

**MLT  
MAGNETOSTRICTIVE LEVEL TRANSMITTER**

**Operating Manual**

MLT-DT-JS-1008-2020(B)



## PREFACE

Thank you for choosing the products of Dandong Top Electronics Instrument (Group)-Co.,Ltd. This operation manual provides you with important information on installation, connection and commissioning as well as on maintenance, troubleshooting and storage.

Please read it carefully before installation and commissioning and keep it as part of the product near the meter for easy reading.

This manual can be downloaded by entering the version number at [www.ddtop.com](http://www.ddtop.com).

If the instructions are not followed, the protection provided by the meter may be destroyed.

### Trademark, Copyright and Restriction Instructions

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The performance specifications of the meter are effective as of the date of publication and are subject to change without notice. Dandong Top Electronics Instrument (Group)Co.,Ltd. reserves the right to modify the products described in this manual at any time without prior notice.

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Dandong Top Electronics Instrument (Group) Co.,Ltd. guarantees that all variable area flow meters have no defects in materials and manufacturing processes within one year from the date of delivery.

During the warranty period, if the product returns with quality problems and the claim is determined by the manufacturer to be within the scope of warranty, Dandong Top Electronics Instrument (Group) Co.,Ltd. is responsible for repair or replacement of the buyer (or owner) free of charge. Dandong Top Electronics Instrument (Group) Co.,Ltd. is not responsible for the costs caused by improper use of equipment, labor claims, direct or subsequent damage and installation and use of equipment. In addition to the special written warranty certificate for certain products of Dandong

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Dandong Top Electronics Instrument (Group) Co.,Ltd. has passed the ISO9001 quality system certification. The whole process of product production is strictly in accordance with the scope of the quality system, providing the strongest guarantee for product and service quality.

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## 1. Safety Tips

For safety reasons, it is expressly prohibited to modify or change the product without authorization.

Repair or replacement is only allowed to use the accessories specified by the manufacturer.

### 1.1 The explosion may cause death or serious injury.

When installing the device in an explosive environment, be sure to comply with applicable local, national and international standards, codes and regulations. Ensure that the equipment is installed in accordance with intrinsically safe or non-flammable site operating procedures.

### 1.2 Process leakage may cause serious injury or death.

If the process seal is damaged, the medium may leak at the connection.

### 1.3 Failure to follow the safety installation guidelines may result in death or serious injury.

All operations described in this manual must be carried out by trained and qualified or end-user-appointed personnel.

## 2. Product Descriptions

### 2.1 Main structure-Figure 1

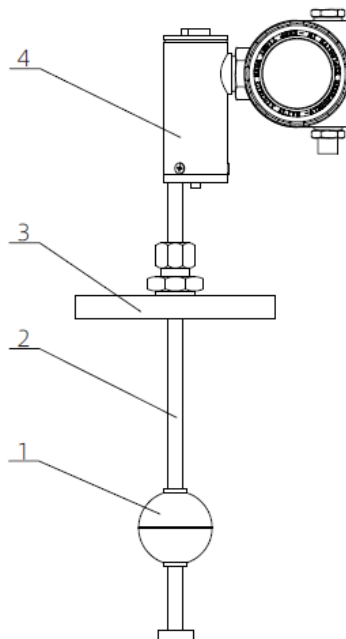


Figure 1 Product Main Structure

- (1) Magnetic float, level sensing element, with internal magnets
- (2) Probe rod with magnetostrictive cord
- (3) Process connection flanges
- (4) Transmitter assembly

## 2.2 Working Principle - Figure 2

The core of MLT type magnetostrictive level transmitter is the sensor, and the core of the sensor, the magnetostrictive wire, is made of rare earth super magnetostrictive material, which is known as "black earth gold" in the modern industry. It has the advantages of high strain value and strong electric (magnetic) mechanical wave conversion ability, which can transform small magnetic field vector changes into mechanical waves. The working principle is: there is a tensioned magnetostrictive wire (1) inside the sensing tube, and the sensor circuit emits current pulses (2) along the magnetostrictive wire, thereby forming a circular magnetic field around the magnetostrictive wire (3). There is a set of permanent magnets (4) inside the float, whose magnetic field makes the magnetostrictive wire magnetize in the axial direction. When the two magnetic fields are superimposed, a torsional pulse (5) will be generated at the position of the float. The pulse is transmitted to both ends along the magnetostrictive line, one end is transmitted to the top of the sensor tube, received by the sensor circuit, and the other end is transmitted to the bottom of the sensing tube. The time difference between the start pulse and the return pulse is measured to determine the float position.

## 2.3 Packaging

Please take the packaging waste to a special recycling facility.

## 2.4 Lifting and Transportation

Please use quality lifting equipment and lifting straps, and pay attention to safety.

## 2.5 Storage

Storage temperature  $-20^{\circ}\text{C}\sim 40^{\circ}\text{C}$

Storage humidity  $\leq 40\%$

### 3. Technical Parameters

#### 3.1 Key Performance

3.1.1 National explosion-proof certification and certification mark has been passed

Intrinsically safe Ex ia II CT5/T6 Ga

Flame-proof Ex d II CT1 ~ T5/T6 Gb

3.1.2 Implementation Standards

GB / T 21117-2007 Magnetostrictive Level Transmitter

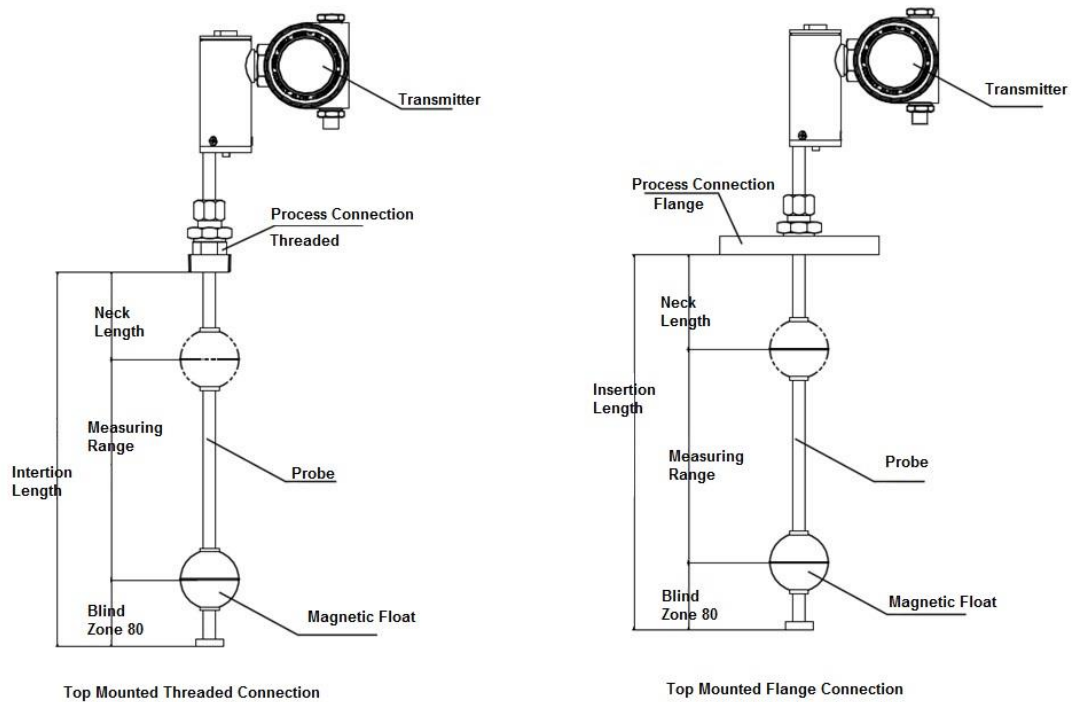
#### 3.2 Main Parameters

3.2.1 Power Supply: 15 ~ 30V DC

3.2.2 Signal Output: 4 ~ 20mA DC

### 4. Outline Diagram-Figure 3

If special size is required when ordering, the actual size shall prevail



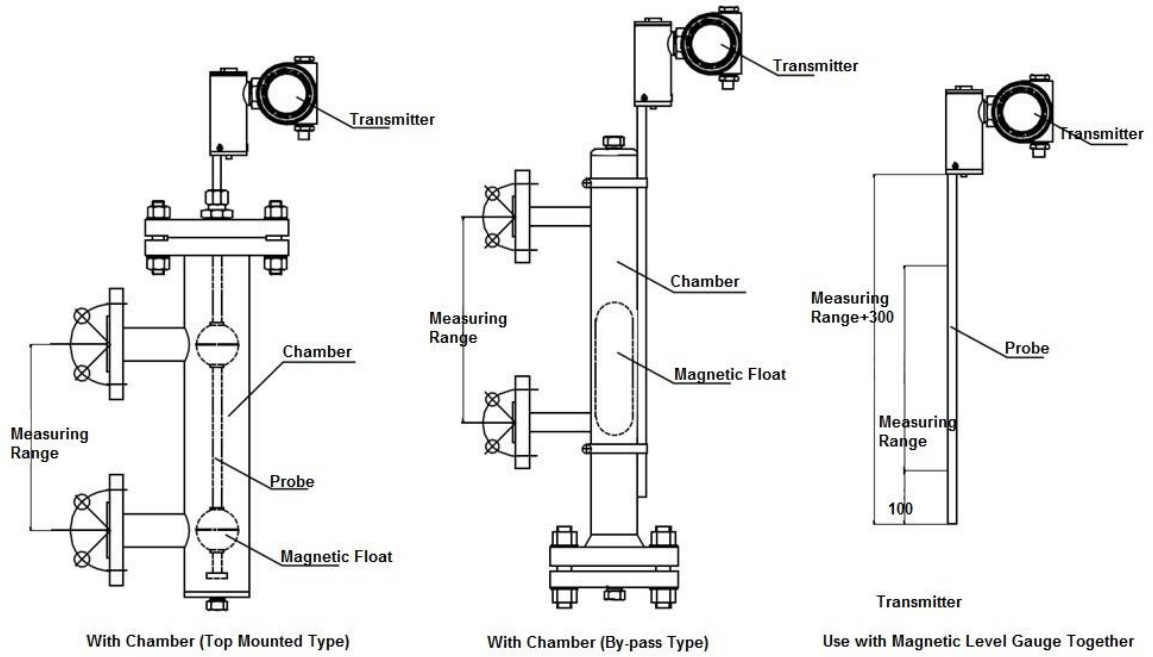


Figure 3 Outline Diagram

## 5. Unpacking and Inspection

### 1.4 Precautions for Unpacking Inspection

5.1.1 Check whether the product nameplate (Figure 4) is consistent with the supply list information



Figure 4 Nameplate



5.1.2 Check the quantity and material of each part against the packing list.

## 1.5 Content of Inspection

5.2.1 Check whether the appearance of the meter is defective or damaged.

## 6. Installation

### 6.1 Installation Tool

6.1.1 Wrenches, flange washers and flange bolts for process connections.

6.1.2 Level (device)

### 6.2 Installation Technical Requirements

6.2.1 Top-mounted flange connection type: In order to avoid damage to the probe during shipment, this type of top-mounted flange and level transmitter are packaged separately, and they need to be assembled according to Figure 1 before installation.

6.2.2 When installing a magnetostrictive liquid level transmitter with a bypass chamber, the side flange axis of the chamber must be perpendicular to the horizontal plane.

6.2.3 The transmitter is designed for on-site installation, and the ambient temperature should be within the specified range. However, when installing, keep as far away as possible from shaking, corrosive air and occasions that may cause mechanical damage. The instrument is best installed in a place where there is an operating platform, and the area must have a lightning protection device.

6.2.4 Try not to install the measuring rod at the inlet and outlet. If this is not possible, a baffle should be installed between the measuring rod and the inlet and outlet.

### 6.3 Installation Process

6.3.1 Place the gasket on the sealing surface of the container flange.

6.3.2 Pick up the liquid level transmitter carefully, pay attention that the probe is easy to bend and damage, do not hold the transmitter to force the probe.

6.3.3 Align the transmitter flange with the container flange, install flange bolts and nuts, and ensure that the flange gasket is installed correctly.

## 7. Configuration

### 7.1 Configuration Tools

- (1) Power supply 24VDC
- (2) 250  $\Omega$  resistor for HART communication protocol
- (3) Communicator supporting HART protocol (Rosemount 275, 375, 475)

### 7.2 Electrical Wiring

7.2.1 Unscrew the power terminal box cover, wiring according to Figure 5, internal grounding wire to armor cable outer armor (if any).

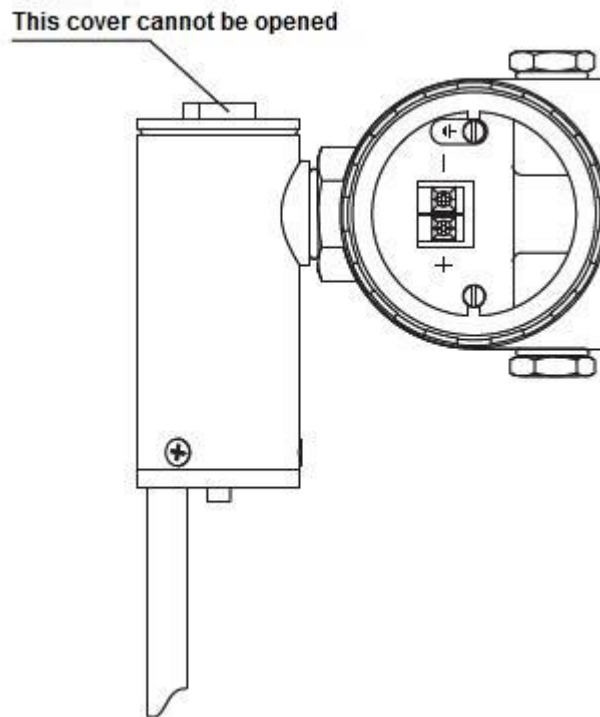


Figure 5

7.2.2 After completing the wiring, check whether the polarity of the wiring is correct, the housing of the meter must be well grounded, and then connect the 24VDC standard power supply.

7.2.3 It is recommended to use a handheld communicator that supports the HART475 communication protocol for configuration.

### 7.3 Configuration Process

This section describes how to use the 3 local keys (Enter  $\leftarrow$   $\downarrow$ ), (Up key "  $\uparrow$  "), (Down key "  $\downarrow$  "), and the LCD display to configure the parameters in the instrument.

#### 7.3.1 LCD Display function overview

The full screen information is shown in Figure 7-1. The variables that can be displayed on the LCD screen include current (Figure 7-2), percentage (Figure 7-3) and main variable (Figure 7-4). You can set to display a single variable, or you can set the percentage and the main variable to cycle display,

and the effective digits of the decimal part can be set by DCS or handheld devices (0, 1, 2, 3, 4 decimals). The display mode is set by the 475 configuration software or keys. If the percentage and main variable are set to be displayed cyclically, the LCD will display these two variables alternately with a period of 3 seconds.

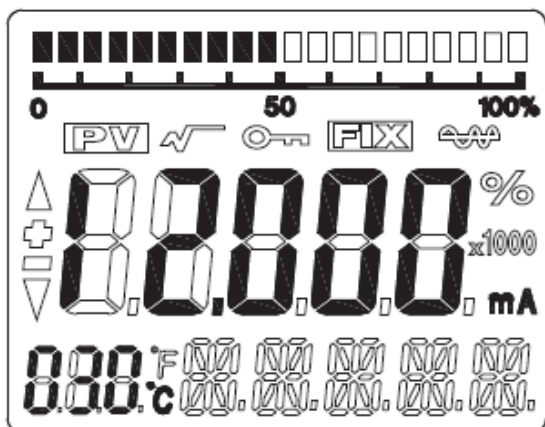


Figure 7-1 Full screen display of LCD

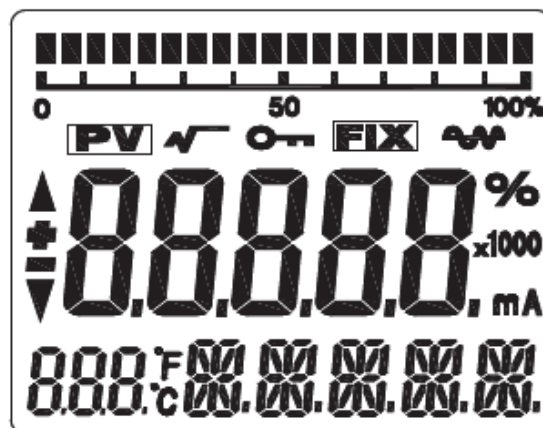


Figure 7-2 Current display

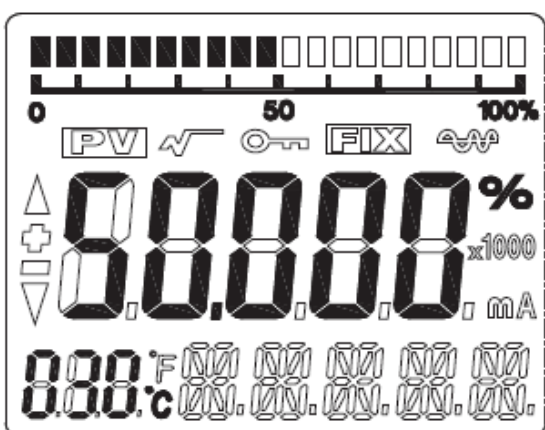


Figure 7-3 Percentage display

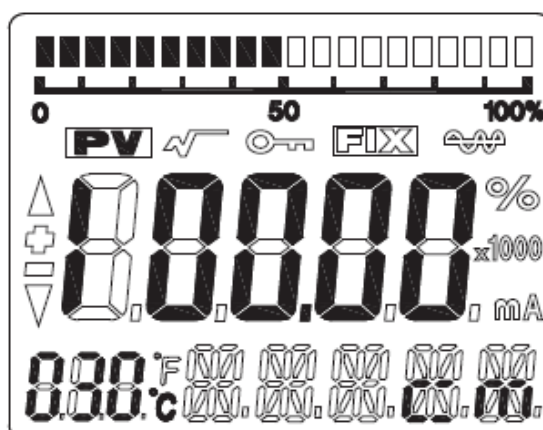





Figure 7-4 Main variable display

### 7.3.2 LCD display symbol description

- ① If it is in HART communication status, the symbol  on the right corner of the LCD screen will flash.
- ② If it is in root output, the LCD will display .
- ③ If a fixed output current is set, the LCD will display **FIX**.
- ④ If the write protection is activated, the LCD will display .
- ⑤ The three "888" display bits in the lower left corner of the LCD display the temperature of the electronic module and the menu number during configuration.

### 7.3.3 Button function description

There are a total of three buttons on the LCD panel. The three buttons are the enter key "←", the down key "↓", and the up key "↑".

- The "↑" and "↓" keys are used to prompt the increase or decrease of data bits and the shift of the decimal point;
- The "←" key is used to enter the prompt data setting interface and save the data.

### 7.3.4 Description of parameter configuration

Long press "←" when the "888" character in the lower left corner displays 1 ~ 17, it indicates that the transmitter is in the field configuration mode with menu rotation. At this time, you can input the initialization code, modify the parameters, calibrate the instrument or perform migration by pressing the keys. .

The data setting process utilizes:

- The "←" key is used to select the digit and decimal point to be edited and confirm the final save.  
(Flashing is selected)
- The "↑" key is used to increase the flashing digits to cycle from 0-9 and move the decimal point to the right.
- The "↓" key is used to decrement the flashing digits to cycle from 9-0 and move the decimal point to the left.

The setting process is as follows:

(1) Long press the '←' key to enter the data configuration interface. At this time, the lower left corner displays '01', and the data line displays '00005'. When the '←' key is pressed again, the symbol bit starts to flash, indicating that the symbol can be modified Bit.

(2) If you press the '↑' key or '↓' again, you can switch the sign of the data.

(3) Press the '←' key again, the symbol is selected and the first digit starts to flash, indicating that it can be modified. Press for a long time or repeatedly press the '↑' key or '↓' to set the number between 0-9 between cycles.

(4) Press the '←' key again, the first digit is set and the second to fifth digits can be set in

sequence at the same time. The setting method is exactly the same as the first digit.

(5) After setting the fifth digit, press '←' to start setting the decimal point. The decimal point starts to flash at the same time, indicating that the decimal point can be set. At this time, press the '↑' key or '↓' to move the position of the decimal point to the right or left to cycle through.

(6) After the decimal point is set, press the '←' key, the up and down arrows on the left will light up, indicating that the setting is saved.

(7) Press '←' again to restart setting data.

### 7.3.5 Key function code quick reference table

When using button configuration on site, the two "888" display characters in the lower left corner of the LCD indicate the current setting menu number, which is the setting function performed by the current button. The corresponding relationship is:

"888" display in the lower left corner	Set variable
0 or empty	Normal Display
1	Format
2	Set unit
3	Set the lower limit of the range LRV
4	Set the upper limit URV
5	Set damping time
8	Density (standby)
9	Any point migration input compensation value, compensation value = P actual measurement - P pre-output
11	LRV calibration
12	URV calibration
17	View sensor value

The instrument calibration, upper and lower limits of range and damping setting can be completed as described in 7.3.4

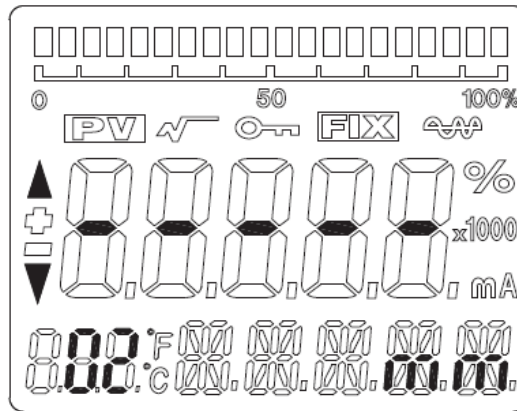
### 7.3.6 Unit Setup

The units that can be set are: m, cm, mm, feet, and inch.

① Long press the '←' key to enter the configuration mode (first menu No. 1 is displayed,

the up and down arrows on the left are lit).

- ② Press the "↑" key to switch the menu to No. 2, and the current unit symbol is displayed in the lower right corner.



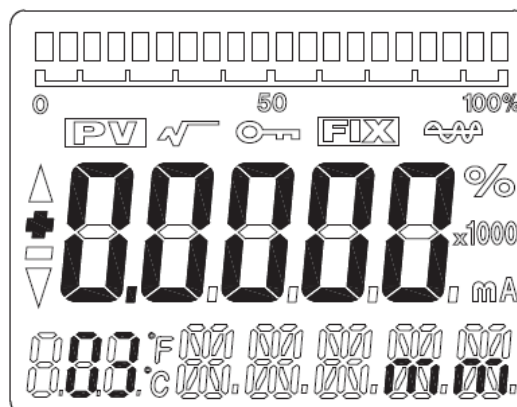
Unit Setup

- ③ Press the "←" key again, the unit starts to flash, and press the '↑' key or '↓' to switch to the unit you want to set.
- ④ Press the "←" key again, the unit setting is completed and the up and down arrows on the left will light up.

### 7.3.7 Range setting

Set the lower limit of the range LRV

- ① Long press the '←' key to enter the configuration mode (first menu No. 1 is displayed, the up and down arrows on the left are lit).
- ② Press the "↑" key to switch the menu to No. 3, and the LCD will display the current LRV value.



Range Setting

- ③ Press the "←" key again, and the symbol starts to flash. At this time, press the '↑' key or

'↓' to switch to the sign you want to set.

- ④ Press the "←" key to complete the symbol setting and start to set the highest digit of the range. At this time, press the "↑" key or "↓" to increase or decrease the current flashing digit and press the "←" key confirm, set other digits and decimal points in sequence, and the menu item setting is completed when the up and down arrows on the left light up.

Set the upper limit URV

Switch the menu to No. 4, and the LCD displays the current URV value at the same time, and then repeat the steps ③ and ④ in 7.3.7 to set.

### 7.3.8 Damping setting

Switch the menu to No. 5, and the LCD will display the current damping value at the same time, and then repeat the steps ③ and ④ in 7.3.7 to set until the completion.

### 7.3.9 Two-point calibration

LRV calibration

- ① First adjust the PV value to the zero position
- ② Switch the menu to No. 11, and the LCD will display the current calibration position value at the same time, and then repeat ③④ in 7.3.7 to input the zero point value for zero point position calibration.
- ③ Press the "←" key until the up and down arrows on the left light up the zero position calibration is completed

URV calibration

- ① First adjust the PV value to the full-scale position
- ② Switch the menu to No. 12, and the LCD will display the current calibration position value at the same time, and then repeat ③④ in 7.3.7 to input the full scale value for full scale position calibration
- ③ Press the "←" key until the up and down arrows on the left light up the full scale position calibration is completed

### 7.3.10 Move at any point

Menu '9' can realize any point migration function. The user can migrate the current PV value to any point within the range. (Enter compensation value) The setting process is as follows:

- ① Long press the '←' key to enter the configuration mode (first menu No. 1 is displayed, the up and down arrows on the left are lit)
- ② Press the "↑" key to switch the menu to '9' and the LCD will display the current PV compensation value
- ③ Press the "←" key again, and the symbol starts to flash. At this time, press the '↑' key or '↓' to switch to the sign you want to set.
- ④ Press the "←" key to complete the symbol setting, and at the same time the highest digit of the parameter to be set starts to flash. At this time, press the '↑' key or '↓' to increase or decrease the current flashing digit, and press the "←" key to confirm and start the next digit setting, and set other digits and decimal points in sequence.

When the up and down arrows on the left side light up, the menu function setting is complete.

Compensation value calculation method:

Compensation value = PV actual measurement - PV pre-output

**Note:** The key configuration process will not automatically exit and it is needed to manually exit the key configuration. The method is to continuously press the '↑' key or '↓' key in the switching menu state to increase or decrease the menu. When the menu is greater than 17 or less than 1, exit the button configuration state and enter the normal output mode.

## 8. Precautions

8.1 The use density should be the same as the design density, please notify the factory if the density changes;

8.2 During the disassembly and assembly process, try to protect the probe to prevent it from being damaged by force;

8.3 Make sure that the power supply is safe and reliable, and the power supply should be connected in accordance with the correct positive and negative poles;

8.4 Do not use unmatched handheld communicator to operate the meter;

8.5 Magnetostrictive level transmitter is not suitable for occasions with high vibration;



8.6 The medium with viscosity  $\geq 500\text{mPa/s}$  is not suitable for measuring with magnetostrictive level transmitter;

8.7 The operating temperature range of electronic components is  $-40^{\circ}\text{C}\sim+80^{\circ}\text{C}$ , and the temperature range displayed on the LCD screen is  $-30^{\circ}\text{C}\sim+80^{\circ}\text{C}$  (the LCD does not display beyond the range, and the remote transmission is normal);

8.8 After commissioning, tighten the display and power cover to prevent the meter from getting wet.

## 9. Fault Analysis and Troubleshooting

Fault analysis and troubleshooting	Cause of issue	Troubleshooting method
After power on, the LCD screen does not light up	<ol style="list-style-type: none"> <li>1.The polarity of the power supply is reversed or the power supply fails</li> <li>2.There is an open circuit in the line</li> </ol>	<ol style="list-style-type: none"> <li>1. Connect the power supply correctly</li> <li>2. Check whether the circuit board wiring in the transmitter is reliable</li> </ol>
After using for a period of time, the magnetic float is difficult to move	Iron filings or other dirt on the magnetic float	Evacuate the medium first, then take out the magnetic float to remove iron filings or other dirt on the maglev ball
The container is not full yet, but the transmitter shows 20mA or higher	<ol style="list-style-type: none"> <li>1. The circuit board is damaged</li> <li>2. Inaccurate calibration</li> </ol>	<ol style="list-style-type: none"> <li>1. Repair the circuit board and contact the factory</li> <li>2. Recalibrate</li> </ol>
The transmitter output is always at the minimum	<ol style="list-style-type: none"> <li>1. The magnetic float is stuck at one point</li> <li>2. Leakage of float</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean up the magnetic float and probe</li> <li>2. Replace the float</li> </ol>
The output signal fluctuates irregularly	<ol style="list-style-type: none"> <li>1. External electromagnetic interference</li> <li>2. Unreliable grounding</li> </ol>	<ol style="list-style-type: none"> <li>1. Eliminate external interference</li> <li>2. The cable shielding layer is reliably grounded, and the meter is well grounded</li> </ol>
Output current drift	Circuit board failure	Replace the circuit board
Display NVMFL	Data line failure	Check whether the connecting wire between the two chambers is damaged
Display CURFL	Loop current failure	<ol style="list-style-type: none"> <li>1. If the grounding reliable</li> <li>2. Recalibrate</li> <li>3. The instrument circuit function is damaged</li> </ol>
After the first use, the reading is inaccurate	Factory calibration information is not accurate	Recalibration

## 10. Disassemble

### 10.1 Warning






Before disassembling, pay attention to dangerous process conditions, such as pressure, high temperature, corrosive or toxic media in the container, etc.

Please refer to the instructions in the chapter 6.3 Installation Operation Process and 7.2 Electrical Wiring, and remove the components in the reverse order of the operation steps.

### 10.2 Waste removal

Please follow the current regulations in each region for waste disposal.

## 11. Product Certification

Product Certification		
Certification	Certification No.	Certification Scope
SIL3	 NO.1N191227.DTEWT37	SIL 2 @ HFT=0; SIL 3 @ HFT=1, Route 2 <sub>H</sub>
ATEX	 Sira 19ATEX1145X	II 1G Ex ia IIC T5/T4 Ga Ta = -40°C to 70°C  II 2G Ex db IIC T3...T6 Gb Ta = -40°C to 60°C/70°C/80°C
IECEX	 IECEX SIR 19.0048X	Ex db IIC T3...T6 Gb Ex ia IIC T5/T4 Ga Ta = -40°C to 70°C for Ex ia Ta = -40°C to 60°C/70°C/80°C for Ex db
CE	 AE 50464786 0001	
Explosion-proof	 Intrinsically Safe Flame-proof CCR1 17.2056X CCR1 17.1001X	Ex ia IIC T5/T6 Ga Ex d IIC T1~T5/T6 Gb