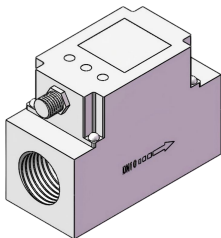


S01 Flow Meter Series
(Intelligent)

S01 Liquid Turbine Flow Meter

Instruction Manual



Foreword

Thank you for choosing our intelligent liquid turbine flow meter, independently developed and manufactured by our company.

The instruction manual for the liquid turbine flow meter details how to use this product correctly and safely. To prevent damage to the instrument or ensure its stable operation, please carefully read this manual before installation and commissioning.

Step 1: Must-Read Before Unpacking and Inspecting Goods

1. **Verify the packing list:** Check that all accessories are complete.
2. **Visual inspection:** Check that the instrument is intact and free from any visual damage caused during transportation.
3. **Power-on test:** After connecting the instrument to a DC 24V external power supply, check that the default interface of the instrument display is complete and that the buttons operate normally.
4. **Verify that all installation accessories are complete:** Prepare for installation.

Step 2: Installation Guide

1. **Suitable Installation Environment:** Temperature $-20^{\circ}\text{C} \sim 65^{\circ}\text{C}$, Humidity $5\% \sim 90\%$
2. **Pipeline Pre-treatment:** Purge the pipeline before installation to remove welding slag, rust, and other impurities to prevent damage to the impeller.

3.Standard Installation: Install according to the flow direction markings; reverse installation is prohibited. The straight pipe sections before and after the impeller must meet standards (generally 10D before and 5D after, refer to the manual). See installation requirements for details.

4.Gradual Valve Opening: Slowly open the front valve to introduce the medium to prevent water hammer damage to components.

5.Pipeline Pressure Testing: Perform a pressure test to check for leaks, ensuring no leaks in the pipeline and guaranteeing measurement accuracy and safety.

6.Airtightness Test: Check the seals at the connection between the instrument and the pipeline; no leaks are required to ensure stable measurement.

7.Stable Operation: Slowly open the rear valve; start the instrument after the pressure and flow rate stabilize.

8.Normal Operation of the Instrument.

Product Introduction

Product Overview

The LTFM series is a velocity-type instrument based on the principle of conservation of angular momentum. When liquid flows through the sensor, it drives the impeller to rotate. Within a specific flow range, the impeller speed and flow velocity are linearly related. Through electromagnetic induction or photoelectric conversion, the rotational signal is converted into electrical pulses, which are then processed by an adapter circuit to output instantaneous and cumulative flow rates. This instrument boasts significant advantages: accuracy of 0.2–1.0 grade, millisecond-level response speed, wide rangeability (1:10–1:20), small size, low pressure loss, and support for both horizontal and vertical installation (straight pipe sections are required). Due to its stable performance and strong adaptability, it is widely used in petrochemical, metallurgical, power, water supply and drainage, and food and beverage industries, and is suitable for flow measurement of clean, low-viscosity liquids such as water, ethylene glycol, and methanol.

Features

- ◇ **High Precision:** 0.5-1.0 accuracy, suitable for trade settlement and process control scenarios.
- ◇ **Low Pressure:** Optimized flow channel structure design, **pressure loss <0.05MPa at rated flow**, reducing system energy consumption.
- ◇ **Easy Installation:** Supports both horizontal and vertical installation modes, ensuring measurement stability.
- ◇ **Quick Response:** Millisecond-level signal response, quickly capturing instantaneous flow changes, suitable for dynamic flow monitoring.

- ◊ Multiple Outputs: Pulse, 4-20mA, and RS485 multiple outputs, facilitating integration with PLC, DCS, and other control systems.

- ◊ Wide Measuring Range: Measuring range ratio 1:10~1:20, covering the micro-flow range, reducing selection limitations.

- ◊ Reliability: No zero-point drift, low pressure loss (<0.05MPa)

- ◊ Small Size: Ultra-compact structure, small diameter (DN4~DN10), lightweight design.

Product Application

- ◊ Pharmaceutical Industry—Precision Delivery of Liquid Pharmaceuticals

- ◊ Power Industry—Boiler Feedwater/Cooling System Testing

- ◊ Water Supply and Drainage Industry — Municipal Pipeline/Industrial Water Testing

- ◊ Petrochemical Industry—Refined Oil Product Measurement

- ◊ Food and Beverage Industry—Ingredient and Filling Measurement

Technical Parameters

◊Nominal Pressure (Kpa) : 0KPa~1000KPa

◊Ambient Temperature: -20~65℃

◊Medium Temperature: -60~100℃

◊Material: 304 Stainless Steel/316 Stainless Steel

◊Flow Rate Range : 0.5~666L/min, depending on pipe size.

Please refer to the flow rate range table for specific standard flow rates.

◊Accuracy: $\leq \pm 1\%$ F.S (flow rate)

◊Repeatability: $\leq 0.3\%$

◊Range Ratio: 1:10, 1:20

◊Connection Method: Thread/ Flang/ Clamp

◊Power Supply: 24VDC

◊Output Signal: Three-wire pulse output, three-wire 4-20mA output, RS485 output.

◊Protection Rating: IP65

◊Measurement Medium: Liquid

◊Transmission Distance: Pulse output $\leq 300\text{m}$, 4-20mA output $\leq 1200\text{m}$, load resistance $\leq 500\Omega$ (24V), RS485 output $\leq 1000\text{m}$.

Measurement Range

Different pipe diameters will have different flow measurement ranges. When selecting a flow meter, it is crucial to choose one based on the intended flow range. The biggest mistake is selecting a meter based solely on pipe diameter. Choosing a meter based on pipe diameter is highly susceptible to measurement errors due to insufficient flow rate.

The flow range of a liquid turbine flow meter is determined based on the operating flow rate. Therefore, when selecting a meter, convert the current flow rate to the operating flow rate and then compare it with the flow range table to ensure that the commonly used flow rate falls within the middle range of the meter's measurement range.

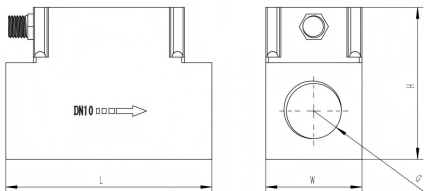
Reference Conditions

Liquid: Room temperature water, $t=20^{\circ}\text{C}$, $\rho=998.2\text{kg/m}^3$

Reference Flow Range Table for Liquid Turbine Flow Meter under Reference Conditions

Selection Code	Measuring Range (L/m)	Frequency Range(Hz)	Instrument Coefficient Range (P/L)
S01-4L	0.5-5	166-1666	20000
S01-6L	1-10	213-2130	12800
S01-10L	3.3-33	81-810	1460
S01-15L	10-100	146-1460	880
S01-20L	13.3-133	86-860	390
S01-25L	16.6-166	55-550	198
S01-32L	25-250	70-700	170
S01-40L	33.3-333	38-380	68.5
S01-50L	66.6-666	30-300	27.5

Structural Dimensions



Diameter	Body Length (L)	Body Height (H)	Body Width (W)	Thread Size (G)
DN4	80	55	35	G½
DN6	80	55	35	G½
DN10	80	55	35	G½
DN15	100	55	35	G½
DN20	120	60	40	G¾
DN25	120	65	45	G1
DN32	120	75	55	G1 1/4
DN40	120	80	60	G1 1/2
DN50	120	90	70	G2

Product Installation

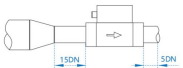
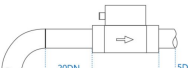
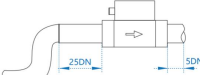
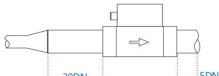
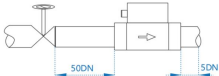
■ Instrument installation environment requirements

1. The flow meter should be installed indoors. If installed outdoors, it should be covered to prevent rainwater intrusion and direct sunlight, which can affect its lifespan. (When wiring the flow meter, the shielded wire should be U-shaped, and the wire should enter the casing from bottom to top to prevent rainwater from entering the casing along the wires.)
2. The flow meter should not be near strong external magnetic fields, high-powered equipment, or high-frequency equipment, and should not share a power supply with these devices.
3. Do not share a power supply with equipment that pollutes power sources, such as frequency converters and welding machines. If necessary, install a power purification system.
4. Avoid high-temperature, low-temperature, corrosive, or extremely humid environments. If installation is unavoidable, proper protection measures must be taken for the flow meter.
5. To ensure uninterrupted liquid flow during maintenance, it is recommended to install a bypass pipe at the sensor installation location.
6. Sufficient space should be left around the instrument installation point for wiring and regular maintenance.
7. When the fluid contains impurities, a filter should be installed. The filter mesh size depends on the flow rate and impurities, generally 20-60 mesh. When the fluid contains free gas, a deaerator should be installed. The entire piping system should be well-sealed.
8. Users should fully understand the corrosive properties of the measured medium and take strict precautions to prevent sensor corrosion.

■ Instrument installation piping requirements:

Flow meters have specific requirements regarding the upstream and downstream straight pipe sections at the installation point; otherwise, the flow field of the medium in the pipeline will be affected, impacting the instrument's measurement accuracy. The upstream and downstream straight pipe lengths must meet the requirements shown in the diagram below.

(DN is the nominal diameter of the instrument, unit: mm)

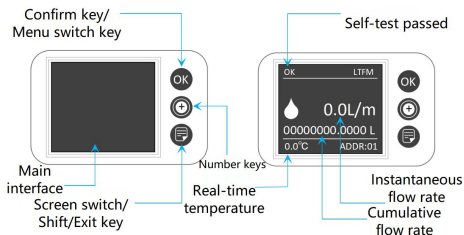
 Concentric contraction fully open valve	 A 90-degree bend
 Two 90-degree bends on different planes	 Two 90-degree bends on the same plane
 Concentric expander	 Semi-open regulating valve (not recommended)

■ Installation precautions:

1. Upon initial use, slowly fill the meter with liquid before opening the outlet valve; avoid subjecting it to high-speed fluid impact when empty.
2. The inner diameters of the upstream and downstream piping should be the same. If there is a difference, the inner diameter of the piping (D_p) and the inner diameter of the flow meter (D_b) should satisfy the following relationship: $0.98D_b \leq D_p \leq 1.05D_b$.
3. The liquid being measured must be clean and free of fibers, particles, and other impurities.
4. When measuring high-temperature or low-temperature media, pay attention to insulation measures. The internal temperature of the converter (inside the meter housing) should generally not exceed 70°C . Low temperatures can easily cause condensation inside the converter, reducing the insulation resistance of the circuit board and affecting the normal operation of the instrument.
5. The maintenance cycle is every six months. During inspection and cleaning, avoid damaging the measuring chamber components (especially the impeller). Pay attention to the relative position of the guide components and the impeller during assembly.
6. When not in use, drain the internal liquid, install protective covers at both ends to prevent dust, and store in a dry place.
7. The matching filter needs to be cleaned regularly; when not in use, handle it in the same way as the sensor.
8. Before installation, connect the display instrument to power on and check the display function by blowing air or turning the impeller. Installation can only proceed if the function is normal. If there is any abnormality, troubleshoot the problem.

Panel Diagram

■ LCD display type



■ Button introduction

(Confirm Key): Enables a shift function in the password setting interface; functions as a confirmation key in the submenu interface.

(Number Key): Enables value modification in the password and menu setting interfaces.

(Shift Key): Switches between screen menus on the main interface; shifts values in the menu setting interface.

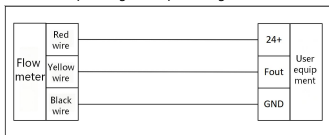
Wiring Method

■ Aviation plug cable wiring definition

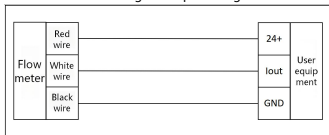
Serial Number	Airplane Connector Cable Wire Sequence Color	Function Definition
1	Red	External power supply; positive input of DC24V
2	Black	External power supply; negative input of DC24V
3	Yellow	Pulse output positive; red, black and yellow wires connect to three-wire pulse output.
4	White	Current output positive; red, black and yellow wires connect to three-wire current output.
5	Brown	RS485 output signal A
6	Blue	RS485 output signal B

■ Electrical wiring diagram

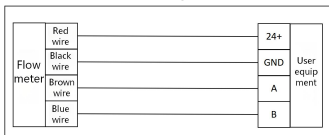
◊ Three-wire pulse signal output wiring



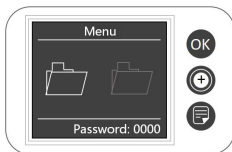
◊ Three-wire 4-20mA signal output wiring



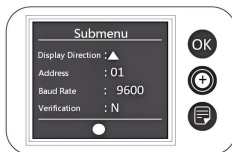
◊ Four-wire RS485 output wiring



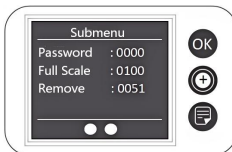
■ Menu introduction



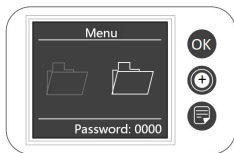
Press the shift key once, then press the confirm key. Use the numeric keys to modify the value and the shift keys to move the value. Enter the password "2010" and press the confirm key to enter the RS485 settings menu.



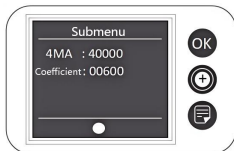
Display Orientation: Modifies the LCD screen display position.
Address: Sets the RS485 address bits; the default is 01.
Baud Rate: Sets the RS485 baud rate; the default is 9600. Supports 4800, 9600, 19200, and 38400.
Parity: Sets the RS485 parity bits; N for no parity, O for even parity, and E for odd parity.



Password: Change user password.
Full Range: Set the full range corresponding to 4-20mA.
Cutoff: Set the lower limit cutoff frequency.



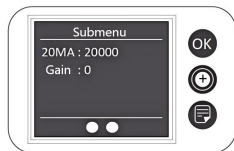
Press the shift key twice, then press the confirm key once. Use the numeric keys to modify the value, and press the confirm key to shift again. Enter the password 4321 and press the OK key to enter the current calibration menu.



4mA: Verify the zero-point value of 4~20mA current.

Coefficient: Instrument coefficient, unit is P/m^3 , the input value needs to be divided by 100.

Example: Calibration coefficient is 8300000 P/m^3 , input coefficient is 83000



20mA: Verify 4-0mA full-scale current.

Gain: Reserved

Routine Maintenance

Routine maintenance of liquid turbine flow meters focuses on preventing impurities, ensuring accuracy, and protecting components. This involves regular cleaning, condition checks, and proper storage to guarantee stable sensor operation, extend service life, and ensure accurate and reliable measurement data.

Key Maintenance Points

1. **Regularly clean the filter:** The filter needs to be disassembled and cleaned regularly to remove trapped particles, fibers, and other impurities, preventing obstruction of media flow and preventing impurities from entering the measuring chamber and damaging the impeller.
2. **Semi-annual maintenance and calibration:** Disassemble the sensor every six months for inspection, cleaning the inner wall of the measuring chamber and the impeller, and checking the impeller's rotational flexibility; perform accuracy calibration if necessary to ensure measurement errors are within acceptable limits.
3. **Cable and signal inspection:** Regularly check the laying status of transmission cables. Avoid wear on overhead cables, and ensure buried cables have undamaged conduits; verify signal output stability and check for loose wiring, signal drift, and other problems.
4. **Proper storage during downtime:** When the sensor is not in use, drain any residual liquid and install protective covers at both ends for dust and moisture protection; store all components together with the sensor in a dry, ventilated place to prevent rust or component aging.

5. Real-time monitoring of operating status: During daily operation, pay attention to abnormal impeller rotation noise and pressure loss. If the medium contains excessive impurities, stop the machine immediately to prevent impeller jamming or wear.

■ Warning and personal injury

Do not use this product on safety protection devices or emergency stop equipment, or in any other application where a malfunction of this product could result in personal injury, unless there is a specific purpose or authorized use. Refer to the product datasheet and instruction manual before installing, handling, using, or maintaining this product. Failure to follow these recommendations may result in death or serious personal injury. The company will not be liable for any personal injury or death arising therefrom, and will disclaim all claims against the company's management, employees, affiliated agents, distributors, etc., including costs, claims fees, attorney fees, etc.

Due to the inherent design of the components, they are sensitive to static electricity. To prevent damage from static electricity or degrade product performance, please take necessary anti-static measures when using this product.

The company is only responsible for products that malfunction when used in accordance with the product's technical specifications. The company makes no warranty regarding the application of the product in non-recommended special scenarios. The company makes no commitment regarding the reliability of the product when used in other products or circuits not supplied by the company.

This manual is subject to change without notice.

The data in this specification is for reference only; the final product shall prevail.

The final interpretation of this product information rests with our company.

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Appendix 1 RS485 Communication Protocol

The turbine circuit uses the MODBUS-RTU protocol, supporting only read command 03 and not write operations. The baud rate is 9600; other baud rates are not supported.

Modbus Poll software RTU connection:

Display Option – Floating Pt (Data display format – floating point).

Command 03: HOLDING REGISTER (Read holding register).

Device id: Internal address of the instrument.

Address: Starting address of the instrument parameter, from 1 to 14.

Length: Data length. $\text{Length} + \text{Address} \leq 14$

Parameter Address: 40001-2: Reserved

40003-4: Instantaneous Flow Rate

40005-6: Medium Temperature

40007-8: Frequency

40009-10: Cumulative Flow Rate (hundreds digit and above)

40011-12: Cumulative Flow Rate (hundreds digit and below)