aobo instrument

2024
PRODUCT
INTRODUCTION

Dual-path Liquid Ultrasonic Flowmeter

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Company Profile

Weifang AOBO Instrument Technology Development Co., Ltd., founded in 2002, with registration capital of 10 million RMB, is a "High-Tech" and "Double-Software Certification" enterprise specialized in "flow measurement and intelligent measurement & control" industry, integrating R&D, production, sales and service.

The company has a core R&D team for computer software and technology, automatic intelligent control, HVAC engineering design and flow measurement. It has the ability to provide customers with specific solutions and complete sets of products according to their different needs, based on years of practical experience. Especially in the heating industry, by the customer's recognition, has a high reputation in the industry.

The products are mainly used in the measurement and control of "steam, liquid, gas, sewage and tap water"; and especially suitable for energy monitoring and energy-saving control in many industries, such as thermal power plants, thermal companies, residential heating, petroleum, chemical industry, papermaking, food, coating, printing & dyeing and HVAC.

Since its foundation, based on self-developed and leading technology, reliable quality, high-quality service and good reputation, our company has been warmly accepted by customers, and become a designated supplier for many central enterprises and listed companies.

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I. Product Overview

ABDT-LCT-DW Dual-path liquid ultrasonic flowmeter adopts the time difference method to calculate the flow and uses advanced micro-processing digital technology, which is especially suitable for the flow measurement of regional heating, heat source plant, heat exchange station, HVAC (air conditioning refrigeration equipment), tap water and other liquids.

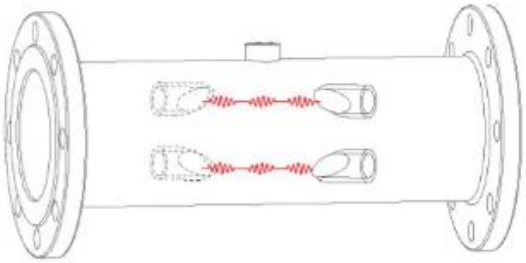
ABDT-LCT-DW Dual-path liquid ultrasonic flowmeter includes flow sensor and flow converter; flow sensor adopts multi-channel ultrasonic wave to measure the medium flow speed of different fluid layers in the pipeline and automatically compensates the cross-section flow speed of the medium in the pipeline. Flow converter adopts a high speed mixed signal processing CPU and it is equipped with high precision time measurement system to achieve ps grade. It has fast dynamic response speed, making higher accuracy of flow speed measurement and repeatability and better stability.

The transducer has the continuous flow maintenance and replacement function to completely solve the sensor leakage problem.

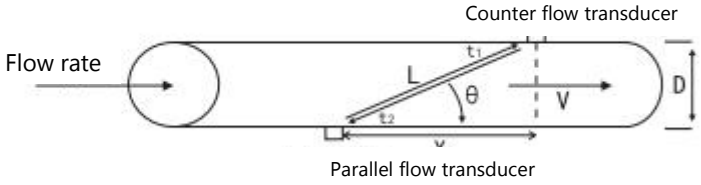
II. Operational Principle

ABDT-LCT-DW Dual-path liquid ultrasonic flowmeter adopts the measurement principle of time difference method. A sound wave travelling in the direction of flow of the product is propagated at a faster rate than one travelling against the flow, hence the acoustic signal transmission time has a difference (instant difference). The time difference method ultrasonic flowmeter is measured according to the specific principle of the specific relationship between the medium flow speed and the time difference. As long as the time upstream and downstream are accurately determined, the instantaneous flow speed can be found

according to the flow speed and its specific relationship and then the instantaneous flow can be calculated.



The transducers (sensors) are installed on both sides of the fluid line and separated by a certain distance. It is assumed that the internal diameter of the pipeline is D and the length of ultrasonic passed is L. The spacing of 2 transducers in the pipeline direction is X and ultrasonic transmission time downstream is t1 and the transmission time upstream is t2. The angle of ultrasonic transmission direction and fluid flow direction is θ, so t1, t2 and can be expressed in the following formula:



$$t_1 = \frac{L}{C + VCOS\theta} \qquad t_2 = \frac{L}{C - VCOS\theta}$$

$$\Delta t = t_2 - t_1 = \frac{2LVCOS\theta}{C^2 - V^2COS^2\theta} \approx \frac{2LVCOS\theta}{C^2} (C >> V)$$

$$V = \frac{\Delta t C^2}{2LCOS\theta}$$

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

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

III. Product Characteristics

(1) No cut-out online maintenance;

(2) Strong anti-bubble and anti-interference ability;

(3) The sensor resists high temperature up to 200℃;

(4) The dynamic measurement range is above 1:50;

(5) Measure the flow speed of different profiles for the best accuracy;

(6) Full-pass pipe section structure, with no pressure drop and stable flow speed;

(7) Integrated or remote type installation;

(8) Measuring liquid is not affected by electrical conductivity;

(9) One-way up to 5000Hz high-speed pulse output;

(10) One-way standard (4-20) mA current output;

(11) M-BUS communication interface;

(12) RS232/485 interface, standard MODBUS protocol.

IV. Technical Parameter(s)

Nominal diameter: DN50-DN2000;

Measurement medium(s): Non corrosive, single, pure sound transmitting liquid;

Medium temperature: ≤200℃;

Accuracy: 1.0%;

Repeatability: 0.2%;

Measurable range 1:100

Case material: carbon steel; stainless steel;

Power supply: AC220V±10%, 50Hz or（9-24）VDC；

Signal output: pulse equivalent (0.01-9999) L/N (set), stability of 30ppm, standard current (4-20)mA output;

Communication output: M-BUS communication interface, RS232/485 interface, standard MODBUS protocol.

V. Flow Converter

The flow converter has a hardware temperature compensation circuit and software temperature compensation model, which is more suitable for heating high-temperature water metering compared to other flow meters to ensure the accuracy of flow measurement at different temperatures. Equipped with 6 multi-function buttons, industrial large screen LCD display, optional Chinese and English menu, humanized design and simple operation.

1.Flow measurement

High-performance measurement chip, instrument instantaneous flow resolution 0.001m^3/h, cumulative flow resolution 0.1L.

2.Pulse output

The instrument can output 1-way of high-speed pulse, range (1-5000)Hz, pulse equivalent(0.01-9999.99)L/N can be set.

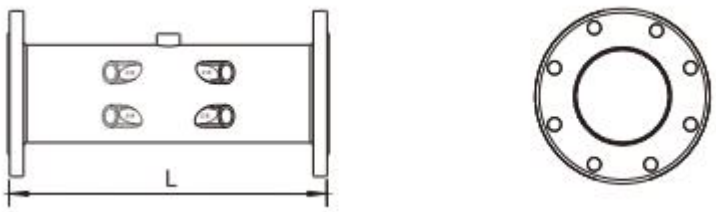
3.Standard current signal output

The instrument can output a 1-way (4-20)mA signal. Accuracy 0.5%FS.

4.Standard current signal input

The instrument supports standard current signal input, measure range (4-20)mA.

VI. Body Size



Overall dimension (mm)

Diameter (DN)	50	65	80	100	125	150	200	250

L(mm)	300	350	350	350	350	500	500	600/450
Diameter (DN)	300	350	400	450	500	600	700	800
L(mm)	500	550	600	625	625	750	875	1000
Diameter (DN)	900	1000	1200	1400	1600	1800	2000	
L(mm)	1230	1300	1360	1400	1480	1560	1660	

Note : Flange std.:GB/T9124.1-2019

VII. Installation Mode Features

(1) It is suitable for some pipes with poor sound conduction due to poor material;

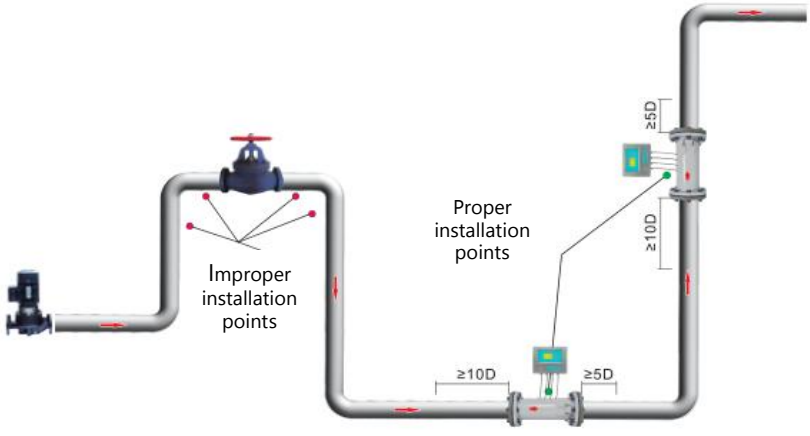
(2) It is suitable for the cases, where ultrasonic signal attenuation is serious, and the insert type sensors cannot be installed due to serious rust, liner and pipeline space clearance and other reasons;

(3) Pipe segment sensor solves the problem of poor measurement accuracy caused by the installation process of clamp-on type sensor and insert type sensor;

(4) It solves the problem of decreasing measurement accuracy caused by artificial installation and debugging error;

(5) It is suitable for liquid measurement of normal pipe diameter with high accuracy.

7.1 Installation requirements



Installation & measurement point(s)

7.2 Measurement point selection

The ultrasonic flowmeter is the simplest and most convenient in the installation of all flowmeters. Simply select a suitable measuring point and input the pipe parameters at the measuring point into the flow converter to install the sensor. When selecting the measurement point, the selection of the fluid field is required to ensure the measurement accuracy. The following principles shall be followed during the installation:

(1)Select fluid-filled segments, such as horizontal fluid-filled segments or vertical sections where the fluid flows from bottom to up;

(2)The measuring point shall be at least 10 times diameter (≥ 10D) from the upstream and more than 5 times diameter (≥ 5D) from the downstream. There are no valves, elbows, reducer or expand pipe size and other devices that interfere with the flow field within this range. If there is a pump, three-way, regulating valve, orifice, gradually expanding pipe section or other devices that will cause rotating flow in front of the measuring point, the upstream straight pipe section shall be longer. On the horizontal pipe section, the sensor is generally installed at 9 o'clock and 3 o'clock (horizontal) positions of the pipe;

(3)Avoid 6 and 12 o'clock (vertical) positions to avoid signal attenuation caused by the sediment at the bottom of the pipeline or the bubbles or holes on the upper part of the pipeline;

(4)Ensure that the temperature at the measuring point is within the measurable working range;

(5)Consider reserving 1-2 persons operation space for installation to facilitate maintenance;

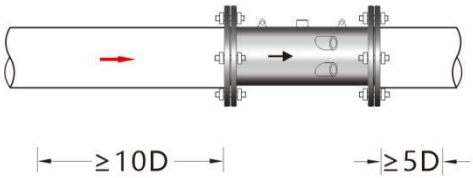
(6)Buried pipeline and piping shaft, pay attention to waterproof and moisture-proof;

(7)The scale condition of the clamp-on type ultrasonic flowmeter is fully considered during the installation, and the pipe section without scale is selected for measurement as far as possible. If it is not fully satisfied, the scale should be considered as the liner to obtain better measurement accuracy;

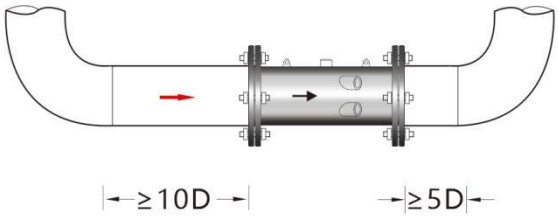
(8)When installing clamp-on type ultrasonic flowmeter, select pipe sections with uniform density and easy ultrasonic transmission.

7.3 Installation precautions

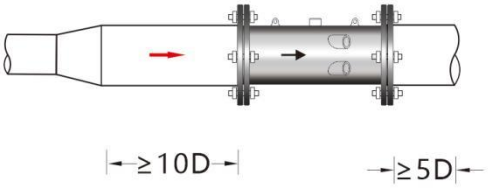
Keep long enough straight pipe section upstream and downstream of the ultrasonic flow sensor (D is the sensor diameter) as required in the figure below



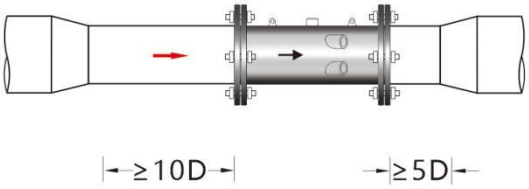
Horizontal straight pipe



Installation at lower part of pipe to ensure full pipe

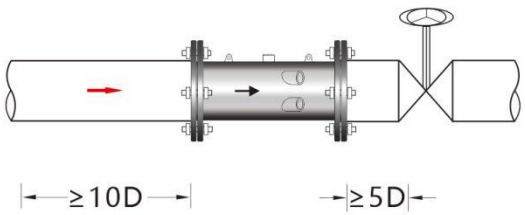


Concentric pipe-expanding



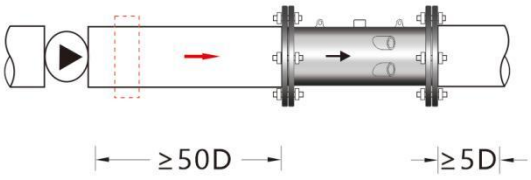
Concentric pipe-contracting

Globe valve



Valve installation behind meter to avoid turbulent flow

Water pump



Water pump installation before meter to avoid negative pressure and maintain 50-fold straight pipe sections

VIII. Production Type Selection

ABDT-LCT Ultrasonic Flowmeter Specifications

ABDT-LCT	a	b	c	d	e	f	g	h

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.

VX. Liquid Flow and Velocity Table

FlowVelocity -Flow Rate Comparison Table										
Flow rate m^3/h / Flow velocity m/s / Diameter mm	0.05	0.1	0.2	0.3	0.5	1	2	3	4	5
6	/	0.010	0.020	0.030	0.051	0.102	0.204	0.305	0.407	0.509
8		0.018	0.036	0.054	0.090	0.181	0.362	0.543	0.724	0.904
10	/	0.028	0.057	0.085	0.141	0.283	0.565	0.848	1.130	1.413
12		0.041	0.081	0.122	0.204	0.407	0.814	1.221	1.623	2.035
15	0.032	0.064	0.127	0.191	0.318	0.636	1.272	1.909	2.545	3.181
20	0.057	0.113	0.226	0.339	0.565	1.131	2.262	3.393	4.527	5.655
25	0.088	0.177	0.353	0.530	0.883	1.767	3.534	5.301	7.069	8.836
40	0.226	0.452	0.904	1.356	2.261	4.523	9.048	13.572	18.096	22.620
50	0.353	0.707	1.413	2.120	3.532	7.069	14.137	21.206	28.274	35.343
65	0.597	1.194	2.388	3.582	5.970	11.946	23.892	35.838	47.784	59.730
80	0.905	1.809	3.617	5.426	9.043	18.096	36.191	54.287	72.382	90.478
100	1.414	2.826	5.652	8.478	14.13	28.274	56.549	84.823	113.097	141.371
150	3.181	6.359	12.717	19.08	31.79	63.617	127.235	190.852	254.470	318.086
200	5.655	11.304	22.608	33.91	56.52	113.10	226.19	339.29	452.39	565.49
250	8.836	17.663	35.325	52.99	88.31	176.71	353.43	530.14	706.86	883.57
300	12.72	25.434	50.868	76.30	127.17	254.47	508.94	763.40	1017.88	1272.35
350	17.32	34.619	69.237	103.86	173.09	346.36	692.72	1039.08	1385.44	1731.80
400	22.62	45.216	90.432	135.65	226.08	452.39	904.78	1357.17	1809.56	2261.95
450	28.63	57.227	114.30	171.68	286.13	572.56	1145.11	1717.67	2290.22	2862.78
500	35.34	70.650	141.30	211.95	353.25	706.86	1413.72	2120.58	2827.43	3534.29
600	50.89	101.74	203.472	305.21	508.68	1017.88	2035.75	3053.63	4071.50	5089.38
700	69.27	138.47	276.948	415.42	692.37	1385.44	2770.88	4156.32	5541.77	6927.21
800	90.48	180.86	361.728	542.59	904.32	1809.56	3619.11	5428.67	7238.23	9047.79
900	114.5	228.91	457.812	686.72	1144.53	2290.22	4580.44	6870.66	9160.88	11451.1
1000	141.4	282.60	565.20	847.8	1413	2827.4	5654.9	8482.3	11309.7	14137.2
1200	203.6	406.94	813.888	1220.83	2034.72	4071.5	8143.0	12214.5	16286.0	20357.5
1400	277.1	553.90	1107.79	1661.69	2769.48	5541.8	11083.5	16625.3	22167.1	27708.8
1600	361.9	723.46	1446.91	2170.37	3617.28	7238.2	14476.5	21714.7	28952.9	36191.1
1800	458.0	915.62	1831.25	2746.87	4578.12	9160.9	18321.8	27482.7	36643.5	45804.4
2000	565.5	1130.4	2260.8	3391.2	5652	11309.7	22619.5	33929.2	45238.9	56548.7

2200	684.2	1367.78	2735.57	4103.35	6838.92	13684.8	27369.6	41054.3	54739.1	68423.9
2400	814.3	1627.78	3255.55	4883.33	8138.88	16286.0	32572.0	48858.1	64144.1	81430.1
2600	955.7	1910.38	3820.75	5731.13	9551.88	19113.4	38226.9	57340.3	76453.7	95567.1

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