

FUL31 Series

User Manual

FY/JC 100 A / O 15/10 V 1.2



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1、 Summary

FUL31 series two wire ultrasonic level gauge Adopt original imported chip, double frequency echo signal The theory integration technology is received in actual use The signal is more stable and reliable. Easy installation and maintenance Applicable to water, acid, alkali, salt, corrosion, high temperature, etc Various fields.

2、 Principle

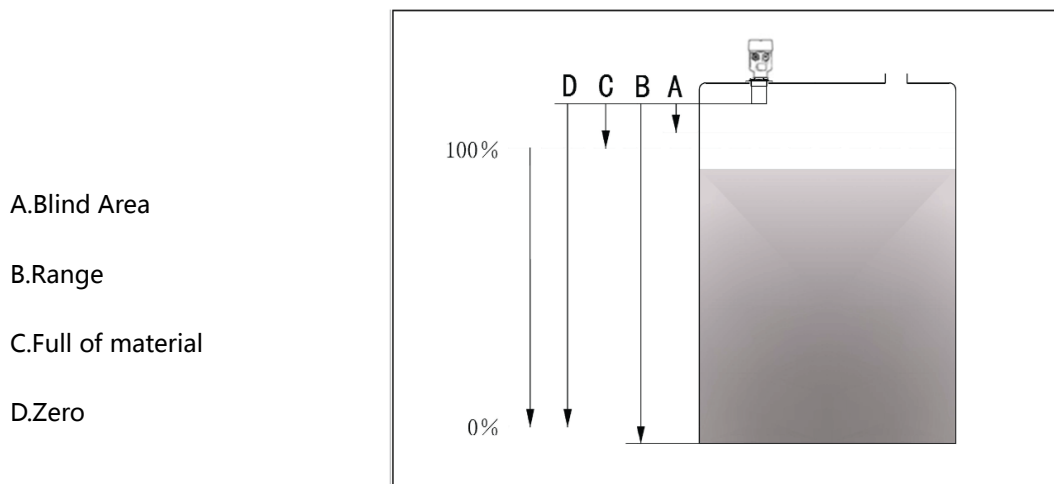
The principle of the ultrasonic level meter is that the ultrasonic pulse emitted by the transducer (probe) is reflected back when it encounters the surface of the medium under test.

Ultrasonic pulse travels at acoustic velocity, and the time interval from transmission to receiving ultrasonic pulse is proportional to the distance from the transducer to the surface of the measured medium. The relation between this distance value S and sound velocity C and transmission time T can be expressed by formula:

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

Since the emitted ultrasonic pulse has a certain width, the reflected wave and the transmitted wave are overlapped in a small section near the transducer, which cannot be identified or measured. This area is called the measurement blind area, and the size of the blind area is related to the operating frequency of the ultrasonic level meter.

Measure the lower edge of the benchmark interview probe.



3、 Features

- The circuit design selects the high quality power module from the power supply part, and the components choose the imported high stable and reliable components, which can completely replace the same type of foreign instruments.
- The patent acoustic intelligent technology software can carry out intelligent echo analysis without any debugging and other special steps. This technology has the function of dynamic thinking and dynamic analysis.
- We have the patent technology of sound wave intelligence, which greatly improves the precision of the instrument.
- This instrument is a non-contact instrument, which does not contact with the liquid directly, so the fault rate is low The instrument provides a variety of installation methods, users can fully calibrate the instrument through this manual.
- The input and output line of the meter have lightning protection, over-current and over voltage protection.

4、 Introduction

Industrial level measurement, solid particle measurement, especially in water treatment industry.Measurement range: standard probe, anti-corrosion seal type,

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

Solid (0.3 ~ 2)m solid (0.3 ~ 1.5)m

Process connection: M66 x 2 or flange

Probe material: PVDF or PTFE

Shell material: cast aluminum

Process temperature: (40 ~ 70 °C)

Process pressure: -0.02 ~ 0.1MPa

Precision: + / - 10mm (full range)

Signal output :4 ~ 20mA, 4 ~ 20mA/HART

Power source: two - wire 24V DC

Four-wire 24V DC/220V AC

Explosion-proof grade: Ex-d II C T4 Gb

5、 Installation Guide

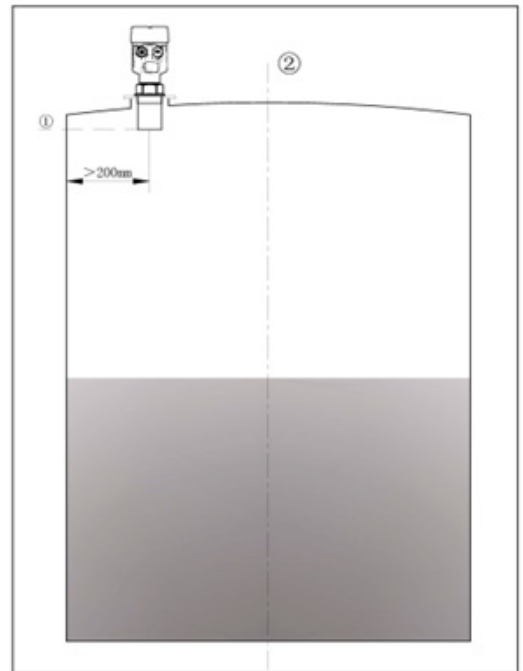
5.1 Installation location Installation of 5 meters and 10 meters

ultrasonic waveWhen installed, keep
the gauge at least 200mm away fromthe container wall.

It is recommended to be larger than 500mm.

①Lower edge of sensor (acoustic emission surface)

②Enter the center line of the storage tank

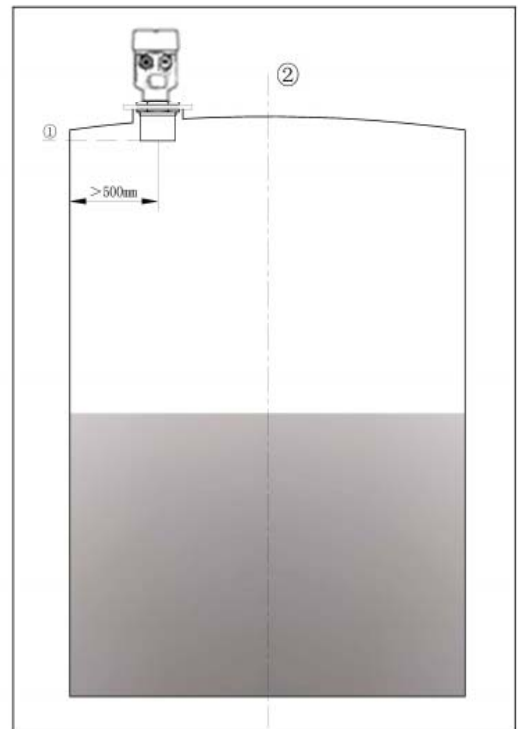


- Installation of 10 m ultrasonic

When installing, keep the meter at least 500mm
away from the container wall.

①Lower edge of sensor (acoustic emission surface)

②Enter the center line of the storage tank



5.2 Installation

- Installation requirement

The instrument must be kept at a certain distance from the tank wall (see 3.1 installation location for details)

When a transducer emits an ultrasonic pulse, it has a certain beam Angle. From the lower edge of the transducer to the surface of the measured medium, in the area radiated by the ultrasonic beam, try to avoid obstacles A and B;

Such as: ladder, location switch, heating coil, diversion trough and so on.

Note that the ultrasonic wave must not intersect the feed flow.

The highest material level shall not enter the measurement blind area when installing the instrument.

The instrument should be installed so that the transmitter direction of the transducer is perpendicular to the liquid level.

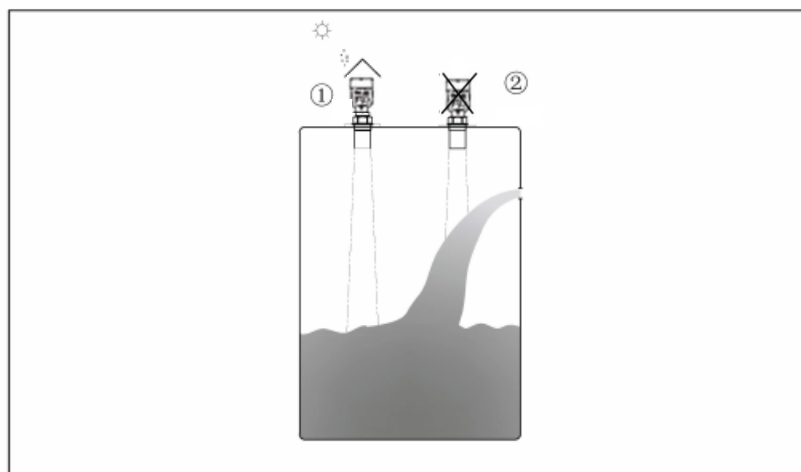
The instruments installed in the explosion-proof area must comply with the national regulations on the installation of explosion-proof dangerous area. The shell of benan type is made of aluminum. This instrument can be installed on the occasions where explosion protection is required. The instrument must be connected to the earth.

- Typical installation error

Do not install the instrument above the feed inlet, the real liquid level can not be measured. At the same time attention: outdoor installation should be taken sun, rainproof measures.

(1) correct

(2) error



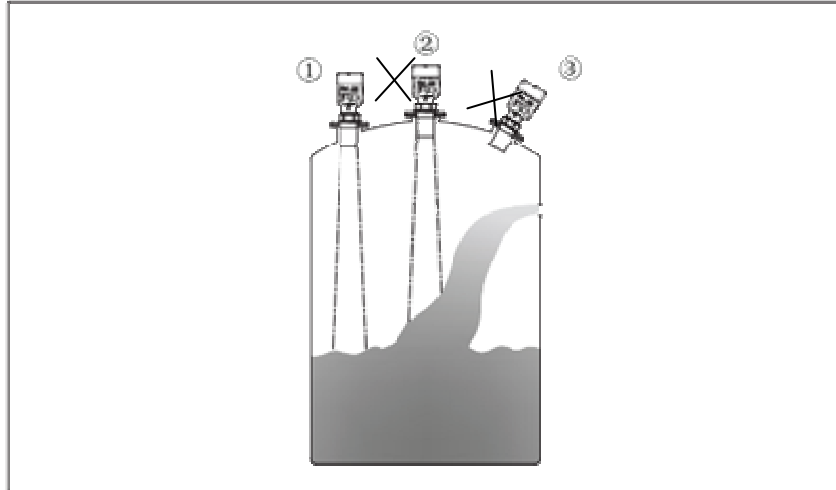
The transducer should be perpendicular to the surface of the medium under test ;

The meter should not be installed in the middle of the top of the arch to avoid multiple reflections

① Correct

② Error

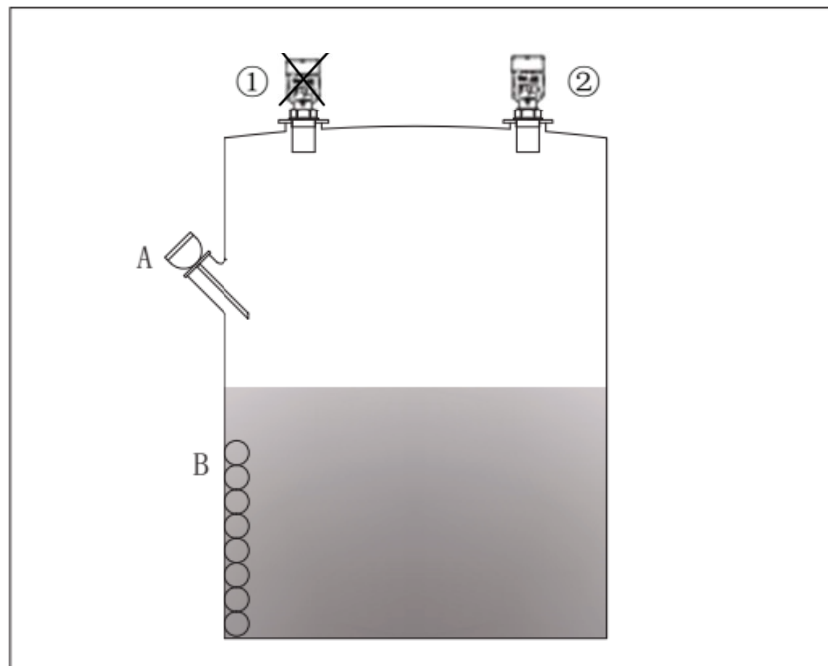
③ Error



When the instrument is installed, it should avoid obstacles A and B

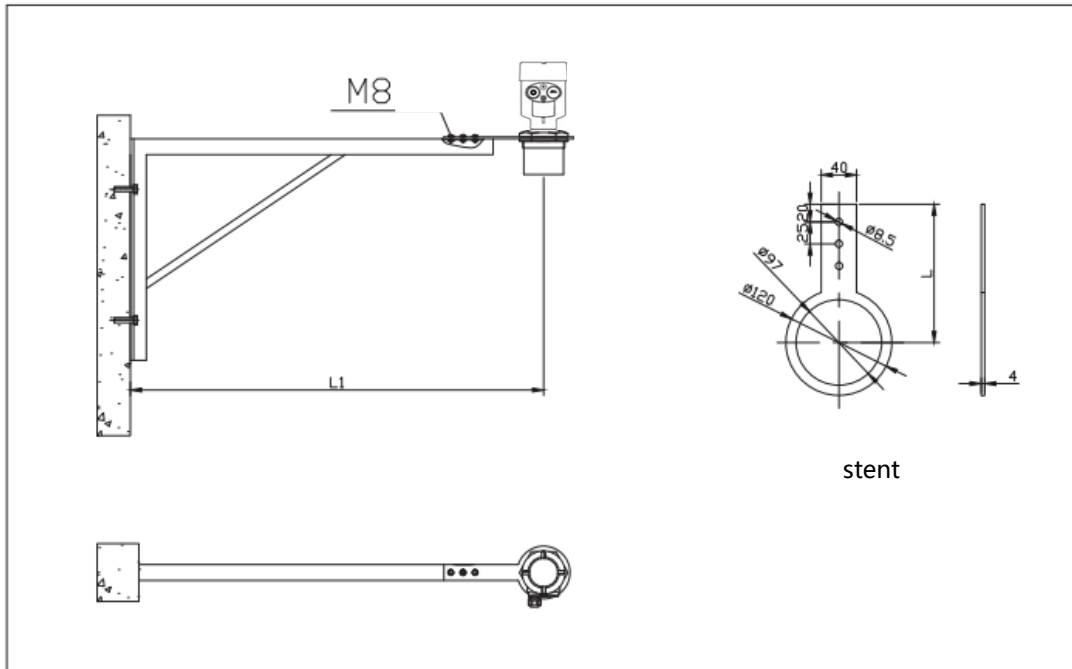
① Error

② Correct



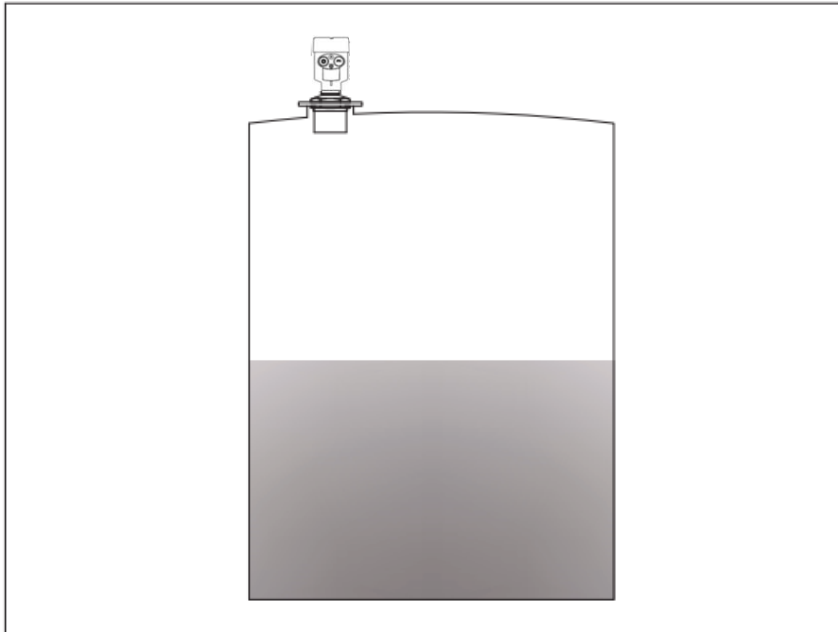
- **Bracket installation**

The installation of an ultrasonic level gauge.



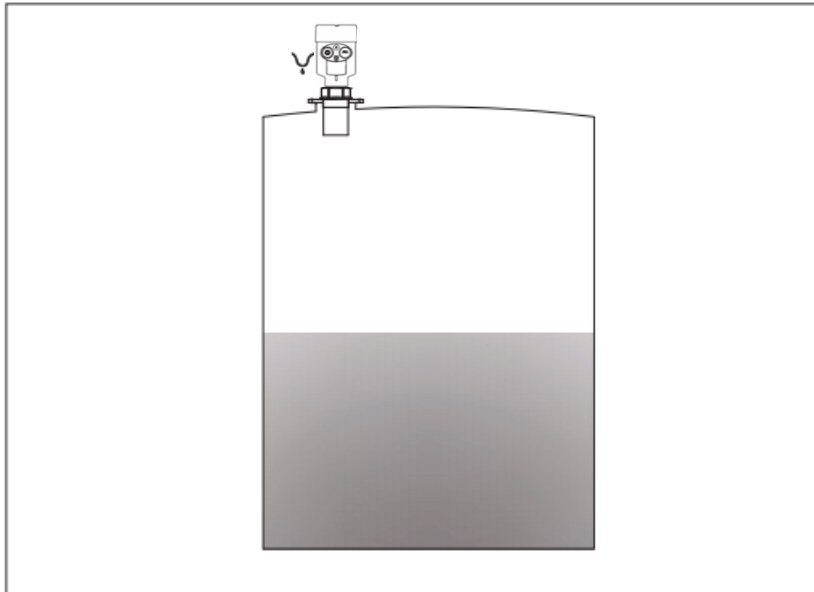
- **Flanged Installation**

Installation of flanged ultrasonic level gauge.



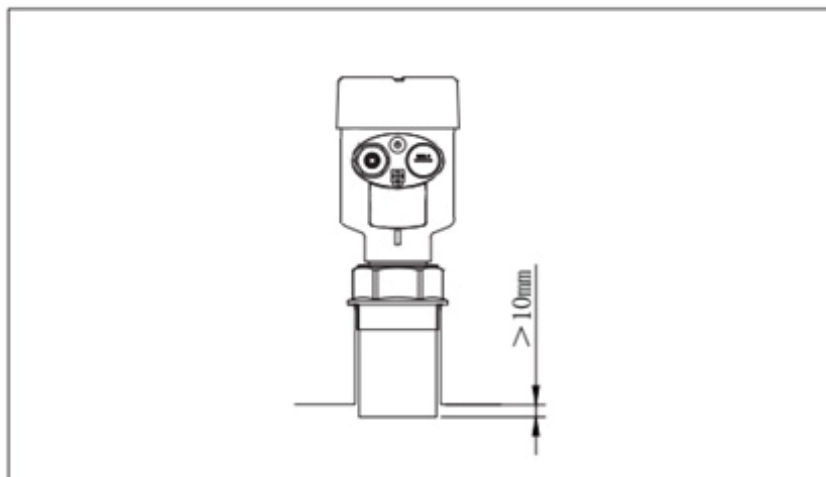
- **Moistureproof**

For installation outside or in a damp chamber, tighten the cable seal sleeve and bend the cable downward into a u-bend at the inlet. As shown in the figure:



- **Container nozzle**

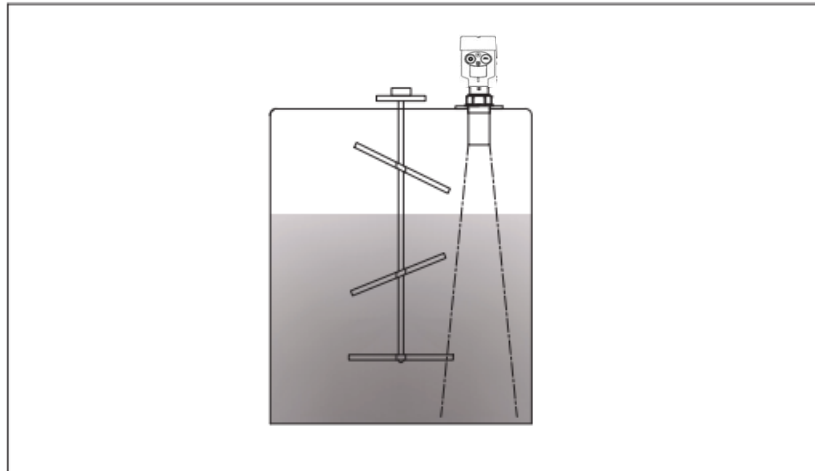
Length of container nozzles: the probe must be kept at least 10mm out of the nozzles.



- **Foam**

As a result of feeding, stirring, or other processes in the container, foam can form on the surface of some liquid media, attenuating the emission signal. If the foam causes measurement error, the sensor should be installed in the waveguide tube or the radar level gauge should be used. The radar level gauge is not affected by foam and is the best choice for this application.

When there is stirring in the tank, the instrument should be installed as far as possible away from the mixer. If foam or upturned waves are generated by agitation, the waveguide installation shall be used.

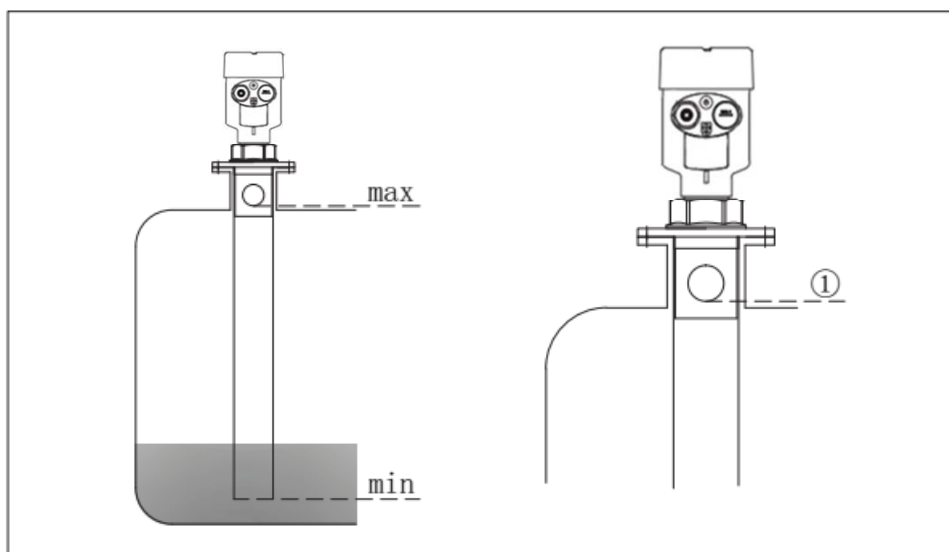


- **The air current**

If there is a strong air flow in the container, for example, outdoor installation, which is very windy, or air turbulence inside the container, it is recommended to install the sensor in the waveguide tube, or use the pulsar level gauge or the waveguide radar level gauge.

- **Waveguides installation**

The diameter of the through air hole (5-10) mm is used to install the guide pipe (guide pipe or bypass pipe), which can avoid the influence of obstructions, foam and air eddy current in the container on the measurement.



Note: the material should not be measured by waveguide tube.

6、 Electrical Connection

- **Power Supply Mode**

4~20mA/HART (two-wire) power supply and output current signal share one two-core cable. Please refer to the technical data for the specific power supply voltage range. A safety grid shall be added between the power supply and the meter for the native ampere type.

4~20mA/HART (four-wire) power supply and current signal respectively use one two-core cable. Please refer to the technical data for the specific power supply voltage range.

The current output of standard instrument can be grounded. The current output of explosion-proof instrument must be floating output. Instrument and earthing terminals shall be well grounded and shall normally be grounded to the tank's earthing point and, in the case of plastic tanks, to the adjacent ground.

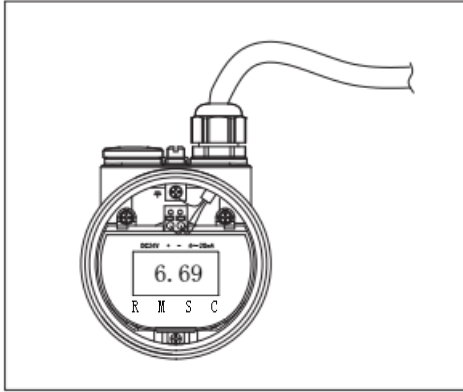
- **Cable installation**

Generally speaking, the power supply cable can be used with two core cables. The outer diameter of the cable should be (5~9) mm to ensure the sealing of the cable inlet. If electromagnetic presence exists, shield cable is recommended. Shielding cables shall be used for power supply cables of 4-20ma /HART (two-wire system), and both ends of shielding cables of 4-20ma /HART (four-wire system) shall be connected. Inside the sensor, the shield must be connected directly to the internal grounding terminal. External grounding terminals on the enclosure must be connected to the earth. If there is a ground current, the shielded end of the shield cable away from the instrument side must be grounded through a ceramic capacitance (e.g. 1nF 1500V) to isolate and bypass high frequency signals.

- **Connection mode**

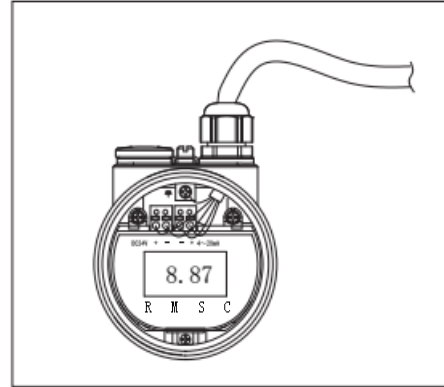
- **Two-wire**

Used for HART two-wire power supply and signal output 24V DC power supply, 4~20mA output



- **Four-wire**

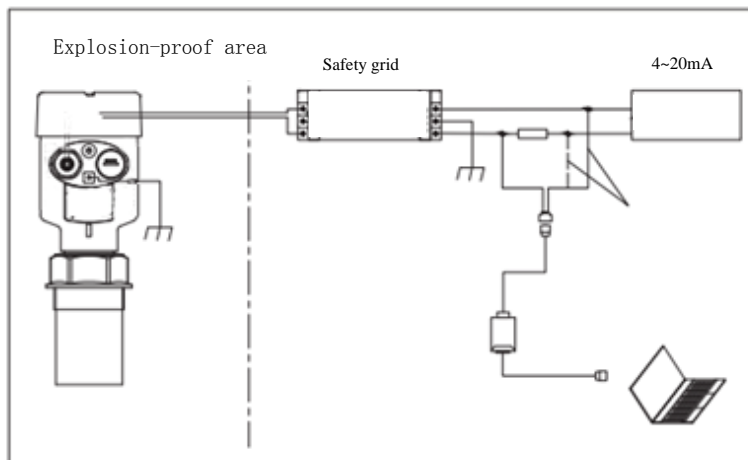
220V AC/50Hz or 24V DC power supply, 4 ~ 20 ma output



- **Explosion-proof connection**

This product explosion-proof marks: Exd II C T4 Gb. The ultrasonic level meter is made of aluminum casing material, and the internal structure is sealed with glue, so as to ensure that the spark generated by the fault of transducer and circuit will not be released. Product is suitable for Exd II T4 Gb explosive-proof grade below C level continuous measurement of flammable medium.

The product shall be powered by safety grid when used in explosion - proof situation. All cables should be screened with a maximum length of 600m. Distribution capacitance is no more than 0.1x F/km and distribution inductance is no more than 1mH/km. When the ultrasonic level gauge is installed, it must connect the earth.



7、 Debugging&Adjustment

Method

- Three methods :
- 1.Adjust the dial button
 2. PC software debugging
 - 3.HART Handheld programmer debugging

1、 Adjust the dial button

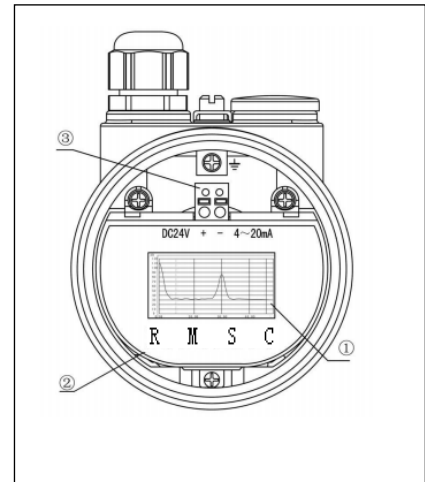
The instrument is debugged by four keys on the meter head.

After completion of debugging general only for the field display.

(1)LCD

(2) button

(3)Wire terminal



2、 PC software debugging

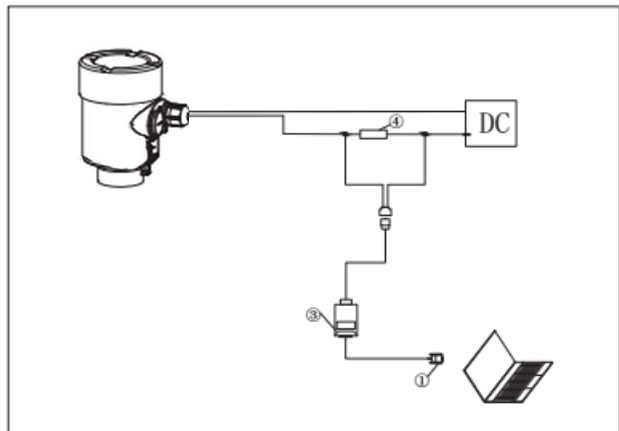
Connect the upper computer through HART

(1) the USB interface

(2) header

(3) the HART adapter

(4) 250 Ω resistance



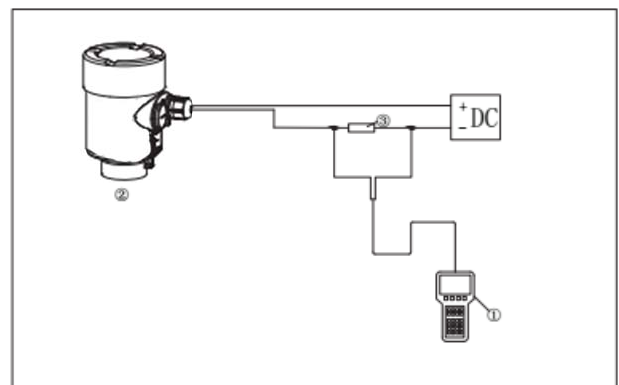
3、 HART Handheld programmer debugging

Program with HART handheld programmer

(1)Switch handheld programmer

(2) header

(3) 250 Ω resistance



Technical Parameter

• General Data

Process Connection

-connection 5m	thread M66×2
-connection 10m	thread M66×2
-connection 15m	bracket or flange

Material

-Transducer	PA66+GF30
-Transducer seal	silica gel
-Shell	aluminum
-Shell seal	silicone rubber
-Upper window	Polycarbonate
-Ground terminal	stainless steal

Weight

-5m&10m	2kg (Depends on the process connection)
-15m	6kg (Depends on the process connection)

• Supply Voltage

Two-wire type Standard	16~36V DC
Intrinsic safety	21.5~26.5V DC
Power	max.22.5mA
limited wave	
-<100Hz	U _{ss} <1V
-(100~100k)Hz	U _{ss} <10mV
Four-wire type Standard	24V DC/220V AC
Power	max.1VA , 1W

• Cable Parameter

Cable inlet/plug

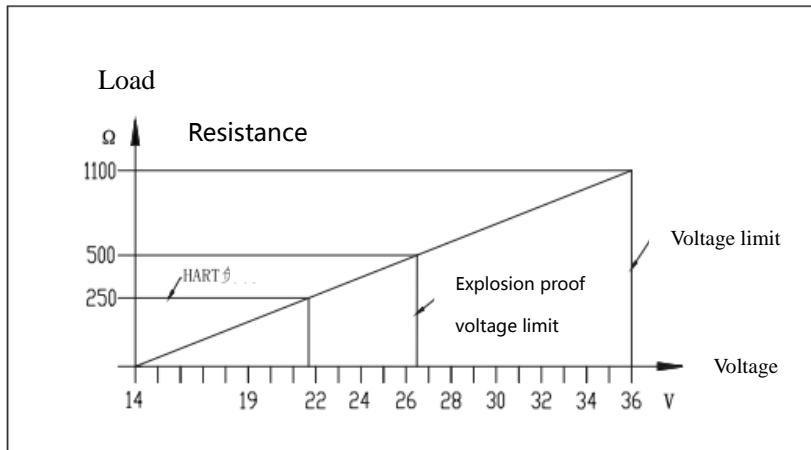
2 G1/2 Cable inlet (cable diameter 5...9mm) ,

The spring terminals are used for the conductor cross section 2.5mm squared

• Output Parameter

Output signal	4~20mA 4~20mA/HART
Resolution	1.6μA
Fault output	20.5mA ; 22mA ; 3.9mA
Damping time	0-30s , adjustable

- Two-wire type load resistance diagram.



Feature	Blind Area	
	5m	0.4m
	10m	0.4m
	15m	0.4m
	Ultrasonic Frequency	
	5m	50kHz
	10m	40kHz
	15m	28kHz
	Adjustment Interval	>2s (Depends on the parameters)
	Setting time	>3s (Depends on the parameters)
	Launching angle	
	5m/10m	5°
	15m	3°
	Resolution	1mm
	Repeatability	±3mm
	Accuracy	±0.5% (Full Range)
	The process temperature -40~70°C	
	Relative Humidity	<95%
	Pressure	<0.1MPa
	Vibration Resistance	mechanical shock 10m/s

8、 Selection Code

Sensor code					Transmitter code							optional	Description
FUL31	-X	X	-X	X	X	-X	X	X	X	-X	X	-X	—Range (M)
Type	-L											Low frequency level meter	
	-H											High frequency level meter	
	-C											Lever difference sensor	
	-O											Open Channel Flowmeter	
EX type	—											Standard form	
	Ex											CT4	
The probe materia	-S											ABS	
	-F											PTFE	
The probe number	A											Single Probe	
	B											Double Probe (Liquid level gauge only)	
grade	A											IP65	
	B											IP67	
Structure	-Y											integral	
	-F											Split-type	
Supply power	1											220V AC	
	2											24V DC	
Output signal	1											4~20MA	
	2											Switching value	
Communication output	0											—	
	1											RS485	
	2											HART	
Electrical interface	-M											M20*1.5	
	-G											G1/2"	
Accuracy class	A											±10mm	
	B											±5mm	
Accessory												flange , bracket, signal wire (_m)	

Illustration

Model : FUL31-H-SAA-Y210-GA-5M

High frequency ultrasonic level meter, probe: 1 ABS plastic, protection grade: IP65, integral structure, power supply: 24V DC, 4-20ma signal output, electrical interface: M20*1.5, precision: ±10mm, PP flange with DN80 and L bracket



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