VORTEX FLOW METER
S-VTX

Instruction Manual
Version 21

CONTENT

Thank you for purchasing the digital Vortex flow meter.
To ensure correct use of the instrument, please read this manual thoroughly and fully understand how to operate the instrument before operating it.

• Safety and Modification Precautions

	Indicates safety attentions which are dangerous.
	Indicates safety attentions which are needed to pay attention to.
	Indicates safety attentions which are forbidden.

Error operation in case of ignoring the tips might cause the personal injury, or damage to the instrument and property.

Select explosion-proof instrument for explosive environment application

Confirm whether the nameplate of instrument has the identifiers of explosion-proof certification and temperature class, the instrument can't be used in explosive environment without those identifiers.

The explosion-proof temperature class of instrument must meet the explosion-proof and temperature of environmental requirements on site

When the instrument is used in explosion-proof environment, make sure that the explosion-proof certification and temperature class of instrument meet to the requir-ements on site.

No opening while working in explosive environment

Before wiring, please power instrument off.

The protection class of instrument must meet the working condition requirements on site

The requirement of protection class on site should be under, or the same as the protection class of instrument to ensure that the instrument is working fine.

If doubting that the instrument in the event of failure, please do not operate it

If there are something wrong with the instrument or it had been damaged, please contact us.

■ Digital Vortex flow meters are thoroughly tested at the factory before shipment.

When these instruments are delivered, perform a visual check to make sure that no damage occured during shipment.

■Transportation and Storage Precautions

If the instrument is to be stored for a long period of time after delivery, please follow below points.

The instrument should be stored in original packing.

The instrument need to be stored in the place where will not be exposed to rain or water.

Temperature: -40 to +60℃

Humidity: 5 to 100% RH

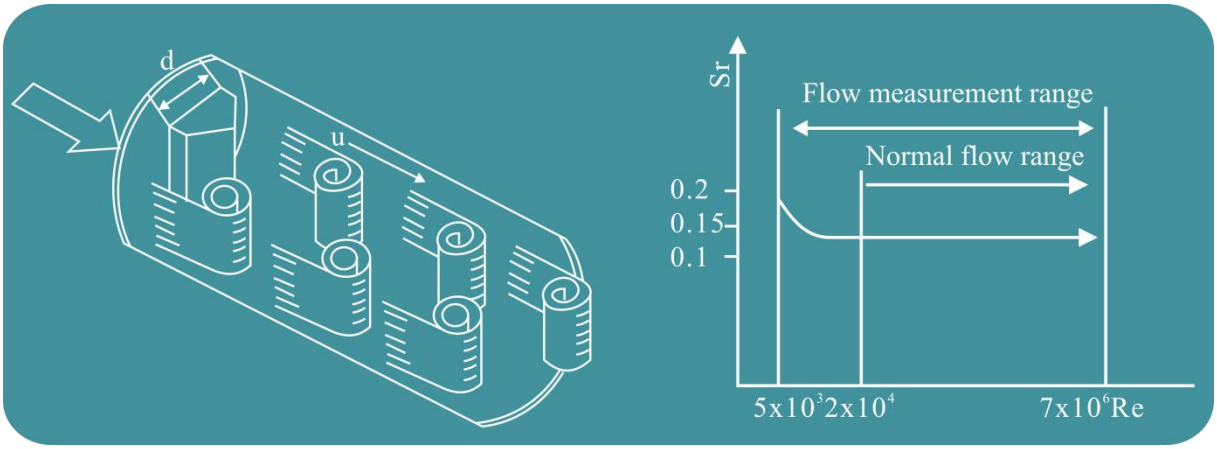
1. Introduction

1.1 Principle

Setting a triangular prism vortex generator in the flow meter, regular vortex will be generated at both the sides of triangular prism, which is called Karman swirl. As showed on the drawing 1.1, vortex are arranged regularly at the downstream of vortex generator. Suppose the vortex generation frequency is F,

the average flow velocity of medium is V, d is the width of the surface of triangular prism incident flow, and D for the nominal diameter of flow meter. Then we get the computation formula:

$$f = Sr \frac{\overline{V}}{(1 \sim 1.25d/D)\, d}$$



1.2 Basic Parameters

Measured Medium	Liquid, Gas, Steam	
Medium Temp.	-40 ～ + 250℃; 40 ～ + 350℃ (high temperature type)	
Nominal Pressure	0.6MPa, 1.0MPa, 1.6MPa, 2.5MPa, 4.0MPa	
Accuracy	±1.0% (Flange/Wafer) ±1.5% (Insertion type)	
Flow Range	Liquid:0.4-7.0m/s; Gas:4.0-60.0m/s; Steam:5.0-70.0m/s	
Specifications	DN15-DN300 (flange/wafer type) DN80-DN2000 (insertion type) DN15-DN100 (thread/sanitary type)	
Material	SS304 (standard) SS316 (optional)	
Reynolds Number	Normal 2x104~7x106	
Resistance Coefficient	Cd≦2.6	
Vibration Acceleration Allowed	≦0.2g	
IEP ATEX	IIG Exia IICT5 Ga	
Ambient Condition	Ambient Temp.	-40℃~65℃ (Non ex-proof site) -20℃~55℃ (Ex-proof site)

	Relative Humidity	≦85%
	Pressure	86-106kPa
Power Supply	DC12-30V or 3.6V lithium battery powered	
Signal Output	4-20mA, Pulse	
Communication	RS485 Modbus or HART	

1.3 Flow Range

Table 1 Liquid and Air Flow Range Table (m^3/h)

Nominal DN(mm)	Liquid (m^3/h)		Air (m^3/h)	
	Standard Range	Extended Range	Standard Range	Extended Range
15	0.8-6	0.5-8	6-40	5-50
20	1-8	0.5-12	8-50	6-60
25	1.5-12	0.8-16	10-80	8-120
32	2-20	1.5-25	15-150	10-200
40	2.5-30	2-40	25-200	20-300
50	3-50	2.5-60	30-300	25-500
65	5-80	4-100	50-500	40-800
80	8-120	6-160	80-800	60-1200
100	12-200	8-250	120-1200	100-2000
125	20-300	12-400	160-1600	150-3000
150	30-400	18-600	250-2500	200-4000
200	50-800	30-1200	400-4000	350-8000
250	80-1200	40-1600	600-6000	500-12000
300	100-1600	60-2500	1000-10000	600-16000
400	200-3000	120-5000	1600-16000	1000-25000
500	300-5000	200-8000	2500-25000	1600-40000
600	500-8000	300-10000	4000-40000	2500-60000

Table 2 Saturated Steam Mass Flow Range Table (kg/h)

Absolute Pressure (MPa)		0.2	0.3	0.4	0.5	0.6	0.7	0.8
Temperature (℃)		120.2	133.5	143.62	151.84	158.94	164.96	170.41
Density (kg/m3)		1.129	1.651	2.163	2.669	3.17	3.667	4.162
DN15	Qmin	5.645	8.255	10.815	13.345	15.85	18.335	20.81
	Qmax	56.45	82.55	108.15	133.45	158.5	183.35	208.1
DN20	Qmin	6.774	9.906	12.978	16.014	19.02	22.002	24.972
	Qmax	67.74	99.06	129.78	160.14	190.2	220.02	249.72
DN25	Qmin	9.032	13.208	17.304	21.352	25.36	29.336	33.296
	Qmax	135.48	198.12	259.56	320.28	380.4	440.04	499.44
DN32	Qmin	20.322	29.718	38.934	48.042	57.06	66.006	74.916
	Qmax	203.22	297.18	389.34	480.42	570.6	660.06	749.16
DN40	Qmin	22.58	33.02	43.26	53.38	63.4	73.34	83.24
	Qmax	338.7	495.3	648.9	800.7	951	1100.1	1248.6
DN50	Qmin	28.225	41.275	54.075	66.725	79.25	91.675	104.05
	Qmax	564.5	825.5	1081.5	1334.5	1585	1833.5	2081
DN65	Qmin	45.16	66.04	86.52	106.76	126.8	146.68	166.48
	Qmax	903.2	1320.8	1730.4	2135.2	2536	2933.6	3329.6
DN80	Qmin	67.74	99.06	129.78	160.14	190.2	220.02	249.72
	Qmax	1354.8	1981.2	2595.6	3202.8	3804	4400.4	4994.4
DN100	Qmin	112.9	165.1	216.3	266.9	317	366.7	416.2
	Qmax	2258	3302	4326	5338	6340	7334	8324
DN125	Qmin	169.35	247.65	324.45	400.35	475.5	550.05	624.3
	Qmax	3387	4953	6489	8007	9510	11001	12486
DN150	Qmin	225.8	330.2	432.6	533.8	634	733.4	832.4
	Qmax	4516	6604	8652	10676	12680	14668	16648
DN200	Qmin	395.15	577.85	757.05	934.15	1109.5	1283.45	1456.7
	Qmax	9032	13208	17304	21352	25360	29336	33296
DN250	Qmin	564.5	825.5	1081.5	1334.5	1585	1833.5	2081
	Qmax	13548	19812	25956	32028	38040	44004	49944
DN300	Qmin	677.4	990.6	1297.8	1601.4	1902	2200.2	2497.2
	Qmax	18064	26416	34608	42704	50720	58672	66592

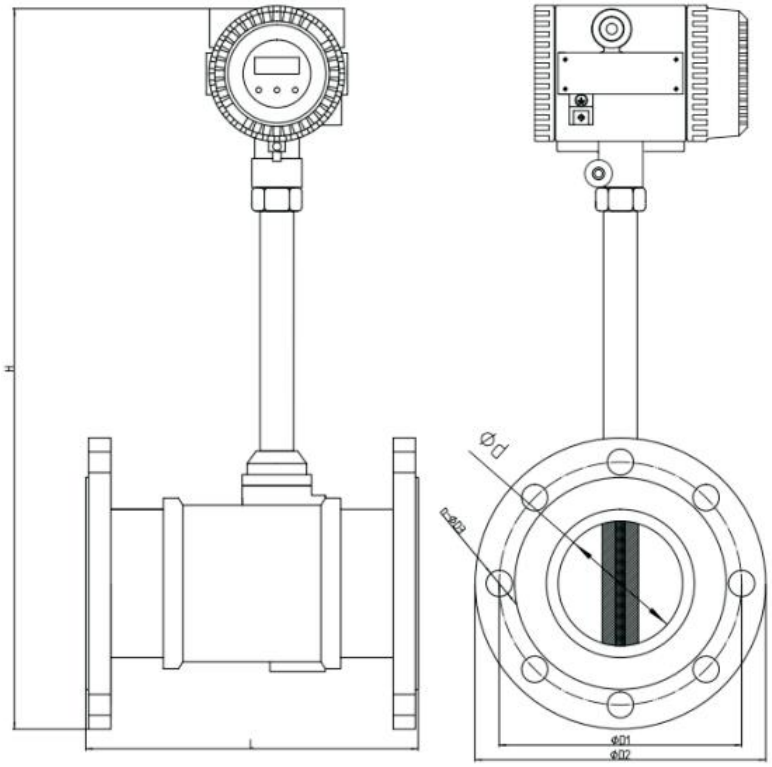
Absolute Pressure (MPa)		0.9	1.0	1.2	1.4	1.6	1.8	2.0
Temperature (℃)		175.36	179.68	187.96	195.04	201.37	207.11	212.37
Density (kg/m^3)		4.665	5.147	6.127	7.106	8.085	9.065	10.05
DN15	Qmin	23.325	25.735	30.635	35.53	40.425	45.325	50.25
	Qmax	233.25	257.35	306.35	355.3	404.25	453.25	502.5
DN20	Qmin	27.99	30.882	36.762	42.636	48.51	54.39	60.3
	Qmax	279.9	308.82	367.62	426.36	485.1	543.9	603
DN25	Qmin	37.32	41.176	49.016	56.848	64.68	72.52	80.4
	Qmax	559.8	617.64	735.24	852.72	970.2	1087.8	1206
DN32	Qmin	83.97	92.646	110.286	127.908	145.53	163.17	180.9
	Qmax	839.7	926.46	1102.86	1279.08	1455.3	1631.7	1809
DN40	Qmin	93.3	102.94	122.54	142.12	161.7	181.3	201
	Qmax	1399.5	1544.1	1838.1	2131.8	2425.5	2719.5	3015
DN50	Qmin	116.625	128.675	153.175	177.65	202.125	226.625	251.25
	Qmax	2332.5	2573.5	3063.5	3553	4042.5	4532.5	5025
DN65	Qmin	186.6	205.88	245.08	284.24	323.4	362.6	402
	Qmax	3732	4117.6	4901.6	5684.8	6468	7252	8040
DN80	Qmin	279.9	308.82	367.62	426.36	485.1	543.9	603
	Qmax	5598	6176.4	7352.4	8527.2	9702	10878	12060
DN100	Qmin	466.5	514.7	612.7	710.6	808.5	906.5	1005
	Qmax	9330	10294	12254	14212	16170	18130	20100
DN125	Qmin	699.75	772.05	919.05	1065.9	1212.75	1359.75	1507.5
	Qmax	13995	15441	18381	21318	24255	27195	30150
DN150	Qmin	933	1029.4	1225.4	1421.2	1617	1813	2010
	Qmax	18660	20588	24508	28424	32340	36260	40200
DN200	Qmin	1632.75	1801.45	2144.45	2487.1	2829.75	3172.75	3517.5
	Qmax	37320	41176	49016	56848	64680	72520	80400
DN250	Qmin	2332.5	2573.5	3063.5	3553	4042.5	4532.5	5025
	Qmax	55980	61764	73524	85272	97020	108780	120600
DN300	Qmin	2799	3088.2	3676.2	4263.6	4851	5439	6030
	Qmax	74640	82352	98032	113696	129360	145040	160800

Table 3 Superheated Steam Density & Relative Temperature and Pressure (Kg/m³)

Absolute Pressure (MPa)	Temperature（℃）					
	150	200	250	300	350	400
0.1	0.52	0.46	0.42	0.38		
0.15	0.78	0.70	0.62	0.57	0.52	0.49
0.2	1.04	0.93	0.83	0.76	0.69	0.65
0.25	1.31	1.16	1.04	0.95	0.87	0.81
0.33	1.58	1.39	1.25	1.14	1.05	0.97
0.35	1.85	1.63	1.46	1.33	1.22	1.13
0.4	2.12	1.87	1.68	1.52	1.40	1.29
0.5	-	2.35	2.11	1.91	1.75	1.62
0.6	-	2.84	2.54	2.30	2.11	1.95
0.7	-	3.33	2.97	2.69	2.46	2.27
0.8	-	3.83	3.41	3.08	2.82	2.60
1.0	-	4.86	4.30	3.88	3.54	3.26
1.2	-	5.91	5.20	4.67	4.26	3.92
1.5	-	7.55	6.58	5.89	5.36	4.93
2.0	-	-	8.968	7.97	7.21	6.62
2.5	-	-	11.5	10.1	9.11	8.33
3.0	-	-	14.2	12.3	11.1	10.1
3.5	-	-	17.0	14.6	13.0	11.8
4.0	-	-	-	17.0	15.1	13.6

1.4 Dimension

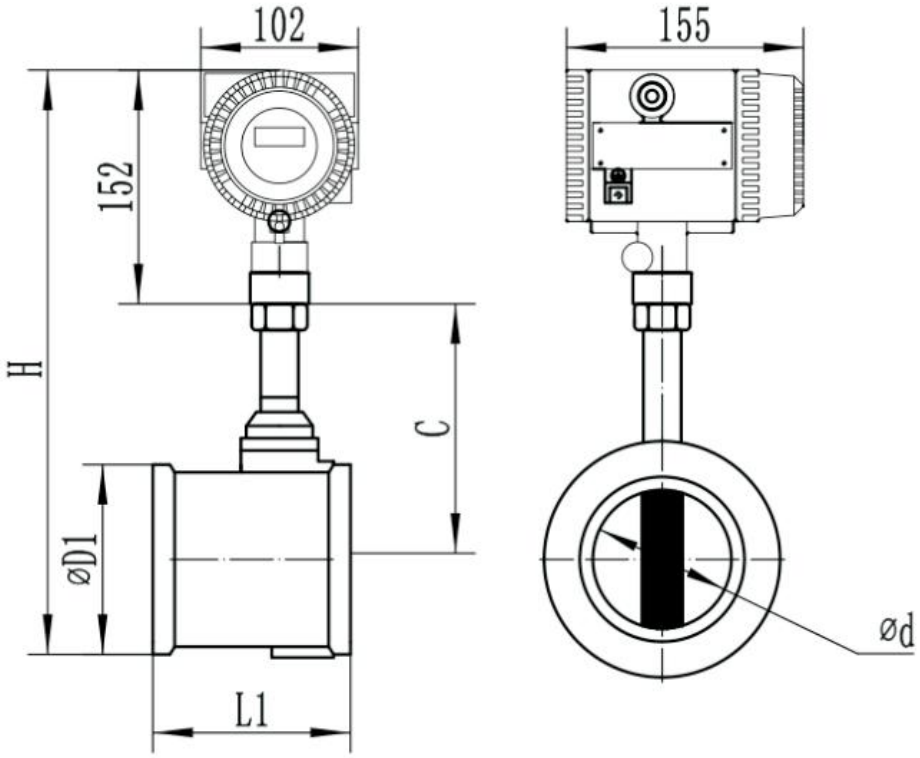
1.4.1 Flange Connection Type (DIN PN16 as reference)



DIN PN16 Flange Connection Dimension

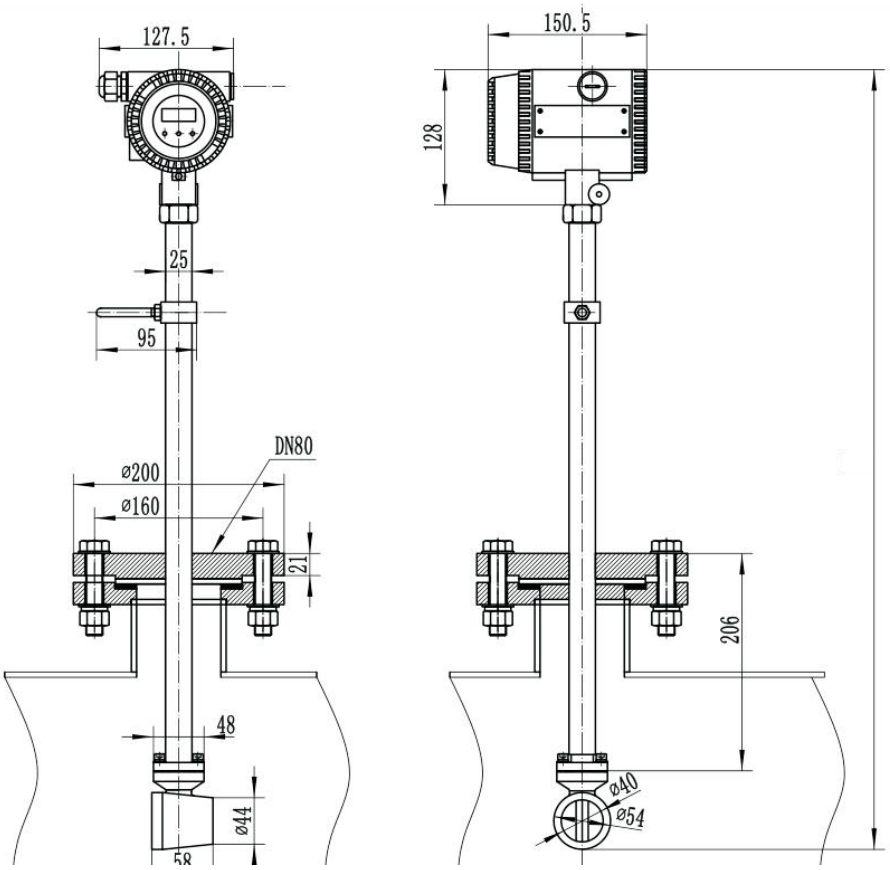
Size	L	H	d	D1	D2	n-D3
DN15	170	440	15	65	95	4-ϕ14
DN20	170	445	20	75	105	4-ϕ14
DN25	170	450	26	85	115	4-ϕ14
DN32	170	462	32	100	140	4-ϕ18
DN40	190	465	38	110	150	4-ϕ18
DN50	190	473	48	125	165	4-ϕ18
DN65	220	487	62	145	185	4-ϕ18
DN80	220	500	73	160	200	8-ϕ18
DN100	240	533	95	180	220	8-ϕ18
DN125	260	560	118	210	250	8-ϕ18
DN150	280	608	140	240	285	8-ϕ22
DN200	300	640	200	295	340	12-ϕ22
DN250	360	705	250	355	405	12-ϕ26
DN300	400	752	300	410	460	12-ϕ26

1.4.2 Wafer Connection Type

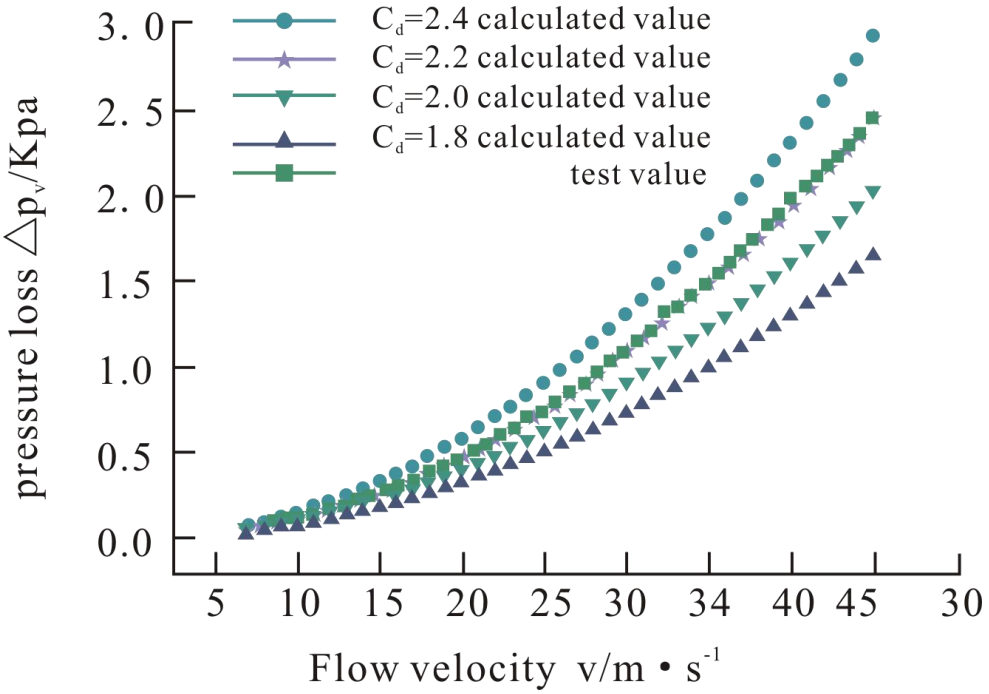


Size	L1	D1	d	C
DN15	65	65	15	240.5
DN20	65	65	20	240.5
DN25	65	65	26	240.5
DN32	65	65	32	240.5
DN40	80	76	38	237
DN50	80	88	48	237
DN65	92	101	62	242.5
DN80	100	112	73	247
DN100	124	134	95	271
DN125	145	158	118	284
DN150	165	180	140	313
DN200	195	247	200	319.5
DN250	115	300	250	348
DN300	130	347	300	369.5

1.4.3 Insertion Type



1.5 Pressure Loss



2. Installation

Caution

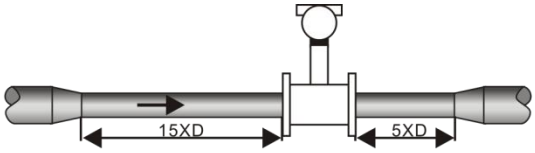
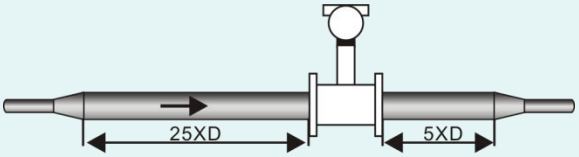
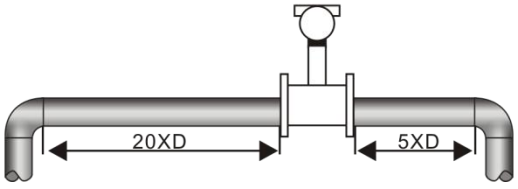
●Installation of the vortex flow meter must be performed by expert engineer or skilled personnel.
●Be careful that no damage is caused to people through accidentally dropping.
●When the vortex flow meter is processing with hot mediums like hot fluid or steam, be careful not to get burnt.
●All procedures relating to installation must comply with the installation requirements.
●Suggest to select an area subject to minimize mechanical vibration. If the flow meter is subject to vibrations, it is recommended to provide pipeline supports.
●No collision by hard subject, when the flow sensor is being installed, otherwise the accuracy will be influenced, even the flow meter will be damaged.

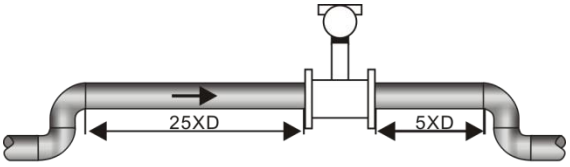
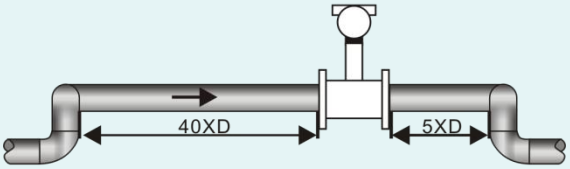
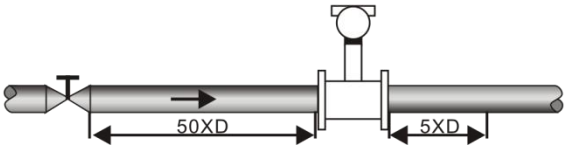
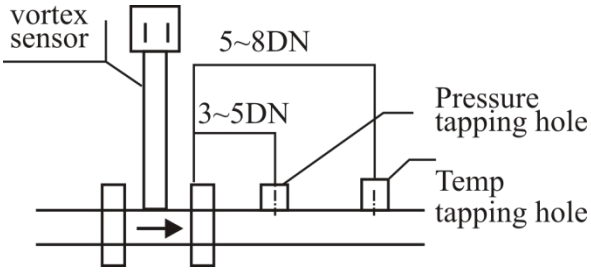
2.1 Flange / Wafer Type Installation

● Installation Direction

Horizontal or Vertical (The flow direction should always be upwards while vertical installation)

● Straight Pipe Length Recommendation (D: Nominal Diameter mm)

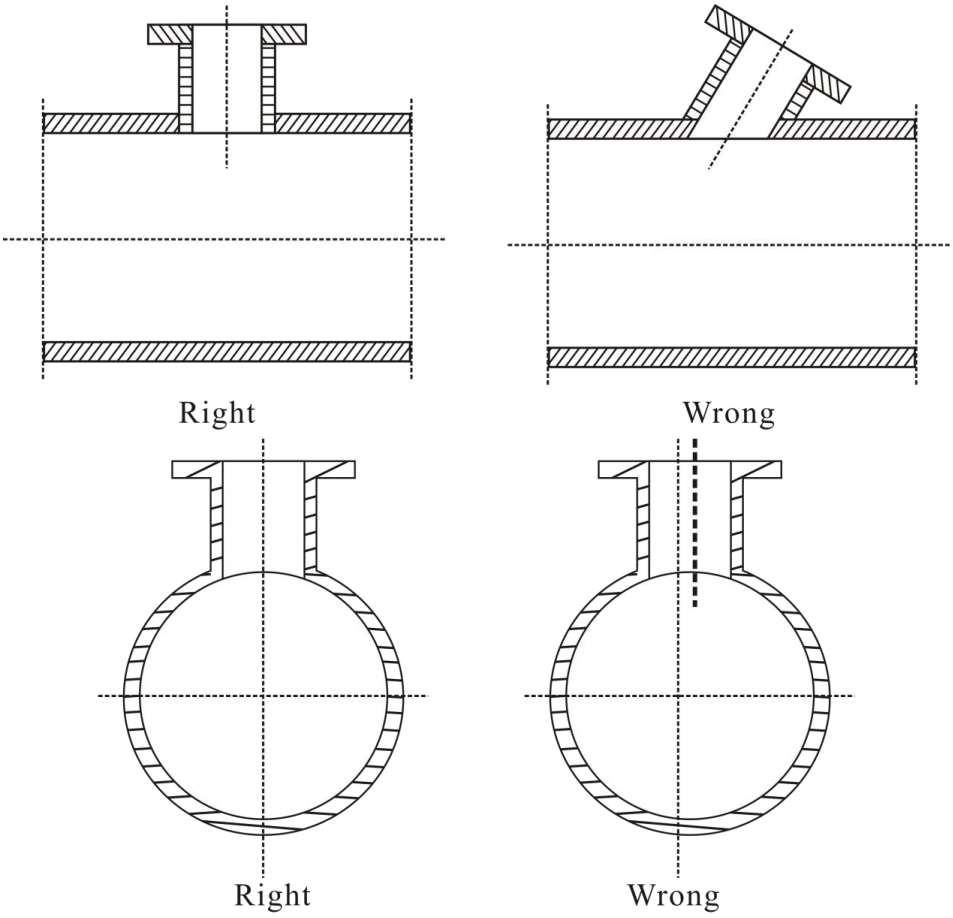
Description	Figure
Concentric reducers pipeline	
Concentric expansion pipeline	
Single quarter bend	

Description	Figure
Two quarter bends on the same surface	
Two quarter bends on the different surface	
Regulating valve,half-open gate	
Valve position	Flow regulating valve must be installed at the downstream of flow sensor.
Pressure and temperature taps (for remote type vortex flow meter with T&P compensation only) Remote type vortex flow meter with pressure and temperature compensation need to place pressure and temperature tap according to the requirement.Install pressure tapping point at 3-5D downstream of flow sensor and temperature taking point at 5-8D downstream of flow sensor.	
Vibration Flow sensor should be not installed on a strong vibration pipeline	If install the flow sensor on a vibration pipeline, there are following methods to decrease the disturbing of vibration: Installing a fixed support on pipeline at 2D upstream of flow meter. At the condition of meeting the straight length, install a hosepipe as a transmission.
High temperature pipeline	If the heat preservation not good, the flow meter should be installed downward vertical.

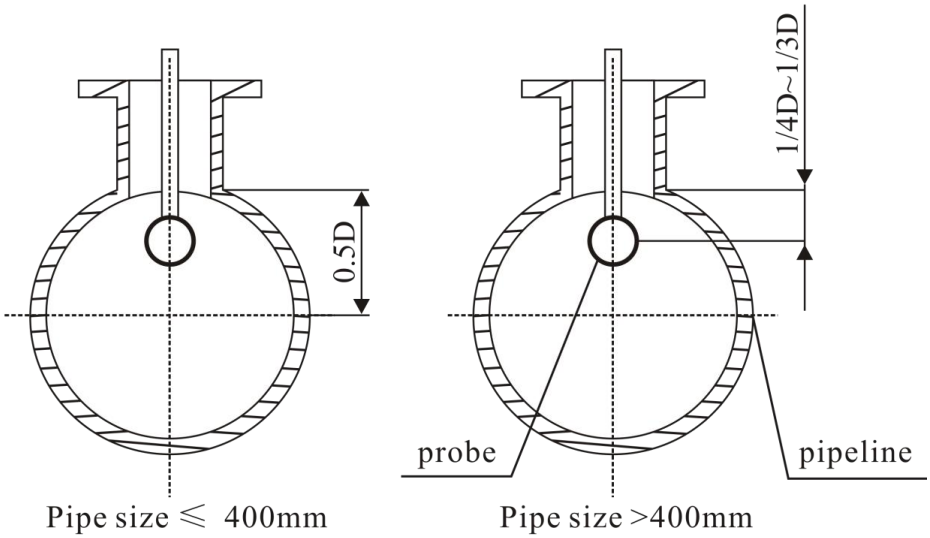
If the length of upstream can not meet the requirement, suggest to install a flow regulator at the upstream pipeline.

2.2 Insertion Type Installation

Straight Pipe Length Recommendation	Upstream ≧ 15D, Downstream ≧ 5D
Installation Steps	1. Open a Φ100mm round hole in the pipeline. The periphery of the hole should be free of burrs to ensure the vortex probe pass smoothly.
	2. Weld the connection base at the round hole of the pipeline. Pay attention to the vertical direction during welding. After welding, the axis is required to intersect the axis of the pipeline positively, and the extension line of the flange short pipe passes through the center of the pipeline. (Refer to Pic 2.2.1)
	3. Please follow below insertion length requirement Pipe size ≤DN400mm, insertion length 1/2D Pipe size > DN400mm, insertion length 1/4D-1/3D (D=pipe size) (Refer to Pic 2.2.2)
	4. The connection between the flanges should be equipped with gaskets. Rubber plates for normal temperature, heat- resistant materials such as asbestos plates for high temperature.
	5. Installation and disassembling methods at the condition of hot tapping (with ball valve) Take disassembling as example, while disassembling, loosen the fixing screw on the lock nut, then loosen the lock nut. Pull the insertion rod upwards until the probe is at the limit position on the upper part of the ball valve, (at this time the ball valve can be closed exactly). Then remove the fixing bolts of the upper connecting flange, and then gently take off the flow meter. The installation steps of the flow meter at the condition of hot tapping is reverse to above steps.



Pic.2.2.1 Correct mounting position of connection base



Pic.2.2.2 Insertion Depth

● Attention for installation

1.The flow direction must be same as the flow indication rod, strictly forbidden to wrench the flow rod;

2. Removing burr and welding slag.

3. Wiring

Warning

●The wiring of the vortex flow meter must be performed by expert engineer or skilled personnel. Before wiring, check that no voltage is applied to the power cable. The supply voltage is within the range of the instrument.

Grounding

Terminal boards

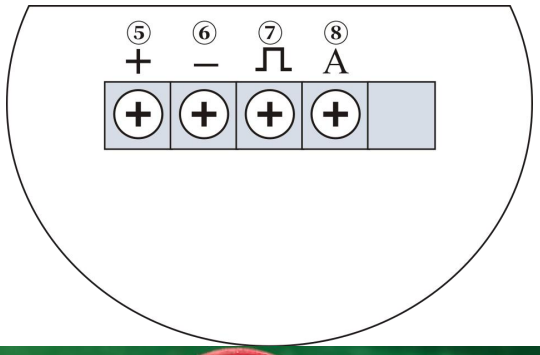
According to different functions there are four types of terminal boards:

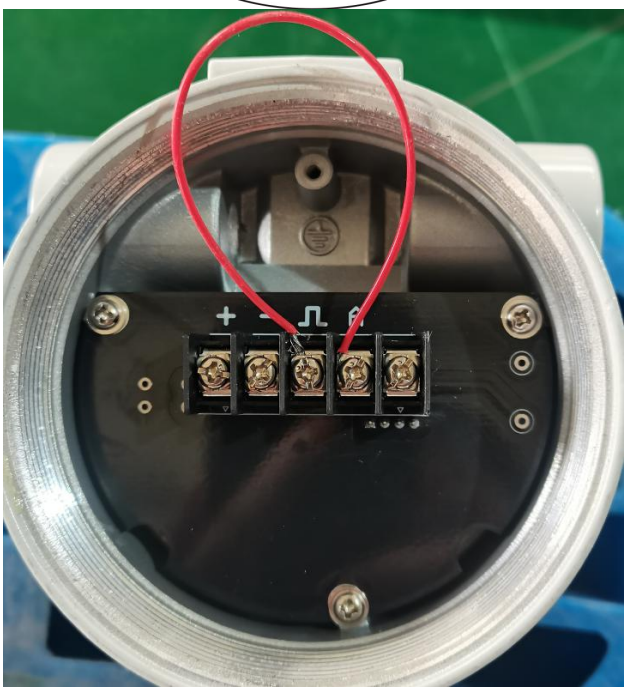
① Normal type without compensation, 4-20mA+Pulse+HART
② Normal type without compensation, 4-20mA+Pulse+RS485
③ With compensation, 4-20mA+Pulse+HART
④ With compensation, 4-20mA+Pulse+RS485

Note

The pulse output is of "MOS" type and a PLC is needed which has a NPN input.
L'uscita ad impulsi è di tipo " MOS " ed è necessario un PLC con ingresso NPN.

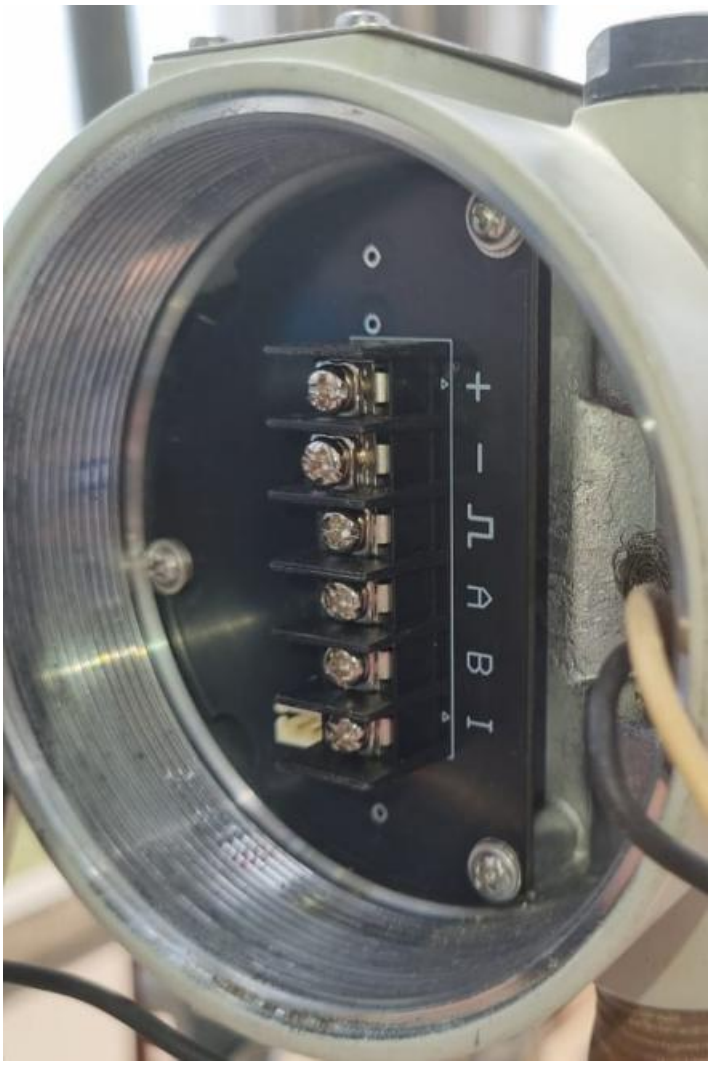
1.1 Normal Type Without Compensation, 4-20mA+Pulse+HART





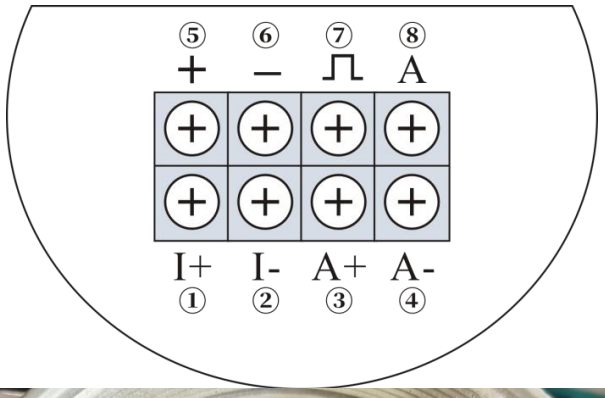
Connection	Description
Power Supply (two wire)	DC24V + → + DC24V - → -
4-20mA	4-20mA + → + 4-20mA - → -
Pulse	Pulse + → **П (represent ⎍)** Pulse - → - Short circuit “**П**” and “A” Note: Terminal “A” is mainly used for short circuit, if short circuit “**П**” and “**A**”, there’s no need to add external resistor.
HART	“+” and “-”

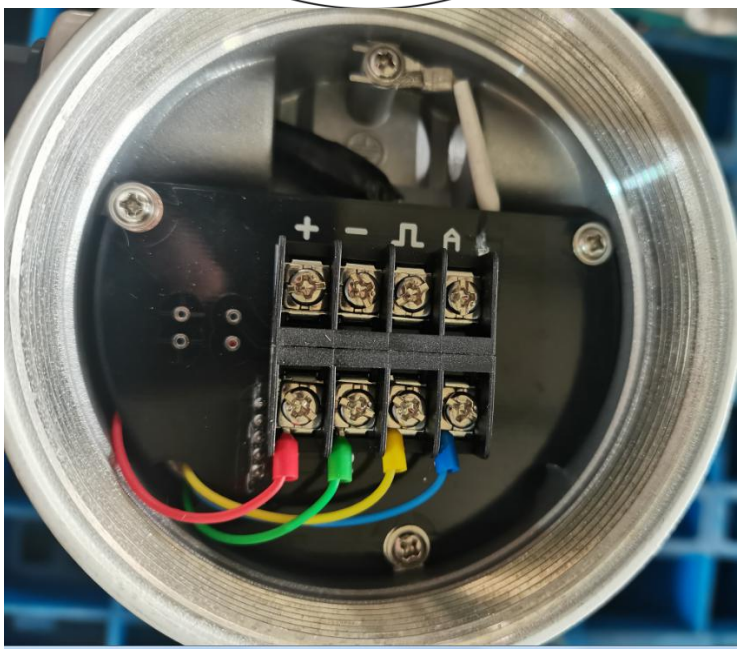
1.2 Normal Type Without Compensation, 4-20mA+Pulse+RS485



Connection	Description
Power Supply	DC24V + → + DC24V - → -
4-20mA	4-20mA + → I (Io) 4-20mA - → -
Pulse	Pulse + → **П (represent ⎍)** Pulse - → -
RS485	RS485 + → A RS485 - → B

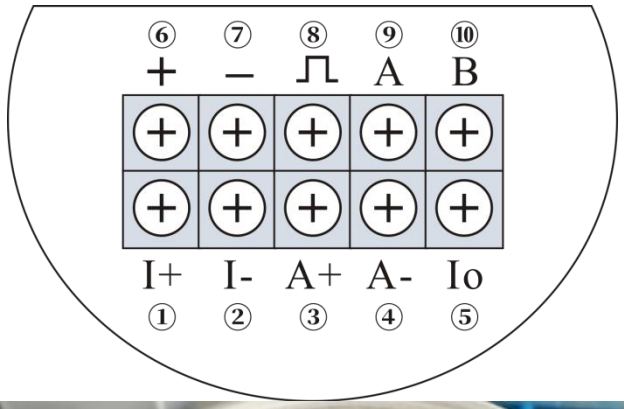
1.3 With Compensation, 4-20mA+Pulse+HART

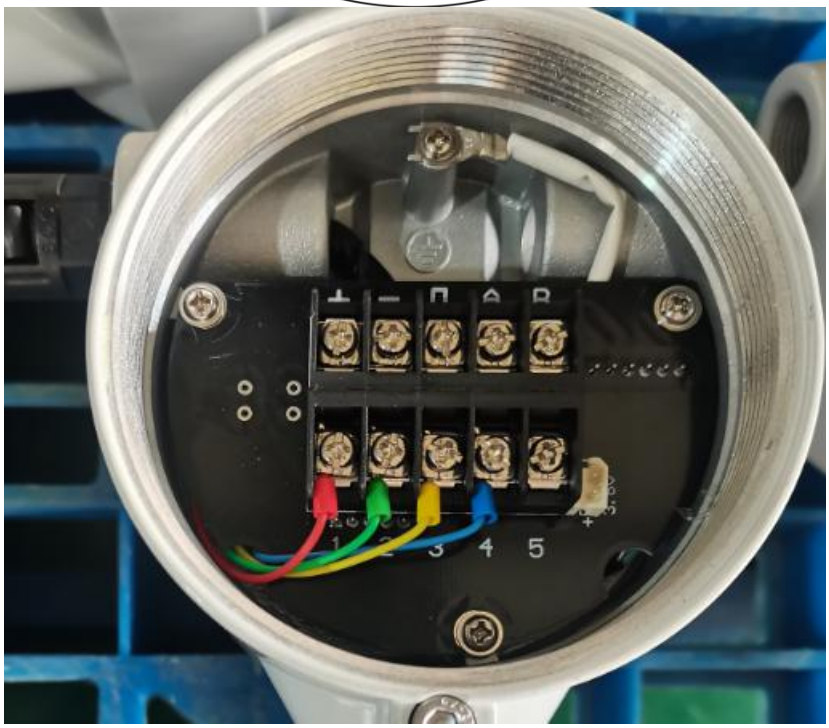




Connection	Description
Power Supply (two wire)	DC24V + → + DC24V - → -
4-20mA	4-20mA + → + 4-20mA - → -
Pulse	Pulse + → **П (represent ⎍)** Pulse - → - Short circuit **П** and A Note: Terminal "A" is mainly used for short circuit, if short circuit "**П**" and "A", there's no need to add external resistor.
HART	"+" and "-"

1.4 With Compensation, 4-20mA+Pulse+RS485





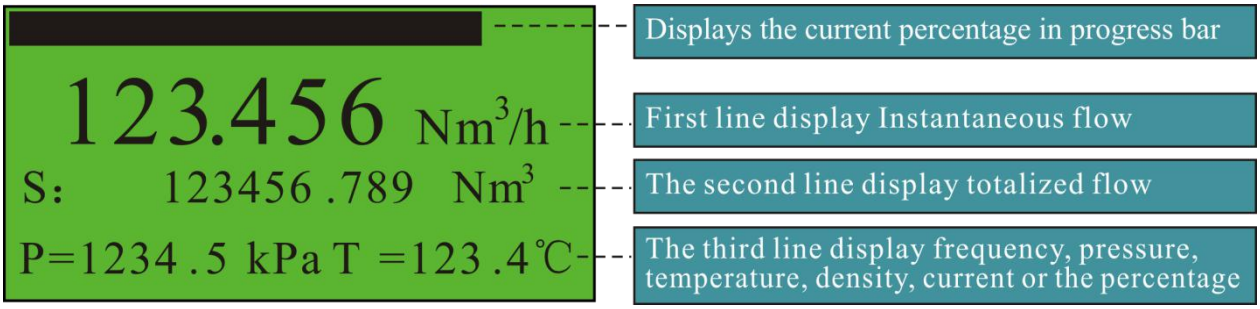
Connection	Description
Power Supply	DC24V + → + DC24V - → -
4-20mA	4-20mA + → **5 (Io)** 4-20mA - → -
Pulse	Pulse + → **Π (represent ⎍)** Pulse - → -
RS485	RS485 + → **A** RS485 - → B

4. Operation

Warning

- Do not open the cover with wet hands.
- When opening the cover, wait for more than 2 minutes after turning off the power.

4.1 Display Configuration



Notes:

▲If the pressure sensor is set to "automatic acquisition" mode, when pressure sensor failure is detected, the corresponding value will be replaced by the manual setting value (the value set in basic menu "Gauge Pre. KPa") and the value will flash on display.

▲If the temperature sensor is set to "automatic acquisition" mode, when temperature sensor failure is detected, the corresponding value will be replaced by manual setting value (the value set in basic menu "Temperature")and the value will flash on display.

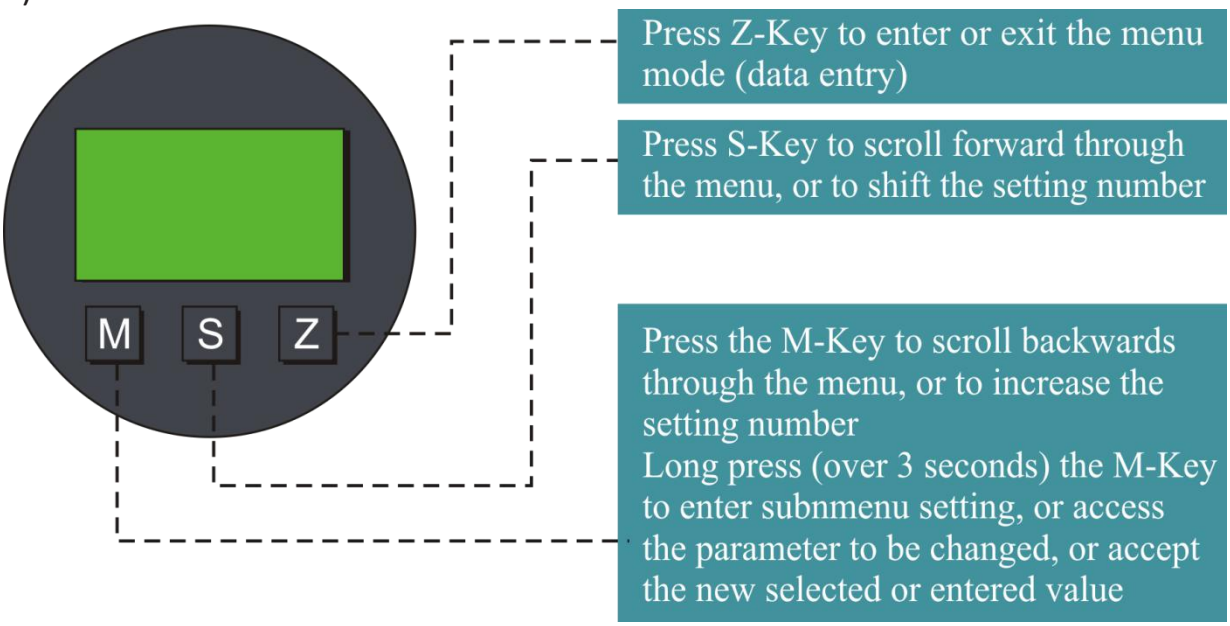
▲When the flow mode is set as "Sat_Steam (P)", it means saturated steam with pressure compensation only. At this time temperature value will display as "----" which means the acquisition of temperature sensor is not activated.

▲When the flow mode is set as "Sat_Steam (T)", it means saturated steam with temperature compensation only. At this time pressure value will display as "----" which means the acquisition of pressure sensor is not activated.

You can press KEY-M to change the third line display variables. Use indicator to distinguish between different display variables shows in the second line.

4.2 Data Setting Method

Data setting can be performed with the three keys on the front panel (M, S and Z).



◆ Enter or Exit Menu Mode

Enter Menu Mode

In the operating mode, press the "Z" key to enter the menu mode (data entry).

Exit Menu Mode

In the menu mode, press the "Z" key to back to the operating mode.

◆ **Data Entry Method**

Press M-Key for 2 seconds to enter setting, and the menu options will start flashing.

Short press M-Key or S-Key to scroll backwards or forwards the menu.

Press M-Key for 2 seconds to save (access) the parameter.

5. Menu List

5.1 Basic Function

Menus settings have been done by our engineer. In normal case do not suggest user to change menu by themselves which may cause the meter work improperly.

Menu	Description	Setting method
Contrast	1~5 Normal set as 3.	Menu Selection
Protection	ON / OFF	Press “M” button for 2 seconds to change
Min Alarm(%)	Set low alarm value. Unit: %	Direct Input
Max Alarm(%)	Set high alarm value. Unit: %	Direct Input
Meter Size	View meter size setting.	Read Only
Flow mode	Liquid Qv: Liquid volume Liquid Qm: Liquid mass Gas Qv: Gas volume Gas Qm: Gas mass Steam Qv: Steam volume Steam(P/T): Steam mass Sat_Steam(T): Saturated steam mass (temperature compensation) Sat_Steam(P): Saturated steam mass (pressure compensation)	Menu Selection
Unit-Qv Unit-Qm	Volume units supported: Nm3/h, Nm^3/m, Nm^3/s, l/s, l/m, l/h, m^3/s, m^3/m, m^3/h, m^3/d, Scf/s, Scf/m, Scf/h, cf/s, cf/m, cf/h, USG/s, USG /m, USG /h, UKG/s, UKG /m, UKG /h, bbl/h, bbl/d Mass units supported : g/s ，g/m，g/h，kg/s，kg/m，kg/h，kg/d， t/m，t/h，t/d， lb/h，lb/d Note: accumulative flow unit based on the instant flow unit.	Menu Selection
Range 100%	Set the Qmax value for selected flow mode (= 20 mA)	Direct Input
Density (kg/ m^3) Density (g/c m^3)	Set gas density (unit: Kg/m^3) Set liquid density (unit: g/cm3)	Direct Input
Gauge Pre.(KPa)	Use for gas or steam measure. Unit: kPa.	Direct Input

Temperature (℃)	Use for gas or steam measure. Unit: ℃.	Direct Input
PV Cutoff (%)	Range: 0% ~ 20%	Direct Input
Damping	Range: 0 ~ 64S	Direct Input
Disp. Point	Set the first line display point, can be 0,1,2, 3.	Menu Selection
Display Mode	Set display mode.	Menu Selection
Totalizer reset	When Lcd display "Yes", long press M-Key to reset the totalizer and overflow counter.	Menu Selection
Number of totalizer overflows	Display of the number of totalizer overflows; 1 overflow = 10,000,000	Read Only
K-Factor	View the K-Factor.	Read Only

■ Flow Unit & Total Flow Unit Relation

Flow Unit	Total Flow Unit
Nm^3/h，Nm^3/m，Nm^3/s	Nm^3
m^3/d，m^3/h，m^3/m，m^3/s	m^3
l/h，l/m，l/s	L
Scf/s，Scf/m，Scf/h，	Scf
cf/s，cf/m，cf/h，	cf
USG/s，USG /m，USG /h，	USG
UKG/s，UKG /m，UKG /h，	UKG
bbl/h，bbl/d，	bbl
g/h，g/m，g/s	g
kg/d，kg/h，kg/m，kg/s	kg
t/d，t/h，t/m	t
lb/h，lb/d	lb

5.2 Advanced Function (Password Protection)

Below menus are for expert engineers only. All settings had been done properly during flow meter calibration in factory. Do not suggest user to change any of the settings which may cause flow meter work improperly.

Menu		Description	Password	Setting Method
M51	Signal Monitor	LCD display: 450.00 This is the PGA gain. CH2 CH2 is signal channel.	****50	Read Only
M52	Meter Size	Options: 15mm, 20mm, 25mm, 32mm, 40mm, 50mm, 65mm, 80mm, 100mm, 125mm, 150mm, 200mm, 250mm, 300mm, 350mm, 400mm, 450mm, 500mm, 600mm;		Menu Selection
M53	Fluid Type	Options: Gas, or Liquid.		Menu Selection
M54	Low Flow Limit	According to the meter size and measuring media, set the corresponding low limit of the flow. The unit of 'Low Flow Limit' is fixed as m^3/h.		Direct Input
M55	High Flow Limit	The 'High Flow Limit' defaults to 10 times the 'Low Flow Limit', the actual measurement of the upper limit of 2.5 times the set value. The unit of 'High Flow Limit' is fixed as m^3/h. When the actual required range ratio exceeds 20: 1, can manually modify the 'High Flow Limit'.		Direct Input
M56	Max AMP.	Between 200 and 1000 suggested. Typically about 400.		Direct Input

M57	K-Factor	Set average calibration k-Factor (1/m^3) Means how many pulses corresponding to		Direct Input
M58	Pulse Factor Unit	Options: m^3, N m^3, t, kg, Scf, cf, USG, UKG, bbl, lb.		Menu Selection
M59	Pulse Factor	Set the number of output pulses corresponding to one 'Pulse Factor Unit'. Note: If you want to output the original pulse, set 'K-factor [57]' and 'Pulse factor [59]' to the same value, and 'Pulse Factor Unit [58]' must set to m^3.		Direct Input
M60	K-Factor Trim Fi K-Factor Trim Yi	Five-point K-Factor correction. Where Fi is the reference frequency, Yi is the correction coefficient K. i=1,2,3,4,5.	****60	Direct Input
M61	Frequency Factor	The reference frequency value of the five-point correction is multiplied by the frequency factor, and then the new reference frequency value of the correction point is obtained.Normally, this value should be 1.When calibrated with water, for gas measurements, you can set the coefficient so that the five-point correction factor remains in effect.	****61	Direct Input

M62	AMP. Channel	There are CH_1, CH_2, CH_3 three options. CH_3 gain maximum CH_1 gain minimum Note: CH2 generally used for liquid measurement, which corresponds to the configuration software, select X1 and X2.CH_3 generally used for gas measurement, which corresponds to the configuration software, select X1, X2 and X3.	****62	Menu Selection
M63	Work Mode	There are F_1, F_2, F_3, F_4 four options. F_1: Anti-vibration Mode F_2: Normal Mode F_3: Turbine Mode F_4: Test Mode Note: Generally choose F_2.	****63	Menu Selection
M40	Trim 4mA	Steps: 1.Press M-Key for 2 seconds, enter trim; 2.Short press M-key to decrease current. Press S-Key to increase current. Stepping is 16 microamperes. 3.Press M-Key for 2 seconds to save new trim value. Or press Z-Key to exit without saving.	****40	
M41	Trim 20mA			
M70	Temp. Measure	Temperature acquisition mode setting. Options: Manual, or Auto. Manual: Temperature uses the input reference value. Auto: Temperature is automatic acquisition, should be use external Pt1000 or Pt100.	****70	Menu Selection

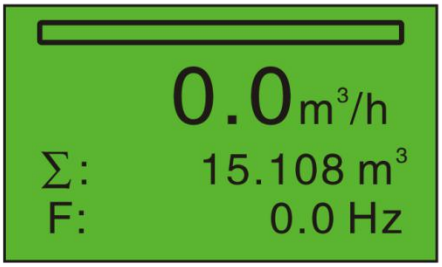
M71	Pressure Measure	Pressure acquisition mode setting. Options: manual, or auto. Manual: If select manual, the pressure value will be replaced by the manual setting value (the value set in basic menu “Gauge Pre. Kpa”). Auto: If select auto, pressure value is by automatic acquisition, need to connect with external pressure sensor.		Menu Selection
M72	Temperature Low Trim	Enter the lower calibration resistance value. unit: ohm. Use standard resistance as input. For example: 1000 for Pt1000, or 100 for Pt100.		Direct Input
M73	Temperature Low Trim	Enter the high calibration resistance value. unit: ohm. Use standard resistance as input. For example: 2500 for Pt1000, or 250 for Pt100.		Direct Input
M74	Pressure Low Trim	Enter the calibration reference pressure value. Unit: KPa. Apply the standard pressure to the sensor. For example: 0 KPa		Direct Input
M75	Pressure High Trim	Enter the calibration reference pressure value. Unit: KPa. Apply the standard pressure to the sensor. For example: 1000 KPa		Direct Input

M76	Pre. Cutoff	Set the low pressure cutoff value. Unit: KPa. If the measured pressure value is less than 'Pre. Cutoff', the pressure will be set to 0 kPa.		Direct Input
M77	Set Pre. Bias	Set the pressure bias value. Unit: Kpa. Enter the current actual pressure value to achieve bias. The pressure value will be set as the entered value.		Direct Input
M38	Min Pre. (Kpa)	This parameter is only used for steam mass measurement. In the steam mass measurement mode, if the pressure is less than the set 'minimum pressure value' when the pressure compensation is activated, the flow will automatically return to zero.	****38	Direct Input
M39	Min Temp. (℃)	This parameter is only used for steam mass measurement. In the steam mass measurement mode, if the temperature is less than the set 'minimum temperature value' when the temperature compensation is activated, the flow will automatically return to zero.	****38	Direct Input
M11	Version	To view the embedded software version.	****11	Read Only
M12	Max Frequency	The internal conversion frequency value corresponds to the 'High Flow Limit'.		Read Only

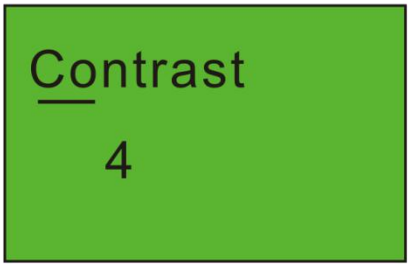
M13	Min Frequency	The internal conversion frequency value corresponds to the 'Low Flow Limit'.		Read Only
M90	Modbus Addr.	1 ~ 247	****90	Direct Input
M91	Modbus Baud.	"9600", "4800" , "2400" , "1200" , "600"		Menu Selection
M111	Total Preset	Used to directly set the current total flow value.	****111	Direct Input
M721	Temp. Data X0; Temp. Data Y0; Temp. Data X1; Temp. Data Y1;	You can directly view and modify the temperature sensor calibration values. Temp. Data X0 and Temp. Data X1 are internal ADC measurements. Temp. Data Y0[73] and Temp. Data Y1[74] are the input calibration value.	****721	Direct Input
M741	Pre. Data X0; Pre. Data Y0; Pre. Data X1; Pre. Data Y1;	You can directly view and modify the pressure sensor calibration values. Pre. Data X0 and Pre. Data X1 are internal ADC measurements. Pre. Data Y0[75] and Pre. Data Y1[76] are the input calibration value.	****741	Direct Input

● How to adjust the LCD contrast?

Power on display

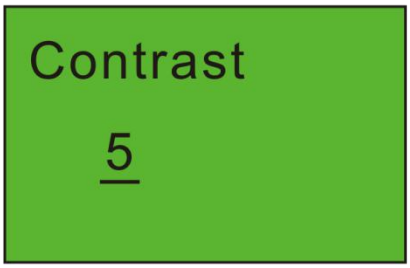


Press "Z" button, and then press "S" button to find menu "Contrast"



Press "M" button for 2 seconds to enter into this menu, press "S" button to choose the options.

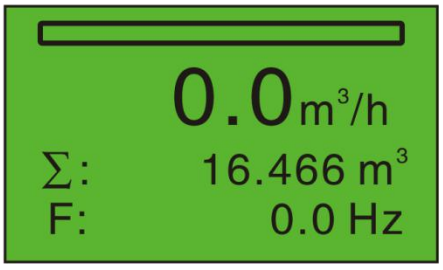
Default is "4", max number is "5".



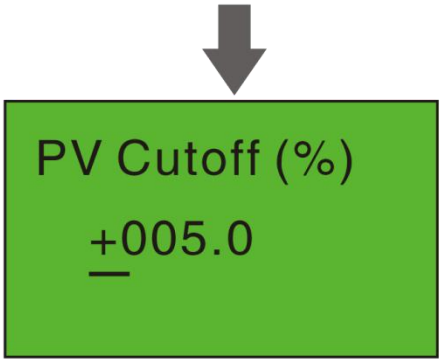
Press "M" button for 2 seconds to save the settings, and then press "Z" button to back to main display.

● How to set low flow cutoff?

Power on display



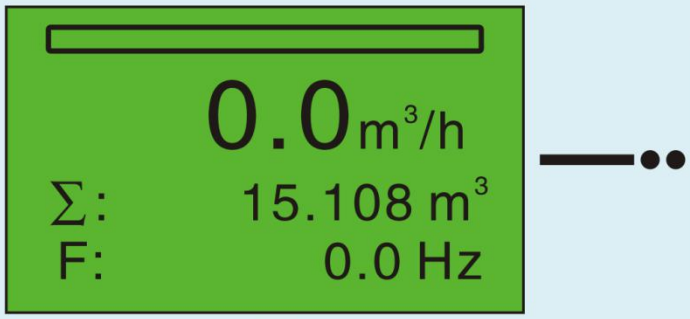
Press "Z" button and then press "S" button to find menu "PV Cutoff (%)"
Press "M" button for 2 seconds to enter this menu, Default value is 5.0.



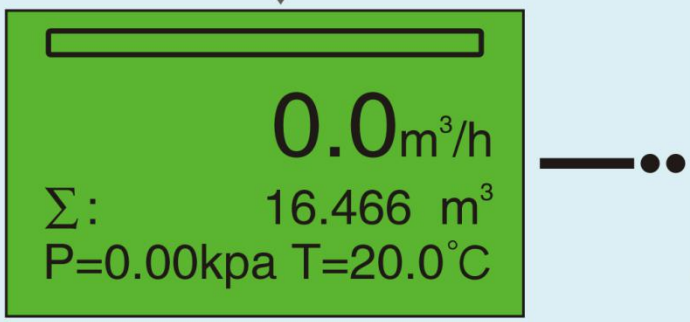
Press "S" button to move cursor and "M" button to set value you need.
Then Press "M" button for 2 seconds to save settings, and then press "Z" button to back to main display.

● How to check frequency, temperature, pressure, flow percentage value etc?

Power on display can check the frequency on the bottom line.

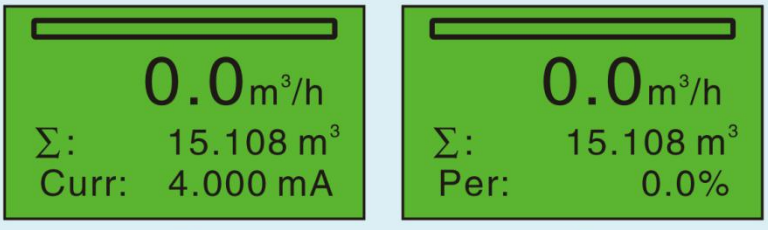


Press “M” button for 2 seconds, it can display pressure, temperature value.



Press “M” to check density, current and flow percentage value etc.

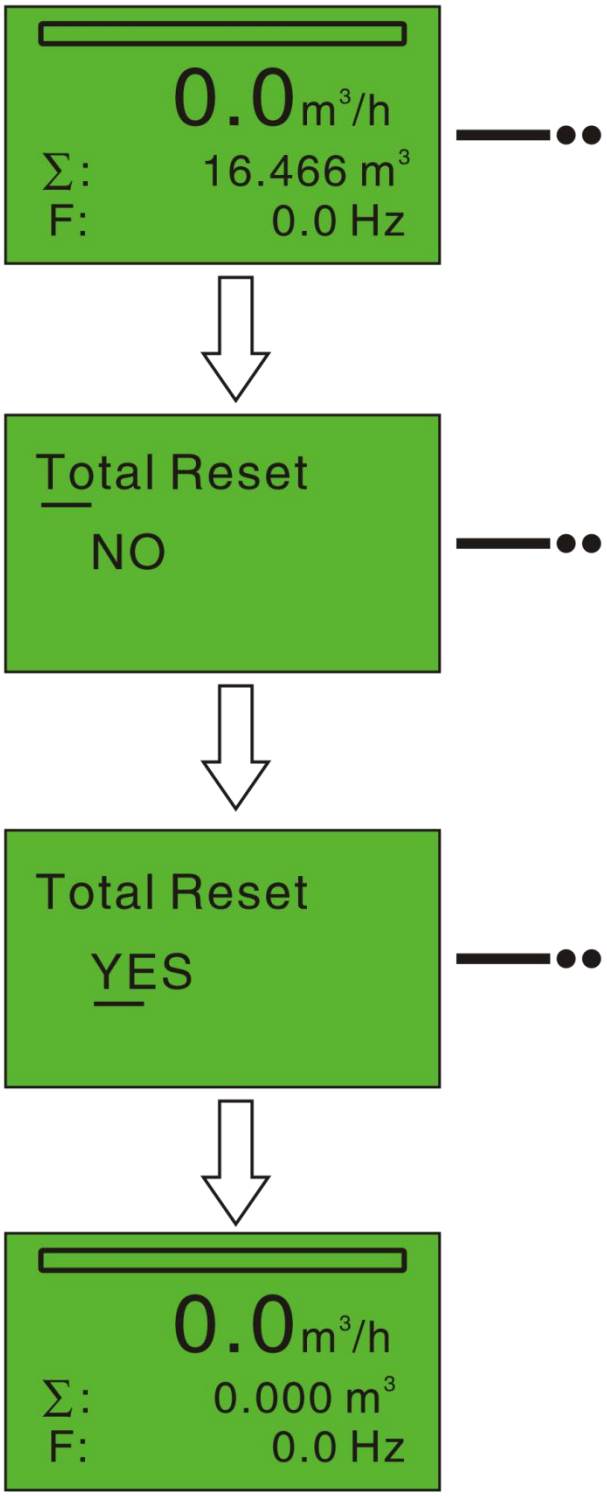
① ② ③



④ ⑤

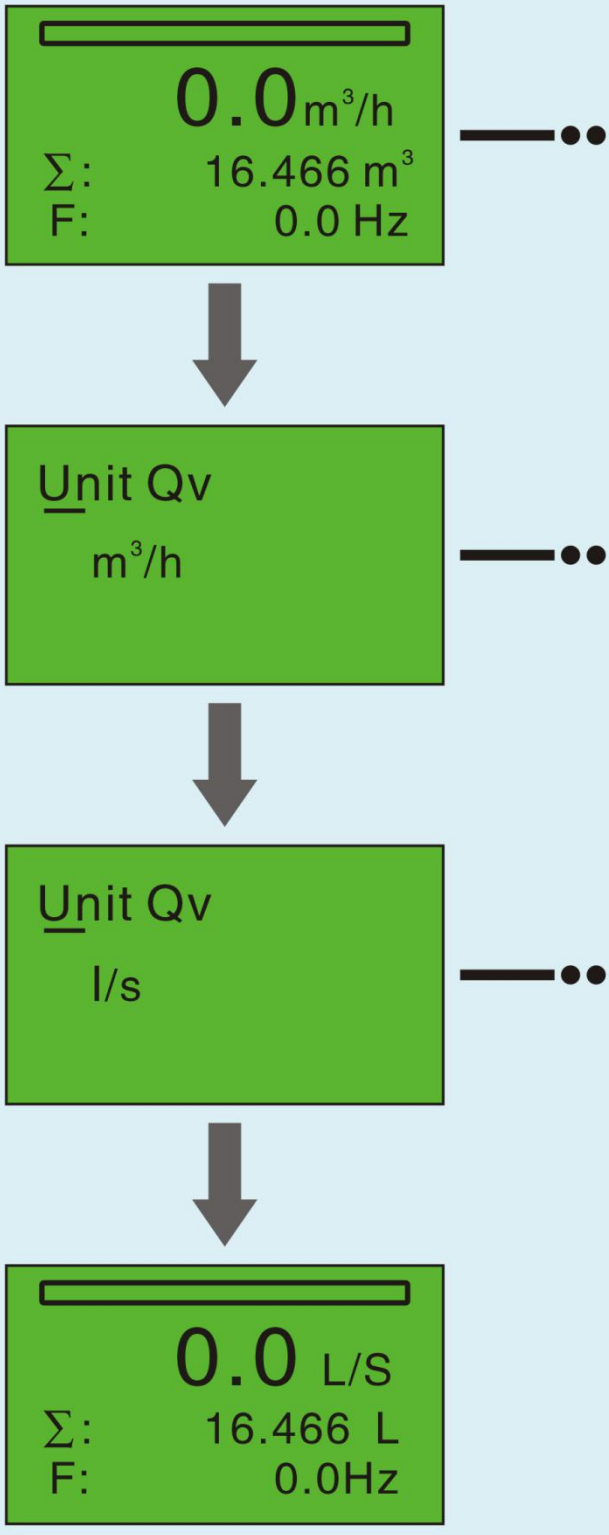
How to clear total flow?

Power on display
For example, total flow value is 16.466m^3.



● How to change flow unit ? (Take an example, change volume flow unit from m^3/h to L/s)

Power on display



Press “Z” button, and then press “S” button to find menu “Unit Qv” (this is to set volume flow unit)

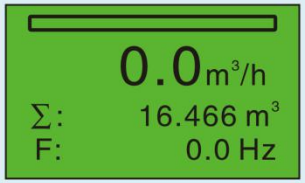
Press “M” button for 2 seconds enter this menu, press “S” button to find menu “L/S”

Press “M” button for 2 seconds to save settings.

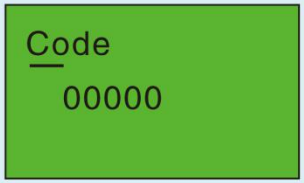
Press “Z” button to exit menu and back to main display.

● How to set pulse parameters?

Power on display

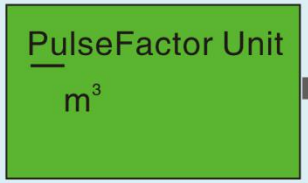


Press “Z” button and then Press “S” button to find menu “Code”

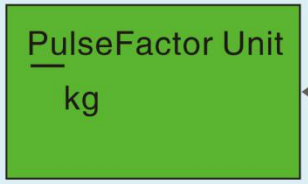


Press “M” button for 2 seconds to enter this menu, and then press “S” button move cursor and press “M” button set number “00050”.

Press “M” button for 2 seconds to enter. Press “S” button to find menu “PulseFactor Unit” (Default is m³)

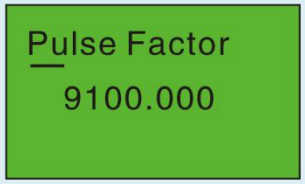


For example, if need to change to “kg”, Press “M” button for 2 seconds to enter this menu, and press “S” button to change to “kg”

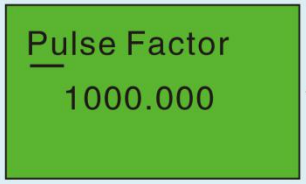


Press “M” button for 2 seconds tosave settings.

And then press “S” button to find the next menu “Pulse Factor”



Press “M” button for 2 seconds to enter this menu, press “S” button to move cursor and press “M” button to set values. For example change to “1000”

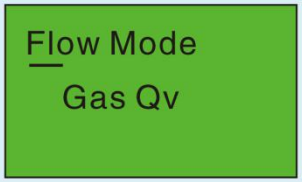


Press “M” button for 2 seconds to save settings and press “Z” button to exist and back to main display.

● How to adjust the medium type? (For example, change gas flow to liquid flow)

Power on display

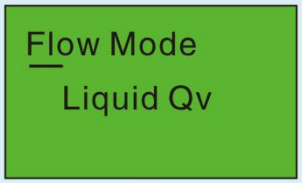
Press “Z” button, and then press “S” button to find menu “Flow Mode”



Options in this menu:

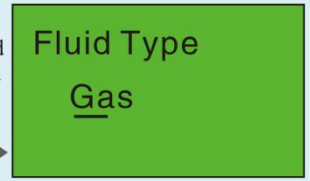
Flow Mode	Description
Gas Qv	Gas volume flow
Gas Qm	Gas mass flow
Steam Qv	Steam volume flow
Steam (P/T)	Steam mass flow with both temperature and pressure compensation
Sat_Steam(T)	Saturated steam mass flow with temperature compensation only
Sat_Steam(P)	Saturated steam mass flow with pressure compensation only
Liquid Qv	Liquid volume flow
Liquid Qm	Liquid mass flow

Press “M” button for 2 seconds to enter this menu and press “S” button to choose “Liquid Qv”

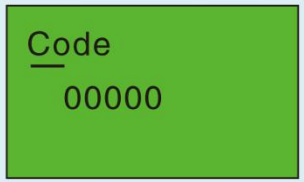


Press “M” button for 2 seconds to save settings. Press “S” button to find menu “Unit Qv” (for liquid Qv flow unit need in volume flow unit) Set “Unit Qv” as “m³/h”.

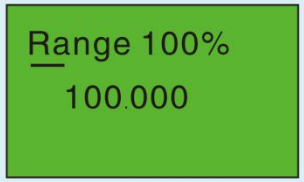
Press “M” button for 2 seconds to save and then press “S” button to find menu “Fluid Type”



Press “M” button for 2 seconds to enter this menu, and then press “S” button to move cursor and press “M” button to set number “00050”.



Press “S” button to find menu “Code”

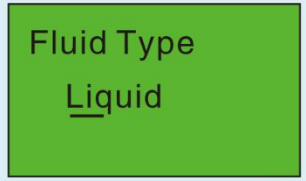


Press “S” button to find menu “Range 100%” and set according to the recommend flow range for your medium type.

Options in this menu

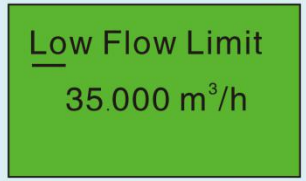
Fluid Type	Description
Gas	For gas, and steam
Liquid	For liquid flow

Press “M” button for 2 seconds enter this menu, and press “S” button to choose “Liquid”



Press “M” button for 2 seconds to save settings.

Then Press “S” button to find “Low Flow Limit”



Set the number according to the min flow of your medium type and size correctly.

Leakage	1) The pressure in the pipe is too high 2) The nominal pressure of the sensor is incorrectly selected 3) The seal is damaged 4) The sensor is corroded	1) Adjust the pipe pressure and change the installation position 2) Choose a higher nominal pressure sensor 3) Replace the gasket 4) Take anti-corrosion and protection measures
Abnormal Noise	1) The flow rate is too high, causing strong tremor 2) Cavitation phenomenon occurs	1) Adjust the flow or replace a large-caliber instrument 2) Adjust the flow rate and increase the liquid pressure

6.Trouble Shooting

Fault	Reason	Solution
Measurement Error	1) Straight pipe section is not enough 2) Supply voltage changes too much 3) The instrument exceeds the verification period 4) The inner diameter of the flow meter and the pipe are quite different 5) The installation is not concentric or the gasket is protruding into the flow tube 6) The sensor is stained or damaged 7) There is two-phase flow or pulsating flow 8) There is leakage in the pipeline	1) Lengthen the straight pipe section or install a regulator 2) Check the power supply 3) Timely inspection 4) Check the piping inner diameter to correct the meter coefficient 5) Adjust and install, rest the gasket 6) Clean or replace the sensor 7) Eliminate two-phase flow or pulsating flow 8) Eliminate leakage
Unstable/ Irregular Output signal	1) There is a strong electrical interference signal 2) The sensor is stained or damp, and the sensitivity is reduced 3) The sensor is damaged or the lead is not in contact 4) Two-phase flow or pulsating flow 5) The impact of pipeline vibration 6) Unstable process 7) The sensor installation is not concentric or the gasket protrudes into the tube 8) Upstream and downstream valve disturbance 9)The pipe is not fully filled with fluid 10) The vortex generator has windings 11) There is cavitation phenomenon	1) Strengthen shielding and grounding 2) Clean or replace the sensor 3) Check the sensor and lead 4) Strengthen process management and eliminate two phases flow or pulsating flow 5) Take measures to reduce vibration 6) Adjust the installation position 7) Check the installation and correct the inner diameter of the gasket 8) Lengthen straight pipe section or install adjuster 9) Installation location and method of replacing the sensor 10) Eliminate entanglement 11) Reduce the flow rate and increase the pressure in the pipe

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