aobo
instrument

Handbook

ABDT-LFM Metal Rotameter

Weifang AOBO Instrument Technology Development Co.,Ltd

CONTENTS

I. Product Overview 2

II. Measuring Principle 2

III. Features 3

IV. Technical Parameters 4

V. Structural Composition of Intelligent Metal Tube Totameter Flowmeter 4

VI. Indicator and Limit Alarm Device 11

VII. Caliber Calculation and Flow Meter 13

VIII. Flow Meter Installation Methods and Precautions 16

I. Product Overview

Metal tube ratometer flowmeter is a kind of variable area flow measuring instrument. It has features as small volume, large detection range and convenient operation. It is especially suitable to measure flow media with small flow velocity and small flow speed.

Over the past years, metal tube rotameter flowmeter is widely applied in the industries such as petrochemical, steel, power, metallurgy, light industry, food, pharmacy and water treatment, it has superior performances and satisfactory performance-price.

II. Measuring Principle

Our metal tube float flowmeter is composed of two parts:sensor and indicator. The sensor is mainly composed of a connect flange,measuring tube,float and an upper and lower guide. The indicator consists of housing,magnetic drive system,dial, and an electric remote transmission system.

In the vertical measuring tube, there is a measuring part that can be moved up and down-float (Fig. 1). When the fluid pass through the tube from bottom to top,the float is subjected to the force of the fluid and moves upwards along the tube. When flow rate increases,float displacement increases.When flow rate decreases,float displacement decreases.

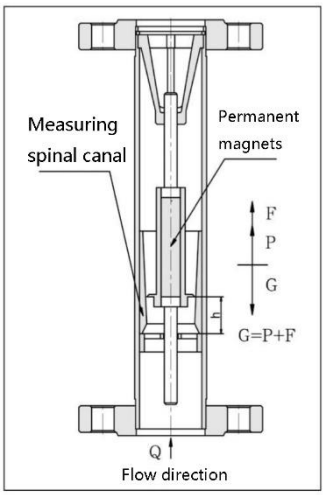


Fig. 1

The position of float in the measuring tube is determined so as to determine the size of the annular area between the float and the conical tube. When the flow rate of the fluid is maintained at a constant flow rate Q, the float is also in a state of dynamic equilibrium and stays at a position h in the conical tube where the annular area

between the float and the conical tube remains constant. The float is subjected to three forces: the gravity G of the float, the buoyancy F of the float, and the force P of the float by the fluid. These three forces reach equilibrium. According to the laws of fluid dynamics, the principle of force balance, and the law of fluid continuity, the instantaneous fluid flow through the annular area can be calculated at this time. Therefore, the metal tube float flow meter is a principle of measuring the flow rate with a variable area.

Inside the float, a high-performance permanent magnet is embedded. When the float is in an equilibrium position, a uniform and stable magnetic field is formed around the float. A magnetic sensor is installed on the outside of the conical tube, so that the linear displacement of the float in the measuring tube can be transmitted to the indicator through a non-contact manner, and after detection and processing, it is finally displayed on the indicator dial or the output is correspondingly the standard 4 ~ 20mA current signal.

III. Features

- ♦ Suitable for small-diameter and low-flow media flow measurement;
- ♦ The requirement for straight pipe sections is not high;
- ♦ Keyboard on indicator, convenient operation setting;
- ♦ Non-contact magnetic coupling drive;
- ♦ Optional DC power supply or battery power supply mode;
- ♦ With data recovery, data backup and power-down protection;
- ♦ Dual-line LCD display, on-site instantaneous/cumulative flow display;
- ♦ Reliable operation, low maintenance, long service life;
- ♦ Wide range ratio 10:1;
- ♦ Full metal structure, suitable for high temperature, high pressure and strong corrosive media;
- ♦ Can be used in flammable and explosive dangerous situations;
- ♦ Multi-parameter calibration function.

IV. Technical Parameters

Nominal diameter:DN15,DN25,DN50,DN80,DN100,DN150 DN200 etc. (Other diameters can be customized).

Measurement range(water):1-250000l/h (gas):0.05～3000m^3/h.

Ratio of range :10:1　　20:1 for special type

Precision degree:1.5 grade

Pressure Grade:DN15-DN50 4.0-40MPa　　DN80: 1.6MPa-10MPa

DN100 1.6-6.4MPa　　DN150: 1.6MPa-4.0MPa

Media temperature: standard type:-30℃～100℃,High Temp.:120℃～350℃

Power supply:24VDC, Lithium battery, 220VAC

Environment temperature: Field pointer type:-40℃～120℃, remote type:-30℃～60℃

Storage conditions: Temperature: -40~85 ℃ Humidity: ≤ 85%

Connection: Flange, clamp, thread(client supply the related standard)

Electrical interface:M20*1.5

Protection level:IP65

Explosion proof: Exia Ⅱ C T6 Ga

Pressure lose:see detailed table

Media viscosity:DN15: η <5mPa.s　DN25: η <250mPa.s　DN50-DN150:< η <300mPa.s

Wetted Liquid material: R1:304, 0Cr18Ni9Ti　RO:316Ti, 0Cr18Ni12Mo2Ti　HC: Hastelloy C RL:316L　00Cr17Ni14Mo2　Ti: Titanium alloy　RP: PTFE lining

V. Structural Composition of Intelligent Metal Tube Rotameter Flowmeter

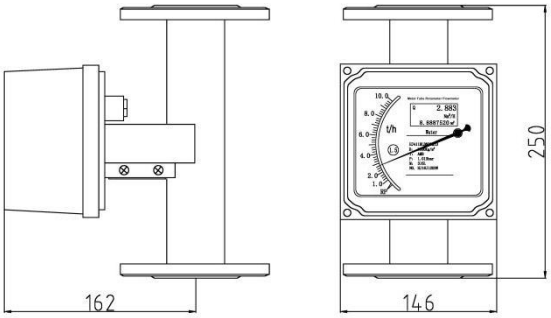
This metal tube rotameter flowmeter consist of two parts: measuring tube and indicators.By selecting different forms of measuring tubes and indicators, various forms of complete instrument can be assembled to meet the needs of the site. The appearance and dimensions of various types of flow meters, connection flange standards, and installation

dimensions of magnetic filters are as follows.

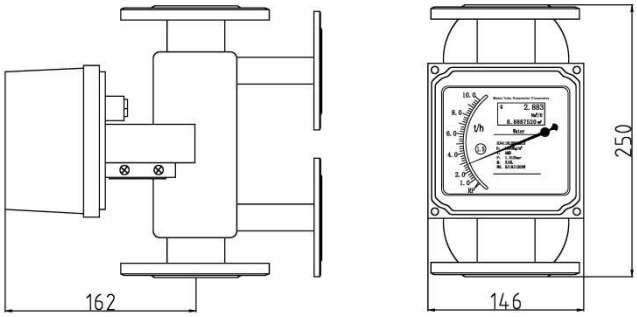
5.1 Product classification

The metal tube float flowmeter can be divided into six types according to the indicator structure, and each indicator structure can be further divided into standard type, high temperature type, jacket type, etc. Below are separate explanations. Described separately below.

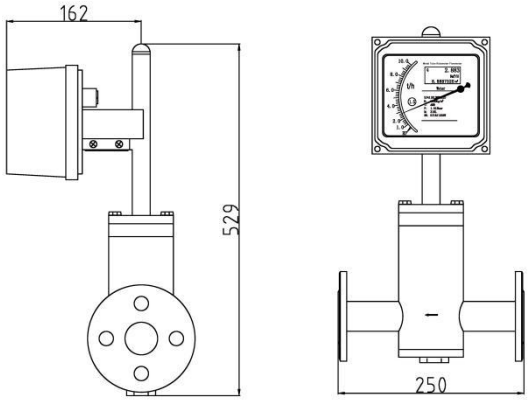
5.1.1 M1 type indicator



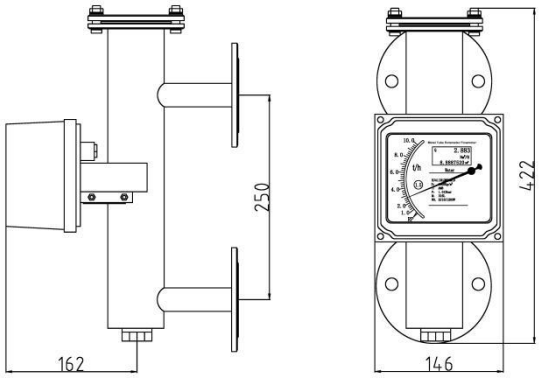
M1 Vertical type



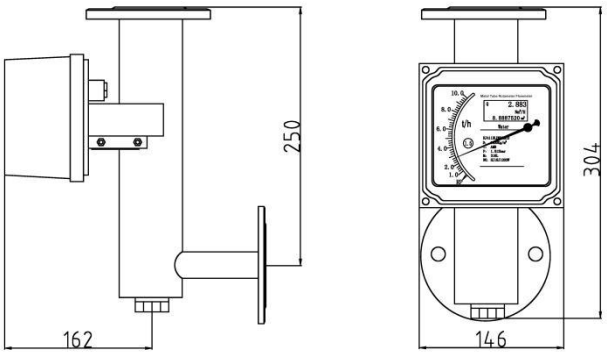
M1 Insulation jacket type



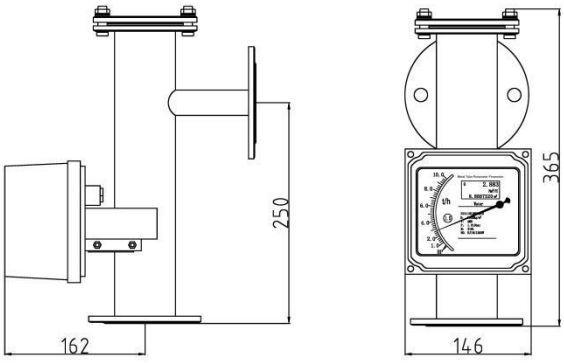
M1 T Horizontal type



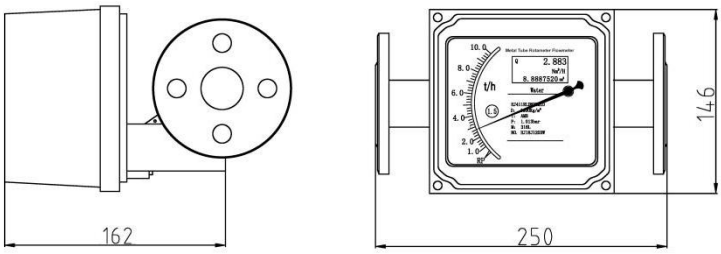
M1 Side in and side out type



M1 Side in and up out type

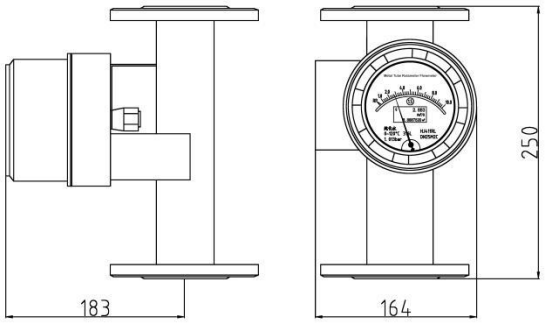


M1 Bottom in and side out

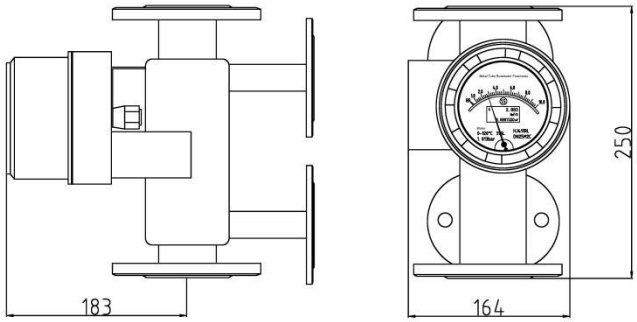


M1 Horizontal spring type

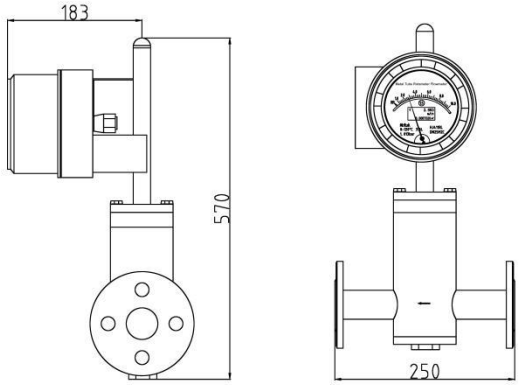
5.1.2 M2 type indicator (the same to M5 type indicator)



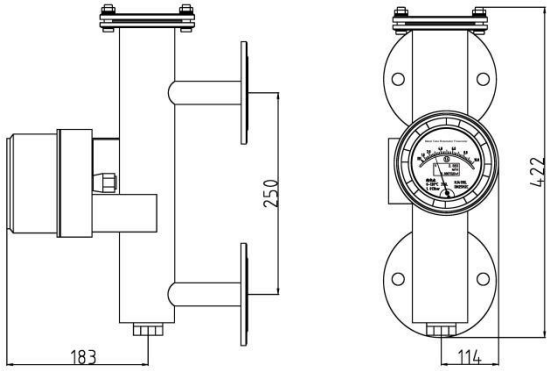
M2 Vertical type



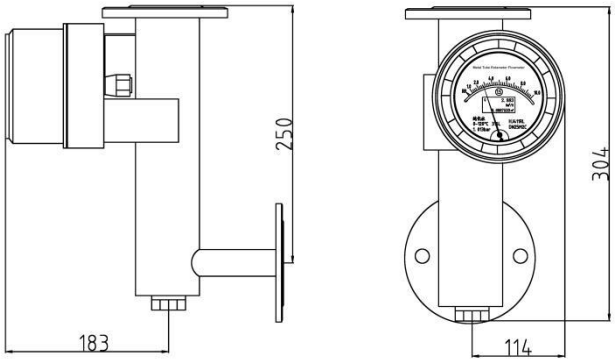
M2 Insulation jacket type



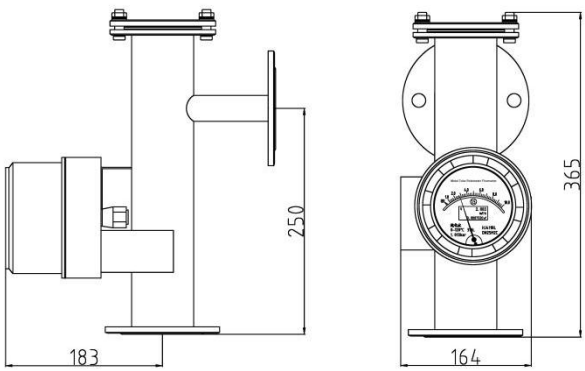
M2 T Horizontal type



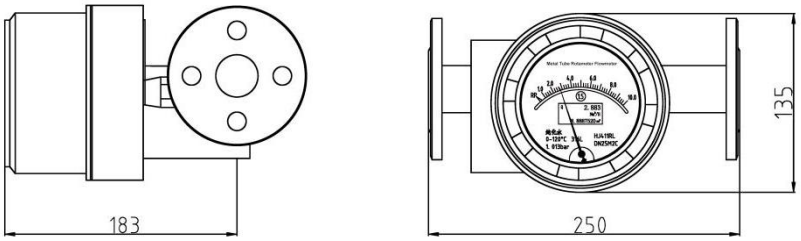
M2 Side in and side out type



M2 Side in and up out type

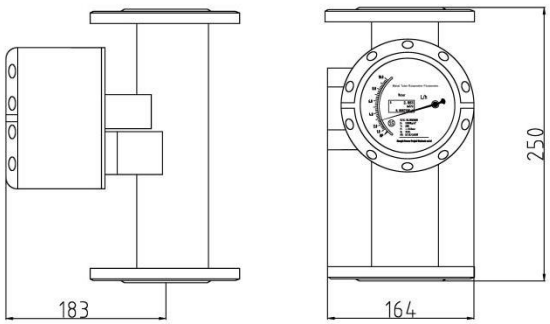


M2 Bottom in and side out

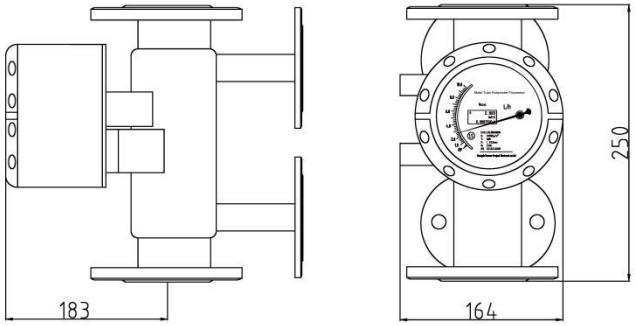


M2 Horizontal spring type

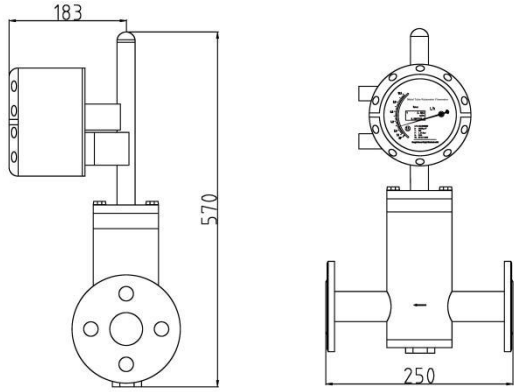
5.1.3 M6 type indicator



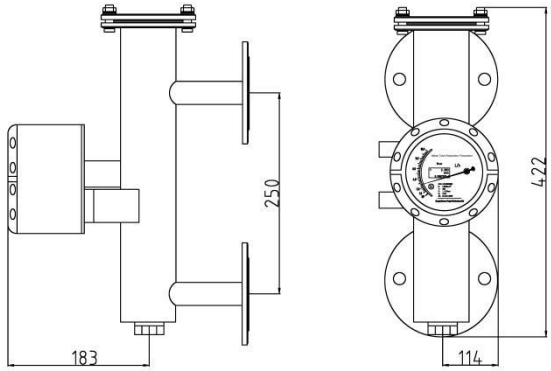
M6 Vertical type



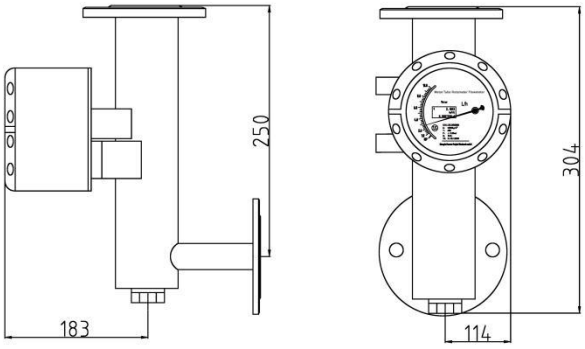
M6 Insulation jacket type



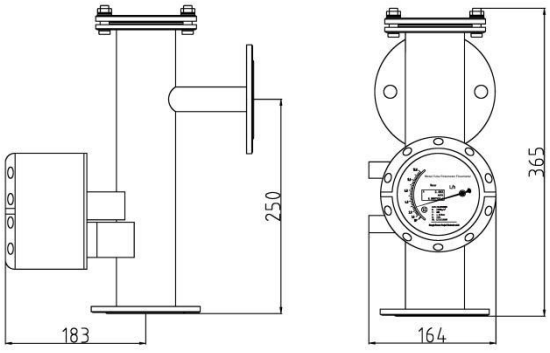
M6 T Horizontal type



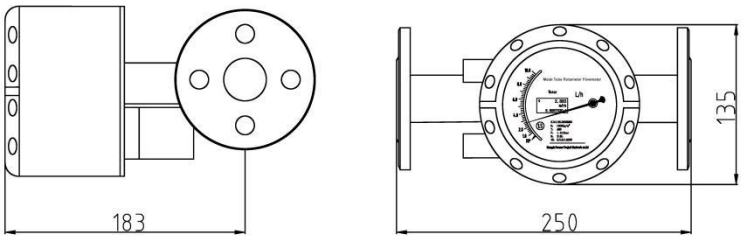
M6 Side in and side out type



M6 Side in and up out type



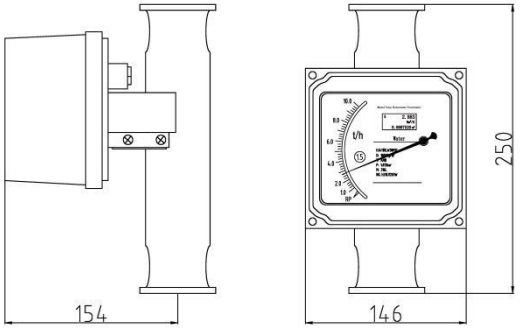
M6 Bottom in and side out



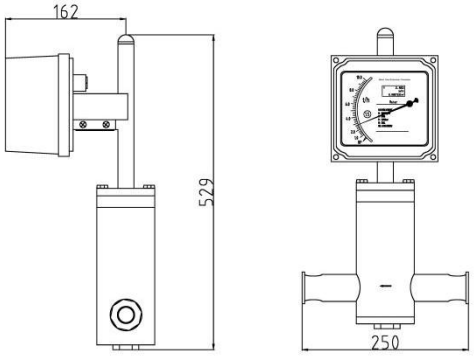
M6 Horizontal spring type

Caliber	DN15	DN25	DN50	DN80	DN100	DN150	DN200
Vertical type Kg	5	6.5	10	16	17	35	50
Jacket type Kg	7.5	9.5	13	19	20	40	55
T type horizontal Kg	6	10	20				
horizontal spring type Kg				16	17	35	50
bottom in and side out type Kg	6	7	14	24	28	52	60
Side in and side out type Kg	5.5	6.5	13	22	26	50	57
Side in and up out type Kg	5.5	6.5	10.5	16	17	36	52

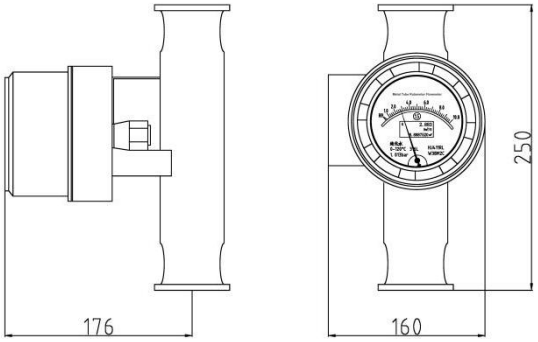
5.1.4 Sanitary Type



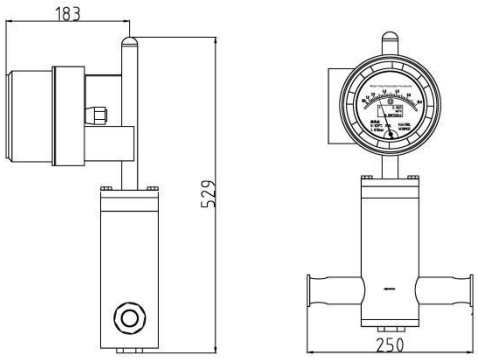
M1 Vertical sanitary type



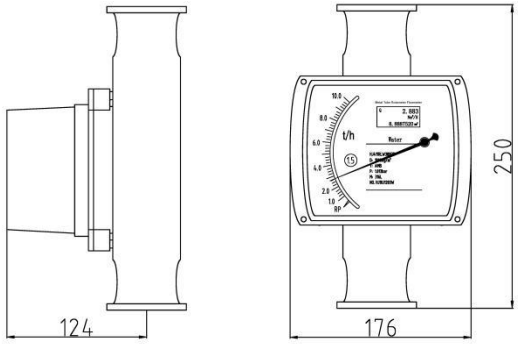
M1 Horizontal sanitary type



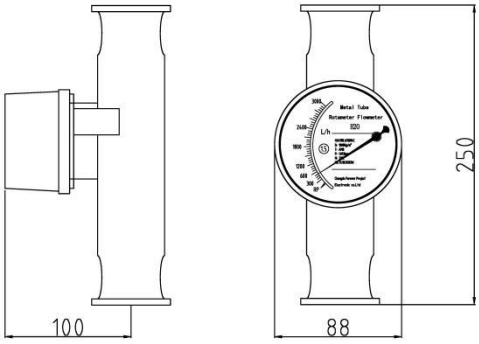
M2 and M5 Vertical sanitary type



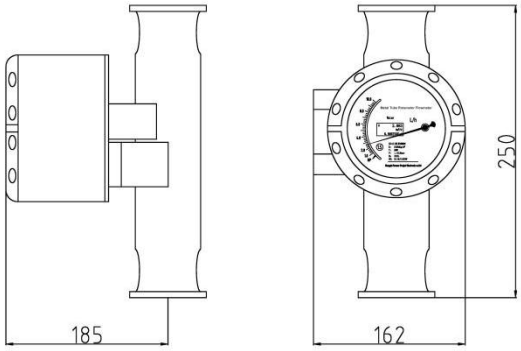
M2 and M5 Horizontal sanitary type



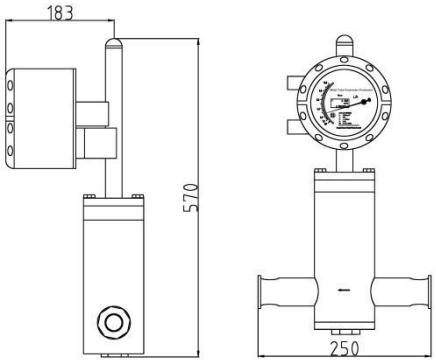
M3 Vertical sanitary type



M4 Horizontal sanitary type



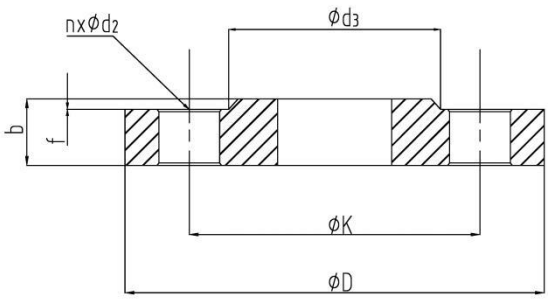
M6 Vertical sanitary type



M6 Horizontal sanitary type

5.2 Flange size

The metal tube float flow meter standard type adopts GB/T9119-2000 flange standard, other flanges standards are made according to user requirements.



DN/PN	D	K	d3	b	F	N	D2
1.5/4.0	95	65	46	14	2	4	14
25/4.0	115	85	65	16	2	4	
50/4.0	165	125	99	20	2	4	18
80/1.6	200	160	132	20	2	8	18
100/1.6	220	180	156	22	2	8	18

125/1.6	250	210	184	22	2	8	18
150/1.6	285	240	211	24	2	8	22

Chinese national standard flanges (GB/T9119-2000)

DN	D	K	d3	b	F	N	D2
1/2"	88.9	60.5	35.1	11.2	1.6	4	15.7
1"	108	79.2	50.8	14.2	1.6	4	15.7
2"	152.4	120.7	91.9	19.1	1.6	4	19.1
3"	190.5	152.4	127	23.9	1.6	4	19.1
4"	228.6	190.5	157.2	23.9	1.6	8	19.1
5"	254	215.9	185.7	23.9	1.6	8	22.4
6"	279.4	241.3	215.9	25.4	1.6	8	22.4

American national standard flange (ANSI B 16.5 150lb)

DN/PN	D	K	d3	b	F	N	D2
1.5/4.0	95	65	46	16	2	4	14
25/4.0	115	85	68	18	2	4	14
50/4.0	165	125	102	20	3	4	18
80/1.6	200	106	138	20	3	8	18
100/1.6	220	180	162	20	3	8	18
125/1.6	250	210	188	22	3	8	18
150/1.6	285	240	218	22	3	8	22

German national standard flange (DIN2501)

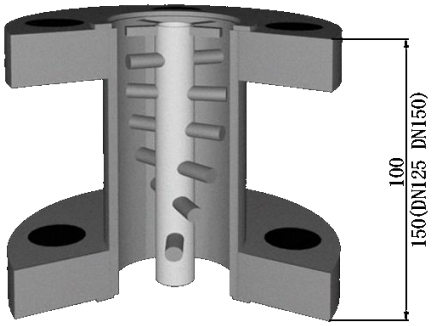
Standard	Name	Pressure rating PN MPa					Standard	Name	Pressure rating PN MPa
HG20527-1992	Steel pipe flange	0.6	1	1.6	2.5	4	DIN2527-1992	Flange	0.25-10.0
HG20592-1992	Steel pipe flange	0.6	1	1.6	2.5	4	DIN2566-1975	Thread flange	1.0-1.6
HG20592-1997	Steel pipe flange	0.6	1	1.6	2.5	4	DIN2573-1975	Welding plate flange	0.6-1.0
HGJ44-76-1991	Steel pipe flange	0.6	1	1.6	2.5	4	DIN2655-1975	Flat welding ring plate flexible flange	0.25-4.0
GB112-9123-200	Steel pipe flange	0.6	1	1.6	2.5	4	DIN2673-1962	Welding ring plate sleeve flange	1

The DIN2501 flange standard is basically equivalent to the following standards and can

be used in conjunction with others.

5.3 Magnetic filter

If the media contains ferromagnetic particles, please install a magnetic filter in front of the meter inlet. The height below DN100 (inclusive) is 100mm, and 150mm above DN100.



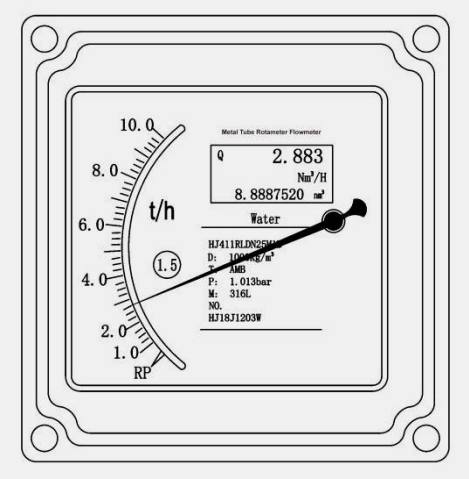
VI. Indicator and Limit Alarm Device

The indicator of metal tube float flow meter is the display and conversion part of the flow meter. The limit alarm device can realize the flow limit alarm and complete the function of the flow switch.

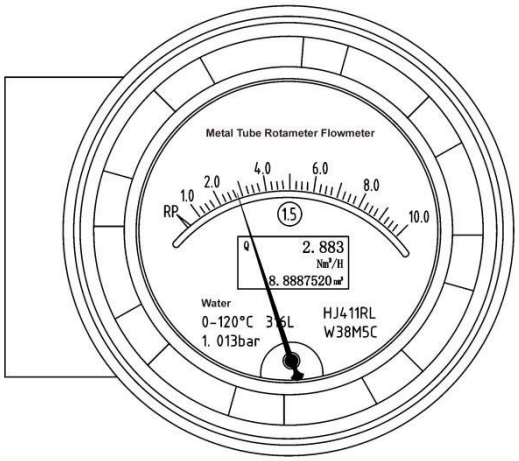
6.1 Indicator selection

Users can choose the local display type, remote transmission type, intrinsically safe explosion-proof type, explosion-proof type or HART protocol type and RS485 communication according to the actual site requirements. Detailed descriptions of various indicators are shown in the table below.

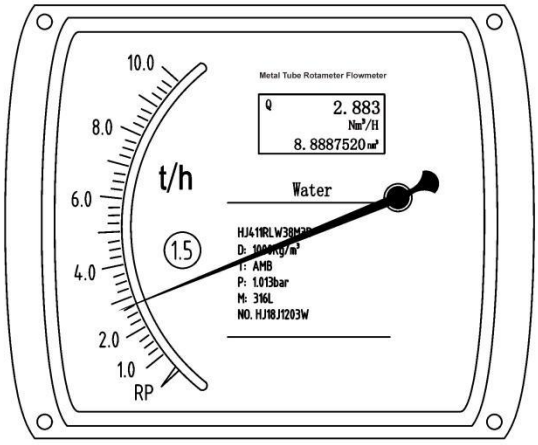
Indicator type	Indicator function description
M1 type	Square shell can be used as local type and electric remote type.
M2 type	Round shell, can be used as local,electric remote type,battery power type and AC220V power type. Flameproof design, optional HART protocol function, circuit board output upper and lower limit alarm or local dry contact alarm
M3 type	Rectangular shell, can be used as local and electric remote type.
M4 type	The small circular stainless steel shell,specially designed for narrow installation positions, can be used as local and electric remote type.
M5 type	The circular stainless steel shell, can be used as local and electric remote type.
M6 type	New round shell, can be used as local and electric remote type. Flameproof design, optional HART protocol function,RS485 communication, pulse output,or local dry contact alarm.
M8 type	The Die cast stainless steel shell, can be used local electric remote type. Optional RS485 communication, pulse output,or local dry contact alarm.



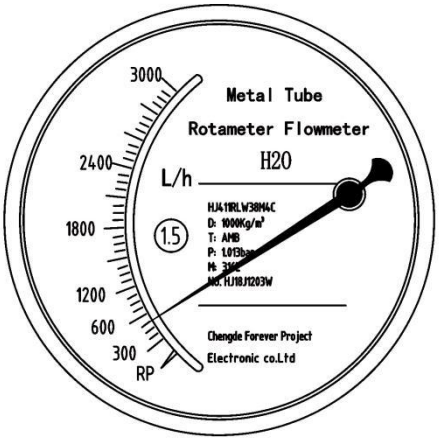
M1 Type indicator



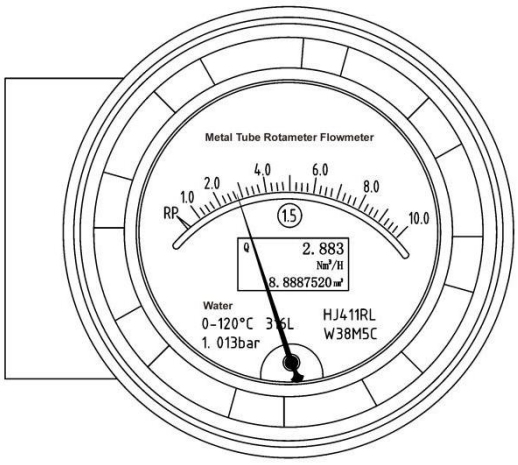
M2 Type indicator



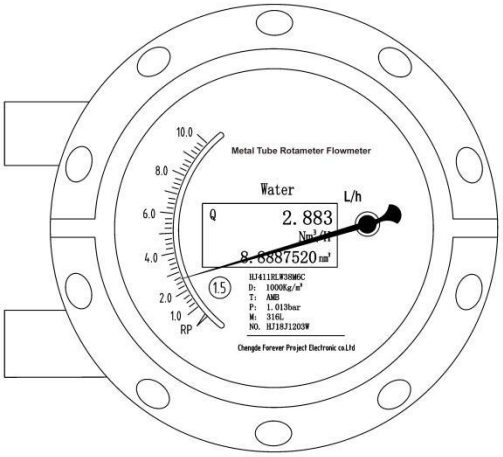
M3 Type indicator



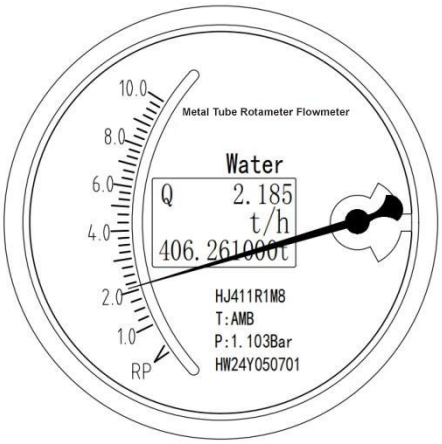
M4 Type indicator



M5 Type indicator



M6 Type indicator



M8 type indicator

6.2 Alarm Device Selection

KI, K2 limit alarm switch device is installed in the M1,M2,M5 and M6 type local indicator, and can be used to upper and lower limit alarms. The alarm point can be arbitrarily set.The K1 and K2 limit alarm switches are installed in the indicator, and together with the accompanying magnetic device installed on the shaft system, form the local alarm system. The alarm points can be set arbitrarily within the full flow range and indicated on the dial through a positioning pointer.

6.2.1 Technical parameters of the alarm switch

Contact mode	A(SPST-NO)	Max. insulation resistance	100m Ω
Electric shock load	50W	Operating time	0.5mS
Max. switch voltage	24VDC/220VAC	Bounce time	0.2mS
Max. switch current	1A	Release time	0.3mS
Working Temp.	-25℃～60℃	Maximum operating frequency	100Hz

When the metal tube float flowmeter alarm controls other equipment, a small intermediate relay must be used for conversion.

VII. Flow Meter Flow Range Table

7.1 The flow range table of Vertical installation form flow meter (see

the following table)

Caliber	Float number	Water L/h (0.1013MPa abs 20℃)		Air m^3/h (0.1013MPa abs 20℃)	Pressure loss KPa (Request low pressure loss to be negotiated with the manufacturer)	
	Float material	Stainless steel	PTFE, Ti	Stainless steel	Stainless steel	PTFE
DN15	F15.0	10	-	-	1.5	-
	F15.1	16	-	0.5	1.5	-
	F15.2	25	-	0.7	1.5	-
	F15.3	40	25	1.2	1.5	1.5
	F15.4	60	40	1.8	1.5	1.5
	F15.5	100	60	2.8	1.5	1.5
	F15.6	160	100	4.5	1.5	1.5
	F15.7	250	160	7.5	3	1.5
	F15.8	400	250	12	3	3
	F15.9	800	400	18	3.5	3
DN25	F25.0	1000	600	30	1.5	1.5
	F25.1	1200	800	35	1.5	1.5
	F25.2	1600	1000	45	3	1.5
	F25.3	2000	1200	60	3	1.5
	F25.4	2500	1600	75	3.5	3
	F25.5	3000	2000	90	3.5	3
	F25.6	4000	2500	120	8	3.5
	F25.7	5000	3000	150	8	3.5
	F25.8	8000	-	180	16	-
DN50	F50.0	6000	4000	180	3	3
	F50.1	8000	5000	240	3	3
	F50.2	10000	6000	300	4	3
	F50.3	12000	8000	360	4	3
	F50.4	16000	10000	480	8	4
	F50.5	30000	12000	600	8	4
DN80	F80.0	25000	16000	750	14	8
	F80.1	30000	20000	900	14	9
	F80.2	40000	25000	1200	20	12
	F80.3	70000	30000	1500	20	15
DN100	F100.0	60000	40000	1800	28	25
	F100.1	80000	50000	2400	28	27
	F100.2	120000	60000	3000	40	38
DN125	F125.0	100000	80000	3000	45	35

	F125.1	150000	100000	-	48	40
DN150	F150.0	150000	100000	-	48	40
	F150.1	200000	125000	-	50	42.5

7.2 The flow range table of horizontal installation form flow meter (see the following table)

Caliber	Float number	Water L/h		Air m^3/h	Pressure loss KPa	
		(0.1013MPa abs 20℃)		(0.1013MPa abs 20℃)	(Request low pressure loss to be negotiated with the manufacturer)	
	Float material	Stainless steel	PTFE、Ti	Stainless steel	Stainless steel	PTFE
DN15	F15.5	160	100	4.5	1.5	1.5
	F15.6	200	120	6	1.5	1.5
	F15.7	250	160	7.5	2	2
	F15.8	400	250	12	2	2
	F15.9	800	400	18	3.5	3.5
DN25	F25.0	1000	600	30	1.5	1.5
	F25.1	1600	1000	45	1.5	3
	F25.2	2000	1200	60	3	3
	F25.3	2500	1600	75	3	3.5
	F25.4	3000	2000	90	3.5	3.5
	F25.5	6000	2500	120	8	8
DN50	F50.0	6000	4000	180	3	3
	F50.1	8000	5000	240	3	3
	F50.2	10000	6000	300	4	4
	F50.3	12000	8000	360	4	4
	F50.4	25000	10000	480	8	8
DN80	F80.1	25000	16000	750	14	14
	F80.2	30000	20000	900	14	14
	F80.3	60000	25000	1200	20	22
DN100	F100.0	60000	40000	1800	30	30
	F100.1	80000	50000	2400	30	30
	F100.2	100000	60000	3000	45	45
DN125	F125.1	100000	80000	3000	45	45.5
	F125.2	125000	100000	-	46	48
DN150	F150.1	125000	100000	-	48	46
	F150.2	150000	125000	-	50	42.5

Note: The data in the above table of the flow range is the standard parameter of the

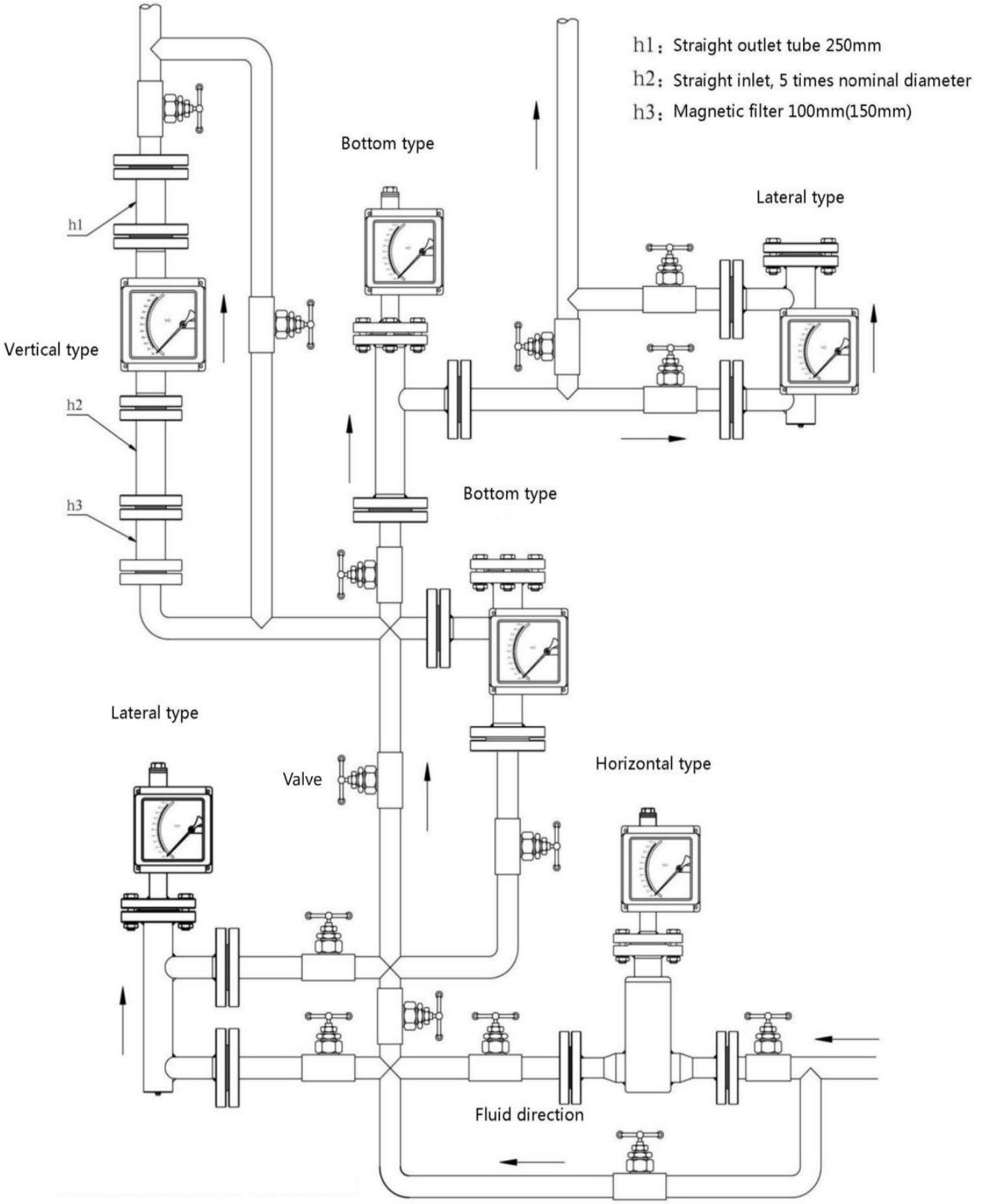
flow meter. If the user has a special flow range, Please consult with the supplier.

♦ Hygienic flow meter reference table (clamp type) is generally in accordance with the American standard

DN	Pipeline standards	Pipe outer diameter	Clamp size
15	1/2"	Φ 19	Φ 50.5
20	3/4"	Φ 22	Φ 50.5
25	1"	Φ 25.4	Φ 50.5
32	1.1/4"	Φ 32	Φ 50.5
40	1.1/4"	Φ 38	Φ 50.5
50	2"	Φ 51	Φ 64.0
65	2.1/2"	Φ 63	Φ 77.5
80	3"	Φ 76	Φ 91.0
100	4"	Φ 101.6	Φ 119.0

VIII. Flow Meter Installation Methods and Precautions

Flowmeters of different specifications can be selected according to the layout of the field process piping. The vertical installation type is a standard type, and the other types are all extended types. For on-site permission, try to select the vertical type. The flow meter installation method of various installation forms can be referred to the following schematic diagram.


h1：Straight outlet tube 250mm
h2：Straight inlet, 5 times nominal diameter
h3：Magnetic filter 100mm(150mm)
Bottom type
Lateral type
h1
Vertical type
h2
h3
Bottom type
Lateral type
Valve
Horizontal type
Fluid direction

8.1 Flowmeter Installation Precautions

1.When the instrument arrives at the site, it should be unpacked and removed from the package and carefully inspect the instrument for shipping damage before being installed in the process piping.

2.Before installing the instrument, the process pipeline shall be purged and cleaned to prevent ferromagnetic impurities in the pipeline from attaching to the float of the instrument, affecting the normal measurement of the instrument, and serious damage to the instrument. If it cannot be avoided, a magnetic filter should be installed in the instrument's inlet.

3.As the measuring mechanism of the instrument adopts magnetic transfer and magneto-electric signal processor, in order to ensure the normal use and performance of the instrument, no ferromagnetic substance, strong magnetic field and strong electromagnetic field are allowed in the installation range of at least 500mm.

4.The instrument installed in the pipeline shall not be subjected to stress. The inlet and outlet of the instrument shall have reasonable pipeline support so that the instrument will receive the least stress on the process pipeline.

5.The installation of the instrument is divided into horizontal installation and vertical installation. The vertical installation of the instrument shall ensure the verticality of the instrument and the deviation of inclination shall not be larger than 3 degrees; the horizontally installed instrument shall ensure the horizontal straightness of the instrument and the deviation of inclination shall not be larger than 3 degrees.

6.When the instrument is installed, the caliber of the upstream and downstream pipelines should be the same as the caliber of the instrument, and the connecting flanges should be matched with each other; to ensure the measurement accuracy and stability of the instrument, the length of the upstream straight pipe segment of the instrument is 5 times the nominal caliber of the instrument. The minimum length of the downstream straight section is 250mm.

7.Instruments for measuring gas, if the instrument directly discharges gas into the atmosphere, it will cause the data of the instrument to be distorted and even damage the

instrument. In this working condition, a throttle valve should be installed at the outlet of the instrument.

8.Be careful when installing PTFE-lined instruments. Under low temperature conditions, PTFE will also be deformed under pressure, so do not tighten it as it is installed. The installation torque is shown in the table below.

Caliber	Maximum torque	Stud bolts
mm	Kgf.m	4*M12
DN15	0.9～0.95	4*M12
DN25	2.0～2.2	4*M16
DN50	5.2～5.6	8*M16
DN80	4.5～4.8	8*M16
DN100	4.6～5.0	8*M16
DN125	5.0～5.3	8*M18
DN150	6.5～6.8	8*M20

8.2 Instrument Maintenance

1.The instrument is a precision device. It must be handled with care in transportation, installation, storage and use, so as to avoid savage transport, excessive force installation and random placement. During all operations, the relative position of the sensor and indicator must be ensured to be unchanged, and the position change will directly affect the measurement accuracy of the instrument.

2.In the long-term use process, ferromagnetic impurities in the pipeline are inevitably adsorbed on the floater. This will trap the float or affect the measurement accuracy. The floater in the sensor should be cleaned from time to time; if a magnetic filter is installed, Regular cleaning is also required.

3.The instrument indicator is equipped with electronic components. After the instrument is wired or after removing the housing, the screw must be tightened to ensure the sealing of the housing,prevent impurities, water or other substances from entering and ensure reliable grounding of the instrument housing.

4.After the instrument is installed, when it is used for the first time, pay attention to:

When opening the valve, in order to avoid the formation of pressure shocks, the float crashes into the limit device, causing damage to the instrument. Be sure to open the valve slowly!

Gauges for measuring gas are equipped with air dampers to minimize the oscillation of the float; to ensure the stability of the float, a throttle valve can be installed at the outlet of the instrument.

5.For remote-type instruments, first ensure that the instrument is properly wired before power is applied; for hazardous applications, an explosion-proof type must be selected and installed in accordance with the requirements of explosion-proof.

Contact

AOBO Instrument Technology Development Co.,Ltd

No. 8009 Minzhu St.-Weifang,Shandong Province

261100,China

Mob.: +86 19953631088/+8619953631096

Email: aobometer@gmail.com

All of the catalogue and company information can be found at:

WWW.AOBOINSTRUMENT.COM