

JC-080 Smart Vortex Flowmeter

Product parameters



Flow Instrument

- ✓ Factory Price
- ✓ OEM Service
- ✓ Professional Technical Team
- ✓ Fast Delivery Time



Size	DN15-DN300	Temperature(° C)	20~+120°C
Cable Entry	1/2NPT,M20x1.5	Output signal	4-20 mA electric signal
Material	SS, Aluminum Alloy	Accuracy	1%
Power supply	With Li battery and can be used for three years /24VDC		
Working environment	-10~+55°C,RH 5%~90%		

Introduction

PRODUCT PHOTOGRAPH

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Smart Integral type
Pulse output without Display



Smart Integral type
LCD display with 4-20ma



Smart Integral type
With tempt& pressure
compensation



Smart Integral type
Inserted type

I APPLICATION & FEATURES

JC-080 series smart vortex flowmeter is mainly used for measuring flow of industrial pipeline fluid, such as gas, liquid and steam, etc. It has little pressure loss, broad span range and high accuracy. It is not under influence of density, pressure, temperature and viscosity when measuring volumetric flow. It has no movable mechanical parts with high reliability and little maintenance.

II OPERATION PRINCIPLES

Setting vortex generation body (bluff body) in fluid, regular vortices will alternately generate from two sides of vortex generation body. This kind of vortex is called Karman vortex. See picture 1. Vortex is at downstream of vortex generation body, unsymmetrical array. Set occurrence to be f , average flow speed of measured medium U , face width d and diameter D . According to Karman principle, existing following relation :

$$f = StU_1/d = StU/md$$

U_1 - average flow speed at two sides of vortex generation body, m/s

St - Strouhal number

m – ratio of segment area and pipeline cross sectional area

$$m = 1 - \frac{2}{\pi} \left[d/D \sqrt{1 - (d/D)^2} + \sin^{-1} \frac{d}{D} \right]$$

Instantaneous volumetric flow q_v :

$$q_v = \pi D^2 U / 4 = \pi D^2 m d f / 4 St$$

$$K = f / q_v = \left[\pi D^2 m d f / 4 St \right]^{-1}$$

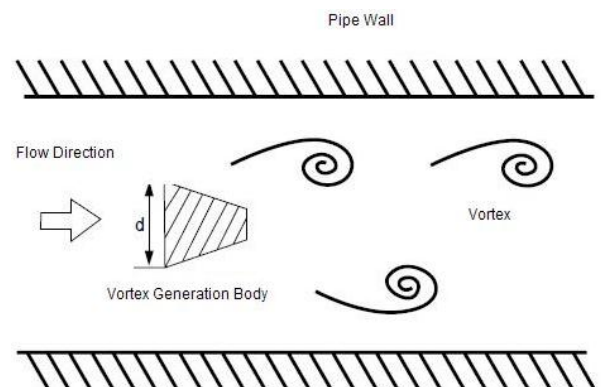


Diagram 1 Karman Vortex

In the formula K --- Instrument Coefficient, pulse number/m³ (P/m³)

K has relation with vortex generation body, pipeline dimension and Strouhal number. Strouhal number is a parameter without dimension. It has something to do with shape of vortex generation body and Reynolds number. Seeing from the picture, in the range of $Re = 2 \times 10^4 \sim 7 \times 10^6$, St can be seen to be a constant. When measuring gas flow, flow calculation formula of JC-080 is

$$Q_m = Q_v \frac{P T_n Z_n}{P_n T Z} = \frac{f}{K} \frac{P T_n Z_n}{P_n T Z}$$

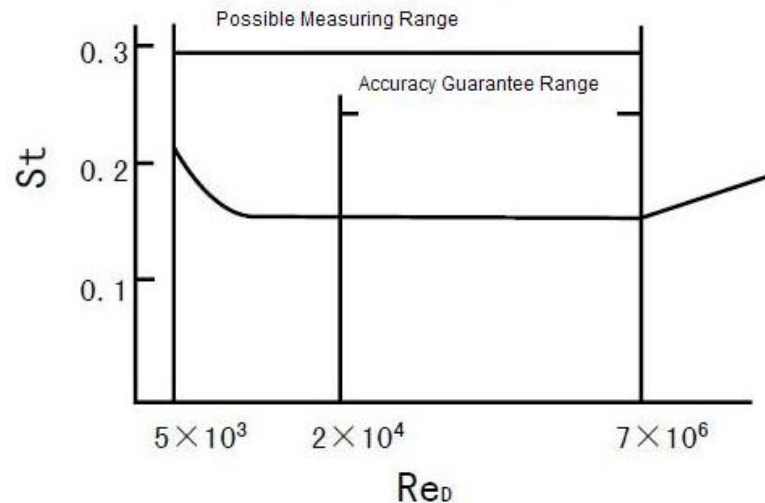


Diagram 2 Relation Curve of Strouhal number and reynold number

In the formula, Q_v , Q --- volumetric flow under standard conditions and working conditions, m³/h

P_n , P --- absolute pressure under standard conditions and working conditions, Pa.

T_n , T --- thermodynamics temperature under standard conditions and working conditions, K

Z_n , Z --- gas compression coefficient under standard conditions and working conditions

Seeing from the above formula, pulse frequency signal output by JC-080 is not influenced by fluid physical properties and component changes, that is, instrument coefficient only has relation with vortex generation body and dimension of pipeline in a certain range of reynold number. But the flowmeter must measure mass flow in material balance and energy measurment, here output signal of flowmeter should monitor volumetric flow and fluid density, therefore, fluid physical properties and component have direct influence on flow measurement.

III MAIN TECHNICAL PARAMETERS

1. Main Technical Data

sheet 1

Standard		Q/320831AHH003-2004 JB/T6807-93,ISO,CE
Medium		Gas, liquid, steam
Caliber	Flange holding (clamp-on) type	25, 32, 50, 80, 100, 150, 200, 250, 300
	Flange connection type	100, 150, 200, 250, 300
Measuring Range	Normal range of flow speed	Reynold number $1.5 * 10^4 \sim 4 * 10^6$; gas 5~50m/s; liquid 0.5~7m/s
	Normal range of flow rate	Liquid, gas flow range-sheet2; steam flow range-sheet 3
Accuracy		Class 1.5
Temperature		Normal temperature -25℃~100℃ High temperature -25℃~150℃ -25℃~250℃
Output Signal	Pulse voltage output signal	Square wave pulse
	Current remote signal	4 ~ 20 mA, transmission distance 100m
Environmental Conditions		Temperature: -25℃~+55℃ humidity: 5~90%
Material		SS, Aluminum Alloy
Power		24 V DC or lithium battery 3.6V
Ex		Exd II BT4
Protection Class		IP65
Requirements to front & back straight tube section		See Diagram 14

2. Flow range of liquid, gas under working conditions

sheet 2

Nominal Diameter(mm)	25	32	50	65	80	100	150	200
Liquid (m3/h)	1~10	1.5~18	4~55	6.3~72	9~135	14~200	32~480	56~800
Gas (m3/h)	25~60	15~150	35~350	60~390	90~900	140~1400	300~3000	550~5500

3. Mass flow range of saturated water steam vapour

sheet 3

Unit: (kg/h)

Absolute Pressure P/Mpa	0.2	0.3	0.4	0.5	0.6	0.7	0.8
Temperature T/°C	120.23	133.54	143.62	151.84	158.94	164.96	170.41
Density ρ (kg/m ³)	1.129	1.651	2.163	2.669	3.170	3.667	4.162
DN25 Qmin	14	17	19	22	23	25	27
Qmax	140	170	190	220	230	250	270
Extendable Max Upper	140	204	267	330	391	453	541
DN32 Qmin	31	38	44	48	53	57	60
Qmax	310	380	440	480	530	570	600
Extendable Max Upper	357	522	684	844	1003	1160	1317
DN50 Qmin	52	63	73	81	88	95	101
Qmax	520	630	730	810	880	950	1010
Extendable Max Upper	558	816	1069	1320	1568	1813	2058
DN65 Qmin	67.8	99	131	160	180	200	215
Qmax	678	990	1310	1600	1800	2000	2150
Extendable Max Upper	900	1326	1741	2134	2535	2733	3330
DN80 Qmin	122	148	170	188	205	221	235
Qmax	1220	1480	1700	1880	2050	2210	2350
Extendable Max Upper	1429	2090	2738	3379	4013	4642	5269
DN100 Qmin	175	212	242	269	293	315	336
Qmax	1750	2120	2420	2690	2930	3150	3360
Extendable Max Upper	2233	3266	4278	5279	6270	7254	8233
DN150 Qmin	350	423	484	538	586	631	672
Qmax	3500	4230	4840	5380	5860	6310	6720
Extendable Max Upper	5025	7348	9627	11879	14019	16321	15824
DN200 Qmin	700	846	969	1076	1176	1261	1344
Qmax	7000	8460	9690	10760	11730	12610	13440
Extendable Max Upper	8933	13064	17115	21119	25083	29016	32993
Absolute Pressure P/Mpa	0.9	1.0	1.2	1.4	1.6	1.8	2.0
Temperature T/°C	175.36	179.88	187.96	195.04	201.37	207.11	212.37
Density ρ (kg/m ³)	4.655	5.147	6.127	7.106	8.085	9.065	10.05
DN25 Qmin	28	30	33	35	37	40	42
Qmax	280	300	330	350	370	400	420
Extendable Max Upper	575	636	757	878	999	1120	1242
DN32 Qmin	64	67	73	79	84	89	94
Qmax	640	670	730	790	840	890	940
Extendable Max Upper	1473	1629	1939	2249	2559	2869	3180
DN50 Qmin	107	112	122	132	140	149	157

Qmax	1070	1120	1220	1320	1400	1490	1570
Extendable Max Upper	2302	2545	3030	3514	3998	4483	4970
DN65 Qmin	220	225	235	245	255	265	275
Qmax	2200	2250	2350	2450	2550	2650	2750
Extendable Max Upper	3724	4117	4902	5685	6470	7252	8038
DN80 Qmin	249	261	285	307	328	347	365
Qmax	2490	2610	2850	3070	3280	3470	3650
Extendable Max Upper	5893	6515	7757	8996	10235	11476	12723
DN100 Qmin	355	374	408	439	468	496	522
Qmax	3550	3740	4080	4390	4680	4960	5220
Extendable Max Upper	9208	10181	12120	14057	15993	17932	19880
DN150 Qmin	711	747	815	878	936	992	1044
Qmax	7110	7470	8150	8780	9360	9920	10440
Extendable Max Upper	20719	22909	27270	31628	35985	40347	44732
DN200 Qmin	1421	1494	1630	1756	1873	1983	2088
Qmax	14210	14940	16300	17560	18730	19830	20880
Extendable Max Upper	36834	40727	48481	56228	63794	71729	79523

IV STRUCTURE & DIMENSION

A. This series vortex flowmeter has two types of connection forms and dimension

1. Wafer (Clamp-on) Type

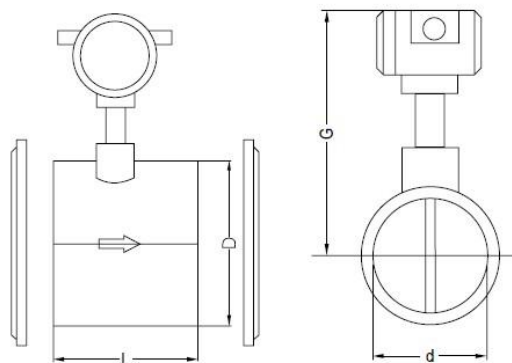


Diagram 3

2. Flange Connection

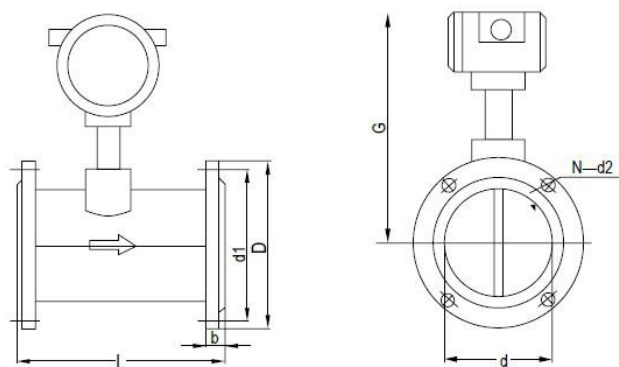


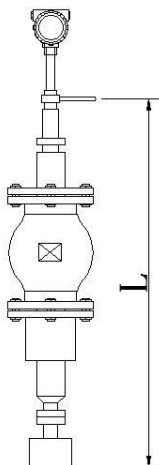
Diagram 4

Dimension of Vortex Flowmeter—flange holding type & flange connection type

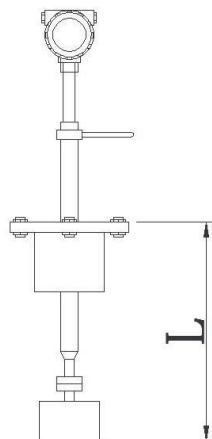
Sheet 4

	DN (mm)	Pressure MPa	L mm	G		D mm	dl mm	N-d2	d mm	b mm	Weight Kg
				Normal Temp.	High Tem p.						
Wafer Type	25	2.5~4.0	80	342	500	76	-	-	25	-	7
	32	2.5~4.0	80	342	505	76	-	-	32	-	10
	50	2.5~4.0	80	337	515	86	-	-	50	-	12.5
	65	1.6~2.5	80	345	530	102	-	-	65	-	28
	80	1.6~2.5	100	350	540	112	-	-	80	-	25
	100	1.6~2.5	110	330	550	132	-	-	100	-	35
	150	1.6	140	355	575	203	-	-	150	-	40
	200	1.6	150	380	600	259	-	-	200	-	46
Flange Connection Type	25	2.5~4.0	180	342	500				25		10
	32	2.5~4.0	180	342	505				32		12
	40	2.5~4.0	180	337	515				40		14
	50	2.5~4.0	180	345	530				50		15
	65	1.6~2.5	200	350	540				65		20
	80	1.6~2.5	200	330	550				80		25
	100	1.6~2.5	220	355	575	125	180	8-Ø18	100	26	30
	125	1.6~2.5	220	380	600						32
	150	1.6	240	342	500	280	240	8-Ø23	150	28	34
	200	1.6	240	342	505	335	295	12-Ø23	200	30	41

B . Inserted Vortex flow meter



a. Inserted type with ball valve



b. Inserted vortex flow meter

	Size (mm)	DN250	DN300	DN400	DN500	DN600	DN800-2000
a	L	680	705	755	805	855	905-1555
b	L	255	280	330	380	430	530-1130

V MODEL SELECTION & CALCULATION

1. Caliber of flowmeter should be chosen according to max working flow Q_v ; to get much wider working flow range, max working flow should be not less than 1/2 of rated max flow Q_{max} . Corresponding reynold number range of linear flow range is $2 \times 10^4 \sim 7 \times 10^6$.

For liquid, please look up in sheet 2 according to picture 9; for gas please work out flow range under working conditions according to picture 10, looking up in sheet 2.

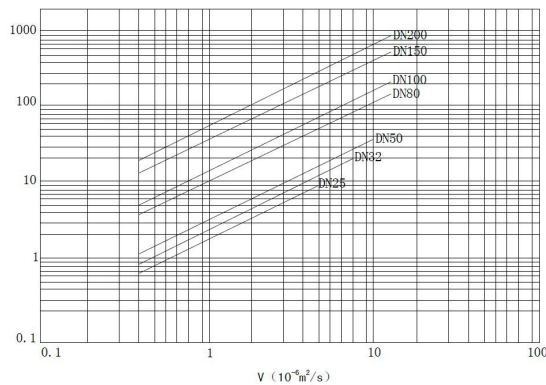


Diagram 5 Relation between Min flow of liquid and moving viscosity

2. Change flow under standard conditions into flow under working conditions

(1) Change density ρ_n under standard conditions into ρ under working conditions

$$\rho = \rho_n \times \frac{0.1013+P}{0.1013} \times \frac{273.15+20}{273.15+T}$$

(2) Calculate flow Q under working conditions

a. Find out Q_v by Q_n under standard conditions

$$Q_v = Q_n \times \frac{\rho_n}{\rho}$$

b. Find out Q_v by mass flow Q_m

$$Q_v = Q_m / \rho$$

3. Conversion between Dynamic viscosity μ and moving viscosity ν

$$\nu = \frac{\mu}{\rho}$$

ρ — density under working conditions (kg/m³)

ρ_n — density under standard conditions (kg/m³)

P — pressure under working conditions (MPa)

T — temperature under working conditions (°C)

Q_v — flow under working conditions (m³/h)

Q_n — flow under standard conditions (m³/h)

Q_m — mass flow (kg/h)

μ — dynamic viscosity (Pa · S)

ν — kinematic viscosity (m²/s)

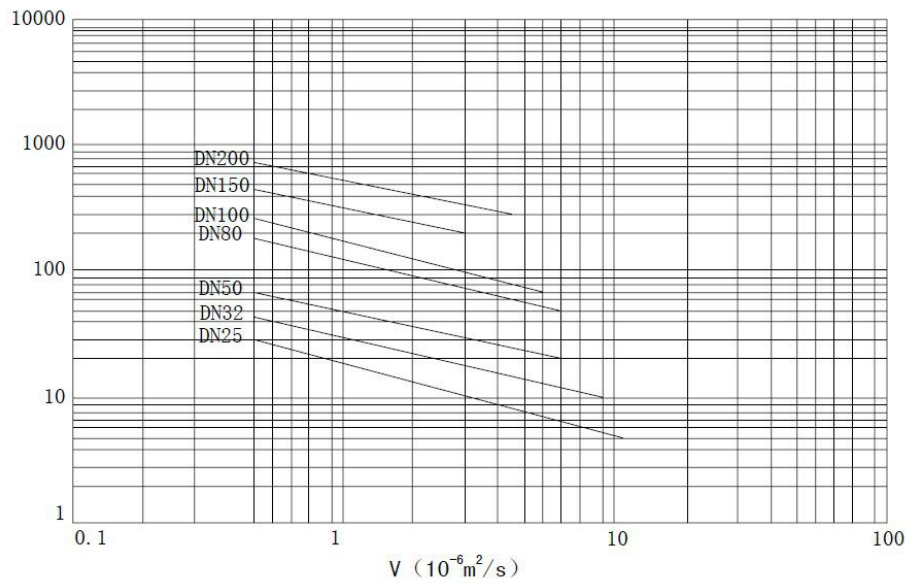


Diagram 6 Relation between Min flow of Gas/superheated steam and density

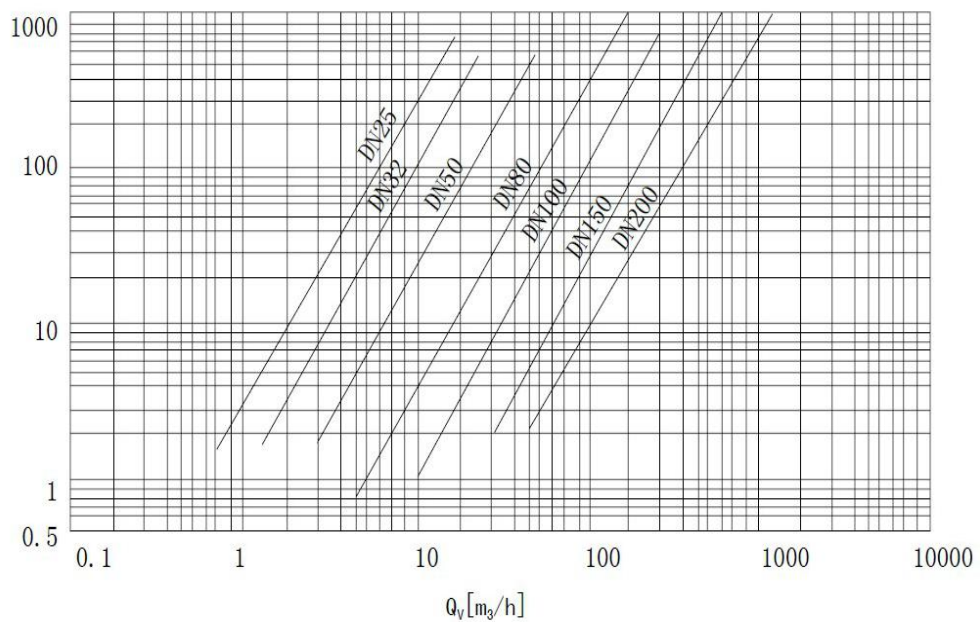


Diagram 7 Pressure loss for medium of water (20°C, 1013mbar, $\rho=998\text{kg/m}^3$)

4. Density of commonly used gas under standard conditions (0.101325Mpa, 20°C)

sheet5

Gas	Density (Kg/m3)	Gas	Density(Kg/m3)	Gas	Density (Kg/m3)
Acetylene	1.083	Normal Butane	2.4163	Ethane	1.2500
Ammonia	0.7080	Ethylene	1.1660	Methane	0.6669
Propane	1.8332	Neon	0.83914	Natural Gas	0.776
Air	1.2041	Argon	1.6605	Carbon Dioxide	1.829
Carbon Monoxide	1.165	Hydrogen	0.0838	Oxygen	1.3302
Propylene	1.7459	Nitrogen	1.1646		

5. Pressure Loss

i Pressure loss at measuring liquid

Diagram 7 is the relation of pressure loss and flow at measuring flow of water (20°C, 1013mbar, $\rho = 998\text{kg/m}^3$)

At measuring other liquid with density of ρ_s , calculating pressure loss according to following formula:

$$\Delta P' = \frac{\rho_s}{998} \times \Delta P$$

$\Delta P'$ — pressure loss of measured liquid (mbar)
 ΔP — pressure loss of water found from Diagram 7

ii Pressure loss at measuring gas (overheated steam)

Diagram 8 is pressure loss at measuring air (20°C, 1013mbar, $\rho = 1.2\text{kg/m}^3$). Using the following formula to calculate density ρ_s of other gas:

$$\Delta P' = \frac{\rho_s}{1.2} \times \Delta P$$

$\Delta P'$ — pressure loss of medium (mbar)
 ΔP — pressure loss of air found from Diagram 8

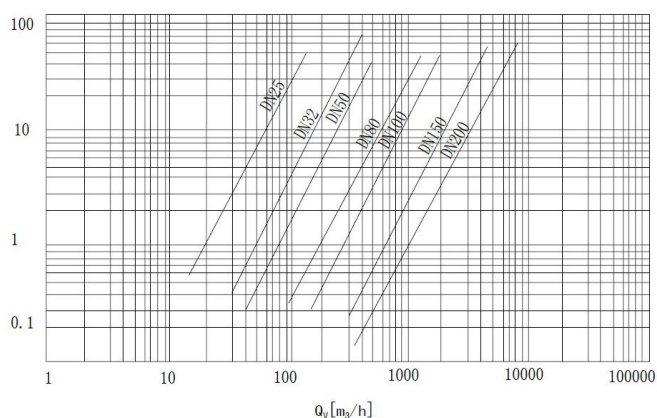


Diagram 8

VI MODEL SELCECTION

Code	Nominal Diameter (mm)	Flow Range (m3/h)	Remarks
JC-080-25	DN25	1.4~12(L) 8.8~124(G) 7-124(S)	1. Make reference to sheet 3 for steam flow range 2. DN250 ~ DN600 can be provided according to customers' requirements 3. For DN300 and above, we recommend Insertion Type Vortex Flowmeter 4. L is liquid ,G is gas , S is steam
JC-080-32	DN32	2.0~20(L) 15~200(G) 12-200(S)	
JC-080-40	DN40	3.2~36(L) 23~300(G) 18-300(S)	
JC-080-50	DN50	5~56(L) 35~450(G) 28-450(S)	
JC-080-65	DN65	8.2~96(L) 63~820(G) 50-820(S)	
JC-080-80	DN80	12.5-145(L) 90~1200(G) 75-1200(S)	
JC-080-100	DN100	20~224 142~1950 120-1950	
JC-080-125	DN125	30~352 220~3000 175-3000	
JC-080-150	DN150	44~512 320~4400 260-4400	
JC-080-200	DN200	79~920 565~7800 440-7800	
JC-080-250	DN250	140-1200 850-12400 720-12400	
JC-080-300	DN300	175-2020 1250-17500 1020-17500	

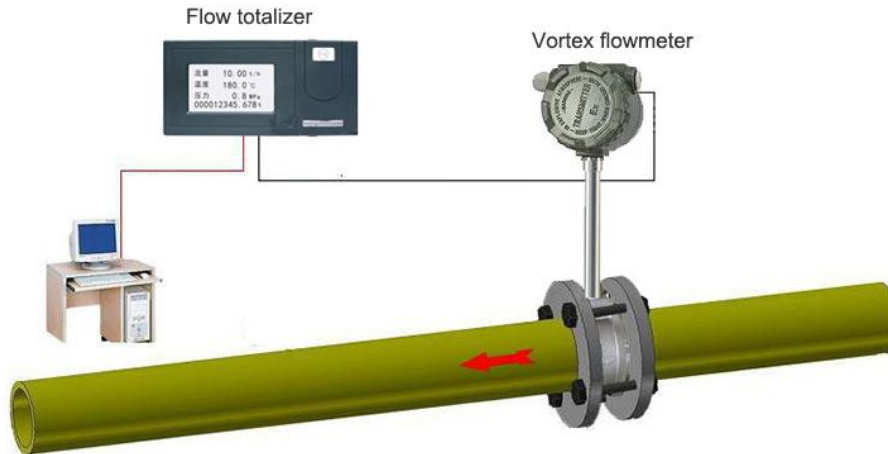
Code	Function 1		
N	No Temperature & Pressure compensation		
Y	Temperature & Pressure compensation provided		
Code	Output	Code	Output
F1	4 ~ 20 mA (two wires)	F2	4-20ma (three wires)
F3	RS 485 interface	F4	Pulse/Frequency
Code	Medium	Code	Medium
J1	Liquid	J3	Steam
J2	Gas		
Code	Connection		
L1	Wafer Type		
L2	Flange Connection Type		
Code	Function 2		
E1	1.0		
E2	1.5		
T1	Normal temperature		
T2	High Temperature		
T3	Steam		
P1	1.6 MPa		
P2	2.5 MPa		
P3	4.0 MPa		
P0	Special pressure		

D1	Internal 3.6 V
D2	24V DC
I	Integral type
R	Remote type (10M cable)

JC-080-25	Y	F1	J1	L1	E1T1P1D2 I
Explanation : Size: DN25 Y: Temperature & Pressure compensation provided F1 :4 ~ 20 mA (two wires) for output J1: Medium is Liquid L1: Wafer Type E1: 1.0 for accuracy T1: Normal temperature P1:1.6 MPa D2:24V DC I: Integral type					

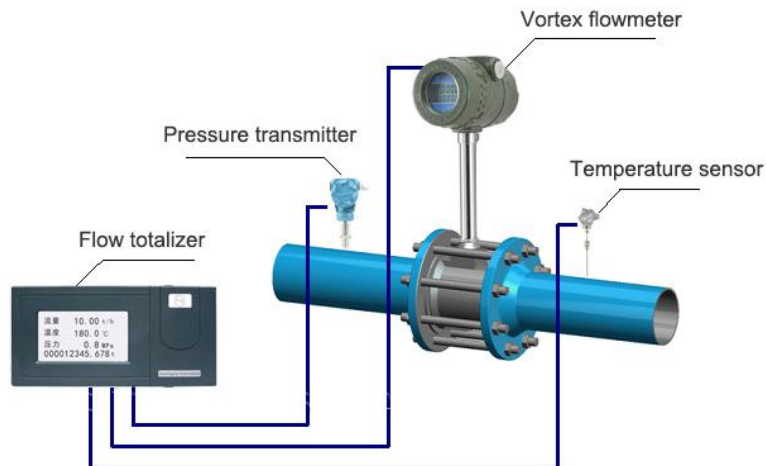
Attention : Vortex Flowmeter can't apply in the site with vibration .

1. Measurement for conduction oil



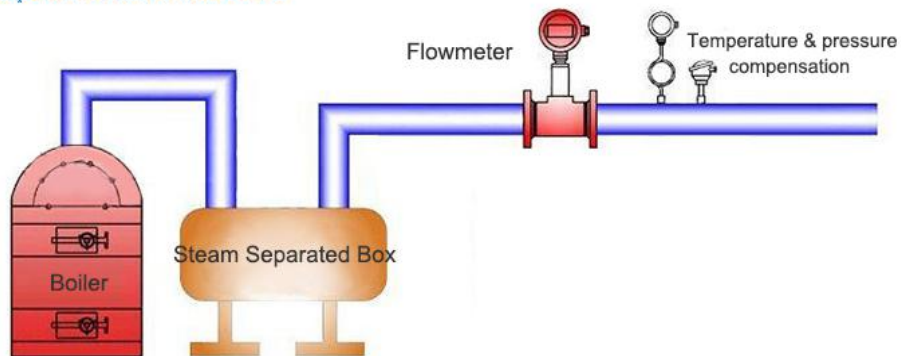
Heavy oil, light oil or flammable liquid is used in heat conduction boiler as fuel. As heat carrier, heat conduction oil of liquid type is circulated compulsively taking advantage of circulation oil pump. After passing the heat energy to heat users, it returns to straight-flow special industrial furnace for re-heating, which is widely used in petrochemical, textile, printing and dyeing, rubber, food processing, wood processing, pitch heating, carbon production, vegetable dehydration, paint baking etc. Its working temperature is below 350°C

2. Compressed Air Metering



Compressed air, transferred from electric energy or thermal energy by air compressor, is important secondary power in industrial production and an essential economic index of cost accounting in enterprise and public institution, which can manage working medium transferred from large energy to save energy and improve equipment management level. That is the main purpose of compressed air flow rate metering.

3, Steam Measurement



Steam is one of the mostly important source , also the main energy for city centrally heated system . It is a very important economical index for cost accounting for enterprise and public institution . The right measurement for steam flowmeter will directly affect the economic interest between steam supplier and end user . BCST can supply perfect steam measurement system solution .
