Start from Passion, Excelling in Concentration

VORTEX FLOWMETER USER MANUAL

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Directory

1. Overview

1.1 Principle and scope of application

Vortex flowmeter is one of the main flow meter products in the world, which is widely used in petroleum, chemical industry, metallurgy, heating and other departments. The flow of liquid, gas and steam is detected and measured.

A triangular column vortex generator is set in the fluid, and regular vortices are alternately generated from both sides of the vortex generator. This vortex is called Karman vortex. As shown in Figure 1.1, the vortex rows are asymmetrically arranged downstream of the vortex generator.

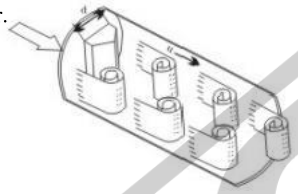
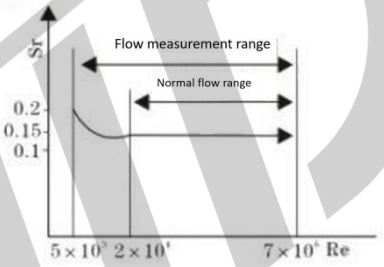


Figure 1.1

If the diameter of the table body is D, the relationship can be obtained:

$$f=Sr\ \frac{\overline{V}}{(1\sim1.25d/D)\,d}$$

where: Sr: Strohal number



The vortex flow sensor is formed by installing the detection probe and the corresponding circuit in the vortex generating body. The vortex flow sensing probe adopts special structure and material, and is an improved vortex flow sensor.

1.2 Features

The detection element does not contact the fluid, high reliability, strong medium adaptability

- No moving parts, wear resistance, solid and simple structure
- Good seismic performance
- Wide allowable operating temperature range, -40 ℃ ~ +350 ℃
- Wide measurement range and high accuracy
- Pulse signal output or two-wire 4 ~ 20mA current signal output

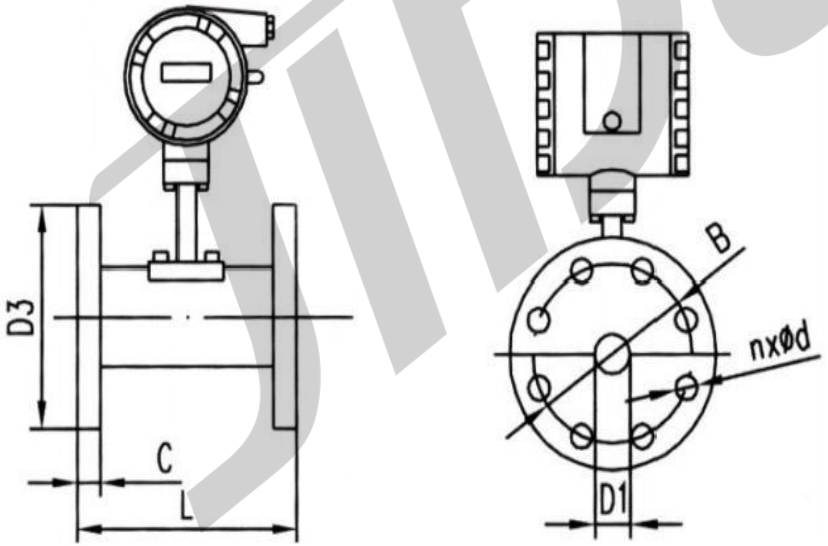
2.Basic parameters

Measuring medium	Liquid, gas, vapor (single-phase medium or can be considered single-phase medium)		
	Saturated steam can be considered as single-phase medium when its dryness is ≥85%		
Medium temperature	-40 ℃ ~ +350 ℃		
Medium pressure	1.6MPa, 2.5MPa, 4.0MPa (pressure above 4.0MPa, need special custom)		
Accuracy	1.0 level 1.5 level		
Span ratio	1:8~1:30 (reference standard temperature air) 1:8~1:40 (reference room temperature water)		
Flow rate range	Liquid 0.4~7.0 m/s, Gas 3.0~60.0 m/s, Steam 5.0~70.0 m/s		
Specifications	DN15 ~ DN300,>DN300 need special custom		
Material	304 stainless steel		
Reynolds number	Normal 2x 10 ° ~ 7x 10 °		
drag coefficient	Cd≤2.6		
Allowable vibration acceleration	LUGB-2 type ≤0.2g		
Protection level	IP65		
Explosion-proof grade	Exia IIC T6 Gb		
Environmental conditions	Ambient temperature	-40 ~ +55 ℃ (non-explosion-proof place) -20 ~ +55 ℃ (explosion-proof place)	
	Relative humidity	≤85%	
	Atmospheric pressure	86 ~ 106kPa	
Power supply	Non-explosion proof type	pulse type	+ 12VDC 20mA
		current type	+ 24VDC 20mA
Output Signal	Frequency pulse signal 2~3000Hz low level ≤ 1V high level ≥ 6V		
	Two-wire 4 ~ 20mA signal (isolated output) load ≤ 500Ω		

3.Sensor selection

3.1 The sensor is composed of two parts: the detection body and the detection amplifier and the connecting rod. The table body and its components and the connecting rod are all made of Crl8Ni9Ti material, which has the advantages of anti-corrosion and durability.

The internal vortex generator and the table body are connected. Gas protection self-fusion welding is adopted, which is firm and durable. The separation structure of the detection probe and the vortex generating body makes the difficult phenomenon that the pressure guide hole is blocked and cannot work satisfactorily solved. Structure form and dimensions as shown in the figure: Fig. 1 Exterior Dimension of Sensor



Nominal diameter (mm)	Shell inner diameter D1 (mm)	Shell length L (mm)	Flange outside diameter D3 (mm)	Bolt hole distance of heart B (mm)	Flange thickness C (mm)	Bolt hole diameter d (mm)	Number of bolts n
15	15	200	95	65	14	14	4
20	20	200	105	75	16	14	4
25	25	200	115	85	18	18	4
32	32	180	140	100	18	18	4
40	40	180	150	110	18	18	4
50	50	200	165	125	20	18	4
65	65	200	185	145	20	18	4
80	80	250	200	160	20	18	8
100	100	250	220	180	22	18	8
125	125	250	250	210	22	18	8
150	150	250	285	240	24	22	8
200	200	300	340	295	26	22	12
250	250	300	405	355	28	26	12
300	300	300	460	410	32	26	12

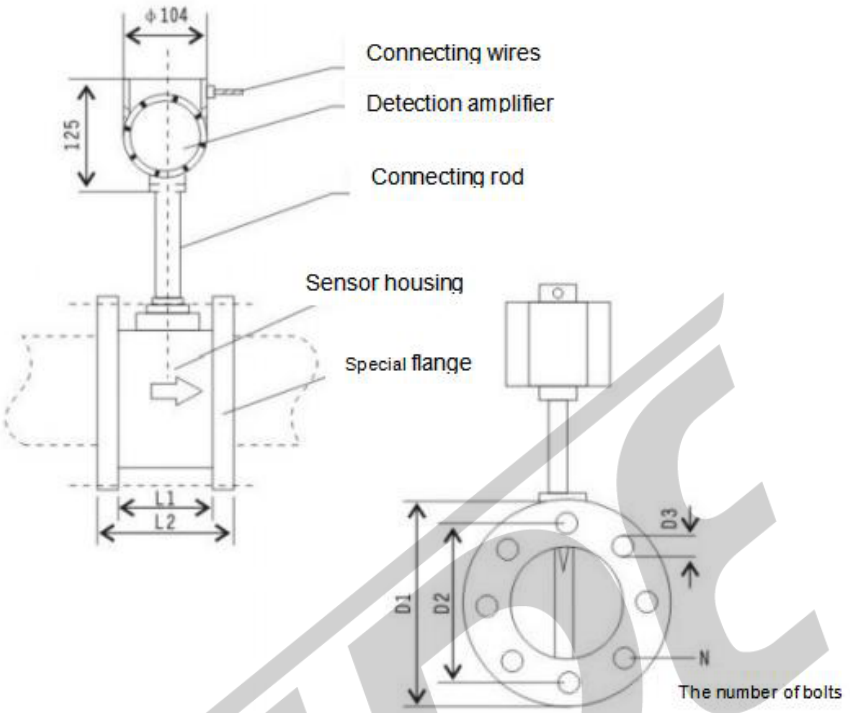


Figure 2 the external dimensions of the flanged clamping type vortex flowmeter

Flange clamping type external dimension:

Caliber	L1	L2	D1	D2	D3	N
15	65	95	125	100	13	4
20	65	95	125	100	13	4
25	65	95	125	100	13	4
32	66	96	140	100	13	4
40	80	114	145	110	13	4
50	80	114	160	125	17	4
65	93	135	180	145	17	6

Caliber	L1	L2	D1	D2	D3	N
80	100	142	195	160	17	6
100	126	168	230	190	17	8
125	146	192	245	210	17	8
150	166	216	280	240	21	8
200	196	246	335	295	21	12
250	114	168	405	355	21	12
300	130	184	460	410	21	12

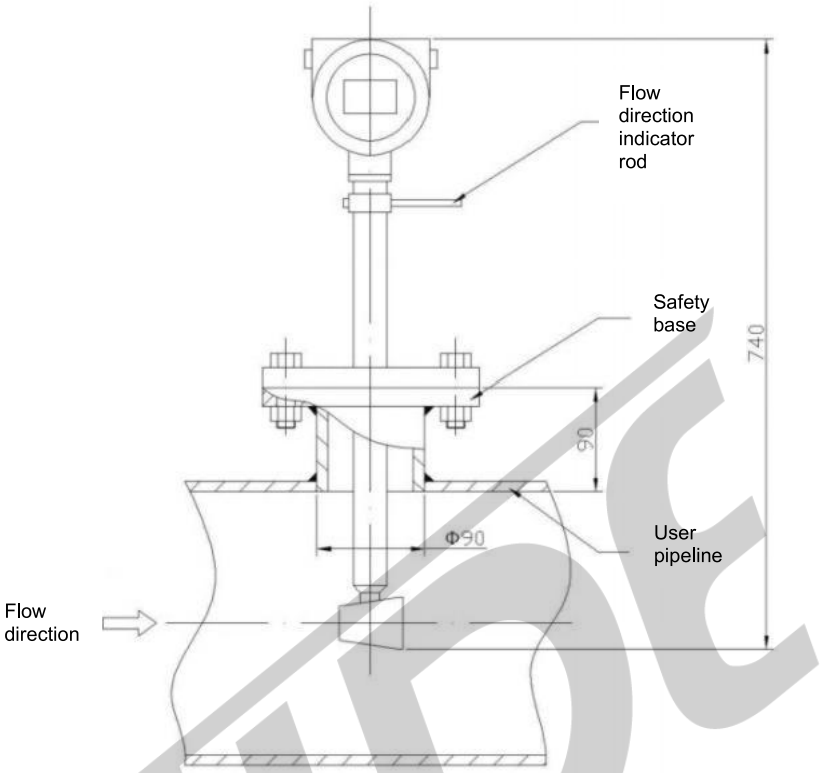


Fig. 3 Outline, Dimension and Installation Schematic Diagram of Plug-in Vortex Flowmeter

The plug-in vortex flowmeter is mainly used for the flow measurement of large-diameter gas, liquid, and steam media in industrial pipelines in various industries. It is characterized by simple structure, no movable mechanical parts, low pressure loss, wide range ratio, and scope. It is up to 10~15 and cost-effective.

Matters needing attention in installation:

1. The part of the installation base inserted into the pipeline shall not exceed the inner wall of the pipeline;
2. The position of the base on the pipeline shall be upright and not skewed;
3. Deburring and welding slag removal;
4. The flange plane of the base is parallel to the pipeline axis;
5. Ensure that the flow direction of the medium is consistent with the flow direction indicator rod, and it is strictly prohibited to pull the flow direction indicator rod.

Table 5: Reference Flow Range Table

Nominal diameter DN (mm)	Liquid (t = 20 ℃ po = 1000 kg/m³)		Gas (t = 20 ℃ 101325Pa air)	
	Standard Range	Measured flow range	Standard Range	Measured flow range
15	0.8-6	0.6 to 12	0.8-6	2 to 60
20	1 to 8	0.7 to 12	5 to 40	4 to 60
25	1.5 to 12	0.8 to 16	8 to 50	8 to 120
32	2 to 14	0.9-26	10 to 80	9 to 200
40	2.5-30	1.5-40	14-200	18-300
50	3 to 50	2 to 60	20 to 200	20 to 500
65	5 to 80	3 to 90	30 to 300	35 to 900
80	8 to 120	5 to 150	50 to 500	60 to 1200
100	12-200	6 to 240	80 to 1000	85 to 2000
125	20 to 300	13 to 390	100~1000	130~3000
150	30 to 400	15 to 600	150~1600	200~4000
200	50 to 800	30 to 1600	250~2500	350~8000
250	80 to 1200	40 to 1600	400~4000	500~1200
300	120~1300	50 to 2000	600~6000	600~1800
350	170~1800	100~2200	1000~10000	1000~18000
400	200~2300	140~2700	1400~14000	1400~32000
450	290~2900	170~3400	1600~16000	1700~40000
500	300~3500	200~4200	2500~25000	2000~50000
600	500~5100	300~6100	4000~40000	3000~72000

3.2 Selection of flow range under working conditions

Different caliber, different media, vortex flow sensor, transmitter measurement range is not the same, the selection of special media must be calculated to determine.

3.2.1 Selection of gas flow range

The upper limit flow of the vortex flowmeter is generally not affected by the pressure and temperature of the medium. The flow range mainly depends on the working density and kinematic viscosity of the medium. Therefore, the determination of the flow range is actually the lower limit flow available for accounting.

Calculation 1: First calculate the lower limit flow Q of the working condition determined by the density, formula

$$Q = Qop. /p(m^3h)$$

Where: Q:lower limit flow rate of the instrument under the working condition density of the medium

Q: Lower limit flow (m'/h) P of the instrument under reference conditions. : Reference air density, p. =1.205kg/m⁸

P: density of measured medium under working conditions (kg/m³)

Calculation 2: Accounting for the lower limit flow determined by the kinematic viscosity Q, Eq.

Q.= Q. * v/v. (m³/h)

Where: Q: lower limit flow rate for the medium

Q: lower limit flow under reference conditions;(m³ /h)

Reference viscosity, 15 kgm/S²

V: viscosity of measured medium under working conditions (kgm/S²)

V: Compare Q. with Q, the larger flow rate is taken as the actual lower limit flow rate of the gas.

3.2.2 Selection of liquid flow range

(1)The flow range of the liquid is shown in Table

(2) If the measured medium is not

p = 1000 kg/m, the formula can be used.

(3) Select the calculation.

3.2.3 Selection of steam flow range

Saturated steam: please select by referring to table (3).

Superheated steam: The density corresponding to the pressure and temperature can be found through the (4) of the table. The flow range of the superheated steam can be determined by taking the flow range of the similar density of the table (3).

Table 3: Mass Flow Range of Saturated Steam (kg/h)

absolute pressure p (MPa) temperature t (℃) density kg/m	0.2 120.2 1.129	0.3 133.5 1.651	0.4 143.62 2.163	0.5 151.84 2.669	0.6 158.94 3.170	0.7 164.96 3.667	0.8 170.41 4.162	09 175.36 4.665	1.0 179.68 5.147	1.2 187.96 6.127	1.4 195.04 7.106	1.6 201.37 8.085	1.8 207.1 9.065	2.0 212.37 10.05
DN20 Qmin Qmax Measured upper limit lower measurable limit	9 60 80 9	11 83 102 11	12 108 130 12	13 134 160 13	15 158 190 15	16 183 220 16	17 208 250 17	18 233 279 18	19 257 309 19	20 306 368 20	22 355 426 22	24 404 485 24	25 453 544 25	26 503 603 26
DN25 Qmin Qmax Measured upper limit lower measurable limit	14 93 136 14	17 133 198 17	19 173 260 19	21 215 320 21	23 254 380 23	25 293 440 25	27 333 499 27	28 372 559 28	30 412 618 30	33 490 735 33	35 568 853 35	37 647 970 37	39 725 1088 39	42 804 1206 42
DN40 Qmin Qmax Measured upper limit lower measurable limit	35 233 400 32	42 332 498 38	48 433 649 44	54 534 801 48	59 634 951 53	63 733 1100 57	67 832 1249 60	71 931 1397 64	75 1029 1544 67	82 1225 1838 73	88 1421 2132 79	94 1617 2426 84	99 1813 2720 89	104 2010 3015 94
DN50 Qmin Qmax Measured upper limit lower measurable limit	52 400 667 52	64 498 826 64	73 649 1080 73	81 801 1335 81	88 951 1585 88	95 1100 1834 95	100 1249 2081 100	107 1397 2328 107	112 1544 2574 112	122 1838 3054 122	132 2132 3553 132	140 2426 4043 140	149 2720 4533 149	157 3015 5025 157
DN65 Qmin Qmax measurable upper limit measurable lower limit	88 667 933 88	106 826 1320 106	121 1080 1730 121	135 1335 2135 135	147 1585 2536 147	158 1834 2934 158	168 2081 3330 168	178 2328 3724 178	187 2574 4118 187	204 3054 4902 204	220 3553 5685 220	234 4043 6468 234	248 4533 7252 248	261 5025 8040 261
DN80 Qmin Qmax Measured upper limit lower measurable limit	140 1166 1400 105	170 1650 1980 127	194 2160 2596 145	215 2700 3240 161	235 3170 4015 176	252 3660 4644 189	269 4160 5270 201	284 4655 5896 213	299 5150 6520 224	326 6130 7760 345	350 7100 9000 263	375 9080 10240 280	397 9060 11480 298	418 10000 12730 313
DN100 Qmin Qmax Measured upper limit lower measurable limit	175 1166 2332 175	212 1650 3300 212	242 2160 4320 242	269 2700 5400 269	293 3170 6430 293	315 3660 7320 315	336 4160 8320 336	355 4655 9310 355	374 5150 10300 374	408 6130 12260 408	439 7100 14200 439	468 8080 16160 468	496 9060 19120 496	522 10050 20100 522
DN125 Qmin Qmax Measured upper limit lower measurable limit	262 1866 3500 262	317 2640 4950 317	363 3460 6490 363	404 4270 8000 404	440 5070 9510 440	473 5870 11000 473	504 6660 12500 504	533 7450 14000 533	560 8240 15440 560	611 9800 18400 611	658 11370 21300 658	702 12940 24260 702	744 14500 27200 744	783 16080 30200 783
DNI50 Qmin Qmax Measured upper limit lower measurable limit	437 292 4666 350	529 4130 6600 423	605 5408 8650 484	673 6670 10680 538	733 7930 1268 586	788 9170 14670 631	840 10400 16650 672	888 11640 18620 711	934 12870 20590 747	1091 15320 24500 815	1097 17770 28420 878	1171 20210 32340 936	1239 00660 36260 990	1305 25120 40200 1044
DN200 Qmin Qmax Measured upper limit lower measurable limit	700 4666 9330 610	847 6600 13200 740	969 8650 17300 848	1076 10680 21360 942	1173 12680 25360 1026	1261 14670 29340 1104	1344 16650 33300 1176	1421 18620 37240 1243	1494 20590 41180 1308	1630 24500 47000 1427	1756 28420 56850 1536	1873 32240 64680 1638	1983 36260 72520 1735	2088 40200 80400 1827
DN250 Qmin Qmax Measured upper limit lower measurable limit	1050 6998 13997 875	1270 9906 19810 1056	1614 12980 25960 1210	1759 16010 32030 1345	1892 19020 38040 1466	2016 22000 44000 1577	2132 24970 49940 1680	2241 27930 55860 1776	1446 30880 61760 1868	2634 36760 73520 2038	2808 42640 85270 2195	1453 48500 97000 2340	2975 54390 108780 2480	3132 60300 120600 2610
DN300 Qmin Qmax Measured upper limit lower measurable limit	1750 11664 20995 1050	2116 16510 29720 1270	2422 21630 38930 1453	2690 26690 48040 1614	2932 31700 57050 1759	3153 36670 66000 1892	3359 41620 74900 2016	3550 46550 83800 2132	3736 51470 92650 2241	4076 61270 110300 2446	4389 71050 127900 2634	4682 80850 145530 2808	4958 90650 16320 2975	5220 10050 180900 3132

Table 4: Density of superheated steam relative to pressure and temperature (Kg/m³)

Absolute pressure MPa	Temperature (℃)					
	150	200	250	300	350	400
0.1	0.52	0.46	0.42	0.38		
0.15	0.78	0.70	0.62	0.57	0.52	0.49
0.2	1.04	0.93	0.83	0.76	0.69	0.65
0.25	1.31	1.16	1.04	0.95	0.87	0.81
0.33	1.58	1.39	1.25	1.14	1.05	0.97
0.35	1.85	1.63	1,46	1.33	1.22	1.13
0.4	2.12	1.87	1.68	1.52	1.40	1.29
0.5		2.35	2.11	1.91	1.75	1.62
0.6		2.84	2.54	2.30	2.11	1.95
0.7		3.33	2.97	2.69	2.46	2.27
0.8		3.83	3.41	3.08	2.82	2.60
1.0		4.86	4.30	3.88	3.54	3.26
1.2		5.91	5.20	4.67	4.26	3.92
1.5		7.55	6.58	5.89	5.36	4.93
2.0			8.968	7.97	7.21	6.62
2.5			11.5	10.1	9.11	8.33
3.0			14.2	12.3	11.1	10.1
3.5			17.0	14.6	13.0	11.8
4.0				17.0	15.1	13.6

4. Installation conditions

4.1 The sensor should be installed horizontally or vertically (liquid flow direction from bottom to top) on the pipe corresponding to its nominal diameter.

4.2 The upstream and downstream of the sensor should be equipped with a certain length of straight pipe section, and the length should meet the requirements shown in the table below.

Straight Segment Length Configuration

Upstream pipeline form	Length of upstream straight pipe section	**Length of downstream straight pipe section**
Concentric tube fully open gate valve	⩾12DN	⩾ 5DN
Concentric shrink fully open gate valve	⩾ 15DN	
A 90 ° elbow	⩾20DN	
2 90 ° elbow in the same plane	⩾ 25DN	
2 90 ° elbows in different planes	⩾ 40DN	
Regulating valve, half-open gate valve	⩾ 50DN	

4.3 The flow regulating valve shall not be set on the upstream side of the sensor

4.4 If the length of the upstream straight pipe section cannot meet the requirements of the above table, it is recommended that the user install a fluid rectifier in the upstream pipeline.

4.5 the sensor should not be installed on the pipeline with strong vibration, so as not to affect the accuracy. If the sensor is installed and used on the pipe section with vibration, the following measures can be taken to reduce the interference caused by vibration;

a. To be upstream of the sensor 2 the fixed support point of pipeline shall be installed at D.

b. Under the premise of meeting the requirements of straight pipe section, add hose transition

4.6 When the sensor is installed on the high temperature pipeline, if the heat preservation is not good, the sensor must be installed vertically downward.

4.7 The vortex flow sensor is not allowed to be hit with hard objects during installation, otherwise it will affect the measurement accuracy and even damage the instrument

4.8 When the measured medium need to temperature and pressure correction, should be in the sensor after 3-5 DN at the pressure point, in the sensor after 5-8 DN for temperature point. (as Figure 1.3)

4.9 Installation of Plug-in Vortex Flowmeter

4.9.1 When selecting the installation site of the plug-in vortex flowmeter on the pipeline, the length of the upstream straight pipe section shall be ⩾15D, and the length of the downstream straight pipe section shall be ⩾5D.

4.9.2 In the pipeline with gas cutting method to open a Φ100mm round hole, the hole should be around no burr, to ensure that the probe smoothly through.

4.9.3 The flange short pipe shall be welded at the circular hole of the pipeline. Attention shall be paid to the vertical direction during welding. After welding, the axis shall be orthogonal to the axis of the pipeline, and the extension line of the flange short pipe shall pass through the center of the transverse surface of the pipeline. (See Figure 4)

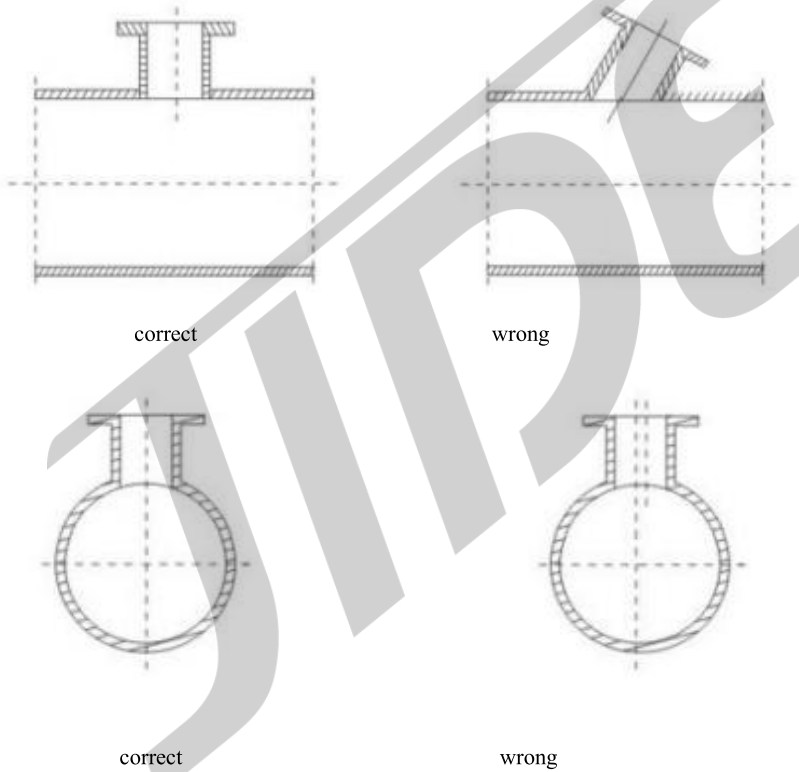


Fig. 4 Flange Position of Plug-in Vortex Flowmeter Installed on Pipeline

4.9.4 The determination of the length Y value of the insertion rod below the lower connection flange of the vortex flowmeter should be based on the actual factory standard. Users do not need to adjust it. However, in special circumstances, when calculating the insertion depth, appropriate adjustments can be made based on the length of the straight pipe section and the working medium, etc. Generally, when the straight section of the measuring pipe is long enough or the diameter of the measuring pipe is over 400mm, the average flow velocity point measurement method is adopted first. The measurement accuracy of this method is basically not affected by the change of Reynolds number. The insertion depth of the probe is Y=0.25R to 0.25D(R is the radius of the measuring pipe and D is the diameter of the measuring pipe). When the straight section of the measuring pipe is short or the diameter of the measuring pipe is 400mm or less (including 400mm), the central flow velocity point measurement method is adopted, with an insertion depth of Y=0.5D(see Figures 3 and 5). After the measurement depth is determined, the length of the insertion rod can be adjusted before installation, and the direction mark of the impact point can be set accurately to ensure that the direction of the vortex generator is consistent with the flow direction of the measurement pipeline as required in Figure 3 (see Figure 3). At this time, the flowmeter can be fixed to the flange short pipe by bolt connection.

4.9.5 Gaskets should be installed between the flanges (see Figure 3). Heat-resistant materials such as rubber sheets should be used at normal temperature and asbestos sheets at high temperatures.

4.9.6 Continuous flow loading and unloading method (with ball valve). When disassembling, first loosen the set screw 4, then loosen the lock nut 5, and then push the insertion rod upward until the probe is located at the limit position on the upper part of the ball valve. At this time, the ball valve can be just closed. Remove the upper connecting flange 8, bolt 12 and nut 11, and then lower the end of the flowmeter. The order of installing the flowmeter is reverse to that of removal.

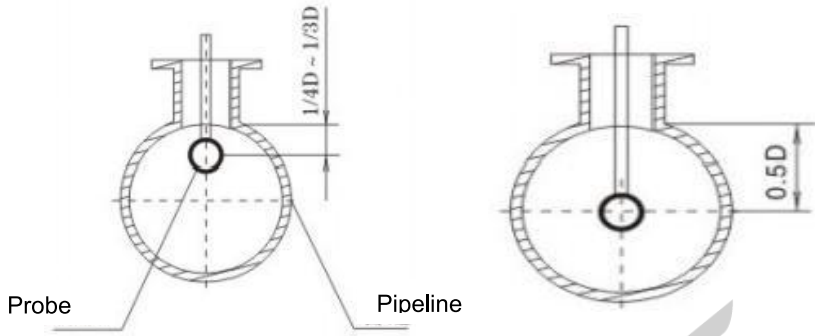


Fig. 5 Insertion Position
(Insertion depth shall be subject to actual calibration of reserves)

5. VM21 Pulse Output Vortex Flowmeter Amplifier Board Instructions

1) Function of each switch:

K1 switch K1 selects the impedance gas and DN200 liquid (ON) for 1 and 5, and 1=5 for large diameter liquid K1 is OFF.

K1 2=6;3=7;4=8 charge amplification factor. When K1 is used, 1-4 bits and 5-8 bits must be used correspondingly, I .e. 1=5,2=6,3=7,4=8 must be set to ON or OFF.

2~4 and 6~8 in a number of ON, the capacitance is set to ON switch capacitance and.

When the upper limit frequency (= C32) 1~8 is ON, the capacitor is the sum of the capacitors at the switch set to ON.

K3 When the selected lower limit frequency (= C33) 1 to 8 is ON, the capacitance is the sum of the capacitances at the switches set to ON.

Amplification gain and trigger sensitivity are adjusted by 4-bit switch, and 1/2/3/4 bits of switch represent 1/2/ 4/8 respectively; The sum of ON numbers is 1~15.

GB = 1~15 amplifier gain (commonly 4~8) corresponds to the resistance ratio of 300 /(100K-4K7), and the amplification rate of 1~15 increases.

SB = 1~15 flip-flop threshold (usually 4~8) corresponds to a resistance ratio of 300 /(100K-4K7), and 1~15 sensitivity is increased.

2) Circuit wiring:

V + = 12/24V power supply, ㄇ = output pulse (collector open pull resistor 510/2 K),0 = power ground; The power supply selection jumper JVC/JOU shall jump to the 12V or 24V side depending on the power supply voltage.
XT is connected to the vortex sensing probe line.

3) Test point signal:

The test point TPO is the ground, TP1 is the sine signal after (K1 and GB) adjustable amplification, TP2 is the clipped sine wave after band-pass filtering and limiting determined by (K2 and K3), and TP3 is the square wave after (SB) Schmidt triggers the return limit.

Different caliber and media switch selection see attached table. According to the actual signal, K2 and K3 are first adjusted to expand the frequency band, and the gain of K1 charge amplifier is adjusted if necessary. For high temperature probes, GB should be increased, and K1 should be reduced if necessary.

Vortex flowmeter amplifier parameter setting reference table (liquid may deviate greatly)

Caliber mm	K1								K2								K3							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
20	↑		↑		↑		↑						↑				↑	↑	↑					
25	↑		↑		↑		t						f							↑				
40	↑			1	↑			↑							↑			+	↑	↑				
50	↑			↑	↑			↑							One						↑			
80	↑			↑	+			↑						t	4					↑	↑			
100	↑			t	↑			↑						t	One							↑		
125	↑			↑	t			↑								t							f	
150	↑			f																			↑	
200				↑				↑								t								
250			↑	↑			↑	↑							One	↑							↑	↑
300								↑							↑	↑							↑	
350			↑	↑			↑	↑							↑	t							↑	
400			↑	↑			↑	↑					↑	↑	1	↑				↑	↑	Ten	t	

Vortex flowmeter amplifier parameter setting reference table (gas)

Caliber mm	K1								K2								K3							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
20	↑				↑	↑											Ten							
25	t				↑	↑			↑								↑							
40	↑		f		↑		↑			↑								↑						
50	t		f		↑		↑			↑									↑					
80	↑		f		↑		4				↑						↑		↑					
100	↑		↑		↑		↑				t						↑	↑	↑					
125	t		↑		↑		↑					t					One	t	↑					
150	↑		↑		↑		One					f								t				
200	t			↑	↑			t					t							t				
250	↑			t	↑			↑						↑			f	↑	t	↑				
300	↑			↑	↑			↑							↑						↑			
350	↑			↑	↑			↑								t					↑			
400	↑		↑	↑	↑		↑	t								↑				↑	↑			

Vortex flowmeter amplifier parameter setting reference table (steam)

Caliber mm	K1								K2								K3							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
20	↑	↑			↑	One			↑								↑							
25	↑	↑			↑	↑			↑								↑							
40	↑		↑		↑		↑			↑								↑						
50	t		↑		↑		↑			f								↑						
80	↑		f		↑		↑				t						↑	↑						
100	↑		↑				↑				t						↑		f					
125	↑		f		↑		↑					t					↑	↑	↑					
150	t		↑		↑		↑					t					↑	↑	f					
200	↑			↑	↑			↑					t				↑	↑	↑					
250	↑			↑	↑			↑						↑			↑	↑	One					
300	t			↑	↑			t							↑		↑	↑	↑	↑				
350	↑			↑	↑			↑								↑	↑	↑	↑	↑				
400	t			↑	f			t								t					↑			

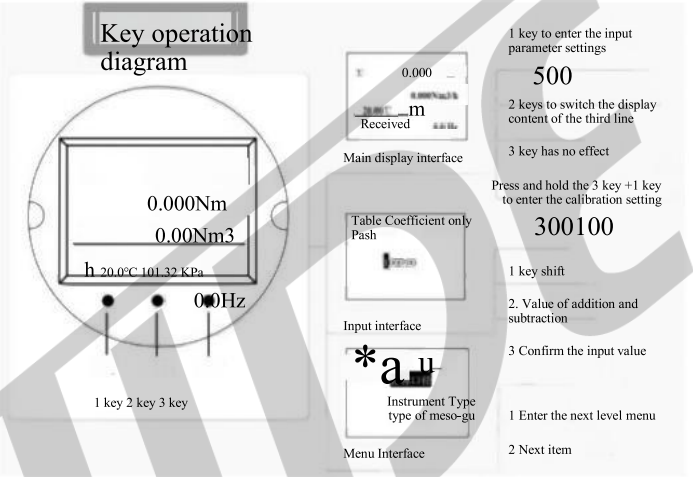
The arrow up indicates that the switch position is ON, and the switch without the arrow is OFF.

The above table values are for reference only. In actual use, due to different liquid viscosity and gas density, it should be adjusted near this value. When the frequency is low, K2/K3 can be 1 to the third gear in the direction of large diameter. When the frequency is high, K2/K3 can be 1 to the third gear in the direction of small diameter.

K2 affects only the upper limit frequency, while K3 mainly affects the lower limit but also the upper limit. The smaller the gear, the higher the working frequency, the higher the gear, the lower the working frequency.

6. Instructions for on-site display of vortex flowmeter magnifying board

6.1 Key Operation Instructions



6.2. Main display interface

Σ	**0.000Nm3**
	0.000Nm3/h
20.00 ℃	101.32MPa
Status Bit	**0.0Hz**

1, The main variable (cumulative/instantaneous optional)

2. Secondary variables (based on primary variables)

3, The flow rate + current (optional)

4.Temperature + pressure (optional)

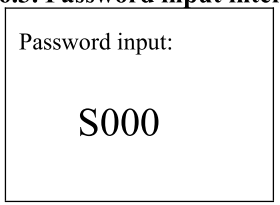
5.Flow percentage + density (optional)

Switch in line 3

Note: For the operation method,

6. Status: Power Status + Communication Type + Media Type
7. Frequency

6.3. Password input interface

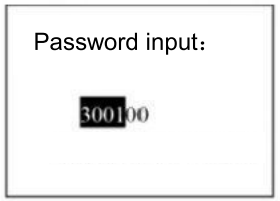


1.Main display press 1 key to enter parameter setting

Note: (Code 5000) Instrument operation parameter setting

2. Press and hold the main display screen and hold the 3 key +1 key to enter the calibration setting

Note: (Password 300100) Calibration of temperature, pressure, current and flow rate）



Key operation instructions:

1 Key --- Shift

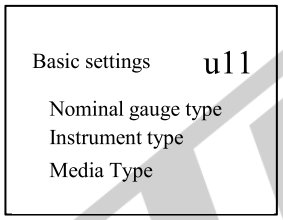
2 Key --- Add and Subtract Values

3 Key --- Confirm the input value.

Note: To enter the calibration setup please contact the engineer

First, hold down the 3 key and press the 1 key at the same time

6.4 Menu display interface



1.Current menu name

2. Subordinate Menu No./Total

3. Lower level menu name

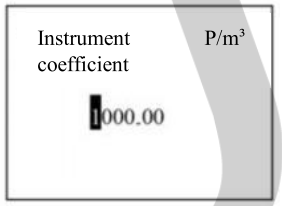
Key operation instructions:

1 key --- enter lower level menu

2 Key-Next

3 key --- Return to the upper menu.

6.5 Input operation interface



1.Current menu name
2. Set value unit
3. Input setting value
Key operation instructions:

1 Key --- Shift

2 Key --- Add and Subtract Values

3 Key --- Confirm the input value.

6.6, Display screen

The display screen is a plug-in installation. For the flowmeter with LCD display screen purchased, the display screen has been installed when leaving the factory. If the display is purchased separately, the display must be installed using the small size instrument screwdriver and display kit.

The display screen has hot plug function, but except for emergency special circumstances, the instrument must be powered off during installation before installation.

Steps to install LCD display:

1. If the flowmeter is installed in the loop, fix the loop and disconnect the power supply.
2. Remove the flowmeter cover from the electronics side.
3. Plug the LCD display screen and the main board LCD row mother interface tightly.
4. Put the mounting screws into the LCD display and tighten them with the screws.
5. connect the extended cover and screw at least 1/3 more turns after the O-ring reaches the contact state.

Note:

①The circuit board is very sensitive to static electricity. Attention should be paid to the safety of electrostatic sensitive parts.

② Pay attention to the orientation of the LCD installation screen, and make sure that the pin 2*6 is correctly connected and not misaligned.

The following LCD temperature limits should be noted:

Operating: (- 2 0 to 4 5 ℃) - 4 to 1 1 3 ° F

Storage: (- 4 6 to 8 5 ° C) - 5 0 to 1 8 5 ° F

7. Installation wiring

7.1. Signal output type

According to the output signal of the instrument, the instrument is divided into 6 models

(1) I type: Dual power supply (battery and 2 4 V)+ output pulse signal

(2) II type: 24V power supply + pulse output + two-wire 4~20 mA output

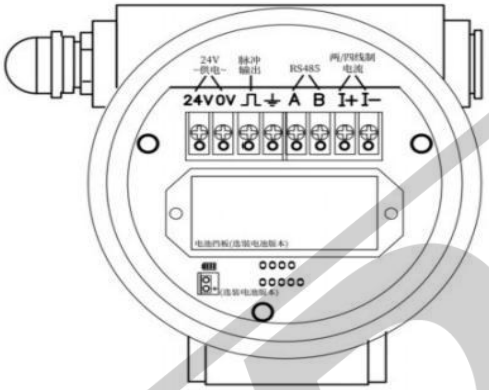
(3) III type: Dual power supply (battery and 2 4 V)+ two-wire current output + pulse output

(4) IV type: 485 output + pulse output

(5) V type: 485 output + two/3/four-wire current output + pulse output

(6) VI type: Dual power supply +485 output + two/3/four wire current output + pulse output

7.2. Wiring board physical diagram



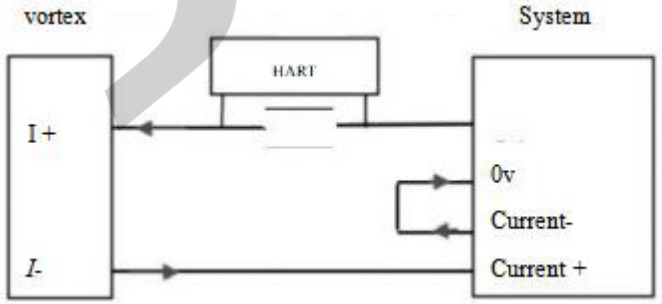
7.3. Wiring Instructions

(1) Battery powered

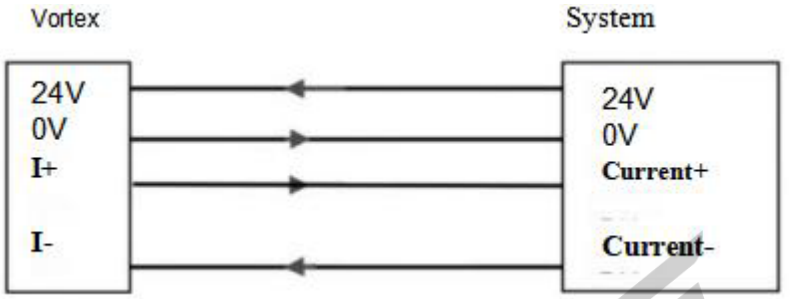
When the instrument is powered, unscrew the back cover and insert the battery into the battery-specific plug.

(2) Pulse output signal wiring (non-calibration output/calibration output/frequency output)

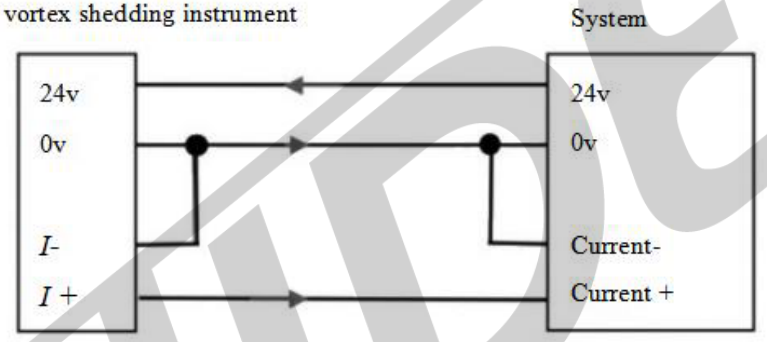
(3) Two-wire 4~20 mA current output signal wiring



(4) Four-wire 4~20 mA current output signal wiring (compatible with 485 integrated type)

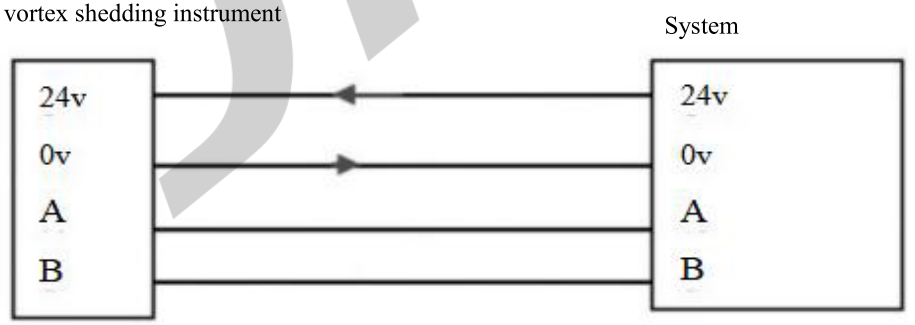


(5) Three-wire 4~20 mA current output signal wiring (compatible with 485 integrated type)



(6)485 output signal wiring

vortex shedding instrument



Note：

① Two/four-wire current output optional HART, wiring circuit is the same, only I + VI-port into the HART terminal resistor.

② Optional Bluetooth does not require additional wiring.

8. Configuration parameters

8.1 Process Variables

8.1.1 Primary Variable (PV)

PV-is the measured value of the main variable based on the actual measurement. This variable is currently the instantaneous flow, and the flow variable has mass or volume.

If the units for the flow are incorrect, refer to "Flow units" and "Time units" in "Basic settings" on page 22 ". Use the Process Variable Units feature to select units for your application.

8.1.2 Range of PV

Percent of Range-The primary variable, expressed as a percentage of range, provides data on the location of the measured flow of the flowmeter within the configured range of the flowmeter.

8.1.3 Flow rate (m/s)

Velocity-according to the PV main variable and flowmeter diameter size actual measurement of the measured value, the flow rate of the unit is fixed as m/s, will not follow the PV main variable unit change.

8.1.4 Analog Output

Analog Output-The analog output variable provides the analog value of the primary variable. There are two kinds of analog output: pulse equivalent and 4 ~ 20mA. If the pulse equivalent output does not match, refer to P23 "Pulse equivalent" adjustment; 4~20 mA should be checked against the actual loop reading given by multimeter. If the two do not match, a 4-20 mA adjustment is required. Please contact the engineer to go to "current calibration" in the P30 "calibration settings" for adjustment.

8.1.5 Density

Density-Measure the density of the medium. Flowmeters equipped with temperature or pressure sensors can measure and calculate the measured value of steam in real time. No sensors or other medium types support manual setting of fixed medium density. When the flowmeter provides mass measurement, if it does not match, press 2 to switch the third line in the main display interface to check whether the density is normal.

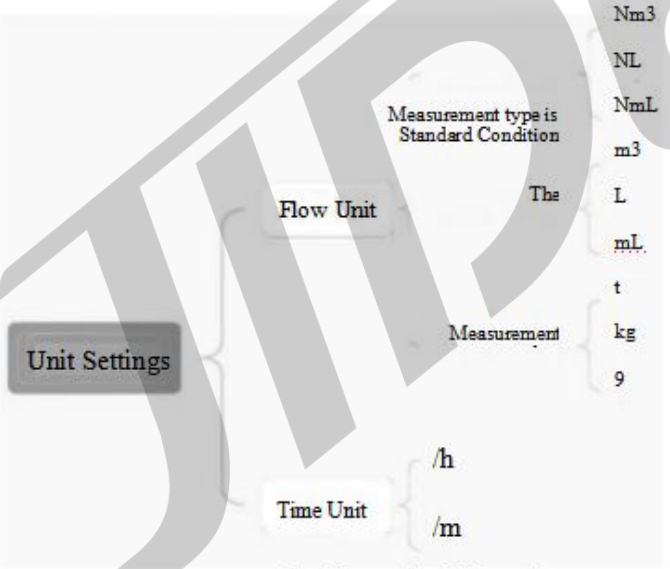
8.1.6 Temperature/Pressure

Temperature/Pressure-Measure the temperature/pressure of the medium. The flowmeter equipped with temperature or pressure sensor can measure the measured value of temperature/pressure in real time, or support manual setting of fixed temperature/pressure. When the flowmeter provides mass measurement or standard temperature measurement, it is inconsistent with the actual situation. Press 2 keys on the main display interface to switch the third line to check whether the temperature and pressure are normal.

8.1.7 Process Variable Units

Process Variable Units-Allows you to view and configure process variable units such as volume, velocity, mass flow, temperature, pressure, and process fluid density.

Percent of Range-The primary variable, expressed as a percentage of range, provides data on the location of the measured flow of the flowmeter within the configured range of the flowmeter.



Configuration Figure 1

8.2. Parameter Setting (Password 5000)

Configuration Figure 2

8.2.1 Basic Settings

8.2.1.1 Nominal caliber
Set the caliber of the flowmeter, in mm

8.2.1.2 Instrument Type
Select flowmeter type: full tube/insert

8.2.1.3 Media Type
Select medium type: gas/liquid/steam

8.2.1.4 Measurement Type
Select the measurement type: working condition/standard condition/quality

8.2.1.5 Flow Unit
Select Flow Unit: Refer to Figure 1 for P21 Configuration

8.2.1.6 The time unit
Select Time Unit: Refer to Figure 1 of P21 Configuration

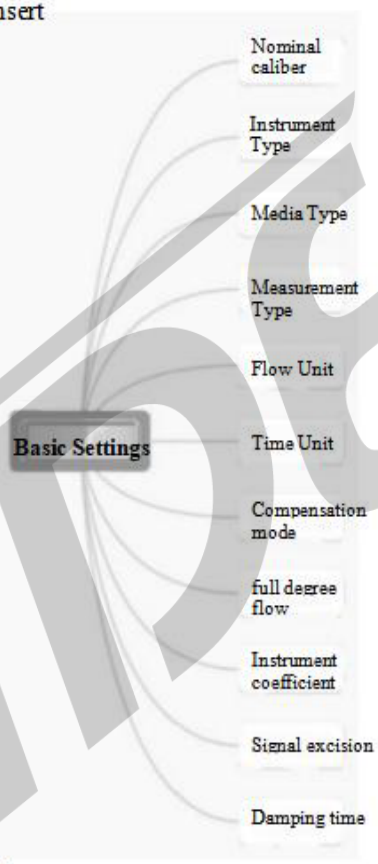
8.2.1.7 Compensation Mode
Select compensation mode: gas temperature and pressure compensation or fixed value compensation

8.2.1.8 Full Flow
Sets the maximum analog output range of the master variable

8.2.1.9 Instrument coefficient
Set according to calibration results

8.2.1.10 Signal excision
Less than the set cut-off frequency value is no longer displayed in Hz.

8.2.1.11. Damping time
Set the damping time, 60 maximum s, single-bit is second s.



Configuration Figure 3

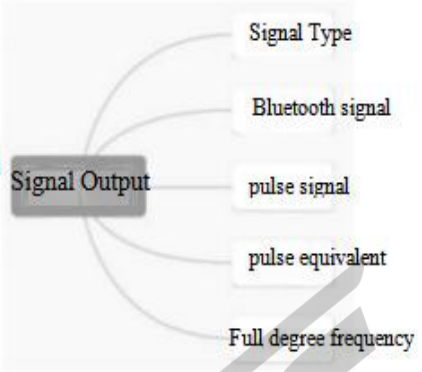
8.2.2 Signal output

8.2.2.1 Signal Type
Select signal output type:

HART/RS485/off

8.2.2.2 Bluetooth signal
Enables or disables the Bluetooth signal output

8.2.2.3 Pulse signal
Pulse signal settings:
1. Pulse output
2. Equivalent Output
3. Off-pulse no output



Configuration Figure 4

8.2.2.4 Working condition density
Working condition mass = working condition volume * working condition density

8.2.2.5 Standard **Condition Density**
Standard Condition Mass = Standard Condition Volume * Standard Condition Density

8.2.2.6 Pulse Equivalent
Set the pulse equivalent output according to the actual demand

8.2.2.7 Full Degree Frequency
Set the maximum frequency value.

8.2.3 Auxiliary parameters

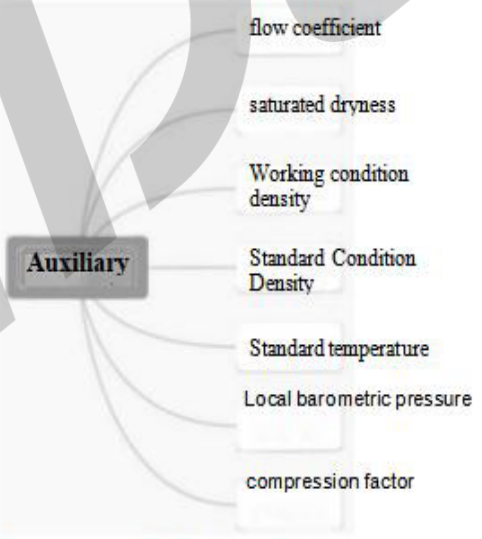
8.2.3.1. Flow coefficient
Flow compensation coefficient

8.2.3.2 Saturated dryness
Saturated dryness of compensation steam

8.2.3.5 Standard temperature
Temperature under local standard operating conditions

8.2.3.6 Local Barometric Pressure
Stress under local standard working conditions

8.2.3.7 Compression factor
When the landmark condition metering air compression coefficient compensation.



Configuration Figure 5

8.2.4. Temperature setting

8.2.4.1 Sensors

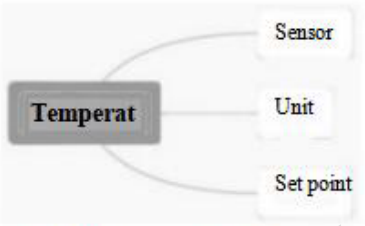
Enable/Disable Use Sensor

8.2.4.2 Units

Select temperature unit: ° C or ° F

8.2.4.3 Set value

Artificially set a fixed temperature value



Configuration Figure 6

8.2.5 Pressure setting

8.2.5.1 Sensors

Enable/Disable Use Sensor

8.2.5.2 Unit

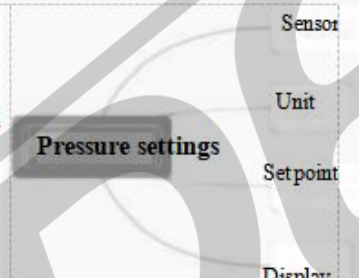
Select pressure unit: MPa or KPa or Pa

8.2.5.3 Setting value

Artificially set a fixed pressure value

8.2.5.4 Display

Select absolute pressure display or gauge pressure display



Configuration Figure 7

8.2.6 Communication Settings

Configuration Figure 8

8.2.6.1 ModBus

1. No.: 485 Address of communication instrument
2. Check: Select odd check/even check/no check/I/no check II
3. Baud rate: 2400/4800/9600/19200
4. Decoding sequence: 3412/1234/2134/4321
5, delay: according to different system reading speed setting, the general default can

8.2.6.2, HART

1. Polling: polling number of HART instrument
2, delay: according to different system reading speed setting, the general default can be
3. Write Protection: Set write protection, which is generally the default
4, set the main variable, the second, 3. 4 variable object.

8.2.6.3 BLUETOOTH (Bluetooth)

1. Number: Set the Bluetooth name of the instrument

8.2.7 Signal Processing

8.2.7.1 Algorithm Mode

Select Mode_S ~ 10 level, signal processing by FFT, etc. Level, according to seismic/interference and other field conditions to choose the

8.2.7.2 Filter Mode

Fast: fast follow-up when the flow changes greatly. Change hour according to damping filter

Standard: Gain adjustment

8.2.7.3 Gain adjustment

Adjust the frequency limit

8.2.7.4 Frequency Limits

Upper frequency limit: the upper frequency limit of the algorithm processing signal

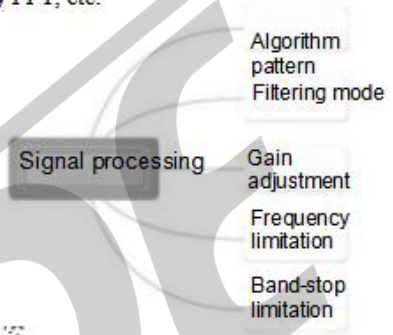
Lower Frequency Limit: Lower Frequency Limit for Algorithm Processing Signal

Lower Limit Algorithm: Algorithm mode level setting less than the lower limit of frequency

8.2.7.5 Stopband limit

Stop band mode: on/off whether to shield the upper limit of frequency limit in the frequency limit section

Limit section frequency lower limit



8.2.8 Cumulative processing

8.2.8.1 Clearing

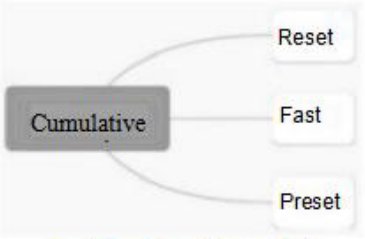
Enable-Clear Cumulative Flow

8.2.8.2 Quick

Enable-turn on the one-button zero clear

8.2.8.3 Preset

Set the cumulative value, the preset value does not exceed the 1 million



configuration Figure 10

8.2.9 Instrument settings

8.2.9.1 Language

Select Chinese/English display

8.2.9.2 Write Protection

Set write protection, the general default can be

8.2.9.3 Main Variables

Toggle Instantaneous/Cumulative as the main variable in the first line in large font

8.2.9.4 Backlight Control

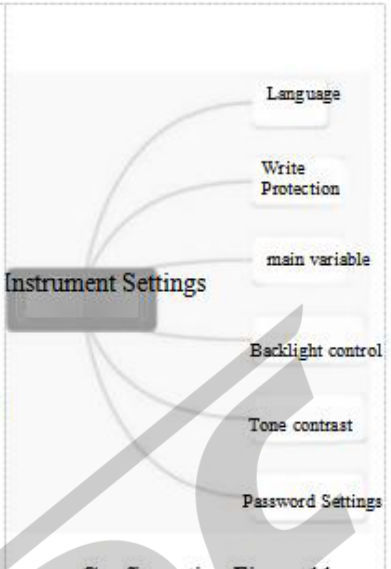
Control Backlight Auto/Enable/Turn Backlight Off

8.2.9.5 Contrast

Adjust the LCD contrast according to the actual display definition

8.2.9.6 Password Setting

Change the entry password of parameter setting, the initial value is (5000)



Configuration Figure 11

9. Specifications

9.1, Specifications

Except for special customization, the following specifications are applicable to both PTFMV1.0 and PTFM V1.0S models.

9.2. Technical parameters

Nominal diameter (mm)	15, 20, 25,32,40,50,65,80,100,125,150, 200,250,300(300~1000 plug-in)
Nominal pressure (MPa)	DN15-DN2004.0(>4.0 agreement supply) DN250-DN3001.6(>1.6 agreement supply)
Medium temperature (℃)	-40 to 150,-40 to 260,-40 to 330;
Body Material	304,316L
Sensor Material	316L
Accuracy	± 1%R,± 1.5%R; plug-in: ± 2.5%R,
Range Degree	1:6-1:100

Supply voltage	Sensor: DC +12V,DC +24V; Transmitter: DC +12V,DC +24V; Battery powered: 3.6V battery
Output signal	Square wave pulse: high level≥ 5V, low level ≥ 1V; Current: 4 ~ 20mA;HART;RS485; Bluetooth
pressure loss coefficient	Conform to JB/T9249 standard Cd ≤ 2.4
Explosion-proof sign	Intra-safe type: Exd Ⅱ ia CT2-T5 flameproof type: Exd Ⅱ CT2-T5
Protection level	Common type IP65 Submersible type IP68
Environmental conditions	Temperature -20 ℃ ~ 55 ℃, relative humidity 5% ~ 90%, atmospheric pressure 86 ~ 106kPa
Applicable media	Gas, liquid, steam

9.3 Flow range

9.3.1 PTFM V1.0S type flow range

Type PTFMV1.0S				
Instrument caliber (mm)	Liquid		Gas	
	Measurement range (m^3/h)	Flow rate range (m/s)	Measurement range (m^3/h)	Flow rate range (m/s)
15	0.15-5.1	0.2-8	2.1-32	3.3-50
20	0.21-9	0.19-8	2.83-73.5	2.5-65
25	0.35-15	0.19-8	3.9-141	2.2-80
32	0.55-23.15	0.19-8	6.37-231	2.2-80
40	0.86-36.17	0.19-8	9-362	2-80
50	1.34-56.52	0.19-8	10.6-848	1.5-120
65	2.27-85.52	0.19-8	18-1433	1.5-120
80	3.44-144.6	0.19-8	27-2170	1.5-120
100	5.37-226	0.19-8	42.4-3391	1.5-120
125	8.4-353	0.19-8	66.3-5299	1.5-120
150	12.1-508	0.19-8	95.4-7630	1.5-120
200	21.5-904	0.19-8	170-9043	1.5-80
250	33.56-1413	0.19-8	265-14130	1.5-80
300	48.32-2035	0.19-8	382-20000	1.5-80

Flow Range Table 1

9.3.2, PTFM V1.0 type flow range

PTFMV1.0				
Instrument caliber (mm)	Liquid		Gas	
	Measurement range (m^3/h)	Flow rate range (m/s)	Measurement range (m^3/h)	Flow rate range (m/s)
15	0.19-4.45	0.3-7	3.05-28.6	4.8-45
20	0.34-7.91	0.3-7	3.4-58.8	3-52
25	0.53-15	0.3-7	5.3-123.6	3-70
32	0.87-20.26	0.3-7	8.7-203	3-70
40	1.36-31.65	0.3-7	13.5-316	3-70
50	2.12-49.46	0.3-7	21-530	3-75
65	3.58-83.58	0.3-7	35.8-895	3-75
80	5.43-126.6	0.3-7	54-1356	3-75
100	8.48-198	0.3-7	84.8-2120	3-75
125	13.25-310	0.3-7	132-3312	3-75
150	19-445	0.3-7	190-4770	3-75
200	33.9-790	0.3-7	340-7912	3-80
250	53-1236	0.3-7	530-12364	3-80
300	76.3-1780	0.3-7	763-17800	3-80

Flow Range Table 2

10. Common faults

10.1 Current abnormality

10.1.1 Fault current

If the self-diagnostic function detects a serious flowmeter fault, an analog signal of 4 to 20mA HART (compatible) is driven to the following values:

1.Low current: 3.37~3.75mA,

2.Medium current: 26mA,

3.High current: 50mA,

The above current value indicates that the current output module of the flowmeter has abnormal hardware. Please contact the engineer.

10.1.2 Saturation current

When the working flow exceeds the range point, the analog output continues to follow the working flow until it reaches 20mA saturation value; regardless of the operating flow rate, the output will not exceed the listed saturation value.

Therefore, when the current reaches the saturation value of 20 mA, the reading values of the system and the flowmeter do not match. Please check whether the full flow settings of the system and the flowmeter are consistent. The full flow settings of the flowmeter refer to P22 "of 8.2. 1.8, full flow".

10.2 Response time

The minimum response time of the flowmeter is 1 s

10.3 Flow lower limit cut-off

If the flowmeter does not reach the lower limit of the flow "P27 and P28 flow range table", it will be cut off to 0. Please check whether the signal cut off is set. If the real-time frequency is less than the set value, the flow rate will be cut off to 0. The signal cut off of the flowmeter will be set for reference. P22"8.2. 1. 10, signal excision".

10.4. Traffic Abnormal

The flowmeter shows abnormal flow measurement value, mainly including the following 3 conditions:

1. The actual flow becomes larger but the flowmeter measurement becomes smaller
2. The actual flow becomes smaller but the flowmeter measurement becomes larger
3. The actual flow is stable but the flowmeter measurement fluctuates greatly

The main investigation of the following points:

1, whether the pipeline vibration, vibration amplitude.

2. Whether there are enough straight pipe sections left before and after the installation of the flowmeter.

3.Whether there are relatively large interference sources near the installation position of the flowmeter, such as fans, frequency converters, transformers, etc.

4. Whether the pipeline is electrically connected.

5. Whether the DC power supply is mixed with AC pollution.

PTFM V1.0S flowmeter can contact the engineer to set the "8.2.7.1, algorithm mode" of P25, and select the appropriate algorithm Mode level to correct and compensate vibration and interference.

10.5 Display error

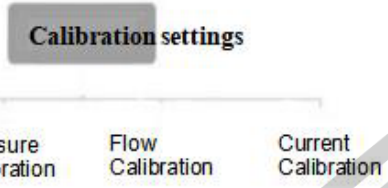
1. The flowmeter and the system communicate with each other in analog signal. It is possible that there is an error in the system display after the two sides have been running for a long time, which is normal.

Since the analog signal output depends on line communication, the line loss increases with the increase of distance, and the 4-20- mA current signal and pulse frequency signal will have more or less systematic errors.

2. The flowmeter and the system carry out wireless communication, and the display error is mainly caused by communication settings. For specific communication settings, please refer to P24, of "8.2.6, Communication Settings".

11.Calibration settings (password 300100)

Calibration Figure 1



11.1. Temperature Calibration

11.1.1 Sensors

Select PT100 or PT1000 sensor

11.1.2 Automatic Sampling

Press the 2 key to select range 00 or 01 to modify the current sampling range

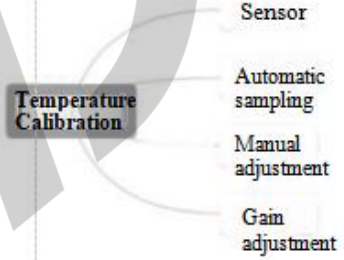
Press the 2 key to select the sampling value 00 or 01, press the 1 key to automatically sample and collect the current sampling value

11.1.3 Manual adjustment

Manually correct the set value of range 00 or 01, sampling value 00 or 01

11.1.4 Gain adjustment

Select the gain level of Gain_6.0 V/ Gain_4.0V/Gain_2.0V/Gain_1.0V/ Gain_0.5V/Gain_0.2V, the smaller the value, the higher the resolution, the larger the value, the larger the measurement range



Calibration Figure 2

11.2. Pressure calibration

11.2.1 Sensors

Select gauge pressure or absolute pressure for sampling

11.2.2 Automatic Sampling

Press the 2 key to select the range 00,01 or 02 to modify the current sampling range

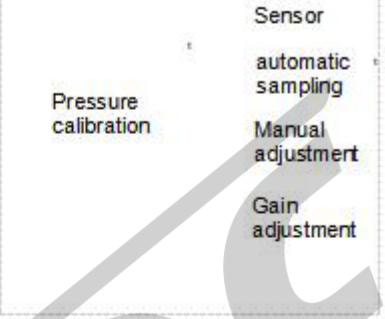
Press the 2 key to select the sampling value 00,01 or 02, and press the 1 key to automatically sample and collect the current sampling value

11.2.3 Manual adjustment

Manually correct the set value of the range 00,01 or 02, sampling value 00,01 or 02

11.2.4 Gain adjustment

Select the gain level Gain_6.0V/ Gain_4.0V/Gain_2.0V/Gain_1.0V/ Gain_0.5V/Gain_0.2V, the smaller the value, the higher the resolution, the larger the value, the larger the measurement range



11.3. Flow calibration

11.3.1 Number of correction segments

According to the actual calibration requirements, the total number of correction segments shall not exceed 9

11.3.2. Correction parameters

Set the maximum 9-segment correction frequency range, from small to large

Set a maximum of 9 segments of the corrected frequency range of the instrument coefficient

11.4. Current calibration

11.4.1 Current Zero

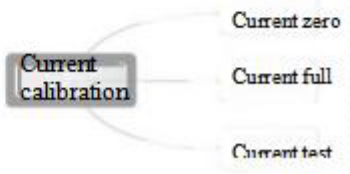
According to the actual measured current value input, current zero automatic calibration

11.4.2 Current Full

According to the actual measured current value input, current full automatic calibration

11.4.3 Current Test

Select a current test point and output current test according to the set value



Calibration Figure 5

JIDE INTELLIGENT FLOWMETER

Integrated electromagnetic flowmeter

Split-type electromagnetic flowmeter

Split-type electromagnetic flowmeter

Split-type electromagnetic flowmeter

Intelligent water meter

Vortex flowmeter

Vortex flowmeter

Turbine flowmeter

Mass flowmeter

Float flowmeter

Thermal gas mass flowmeter

Controller