ULTRASONIC LEVEL SENSOR

AIULS

USER MANUAL

VER. 1.0

ARANKA

Simple setup instructions

for Ultrasonic level meter menu

Tip: because the product is constantly updated, the product specification and installation specification can not be guaranteed to be consistent with the latest product. The product itself and instructions will not be notified to each customer if any changes, if necessary, please contact our sales staff directly. The part of the change contains but is not limited to the following parts.

blind areas, performance parameters, functions, structures, shapes, colors, etc. of

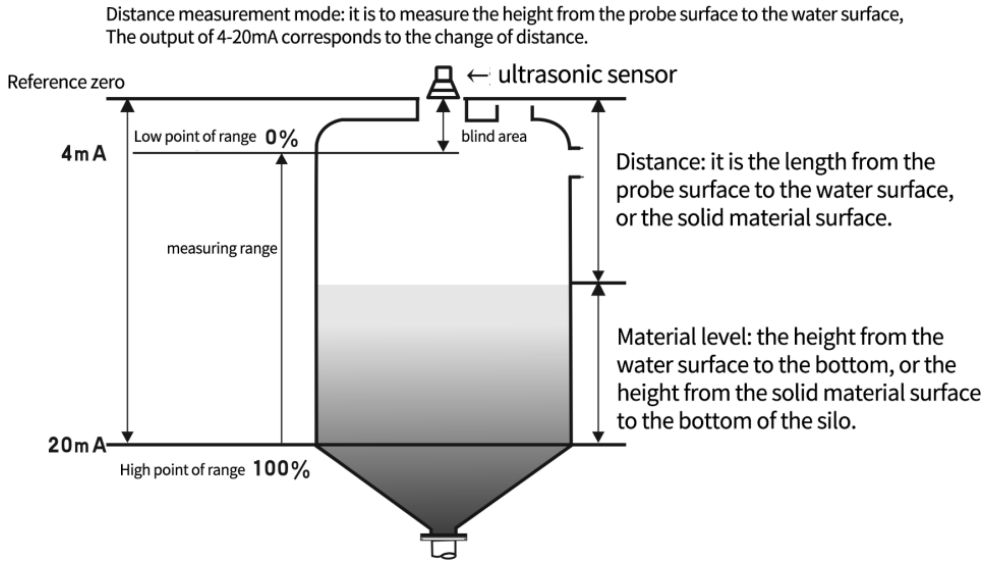
1. products.

2. the function, structure, display mode, operation habits of the software.

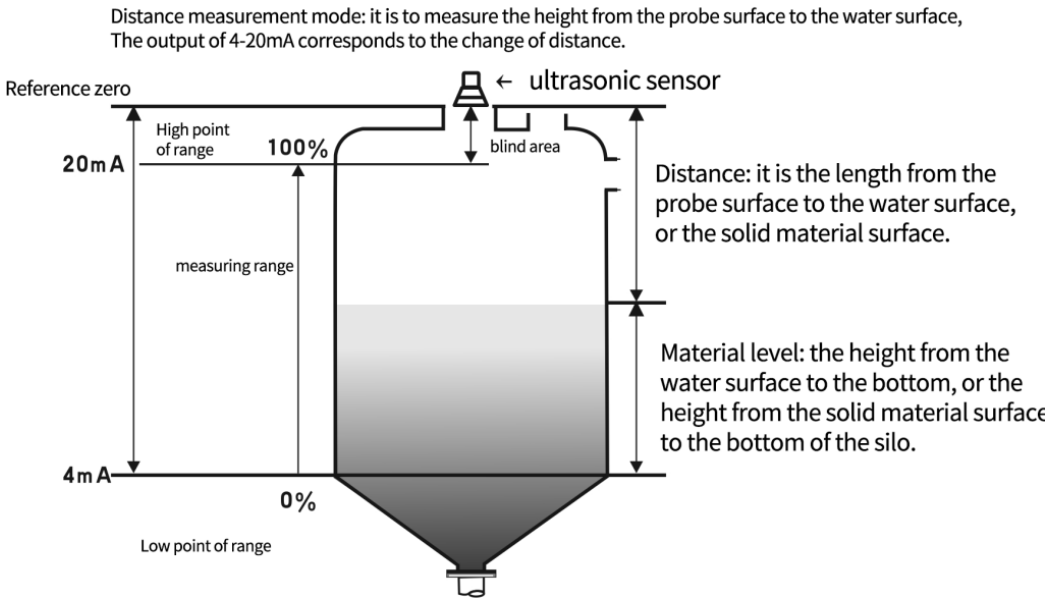
3. any operation of hardware must be carried out after power failure, if live operation causes short circuit and other faults, it is not covered by warranty.

4. open cover operation, must be carried out after power failure, and no liquid into the instrument, if there is a liquid into the failure, not within the scope of warranty.

The ultrasonic level meter produced by our company, normally, according to the installation requirements of the instructions, after installing the equipment, only need to set the following parameters, the equipment can be used normally.



Distance measurement diagram



Schematic diagram of object level measurement

I. Product profile

Ultrasonic level meter (measuring material level, liquid level), is a non-contact, high reliability, high cost-performance, easy to install and maintain the level measurement instrument. It does not need to contact the medium to meet most of the level measurement requirements, is our company after many years of efforts to develop, with complete independent property rights of the new generation of ultrasonic level meters.

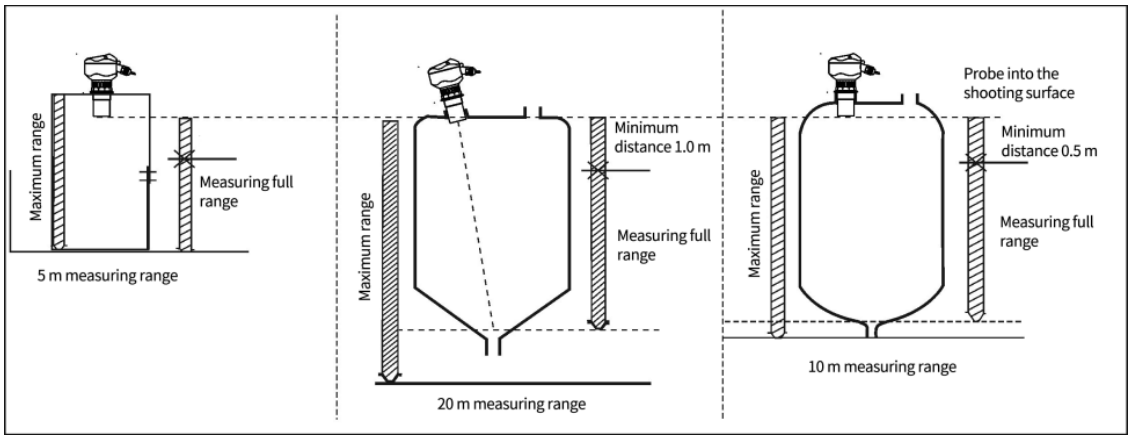
II. Debugging

Because the instrument site installation environment is different. Therefore, the ultrasonic level meter must know the basic conditions of the required measurement before working, such as measuring range, zero point, full range and field working conditions, etc. Therefore, the instrument must be set before measurement.

III. Installation guidelines

3.1 Understanding of technical terms

Measuring range: The meaning of measuring range is very important in instrument selection. Please see the following diagram.



3.2 Emission angles and false echoes

The ultrasonic wave velocity is focused through the probe, and the pulse wave velocity is emitted like the speed of light of the flashlight. The farther away from the probe, the greater the diffusion area.

Any object in the launching angle, such as: pipe, support, weld, stiffener, stirring propeller, hanging wall object, will cause very strong false echo, especially the object the probe in the transmitting angle.

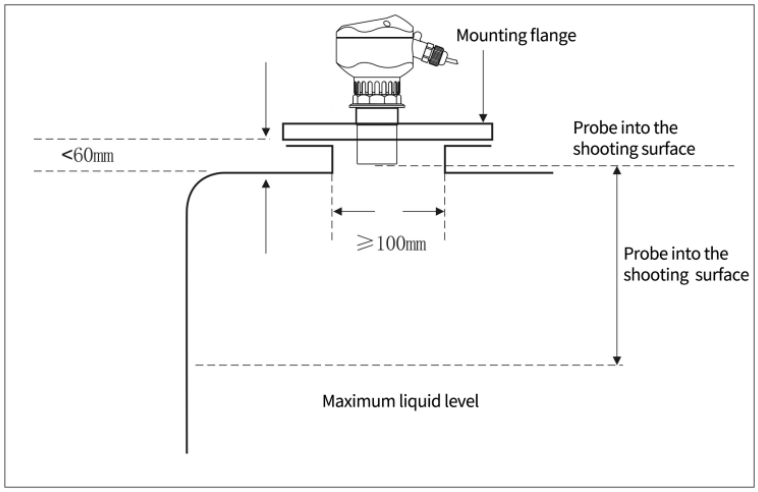
For example, the false echo caused by the pipe 6 meters from the probe is 9 times stronger than the false echo caused by the same pipe 18 meters from the probe.

★ try to make the axis of the sensor perpendicular to the surface of the medium and avoid any other objects in the emission angle. Such as: pipes and supports, etc.

3.2.1 Measuring liquids

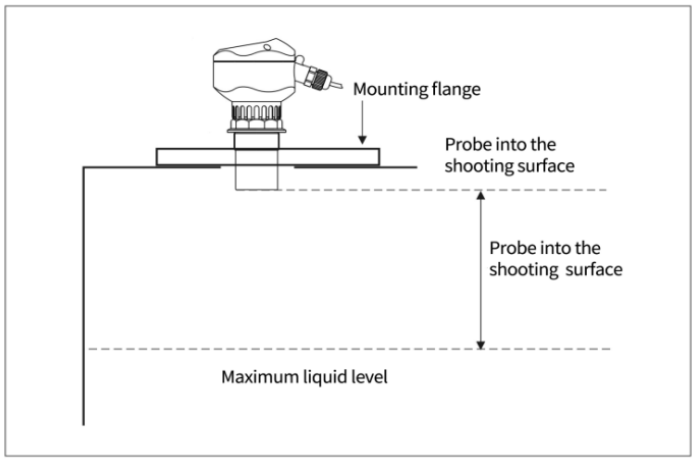
3.2.1.1 Flattop cans

The flat top tank generally has a very short pipe, the base surface of the pipe is the bottom surface of the flange ,≤ the length of the pipe is 60 mm, the inner diameter of the pipe ≥100 mm, the inner wall of the pipe is flat without burrs and protrusions, the emission surface of the probe after installation is less than 3 cm of the lower bottom surface of the flange.

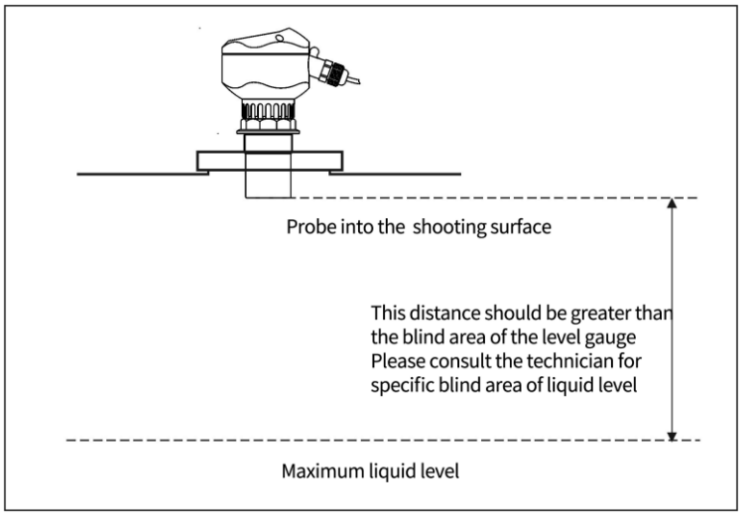


Flange mounted, installed in very short pipe

The ideal installation is to install the instrument directly on the flat top container, without using the nozzle, the circular opening on the container can be enough to fix the flange or universal joint for installation. The probe emission surface is below the datum level.

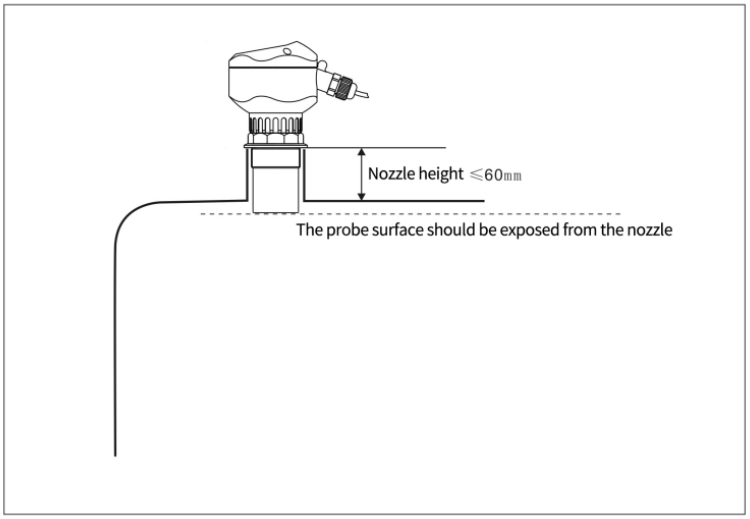


Flange type (locking flange), mounted on flat tan



Flange mounted on nozzle-free flat tank

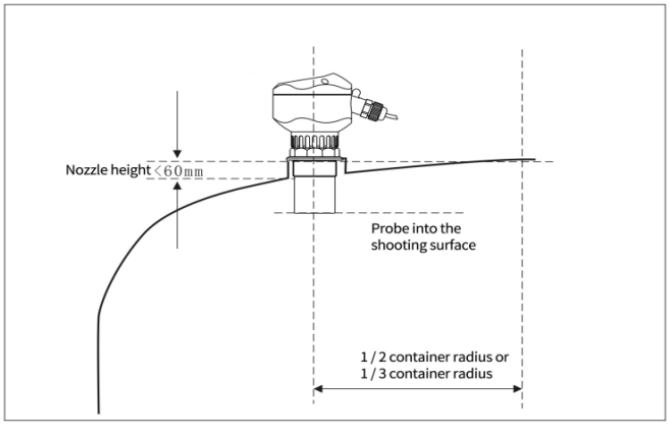
Installed on the same threaded nozzle as the probe, in this case, the inner diameter of the nozzle is almost the same as the outer thread of the probe, and the emitter surface of theprobe must extend more than 1 cm of the nozzle and cannot be shrunk in the nozzle.



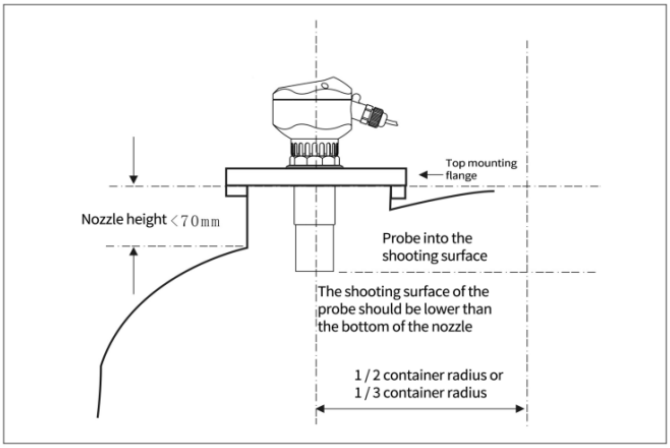
The probe is mounted on the threaded pipe

3.2.1.2 Arch roof

For arched tanks, the instrument should not be installed in the center of the top of the tank, but at 1/2 or 2/3 of the radius of the top of the tank (if a certain distance from the wall of the tank is satisfied). For ultrasonic pulses, the top of the arch tank is like a convex lens, and if the probe is mounted on the focus of the convex lens, it will receive all false echoes. Therefore, the sensor probe should be avoided in the center of the arch tank top.



Mounted on threaded pipe - arched top



Mounted on flange - arched roof

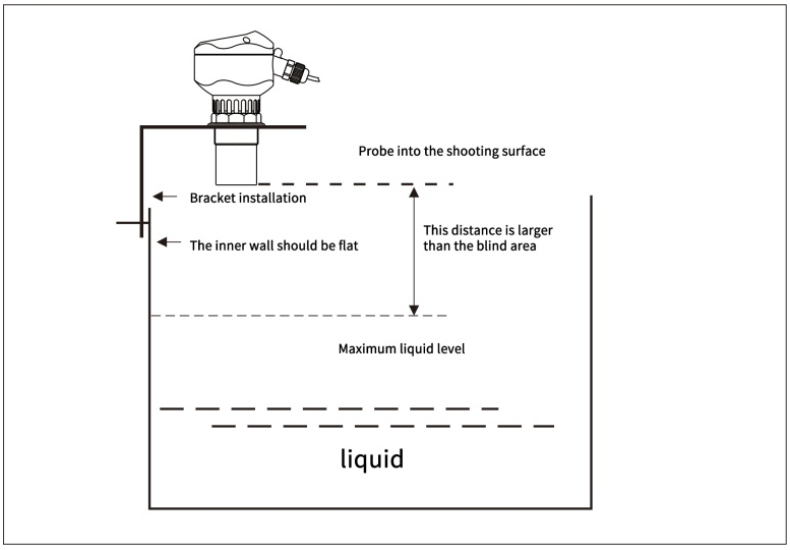
the probe thread of the ultrasonic level gauge is not so long (we can customize the extended probe to make the probe emitter lower than the bottom of the nozzle). In such cases, we need to pay attention to the proportional relationship between the diameter of the pipe and the length of the pipe and the lower exit must cut a 45° angle.

Serial number	Length of pipe	Minimum diameter of pipe	Remarks
1	150 mm	100 mm	The inner wall of the pipe is free of burrs, bumps, vertical up and down, and the weld should be polished. Connect the nozzle and top of the tank to do 45℃ angle polishing from the inside out of the nozzle.
2	200 mm	150 mm	
3	250 mm	180 mm	
4	300 mm	220 mm	
5	400 mm	280 mm	

3.2.1.3 Open container

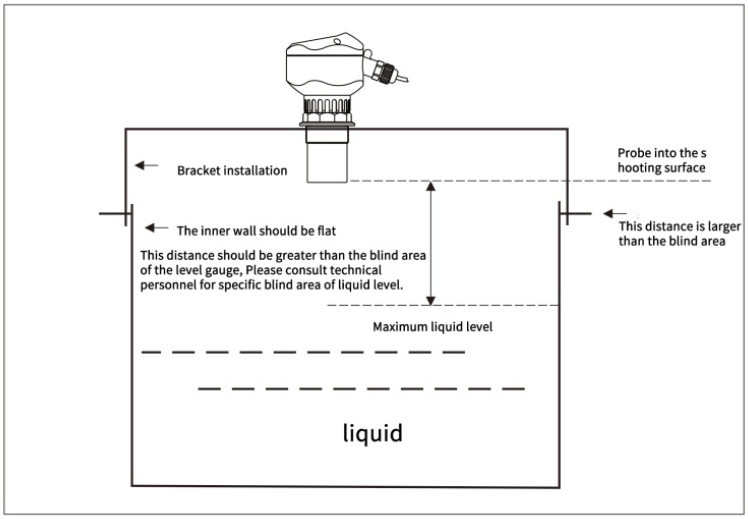
For open containers, support can be used to install, pay attention to the bearing capacity of the support, so that the sensor and container wall to maintain a certain distance. If the inner wall of the open container or silo is flat, no hanging material occurs, and no other object is on the inner wall, the distance from the sensor to the wall of the container is detailed in the table below:

Maximum range	Minimum Distance from wall	Maximum range	Minimum Distance from wall	Maximum range	Minimum Distance from wall
5 m	0.5 m	10 m	1.0 m	15 m	1.5 m



Open container - top mounted with side support

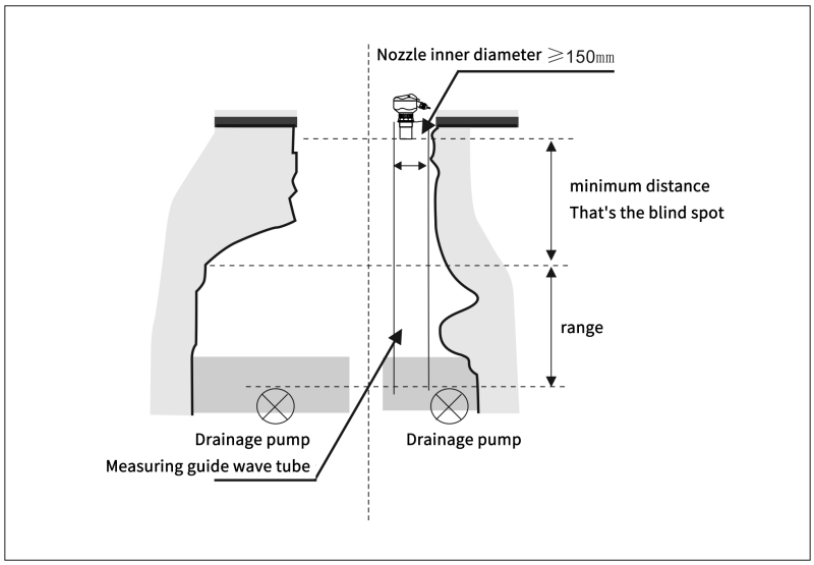
Because the open container has no focusing effect, the sensor can be installed in the middle of the container.



Open container - top center bracket mounted

Drainage wells are generally narrow and uneven, which makes ultrasonic measurement very difficult. This problem can be solved by installing a pipe or installing the entire measuring casing. Attention should be paid to the fact that the blind area will become3about 50~100 after the sensor is placed in the nozzle.

So in the case of the use of the nozzle, if the original probe blind area is 0.50 meters, then into the nozzle, the blind area will increase to 1.00 meters.



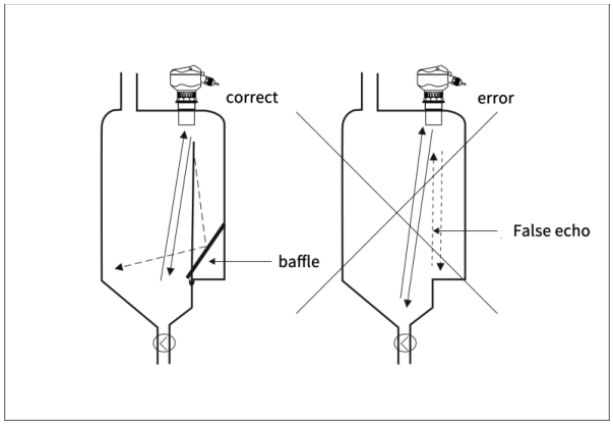
Pipe and measuring casing used for drainage well measurement

Ordinary wells (including water wells, deep wells), the general diameter is not large, can be installed measuring casing to achieve the best measurement effect, measuring casing wall must be smooth (can be used PVC、PE pipe), the inner diameter ≥150 mm(measuring range of 4 meters). More than 4 meters of takeover to consult the manufacturer.As long as the measuring tube can keep clean, no adhesive medium, no seams inside, it can be measured.

The measuring casing should be immersed in the medium all the time, which can ensure the accuracy of the measurement in the measuring tube.

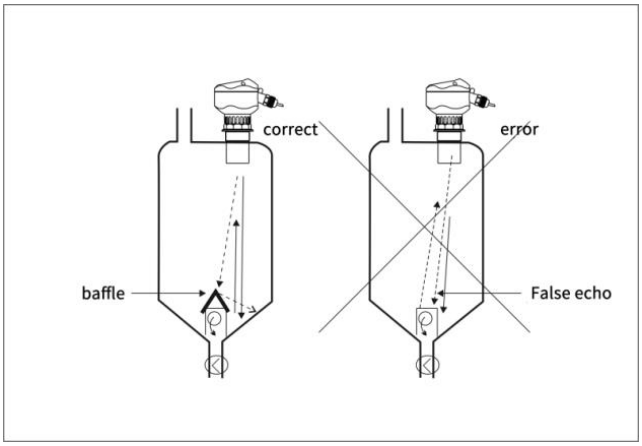
3.3.1 Installation in containers

When installing sensors, be careful not to have other devices or feed to block ultrasonic beams. The protrusions or obstacles like steps in the plane of the container will have a great impact on the measurement. A refraction plate can be blocked at the protruding to refract the false echo away, thus ensuring the accuracy of the measurement.



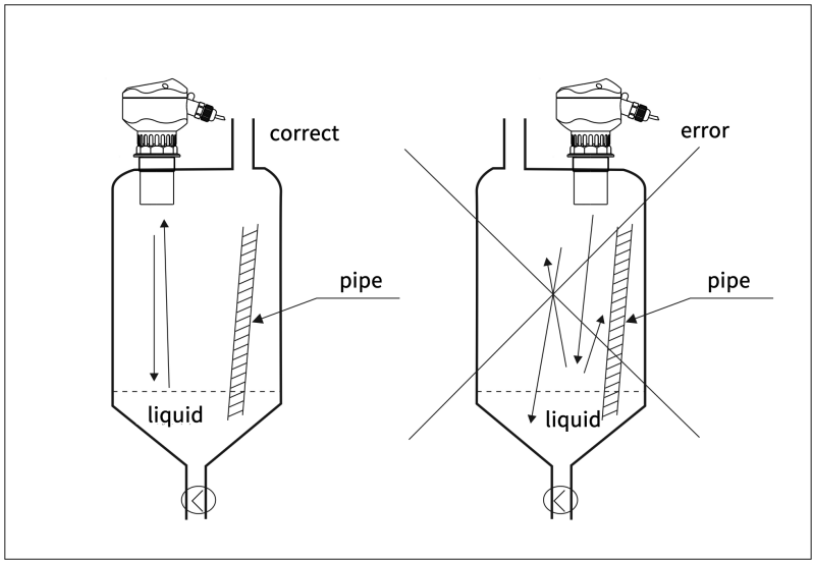
Obstacles of the step-like inside the vessel -- need to be refracted by the false echo by the inclined transverse plate

If the upper surface of an object in the lower part of the container is flat, the inlet of various media must be blocked with a certain angle of refraction.



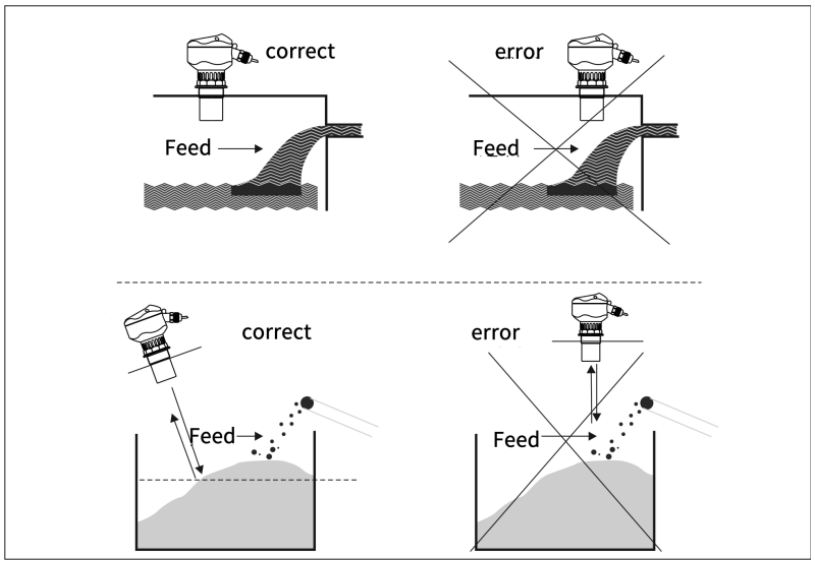
Flat-top bulges at the bottom of the container -- add a baffle

the design of measurement points, we must pay attention to the diffusion range of ultrasonic signals without other devices.



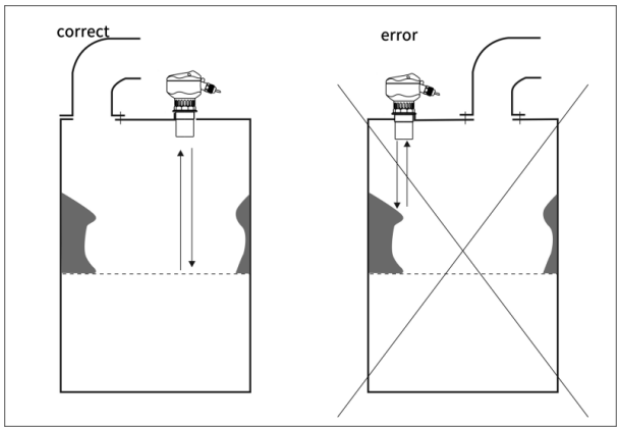
Obstacles in containers - tubes

Do not install the sensor in or above the filling flow, leave the inlet for a certain distance.



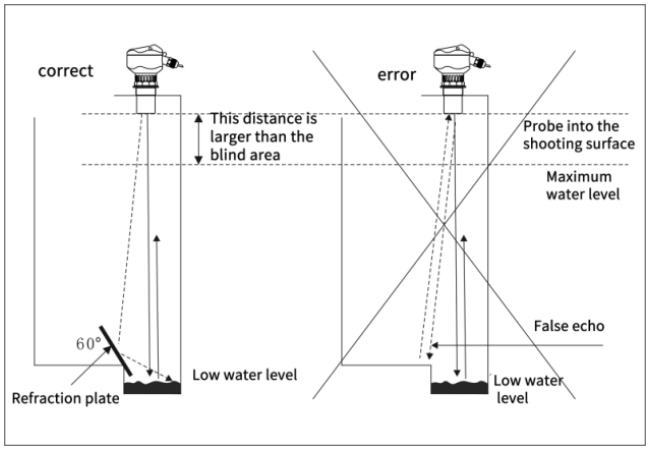
Sensors should not be installed in or above the feed stream

asphalt tank, cement mixing tank. If the sensor is installed too close to the container wall, the medium adhered to the container wall will cause a strong false echo, so the sensor should keep a certain distance from the container wall.



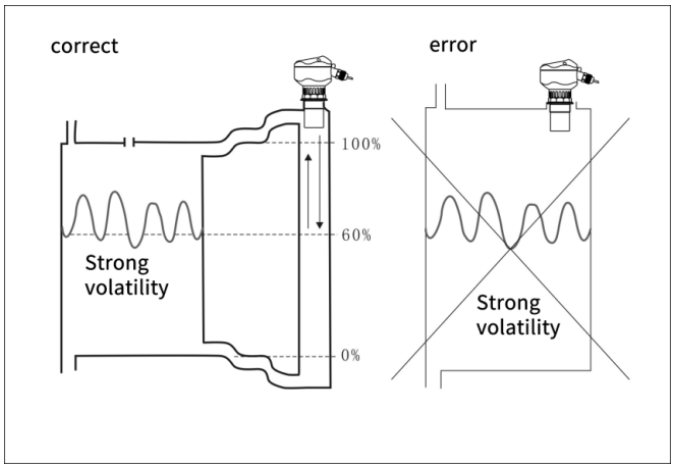
Adhesives on the wall of the container -- a distance from the adhesive

In the reservoir, generally speaking, according to the highest water level to determine the installation height of the instrument, we must pay attention to the distance between the highest water level and the probe.



Obstacles at the bottom of the pool - refracted by baffles

If there is a strong vortex, vortex in the container, such as: agitator, strong chemical reaction caused by eddy current, measurement will be difficult. The ideal way is that the sensor probe can be installed in the guide tube or bypass tube measurement.

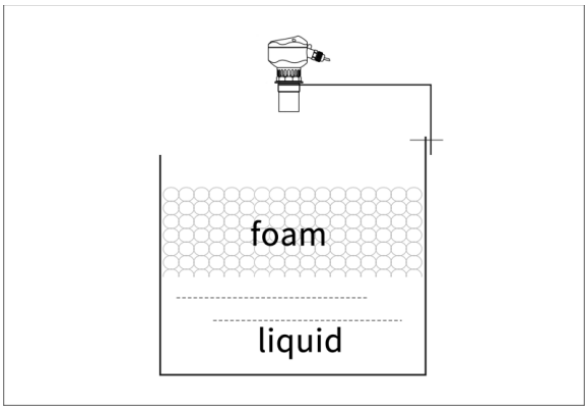


Medium surface fluctuation -- measurement with bypass tube or with waveguide

3.3.2 Common installation errors

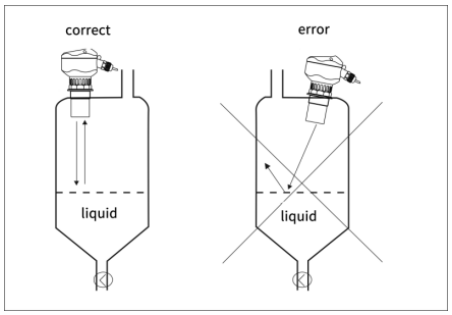
Bubble: If the bubble on the surface of the medium is large and the bubble layer is thick, it will cause measurement error and even cannot receive reflected ultrasonic wave. Please take measures to prevent bubbles from producing, or install sensors in bypass tubes for measurement.

Other measuring instruments can also be used, such as radar level meter or magnetostractive level meter.



Where bubbles are produced

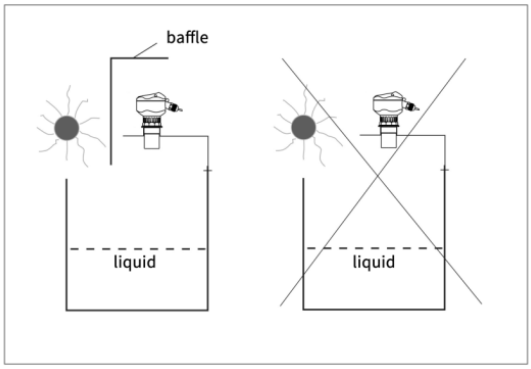
If the sensor is not aligned with the surface of the medium, the measurement signal will be weakened. In order to ensure the best measurement effect, the axis of the sensor should be aligned with the surface of the medium, that is, perpendicular to the surface of the measured interface.



The sensor probe shall be perpendicular to the surface of the medium

3 Mounted in a temperature-changing position

In places where the temperature changes greatly, such as strong solar radiation, will cause measurement error, this error will increase 2-4 on the basis of the original measurement accuracy, please install sunshade to solve.



Change of temperature -- add shade or instrument box

4 The minimum distance from probe to medium is less than blind area

If the distance between the probe and the highest position of the medium is less than the blind area of the instrument, the measured values are all wrong.

If the sensor is installed too close to the container wall, it will produce strong false echo. The uneven inner surface of the container wall, the adhesive medium, the rivets on the inner wall of the container, the screws, the stiffeners and the welds will cause a strong false echo and be loaded on the effective echo signal. Therefore, please note: keep the distance between the sensor and the container wall according to the maximum distance measured as needed. See the table below for details.

Maximum range	Distance from wall	Maximum range	Distance from wall	Maximum range	Distance from wall
5 m	0.5 m	10 m	1.0 m	15 m	1.5 m

For worse measurement conditions, continue to expand the distance between the sensor and the container wall until no false echo appears.

IV. Setup

4.1 Introduction to the running mode interface

This series of ultrasonic level meters have two working modes: operation and setting. After the equipment is electrified and the initialization process is completed, the level meter will automatically enter the operation mode and start measuring data. At this point, the measurement is a level measurement mode. The relative output is 4~20 mA. The output current is proportional to the level of the object.

The operating mode interface of the ultrasonic level meter is as follows:

LCD screen after unscrew the lid

LCD screen with lid

There are F1、F2 and F3 keys.

● press the F3 key, enter the setting function, you can view and modify the parameters;

● press the F1 key to turn up the menu (the previous menu), press the F2key to turn down the menu (the next menu), to find the menu to view or change;

● press the F1 key 3 seconds after loosening, into the current menu settings, underline to the second line, indicating that you can modify the parameters;

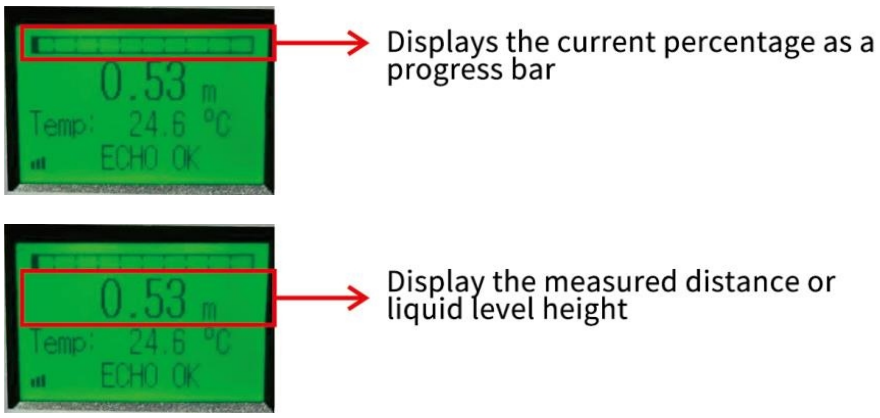
● setting data: pressthe F1 key to modify the current number, press the F2 key to move the setting position; change options: press the F1 key up, press the F2 key down;

● save data: press the F1 key for 3 seconds, save the settings; underline back to the first line, and then scroll the menu with the F1 and F2 keys.

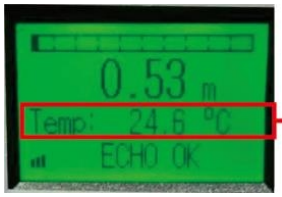
● exit settings: press the F3 key to discard the currently set data; or return to the next menu; or exit the key settings;

4.2 Interface description:

LCD use 128/64 lattice display, support multivariable display at the same time.



Hold down the F1" key until line 2 shows switching to the next value and release the button. then each time "F1" key is pressed, the variables are shown to cycle switching between percentage (Per ：), temperature (Temp：), and distance (Dist), respectively.



Display percentage, current value, temperature distance, through F1 key can switch between this display content.

Display current signal status

If the signal is not received, the signal intensity sign here will disappear.

Display measurement status, alarm information, etc

Description of measurement status:

●ECHO OK: echo measurement is normal. The signal intensity is displayed on the left.

●Er: 01-Comm fail： hardware failures

●Er: 02-Comm Prof： software version is incorrect

●Er: 03-Echo Loss： echo loss

●Er: 04-LargeNoise： signal noise is excessive

●Alm: Low Limit： below alarm limit

●Alm: High Limit： above alarm limit

4.3.1 Basic Function Menu

Contrast (Contrast)

Sets the contrast of the LCD display.

(Protection)

When set to open (Write Disable), parameters are not allowed to be modified. By setting the option to close (Write Enable), you can modify the parameters by pressing the button.

Measurement mode (Measure Mode)

May be set to measure distance (Distance), object position (Level) or empty height (Empty)

Range unit (Range Unit)

Units supported include mm 、 Cm 、 m 、 FEET (feet), INCH (inches).

Range ceiling (Range 100%)

Sets the distance value corresponding to the output of 20 mA, or the object value, or the null value.

Range limit (Range 0%)

Sets the distance value corresponding to the output of the 4 mA, or the object value, or the null value.

Damping (S)

Set range 0~32 seconds. The greater the damping, the more stable the output and the slower the response.

Decimal (Disp.Point)

Set the number of digits after the decimal point of the main variable (the first line shows the data).

Lower limit alarm (Alarm Low)

Set the lower limit alarm value, the unit is the same range unit.

Set the upper limit alarm value, the unit is the same range unit.

Upper limit alarm return (Alarm High Hyst.)

Set the upper limit alarm return difference, the unit is the same range unit.

Password (Code)

Enter the opcode (password) and enter the corresponding advanced function settings.

The password supported is as follows:

00050: Advanced function setting, including measurement range (maximum measurement length), blind area, response rate, echo algorithm selection, etc;

00060: False echo suppression system, probe excitation frequency;

00070: Sound speed calibration, temperature sensor calibration

00011: View Version Number

00509: Setting up Chinese/English menu

4.3.2 Password 00050 into the classified operations menu

Signal monitoring (Signal Monitor)

You can view the current measured distance value in real time, as well as the current signal intensity. Distant signal intensity should be greater than 1 mV.

Address (Slave Address)

Set the address of the converter.

Installation height (Measure Range)

Set installation height, this parameter determines the longest measurement distance, it is recommended to set according to the actual use.

Blind area (Blanking)

Set probe blind area (0.2~2 m), it is recommended to set according to probe parameters.

The maximum change rate of the object position can be chosen as fast (10 m/min), medium speed (1.0 m/min) or slow speed (0.1 m/min).

Echo algorithm (Echo Algorithm)

Maximum confirmation: select the maximum amplitude echo from the echo as the real echo.

First wave: take the first effective echo as the real echo.

Echo locking mode (Echo Lock.)

Close: immediately respond to the echo, but limited by the response rate.

Maximum mode (Max): when the echo number exceeds the set echo sampling A or echo sampling B, it is considered to be a real echo.

Mixer mode (Agitator): echo sampling A default is 5, echo sampling B default is 2, working mode is the same as "maximum value mode ".

When there is a stirrer in the field, be sure to select "maximum value mode" or "stirrer mode "!

Echo sampling A(Sampling Up)

When the number of collected echoes in the upper part (closer to the probe) exceeds this set value, it is considered to be a real echo.

Echo sampling B(Sampling Down)

When the number of collected echoes in the lower part (farther from the probe) exceeds this set value, it is considered to be a real echo.

Failure Safety Mode (FailSafe Mode)

When the device fails, the output value of the main variable has three modes: keep the last valid value (Hold), error value, or custom security value (Failsafe Value).

Custom security value (Failsafe Value)

User-defined fault safety values in range units.

(Temp.Unit)

Set temperature units : ℃, F、R、K.

Optional: sensor, or fixed temperature value.

Fixed temperature (Fixed Temp)

Set the temperature value used when the temperature source selects a fixed temperature value.

4.3.3 Password 00060 into the classified operations menu

False echo suppression (Echo Algo.Coef.)

Set the suppression intensity of false echo by default to 50. the suppression intensity can be increased when a false echo closer (closer to the probe) than the real echo is collected in the field.

Minimum threshold (Noise Level)(MV)

A minimum threshold needs to be increased when "Er：04-LargeNoise"" occurs (used to suppress excessive noise in the field). Scope 75~400 mV.

Sensor frequency (kHz)(Sensor Freq (kHz)

Set the excitation frequency of the probe. The current allowable setting range is 30 kHz ~50 kHz.. The

When the excitation frequency of 15~30 KHz is needed ,2 capacitors need to be added to the circuit.

4.3.4 Password 00070 into the classified operations menu

Acoustic Speed Calibration (Calib Sound speed)

Calibrate the sound speed by entering the actual distance of the current distance probe.

Note: when you first enter this menu, the current sound speed is displayed. After entering the settings, you can enter the current actual distance value.

Speed of sound (20℃)(Sound speed(20℃)

Check the sound speed at **20℃** after calibration. Here can only view, can not modify!

Offset setting (Set Bias)

By setting the offset, the measured value can be offset. Set to a positive number will increase the measured value.

Correction of temperature deviation (Temp.Bias)

When the temperature value is not correct, set this value to offset the collected temperature value. Setting to a positive number will increase the temperature value.

Calibration at low temperature (Temp.Low Trim)

Enter the current actual temperature value to calibrate the temperature sensor.

Note: be sure to calibrate the high temperature at the same time.

High temperature calibration (Temp.High Trim)

Enter the current actual temperature value to calibrate the temperature sensor.

Note: be sure to calibrate the low temperature at the same time.

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