CYK TECHNOLOGY

FLUID MEASUREMENT

ULTRASONIC LEVEL SENSOR

User's Manual

LUDP / LUDR

Preface

Thank you for purchasin ultrasonics level transmitter. Please read this manual carefully before operating and using it correctly to avoid unnecessary losses caused by false operation.

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 in explosion-proof occasions.

Versions :

- LUDP Compact Version
- LUDR Remote Version

Disclaimer

After opening the box, please confirm the package contents before starting the operation. If you find that the model and quantity are incorrect or there is physical damage in appearance, please contact us.

No.	Name	Quantity	Note
1	Ultrasonic Level Transmitter	1	
2	Manual	1	
3	Certificate	1	

Instructions

Notes: as the product is renewed continuously, it cannot be ensured that the product manual and installation manual are in line with the latest product. The Company cannot inform every client of the change (if any) in product itself and its operation instructions. Please directly contact the corporate sales personnel for any needs. The change includes but is not limited to the following:

- Product blind area, performance parameters, functions, structure, shape, color, etc.
- Software functions, structure, display mode, operating habit, etc.
- Any operation on the hardware must be conducted after power off. Failures, like short circuit, caused by power-on operation are beyond the range of warranty.
- The uncapping operations must be conducted after power off and no liquid is allowed to enter in the meter. Any failure caused by the entering in of liquid is beyond the range of warranty.

Illustration Description:

* This is an important reminder, please read it carefully and follow the requirements strictly.
◊ This is a general reminder, please read it carefully so as not to cause trouble in use

Contents

Chapter 1: Product Introduction

Ultrasonic level meter (for material and liquid level measurement) is a non-contact highly reliable and cost-effective material level measuring instrument which is easily installed and maintained. It can meet most of the material level measurement requirements without touching the medium. It is a new generation ultrasonic level meter with fully independent property rights developed by the company via years of hard work.

Chapter 2: Operating Instructions for Simple Settings

As the meter installation site environment is different, the basic information of measurement to be done must be learnt before the operation of the ultrasonic level meter, such as the measuring range, zero point, full scale and site conditions. Therefore, the meter must be set before measurement.

Others: please do not modify probe selection, parameter correction and algorithm selection without permission.

Normally the ultrasonic level meter produced by us shall be installed as per the installation requirements of the manual and after that, the equipment can be normally used only after the following several parameters are set.
There are three buttons on the panel, via which the meter can be adjusted. The measured values are displayed on the LCD screen after the adjustment.

$$\boxed{\textbf{SET}}$$

◇ Enter Menu Item   ◇ Exit Menu Item   ◇ Confirm Parameter Modification

$$\boxed{\blacktriangle} \qquad \boxed{\blacktriangledown}$$

◇ Move Cursor   ◇ Modify Parameter   ◇ Choose Menu Item

2.1 Enter the Menu

After power-on display of the meter**, long press the set button (SET) for 2s to enter in the main menu.**
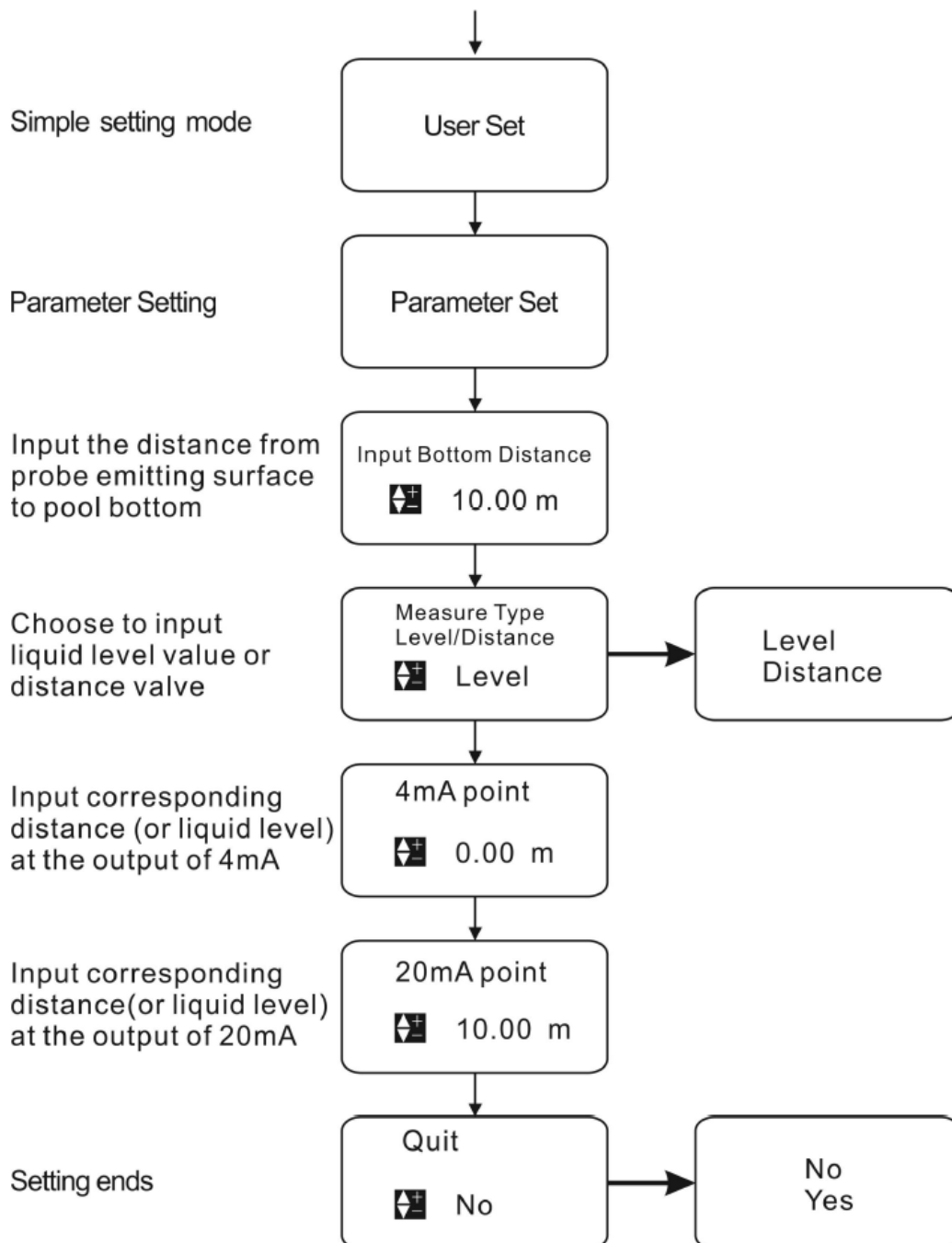
The menu modes include expert setting mode and simply setting mode.

The menu query table of simple setting mode is as shown in the below.

Menu query table of simple setting mode
Note:long press SET for 2s to enter in the menu for the time.

Press SET to enter in

Simple setting mode	**User Set**
Parameter Setting	**Parameter Set**
Input the distance from probe emitting surface to pool bottom	**Input Bottom Distance** 10.00 m
Choose to input liquid level value or distance valve	**Measure Type Level/Distance** Level → Level / Distance
Input corresponding distance (or liquid level) at the output of 4mA	**4mA point** 0.00 m
Input corresponding distance(or liquid level) at the output of 20mA	**20mA point** 10.00 m
Setting ends	**Quit** No → No / Yes

The menu query table of expert setting mode is shown in "**VI. Menu Interface & Operating Instructions:** ".

2.2 Select Measuring Mode:

Measuring modes are divided into distance measuring mode and material level measuring mode. And the factory default is material level measurement.

2.3 Input probe height Value :

Input probe height value to "reference zero point" (probe height is the distance from probe emitting surface to tank bottom or pool bottom).

2.4 Diagram of distance and material level measurement

❶ Under distance measuring mode, setting of reference zero point is meaningless and the positions of maximum of measuring range and minimum of measuring range are as shown in Fig. 1.1

Distance Measurement Mode; measure the distance from probe emision surface to water surface, output 4-20 mA corresponds to the variation of distance.
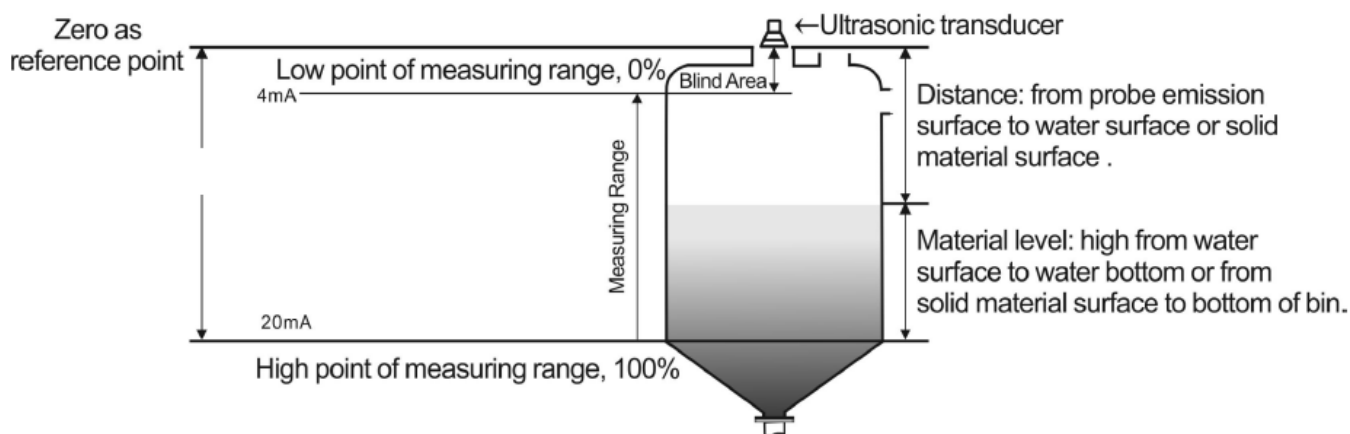

Fig. 1.1 Diagram of Distance Measurement

❷ Under material level measuring mode, the positions of reference zero point, maximum of measuring range and minimum of measuring range are as shown in Fig. 1.2

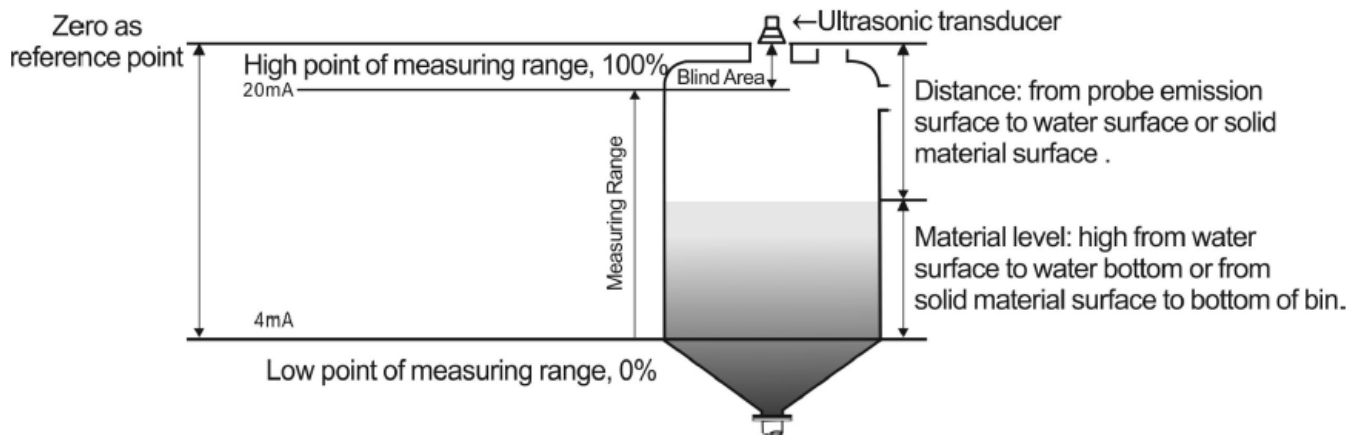Level Measurement Mode; measure the distance from water surface to water bot-

Fig. 1.2 Diagram of Material Measurement Level

Low Point: the distance from the reference plane to this position. When the low point of the range is higher than the reference plane, the value is positive, and when it is lower than the reference plane, the value is negative. When the liquid level is at this position, 4mA current is output.

High Point: the distance from the reference plane to this position. The value is positive when the range high point is higher than the reference plane, and negative when it is lower than the reference plane. When the liquid level is at this position, 20mA current is output.

2.5 Anti-interference Measures:

After the equipment is installed, it must be grounded separately, don't use the common ground of the electrical box or instrument box.

Suggestion: When the ultrasonic level meter is connected to the frequency converter, PLC and other devices that have interference, an isolation transformer should be added to the power supply part, and a signal isolator should be added to the signal part, and reliable grounding should be done.

♦   The signal line must not be installed in the same slot with the power line and the power line. It must be installed separately through a metal pipe, or installed away from the power line and power line. Under the premise of not being installed through the pipe, the distance from the power line and power line at least 1 meter
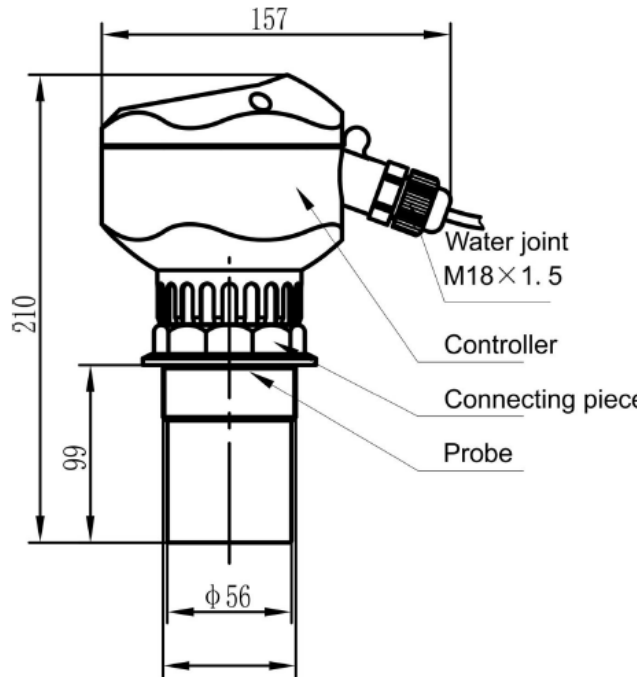
Chapter 3: Main Technical Parameter

Function	Compact Type	Remote Type
Measuring Range	5m, 10m, 15m, 20m, 30m, 40m, 50m, 60m	5m, 10m, 15m, 20m, 30m, 40m, 50m, 60m, 70m
Measurement Accuracy	0.5%-1.0%	
Resolution Ratio	3mm or 0.1% (whichever is greater)	
Display	English LCD	
Analog Output	4-wire system, 4~20mA/ 510Ω load 2-wire system, 4~20mA/ 250Ω	4~20mA/ 510Ω load
Relay Output	2 groups (i.e. AC 250V/ 8A or DC 30V/ 5A) optional, state programmable	2 groups for single channel and 4 groups for double channels (optional) AC 250V/ 8A or DC 30V/ 5A, state programmable
Power Supply	Standard configuration: 24VDC Optional: 220V AC+15% 50Hz Customized: 12VDC	Standard configuration: 220V AC+15% 50Hz Optional: 24VDC 120mA Customized: 12VDC
Ambient Temperature	Display instrument: -20~+60ºC Probe: -20~+80ºC	
Communication	RS485, RS232 communication (optional)	
Ingress Protection	Display Instrument: IP65, Probe: IP68	
Probe Cable	None	100m available, standard configuration: 10m
Probe Installation	Select type based on measuring range and probe	

Power Consumption

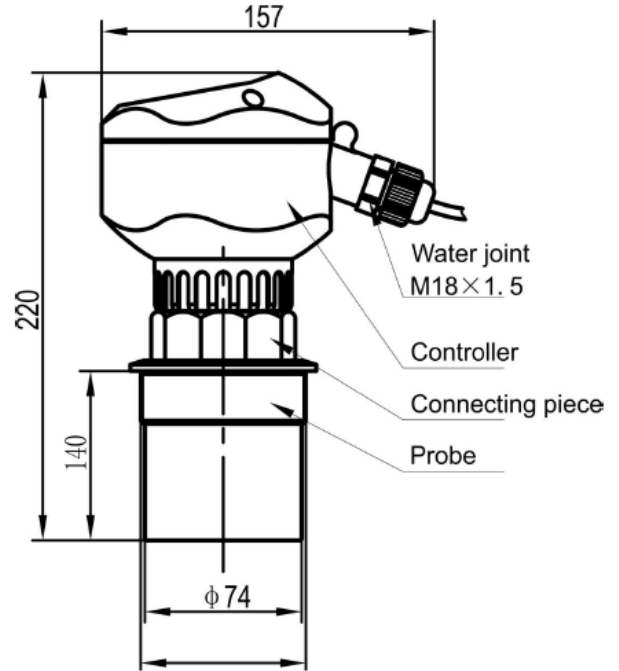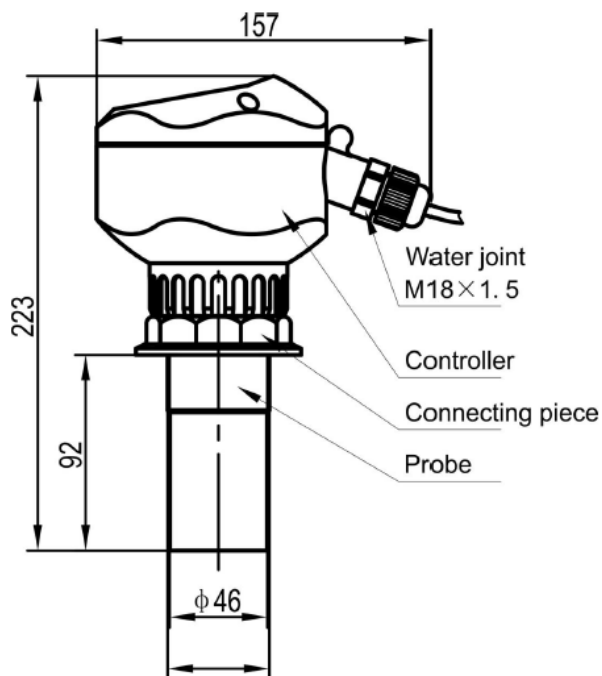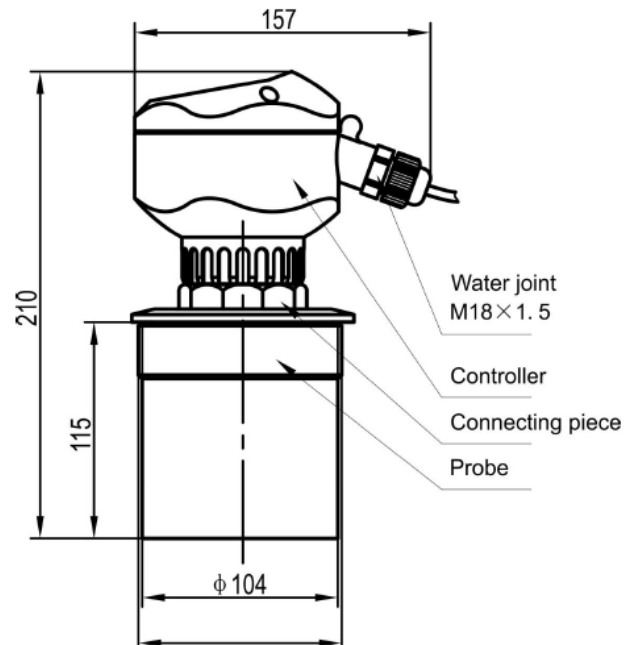|	
Power Consumption (Remote Type)	The power supply of Remote type is 24V power and the electricity consumed for such type is 100mA without relay, 150mA with 2 relays, 200mA with 4 relays. Specific power consumed is shown in below: 24V×100mA=2.4W for remote type without relay; 24V×150mA=3.6W for remote type with 2 relays; 24V×200mA=4.8W for remote type with 4 relays;
Power Consumption (Compact Type)	The integrated type with four-wire system is powered by 24V power supply and its electricity consumed is 80mA without relay, 105mA with a relay and 150mA with 2 relays. Specific power consumed is shown in below: 24V×80mA=1.92W for integrated type without relay; 24V×150mA=3.6W for integrated type with 2 relays;
Power Consumption (Compact Type)	The integrated type with two-wire system is powered by 24V power supply. It cannot be equipped with relay and its electricity consumed is 20mA. Specific power consumed is shown in below: 24×20mA=0.48W for integrated type without relay;

Chapter 4: Installation Guide

4.1 Installation Dimension of Level Meter

4.1.1 Standard Remote Type Ultrasonic Level Meter:

Structural Drawing

4.1.2 Enhanced Compact Type Ultrasonic Level Meter:

Side Picture   Front Picture

For the range of 5m, 10m

157
210
99
Water joint M18×1.5
Controller
Connecting piece
Probe
φ56

M60x2 or G2" Screw Thread

For the range of 15m, 20m

157
220
140
Water joint M18×1.5
Controller
Connecting piece
Probe
φ74

M78x2 Screw Thread

Other size available

157
223
92
Water joint M18×1.5
Controller
Connecting piece
Probe
φ46

M48X2 or G1-1/2 screw thread

157
210
115
Water joint M18×1.5
Controller
Connecting piece
Probe
φ104

M108X2 screw thread

4.2 Installation Guide

4.2.1 Understand Terminology :

❶ **Measuring Range:** The meaning of measuring range is very important for meter type selection. Please refer to the diagrams below.
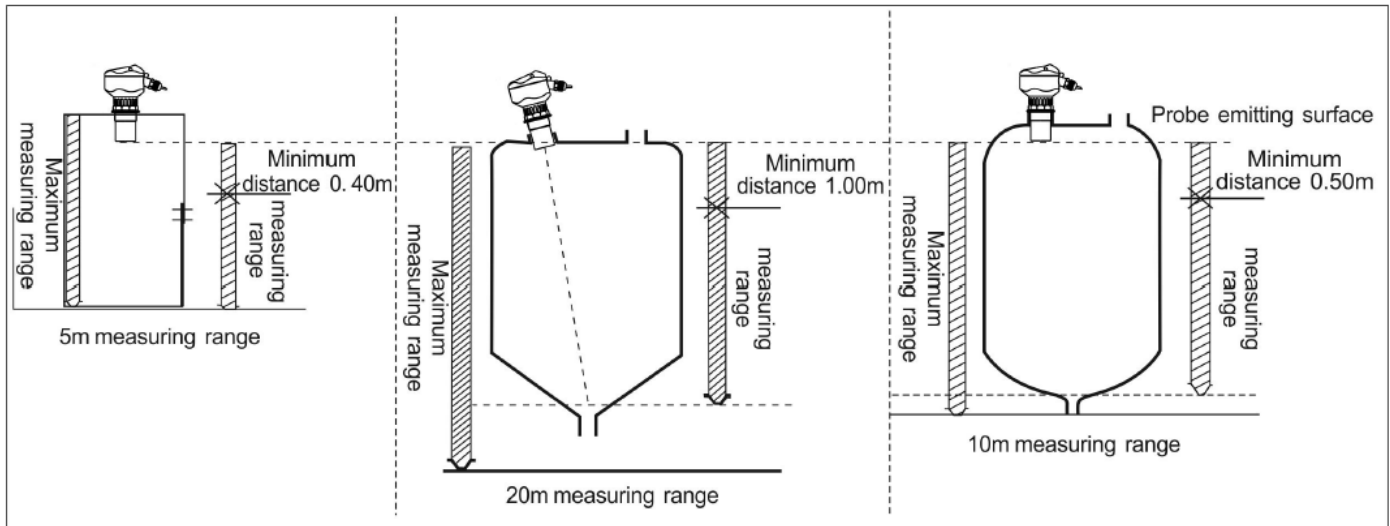
❷ **Emitting Angle and False Echo**

Ultrasonic wave beam is gathered by the probe. The emitting of impulse wave beam is like the light beam of flashlight. The further it is from the probe, the greater the diffusion area is.

Any objects within the launch angle, such as pipes, brackets, welds, stiffeners, stirring propellers, and wall-mounted objects, will cause strong false echoes, especially objects closer to the probe within the launch angle.

For example: the false echo caused by a pipe at a distance of 6 meters from the probe is 9 times stronger than the false echo caused by the same pipe at a distance of 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 within the emission angle. Such as: pipes and brackets.

4.2.2 Select Measuring Range:

Measuring range is decided by the range of ultrasonic probe which is subject to the site working environment, object to be measured and temperature, etc. Decide the measuring range needed based on the table below.

Liquid Surface	Attenuation Multiple	Attenuation Percentage	Magnification of Measuring Range
Stable	0dB	0%	Magnification is unnecessary
Ripple	5...10dB	50~67%	1 times of the measuring range
Major fluctuation (for example, there is mixing blade)	10...20dB	90%	3 times of the measuring range

Solid Material Surface	Attenuation Multiple	Attenuation Percentage	Magnification of Measuring Range
Hard, rough (such as granular rubber)	40dB	99%	10 times of the measuring range
Soft (such as pulverized coal, cement and coal ash)	40...60dB	99~99.9%	Use not recommended

With Dust	Attenuation Multiple	Attenuation Percentage	Magnification of Measuring Range
None	0dB	0%	Magnification is unnecessary
Little	5dB	50%	1 times of the measuring range

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Temperature Difference Between Probe and Medium Surface	Attenuation Multiple	Attenuation Percentage	Magnification of Measuring Range
≤20°C	0dB	0%	Magnification is unnecessary
≤40°C	5...10dB	50~67%	1 times of the measuring range
≤80°C	10...20dB	67~90%	2 times of the measuring range

The calculation method of signal attenuation is to add all signal attenuation amounts if there are several conditions on site.

With little feedstock   5...10dB
With little steam   5...20dB
Temperature difference between probe and medium surface ≤40ºC
5...10dB
Total   minimum: 15dB
                                 maximum: 40dB

Under such circumstances, if the actual maximum measuring range is 5m, ultrasonic level meter with measuring range of 50m shall be selected for the measurement.
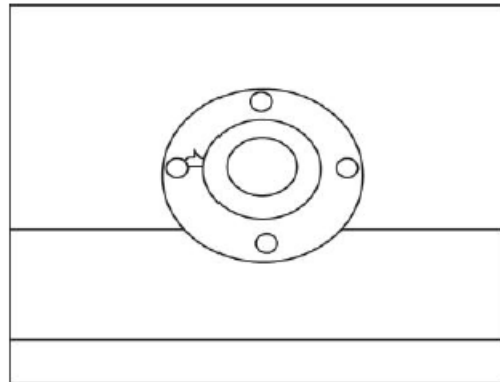
www.ceyeko.com

4.2.3 Installation of Thread at the Bottom :

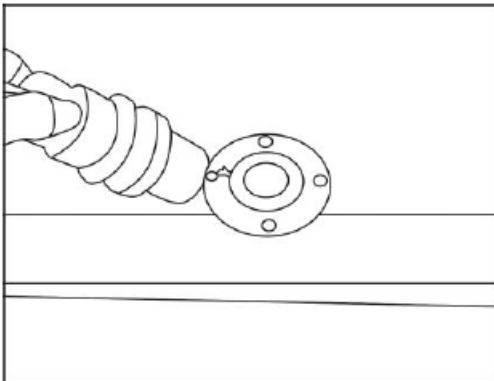♦ <u>It is recommended to use plastic flange to connect with the sensor during the installation.</u>
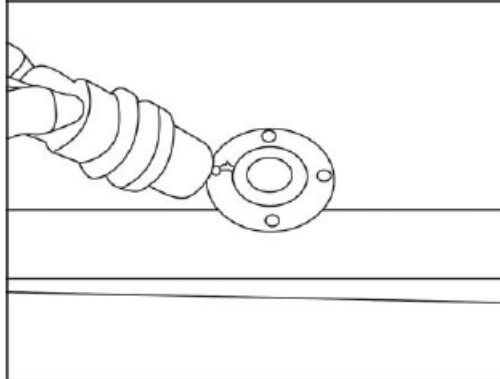
01.Install a flange on the object to be measured
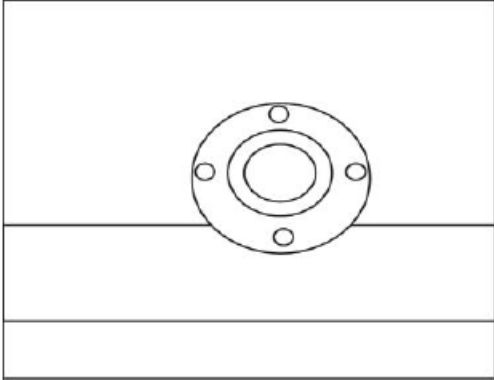
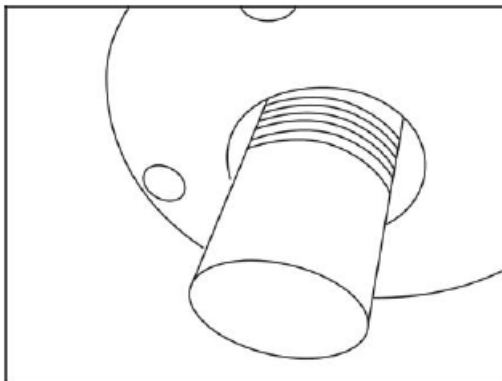02.Place a spacer of the same in-ner diameter on the flange
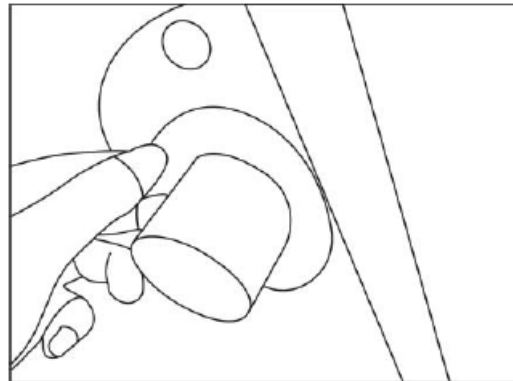
03.Align the transducer with flange hole
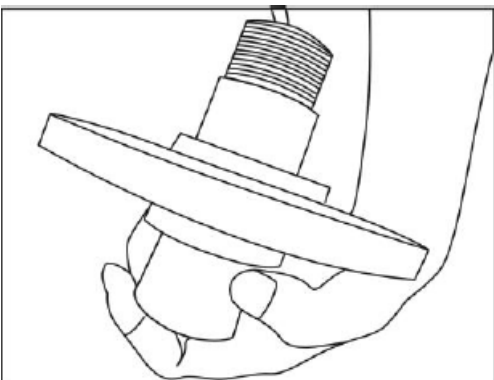
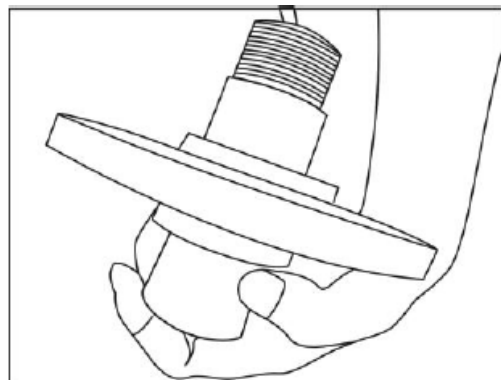04.Place the transducer in flange hole

05.See from the flange bottom

06.Place a spacer of the same inner diameter under the flange
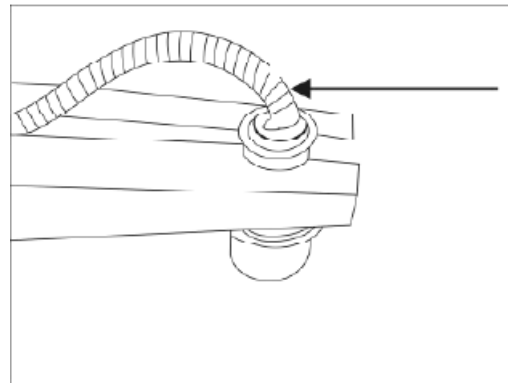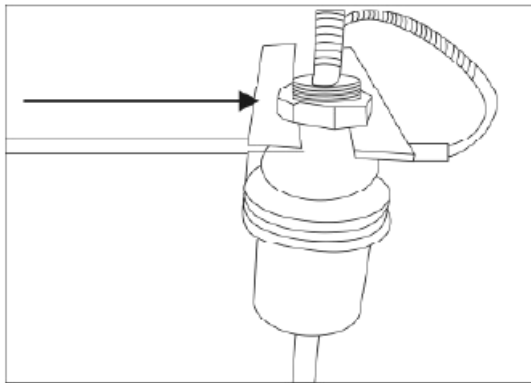
07.Tighten nuts to fix the transducer

08.Transducer installed

4.2.4 Top Thread Installation-Hoisting Installation:

02.Put a gasket on the flange

◊   Installation on the tank, pool, cover plate and support is basically the same as above.

♦   After probe installation, the probe emission surface must be exposed from the cover plate or waveguide and it shall not be in the cover plate or waveguide.

4.2.5 Liquid Measurement:

(1) Flat-Top Tank

Normally, the flat-top tank has a short connecting pipe whose datum plane is the undersurface of flange. Under the premise that the connecting pipe length is ≤60mm, inner diameter is ≥100mm and inner wall is smooth and free of burr and bulges, the measurement can be carried out if the emitting surface of installed probe is 3cm below the flange undersurface.
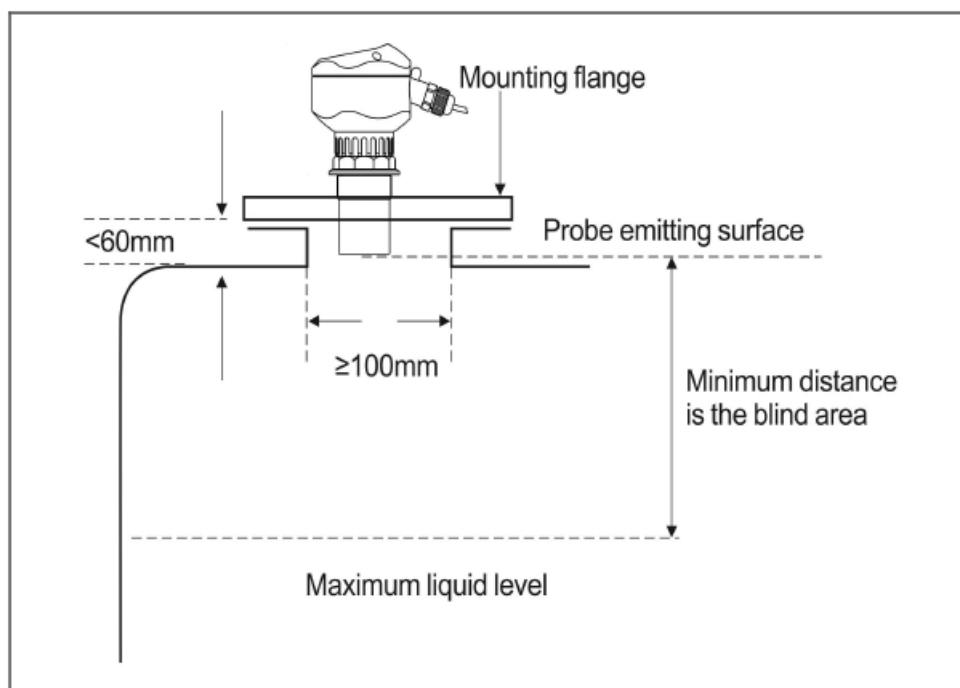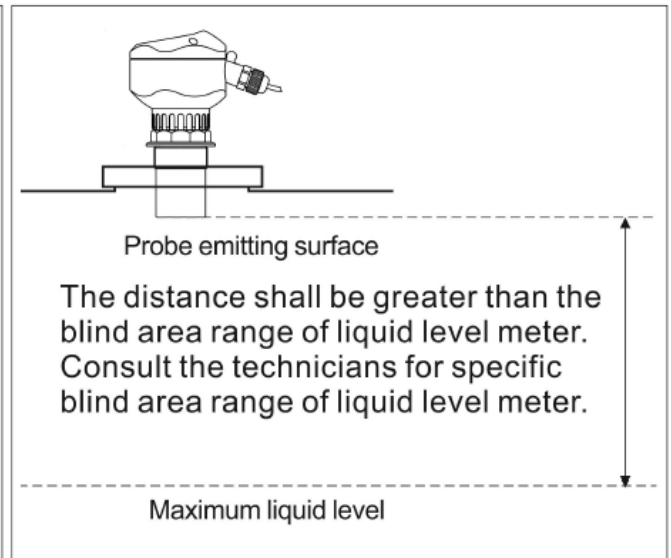

Flange installation in a short connecting pipe

The most ideal installation is to directly install the meter on the flat-top container without using the connecting pipe and the round opening on the container is good enough for the fixing of mounting flange or cardan joint. The probe emitting surface is below the datum plane.
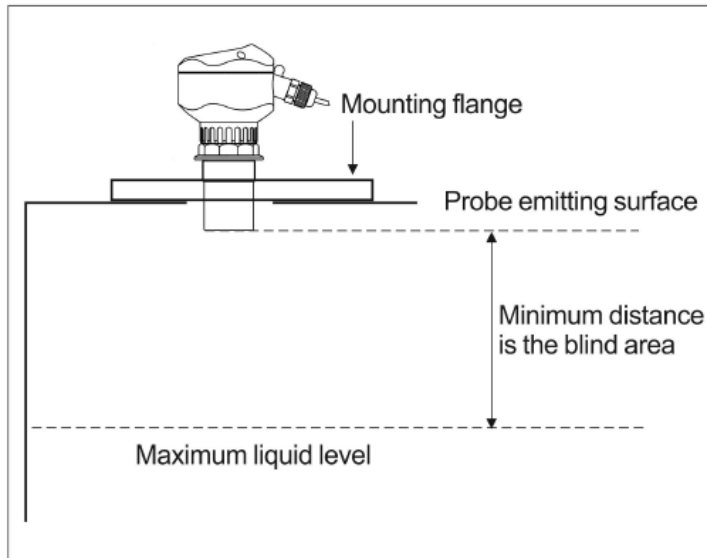
| Flange-type (locking flange) installation on the flat-top tank | Flange-type installation on the flat-top tank without connecting pipe |

In case of installation on nipple joint similar to a probe, the inner diameter of con-necting pipe shall be identical to the external thread and the probe emitting surface must be exposed for at least 1cm from the connecting pipe and it shall not be inside the connecting pipe.
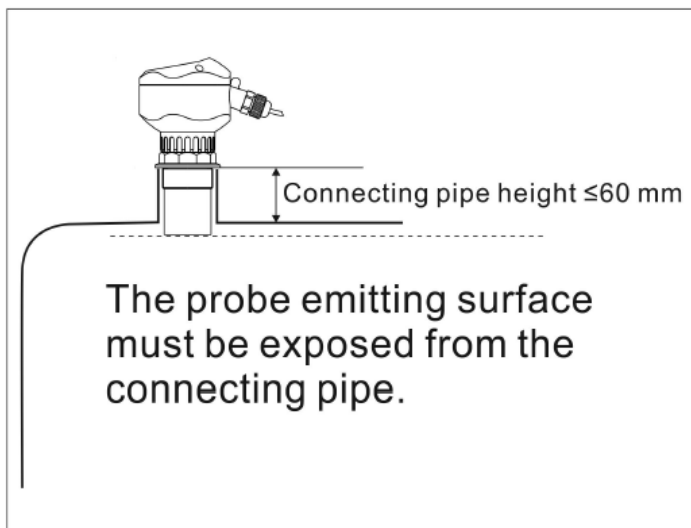
| Probe installation on nipple joint | Hoisting thread connection at the remo-te type probe top |
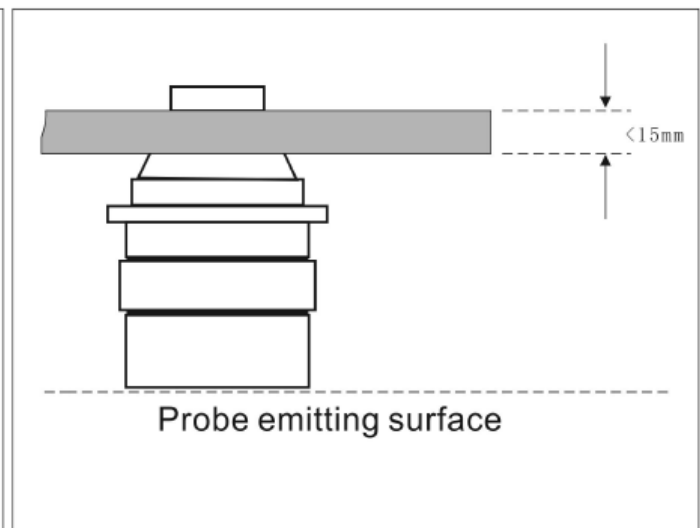
Similarly, the remote type sensor can be installed via top hoisting thread and the di-mensions of hoisting thread include M30×1.5, M32×1.5 and M38×1.5.

(2) Arch Top Tank

For arch tank, it's better not to install the meter in the middle of the tank top. Instead, the meter shall be installed at 1/2 or 2/3 of the tank top radius (under the premise that certain distance from the tank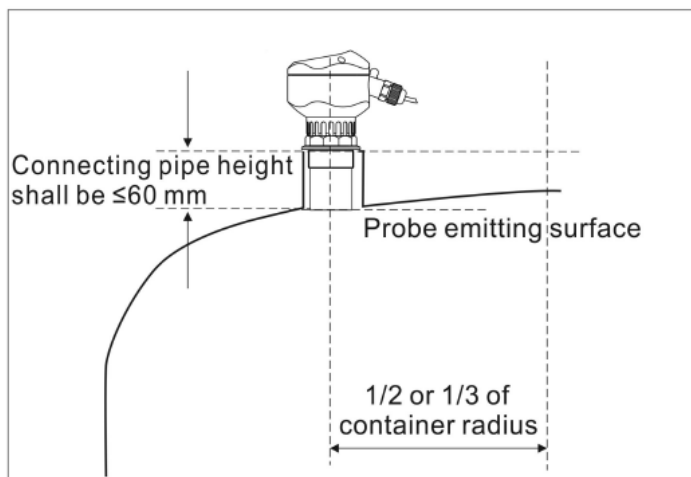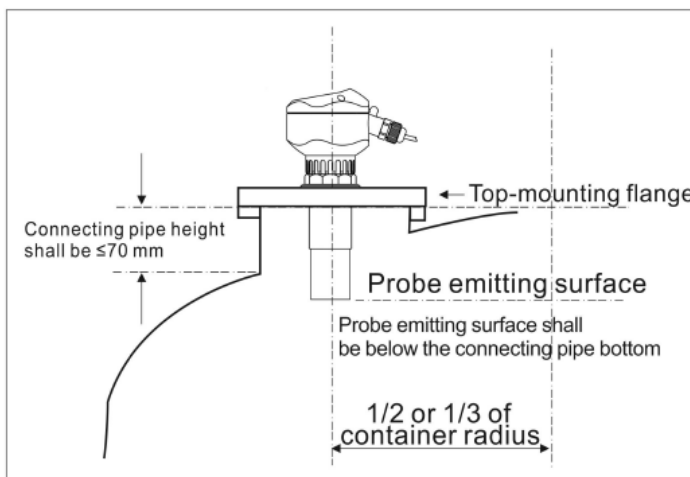 wall is met). The arch tank top is like convex lens to the ultrasonic pulse. If the probe is installed at the focus of convex lens, it will receive all the false echoes. Therefore, the sensor shall not be installed in the middle of the arch tank top.

Installation on nipple joint – arch tank top

Installation on flange – arch tank top

For most arch tanks, the length of connecting pipe plus flange on the top is 150-180mm. But the part below the probe thread of ultrasonic level meter is not so long (elongated probe is available for customization to make sure the probe emitting surface is below the connecting pipe bottom). In this case, the proportional relation between the diameter and length of connecting pipe shall be noted.

#	Length of Connecting Pipe	Minimum Inner Diameter of Connecting Pipe	Remarks
1	150mm	100mm	The inner wall of connecting pipe is free of burr and bulges and vertical and the weld joint shall be polished. The connection of connecting pipe and tank top shall be outwards polished at an oblique angle of 45º.
2	200mm	150mm	
3	250mm	180mm	
4	300mm	220mm	
5	400mm	280mm	

(3) Arch Top Tank

For open container, the support shall be used for installation. The bearing capacity of support shall be noted and certain distance shall be kept between the sensor and container wall. If the upper part and lower part of the open container or stock bin inner wall are flat and free of hanging objects and any other objects, the distance between the sensor and container wall is detailed as follows:

Maximum Measuring Range	Minimum Distance to Wall	Maximum Measuring Range	Minimum Distance to Wall	Maximum Measuring Range	Minimum Distance to Wall
5m	0.6m	10m	1.2m	15m	1.8m
20m	2.5m	30m	3.5m	40m	5m
50m	6m	60m	7m	70m	8m
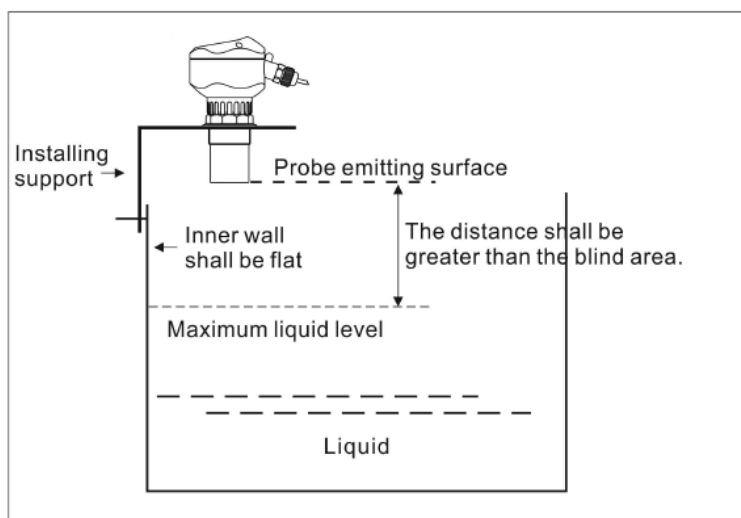
Installation on open container – with top against the support at one side

As the open container has no focusing effect, the sensor can be installed in the middle of the container.
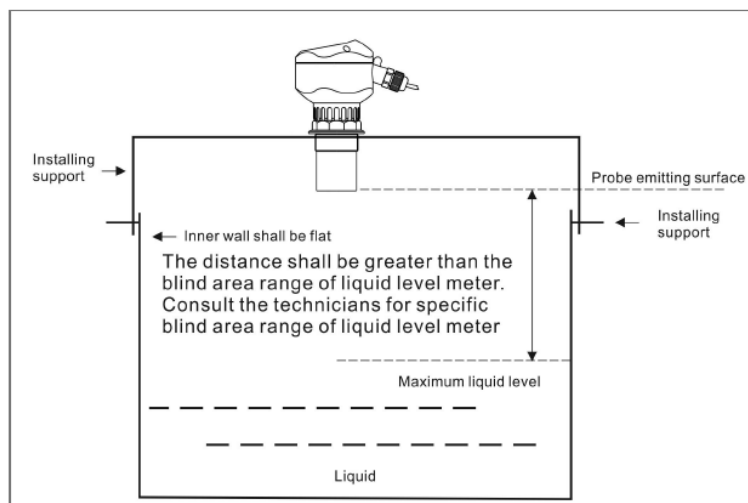
Installation on open container – with support at the top middle part

(4) Draining Well and Common Well

Normally, the wellhole and wellhead of drainage well are narrow and the well wall is uneven, which makes it difficult to conduct ultrasonic measurement. This can be solved by installing a section of connecting pipe or a whole measuring casing. Attention shall be paid to the fact that the blind area will be enlarged for about 50~100% after the sensor is put into the connecting pipe. So the factors for blind area expansion shall be considered.

Thus, when the connecting pipe is used, if the original probe blind area is 0.50m, it will be enlarged to 1.00m after the probe is put into the connecting pipe.
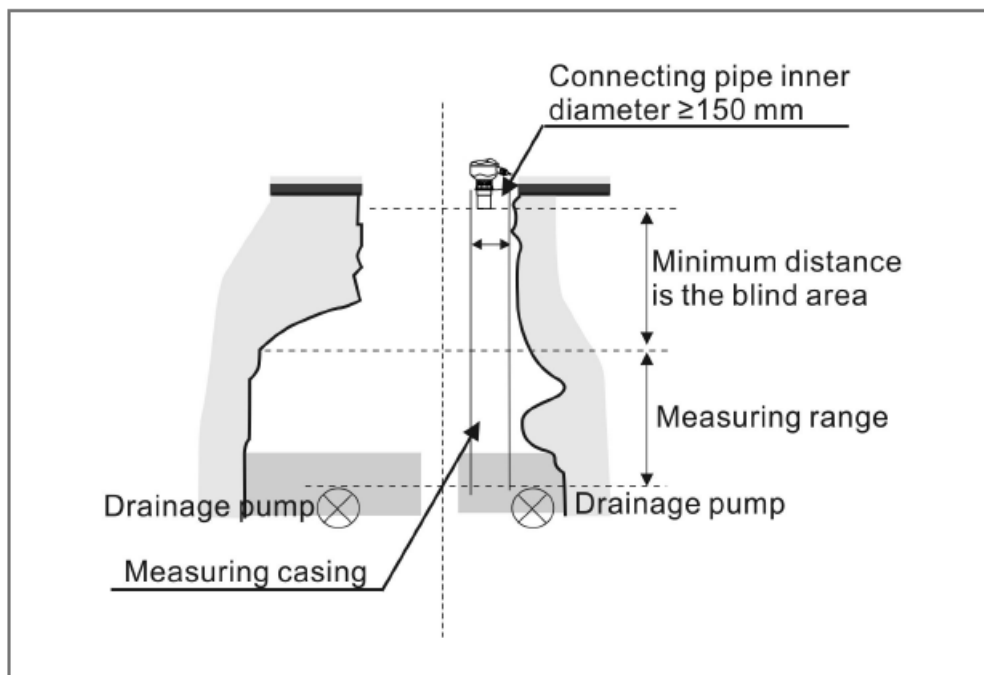
Connecting pipe and measuring casing used for drainage well measurement

For common well (including water source well and deep well), normally the diameter is small and the best measuring effect can be reached by installing measuring casing. The inner wall of measuring casing must be smooth (PVC and PE pipe can be used) and the inside diameter shall be ≥150mm (measuring range within 4m). The manufacturer shall be contacted for connecting pipe longer than 4m. The measurement can be carried out as long as the measuring casing is clean and free of attached medium and internal joint.

The measuring casing shall be soaked in the medium all the time, which can ensure the accurate measurement within the measuring casing.

4.3 Solid Measurement

4.3.1 Flange Installation:

Similar to liquid medium measurement, the meter can be installed on the counter flange of container connecting pipe. The solid reflecting surface is different from that of the liquid and it is not a plane, which shall be considered during installation. The probe emitting surface shall be perpendicular to the surface of solid to be measured and the probe shall be exposed from the connecting pipe.

At the solid measurement site, in most cases, probe inside the connecting pipe will lead to pulsating of measured data or "wave loss".

To solve the problem, the universal flange can be used. In this case, the probe emitting surface can easily be aligned to the reflecting surface of the solid to be measured merely by rotating the flange.
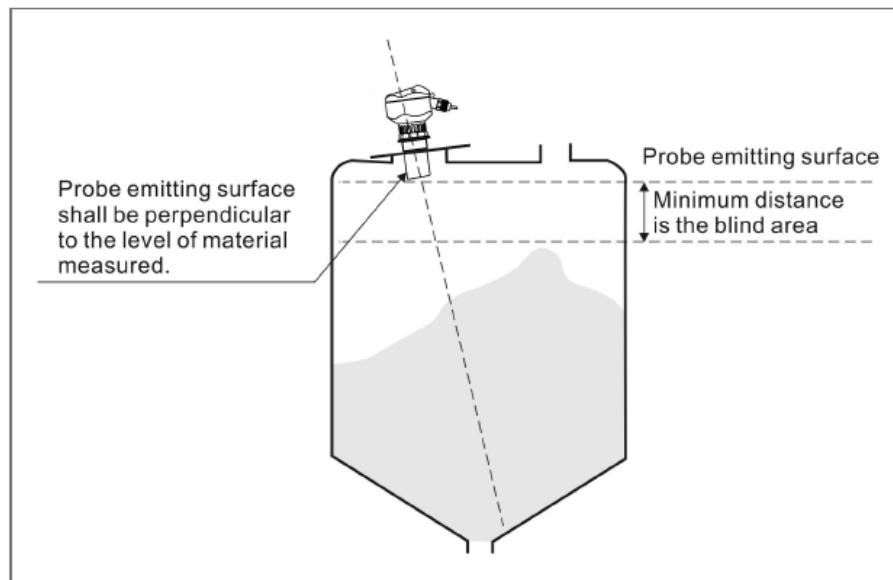
Compact type sensor installed on container flange
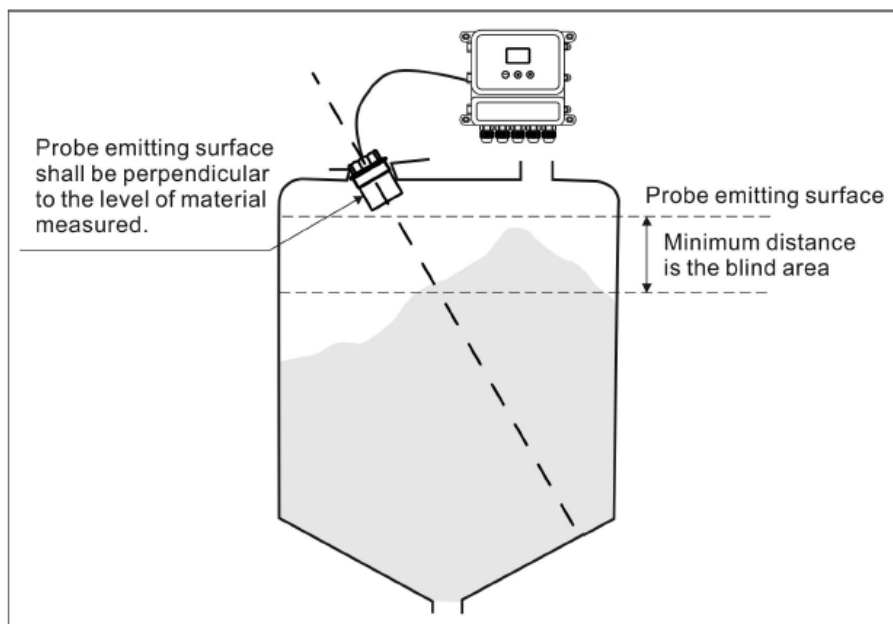
Remote type sensor installed on container flange

4.3.2 Installation via Nipple Joint:

During installation via nipple joint, the probe must be exposed for at least 2cm abo-
ve the connecting pipe bottom.
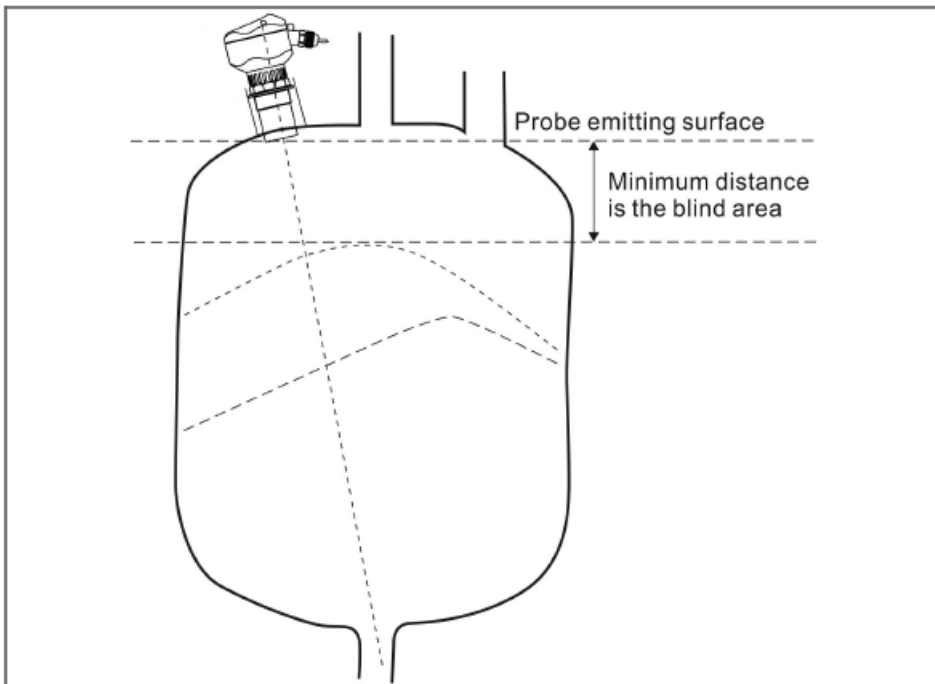
4.3.3 Doorframe Installation

Doorframe installation can be applied for the open container and the axis of connec-
ting pipe must be aligned to the container opening or perpendicular to the medium
surface.
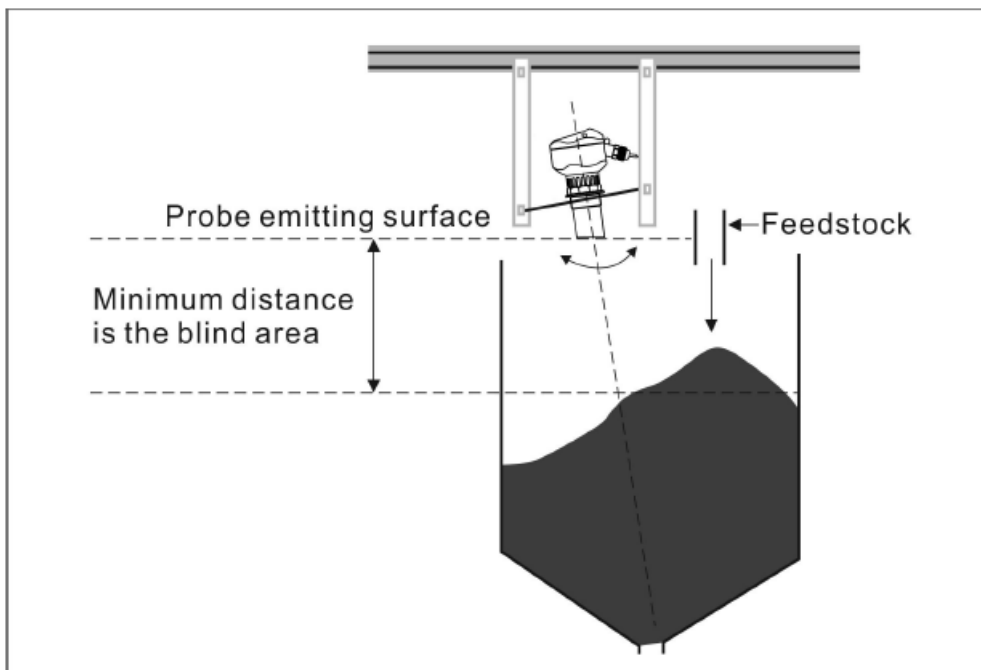
Compact type sensor –
doorframe installation

During installation for material piles in the open air, several meters are required for
the measurement of large material pile in the open air. The meters can be fixed on
the hoist frame and sensor probe shall be aligned to the medium surface.
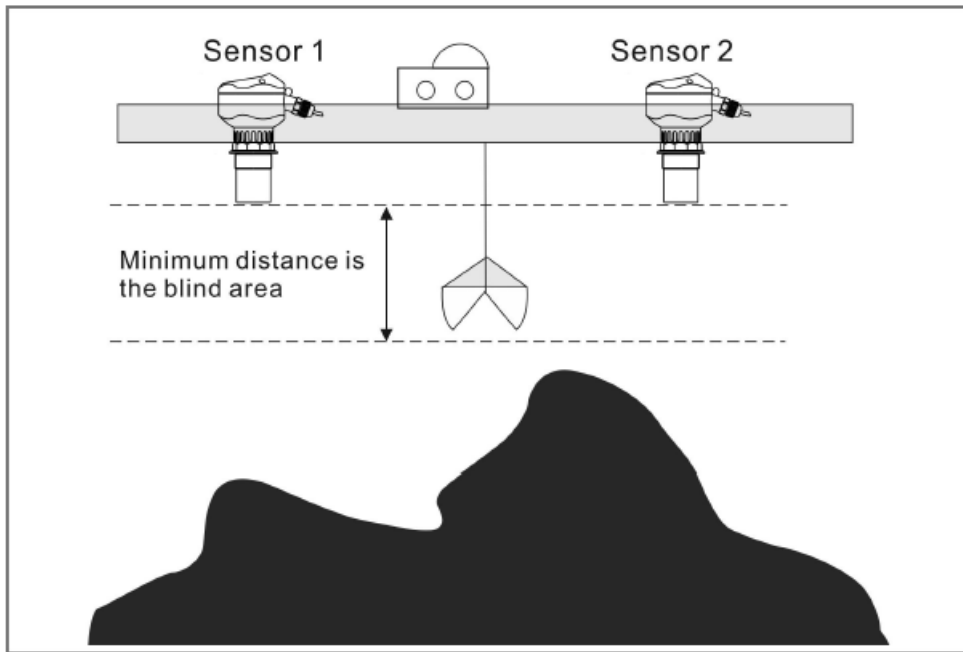
Measurement of material pile in the open air – installation on hoist frame

4.3.4 How to Extend the Connecting Pipe for Measurement

A minimum distance shall be kept between the probe of ultrasonic level meter and surface of measured medium, which is normally called the blind area. However, if the minimum distance cannot be ensured on site in some cases, an extended connecting pipe shall be installed on the container.

(1) How to extend the connecting pipe for measuring liquid

Try to keep the inner wall of the nozzle as smooth as possible, and the nozzle shall not be immersed in the medium to prevent the medium from contaminating the nozzle or adhering to the inner wall of the nozzle.

The bottom of the connecting tube should be cut at a 45° bevel to avoid strong echoes at the bottom of the connecting tube. At the same time, the ratio of the height of the connecting tube to the inner diameter of the connecting tube should be ≤5:3.

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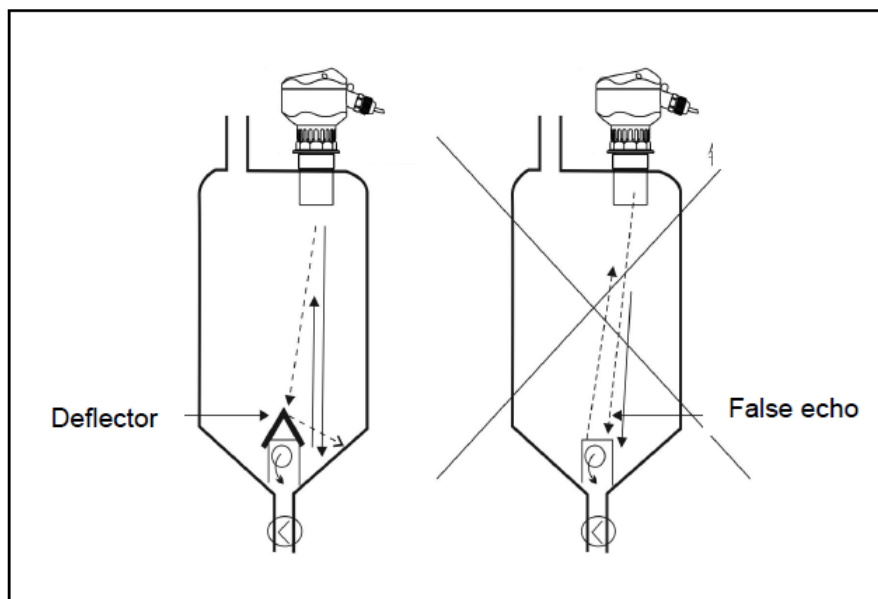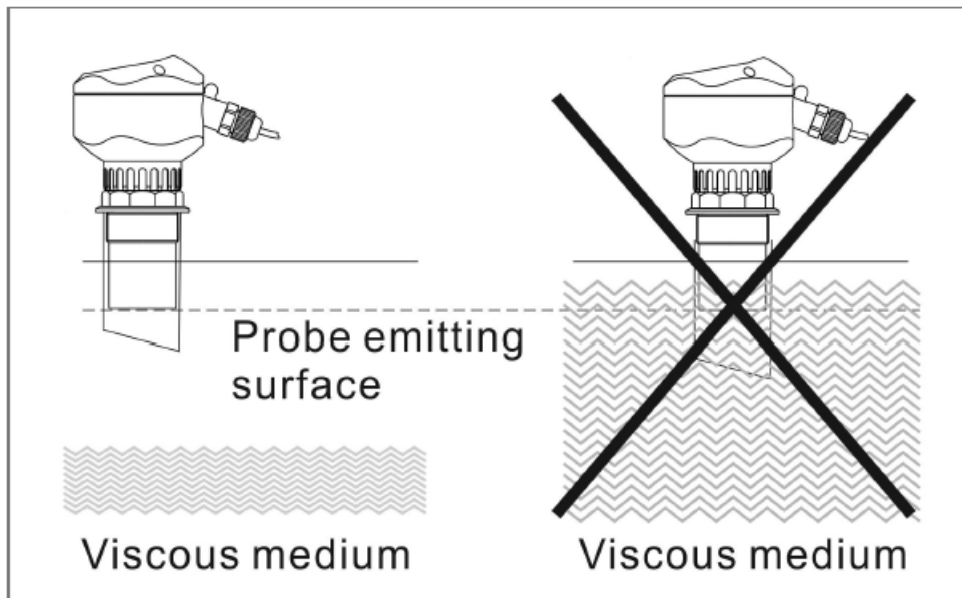
Measurement of material pile in the open air – installation on hoist frame

If it is non-adhesive medium, the extended connecting pipe can be soaked in the medium for a long time (as long as the pipe is not corroded by the liquid and no impurities are attached to the inner wall of the pipe). In this way, the measurement can be more accurate as it is not affected by other devices in the container.

The inner diameter of connecting pipe shall be as great as possible and the inclined cut shall be smooth. The relationship between the height L and inner diameter φ of connecting pipe is as shown below.

#	Length (L) of Connecting Pipe	Minimum Inner Diameter (φ) of Connecting Pipe	Remarks
1	150mm	100mm	The inner wall of connecting pipe is free of burr and bulges and vertical and the weld joint shall be polished. The connection of connecting pipe and tank top shall be outwards polished at an oblique angle of 45º.
2	200mm	120mm	
3	250mm	150mm	
4	300mm	180mm	
5	400mm	240mm	
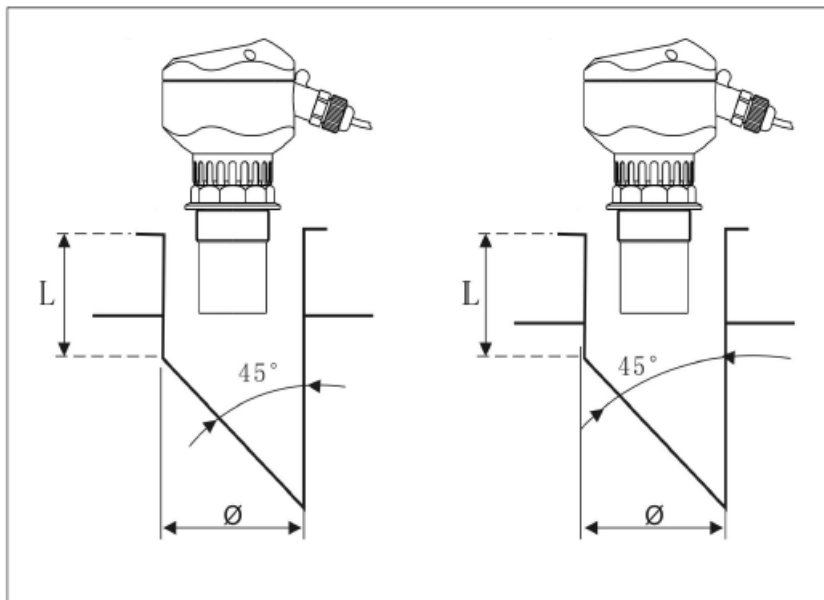
Extended connecting pipe not soaked in the medium

If the extended connecting pipe is installed all the way through the tank from top to the bottom, the relationship between the inner diameter of connecting pipe and sensor measurement distance is shown as follows.

Maximum Measuring Range	Minimum Inner Diameter of Connecting Pipe	Maximum Measuring Range	Minimum Inner Diameter of Connecting Pipe
5m	150mm	10m	200mm
15m	250mm	20m	300mm

(2) How to extend the connecting pipe for solid measurement

Measurement of solid medium is different from that of liquid. The conical extended connecting pipe with an angle of 25°~30° shall be used.
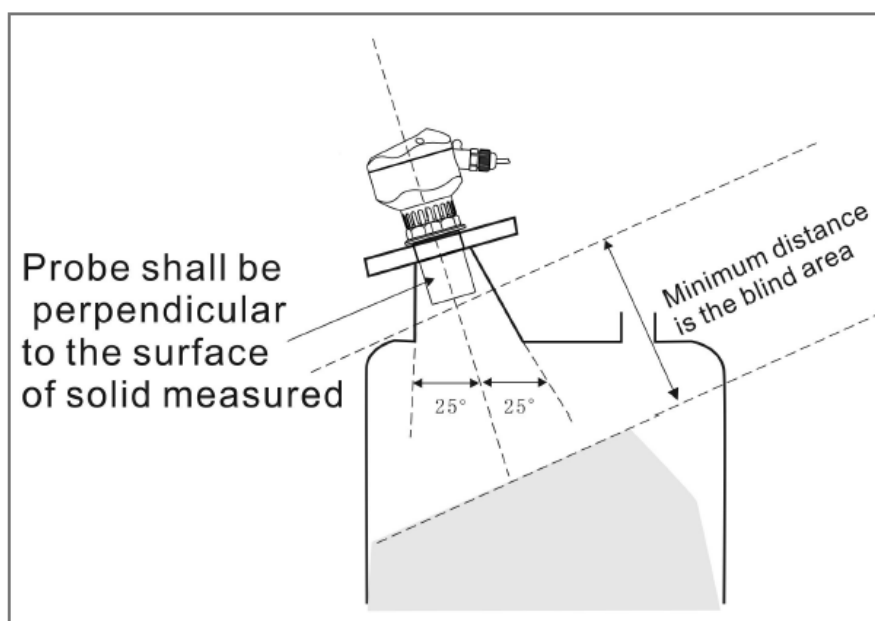
Extended connecting pipe for solid medium measurement

4.3.5 Installation Should Avoid False Echo

A minimum distance shall be kept between the probe of ultrasonic level meter and surface of measured medium, which is normally called the blind area. However, if the minimum distance cannot be ensured on site in some cases, an extended connecting pipe shall be installed on the container.

(1) Devices and installation in the container

During sensor installation, it shall be ensured that the ultrasonic wave beam is not blocked by other devices or feedstock. The bulges on the plane or stair-like barriers in the container will have a great impact on the measurement and a deflector can be provided on the embossment to reflect the false echo so as to ensure accurate measurement.
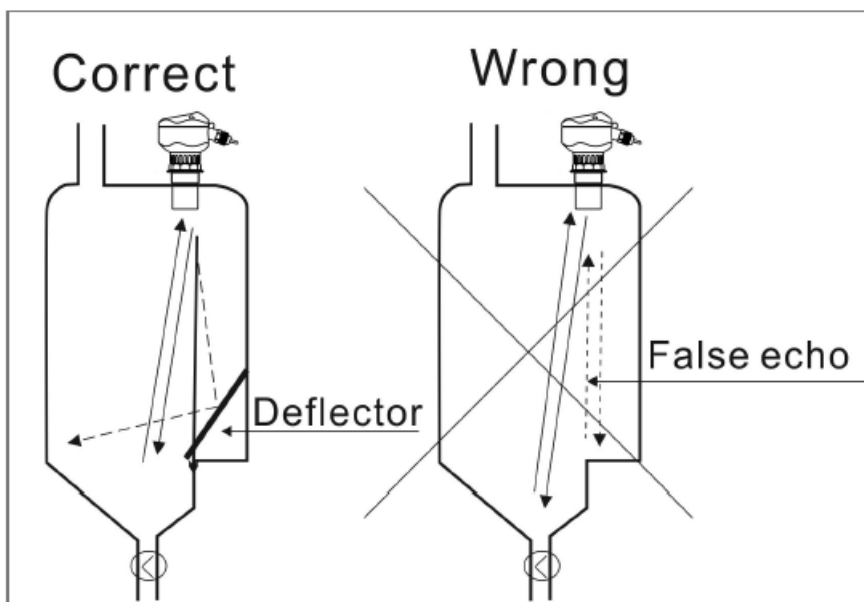
Stair-like barriers in the container – inclined deflector needed to reflect the false echo

If the upper surface of object at the lower part of the container is a plane, the inlet for various media must be covered with a deflector set at certain angle.
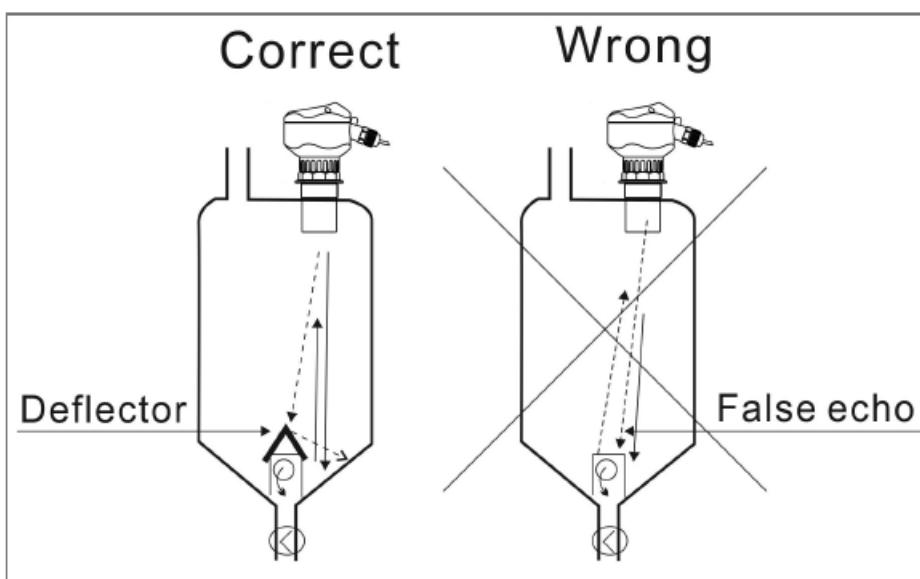
Flat-top bulge at the bottom of the container – deflector required

The devices in the container such as pipe and support will affect the measurement. For the design of measuring points, it must be ensured that no other devices are within the diffusion range of ultrasonic wave signal.
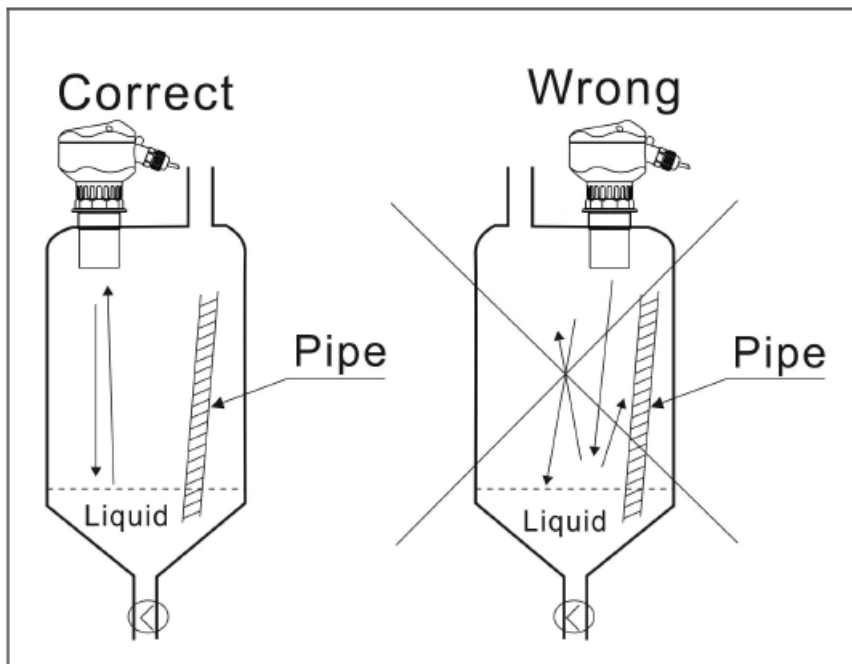
Barrier in the container - pipe

The sensor shall not be installed in or above the charging feedstock flow and it shall be kept from the feed inlet for certain distance.
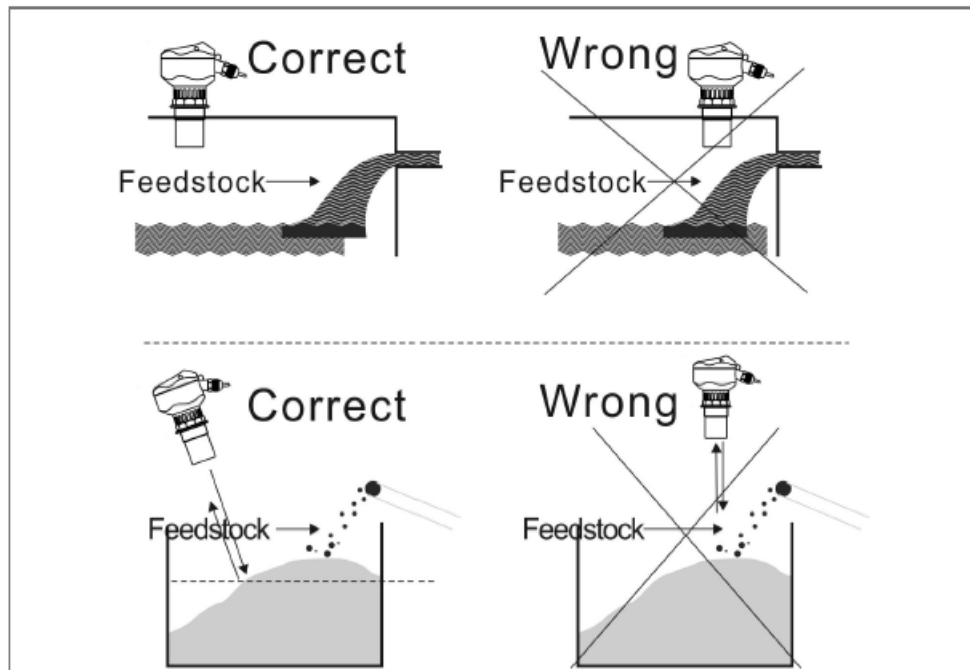
Sensor shall not be installed in or above the charging feedstock flow

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Where there is viscous medium in the container, such as crude oil storage tank, mud tank, asphalt tank and cement mixing tank, if the sensor is installed close to the container wall, the medium attached to the container wall will lead to strong false echo. Therefore, certain distance must be kept between the sensor and the container wall.
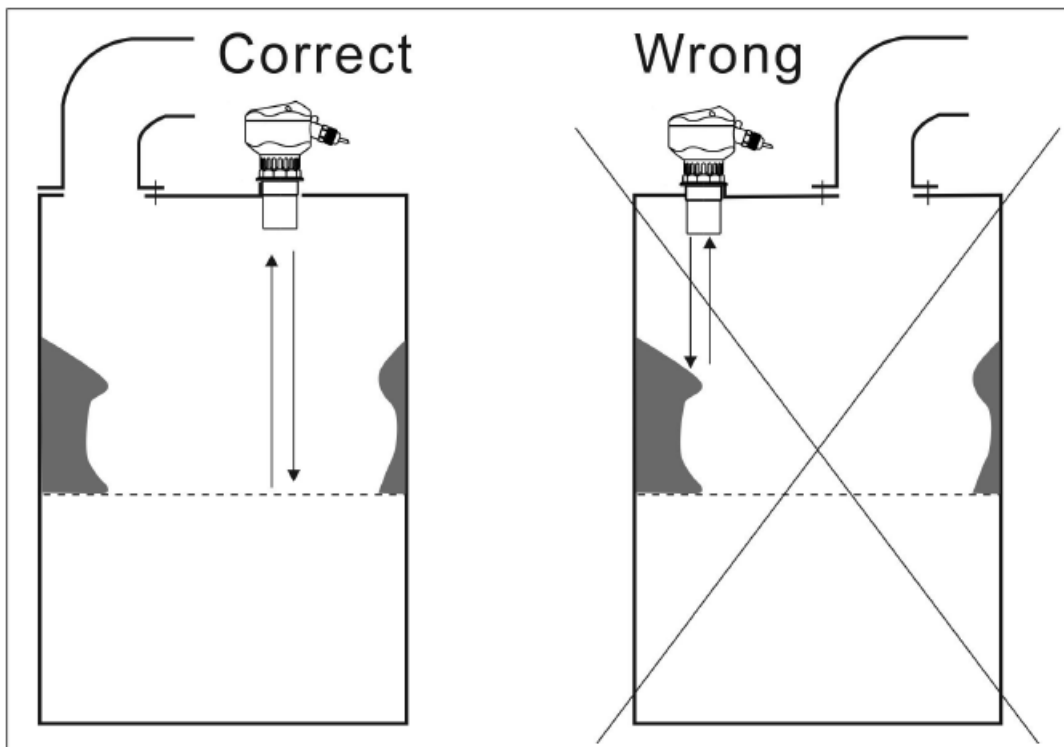
Attachment on container wall – certain distance must be kept from the attachment

In the water storage pool, the installation height is generally decided based on the maximum water level. The distance between maximum water level and probe must be noted. If the objects with elevation difference at the pool bottom are exposed in case of low water level, the edge shall be covered with a deflector.
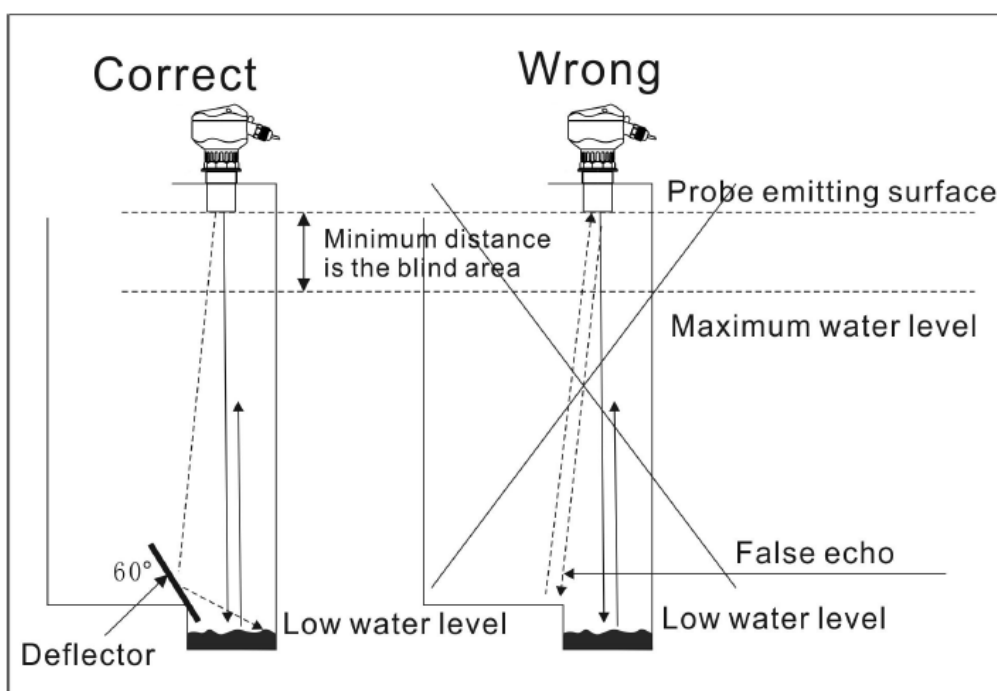
Barriers at the pool bottom – reflect with a deflector

If there is strong eddy or vortex in the container, such as eddy caused by the stirrer or strong chemical reactions, the measurement can be difficult. The ideal method is to install the sensor probe in the waveguide or by-pass pipe for measurement.
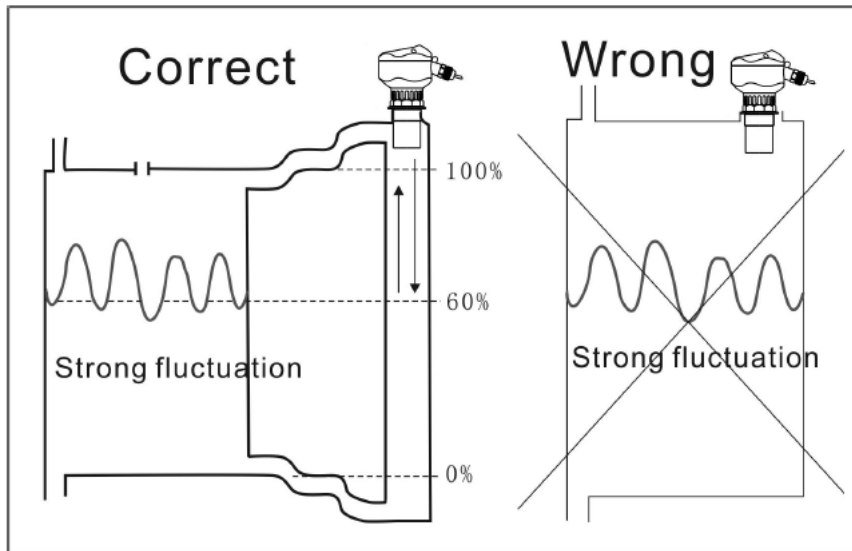
Great fluctuation at medium surface –
use by-pass pipe or waveguide for measurement

(2) Common Installation Errors

❶ **Bubble:** if the bubbles on the medium surface are large and the bubble layer is thick, measuring error is likely to take place and the reflected ultrasonic wave may even unable to be received. Measures shall be taken to prevent the generation of bubbles or the sensor shall be installed in the by-pass pipe for measurement.

Other measuring meters can also be used, such as radar liquid level meter or magnetostrictive liquid level meter.
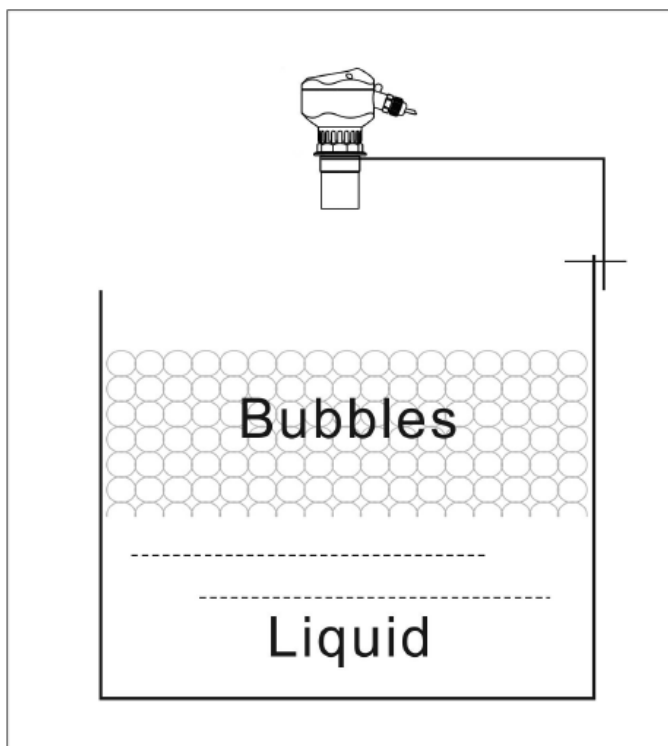
Occasions when bubbles are generated

❷ **Incorrect installation direction of the sensor**

If the sensor is not installed aligned to the medium surface, the measuring signal will be weakened. To ensure the best measurement effect, the axis of sensor shall be aligned to the surface, i.e. perpendicular to the surface of measured interface.
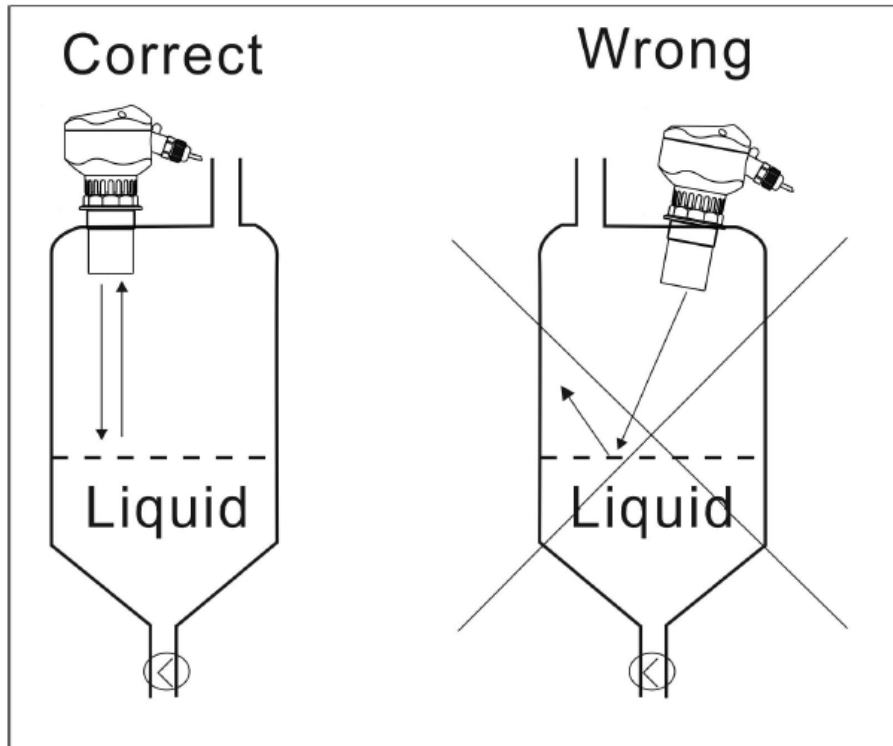
Sensor probe shall be perpendicular to medium surface

❸ **Installed at positions with great temperature change**

Measurement error is likely to take place at positions with great temperature change, such as place with strong sun illumination. The error will add by 2-4% on the basis of original measurement accuracy. Therefore, sun louver shall be installed to solve the problem.
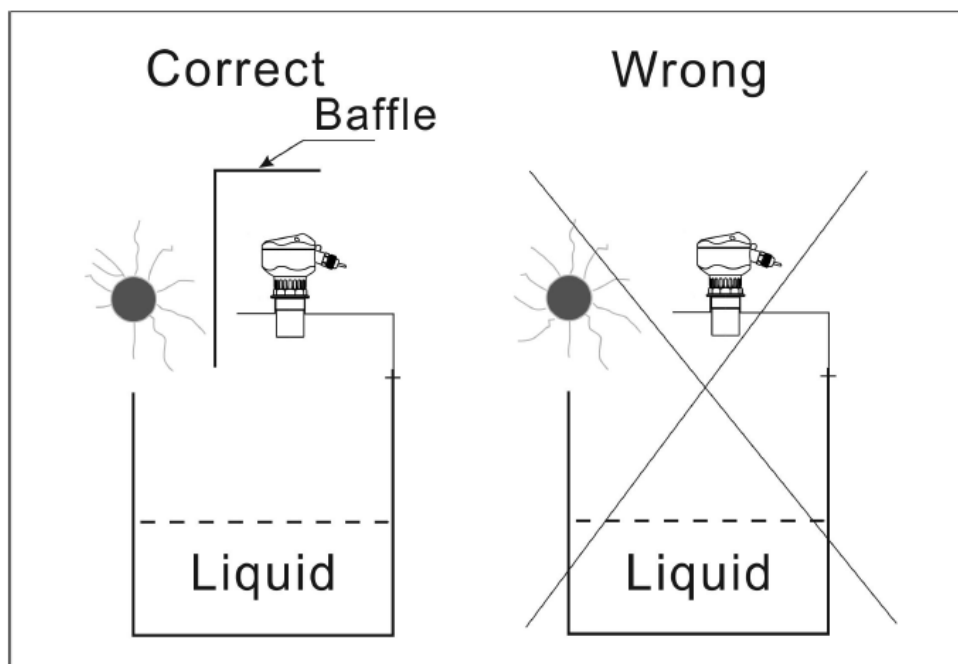
Great temperature change – add sun louver or meter box

❹ **Minimum distance to medium less than the blind area**

If the distance form probe to maximum level of the medium is less than the blind area of the meter, the measured values are wrong.

❺ **Sensor is too close to the container wall**

If the sensor is installed too close to the container wall, strong false echo will be generated. The uneven inner surface of the container wall, attached medium, rivet, screw, reinforcing rib and joint weld on the container inner wall will lead to strong false echo which will be loaded on the effective echo signals. Therefore, the maximum distance shall be measured based on the requirements to keep the distance between the sensor and container wall, which is detailed as follows:

Maximum Measuring Range	Distance to Wall	Maximum Measuring Range	Distance to Wall	Maximum Measuring Range	Distance to Wall
5m	0.5m	10m	1.0m	15m	1.5m
20m	2.5m	30m	4m	40m	5m
50m	6m	60m	7.2m	70m	8.5m

Under worse measuring conditions, the distance between the sensor and the container wall shall be enlarged until no false echo occurs.

4.4 Electric Wiring Diagram

∗ Prompt: make sure the connecting cable between the probe and meter body of Remote-type ultrasonic level meter is long enough in advance. Connection with other cable for extension on site is not allowed as it will affect the signal transmission quality and strength.

∗ During power line connection, AC power line shall not be connected to any other terminals except AC terminals. Otherwise, the meter circuit or components and parts will be burnt.

∗ 485, 232 and 4-20ma output terminals shall not be short-circuited as short circuit will lead to burning of internal circuits.

The cables connecting the sensor and main equipment shall not be put in a trunking with any alternating current. If it can not be prevented, the cables of sensor shall be protected by a cable conduit to completely shield the electromagnetic interference caused by alternating current.

4.4.1 Electric wiring diagram of standard single-probe Remote-type ultrasonic level meter:
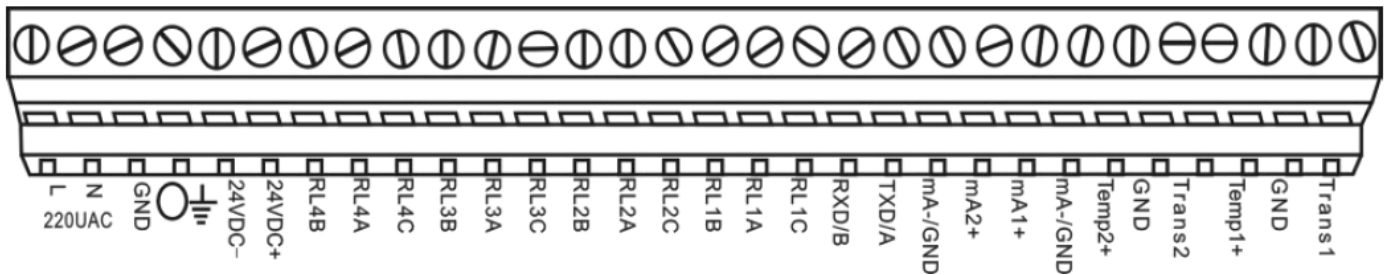
♦ **Diagram of standard single-channel Remote-type wiring terminals**
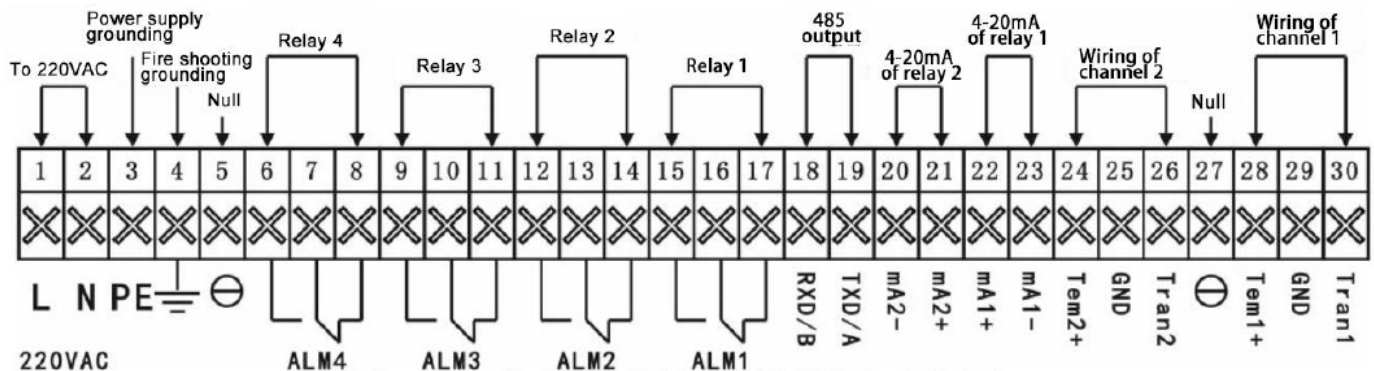
Wiring Method:

Grounding:

1) Make sure the grounding terminal of the meter is actually grounded and the meter does not share ground terminal with other equipment

2) Connect terminal 4.

3) Ground resistance must be less than 4 Ω

Transducer:

red wire: connected to Trans1 (transducer);

blue wire: Temp 1 + temperature sensor +

Black wire: GND (ground wire)

Current Output: "current +" connected to mA1 +; "current -" connected to mA- / GND

Relay: RLlnA and RLnB are normally open;

To ensure the default state of relay is "normally open", RLlnA and RLnB shall be connected. RlnA and RLnC are normal closed.

To ensure the default state of relay is "normally closed", RLlnA and RLnC shall be connected.

Power Line: AC: connected to L and N

DC: 24V+ connected to 24VDC+ and 24V- connected to 24V DC-.

485 Connection: 485A connection "TXD/485A" terminal,

485B connection "RXD/485B" terminal.

232 Connection: TXD connection "TXD/485A" terminal,

RXD connection "RXD/485B" terminal.

232 ground connection "mA-/GND" terminal.

232 Output Wiring:

RS485 output
4-20mA of relay 2
4-20mA of relay 1
Wiring of channel 2
Null
Wiring of channel 1

| 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |

RXD/B · TXD/A · mA2- · mA2+ · mA1+ · mA1- · Tem2+ · GND · Tran2 · ⏚ · Tem1+ · GND · Tran1

For RS232 output , this terminal is grounding terminal
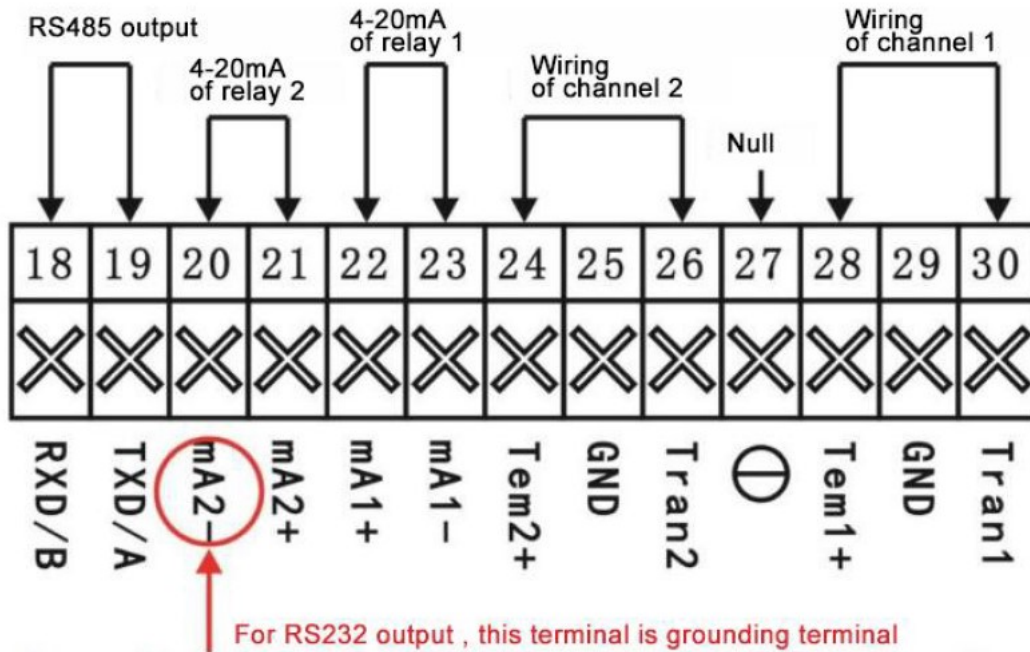
Relay output connection method:
Take "Relay 1" as a example, others are same

Relay 1

| 15 | 16 | 17 |

Pickup: didn't reach the setting value

Breakaway: reaches the setting value

Pickup: reached the setting value
Breakaway:didn't reach the setting value
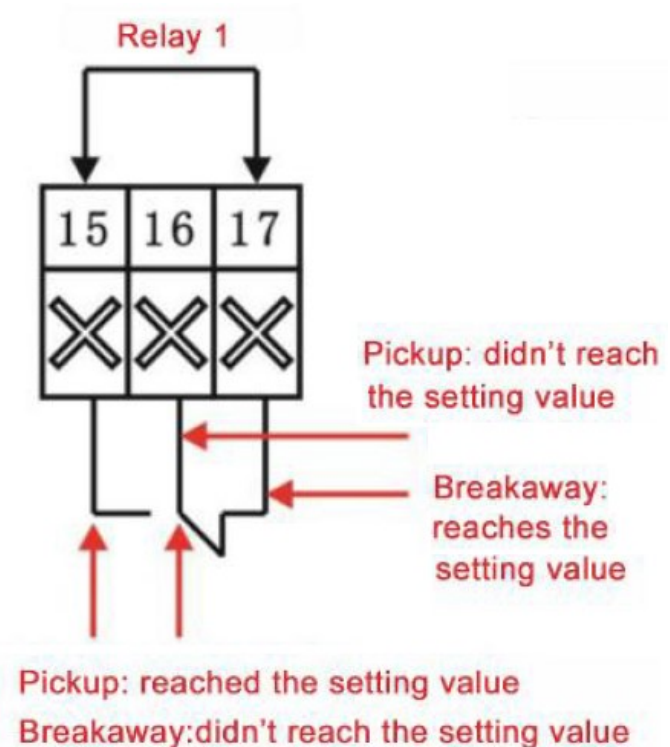
4.4.2 Wiring Diagram of Compact Type :

♦ **Enhanced Compact type with four-wire system**
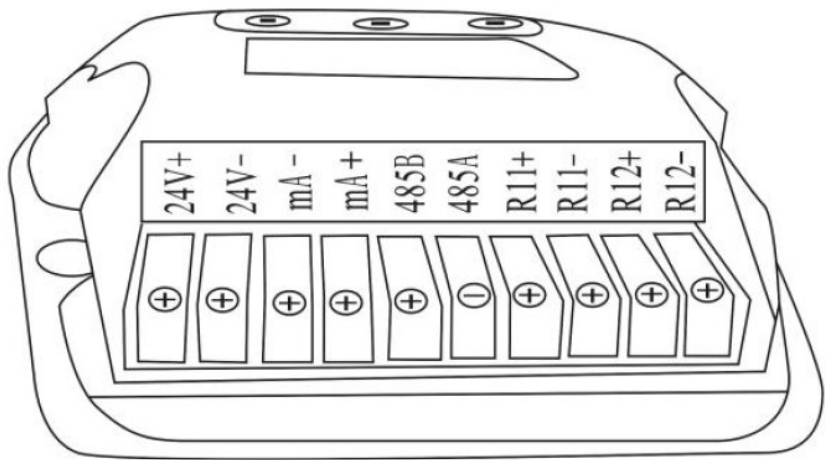
Electric Wiring Diagram of Enhanced Integrated Type with Four-wire System

24VDC Power Supply Wiring Diagram of Four wire System

220VAC Power Supply Wiring Diagram of Four wire System

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♦ **Enhanced Compact type with two-wire system**
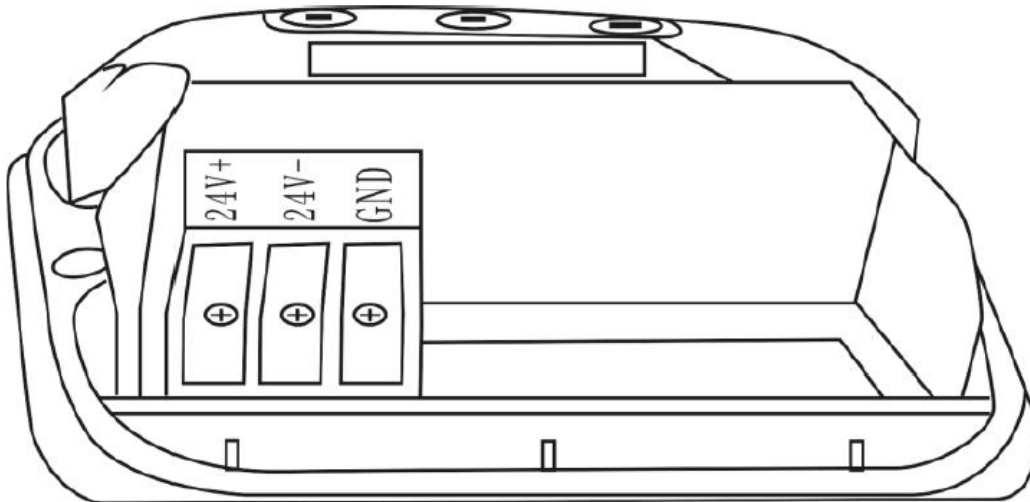
Electric Wiring Diagram of Two-wire System
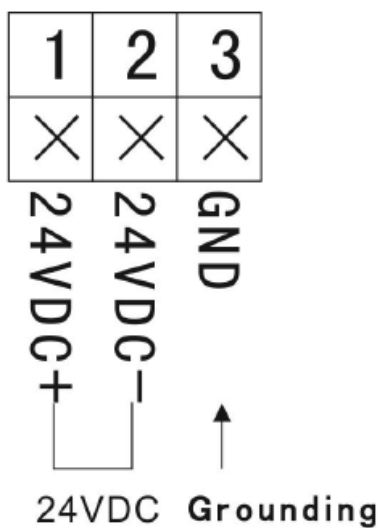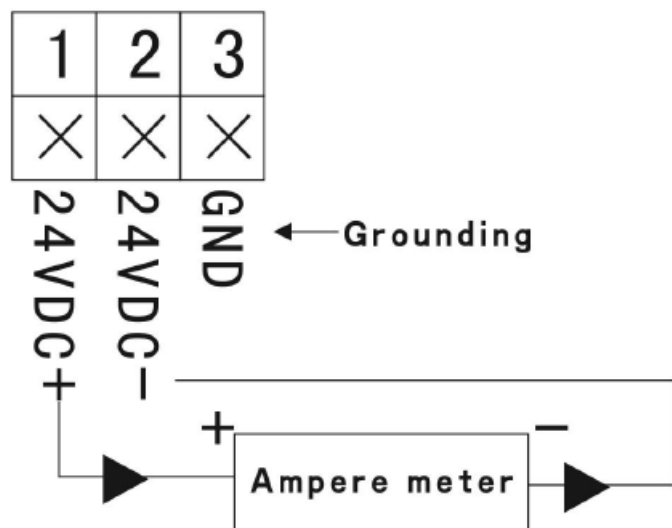
Wiring Diagram of Two-wire   Ampere Meter Diagram of Two-wire

Chapter 5: Settings

5.1 Introduction of Interface of Operation Mode

Two working modes, operating and setting modes are provided for this series of ultrasonic level meter. After being powered on and initialized, the level meter will enter in the operating mode automatically, and start to measure data.

Measurement at the time is under material level measurement mode and the relative output is 4~20mA. Output current is in direct proportion to the material level.

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

Note: language selection, hold the ⊘ and ⊘ buttons at the same time to switch
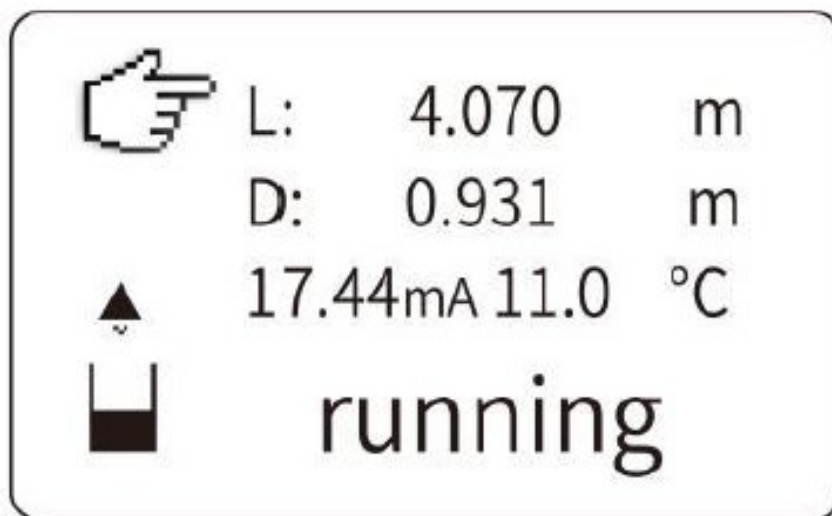
Two-wire (English)
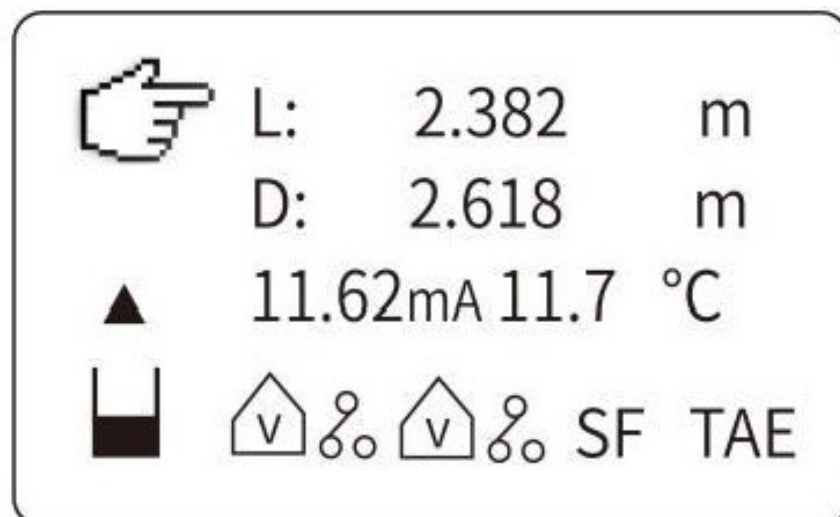
Four-wire (English)

Chapter 6: Menu Interface & Operating Instructions

The menu modes include expert setting mode and simply setting mode.

See the homepage for menu query table of simply setting mode.

See the appendix for menu query table of expert setting mode.

Menu interface of expert setting mode and operating instructions are shown below:

❶ Press SET in operating mode interface to enter in the "Mode selection "main menu:

Specialty setting mode ⟶
Simple setting mode ⟶

```
0 Quit
1 Factory Set
2 User Set
```
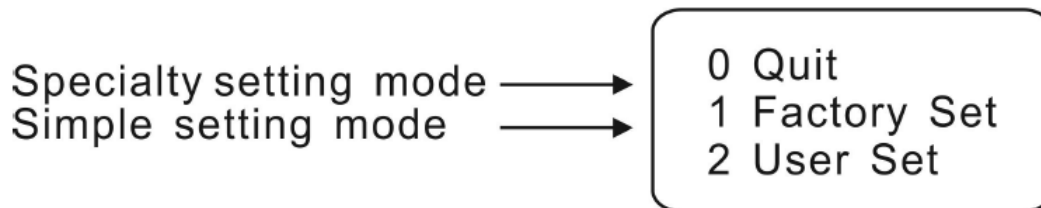
❷ Descriptions of the main menu items:

♦   Interface of the main menu with unlocked parameters:

1. Press "▲" or "▼" to select the menu to be modified, and then press "SET" to enter in this menu.

2. Press "SET" to exit from this menu.

```
0 Quit
1 Parameter Lock
2 Range Set
3 Measure Type
```

```
4 Transducer Set
5 Algorithm Select
6 Alarm Setting
7 Calibration
```

```
8 Communication
9 Reset Selection
```
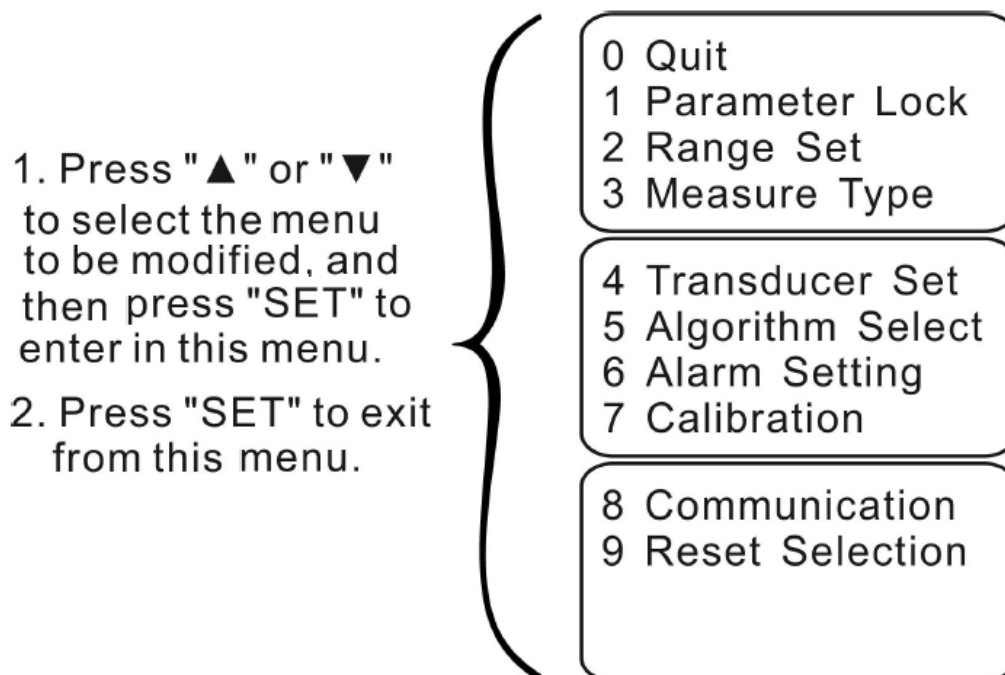
◆   **"0 Set end"**

Chose this item, and press SET to exit to the operating mode interface.
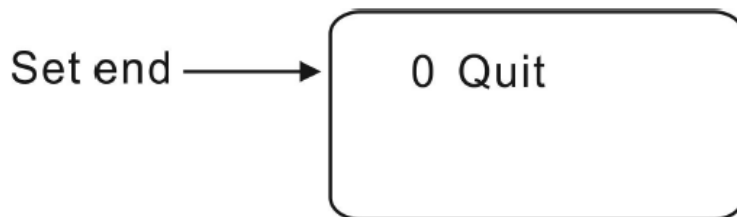
◆   Interface of the main menu with locked parameters:
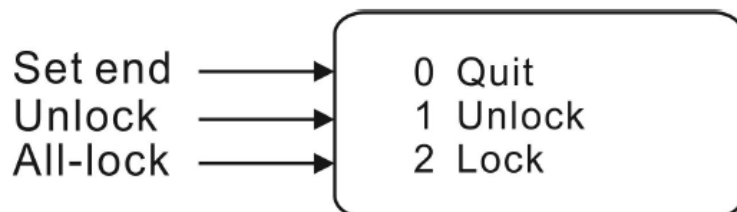
◆   **"1 Parameter Locking"**

If you do not want other people to make random changes of the parameters, you can lock the menu, and the menu can be unlocked with passwords. The initial password of the level meter is 25, and users can change the initial password and set their own passwords randomly (tips: please remember your own password, otherwise you need to contact with the manufacturer).

Descriptions：

Unlock: unlock, and all parameters of the menu can be changed randomly.
All-lock: for the conditions, the changes can be made only after entering password.
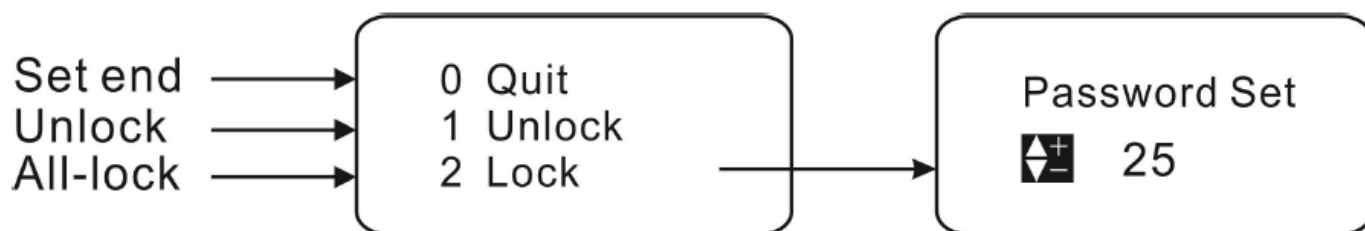
∗   If the parameters are locked, press SET and enter in the unlocking interface for parameter locking:
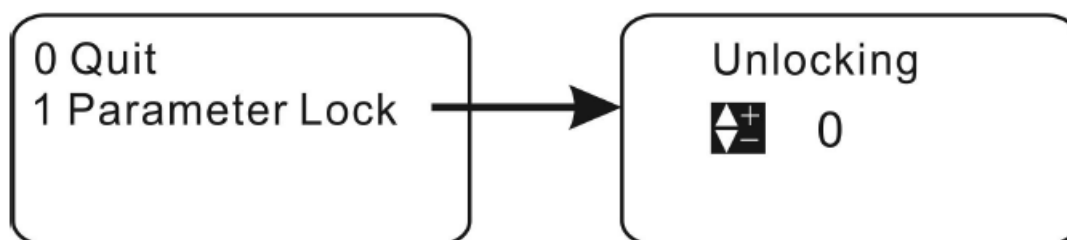
♦ **"2 Range Set "**

Set reference zero point, low range point, high range point and display unit.

1 Bottom Distance(Reference zero point): set the reference zero point of the level meter, and this value is only useful for material level measurement; the factory default is the maximum range.

2 Range-L(Low range point): set the output measurement value relative to 4mA of the level meter, and the factory default is 0.

3 Range-L(High range point): set the output measurement value relative to 20mA of the level meter, and the factory default is the maximum range.

4 Unit Selection(Display unit): there are three optional units, including m, cm and mm, wherein m stands for meter, cm for centimeter and mm for millimeter. The factory default is m.
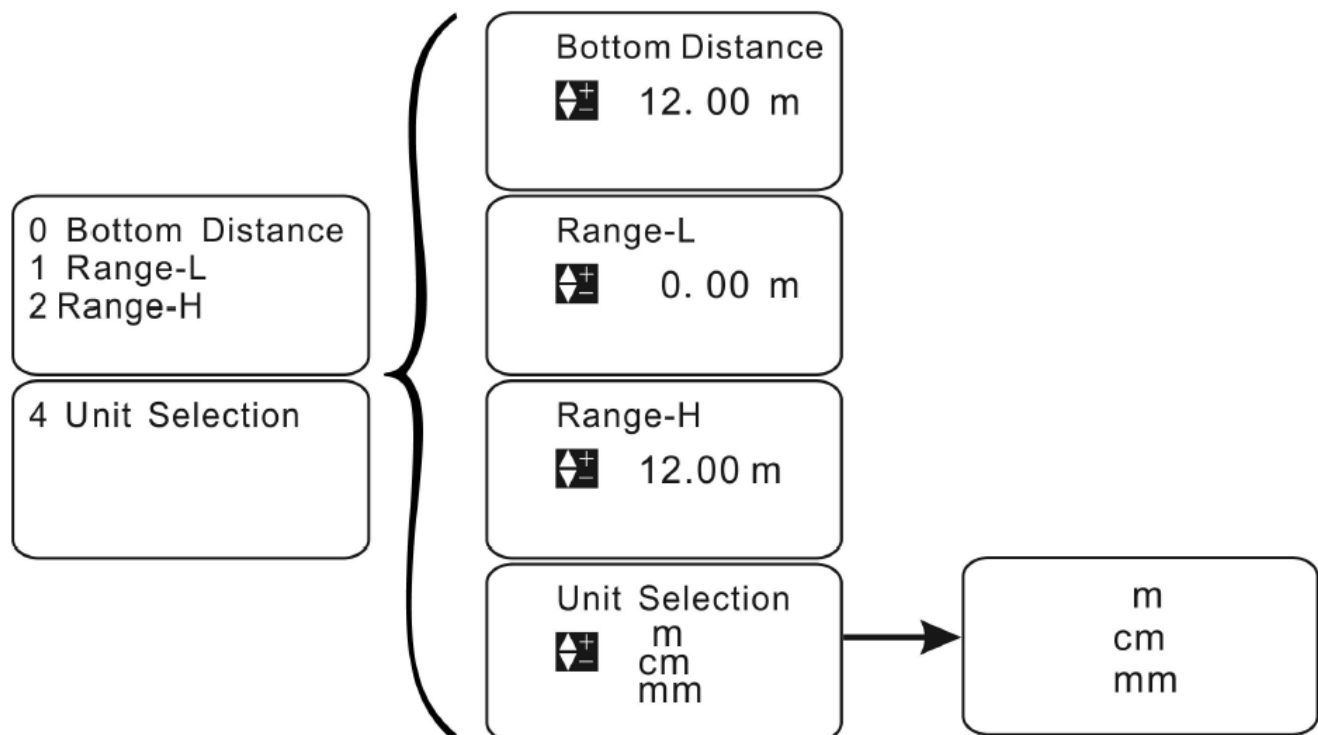
♦ **"3 Measuring Mode"**

Type Selection (Select Mode): there are two optional items, i.e. Distance measurement and material level measurement.
Distance Measurement: the display value is the distance from the probe to the surface measured;
Material Level Measurement: the display value is the distance from the bottom to liquid surface, i.e. liquid level height.
The factory default is material level measurement.

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Damping Rate (Response Rate): there are three optional items, i.e. slow speed, medium speed and fast speed.

Slow Speed: the response rate is slow and measuring accuracy is high, not easy to be disturbed;

Medium Speed: the parameters are between those for slow speed and fast speed;

Fast Speed: the response rate is fast and measuring accuracy is low, very easy to be disturbed. The factory default is medium speed.

Safe Level (Safe Material Level): there are four optional items, i.e. remaining, minimum value, maximum value and setting value.

Remaining: the display value is the final measured value before wave loss, and the current is the corresponding value;

Minimum: the display value is 4mA after wave loss, and the current 4mA;

Maximum: the display value is 20mA after wave loss, and the current 20mA;

Setting Value: the display value is the final measured value after wave loss, and the current output is the setting value of setting current. The factory default is the re-maining value.

Current Set (Set Current): set the output current after wave loss, which shall be more than 3.6mA and less than 22mA, and become invalid in case of remaining/ minimum/maximum values on reselection. The factory default is 3.6mA.

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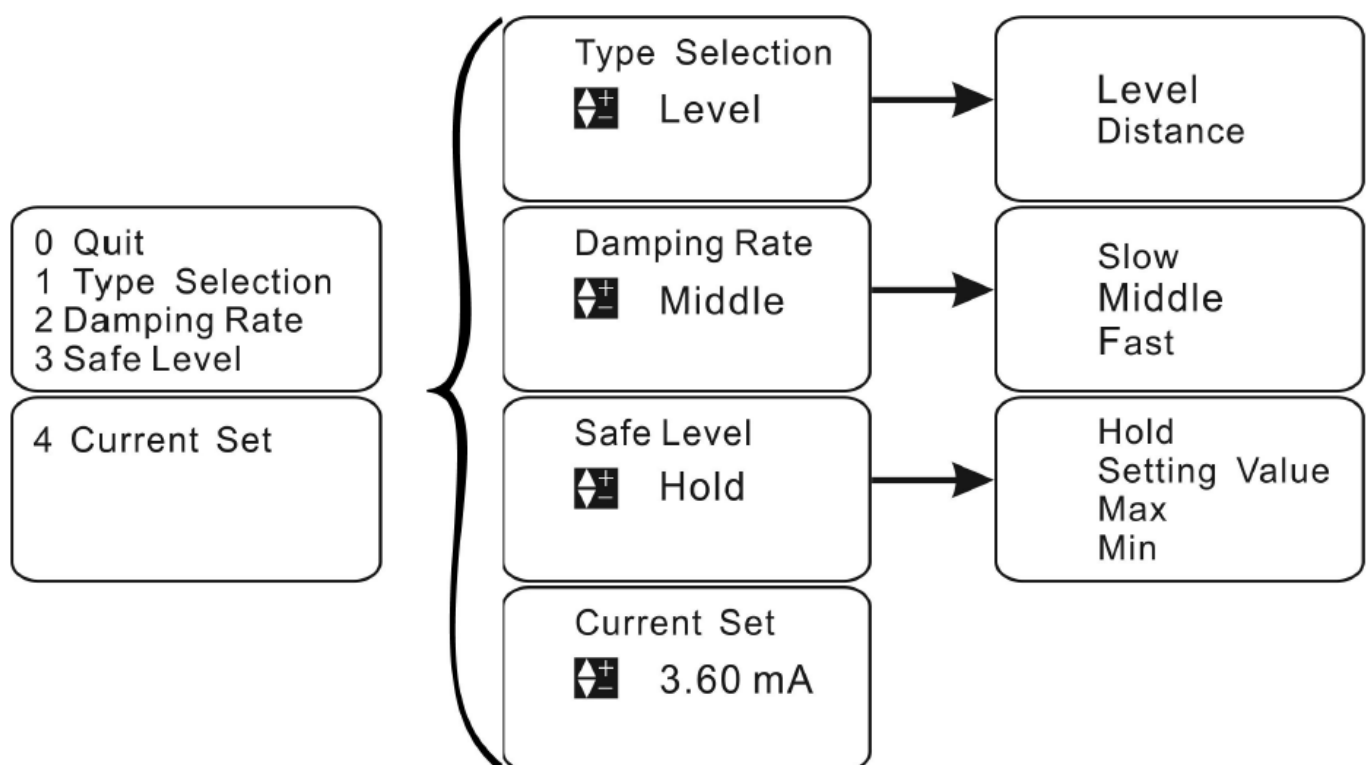
- ♦ **"4 Transducer Set (Set Probe)"** **(Do Not Modify This Parameter)**

Select probe and set relevant parameters.

1. *Transducer Type(Probe selection):* 1~9 options. Select the probe according to label on it. Factory default is 5.
2. Blanking(Blind area setting): set near-end blind area of probe; and factory default varies with the matched probe.
3. Sensitivity S(Short sensitivity): to be modified under the guidance of Professional technical personnel only.
4. Threshold S(Short threshold value): to be modified under the guidance of professional technical personnel only.
5. Sensitivity L(Long sensitivity): to be modified under the guidance of Professional technical personnel only.
6. Threshold L(Long threshold value): to be modified under the guidance of professional technical personnel only.

```
0 Quti
1 Transducer Type
2 Blanking
3 Sensitivity S

4 Threshold S
5 Sensitivity L
6 Threshold L
```

| Transducer Type |
| 1 |

| Blanking |
| 0. 50 m |

| Sensitivity S |
| 90 |

| Threshold S |
| 60 |

| Sensitivity L |
| 30 |

| Threshold L |
| 90 |
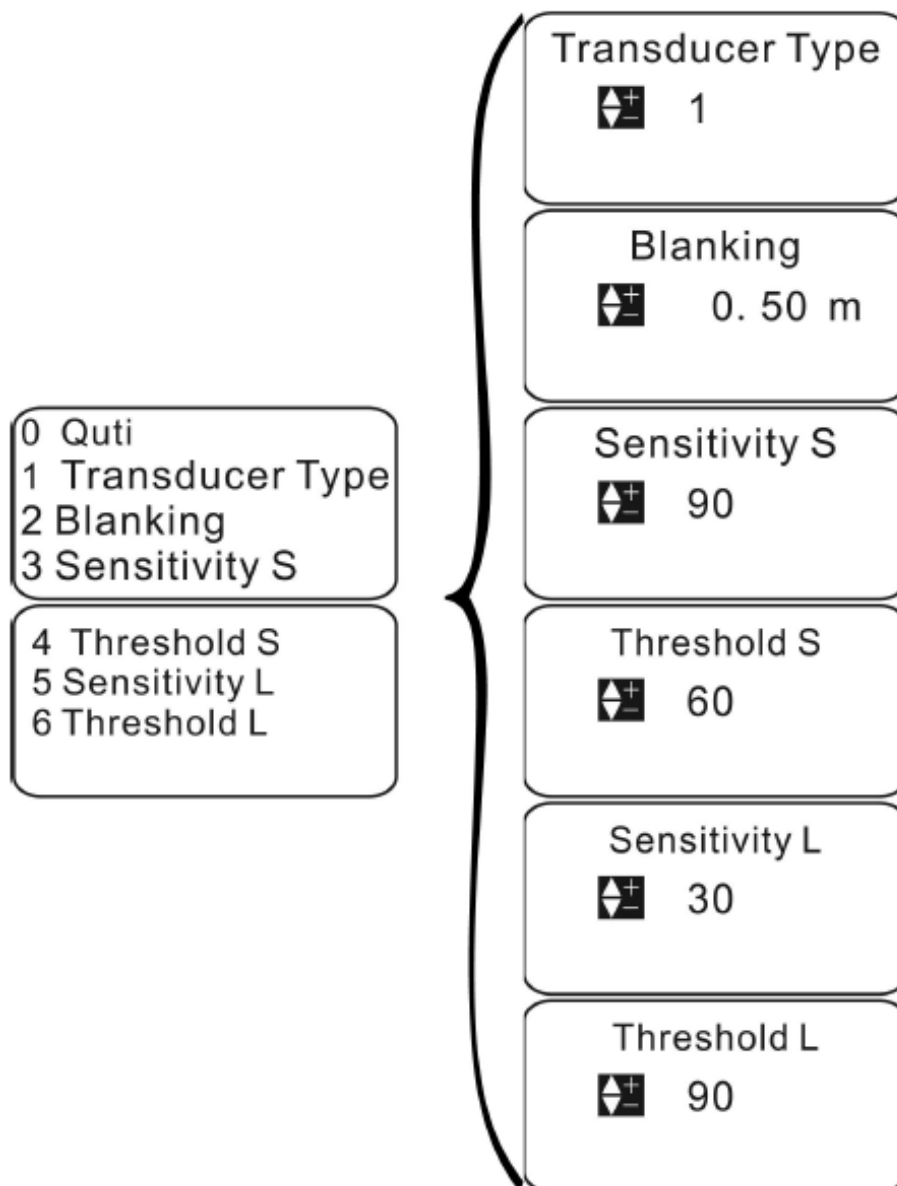
♦ **"5 Algorithm Select (Set Probe)"** (Do Not Modify This Parameter)

Algorithm Select(Select algorithm): there are seven options, including special environment 1, special environment 2, special environment 3, special environment 4, special environment 5, special environment 6, and special environment 7.
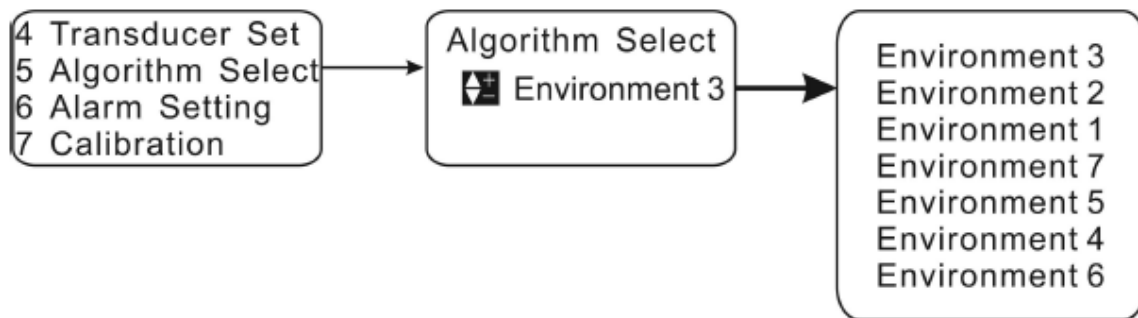
♦ **"6 Alarm Setting" Set Alarm Relay.**

Alarm 1 Mode: closed mode, low-level alarm and high-level alarm are optional.

Closed: relay 1 is out of service; low-level alarm: relay 1 sends low-level alarm signal; and high-level alarm: relay 1 sends high-level alarm signal. Factory default is closed mode.

Alarm 1 Value: the unit is m and factory default is 0.

Alarm 1 Diff (Alarm 1 return difference): the unit is m, and after being triggered, the alarm can be canceled only after the measured value reaches the alarm value +/- alarm return difference. Factory default is 0.

Setting method of alarm 2/3/4 mode is the same as above.

Example: (how to use a relay to control startup/shutdown of water pump) Through alarm return difference, one relay can control the whole working process of water pump from low level to high level.

- **For Water Drainage:** when water level is below 1m, water pump stop draining; when water level rises to 5m, water pump start to drain water. Detailed settings are shown below:

Alarm 1 mode: high-level alarm. Alarm 1 value: 5.00m; alarm 1 return difference: 4.00m.

- **For Water Supply:** when water level is below 1m, water pump start to feed water; when water level rises to 5m, water pump stop feeding water. Detailed settings are shown below:

Alarm 1 mode: low-level alarm. Alarm 1 value: 1.00m; alarm 1 return difference: 4.00m.

Alarm1 Mode	Close
Close	High Alarm
	Low Alarm

Alarm1 Value
0. 00m

Alarm1 Diff
0. 00m

Alarm2 Mode	Close
Close	High Alarm
	Low Alarm

Alarm2 Value
0. 00m

Alarm2 Diff
0. 00m

Alarm3 Mode	Close
Close	High Alarm
	Low Alarm

Alarm3 Value
0.00m

Alarm3 Diff
0.00m

Alarm4 Mode	Close
Close	High Alarm
	Low Alarm

Alarm4 Value
0.00m

Alarm4 Diff
0.00m

0 Quit
1 Alarm1 Mode
2 Alarm1 Value
3 Alarm1 Diff

4 Alarm2 Mode
5 Alarm2 Value
6 Alarm2 Diff
7 Alarm3 Mode

8   Alarm3 Value
9   Alarm3 Diff
10 Alarm4 Mode
11 Alarm4 Value

12 Alarm4 Diff

♦ **"7 Calibration (Parameter Correction)"** **(Do Not Modify This Parameter)**

Carry out correction of range, sound velocity, current output and reference level.

1. **Range Adjust (Range correction):** after input of the actual value, the System will correct the range automatically. Factory default is the measured value.

2. **Sound Adjust (Sound velocity correction):** after input of the actual value, the system will correct the sound velocity automatically, applied when gas composition is not air. For example, propagation velocity of sound is different in places with gasoline, acetone, ethyl alcohol and other volatile gas, so correction is necessary.

3. **4mA Adjust (4mA correction):** keep modifying the value until the actual output current reaches 4mA. Factory default is 3100.

When multimeter is connected to 4-20ma positive pole in series, this number shall be increased or decreased by 1 so that 4mA correction can be realized.

4. **20mA Adjust (20mA correction):** keep modifying the value until the actual output current reaches 20mA. Factory default is 7200.

5. **Voltage (Reference level):** input the measured voltage at relevant test point. Factory default is 5.00.

```
0 Quit
1 Range Adjust
2 Sound Adjust
3 4mA Adjust

4 20mA Adjust
5 Voltage
```

```
Range Adjust
    10.00 m

Sound Adjust
    0.00 m

4mA Adjust
    3100

20mA Adjust
    7200

Voltage
    5.00 V
```
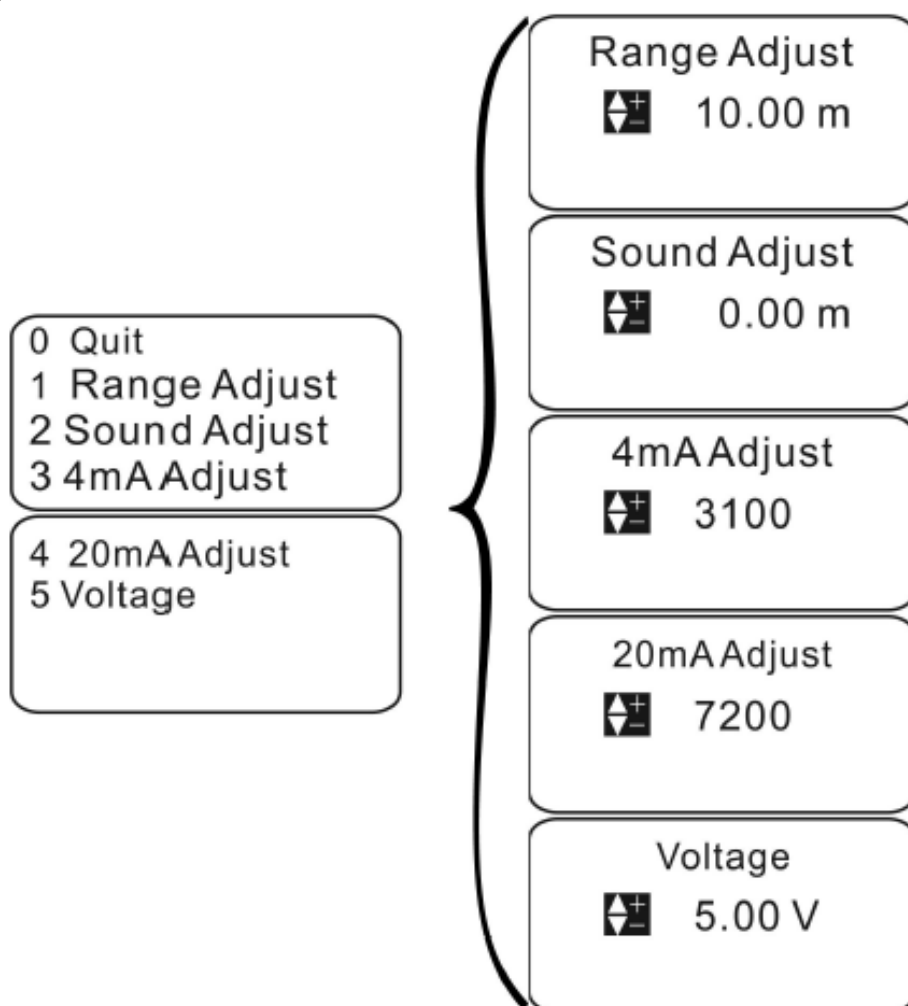
♦ **"8 Communication Setting"**

1. **Address (Communication Address):** select communication address; and the default is 1.

2. **Baud Rate:** select communication frequency among 2400, 4800, 9600 and 19200; and the default is 9600.

3. **Working Mode (Operating Mode):** select communication operating mode between "Automatic report mode" and "Inquiry mode"; and the default is "Automatic report mode".
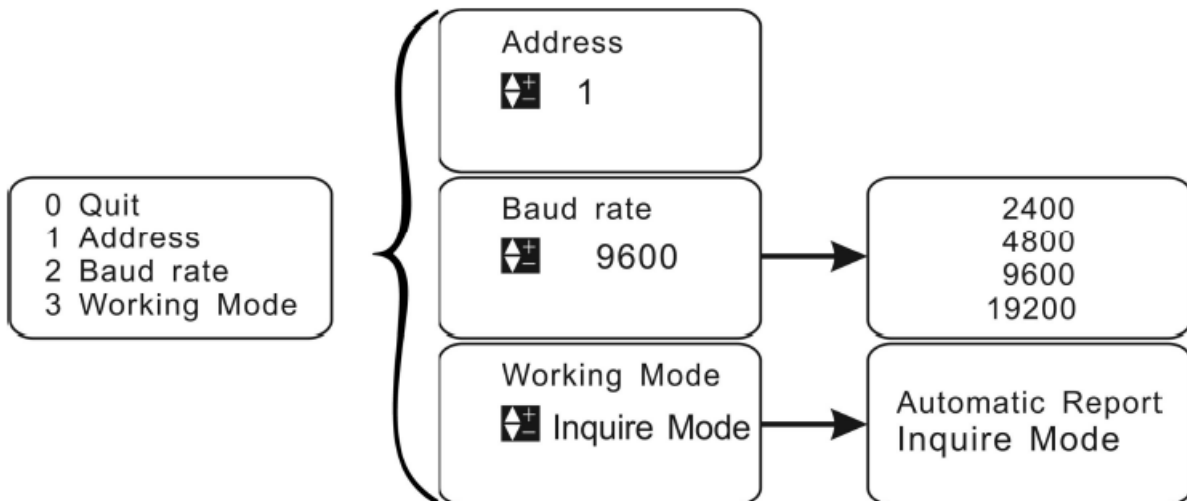
♦ **"9 Reset Options"**

1. **Factory Reset:** Yes: restore factory settings so that setting error can be re-solved.

No: exit. Factory default is No.

2. **System Reset: Yes: restore system settings. No: exit. Factory default is No. (Do Not Modify This Item.)**

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Chapter 7: Trobleshooting

If all wirings are normal through inspection in case of a fault, after ultrasonic level meter is grounded, you can keep pressing " ▲ ", then press "SET" to show echo menu, take a photo of the echo menu and send it to us via MMS or picture. By this way,

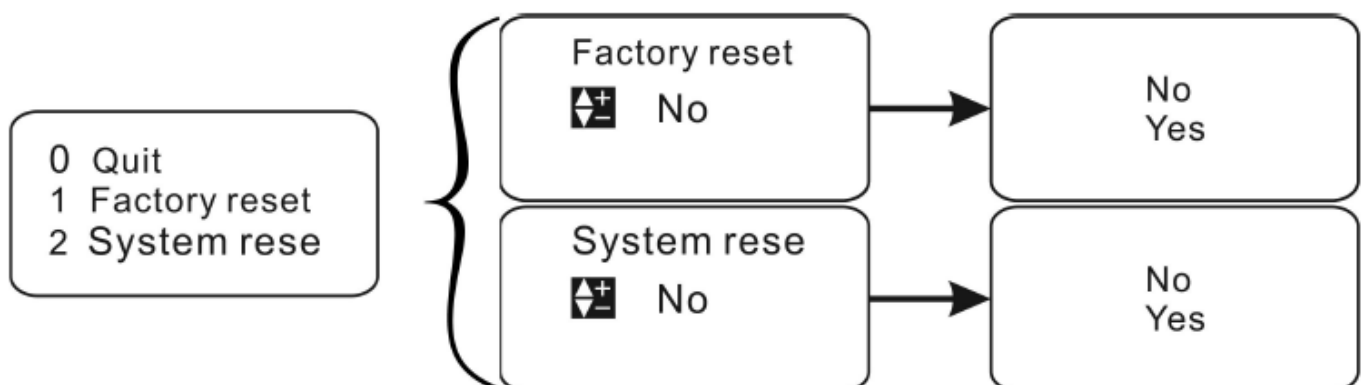| Faults	Causes	Handling
Level meter does not work.	Power supply is not well connected.	Inspect power line.
Level meter does not display data.	1.Power supply is not well connected.	1.Inspect power line.
	2.Wiring between LCD and mainboard falls off or comes loose.	2.Inspect the wiring and connect it again.
	3.The LCD is damaged.	3.Maintain it in the factory.
Level meter works but there is no change of trumpet icon (▲) on the LCD, which means that the system is in wave loss state.	1.The measured area is beyond the measuring range of level meter.	1.Replace the level meter with a level meter with greater measuring range.
	2.The measured medium has strong disturbance, vibration or heavy dust.	2.The meter will restore the normal measurement automatically after the measured medium gets back to calm.
	3.There are strong interference sources around such as frequency converter and motor.	3.Check surrounding environment and realize good electromagnetic shielding. Do not share one power supply with frequency converter and motor, and make it grounded reliably.
	4.The probe is not aligned to the measured surface.	4.Reinstall probe and make it perpendicular to liquid surface.
	5.There are redundant objects in the measured space, such as support rod and feed opening.	5.Select an appropriate position for installation and prevent an interfering object.
	6.The liquid level is in a blind area.	6.Raise the installation position of probe.
	7.The measured medium is soft powder or there is foam on liquid surface.	7.Check whether the medium is powder. If so, consult the manufacturer.

Chapter 8: Fault Causes at Site According to Echo Pattern

How to judge the fault causes at site according to echo pattern

The ultrasonic level gauge has a function that it can show the ultrasonic wave form reflected from the site, so that the fault causes at site can be roughly judged according to the shape of echo. Now, please allow me to explain it in details.

Enter echo pattern: press the ⬆ button and hold on, and then press the Set button and hold on for 3s, an echo pattern will appear.

Exit echo pattern: press the ⬇ button and hold on, and then press the Set button and hold on for 3s, the echo pattern will disappear.

8.1 Resonance

When the probe is connected with a metal support or flange, the unceasing vibration of probe will be transmitted to the metal flange and then reflected by the metal flange back and accumulated on the probe, forming a strong echoed signal.
As a result, a condition that the water level of the pond is 3m but the ultrasonic level gauge shows nearly full measuring range appears.
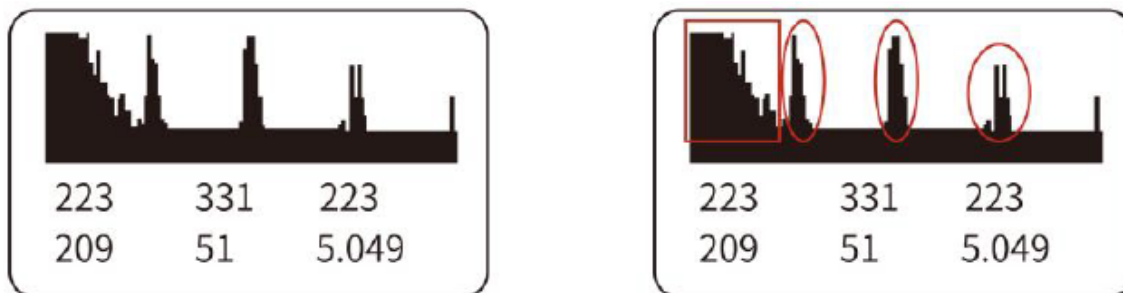
Fig. 1 Echo Signals Caused by Resonance

In the echo pattern, echo close to the left is the echo close to the probe, while the echo close to the right is the echo away from the probe.

The figure on the left is an ultrasonic echo picture taken at site and the figure on the right is a comparison graph. The echo in the frame I marked in the right figure is c used by the resonance between probe and metal support. Although the wave caused by resonance is fixed and the reflected waves on the right are very clear, the ultrasonic level gauge often shows the pool is full because the strength and width of the reflected waves on the right can not be compared with the wave caused by resonance.
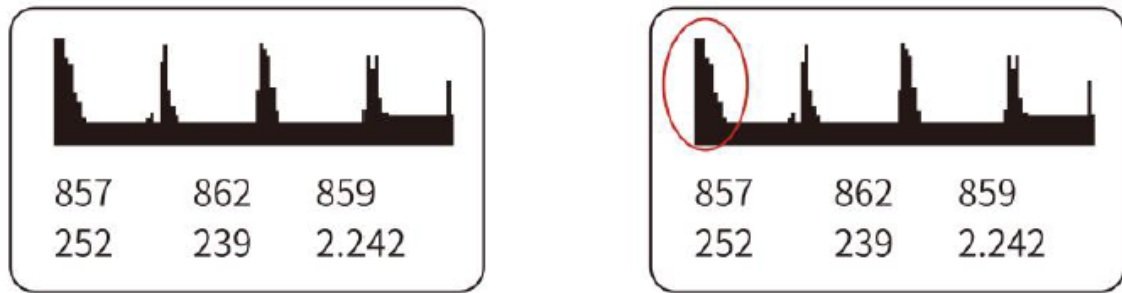
Fig. 2 Echo Signals after Resonance Problem Solved

After the resonance problem is solved, the echo close to the left is obviously narrower than that shown in Fig. 1 and the real echo can be recognized by the ultrasonic level gauge then.

8.2 Liquid enters the blind area of ultrasonic level gauge
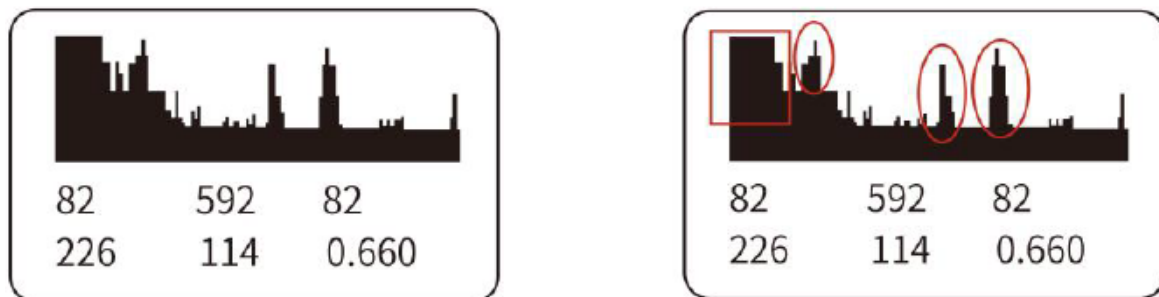
Fig. 3 Echo Pattern after Liquid Enters Blind Area

The ultrasonic level gauge has a blind area at the position near the emitting surface of probe. The blind area will increase with the increase of effective measuring distance. For example, the ultrasonic level gauge with a measuring range of 5m has a 0.50m blind area at 20 °C.

The echo enclosed by the red frame in figure above is the high-intensity echo caused by blind area and the echo enclosed by red circle is normal echo signal. Due to strong echo caused by blind area, the real echo signals on the right are covered and the measured water level data may be any values. Seeing carefully, you may find that the echo in blind area is similar to the echo caused by resonance in Fig. 1.

After we raise the installation position of probe to make the distance from the highest water level to the emitting surface of probe be greater than 0.50 (blind area), we find that the echo close to probe on the left changes.

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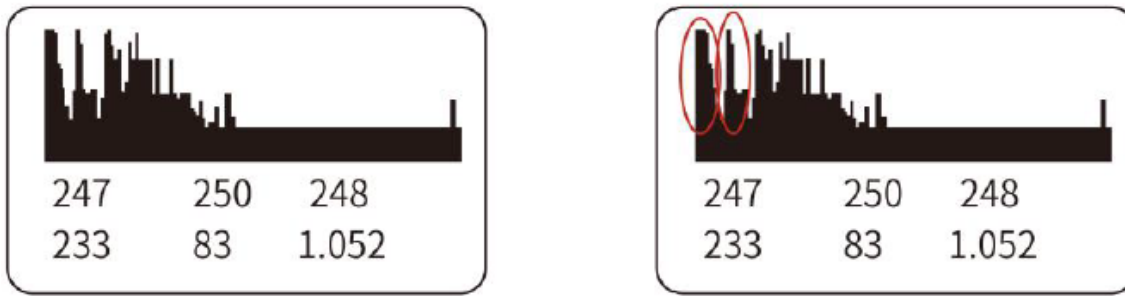
Fig. 4 Echo Pattern after Probe Lifting

8.3 Electromagnetic Interference

Electromagnetic interference at site mainly comes from frequency converter, motor and centrifuge. These interferences are mostly transmitted through power grid. If the power supply system of a plant has one frequency converter, the entire power grid will be polluted. Let's use see the normal echo pattern:
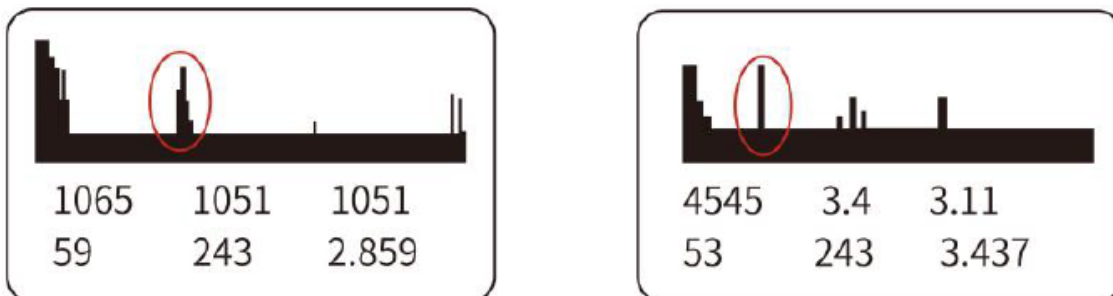
Fig. 5 Normal Echoed Signals

The two figures above are normal echo patterns. The downmost base line (the cross bar from the left to right) is about 4mm high. It is clear and same high from the left to right, without burrs. Signals in the red circle are ultrasonic echoed signals and they are very obvious.
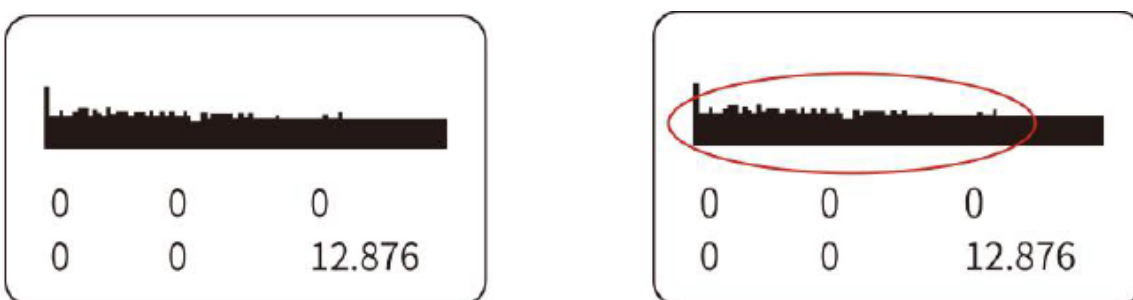
Fig. 6 Echo Pattern under Electromagnetic Interference

The left figure above is the original figure. On the right figure, I enclosed the burrs with a red circle and they are caused by electromagnetic interference. In the echo pattern, there is no obvious echo and the burrs above the base line just Show electromagnetic interference. The three figures in the first row and the first two figures in the second row below the base line are all 0, meaning that the echo is covered by the wave from probe.
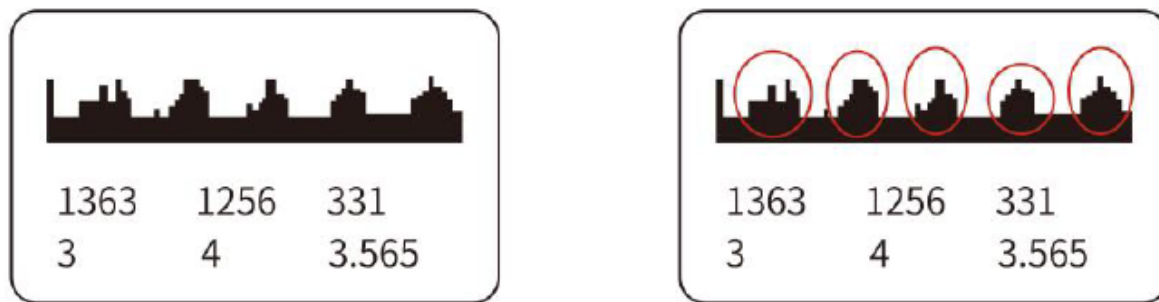
Fig. 7 Echo Pattern under Interference of Frequency Converter

The left figure above is the original figure. On the right figure, I enclosed the wave crests with red circles. The wave crests enclosed by the red circles are uniformly spaced based on certain laws and they are electromagnetic interferences caused by typical frequency converter. The figures in the two rows below the base line are not 0 but they don't make sense as they are caused by electromagnetic interference.
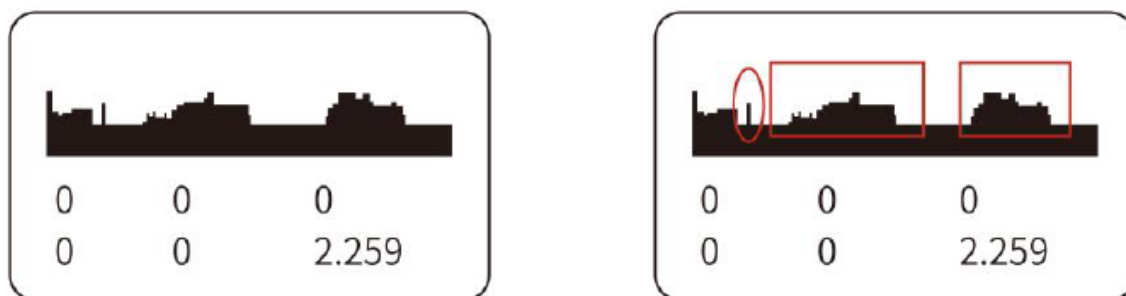
Fig. 8 Echo Pattern under Interference of Frequency Converter

The left figure above is the original figure. On the right figure, I enclosed the real echo with red circles and enclosed the interference waveform with red frame. The interference waveform is quite higher than the real echo and it can not recognized by the ultrasonic wave.
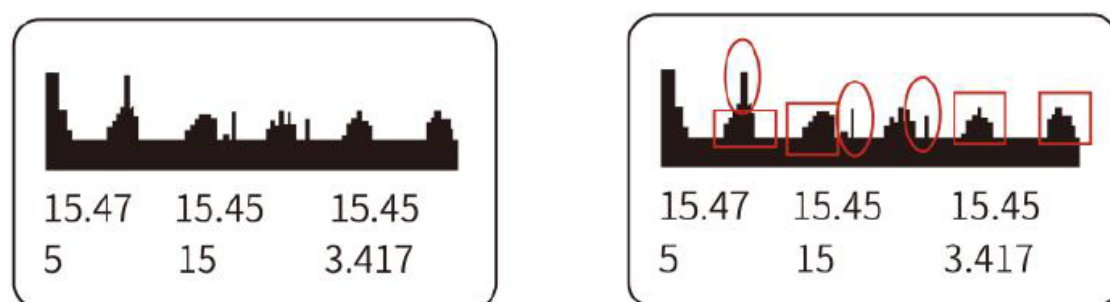
Fig. 9 Echo Pattern under Interference of Frequency Converter

Fig. 9 is interesting. The echo enclosed by circle is real echo and the echo enclosed by frame is the interference wave of frequency converter. Although there is interference of frequency converter, the data measured at site is correct as the echoed signal intensity on water surface is obviously stronger than the interference signal of frequency converter.
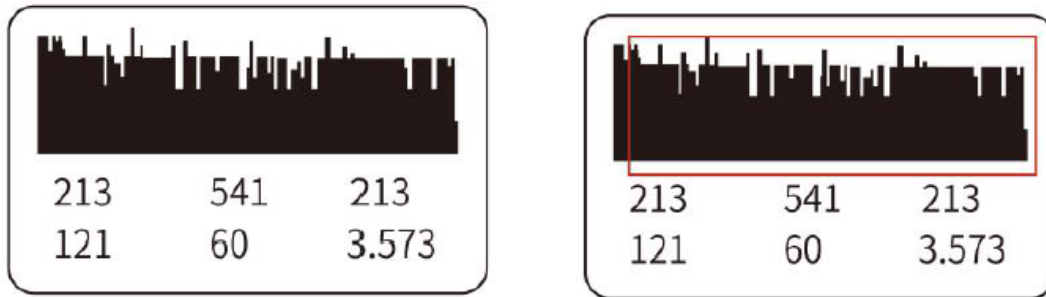
Fig. 10 Echo Pattern under Strong Interference

The left figure above is the echo pattern under strong interference and the figure shows high interference waves from left to right. Under the condition, ground connection can not solve all problems. At this time, we should judge the interference is from the power supply or the air.

If the electromagnetic interference is from air, a metal instrument box should be made for the instrument and the instrument box should be grounded.

Therefore, if the electromagnetic interference is from cable, especially for the ultrasonic level gauge applying two-wire system frequency used, a passive signal isolator should be used to solve the interference problem.

For meter applying four-wire system, isolated power supply should be applied and signal isolator should be applied at 4-20ma output part.

8.4 Effects of Connecting Pipe to Measurement

If the probe of ultrasonic level gauge is in a connecting pipe, some problems may be caused as the connecting pipe may amplify the signals. Generally, the height and diameter of the connecting pipe are in proportion, i.e. 5:3. If the height is 200mm, the inner diameter of connecting pipe will be above 120mm.
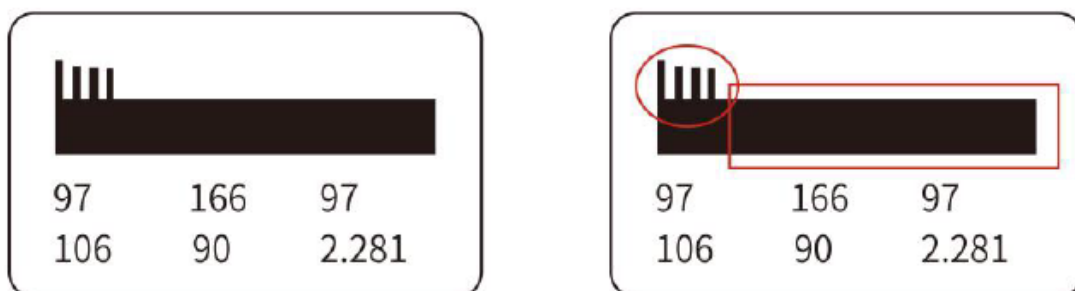
Fig. 11 Echo when Probe is in Connecting Pipe

In the figure above, the base line of echo pattern is very wide, which is caused by signal amplification by connecting pipe. The echo enclosed by circle is real echo while the part enclosed by frame is wide base line.
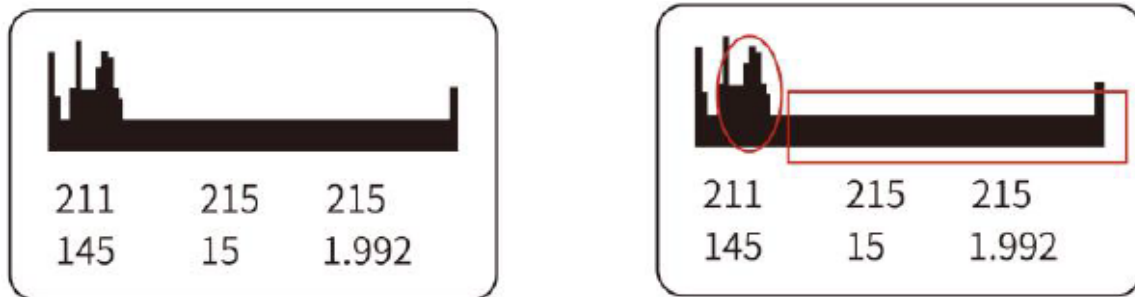
Fig. 12 Echo when Probe is Out of Connecting Pipe

After the ultrasonic level gauge is taken out of the connecting pipe, the base line narrows obviously and becomes normal. The echo in circle will be much higher than the base line.

Chapter 9: Modbus Communication Protocol V1.4 Version

Modbus RTU mode communication protocol

1. The hardware adopts rs-485, master-slave half-duplex communication, the host calls the slave address, and the slave responds mode communication.
2. Data frame 10 bits, 1 start bit, 8 data bits, 1 stop bit, no parity.
3. Baud rate: 2400 4800 9600 19200 (default is 9600)
4. Function code 03h: read register value

1	2	3	4	5	6	7	8
ADR	03H	Start re-gister high byte	Start re-gister low byte	Number of regis-ters high byte	Register number low byte	Crc code low byte	Crc code high byte

1st byte adr: slave address code (=001~254)

2nd byte 03h: read register value function code

3rd, 4th byte: Register start address to be read

5th, 6th byte: number of registers to read

7th, 8th byte: crc16 check from byte 1 to 6

When the slave receives the correct, the slave sends back:

1	2	3	4, 5	6, 7	6	M-1, M	M+1	M2
ADR	03H	Total number of bytes	Register data 1	Register data 2	… …	Register data m	Crc code low byte	Crc code high byte

1st byte adr: slave address code (=001~254)

2nd byte 03h: Return read function code

3rd byte: Total number of bytes from 4 to m (including 4 and m)

4th to m bytes: register data

M+1, m+2 bytes: crc16 check from byte 1 to m

When the slave receives an error, the slave sends back:

1	2	3	4	5
ADR	83H	Information co-de	Crc code low byte	Crc code high byte

1st byte adr: slave address code (=001~254)

1st byte 83h: Error reading register value

3rd byte information code: see information code table

4th, 5th byte: crc16 check from byte 1 to 3

Function code 06h: Write a single register value

The host sends:

1	2	3	4	5	6	7	8
ADR	06	Register address high byte	Register address low byte	Data high byte	Data low byte	Crc code low byte	Crc code high byte

When the slave receives the correct, the slave sends back:

1	2	3	4	5	6	7	8
ADR	06	Register high byte	Register low byte	Data high byte	Data low byte	Crc code low byte	Crc code high byte

When the slave receives an error, the slave sends back:

1	2	3	4	5
ADR	86H	Error message code	Crc code low byte	Crc code high byte

1st byte adr: slave address code (=001~254)

1st byte 86h: Write register value error function code

3rd byte information code: see information code table

4th, 5th byte: crc16 check from byte 1 to 3

Function code 10h: Write multiple register values consecutively

1	2	3	4	5	6	7
ADR	10H	Start register address high byte	Start register address low byte	Number of registers high byte	Number of registers low byte	Total number of data bytes

8,9	10, 11	N, N+1	N+2	N+3
Register data 1	Register data 2	Register data m	Crc code low byte	Crc code high byte

When the slave receives the correct, the slave sends back:

1	2	3	4	5	6	7	8
ADR	10H	Start register address high byte	Start register address low byte	Number of registers high byte	Number of registers low byte	Crc code low byte	Crc code high byte

When the slave receives an error, the slave sends back

1	2	3	4	5
ADR	90H	Error message code	Crc code low byte	Crc code high byte

1st byte adr: slave address code (=001~254)

1st byte 90h: Write register value error function code

3rd byte information code: see information code table

4th, 5th byte: crc16 check from byte 1 to 3

Register definition table: (Note: The register address is encoded in hexadecimal)

Deposit Ground site	Description	only read	Deposit Ground site	Description	only read
0000	Distance/ level instantaneous value (2 bytes high first)	√	0001	Analog output instantaneous value (2 bytes high first)	√
0002	Distance/ level instantaneous value (2 bytes high first)	√	0003	Reserved	
0004	Reserved		0005	Reserved	
0006	Reserved		0007	Reserved	
0008	Reserved		0009	Reserved	
000A	Reserved		000B	Reserved	
000C	Reserved		000D	Reserved	
000E	Reserved		000F	Reserved	
0010	Reserved	√	0011	Reserved	√
0012	Reserved	√	0013	Reserved	
0014	Reserved		0015	Reserved	
0016	Reserved		0017	Reserved	
0018	Reserved		0019	Reserved	
001A	Reserved		001B	Reserved	
001C	Reserved		001D	Reserved	
001E	Reserved		001F	Reserved	
0020	Reserved		0021	Reserved	
0022	Alarm 1 value (2 bytes high first)		0023	Alarm 1 back difference (2 bytes high first)	
0024	Alarm 2 value (2 bytes high first)		0025	Alarm 2 back difference (2 bytes high first)	
0026	Alarm 3 value (2 bytes high first)		0027	Alarm 3 back difference (2 bytes high first)	
0028	Alarm 4 value (2 bytes high first)		0029	Alarm 4 back difference (2 bytes high first)	
002A	Reference zero point (2 bytes high first)		002B	Range high (2 bytes high first)	
002C	Low range (2 bytes high first)		002D	Set current (2 bytes high first)	
002E	Blind zone setting (2 bytes high first)		002F	Reserved	

Deposit Ground site	Description	only read	Deposit Ground site	Description	only read
0030	Reserved		0031	Reserved	
0032	Reserved		0033	Reserved	
0034	Reserved		0035	Reserved	
0036	Reserved		0037	Reserved	
0038	Reserved		0039	Reserved	
003A	Reserved		003B	Reserved	
003C	Reserved		003D	Reserved	
003E	Reserved		003F	Reserved	
0040	Reserved		0041	Reserved	
0042	Reserved		0043	Reserved	
0044	Reserved		0045	Reserved	
0046	Reserved		0047	Reserved	
0048	Reserved		0049	Reserved	
004A	Reserved		004B	Reserved	
004C	Reserved		004D	Reserved	
004E	Reserved		004F	Reserved	
0050	Reserved		0051	Reserved	
0052	Reserved		0053	Reserved	
0054	Reserved		0055	Reserved	
0056	Reserved		0057	Reserved	
0058	Reserved		0059	Reserved	
005A	Reserved		005B	Reserved	
005C	Alarm 1 mode Alarm 2 mode		005D	Alarm 3 mode Alarm 4 mode	
005E	Measurement mode unit selection		005F	Algorithm selects safety level	
0060	Probe type response speed		0061	Factory reset system reset	
0062	Baud rate mode of operation		0063	Reserved	
0064	Reserved		0065	Reserved	
0066	Reserved		0067	Reserved	
0068	Reserved		0069	Reserved	

Remarks:

❶ 2 bytes hexadecimal notation, high order first: (Note: floating point numbers are multiplied by 100, expressed in hexadecimal)

♦ The distance or level value returned is in cm

(1) Example: The current meter address is 1 send:

01 03 00 00 00 01 84 0A

Return:

01 03 02 00 10 b9 88

The two bytes of red indicate: the current measured value is 0.16 meters (0x0010)

Note: Positive and negative flag: When the measured value and temperature are positive, the highest bit of the high byte is 0; when it is negative, the highest bit of the high byte is 1;

Example:

When the current measurement is -0.16 meters, return: 01 03 02 80 10 e8 06

❷ **Measurement Mode:** 0 - measuring distance; 1 - measuring level

Safety Level: =0, hold; =55, minimum; =aa, maximum; =a5, set value

Alarm 1, 2, 3, 4 Modes: 0 — off; 1 — low alarm; 2 — high alarm

Unit Selection: = 0, mm; = 1, cm; = 2, m

Algorithm selection:

0—special environment one;

1—special environment two;

2—special environment three;

3—special environment four;

4—special environment five;

5—Special environment six;

6—Special environment seven

Probe Type: 0—select 1; 1—select 2; 2—select 3; 3—select 4; 4—select 5; 5—select 6; 6—select 7;7—Select 8; 8—Select 9;

Response Speed: 0—slow speed; 1—medium speed; 2—fast;

Factory Reset: 0—No; 1—Yes;

System Reset: 0—No; 1—Yes;

Baud Rate: 0—2400; 1-4800; 2-9600; 3-19200

Working Mode: 0—automatic reporting mode; 1—query mode

❸ Register sub-area performs read and write operations

First area 0010 — 0021 Read only

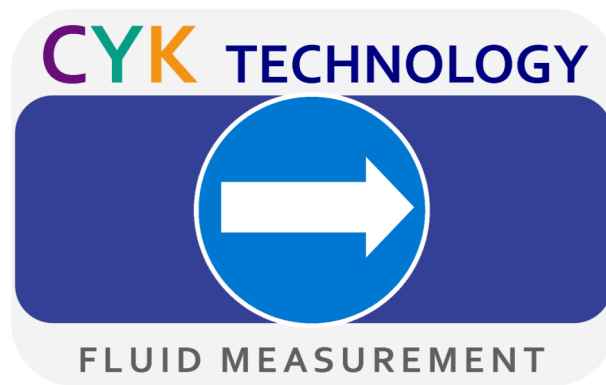Second area 0022 — 005b read and write

Third area 005c - 004b read and write

In the same area, you can read (or write) a parameter in a single time, or you can read (or write) all the parameters in the area, and do not allow read and write operations across the area.

❹ All reserved registers are currently undefined and are reserved for future upgra-de compatibility.

Information Code Table

Information code	Express meaning
01H	Illegal function code
02H	Illegal data address
03H	Illegal data value
04H	Crc16 checksum error
05H	Received correctly
06H	Receive error
07H	Parameter error

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LUDP / LUDR Ultrasonic Level Sensor Manual
LUDx_M_V0.0