User Manual

Ultrasonic level transmitter

U-PZ/MPZ-EN6

Preface

Thank you for purchasing the Ultrasonic level transmitter. Please read this manual carefully before operating and using it correctly to avoid unnecessary losses caused by false operations.

Note

- Modification of this manual's contents will not be notified as a result of some factors, such as function upgrading.
- We try our best to guarantee that the manual content is accurate, if you find something wrong or incorrect, please contact us.
- This product is forbidden to use on explosion-proof occasions.

Version

U-PZ/MPZ-EN6

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Chapter 1 Introduction

The ultrasonic level meter is a universal level meter that has the advantages of various other level gauges to realize a fully digital and humanized design. It has perfect level measurement and control, data transmission, and man-machine communication functions. This product adopts a modular circuit design, military-quality multi-layer PCB board, tight hardware structure, and reasonable layout. This product supports isolated 4 ~ 20mA, HART output.

This product uses imported industrial-grade chips, digital temperature compensation, and other related special integrated circuits. It has strong anti-interference ability, can set upper and lower limits, online output adjustments arbitrarily, and has a local display. The shell is made of engineering plastic ABS waterproof shell. The shell is small and quite sturdy. This product can meet most of the measurement requirements of liquid level and material level without contacting industrial media, completely solves the shortcomings of winding, clogging, leakage, medium corrosion, and inconvenient maintenance caused by traditional measurement methods such as pressure type, capacitance type, and float type level meter. Therefore, it can be widely used in various fields related to material level and liquid level measurement and control.

Chapter 2 Characteristics

- Wide work voltage
- Backup and recovery parameter set
- Free adjustment of the range of analog output
- Set a filter value to remove
- Custom serial port data format
- Capable with 2-/3-/4-Wire
- Optional increment/difference distance measurement to measure air space or liquid level
- 1-15 transmitted pulse intensity depending on working conditions

Chapter 3 Parameter

Table 1

Model	ZP	ZPM
Power supply	(18~28)VDC (2-wire), (12~24)VDC, 220VAC	(12~24)VDC
Range	5m,10m, 15m (optional)	1m,2m (optional)
Blind zone	0.4m (5m range) 0.5m (10m range) 0.6m (15m range)	≤0.06m (1m range) ≤0.15m (2m range)
Measure error	±0.3% F. S	±0.5% F. S
Display	OLED	
Display resolution	1mm	
Power consumption	<1.5W	
Output (optional)	(4～20) mA, RL>600Ω(Standard), current output accuracy 0.3%FS (1～5)V \ (1～10)10V RS485 HART(two-wire), 3-Channel NPN	
Relay output	2 relays (AC: 5A 250V, DC:10A 24V)	2 relays (AC:2A 250V, DC:5A 24V)
Material	ABS, PP	Cast aluminum, 304
Launch angle	＜10°	＜6°
working environment temperature	(-20~60)℃，high temperature (optional)	
Protection degree	IP65, IP68 (optional)	
Electrical interface	M20X1.5	
Installation	M60X2	M30X1.5

Chapter 4 Operation & setting

The instrument is an OLED display, with key operation instructions. Press A appears instruction interface. According to the instructions, the operation can work. 1: Users' manual Power on press A then press C twice to enter the manual. (no password)

Table 2 Menu of 3-/4-wire ultrasonic level transmitter

Examples of basic setup steps			
The instrument is displayed as an OLED display with a key operation prompt function. Press A to display the key prompt interface, just follow the prompts. The default user password is "0000" and the administrator password is "1000"			
(A) Menu, shift, return (B) Scroll down, add up (C) Confirm			
Menu and functions			
Primary menu	Secondary menu	Tertiary menu	Quaternary menu
Installation settings	solid/liquid mode	solid level	Installation Height "0"
		liquid level	Enter installation Height(m)
			Enter level height(m)
	working environment		
output settings	analog value	output start	corresponds to 4mA
		output end	corresponds to 20mA
		adjust output lower limit	not changeable
		adjust output higher limit	not changeable
		virtual output	default "0"
		Analog output configuration	default "V0E0"
	Serial port	Serial port address	0~255
		Serial baud rate	900~36000

		Check Digit	
		Serial port delay	
		Serial read and write status	
		Custom receive protocol	
		Custom sending protocol	
	Switch	1 Channel D value	Default unit（m）
		1 Channel H value	Default unit（m）
		2 Channel D value	Default unit（m）
		2 Channel H value	Default unit（m）
		3 Channel D value	Default unit（m）
		3 Channel H value	Default unit（m）
		Switch output configuration	
Display settings	unit		
	Retain decimal places		
	Show conversion		
	Contrast		
	Off display delay		
Prob settings	Medium	Choose the Medium	
		Enter sound speed	
	Probe characteristics	Measurement period	
		Blind Zone	Not recommended to modify
		Emission intensity	
		Receive gain	

		Sampling threshold	
	Filtering		
	Parameter correction	Temperature correction	
		Display correction	
		Linear correction	Not recommended to modify
		Sonic boom	
System settings	user settings	User password modification	
		Administrator password modification	
	Low power settings	Wake up cycle	
		operating hours	
		Low voltage protection	
	Language	Chinese、English	
	Reset		
The custom configuration format is as follows: Example: H; M40u8;			
Note: Use ";" to separate different sentences. Configure parameters in the form of keywords + numbers.			
The available keywords are: H means to communicate in hexadecimal mode; the characters in "" double quotes are sent directly; M digital menu (character mode: d decimal places, l reserved data length; Hex mode: u8 single byte, u16 Double byte, u32 four bytes); T time format; S string menu; Y system characters; E check mode (E1 XOR E2 CRC low bit first E3 CRC high bit first).			
Clear the custom protocol menu, this machine will only support Modbus_RTU and AT command format.			
AT command format description: read menu item AT + MENU + menu number? \ R \ n			
Write menu item AT + MENU + menu number = xxxx \ r \ n			
Save parameter AT + EEPROM = WRITE \ r \ n			

Read parameter AT + EEPROM = READ \ r \ n
Restore parameter AT + EEPROM = RECOVERY \ r \ n
Read data from SD card AT + DATA? \ R \ n
\ r \ n is the carriage return and line feed character on the keyboard.

Table 3 Menu of two-wire ultrasonic level transmitter

Examples of basic setup steps				
The instrument is displayed as an OLED display with a key operation prompt function. Press A to display the key prompt interface, just follow the prompts. The default user password is "0000" and the administrator password is "1000"				
(A) Menu, shift, return (B) Scroll down, add up (C) Confirm				
Menu and other functions				
Primary menu	Secondary menu	Tertiary menu	Quaternary menu	Remarks
User login				“0000”
Administrator login				“1000”
Installation settings	solid/liquid mode	solid level		Installation Height“0”
		liquid level	Enter installation Height(m)	Enter installation Height(m)
			Enter level height(m)	Enter level height(m)
	working environment			Open or closed
output settings	analog value	output start		corresponds to 4mA

		output end		corresponds to 20mA
		Adjust output lower limit.		not changeable
		Adjust output higher limit		not changeable
		virtual output		default “0”
		Analog output configuration		default “V0E0”
		Config		
	Serial port	Serial port address		HARTDevice address
		Serial read and write status		
Display settings	unit			
	Retain decimal places			
	Show conversion			
	Contrast			
	Off display delay			
Prob settings	Medium	Choose the Medium		Not recommended to modify
		enter sound speed		

	Probe characteristics	Measurement period		
		Blind Zone		
		Emission intensity		
		Receive gain		
		Sampling threshold		
	Filtering			
	Parameter correction	Temperature correction		Not recommended to modify
		Display correction		
		Linear correction		
		Sonic boom		

Chapter 5 Installation & precaution

5.1 Dimension (ZP)

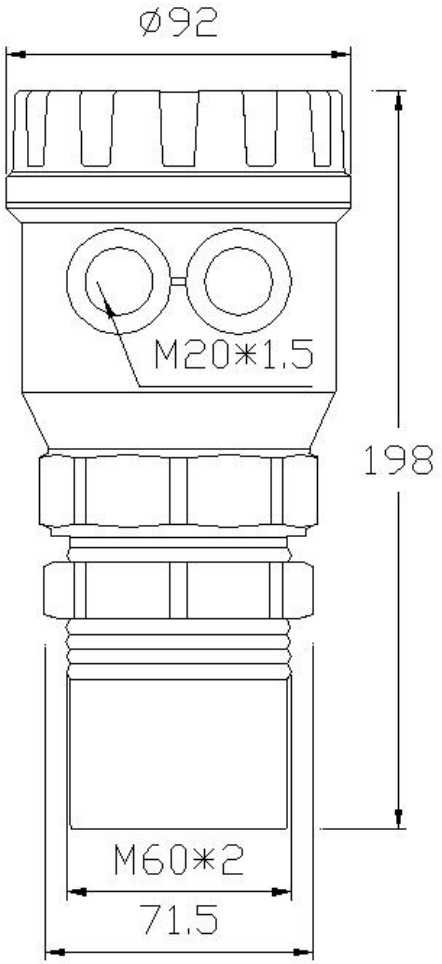


fig. 1 Standard

5.1 Dimension (ZPM)

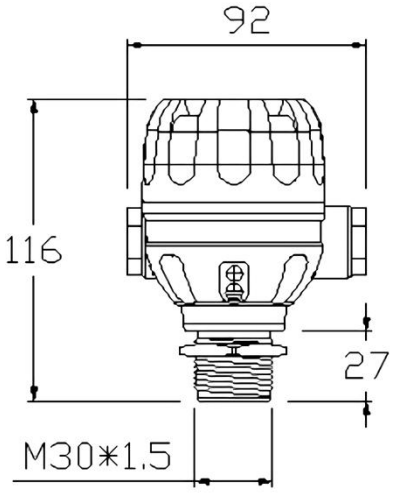


fig. 2 Without Relay

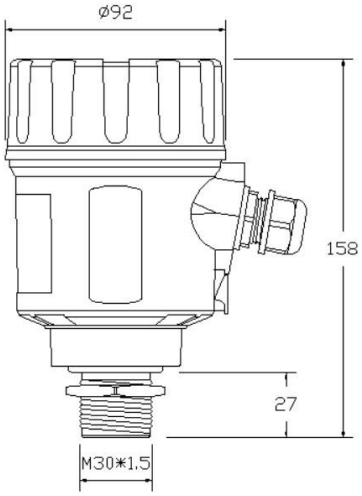
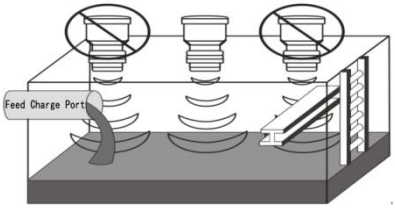


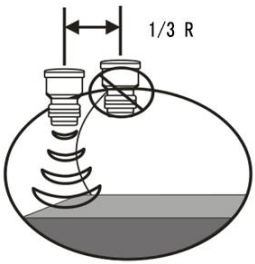
fig. 3 Relay Output

5.3 Sensor installation

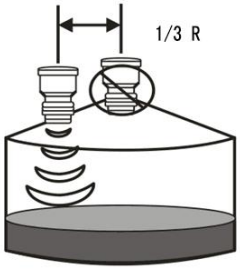
- Sensor should be placed where there is no obstacle between emission surfaces and measured liquid, it also should be far away from feeding throats.
- Tank shape should be considered. Some types of containers will bring a second echo, especially conical and spherical tanks. A good installation place will solve the problem.



Figures 3

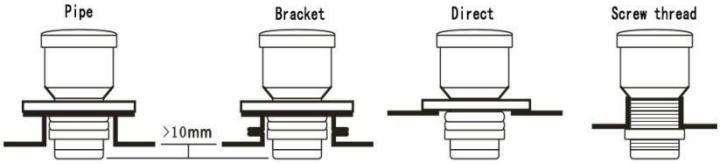


Figures 4



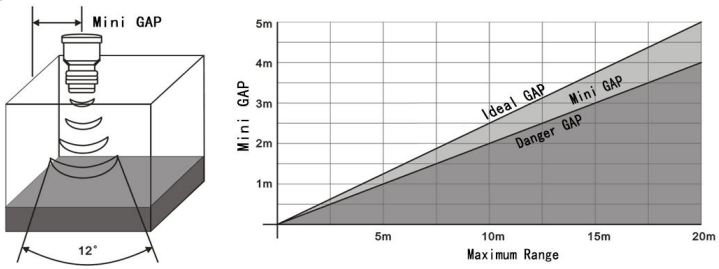
Figures 5

- The level meter can be installed by a flange or ∅61 hole, whatever installation way, make sure the sensor bottom through the installation hole or flange.



Figures 6

- If the liquid to be measured has sewage, afloat impurities, or fluctuation, use a waveguide and the diameter of the waveguide should be over 120mm, chart 5

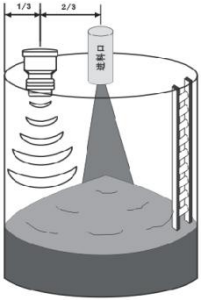


Figures 7

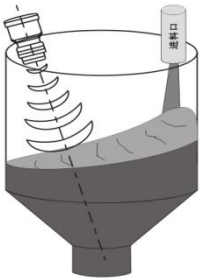
- In the measurement of solid materials, the probe needs to be typically installed at a distance from the side wall 1/3 of the container wall to the center feed inlet. When the material piles up, it will form a cone. The installation positions of the probes shown in Figures 6 and 7 will give a reading of the average level. This average level is the level height when the material is leveled. This is true for conical stacking or concave stacking surfaces that occur during unloading.

  The average level height measured by this installation is only correct for cylindrical containers and the inlet is at the centerline of the container. For containers of other shapes or feed ports that are not in the middle, the installation of the probe should be in accordance with the requirements of the user and should meet the foregoing requirements.

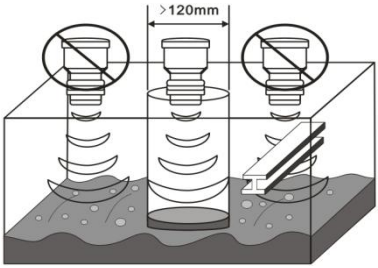
- For a liquid with a calm surface without waves, ultrasonic measurement will obtain the best results. If there is debris, bubbles, or large fluctuations on the surface of the liquid, a waveguide should be installed. The diameter of the waveguide should be greater than 120mm, and there is no joint. As shown in Figure 8



Figures 8

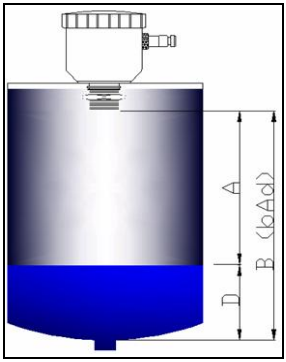


Figures 9



Figures 10

5.4 Work mode



Figures 11

- Measure liquid level

B（Installation Height）is the distance from the bottom of the container to the sensor surface, A is the distance between the sensor surface and liquid surface; D is the height of the liquid, D= B（Installation Height）-A, display value is bottom of the container to the liquid surface(D).

- Measure air distance

Set BD =0， the display value is the distance from the sensor surface to the liquid surface（A）.

5.5 Environment and Filtering

This instrument defaults dynamic filtering, to avoid the filter interference of mixing, tank walls, and other fixed bars. But for a totally enclosed small space or other easily formed secondary echo environments, it's not reliable. When the display value is about twice the actual value regularly, change **"Environment" to "Closed**".

5.6 Power supply

DC 24V power is better. When it's from switch power, the DC negative must contact the ground. Refer to the tags attached to the instrument for wiring. In order to keep it working reliably and display precisely, please electrify ＞15 minutes before work. When operated outdoors, it should be placed under sunscreen to avoid direct sunshine and rain. Lightning-proof measures should also be taken outdoors.

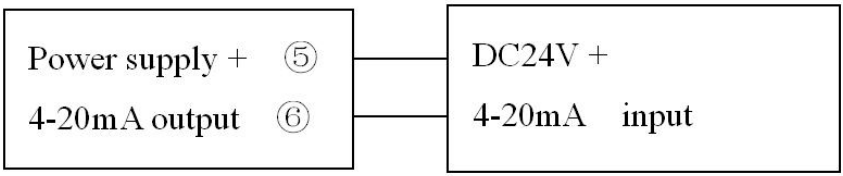
Chapter 6 Wiring

6.1 Wiring (ZP)

When wiring, the number on the terminals corresponds to the number on the label (more details see 6.5.1.1 and 6.5.1.2)

Wiring diagram of current (voltage) output connecting with the secondary instrument.

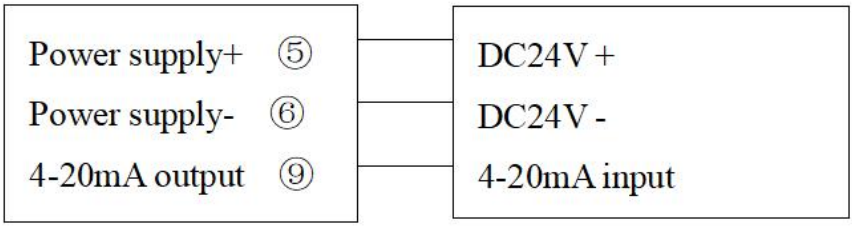
6.1.1 Two-wire



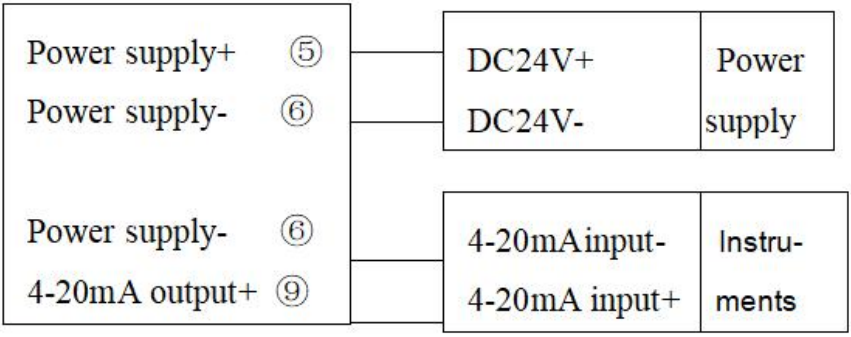
Ultrasonic level transmitter Instruments

Figures 12

6.1.2 Three Wire

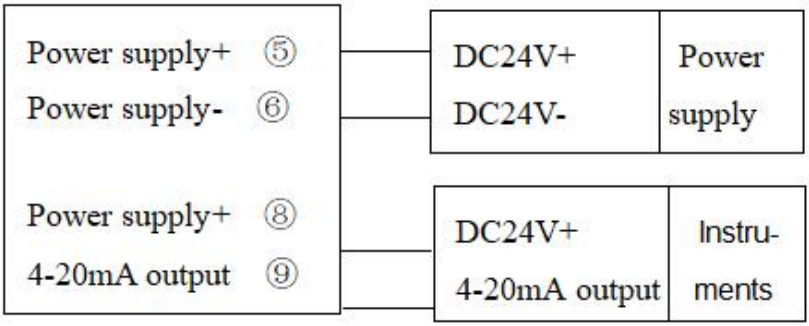


Ultrasonic level transmitter Instruments



Figures 13

6.1.3 Four Wire



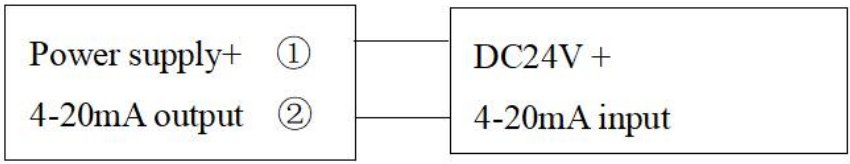
Figures 14

6.2 Wiring （ZPM）

When wiring, the number on the terminals corresponds to the number on the label (more details see 6.5.2.1 and 6.5.2.2)

Wiring diagram of current (voltage) output connecting with the secondary instrument.

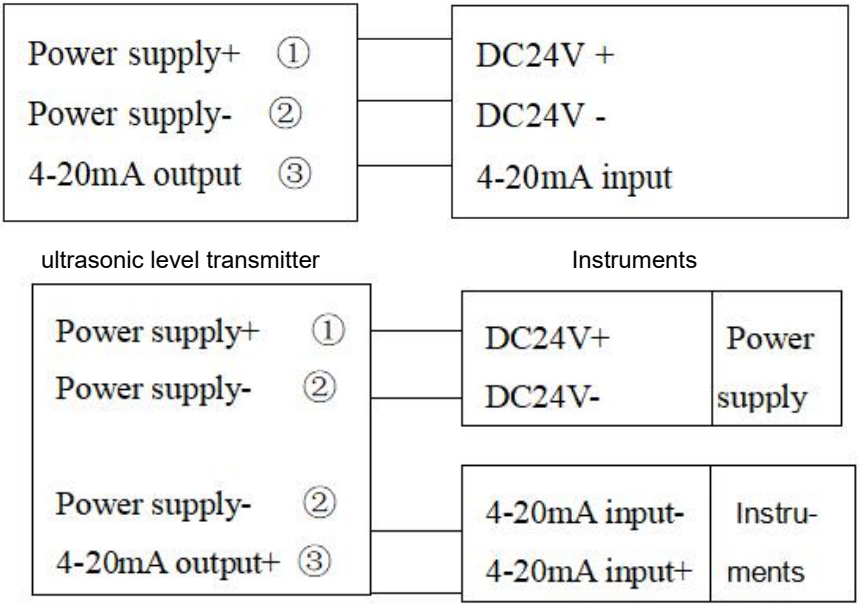
6.2.1 Two-wire



ltrasonic level transmitter Instruments

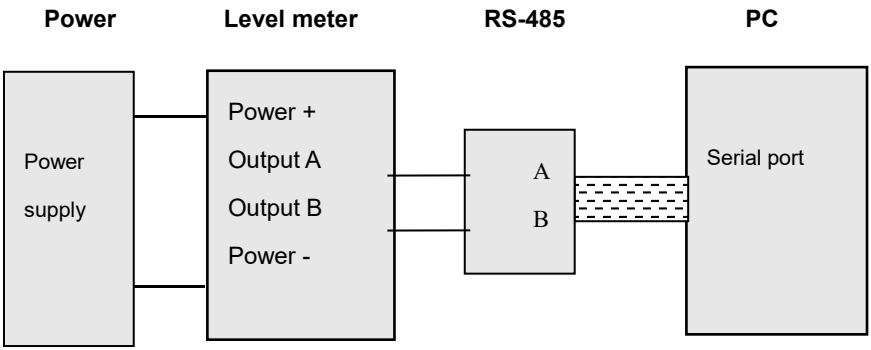
Figures 15

6.2.2 Three Wire



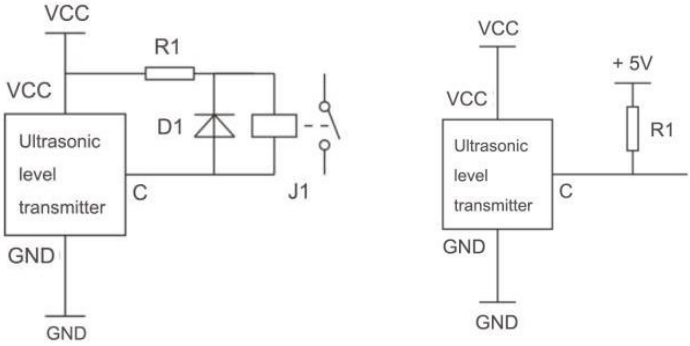
Figures 16

6.3 Serial output connecting with PC



Figures 17

6.4 NPN output wiring diagram



Conventional relay TTL output

Figures 18

Relay output setting：

This instrument has 2 relays or 3 NPN outputs. When using relay control, it must be set control point: D and H. D for the relay start point, and H for the relay endpoint. X for display value. It works as follows:

When D < H

X < D close	D	D<X<H retain	H	X > H Disconnect

when D > H

X > D close	D	D>X>H retain	H	X < H Disconnect

6.5 Wiring definition

6.5.1 Wiring definition (ZP)

6.5.1.1 Definition of three (four) wire system wiring

Please follow the logo characters on the terminal of the machine to connect !!!

Table 4

Wiring definition	Terminal	Equipped
Power Supply	⑤ DC12~24V+	☐YES / ☐NO
	⑥ DC12~24V-	
	⑩ AC220V(L)	☐YES / ☐NO

	⑪ AC220V(N)	
Current output	⑨ 4~20mA+ (3-wire system)	☐YES / ☐NO
	⑥ 4~20mA- (4-wire System）	
Voltage output	⑨ ☐0~5V☐0~10V☐others__	☐YES / ☐NO
Serial output	③ RS485(A)	☐YES / ☐NO
	④ RS485(B)	
NPN switch output	① N1	☐YES / ☐NO
	② N2	☐YES / ☐NO
	☐⑦N3 ☐⑩N3 ☐⑪N3	☐YES / ☐NO
Relay control output Ⅰ	① J1_COM	☐YES / ☐NO
	② J1_NO	
Relay control output Ⅱ	⑩ J2_COM	☐YES / ☐NO
	⑪ J2_NO	

6.5.1.2 Definition of two-wire system wiring

Table 5

Wiring definition	Terminal	Equipped
Power Supply	⑤ DC18~28V	☐YES / ☐NO
Current output	⑥ 4~20mA	☐YES / ☐NO
	⑥ HART	☐YES / ☐NO
Groud	⑦ ⏚	☐YES / ☐NO

6.5.2 Wiring definition (ZPM)

6.5.2.1 Definition of three (four) wire system wiring

Please follow the logo characters on the terminal of the machine to connect !!!

Table 6

Wiring definition	Terminal	Equipped
Power Supply	Build in battery	☐YES / ☐NO

	① DC12~24V+	☐YES / ☐NO
	② DC12~24V-	
Current output	③ 4~20mA+ (3-wire system)	☐YES / ☐NO
Voltage output	④ ☐0~5V☐0~10V☐others__	☐YES / ☐NO
Serial output	④ RS485(A)	☐YES / ☐NO
	⑤ RS485(B)	
NPN switch output	⑤ N1	☐YES / ☐NO
	④ N2	☐YES / ☐NO
	③ N3	☐YES / ☐NO

6.5.2.2 Definition of two-wire system wiring

Table 7

Wiring definition	Terminal	Equipped
Power Supply	① DC18~28V	☐YES / ☐NO
Current output	② 4~20mA	☐YES / ☐NO
	② HART	☐YES / ☐NO

Chapter 7 Troubleshooting

1. Not working, no display, no sound
Possible reasons:
① Power is not connected or “+””-”polarities are connected reversely ② Too low voltage resulting no working or too high resulting damage
Solutions：
① Check to ensure correct wiring as instructed. ② Use 12-24V DC supply or contact the distributor.
2. No display, sensor has sound
Possible reasons：
① Turning off ② Connected to high voltage, damaging display chip
Solutions:
① Press “B” to turn on display; ② contact with the distributor.
3. With sound and display, the values do not change with distance
Possible reasons:
③ Too low input voltage ④ Sensor or power driver damaged
Solutions:
③ 12-24V DC supply ④ Contact with distributor
4. With display, but the value is irregular fluctuation
Possible reasons:
① Deflective installation ② improper setting of pulse intensity, leading to great residual vibration or diffraction ③ more than 2 instruments work together, interfering with each other ④ too much electromagnetic disturbance in the working area

⑤ There are bubbles or debris on the liquid
Solutions:
① Adjust the axis of the sensor vertically to the surface to be measured
② in general, range of 1-3m, transmit intensity is 2-5
③ try to eliminate interference
④ find out the disturbance source and shield
⑤ eliminate bubbles or debris
5. Big error
Possible reasons:
⑥ Non-vertical installation, leading to multiple reflections
⑦ installed too close to the wall, a sonic wave reflected midway
⑧ check “BD”
⑨ check temperature display
Solutions:
① Adjust installation positions several times.
② correctly set **“BD”**
③ adjust the temperature (**“TE”**) to the proper value.
6. Abnormal current output
Possible reasons:
① Too large load resistance
② FS, AL, or AH changed.
③ undesired supply rectification and filtering
④ electrify time is not enough
Solutions:
① Lower load resistance
② readjust parameter
③ replace with DC-regulated supply with a larger capacity
④ electrify ＞15 minutes before work
7. Abnormal RS485 output

Possible reasons:
① Reverse connecting of A and B ② incorrect parameter of serial ports, it does not match with the main unit
Solutions:
① Change wiring, ② reset parameter, the same as the main unit
8. Abnormal control output
Possible reasons:
①Wrong parameter. Setting ②external current-limiting resistor too large ③external current-limiting resistor is too small, damaging the level meter
Solutions:
①Reset parameter ②decrease current-limiting resistor ③ Contact with distributor

Chapter 8 Warranty & After-sales Service

We promise to the customer that the hardware accessories provided during the supply of the instrument have no defects in the material and manufacturing process.

From the date of the purchase, if the user's notice of such defects is received during the warranty period, the company will unconditionally maintain or replace the defective products without charge, and all non-customized products are guaranteed to be returned and replaced within 7 days.

Disclaimers:

- During the warranty period, product faults caused by the following reasons are not in the scope of the Three Guarantees service.
- Product faults caused by improper use by customers.
- Product faults caused by disassembling, repairing, and refitting the product.

After-sales service commitment:

- We promise to deal with the customer's technical questions within 2 hours.
- For the instruments returned to the factory for maintenance, we promise to issue the test results within 3 working days and the maintenance results within 7 working days after receiving them.