Liquid Turbine Flow Meter

User Manual

Content

Warning

When the Flowmeter is installed at explosion hazard field, DON'T remove the COVERPLATE when the meter is powered. Please make parameter setting at safe filed prior to installation.

Special Notice

Pictures & Descriptions are for your information only, please refer to the actual product. Parameters are subjected to changes without notice.

1.0 GENERAL INFORMATION

This manual will assist you in installing, using and maintaining your turbine flow meter. It is your responsibility to make that all operators have access to adequate instructions about safe operating and maintenance procedure.

Warning

For your safety, review the major warnings equipment.

1. Use only fluids that are compatible with the housing material and wetted components of your turbine.

2. When measuring flammable liquids, observe precautions against fire or explosion.

3. When handling hazardous liquids, always follow the liquid manufacturer's safety precautions.

4. When working in hazardous environments, always exercise appropriate safety precautions. and cautions below before operating your

5. During turbine removal, liquid may spill. Follow the liquid manufacturer's safety precautions for clean up of minor spills.

6. Do not blow compressed air through the turbine.

7. Handle the rotor carefully. Even small scratches or nicks can affect accuracy.

8. When tightening the turbine, use a wrench only on the wrench flats.

9. For best results, calibrate the meter at least 1 time per year.

Product Description

Turbine flow meters have the features: high accuracy, good repeatability, convenient installation/maintenance, simple structure etc.

Liquid flows through the turbine housing causing an internal rotor to spin. As the rotor spins, an electrical signal is generated in the pickup coil. This signal is converted into engineering units (liters, cubic meters, gallons etc.) on the local display where is applicable. Optional accessory modules can be used to export the signal to other equipment.

Upon receipt, examine your meter for visible damage. The turbine is a precision measuring instrument and should be handled carefully. Remove the protective plugs and caps fbr a thorough inspection. If any items are damaged or missing, contact

Make the turbine flow model meets your specific needs. For your future reference, it might be useful to record this information on nameplate in the manual in case it becomes unreadable on the turbine. Refer to the nameplate for your customized product's specification.

2.0 SPECIFICATIONS

Performance

Repeatability:	±0.2%
Accuracy:	Standard: ±1% of reading; Optional: ±0.5% of reading

Wetted Components

Housing:	Standard - 304 Stainless Steel Optional - 316 Stainless Steel
Bearings and Shaft:	Tungsten Carbide
Rotor:	Standard - 2Crl3 Stainless Steel (Optional Alloy CD4Mcu)
Retaining Rings:	316 Stainless Steel

Output Signal: (Where applicable)

Sensor:	Pulse signal (Low Level: <0.8V; High Level: >8V)
Transmitter:	4 to 20 mA DC current signal

Signal Transmission Distance: <1,000 m

Electrical Connections:

Basic Type:	Hausman Connector or three-core cable
Explosion Proof Type:	ISO M20x 1.5 Female

Explosion Proof Level:

Standard:	None
Optional:	ExdIIBT6

Protection Level: IP65

3.0 OPERATION CONDITIONS

Ambient:

Temperature: -10°C to +55°C
Pressure: 86 to 106 KPa
Relative Humidity: 5% to 90%

Power Supply:

Sensor: +12V DC (Optional: +24V DC)
Transmitter: +24V DC
Field Display Type B: Integral 3.2V Lithium Battery (Others available on request)
Field Display Type C: +24V DC

Fluid Temperature and Pres:

Temperature: Pres: -20°C to+110°C
Fluid pres should be limited according to rating.

Measurable Flow Rate Range and Pres Level: (See table 1)

Table 1 . Measurable Flow Rage Range and Pres Rating

Nominal Diameter		Standard Flow Range (SFR)	Extended Flow Range (EFR)	Standard Pres Rating	Customized Pres Rating
(mm)	(in.)	(m^3/h)	(m^3/h)	(MPa)	(MPa) - Flange Fitting
4	0.15	0.04 to 0.25	0.04 to 0.4	Thread: 6.3	12, 16,25
6	0.25	0.1 to 0.6	0.06 to 0.6	Thread: 6.3	12, 16, 25
10	0.4	0.2 to 1.2	0.15 to 1.5	Thread: 6.3	12, 16,25
15	0.5	0.6 to 6	0.4 to 8	Thread: 6.3; Flange: 2.5	4.0, 6.3, 12, 16, 25
20	0.75	0.8 to 8	0.45 to 9	Thread: 6.3; Flange: 2.5	4.0, 6.3, 12, 16, 25
25	1	1 to 10	0.5 to 10	Thread: 6.3; Flange: 2.5	4.0, 6.3, 12, 16,25
32	1.25	1.5 to 15	0.8 to 15	Thread: 6.3; Flange: 2.5	4.0, 6.3, 12, 16,25
40	1.5	2 to 20	1 to 30	Thread: 6.3; Flange: 2.5	4.0, 6.3, 12, 16, 25
50	2	4 to 40	2 to 40	Flange: 2.5	4.0, 6.3, 12, 16, 25
65	2.5	7 to 70	4 to 70	Flange: 2.5	4.0, 6.3, 12, 16,25
80	3	10 to 100	5 to 100	Flange: 2.5	4.0, 6.3, 12, 16, 25
100	4	20 to 200	10 to 200	Flange: 1.6	4.0, 6.3, 12, 16,25
125	5	25 to 250	13 to 250	Flange: 1.6	2.5, 4.0, 6.3, 12, 16
150	6	30 to 300	15 to 300	Flange: 1.6	2.5, 4.0, 6.3, 12, 16
200	8	80 to 800	40 to 800	Flange: 1.6	2.5, 4.0, 6.3, 12, 16

4.0 CAUTIONS FOR INSTALLATION

Mounting Positions

Turbine flow meters should be installed at the place in compliance with the requirements below:

- ♦ Easy maintenance
- ♦ No vibration
- ♦ No electromagnetic interface
- ♦ Away from heat source

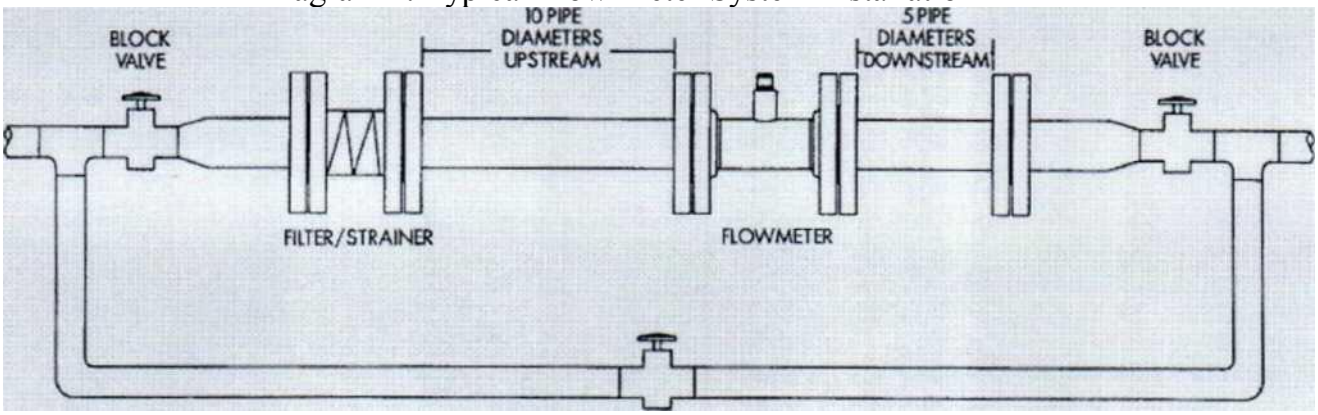
Mounting Orientation

All turbine flow meters are designed to measure flow in only one direction. The direction is indicated by the arrow on the body.

Required Lengths of Straight Runs

Flow altering device such as elbows, valves and reducers can affect accuracy. See diagram 1 fbr typical flow meter system installation.

Diagram 1. Typical Flow Meter System Installation



The recommended guidelines are given to enhance accuracy and maximize performance. Distance given here are minimum requirements; double them fbr desired straight pipe lengths.

- Upstream: allow a minimum straight pipe length at least 10 times the internal diameter of the pipe. For example, with the 50mm pipe, there should be 500mm of straight pipe immediately upstream. Desired upstream straight pipe length is 1000mm.
- Downstream: allow a minimum straight pipe length at least 5 times the internal diameter of the pipe. For example, with the 50mm pipe, there should be 250mm of straight pipe immediately upstream. Desired upstream straight pipe length is 500mm.

See diagram 2 for straight pipe length requirement when there is altering device.

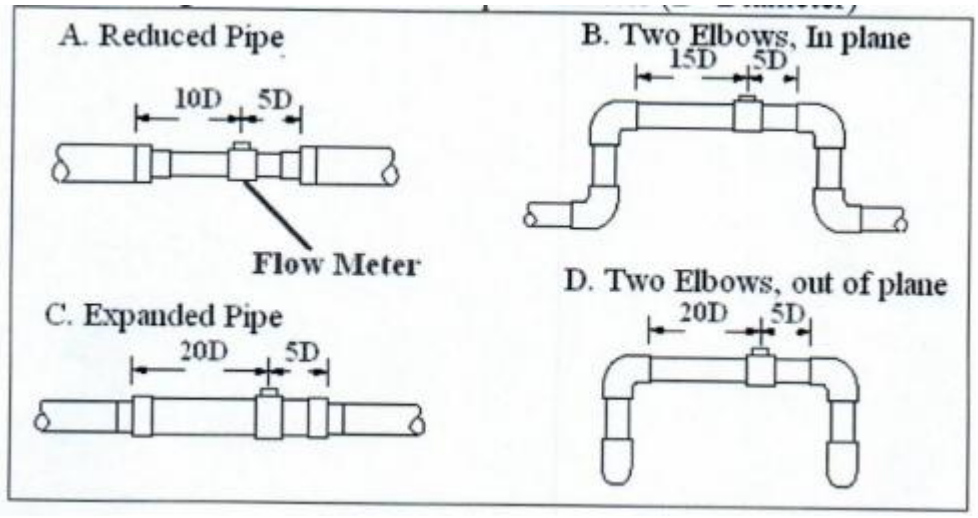


Diagram 2. Number of Pipe Diameter (=Diameter)

Warning: Precaution for direct sunshine and rain when the meter is installed outside.

Anti-Cavitation

Cavitation can be caused by entrained air, and it can seriously damage the rotor on a turbine flow meter. An amount higher than about 100 mg/1 of entrained air or gas can produce error. In addition, cavitation can be caused by too little backpressure on the flow meter. For turbine flow meters, you should provide a backpressure (downstream pres) of at least 1.25 times the vapor pres, plus 2 times the pres drop through the flow meter. See formula 1.

Formula 1: $Pb > 1.25><P_V + 2x (P_{in} — P_{out})$

In formula 1: (P_b: Back pressure; P_v: Vapor Pres; P_{in}: Inlet Pres; P_{out}: Outlet Pres)

Create backpressure by installing a control valve on the downstream side of the meter at the proper distance detailed above.

Special Notice

Foreign material in the liquid being mead can clog the meter's rotor and adversely affect accuracy. If this problem is anticipated or experienced, install screens to filter impurities from incoming liquids.

To en accurate measurement, drain all air from the system before use.

When the meter contains removable coverplates. Leave the coverplate installed unless accessory modules specify removal. Don't remove the coverplates when the meter is powered, or electrical shock and explosion hazard can be caused.

Thread Connections

1. To protect against leakage, seal all threads with an appropriate sealing compound. Make the sealing compound does not intrude into the flow path.
2. Make the arrow on the outlet is pointed in the direction of the flow.
3. Tighten the turbine onto the fittings. Use a wrench only on wrench flats.

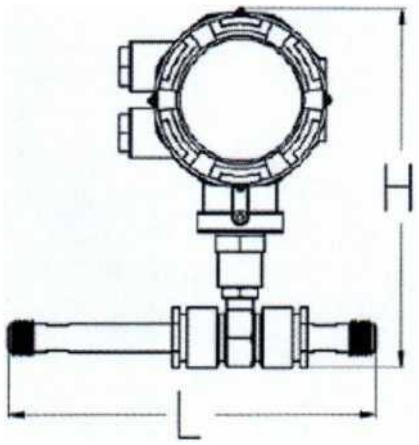
Flange Connections

For standard product, the flange follows GB/T 9119-2000 (ISO 7005-1) RF (Raised Face).
Note: flange can be customized following other criterias.
Use a gasket between the meter flange and mating flange. Determine the material of the gasket based on the operating conditions and type of fluid.
Note: Do not over tighten the flange bolts. This may cause the gasket to be compressed into the flow stream and may decrease the accuracy of the meter.

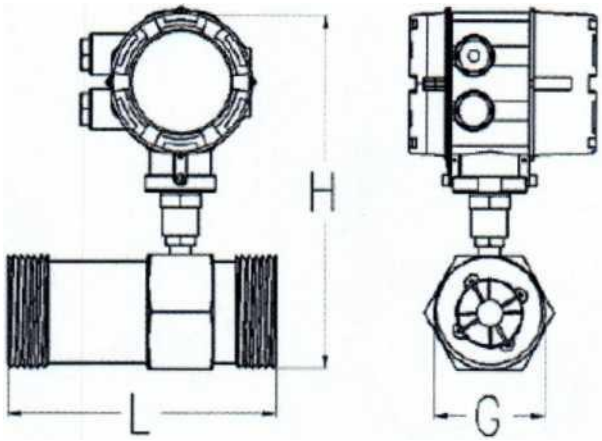
5. INSTALLATION DIMENSIONS

Thread or flange connection is used according to different flow models.

Thread connection dimensions



DN4-DN10
(straight section is included)



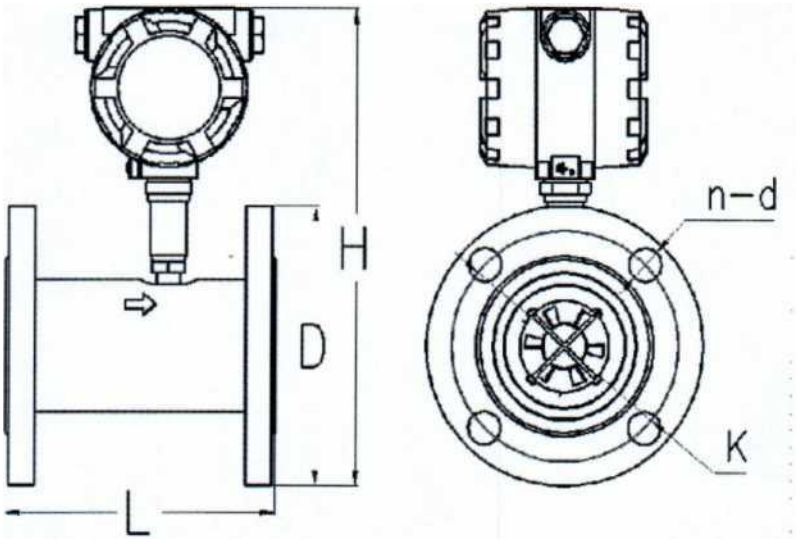
DN15-DN50

Diameter (mm)	L (mm)	H(mm)				G male Thread
		Pulse Type	Pulse Type with Ex.	4-20mA Type with Ex	Intelligent Display Type	
4	225	140	145	145	210	Gl/2
6	225	140	145	145	210	Gl/2

10	345	145	150	145	210	Gl/2
15	75	145	150	150	215	G1
20	80	150	155	155	220	G1
25	100	155	160	160	225	Gl-1/4
32	140	175	180	180	245	G2
40	140	180	185	180	250	G2
50	150	185	190	190	255	G2-1/2

Notice： The straight section is included for DN4-DN10, but not DN15-DN50

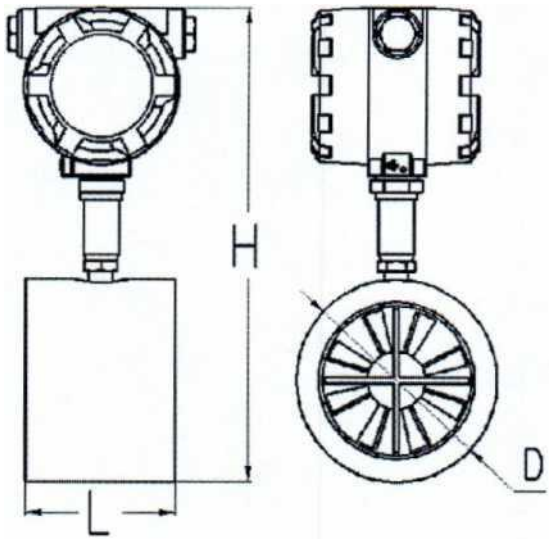
Flange connection



Diameter (mm)	L (mm)	D (mm)	K (mm)	H(mm)				d (mm)	n	Press. Rate
				Pulse Type	Pulse Type with "Ex.	4-20m/V Type with Ex	Intelligent Display Type			
15	75	95	65	175	180	180	245	14	4	2.5Mpa
20	80	105	75	185	190	190	255	14	4	
25	100	115	85	200	195	195	260	14	4	
32	140	140	100	210	215	215	275	18	4	
40	140	150	110	195	220	220	285	18	4	
50	150	165	125	230	235	235	295	18	4	

65	170	185	145	255	260	260	325	18	4	1.6Mpa
80	200	200	160	260	265	265	330	18	8	
100	220	220	180	285	285	285	350	18	8	
125	250	250	210	310	315	315	380	18	8	
150	300	285	240	345	345	345	410	22	8	
200	360	340	295	395	400	400	465	22	12	

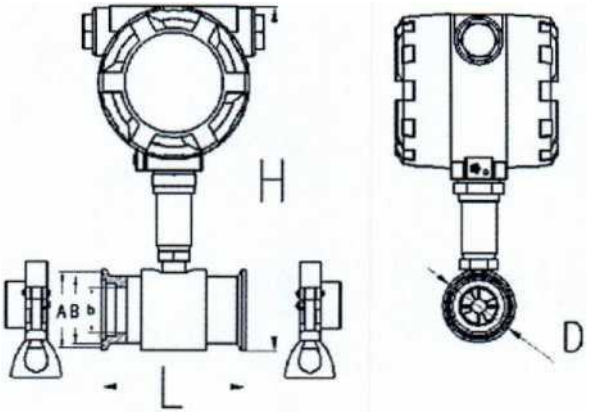
Wafer Connection



Diameter (mm)	L (mm)	D (mm)	H(mm)			
			Pulse Type	Pulse Type with Ex.	4-20mA Type with ' Ex	Intelligent Display Type
4	50	38	145	X		215
6	50	38	145			215
10	50	38	145			215
15	55	47	155			220
20	60	53	160			225
25	60	58	165			230
32	70	66	170			240
40	70	72	180			245
50	70	92	195			260
65	80	100	205	210	210	275
80	90	112	220	225	225	290
100	100	137	245	250	250	310
125	120	165	270	275	275	340
150	150	190	295	300	300	365

200	150	243	350	350	350	415

Sanitary Connection



Diameter (mm)	L (mm)	I) (mm)	A (mm)	B (mm)	b (mm)	H(mm)			
						Pulse Type	Pulse Type with Ex.	4-20mA Type with Ex	Intelligent Display Type
4	50	50.5	46	40.5	4	145	150	150	210
6					6	145	150	150	210
10					10	145	150	150	210
15	100				15	155	160	160	225
20					20	160	160	160	225
25					25	160	165	165	230
32	120				32	165	165	165	230
40	140	64	59	110	40	175	180	180	245
50	150	78	73.5	125	50	185	190	190	255
65	170	91	86	145	65	205	205	205	270
80	200	106	100.5	160	80	215	220	220	285
100	220	119	113	180	100	235	240	240	305

6.0 ELECTRICAL WIRING

Warning: Electrical Hazard

Disconnect power before beginning installation.

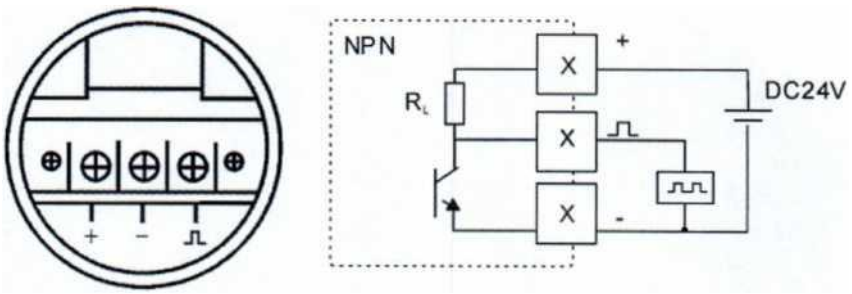
Turbine Flow Sensor/Transmitter

♦ 1. Pulse Type without Explosion Proof

Terminal wiring

Terminal Symbols	Description
Red Wire	Power Supply: "24V+"
Black Wire	Power Supply: “24V-”
Blue Wire	Pulse Output

♦ 2. Pulse with Explosion Proof:



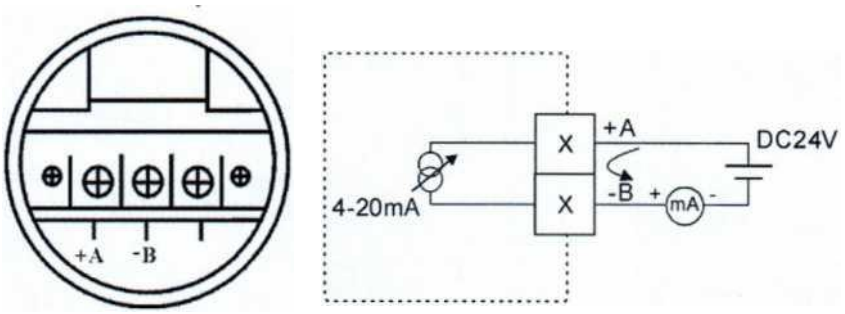
Notice: (1) High level amplitude >22V

(2) Low level amplitude<0.8V

(3) Load capacity〉1100Q

(4) Pulse Jrequency<3000Hz

♦ 3. 4-20mA Output with Explosion Proof Type



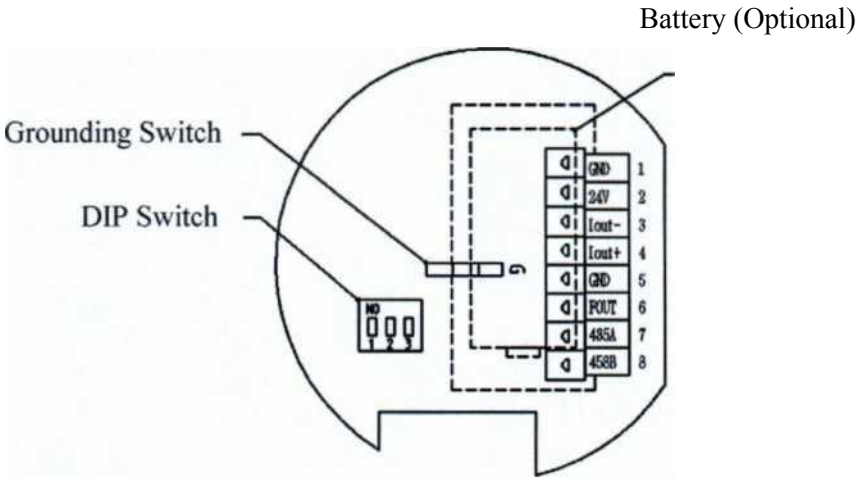
♦ 4. Function table for the Intelligent display type

Main Power	Display	Output						
		Pulse	Scaled Pulse	Current				Modbus RS485
				4-20mA 2 wire	4-20mA 3 wires	0-20mA 4 wires	4-20mA 4 wires	
Battery	•	•						
24V DC	•	•	•	•	○			•
24VDC+Battery	•	•	•	•	○			•
220 Vac	•	•	•			○	•	•
Description of the symbols:		• Default Function				○ Optional		

Notice:

1. *The pulse means the signal which is in direct proportion to the impeller speed.*
2. *The scaled Pulse means the signal -when the flow rate reach ONE unit volume (m3, L, 0.01L...)*
3. *The batter model is ER34615*
4. *The battery model is ER26500*

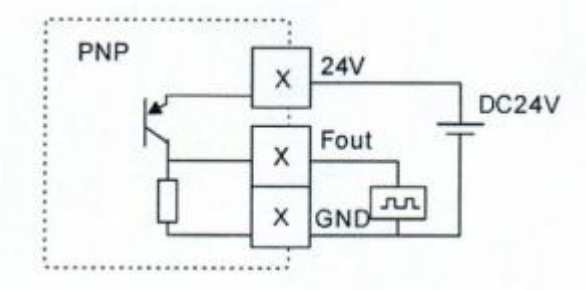
4.1 24V DC powered type



Terminal Configuration

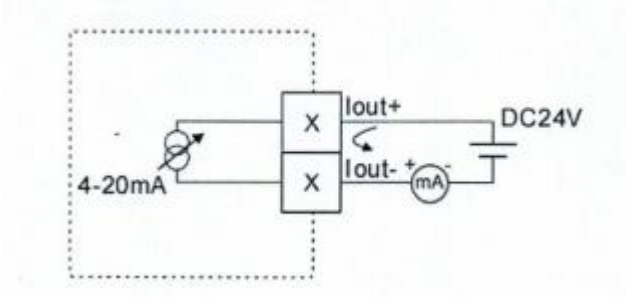
Terminal No.	Terminal Symbols	Description
1	GND	24V- DC Power Supply
2	24V	24V+ DC Power Supply
3	Lout-	Current Output 4 to 20 mA DC (-)
4	Lout+	Current Output 4 to 20 mA DC (+)
5	GND	24V- DC Power Supply
6	-FOUT	F-OUT: Pulse output
7	485A	RS485-
8	485B	RS485+

4.1.1 Pulse / Scaled Pulse output

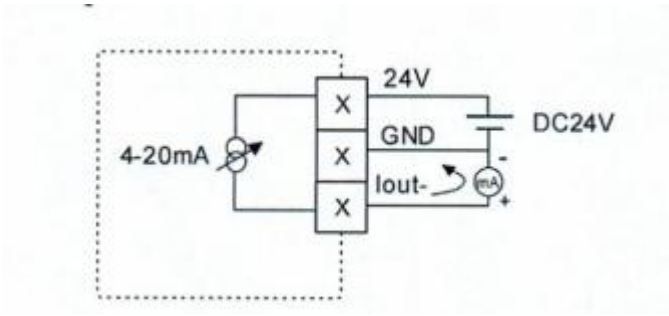


Notice: (1) High level amplitude >22V
(2)Low level amplitude<0.8V
(3)Load capacity> 1100Q
(4)Pulse frequency<3000H

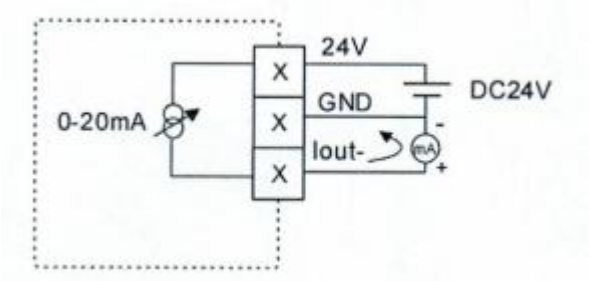
4.1.2 (2 Wire) 4-20mA Output



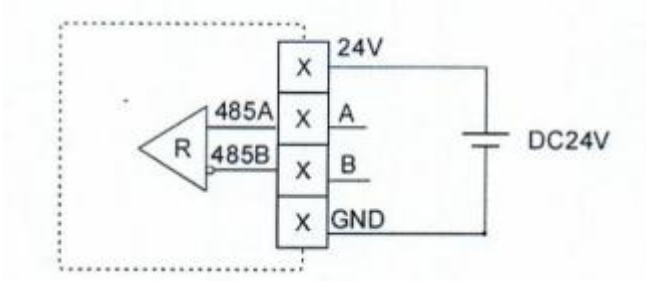
4.1.3 (3 wires) 4-20mA output



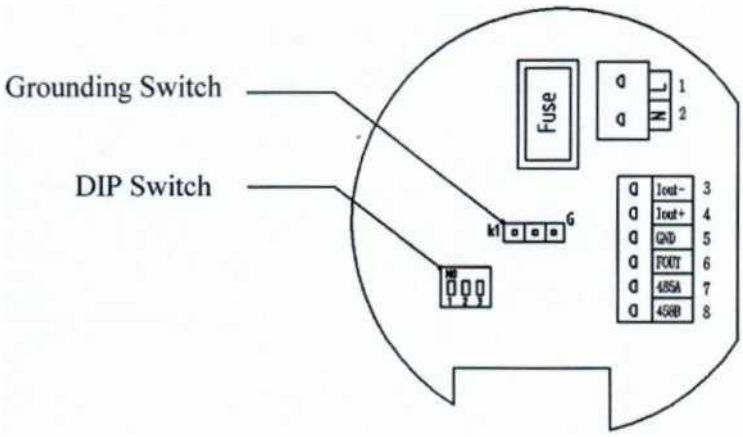
4.1.4 (3 wires) 0-20mA Output



4.1.5 RS485 Communication



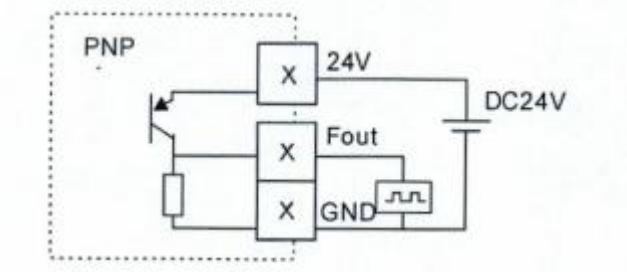
4.2 220Vac powered type



Terminal Configuration

Terminal No.	Terminal Symbols	Description
1	L	AC 220V Power Supply
2	N	AC 220V Power Supply
3	Lout-	Current Output
4	Lout+	Current Output
5	GND	Current / Pulse output -
6	FOUT	FOUT: Pulse output
7	485A	RS485-
8	485B	RS485+

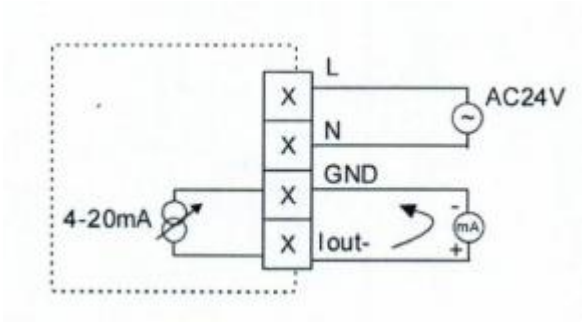
4.2.1 Pulse / Scaled Pulse output



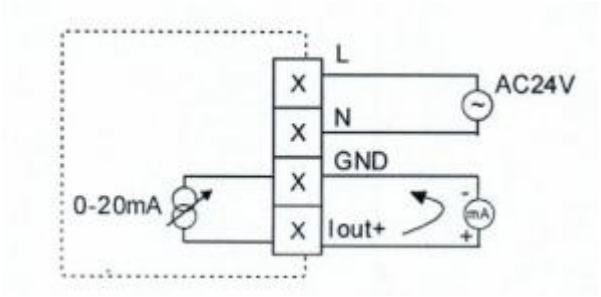
Notice: Three conditions are necessary for pulse output High level amplitude >22 V

Low level amplitude<0.8V
Load capacily> 1100C1
Pulse frequency<3000Hz

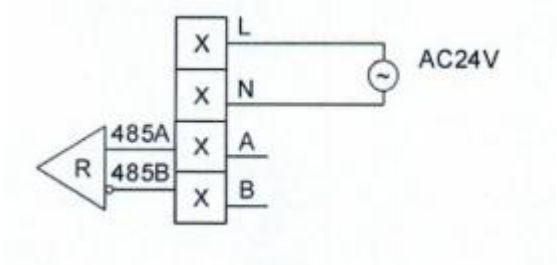
4.2.2 (4 Wire) 4-20mA Output



4.2.3 (4 Wire) 0-20mA Output



4.2.4 RS485 communication



4.2.5 Function table for

DIP Switch: K1			
Function	**1**	**2**	3
Original Pulse Output	**ON**	OFF	OFF
Scaled Pulse Output: 1 m^3 / Pulse	OFF	**ON**	OFF
Function Reserved	OFF	OFF	**ON**

7.0 Parameter set

Display panel

7.1 There are four Keys: "Enter" "→" "↑" "Esc"、

KEYS	Description
Enter	Save the value and advance to next menu
→	For numerical values, move cursor position
↑	To change number unit, setting
Esc	Return to measuring model

7.2 Description of Password Grade

Password	Description
1234	Modify parameters
5555	Total rate reset

7.3 Description of menu

Menu	Parameter	Setting Method	Grade	Description		
				Value	Flow Unit	Total Flow Unit
F-l	Unit	.Select parameter	User	0	M3/h	M3
				1	L/h	L
				2	L/min	L
				3	US Gal/min	US Gal
				4	UK Gal/min	UK Gal
				5	US Gal/h	US Gal
				6	UK Gal/min	UK Gal

				7	KG/h	Kg
				8	t/h	T
				9	Ft3/h	Ft3
F-2	Damp time	Input value	User	Unit: Second Value: 0~99s		
F-3	Max flow rate	Input value	User	Unit: The same to the F-l		
F-4	Min flow rate	Input value	User	When the flow rate lower than min flow rate, the flow rate will display 0; The unit is the same to the F-l		
F-5	Max frequency output	Input value	User	Accuracy: 0.1 Hz		
F-6	Density	Input value	User	When need to display mass unit, it needs to input the density of liquid. The unit of density is g/cm3		
F-7	Pulse output	Select parameter	User	1: Original pulse output 2: Corrected pulse output		
F-8	Scaled pulse	Select parameter	User	0.001: 0.01 unit volume / pulse 0.01:0.01 unit volume / pulse 0.1: 0.1 unit volume / pulse 1: 1 unit volume / pulse 10: 10 unit volume/ pulse		
F-9	Pulse width	Input value	User	The value is between 0005-2000 range, and it's multiple of 5 with ms unit;		
F-10	Communication	Select parameter	User	Address: 1-247 Baud rate: 1200, 2400, 4800, 9600, 19200		
F-11	Baud	Select parameter	User	N(No verify) 0(Odd verify) E(Even verify) Data length: 7,8 Stop bits length: 1,2		
F-12	Total flow	Input value	User	It could be modified with right code		
Pl	Linearization of the Flowcurve: point 1	Input value	Factory only	First Row: Corrected Frequency (Fl) without decimal, Fl Second Row: Coefficient error with (KI) six decimals		
P2	Linearization of the Flowcurve: point 2	Input value	Factory only	First Row: Corrected Frequency (F2) without decimal, Fl Second Row: Coefficient error with (K2) six decimals		
P3	Linearization of the Flowcurve: point 3	Input value	Factory only	First Row: Corrected Frequency (F3) without decimal, Second Row: Coefficient error with (K3) six decimals		
P4	Linearization of the Flowcurve: point 4	Input value	Factory only	First Row: Corrected Frequency (F4) without decimal, Second Row: Coefficient error with (K4) six decimals		
P5	Linearization of the Flowcurve: point 5	Input value	Factory only	First Row: Corrected Frequency (F5) without decimal, Second Row: Coefficient error with (K5) six decimals		
P6	Linearization of the Flowcurve: point 6	Input value	Factory only	First Row: Corrected Frequency (F6) without decimal, Second Row: Coefficient error with (K6) six decimals		
P7	Linearization of the Flowcurve: point 7	Input value	Factory only	First Row: Corrected Frequency (F7) without decimal, Second Row: Coefficient error with (K7) six decimals		
P8	Linearization of the Flowcurve: point 8	Input value	Factory only	First Row: Corrected Frequency (F8) without decimal, Second Row: Coefficient error with (K8) six decimals		
P9	Coefficient	Input value	Factory only	First Row: Corrected Frequency with one decimal, Second Row: Coefficient error with two decimals, unit: /L,K		

8.0 TROUBLESHOOTING

Symptom	Probable Cause	Solution
Measurement is not accurate	1. Turbine operated below minimum rate.	Increase flowrate. Refer to Section 3.0 Operation Conditions
	2. Turbine partially clogged with dried liquid	Remove turbine. Clean carefully. Make rotor spins freely.
	3. Installed too close to fittings.	Install correctly. Refer to Section 5.0 Cautions for Installation
LCD Display Abnormity	1. Battery Power Type: Bad contact on the connector between battery and PCB	Open back cover and repower the flow meter
	2. DC Power Type: supply voltage is abnormal	Check and en power supply is 24V DC

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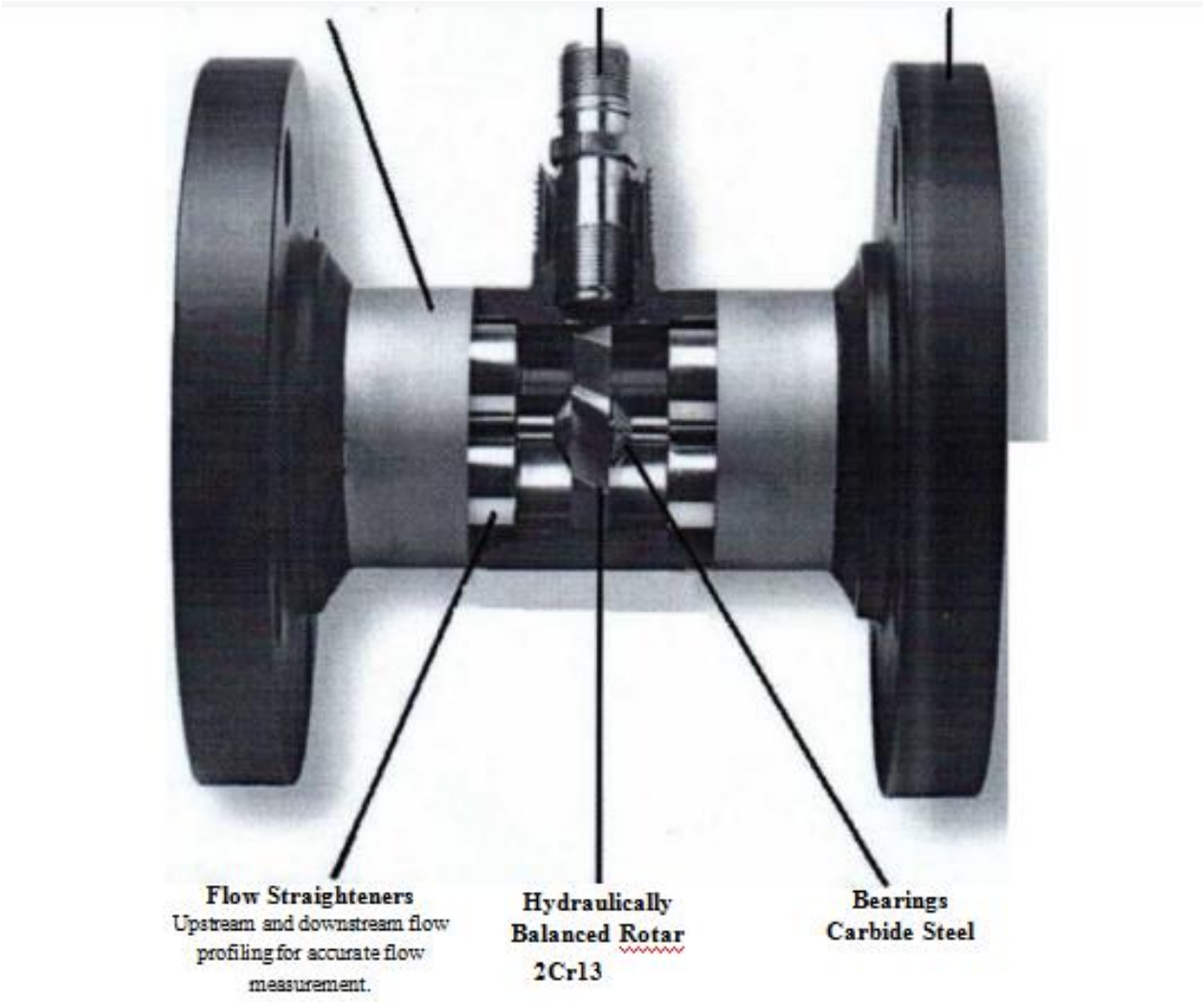

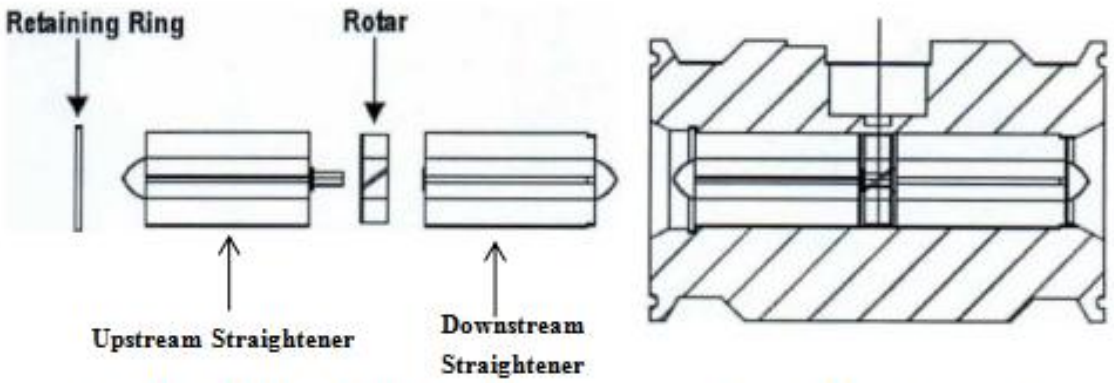

Exploded View of Internal

Assembled Internals

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