

Thank you for purchasing our product! In order to ensure the safety and effectiveness of our product please read this manual before installation and operation.



External Ultrasonic Liquid Level Control

Manual

Xi'an Huashun Measuring Equipment Co., Ltd.

Content

1. General Description	3
2. Selection Guide	3
3. Parameters	5
4. Operating Environment	5
5. Structure and Parts.....	6
6. Installation	8
6.1 Basic Knowledge of Control and Cable Installation	8
6.2 Probe Installation	8
6.3 Transmitter Installation.....	10
7. Calibration and Other Settings.....	14
7.1 Electric Connection.....	14
7.2 Description of Indicating Lights.....	15
7.3 Calibration	15
8. Maintenance, Repair and Cautions.....	23
8.1 Maintenance	23
8.2 Cautions	24
8.3 Trouble Shooting and Analysis	25
9. Packing Inspection.....	25
10. Packing List.....	26
11. Water proof Structure and Wearing Parts.....	26
Appendix: Suggested special probe installation methods	27

1. General Description

The External Ultrasonic Liquid Level control is a new type of liquid level monitoring and alarming instrument. The high frequency ultrasonic pulse produced by the probe of the liquid level control can pass through tank wall and transmit between the tank wall and the liquid and then be reflected back. By detecting and calculating the reflective behavior, the level control can identify whether there is liquid at the monitored position. The liquid level control can send relay signal to succeeding devices or other equipment at the mean time, which can realize the function of simultaneous monitoring or controlling.

This instrument is especially suitable for monitoring liquid level in a tank and alarming when the level reaches maximum or minimum. It can be also used to identify the existence of liquid in pipe (dry condition protection). The tank can be made of various kinds of metal, metalloid or unfoamed plastic. Such measurement technique is not interfered by medium density, permittivity, conductivity, reflection coefficient, pressure, temperature, precipitation or other factors. Therefore it can be applied to level control of various types of liquid in industries of pharmaceuticals, petroleum, chemical, electricity, food and so on. It is an ideal choice for the detection of dangerous toxic or corrosive liquid.

2. Selection Guide

HS—ULC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
HS-ULC									P	Ordinary Cable	
									K	Armored Cable	
									A	Basic Equipment	
									B	Stainless Steel Equipment	
									C	For Spherical Tank	
									D	For Petroleum Industry	
							1	M20*1.5 Connector			
							2	G1/2′			
							3	NPT1/2″			
							4	NPT3/4″			
							5	G3/4″			
							L	Two-wire System			
							S	Four-wire System			
							1	Composite Probe			
							2	Dual Probe			
							1	Probe for Pipe with Small Diameter Pipeline			
							2	Probe for Pipe with Large Diameter Pipeline			
							D	Double Calibration			
							E	Single Calibration			
							P	One-piece Type			
							F	Split Type			
							G	Split and High Temperature Type			
							A	Common Type			
							B	Explosion proof Type			
HS-ULC-EC	2 in 1(Low &High level)Normal Temperature										
HS-ULC-EG	2 in 1(Low &High level)Normal Temperature										

Explosion proof Mark: Exd II CT6 Gb

3. Parameters

Repeatability error	±2mm
Measurable tank wall thickness	Max 70mm
Ambient temperature	-50℃～60℃ (-58 °F – 140 °F)
Ambient humidity	15%～100%RH
Power	DC 24V (18～36V) 0.05A
Output signal	Relay output (1 unit single-pole, double-throw control contact is passive nodes)
Relay capacity	DC 30V 6A / AC 250V 6A
Electrical interface	Different types available for different operating condition
Diameter of threading hole	Φ8mm (adaptive cable diameter Φ6～8mm)

4. Operating Environment

Measurable Tank Material: The probe installation area on tank wall should be hard material with good conductivity such as carbon steel, stainless steel, various hard metal, fiber glass, epikote, rigid plastic, ceramics, glass, rigid rubber and other composite material. The internal and external surface of installing position should be smooth. If there are multipal layers in tank wall, the layers should compact without foam or air gap such as sulfide rigid rubber lining, epikote lining, stainless steel lining, and titanium.

Measurable tank wall thickness: 2-70mm

Measurable tank type: Horizontal tank, spherical tank, vertical tank and so on.

Medium: The measurement result is not interfered by density, permittivity, temperature, pressure, purity, viscosity of medium.

5. Structure and Parts

Net weight: 2.5kg

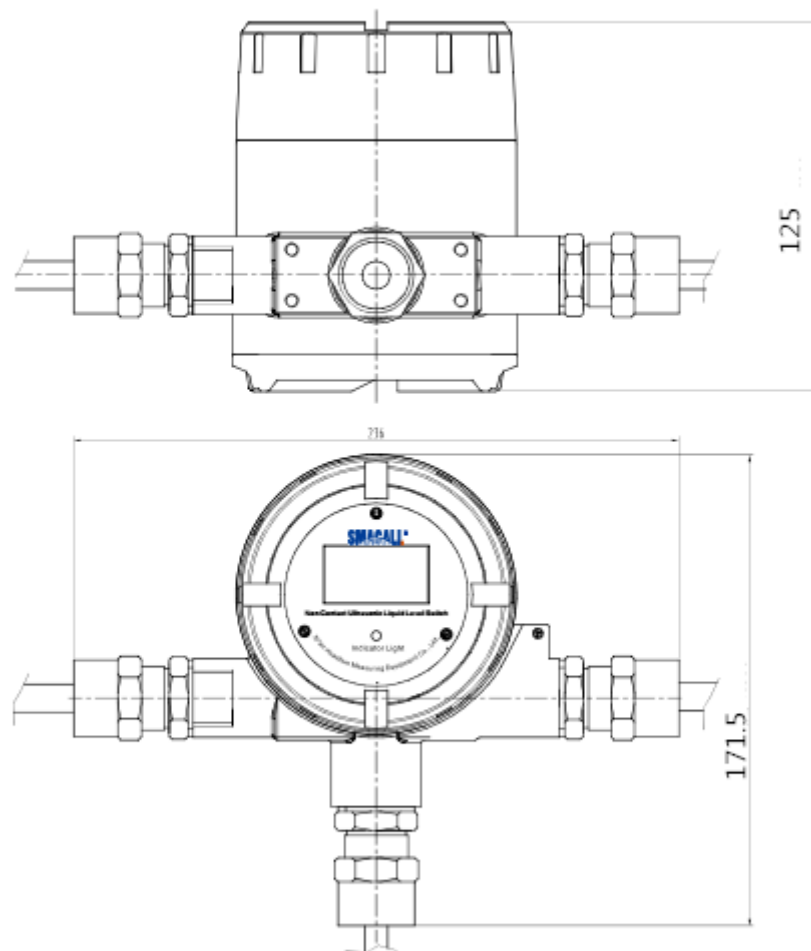


Fig. 1 Structure

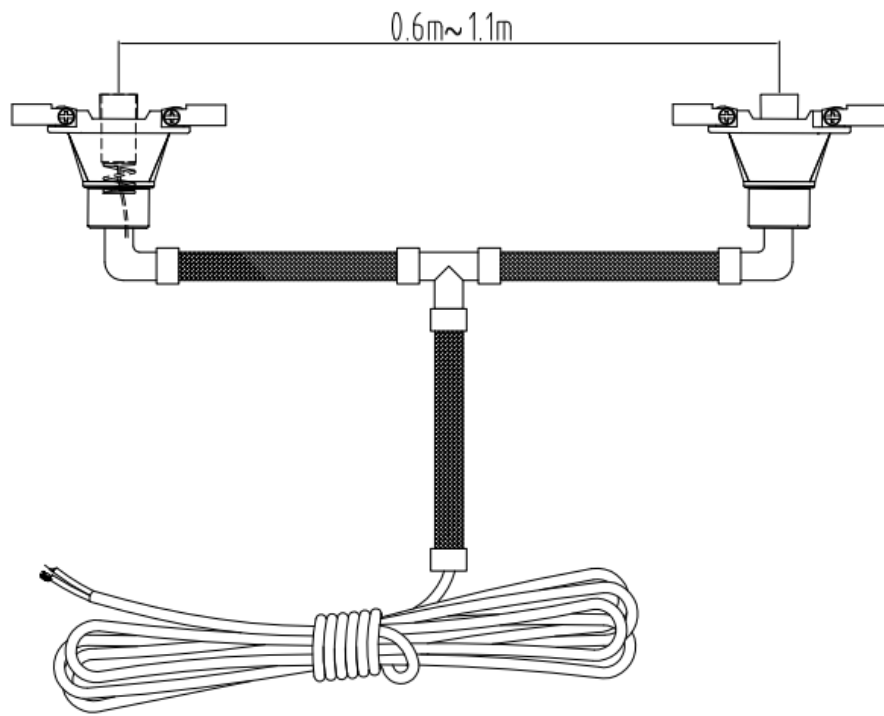


Fig. 2 Probe and Cable Component



Fig. 3 Probe Head

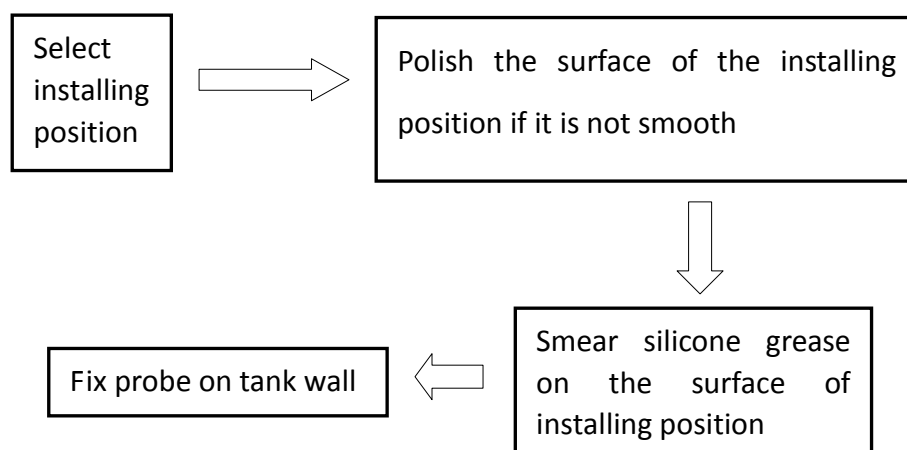
6. Installation

6.1 Basic Knowledge of Control and Cable Installation

1. Only cables with certified Explosion mark Exd IICGb and IP67 or better than IP67 can be used in stuffing box; the connection dimension should be subject to the regulation of GB3836.2-2010;
2. Please don't use other ultrasonic equipment or the electromagnetic device nearby to avoid equipment malfunction caused by mutual interference.
3. The two probes of the liquid level control must be arranged horizontally on tank wall, and the distance must be between 0.6m~1.1m (1.5m for spherical tanks).
4. Weld joint should be away from the area between two probes and there should be some distance between weld joint and every probe.

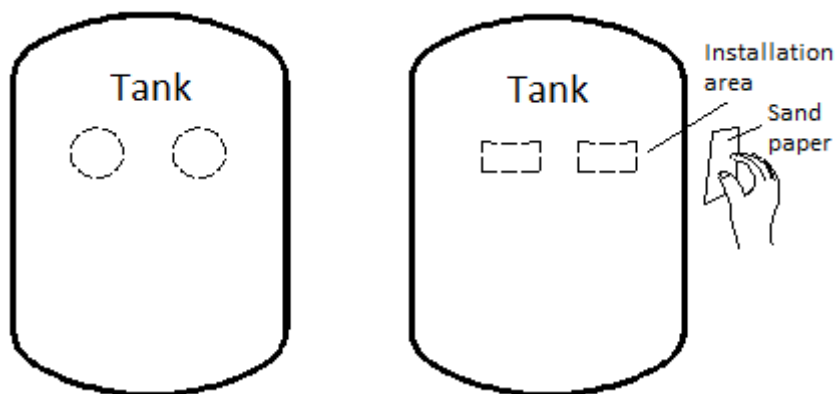
6.2 Probe Installation

1. For the magnetic tank, attach magnetic suction cups directly to the tank wall.
2. For tanks made of other materials like glass and stainless steel, glue, supporter, welding or other possible methods can be applied to fix the probes on tank wall.(See Appendix for specific welding procedures) Take magnetic attachment as an example, the process of probe installation is shown as the following:



- a. Select two positions for probe installation on tank wall.
- b. Polish the surface of the installing positions.

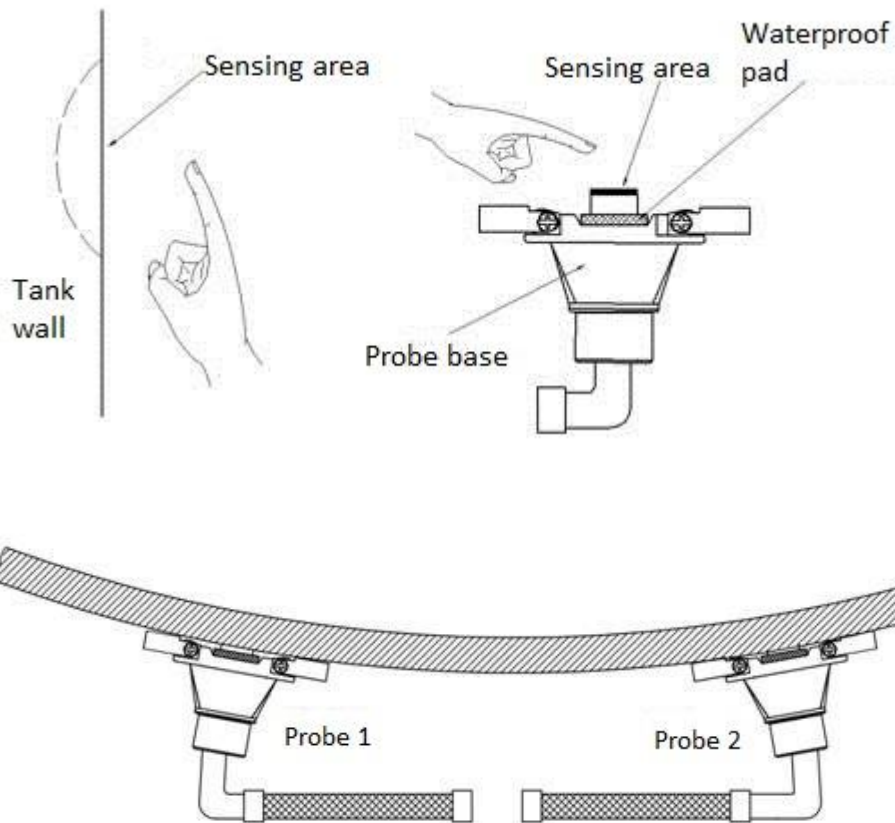
Polish and clean two surface regions with 120mm in length and 90mm in width by using file, sandpaper or other tools (The horizontal spacing of the two positions should be between 60mm and 110mm). The polished surface should be smooth (without obvious roughness when touched by hand). Degrease and clean the surface with acetone (or other appropriate cleanser) to make sure there is no dirt, dust, particles or other matters. Apply anti-rust paint on the surface and wait for the surface to dry. (If there is insulating layer on tank wall, remove the insulating layer between the two positions to make sure there is no weld joint there.)



3. Probe Installation:

Apply proper amount of silicone grease evenly on the sensing surface of probe and the probe installation surface on the tank wall.

- a) Fix probe and probe base on the tank wall by suction. After attaching the probes on the tank wall, do not turn or shake them to avoid improper contact between the probe and the tank wall caused by leakage of silicon grease.
- b) The installation method of two probes are the same. Please make sure that the two probes are at the same horizontal level with a distance between 0.6m-1.1m (1.5m for spherical tank).
- c) The direction of the two probes: for small tanks, please install in regular directions according to the following figure; for large tanks, probe base should be turned 90° to protect the silicone grease applied on the head of probe from rain after installation.



Cautions:

1. When receiving the product, please check if the water isolation sponge between the probe sensing surface and the probe base is intact and attached to probe base tightly.
2. After the installation of probe, avoid collision and displacement. Fix the power line and other connected cables firmly to avoid gravitational or accidental pull on the device which will influence measuring precision.

6.3 Transmitter Installation

Generally there are two methods to install transmitter--installation with integrated galvanized tube or with independent poles. The following are the description of how transmitter can be installed in these two methods.

6.3.1 Transmitter Installation with Integrated Galvanized Tube

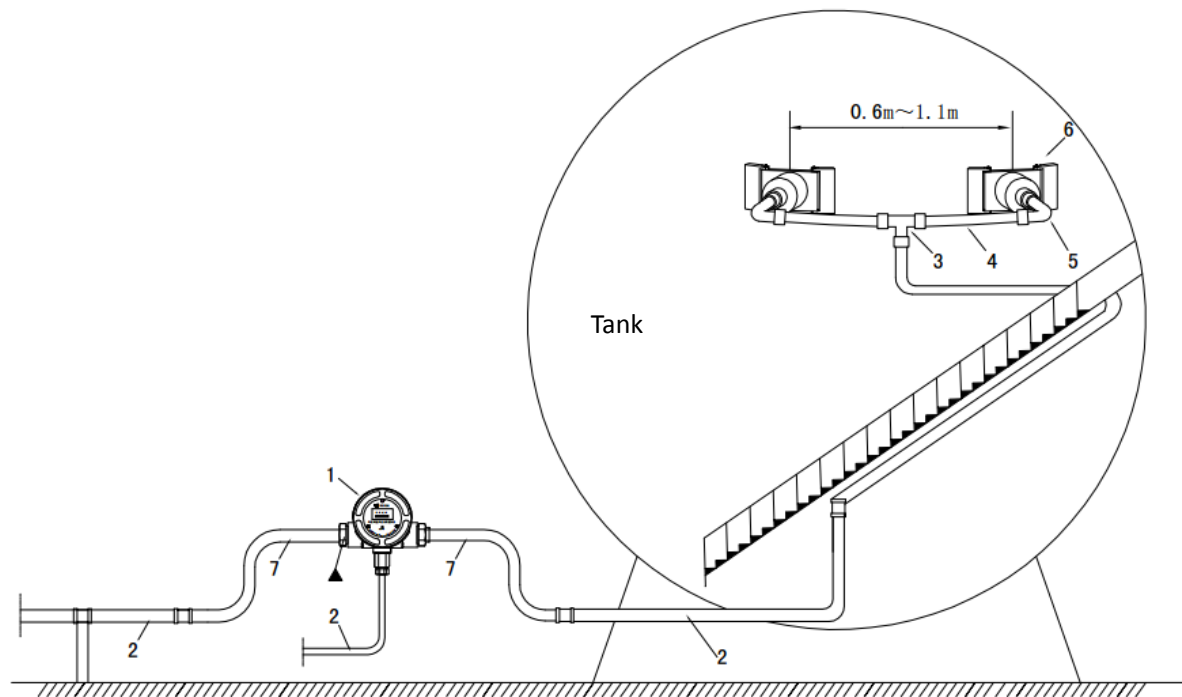
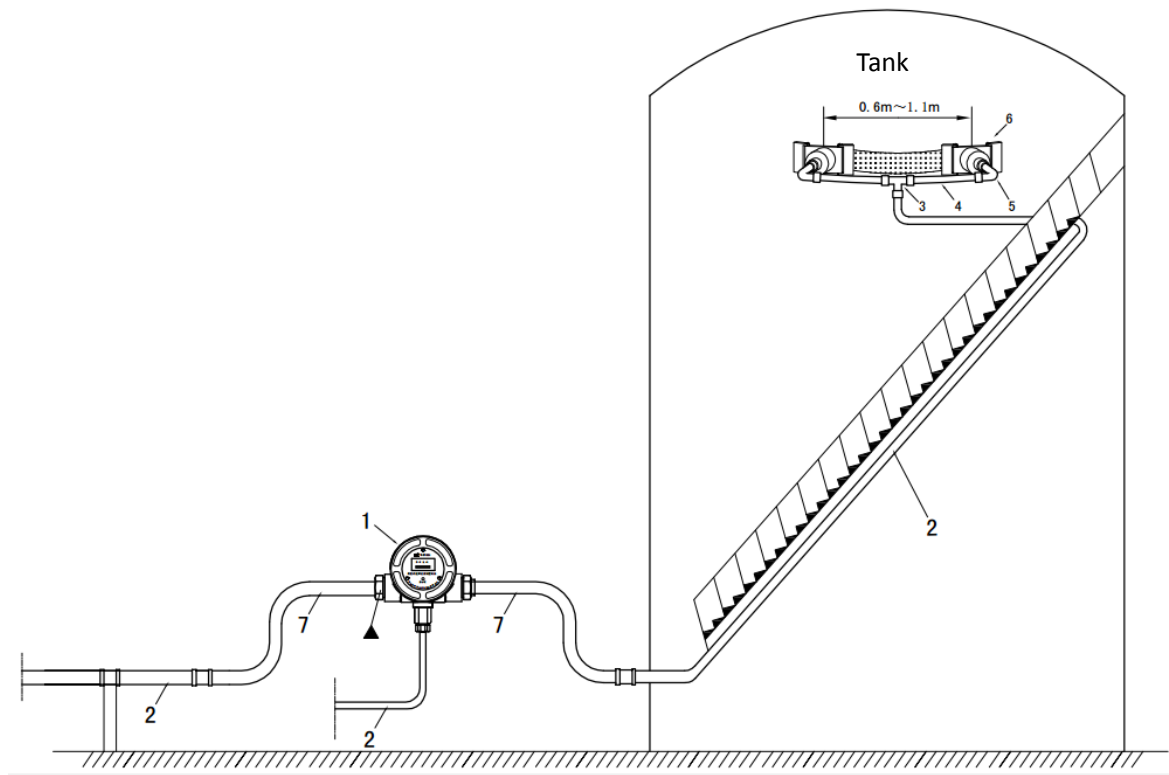


Figure 6-1 Installation with Galvanized Tube

In the figure:

1. Liquid level control
2. Galvanized tube
▲ --electrical interface
3. Tee Joint
4. Explosion proof flexible tube
5. Right-angle connector
6. Ultrasonic probe and suction cup
7. Explosion proof hosepipe (2 pieces)

Cautions:

1. The surface of installation position should be polished until it is smooth and rust-free. **APPLY SILICONE GREASE** on probe head before installation of suction cups.
2. The probe and cable components (including 3,4,5,6) have been assembled in factory. Item 2 and 7 should be prepared by the user.
3. The ultrasonic probe for high-level alarm is recommended to be installed near the caracole for easy installation and maintenance. The signal cable of probe should be connected with transmitter through the galvanized tube along the caracole.
4. Explosion tubes should be connected with horizontal interface of the transmitter respectively. After installation, the transmitter should be higher than the galvanized tube on both sides.
5. The standard model of the hickeys of the control and the flexible tubes is M20X1.5. Make sure that the hickeys are the same on the installation site. Other hickey model can be provided under request. Please find more details from *Selection Guide*. The joining points of tubes and the transmitter should undergo waterproof and explosion-proof procedures.

6.3.2 Transmitter Installation with Independent Poles or Tubes

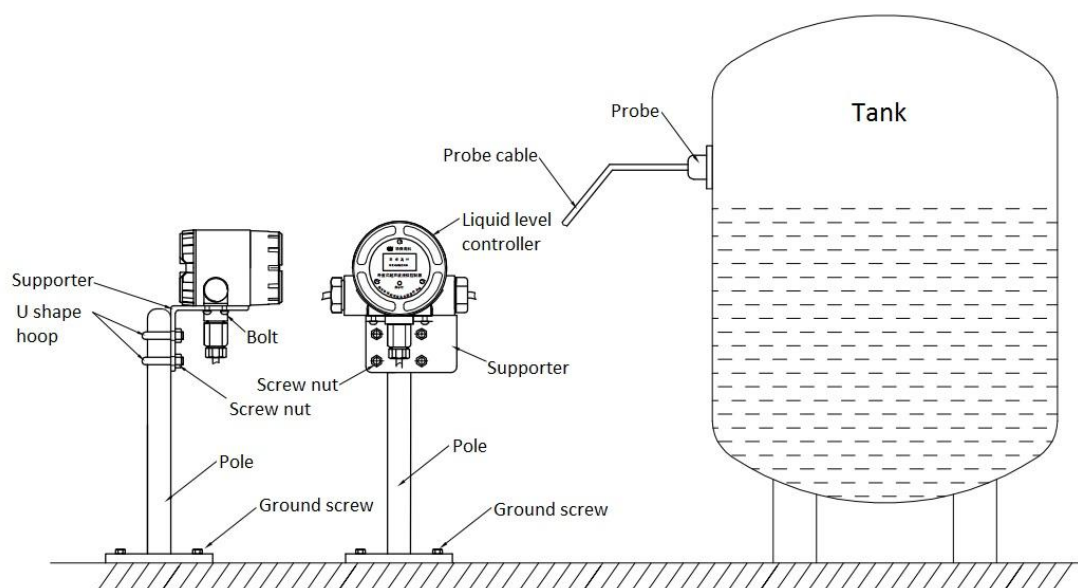


Fig. 6-2a Transmitter Installation with Independent Poles

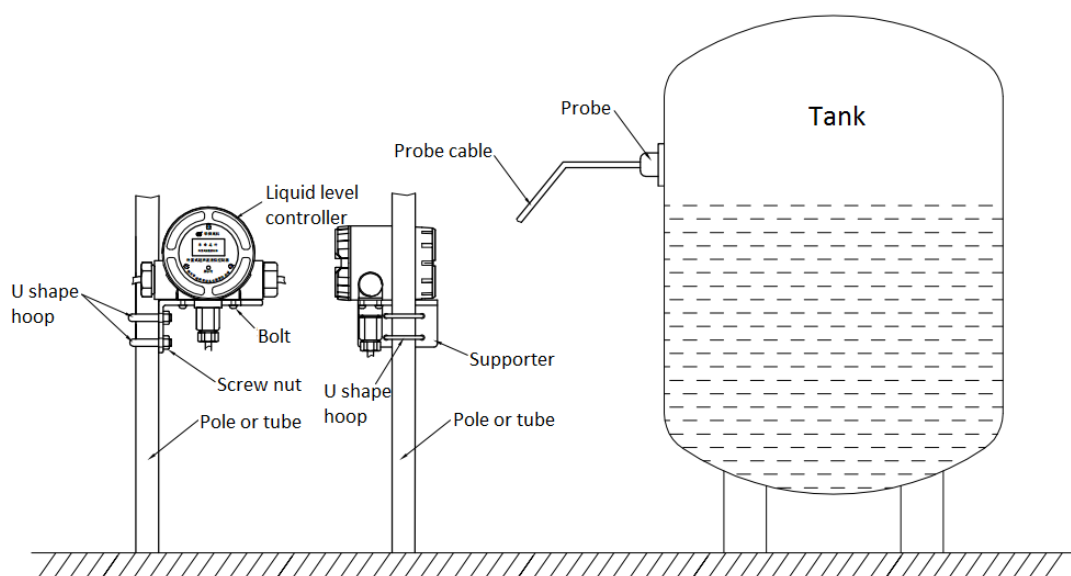


Fig. 6-2b Transmitter Installation with Tubes

1. If the transmitter is to be installed on an independent pole, please weld the components. (The recommended diameter of the pole is 40mm). Fix the pole with M5 ground screws on a flat and stable position on the site. (See Fig. 6-2-(a)).
2. Fix the assembled transmitter and its supporter with 2 standard U shaped hoops, 4 M5 washers and screw nuts on the top of the pole or at a suitable height of one tube on the site (appropriate tube diameter: 40mm) (See Figure 6-2-(b)).

3. Connect power line, probe cable and signal cable with the corresponding terminals on the transmitter; tighten the outlets of lines and close the lid.

Note: Independent pole should be prepared by users. All outlet joints must be tightened to ensure they are explosion-proof and waterproof.

7. Calibration and Other Settings

7.1 Electric Connection

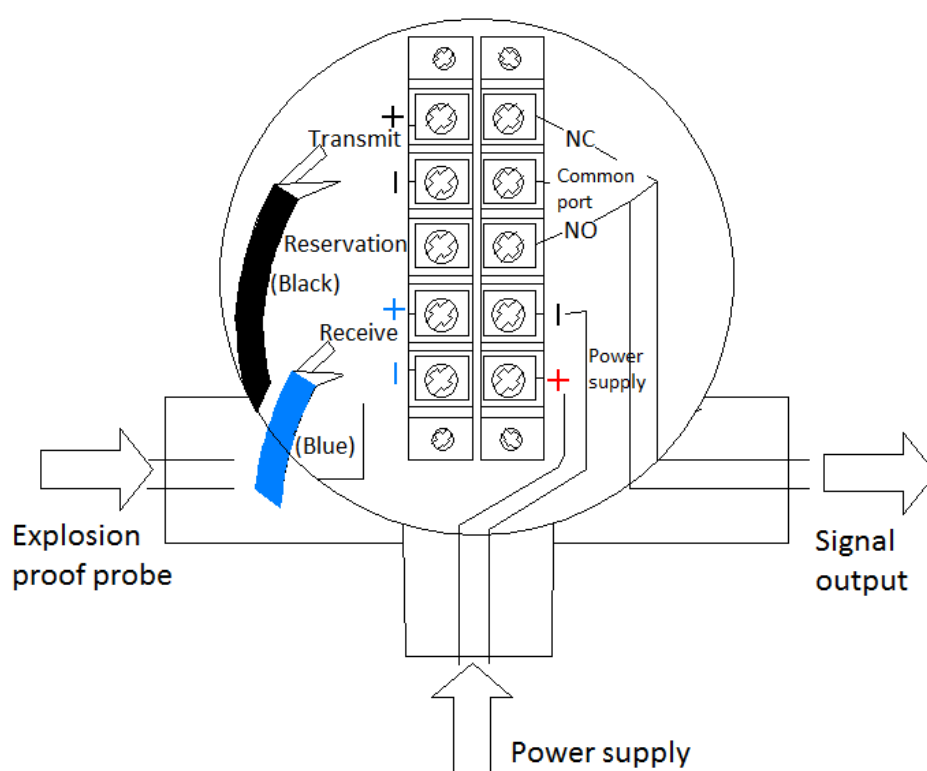
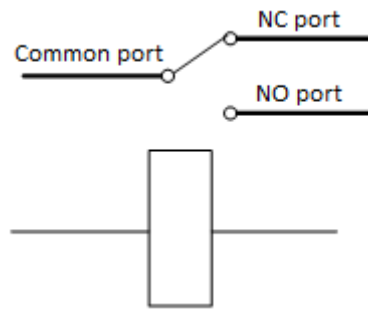


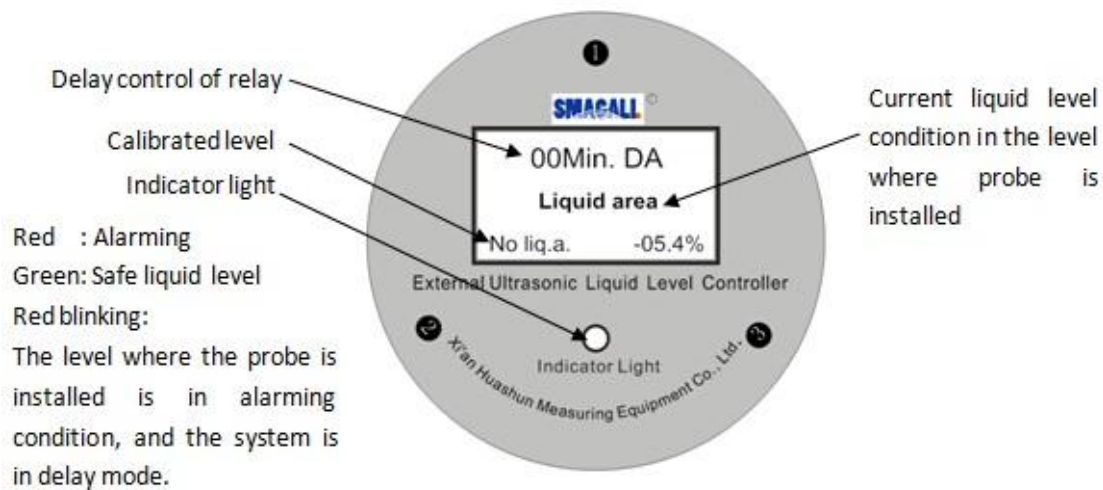
Fig. 7-1 Electric Connection

Alarm Output Wiring of Single-pole Double-throw Relay (DC30V 6A/AC250V 6A)

Installing Position	Liquid Level Status at the Probe Position During Calibration	Relay Wiring (Output alarm signal)
High-level Alarm	Liquid area	Normal open
	No liquid	Normal close
Low-level Alarm	Liquid area	Normal close
	No liquid	Normal open



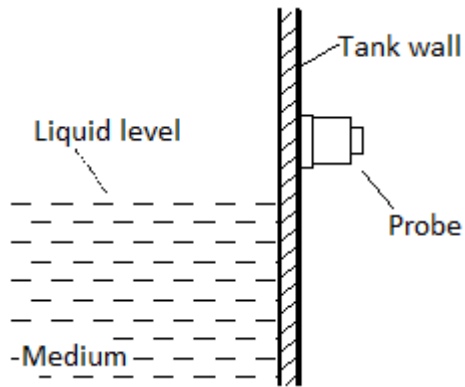
7.2 Description of Indicating Lights



7.3 Calibration

The methods of calibration procedures are the same regardless of the installation position (whethere there is liquid at the installation position). The procedure is in the following:

- Please operate with a magnetic pen according to the following instructions;
- After setting all necessary parameters and calibrating, please return to working interface to resume measuring functionality.



1. Power on

When the normal operating interface is displayed in screen, the result is invalid. Go to step 2 to calibrate. See figure 7-3.

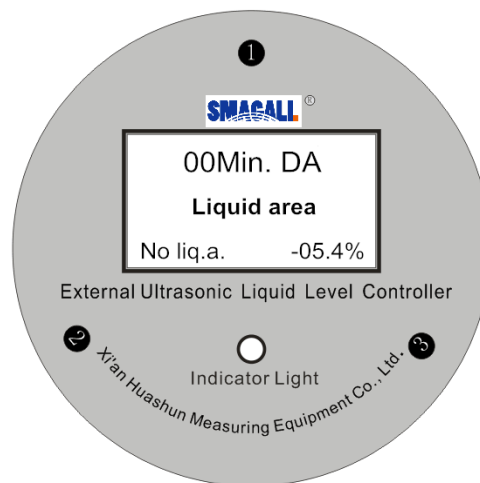


Fig. 7-3 Normal Operation Interface

2. Calibration

Use a Magnetic pen to touch 3. The system should enter calibration interface, displaying *Calibration* on the screen as shown in Fig. 7-4.

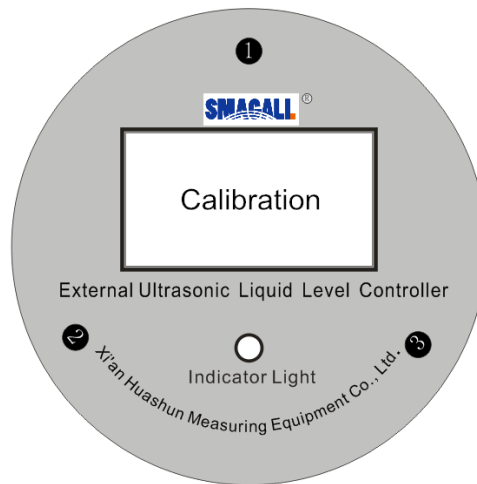


Fig. 7-4 Calibration Interface

Select threshold: Select an operating threshold by touching 2, as shown in figure 7-4. After the selection of operating threshold, touch 3 again to confirm, exit and enter **Select liq. Lev.(select liquid level)**.

Note: It is only when a threshold calibration was carried out successfully prior to the selection of operating threshold, one can select **Calibrated th.** (calibrated threshold) (**Default th.** (Default threshold) can also be selected as the user requires.). Otherwise, even if the user has not calibrated threshold before and selects **Calibrated th.** (calibrated threshold), the system will report error and continue using **Default th.** (Default threshold).

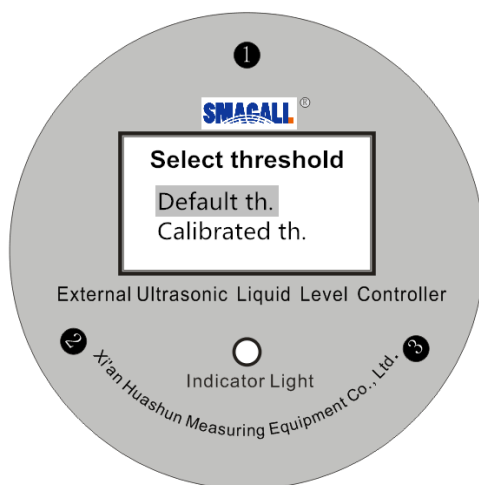


Fig. 7-5 Select operating threshold

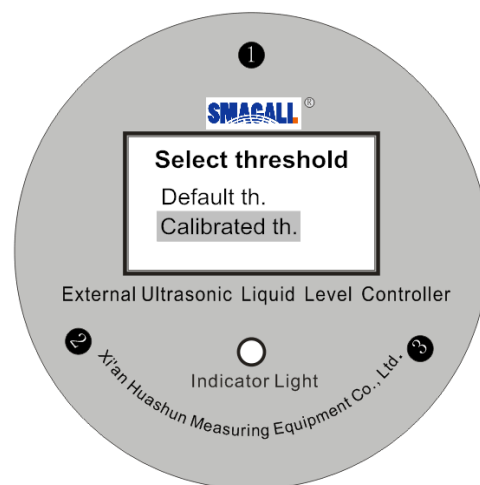


Fig.7-6 Enter next interface

Select liq. Lev. (select liquid level): Here *liquid level* is where the probe is placed when calibrating. The selection of liquid level is made by touching 2 (Fig. 7-7). After selecting a liquid level, touching 3 will bring the system to the next interface--**S. tank wall th.** (Select tank wall thickness).

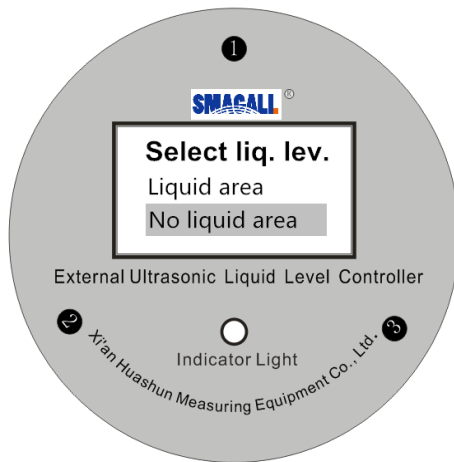


Fig. 7-7 Select liquid level during calibration

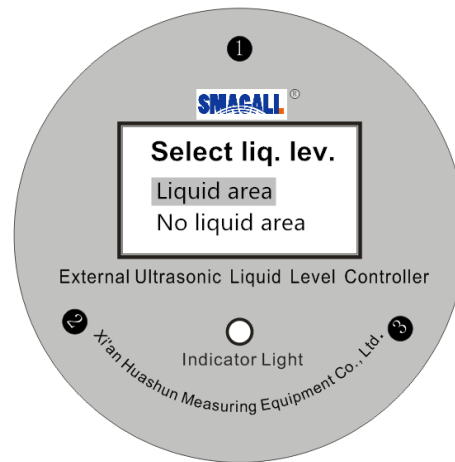


Fig. 7-8 Enter next interface

S. tank wall th. (Select tank wall thickness): There are two choices-- "<40mm" or ">=40mm". 2 is used to choose between the two ranges, as shown in figure 7-9. After selecting, touch position 3 to confirm and enter the next interface. (See Fig. 7-10)



Fig. 7-9 Select tank wall thickness

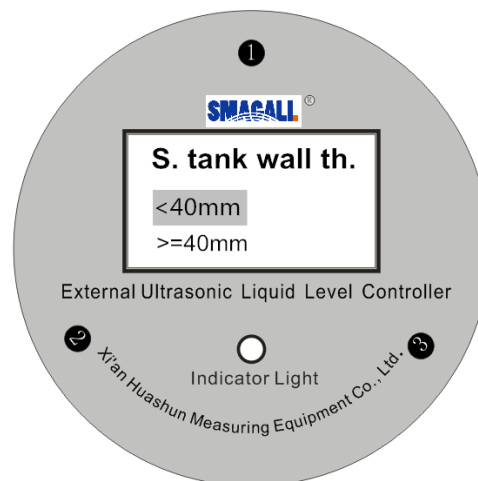


Fig. 7-10 Enter next interface

Note: Normally this parameter only needs to be set when the ultrasonic liquid level control is just installed. Afterwards, touch 3 directly to complete calibrate.

Calibration (see Fig.7-11):Wait until the screen displays *Pls. Touch 3 to comple. cal.* (please touch 3 to complete calibration.), and do as it displays.

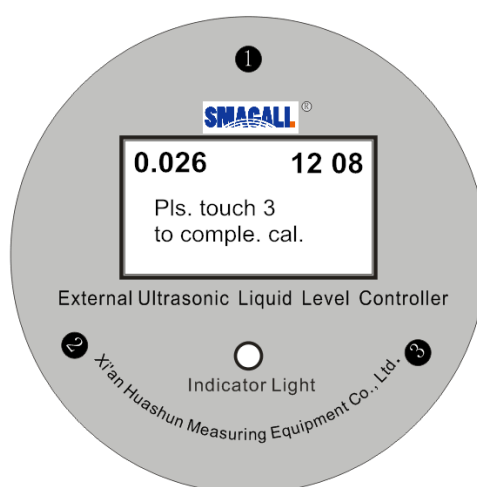


Fig. 7-11 Complete calibration

If *Cal. uncompleted, pls. wait* (Calibration is uncompleted. Please wait.) is displayed on screen instead, and it stays for more than 10 seconds, please reinstall the probe and wait until *Pls. touch 3 to comple. cal.* (please touch 3 to complete calibration.) is displayed.

Note: If the system fails to calibrate because of false installation or hardware problems, the screen will display *Cal. Failed* (Calibration failed). If the above situation happens, reinstall ultrasonic probe and touch 3 to complete calibration.

If user touches 3 unintentionally and enters liquid level selection interface, touch 1 to exit without calibration.

3. User Function Settings (optional)

Sys. self-test (System self-test): This function is to test if the liquid level control can work reliably after all installation is completed (e.g. electrical connection and probe attachment on tank wall). If there is anything abnormal, the system will indicate and give suggestions for solving the problem. Please take measures according to indication of system.)

During operation, touch 1 with a magnetic pen to enter **Sys. self-test** (System self-test) interface(see Fig. 7-12). Touch 2 to select **Sys. self-test** (System self-test) (there is no

self-test by default) (see Fig. 7-13).After selecting self-test (by choosing Yes), touch 1 to start self-testing. After self-test, system returns to the main interface of self-test automatically. Self-test can be done several times by choosing Yes until system self-test becomes normal.

If the user does not intend to run self-test, select No and touch 1 to enter the next function *Relay delay*.

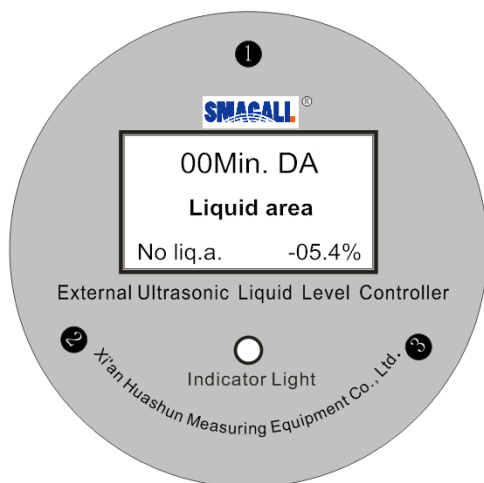


Fig. 7-12 From operation to self-test

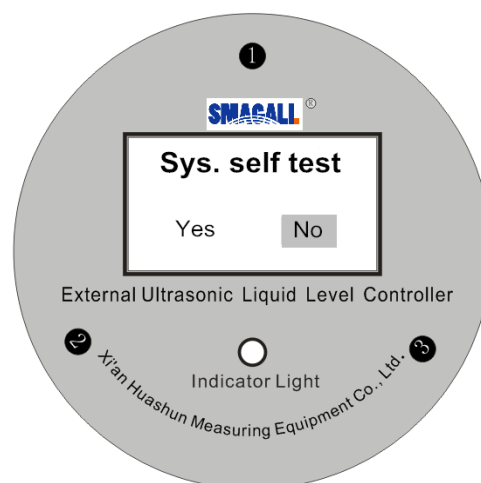


Fig. 7-13 Enter self-test or skip it to next function

Relay delay: This function is to avoid the damage of electric appliance of relay due to frequent relay alarms caused by severe fluctuation of liquid level where probe is placed.

Enter the interface *Relay delay*. There are 2 modes that can be selected--*Delay after send* (Delay after relay sends signal) and *Delay befo. Send*(Delay before relay sends signal.). Select by touching 2 (See Fig. 7-14). After selection of a suitable mode, touch 1 again to set delay time (see Fig. 7-15).



Fig. 7-14 Operating modes of relay

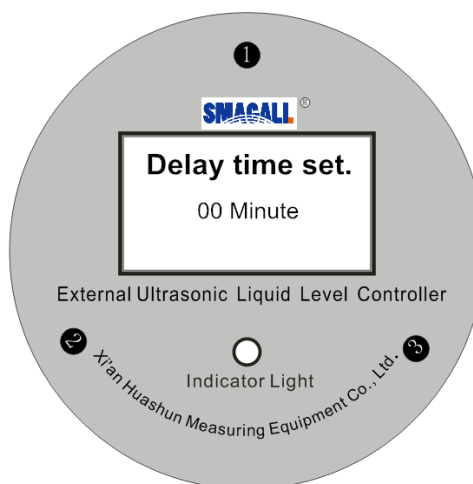


Fig. 7-15 Delay time setting

Delay time set. (Delay time setting):

Touch 1 to add 1 minute (see Fig. 7-16); touch 2 to reduce 1 minute (see Fig 7-17). After delay time setting, touch 3 to exit from delay setting interface and enter *Threshhod calibration* interface.(see Diagram 7-18).

A. **Delay after send** (Delay after relay sends signal)

It indicates that when liquid level rises up to or drops down to the level of the probe, the relay will send the alarming signal instantly. But after it sends the alarming signal there will be a delay (set by the user) during which the variation of liquid level does not affect display of replay and the output of relay.

B. **Delay befo. Send** (Delay before relay sends signal.)

It indicates that when liquid level rises up to or drops down to the level of probe, the relay does not send signal for a period of time (called delay time, set by users) and display remains the same. When the dalay time is up, the relay will or will not alarming signal according to current liquid level. During delay, the variation of liquid level does not affect display and device and output of relay.



Fig. 7-16 1 minute increase

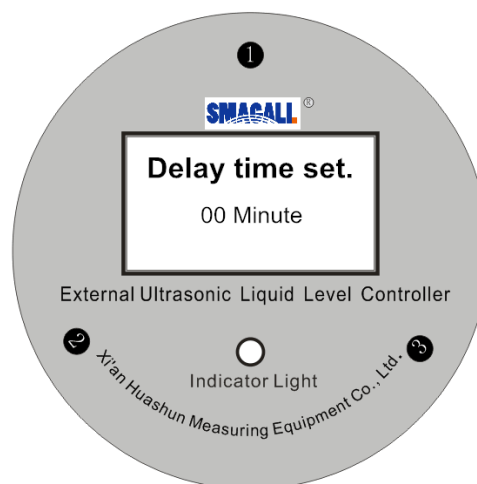


Fig. 7-17 1 minute decrease

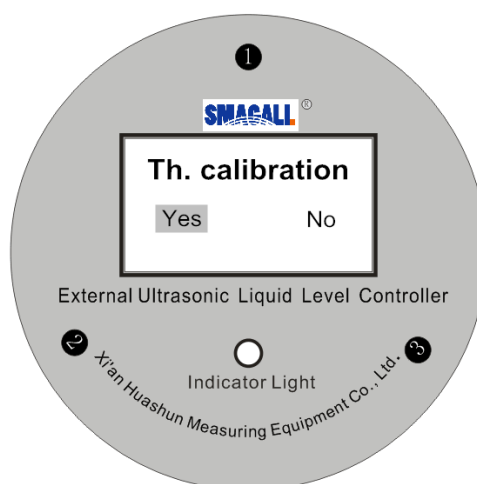


Fig. 7-18 Threshold calibration interface after delay time setting

C. During operation, and under the delay interface, there is a indicating light blinking in 2Hz. At the same time, the screen will display the remaining delay time (in minute).

D. During a delay, calibration and relay setting are not allowed.

Th. calibration (threshold calibration):

Note: When the user finds the liquid level is in the alarming level while the control still indicate safe liquid level and does not send alarming signal, under this circumstance, *Th. calibration* (threshold calibration) can be used for automatic threshold setting.(If the default threshold is correct or the threshold has never completed one liquid level variation from safe level to alarming level, after carrying threshold calibration, the system will indicate that the threshold calibration fails and will use

the default threshold parameters.

Operating procedure: Select *Yes* by touching position 2 and touch 1 to operate threshold calibration. If there is no need to calibrate threshold, select *No* (see Fig. 7-19). Then Touch 1 to return to operating interface(see Fig. 7-20).



Fig. 7-19 Select Yes/No

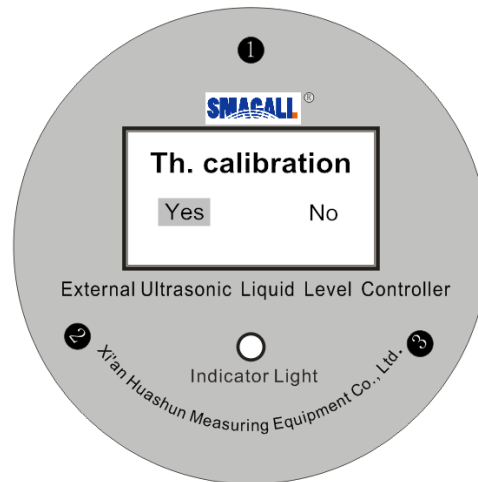


Fig. 7-20 Select Yes to calibrate threshold

Cautions:

- A. Avoid collision and displacement of the control during calibration.
- B. Do NOT turn off the power supply during calibration.
- C. The condition of liquid level control may change slightly due to vibration and other factors. Therefore it is suggested that the user runs through the calibration processes regularly (once a month) to ensure measuring precision.

8. Maintenance, Repair and Cautions

8.1 Maintenance

- Keep the control always clean and away from water, damp, corrosion and violent collision
- If the liquid level control is to be installed outdoors, it should be kept away from direct sunshine and other heat source and the environment should be ventilated. If ambient temperature exceeds the rated maximum, protection measures should be taken to lower the ambient temperature. If ambient temperature is too low, protection box or other anti-freeze protection should be applied. Additionally, the

control should be kept dry.

- The liquid level control and probe should be inspected and calibrated once a month.

8.2 Cautions

1. The ambient temperature range for the control is $-58^{\circ}\text{F} \sim 158^{\circ}\text{F}$. If the temperature of the liquid medium in the tank (to be measured) will cause the surface temperature of the control to be out of the rated range, protection measures must be taken.
2. The installation position of liquid level control should be kept away other heat source.
3. Users should not replace parts (exception wearing parts) of liquid level control without serious consideration.
4. Wearing parts (rubber seal ring) should be replaced periodically. Please refer Chapter 11 for specifications.

**Caution: DO NOT OPEN THE COVER WITH POWER ON IN DANGEROUS AREAS
(e.g. ATMOSPHERE containing EXPLOSIVE GAS).**

8.3 Trouble Shooting and Analysis

Fault	Analysis	Solution
Indicating light is off.	Power or wiring failure	Check power supply and wiring.
There is no signal change when the actual detection changes (from “liquid area” to “no liquid”, and vice versa”). Or there is abnormal fluctuation in the signal.	The calibration is not effective which can be caused by the following reasons: 1.Improper contact between the probe and the tank wall. 2.The installation surface is not smooth. 3.Improper installation position. 4.Faulty threshold parameter 5. If all above causes are eliminated, please contact the manufacture for help.	A. Apply silicone grease on the contact surface of probe, reinstall, and calibrate. B. Smoothen the installation surface, reinstall, and calibrate. C. Change installation position, reinstall, and calibrate. D. Calibrate threshold again

9. Packing Inspection

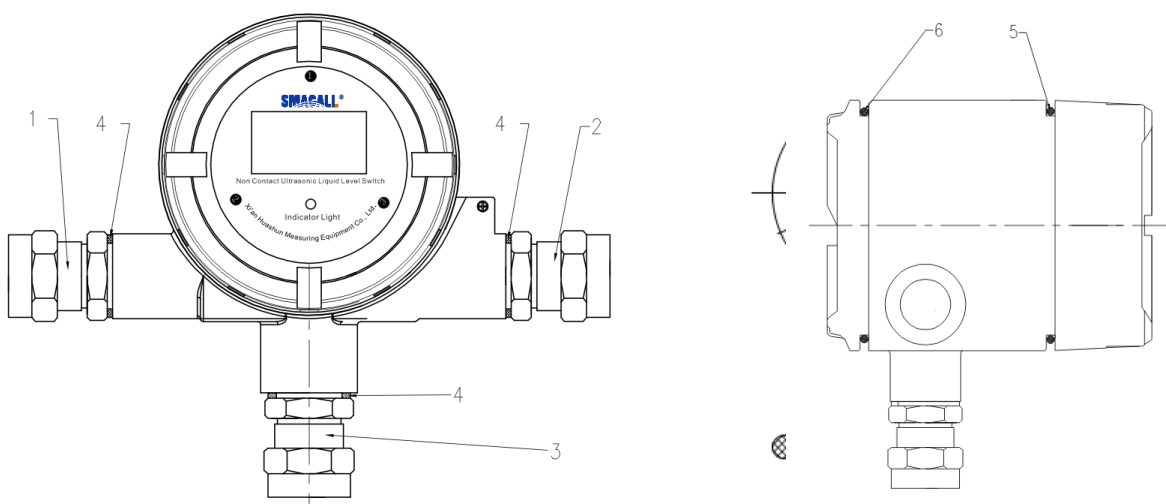
When opening the meter box for the first time, please check the following items:

- Whether the name, model and other contents on nameplate are correct;
- Whether there are cracks or broken parts on the shell and the glass speculation cover;
- Whether contents in box are complete according to packing list.

10.Packing List

Ultrasonic liquid level switch	1
Ultrasonic probes and cable components	1
Manual	1
Onsite Installation Instruction	1
Silicone grease	
Magnetic pen	1
U shape hoops	

11. Water proof Structure and Wearing Parts



The figures above include:

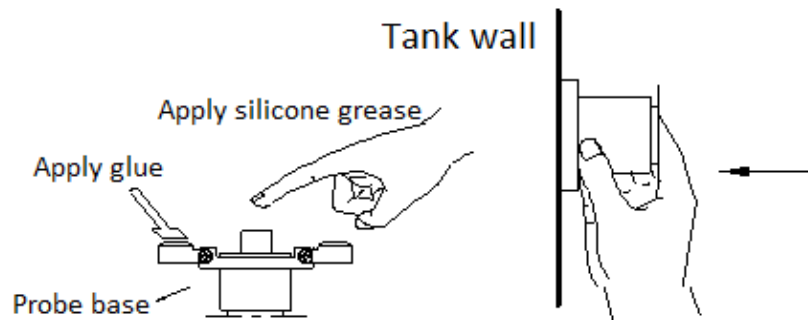
1. Relay output port; anti-explosion packing seal;
outer diameter of cable: $\Phi 6 \sim 8$ mm.
2. Ultrasonic probe port; anti-explosive packing seal;
3. Outer diameter of cable: $\Phi 6 \sim 8$ mm
4. Power supply port; anti-explosive packing seal;
5. Device port, O shape ring with diameter $\Phi 18 \sim 2.65$ mm
6. O shape ring for the front cover, $\Phi 90 \sim 3.55$ mm
7. O shape ring for the back cover, $\Phi 90 \sim 3.55$ mm

Cautions:

1. After wiring, users should tighten position 1,2,3 and 4 (all these 4 positions should be applied with silicone grease to ensure its leakproofness)
2. During installation or operation, if users find the positions in the above figures loose, please tighten them in time in case of water leaks.
3. Changing any part without confirmation with our company is not permitted. If there is any missing or worn sealing parts, please alter them according to the specifications in the above figures.

Appendix: Suggested special probe installation methods

The following installation methods are suggested if probe is to be installed on non magnetic tank.



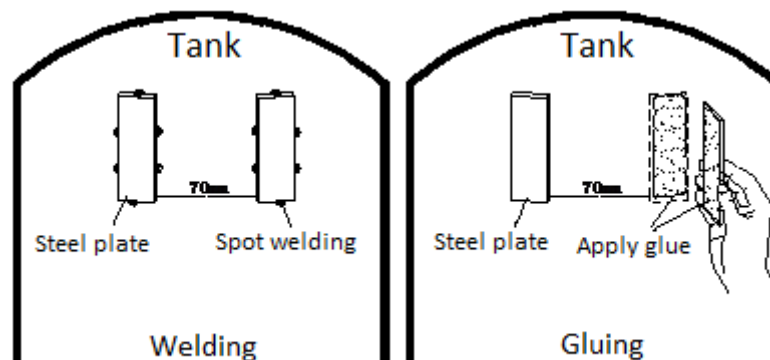
1. Install with glue

Apply glue on both sides of suction cup and related area of tank wall. Do not apply glue on the area on tank wall which contacts to sensing surface of probe.

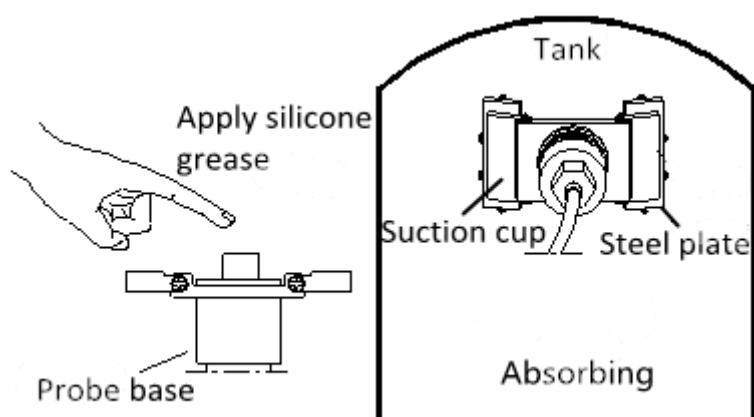
2. Install with weld.

3. Install with steel plate.

--Attach steel plate on tank wall by welding or gluing;



--Attach probe on the steel plate.



Contact Details

Website: www.smagalls.com

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