Vortex Flow Meter

ZEST Engineering Vortex Gas Flowmeter is used to measure the flow of liquids, Gases or Steam in pipelines. Its characteristics are no pressure loss, no moving parts and no maintenance. Though it is similar to Electro Magnetic Flowmeter the one advantage Vortex Meter has over EMF is the medium need not be conductive as in the case of EMF. This flowmeter adopts piezoelectric sensor, has high reliability, and works with in -20^0C to $+250^0$C. It gives standard analogue signal (4 ~ 20mA) or Digital pulse signal outputs. It is compatible with digital systems like Computer, DCS Systems, Dataloggers, etc.

Measuring Principle:

The vortex shedding phenomena is easily observable in nature. As a flow stream passes an obstacle in its path, vortices are alternately shed on each side. A flag that waves in the wind is a good example of vortex shedding. The flagpole is the obstacle; as the wind passes it is shed into vortices that make the flag wave and the flagpole acts as a bluff body, or a shedder bar.

Vortex flowmeters take advantage of two convenient circumstances of physical phenomena; the first is that the frequency at which vortices are shed is directly proportional to the flow velocity and the second convenience is you only have to count the number of 'pulses' made by the vortices passing downstream over a given interval of time to directly measure the volumetric flow rate of the fluid.

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Vortex Flow Meter

$$f = Sr \frac{V}{(1 - \frac{4d}{\pi D})\, d}$$

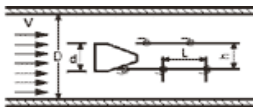


Figure 1 Diagram of vortex formed

f-Vortex frequency
d-Width of bluff body which faces the flow
Sr-Strouhal number (K – factor)
V—Average flow velocity in the pipe
D— Inside diameter of pipe

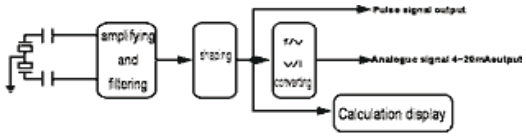
The experiment proves that if the distance between two vortex series h and the distance between two adjacent vortices in same series L are satiated with the formula L/h=0.218, then the non-symmetric vortex series can be kept in steady status. If the Reynolds number Re of flow varies within 5000 to 150000, Sr will basically be kept unchanged. So when Sr and d are constant, f will be directly proportional to the average flow velocity of the fluid, i.e. f is directly proportional to the volumetric flowrate Q of the fluid, but has no relation to the parameters as pressure, temperature, density, etc.

When vortexes are generated at both sides of the bluff body, the bluff body subjected by the action direction, signal is induced. The alternating frequency of the ascending force is same as the frequency of the vortex.

After the signals are transmitted to the converter, the signal is amplified and shaped and the impulse signal, which is linearly proportional to the velocity, is obtained. This signal can also be converted into 4~20mA standard output. The relationship between the volumetric flowrate Q and frequency f is:

$$Q = \frac{f}{k}$$

Q - is the volumetric flowrate of the fluid in liter/second
f – is frequency in number of pulses/second
K is the meter coefficient in number of pulses/litre
Function is as in the following figure:



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Technical Specifications:

Standard adopted		Q/YHC0401-2001 JB/T6807-93
Medium		Gas, liquid, steam
Diameter: Wafer Type (mm) Flange Type Insertion Type		15, 25, 30, 40, 50, 65, 80, 100 125, 150, 200 200 ~ 2000
flow measuring scope	Normal flow velocity range	Gas 5~50m/s liquid 0.5~7m/s
	Normal flowrate range	Liquid, gas, steam and insertion type flow range refer to table 2,3,4
Accuracy		±1% depending on the site conditions
Medium temperature		Routine temperature –25^{0}C ~ 100^{0}C; High temperature -25^{0}C ~ 250^{0}C
Working pressure		1.6MPa; 2.5MPa; 4.0MPa (Supplied as per order)
Output signal (signal cable connection is M20×1.5)	Pulse voltage output signal	High level8~10V Low level0.7~1.3V (Ex-proof version: High level 4~5V, Low level 0.7~1.3V) Duty ratio of pulse is about 50%, transmission distance 100 meters
	Standard current output signal	Allowable external load resistance less than600Ω(24V DC) Transmission distance is 3000 meters
Working environmental condition		Temperature: -25^{0}C ~ +55^{0}C; Humidity: 5~90% RH50^{0}C
Material		Meter body:1Cr18Ni9Ti Converter housing: AL-alloy
Power supply		12V DC±10%; 24V DC±10%; or dual lithium battery 3.6V 7.5Ah
Explosion supply grade		Intrinsically safe class iaIIc T1-T5
Protection Grade		IP65
Requirement of straight lengths		Upstream≥15~35DN; Downstream ≥10DN

Flowrate Range of Liquid, Gas (on working condition) Table 2

Media	DN mm	15	25	32	40	50	65
Liquid	m3/h	0.3~4	1.2~13	1.5~18	2.25~30	4~50	5.9~84
Air	m3/h	5~30	10.2~80	15~150	22~220	35~350	60~600
Media	DN mm	80	100	125	150	200	

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