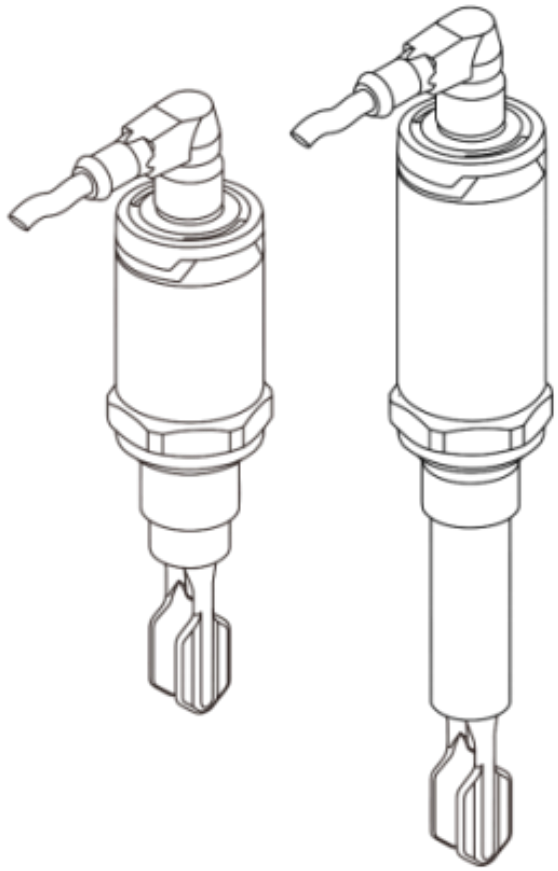
Technical Information

LSF01
Compact tuning fork level switch



Winters Instruments

Contents

1. Product introduction

1.1 Product Overview

LSF01 compact tuning fork level switch is an economical limit control switch specially designed for liquid limit measurement. The overall structure of the product is small and lightweight, the total length of the product is 160.5mm, the maximum diameter is 31.5mm, and the length of the tuning fork is only 38mm. This product is not only suitable for containers, tanks, tank and foam, bubble, viscous liquid and vibration interference level limit measurement, but also suitable for small containers and small space around the tank. Also based on the design principle of detecting the change of vibration frequency when the fork is immersed in the medium, the product can measure the density of the medium as low as 0.7g/cm³.

1.2 Working Principle

The LSF01 compact tuning fork level switch is based on the design principle of detecting the change of vibration frequency when the tuning fork body is immersed in the medium. That is, when the fork is in contact with the measured liquid, the resonant frequency of the fork is significantly reduced, and the change of vibration frequency is directly reflected in the output signal of the piezoelectric detection device. The detection circuit determines the change of the required rate and outputs a switching signal.

1.3 Application Scope

LSF01 tuning fork level switch is specially used for measuring the level limit of containers, tanks and various pipelines, widely used in water conservancy, chemical, environmental protection, food, medicine and other industries.

2. Product structure and characteristics

2.1 Product Structure

Figure 1 LSF01 consists of the following components

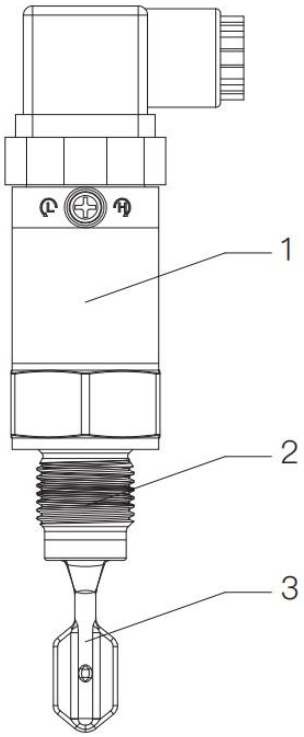


Figure 1 Overall structure of LSF01

1- Housing with electronic components 2- Process connection 3- Vibrating fork

2.2 Product Features

2.2 Product Features

(1) The structure is small and light, the total length is 160.5mm, the maximum diameter is 31.5mm, the fork length is only 38mm;
(2) Especially suitable for liquid limit measurement of pipelines and narrow Spaces;
(3) The medium density can be measured as low as 0.7g/cm³;
(4) Economic and practical, cost-effective;
(5) Free from foam, bubbles, viscosity, vibration and liquid properties;
(6) The design based on the change of detection frequency has high reliability;
(7) Simple operation, safe and reliable, strong versatility.

3. Installation guide

3.1 Before Installation

Before installing the instrument, check whether the instrument model meets the site environmental requirements, such as process pressure, process temperature, and chemical properties of the medium, to ensure that the instrument can be used normally after installation.

3.2 Installation

In general, the LSF01 can be installed in any position as required, which can be installed horizontally, vertically or tilted. When the measured medium has viscosity, in order to reduce or avoid the phenomenon of hanging, please install the instrument vertically.

3.3 Installation Direction

When installing LSF01, the fork surface should be in the same direction as the liquid lifting or flowing, which can avoid the measurement error caused by the resistance of the medium to the fork body, as shown in Figure 2.

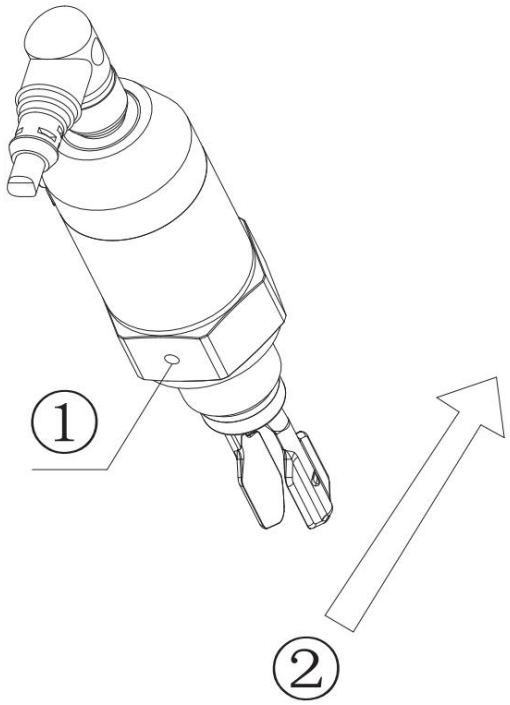


Figure 2 Medium flow direction

① Sign point of threaded connection ② medium flow direction

3.4 Avoid the inlet

LSF01 installation location should be selected to avoid measurement errors caused by installation in the inlet position, and even the instrument, as shown in Figure 3.

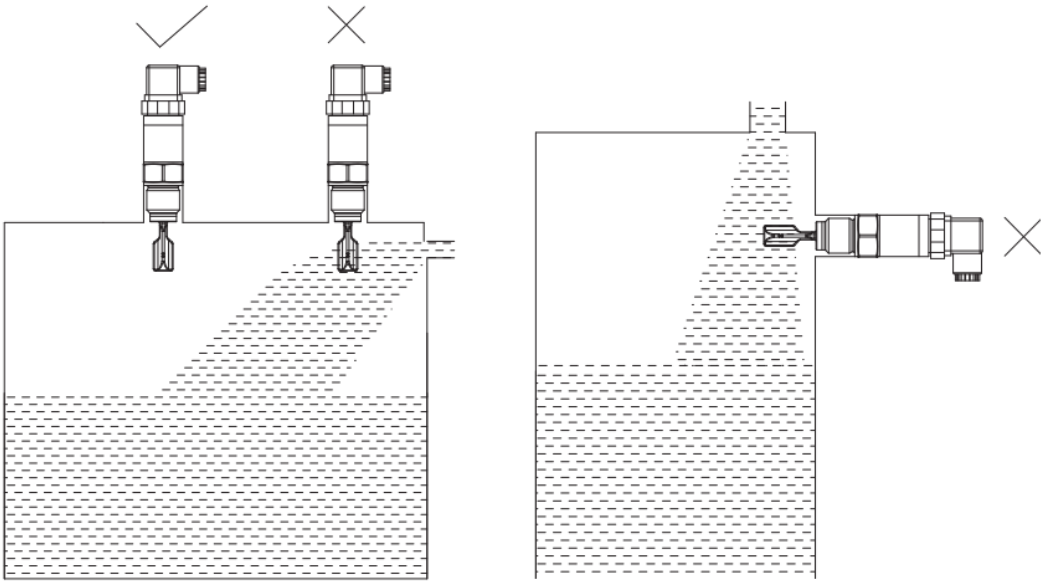


FIG. 3 Installation diagram to avoid the inlet

3.5 Pressure/Vacuum

For over-pressurized or under-pressurized containers or pipes, the sealing integrity of the process joints must be ensured. Before installation, ensure that the sealing material meets the requirements of the field process temperature and process pressure.

3.6 Moisture Resistance

As shown in Figure 4, when the meter is installed outdoors or in a humid environment, if it rains or there is condensation, rain and condensate will flow down with it, so before connecting the cable, please bend the cable and lead it downward to prevent moisture from entering the meter.

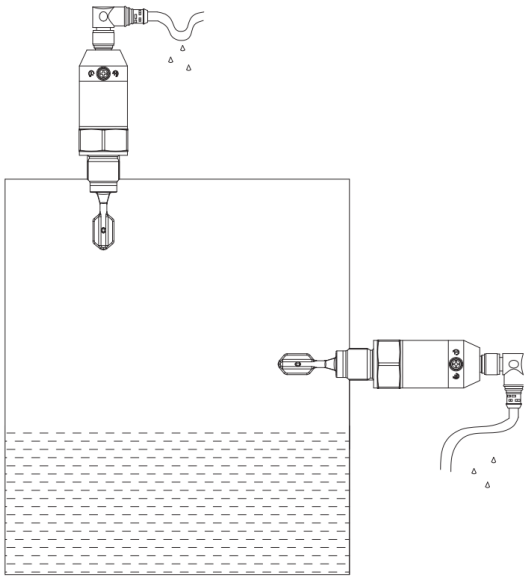


Figure 4 Moisture-proof installation

4. Wiring

4.1 Safety Tips

From a safety point of view, wiring can only be performed in the case of power failure.

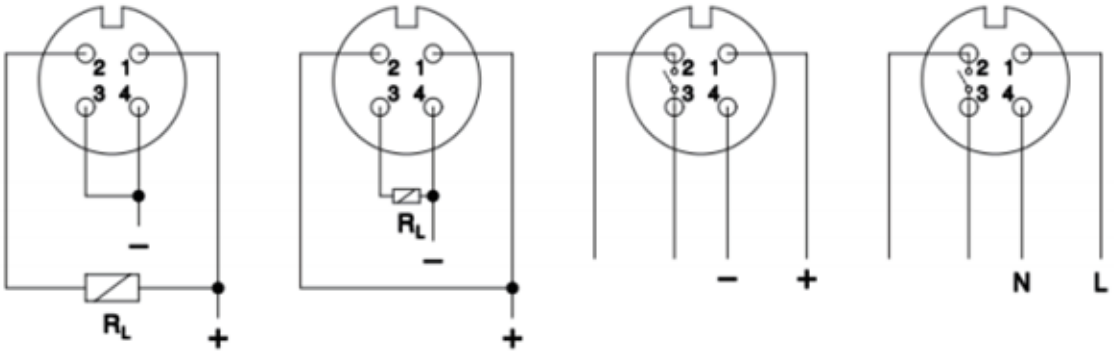
4.2 Security Tips

The cables of LSF01 are generally general-purpose cables with circular cross sections. The cross-sectional diameter of the valve type cable is 4.5~8mm, otherwise the sealing effect of the cable entrance cannot be ensured.
If you need to use cables of other specifications, use matching cable inlet bolts and pay attention to the sealing performance of the replaced cable inlet.

4.3 Wiring Diagram

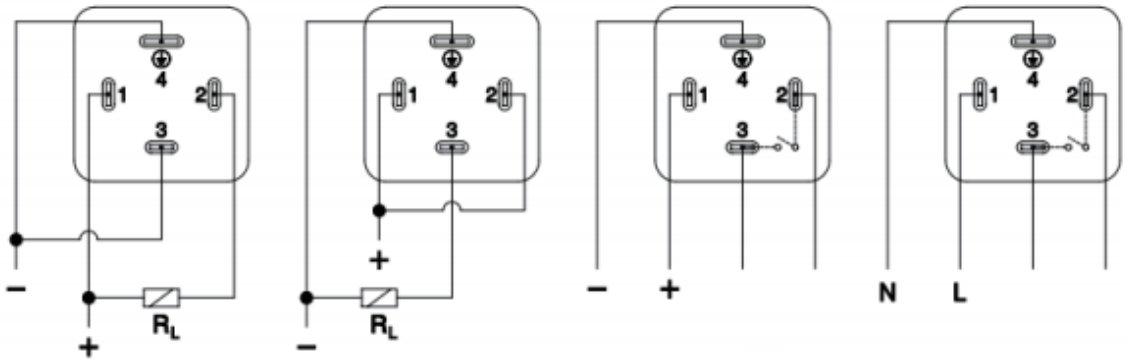
Connect cables securely according to the following diagram.

Figure 5, 6, 7, 8 are the wiring diagrams of the M12×1 connection mode.



DC NPN Figure 5 | DC PNP Figure 6 | DC Relay Figure 7 | AC Relay Figure 8

FIG. 9, 10, 11 and 12 are the wiring diagrams of the solenoid valve joint connection.



DC NPN Figure 9 | DC PNP Figure 10 | DC Relay Figure 11 | AC Relay Figure 12

Instructions:

(1) RL is the load resistance (contactor, relay, etc.)

(2) The cable of M12×1 connection does not belong to the standard accessories shipped by our company, if necessary, please pay attention to matching.

The colors of M12x1 cables correspond to brown-1, white-2, blue-3, and black-4 terminals. Please note identification when connecting.

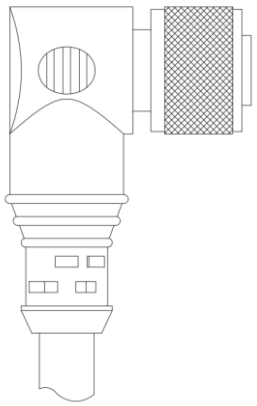


Figure 13 Cable fittings for connection mode

5. Debugging

5.1 Converting high-Low Bit Mode

For the two limit alarm functions of overflow protection and anti-dry operation, the high and low position mode of the instrument should be adjusted according to the actual requirements of the field (H/L) switch, and finally reach the signal output state required by the customer.

High and low debugging steps:
(1) Use a screwdriver to unscrew and remove the screws of the housing part (see Figure 14), and the electronic potentiometer inside can be seen;
(2) Rotate the electronic potentiometer gently clockwise with a flat-head screwdriver to the end, then the instrument is in high mode (see Figure 15);
(3) Gently turn the electronic potentiometer counterclockwise with a flat-head screwdriver to the end, then the instrument is in low mode (see Figure 15) :
(4) After debugging the high and low position mode, please tighten the screws of the housing part and power on again (see Figure 16).

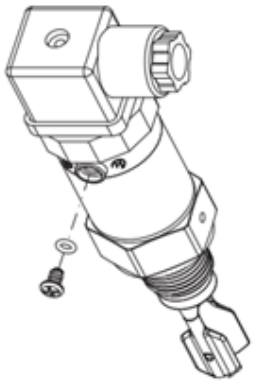


Figure 14


Figure 15

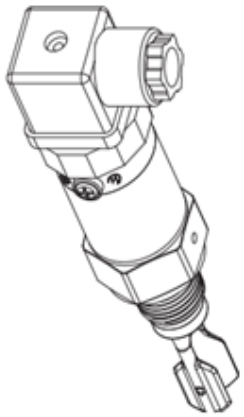


Figure 16

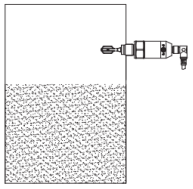
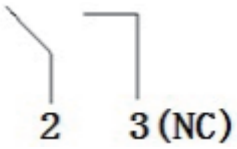
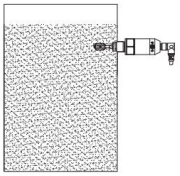
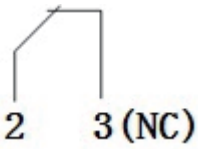
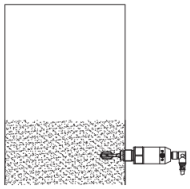
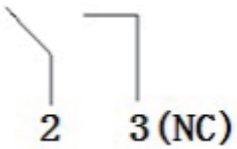
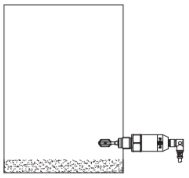
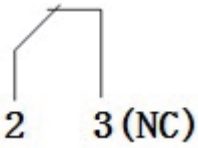
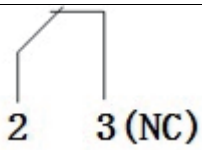
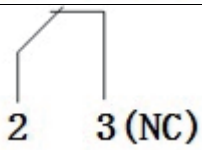
5.2 Indicators

An indicator to show the status of the switch
Green = Normal operating status
Red = Alarm status
Blinking red: The system is faulty

5.3 Signal Output function table

This product is equipped with a single pole single throw (SPST) relay switch.
Table 1 lists the signal output state in the height and low mode corresponding to the relay output mode after the instrument is powered on in the relay normally closed (NC) mode.

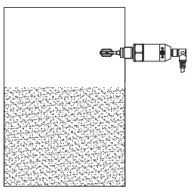
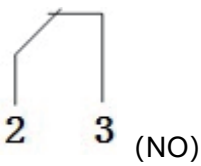
Table 1 Output mode of relay in normally closed (NC) mode

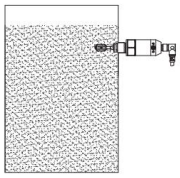
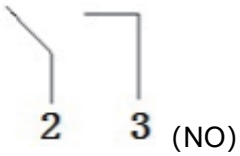
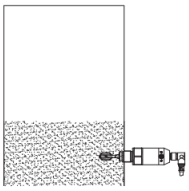
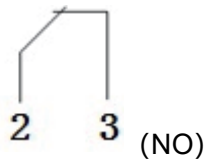
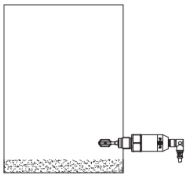
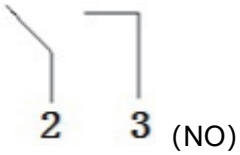
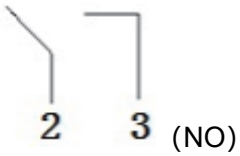
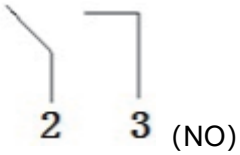
Operation mode	**Installation position**	**Relay status**	**Pilot lamp**
High mode (H) overflow protection			green.
High mode (H) overflow protection			red.
Low mode (L) dry operation protection			green.
Low mode (L) dry operation protection			red.
breakdown	Arbitrary position		Red flicker
outage	Arbitrary position		Extinguish

Note: The figure above is the default state of the meter after power-on in the relay normally closed (NC) mode, where 2 is the common point and 3 is the normally closed contact. Customers can customize the normally open or normally closed mode according to their specific needs.

Table 2 lists the signal output state in the height and low mode corresponding to the relay output mode after the meter is powered on.

Table 2 Output state of the relay in normally open (NO) mode

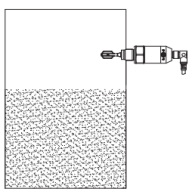
Operation mode	**Installation position**	**Relay status**	**Pilot lamp**
High mode (H), overflow protection			Green

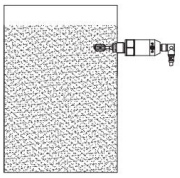
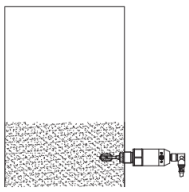
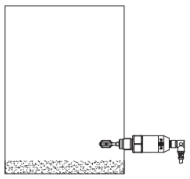
High mode (H), overflow protection			red
Low mode (L), dry operation protection			Green
Low mode (L), dry operation protection			Red
breakdown	Arbitrary position		Red flicker
Failure/power outage	Arbitrary position		Extinguish

Note: The figure above is the default state of the meter after power-on in the relay normally open (NO) mode, where 2 is the common point and 3 is the normally open contact. Customers can customize the normally open or normally closed mode according to their specific needs.

Table 3 lists the signal output state of the NPN/PNP output mode in the corresponding height and low mode after the instrument is powered on.

Table 3 NPN/PNP output status

Operation mode	**Installation position**	**NPN status**	**PNP status**	**Pilot lamp**
High mode (H), overflow protection		turn-on	turn-on	green.

High mode (H), overflow protection		disconnect	disconnect	red.
Low mode (L), dry operation protection		turn-on	turn-on	green.
Low mode (L), dry operation protection		disconnect	disconnect	red.
breakdown	Arbitrary position	disconnect	disconnect	Red flicker
power outage	Arbitrary position	disconnect	disconnect	Extinguish

Safety tip: During the test, please do not hold the fork body to test the function of LSF01, which may cause the fork body deformation or even damage.

6. Failure and maintenance

6.1 Fault Analysis

It is the responsibility of the equipment user to take appropriate measures to eliminate the occurrence of fault phenomena.

The LSF01 is of high quality and reliability, however, some failures may occur during operation. Possible faults mainly occur in the following areas:

Electronic components

Power supply

Installation position

Vibrate fork

When there is a fault problem, the output signal can be checked first. In many cases, the cause of the fault can be detected by the output signal and the corresponding fault phenomenon can be dealt with.

Table 4 General failure analysis table

Fault type	Cause analysis	Fault handling
Green light off	Operating voltage is too low	Check operating voltage
	Electronic component damage	Please replace the meter.
	outage	Check the power supply and cable connections
Indicator outlet Blinking red	Fork failure	Check whether the fork is damaged or severely corroded
	Other components of	Replace the meter or send it back for

	the instrument are damaged	repair

Depending on the cause of the failure and the actions taken, the described steps should be completed again as described in the "Debugging" chapter if necessary.

6.2 Instrument Maintenance

The services we provide to our customers include technical consultation, user training, on-site installation and commissioning, product replacement and repair, and on-site technical support. The warranty period of the product is one year, the warranty period for you free maintenance, long-term technical support, in use if you need to consult can call us, we will be happy to serve you.

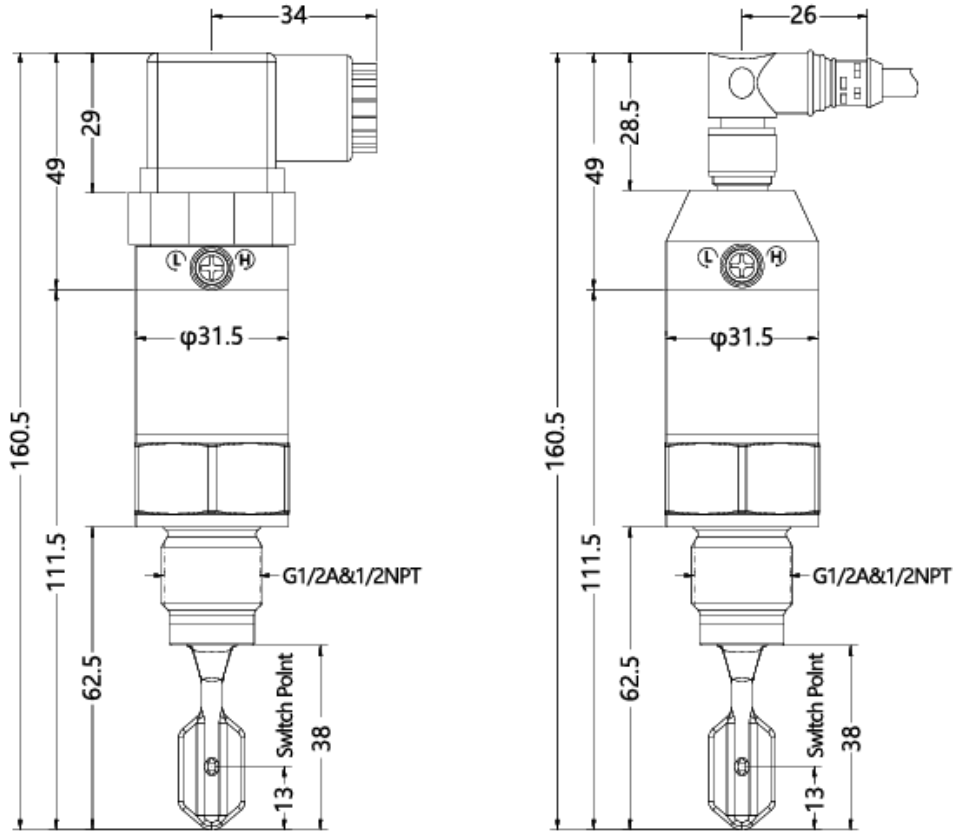
7. Technical parameters

Case: Plastic PC
Process connection: Thread 316L
Probe and pipe: fork 316L
Surface finish degree
Standard type: 3μm
Sanitary type: < 0.8μm; < 0.3μm
Meter weight: 250g
Measurement frequency: about 1100Hz
Environmental condition
Ambient temperature on the shell: -40~70℃
Storage and transportation temperature: -40~80℃
Process condition
Process pressure: -1~40bar
Process temperature (normal temperature type) : -50~100℃
Process temperature (high temperature type) : -50~150℃
Sensitivity (minimum measurement density)
Density: > 0.7g/cm³
High-low conversion mode
High: Overflow protection
Low: Dry operation protection
Switching delay
Contact material: 0.5s
No material: 1s
Measurement accuracy
Measurement deviation: ±1mm
Delay: 3.0±0.5mm
Repeatability: 0.1mm
Output mode
Relay rated load: AC125V 0.5A; DC 24V 1A
NPN/PNP: load current < 300mA; Voltage drop < 1.6V
Operating voltage
Relay: 85~253VAC/10~35VDC
NPN/PNP : 10~35VDC
Electrical protection measure
Class of protection
M12× 1 : IP66/67
Valve connection head: IP65

8. size drawing

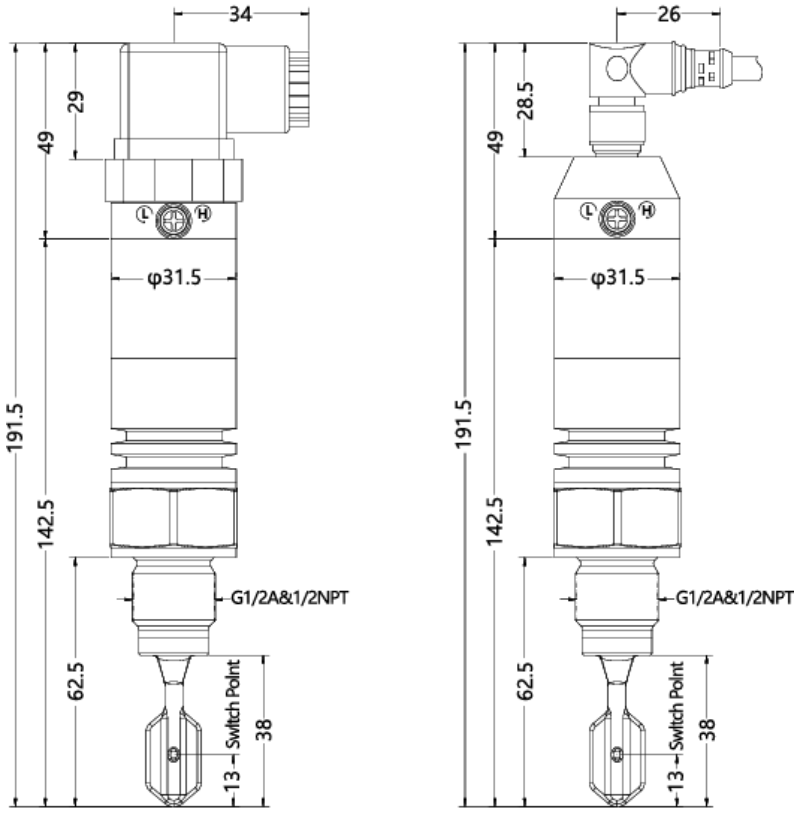
LSF01- room temperature - Thread

Solenoid valve joint connection method M12×1



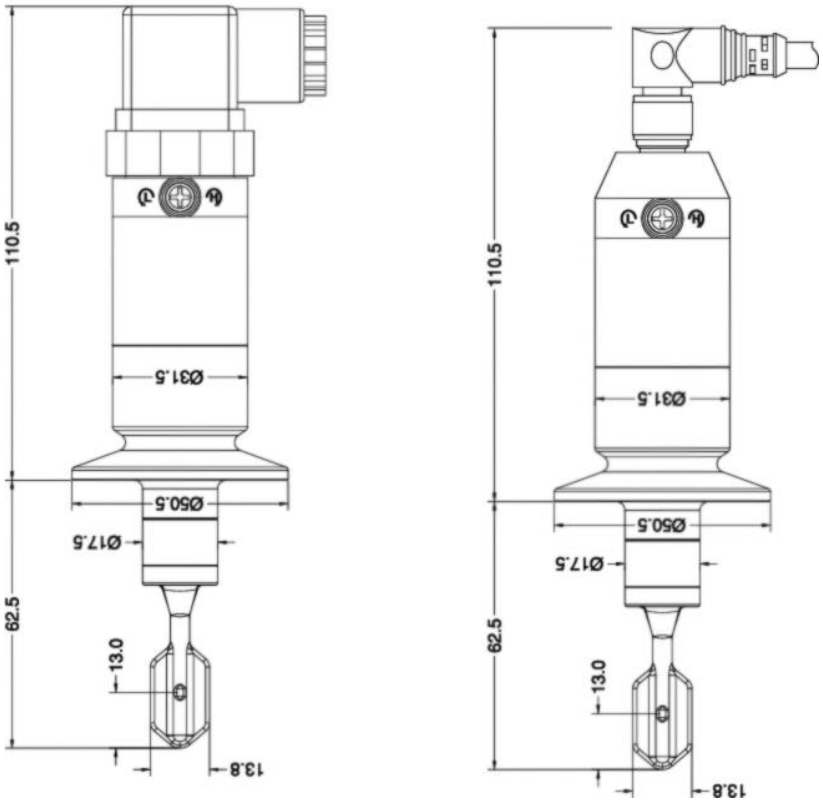
LSF01- High temperature – Thread

Solenoid valve joint connection method M12×1



LSF01- Room temperature - Clamp 1"

Solenoid valve joint connection M12×1



9.Storage and transportation

9.1 Packaging

The meter you purchase will be protected by packaging materials in transit.

Standard meters are packaged in cartons, which do not harm the environment and can be reused. The protection of the fork can be provided with an additional cover made of cardboard. For special forms, PE foam or PE film is also used for protection. Please ask a professional recycling company to recycle the packaging materials.

9.2 Transportation

The instructions on the shipping package should be followed, otherwise the instrument will be damaged.

Upon receipt of the goods, please check the packaging for integrity and possible shipping damage. If there is damage or hidden defects found in the transportation process, the information should be timely feedback.

9.3 Storage

The following conditions should be followed when storing packaged objects:

(1) Avoid open storage

(2) Avoid storage in places with damp and large dust

(3) Avoid contact with corrosive media

(4) Avoid strong exposure to sunlight

(5) Avoid mechanical vibration

(6)storage environment

(7) Relative air humidity: 20 ~ 85%

Storage temperature: -40~80℃

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