Ziasiot

Instructions

Vortex street flowmeter

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Summary

Vortex street flowmeter is a speed flow meter based on the theory of natural vibration of fluid and piezoelectric crystal or differential capacitor as the detection component.

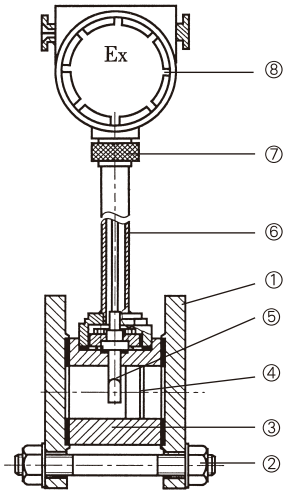
This product adopts unique differential technology, with isolation, shielding, filtering and other measures, to overcome the same products of poor seismic resistance, large noise, small signal data disorder and other problems, and adopts a unique detection probe packaging new technology and protective measures, to ensure the reliability of the product.

The product has three measurement types: basic type, differential pressure type and temperature and pressure compensation. The basic type measures the flow signal of single working condition, the differential pressure compensation type directly measures the mass flow, the temperature and pressure compensation can measure the temperature, pressure and flow signal at the same time, and output the standard volume flow or mass flow after compensation. The product has two structural types of pipe type and insert type, can be displayed on site, can also be long distance transmission, each type has high temperature, high pressure, anti-corrosion, explosion-proof and other specifications, and integral and split structure, to adapt to different measurement media and installation environment.

The instrument has a series of advantages, such as wide range ratio, high accuracy, convenient installation and maintenance, and wide medium adaptability. It can be widely used in petroleum, chemical industry, metallurgy, machinery, food, paper making, medicine, as well as urban pipeline heating, water supply, gas and other industries of various low viscosity liquid, gas, steam and other single-phase fluid process measurement and energy saving management.

Fundamental structure

① flange
② binding bolt
③ table body
④ vortex generator
⑤ detection probe
⑥ watch rod
⑦ locknut
⑧ amplifier shell



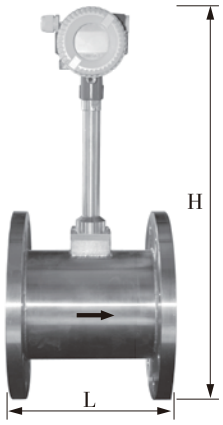
Product characteristics

- The structure is simple and firm, no moving parts, long service life, small pressure loss, low operating cost.
- New structural design of mechanical vibration resistance, shock resistance and dirt resistance is adopted.
- It achieve high exchangeability and versatility from the detection probe to the transport discharge path.
- The circuit adopts surface mounting process, with compact structure and high reliability.
- Set the menu according to the general operation principle, and use Chinese characters to prompt, clear and intuitive, simple to operate.
- Within a certain range of Reynolds number, the output signal is not affected by the physical properties of the changes and components of the measured medium, and the instrument coefficient is only related to the shape and size of the vortex body, so it is generally not necessary to reciliate the instrument coefficient after replacing the accessories.
- The 12864 full dot matrix LCD display with fine low power consumption displays the instantaneous flow and cumulative flow, and compensates the measured temperature and pressure, and the data is rich and intuitive.
- It has the multipoint linear correction function and greatly improves the measurement accuracy. After using the high-speed algorithm of single pulse and pulse by pulse measurement, the compression or broadening calculation is only delayed one by one time, to achieve complete real-time linear compensation, this performance reaches the world's leading level.
- The differential pressure compensation vortex street mass flowmeter can directly measure the mass flow rate, which is not affected by the medium component or the dry degree change, and the measurement accuracy is higher.
- The temperature and pressure compensation built-in or external sensor automatically corrects temperature and pressure, directly converting the working condition flow into mass flow or volume flow under standard state. The measurement is simple and accurate, and 12 compensation algorithms can meet almost meet all flow compensation requirements.

Technical parameter

Measurement medium	Liquid, gas, and steam
Inside nominal diameter	Franka installation: DN 15~DN 300 Flange connection type, pipe butt welding type: DN 15~DN 400 Thread connection type, clamp connection type: DN 15~DN 100 Fixed insertion type, ball valve insertion type: DN 200~DN 2500
Temperature range	Piezoelectric type: pipe type-20℃ ~ 350℃ plug-in type-10℃ ~ 300℃ Capacitance type: pipe type-50℃ ~ 500℃ insert type-30℃ ~ 450℃
Pressure specifications	1.6Mpa, 2.5 Mpa, 4.0 Mpa, and higher pressure specifications can be specially customized
Range degree	Normal range of 1:10 Extended range of 1:15
Accuracy	Fluid: ± 1.0% of the indicated value Gas, steam: ± 1.5% of the indicated value Inset-in: ± 2.5% of the indicated values
Repetitiveness	≤1 / 3 of the accuracy
Power supply voltage	Pulse output type + 12VDC, + 24VDC (optional) 4 ~ 20mA . DC current output type + 24VDC The field display instrument comes with 3.6V lithium battery with a service life of more than 2 years
Output signal	Pulse frequency signal 0.1 ~ 3000Hz (low level 1V high level 6V) Two-line system of 4 ~ 20mA. DC current signal (with HART communication) Three-line system 4 ~ 20mA. DC current signal (with RS 485 communication)
Ambient condition	Ambient temperature: ordinary type-30℃ ~ 60℃ explosion-proof type-25℃ ~ 50℃ field display type-10℃ ~ 50℃ Ambient humidity: relative humidity of 5% ~ 85% Atmospheric pressure: (86 ~ 106) KPa
Allow the vibration acceleration	Piezoelectric type 0.2g Capacitance type 1.0g
Signal transmission distance	Pulse signal of 500m Current signal is 1,000 m RS 485 Communication: 1,200 m
Signal line interface	Inner thread M 201.5
Explosion-proof sign	Octal type Exd Ⅱ BT5 BenAnn type Exia Ⅱ C T 5
Levels of protection	Common-type IP65 Diving type IP68
Instrument material	1Cr 18Ni9Ti special materials can also be used according to user requirements

Main external dimensions of the product

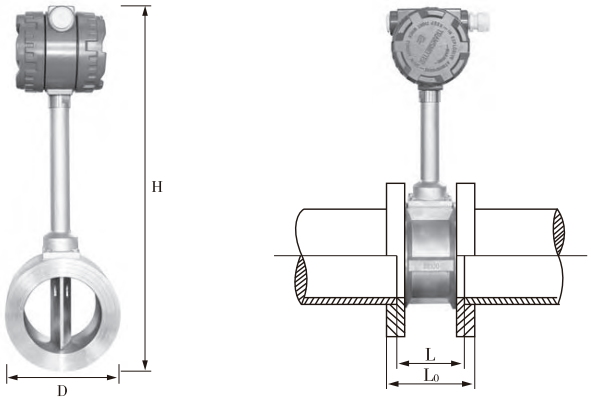


Nominal diameter	Instrument length	Instrument height	Installation flange				Install bolts		Piping specifications
			Outer diameter of flange	Flange thickness	Bolt hole spacing	Bolt aperture	Number of bolts	Bolt specifications	
15	180	415	95	14	65	14	8	M12×60	Φ18×1.5
20	180	420	105	16	75	14	8	M12×60	Φ25×2.5
25	180	425	115	16	85	18	8	M12×60	Φ32×3.5
32	180	435	140	18	100	18	8	M16×70	Φ39×3.5
40	180	435	150	18	110	18	8	M16×70	Φ48×4
50	180	440	165	20	125	18	8	M16×70	Φ59×4.5
65	180	460	185	20	145	18	8	M16×70	Φ74×4.5
80	200	490	200	20	160	18	16	M16×70	Φ89×4.5
100	220	510	220	22	180	18	16	M16×80	Φ109×4.5
125	240	535	250	22	210	18	16	M16×80	Φ134×4.5
150	270	570	285	24	240	22	16	M20×80	Φ159×4.5
200	300	625	340	26	295	22	24	M20×90	Φ219×9
250	320	685	405	28	355	26	24	M24×100	Φ273×22
300	350	710	460	32	410	26	24	M24×100	Φ325×12
350	370	790	520	38	470	26	32	M24×115	Φ377×13
400	400	845	580	42	525	30	32	M27×120	Φ426×13

Note: 1. The above parameters are only applicable to the vortex street flow meter with the following pressure specification of 1.6MPa.

2. The length of the instrument is standard size, and the length of the integrated pressure compensation instrument is increased by 50mm.

3. Flange connected vortex street flowmeter is not equipped with pipe flange and bolts when leaving the factory, and users need to buy separately. The standard of connecting flange is GB / T9119-2000 flat welded steel pipe flange.



Nominal diameter	Instrument length	Installation length	Instrument height	Instrument outer diameter	Piping specifications
15	80	116	400	68	ϕ18×1.5
20	80	116	400	68	ϕ25×2.5
25	80	116	400	68	ϕ32×3.5
32	80	116	400	68	ϕ39×3.5
40	80	116	404	80	ϕ49×4.5
50	80	116	412	88	ϕ59×4.5
65	80	116	428	105	ϕ74×4.5
80	80	116	446	120	ϕ89×4.5
100	80	118	472	148	ϕ109×4.5
125	85	124	492	174	ϕ134×4.5
150	90	135	515	196	ϕ159×4.5
200	105	150	570	250	ϕ219×9
250	120	166	620	300	ϕ273×11
300	135	185	670	350	ϕ325×12

Note: 1. The above parameters are only applicable to the pressure meter below 2.5MPa.
2. The installation flange is a special flange, which has been equipped when leaving the factory. The installation of flange is the enterprise standard and is recommended to use.

Explain:1. The above dimensions are only for reference in the design and selection, and the actual size shall be subject to the factory or order confirmation.
2. The diameter of common seamless steel pipe is the diameter of metric steel pipe. If the British steel pipe is used, it should be indicated when ordering.
3. Pipe welding type, thread connection type, clamp connection type, fixed insertion type, ball valve insertion type structure appearance size, as well as high temperature type, ultra-low temperature type shape size shall be subject to the delivery or order confirmation.
4. Flowmeter installation flange adopts enterprise standard or national standard GB / T9119-2000, but also according to the needs of users to use other national departments or other industry standards, or use other national standards (American standard, German standard, Japanese standard, etc.), if special standards, please indicate when ordering.

Model and specification

Vortex street flow meter type spectrum										Explain
HLB HLE	Piezoelectric vortex flowmeter Capacitive vortex flowmeter									Instrument type
	2 3 4 5 6 7 8	Flange clamp type Flange connection type Pipe butt welding type Threaded connection type Clamp connection type Fixed plug-in type Ball valve plug-in type								Way to install
		2 3 4	Liquid Gas Steam							Measurement medium
			-X	The nominal diameter of the flow meter is represented by 2-4 Arabic numerals For example, DN200 is represented by 200						Inside nominal diameter
				-2 -3 -4 -5 -6 -7 -8 -9	No display of pulse frequency signal Pulse frequency signal band display Battery powered on-site display Two wire system 4~20mA signal without display Two wire system 4~20mA signal band display Two wire system 4~20mA signal with HART communication Three wire system 4~20mA signal band display Three wire system 4~20mA signal with RS485 communication				Output signal
					2 3 4 5 6	-50 ℃~50 ℃ (capacitive only) -20 ℃~50 ℃ 50 ℃~250 ℃ 50 ℃~320 ℃ 50 ℃~500 ℃ (capacitive only)				Temperature specification
						2 3 4 5 6	1.6 Mpa 2.5 Mpa 4.0 Mpa 6.4 Mpa Higher pressure specifications (up to 32 Mpa)			Pressure specifications
							M P T PT	Differential pressure compensation type Pressure compensation type Temperature compensation type Temperature and pressure compensation type		Compensation type
								F Q S N G B Y	Split type Diving type Scale type Corrosion resistant type Explosive type Benan explosion-proof type Integrated compensation type	Other options
HLE	3	4	-80	-6	6	3	M	Y	Integrated capacitive differential pressure vortex street mass flowmeter,flange connection type, medium less than 500℃ steam, DN 80, PN 25, current signal output band display.	

Lectotype

The selection of the vortex street flowmeter is a very important work, and the correct selection is the prerequisite for the normal operation of the flowmeter.Statistics show that 70% of the failure of the flowmeter is caused by the wrong selection or improper installation. Therefore, the flow meter must be selected correctly, and the specific selection methods can refer to the following several:

1. Selection of instrument type

Piezoelectric vortex street flowmeter has a series of advantages such as wide range ratio, high accuracy, convenient installation and maintenance and wide adaptability of medium, and has good use economy, which is a more commonly used flow metering instrument at present. Capacitive vortex flowmeter has all the advantages of piezoelectric vortex flowmeter, but also has a high temperature tolerance, temperature adaptation range-50℃ ~500℃. Capacitive vortex street flowmeter signal processing using advanced digital spectrum technology can adapt to a variety of measuring media, lower measurement lower limit, superior anti-interference and earthquake resistance, realize the ready to use, no adjustment and maintenance.

2. Selection of the installation method

Franka installation is the preferred installation method, because of its compact structure, easy installation, and short supply cycle, suitable for most applications.
Flange connection type is mostly used for integrated differential pressure, pressure, pressure compensation vortex street flow meter and some special applications.
Pipe butt welding type and clamp connection type are suitable for high pressure medium, in which the clamp connection type can be removed.
Thread connection type is mainly used for small caliber, food grade hygiene requirements.
Fixed insert and ball valve insertion are suitable for large diameter, generally choose fixed insert, convenient installation, lower cost; ball valve insertion can be continuously flow maintenance, mostly used for dirty media, easy to scale, need regular cleaning occasions.

3. Determination of the measurement range

The measuring range of different diameter vortex street flowmeter is different, even if the same diameter flowmeter is used in different media, its measuring range is also different. The actual available measurement range is determined by calculation, and the table below provides the flow range of the three typical media under specific conditions.

Reference table for flow range of pipe flowmeter

DN(mm)	15	20	25	32	40	50	60
Water	1.2-6.2	1.5-10	1.6-16	1.9-19	2.5-26	3.5-38	6.2-65
Air	5-25	6-50	9-80	13-130	18-180	30-300	48-480
Vapour	5.8-30	6.5-55	10-100	15-150	22-220	580-500	75-750
DN(mm)	80	100	125	150	200	250	300
Water	10-100	15-150	25-250	36-380	62-650	140-1400	200-2000
Air	75-750	12-120	150-1500	260-2600	450-4500	680-6800	1000-10000
Vapour	120-1200	19-1900	280-2800	450-4500	800-8000	1200-12000	1800-18000

Reference table for the flow range of the insert flowmeter

DN(mm)	200	250	300	350	400	450
Water	70-700	110-1100	180-1800	210-2100	270-2700	350-3500
Air	600-6000	1060-10600	1500-15000	2000-20000	2700-27000	3300-33000
Vapour	680-6800	1100-11000	1700-17000	2400-24000	3200-32000	4000-40000
DN(mm)	500	600	800	1000	1200	1500
Water	450-4500	600-6000	800-8000	1200-12000	1800-18000	2600-26000
Air	4200-42000	6100-61000	11000-110000	17000-170000	24000-240000	38000-380000
Vapour	5200-52000	7100-71000	13000-130000	20000-200000	28000-2800000	42000-4200000

The above flow range is the data of three typical media under specific conditions:

Liquid media is water:

T=20℃ ρ = 999.8 Kg/m^3 μ = 1.0 cp

Gas media is air:

T=20℃ P=101.325kPa (pressure) ρ = 1.293 Kg/m^3 μ =0. 084 cp

Steam is superheated steam:

T=188℃ P=0.48 MPa (pressure) ρ = 2.277 Kg / m^3 μ = 0. 0

The upper flow rate of the vortex street flowmeter is generally not affected by the working density and motion viscosity of the medium, while the lower flow rate depends on the working density and motion viscosity of the medium. Therefore, determining the flow range is actually to determine the lower flow rate actually available. When the working conditions of the measuring media change, the lower limit flow value should be corrected according to the actual density and viscosity.

Density correction: $Q_1=Q_0\times\sqrt{\rho_0/\rho}$ Adhesion correction: $Q_2=Q_0\times \mu/\mu\ 0$

In the formula: Q_1, Q_2— the measurable lower limit flow rate of the measuring medium after density and viscosity correction, m^3/h

Q_0 — Lower limit flow rate of typical medium, m^3/h

ρ_0 , ρ — Operating density of typical medium and measuring medium, Kg/m^3

μ_0 , μ — Dynamic viscosity of typical medium and measuring medium, CP

When $Q_1 > Q_2$, the measurable flow range and linear flow range are $Q_1 \sim Q_{max}$; for $Q_1 \leq Q_2$, the measurable flow range is $Q_1 \sim Q_{max}$, and the linear flow range is $Q_2 \sim Q_{max}$; Qmax is the upper limit of typical medium.

4. Selection of nominal diameter

The selection of nominal diameter should first determine the volume flow range of the measuring medium under the working condition, and then calculate the actual measurable flow range of the pipe diameter. If the flow range of the measured medium is within the actual measurable flow range of the corresponding diameter, the flow meter with the same diameter as the piping diameter can be selected; if the actual measurable flow range of the corresponding diameter cannot meet the requirements of the lower limit flow, the diameter should be reduced and re-calculated; if the actual measurable flow range of the corresponding diameter cannot meet the requirements of the upper limit flow, then the diameter should be increased and re-calculated.

If only the mass flow rate of the measured medium or the volume flow rate under the standard condition is known, the volume flow rate under the working condition should be converted first and then compared to the actual measurable flow rate range calculated.

The volume flow rate under the mass flow conversion condition is calculated by the following formula:

$$Q = M / \rho$$

In the formula: Q — Operating volume flow rate, m^3/h

M — Mass flow rate, Kg/h

ρ — Operating medium density, Kg/m^3

The volume flow rate under standard conditions is calculated using the following formula:

$$Q = \frac{0.101325\ (273.15+T)}{293.15\ (0.101325+P)} \times Q_b$$

In the formula: Q_b — Standard volume flow rate, m^3/h

P — Working pressure of the medium, gauge pressure MPa

T — Working temperature of the medium, ℃

If the working density and motion viscosity of the measuring medium are not much different from the three typical media, the appropriate 9 nominal diameter can be selected without checking the table by calculation; if the working density and motion viscosity of the measuring medium are very different from the three typical media, if hydrogen with small density and oil with large viscosity, the vortex street flow meter may not be applicable, and the measurable flow range should be carefully calculated.

5, the choice of compensation type

The vortex street flowmeter measures the working volume flow, if you need to measure the standard condition flow or mass flow, it needs to make compensation, including differential pressure compensation type, pressure compensation type, temperature compensation type, temperature and pressure compensation type.

Differential pressure compensation vortex street mass flowmeter is a milestone product developed by our company's research and development team after years of painstaking research. It is the first in the world and has obtained the national patent. It is a real sense of vortex street mass flowmeter. Traditional vortex street flowmeter is using the setting density or temperature, pressure compensation density method to calculate the mass of the measuring medium flow, and the density because of the medium component or dry, degree change, simple by setting density or temperature pressure compensation method cannot reflect this change, thus produces a technical error. The differential pressure vortex street mass flowmeter developed by our company uses the function of differential pressure and density to calculate the density by measuring the differential pressure. This measurement scheme is not affected by the change of medium component or dry degree, especially suitable for the measurement of unstable mixing gas, liquid, humidity steam and moisture vapor with unstable components. The temperature compensated vortex flowmeter is suitable for measuring the mass flow of saturated steam with stable pressure; the pressure compensated vortex flowmeter is suitable for measuring the standard flow of gas with little temperature change and the mass flow of saturated steam; the temperature and pressure compensation vortex flowmeter is suitable for measuring the mass flow of steam and the standard flow of gas, and the compensation accuracy is higher.

6. Other types of selection

The split vortex street flowmeter is installed in humid environment or high temperature. The circuit part is separated from the sensor to avoid the influence of bad environment on the detection circuit.

The submersible vortex street flowmeter adopts special waterproof process, protection grade IP68, can work underwater for a long time, suitable for the risk of flooding.

The reduced diameter type vortex street flowmeter has a lower flow measurement lower limit, which is suitable for the low medium flow and not convenient for pipe shrinkage.

Integrated compensation type vortex street flowmeter is the integrated design of compensation equipment and flowmeter to become a part of the flowmeter. This design has a higher degree of integration and the installation is easier, but the production cost is also higher.
Corrosion-resistant vortex street flowmeter is used to measure the corrosive medium of 304 stainless steel. The surface body is processed and manufactured with the corresponding corrosion-resistant materials. When the measuring medium is a corrosive gas or liquid, the specific requirements and the material situation of the installed pipes shall be provided in advance.
The explosion-proof type is not allowed for O type, while the explosion-proof instrument is not allowed to open the shell adjustment circuit. The advantages of the instrument are simple installation, no safety grid, low cost, for general dangerous situations.
Complete the above selection, then select other parameters according to the spectrum table, and combine the code in the specified order, you can get the model of the vortex street flowmeter.