aobo

instrument

2023
PRODUCT
INTRODUCTION

ULTRASONIC FLOWMETER

CONTENTS

I. Overview

AOBO-LCT series ultrasonic flowmeter is a general time difference ultrasonic liquid flowmeter designed by using VLSI and low-voltage wide pulse emission technology. It is suitable for continuous measurement of homogeneous liquid without high concentration suspended particles or gas in industrial environment.

Function Characteristics

1) Hardware modular design, easy production and maintenance operation;

2) Built in 4M byte data recorder and record 200000 lines of timing output or real-time printing data;

3) Electrical isolation RS485 interface, including more than 10 kinds of communication protocols such as MODBUS, M-BUS and FUJI;

4) Electrical isolation 0~20mA or 4~20mA current loop output, optional loop power supply mode (two-wire system);

5) Optional HART Protocol;

6) Heat measurement function in accordance with CJ128 national heat meter standard;

7) 8~36VDC,220VAC power supply mode is optional;

8) It has the functions of manual accumulator and batch controller;

9) The cumulative recording function of month, year and day; and record the cumulative flow, cumulative heat and other data in the first 512 days (every day) and the first 128 months (every month);

10) Record and review the power-off time and other data of the previous 32 times;

11) The interval can be set from 1 second to 24 hours. There are up to 22 outputs;

12) Three analog inputs with accuracy of 0.1%.

Please know the working power supply and model of the product before use to prevent abnormal operation or damage caused by misconnection.

Technical parameters:

- Power suplly:AC(85~264)V or isolation DC(8-36)V

- Repeatability:better than 0.2%.

- Accuracy:better than 1%

- Signal output :

  One channel standard isolation RS485 output;

  One channel isolation 4-20mA or 0-20mA active output;

  One channel OCT output (programmed between the pulse width(6-1000ms),default before leaving factory (200ms);

  One channel isolation relay output,with positive, negative, net accumulation pulses and different alarm signals.

- Signal input:

  Two channel three wire system PT100 platinum resistor input loop,to make heat meter has the function of displaying heat quantity.

  Three channel 4-20mA input optional,accuracy:0.1%,has the ability to input the signals of pressure, liquid level, temperature and so on.

- Display:2*20 backlit LCD(Chinese and English optional)

- Operating:4*4 tactile keypad

- Other functions:automatic memory the positive,negative,net totaliser flow rate and heat quantity of the last 512 days,128 months,10years.

  Automatic memory the time of power on/off and flow rate of the last 30 times, realize to replenish by hand or automatically,read the datas through Modbus communication protocol.

- Protection level:mainframe IP65,Transducer:IP68;

- Transducer:clamp-on type; Insertion type.

II. Operation and display

The product adopts window software design. All input parameters, instrument settings and display measurement results are uniformly subdivided into more than 100 independent windows. Users can enter parameters, modify settings or display measurement results by "visiting" a specific window. Windows are numbered with two digits (including + sign), from

00 to 99, followed by + 0, + 1, etc. Window number, or window address code, indicates a specific meaning.

There are three main types of windows:

(1) Data type, such as M11 and M12;

(2) Select item type, such as M14;

(3) Pure display type, such as M01, M00.

Access the data window to view the corresponding parameters. If you want to modify the value, you can directly type the value key and press "ENT" key; You can also type the "ENT" key, then type the digit key, and then type the "ENT" key to confirm.

Access the selection window to view the corresponding selection. If you want to modify, you must first type the "ENT" key, and then ">" and flashing cursor will appear on the left side of the screen, indicating that you have entered the modifiable selection state. Users can use "►/+"key and "▼/-"key to move out the desired selection item, type "ENT" key for confirmation, or directly output the selection item corresponding to the number and type "ENT" key to confirm. The display window is only displayed for users to browse and cannot be modified.

For example :to use 16 keys keyboard.

⓪ – ⑨ and (•) are used to input digits or Menu number.

(◄) key is used to left backspace or delete left character.

(▲/+) and (▼/-) are used to enter upper and lower Menu.

when inputing digits,it equals to plus or minus key.

(MENU) key is used to visit Menu,firstly press this key and then press two digits keys to enter related Menu.for example,if you input outside pipe diameter,press (MENU) (1)(1) is the address code of outside pipe diameter parameter.

(ENT) key is used to ensure the input digit or chosen content.the other function is to press this key to enter "modify" status before inputing parameters.

■ **detailed information of Menu**

flow rate/flow totalizer display	00	display instant flow rate/net totalizer,adjust the units in M30-M32
	01	display instant flow rate/instant flow velocity, adjust the units in M30-M32
	02	display instant flow rate/positive totalizer, adjust the units in M30-M32
	03	display instant flow rate/negative totalizer, adjust the units in M30-M32
	04	display instant flow rate/date time
	05	display heat flow rate/total heat quantity,adjust the units in M84 ,M88.
	06	display temperature input T1,T2
	07	display analogue input AI3,AI4
	08	display system error code
	09	display today net totalizer
initial setup	10	input outside perimeter of pipe
	*11	input pipe outer diameter,data range:0-18000mm
	*12	input pipe wall thickness
	*13	input pipe inner diameter
	*14	choose the kinds of pipe materials
	15	input sound velocity of pipe material
	16	choose kinds of liner
	17	input the sound velocity of liner
	18	input the thickness of liner
	19	input inner pipe wall absolute degree of roughness
	*20	choose kinds of fluids
	21	input fluid velocity

	22	input fluid viscosity
	*23	choose the types of transducers,including more than 20 types to use
	*24	choose transducer installation method
	*25	display transducer installation space
	*26	parameter solidifying and setup
	27	store and read installation parameters on installation point
	28	When signal set turning poor,keep last datas,choosing"yes"means when the signal turning poor,the flow meter display last correct measured datas.
	29	Input signal strength when the pipe flow is set to be empty.for example:inputing 65 means when the signal strength is lower than 65,the flow meter will think that there is no liquid in the pipe and display the flow value as zero.
	30	choose metric or imperial unit
	31	choose instant flow rate unit
Flow Unit setup	32	choose totalizer unit
	33	choosing the totaliser multiplying factor which function is to multiply totaliser data rang,normaly set it as x1
	34	net totaliser switch
	35	positive totaliser switch
	36	negative totaliser switch
	37	restore parameters setup before leaving factory and reset totaliser
	38	manual totaliser(the key to control on/off)
	39	choose operating language,including 8 kinds of different languages for

		international users to use
	3•	setup the LCD display method,inputing 0 or 1 means regular displaying content.inputing 2-39 means automatically cycle displaying method,displaying the previous menu of 2-39,time interval is 8 seconds.when inputing accures ,displaying according to the inputing operation.when there is no inputing operation,it will automatically enter cycle displaying status.(detailed information in §3.1)
	*40	damper coefficient
	*41	Input low flow velocity cutoff value
	42	Setup static zero point
	43	clear zero point setup and manually setup zero point,restore default before leaving factory.
	44	Set up zero point deviant by hand
Choosing setup	45	meter coefficient,rectification coefficient
	46	input Network address identification number (IDN)
	47	password protecting operation,after the meter was setup with password,only browse menus without any modification.
	48	Input degree of linearity broken line rectification data.at most there is 12 segments broken line,used for users to rectify meter nolinear.
	49	Network communication tester,on this window to visit the datas transfered from upper computer to judge the problems arised during communication.
Scheduled time	50	Optional setup of datas output at scheduled time,choose output content at scheduled time to print,more than 20 to selet

output	51	Setup output time at scheduled time
	52	Printing data flow direction control.by default printing data will flow directly to thethermal printer hanged inside bus.setup printing data output to outside serial port(RS485 port)
AI5 setup	53	display analogue input AI5(reserved for the TDS16 mainboard)
	54	Setup of OCT totaliser pulse output,pulse width,range:6 Ms-1000Ms.
	55	choose current loop mode
	56	corresponding data to output of current loop 4mA or 0mA
	57	corresponding data to output of current loop 20mA
	58	Verification of current loop output.applied to check whether current loop is normal or not.
	59	present output of current loop
Input and output setup	60	Date time and setup.the date time of the new flow meter is realized by CPU,when upgrading software,time will be slow, so after upgrading,recommend to adjust the date and time to display correctly
	61	Software version information and Electronic Serial Number (ESN)
	62	setup serial port parameter
	63	Communication protocol choosing(including compatible protocol choosing),two options,choosing MODBUS-RTU means using binary system MODUS-RTU protocol.choosing MODBUS-ASCII+previous protocol means using ASCII protocol,at this time can support several protocols simultaneously,including MOSBUS-ASCII,previous 7 version protocol,FUJI protocol,Meter-BUSx protocol etc.
	64	Analogue input AI3	By inputing measuring range ,the flow meter will turn

	65	Analogue input AI4	current signal into data range users need,so
	66	Analogue input AI5	display related analogue input that corresponding to physical parameter data.
	67		Setup frequency range of frequency output signal.frequency signal output represent instant flow rate value by signal frequency value. default:0-1000Hz; max-range:0-999Hz.output frequency signal by special frequency output unit.
	68	setup lower limit flow of frequency signal output	
	69	setup upper limit flow of frequency signal output	
	70	LCD backlit control	
	71	LCD contrast ratio control	
	72	Work timer,logging work time of the meter by unit of second.it can reset.	
	73	setup lower limit flow of frequency signal output	by setuping the lower and upper limit of alarm,confirm a range,when actual flow is over the range set in this window,then create a alarm signal output.alarm signal can be transferred to outside by setuping OCT or relay
	74	setup upper limit flow of frequency signal output	
	75	LCD backlit control	
	76	LCD contrast ratio control	
	77	beeper setup options	
	78	setup Open Collector Transistor output(OCT) output options	
	79	setup relay(OCT2) output options	
	80	choose input signal of batch controller	
	81	batch controller	

Heat Quantity Measuring	82	day/month/year totaliser,check the flow rate and heat quantity of the totalisers
	83	Automaticaly replenish flow switch during the period of power off,default status:off.this function is not available under special conditions.
	84	Choosing heat quantity unit, 0.Gj(default) 2.Kcal 3.Kw 4.BTU (imperial unit)
	85	Choose temperature signal origin,if choosing inputing temperature signal by AI3,AI4,then need temperature transmitter that can output 4-20mA current signal.
	86	heat capacity,default: GB-CJ128 enthalpy potential method. Temperature difference method is available also.
	87	heat quantity totaliser switch
	88	Heat quantity multiplier factor.
	89	display present temperature difference and setup temperature difference sensitivity.
	8•	Options of installation of heat meter on supply water pipe or return water pipe
Diagnosis	*90	Display the signal strength and signal quality
	*91	Display the transit time ratio
	92	Display the calculated fluid sound velocity .
	93	Display the total transit time and the delta time
	94	Display the Reynolds number and the pipe coefficient
	95	Display positive,negative heat quantity totaliser,start cycle display function.

III. Troubleshooting

AOBO-LCT series converter designed perfect self-diagnosis function. The errors are displayed on the upper right corner of the menu window via identification code in a timely order. Display orderly all the existing errors on M08.

Hardware self-diagnosis is conducted every time when power is on. Some errors can even be detected during normal operation.For those errors undetectable due to incorrect settings or improper testing conditions, the flow meter will also display useful information to help the user to quickly debug the error and solve the problems according to following listed methods.

Displayed errors have two kinds:one is circuit hardware errors information,arising possible problems and solve method can refer to table 1.if finding problems when power is on,and in the state of measuring,it will display "* F"on the upper left corner of screen.power on again,check the displayed information,adopts measures according to following table.if the problems still exist,contact manufacter. The other is error information about measurement.refer to table 2.

Table 1. Hardware self-diagnosis errors and solutions after power on

LCD display information	Causes	Solution
ROM verification Error	* ROM operation illegal / error	* Contact the manufacturer.
Logger reading error	* Stored parameters are wrong	*power on again/contact manufacturer.
System logger error	* System stored data area has error	*power on again/contact manufacturer.
Measuring circuit hardware error	* Sub-CPU circuit errors	*power on again/contact manufacturer.
Cpu clock speed error	* System timer has errors	*power on again/contact manufacturer.
Date time error	* System date and time are wrong	* reset date and time
No Display. Erratic or Abnormal Operation	* Problem with wiring	*check wiring connections. no influence of measuring normaly

|			
No response to key pressing	*Keypad is locked *Bad plug connection		* input password to unlock keyboard,or check wiring connections,no influence of measuring normaly

Table2. Working status errors code causes and solutions

code	M08 displaying	causes	solutions
*R	system work normaly	* normal system	
*J	Circuit Hardware Error	* Hardware problem	* Contact the manufacturer
*I	No Signal	✱Unable to receive signal	* Make sure the transducer is in tight contact with pipe surface, the couplant is enough .
			* Polish the pipe surface and clean the pipe
		* Loosen contact or not enough couplant between transducer and pipe surface.	*surface. Clear paint,rust.
		* Transducers installed improperly	* Check original installation parameter settings
		* scaling on inner pipe wall is too thick.	* Clear the scaling or change the pipe with
			* thick scaling,normaly change to another measurement point that has little scaling,the meter can work normaly.
			* Wait until the liner has been solidified and then test.
*H	lower signal strength received	* lower signal	* solutions are the same with code "I"。
		* causes are the same with code "I"	
*H	poor signal quality received	* poor signal quality	* include above all solutions
		* include above all caused	
*E	The current of Current Loop is Over 20mA (not influence the measurement if not using current output)	*4-20mA current loop output overflow 100%	* Check current loop settings on M56. or Confirm if the actual flow rate is too high.
		*Improper settings for current loop output 。	
*Q	Frequency Output is over the set value(not	* 4-20mA current loop output overflow 120%	* Check frequency output settings(refer to M66-M69). or Confirm if the actual flow

	influence the measurement if not using frequency output)	＊Improper settings for current loop output 。	rate is too high.

⚠️

Attention:the codes of ＊Q,＊E displayed do not affect measurement,only means current loop and frequency output have problems.

IV. Overall dimension and wiring diagram
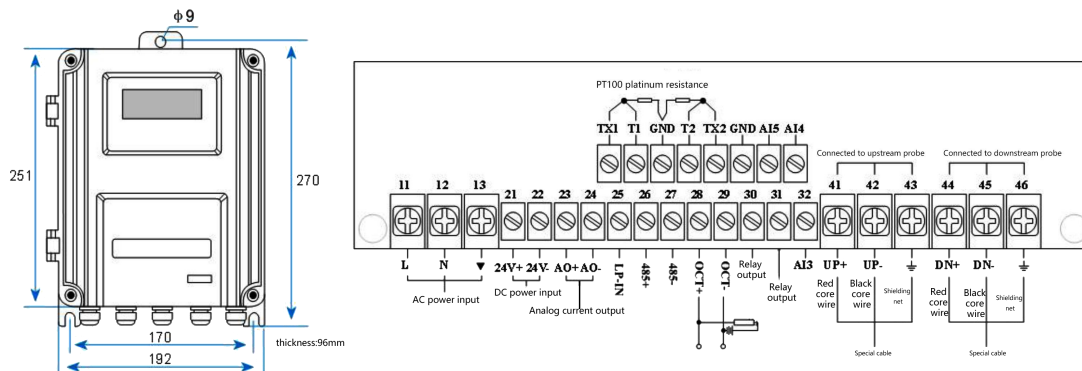
V. Transducers installation

1. Overall

The following steps are generally followed for installing the flow sensor:

(1) choosing measurement point;

(2) Select the appropriate installation method according to the site conditions or the type of sensor purchased;

● Type selection of insertion type flow sensor: insertion type B; Installation method: Z method

● External clamp flow sensor: the sensor type has been set before delivery, and other parameters such as "outer diameter, wall thickness and installation mode" are set according to the site conditions.

(3)Enter the pipe parameters and calculate the installation distance between the two flow sensors;

(4)Field mounted sensors;

(5)Signal check.

2.choosing measurement point

To ensure measurement accuracy and stability,the installation point of tranducers should be on the straight pipe full of well distributed fluid(when installing,the pipe must be full of liquid).

following principle:

2.1 Pipe must be full of liquid that is uniform and easy to travel the ultrasonic beam(vertical pipe or horizontal pipe)
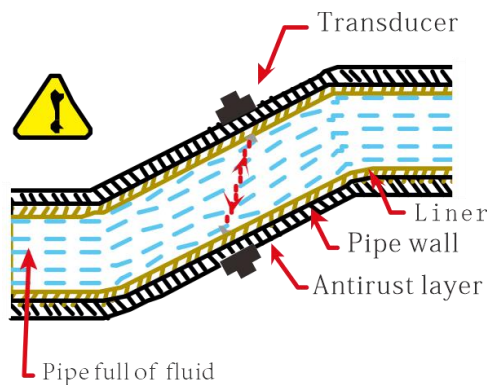

2.2 Upstream transducer should be installed at the place where the upstream length of the straight pipe is at least 10D and the downstream length is at least 5D where install the downstream transducer,so the pipe length should be straight without any valve,pump,angle head, D stands for pipe ouside diameter. The installation point should stay away from valves,pump,high pressure current,transformers interference source etc.
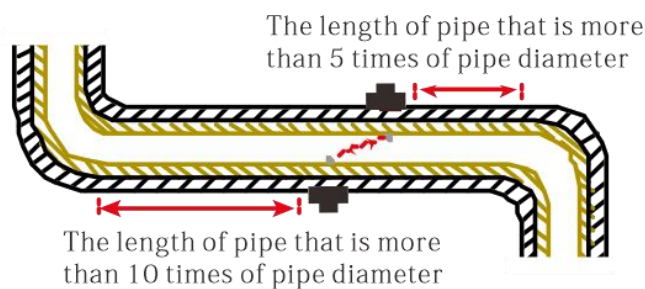
2.3 Avoid to install on the highest point of pipe system or vertical pipe with free exit(flow down)
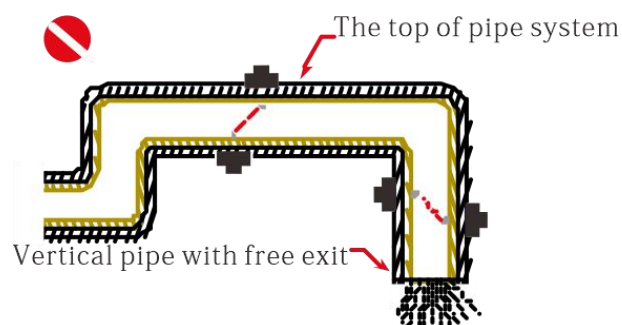
2.4 For the opened pipe or half full pipe,the transducers should be installed on U type pipe.
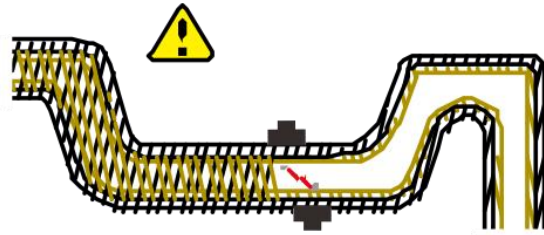
2.5 The two transducers must be installed in horizontal direction to pipe axis plane,within ±45° of axis line horizontal plane, to prevent bubbles or not full in upper pipe or sediment in down side of pipe to influence transducer measurement normaly.if there is space limit of installation that could not install horizontal symmetry,then install the transducers vertically or dip angle under the condition of no bubbles in upper parts of pipe.

3. Instrument well construction requirements

If need to install transducers in instrument well,there must be enough installation room,convenient for people to stand up to work,distance between pipe wall and well wall is at least above 550mm,width is more than (D+550*2)mm,cement pipe width is more than (D+700*2)mm,instrument well axial width L is more than D+1200mm.when installing transducers,avoid the place of flange,welding line,reducing,do best to install transducers in the range of +/-45°of horizontal position of pipe axis.
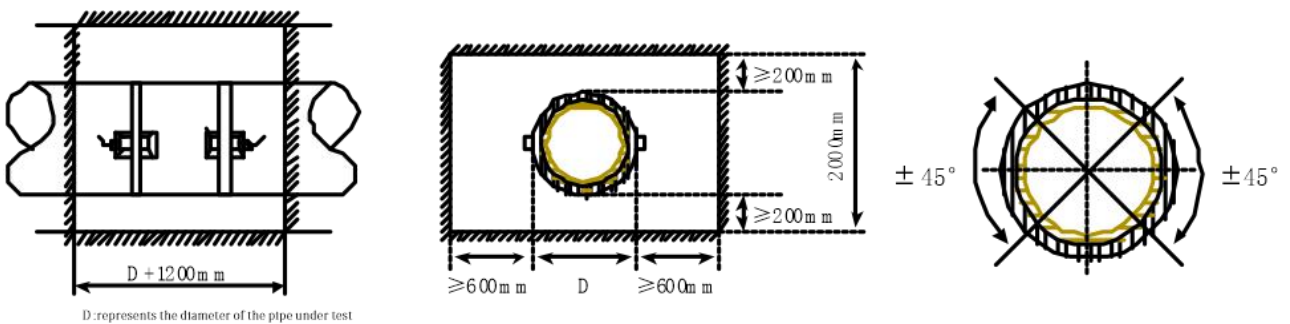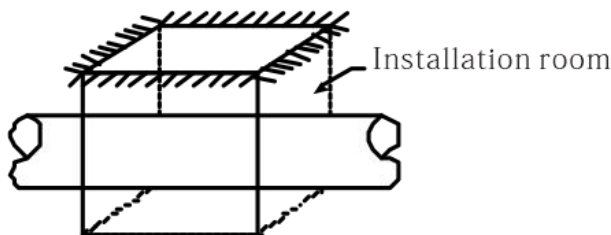
⚠ Attention:

(1)Do best to install transducers in the range of +/-45° of horizontal position of axis .

(2)Connect the mainframe enclosure with ground.

(3)Avoid the installation place of flange,welding line,reducing

(4)Enough installation room,convenient for people to stand up to work

4.Quickly input pipe parameter steps

Need input following parameters when normaly measuring：

  (1) pipe outer diameter

  (2) pipe wall thickness

  (3) pipe material

  (4) liner parameter(if has liner,then include liner thickness and sound velocity)

  (5) fluid types

  (6) tansducers tpye(mainframe can support many kinds of transducers)

  (7) transducers installation method

  (8) solidificaiton parameter

5. Clamp on type transducer installation method

Before installation,choose density pipe to install transducers,and clean the installation area,clear away rust,paint,anti-rust layer,it is the best to use angle grinder to polish,use cleaning cloth with alcohol or acetone to clear oil and dust,coat enough couplant around the center of installation area,attach the transducers on the pipe and fix it without air bubbles or sand between transducers and pipe wall.

S2-type transducer   M2-type transducer   L2-type transducer

Work frequency	1MHz		
Suitable pipe diameter(mm)	DN15-DN100	DN50-DN700	DN300-DN6000
Outer size	50*30*29mm	100*40*35mm	120*55*45mm
quality	175g	259g	535g

Remarks:users input transducers parameters by yourself

5.1 Installation space

Installation space of clamp on type transducer is inner edge distance of the two transducers(face to face),after inputing the required parameters in Menu,check the display on M25,that is the installation space.

5.2 Installation method

The method has 2 kinds: V method,Z method，N method and W methos.

V method(suitable to the pipe diameters within the range DN15-DN200mm)

Normaly,V method is standard installation method,convenient to use with precise measurement,when installation,the two transducers horizontally align,its centre line is horizontal with pipe axis line.
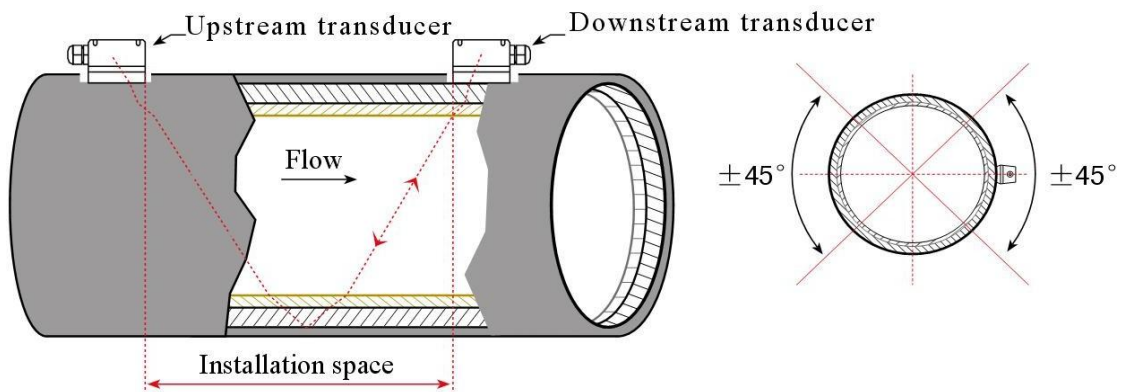
Z method (the most commonly used method)

When the pipe diameter is wide,or there are suspended matters in fluid,too thick scaling or liner inside pipe inner wall,that can make the flow meter can not work normaly and signal poor by using V method installation,so need to use Z method to install,its features are direct transfering without reflection(called sigle sound path),little signal attenuation.

6. Insertion type transducer installation method

Installation method: Z method, applicable to above DN80

Sensor type: insert type B

Installation tools: special opening tools provided by the company, 400W electric hand drill (preferably adjustable speed), wrench, etc.

Installation distance L: the distance of the sensor along the pipe axis (see M25), or L = inner diameter -9.113mm

6.1 Locate the installation point

Input the pipe parameters on the mainframe, the installation space L (L=inside diameter －9.113mm) will be calculated. (the two sensors must be located in the same axis plane), the installing space L should be the distance between the centers of the two sensors horizonally.

A. Making a fixed position paper:take a 4D(D refers to the pipe inner diameter) long and 200mm (or D) wide rectangular paper (according to actual situation on spot, the paper tape can also be replaced by moisture-and-corrosion resistant materials), and draw a line about 100mm from the edge; Wrap the fixed position paper on the cleaned surface of the pipe, making sure that the two paper sides are overlapping and aligned and thus the line drawn may be parallel with the pipe axis.
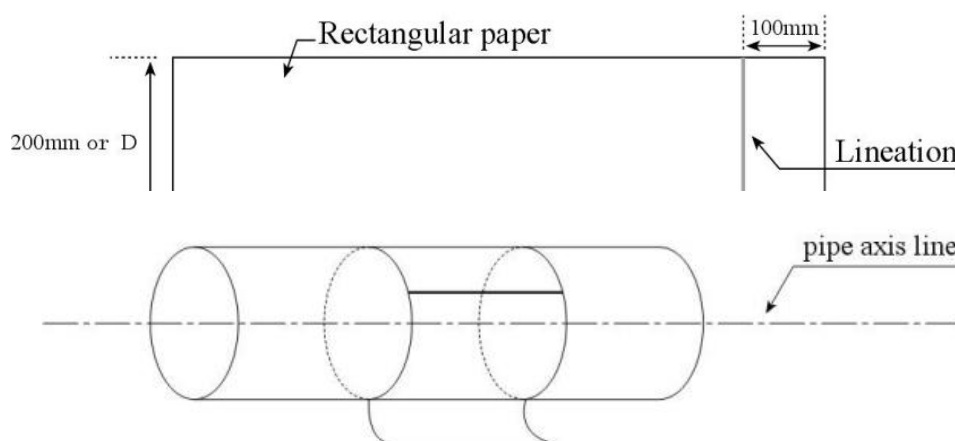
B. Extend the straight line on the fixed position paper, draw a straight line on the pipe, and the intersection point between the drawn straight line and an edge of the positioning paper is A; Starting from point A, measure 1 / 2 of the circumference of the pipe along the edge of the positioning paper. The parallel intersection is C. draw a straight line parallel to the pipe axis at point C (that is, parallel to the straight line on the positioning paper).

A parallel line with pipe axis line

pipe axis line

A

parallel line with pipe axis line   C

C   A
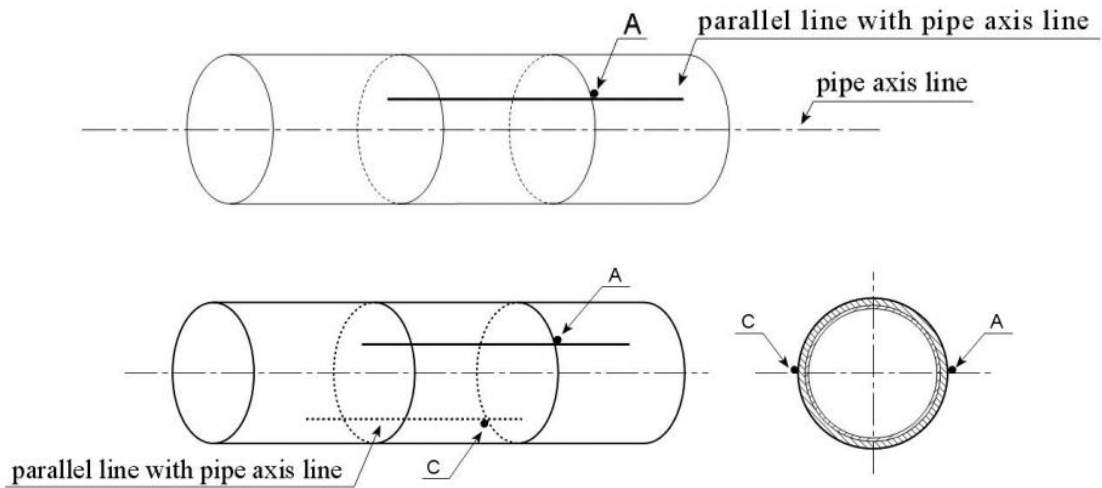
C. Removing the fixed position paper and starting from C, the installation space L should be measured along the line, draw on the pipe ,the point is B. Thus, A and B are the points where the transducers are to be installed. For example, L=280mm. Then two bases of ball valves should be welded respectively on   A and B, making sure the centers of bases overlap A and B respectively.

280mm   A

B   C

A

B   C
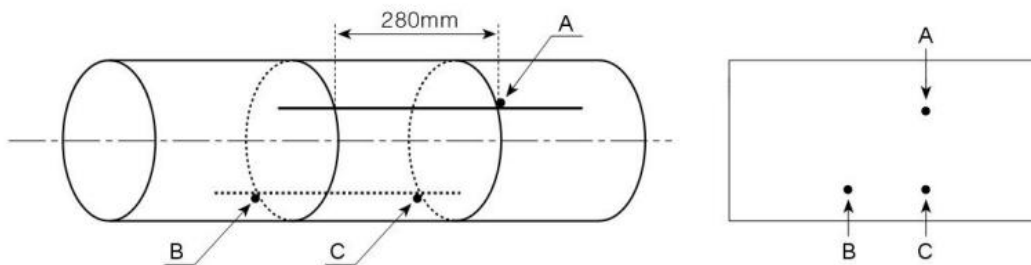
6.2 Welding the base of the ball valves

For pipes that can be welded (such as steel and stainless steel, etc.), just weld the base on the pipe (Stainless steel pipe should be welded to stainless   base,please indicate in your order). Before welding, the rust and paint on the section where the sensors are to be installed shall be cleaned up by using an angle grinder, and the oil dirty and dust should be cleaned by using acetone or alcohol. to prevent water leakage,so the work of welding is very important, making sure the centers of bases overlap A and B respectively,no air bubbles.

For pipes which material cannot be welded directly (such as cast iron and cement, etc.),

special hoops (with airproof rubber pads) should be used. The bases of the ball valves have been welded on the hoops.

These hoops are directly fixed on the pipe and make sure that the centers of the ball valves overlap A and B respectively. Finally, the ball valves should be closely fixed on the bases welded on the hoops to prevent water leakage.
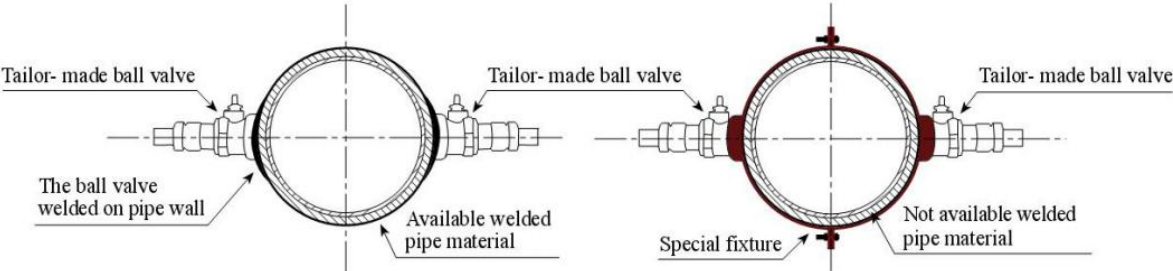
6.3 hole-drilling

Connect the sealed sheath of the hole-drilling machine and the outer screw thread of the tailor-made ball valves,screw tightly,open the ball valves,push the drill pipe to touch the outer surface of pipe; then the drill pipe shall be locked to the handle rotary drill before the drill is switched on. During drilling, the drill machine should work in a low speed to avoid sticking or even drill bit breaking.after drilling through pipe wall,pull back the drill pipe until the head of drill bit reach the ball valves spool,turn off the ball valves,take down hole-drilling machine.
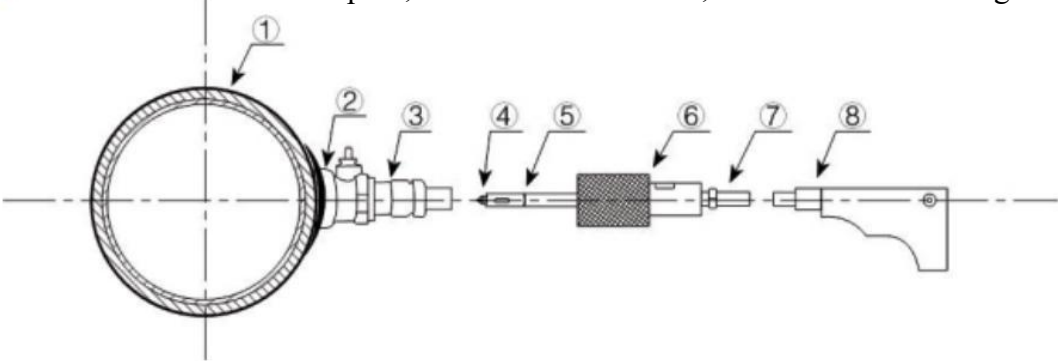

①Pipe

②Ball valve base

③Tailor-made ball valve

④Locating drill pipe bit

⑤19 super hole cutter

⑥Seal gland

⑦Drill pipe

⑧Hole-drilling machine

6.4 inserting the transducers

screw the screw mut to a position under the bottom of the transducer and screw the transducer through the ball valve to ball valve spool. Open the ball valve and continue to screw the transducer until the head of transducer passes the inner wall of the pipe. Before the wires are connected, the angle of the transducer should be adjusted to make sure that the head of two transducers can be in face to face position so as to send and receive the signals properly(the hole for line of two transducers should be upward or downward at same time).and then fix the screw mut,connect the wires,use silicon rubber to seal the connection place.
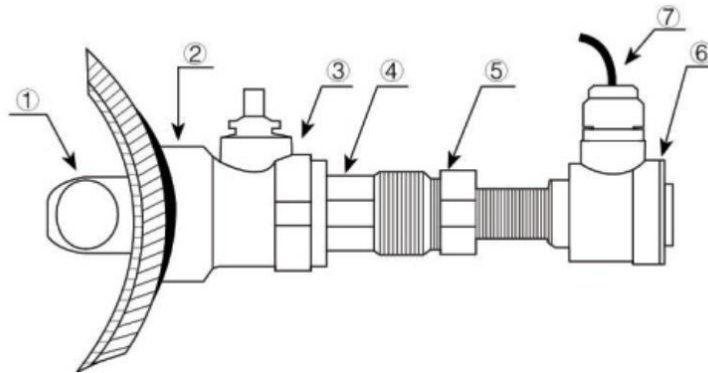
①transducer
②ball valve base
③tailor-made ball valve
④screw thread
⑤locknut
⑥connecting box
⑦signal cable

6.5 Length calculation of the part of transducer into the pipe inner wall

Insertion style transducer is made of stainless steel by casting. As the transducer's length A and the pipe wall's thickness B are known,and   the length part of transducer left outside the pipe can be measured, the length of the inner part of the transducer can be calculated

through the formula: L=A-B, C=0

Note:the length A of different types of transducers are:Standard insertion type B:A=170mm;Standard insertion type C:A=220mm,and Cement insertion type B:A=310mm.
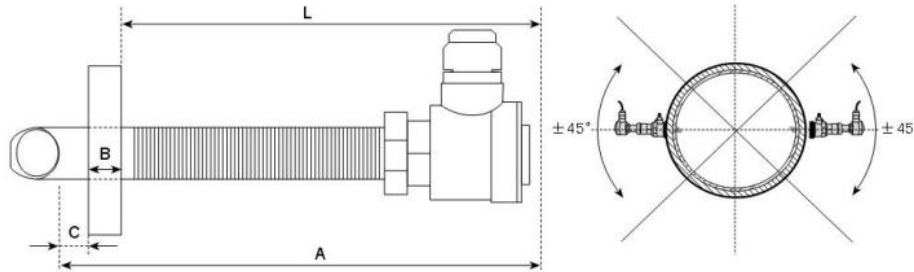
6.6 Signal quality(Q value)

Signal quality is indicated as the Q value(display on M90) that represent the receiving signal is good or not,TDS-100F series use 00-99 digits to represent signal quality.00 represent the worst signal,99 represent the best signal,normaly the signal quality should be above 60. the reason of poor signal quality could be big interference,or worse installation of transducers,or using bad quality,not professional signal cable.normaly ,to adjust transducers repeatly,check the couplant that is enough or not,until the signal is better.

6.7 Transit time ratio

Transit-time ratio (visit on M91)is usually used to check whether the transducer installation space is good .If the pipe parameters are correct and the transducers are installed properly,the transit time ratio should be in the range of 100±3%.when the ratio is over the range,you should check,

a)If the entered pipe parameters are correct?

b)If the actual space of the transducers is the same as or close to what shown on window M25.

c)If the transducers are installed properly in the same axis plane of pipe?

d)If the mounting location is good, if the pipe has changed shape, or if the pipe is too old (i.e., too much corrosion or liner inside the pipe)?

e)If there is any interference source around the flow meter?

VI. Heat measurement

As an instrument for heat (cold) measurement through heat calculator, meeting the European standard EN1434 "Heat Meters", ultrasonic heat (cold) meter adopts the principle of ultrasonic time difference for flow measurement, and which can be divided into integrated type and separated type in accordance with the structure.

Operational Principle

1. $$Q = \int_{\tau_0}^{\tau_1} q_m \Delta h d\tau$$

Q—heat released or absorbed (J or Wh)

q_m—mass flow of water flowing through the heat meter (kg/h)

$\triangle h$—water enthalpy difference at the inlet and outlet temperature for heat exchange system (J/kg)

t ——time (h)

2. When installed in the feed water inlet: instantaneous heat $q_{heat}=qv\times\rho_{feed}\times(h_{feed}-h_{return})$

When installed in the return water outlet: instantaneous heat $q_{heat}=qv\times\rho_{return}\times(h_{feed}-h_{return})$

Where,

qv= instantaneous flow for volume

ρ_{feed}=water density at the feed water inlet temperature

ρ_{return}=water density at the return water outlet temperature

h_{feed}=heat enthalpy of water at the feed water inlet temperature

h_{return}=heat enthalpy of water at the return water outlet temperature

Under normal conditions, the temperature sensor with 3 wire PT100 platinum resistance is used for the heat (cold) meter with working power supply of AC220V, and the temperature sensor with 2 wire PT1000 platinum resistance is used for the heat (cold) meter with working power supply of 3.6V (lithium battery).

Wiring for PT100 platinum resistance:

The power supply end and signal end of the feed water circuit platinum resistance shall be respectively connected with the above wiring terminals TX1 and T1; the power supply end and signal end of the return water circuit platinum resistance shall be respectively connected

with the wiring terminals TX2 and T2. The other end of the platinum resistance shall be connected with the "GND" terminal of the circuit board, and common-grounding is realized for the two platinum resistances.

Wiring for PT1000 platinum resistance:

Both ends of the feed/return water platinum resistance shall be connected with the two terminals corresponding to T1 and T2 respectively.

When extending the connection wire of temperature sensor, please use the wire with larger wire diameter as far as possible, and ensure that all the wires connected with the temperature sensor have the same size.

Please note that, common-grounding shall be provided for the temperature measurement circuit and the flow measurement circuit.

Common menu options for heat (cold) measurement:

M84: select the unit used for temperature measurement;

M85: select the input source of temperature signal (T1 and T2, or AI3 and AI4) (T1 and T2 by default);

M86: select enthalpy difference method or temperature difference method (enthalpy difference method by default);

M87: heat accumulator switch;

M88: set the multiple factor of the accumulator during heat accumulation, that is, define the range of the accumulator;

M89: display the current temperature difference and set the temperature difference sensitivity during heat accumulation. By setting an appropriate temperature sensitivity value, the accumulator can not accumulate heat when the temperature difference is very low, so as to avoid the incorrect accumulation. The low temperature difference sensitivity is generally set to 0.1 ℃ when leaving the factory;

M8·: select the installation position of heat meter (feed water pipe or return water pipe);

M06: display the temperature values and the equivalent resistance values for the current two inputs, i.e., T1 and T2;

M95: display the contents of the current (positive/negative) heat accumulator;

M05: display heat flow / total heat;

Use 4-20mA current loop output (optional output by HART protocol);

Select the output mode in window M55, such as flow output or heat output;

Enter the flow value represented by 4mA in window M56;

Enter the flow value represented by 20mA in window M57.

For example, if the flow range of a pipeline is 0-1,000m³/h, enter 0 in window M56, enter 1,000 in window M57, and enter window M26 to confirm the settings (no setting confirmation required for some models).

How to output integrated pulse

Integrated pulse can only be output by the hardware OCT or a relay. Therefore, the corresponding settings must be realized for the hardware OCT or the relay (see windows M78 and M79);

For example, if you want to use the relay to output positive integrated pulse, and each pulse corresponds to the flow of 0.1m³, the settings required are as follows:

1. Type MENU 3 2, and select the integrated flow unit "Cubic meter (m³)";

2. Type MENU 3 3, and select the multiple factor "2.×0.1";

3. Type MENU 7 9, and select "9. positive integrated pulse output".

Note: the suitable integrated pulse shall be selected. If the integrated pulse selected is too large, the output cycle will be too long; if the pulse is too small, the relay will act more frequently, affecting its service life. In addition, the frequent actions may cause the missing pulse. Therefore, it is recommended to use the rate of 1~60 pulse(s)/min.

How to output by the frequency signal

For example, if the flow range is 0~3,600m³/s, it is required to output the corresponding frequency signal 0~1,000Hz. The settings required are as follows:

Type MENU 6 7, and enter the lower limit frequency "0" and the upper limit frequency "1000";

Type MENU 6 8, and enter 0;

Type MENU 6 9, and enter 3,600;

Type MENU 7 8, and select "24 frequency signal output";

At this time, the flow of 0 m³/s corresponds to 0 pulse, and the flow of 3,600 m³/s

corresponds to 1,000 pulses. If 432 pulses are detected per second, you can know that the instantaneous flow of the current flowmeter is "432*(3600/1000) = 1,555.2 m^3/s. In this example, the pulse equivalent = 3,600/1,000 = 3.6 m^3/pulse.

There is no special output circuit for the frequency signal, and its signal output must be realized by OCT.