Liquid Turbine Flow Meter
User Manual

I. Overview

LWG Y series turbine flow sensors (hereinafter referred to as sensors) are based on the torque balance principle and belong to the velocity-type flow meter category.

The sensors feature a simple structure, compact size, high accuracy, good repeatability, fast response, and convenient installation and maintenance. They are widely used in industries such as petroleum, chemical, metallurgy, water supply, and papermaking, making them ideal instruments for flow measurement and energy conservation.

Used in conjunction with display instruments, the sensor is suitable for measuring liquids in closed pipelines that do not corrode stainless steel (1Cr18Ni9Ti, 2Cr13), corundum (Al2O3), or hard alloys, and that are free of fibers, particles, and other impurities.

When paired with display instruments that have special functions, the system can also perform quantitative control, over-limit alarms, and other operations.

By selecting the explosion-proof version of this product (Exd Ⅱ CT6 Gb), it can be used in hazardous and explosive environments.

The sensor is applicable to media with viscosity less than 5×10-6m2/s at operating temperature. For liquids with viscosity greater than 5×10-6m2/s , the sensor must be calibrated with the actual liquid before use.

If users require specially designed sensors, orders can be negotiated. For explosion-proof sensors, please specify when placing the order.

II. Basic Type LWG Y Turbine Flow Sensor

1. Structural Features and Working Principle

(1) Structural Features

The sensor adopts a hard alloy thrust bearing structure, which not only ensures accuracy and enhances wear resistance, but also features a simple, robust design that is easy to assemble and disassemble.

(2) Working Principle

When fluid flows through the sensor housing, the blades of the turbine are set at a certain angle to the flow direction. The fluid’s impact force generates a torque on the blades, overcoming friction and flow resistance, causing the blades to rotate. After a short stabilization period, the rotation speed becomes steady. Under certain conditions, the rotational speed is proportional to the flow velocity.

Because the blades are magnetically conductive, they pass through the magnetic field of a signal detector (composed of a permanent magnet and a coil). As the blades rotate, they cut through magnetic lines of force, periodically changing the magnetic flux through the coil, which induces electrical pulse signals at both ends of the coil. These signals are then amplified and shaped by an amplifier into continuous rectangular pulse waves with a certain amplitude. The pulses can be transmitted remotely to a display instrument to indicate the fluid's instantaneous or total flow.

Within a certain flow range, the pulse frequency f is proportional to the instantaneous flow rate Q of the fluid passing through the sensor. The flow equation is: $Q = 3600 \times \frac{f}{k}$

In the formula:

f —— Pulse frequency [Hz]

k —— Sensor's meter coefficient [1/m³], provided in the calibration certificate. If given in [1/L]: $Q = 3.6 \times \frac{f}{k}$

Q —— Instantaneous flow rate of the fluid (under operating conditions) [m³/h]

3600 —— Conversion factor

The meter coefficient for each sensor is specified by the manufacturer in the calibration certificate. The k value is entered into the corresponding display instrument to enable display of instantaneous and cumulative total flow.

2. Basic Parameters and Technical Performance

(1) Model Selection Parameters:

Model	Nominal Diameter	Output Type	Connection Type	Accuracy Grade	Range Type	Housing Material	Impeller Material	Explosion-Proof Type	Pressure Level	Temperature Grade
LWG Y	4mm	N – 3-wire pulse output, 12–24V power supply	L – Threaded connection	C1 – Grade 0.5	S – Standard Range	S – 304 Stainless Steel	- – Standard impeller 2Cr13 (201)	- – Non-explosion-proof by default	N – Normal Pressure	- – 100°C (Default, no marking)
	6mm	A – 4–20mA output with 2088 display	NL – Internal thread connection	C2 – Grade 1.0	W – Wide Range	P – PE (medium temp <30°C)	S – Dual-phase stainless steel	E – Explosion-proof (ExdIICT6 Gb)	Px – High Pressure (specify)	Tx – High Temperature (specify)
	10mm	A1 – 4–20mA output with Hart protocol	K – Clamp connection			L – 316L Stainless Steel				
	15mm	V – 0–10V output with 2088 display	F – Flange connection							
	20mm	V1 – 0–5V output with 2088 display	J – Flange-mounted installation							
	25mm	V2 – 0–10V output with Hart protocol								
	32mm	V3 – 0–5V output with Hart protocol								
	40mm	D – RS485 output								
	50mm									
	65mm									
	80mm									
	100mm									
	125mm									
	150mm									
	200mm									

Notes:
1.Temperature Grades:T1 = 120°C T2 = 150°C T3 = 180°C
2.Pressure Levels:P1 = 4 MPa P2 = 6.3 MPa P3 = 10 MPa P4 = 16 MPa P5 = 25 MPa P6 = 32 MPa P7 = 42 MPa

(2) Medium Temperature: -20 to +100℃

(3) Ambient Temperature: -20 to +55℃

(4) Power Supply: Voltage: 12~24VDC, Current: ≤10mA

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

3. Installation, Operation, and Adjustment

(1) Sensor Installation

The installation method of the sensor varies by specification. It uses either threaded or flange connections. Installation methods are shown in Figures 1, 2, and 3. Installation dimensions are listed in Table 2.

Figure 1: Schematic diagram of LWG Y-4 to 10 threaded connection sensor structure and installation dimensions

1. Filter
2. Upstream Straight Pipe Section
3. Impeller
4. Pre-amplifier
5. Housing
6. Downstream Straight Pipe Section

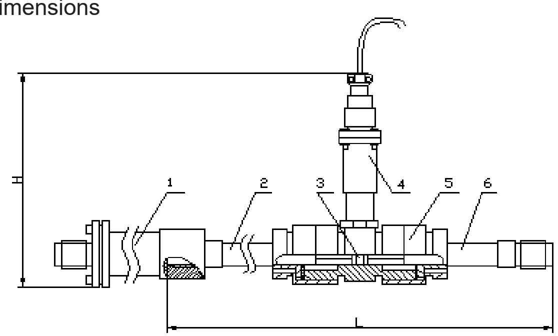


Figure 2: Schematic Diagram of Structure and Installation Dimensions for LWG Y-15 to 50 Threaded Connection Sensors

1. Housing
2. Front Guide Component
3. Impeller
4. Rear Guide Component
5. Pre-amplifier

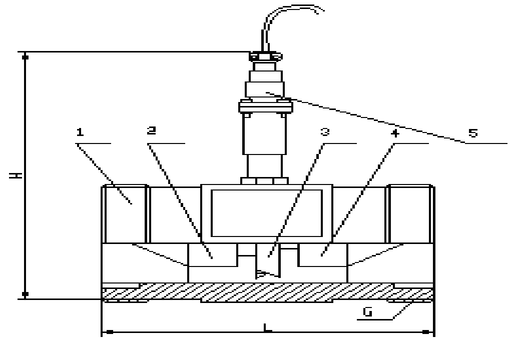
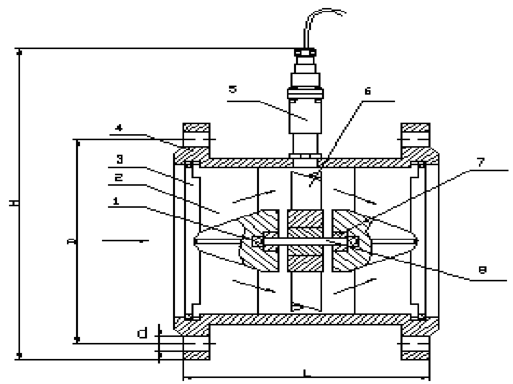
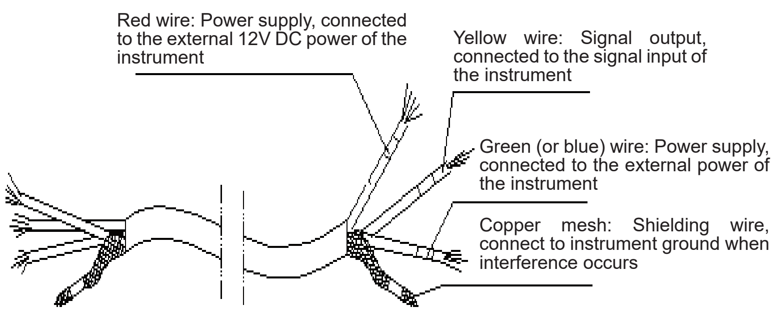


Figure 3: Schematic Diagram of Structure and Installation Dimensions for LWG Y-15 to 200 Flange Connection Sensors

1. Ball Bearing
2. Front Guide Component
3. Expanding Ring
4. Housing
5. Pre-amplifier
6. Impeller
7. Bearing
8. Shaft

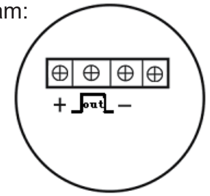


(2) LWG Y-N Type Pulse Output Wiring Instructions: As shown



(3) Explosion-Proof Pulse Output Wiring Instructions:
Open the rear cover as shown in the diagram:

"+" connects to power supply positive (+),
"–" connects to power supply negative (–),
"OUT" is the signal output



(4) Sensor Structure Dimensions and Measurement Range

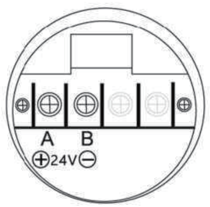
Diameter (mm)	Threaded Connection (mm)		Flange Connection (mm)					Clamp Connection Dimensions (mm)		Flow Range (m³/h)	
	L	G	L	D1	K	d	n	L	D	Standard Range	Extended Range
4	225	G1/2						50	50.5	0.04~0.25	0.04~0.4
6	225	G1/2						50	50.5	0.1~0.6	0.06~0.6
10	345	G1/2						50	50.5	0.2~1.2	0.15~1.5
15	75	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. For vertical installation, the fluid must flow upward.
The pipe should be completely filled with liquid and free of air bubbles.
During installation, the fluid flow direction must match the arrow on the sensor housing.
The upstream side of the sensor should have a straight pipe section of at least 10 times the nominal diameter, and the downstream side should be at least 5 times the nominal diameter. The inner wall of the pipe must be smooth and clean, free from scale or oxidation.
The sensor should not be installed near a valve or pump outlet, and the sensor must align coaxially with the upstream pipeline. Gaskets used for sealing must not extend into the pipe.
The sensor should be kept away from external electric and magnetic fields. Effective shielding should be applied if necessary to avoid external interference.
To verify the proper installation of the sensor, it is recommended to install a bypass pipeline at the sensor installation location.
If the sensor is installed outdoors, ensure waterproof protection for the amplifier and connector.
The wiring between the sensor and the display instrument is shown in Figure 4.
When the fluid contains impurities, a filter should be used. The filter should be selected according to flow rate and impurity level, generally recommended to be 20–60 mesh.
If the fluid contains gas, a degasser should be installed, and the entire piping system must be well-sealed and reliable.
Users should fully understand the corrosive nature of the measured medium and take precautions to prevent sensor corrosion.

(5) Usage and Adjustment
◆ During operation, the measured liquid should be clean and free of fibers or particle impurities.
◆ When starting to use the sensor, it must be filled slowly with liquid before opening the outlet valve. Never expose the sensor to high-speed fluid impact in a dry state.
◆ The maintenance cycle of the sensor is generally six months. During inspection or cleaning, avoid damaging internal components, especially the impeller. When reassembling, pay attention to the positioning of the guide parts and impeller.
◆ If the sensor is not in use, flush out the internal liquid, seal both ends with protective covers to prevent dust, and store it in a dry place.
◆ The filter used with the sensor should be cleaned regularly. When not in use, flush out internal liquid, cover with a dust cap like the sensor, and store in a dry place.
◆ Sensor signal cables may be routed overhead or buried (if buried, they should be housed in metal conduit).
◆ Before installing the sensor, connect it to the display or oscilloscope and power on. Blow air or spin the impeller by hand to check for signal display. Install the sensor only if display is normal. If not, check all parts for faults and fix them.

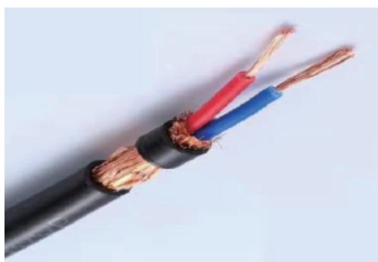
III. LWG Y-A/A1 Type Turbine Flow Transmitter

The LWG Y-A/A1 turbine flow transmitter is based on the LWG Y basic type turbine flow sensor, with the addition of 24VDC power supply and a 4–20mA two-wire current transmission function. It is particularly suitable for use with display instruments, industrial control computers, and DCS (Distributed Control System) platforms.
For flow ranges, sensor dimensions, installation, and maintenance details, please refer to Section II: “LWG Y Basic Type Turbine Flow Sensor.”
Flow Calculation Formula: $Q=\frac{I-4}{16}Q_F$
Where:
Q —— Actual flow rate
Q_F —— Full-scale flow value
I —— Output current
Transmitter Power Supply Voltage: DC 24V
Wiring diagram for Type A:
A(—) → 24V+
B(+) → Signal output
“A” is the 15~24V power supply positive (“+”) terminal
“B” is the 4~20mA current output terminal



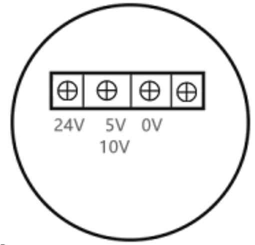
Connect “A” to the +24V external power supply. The current flows from terminal “B” to the sampling resistor of a computer or display device, and after passing through the sampling resistor or other load, it returns to the power supply negative (“–”) terminal.
A1 Type Wiring

Red wire connects to 24V
Blue wire connects to Signal+
Signal– and 0V are short-circuited



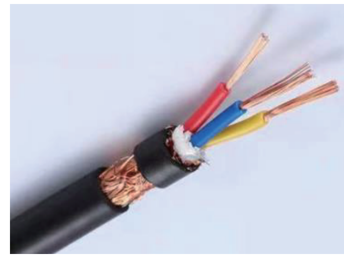
IV. LWG Y-V/V1 Type Turbine Flow Transmitte

24V and 0V are the 24V power supply
5V/10V is the output signal
Power and signal share the same 0V ground



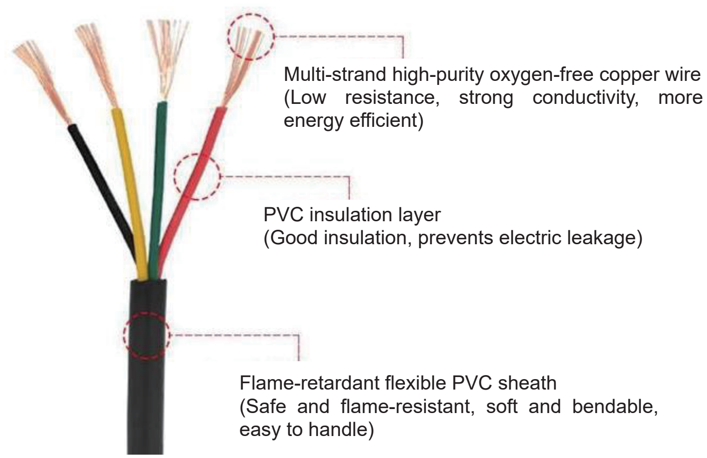
V. LWG Y-V2/V3 Type Turbine Flow Transmitte

Red wire: Power supply 24V,
Blue wire: Power ground 0V,
Yellow wire: Output signal 5V/10V,
Signal and power share the same 0V ground.



VI. LWG Y-D Type Turbine Flow Transmitter

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



Address (Decimal)	Variable Name	Type	R/W	Description
0	Instantaneous Flow Decimal Digits	16-bit Signed Integer	Read	Defined by register 115 and 116
1	Instantaneous Flow Unit	16-bit Signed Integer	Read	Defined by register 115 and 116
2	Flow Density	32-bit Float (CDAB)	Read	Default: Kg/m3 , not editable
3~4	Totalizer	32-bit Float (CDAB)	Read	Unit defined by register 1
5~6	Meter Coefficient (P/L)	32-bit Float (CDAB)	Read	
13	Meter ID	16-bit Signed Integer	Read	
256~257	Accumulated Flow	32-bit Float (CDAB)	Read	
258~259	Instantaneous Flow	32-bit Float (CDAB)	Read	
512	Write Password	16-bit Signed Integer	Write	
115	Instant Flow Unit - Numerator	16-bit Signed Integer	Write	0: Nm3 , 1: m3 , 2: L, 3: USG, 4: Kg, 5: T, 6: mL
116	Instant Flow Unit - Denominator	16-bit Signed Integer	Write	0: h, 1: min, 2: s
117	Accumulated Flow Unit	16-bit Signed Integer	Write	Same as register 115
118	Totalizer Unit - Numerator	16-bit Signed Integer	Write	Same as register 115
119	Totalizer Unit - Denominator	16-bit Signed Integer	Write	Same as register 116
120~121	Totalizer	32-bit Float (CDAB)	Write	
122~123	Damping Coefficient	32-bit Float (CDAB)	Write	
124~125	Cut-off Time	32-bit Float (CDAB)	Write	
144~145	Fluid Viscosity	32-bit Float (CDAB)	Write	
146~147	Sensor Diameter	32-bit Float (CDAB)	Write	
162~163	Meter Coefficient (P/L)	32-bit Float (CDAB)	Write	
191	Waveform	16-bit Signed Integer	Write	
192	Device Address	16-bit Signed Integer	Write	
193	Parity Check	16-bit Signed Integer	Write	0: None, 1: Odd, 2: Even

VII. Maintenance and Common Faults

For common faults and troubleshooting methods of the sensor, refer to Table 3. The maintenance interval should not exceed six months.

No.	Fault Phenomenon	Cause	Solution
1	No output signal	1. Power not connected;	1. Connect power; supply correct voltage.
		2. Impurities in pipe, impeller not	2. Clean impurities; ensure clean medium.
2	Display shows "calibration" signal but no flow signal.	1. Incorrect or faulty wiring	1. Check wiring and quality per diagram.
		2. Amplifier failure or damage.	2. Repair or replace amplifier.
		3. Converter (circuit) open or	3. Repair or replace circuit.
		4. Impeller stuck.	4. Clean sensor and pipe.
		5. No fluid flow or pipe blockage.	5. Open valve or pump; flush pipe.
3	Display unstable; inaccurate measurement.	1. Actual flow exceeds meter range or is unstable.	1. Match flow with sensor range; stabilize flow.
		2. Incorrect coefficient setting.	2. Set correct coefficient.
		3. Fiber or debris inside sensor.	3. Clean sensor.
		4. Air bubbles in liquid.	4. Remove air bubbles.
		5. Strong electromagnetic	5. Relocate or shield from interference.
		6. Severe wear of sensor	6. Replace guide or impeller shaft.
		7. Shield wire or ground wire	7. Check and reconnect wires.
		8. Display device malfunction.	8. Repair display device.

If the user follows the instructions in the manual for proper storage and use, and the sensor fails to function properly due to manufacturing defects within one year from the date of shipment, the manufacturer will provide free repair.

VIII. Transportation and Storage

The sensor should be packed in a sturdy wooden or cardboard box and must not move freely inside. Handle with care during transport; rough handling is not permitted.

Storage conditions should meet the following requirements:
1. Protection from rain and moisture.
2. No exposure to mechanical shock or vibration.
3. Temperature range: -20°C to +55°C.
4. Relative humidity not exceeding 80%.
5. No corrosive gases in the storage environment.

IX. Unpacking Instructions

1. After unpacking, check whether the documents and accessories are complete.
Packing documents include:
One user manual
One product qualification certificate
2. Check whether the sensor has been damaged during transportation and handle accordingly.
3. After confirming receipt of the "qualification certificate", do not lose it, as it is required to set the meter coefficient!

X. Ordering Instructions

When ordering a turbine flow sensor, the user must specify the fluid type, working pressure, working temperature, flow range, fluid viscosity, and installation conditions to ensure proper model selection.

If explosion-proof functionality is required, be sure to specify and follow the corresponding explosion-proof classification.

If on-site service or system integration is needed, please refer to the drawings and manual or consult our technical staff, who can help select the appropriate model based on the information provided.

If transmission signal cables are needed, please specify when ordering.