Liquid Turbine Flow Meter

Operation Manual

- High-quality turbine, exceed the normal measurement range.

Ⅰ. Overview

The LWGY series turbine flow sensor (hereinafter referred to as the sensor) is based on the principle of torque balance and belongs to the speed type flow meter. The sensor has the characteristics of simple structure, light weight, high precision, good repeatability, sensitive response, easy installation and maintenance, etc. It is widely used in petroleum, chemical industry, metallurgy, water supply, papermaking and other industries. It is an ideal instrument for flow measurement and energy saving.

The sensor is used together with the display instrument, and it is suitable for measuring the liquid in the closed pipeline that does not corrode with stainless steel 1Cr18Ni9Ti, 2Cr13, corundum Al2O3, hard alloy, and has no impurities such as fibers and particles. If it is matched with a display instrument with special functions, it can also perform quantitative control and over-quantity alarm. Choose the explosion-proof type (ExdII CT6 Gb) of this product, which can be used in the environment with explosion hazard.

The sensor is suitable for medium with a viscosity less than 5×10-6m2/s at the working temperature. For liquids with a viscosity greater than 5×10-6m2/s, the sensor must be calibrated with real liquid before use.

If the user needs to use a special type of sensor, the order can be negotiated, and when the explosion-proof sensor is required, it should be explained in the order.

Ⅱ. LWGY basic type turbine flow sensor

1. Structural features and working principle

（1）Structural features

The sensor is a thrust type of hard alloy bearing, which not only ensures the accuracy and improves the wear resistance, but also has the characteristics of simple structure, firmness and convenient disassembly and assembly.

（2）Working principle

The fluid flows through the sensor housing. Since the blades of the impeller have a certain angle with the flow direction, the impulsive force of the fluid makes the blades have a rotational torque. After overcoming the frictional torque and fluid resistance, the blades rotate, and the speed is stable after the torque is balanced. Under certain conditions, the rotation speed is proportional to the flow velocity. Because the blade has magnetic permeability, it is in the magnetic field of the signal detector (composed of permanent magnet steel and coil). The rotating blade cuts the magnetic field line and periodically changes the magnetic

flux of the coil. , so that the two ends of the coil induce an electric pulse signal, which is amplified and shaped by the amplifier to form a continuous rectangular pulse wave with a certain amplitude, which can be transmitted to the display instrument remotely to display the instantaneous flow or total amount of the fluid. Within a certain flow range, the pulse frequency f is proportional to the instantaneous flow Q of the fluid flowing through the sensor, and the flow equation is:

$$Q = 3600 \times \frac{f}{k}$$

In the formula:

f——Pulse frequency[Hz]

k——Meter factor of the sensor[1/m^3], given by the checklist.

If the unit is [1/L] $Q = 3.6 \times \frac{f}{k}$

Q——Instantaneous flow of fluid (under working condition)[m^3/h]

3600——Conversion factor

The instrument coefficient of each sensor is filled in the verification certificate by the manufacturer, and the k value is set in the supporting display instrument to display the instantaneous flow and cumulative total.

2. Basic parameters and technical performance

（1）Selection parameters ;

Type	LWGY									Liquid Turbine Flow Meter
Nominal Diameter	4									4mm
	6									6mm
	10									10mm
	15									15mm
	20									20mm
	25									25mm
	32									32mm
	40									40mm
	50									50mm
	65									65mm
	80									80mm
	100									100mm
	125									125mm
	150									150mm
	200									200mm
Output type		N								3-wire pulse output, 12~24v power supply
		A								4~20mA output, 2088 gauge
		A1								4~20mA output, Hersman
		V								0~10V output, 2088 gauge
		V1								0~5V output, 2088 gauge
		V2								0~10V output, Hersman
		V3								0~5V output, Hersman
		D								RS485 output
Connection method			L							Male thread connection
			NL							Female thread connection
			K							Clamp connection
			F							Flange connection
			J							Flange clamping
Accuracy class				C1						Level 0.5
				C2						Level 1.0
Range type					S					Standard range
					W					Extended range
Body material						S				304 Stainless steel

	P					PE（Medium temperature≤30℃）
	L					316L Stainless steel
Impeller material		-				Conventional impeller 2Cr13 (201) material
		S				Duplex Steel Material
Explosion-proof type			-			Unmarked non-explosion-proof, not added by default
			E			Explosion-proof （ExdIICT6 Gb）
Pressure Level				N		Regular pressure
				Px		High pressure (specify before ordering)
Temperature class					-	100°C (no addition by default)
					Tx	High temperature (specify before ordering)
	Explanation: 1、Temperature class: T1=120℃ T2=150℃ T3=180℃ 2 、 Pressure Level: P1=4MPa P2=6.3MPa P3=10MPa P4=16MPa P5=25MPa P6=32MPa P7=42MPa（Conventional thread connection defaults to 6.3MPa Conventional flange connection defaults to 1.6MPa)					

（2）Medium temperature: -20～＋100℃.

（3）Ambient temperature: -20～＋55℃.

（4）Power supply: voltage: 12~24VDC, current: ≤10mA.

（5）Transmission distance: the distance from the sensor to the display instrument can reach 1000m.

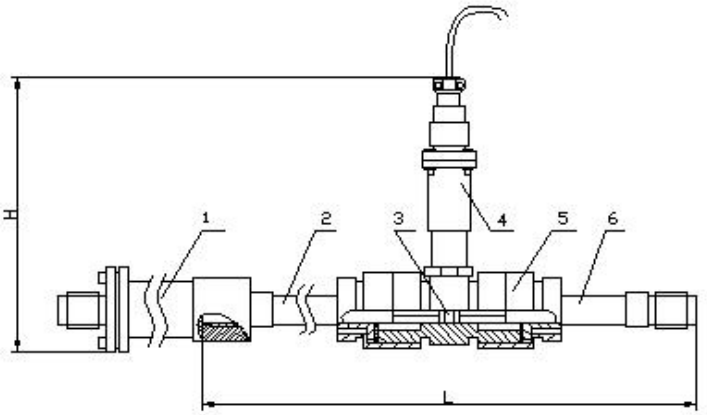
3. Installation, use and adjustment

（1）Sensor installation

The installation method of the sensor is different according to the specifications, using threaded or flange connection, the

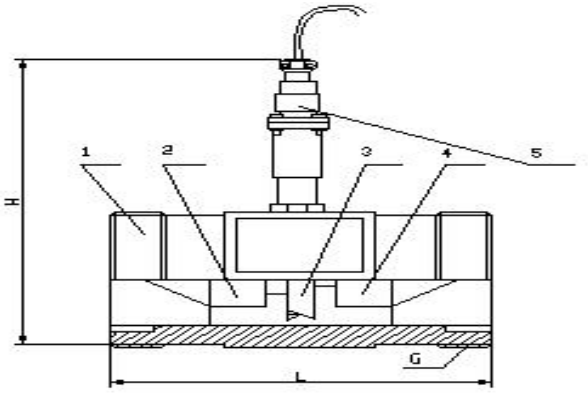
installation method is shown in Figure 1, Figure 2, and Figure 3, and the installation dimensions are shown in Table 2.

Figure 1: LWGY-4～10 Schematic diagram of the structure and installation dimensions of the thread connection sensor



1.Filter 2. Front straight pipe section 3. Impeller
4. Pre-amplifier 5. Housing 6. Rear straight pipe section

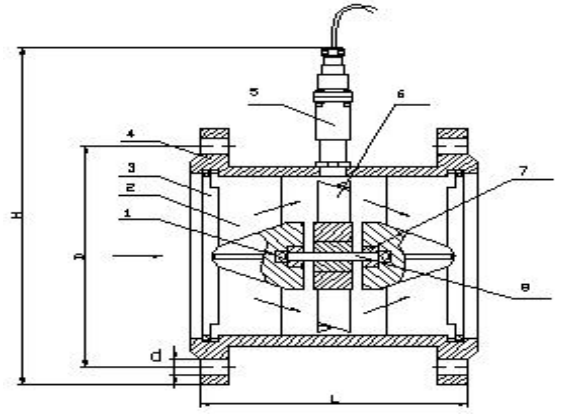
Figure 2: LWGY-15～50 Schematic diagram of the structure and installation dimensions of the threaded connection sensor



1. Housing 2. Front guide 3. Impeller

4. Rear guide 5. Pre-amplifier

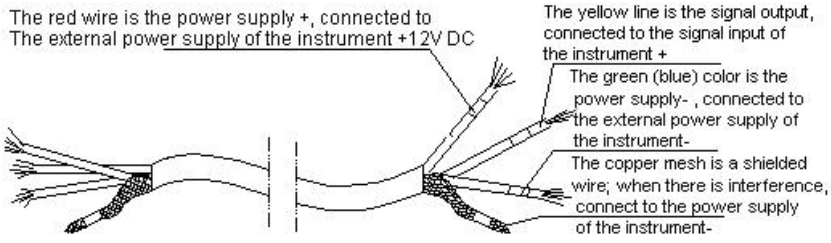
Figure 3: LWGY-15～200 Schematic diagram of the structure and installation dimensions of the threaded connection sensor



1. Ball bearing 2. Front guide 3. Expander ring 4. Housing

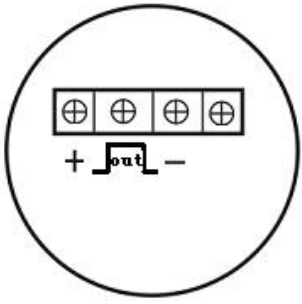
5. Pre-amplifier 6. Impeller 7. Bearing 8. Shaft

（2）LWGY-N Type pulse output wiring instructions: as shown in the figure



（3）Explosion-proof pulse output wiring instructions:

Open the rear cover, as shown in the figure:



"+" is connected to the power supply +, "-" is connected to the power supply-，“ out ” for signal output

（4） Sensor structure size and range

DN (mm)	Thread connection （mm）		Flange connection （mm）					Clamp connection （mm）		Flow Range(m^3/h)	
	L	G	L	D1	K	d	n	L	D	Normal	Expand
4	225	G1/2						50	50.5	0.04~0.25	0.04~0.4
6	225	G1/2						50	50.5	0.1~0.6	0.06~0.6
10	345	G1/2						50	50.5	0.2~1.2	0.15~1.5
15	75	G1	75	95	65	14	4	100	50.5	0.6~6	0.4~8
20	85	G1	85	105	75	14	4	100	50.5	0.8~8	0.45~9
25	100	G5/4	100	115	85	14	4	100	50.5	1~10	0.5~10
32	140	G3/2	140	140	100	18	4	120	50.5	1.5~15	0.8~15
40	140	G2	140	150	110	18	4	140	64	2~20	1~20
50	150	G5/2	150	165	125	18	4	150	78	4~40	2~40
65			170	185	145	18	4	170	91	7~70	4~70
80			200	200	160	18	8	200	106	10~100	5~100
100			220	220	180	18	8	220	119	20~200	10~200
125			250	250	210	18	8			25~250	13~250
150			300	285	240	22	8			30~300	15~300
200			360	340	295	22	12			80~800	40~800

The sensor can be installed horizontally or vertically, and the fluid direction must be upward when installed vertically. The liquid should fill the pipe without air bubbles. When installing, the liquid flow direction should be consistent with the direction of the arrow indicating the flow direction on the sensor housing. The upstream end of the sensor should have a straight pipe section of at least 10 times the nominal diameter, and the downstream end should have a straight pipe section of no less than 5 times the nominal diameter.

The inner wall should be smooth and clean without defects such as dents, scales, and peeling. The axis of the pipeline of the sensor should be aligned with the axis of the adjacent pipeline, and the gasket used for connection and sealing must not go deep into the inner cavity of the pipeline.

The sensor should be far away from the external electric field and magnetic field, and if necessary, effective shielding measures should be taken to avoid external interference.

In order not to affect the normal delivery of liquid during maintenance, it is recommended to install a bypass pipe at the installation place of the sensor.

When the sensor is installed outside, please do a good job of waterproofing the amplifier and plug. The connection between the sensor and the display instrument is shown in Figure 4.

When the fluid contains impurities, a filter should be installed. The mesh of the filter depends on the flow of impurities, generally 20-60 mesh. When the fluid is mixed with free gas, an air eliminator should be installed. The entire piping system should be well sealed.

Users should fully understand the corrosion of the measured medium, and strictly prevent the sensor from being corroded.

（5）Use and adjustment

◆ When in use, the measured liquid should be kept clean and

free from impurities such as fibers and particles.

◆ When the sensor starts to be used, the sensor should be filled with liquid slowly, and then the outlet valve is opened, and the sensor is strictly prohibited from being impacted by high-speed fluid when it is in an anhydrous state.

◆ The maintenance cycle of the sensor is generally half a year. When overhauling and cleaning, please be careful not to damage the parts in the measuring chamber, especially the impeller. When assembling, please pay attention to the positional relationship between the guide and the impeller.

◆ When the sensor is not in use, the internal liquid should be cleaned, and protective sleeves should be added to both ends of the sensor to prevent dust from entering, and then stored in a dry place.

◆ When used, the filter should be cleaned regularly. When not in use, the liquid inside should be cleaned. Like the sensor, add a dust cover and store it in a dry place.

◆ The transmission cable of the sensor can be laid overhead or buried (iron pipe should be put on when buried.)

◆ Before installing the sensor, first connect the wires to the display instrument or oscilloscope, turn on the power supply, blow or manually turn the impeller, and make it rotate quickly to observe

whether there is a display, and then install the sensor when there is a display. If there is no display, check the relevant parts and troubleshoot.

Ⅲ．LWGY-A/A1 Turbine Flow Transmitter

The LWGY-A/A1 turbine flow sensor is based on the LWGY basic turbine flow sensor, adding 24VDC power supply and 4-20mA two-wire current transmission function. It is especially suitable for use in conjunction with computer control systems such as displays, industrial computers, and DCS.

Please read the second part of this manual "LWGY Basic Turbine Flow Sensor" for the flow measurement range of each caliber of the transmitter, sensor structure size, installation method, maintenance, etc.

Flow calculation formula: $Q=\frac{I-4}{16}Q_F$

In the formula: Q——actual flow

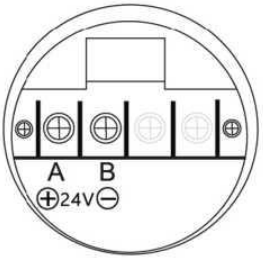
Q_F - the upper limit of the range

I - current output

Transmitter supply voltage: DC24V

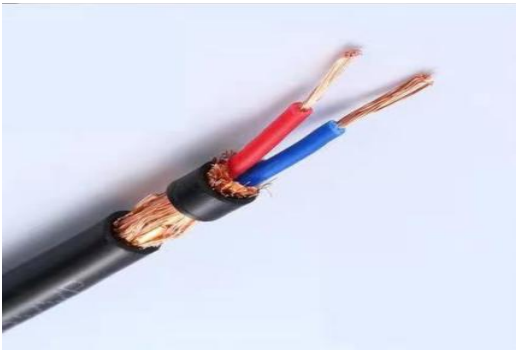
Type A wiring diagram is as follows:

A(+) — 24V+ B(-)—Signal output



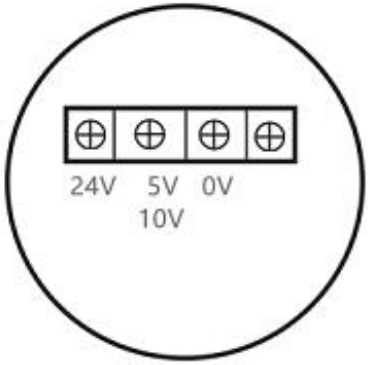
"A" is the "+" terminal of 15~24V power supply
"B" is 4" 20mA current output terminal
"A" is connected to the +24V external power supply, and the current output flows from the "B" terminal to the sampling resistor of the computer or display meter, and then flows back to the "_" terminal of the power supply after passing through the sampling resistor and other loads

Type A1 wiring



Red is connected to 24v, blue is connected to signal +, signal - shorted connected with 0V

Ⅳ. LWGY-V/V1 Turbine Flow Transmitter

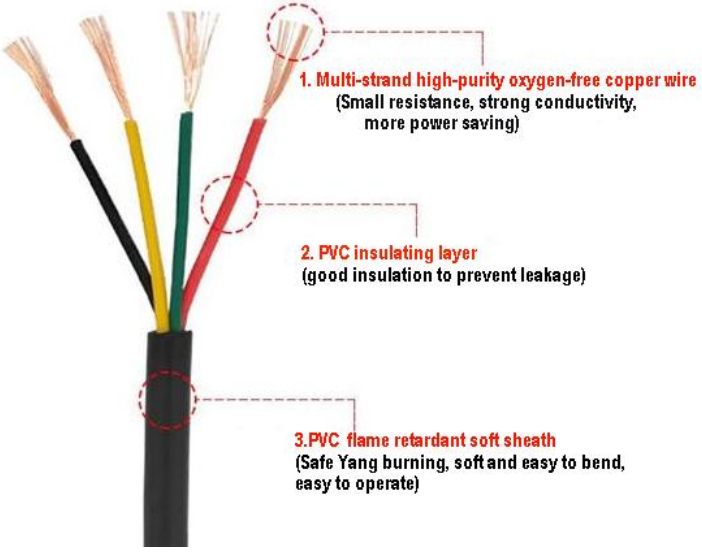


24V, 0V is 24v power supply, 5V/10V is output signal, power supply and signal are 0V

Ⅴ、 LWGY-V2/V3 Turbine Flow Transmitter

Red power supply is 24V, blue is power supply 0V, yellow is output signal 5V/10V, the signal and power supply are 0V

Ⅵ、 LWGY-D Turbine Flow Transmitter



Red: 24V+; Blue: 0V; Green: 485A; White: 485B

Address (10#)	Variable name	Type	Read and write	Explanation
0	Instantaneous flow decimal places	16-bit unsigned integer	Read only	
1	Instantaneous flow unit	16-bit unsigned integer	Read only	Same as 115 116 definition
2	Fluid density	16-bit unsigned integer	Read only	Default Kg/m3, cannot be changed
3~4	Range	32-bit float (CDAB)	Read only	Same unit as 1
5~6	Meter coefficient (P/L)	32-bit float (CDAB)	Read only	
13	Meter ID	16-bit unsigned integer	Read only	
256~257	Accumulation	32-bit floating point number (CDAB)	Read only	
258~259	Instantaneous flow	32-bit floating point number (CDAB)	Read only	
512	Write 1 to clear the total	16-bit unsigned integer	Read and write	
115	Instantaneous flow unit molecule	16-bit unsigned integer	Read and write	0:Nm3 1:m3 2:L 3:USG 4:Kg 5:T 6:mL
116	Instantaneous flow unit denominator	16-bit unsigned integer	Read and write	0:h 1:min 2:s
117	Cumulative flow unit	16-bit unsigned integer	Read and write	Same as 115 definition
118	Scale Unit Molecule	16-bit unsigned integer	Read and write	Same as 115 definition
119	Denominator of range unit	16-bit unsigned integer	Read and write	Same as 115 definition
120-121	Range	32-bit floating point number (CDAB)	Read and write	

122-123	Small signal excision	32-bit floating point number (CDAB)	Read and write	
124-125	Damping time	32-bit floating point number (CDAB)	Read and write	
144-145	Fluid density	32-bit floating point number (CDAB)	Read and write	
146-147	Sensor caliber	32-bit floating point number (CDAB)	Read and write	
162-163	Meter coefficient (P/L)	32-bit floating point number (CDAB)	Read and write	
191	Baud rate	16-bit unsigned integer	Read and write	
192	Device address	16-bit unsigned integer	Read and write	
193	Parity	16-bit unsigned integer	Read and write	0: None: 1: Odd 2: Even

Ⅶ .Maintenance and common faults

See Table 3 for possible general faults and elimination methods of the sensor, and the maintenance cycle should not exceed half a year.

Number	Symptoms	Reason	Elimination method
1	No output signal	1. The power supply is not connected, and the given voltage is incorrect. 2. There are impurities in the pipeline, and the impeller does not rotate.	1. Turn on the power supply and set the voltage as required. 2. Clean up impurities to ensure clean medium.

2	The display instrument has a display for the "calibration" signal but no display for the flow signal.	1. The wiring between the sensor and the display is wrong, or there are faults such as open circuit, short circuit, poor contact, etc. 2. Faulty or damaged amplifier. 3. The converter (coil) is open or shorted. 4. The impeller is stuck. No fluid flow or blockage in tube.	1. Refer to Figure 4 to check the correctness and quality of wiring. 2. Repair or replace amplifier. 3. Repair or replace coil. 4. Clean the sensor and pipe. Open the valve or pump and clean the pipeline.
3	The display instrument is unstable; the measurement is incorrect.	1. The actual flow exceeds the measurement range of the meter or is unstable. 2. The instrument coefficient K is set incorrectly. 3. Impurities such as fibers are caught in the sensor. 4. There are air bubbles in the liquid. 5. There is strong electromagnetic field interference near the sensor. 6. Sensor bearings and shafts are severely worn. 7. The sensor cable shield or other ground wire is disconnected or poorly connected to the line ground. 8. Display meter failure.	1. Adapt the measured flow rate to the measuring range of the sensor and stabilize the flow rate. 2. Make the coefficient K set correctly. 3. Clean the sensor. 4.Take degassing measures to eliminate air bubbles. 5. Try to stay away from the source of interference or take shielding measures. 6. Replace the "Guide" or "Impeller Shaft". 7. Refer to Figure 4, and connect the wires. 8. Check the display instrument.

If the user keeps and uses the sensor in compliance with the instructions, within one year from the date of shipment from the

manufacturer, if the sensor fails to work due to poor manufacturing, the manufacturer can repair it for free.

Ⅷ .Transportation and storage

The sensor should be packed in a strong wooden box or carton, and it is not allowed to move freely in the box. It should be handled with care when handling, and rough loading and unloading is not allowed.

The storage location should meet the following conditions:

1. Rainproof and moistureproof.
2. Not subject to mechanical vibration or impact.
3. Temperature range -20℃～+55℃.
4. The relative humidity is not more than 80%.
5. There is no corrosive gas in the environment.

Ⅸ. Precautions for unpacking

1. After unpacking, check whether the documents and accessories are complete according to the packing list.

Packing documents include: an instruction manual

A product certificate

2. Observe whether the sensor is damaged due to transportation, so as to handle it properly.

3. The user should keep the "certificate of qualification" properly and do not lose it, otherwise the instrument coefficient

cannot be set!

Ⅹ. Order information

When ordering a turbine flow sensor, the user should pay attention to select the appropriate specification according to the nominal diameter of the fluid, working pressure, working temperature, flow range, fluid type and environmental conditions. When there is an explosion-proof requirement, an explosion-proof sensor must be selected, and strict attention should be paid to the explosion-proof grade.

When you need our company's display instrument matching, please refer to the corresponding manual to choose the appropriate model, or our company's technical staff can design and select the model for you according to the information you provide. Specify when cables for signal transmission are require.