

Non-Invasive Level Switch

Manual Book (Ver: 2.0-B)

MC Shaan 01000373

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1. Instrument warranty and service scope

From the date of consignment, Instrument host warranty period is one year, rest part warranty period is half year. This warranty is limited to the original purchaser and the users of the designated dealers from SK. And do not apply to any SK think due to misuse, alteration, neglect or damage caused by the accidents and abnormal cases when using the instrument.

For the instruments return to SK within the warranty scope, SK supply free warranty. To obtain the warranty service, please contact the service apartment in SK and attach the fault description, with the permission of the company, u can send instrument to SK service department.

If the instrument has passed the quality assurance period or the failure is due to misuse, alteration, negligence, accident, or abnormal using, SK will be Instrument after maintenance, by the sound of electronic mail client, the client shall pay maintenance and transport costs according to the maintenance fee standard, and repair it after the permission. Finished the maintenance, the instrument will be sent to client by SK, and the client will stand the maintenance fee and freight.

Instrument warranty and service scope

Strongly recommended: in the process of normal use, in order to improve the measuring accuracy and measuring stability, suggested that every 1 months for calibration operation.

2. Open-box inspection

- Operation instruction.
- Instrument certification.
- Instrument package list.
- Transmitter.
- Verify the name, model, and other information on the nameplate
- If the housing of transmitter is intact and observe if the window glass cover is broken.
- Check items against the packing list

2.1 Note

Please read this manual before installing the instrument.

Storage and transportation

3. Storage and transportation

3.1 Storage

- Temperature: - 40~+60 °C
- Use the original packaging.

3.2 Transportation

- Transport the measuring instruments to the work place or process connection using the original packaging.
- During transportation and storage, collision, moisture, and chemical erosion should be prevented

4. Product Introduction

4.1 Instructions

Non-invasive level switch (hereinafter referred to as level switch) is a new type of liquid level monitoring and alarm device. Mainly used for monitoring the liquid level of storage tanks, achieving upper and lower limit alarms or monitoring the presence of media in pipelines (dry state protection), suitable for liquid level process control in industries such as medicine, petroleum, chemical, power, food, etc

This product is an explosion-proof type and can be directly used in flammable and explosive situations. It is widely used in high and low liquid level alarm systems for high-pressure and atmospheric storage tanks in industries such as medicine, petroleum, chemical, power, and food. The product adopts an external mounting method, without moving the tank or using fire. Safe and reliable to use, with high sensitivity, its comprehensive performance has advanced domestic and international levels, providing strong guarantees for safe production.

4.2 Tech Specification

Signal Output	Relay output(passive node)
Relay Capacity	DC 28V 5A、AC 250V 5A
Repeatability Error	$\pm 5\text{mm}$
Measured wall thickness	$\leq 60\text{mm}$
Power	3 W
Communication	RS-485、IR、Modbus
Ambient Temperature	$-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$
Ambient Humidity	(15%~100%) RH
Power Supply	DC 24V
Electrical Connection	M20×1.5 or 1/2NPT
Housing Material	Cast Aluminum

Product Introduction

Protection Class	IP67
Explosion-proof Grade	ExdIICT6 GB
Sensor Probe Housing	ABS+PC
Process Temperature	-50°C ~ +100°C
Weight	2KG
Sizes	length158mm×width112mm×height148mm
Base Hole Diameter	M5

4.3 Application

4.3.1 Measured Tank

The tank wall where the sonar probe is installed requires to be made of hard material that can transmit signals well. For example, materials such as carbon steel, stainless steel, various hard metals, fiberglass, epoxy resin, hard plastics, ceramics, glass, hard rubber, or other composite materials. The inner and outer surfaces of the tank wall should be flat. If the container wall is made of multiple layers of material, the layers should be in close contact without bubbles or gas interlayers. For example: vulcanized hard rubber lining, epoxy resin lining, stainless steel lining, titanium lining.

4.3.2 Requirements for medium temperature

The allowable temperature range for the probe is -50 °C to 100 °C. As the probe is tightly attached to the container wall, the probe temperature is approximately the same as the container wall temperature. Therefore, the temperature of the tested medium is generally required to be within -50 °C to 100 °C.

4. 3. 3 Instrument ambient temperature

The process temperature range of the liquid level switch host is $-20\text{ }^{\circ}\text{C}$ ~ $60\text{ }^{\circ}\text{C}$. In northern regions, it is recommended to use a watch protection box in areas with strong direct sunlight. It is recommended to install the instrument in a cool place or use a sunshade to avoid excessive temperature inside the instrument due to exposure to sunlight, and to provide good ventilation and heat dissipation.

4. 3. 4 Explosion proof, anti-corrosion, and protection class

The level switch adopts an explosion-proof and anti-corrosion structure with aluminum alloy casting seal and epoxy coating on the surface. Suitable for harsh environments containing explosive mixed gases, medium concentration corrosive gases, and a humidity range of 15% -95%.

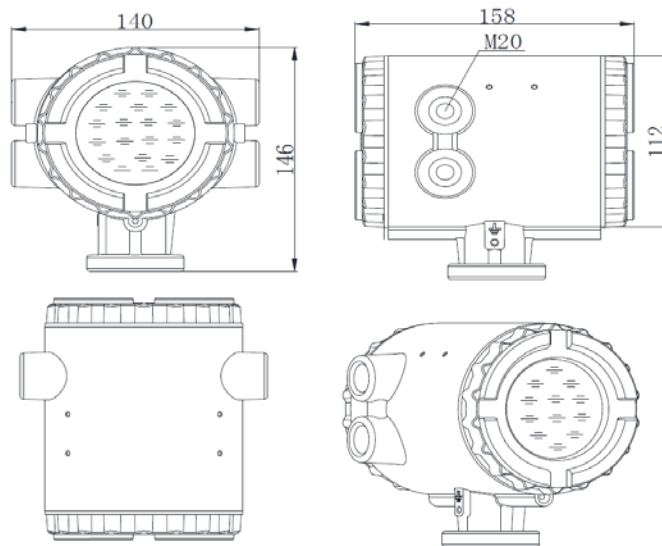
Explosion-proof Grade: ExdIICT6 GB

Corrosion protection Class: WF1

Protection Class: IP65、IP67

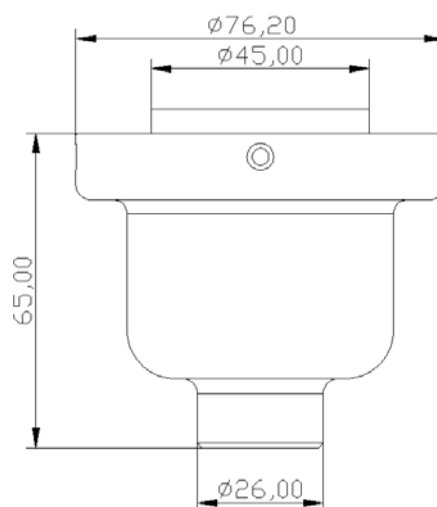
5. Dimensions

5.1 Dimensions of transmitter, P1 (Unit: mm)



P1 Dimension of transmitter

5.2 Dimensions of sensor probe, P2 (Unit: mm)

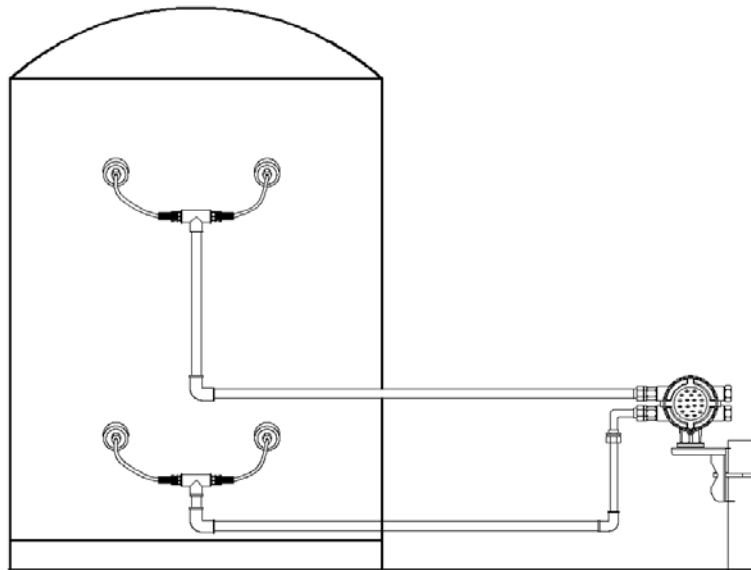


P2 Dimensions of sensor probe

6. Installation

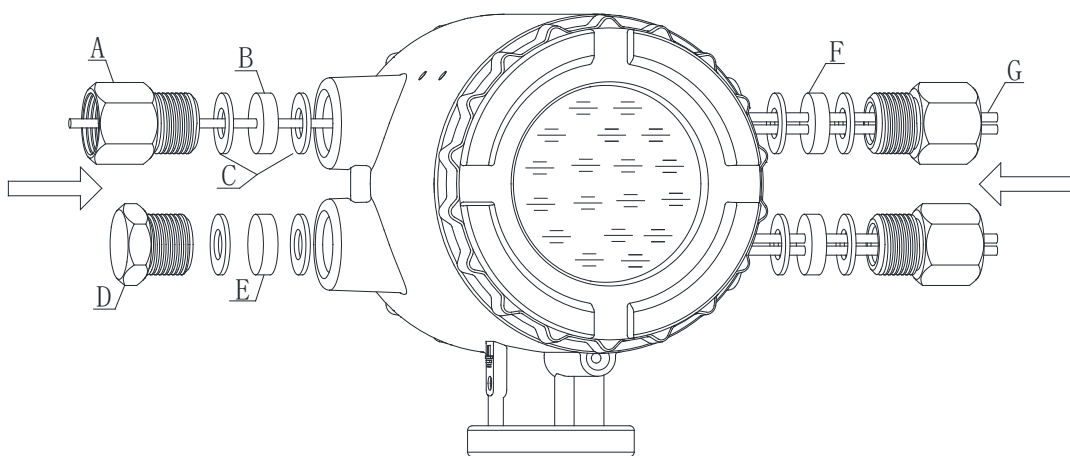
6.1 Installation of level switch

6.1.1 Installation of level switch



P3 Installation of level switch

6.1.2 Level switch pipeline connection

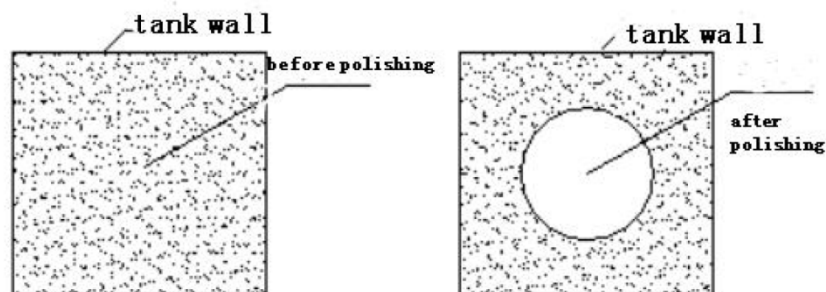


P4 Pipeline Connection

6.2 Sensor Probe Installation

6.2.1 Probe installation steps

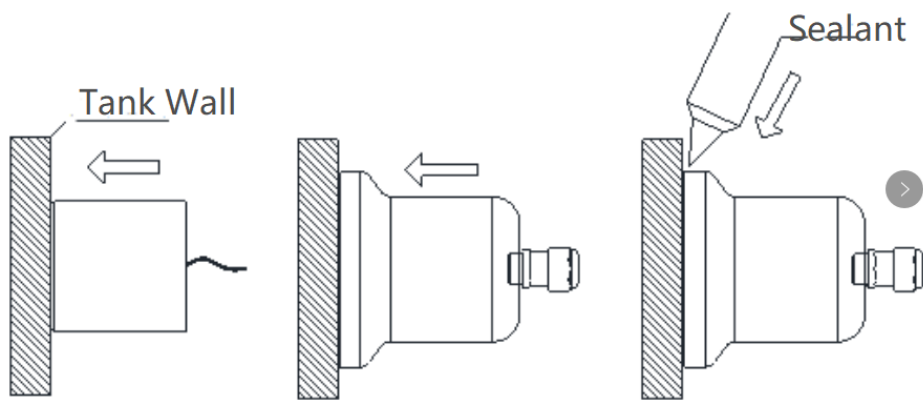
- Remove the protective material from the outer side of the container at the installation point of the probe, and use sandpaper to polish and clean the surface here. It is required to be polished to not less than ϕ A 100mm circular flat surface should be flat, free from oil stains and small particles (as shown in step 1);
- Take out the probe and evenly apply a layer of silicone grease (2-3mm thick) on the surface of the probe (as shown in step 2);
- Press the probe tightly against the polished smooth area and slowly rotate it to confirm the signal condition (as shown in step 3);
- After confirming that the signal meets the requirements, attach the probe fixing seat to the tank wall (as shown in step 4), and apply sealant along the gap between the fixing seat and the tank wall for one week;
- Non magnetic tank walls can be installed by adding adapter plates (as follows, the installation process for non magnetic container probes)
 - a、Installation process of magnetic tank probe:



Step1 polishing



Step2 Apply silicone to the probe



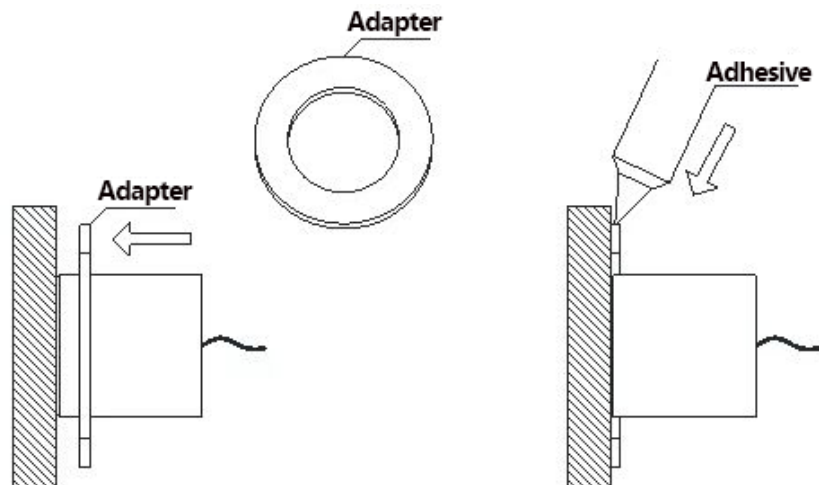
Step3 probe is tightly attached to the tank wall

Step4 Install the probe fixing seat

Step5 Apply sealant

b、 Installation process of non magnetic tank probe

Steps 1 to 5 are the same as above, and steps 3 -1 and 3 - 2 are added after step 3.



Step3-1 Installing the adapter plate

Step3-2 Apply quick drying adhesive

6.3 Selection of probe installation position

- The installation position of the probe is the alarm position.
- Near the installation position of the probe and opposite the installation position of the probe, avoid liquid inlet and outlet.
- The two probes should be kept on the same horizontal line as much as possible, and the maximum error should not exceed the distance of one probe.
- The installation distance between two probes ranges from 1 to 1.5 meters.
- There should be no obstructions on the side of the vessel opposite the probes, Please avoid welding seams and obstacles between two probes.

6.4 Installation Note

- When the outgoing line of the liquid level switch needs to be separated or rewired, an explosion-proof junction box must be used (with an explosion-proof certificate and an Ex mark on the junction box). When there are excess outlets in the junction box, sealing components consistent with the explosion-proof type of the junction box must be used to ensure its explosion-proof performance.

- The maximum allowable ambient temperature for the liquid level switch host is $-20\text{ }^{\circ}\text{C}\sim+60\text{ }^{\circ}\text{C}$. When the ambient temperature exceeds the temperature range of the liquid level switch, corresponding protective measures must be taken.

- The installation of liquid level switches should avoid the influence of external heat sources.

- Users are not allowed to replace the internal components of the liquid level switch at will, and it is strictly prohibited to open the cover with electricity in hazardous areas (explosive gas environments)

- The installation, use, and maintenance of liquid level switches should comply with the relevant provisions of this user manual and GB3836.15-2000 "Electrical Equipment for Explosive Gas Atmospheres – Part 15: Electrical Installation in Hazardous Areas (excluding coal mines)".

7. Electrical connections

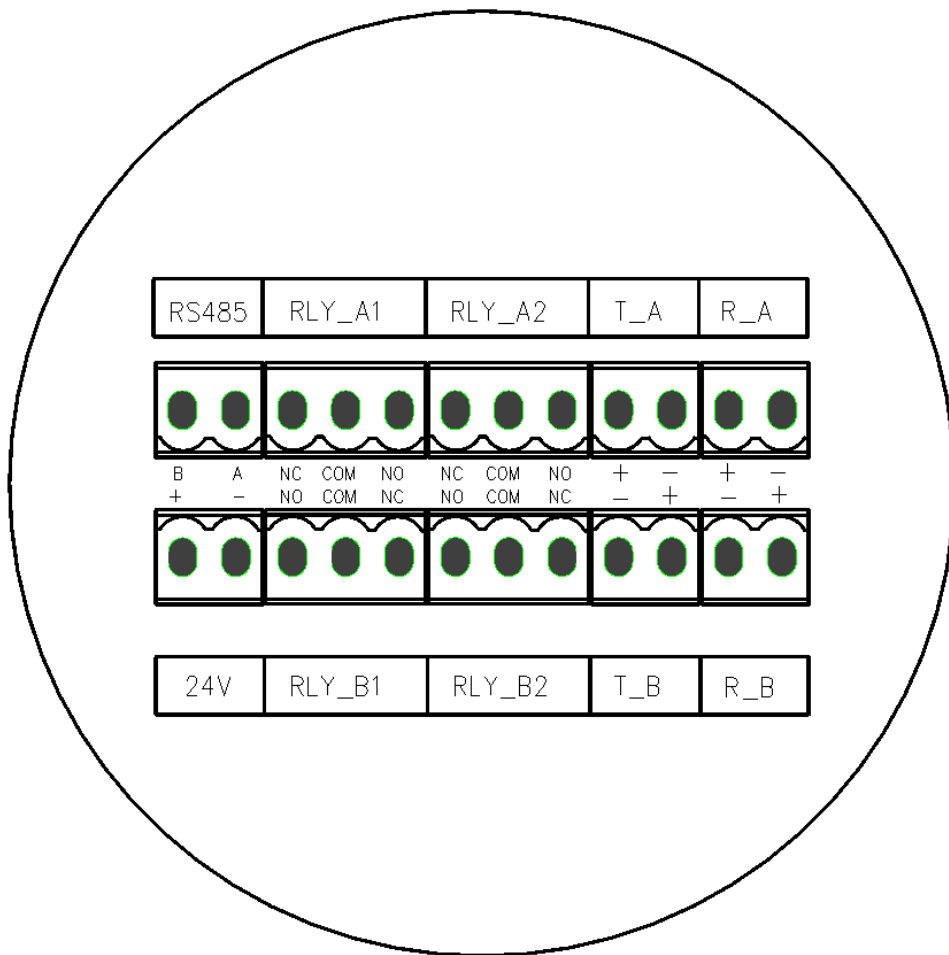
7.1 Liquid level switch power supply

Operational voltage: DC 24V

Allowable range of voltage variation: DC20V~28V

Power: 3W

7.2 Liquid level switch wiring terminals



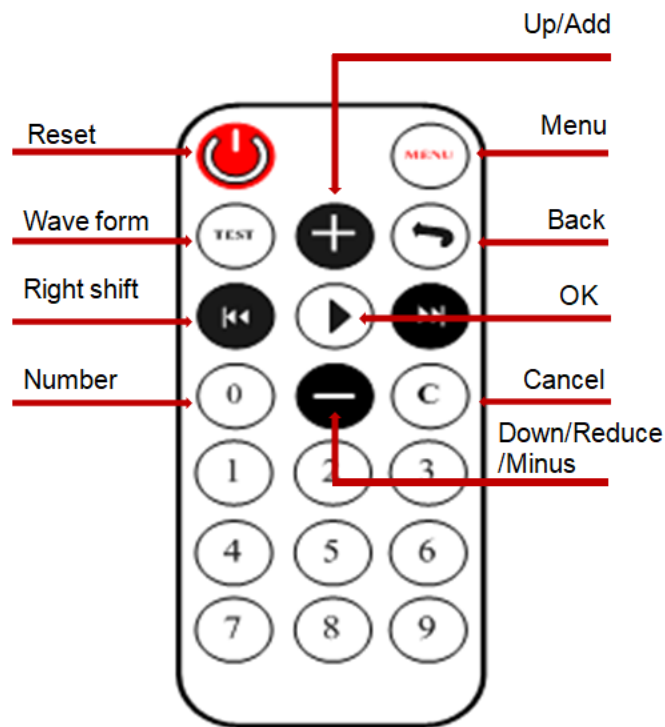
P5 wiring terminals

Name	Function
RS-485 (B)	RS485 B
RS-485 (A)	RS485 A
RLY_A1 (NC)	A point relay normally closed point
RLY_A1 (COM)	A-point relay common terminal
RLY_A1 (NO)	A point relay normally open point
RLY_A2 (NC)	A point fault output relay normally closed point
RLY_A2 (COM)	A point fault output relay common terminal
RLY_A2 (NO)	A point fault output relay normally open point
T_A (+)	Positive terminal of A-point emission probe
T_A (-)	Negative terminal of A-point emission probe
R_A (+)	Positive terminal of point A receiving probe
R_A (-)	A-point receiving probe negative terminal
24V(+)	24V power supply positive terminal
24V(-)	24V power supply negative terminal
RLY_B1 (NO)	B point relay normally open point
RLY_B1 (COM)	B-point relay common terminal
RLY_B1 (NC)	B point relay normally closed point
RLY_B2 (NO)	B point fault output relay normally open point
RLY_B2 (COM)	B-point fault output relay common terminal
RLY_B2 (NC)	B point fault output relay normally closed point
T_B (-)	Negative terminal of B-point emission probe
T_B (+)	Positive terminal of B-point emission probe
R_B (-)	B-point receiving probe negative terminal
R_B (+)	B point receiving probe positive terminal

8. Instrument debugging

8.1 Instrument parameter setting human-machine interface

The instrument parameters are set using a specially equipped infrared remote control for operation, and the effective buttons are shown in P 1-1 below:



P1-1 Infrared remote control

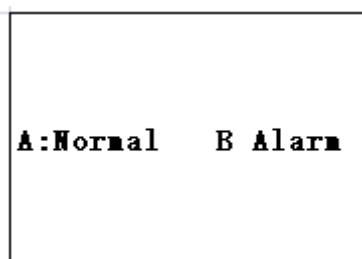
Key	Work interface	Function
Reset /Restart	Any interface	Reset and restart
MENU	Operation interface	Enters the menu interface under the operation interface
	Menu interface	Back to the operation interface
TEST/Wave form	Operation interface	Enter wave interface
	Wave interface	Back to Operation interface
Cancel	Menu interface	Back to last manu
UP (+)	Menu interface	Move up

Instrument debugging

Down (↓)	Menu interface	Move down
OK	Menu interface	Confirm or enter the next menu
No key(0,1,⋯)	Menu interface	Input Nos
Left (←)	Menu interface	Move left
Right (→)	Menu interface	Move right

2、Operation interface

The liquid level switch B mode operation interface is shown in P1-2:



P1-2 The liquid level switch B mode operation interface

The list of valid statuses is displayed as follows:

state	Explanation
Normal	The instrument is working normally and in an alarm free
Alarm	The instrument is working normally and in an alarm state
Abnorm	System abnormality, unable to function properly, invalid output result
Nocal	No calibration, in off state

3、Instrument operation

3.1、Working characteristics of mode B

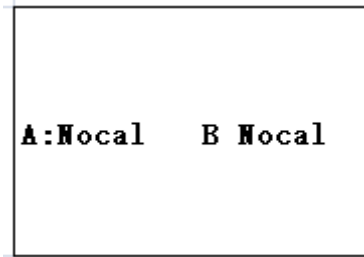
B mode operation requires two probes, one transmitting probe and one receiving probe, both of which should be at the same horizontal height.

The location of the installation point is the alarm location.

3.2、Parameter settings

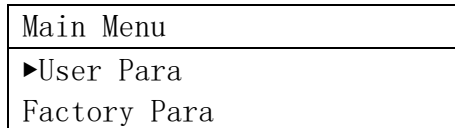
The instrument is powered on and the main interface is displayed as shown in P1-3

Instrument debugging



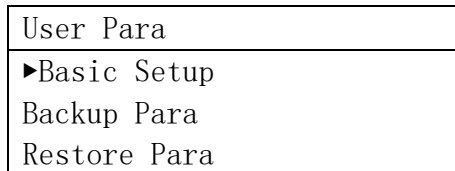
P1-3

(1.1)、 “MENU” enter to menu interface, As shown in P1-4



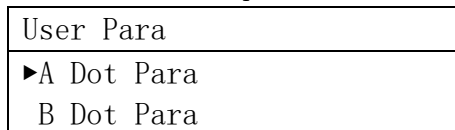
P1-4

(1.2)、 “▶ (OK) ” enter User Para As shown in P1-5:



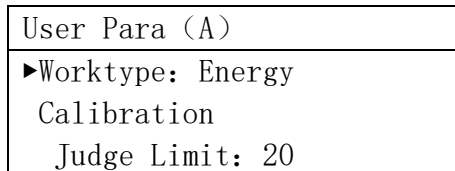
P1-5

(1.3) 、 “▶ (OK) ” Ener Basic Setup As shown in P1-6:



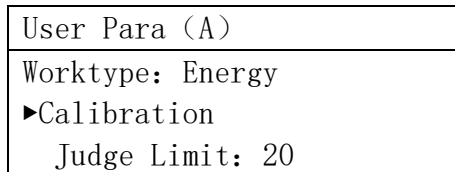
P1-6

(1.4) 、 “▶ (OK) ” Enter A Dot Para As shown in P1-7:



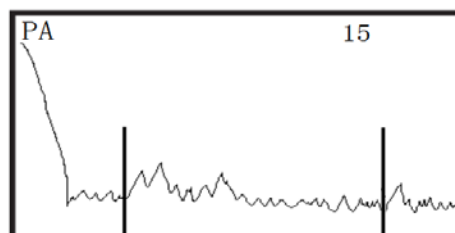
P1-7

(1.5) 、 “Down” Enter Calibration As shown in P1-8



P1-8

(1.6) “ok” Enter Dot A calibration interface. As shown in P1-9

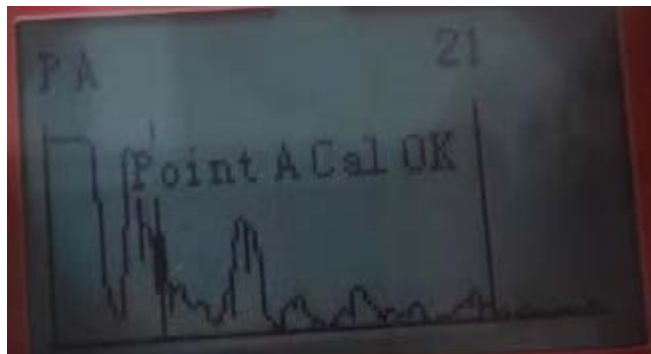


Instrument debugging

P1-9

The instrument starts calibration and displays "A point calibration successful" after successful calibration as shown in P1-10, After a few seconds, return to P 1-8 interface

Note: The calibration can be finished when the vessel is empty.



P1-10

(1.7)、Click the "Menu" button to return to the main interface.

By following the same setup steps and selecting the B-point parameter, B-point calibration can be performed.

Appendix 1

Non-invasive level switch ModBus Protocol Description

1: Read parameters and use command 0x04

Register List:

Register address	Description	data type	Remark
0001H	A Relay	16 bit unsigned integer (0~65535)	0 represents no alarm, Non 0 represents an alarm
0002H	B Relay	16 bit unsigned integer (0~65535)	0 represents no alarm, Non 0 represents an alarm

Instrument debugging

2: Read or set parameters, read using command 0x03, set using command 0x10

Register List:

Register address	Description	data type	Remark
0003H	Damping	16 bit unsigned integer	
0004H	Baudrate	16 bit unsigned integer	bps
0005H	Meausure Range	16 bit unsigned integer	Unit mm [10, 50000]

Note: 1、 The default address of the device is 1, and the initial baud rate is 9600

2、 The device address and initial baud rate can be modified through the instrument menu.

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