



Handbook

ABDT-CS Ultrasonic Level Meter

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I. Measuring Principle

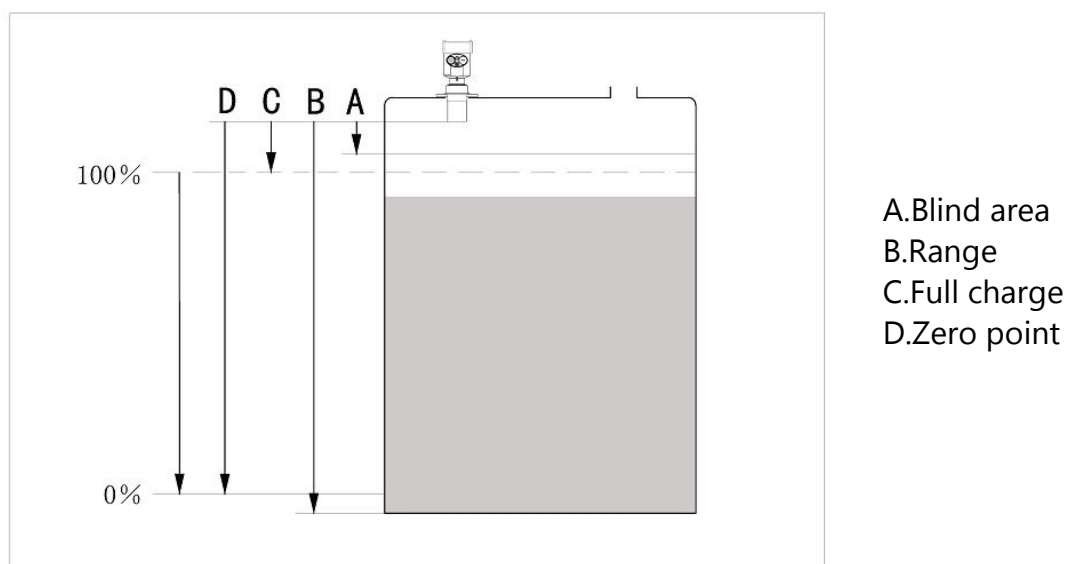
The principle of ultrasonic level meter is that the ultrasonic pulse is sent by the transducer (probe). When the surface of the tested medium is reflected back, some reflected echoes are received by the same transducer and converted into electrical signals.

Ultrasonic pulses travel at acoustic speed, and the time interval from the launch to the reception of the ultrasonic pulses is proportional to the distance from the transducer to the surface of the medium being measured. The relation between the distance value S and the sound velocity C and the transmission time T can be expressed in terms of formulas:

$$S = C \times T / 2$$

Since the launch of the ultrasonic pulse with a certain width, the distance of reflection wave transducer in small region and emission wave overlap, not recognized, can not measure the distance value, this area is known as the measuring blind area, relevant work frequency and size of ultrasonic liquid level meter blind.

The base level of the measurement is the lower edge of the probe.



●Characteristic

Advanced microprocessor is adopted

Unique echo processing technology

False echo storage function

Built in temperature compensation

Small beam

Simple debugging and calibration

II. Instrument Introduction

ABDT-CS21/22-5m



Application: Liquid level measurement

Measuring range: standard probe: corrosion sealed probe:

Liquid (0.3 ~ 5) m liquid (0.3 ~ 4) m

Process connections: M66×2/G2/G1 1/2 thread, PP flange and bracket(Customizable)

Transducer shell material: PA66+GF30 or PVDF

Process temperature: (-40 ~ 70) °C

Process pressure: (-0.02 to 0.1) MPa

Accuracy: ± 0.2% (full scale)

Signal output: (4~20) mA/HART

Power supply: two wire system 24V DC

Four wire system 24V DC/220V AC

Explosion proof grade: Exd IIC T4 Gb

ABDT-CS21/22-10m



Application: Liquid level measurement

Measuring range: standard probe: corrosion sealed probe:

Liquid (0.4 ~ 10)m liquid (0.4 ~ 8)m

Process connections: M66×2/G2/G1 1/2 thread, PP flange and bracket(Customizable)

Transducer shell material: PA66+GF30 or PVDF

Process temperature: (-40 ~ 70) °C

Process pressure: (-0.02 to 0.1) MPa

Accuracy: ± 0.2% (full scale)

Signal output: (4~20) mA/HART

Power supply: two wire system 24V DC

Four wire system 24V DC/220V AC

Explosion proof grade: Exd IIC T4 Gb

ABDT-CS21/22-15m

**Application: Liquid level measurement**

Measuring range: standard probe: corrosion sealed probe:

Liquid (0.5 ~ 15)m liquid (0.5 ~ 12)m

Process connections: M66×2/G2/G1 1/2 thread, PP flange and bracket (Customizable)

Transducer shell material: PA66+GF30 or PVDF

Process temperature: (-40 ~ 70) °C

Process pressure: (-0.02 to 0.1) MPa

Accuracy: ± 0.2% (full scale)

Signal output: (4~20) mA/HART

Power supply: two wire system 24V DC

Four wire system 24V DC/220V AC

Explosion proof grade: Exd IIC T4 Gb

III. Installation Guide

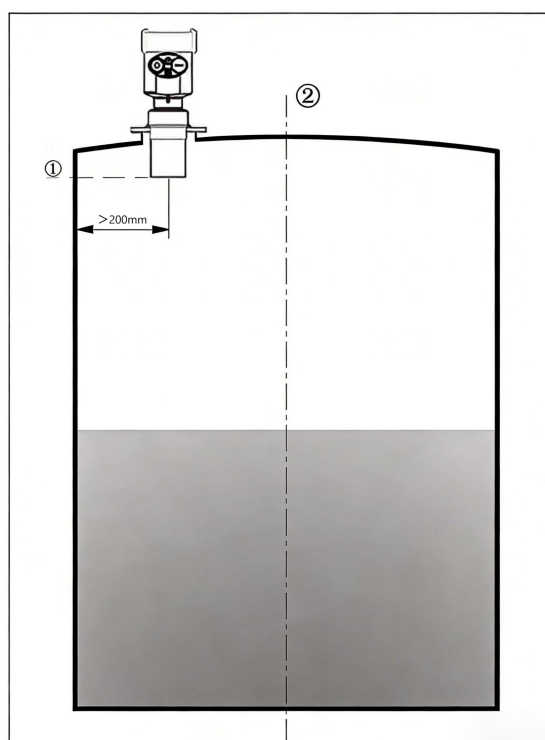
3.1 Installation location description

- Installation of ultrasonic wave 5 meters and 10 meters

At the time of installation, the instrument and vessel wall shall maintain a minimum distance of 200mm, which is recommended to be greater than 500mm.

① Lower edge of sensor
(acoustic emission surface)

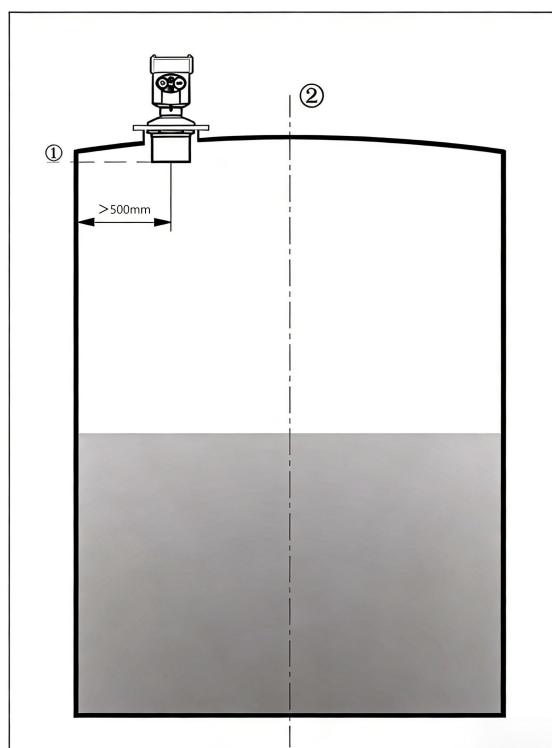
② Central line of storage tank



- Installation of 10 meter ultrasonic wave

At the time of installation, keep the instrument and vessel wall at least 500mm distance.

- ① Lower edge of sensor (acoustic emission surface)
- ② Central line of storage tank



3.2 Install

- Installation requirements

The instrument distance must keep a distance from the tank wall (see installation location 3.1).

When transmitting ultrasonic pulses, the transducer has a certain beam angle. From the edge of the transducer to the surface of the medium to be measured, the A and B obstacles should be avoided as far as the radiation region of the ultrasonic beam is concerned: Such as: ladder, level switch, a heating coil, the guide groove etc..

Note that the ultrasonic beam shall not intersect the feed stream;

When installing instrument, the highest material level shall not enter the measuring blind area;

The installation of the instrument can make the direction of the transducer vertical to the liquid level as much as possible;

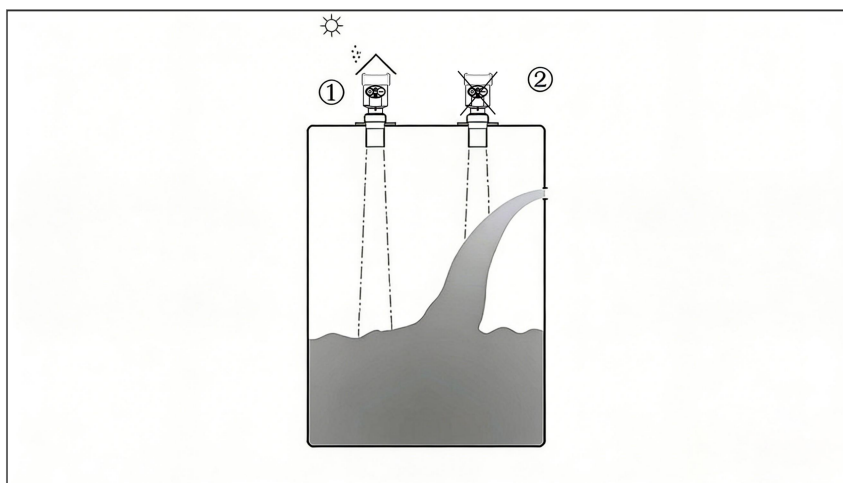
Explosion proof area must comply with the installation regulations of the national

explosion prevention area. This type of shell adopts aluminium shell. This type of instrument can be installed in the explosion-proof requirements of the occasion, the instrument must be grounded.

- Typical error installations

Do not install the instrument at the top of the feed. The actual level cannot be measured. At the same time note: outdoor installation should adopt sun shading and rainproof measures.

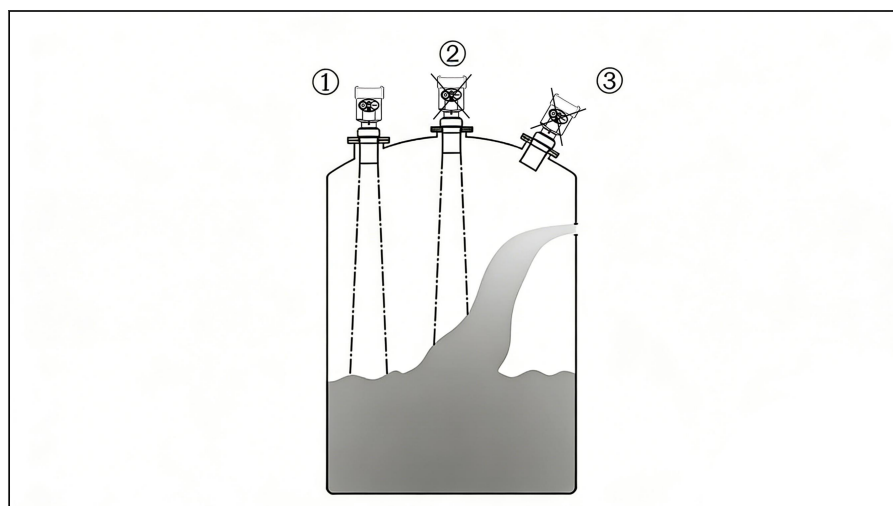
- ① Correct
- ② Error



The transducer shall be perpendicular to the surface of the medium to be measured.

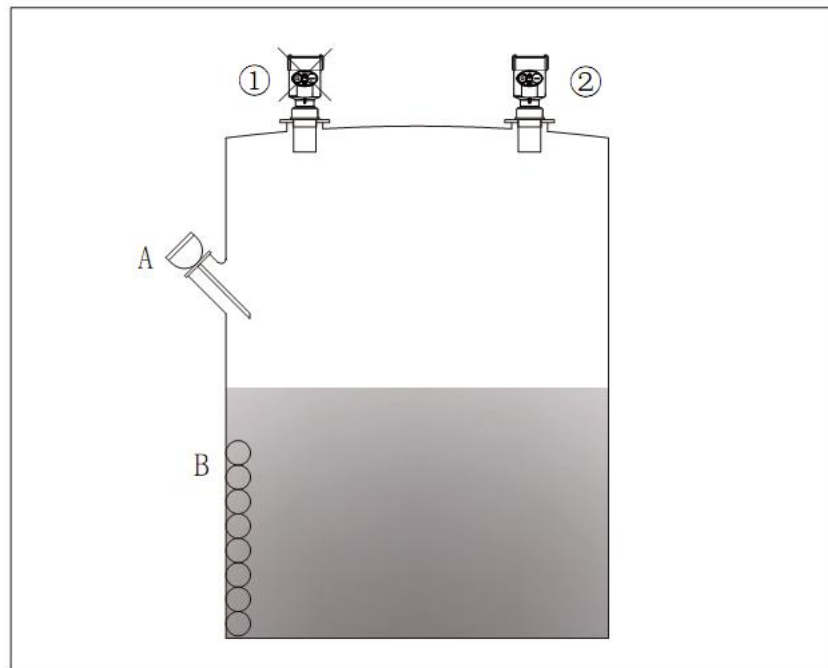
The instrument can not be installed in the middle of the arched tank top to avoid multiple reflections.

- ① Correct
- ② Error
- ③ Error



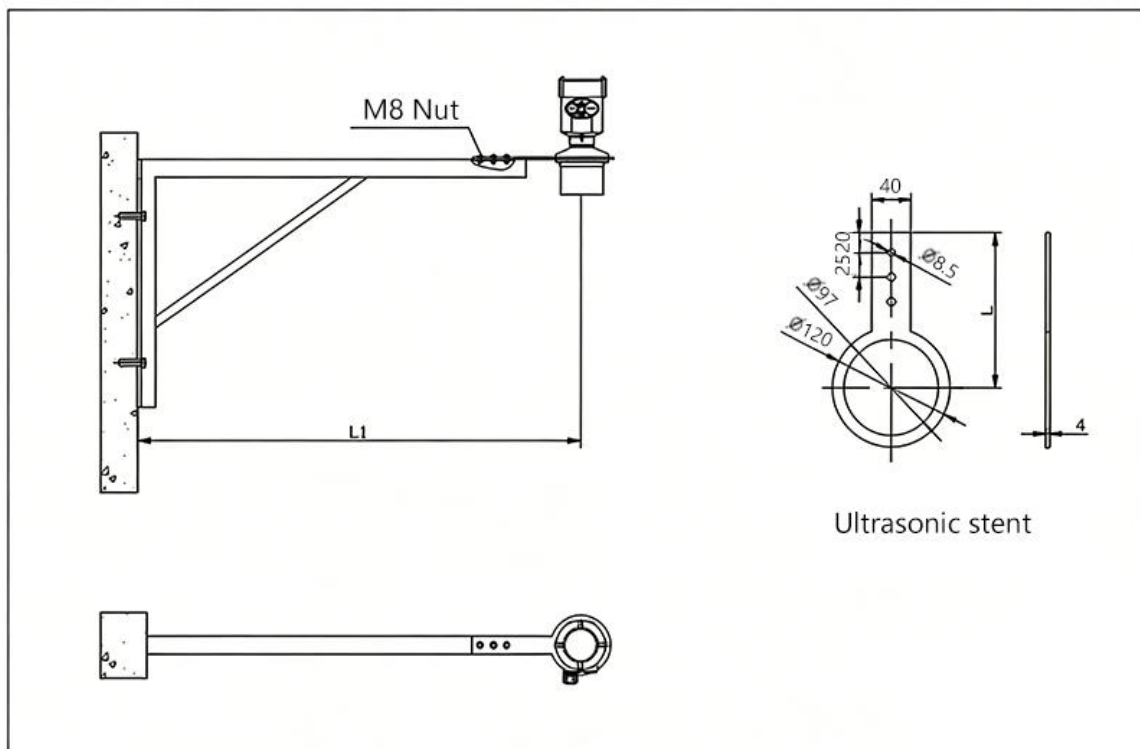
The instrument should avoid A and B obstructions during installation.

- ① Error
② Correct



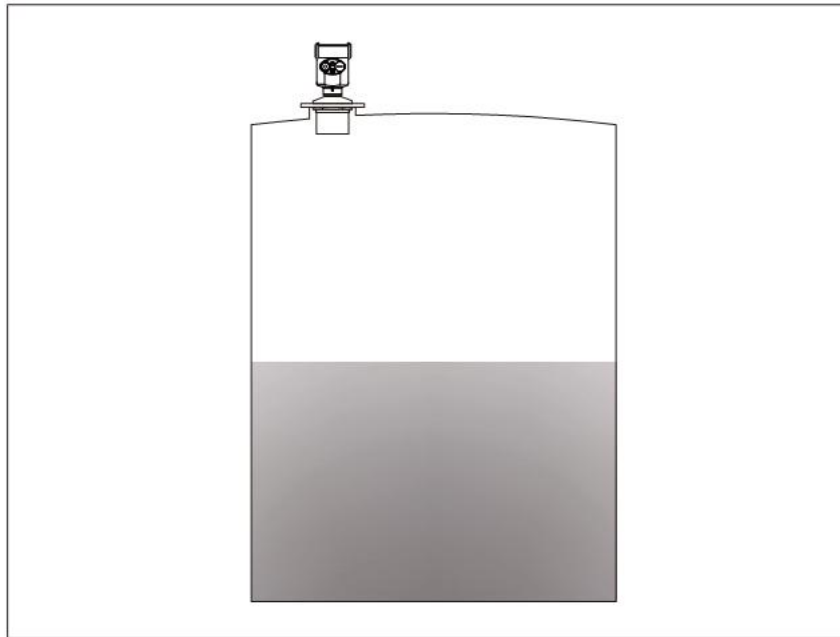
• Bracket mounting

Bracket mounted for 15 meter ultrasonic level meter.



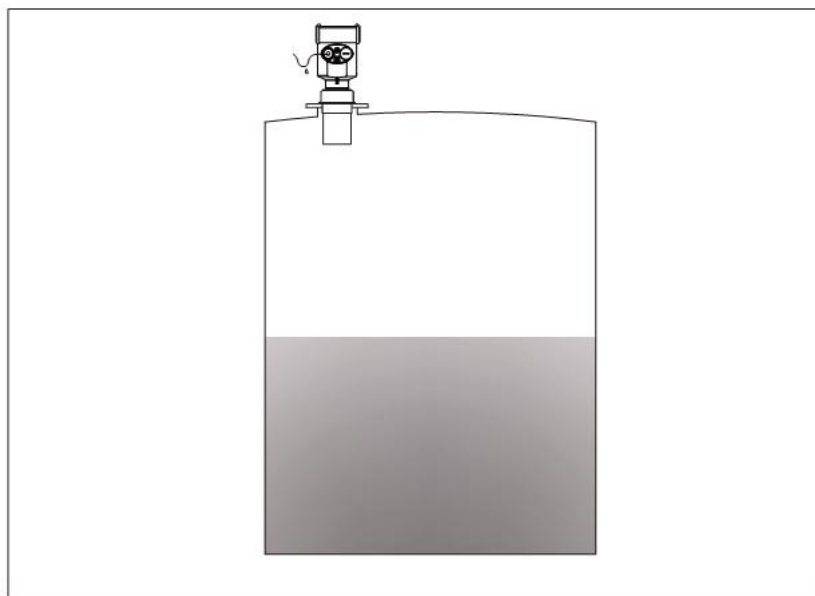
- **Flange mounting**

Flange mounted for 15 meter ultrasonic level meter.



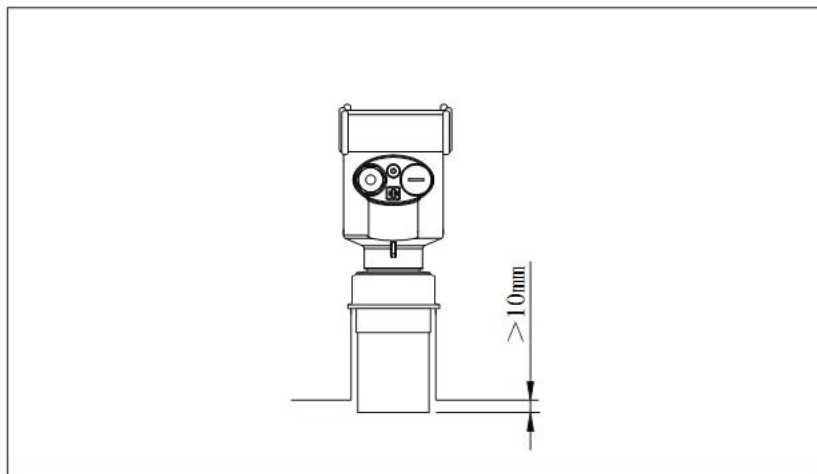
- **Moisture-proof**

For installation in an outdoor or humid room, the cable sealing sleeve shall be tightened and the cable bent downward to U type at the entrance. As shown:



- **Container nozzle**

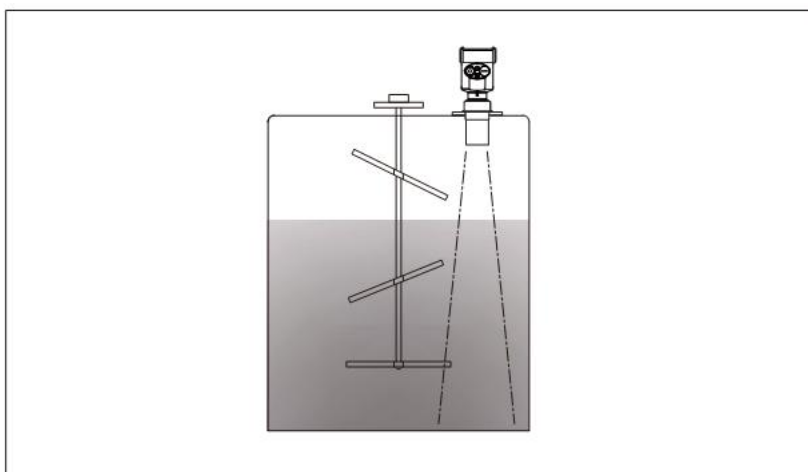
Length of container nozzle: must ensure that the probe extends out of the nozzle, at least 10mm.



● Foam

Foam is formed on the surface of some liquid medium because of feeding, stirring or other process in the container, and the emission signal is attenuated. If the foam causes a measurement error, the sensor shall be mounted in the wave guide tube or using a guided wave radar level meter. Guided wave radar level meter measurement is not affected by foam, and is the best choice for this kind of application.

When the tank is stirred, the instrument is installed as far away from the agitator as possible. If foam or wave is caused by agitation, the wave guide installation shall be used.

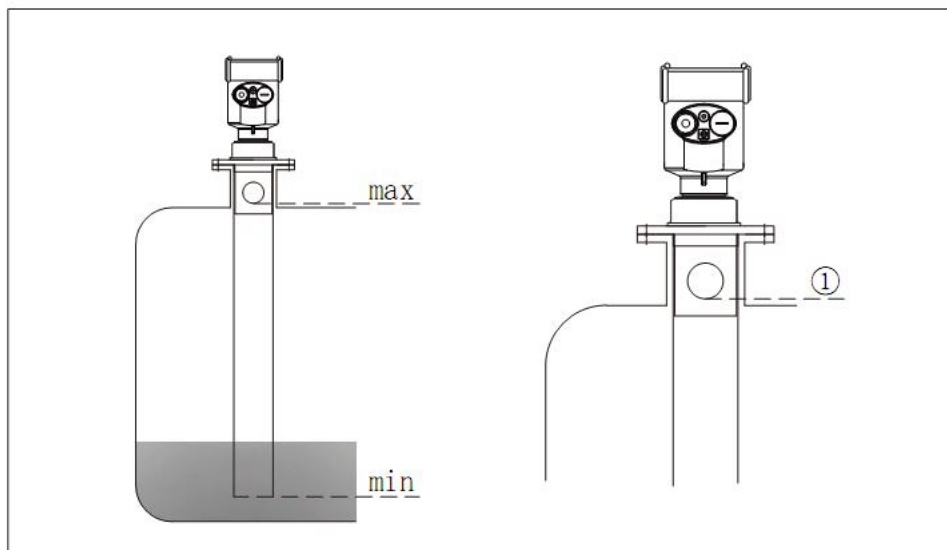


● Airflow

If the container has a strong airflow, such as outdoor installation, and windy, or a container with air vortex, suggested sensors installed in the wave guide tube, or the use of pulse radar level gauge or guided wave radar level meter.

● Guided wave tube installation

The diameter of the air vent (5-10) mm and the use of a guided wave tube (guided wave tube or bypass tube) can avoid the effects of vessel obstruction, foam, and air turbulence on the measurement.



Note: Material is sticky and can not be measured by guided wave tube.

IV. Electrical Connection

● Power supply mode

4~20mA/HART (two wire) power supply and output current signal share a two core cable. Refer to the technical data for the specific power supply voltage range. For intrinsically safe type must be added a safety barrier between the power supply and the instrument.

4~20mA/HART (four wire) power supply and current signals are each using a two core cable respectively. Refer to the technical data for the specific power supply voltage range.

The current output of the standard meter can be output in the form of earthing. The explosion-proof instrument must be current output floating output. The instrument and earthing terminal shall be well grounded, and the ground shall be connected to the junction of the tank, if the plastic tank shall be attached to the adjacent land.

● Connection cable installation

General introduction

The power supply cable can use a universal two core cable, and the outer diameter of

the cable should be (5~9) mm to ensure the sealing of the cable inlet. If electromagnetic is present, shielded cable is recommended.

4~20mA/HART (two wire system)

Shielded cables shall be used in power cables.

4~20mA/HART (four wire system)

Shielded cable ends are connected to ground. Within the sensor, the shield must be directly connected to the internal ground terminal. The outer ground terminal on the housing must be connected to the ground.

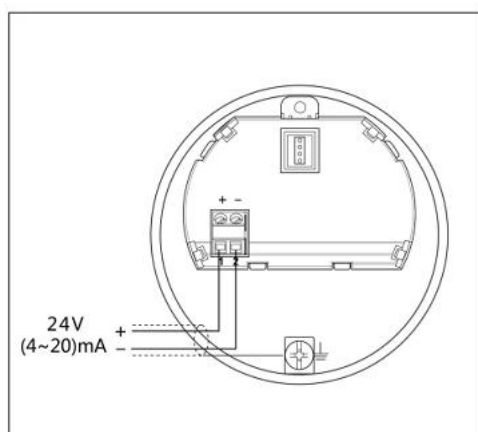
Shielding and wiring of cables

If there is a ground current, the shielding cable away from the instrument side of the shielding end must be grounded through a ceramic capacitor (e.g., 1nF, 1500V) to play a role in isolating and bypassing the high frequency signal.

• Connection mode

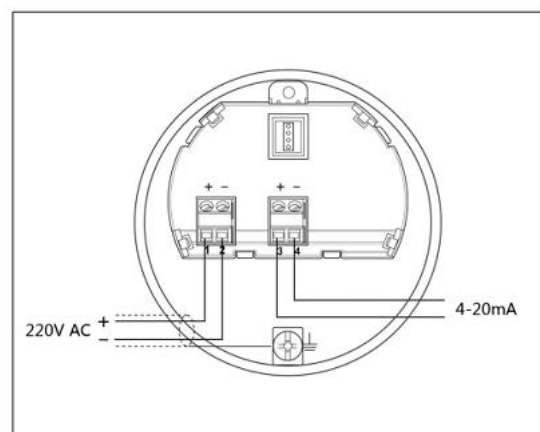
Two wire system

For HART two wire system power supply and signal output, 24V DC power supply, 4~20mA output



Four wire system

220V AC/50Hz or 24V DC power supply,



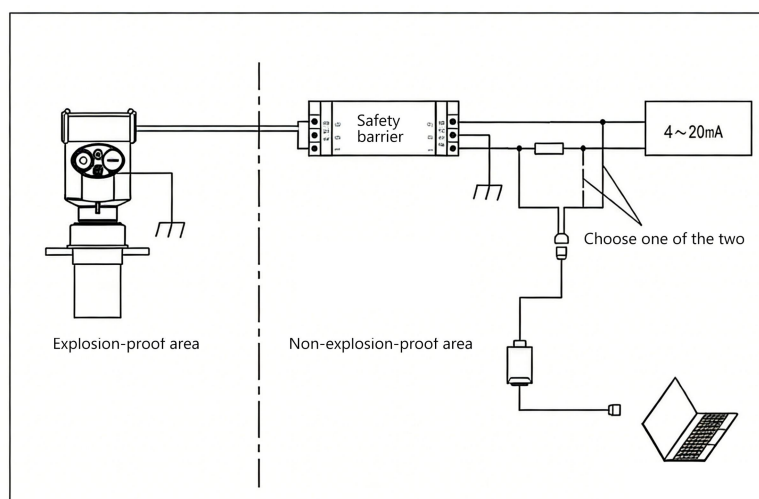
• Explosion proof connection

The explosion proof sign of this product: Exd IIC T4 Gb. The ultrasonic level meter adopts aluminum shell material, and the inner sealing structure is adopted to ensure that the spark produced by the fault of the transducer and the circuit part will not leak out. The product is suitable for Exd IIC T4 Gb, explosion rating, flammable media below the level of

continuous measurement.

The product shall be supplied with safety grid when used in explosion protection.

All cables shall be shielded cables with a maximum length of 600m. The distributed capacitance and inductance less than or equal to 0.1 $\mu\text{F}/\text{km}$ less than 1mH/km. The ultrasonic level meter must be grounded when installed.



V. Instrument Debugging

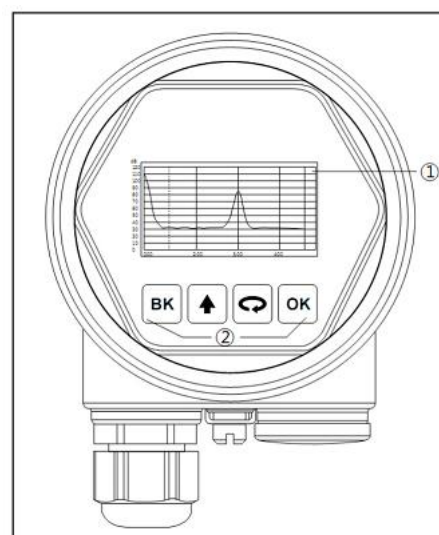
Debugging method

- 1.Header key debugging
- 2.Upper computer software debugging
- 3.HART handheld programmer debugging

1. Header key debugging

The instrument is debugged by using 4 keys on the meter. After debugging, it is only used for field display.

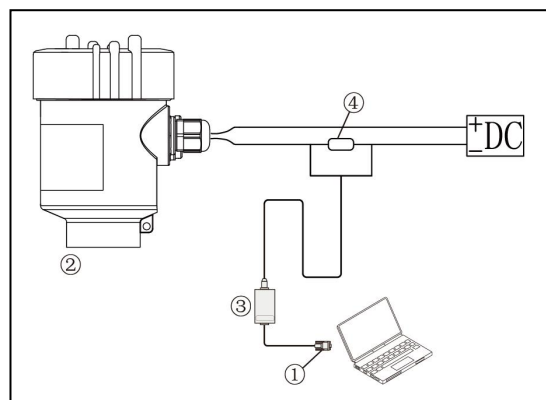
- ① LCD
- ② Key



2. Upper computer software debugging

Connect to PC through HART

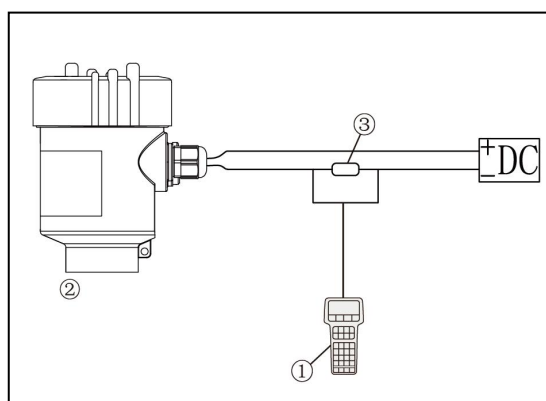
- ① USB interface
- ② Header
- ③ HART adapter
- ④ 250 Ω resistor



3. HART handheld programmer debugging

Programming with HART handheld programmer

- ① Hand programmer
- ② Header
- ③ 250 Ω resistor



VI. Technical Parameter

• General data

Process connection

M66×2/G2/G1 1/2 thread, PP flange(Customizable), bracket(Customizable)

Material Science

-Transducer	PA66+GF30
-Transducer seal	Silica gel
-Shell	Aluminum
-Case seal	Silicon rubber
-Top window	Polycarbonate
-Ground terminal	Stainless steel

Weight

-5 m and 10 m	2kg (Depends on process connections)
-15m	6kg (Depends on process connections)

• Supply voltage

Two wire system

Standard type	16~36V DC
Intrinsically safe	21.5~26.5V DC
Power waste	max.22.5mA
Allowable ripple	
-<100Hz	$U_{ss} < 1V$
-(100~100k)Hz	$U_{ss} < 10mV$

Four wire system

Standard type	24V DC/220V AC
Power waste	max.1VA, 1W

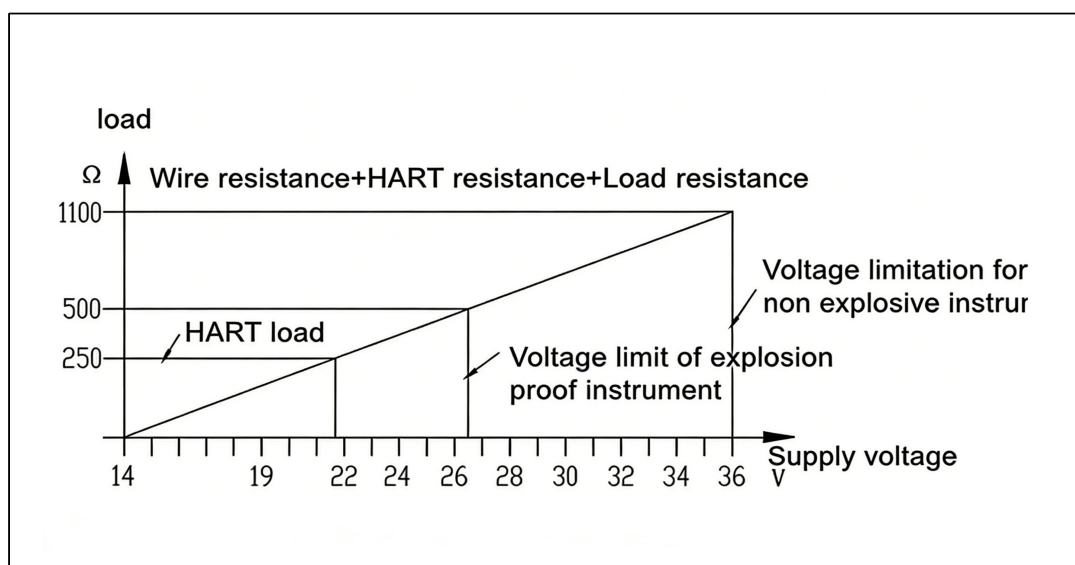
• Cable parameter

Cable inlet / plug	M20*1.5 cable inlet (cable diameter 5-9mm), 1 blind blocks M20*1.5.
Spring connection terminal	For the wire cross section 2.5 mm ²

• Output parameter

Output signal	4~20mA 4~20mA/HART 1-5V
Resolving power	1.6μA
Fault output	20.5mA; 22mA; 3.9mA
Damping time	0-30s, Adjustable

Load resistance diagram of two wire system



Characteristic parameter

Blind area

5m	0.4m
10m	0.4m
15m	0.4m

Ultrasonic frequency

5m	50kHz
10m	40kHz
15m	28kHz

Measurement interval >2s (Depends on the parameter settings)

Adjustment time >3s (Depends on the parameter settings)

Emission angle 15°

Resolving power 1mm

Repeatability ±3mm

Accuracy ±0.2% (Full scale)

Process temperature -40~70°C

Relative humidity <95%

Pressure <0.1MPa

Resistance to vibration Mechanical shock 10m/s

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