# LZYN Mass Flowmeter
# Instruction Manual

Version 1.0 March 2009


**The LZYN series mass flowmeter is developed and manufactured by our company. This manual introduces its mechanical structure, working principle, main specifications, application scope and precautions when operation. Please totally read through the manual before attempt to install and/or operate. For more details about the product, please contact our company and/or the local agents around the world.**

**The transmitter has explosion-proof certified. Please do not to attempt to do anything for it (such as replace parts and components) without authorization for the safety reasons.**

**When maintenance, the main power supply must be turned off at first; when open up the explosion-proof enclosure, be careful to protect the explosion-proof surface well; when installation, be sure that no damage for the ex-proof enclosure, good cable connection, no metal washer, sealed rubber gasket and tightened nut for maintaining the ex-proof function.**

# 1. General

## 1.1 Introduction

LZYN series mass flowmeter (hereafter we call LZYN) is designed based on the Coriolis Principle. It can be widely applied for the process detecting and custody transfer unit in industries such as petroleum, chemical, pharmacy, pulp & paper, food & energy, and so on. As a fairly advanced kind of flow measurement instrument, it has been paid much attention by the world since twenty years.

## 1.2 Principle

LZYN is designed according to the principle of Coriolis force. Under the alternating current effect, the magnet and coil installed on the measuring tube will make two parallel measuring tubes vibrate under some fixed frequency. Once there is flow passing through the tubes, Coriolis force will give rise to deflection (phase shift) on the vibration of two tubes and the deflection of vibration is directly proportional to the mass flow of the fluid. Pick up the deflection of phase and then the mass flowrate can be calculated.
The vibration frequency of measuring tube is determined by the total mass and the fluid inside the tube. When the fluid density changes, the vibration frequency of measuring tube will also change, as a result, the fluid density can be calculated.
The temperature sensor installed outside of the measuring tubes can detect the fluid temperature on time under the coordination of measuring circuit.

## 1.3 Feature

Comparing with the traditional flow measurement method, LZYN has the following obvious merits:
**1.3.1.** Enable to measure directly mass flow rate of fluid in the pipeline without changing any parameters, which avoids the some measurement error of intermediate links. Its mass flowrate can be high accuracy and good repeatability within bigger range of turndown ratio.
**1.3.2.** Ideal for most liquids, such as the common viscosity fluid, the high viscosity fluid, non-Newtonian fluid, slurry containing some suspended solids and/or aeration.
**1.3.3.** Due to the small vibration for the measuring tube, LZYN can be regarded as no moving parts, which can reduce maintenance, enhance stability and extend lifetime.
**1.3.4.** Besides the mass flow measurement, the density and temperature can also be picked up for measurement purpose.

# 2. Technical specification

## 2.1 Main technical specification

### 2.1.1 Sensor specification

Sensor and flow range relationship (only for liquid) -see Table 1

| DN(mm) | Allowable Flow Range (kg/h) | Normal Flow Range for Accuracy 0.1% (kg/h) | Normal Flow Range for Accuracy 0.2% & 0.5% (kg/h) | Stability of Zero Point(kg/h) |
|---|---|---|---|---|
| 10 | 20～1000 | 180～900 | 80～1000 | 0.200 |
| 15 | 40～2000 | 350～1800 | 150～2000 | 0.400 |
| 20 | 80～4000 | 700～3500 | 400～4000 | 0.800 |
| 25 | 120～6000 | 1000～5500 | 600～6000 | 1.200 |
| 40 | 600～30000 | 5000～27000 | 3000～30000 | 6.000 |
| 50 | 1000～50000 | 8000～45000 | 5000～50000 | 10.00 |
| 80 | 2400～120000 | 16000～90000 | 12000～120000 | 24.00 |
| 100 | 4000～200000 | 32000～180000 | 20000～200000 | 40.00 |
| 150 | 10000～660000 | 80000～440000 | 50000～500000 | 100.0 |
| 200 | 20000～1200000 | 200000～900000 | 80000～1000000 | 200.0 |

### 2.1.2 Mass flow measurement

**2.1.2.1** Flow range (see Table 1)

**2.1.2.2** Conversion of basic error for mass flow (see Table 2)

0.1%

$$\pm 0.1\% \pm \left(\frac{StabilityofZeroPo\,\mathrm{int}}{Ins\,\tan\tan\,eousFlow} \times 100\%\right)$$

0.2%

$$\pm 0.2\% \pm \left(\frac{StabilityofZeroPo\,\mathrm{int}}{Ins\,\tan\tan\,eousFlow} \times 100\%\right)$$

0.5%

$$\pm 0.5\% \pm \left(\frac{StabilityofZeroPo\,\mathrm{int}}{Ins\,\tan\tan\,eousFlow} \times 100\%\right)$$

Accuracy is calculated based on the water measurement under the condition of +20℃～25℃ and 0.1MPa～0.2MPa.

**2.1.2.3** Repeatability (see Table 3)

| Accuracy | 0.1% | 0.2% | 0.5% |
|---|---|---|---|
| Repeatability | ±0.05% | ±0.1% | ±0.25% |

Accuracy is calculated based on the water measurement under the condition of +20℃～25℃ and 0.1MPa～0.2MPa.

**2.1.3** Density measurement (see Table 4A)

| | |
|---|---|
| Density Range | （0.2～2.0）g/cm$^3$ |
| Basic Error | ±0.002g/cm$^3$ （Affected by the sensor） |
| Repeatability | 0.001g/cm$^3$ |

**2.1.4** Temperature measurement (see Table 4B)

| | | |
|---|---|---|
| Temperature Range | （-50～+125）℃ | Integrated Type |
| | （-50～+200）℃ | Remote type |
| | （-50～+350）℃ | High Temperature Remote type |
| Basic Error | ≤±1.0℃ | |

## **2.2** Specification of function

**2.2.1** Current output (see Table 5)

4-20mA current output can be configured as mass flow or volume flow.

| | |
|---|---|
| Output Range | (4～20)mA |
| Resolving Power | 0.000244mA |
| Basic Error | 0.2%F.S |
| Temperature Influence | ±0.005%F.S/℃ |
| External resistor should be 250～600Ω | |

**2.2.2** Pulse output (see Table 6)

Positive pulse output can be configured as mass flow or volume flow.

| | |
|---|---|
| Output Range | (0～10)kHz |
| Resolving Power | 0.152Hz |
| Basic Error | ±0.075% |
| Temperature Influence | ±0.001%F.S/℃ |
| Capability of Outrange is 12kHz | |

**2.2.3** Low flow cut-off

When the flow rate value measured is lower than the value of Low Flow Cut-off, the LZYN will output zero flow and the totalizer will stop accumulation. The value of Low Flow Cut-off is usually set to be 1% of the maximum flowrate.

## **2.3** Environment requirement

**2.3.1** Environment vibration (see Table 7)

| | |
|---|---|
| Frequency Range | (10～2000)Hz |
| Acceleration amplitude value | 2g |
| Circulation time | 50 times |

**2.3.2** Environment temperature (see Table 8)

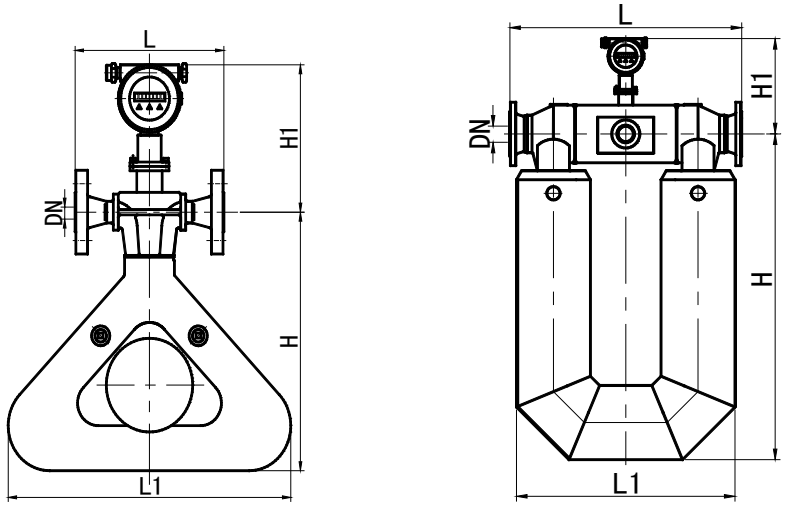
| | |
|---|---|
| Working Temperature | (-20～+55)℃ |
| Storage Temperature | (-20～+70)℃ |

**2.3.3** Environment humidity (see Table 9)

| | | |
|---|---|---|
| Working Humidity | ＜90% | +25℃ No condensation |
| Storage Humidity | ＜95% | |

**2.3.4** Housing protection: IP65

## **2.4** Outline dimension (see Table 10)




| LZYN | DN | L | L1 | H | H1 |
|---|---|---|---|---|---|
| 10 | 10 | 180 | 350 | 290 | 260 |
| 15 | 15 | 180 | 350 | 290 | 260 |
| 20 | 20 | 200 | 450 | 400 | 290 |
| 25 | 25 | 200 | 450 | 400 | 390 |
| 40 | 40 | 520 | 470 | 660 | 280 |
| 50 | 50 | 558 | 550 | 750 | 290 |
| 80 | 80 | 780 | 710 | 1040 | 320 |
| 100 | 100 | 920 | 860 | 1290 | 350 |
| 150 | 150 | 1100 | 1050 | 1600 | 380 |
| 200 | 200 | 1365 | 1150 | 1700 | 420 |

## **2.5** Ordering information

LZYN — □□□ □ □ □ □ □ □ □ □ □ □ □

0 1 2 3 4 5 6 7 8 9 10 11

Note:

0— LZYN series mass flowmeter

1— Nominal size(mm)

2— Structure: 1—Integrate Type 2—Remote type

3— Sensor: P—General Type C—Explosion-proof Type (Details shown in the following) (see Table 11)

| Model | | Explosion-proof Grade |
|---|---|---|
| Integrate Type | LZYN-010～200 | Exdib Ⅱ CT4～T6（Ⅱ C just includes $H_2$） |
| Remote type | LZYN-010～080 | Ex ib Ⅱ CT3～T6（Ⅱ C just includes $H_2$） |
| | LZYN-100～200 | Exdib Ⅱ CT3～T6（Ⅱ C just includes $H_2$） |

4— Transmitter: A—Standard type B—Explosion-proof type Exd[ib] Ⅱ CT6 (Ⅱ C just includes $H_2$)

5— Fluid: Q—Gas Y —Liquid

6— Power supply: 1—24VDC 2—240VAC

7— Output interface: S—RS485 N—No

8— Nominal pressure (MPa)：1—1.6 2—2.5 3—4.0 4—6.4

9— Working temperature rating(℃):1—-50～+125 2— -50～+200 3—-50～+350

10— Signal output: F—Pulse output I—(4～20)mA

11— Accuracy: A—0.1% B—0.2% C—0.5%

For example: **LZYN-080 2 C B Y 1 S 2 2 I B**

Meaning: LZYN series mass flowmeter, DN80mm, Remote type, Sensor of ExdibⅡCT3～T6 (ⅡC just includes $H_2$), Transmitter of Exd［ib］ⅡCT6 (ⅡC just includes $H_{2)}$, liquid, 24VDC, RS485 interface, 2.5MPa, -50～+200℃, 4～20mA current output, 0.2% accuracy

# 3. Introduction

## 3.1 About this manual

This manual mainly introduces the installation, connection, startup, operation, and trouble-shooting for the LZYN. Users must read this manual carefully before attempt to operate it, since improper installation may cause incorrect measurement, meter damage and even person injuries.

## 3.2 Safety

**3.2.1** For the dangerous area application, please make sure that the explosion-proof performance of the flowmeter can comply with the local environmental requirements.

**3.2.2** Please make sure that the power must turn off when attempt to assemble a transmitter.

**3.2.3** Please refer to the manual for normal installation and operation for the flowmeter.

## 3.3 Components

A LZYN is made up of sensor and transmitter, which can be installed integrally or remotely. When a LZYN is installed remotely, sensor and transmitter are connected through special Nine-wire Cable.

## 3.4 Installation procedures

**3.4.1 Location:** Determine the installation spot for the sensor, and also consider the installation space, straight pipeline requirements, and transmitter & valve positions for a whole

**3.4.2 Direction:** Determine the installation direction of sensor in the pipeline

**3.4.3 Installation:** Install LZYN in the pipeline (for integral type)

**3.4.4 Connection:** When LZYN is installed remotely; sensor and transmitter is connected through special Nine-wire cable

**3.4.5 Start-up**

# 4. Installation

## 4.1 Position selection

**4.1.1** The sensor must be far away from interference source which may cause pipe's mechanical vibration such as the pump along the process pipeline. If sensors are installed along the same line, to avoid the mutual influence between each other, the internal distance must at least three times its width.

**4.1.2** When installation, pay attention to the expansion and contraction of the process pipeline due to temperature change. It is strongly recommended that the sensor should not be installed near the expansion joint of the process pipeline. Otherwise, the pipe expansion and contraction will bring about transverse stress which can affect the sensor

zero point stability.

**4.1.3** Sensor should be placed far away from industrial electromagnetic interference sources such as large power motors and transformers, otherwise, the measuring tube's auto-oscillation inside the sensor will be interfered, and the weak signal detected by the speed sensor may be drowned by the electromagnetic noise. Therefore, the sensor should be away from such sources as motors and transformers, at least five meters.

**4.1.4** Sensor should be placed in the lowest point of the pipeline for liquid measurement, let its measuring tubes are always filled with liquids.

**4.1.5** Basic requirement: Install the LZYN in the lowest position of the pipeline so that the liquid can fill with the sensor during the process of zero point calibration and running. The transmitter should be installed in the environment with temperature from -20～+55℃ and humidity <90%.

**4.1.6** Dangerous area: Please confirm if the installation environment is suitable to the explosion-proof performance, which is indicated in the nameplate of LZYN.

**4.1.7** Straight pipe: LZYN does not require the special straight pipe upstream or downstream. However, if more than two mass flow transmitters are installed along the same pipeline, make sure the length of pipe between any two sets is more than 2 meters.

**4.1.8** Maximum length of cable: (see Table 12)

| Cable Model | Cable Specification | Max. Length |
|---|---|---|
| Special Nine-Wire Cable | Special | 300m |

**4.1.9** Working temperature of sensor: (see Table 13)

| | |
|---|---|
| Integral type | (-50～+125)℃ |
| Remote type | (-50～+200)℃ |
| High temperature Remote type | (-50～+350)℃ |

**4.1.10** Valves: It is necessary to carry out zeroing once a LZYN installation is finished. First to close the downstream stop valve and then close the upstream stop valve before zeroing.

## **4.2** Direction

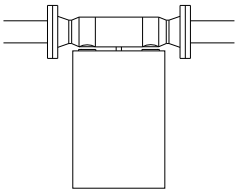
**4.2.1** Basic requirement:

A LZYN works well only when the liquid fills with the measuring tube. In principle, as long as the measuring tube is full of liquid, the LZYN will function in any orientation installation. Generally speaking, A LZYN is installed in the orientation which makes the liquid full of the measuring tube.

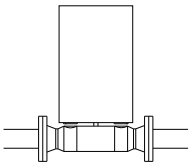
For the horizontal installation, the measuring tube should be installed underside the

pipeline when the process fluid is liquid or slurry (see Picture 1) and topside the pipeline when the fluid is gas (see Picture 2). For the vertical installation, the measuring tube should be installed besides the pipeline when the process fluid is liquid or slurry or gas (shown in Picture 3).

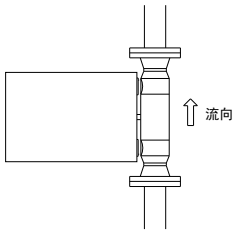
**Picture 1**



**Picture 2**



**Picture 3**

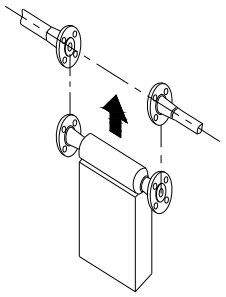



**4.2.2** Flow direction:

There is obvious flow arrow which indicates the proper flow direction on the front side of the sensor, so install the LZYN according to it. Otherwise, the transmitter may not display the mass flow normally.

For vertical installation, if the fluid is liquid or slurry, the flow direction is down-to-up; if the fluid is gas, the flow direction can be either down-to-up or up-to-down. The transmitter can be mounted with 90° revolution according to the requirement of installation.

## **4.3** Sensor installation



**4.3.1** Basic requirements:

The LZYN installation should decrease the tortuosity of the process connection. Meanwhile, do not support the pipeline by using LZYN sensor (see Picture 4).

**4.3.2** Installation of the LZYN-150 sensor:

It is better support the DN150 sensor by using rubber connector as the buffer.

## **4.4** Wiring

**4.4.1** Basic requirements

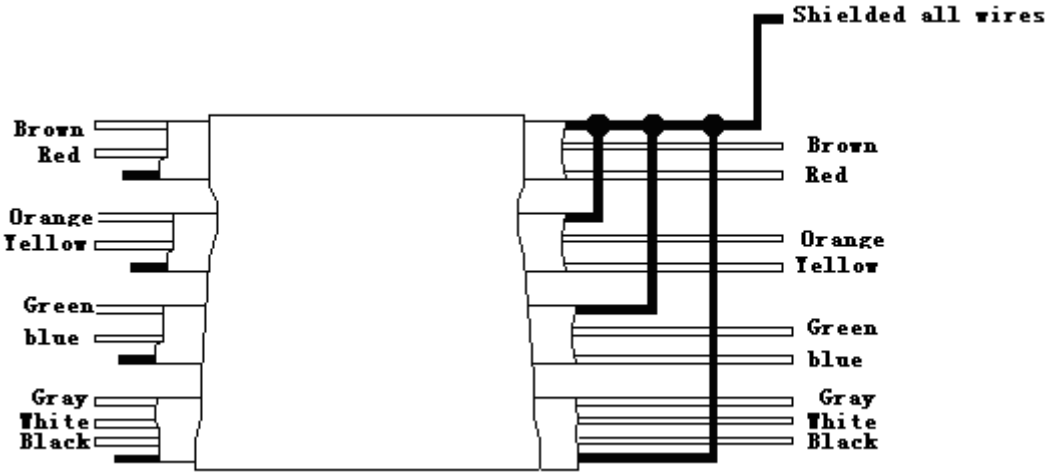
For the LZYN integral type (sensor is installed integrally with transmitter), power connection inside the transmitter is complete. For the LYZN remote type (sensor is installed remotely with transmitter), the connection for transmitter and sensor through a special nine-wire cable is required. If the LZYN-150 (DN150mm) is installed, the booster of sensor is supplied with power connection.

**4.4.2** Junction box

For the LYZN remote type, sensor and transmitter have their own junction boxes used for connecting the special nine-wire cable.

**4.4.3** Cable connection

For the LYZN remote type, the special nine-wire cable is used as signal connection.




**Caution**

**Cut off power before connecting cables. The power voltage must match that indicated in the junction box of the transmitter and the earth connector must be well done using earth wire to ensure its intrinsic safety function.**

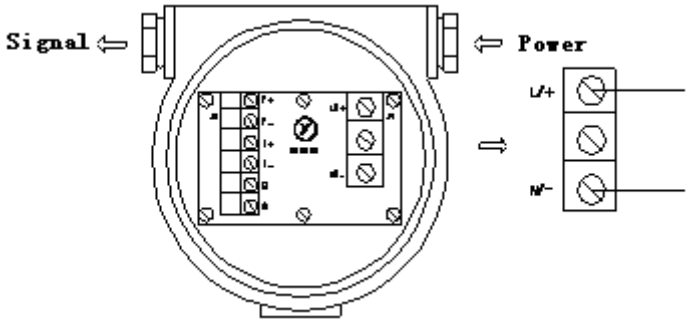
| Line NO. | Line Color | Function |
|---|---|---|
| 1 | brown | The left coil+ |
| 2 | red | The left coil- |
| 3 | orange | The left coil+ |
| 4 | yellow | The left coil- |
| 5 | green | Driving coil+ |
| 6 | blue | Driving coil- |
| 7 | gray | Temperature+ |
| 8 | white | Temperature- |
| 9 | black | Temperature Compensation |

**4.4.4** Earthing

Both sensor and transmitter have to be earthed correctly, otherwise the measurement error will occur and even the LZYN can not work. If the pipeline is connected with the ground, the transmitter can be earthed through the pipeline. If the pipeline is not connected with the ground, the transmitter should be earthed independently.

**4.4.5** Power wiring

Transmitter can be supplied with 240VAC or 24VDC. The power line is more than 0.8mm$^2$ and the maximum length of power line should be 300m. For transmitter of LZYN-150, a signal booster is required to supply with 240VAC.




## **4.5** Start-up

**4.5.1** Zeroing

Zeroing supplies the base point for the flowmeter. After the first installation or reinstallation, Zeroing is required for the LZYN. Before zeroing, close the downstream valve of the flow sensor to make sure that no fluid is passing through the pipe. The sensor must be full of with the fluid which temperature change range should not exceed ±10℃. If fluid is still passing through the pipe (even it is quite low) when the flow meter is under zeroing, it is strongly required to stop zeroing and then or re-zero the meter before officially use it.

**4.5.2** Instrument coefficient

Each set of LZYN has its own instrument coefficients, which have been set before delivery and shown on the calibration sheet. Users do not need to setup instrument coefficients in case when replacing either sensor or transmitter. All the coefficients on the calibration sheet are also typed on the nameplate. Generally, sensor and transmitter are used as a couple on site and coefficients have already been setup into the transmitter. So when the meter being put into use for the first time, user should do not do anything for instrument coefficients.

# **5. Power supply and signal output wiring**

## **5.1** Power wiring

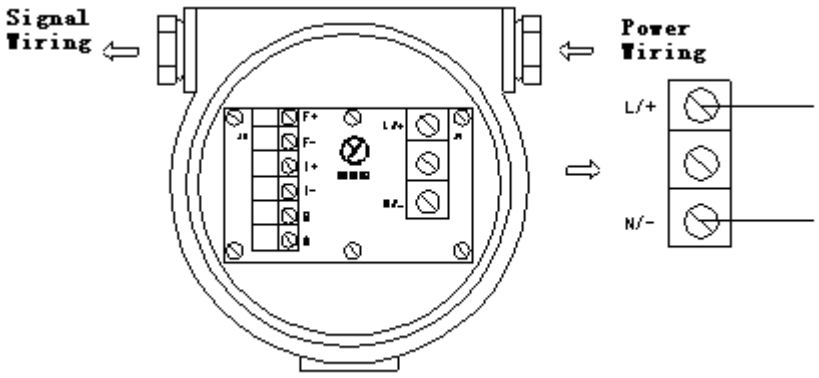
**5.1.1** The basic requirement:

The transmitter can be powered by either 240VAC or 24VDC.

| | |
|---|---|
| 85 to 265 VAC | Power Consumption: Normal 10 W, MAX 15W |
| 18 to 30 VDC | Power Consumption: Normal 10 W, MAX 15W |

**5.1.2** Power Cable

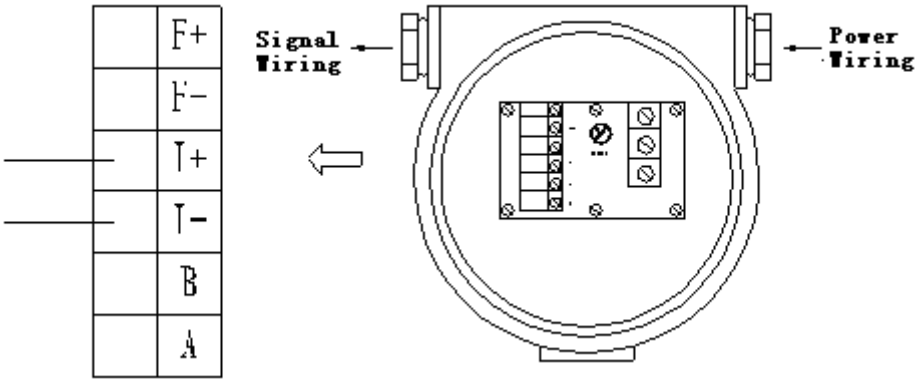
The power line can be 2-wire cable with area of each wire >0.8 square millimeters. The maximum length is 300m.




## **5.2** Current output wiring

**5.2.1** 4~20mA passive output can be configured to mass flow or volume flow.

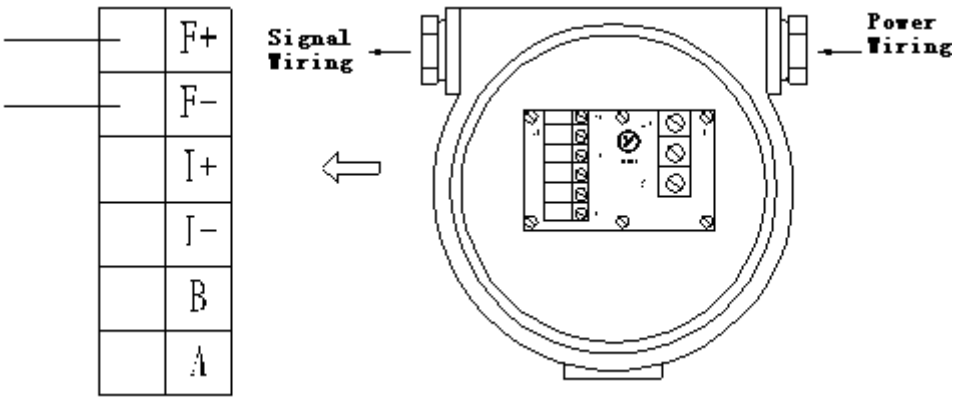
**5.2.2** The cable can be 2-wire cable with area of each wire > 0.5 square millimeters.




## **5.3** Pulse output wiring

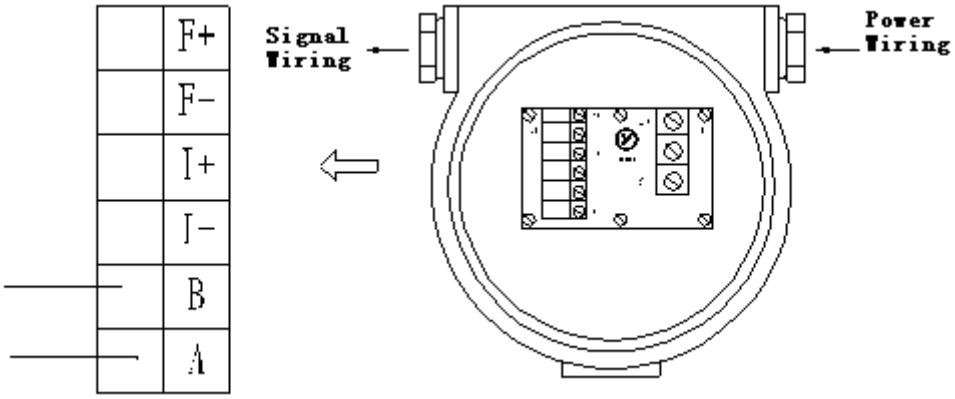
**5.3.1** Positive pulse output can be configured to mass flow or volume flow.

**5.3.2** The cable can be 2-wire cable with area of each wire > 0.5 square millimeters. The maximum length of output line is 150m.



## **5.4** RS485 output wiring

RS485 output complies with MODBUS protocol. The maximum length of output line is ≤300m.




# 6 Configuration

## **6.1** General

Please configure the transmitter via the operation panel: basic parameter setups, zeroing, low flow cutoff and so on.

## **6.2** Configuration

Please review or set the configuration parameters according to the following indications (press ↓ to turn a page and press → to move the position of cursor or return):

### **6.2.1** Measurement unit

Configuration → E → Flow setting → E → Mass Unit or Mass Flow Unit or Volume Unit or Volume Flow Unit or Density Unit → E → set their values.

### **6.2.2** Low flow cut-off

Configuration → E → Flow setting → E → Zero-Calibration → ↓ → Low Flow Cutoff → (change the number among 0～9) → E → → → Yes → E → confirm the modification of low flow cutoff is successful.

### **6.2.3** Reset totalizer

Configuration → Press E to enter → ↓ → Reset Totalizer → E → Input password to reset state to zero.

### **6.2.4** Current output

Configuration → Press E to enter → ↓ → 4mA Value and 20mA Value → E → Input password to set their values.

### **6.2.5** Pulse output

Configuration → Press E to enter → ↓ → Pulse Equivalent → E → Input password to set

its value.

### **6.2.6** RS485 output

Configuration → Press E to enter → ↓ → Baud Rate → E → Input password to set its value.

**Note: Default password: "000000"**

## **6.3** Calibration

Generally the LZYN does not need recalibration on site because it has been in making at the factory before delivery.

Each LZYN has its own instrumental coefficient, including one flow coefficient and four density coefficients (high density D1, high period K1, low density D2 and low period K2), which will be shown on nameplate of the sensor or on the Calibration Sheet.

Sensor and transmitter are usually delivered together as a flowmeter. The instrumental coefficients have already been setup into the transmitter at the factory so that the user does not need to re-setup any more.

### **6.3.1** Zeroing

Zeroing is very important to maintain high accuracy flow measurement. It is necessary to carry out zeroing when the LZYN being put into use for the first time or re-installed on the pipeline for the second time.

After complete the installation, power on the LZYN at least 30 minutes for warm-up and then make the fluid pass through the flowmeter until the temperature of LZYN is same as working temperature of fluid. After that, close the downstream valve, make the fluid pass through the flowmeter under normal temperature, density and pressure and then close the upstream valve to assure the sensor is full of fluid during the process of zeroing.

Finally, press ↓ → Configuration → Press E to enter → Flow Config → Zero Correction → E → Input password to start zeroing.

### **6.3.2** Flow calibration

The mass measured by the LZYN is resulted from the multiplication of detected signals' time difference between two circuits and flow calibration factor. When its real accuracy is out of the specified range after long-term service, please modify the flow calibration factor according to the following formula:

$$K1=K0\times[1+(M-Mt)/Mt]=K0\times M/Mt$$

Note:

| | |
|---|---|
| K1 | New flow calibration factor, |
| K0 | Old flow calibration factor, |
| M | Total mass flow of Master Meter, |
| Mt | Total mass flow of Tested Meter. |

# 7. Trouble shooting

## 7.1 Overview

During the first installation and operation, if flowmeter seems to be in abnormal working, generally it might be the problem of flowmeter application or the flowmeter itself. Flowmeter application is usually complex issue. It involves in the measurement error fluctuation may be caused by technology or the fluid changing. Therefore this issue needs to be analyzed case by case according to the site application. However this chapter focuses on those malfunctioned flowmeters only: how to find out the causes and solutions for users.

## 7.2 Diagnosis

For the flowmeter fault diagnosis, users can judge by the LED indicator and/or / LCD display, LED lights of different colors and brightness contrast on the panel, which represent the working status of flowmeter. Meanwhile, LCD displays can show the self-diagnostic alarming information on the transmitter, which is helpful for users' judgment and defining the malfunctions.
In addition, it is necessary to employ a digital Multi-meter to test the static resistance values for the sensor.

## 7.3 Sensor

When testing the malfunction of the flowmeter, first of all, detect the coils resistance of sensor. See Table 13 below and check if these values are within the normal range.

| Loop | Line color | Line No. | Normal resistance range |
|---|---|---|---|
| Left coil | Brown, red | 1, 2 | (60～75)Ω |
| Right coil | Orange, yellow | 3, 4 | (60～75)Ω |
| Drive coil | Blue, green | 5, 6 | (6～30)Ω |
| Temperature | Gray, white | 7, 8 | (75～175)Ω |
| Temperature | Gray, black | 7, 9 | (75～175)Ω |

## 7.4 Power connection

For the first time to power on the flowmeter, power supply checkup is necessary to consider the following elements:

- Choose the right voltage for power supply, connect the power cable correctly, open insulating layer of two ends of the cable and pinch them firmly;
- Power cable must not stay with the LZYN signal cable;
- Transmitter needs to be earthed firmly and the earth load is less than 1 Ohm (use the copper wire with area more than 2.5 $mm^2$).

## **7.5** LED Indicator

The flashing speed of LED indicator represents the working status of the flowmeter.

| **LED Indicator** | **Working Status** |
|---|---|
| Always light at beginning | Not pass the self-test |
| Always light afterward | Wrong zero-calibration |
| Light for 1/4second, dark for 3/4 second | Malfunction alarm |
| Light for 3/4second, dark for 1/4 second | Slug flow excesses |

# 8. Explosion-proof

**8.1** The explosion-proof certificates for LZYN mass flowmeter are:

| LZYN Mass Flowmeter | | Explosion-proof Grade |
|---|---|---|
| Integrate Type | LZYN-010～200 | Exdib Ⅱ CT4～T6（Ⅱ C contains hydrogen only） |
| Remote type | LZYN-010～080 | Ex ib Ⅱ CT3～T6 |
| | LZYN-100～200 | Exdib Ⅱ CT3～T6（Ⅱ C contains hydrogen only） |

**8.2** The LZYN Remote type sensor must be used with Remote type transmitter. 9-core cable is used for sensor and transmitter connection. The nine-wire line should be less than 300 meters and the bending radius of wiring installation should be more than 120mm.

**8.3** The ambient temperature range is -20 to 40℃.

**8.4** The LZYN has the earth terminal which must be earthed when put into operation.

**8.5** The user can't change the parameter setups and/or replace the standard explosion-proof parts in the sensor without permission

**8.6** The cable jacket can be divided into two kinds of Φ8.5 and Φ12 according to the inner hole of cable gasket ring while the outside diameters of cables are respectively Φ8～Φ8.5 and Φ8.5～Φ12. Please change the cable and gasket ring once aged or wear out.

**8.7** Be sure that there is no gases which erode aluminum alloy.

**8.8** Be sure that the maintenance or repair should be in safe place without flammable gases.

**8.9** The correspondences between working temperature of fluid and maximum surface temperature of flowmeter body are as follows:

| | T3 | T4 | T5 | T6 |
|---|---|---|---|---|
| Working temperature | 200℃ | 135℃ | 100℃ | 85℃ |
| Surface temperature | 195℃ | 130℃ | 95℃ | 80℃ |