STLU Vortex Flow Meter

Main Features

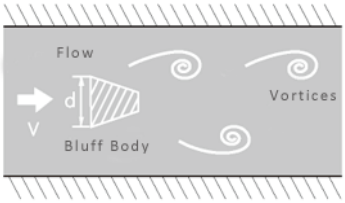
- STLU Intelligent Vortex Flow Transducer is piezocrystal built in bluff body to avoid fluid turbulence caused by external type, no zero drift, and high reliability.
- By lots of wave analysis of vortex flow transducer for a long time, Silver has designed the most scientific probe shape, wall thickness, height, probe rod diameter and matching piezocrystal, adopts advanced CNC to machine to ensure technical parameters of proper alignment and smooth finish etc., and with special treating process to maximatily overcome existed signal influence by intrinsic self-oscillation frequency.
- STLU Intelligent Vortex Flow Transducer has good commonality and interchangeability. Adopt advanced CNC to machine parts such as transducer body and bluff body etc. To ensure machining accuracy to make parts (especial for bluff body) has good commonality, so that, repeatability and accuracy won't be affected by parts change and get signal with high signal noise ratio and good stability.
- Simple & fixed structure, no moving parts, high reliability, convenient maintenance.
- Wide measuring range, turndown ratio can reach 10:1 in Reynolds Number 2×10~ 7× 10. 4 6
- Detecting element not contact with the measured fluids directly, stable performance and long service life.
- Detecting probe and bluff body installed independently, and high temperature resistance piezocrystal sealed in bluff body make transducer simple structure, good commonality and high stability.
- Output pulse signal and current signal directly proportional to flowrate, and have RS-485, Hart, ModBus communication for convenient computer networking.
- When vortex flow transducer measures liquid volumetric flow, it does not need temperature, pressure compensation. Vortex output signal is linear to velocity, that is to say, directly proportional to volumetric flowrate. When measure gas or steam, it needs temperature and pressure compensation. Compensating pressure and temperature is to get volumetric flow of gas under standard state or mass flow of steam.
- Low pressure loss, just 1/4 ~ 1/2 of orifice plate.
- In a specific range of Reynolds Number, flow character just refers to bluff body shape and dimension, and not affected by fluid pressure, temperature, viscosity, density and ingredients.
- Wide application, can measure flowrate of steam, gas, liquid etc

Working Principle

When a column body placed in flowing fluids in pipe, a series of vortices will be generated alternately on each side of the object as shown as below, these eddies known as “Karman Vortices”, the frequency of the vortex shedding is related to the velocity of the fluid and the width of the body. Expressed by formula as below:

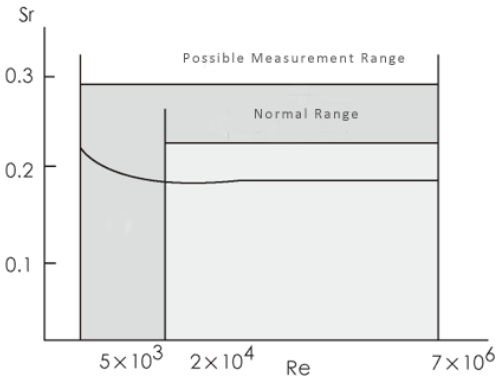
f=Sr .v/d

Thereinto f----fre quency of Karman Vortex shedding
Sr----Strouhal number
v----velocity
d----width of column object



Because the frequency of the vortex shedding is proportional to the velocity, it can be used to calculate the instantaneous flowrate .

Strouhal number is a very important coefficient in the Vortex Flowmeter. In the range of straight line of St≈0.17 in curve, frequency of vort ex shedding is proportional to the velocity, so as long as the frequency (f) be detected, the velocity (v) will be obtained, and volumetric flowrate will be got according to v. For STLU Vortex Flowmeter, its frequency of the vortex shedding was detected by the stress force which exerted



Technical Parameters

Table 1

Vortex Flow meter Main Technical Parameters			
Fluids		Gas, steam	Liquid
Accuracy		±1.5%	± 1.0%
Repeatability		±0.5%	±0.33%
Reynolds Number		2×10^4~7×10^6	
Media Temp.	Standard	-40° C~+350° C	
	Extension	-40° C~+250° C	
Turn Down Ratio		10:1	
Size		DN25~DN500	
Pressure		1.6Mpa/2.5Mpa/4.0Mpa and others	
Velocity		5m/s ~70m/s	0.5 m/s~7m/s
Wet Parts Material		304 SST/316 SST	

Flange Material	Carbon steel/304 SST/316 SST
Bolt Material	Carbon steel/304 SST
Detector Material	316 SST
Connecting Rod	304 SST
Radiator	Aluminum alloy
Mounting	Wafer/Flange
Protection Level	IP65 /IP67/IP68
Power supply	24VDC(18VDC~30VDC)/Battery
Signal Output	(4-20)mA/ pulse
Communication	Hart/Modbus
Electrical connection	2-M20×1.5
Explosive Proof	Exd IIBT4/Exia IICT3-T6
Construction	Compact/Remote
Environment Temp.	With LCD:-10 ~60° C/ Without LCD: -20 ~60° C
Relative Humidity	5% ~90%

Model Selection

Table 2

Mark					
STLU	Silver Automation Instruments Vortex Flow meter				
Code	Working Principle				
VFN	Intelligent Karman Vortices Flowmeter				
Code	Installing Type				
1	Flanged(DN50~DN300)				
2	Wafer type (DN15~DN300)				
3	Fixed Inserted				
4	Adjustable Inserted (without Ball Valve)				
5	Adjustable Inserted (with Ball Valve)				
Code	Measured Fluid				
2	Liquid				
3	Gas				
4	Steam				
Code	Nominal Diameter				
015	15mm	05	50mm	15	150mm
020	20mm	06	65mm	20	200mm
02	25mm	08	80mm	25	250mm

03	32mm	10	100mm	30	300mm
04	40mm	12	125mm	Others	Inserted ≥250mm

Code	Indicator
D	With Digital Indicator
N	No Indicator

Code	Power Supply
1	24V DC
2	3.6V Lithium Battery

Code	Output Signal
0	No output
1	Pulse Output
2	Two Wire :4~20mA DC
3	RS-485 (manufacture-defined protocol)
4	Hart Protocol
5	RS-485 (Modbus)

Code	Fluid Temperature
1	Standard -40~250° C(-40~120° C for inserted)
3	High Temperature Type :+100~+350° C

Code	Rated Pressure				
Code	Standard	Code	Standard	Code	Standard
G1	GB 1.6Mpa	D1	DIN PN16	A1	ANSI Class 150
G2	GB 2.5 Mpa	D2	DIN PN25	A2	ANSI Class 300
G3	GB 4.0 Mpa	D3	DIN PN40	A3	ANSI Class 600
S	Special (specify when order)				

Code	Explosion Proof
N	Non
d	Flameproof
i	Intrinsically Safe

Code	Flow Meter Construction
0	Compact display
1	Remote Display (standard 5 m cable)

Code	Protection Level
0	IP65
1	IP67
2	IP68

Dimensions

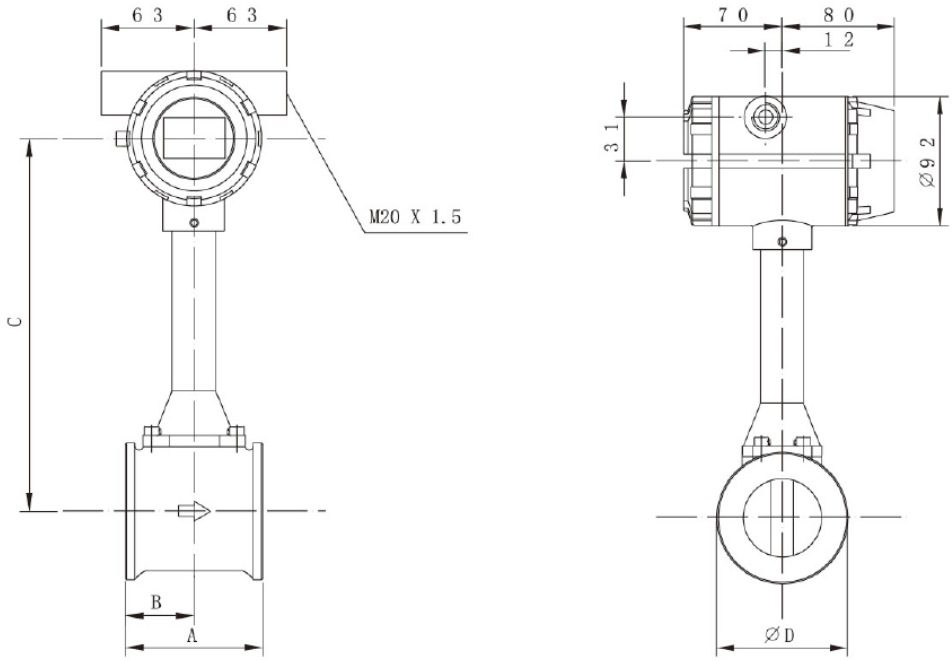


Figure 1. Wafer Type Vortex Flow meter Dimension

Note: Dimension Unit inch (mm)

The electrics housing can be rotated in any angle upon your demand, but should not exceed 360° in the same direction.

Table 3

DN	Shape size		Rated pressure: 1.6Mpa	Unit: mm
	A	B	C	Φ D
25	100	50	254	57
32	100	50	257	65
40	100	50	256	75
50	110	55	256	87
65	110	55	262	109
80	110	55	267	120
100	120	60	271	149
125	133	73	291	175
150	160	90	304	203
200	185	115	331	259
250	210	140	357	312
300	240	165	383	363
350	260	185	408	409
400	285	210	433	460
450	310	235	458	520
500	330	260	483	575

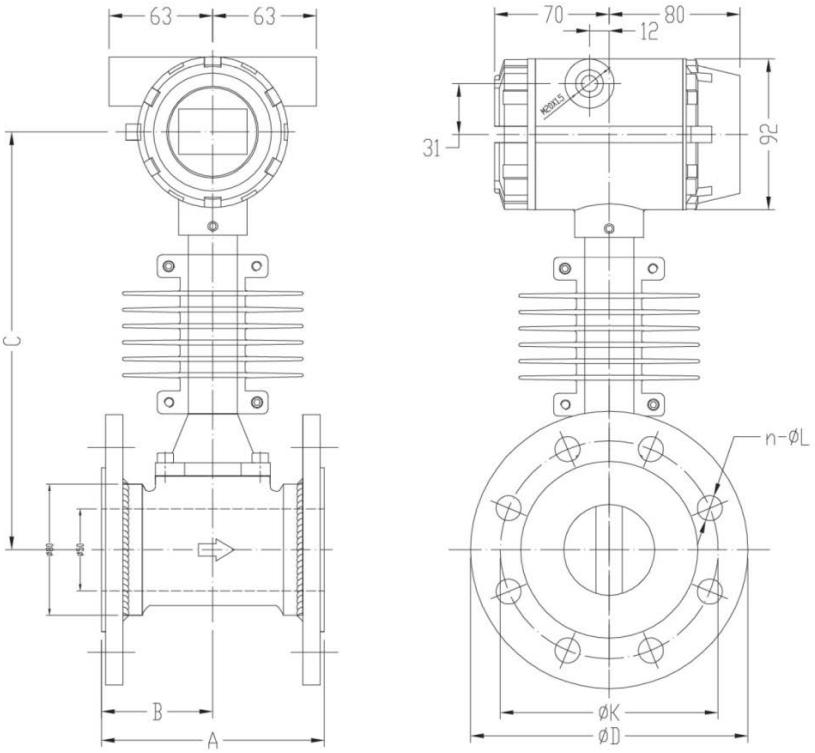


Figure 2. Flange Type Vortex Flow meter Dimension

Table 4

DN	Shape size		Rated pressure 1.6Mpa			Unit: mm
	A	B	C	D	K	n - ϕ L
25	128	64	254	115	85	4- ϕ 14
32	132	66	257	140	100	4- ϕ 18
40	132	66	256	150	110	4- ϕ 18
50	146	73	256	165	125	4- ϕ 18
65	146	73	262	185	145	4- ϕ 18
80	146	73	267	200	160	8- ϕ 18
100	156	78	271	220	180	8- ϕ 18
125	169	91	291	250	210	8- ϕ 18
150	200	110	304	285	240	8- ϕ 18
200	229	137	331	340	295	12- ϕ 23
250	258	164	357	405	355	12- ϕ 25
300	296	193	383	460	410	12- ϕ 25

Flow Range

➘ Liquid Volumetric Flow Range

Flow Unit (m3/h) Table 5

Nominal Diameter(mm)	Min Flow (m3/h)	Max Flow(m3/h)
DN25	28.5/√ ρ	12
DN32	47.4/√ ρ	20
DN40	72.7/√ ρ	30
DN50	110.7/√ ρ	50
DN65	189.7/√ ρ	80
DN80	316.2/√ ρ	130
DN100	474.3/√ ρ	200
DN125	695.7/√ ρ	310
DN150	1011.9/√ ρ	450
DN200	1834.1/√ ρ	800
DN250	2213.6/√ ρ	1200
DN300	3162.3/√ ρ	1800
DN350	4111.0/√ ρ	2400
DN400	5059.7/√ ρ	3000
DN450	6324.6/√ ρ	4000
DN500	7589.5/√ ρ	5000

Note: ρ —liquid density in operation environment, density unit is kg/m^3,water density in normal temperature and normal pressure is 1000 kg/m^3, √ ρ =31.623 kg/m^3.

➘ Gas Volumetric Flow Range

Flow Unit m3/h or Nm3/h Table 6

Nominal Diameter	Operation Flow (m3/h)		Normal Flow (Nm3/h)	
	Min Flow	Max Flow	Min Flow	Max Flow
DN25	6.51/√ ρ	80.2	65.1k/√ ρ	80.2k
DN32	10.67/√ ρ	131.4	10.67k/√ ρ	131.4k
DN40	16.67/√ ρ	205.3	16.67k/√ ρ	205.3k
DN50	26.05/√ ρ	320.7	26.05k/√ ρ	320.7k
DN65	44.02/√ ρ	542.0	44.02k/√ ρ	542.0k
DN80	66.68/√ ρ	821.1	66.68k/√ ρ	821.1k
DN100	104.19/√ ρ	1282.9	104.19k/√ ρ	1282.9k
DN125	162.8/√ ρ	2004.6	162.8k/√ ρ	2004.6k
DN150	234.44/√ ρ	2886.6	234.44k/√ ρ	2886.6k
DN200	416.77/√ ρ	5131.7	416.77k/√ ρ	5131.7k

DN250	651.21/√ρ	8018.3	651.21k/√ρ	8018.3k
DN300	937.74/√ρ	11546.4	937.74k/√ρ	11546.4k
DN350	1276.37/√ρ	15716.0	1276.37k/√ρ	15716.0k
DN400	1667.10/√ρ	20527.0	1667.10k/√ρ	20527.0k
DN450	2109.92/√ρ	25979.4	2109.92k/√ρ	25979.4k
DN500	2604.84/√ρ	32073.4	2604.84k/√ρ	32073.4k

Note: ρ ---Gas density in Working condition, (kg/m^3)

1. Formula $\rho = \frac{(p+0.101325)\times 10.1972\times 10^4}{R\times(T+273.15)}$,In this formula, p- Gauge pressure (Mpa),T-Temperature℃, R-gas constant

2. $K = \frac{p+0.101325}{0.101325}\times\frac{293.15}{T+273.15}$,in the formula, p- Gauge pressure (Mpa),T-Medium Temperature℃;

3. Standard condition means 20℃,0.1Mpa(absolute pressure) or 20℃ at standard atmospheric pressure.

➘ Saturated Steam Mass Flow Range

Flow Unit (t/h) Table 7

Nominal Diameter	0.1MPa		0.2MPa		0.3MPa		0.4MPa		0.5MPa		0.6MPa	
DN25	9.3~88.1kg/h		11.2 ~128.8kg/h		9.3 ~88.1kg/h		14.3 ~208.2kg/h		9.3 ~88.1kg/h		16.8 ~286.1kg/h	
DN32	15.2~144.4kg/h		18.4 ~211.1kg/h		9.3 ~88.1kg/h		23.4 ~341.2kg/h		25.5 ~405.1kg/h		27.5 ~468.8kg/h	
DN40	23.8 ~225.7kg/h		28.8 ~329.8kg/h		9.3 ~88.1kg/h		36.6 ~533.1kg/h		39.9 ~633.0kg/h		42.9 ~732.5kg/h	
DN50	0.04	0.35	0.04	0.52	0.05	0.68	0.06	0.83	0.06	0.99	0.07	1.14
DN65	0.06	0.60	0.08	0.87	0.09	1.14	0.10	1.41	0.11	1.67	0.11	1.93
DN80	0.1	0.90	0.12	1.32	0.13	1.73	0.15	2.13	0.16	2.53	0.17	2.93
DN100	0.15	1.41	0.18	2.06	0.21	2.7	0.23	3.33	0.25	3.96	0.27	4.58
DN125	0.23	2.20	0.28	3.22	0.32	4.22	0.36	5.21	0.39	6.18	0.42	7.15
DN150	0.33	3.17	0.40	4.64	0.46	6.08	0.51	7.5	0.56	8.9	0.60	10.30
DN200	0.60	5.64	0.72	8.25	0.82	10.8	0.91	13.33	1.00	15.83	1.07	18.31
DN250	0.93	8.81	1.12	12.88	1.29	16.88	1.43	20.82	1.56	24.73	1.68	28.61
DN300	1.34	12.69	1.62	18.55	1.85	24.31	2.06	29.99	2.24	35.61	2.41	41.20
DN350	1.82	17.28	2.20	25.25	2.52	33.09	2.80	40.82	3.05	48.46	3.28	56.08
DN400	2.38	22.57	2.88	32.98	3.29	43.22	3.66	53.31	3.99	63.6	4.29	73.25
DN450	3.01	28.56	3.64	41.74	4.17	54.70	4.63	67.47	5.05	80.11	5.43	92.71
DN500	3.7	35.3	4.5	51.5	5.1	67.5	5.70	83.3	6.2	98.9	6.7	114.5

Continued

Nominal Diameter	0.7MPa	0.8MPa	0.9MPa	1.0MPa	1.1MPa
DN25	17.8~322.5kg/h	18.9 ~363.1kg/h	19.8~401.5kg/h	20.8~439.6kg/h	21.7~477.9kg/h

DN32	29.1~528.4kg/h		30.9~594.9kg/h		32.5~657.8kg/h		34.0~720.3kg/h		35.5~783.1kg/h	
DN40	0.05	0.83	0.05	0.93	0.05	1.03	0.05	1.13	0.06	1.22
DN50	0.07	1.29	0.08	1.45	0.08	1.61	0.08	1.76	0.09	1.91
DN65	0.12	2.18	0.13	2.45	0.13	2.71	0.14	2.97	0.15	3.23
DN80	0.18	3.30	0.19	3.72	0.2	4.11	0.21	4.5	0.22	4.89
DN100	0.28	5.16	0.30	5.81	0.32	6.42	0.33	7.0	0.35	7.65
DN125	0.44	8.06	0.47	9.08	0.5	10.04	0.52	11	0.54	11.95
DN150	0.64	11.61	0.68	13.07	0.71	14.45	0.75	15.83	0.78	17.21
DN200	1.14	20.64	1.21	23.24	1.27	25.69	1.33	28.14	1.39	30.6
DN250	1.78	32.25	1.89	36.31	1.98	40.15	2.1	44	2.2	47.8
DN300	2.56	46.45	2.72	52.28	2.86	57.81	3.0	63.3	3.12	68.8
DN350	3.49	63.22	3.70	71.16	3.9	78.69	4.1	86.16	4.24	93.7
DN400	4.55	82.57	4.83	92.95	5.1	102.77	5.3	112.5	5.54	122.3
DN450	5.8	104.5	6.1	117.6	6.43	130.1	6.72	142.4	7.02	154.8
DN500	7.1	129.0	7.5	145.2	7.94	160.6	8.31	175.8	8.67	191.2

Continued

Nominal Diameter	1.2MPa		1.3Pa		1.4MPa		1.5MPa		1.6MPa	
DN25	22.5~516.kg/h		23.3~554.3kg/h		24.1~592.3kg/h		24.9~630.3kg/h		25.6~668.4kg/h	
DN32	0.04	0.85	0.04	0.91	0.04	0.97	0.04	1.03	0.04	1.10
DN40	0.06	1.32	0.06	1.42	0.06	1.52	0.06	1.61	0.07	1.71
DN50	0.09	2.06	0.09	2.22	0.10	2.37	0.10	2.52	0.10	2.67
DN65	0.15	3.49	0.16	3.75	0.16	4.00	0.17	4.26	0.17	4.52
DN80	0.23	5.28	0.24	5.68	0.25	6.07	0.25	6.45	0.26	6.84
DN100	0.36	8.26	0.37	8.87	0.39	9.48	0.40	10.08	0.41	10.69
DN125	0.56	12.9	0.58	13.86	0.60	14.81	0.62	15.76	0.64	16.71
DN150	0.81	18.58	0.84	19.95	0.87	21.32	0.90	22.69	0.92	24.06
DN200	1.44	33.03	1.49	35.48	1.54	37.91	1.59	40.34	1.64	42.78
DN250	2.25	51.61	2.33	55.43	2.41	59.23	2.49	63.03	2.56	66.84
DN300	3.24	74.31	3.36	79.82	3.47	85.29	3.58	90.76	3.69	96.25
DN350	4.4	101.2	4.6	108.6	4.7	116.1	4.9	123.5	5.0	131.0
DN400	5.8	132.1	6.0	141.9	6.2	151.6	6.4	161.4	6.6	171.1
DN450	7.3	167.2	7.6	179.6	7.8	191.9	8.1	204.2	8.3	216.6
DN500	9.0	206.4	9.3	221.7	9.6	236.9	9.9	252.1	10.2	267.4

➘ Over Heated Steam Flow Range

Flow unit (t/h) Table 8

Nominal Diameter(mm)	Min Flow (t/h)	Max Flow(t/h)
DN25	8.82√ρ kg/h	79.48 ρ kg/h
DN32	14.4√ρ kg/h	130.22 ρ kg/h
DN40	22.62√ρ kg/h	203.47 ρ kg/h
DN50	35.34√ρ kg/h	317.93 ρ kg/h
DN65	59.7√ρ kg/h	537.29 ρ kg/h
DN80	90.6√ρ kg/h	813.89 ρ kg/h
DN100	0.14√ρ	1.27 ρ
DN125	0.22√ρ	2.0 ρ
DN150	0.31√ρ	2.86 ρ
DN200	0.56√ρ	5.07 ρ
DN250	0.88√ρ	7.95 ρ
DN300	1.27√ρ	11.45 ρ
DN350	1.73√ρ	15.58 ρ
DN400	2.26√ρ	20.35 ρ
DN450	2.86√ρ	25.75 ρ
DN500	3.53√ρ	31.79 ρ