



Handbook

ABDT-LCT-DW Dual-path Liquid Ultrasonic Flowmeter

Weifang AOBO Instrument Technology Development Co.,Ltd

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I. Overview

The dual-path liquid ultrasonic flowmeter consists of a flowmeter body, ultrasonic transducer and its installation accessories, signal cables, and measurement host. It can be matched with external temperature sensors and pressure transmitters to form a heat metering system, suitable for flow metering and thermal energy metering in hot water supply systems.

The flowmeter adopts high-speed mixed signal processing CPU design, and is equipped with a high-precision time measurement system at the level of picoseconds. The dynamic response speed is fast, so that the accuracy and repeatability of flow rate measurement are higher and the stability is better.

The sensor section adopts a dual-path ultrasonic design to measure velocities of different fluid layers within the pipe. The software automatically compensate the cross-sectional flow rate of the media in the pipeline; at the same time, it has the function that the two channels are standby for each other to ensure normal operation when one channel fails. The converter adopts welded sealing without requiring dedicated ball valves or insertion devices, thoroughly resolving water leakage issues in sensors. Additionally, it provides uninterrupted maintenance and replacement capabilities.

The instrument has an automatic compensation algorithm inside, which is suitable for high temperature water measurement to ensure the accuracy of flow measurement at different temperatures. The use of hardware watchdog can prevent abnormal work in complex industrial occasions. In addition, it has the power loss storage function that the instrument data can be stored for more than 10 years after the power failure.

The instrument has pulse output function and can be programmed to set pulse equivalent. It has dual temperature acquisition channels that collect on-site temperature signals for heat or cooling calculation. The MODBUS communication technology with RS485 interface is adopted to realize networking with various networks or industrial buses and remote meter reading.



ABDT-LCT type



ABDT-UFM / UEM type

II. Main Technical Specifications

2.1 ABDT-LCT type main technical parameters

- 1) Dual-path liquid ultrasonic flowmeter complies with the standards CJ/T 3063-1997 and JJG 1030-2007;
- 2) Nominal diameter: DN50~DN2000;
- 3) Measurement temperature: (0~130) °C;
- 4) Accuracy: $\pm 1.0\%$;
- 5) Repeatability: 0.2%;
- 6) Input signals: 4-way ultrasonic signal
2-way platinum resistance signal
4-way current signal
- 7) Communication interface: RS 232/485 , standard MODBUS protocol;
- 8) Output signal: pulse (0~5000) Hz, current (4~20)mA;
- 9) Working voltage: AC220V $\pm 10\%$, DC12V/0.5 A; power consumption: less than 5 W;
- 10) Medium temperature: (0~130) °C;

2.2 ABDT-UFM/ UEM type main technical parameters

- 1) Dual-path liquid ultrasonic flowmeter complies with the standards CJ/T 3063-1997 and JJG 1030-2007;
- 2) Nominal diameter: DN50~DN2000;
- 3) Measurement temperature: (0~130) °C;
- 4) Accuracy: $\pm 1.0\%$;

5) Repeatability: 0.2%;

6) Output signal: pulse equivalent 0.01~99.99 (1 cumulative unit 10^{-3}), maximum pulse frequency 1000Hz;

7) Communication interface: RS485, standard MODBUS RTU communication protocol;

8) Working voltage:

External DC power supply: DC(9~24) V;

Internal battery power supply: 3.6 V (can work for more than 6 years);

9) Medium temperature: (0~130) °C;

10) Working environment: temperature (-25~55)°C; humidity (5~85)% RH(No condensation)

2.3 Flow range

Table1

Nominal diameter DN	Common flow $Q_p(m^3/h)$	Maximum flow $Q_s(m^3/h)$	Transitional flow $Q_p(m^3/h)$	Minimum flow $Q_p(m^3/h)$
50	15	30	2.0	1.5
65	25	50	3.0	2.5
80	40	80	5.0	4.0
100	60	120	8.0	6.0
125	100	200	13	10
150	150	300	19	15
200	250	500	33	25
250	400	800	50	40
300	600	1200	75	60
350	800	1600	100	80
400	1000	2000	135	100
450	1250	2500	170	125
500	1500	3000	200	150
600	2250	4500	300	200
700	3100	6200	400	300

800	4000	8000	500	400
900	5100	10300	700	500
1000	6300	12700	800	600
1200	9100	18300	1200	900
1400	12400	24900	1600	1200
1600	16200	32500	2100	1600
1800	20600	41200	2700	2000
2000	25400	50900	3400	2500

III. Working Principle

The dual-path liquid ultrasonic flowmeter realizes flow measurement with the principle of time difference. Multiple sensors are installed on the cross sections of the flow. By accurately measuring the time difference of ultrasound propagation along the water flow in both forward and reverse directions on each channel, the flow is calculated with the method of weighted integral, as shown below. Since the flow speed of each point is different in the large diameter pipe, if the flow is calculated based on the flow speed of one point, the error is often very large. The multi-channel ultrasonic flowmeter can solve this problem, and the flow measurement accuracy is greatly improved (Figure 1).

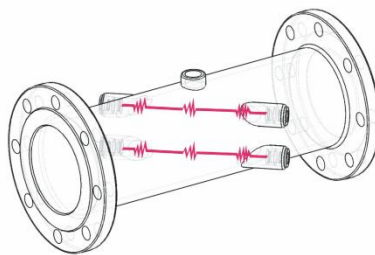


Figure 1

The transducers (sensor) are installed on both sides of the fluid line and separated by a certain distance. Assuming that the internal diameter of the pipeline is D , the path length of ultrasonic is L , the time of ultrasonic propagation in the forward flow direction is t_1 . The time of ultrasonic propagation in the reverse flow direction is t_2 , and the angle between the

ultrasonic propagation direction and the fluid flow direction is θ (Figure 2), then t_1 , t_2 and Δt can be expressed in the following formula:

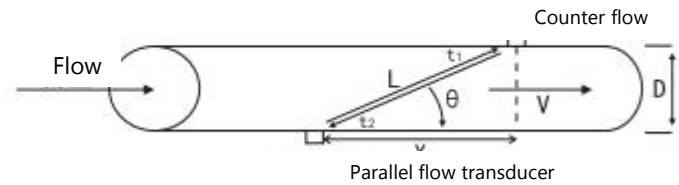


Figure 2

$$t_1 = \frac{L}{C + V \cos \theta} \qquad t_2 = \frac{L}{C - V \cos \theta}$$
$$\Delta t = t_2 - t_1 = \frac{2LV \cos \theta}{C^2 - V^2 \cos^2 \theta} \approx \frac{2LV \cos \theta}{C^2} \quad (C \gg V)$$
$$V = \frac{\Delta t C^2}{2L \cos \theta}$$

Where, C is ultrasound velocity in the non flowing medium, and V is flow velocity of the flowing medium.

$$Q_{flow} = \frac{D^2}{4} \times \pi \times V$$

IV. Product Overall Dimension and Installation

4.1 Product components

4.1.1 ABDT-LCT type

Pipe Section and Transducer	
	
Converter	Connecting Cables

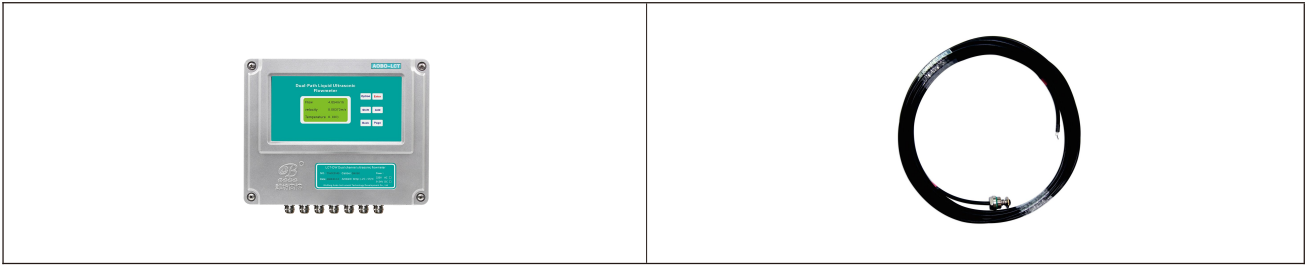


Figure 3

4.1. 2 ABDT-UFM/UEM type (Figure 4, Figure 4-1)

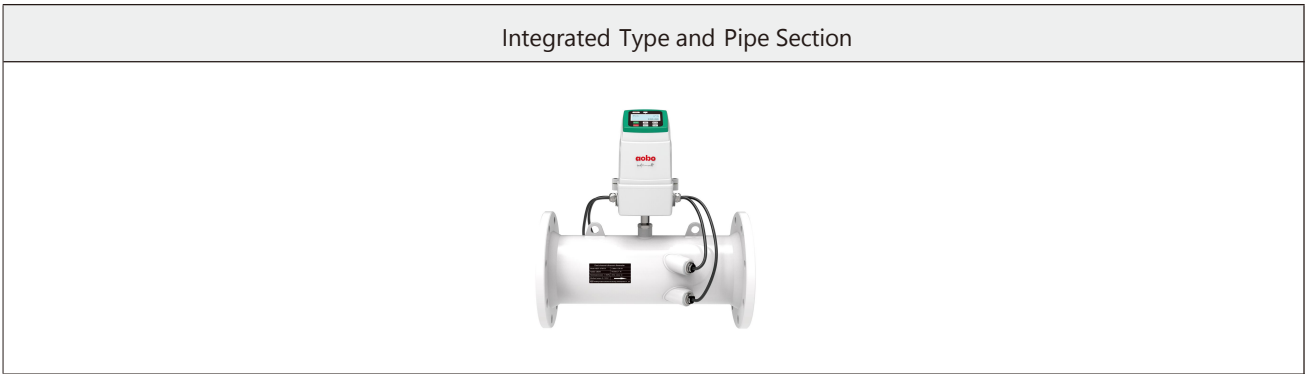


Figure 4

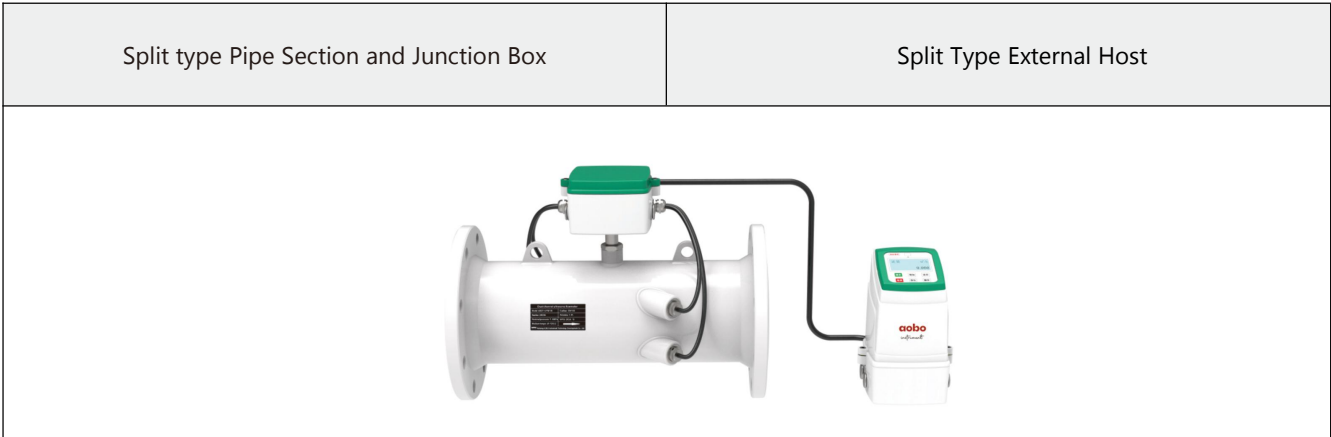


Figure 4-1

4.2 Pipe section dimension (Figure 5)

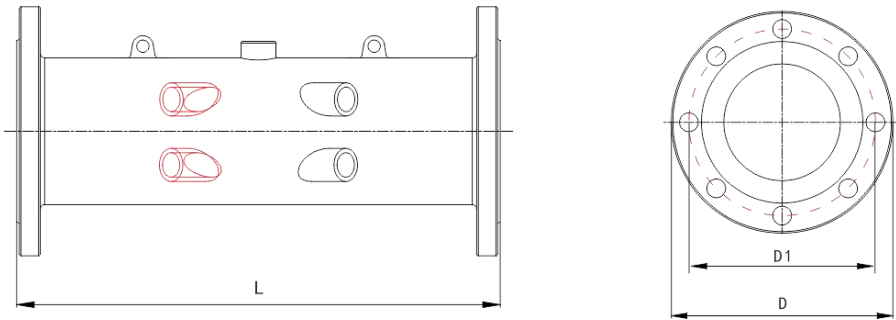


Figure 5

Table2

Nominal diameter DN	L (mm)	D (mm)	D1 (mm)
50	300	165	125
65	350	185	145
80	350	200	160
100	350	220	180
125	350	250	210
150	500	285	240
200	500	340	295
250	600/450	405	355
300	500	460	410
350	550	520	470
400	600	580	525
450	625	640	585
500	625	715	650
600	750	840	770
700	875	910	840
800	1000	1025	950
900	1230	1125	1050
1000	1300	1255	1170
1200	1360	1485	1390
1400	1400	1685	1590
1600	1480	1930	1820
1800	1560	2130	2020
2000	1660	2345	2230

Note: The Flange standard is GB/T 9124.1-2019

4.3 Installation position selection

Requirements for installation position selection: The fluid must fill the pipe section and the flow field must be evenly distributed. There should be no gas or liquid accumulation in the measuring pipe section to ensure measurement accuracy. When installing, the following principles should be followed:

Select fluid-filled sections, for example, the vertical parts of the pipeline (the fluid must flow upward) or the horizontal sections filled with the fluid. (Figure 6).

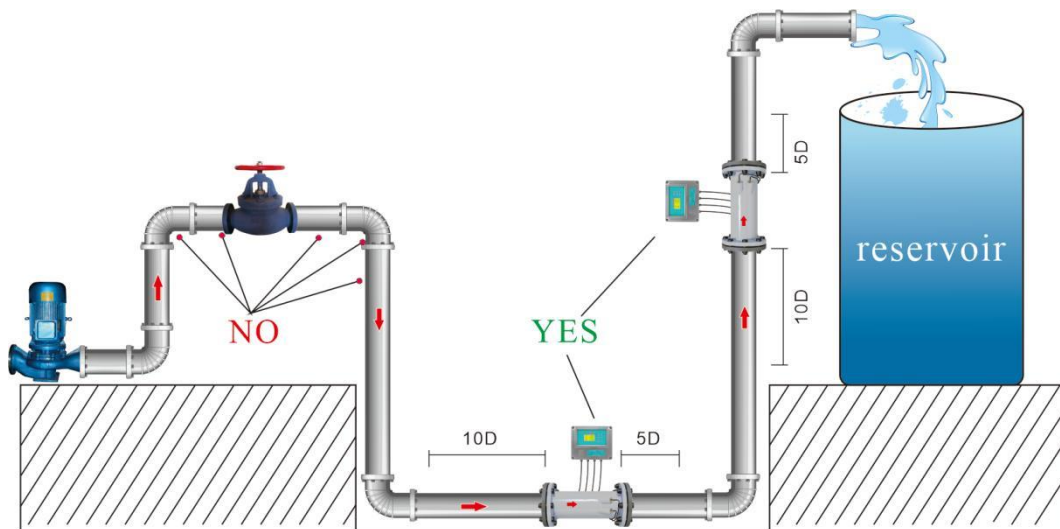


Figure 6

The installation position shall be selected in the uniform and straight pipe section within 10 times diameter (10D) upstream and 5 times diameter (5D) downstream, without any valve, elbow, variable diameter and other devices that may interact the flow field. If there is a pump, T-fitting, regulating valve, throttle hole, gradual expansion pipe section or other device in front of the measurement point, the upstream straight pipe section is required to be 20 times diameter (20D). In the horizontal section, the sensor probe shall be generally installed at 9 and 3 o'clock (horizontal) positions of the pipe.

Avoid 6 and 12 o'clock (vertical) positions to avoid signal attenuation due to the pipe bottom sediment or bubbles and holes on the upper part of the pipe.

Ensure that the temperature at the measurement point is within the working range.

4.4 Installation and wiring of the converter

4.4.1 ABDT-LCT Type converter installation

Figure 7 is a "installation diagram". With 8mm drill bit, make 4 holes for installation in the positions with screw sign. Remove the rubber plug and the installation screws in the plastic bag, then hammer the rubber plug into the drilled hole, secure the installation bracket at the bottom of the flowmeter, put the flowmeter in the position for hole drilling, and then secure the flowmeter with the screws (Figure 7).

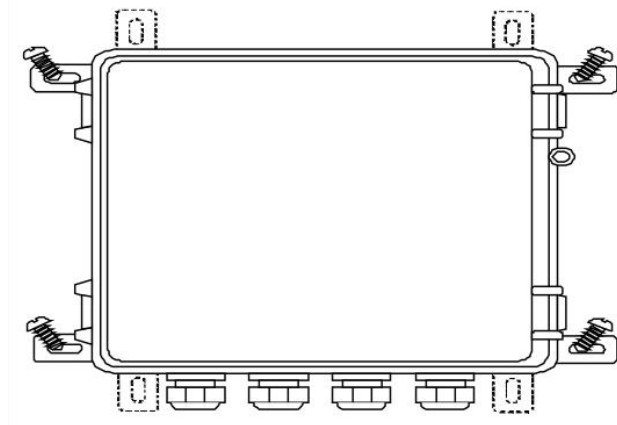


Figure 7

4.4.1.1 Wiring diagram for measurement signal and power supply

Once the flow converter is installed in the specified position as required, the wiring can be started.

Open the upper cover of the host to see the terminal of the converter. Please refer to figure 8 for the specific wiring (Figure 8).

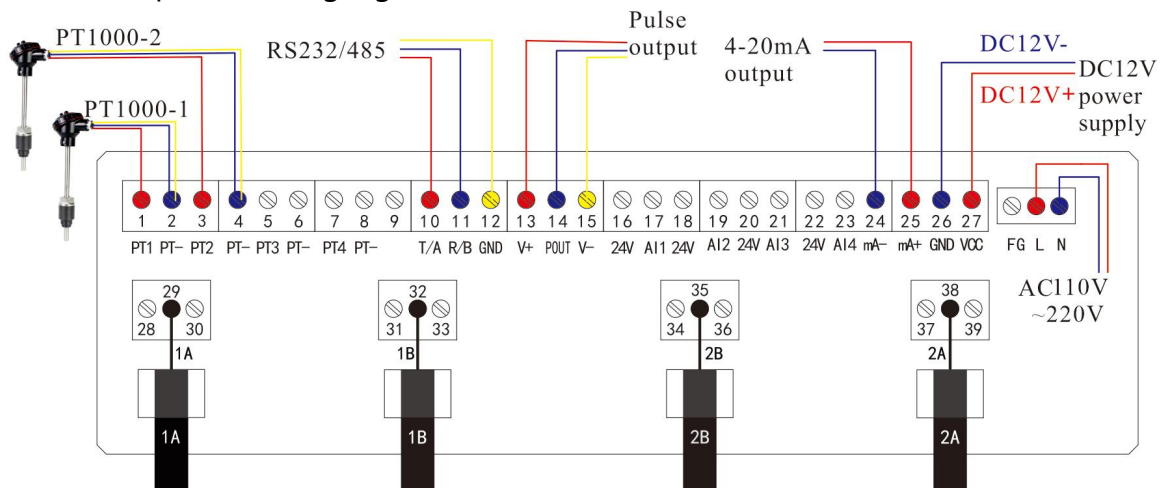


Figure 8

Ultrasonic transducer wiring:

1A-Upstream probe cable on the sensor's top channel, copper core of coaxial cable connected to terminal 29;

1B-Downstream probe cable on the sensor's top channel, copper core of coaxial cable connected to terminal 32;

2A-Upstream probe cable on the sensor's bottom channel, copper core of coaxial cable connected to terminal 38;

2B-Downstream probe cable on the sensor's bottom channel, copper core of coaxial cable connected to terminal 35;

Power supply: 12VDC or 220VAC

Connect 12V+ to the VCC terminal.

Connect 12V- to the GND terminal.

Connect 220VAC to L and N terminals.

Note: AC power supply input and DC power supply input cannot be used at the same time, only one can be selected.

Pulse output wiring diagram(Figure 9)

Connect V+ to power supply voltage:12V

Pout pulse output signal

Connect V- to the external power supply negative electrode

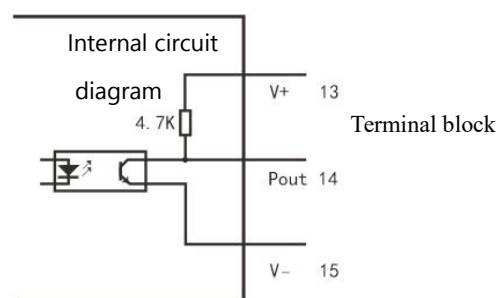


Figure 9

Temperature sensor wiring diagram(Figure 10)

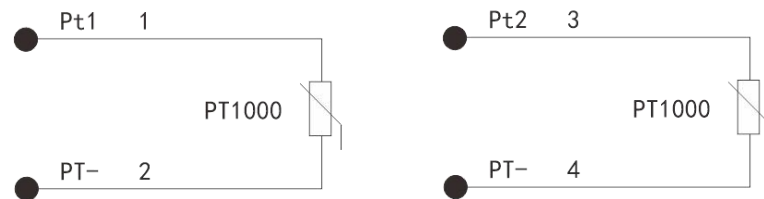


Figure 10

4.4.2 ABDT-UFM/UEM Type converter installation

4.4.2.1 Wiring diagram for integrated type

The integrated terminal block and wiring content refer to Figure 11 and instructions:

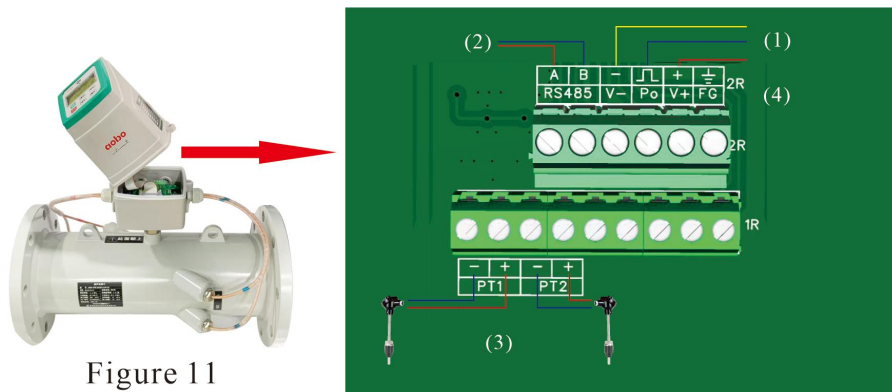


Figure 11

(1) V+/ V-: External DC power supply interface, DC (9-24) V; Po: Pulse output interface (external power supply must be provided when using);

(2) RS485(A/B): External RS485 communication interface (external power supply must be provided when using);

(3) PT1, PT2: Two-channels PT1000 platinum resistance (Connect when measuring heat or cooling capacity; do not connect when measuring flow rate only);

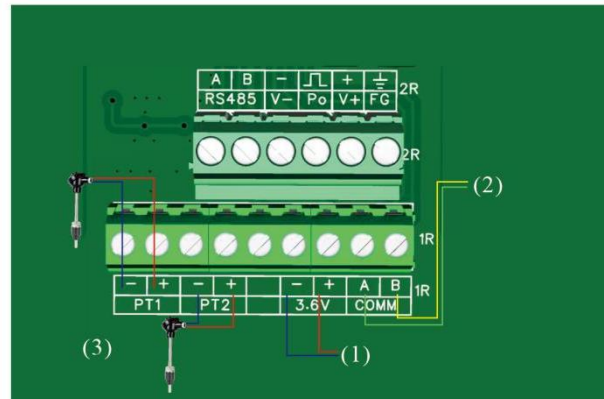
(4) FG: Ground;

4.4.2.2 Wiring diagram for split type

(1) The wiring of the pipe section refer to Figure 12 and instruction



Figure 12



(1) 3.6V(+/-) Connect the prepared 4-core cable to the corresponding terminals 3.6V(+/-) on the pipe section junction board.

(2) COMM (A): Connect the prepared 4-core cable to the corresponding terminals COMM(A) on the converter junction board.

COMM(B): Connect the prepared 4-core cable to the corresponding terminals COMM(B) on the converter junction board.

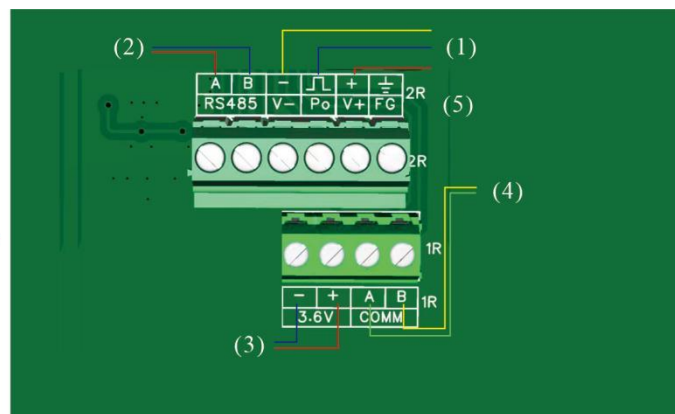
It is used for split type ultrasonic flowmeter.

(3) PT1,PT2: Two-channels PT1000 platinum resistance(Connect when measuring heat or cooling capacity; do not connect when measuring flow rate only).

(2)The wiring of the converter refer to Figure 13 and instruction



Figure 13



(1) V+/ V-: External DC power supply interface, DC (9-24) V; Po: Pulse output interface (external power supply must be provided when using);

(2) RS485(A/B): External RS485 communication interface (external power supply must be

provided when using);

(3) 3.6V(+/-) Connect the prepared 4-core cable to the corresponding terminals 3.6V(+/-) on the pipe section junction board.

(4) COMM (A): Connect the prepared 4-core cable to the corresponding terminals COMM(A) on the pipe section junction board.

COMM(B): Connect the prepared 4-core cable to the corresponding terminals COMM(B) on the pipe section junction board.

This is applicable to the split type ultrasonic flowmeter.

(5) FG: Ground.

Note:

1. RS 485 (A/B), V-, Po, V+, and FG terminals in the wiring box of the separate ultrasonic flowmeter pipe section are not used. RS485, power supply, and pulse wiring must be connected from the terminal of the main host board.

2. When measuring heat or cold by split type ultrasonic flowmeter, the wiring of PT1 and PT2 must be connected to the PT1 and PT2 terminals on the wiring box of the pipe section, The terminals of PT1 and PT2 on the main host board are not used.

Instructions:

1. In the labeling system: The 1R wiring mark corresponds to the 1R terminal block; The 2R wiring mark corresponds to the 2R terminal block.

2. For ultrasonic sensors:

Probe cables 1A, 1B, 2A, 2B of the ultrasonic flowmeter are pre-installed at the factory; No field wiring is required at the probe locations during installation.

V. Equipment Operation Instructions

5.1 Panel components(ABDT-LCT type)

The dual-path ultrasonic interaction panel consists of a 128 * 64 LCD display screen and six keys.



Figure 14

5.1.1 Keys

5.1.1.1 Key function

Table 3

No.	Item	Instruction
1	Enter key	●In the operating condition interface, short-press to enter the programming interface. ●Confirm if the password is correct to enter the sub-menu. ●When changing settings, use this to enter the current setting item. ●Confirm the changed setting value.
2	Add key	●When changing numbers, short-press to increase the value. ●When changing parameters, short-press to switch between parameter options.
3	Back key	●When changing settings, use this to exit the current setting item. ●Return to the home page to save the modified parameters.
4	Option key	●When programming the interface, short-press to select the programming item.
5	Shift key	●When displaying operating conditions, short-press to check signal quality. ●When changing numbers, short-press to move the setting cursor position.
6	Page key	●Pagination function for multiple pages.

5.1.1.2 Operation method of the modification value

Press the "Add" key once to add 1 to the selected number. Press the "shift" key once to move the cursor right by one position. After setting the desired value, press the "Enter" key to automatically move the cursor to the first position on the right, Meaning successful parameter setting. Pressing the "back" key returns to the main interface while automatically

saving all modified parameters.

Menu Abbreviation Cross-Reference Table for ABDT-LCT Type

Table 4

No.	Menu abbreviation name	Menu full name/Explanation
1	TEMP	Temperature
2	PRES	Pressure
3	SYS	System
4	CAL	Calculation
5	MEAS	Clear the accumulated values
6	ZERO	Set the flow zero point
7	CORR	Correction
8	Volume	Cumulative flow
9	Flow	Instantaneous flow
10	Energy	Heat
11	Energy-C	Cooling
12	Power	Instantaneous Heat
13	Power-C	Instantaneous cooling
14	TEMP-F /F-Temperature	Forward water temperature
15	TEMP-R /R-Temperature	Return water temperature
16	F-TEMP Range	Forward water temperature range
17	R-TEMP Range	Return water temperature range
18	F-TEMP Setting	Forward water temperature setting
19	R-TEMP Setting	Return water temperature setting
20	PRES-F/F-pressure	Forward water pressure
21	PRES-R/R-pressure	Return water pressure

22	F-PRES Range	Forward water pressure range
23	R-PRES Range	Return water pressure range
24	F-PRES Setting	Forward water pressure setting
25	R-PRES Setting	Return water pressure setting
26	ENTH-F	Forward Instantaneous Heat
27	ENTH-R	Return Instantaneous Heat
28	CutOff	Cut-off flow rate/small signal cut-off
29	Channel Num	Number of channels
30	Pressure	Pressure range
31	P-equivalent	Pulse equivalent
32	P-Testing	Pulse test
33	Address	Communication address
34	Baud rate	Communication baud rate
35	Decimal Num.	Display decimal number
36	Backlight	Backlight time

5.1.2 Main Menu(Flow mode)

Display cumulative flow(abbreviated as volume) interface after power-on(Figure15).

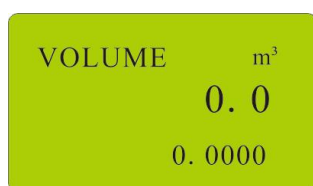


Figure15

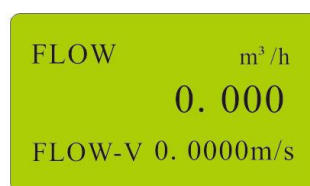


Figure15-1

5.1.2.1 Main Menu(Energy mode)

Display energy interface after power-on(Figure16).

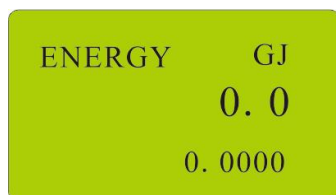


Figure16

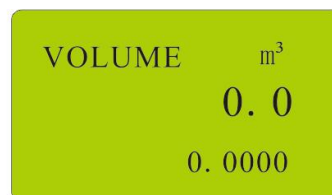
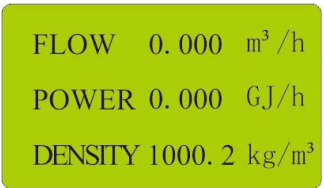
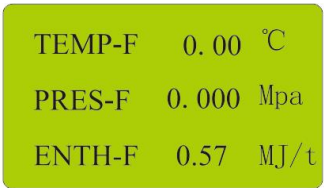


Figure16-1



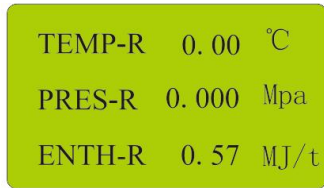
FLOW 0.000 m³/h
POWER 0.000 GJ/h
DENSITY 1000.2 kg/m³

Figure16-2



TEMP-F 0.00 °C
PRES-F 0.000 Mpa
ENTH-F 0.57 MJ/t

Figure16-3

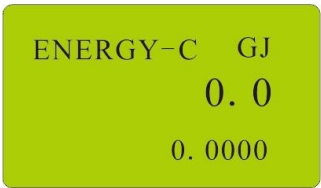


TEMP-R 0.00 °C
PRES-R 0.000 Mpa
ENTH-R 0.57 MJ/t

Figure16-4

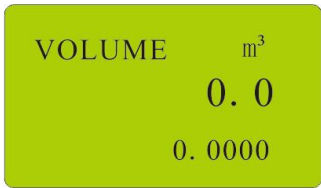
5.1.2.2 Main Menu(Energy-C mode)

Display cooling energy interface after power-on(Figure17).



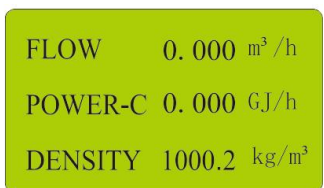
ENERGY-C GJ
0.0
0.0000

Figure17



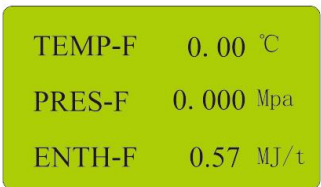
VOLUME m³
0.0
0.0000

Figure17-1



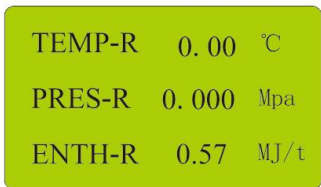
FLOW 0.000 m³/h
POWER-C 0.000 GJ/h
DENSITY 1000.2 kg/m³

Figure17-2



TEMP-F 0.00 °C
PRES-F 0.000 Mpa
ENTH-F 0.57 MJ/t

Figure17-3

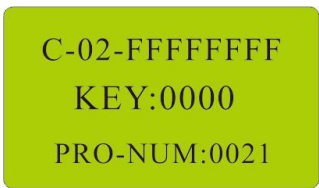


TEMP-R 0.00 °C
PRES-R 0.000 Mpa
ENTH-R 0.57 MJ/t

Figure17-4

5.1.3 Set basic operating parameters

Press "Enter" key on the cumulative heat/cooling interface(abbreviated as energy/energy-c) or cumulative flow interface(abbreviated as volume) to display the password interface as shown in Figure 18 below:



C-02-FFFFFFFF
KEY:0000
PRO-NUM:0021

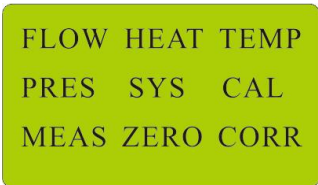
Figure18

The first line displays the serial number.

The second line enters the parameter setting interface.

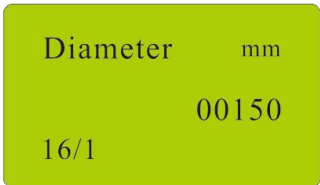
The third line displays the total number of programming times.

After entering the password and pressing the "Enter" button, you will enter the parameter setting interface. The 9 internal parameters displayed in the table are shown in Figure 19. Press the "Option" button to select the corresponding parameters, and press the "Enter" button to enter the cursor corresponding to the parameters.



FLOW HEAT TEMP
PRES SYS CAL
MEAS ZERO CORR

Figure19



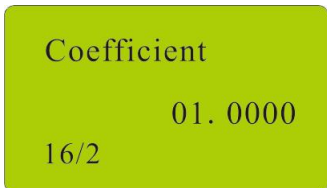
Diameter mm
00150
16/1

Figure20

5.1.3.1 Internal parameters to be set in the meter(flow items)

Nominal diameter of the instrument: The sensor diameter is input into the calculation (generally already set before delivery) (Figure 20).

Flow coefficient: According to the calibration data, it is set (generally already set before delivery) (Figure 20 -1).



Coefficient
01.0000
16/2

Figure20-1



CutOff m/s
00.000
16/3

Figure20-2

Cut-off: small signal cut-off, the flow rate value is not shown below this set value (Figure 20-2).

5.1.3.2 Internal parameters to be set in the instrument(Energy item)



Unit
GJ
5/1

Figure21



Sensor Position
Forward
5/2

Figure21-1

Unit: the unit of energy measurement can be selected according to the instrument diameter and the actual heat consumption. The optional units includes GJ, MJ, MWh, kWh, etc. See the list of internal parameters for details(Figure 21).

Sensor position:Flow sensor position. When measuring heat,choose the forward water pipe or return water pipe according to the site installation position of the instrument, and the instrument will conduct automatic temperature and pressure compensation calculation according to the setting. The instrument is built-in for 0.6MPa and 1.6MPa(Figure 21-1).



Figure21-2

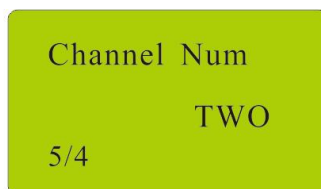


Figure21-3

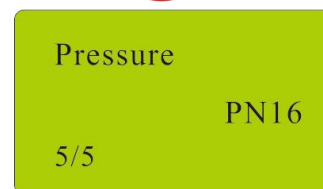


Figure21-4

Angle type: There are six types of angles: A, B, C, D, E and F (usually already set before delivery) (Figure 21-2).

Number of channels(abbreviated as Channel Num): You can choose from eight types such as dual-path, single-channel, and X-pattern (usually already set before delivery) (Figure 21-3).

Pressure: Pressure range. Optional PN10, PN16, PN25 three pressure ranges (generally already set before delivery) (Figure 21-4).

Note:The Angle type, number of channels and pressure range three parameters have been set according to the instrument parameters before delivery. Non-professionals are not allowed to change them at will!

5.1.3.3 Internal parameter to be set for the instrument: temperature items

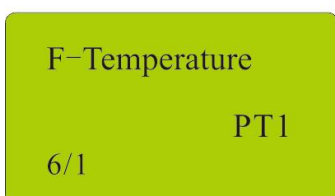


Figure22

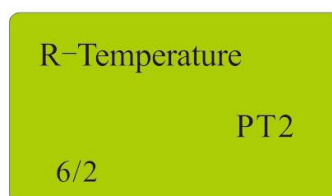


Figure22-1



Figure22-2



Figure22-3

The input of temperature signal includes 7 types: Pt1, Pt2, AI1, AI2, AI3, AI4 and a fixed value; Pt1 channel and Pt2 channel are for Pt1000 sensor, AI1-AI4 channels are for (4-20) mA transmitter;

F-Temperature: Forward water temperature selection. Any of the 9nos input channels

can be selected. If one of A I1-A I4 channels is selected, then the corresponding range value shall be set for the temperature transmitter(Figure 22). (See the parameter list for details)

F-TEMP Setting: Forward water temperature setting. Set the fixed temperature value(Figure 22-4).

R-TEMP Setting: Return water temperature setting. It is the same as the forward water temperature setting(Figure 22-5).

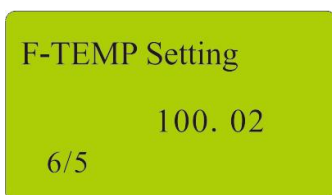


Figure22-4

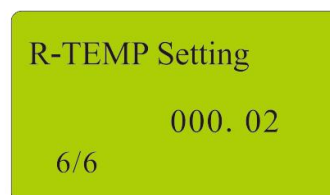


Figure22-5

5.1.3.4 Internal parameter to be set for the instrument: pressure items

The input of pressure signal includes 5 types : AI1, AI2, AI3, AI4 and a fixed value; AI1~AI4 channels are for (4-20) mA pressure transmitter:

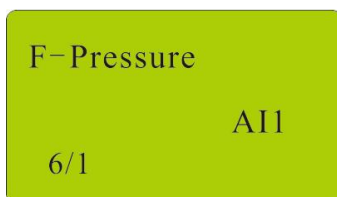


Figure23

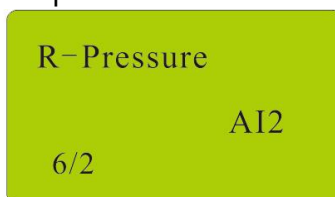


Figure23-1



Figure23-2



Figure23-3

F-Pressure: Forward water pressure selection. You can choose any of the five input channels. When one of AI1-A I4 channels is selected, the corresponding range value shall be set for the pressure transmitter(Figure 23). (See the parameter list for details)

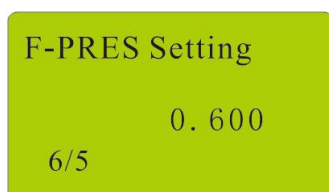


Figure23-4



Figure23-5

F-PRES Setting: Forward water pressure setting. Set the fixed pressure value(Figure 23-4).

R-PRES Setting: Return water pressure setting is the same as the forward water pressure setting(Figure 23-5).

5.1.3.5 Internal parameter to be set for the instrument: system settings

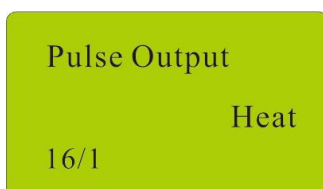


Figure24

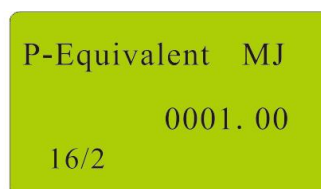


Figure24-1

Pulse output selection: set the pulse equivalent corresponding to the accumulated flow or accumulated heat(Figure 24);

Pulse equivalent:(abbreviated as P-Equivalent) Set how much L per output pulse represents (when selecting output flow) or how much MJ (when selecting output heat) (Figure 24-1);

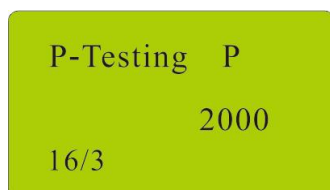


Figure24-2

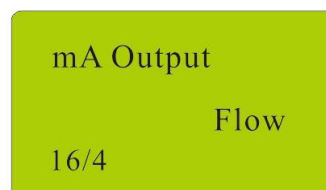


Figure24-3

Pulse testing(abbreviated as P-testing): test whether the pulse output module is working normally. In this interface, the instrument output 2000 pulses per second for counter detection, and the function is invalid during normal use(Figure 24-2).

mA output: output the instantaneous heat or instantaneous flow corresponding to (4-20) mA standard current(Figure 24-3).

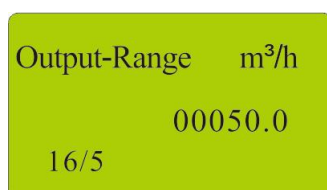


Figure24-4

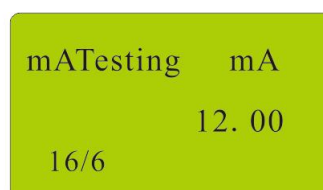


Figure24-5

Output-Range: output the range of flow or heat corresponding to (4-20) mA standard current, that is, output the flow or heat value represented by the output of 20mA(Figure

24-4);

mA testing: test whether the mA module is normal. In this interface, the meter output corresponding to current value. The function is invalid when it is in normal use(Figure 24-5);



Figure24-6

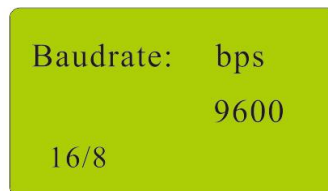


Figure24-7

Communication address: Set MODBUS communication address(Figure 24-6), see the internal parameter list for details;

Communication baud rate: Set MODBUS communication rate(Figure 24-7), see the internal parameters list for details;

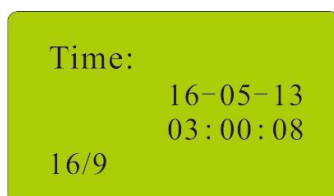


Figure24-8



Figure24-9

Time setting: Set the internal clock time(Figure 24-8);

Reset: after entering the password, press the "Enter" key to clear all accumulated amount, including heat, flow and programming times(Figure 24-9);

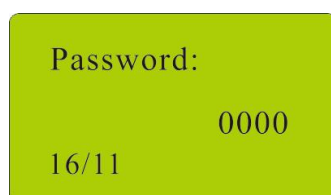


Figure24-10



Figure24-11

Password: set the password for programming(Figure 24-10);

Display modes: fixed display and cycle display; cycle display(cycle display of 3 main interfaces), fixed display(fixed display of the interface set as the "startup display interface"); (Figure 24-11)

Backlight time: 00 means backlight often open; 1-99 means backlight off without pressing any key after this time, unit: minute(Figure 24-12);

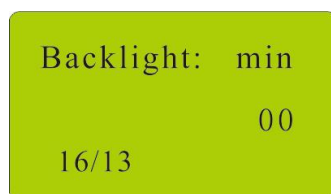


Figure24-12

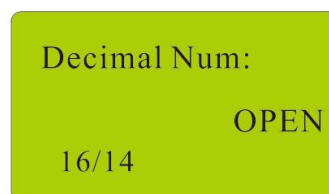


Figure24-13

Display decimal number: accumulated flow and accumulated heat display 1 decimal digit by default. After opening the display decimal digits function, an accumulated amount with 4 decimal digits will be displayed in the display interface for accumulated flow and accumulated heat, and which can be used to value reading during measurement or improve resolution for small flow measurement(Figure 24-13);

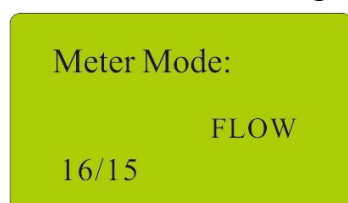


Figure24-14

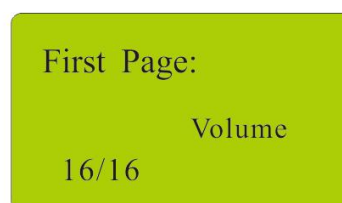


Figure24-15

Meter Mode: switch between flow and heat/cooling(Figure 24-14);

First page: the first page after power on, accumulated flow and instantaneous flow can be set(Flow mode); the first page after power on, accumulated heat, instantaneous heat, flow, forward temperature and return temperature can be set(Heat mode / Cooling mode)(Figure 24-15).

Note: The calibration item is set at the factory. Do not modify by unauthorized personnel.

5.1.4 List of Parameters and Parameter Range

Table 5

Parameter number	Parameter text	Setting method	Parameter range	Note
1	Instrument Diameter	Set data	0~1600mm	The calibration item is set at the factory. Do not modify by unauthorized personnel.
2	Flow Coefficient	Set data	0-99.9999	
3	Cut-off Flow Rate	Set data	0-99.999m/s	
4	CH1 Zero Offset	Set data	-99.999~+99.999	
5	CH2 Zero Offset	Set data	-99.999~+99.999	

6	Transducer type	Select	Hold	
7	Heat unit	Select	GJ/MJ/MWh/KWh	
8	Flow sensor position	Select	Forward water / return water	
9	Angle type	Select	A,B,C,D,E,F	
10	Number of channels	Select	PI type,X type,single channel, dual channel, others	
11	Pressure range	Select	PN10,PN16,PN25	
12	Forward water temperature selection	Select	PT1~PT2/AI1~AI4/set	Users can set the parameters according to the site flow and usage requirements.
13	Return water temperature selection	Select	PT1~PT2/AI1~AI4/set	
14	Forward water temperature range	Set data	0~150	
15	Return water temperature range	Set data	0~150	
16	Forward water temperature setting	Set data	0~150.00	
17	Return water temperature setting	Set data	0~150.00	
18	Forward water pressure selection	Select	AI1~AI4/set	
19	Return water pressure selection	Select	AI1~AI4/set	
20	Forward water pressure range	Set data	0~2.500MPa	Users can set the parameters according to the site flow and usage requirements.
21	Return water pressure range	Set data	0~2.500MPa	
22	Forward water pressure setting	Set data	0~2.500MPa	
23	Return water pressure setting	Set data	0~2.500MPa	
24	Pulse output selection	Select	Flow / heat	
25	Pulse equivalent	Set data	0.01~9999.99L	
26	Pulse testing	Set data	0~5000Hz	
27	mA output selection	Select	Flow/energy	
28	Output range	Set data	0~999999	

29	mA test	Set data	0~20mA	
30	Communication address	Set data	0~255	
31	Baud rate	Select	1200/2400/4800/9600	
32	Time setting	Set data	Time format	
33	Zero clearing	Password	By default / Zero clearing	
34	Password	Set data	0000~9999	
35	Display mode	Select	Fixed display / cycle display	
36	Backlight timeout	Set data	0-99 minute(s)	
37	Display decimal digits	Select	Open / Close	
38	Flow mode	Select	Flow/Energy/Energy-C	
39	First page	Select	Flow mode: cumulative flow, instantaneous flow Heat mode: cumulative heat, cumulative flow, flow, supply temperature, return temperature	

5.2 Panel components(ABDT-UFM/UEM type)

The dual-path ultrasonic interaction panel consists of a 128 * 64 LCD display screen and six keys, which can display operational status, data transmission, parameter settings, and alarm information.(Figure 25)

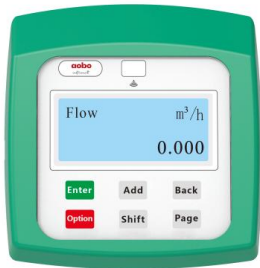


Figure 25

5.2.1 Keys

5.2.1.1 Key function

Table 6

No.	Item	Instruction
-----	------	-------------

1	Enter key	●In the operating interface, short-press to enter the programming interface. ●Confirm if the password is correct to enter the sub-menu. ●When changing settings, use this to enter the current setting item. ●Confirm the changed setting value.
2	Add key	● In the operating condition interface, press briefly to view the historical data. ●When changing numbers, short-press to increase the value. ●When changing parameters, short-press to switch between parameter options.
3	Back key	●When changing settings, use this to exit the current setting item. ●Return to the home page to save the modified parameters.
4	Option key	●When programming the interface, short-press to select the programming item. ●When recording the interface, short-press to toggle recording options.
5	Shift key	●When displaying operating conditions, short-press to check signal quality and configured parameters. ●When changing numbers, short-press to move the setting cursor position.
6	Page key	●Paging function for multiple pages.

5.2.1.2 Operation method of the modification value

Press the "Add" key once to add 1 to the selected number. Press the "shift" key once to move the cursor right by one position. After setting the desired value, press the "Enter" key to automatically move the cursor to the first position on the right, Meaning successful parameter setting. Pressing the "back" key returns to the main interface while automatically saving all modified parameters.

Menu Abbreviation Cross-Reference Table for ABDT-UFM/UEM Type

Table 7

No.	Menu abbreviation name	Menu full name/Explanation
1	VOLUME	Cumulative flow
2	F-V	Forward water velocity
3	WARING	Alarm

4	ENERGY-H	Heat
5	ENERGY-C	Cooling
6	Power	Instantaneous Heat /Cooling
7	DEN	Density
8	TEMP-F	Forward water temperature
9	TEMP-R	Return water temperature
10	ENTH-F	Forward Instantaneous Heat
11	ENTH-R	Return Instantaneous Heat
12	FLOW	Flow
13	CALC	Measurement
14	COMM	Communication
15	ZERO	Reset
16	SYS	System
17	CHEC	Check/Calculation
18	PATH-NUM	Number of channels
19	SOUND ANGLE	Installation angles
20	Cut-OFF	Cut-off flow rate/small signal cut-off
21	Cal-Mode	Measurement mode
22	Unit-P	Power unit
23	TEMP-F	Forward water temperature selection
24	PULSE-TYPE	Pulse output selection
25	Equivalent-V	Flow pulse equivalent
26	Equivalent-E	Heat pulse equivalent
27	BAUDRATE	Communication baud rate
28	ADDRESS	Communication address
29	CLEAR VOLUME	Clear the accumulated amount
30	Backlight-T	Backlight time
31	HIS-RECORD	History records

32	WARNING	Alarm records
33	POWER-OFF	Power-off records

5.2.2 Main Menu(Flow mode)

Display cumulative flow interface after power-on(Figure 26).



Figure26



Figure26-1



Figure26-2



Figure26-3

5.2.3 Main Menu(Heat/cooling mode)

Display Heat/cooling interface after power-on(Figure 27~Figure 27-8).



Figure27(Heat mode)



Figure27-1(Heat mode)

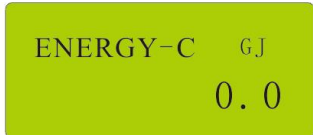


Figure27-2 (cooling mode)

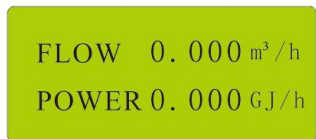


Figure27-3 (cooling mode)



Figure27-4



Figure27-5

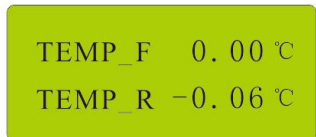


Figure27-6

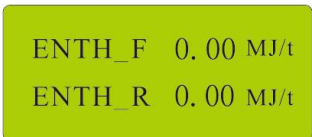


Figure27-7



Figure27-8

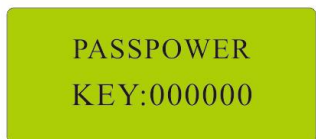


Figure28

5.2.4 Set basic operating parameters

Press "Enter" key on the main interface to input the password interface(Figure 28); Press "Option" key to select the corresponding parameters, and then press "Enter" key to input the parameters corresponding to the cursor.

After entering the programming password (default 002002),enter the internal parameter interface (Figure 29).

5.2.4.1 Internal parameters that need to be set in the meter(flow items)

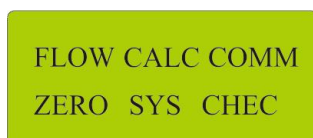


Figure29



Figure30



Figure30-1



Figure30-2

Nominal diameter of the instrument: The sensor diameter is input into the calculation (Figure 30).

Number of channels: You can choose from following channel types such as single channel, dual channels, triple channels and quadruple channels (Figure30-1).

Sound angles: There are six types of angles: A-F(Figure 30-2).

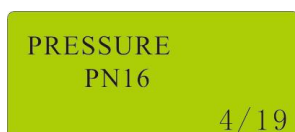


Figure30-3



Figure30-4



Figure30-5

Pressure channel: Optional PN10, PN16, PN25 three pressure channels(Figure 30-3).

Cut-off flow rate: Set the flow for small signal cut-off(Figure 30 -4).

Flow coefficient: According to the calibration data, it is set (Figure 30-5).

(Note: The parameters of the flow item including instrument diameter, number of channels, installation angle, and pressure channel have factory-preset according to the instrument parameters. Do not modify by unauthorized personnel!)

5.2.4.2 Internal parameters to be set in the instrument(Measurement item)

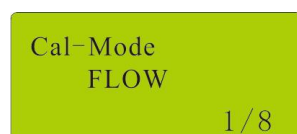


Figure31



Figure31-1

Measurement mode: Select flow, heat and cooling mode according to the actual needs; (Figure 31)

Power unit: the unit of measurement can be selected according to the instrument diameter and the actual heat consumption. The optional units includes kWh,MWh,GJ, MJ etc. (Figure 31-1).



Figure31-2



Figure31-3

Flow sensor position: When measuring heat/ cooling,choose the forward water pipe or return water pipe according to the site installation position of the instrument, and the instrument will conduct automatic temperature and pressure compensation calculation according to the setting. (Figure 31-2).

Forward water temperature selection: The temperature input signals are two Pt1000 platinum resistance (PT1 and PT2). When calculating heat or cooling capacity, select the platinum resistance channel corresponding to the water supply pipeline. If the forward temperature is PT1, the return temperature will automatically use PT2 (Figure 31-3);



Figure31-4



Figure31-5



Figure31-6

Pulse output selection: set the pulse equivalent corresponding to the accumulated flow or accumulated heat (Figure 31-4);

Flow pulse equivalent: When pulse is selected as flow, Set how much L per output pulse represents(Figure 31-5);

Heat pulse equivalent: When pulse is selected as heat, Set how much KJ per output pulse represents(Figure 31-6);

5.2.4.3 Internal parameter to be set for the instrument: Communication items



Figure32



Figure32-1

Communication baud rate: set MODBUS communication rate, see the internal parameters list for details(Figure 32);

Communication address: set MODBUS communication address, see the internal parameter list for details(Figure 32-1).

5.2.4.4 Other parameters

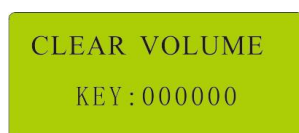


Figure33



Figure33-1

Clear the accumulated amount: After entering the password, press the "Enter" key to clear all the accumulated amount, including flow, heat/cooling (Figure 33).

Backlight time: 00 means backlight often open; 1-99 means backlight off without pressing any key after this time, unit: minute. The backlight only activates when connected to an external power; it remains off when powered by a battery (Figure 33-1).

5.2.5 Recording interface

In the main interface, press the "add" button to display the information of the recording interface. Press the "Optional" button to select historical, alarm, and power outage recording parameters; press the "Enter" button to enter the selected corresponding recording parameters:



Figure34



Figure34-1

History records: This instrument can store 9 groups history records data (Figure 34).



Figure35



Figure35-1

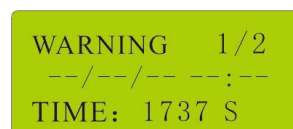


Figure35-2

WARNING 2/2
 FLOW 0.000m³/h
 VOLUME 0.0m³

Figure35-3

Alarm records: This instrument can store 5 sets alarm records (Figure 35 / -1 / -2 / -3).

POWER-OFF 1/6
 TIMES 16
 TIME-ALL 0.00H

Figure36

POWER-OFF1 2/6
 ---/---/--- --:--
 ---/---/--- --:--

Figure36-1

Power-off records: This instrument can store 5 groups power-off records and accumulated power-off times and accumulated power-off time (Figure 36 ,36 -1).

5.2.6 List of parameters and parameter range

Table 8

No.	Item	Sub-item		Parameter range	Unit	Note
1	Flow	Instrument Diameter		50~2000mm		The flow item is set at the factory. Do not modify by unauthorized personnel.
2		Number of Channels		single channel/dual channels/triple channels /quadruple channels/P1 channel/X channel,others reserved.		
3		Installation Angle		Angle A/Angle B/Angle C/Angle D/Angle E/Angle F		
4		Pressure channel		PN10,PN16,PN25		
5		Cut-off flow rate		0~9.99999	m/s	
6		Flow factor		0~9.9999		
7		Time difference	Time difference 1	-9.999~+9.999	ps	
8			Time difference 2	-9.999~+9.999	ps	
9			Time difference 3	-9.999~+9.999	ps	
10		Coefficient correction	Flow 1	Flow Coefficient1	m/s	
11			Flow 2	Flow Coefficient2	m/s	
12			Flow 3	Flow Coefficient3	m/s	
13			Flow 4	Flow Coefficient4		

14			Flow 5	Flow Coefficient5				
15	Measurement	Measurement Mode			Flow/Heat/Cooling			
16		Heat unit			KWh/MWh/GJ/MJ			
17		Flow sensor position			Supply water / return water			
18		Supply water temperature selection			PT1~PT2			
19		Pulse output selection			Flow / Energy			
20		Flow pulse equivalent			0~99.99		L	
21		Energy pulse equivalent			0~999.999		KJ	
22		Communication	Baud rate			1200/2400/4800/9600		
23	Communication address			0~999				
24	Enable			Yes/No				
25	Interval			0~99999		min		
26	Server IP			***.***.***.***				
27	Network port			0~99999				
28	Reset	Clearance of accumulated values, historical records, power-off records, and operating times						
29	System	Backlight time			0~99999		min	
30	Calibration	Used for platinum resistance zero and span calibration						Do not modify by unauthorized personnel.

VI. Common Fault Analysis and Judgment

6.1 Alarm message (ABDT-LCT type)

On the main interface, press the “Page” key to go to the alarm interface, as shown in Figure 37.



Figure37

Table 9

M1	Signal failure for channel 1	M2	Signal failure for channel 2
U1	Upstream probe failure for channel 1	D1	Downstream probe failure for channel 1
U2	Upstream probe failure for channel 2	D2	Downstream probe failure for channel 2
U	Sensor measurement module failure	E1	Channel configuration Error
T11	Sensor open circuit for temperature channel 1	T12	Sensor short circuit for temperature channel 1
T21	Sensor open circuit for temperature channel 2	T22	Sensor short circuit for temperature channel 2

6.2 Alarm message (ABDT-UFM/UEM type)

On the working interface, press the “Page” button to view alarm information, as shown in Figure 38.



Figure38



Figure38-1

Table 10

S1	Probe failure for channel 1	S2	Probe failure for channel 2
T1	Not connected or connected incorrectly for platinum resistance 1	T2	Not connected or connected incorrectly for platinum resistance 2
B1	Not connected for battery or Low Battery	Channel configuration error	Configuration Error: Channel numbers, Installation angle or pressure channels

Common fault analysis and troubleshooting:

6.3 No display on the instrument

- A. Check if the power supply is connected;
- B. Check if the supply voltage meets the requirements;
- C. Check if the power terminal is properly tightened.

6.4 U1D1 or U2D2 alarm (S1 or S2 alarm)

- A. Check if the wiring is correct between the four probe cables 1A,1B,2A and 2B and four probe of the pipe section, ensuring the correct sequence and that the connecting nuts are fully tightened;
- B. Check if the wiring is correct between the four probe cables 1A,1B,2A and 2B and the corresponding terminals of the converter, ensuring the correct sequence and that the connecting nuts are fully tightened;
- C. Check for broken wires in the probe cable;
- D. Check pipe section probes for water ingress or corrosion.

6.5 M1 or M2 alarm

- A. Check whether the probe cable is pressed;
- B. Check pipe section probes and problem cables for water ingress or corrosion.
- C. Check pipeline for air accumulation and vent if necessary;
- D. Check whether there is sediment in the probe position of the pipe section. If so, it should be cleaned up in time.

6.6 T11, T21 alarm (T1 or T2 alarm)

T11: The temperature channel 1 is open circuit. Check whether the PT1000 platinum resistance is properly connected to the PT1 and PT- terminals of the host and whether there is any broken wire in the cable.

T21: The temperature channel 2 is open circuit. Check whether the PT1000 platinum resistance is properly connected to the PT2 and PT- terminals of the host and whether there is any broken wire in the cable.

6.7 T12, T22 alarm

T12: Check whether the short circuit of temperature 1, whether the platinum resistance of PT1000 and the PT1, PT- terminal of the main unit are properly connected, and whether there is a short circuit in the platinum resistance cable;

T 22: Check whether the PT1000 platinum resistance is connected to the PT 2 and PT-terminal of the main unit, and whether the platinum resistance cable is short-circuited.

6.8 Flow measurement inaccuracies or deviations

A. Check whether the flow direction of the flowmeter is consistent with that of the pipeline;

B. Check whether the flowmeter probe cables 1A,1B,2A and 2B are correctly connected to the host and ultrasonic pipe section labels, and there is no disconnection or virtual connection;

C. Check whether the measuring liquid is filled in the sensor measuring tube, and whether there is gas accumulation or sediment in the pipeline. If so, it is necessary to discharge gas or clean the sediment in the pipeline;

D. Check whether the above reported information exists. If so, eliminate each item according to the above reported information.

If there is any problem in the operation process, you can follow the above troubleshooting. If the instrument still cannot work well, please contact our company in time.

ABDT-LCT Ultrasonic Flowmeter Specifications

ABDT-LCT Ultrasonic Flowmeter Specifications

ABDT-LCT	a	b	c	d	e	f	g	h
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Instrument type		LCT						Ultrasonic Flowmeter
a	Sensor	G						Flange Pipe Type
		W						Insertion Type
b	Path	DW						Dual-path
		PW						Multi-path
c	Working Temperature	L						Normal temperature (<60℃)
		G						High temperature (≤160℃)
d	Protection	Y						Integrated type
		F						Remote Display type
e	Protection	1						IP 65
		2						IP 68
f	Ex-mark	1						None
		2						Ex d IIB T4 Gb
g	Power Supply	1						AC 220V
		2						DC (9~24V)
		3						DV3.6V Battery
h	Diameter (mm)						xx	DN50~DN2000

Note:

This model has 4-20mA output signal and RS485 communication by default.

ABDT-UFM130 Ultrasonic Flowmeter Specifications

ABDT-UFM130 Ultrasonic Flowmeter Specifications

ABDT-UFM130			a	b	c	d	e	f	g	h	i	
a	Body Material	C										Carbon Steel
		S										Stainless Steel
b	Measuring Temperature	A										(0~50) °C *
		L										(0~80) °C
		G										(0~130) °C
		H										(0~200) °C
c	Installation	Y										Integrated Type
		F										Remote Display Type
d	Nominal Pressure	C										PN16
		D										PN25
		E										PN40
e	Protection	1										IP65
		2										Sensor IP68+ConverterIP65
f	Power Supply	A										DC3.6V Battery
		B										DC24V
		C										DC3.6V Battery+DC24V
g	Communication							4				RS485
h	Output Signal								p			Pulse
i	Pipe Diameter (mm)									XX		DN50-DN2000

Note:
1.Default Model:ABDT-UFM130CLYC1C4PXX;
2.DC3.6V battery without RS485 communication;
3.Any parameters you want to implement,We can do more.

ABDT-UEM140 Ultrasonic BTU Flowmeter Specifications

ABDT-UEM140 Ultrasonic BTU Flowmeter Specifications

ABDT-UEM140		a	b	c	d	e	f	g	h	i	j	
a	Body Material	C										Carbon Steel
		S										Stainless Steel
b	Measuring Temperature	A										(0~50) °C *
		L										(0~80) °C
		G										(0~130) °C
		H										(0~200) °C
c	Installation	Y										Integrated Type
		F										Remote Display Type
d	Nominal Pressure	C										PN16
		D										PN25
		E										PN40
e	Protection	1										IP65
		2										Sensor IP68+ConverterIP65
f	Power Supply	A										DC3.6V Battery
		B										DC24V
		C										DC3.6V Battery+DC24V
g	Communication						4				RS485	
h	Output Signal							p				Pulse
i	Pipe Diameter (mm)								XX			DN50-DN2000
j	PT1000									J	A class	
										G	B class	

Note:
1.Default Model:ABDT-UEM140CLYC1C4PXXG;
2.DC3.6V battery without RS485 communication;
3.Measuring temperature within (0~50) °C is for colling metering;
4.Any parameters you want to implement,We can do more.

Contact

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