ANDERSON EUROTECH
VALVES AND INSTRUMENTS

AE VORTEX FLOW METER

Products and Solutions

To Measure, Monitor and Control

Flow | Pressure | Level | Temperature | Analytical

For The Process Industries

AE VORTEX FLOW METER

Description

Vortex flow meter is one kind of velocity type flow meter, it's based on Karman vortex theory and adopts piezoelectric crystal to detect the burble frequency of the fluid caused by flowing through the triangular prism in the pipeline and then measure the flow of fluid. It is widely used in petrol, chemical industry, light industry and power heat supply and so on.

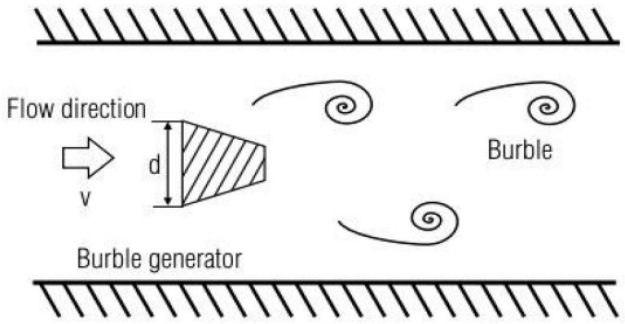
Working Principle

When the fluid in the pipeline passes the burble generator(triangular prism),burble will generate due to the acceleration of partial flow rate. The burble will arise alternatively in two burble lines, which is called Karman vortex.

The releasing frequency of Karman vortex depends on the size of triangle prim and flow rate of fluid, while independent of the medium feature parameter, such as the temperature, pressure, it can be indicated by the following formulas:

$F=sR*v\ (1-1.27*d/D)$ $Q=3600*F/K$ $M=Q*P$

- F.....The releasing frequency of Karman vortex (Hz)
- Sr.....Strouhal number (unit: dimensionless)
- V.....Medium flow rate (m/s)
- d.....The width of triangle prim
- D.....Vortex meter inner diameter (m)
- Q.....Instantaneous volume flow rate (m^3/h)
- K.....Vortex meter coefficient (unit pulse number/m^3)
- M.....Instantaneous quality flow rate (kg/h)
- P.....Fluid density (kg/m^3)



Benefit

- Integrated pressure and temperature compensation.
- 4-20mA, pulse with HART; Optional pulse with RS485
- Wide temperature range up to highest temperature 350℃
- Adopt Japan OVAL technology and design
- Embedded sensor, 4 piezo-electric crystal encapsulated inside the sensor.
- No moving parts, no abrasion, non-wearing parts inside, fully welded SS304 body (Optional SS316)

Standard Specification

- Size : DN15-DN300mm
- Accuracy : ±1.5%(standard), ±1.0%(optional)
- Power Supply : 12VDC,24VDC
- Communication : RS485/Modbus, Hart, Profitbus
- Flange Standard : EN1092-1
  PN10,PN16,PN25,PN40
  ANSI BS16.5 Class 150,300,600
  JIS2220 10K,20K,40
  AS2129 Table D,Table E
  AS4087 PN16,PN21,PN35
- Straight Pipe : Inlet Path ≥ 12D,Outlet Path ≥ 5D
- Signal Output : 4~20 mA,pulse
- Frequency Output : 2~3000 Hz
- Relative Humidity : ≤85%
- Explosion-proof : Exia IIC T6 Gb
- Ambient Temperature :-40℃~55℃ (Non Ex-proof Place)
  -20℃~55℃ (Non Ex-proof Place)
- Nominal Pressure : 1.6 MPa, 2.5 MPa, 4.0 MPa
- Protection Grade : IP65
- Velocity : 0.4~7.0 m/s liquid
  4.0~60 m/s gas
  5.0~70 m/s steam
- Body Material : SS304(Standard),SS316(Optional)
- Resistance Coefficient : Cd ≤2.6
- Oscillatory Acceleration: ≤0.2g
- Reynolds Number : $2x10^4$~$7x10^6$

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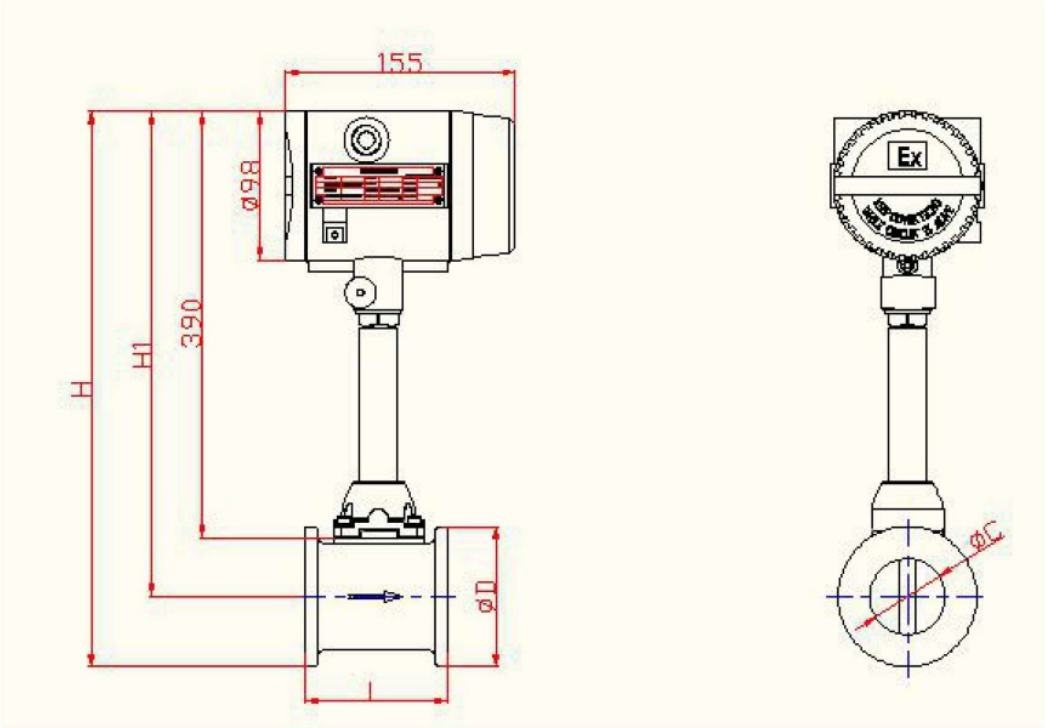
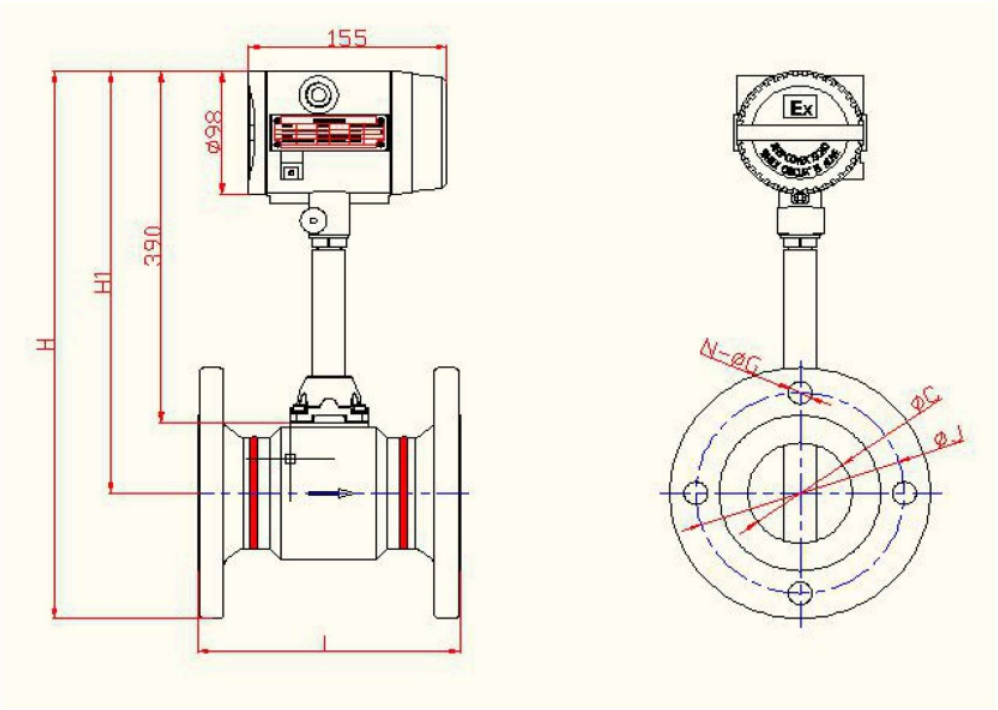


Wafer type

Pipe size	H1	H	L	D	C
15	431	448	70	35.1	15
220	431	452	70	43	20
25	431	456	70	50.8	25
32	431	463	70	64	32
40	428	464	70	73	40
50	431	477	75	92	50
65	440	492	75	105	65
80	448	511	100	127	80
100	459	537	120	157.2	100
125	471	564	103	186	125
150	484	592	120	216	150
200	504	624	98	240	200
250	535	684	114	298	250
300	560	734	130	348	300



Flange type

Pipe size	L	H1	China GB 1.6MPa			ANSI 150RF			ANSI 300RF			C
			H	J	N-ϕG	H	J	N-ϕG	H	J	N-ϕG	
15	170	431	478	65	4-ϕ14	/			/			15
20	170	431	483	75	4-ϕ14	480	70	4-ϕ15	489	82.5	4-ϕ19	20
25	170	431	488	85	4-ϕ14	485	79.5	4-ϕ15	493	89	4-ϕ19	25
32	170	431	501	100	4-ϕ18	490	89	4-ϕ15	497	98.4	4-ϕ19	32
40	170	428	503	110	4-ϕ18	491	98.5	4-ϕ15	506	114.5	4-ϕ23	40
50	170	431	513	125	4-ϕ18	507	120.5	4-ϕ19	513	127	8-ϕ19	50
65	170	440	532	145	4-ϕ18	529	139.5	4-ϕ19	535	149	8-ϕ23	65
80	200	448	548	160	8-ϕ18	543	152.5	4-ϕ19	553	168	8-ϕ23	80
100	220	459	569	180	8-ϕ18	573	190.5	8-ϕ19	586	200	8-ϕ23	100
125	220	471	596	210	8-ϕ18	598	216	8-ϕ23	610	235	8-ϕ23	125
150	270	484	626	240	8-ϕ22	623	241.5	8-ϕ23	643	270	12-ϕ23	150
200	310	504	674	295	12-ϕ22	675	298.5	8-ϕ23	694	330	12-ϕ25	200
250	370	535	737	355	12-ϕ26	738	362	12-ϕ25	757	387.5	16-ϕ30	250
300	400	560	790	410	12-ϕ26	801	432	12-ϕ25	820	451	16-ϕ33	300

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Vortex Flow Meter flow range

Nominal Diameter		Gas Standard Flow Range	Extended Flow Range	Liquid Standard Flow Range	Extended Flow Range
(mm)	(in.)	(m3/h)	(m3/h)	(m3/h)	(m3/h)
DN20	0.75	6-50	5-77	1.2-12	1-15
DN25	1	8-60	8-120	1.6-16	1.6-18
DN32	1.25	12-120	12-200	2-20	2-25
DN40	1.5	20-200	20-300	2-30	2-48
DN50	2	30-300	30-480	3-50	3-70
DN65	2.5	50-500	50-600	12-120	8-140
DN80	3	70-700	70-1230	15-150	10-170
DN100	4	100-1000	100-1920	20-200	15-270
DN125	5	150-1500	140-3000	36-360	25-450
DN150	6	200-2000	200-4000	50-500	40-630
DN200	8	400-4000	320-8000	100-1000	80-1200
DN250	10	600-6000	550-11000	150-1500	120-1800
DN300	12	1000-10000	800-18000	200-2000	180-2500

The Choice for Measured Medium

The choice for gas flow range

The upper limit of vortex flowmeter does not influenced by the temperature and pressure of medium. Flow range is depended on the medium's density and viscosity at working condition.Thus, the confirmation of flow range is calculation the available lower limit flow.

Calculation 1:First of all, using Q_P formula to calculate the working condition lower limit flow,which is determined by viscosity

In the formula $Q_P=Q_{0X}$

Q_P: Medium's lower limit flow at working condition density

Qo: Lower limit flow of flowmeter at reference condition

ρ_o: Reference the air density, $\rho_o=1.205kg/m^3$

ρ : Working condition density of medium to be measured

Calculation 2 Qv formula for calculation the lower flow limit by kinematic viscosity

In the formula: $Q_V=Q_O \times V/V_O$ (m^3/h)

Qv : Lower limit flow of the medium

Qo: Low flow limit at reference condition

Vo: Reference viscosity,15kgm/S²

V: The working condition viscosity of medium(kgm/S²)

Compare Qo and Qv, the larger flow as the real low flow limit of gas.

The choice for liquid flow range

As shown on flow range table 3

The choice of steam flow range

Saturated steam: Reference to table 1 to choose

Superheated steam: Through table 2 to get the pressure, temperature and corresponding density,taking the similar density's flow range from table six to confirm the flow range of superheated steam.

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Measure saturation steam flow rate range

size	flow range		unit (kg/h)									
			0.1MPa	0.2MPa	0.4MPa	0.6MPa	0.8MPa	1MPa	1.5MPa	2MPa	2.5MPa	3MPa
15	Max	32	18.88	36.128	69.12	101.44	133.184	164.704	242.88	321.6	400	480
	Min	1.6	0.944	1.8064	3.456	5.072	6.6592	8.2352	12.144	16.08	20	24
20	Max	56	33.04	63.224	120.96	177.52	233.072	288.232	425.04	562.8	700	840
	Min	2.8	1.652	3.1612	6.048	8.876	11.6536	14.4116	21.252	28.14	35	42
25	Max	88	51.92	99.352	190.08	278.96	366.256	452.936	667.92	884.4	1100	1320
	Min	4.4	2.596	4.9676	9.504	13.948	18.3128	22.6468	33.396	44.22	55	66
32	Max	144	84.96	162.576	311.04	456.48	599.328	741.168	1092.96	1447.2	1800	2160
	Min	7.2	4.248	8.1288	15.552	22.824	29.9664	37.0584	54.648	72.36	90	108
40	Max	226	133.34	255.154	488.16	716.42	940.612	1163.222	1715.34	2271.3	2825	3390
	Min	11.3	6.667	12.7577	24.408	35.821	47.0306	58.1611	85.767	113.565	141.25	169.5
50	Max	352	207.68	397.408	760.32	1115.84	1465.024	1811.744	2671.68	3537.6	4400	5280
	Min	17.6	10.384	19.8704	38.016	55.792	73.2512	90.5872	133.584	176.88	220	264
65	Max	596	351.64	672.884	1287.36	1889.32	2480.552	3067.612	4523.64	5989.8	7450	8940
	Min	29.8	17.582	33.6442	64.368	94.466	124.0276	153.3806	226.182	299.49	372.5	447
80	Max	900	531	1016.1	1944	2853	3745.8	4632.3	6831	9045	11250	13500
	Min	45.2	26.668	51.0308	97.632	143.284	188.1224	232.6444	343.068	454.26	565	678
100	Max	1400	826	1580.6	3024	4438	5826.8	7205.8	10626	14070	17500	21000
	Min	70.6	41.654	79.7074	152.496	223.802	293.8372	363.3782	535.854	709.53	882.5	1059
125	Max	2200	1298	2483.8	4752	6974	9156.4	11323.4	16698	22110	27500	33000
	Min	110	64.9	124.19	237.6	348.7	457.82	566.17	834.9	1105.5	1375	1650
150	Max	3200	1888	3612.8	6912	10144	13318.4	16470.4	24288	32160	40000	48000
	Min	160	94.4	180.64	345.6	507.2	665.92	823.52	1214.4	1608	2000	2400
200	Max	5600	3304	6322.4	12096	17752	23307.2	28823.2	42504	56280	70000	84000
	Min	280	165.2	316.12	604.8	887.6	1165.36	1441.16	2125.2	2814	3500	4200
250	Max	8800	5192	9935.2	19008	27896	36625.6	45293.6	66792	88440	110000	132000
	Min	440	259.6	496.76	950.4	1394.8	1831.28	2264.68	3339.6	4422	5500	6600
300	Max	12600	7434	14225.4	27216	39942	52441.2	64852.2	95634	126630	157500	189000
	Min	630	371.7	711.27	1360.8	1997.1	2622.06	3242.61	4781.7	6331.5	7875	9450

Max flow rate 50m/s; Min flow rate 2.5m/s。

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Selection Table Vortex Flow Meter

Model	LUGB								
Caliber	DN15-DN300								
Structure	Integrated	I							
	Seperated	S							
Nominal	1.6 MPa		P1						
	2.5 MPa		P2						
	4.0 MPa		P3						
Connection	Flange			C1					
	Wafer			C2					
	Tri-clamp			C3					
	Thread			C4					
Medium	Liquid				M1				
	Common Gas				M2				
	Saturated Steam				M3				
	Superheated Steam				M4				
Shell Material	Stainless steel 304					K2			
	Stainless steel 316					K3			
Flange Standard	ANSI 150#, 300#, 600#						F1		
	JIS 10K, 20K, 40K						F2		
	DIN PN10,PN16,PN25,PN40						F3		
Power Supply	24V							D1	
	3.6V Lithium							D2	
Signal Output	4~20 mA,HART								G1
	Pulse,RS485								G2
Special Mark	Standard signal output								B1
	Intrinsically safe ex-proof								B2
	On site display								B3
	Temperature compensation								B4
	Pressure compensation								B5
	Temperature and pressure compensation								B6
	High Temperature 350℃								B7

Sensor

Swirler

Available Flow Totalizer

Installation Straight Length Requirement

Upstream Straight pipe form	The Straight length of upstream	The Straight length of downstream
Concentric tube fully open valve	≥ 12 DN	≧ 5 DN
Concentric contraction fully open valve	≥ 15 DN	
Single quarter bend	≥ 20 DN	
Two quarter bends on the same surface	≥ 25 DN	
Two quarter bends on the different surface	≥ 40 DN	
Regulating valve、Half-open gate valve	≥ 50 DN	

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