NEW-CONSENS

NC300C Series Plug-in vortex-shedding flowmeter

1. Product Overview

NC300C Series Plug-in vortex-shedding flow sensor is widely applied in measuring the heavy caliber gas, liquid and steam flow, and measuring the turbid liquid with small grain and impurity, and used in the automatic controlling system as the flow transmitter. Explosion proof type of the NC300C Series Plug-in vortex-shedding flow sensor is in accordance with the regulations of GB3836-83 *Using the Explosion proof electric equipment in the Explosive environment*, and the Explosion proof symbol is ExdIIBT6.

2. Working principle

Applied the standard ISO7415 (The measurement of the liquid in the ring section closed channel is measuring the seed in a point in the section) of the international standard organization, Used the vortex speed measuring probe buried in the piezoelectric crystal to insert in the heavy caliber industrial pipeline, then transfer toll bar vortex frequency to the current or voltage pulse signal or 4～20mADC current signal that is proportional to flow rate.

3. Figures of the instrument

- could disassembly and assembly the sensor with out current cutting, and separation of the amplifier and sensor (the separation distance is 15m)
- Applied the noise immunization circuit and anti-shock sensor, which made the instrument could resist the shock in working condition.
- Less pressure lost, and wide range, the scope reaches to 1:25.
- No movable parts, and stable for long term, and simple structure and easy to install and maintain.
- The measurable media temperature reach to +250℃

4. Technical parameter

Table1 Technical diameter of the Plug-in vortex-shedding flowmeter

Nominal diameter (mm)	250, 300, 400, 500, 600, 700, 800, 900, 1000
Material of the instrument	1Cr18Ni 9Ti
Nominal pressure (MPa)	PN1.6MPa; PN2.5MPa
Temperature of the measured media (℃)	-40～+250℃
environmental condition	Temperature-10～+55℃, relative humidity 5%～90%, atmospheric pressure 86～106kPa
Grade of the precision	±2.5% of the display value
Range ratio	1:10; 1:15

resistance loss coefficient	Cd<2.6
Output signal	Sensor: Signal of pulse frequency0.1~3000Hz low level≤1V High level≥6V Transmitter: two wire system 4~20mADC current signal
Power supply	Sensor: +12VDC、+24VDC (Optional) Transmitter: +24VDC Display onsite: Self installed in the instrument3.6Vlithium battery
Signal transmission cable	STVPV3×0.3(three-wire system), 2×0.3(two wire system)
Transmission distance	≤500m
Signal cable interface	Internal thread M20×1.5
Explosion-proof marker	ExdIIBT6
Grade of Protection	IP65
Permitted Acceleration of vibration	1.0g

5 Type selections

5.1 The flow range of the general liquid and gas see table 2

Table2 The flow range of the general liquid and gas

Nominal diameter (mm)	Measuring range(m^3/h)		Nominal diameter (mm)	Measuring range(m^3/h)	
	liquid	Gas		liquid	Gas
250	80-1150	1060-10600	900	970-12000	13000-130000
300	130-1400	1540-15400	1000	1130-16900	17000-170000
400	180-2700	2700-27000	1100	1450-18000	19000-190000
500	280-4200	4240-42400	1200	1630-24400	24400-244000
600	410-6100	6100-61000	1300	2020-25300	27000-270000
700	580-7300	7800-78000	1400	2350-29500	31000-310000
800	720-10800	10850-108500	1500	2550-38000	38200-382000

* * The frequency in the table is theoretical value, and the liquid used for measuring test is room temperature water (t=20℃, ρ=1000Kg/m^3). And the liquid used for measuring test is normal temperature and pressure air (t=20℃, P=101.325KPa, ρ=1.205 Kg/m^3)

5.2 The given volume flow-rate from standard to working condition

The measuring unit of the general gas always used the standard volume flow rate, namely Nm^3/h. Use the following formula to converse the standard volume flow rate to working condition volume flow rate, namely, Nm^3/h, then compare with the applicable flow range in Table 3.

$$Q_{工} = Q_{标} \times \frac{0.10325\times(T_{工}+273.15)}{293.15\times(P_{工}+0.101325)}$$

Q工---Q Working condition

Q标---Q standard condition

In the formula: $Q_{工}$ The volume flow rate of the measured media in the working condition （m3/h）

$Q_{标}$: The volume flow rate of the measured media in the standard condition （Nm3/h，20℃，0.1013MPa under the Absolute pressure）

$T_{工}$: The media temperature of the measured media in the working condition.

$P_{工}$: The media pressure of the measured media in the working condition. (MPa)

5.3 For the saturated steam, could refer the flow range comparison in Table 3 (Unit：t/h)

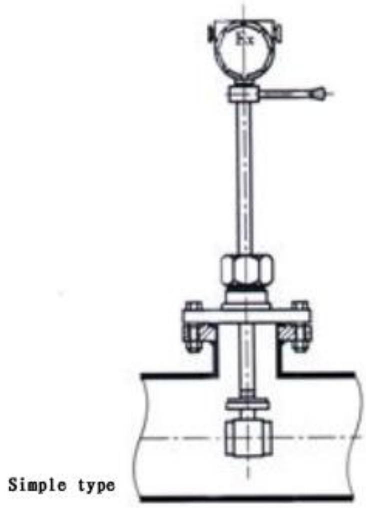
Table 3, the range of the quality and flow rate

（Unit:t/h）

Vapour densitykg/m3		0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0	2.5	3.0
saturation temperature℃		99.7	120.2	143.6	158.8	170.4	179.4	198.3	212.4	223.9	233.8
Vapor density kg/m3		0.5903	1.1295	2.1628	3.692	4.1616	5.1415	7.5940	10.038	12.507	15.007
DN250	Qmin	0.904	1.33	1.726	2.096	2.383	2.671	3.205	3.698	4.438	5.301
	Qmax	4.684	8.999	17.22	25.19	33.08	40.93	60.40	79.68	88.92	97.43
DN300	Qmin	1.302	1.775	2.485	3.108	3.432	3.846	4.651	5.325	6.391	7.633
	Qmax	6.746	12.96	24.79	36.27	47.63	58.93	86.98	114.7	128.3	140.3
DN400	Qmin	2.314	3.156	4.418	5.365	6.101	6.383	8.205	9.467	11.36	13.57
	Qmax	11.99	23.04	44.08	64.48	84.68	104.8	154.6	204.0	227.6	243.7
DN500	Qmin	3.616	4.931	6.903	8.383	9.533	10.68	12.82	14.79	17.75	21.20
	Qmax	18.74	36.00	68.87	100.8	132.3	163.7	241.6	318.7	355.7	389.7
DN600	Qmin	5.207	7.101	9.941	12.07	13.73	15.58	18.46	21.30	25.56	30.53
	Qmax	26.98	51.83	99.17	145.1	190.5	235.7	347.9	458.9	512.2	561.2
DN700	Qmin	7.087	9.665	13.53	16.43	18.69	20.94	25.13	28.99	34.79	41.56
	Qmax	36.74	70.55	135.0	197.5	259.3	320.9	473.6	624.7	697.1	763.8
DN800	Qmin	9.257	12.62	17.67	21.46	24.40	27.35	32.82	37.87	45.44	54.28
	Qmax	47.97	92.15	176.3	257.9	338.7	419.1	618.5	815.9	910，6	997.7
DN900	Qmin	11.27	15.98	22.37	27.16	30.89	34.62	41.54	47.93	57.51	68.70
	Qmax	60.71	116.6	223.1	326.4	428.7	530.4	782.8	1033	1152	1263
DN1000	Qmin	14.46	19.72	27.61	33.53	38.13	42.74	51.8	59.17	71.01	84.81
	Qmax	74.95	144.0	275.5	403.0	529.3	613.2	966.5	1275	1423	1559

6. Structure style and mounting methods

6.1 Structure type



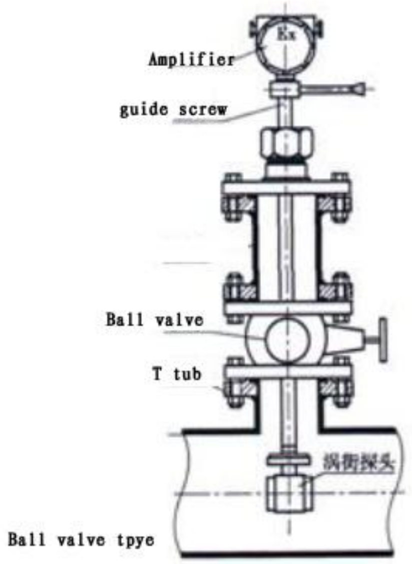


Figure1

Figure 2

6.2 The simple type flowmeter mounting method

- Open aΦ100 round flaw in the mounting point that satisfied the requirement of the straight length of flowmeter.

Welding the lower pipe section of the Φ109×4.5mm base with the opened round flow, and no deflection by eyes.

Insert the speed measuring probe into pipeline, and adjust the inserting depth, in order to tally the center of the probe and the middle shaft of the pipeline, the included angle between the middle line of measuring probe and axlewire should less than 5 degree, then adjust the flow direction sign and let them has the same direction with liquid.

Butt joint flange or ball valve with welded base, then fastening it with screw bolt

6.3 The mounting and dismounting the ball valve type flowmeter (has Shut-off Valve)

- Technical requirement

➢ The un-noted specification and material needs the user to determine it with the actual compressive strength and anti-corrosion.

➢ The location of the “mounting base” should correctitude in pipeline, and on distinct deflection.

➢ Non-steel pipeline could use clamp to fix “mounting base”, and the space in clamp should reach 85 mm as showed in above figure, in order to insert screw bolt M16×65 when mounting ball valve.

➢ The connection standard of the flange: GB4216.4-84。

The schematic diagram of the mounting base.

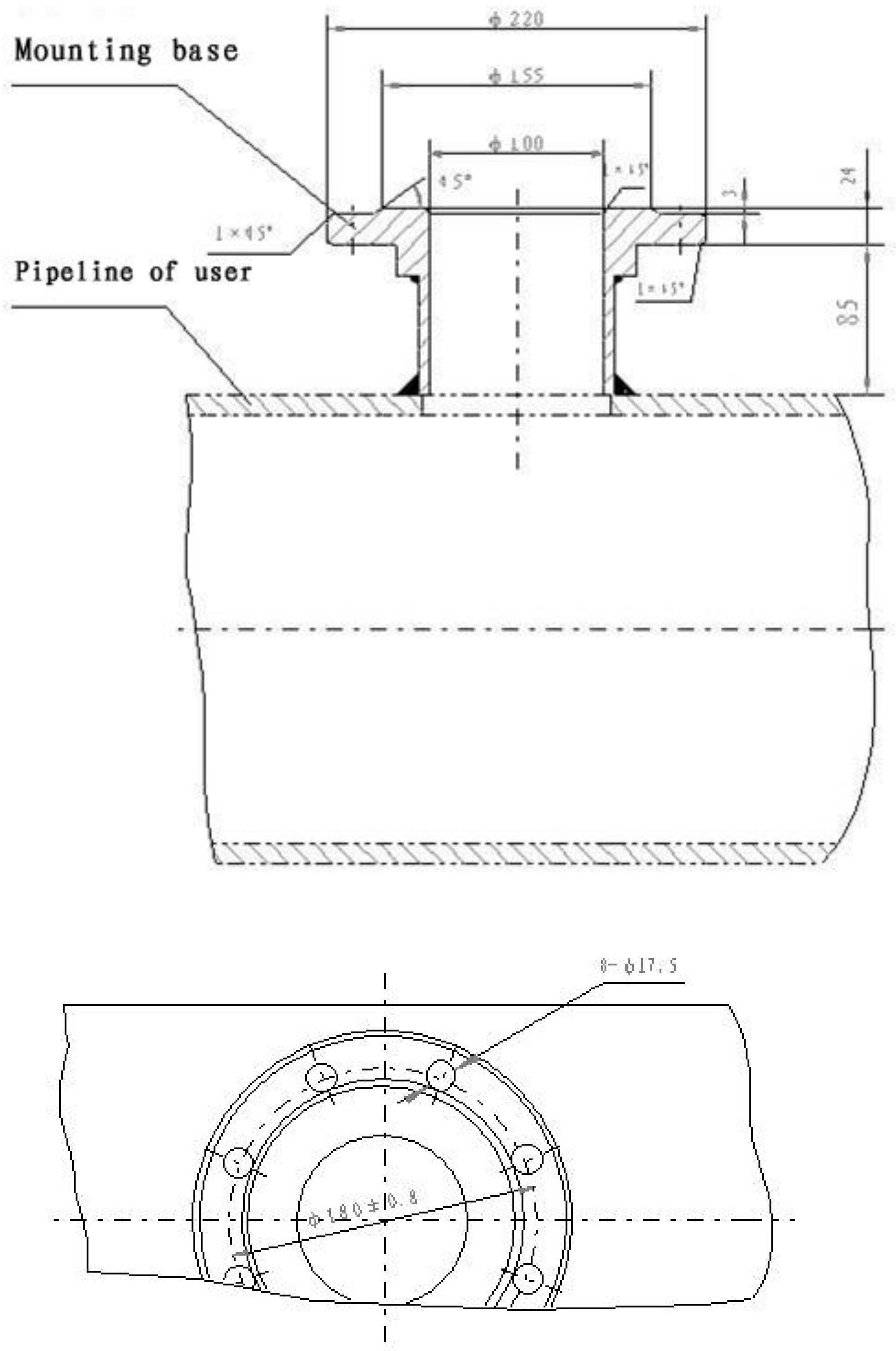


Figure 3 The schematic diagram of the mounting base.

Mounting procedures

In the first mounting, if the measured pipeline is permitted to cut-off flow, the mounting could refer the schematic diagram of the mounting base (Figure 3). If the measured pipeline satisfied the requirement of the straight length of flowmeter that Open aΦ100 round flaw in the mounting point and complete the connection between "mounting base" and pipeline. Then complete the whole mounting work according to the schematic diagram of the mounting (Figure 2). Also cut-off the ball valve temporary after mounting it, which is not influenced the flow liquid and then mounting sensor.

In the first mounting, if the measured pipeline is not permitted to cut-off flow, Firstly complete the fix and seal of "Mounting base (Figure 3) on pipeline, then mounting ball valve, then drill hole with non-stop water drilling machine under the condition of no hole in pipeline. After drilling, dismounting the drilling machine, and mounting sensor; or dismounting drilling machine, temporary cut-off ball valve and then mounting sensor. The mounting and dismounting method of the non-stop water drilling machine is same with the method of sensor.

Remark 1: Shall check the ball valve and ensure the complete open and close before mounting. When Wire stop plunger of the ball valve located from full close to full open, and the valve plug must in the condition of full open, if not, shall amend the wire stop plunger.

Remark 2: The longer side is connected with the "Mounting base" when mounting the ball valve.

Attachment 1——Common system problems and solutions

1. Problems classification

The problem could be classified by system and instrument problems, should check the problem of the system, then check the instrument.

- System includes: Mounting, mistake in connection, caliber mismatch, and flow rate range mismatch, the shock and electromagnetic interference, power supply and improper adjustment of the sensitivity.
- The problem of the instrument: invalid of the measuring probe, the problem of the measuring amplifier, inner short line and instrument liquid leak, etc.

2. The system problem and solution.

01 Has the liquid flow in pipeline with power, but no signal output.

- Check the connection line of the instrument.
- Check the instrument mounting direction.
- Check the flow rate, whether low than normal range.

02 No liquid flow in pipeline with power, but has signal output.

- Check the instrument grounding.
- Check the pipeline whether has strong mechanic shock.

- Check environment, whether has the strong electromagnetic interference, such as the large power electrical appliance or frequency converter and other strong power equipment.

Check whether the high sensitivity, and adjust two potentiometer in counter clock wise till no output.

03 The liquid is stable and required the flow rate in pipeline, but the serious change in output, the output is not stable.

- Interference caused by bad grounding.
- Interference caused by pipeline strong shock.
- Low sensitivity and leak then caused the d image, improve the sensitivity.

04 The mismatch of display flow and actual flow, serious difference.

- The wrong setting of the instrument diameter.
- The serious difference of the temperature pressure of the instrument.
- The flow rate low or high the normal range.

Mistake in mounting, such as block in pipeline, and lack of straight length.

3. Check the problem of the instrument

01 The simple judgment of the problem of the testing amplifier

If there is no professional instrument, observe the signal by Displaying Meter, and sense the signal by hands in the lead wire input terminal of the testing probe of the amplifier, and use this method to judge whether the testing amplifier is in trouble. If the signal is existed, that means the testing amplifier is in working, if not, means the amplifier is in trouble.

02 The simple judgment of problem of the testing probe.

If the instrument no any signal, but the testing amplifier has the signal, that means the testing probe may be in trouble. Check the condition of testing probe by Multimeter, and use Multimeter to test the insulation resistance of two signal wires, if the temperature below 200℃, the insulation resistance should more than 2MΩ, when the temperature higher than 200℃, the insulation resistance should more than 10MΩ. So if the insulation resistance is in accordance with requirement, which means the testing probe is in working, if not, means in trouble.

Attachment 2——Routing maintenance

Vortex-shedding flowmeter has no any movable parts, and no need frequent maintenance in the formal using condition. If the measured media is dirty or easy to scale formation, should clean the inner side of the flowmeter, and protect vortex generator and testing probe while clean them, and avoid to touch the surface and edge angle of these parts. And non-professional person could not dismount any parts in order to avoid the damage for flowmeter. Fastening the shell end cover of the testing amplifier when test the connection and ensure the leak tightness. No any liquid and sundries left in the shell.