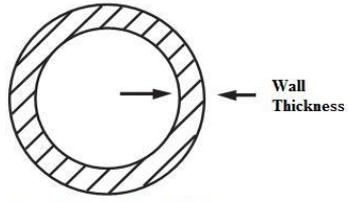
If historical data is not stored, display is as shown in picture 3-101.

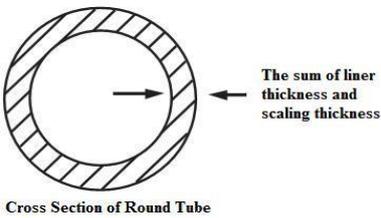


Picture 3-101

4. Parameter and Setting Instruction

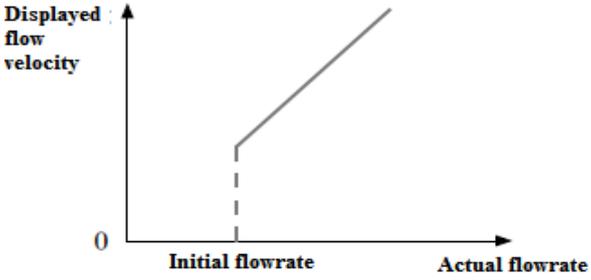
Table 4-1 Parameter and Setting Instruction

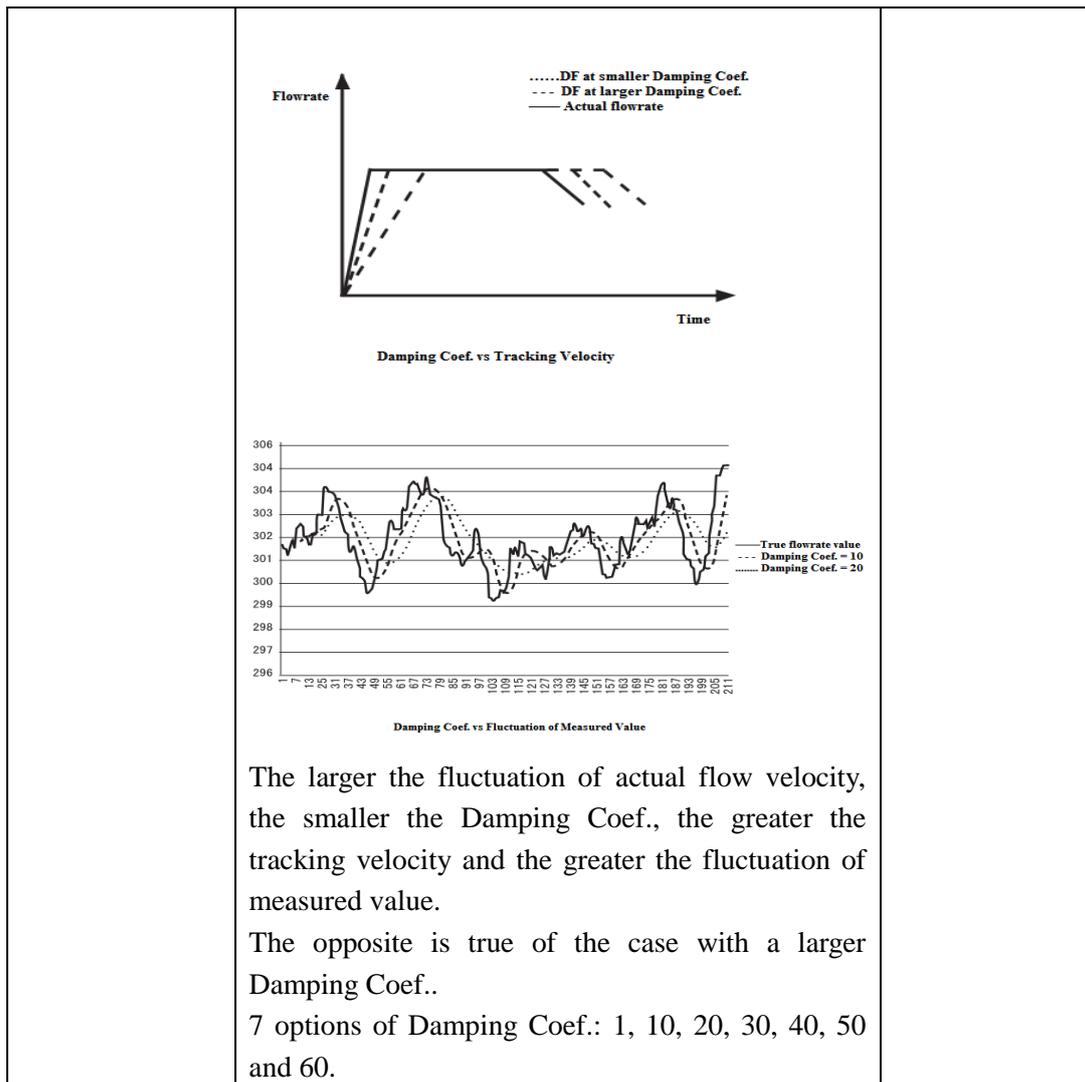
Parameter	Instruction	Factory-set value
Outside Diameter	 <p>Cross Section of Round Tube</p> <p>Setting range: 20.0mm~2600.0mm</p>	273.0mm
Wall Material	Wall material includes steel, cast iron and plastic.	Steel
Wall Thickness	 <p>Cross Section of Round Tube</p>	11.5mm

	Setting range: 0.0mm~200.0mm	
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
Mounting Distance	Mounting distance is the pipeline’s axial distance between 2 transducers of same acoustic path. After setting of meter’s parameters, conversion unit automatically calculates and displays the mounting distance value.	
Positive and Negative Cumulative Flowrate	It is the flowrate 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 flowrate.	
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 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.	4800bps

Baud Rate		
RS-485 Communication Address	Communication address is the native address when using RS-485 interface for the serial communication of multimachine. Communication address range is 001~199.	65
Full Scale of Analog Quantity	<p>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.</p> <p>When the unit settings are m³ and m³/h for meter's current cumulative and instantaneous flowrate (For details, please refer to the menu of "Units of Flow" in Page 24), the setting range of full scale of analog quantity is 1.00~99999.00 m³/h.</p> <p>When the unit settings are L and L/s for meter's current cumulative and instantaneous flowrate (For details, please refer to the menu of "Units of Flow" in Page 24), the setting range of full scale of analog quantity is 0.28~27777.50 L/s.</p> <p>The relation of current (I) and instantaneous flowrate (Q):</p> $I = \frac{Q}{\text{Full Scale}} \times 164$ <p>Among which, the unit of Q and "Full Scale" are m³/h. Unit of I is mA.</p>	1000 m ³ /h
Cumulative Pulse Equivalent	<p>Cumulative pulse equivalent is the algebraic sum of positive cumulative flowrate and negative cumulative flowrate represented by a pulse outputted in a measuring cycle.</p> <p>When the unit settings are m³ and m³/h for meter's current cumulative and instantaneous flowrate (For details, please refer to the menu of "Units of Flow" in Page 24), 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.</p> <p>When the unit settings are L and L/s for meter's current cumulative and instantaneous flowrate (For details, please refer to the menu of "Units of Flow"</p>	0.0 m ³

	<p>in Page 24), 8 options are available for cumulative pulse equivalent, including 0.0L, 100.0L, 500.0L, 1000.0L, 5000.0L, 10000.0L, 50000.0L and 100000.0L.</p> <p>0.0m and 0.0L represent that the cumulative pulse output is closed.</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. 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 on 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, therefore, measuring error. After setting the “zero-point flowrate” parameter, the parameter will be stored by MMU for eliminating measuring error.</p> <div style="text-align: center;"> </div> <p>The cutoff range of zero-point flowrate: -200.000 m³/h~+200.000 m³/h</p> <p>! Attention: For the determination of the “zero-point flowrate”, the pipe flow should be full and in a stagnant status, and the meter has entered its stable measuring status for over 3 minutes.</p>	0.000 m ³ /h
Correction Coef.	Correction Coef. is used for the correction of	Set according

	<p>meter's measuring accuracy. The range of Correction Coef. is 0.9000~1.1000.</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</p> <p>Correction Coef. = $\frac{110.00}{100.00} = 1.1000$</p> <p>After setting of correction coef. to 1.1000, the instantaneous apparent value of the meter should be 110.00 m³/h.</p> <p>⚠ Caution: Correction coef. cannot be freely modified, or the measuring accuracy of the meter may be affected.</p>	<p>to the result of real flow calibration before ex-factory.</p>
<p>Initial Flowrate</p>	<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, conversion unit's displayed instantaneous flowrate and flow velocity are all "zero".</p>  <p>Setting range of initial flowrate: 0.000 ~1.000m/s</p>	<p>0.050m/s</p>
<p>Damping Coef.</p>	<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. At the time when the pipe flow is less stable in regime, the fluctuation of meter-measured values can be suppressed using damping coefficient.</p>	<p>10</p>



5. Transducer Installation and Operation Instruction

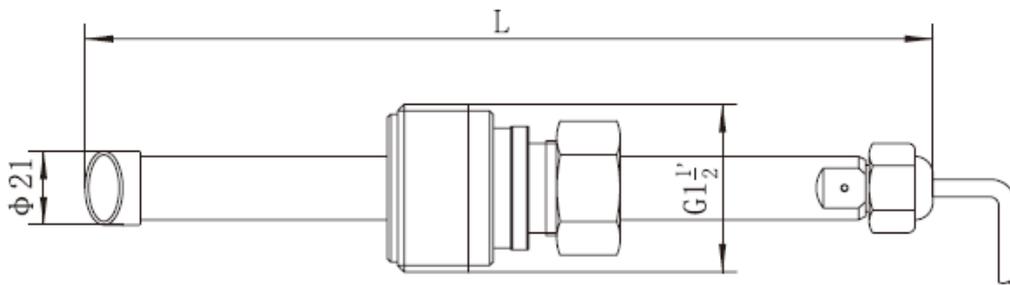
5.1 Technical Parameters of Transducer

Table 5-1 Technical Parameters of Transducer

Transducer Performance	SCL-60 Insertion-type Ultrasonic Flowmeter	SCL-62 Clamp-on-type Ultrasonic Flowmeter
Nominal diameter (mm)	DN80~DN2000	
Material	304 (Stainless steel)	
Range of working pressure	≤2MPa	No restriction on pressure in pipe
Temperature of medium measured	Normal temperature version: 0°C~50°C High temperature version: 0°C~130°C	Normal temperature version: 0°C~50°C High temperature version: 0°C~90°C

Temperature of working environment	-40°C~+70°C	Normal temperature version: -40°C~+45°C High temperature version: -40°C~+70°C
Weight (One pair)	2kg (10m cables included)	1kg (10m cables included)
Protection class	IP68	
Cable length (Wiring distance)	10×nm, n: 1~30	10×nm, n: 1~20

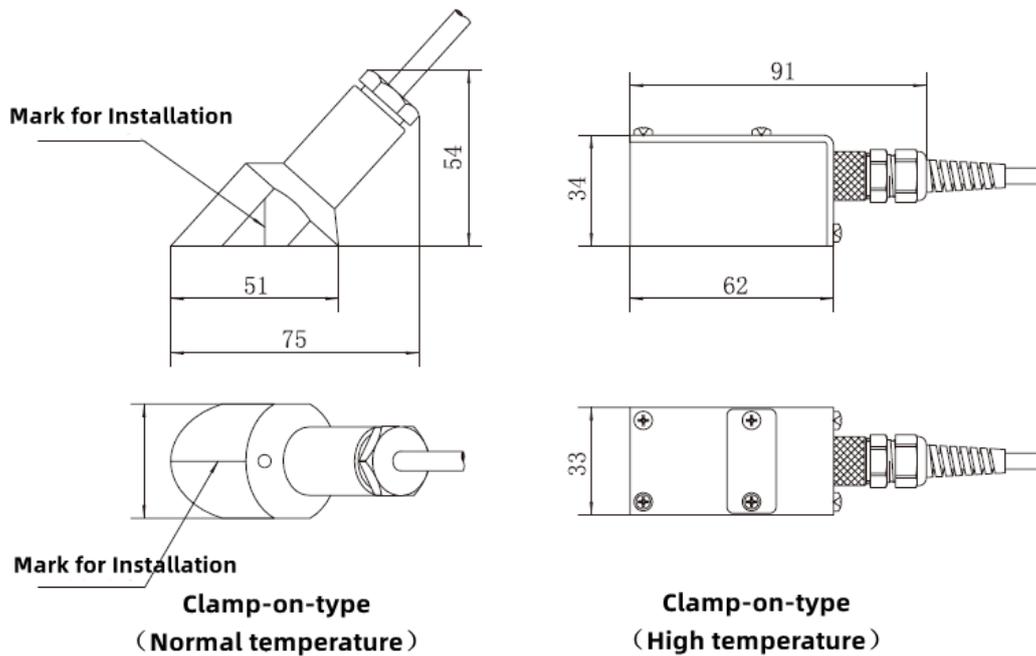
5.2 Dimensions of Transducer



Picture 5-1 Insertion-type Transducer

Table 5-2 Pipe Wall Thickness Adaptable of Insertion-type Transducers

Type	L	Wall thickness adaptable (mm)
Standard length	240	≤ 30
Extended I	280	< 70
Extended II	320	< 110
Extended III	360	< 150
Note: Wall thickness includes thickness of liner and thickness of scale.		



Picture5-2 Clamp-on-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 solves the problem that clamp-on-type transducer cannot stably work for a long period of time.

3. It settles the trouble of weak signal of clamp-on-type transducer due to scale and serious corrosion in inner wall of pipeline. Furthermore, it can be installed on the pipelines that are unweldable or cannot be penetrated by ultrasonic wave, such as cement, PE and etc.

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

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

5.3.2 Clamp-on-type transducer

Features: 1. It is unnecessary for drilling holes in pipeline or shutdown of water flow for mounting of clamp-on-type transducer.

2. It is the ideal choice for the pipeline that don't need for flow monitoring for a long period of time.

Applications: adaptable to pipelines that can be penetrated by ultrasonic wave, such as steel, cast iron, PE, PVC and etc.

5.4 Installation of Transducer

5.4.1 Mounting position of transducer

➤ Straight pipe section requirements

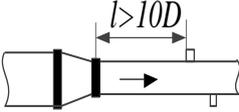
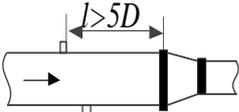
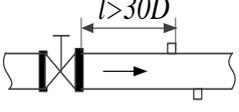
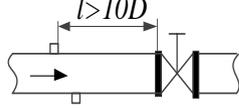
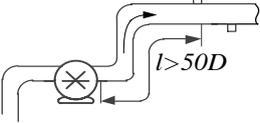
The transducer mounting position and the condition of the pipe where flow measurement are made all exert a great bearing on measuring accuracy. Therefore, for the transducer mounting position, the following conditions should be met:

(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 5-4.

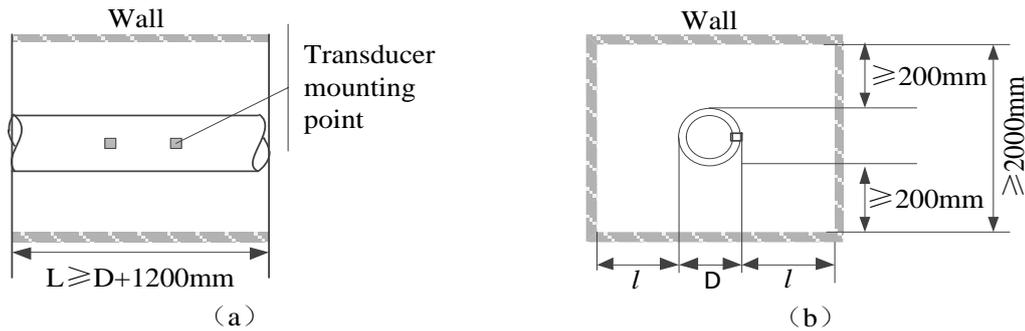
(2) Within the range of 30D on the upstream side, make sure there is no pipe flow disturbing objects like pump, valve, restriction orifice, see table 5-4. (Take the insertion-type transducer as an example)

Table 5-4 Length of shortest straight pipe section

Resistance part	Upstream side	Downstream side
90° Bend		
T-bend		
Expansion joint		

Pipe 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		

(3) Enough space is required for the installation of transducer, see picture 5-3. The size of cement pipe $L > 1500\text{mm}$, other pipes $L > 800\text{mm}$, see picture 5-3(b).

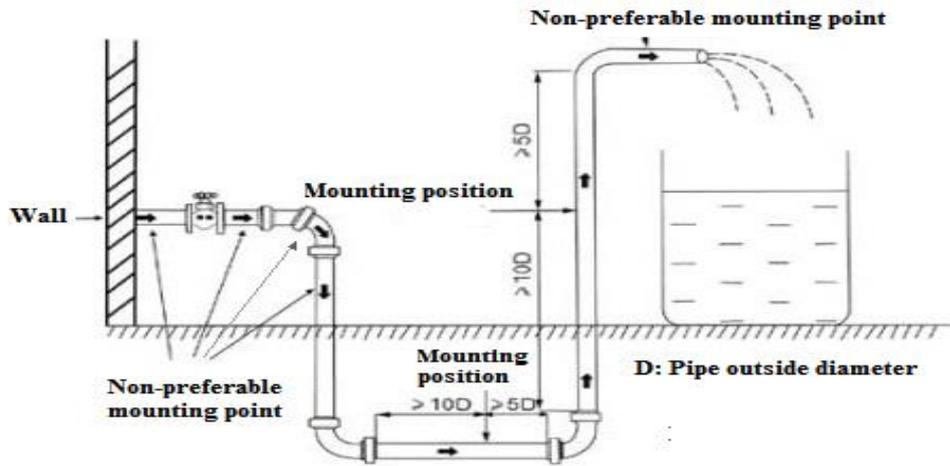


Picture 5-3 Transducer Mounting Space Illustration

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

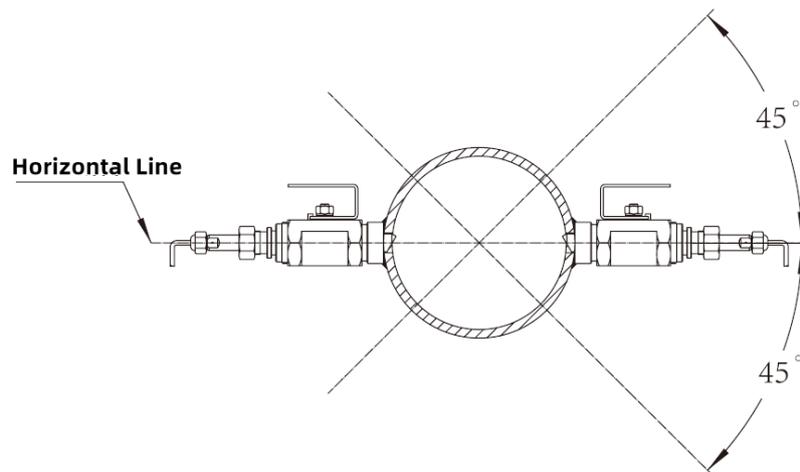
(1) The measuring point should be preferably selected on an upright pipe with upward or inclined flow, or possibly on a horizontal pipe. Avoid the use of the transducer on a down flowing or inclined down-flowing pipe as the latter may not be fully filled with fluid.

(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. (Take the insertion-type transducer as an example)



Picture 5-4 Transducer Mounting Position Illustration

(3) On a horizontal pipe, the transducer installation position should be within $\pm 45^\circ$ from the horizontal line, as shown in picture 5-5. (Take the insertion-type transducer as an example)



Picture 5-5

(4) Never install transducer at the places where the pipe surface is uneven or near welded point. Moreover, the mounting point needs to be polished for removal of dust, dirt and coating.



Attention:

- ① For the mounting of the insertion-type transducer, the pipeline pressure should be less than 1MPa, otherwise the pressure needs to be reduced.
- ② In case the pipe material is not enable to welding, a special tightening device is required for the mounting of the transducer. Please note the pipe material and outside diameter when placing orders.

5.4.2 Installation of insertion-type and clamp-on-type transducers

5.4.2.1 Installation tools

Table 5-5 Installation Tools

Tape	Marking Pen (Separate order)	Paper Tape	Couplant (For clamp-on-type transducer only)	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)

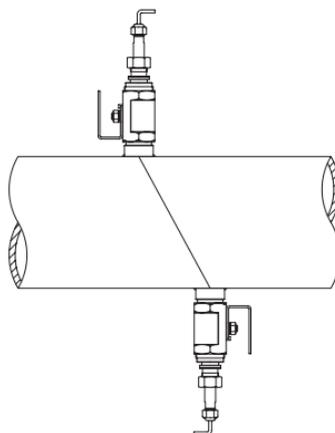
(3) Pipe wall material (Enter this parameter for mounting of clamp-on-type transducer)

(4) Liner thickness (Thickness of scale deposit included)

(5) Liner material (Enter this parameter for mounting of clamp-on-type transducer)

(6) Mounting mode: Z mode or V mode. It is recommended to select the Z mode.

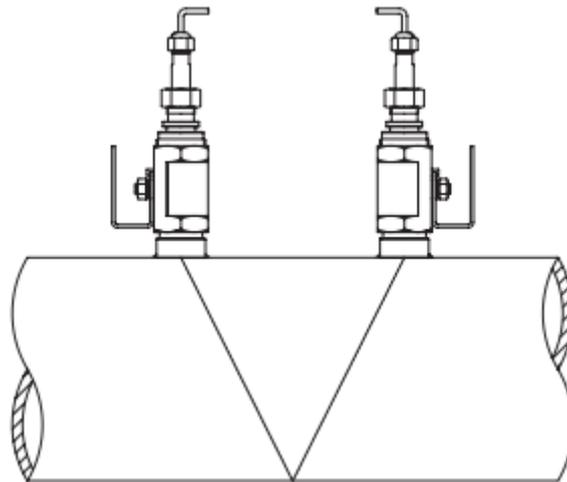
Z mode (Take the insertion-type transducer as an example)



Picture 5-6 Z mode

If the pipe is too big in size or the fluid contains suspended matters or scale deposit on pipe inner wall is too thick or a pipe liner with a greater thickness is used, the normal operation of the meter with its transducers mounted in V mode may be affected due to weakness of signal. Under these circumstances, the Z mode is preferable to V mode. In Z mode, the attenuation of signal is smaller because the signal propagates directly between a pair of transducers without reflection. Recommended measuring pipe diameter range is: DN150-DN1800.

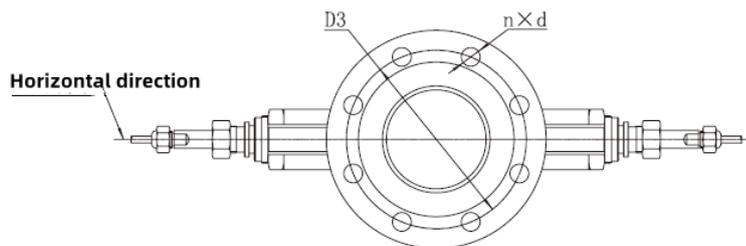
V mode (Take the insertion-type transducer as an example)

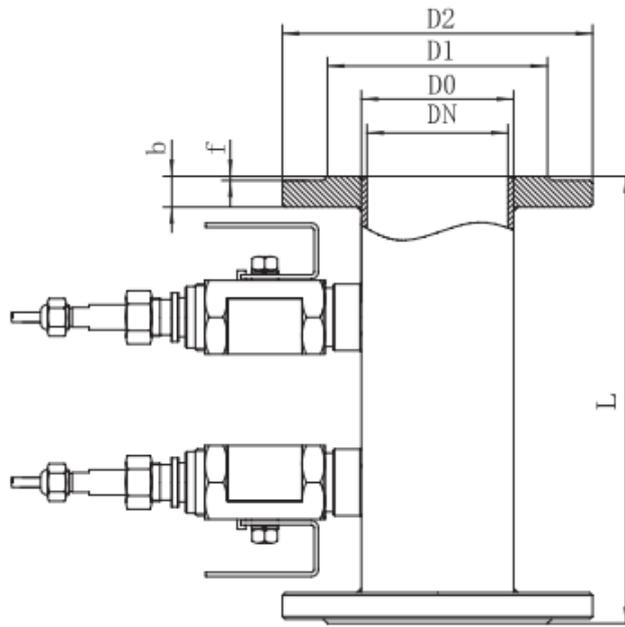


Picture 5-6 V mode

In V mode, the ultrasonic signals propagate between a pair of transducers by way of pipe wall reflection. The V mode is convenient to install and accurate to measure. Recommended measuring pipe diameter range is: DN80~DN150.

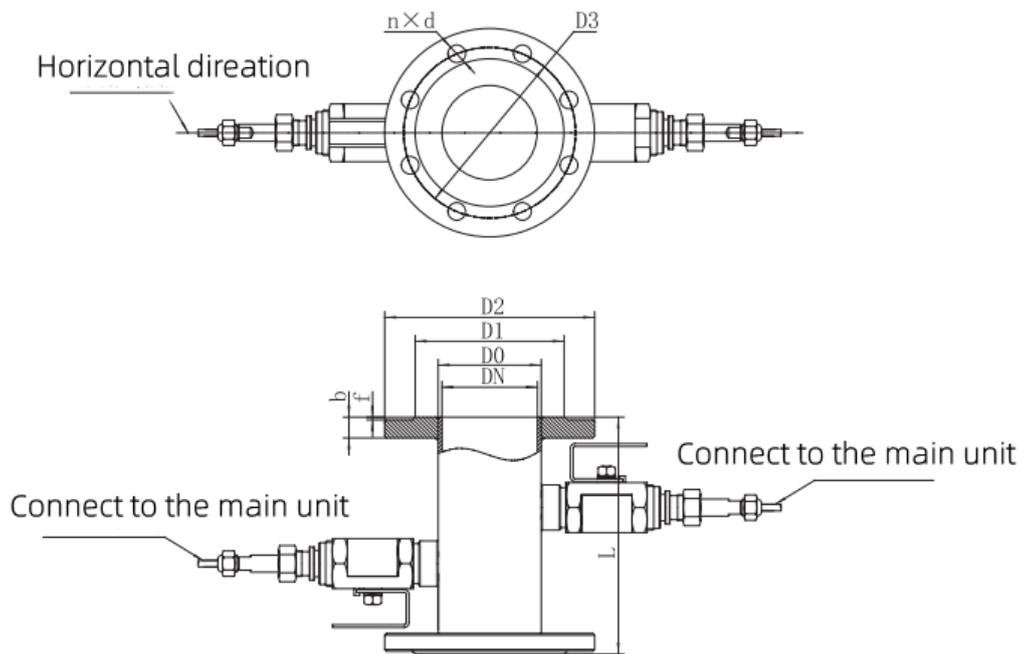
(7) The insertion-type transducer can be mounted directly on the pipe or can be fitted with a dedicated pipe section for installation, suitable for pipe sizes DN80-DN1000. (See picture 5-7 (a) for the installation mode and size of the dedicated pipe section of DN80-DN125. See picture 5-7 (b) for the installation mode and size of the DN150-DN1000 dedicated pipe section.)





DN	D0	D1	D2	D3	L	n	d	b	f	Pressure MPa	
DN80	Φ89	Φ138	Φ200	Φ160	400	8	Φ19	20	3	1.0	
								24		1.6	
										2.5	
DN100	Φ108	Φ158	Φ220	Φ180	400	8	Φ19	22	3	1.0	
		Φ162		Φ235				Φ190		Φ23	26
DN1125	Φ133	Φ188	Φ250	Φ210	400	8	Φ19	22	3	1.0	
			Φ270					Φ220		Φ27	28

Picture 5-7 (a)



DN	D0	D1	D2	D3	L	n	d	b	f	Pressu re MPa
DN150	Φ159	Φ212	Φ285	Φ240	300	8	Φ23	24	3	1.0
		Φ218	Φ300	Φ250			Φ27	30		1.6
										2.5
DN200	Φ219	Φ268	Φ340	Φ295	350	8	Φ23	24	3	1.0
						12		26		1.6
		Φ278	Φ360	Φ310			Φ27	32		2.5
DN250	Φ273	Φ320	Φ395	Φ350	400	12	Φ23	26	3	1.0
			Φ405	Φ355			Φ27	29		1.6
		Φ335	Φ425	Φ3740			Φ30	35		2.5
DN300	Φ325	Φ370	Φ445	Φ400	450	12	Φ23	26	4	1.0
		Φ378	Φ460	Φ410			Φ27	32		1.6
		Φ395	Φ485	Φ430			Φ30	38		2.5
DN350	Φ377	Φ430	Φ505	Φ460	550	16	Φ23	26	4	1.0
		Φ438	Φ520	Φ470			Φ27	30		1.6

		Φ450	Φ555	Φ490			Φ33	38		2.5
DN400	Φ426	Φ482	Φ565	Φ515	550	16	Φ27	26	4	1.0
		Φ490	Φ580	Φ525			Φ30	32		1.6
		Φ505	Φ620	Φ550			Φ36	40		2.5
DN450	Φ480	Φ532	Φ615	Φ565	600	20	Φ27	28	4	1.0
		Φ550	Φ640	Φ585			Φ30	40		1.6
		Φ555	Φ670	Φ600			Φ36	46		2.5
DN500	Φ530	Φ585	Φ670	Φ620	650	20	Φ27	28	4	1.0
		Φ610	Φ715	Φ650			Φ34	44		1.6
		Φ615	Φ730	Φ660			Φ36	48		2.5
DN600	Φ630	Φ685	Φ780	Φ725	700	20	Φ31	34	5	1.0
		Φ725	Φ840	Φ770			Φ37	54		1.6
		Φ720	Φ845				Φ39	58		2.5
DN700	Φ730	Φ800	Φ895	Φ840	800	24	Φ31	35	5	1.0
		Φ795	Φ910				Φ37	58		1.6
		Φ820	Φ960				Φ875	Φ42		60
DN800	Φ830	Φ905	Φ1015	Φ950	850	24	Φ34	38	5	1.0
		Φ900	Φ1025				Φ40	62		1.6
		Φ930	Φ1085				Φ990	Φ48		66
DN900	Φ930	Φ1005	Φ1115	Φ1050	950	28	Φ34	38	5	1.0
		Φ1000	Φ1125				Φ40	64		1.6
		Φ1030	Φ1185				Φ1090	Φ48		70
DN1000	Φ1040	Φ1110	Φ1230	Φ1160	1000	28	Φ37	44	5	1.0
		Φ1115	Φ1255	Φ1170			Φ43	68		1.6
		Φ1140	Φ1320	Φ1210			Φ56	74		2.5

Picture 5-7 (b)

5.4.2.3 Marking off

(1) After setting above mounting parameters in the conversion unit, mark the

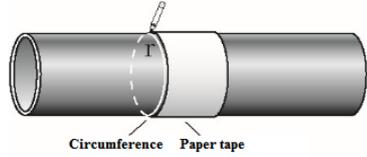
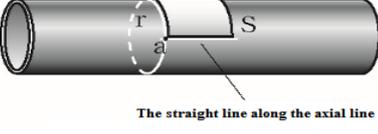
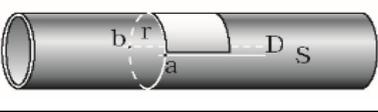
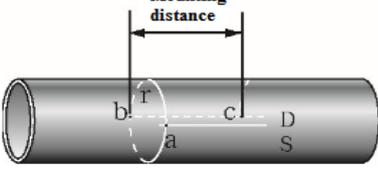
transducer mounting line on pipe according to the meter's displayed mounting distance (For details, refer to the "Mounting Distance").

(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 and measuring tape (See Table 5-5).

(3) Marking method

Table 5-6 Marking Method

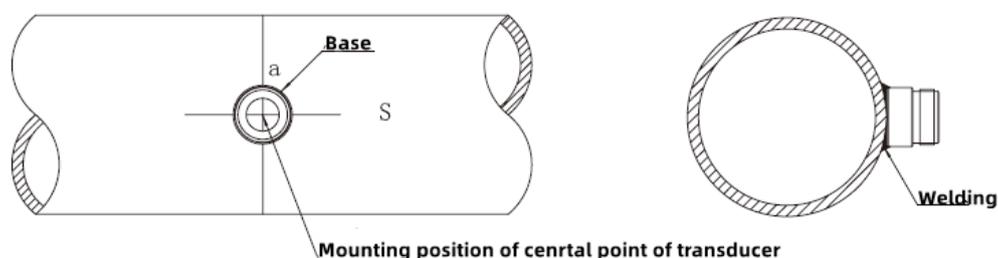
Z mode	
<p>① Wrap the paper tape around the pipe one circuit. Make sure the tow ends of the paper's overlapping part completely coincide with each other. Mark a circumferential line "r" on pipe along the edge of the starting point of the perimeter.</p>	
<p>② Remove the paper tape. Fold the paper tape in two along the perimeter starting line to form a half perimeter. Then draw a line "S" which is perpendicular to and intersects the circumferential line at point "a". The point "a" is the position for the mounting of a transducer.</p>	
<p>③ Draw along the other edge of the paper tape a straight line "D" on pipe to intersect the circumferential line "r" at point "b".</p>	
<p>④ Locate on the straight line "D" starting from point "b" the point "c" using a measuring tape according to the mounting distance displayed by conversion unit. The point "a" and point "c" are the install position for the Z mode.</p>	
V mode	
<p>After finishing the step ② as described above, define the point "e" on the straight line "S" starting from point "a" using a measuring tape, according to the mounting distance displayed by conversion unit. The point "a" and point "e" are the install position for the V mode.</p>	

5.4.2.4 Installation of insertion-type transducer

(1) Installation of base and valve

a. Weldable metal pipe

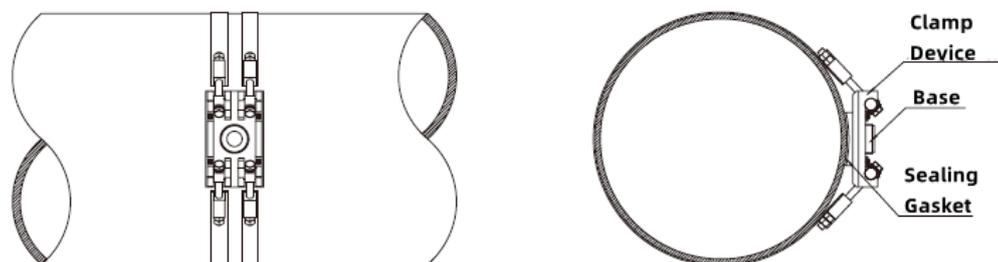
Weld the base provided by the manufacturer onto the pipe. Make sure that the cross line marked on the base coincides with that drawn on the pipe.



Picture 5-8

b. Non-weldable pipe

In case of cast-iron pipe or non-metal pipe on which the metal base can't be welded, a stainless-steel clamping device provided by the manufacturer should be used for fixing the base onto the outer surface to the pipe. The size of clamping device depends on the pipe outside diameter.



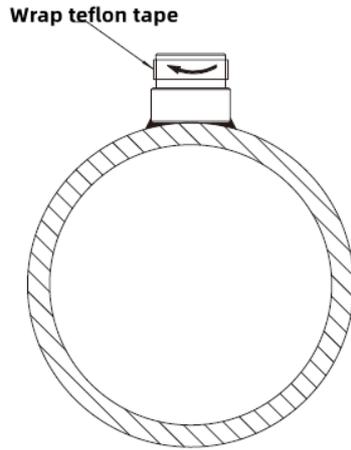
Picture 5-9



Attention:

- ① For welded base, make sure its secure connection and no weld defects such as inclusions and air cavities are allowed.
- ② When installing the base with a stainless steel fastening device, add the special base gasket provided by Huizhong between the base and the pipe wall, and tighten the retaining nut.

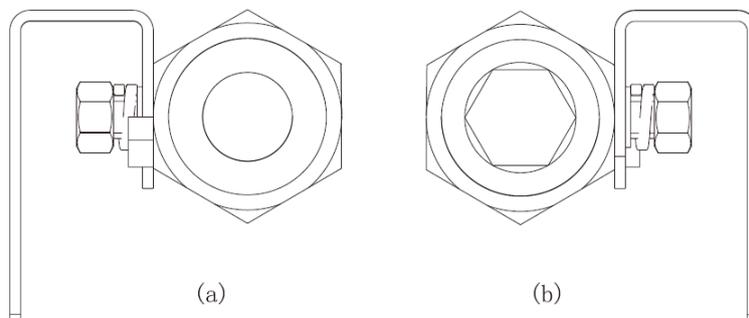
c. After installation of base, wrap the teflon tape around the base thread (See picture 5-10). Put the sealing lead-pad provided by Huizhong into the inner bottom of ball valve (See picture 5-11(b)) and screw ball valve on the base with spanner (See picture 5-12).



Picture 5-10

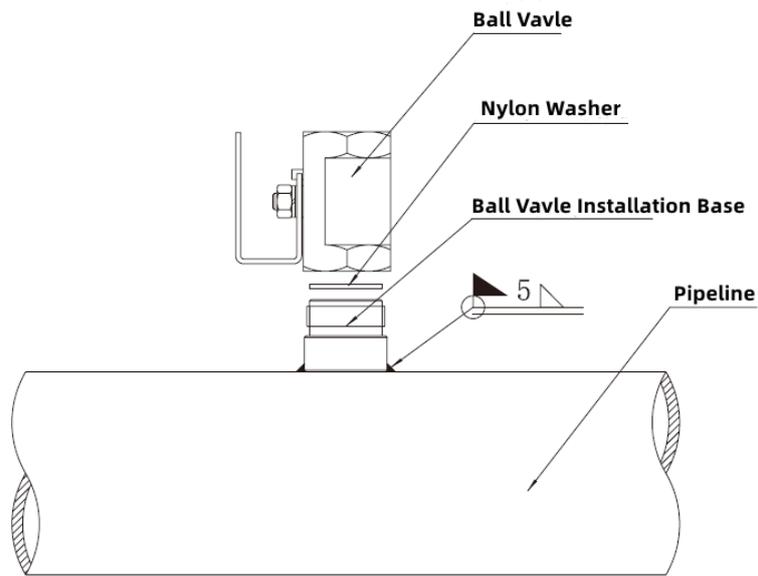
 Attention:

- 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 5-11. One end of the ball valve with hexagonal socket nut (see picture 5-11 (b)) should be connected with base.



Picture 5-11 Ball Valve Connection Thread Diagram

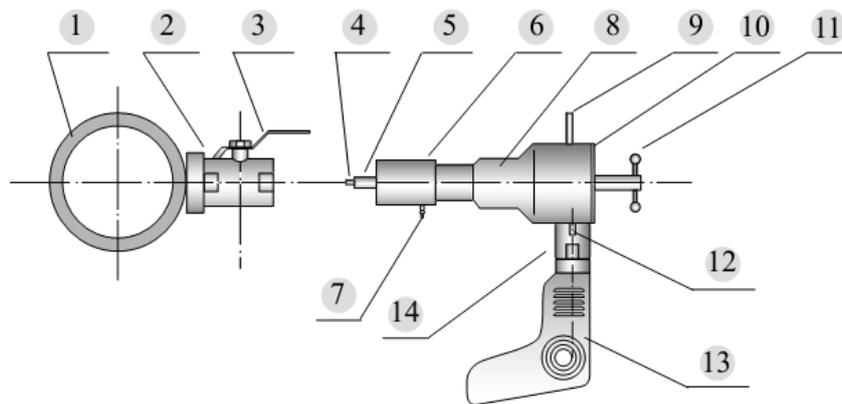
d. After installation, the overall installation completion diagram is as shown in picture 5-12.



Picture 5-12 Installation Diagram

(2) Drilling

⚠ Caution: The drilling is made under the fluid pressure of the pipe system (permissible pressure < 1MPa), so below drilling procedure should be make for 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 5-13 Structure Diagram of Drilling Machine

Drilling Procedure:

- ① Open the ball valve ③ in advance 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 Press down the power switch of hand-held drill ¹³ and at the same time turn slowly the bit travel control handle ¹¹ in clockwise direction to enable the bit to move toward the pipe wall for drilling operation, as shown in picture 5-14.



Picture 5-14 Schematic Diagram of Drilling Operation

⚠ Attention: Never push against the bit during drilling with excessive force for guarding against jamming of bit. Whenever the bit is found to become sluggish in rotation, quickly release the power switch and turn the bit travel 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.

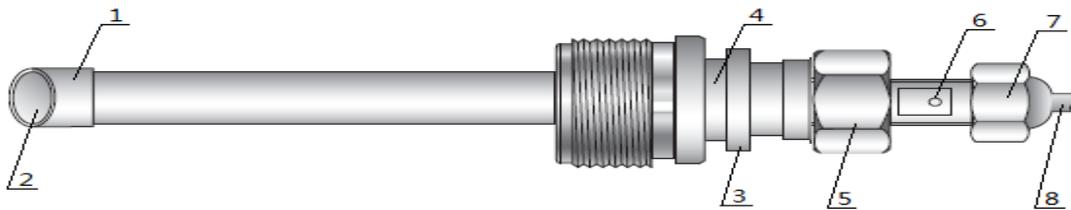
⑧ Loosen the screw-rod locking nut ¹⁰, and pull backward the bit travel control

handle 11 to allow the bit to retract into the threaded bush 6 for valve connection.

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.

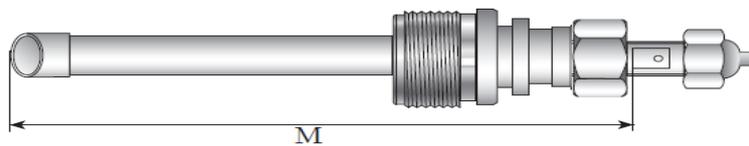
(3) Installation of transducer



Picture 5-15 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

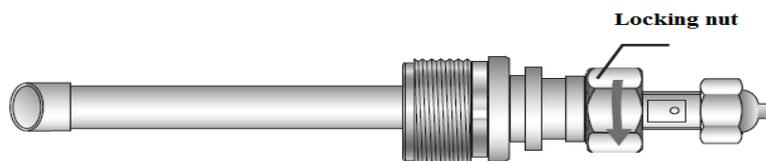
① Measure the M value of transducer for instruction of insertion depth, as shown in picture 5-16.



M value			
Standard type	Extended I	Extended II	Extended III
205	245	285	325

Picture 5-16

② Turn the locking nut 5 in counter-clockwise direction to loosen it, as shown in picture 5-17.



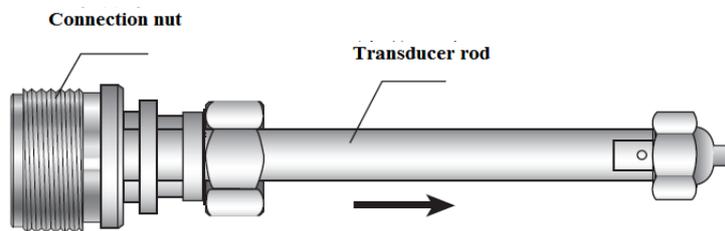
Picture 5-17

⚠ Caution: When installing transducer, the operation personnel should stand on the vertical side of transducer and pipe (See picture 5-18).



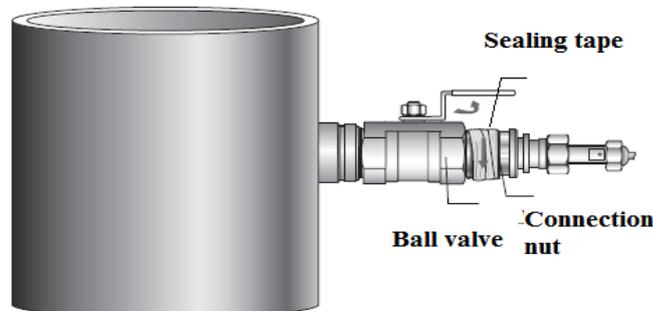
Picture 5-18

③ Retract the transducer rod 1 back into the connection nut 3 position, as shown in picture 5-19.



Picture 5-19

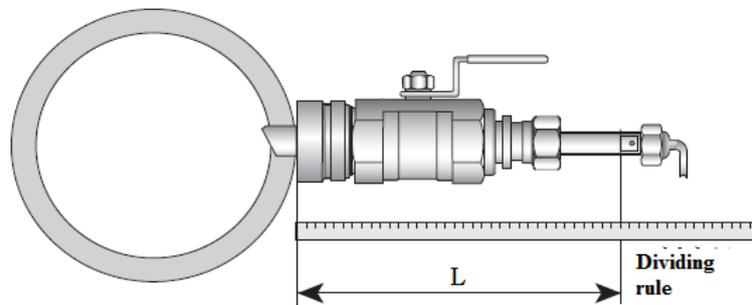
④ Wrap sealing tape onto the thread of connection nut 3 in counter-clockwise way, screw into ball valve a clockwise way and open valve slowly.



Picture 5-20

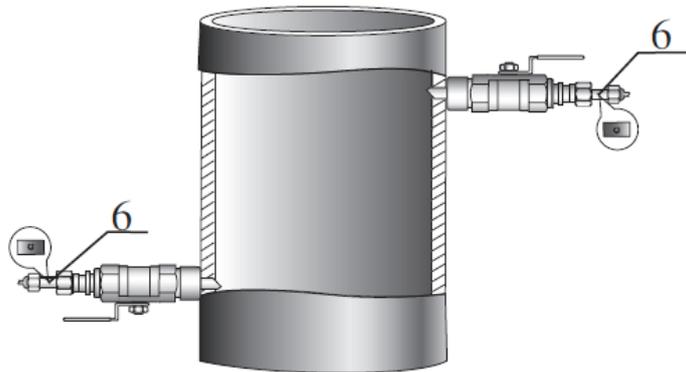
⚠ Caution: Check for any fluid leakage from the connection between the ball valve and connection nut. In case of fluid leakage, close the ball valve and repeat the step ④.

⑤ Push transducer rod 1 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 5-21. If it does not meet the requirements, readjust the insertion depth of transducer, and lock with locking nut 5 at the end.



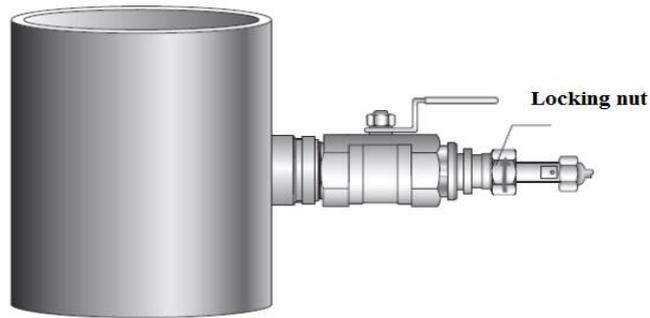
Picture 5-21

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 5-22

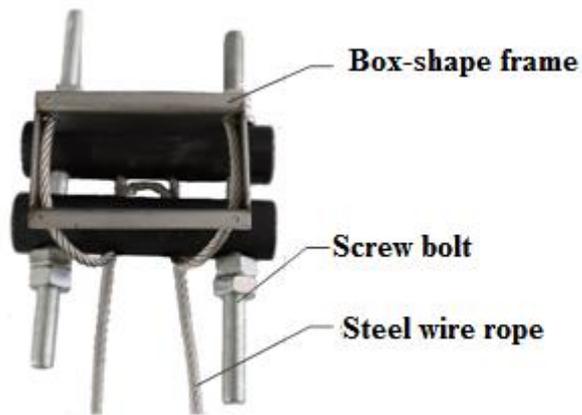
⑦ Hold the transducer and clockwise tight the screw nut. Then the installation is finished.



Picture 5-23

5.4.2.5 Installation of clamp-on-type transducer

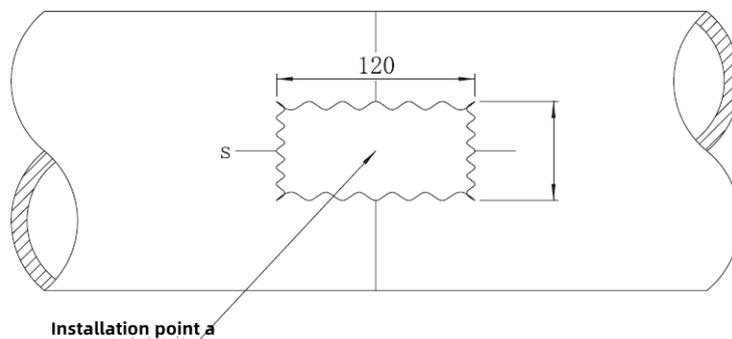
(1) Sectional fixture of clamp-on-type transducer



Picture 5-24 Sectional Fixture of Clamp-on Transducer

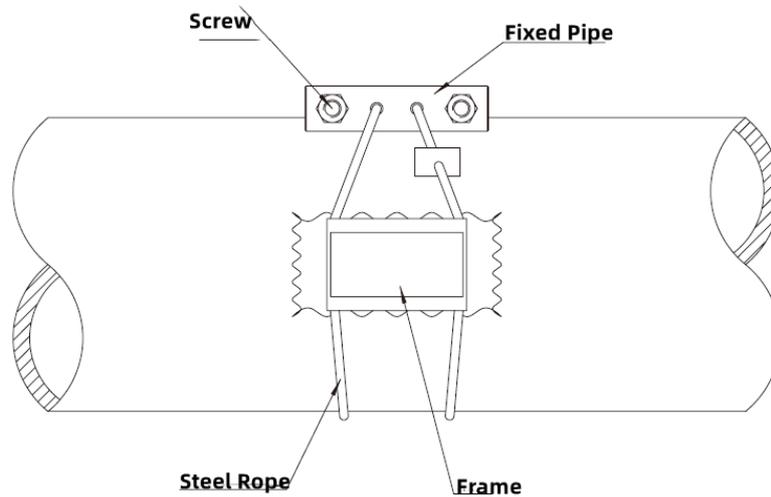
(2) Installation of clamp-on-type transducer

① Use a hand grinding wheel to smooth the rust spots and convex surfaces near the two painted installation points on the pipe. The size of the grinding is larger than that shown in picture 5-25. Only one installation point is showed here.



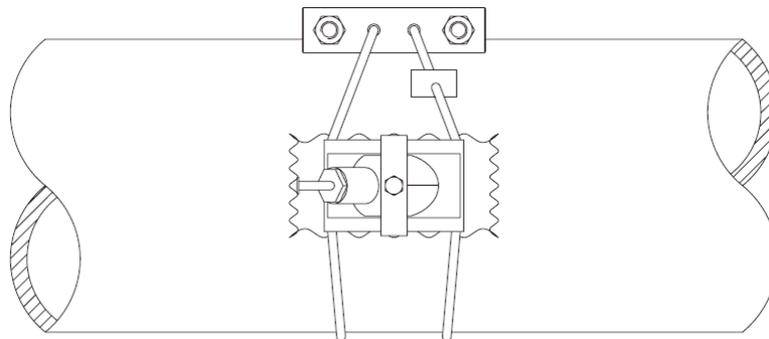
Picture 5-25

- ② Wind a steel rope around the pipe to make sure that the mark lines of the square frame coincide with the cross line on the pipe.
- ③ Tighten the 2 bolts to secure the steel rope is securely tied on the pipe, see picture 5-26.



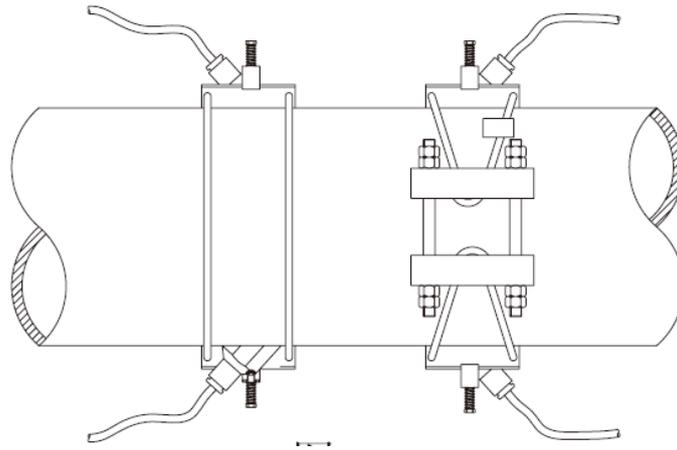
Picture 5-26

- ④ Apply coupling agent evenly on the area of the pipe inside the frame (Thickness of coupling agent applied: >5mm). For use in an environment with a high temperature, special high-temperature agent is used.
- ⑤ Place the transducer into the fixture holder so that the mark line of the transducer is in line with the cross line drawn on the pipe, see picture 5-27. Tighten the bolts and clamp the transducer.



Picture 5-27

- ⑥ Install another transducer at the other mounting point in the same method, noting that the two transducers lead in opposite directions. The installation effect is shown in the picture 5-28.



Picture 5-28

⑦ Observe and measure the signal strength of main unit, and fine-tune the horizontal or vertical position of the transducer to maximize the signal strength.

! Caution: The above installation instructions for the clamp-on-type transducer are based on the example of the normal temperature transducer. The installation method of the high temperature external clamp transducer is the same as this, the difference is that the transducer jig seat size is slightly different.

5.5 Cable Laying

When laid together with other cables in the same channel or laid underground, the transducer cable should run through a metal conduit with an inner diameter of over 25mm.

For overhead cable line with the span between two adjacent cable posts exceeding 10m, rein-forced line should be used to guard against breaking due to excessive wind blow.

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	AC220V power not connected	Check the power connection
	Burning out of fuse tube	Check voltage grade and replace fuse

back lighting			tube
Instantaneous flowrate value is “0”, yet 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 ($> \pm 20\%$)		Check meter mounting parameters and the actual mounting distance. Set the mounting parameters according to specific site conditions. If the 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; marking lines of clamp-on-type transducers facing to each other
		Mounting depth of insertion-type transducer too large or too small	Adjust insertion depth of transducer, complying with mounting requirements of transducer.
		Clamp-on-type transducer: 1. Mounting point on pipe not well grounded; 2. The fastening is loose; 3. Too little coupling agent; 4. Coupling agent too dry	1. Re-grind and polish mounting points; 2. Re-mount transducers; 3. Apply more coupling agent and re-mount transducers; 4. Dismount transducers. Re-apply coupling agent and re-mount transducers
		Transmission of signal impeded due to the presence of thick scale deposit in pipe	Clean pipeline or change measuring points for clamp-on-type transducers. Clean sonic wedge surfaces for insertion-type transducers.

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.Increase input value of wall thickness according to thickness of scale deposit for clamp-on-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 insertion-type transducer; 3.Incorrect mounting of transducers; 4.The failure of transducer; 5. The transducer cable is not securely connected to the measuring host; 6.Main unit trouble	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 transducer; 3.Correct mounting of transducer; 4.Replacement of transducer; 5.Re-connection; 6.Replace the PCB of main unit
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:

①Damage of meter due to purely artificial reasons, such as mechanical impact.

②After-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.

③Damage of meter caused by force of majeure, such as thunder strike.

For the repair work done on site for the above mentioned reasons, the travel expenses and costs of components shall be covered by user.

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	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.Too much gas in horizontal pipe or on the top of pipe or no water in pipe; 3. Entry of pipe OD not coinciding with actual pipe OD	1.For the sound channel with weak signal, adjust the transducers and clean its dirt; 2.Remove gas from pipe, and adjust the transducers for the sound channel with weak signal; 3.Modify pipe OD
“*”	Unstable signal	Occasional appearance of “*” do not affect the operation of meter. For frequent or long-term	Interference of air bubbles: 1.Select the mounting point with rare gas concentration;

		appearance of “*”, probably it is caused by the presence of air bubbles in liquid or electromagnetic interference. Unstable meter measurement, large flow fluctuation, or even failed measurement may occur due to serious interference.	2. Close air inlet or install air exhausting device. Electromagnetic interference: 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	“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.	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.	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	Failure of inner information transmission; Generally, this failure can be removed by auto power on.	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.
“F”	Display of	In case the units of flow of main	If the current units of flow of

	overflow	<p>unit are set to “L, L/s”, cumulative flowrate or instantaneous flowrate measured by main unit exceeds display range of display screen of conversion unit.</p>	<p>the main unit are “L, L/s”, and measured value exceeds conversion unit’s display range, the units of flow of the conversion unit automatically alters to “m³ m³/h”. Details refer to the menu of “Units of Flow”.</p>
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