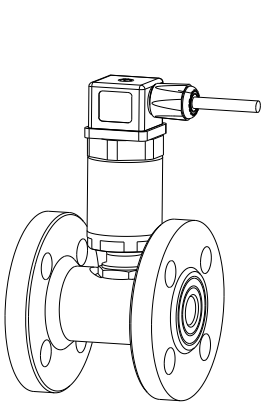
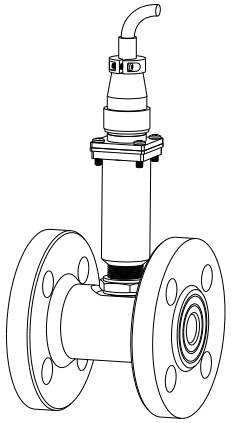
Turbine Flowmeter





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Preface

- Thank you for purchasing our product.
- This manual is about the various functions of the product, wiring methods, setting methods, operating methods, troubleshooting methods, etc.
- Please read this manual carefully before operation. Use this product correctly to avoid unnecessary losses due to incorrect operation.
- After you finish reading, please keep it in a place where it can be easily accessed at any time for reference during operation.

Note

- Modification of this manual's contents will not be notified as a result of some factors, such as function upgrading.
- We try our best to guarantee that the manual content is accurate. If you find something wrong or incorrect, please contact us.
- The content of this manual is strictly prohibited from being reprinted or copied.

Version

U-SUP-FLC420-EN2

Safety Precautions

For the safe operation of this product, please strictly follow the outlined safety precautions.

About this manual

- Please ensure the instrument operators have a careful reading of this manual.
- Before the operation, please study this manual in detail to ensure a thorough comprehension of the device's functionality.
- This manual only describes the product's functions. The responsibility for the device's suitability for any special or personalized purpose lies solely with the operator.

Precautions for product protection, safety, and modification

- For your safety and the normal operation of the product and its controlling systems, the guidelines and precautions specified in this manual are supposed to be fully observed. Operating the instrument in ways not specified in this manual may compromise its protective features. Our company shall not be liable for any malfunctions or accidents resulting from non-compliance with the precautions described.
- When equipping the product and its controlling systems with lightning protection or separate safety protection circuits, it needs to be implemented by other devices.
- If you need to replace components or fittings of the product, please use the model specified by the company.
- This product is not designed for use in systems directly related to personal safety, such as nuclear power facilities, radioactive equipment, railway systems, aviation equipment, marine equipment, and medical equipment. If applied, it is the user's responsibility to implement additional equipment or systems to ensure personal safety.
- Do not modify this product.
- The following safety symbols are used in this manual:



Hazard: Failure to take appropriate precautions may result in serious personal injury, product damage, or major property loss.



Warning: Pay special attention to critical information related to the product or specific sections of this user manual.



- Confirm whether the supply voltage is consistent with the rated voltage before operation.
- Do not use the instrument in a flammable and combustible or steam area.
- To prevent electric shock and operation errors, ensure proper grounding protection is in place.
- Thunder prevention engineering facilities must be well managed: the shared grounding network shall be grounded at the correct electric level, shielded, with wires properly routed, and an SPD surge protector applied as needed.
- Some internal components may carry high voltage. To avoid the risk of electric shock, do not open the front square panel unless it is being handled by trained personnel or maintenance staff authorized by our company.
- To avoid electric shock, disconnect the power before performing any checks.
- Check the condition of the terminal screws regularly. If loose, please tighten them before use.
- Unauthorized disassembly, modification, or repair of the product is not allowed, as it may lead to malfunctions, electric shock, or fire hazards.
- Wipe the product with a dry cotton cloth. Do not use alcohol, benzine, or other organic solvents, and avoid exposing the product to any liquids. If the product falls into the water, please cut off the power immediately to prevent leakage, electric shock, or fire hazards.

- Please check the grounding protection regularly. Do not operate the product if you think that the protection, such as grounding protection and fuses, is inadequate.
- Ventilation holes on the product housing must be kept clear to avoid malfunctions due to high temperatures, abnormal operation, shortened life, and fire.
- Please strictly follow the instructions in this manual; failure to do so may damage the product's protective devices.



- Do not use the instrument if it is found damaged or deformed upon opening the package.
- Prevent dust, wire ends, iron fines, or other objects from entering the instrument during installation, as this may cause abnormal operation or failure.
- During operation, to modify the configuration, signal output, startup, stop, and operation safety shall be fully considered. Improper operation may lead to failure and even destruction of the instrument and control equipment.
- Each part of the instrument has a certain service life, which must be maintained and repaired on a regular basis for long-term use.
- If the product comes to the end of its service life, it should be disposed of as industrial waste as a way of environmental protection.
- Disconnect the instrument when it is not in use.
- If you find smoke from the product, smell odor, abnormal noise, etc., please turn off the power switch immediately and contact the company in time.

Disclaimer

- The company does not make any guarantees for terms beyond the scope of this product warranty.
- This company is not responsible for damage to the instrument, loss of parts, or unpredictable damage caused directly or indirectly by improper operation of the user.

After opening the box, please confirm the package contents before starting the operation. If you find that the model and quantity are incorrect or there is physical damage in appearance, please contact us.

No.	Items	Quantity
1	Turbine Flowmeter	1
2	User Manual	1
3	Certificate of Conformity	1
4	Test Report	1

Note: For customized products, specifications may vary from the standard version. The order shall prevail.

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1 Overview

1.1. Introduction

The turbine flowmeter is a velocity-type instrument used to measure the volumetric flow rate of low-viscosity liquids in closed pipelines, such as water, liquefied petroleum gas, refined petroleum products, light crude oil, organic liquids, and inorganic liquids free of fibers and particulate impurities.

Featuring a simple structure, high accuracy, and easy installation, operation, and maintenance, the product is widely used for flow monitoring and control of small-flow media in industries such as pharmaceuticals, chemicals, food and beverage, and small-scale production lines.

1.2. Working principle

When the measured liquid flows through the flowmeter sensor, its internal impeller rotates with the help of the liquid's kinetic energy. At this time, the impeller blade causes the magnetic resistance in the detection device to change periodically. Therefore, an electric pulse signal proportional to the flow rate is induced at both ends of the detection coil and is amplified by the preamplifier, then sent to the display unit. The single chip microcomputer system in the display unit calculates according to the number of pulses measured and the meter coefficient K of the flowmeter, and displays the instantaneous flow rate and the accumulated total amount.

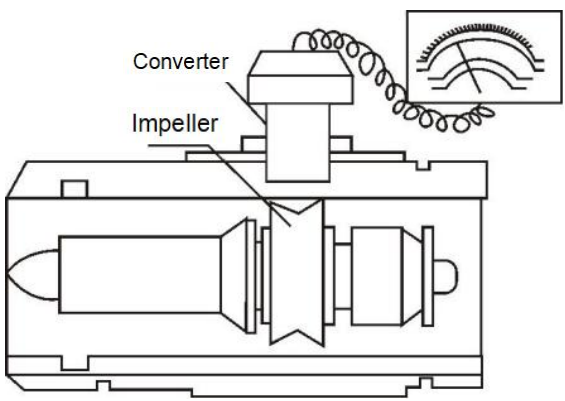


Fig.1 Measuring principle

The relationship between the meter coefficient and instantaneous flow, frequency, pulse number, and cumulative total is:

$$K=f/Q \text{ and } K=N/V$$

In the formula:

f—flow signal frequency (Hz)

Q—instantaneous flow rate (m^3/s, or /L/s)

N—pulse number

V—Total volume (m^3)

1.3. Feature

- High accuracy and good repeatability.
- Wide range ratio, up to 10:1.
- Multiple structural designs for convenient user selection.
- Simple structure, easy to install and use.
- Low power consumption.
- No sealing ring, no leakage.

2 Technical parameters

Table 1 Technical parameters

Input		
Measured variable	Volumetric flow	
Nominal diameter and flow range	Diameter	Flow range
	DN10	(0.2~1.2)m^3/h
	DN15	(0.6~6)m^3/h
	DN20	(0.8~8)m^3/h
	DN25	(1~10)m^3/h
	DN32	(1.5~15)m^3/h
	DN40	(2~20)m^3/h
	DN50	(4~40)m^3/h
	DN65	(7~70)m^3/h
	DN80	(10~100)m^3/h
	DN100	(20~200)m^3/h
	DN125	(25~250)m^3/h
	DN150	(30~300)m^3/h
	DN200	(80~800)m^3/h
Range ratio	DN10	1: 6
	DN15~DN200	1: 10
Output		
Pulse output	Pulse width	Maximum 500ms (divided evenly according to frequency)
	pulse frequency	(1~2000) Hz (depending on turbine diameter)
	Pulse coefficient	Depending on the turbine diameter
Transmitter output	Output type	Two wire (4-20)mA output
	Accuracy	0.1%
	Output load	750Ω@24VDC
Power supply		
Power supply	DC: (12~24)V	

	Note: For model with Hirschmann connector type (4-20)mA, its power supply range is (20-24)VDC.	
Power consumption	24VDC: Max. 0.5W 12VDC: Max. 0.15W	
Electrical interface	Aviation connector or Hirschmann connector	
Performance		
Accuracy	Level 1.0	
Repeatability	1/3 of the accuracy level	
Response time	250ms	
Process		
Medium viscosity	less than 5×10^{-6} m²/s (for liquids with a flow rate greater than 5×10^{-6} m²/s, the flowmeter must be calibrated with actual liquid before use)	
Medium temperature	Standard type: (-20 ~ 80)℃ (stainless steel measuring tube) High-temperature type: (-20 ~ 150)℃	
Process connection	Threaded	DN10~DN50: PN<6.3MPa
		DN65~DN100: PN<1.6MPa
	Flange	DN10~DN200: PN<1.6MPa
	Clamp	DN10~DN50: PN<1.6MPa
		DN65~DN100: PN<1.0MPa
Environment		
Ambient	Temperature: (-20~60)℃ Relative humidity: 5%～90%	
Storage	Temperature: (-40~65)℃ Relative humidity: ≤85%	
Protection level	IP65 (pulse head: IP00)	

3 Structure and Dimensions

3.1. Structure

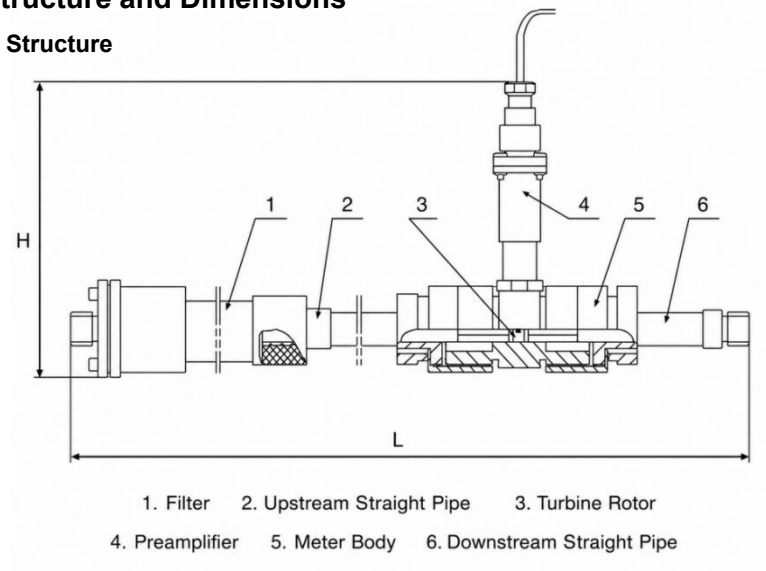


Fig.2 Dimension diagram of the turbine flowmeter

3.2. Dimensions

3.2.1.Pre-amplifier Dimensions

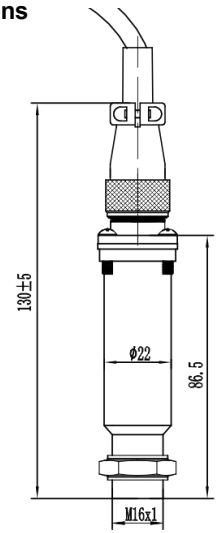


Fig.3 Pulse head with aviation connector (Unit: mm)

3.2.2. Pulse Head with Hirschmann Connector

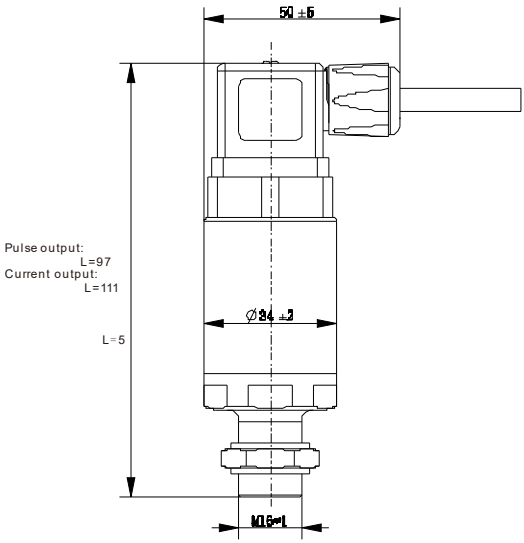
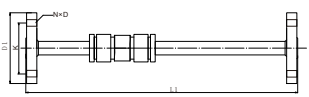
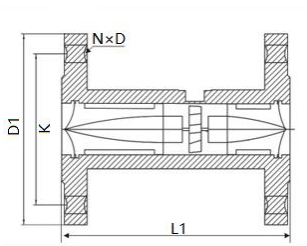


Fig.4 Pulse head with Hirschmann connector (Unit: mm)

3.3. Sensor Dimensions

The flowmeter can be divided into threaded connection, flange connection, and clamp connection according to the connection mode of the meter body.

Table 2 Sensor structure diagram

Process connection	Sensor structure diagram	
Flange connection (Standard: HG/T 20592-2009)	DN10 (including straight pipe section): 	DN15~200: 

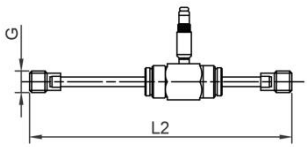
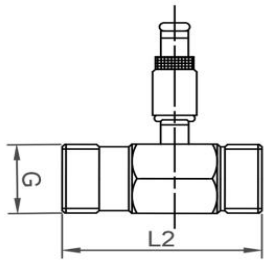
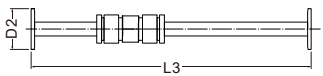
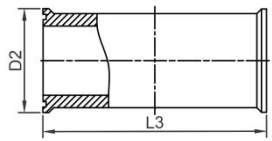
Threaded connection (Standard: GB-T 7307-2001)	DN10 (including straight pipe section): 	DN15~DN100: 
Clamp connection	DN10 (including straight pipe section): 	DN15~DN100: 

Table 1 Sensor dimensions (unit: mm)

DN (mm)	Flange connection					Threaded connection		Clamp connection	
	L1 (mm)	D1 (mm)	K (mm)	D (mm)	N (holes)	L2 (mm)	G (External thread)	L3 (mm)	D2 (mm)
10	345	90	60	14	4	345	G1/2	345	50.5
15	75	95	65	14	4	75	G1	75	50.5
20	85	105	75	14	4	85	G1	85	50.5
25	100	115	85	14	4	100	G1 1/4	100	50.5
32	120	140	100	18	4	120	G1 1/2	120	50.5
40	140	150	110	18	4	140	G2	140	64
50	150	165	125	18	4	150	G2 1/2	150	78
65	175	185	145	18	8	175	G3	175	91
80	200	200	160	18	8	200	G3 1/2	200	106
100	220	220	180	18	8	220	G4 1/2	220	119

DN (mm)	Flange connection					Threaded connection		Clamp connection	
	L1 (mm)	D1 (mm)	K (mm)	D (mm)	N (holes)	L2 (mm)	G (External thread)	L3 (mm)	D2 (mm)
125	250	250	210	18	8	/	/	/	/
150	300	285	240	22	8	/	/	/	/
200	360	340	295	22	12	/	/	/	/

3.4. Material

Casing: 304SS

Body: 304SS or 316LSS

Rotor: Duplex steel 2205 or 430F stainless steel

Process connection: 304SS or 316LSS

4 Installation

4.1. Installation Tips

Please inspect the packaging for any damage or signs of mishandling. If any damage is found, please report it specifically to both the courier and the manufacturer.

Please check the packing list to make sure the batch of goods that you have received is complete.

Please check the instrument nameplate and confirm whether the delivered items are consistent with your order. Check whether the power supply indicated on the nameplate is correct. If not, please contact the manufacturer.

4.2. Storage

① Store the instrument in a dry, dust-free environment.
② Avoid direct sunlight.
③ Keep the instrument in its original packaging.

4.3. Installation Location

(1) **Filled with liquid:** the pipeline must be completely filled with liquid at all times. Otherwise, flow indication and measurement accuracy may be affected.

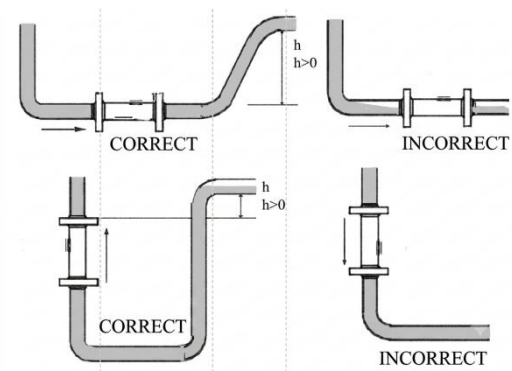


Fig.5 Mounting positions

(2) **Avoid Air Bubbles**. If air bubbles enter a measurement pipe, flow rate indications may be affected, and measurement errors may be caused.

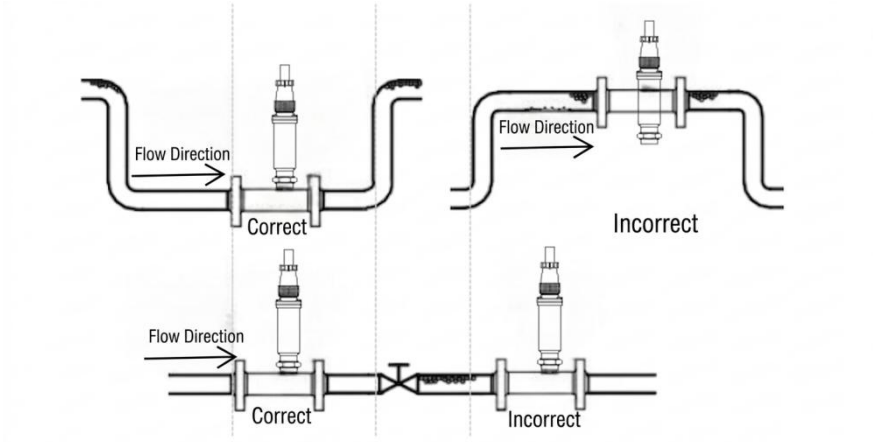


Fig.6 Avoiding air bubbles

4.4. Installation Sites and Requirements

The typical installation of the flowmeter

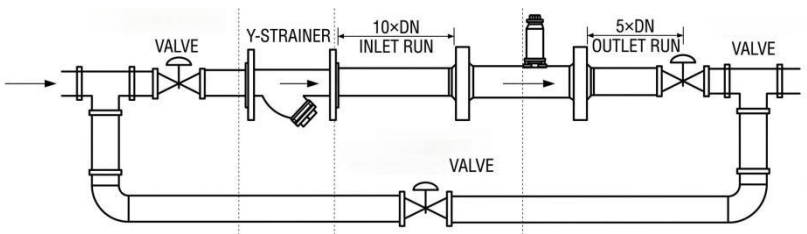


Fig.7 Typical flowmeter system installation

Installation precautions:

(1) The sensor shall be installed in a place that is convenient for maintenance and free from vibration, strong electromagnetic interference, and thermal radiation.

(2) The horizontal sensor installation requires that the pipeline should not have a visually perceptible inclination (generally within 5°), and the perpendicularity deviation of the vertical sensor installation pipeline should also be less than

5°. During measurement, ensure that the bypass pipes have no leakage. In locations where the process flow cannot be interrupted, bypass pipes with reliable stop valves (see figure above) shall be installed. During measurement, ensure that the bypass pipes are leak-free.

(3) First, connect a short nozzle to replace the sensor at the position where the sensor is installed in the newly laid pipeline, and then formally connect the sensor after confirming that the pipeline is clean after the completion of "line cleaning".

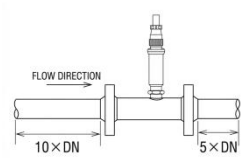
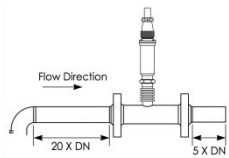
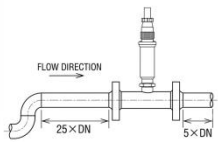
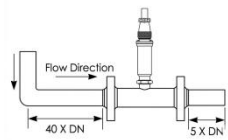
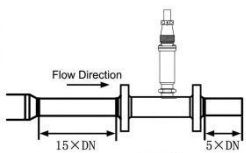
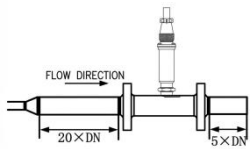
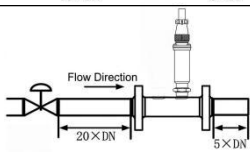
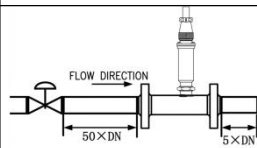
(4) If the fluid contains impurities, a filter shall be installed on the upstream side of the sensor, and the pipeline shall be cleaned regularly to discharge the sediment impurities. If the measured liquid contains gas, a degasser shall be installed on the upstream side of the sensor. The drain outlet and exhaust outlet of the filter and degasser shall be connected to a safe place.

(5) When the sensor is installed outdoors, measures should be taken to avoid direct sunlight and rain.

(6) For explosion-proof flowmeters, do not open the front or rear cover while the unit is energized in a hazardous area. After each opening, the front and rear covers must be securely tightened when reassembled. The meter housing must only be removed or installed in a safe area.

4.5. Required Lengths of Straight Runs

Turbine flowmeters are sensitive to distortions in the velocity profile and to swirl flow. Fully developed flow shall be ensured at the sensor inlet. Therefore, adequate straight pipe lengths or a flow straightener shall be installed according to the type of upstream flow disturbances. The required straight pipe lengths upstream and downstream of the flowmeter are shown in the table below.

Inlet baffle Type	Installation conditions		Outlet baffle Type	Installation conditions	
	Inlet	Outlet		Inlet	Outlet
General			90° Elbow		
Two 90° elbows on the same plane			Two 90° elbows on different planes		
Reducer			Expander		
Fully opened valve			Half-opened valve		

4.6. Post-Installation Check

Table 3 Post-installation check

Checking Items	Results
Is the device free from damage (visual inspection)?	□
Does the meter meet the technical specifications of the measuring point, e.g., medium temperature, process pressure, ambient temperature, and nominal diameter?	□
Are sufficient protective measures in place to prevent the instrument from exposure to direct	□

Checking Items	Results
sunlight or rain?	
Is a suitable wrench used to securely tighten the mounting screws?	□

After installation, the meter should **Not** be left unused for long periods. If it will not be used for an extended period, the following measures must be taken:

1. Check the sealing of the cable gland and entries to ensure that moisture and water do not penetrate the instrument.

2. Perform regular inspections. Check the conditions of the measures mentioned above at least once a year. In situations where water may enter the instrument (e.g., after heavy rainfall), the meter should be checked immediately.

5 Electrical Connections

5.1. Wiring of Turbine Flowmeter with Aviation Connector

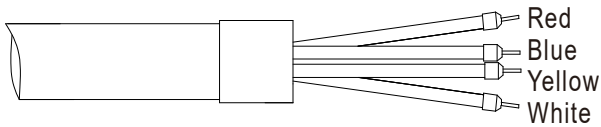


Fig.8 Pulse output wiring description

Table 4 Wiring definition

Output	Pins color	Description
Pulse output (active)	Red	Power+
	Blue	Power- (Pulse signal reference)
	Yellow	Pulse signal output
	White (Shielded)	Grounding

5.2. Wiring of Turbine Flowmeter with Hirschmann Connector

(1) Current Output Type

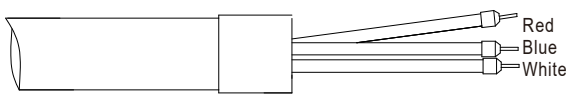


Fig.9 Two-wire current output

(2) Pulse Output Type

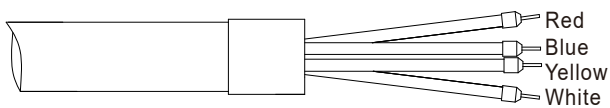


Fig.10 Pulse output

Table 5 Wiring definition

Output Type	Pin Color	Description
(4~20) mA Output	Red	Power + / Current Signal Output
	Blue	Power - / Current Signal Return
	White (Shield)	Grounding
Active Pulse Output	Red	Power +
	Blue	Power - (Pulse Signal Reference)
	Yellow	Pulse Signal Output
	White (Shield)	Grounding

6 Troubleshooting

The following table lists the common troubleshooting methods for turbine flowmeters. If the fault still cannot be solved, please contact our company.

Table 6

Trouble	Analysis	Solutions
The display shows no output of the flow signal or the test signal.	Power is not connected; the applied voltage is incorrect.	Connect the power supply and apply the required voltage.
	The display is faulty.	Inspect and repair the display instruments.
The instrument displays the "calibration" signal, but not the flow signal.	The wiring between the flowmeter and the display may be incorrect, or there may be an open circuit, short circuit, or poor contact.	Check the correctness and quality of the wiring.
	The amplifier is faulty or damaged.	Repair or replace the amplifier.
	The converter (coil) is open or short-circuited.	Repair or replace the coil.
	Impeller stuck	Clean the sensors and pipes.
	No fluid flow or blockage in the pipe	Turn on the valves or pumps to clean the pipelines.
The display flowmeter is malfunctioning and providing incorrect readings.	The actual flow rate exceeds the meter's measurement range or is unstable.	To ensure that the measured flow rate is compatible with the flow meter's measurement range and to stabilize the flow rate.
	The instrument coefficient K is set incorrectly.	Make sure the coefficient K is set correctly.
	Impurities such as fibers can get stuck inside the sensor.	Clean the sensor.

Trouble	Analysis	Solutions
	There are air bubbles in the liquid.	Take degassing measures to eliminate air bubbles.
	There is strong electromagnetic interference near the flow meter.	Keep away from sources of interference or take shielding measures.
	The sensor bearings and shaft are severely worn.	Replace the "guide component" or "impeller shaft".
	The flowmeter cable shield or other grounding conductor is disconnected from the line ground wire or has poor contact.	Connect the wires according to the wiring diagram.
	The flowmeter indicates a malfunction.	Inspection and display instruments

7 Warranty and After-Sales Service

Our company guarantees that any product quality issues arising during the warranty period will be covered under our unconditional warranty policy, which includes free repair, replacement, or return. All non-customized products are eligible for return or exchange within 7 days (excluding products damaged due to misuse). For customized products, the warranty terms specified in the contract shall apply.

Disclaimer

The following situations are not covered under the warranty policy, even during the warranty period:

(1) Product malfunctions caused by improper use by the customer.

(2) Product malfunctions resulting from unauthorized disassembly, repair, or modification by the customer.