



Recorder



Flow



Pressure



Temp



Analyzer



Level

Datasheet

Insertion Type Vortex Flow Meter

LUGBC-SUP

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Vortex flow meter is on the principle of Karman street, to measure liquid, gas and vapour even turbid liquid including micro grain and impurity. Applications: petroleum, chemical industry, paper making, metallurgy, electric force, environmental protection, food industry and etc.

Principle

Vortex flow meter work on the principle of generated vortex and relation between vortex and flow by theory of Karman and Strouhal, which specialize in measurement of steam, gas and liquid of lower viscosity. As shown in below illustration, medium flows through bluff body and then vortex is generated, vortices are alternately formed on both sides with opposite directions of rotation, Vortices frequency is directly proportional to medium velocity. Through numbers of vortices that is measured by sensor head, medium velocity is calculated, plus flow meter diameter, final volume flow come out.

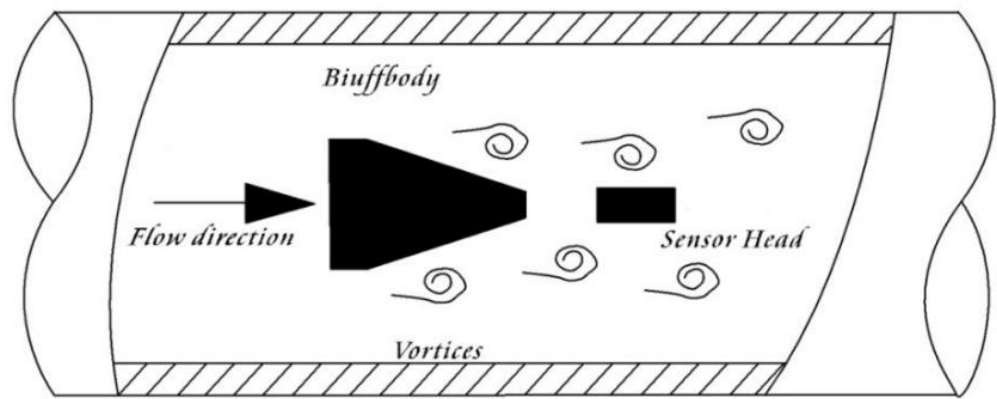


Figure 1

Computational formula as follows:

$F=St \cdot V/md$ Formula 1

$Q=3600 \cdot F/K$ Formula 2

$M=Q \cdot \rho$ Formula 3

Among Formula:

F..... Fluid flow through bluff body generate frequency of vortex (Unit : Hz)

St... Strouhal constant (zero dimension)

V.....Mean velocity of fluid inside the pipeline (Unit : m/s)

m.....The ratio between Lune Circulation area of bluff body at both sides and cross-sectional area
(Unit: zero dimension)

d..... Upstream face width of bluff body inside vortex flow meter (Unit : m)

Q..... Instantaneous volume flow (Unit : m^3/h)

K..... Instrument coefficient of vortex flow meter (Unit : pulses / m^3)

M..... Instantaneous mass flow (Unit : kg/ h)

ρ Fluid density (Unit : kg/ m^3)

Note: vortex flow meter "K" coefficient is corresponding with one diameter, the exact "K" value should be calibrated in practice. Viz. one cubic meter fluid through sensor output numbers of pulse under working condition.

Parameters	
Medium	Liquid, gas, steam(saturated steam and superheated steam)
Diameter	DN200~DN2000
Accuracy	2.5% (1.0%&1.5% optional)
Range Ratio	Gas density:1.2kg/m ³ , Range ratio: 10:1 Liquid density:1000kg/m ³ , Range ratio: 10:1; when the medium density is different, the range ratio will change.
Flow Range	Refer to table 1
Pressure	DN200-DN2000 (priority PN1.6MPa)
Medium Temperature	-40°C ~ 150°C, -40°C~ 200°C
Ambient Conditions	-20°C~55°C(normal); -20°C~ 40°C(explosion-proof)
Relative Humidity	5% - 95%
Atmospheric Pressure	86kPa -106kPa
Electrical Interface	M20*1.5 internal thread (priority)
Power Supply	24VDC±5%, lithium battery 3.6VDC
Current Output	2-wire (4~20) mA, load resistance ≤ 300 Ω (including wire resistance)
Frequency Pulse Output	D2/X1 type: Frequency pulse corresponding to instantaneous flow rate under working conditions (low level ≤ 1V, high level ≥ 6V) X3-2/E3-2 type:Instantaneous flow rate under working conditions corresponds to frequency pulses (low level ≤ 1V, high level=power supply voltage (V) -1V - load current (mA) × 1k Ω, equal pulse width), load current ≤ 9mA; Equivalent pulse corresponding to instantaneous flow rate under standard conditions (low level ≤ 1V, high level=power supply voltage (V) -1V - load current (mA) × 1k Ω, equal pulse width), load current ≤ 9mA Note: The frequency input range is 0.01Hz to 10000Hz, the frequency output range is 0.07Hz to 10000Hz, and the equivalent pulse output range is ≤ 100Hz.
Communication Interface	RS485 ; HART
Ingress Protection	IP65 (IP67, IP68 optional)
Main Body Material	Sstainless steel
Pressure loss	$\Delta P \leq 1.2 \rho_{\perp} V^2$ (ΔP unit is Pa, $\rho_{\perp}$ unit is kg/m ³ , V unit is m /s)
Calibration Method	All flow meters should be calibrated in the way of lower reaches taking pressure before flow meters leave factory.
Display Mode	Intelligent numeric alphabetic display type: twin-row numeric alphabetic LCD (instantaneous flow rate and totalizer) Intelligent dot matrix LCD: English 128*64 dot matrix LCD (instantaneous flow rate, totalizer, temperature and pressure under working condition, battery voltage or density under working condition, instantaneous flow rate under working condition, send-out, time, menu modify records, power-off records, etc)

Table 1 LUGBC vortex flow meter measure liquid of different density corresponding with flow range under working condition

Gas	Density $\rho(\text{kg/ m}^3)$	1.0	1.2	2.0	3.0	4.0	6.0	8.0	10	15	20	Vmax(m/s)
	Vmin(m/s)	5.5	5.2	5.0	4.8	4.6	4.2	4.0	3.8	3.6	3.5	55
Liquid	Density $\rho(\text{kg/m}^3)$	500	600	700	800	900	1000	1200	1400	1600	1800	Vmax(m/s)
	Vmin(m/s)	0.96	0.8	0.70	0.66	0.62	0.60	0.56	0.52	0.50	0.45	6.0

Notes : table 9 that is accuracy $\pm 2.5\%$ of insertion-version vortex flow meter flow range. When accuracy is better than $\pm 2.5\%$, velocity of flow = lower limit of velocity multiplied by coefficient R(R=2-3), the upper limit multiplied by 0.8.

Wiring

Non-display pulse output type (three-wire voltage pulse) wiring

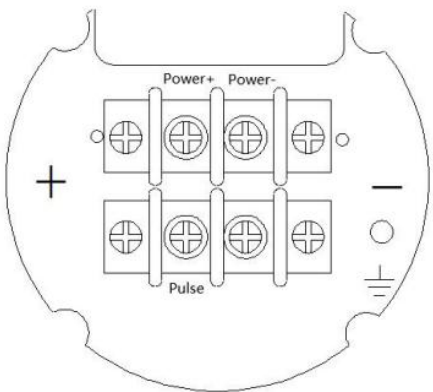


Figure 2

Table 2

Power+: power supply 24VDC+	Note: The Fo on the back circuit board is an internal pull-up resistor switch, which is short circuited by default at the factory and is an active pulse output. When OC gate output is required, Fo needs to be disconnected. When the negative pole of the working power supply and the negative pole of the pulse output are not grounded together, they should be short-circuited.
Power-: power supply 24VDC-	
Pulse: pulse output	

Non-display current output type (2-wire 4-20mA) wiring

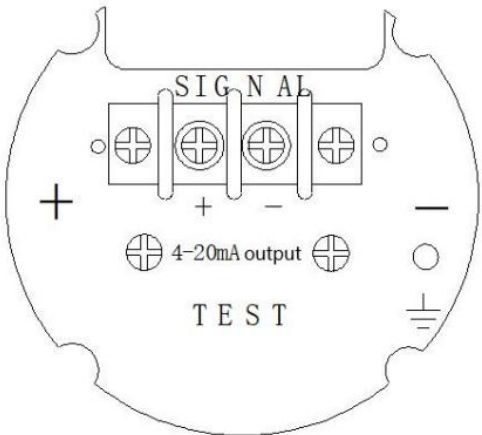


Figure 3

Table 3

Power+: power supply 24VDC +	Note: K5 on the back circuit board is a short-circuit plug between the negative pole of the power supply and the ground. The factory default is the short-circuit state. When the external signal receiving system has a separate "ground", K5 needs to be disconnected, otherwise it will cause inaccurate measurement.
Power-: 4-20mA output	

Local display pulse output type (3-wire ,pulse)

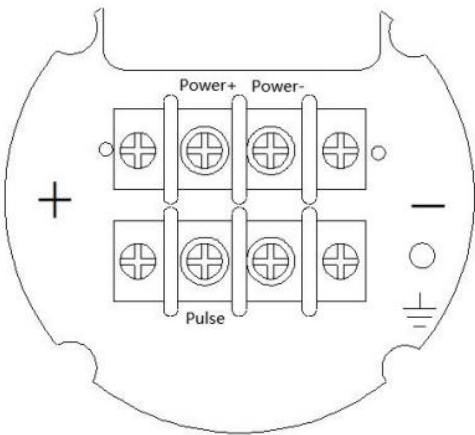


Figure 4

Table 4

Power+: power supply 24VDC+	Note: When the negative pole of the external power supply and negative pole of the pulse input do not share "ground", they should be short-circuited. This type of amplifier always requires battery power to work properly, so after the external power supply is turned on, you still need to turn the battery switch to the "ON" position to use it normally.
Power-: power supply 24VDC-	
Pulse: pulse output	

Local display current output type (2-wire , 4-20mA)

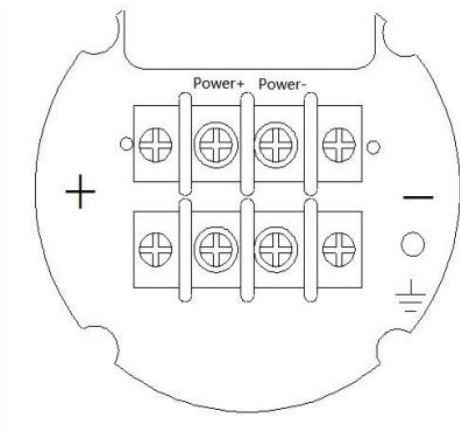


Figure 5

Table 5

Power+: power supply 24VDC+	Note: When the external signal receiving system has a separate "ground", the "pulse (secondary meter)" plug on the back circuit board needs to be disconnected, otherwise the measurement will be inaccurate. This type of amplifier always requires battery power to work properly, so after the external power supply is turned on, you still need to turn the battery switch to the "ON" position to use it normally.
Power-: 4-20mA output	

Ordering code

LUGBC-SUP -2C-Q1-A-P-0-K0-TJ-M1-WG										Description
LUGBC-SUP	-	-	-	-	-	-	-	-	-	
Nominal Diameter	2C									DN200 (8 ")
	2G									DN250 (10 ")
	3C									DN300 (12 ")
	3G									DN350 (14 ")
	4C									DN400 (16 ")
	4G									DN450 (18 ")
	5C									DN500 (20 ")
	6C									DN600 (24 ")
	7C									DN700 (28 ")
	8C									DN800 (32 ")
	9C									DN900 (36 ")
	A0									DN1000 (40 ")
	A2									DN1200 (48 ")
	A4									DN1400 (55 ")
	A6									DN1600 (64 ")
	A8									DN1800 (72 ")
Ball Valve and Mounting Base	Q1									No Ball Valve, Carbon Steel CS Mounting Base
	Q2									No Ball Valve, 304SS Mounting Base
	Q5									DN100 PN16 Carbon Steel Flange Ball Valve, Carbon Steel CS Mounting Base
	Q6									DN100 PN16 304SS Flanged Ball Valve, 304SS Mounting Base
	Q7									DN100 PN16 316SS Flanged Ball Valve, 304SS Mounting Base
Measured Medium	A									Steam
	B									Gas
	C									Liquid
Accuracy			P							Class 2.5
Compensation Method				0						Standard Structure without Compensation
Output, Display and Power Supply						K0				Pulse, No Display, 24VDC
						A1				Two-wire 4-20mA; Display Included
						A3				Three-wire 4-20mA; Display Included; 24VDC
						A2				Two-wire 4-20mA; Display

				Included; 24VDC + Battery Dual Power Supply
	A4			Two-wire 4-20mA + Hart; Display Included
	K2			Pulse + RS485; Display Included; 24VDC
	XX			Others
Heat Resistance Temperature		TJ		-40-140°C
		TV		-40-220°C
Body Material			M1	304SS
Electrical Interface, Shell Material and Protection Level			WG	M20 × 1. 5 Cable Gland; Aluminum; IP65