



Guided Wave Radar Level Meter



High Temperature



Standard



Corrosive



Coaxial



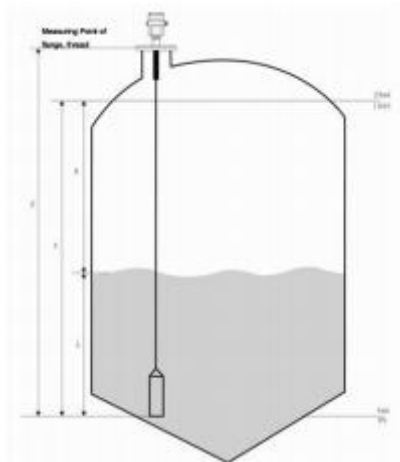
Double Rod/Cable

Guided Wave Radar Level Meter Instruction

1. Product Description

1.1 principle of measurement

Guided Wave Radar is the measuring instruments that based on the time travel principle, the radar wave travel in speed of light, run time can be converted into a level signal by the electronic component. The probe emit the high-frequency pulse and spread along the cable **probe**, the pulse come across the material surface and reflect back then receive by the instrument receiver and converted the distance signal to level **signal**.



Input

Reflected pulse signal conduction transmit along the cable to the electronic circuit part of the instrument, the microprocessor processes this **signal**, identify the echo that generated by the microwave pulses on the material surface. Correct echo signal recognition accomplish by the intelligent software, the distance **D** that from the material surface is proportional to the pulse time travel **T**: $D=C \times T/2$ (**C** represent for speed of light)

As the empty tank distance **E** is already known, the level **L** is: $L = E - D$.

Output

By entering the empty tank height **E** (= zero), full tank height **F** (= full scale) and some applications parameters to set **up**, application parameters will automatically adapt the measurement environment. Corresponds to **4-20mA** output.

1.2 Measurement range

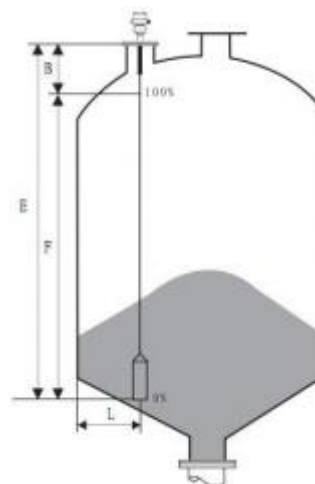
- F—Measuring range**
- E—Empty tank distance**
- B—Top blind zone**
- L— Min. Distance from probe to tank wall**

The top blind zone is the minimum distance between the highest material surface and the measurement reference point.

The bottom blind zone is referring to the distance that near the mooring rope bottom and cannot be accurately measured.

Refers to a distance from the bottom of the blind near the bottom of the cable cannot be accurately measured.

The distance between the top and the bottom blind zone is the effective measurement distance.



Note:

The tank level can be measured reliably only when the material is between the blind zone of top and bottom.

1.3 Technical Parameter:



Standard

Application	Liquid, Powder or Particle
Measuring range	Cable :35m / Rod :6m
Process Connection	G1A / G11/2A / 11/2NPT / Flange
Process Temperature	(-40~120) °C
Process Pressure	(-0.1~4.0) Mpa
Accuracy	±5mm
Antenna/Material	Stainless Steel 304, 316L/PTFE
Antenna Dimension	Φ6mm / Φ8mm / Φ10mm
Explosion Proof	Exia IICT6 / Exd IICT6
Housing	Aluminum: IP67 Plastic: IP66
Output	(4~20)mA/HART/RS485 (Modbus)
Display	LCD, Can Display Curve(Standard)
Power Supply	2-wire: (DC24V) 4-wire: (DC24V or AC220V)



Corrosive

Application	Highly corrosive liquid
Measuring range	Cable :35m / Rod :6m
Process Connection	PTFE/PFA Rf Flange
Process Temperature	(-40~120) °C
Process Pressure	(-0.1~1.6) Mpa
Accuracy	±5mm
Antenna/Material	Stainless Steel 316L with PTFE/PFA
Antenna Dimension	Φ10mm
Explosion Proof	Exia IICT6 / Exd IICT6
Housing	Aluminum: IP67 Plastic: IP66
Output	(4~20)mA/HART/RS485 (Modbus)
Display	LCD, Can Display Curve(Standard)
Power Supply	2-wire: (DC24V) 4-wire: (DC24V or AC220V)



Double Rod/Cable

Application	Small dielectric constant Liquid, Powder or Particle
Measuring range	Cable :35m / Rod :6m
Process Connection	Flange
Process Temperature	(-40 ~ 120) °C
Process Pressure	(-0.1 ~ 4.0) Mpa
Accuracy	±5mm
Antenna/Material	Stainless Steel 304, 316L/PTFE
Antenna Dimension	Φ6mm / Φ8mm / Φ10mm
Explosion Proof	Exia IICT6 / Exd IICT6
Housing	Aluminum: IP67 Plastic: IP66
Output	(4~20)mA/HART/RS485 (Modbus)
Display	LCD, Can Display Curve(Standard)
Power Supply	2-wire: (DC24V) 4-wire: (DC24V or AC220V)



Coaxial

Application	Small dielectric constant Liquid, complex environment
Measuring range	6m
Process Connection	G1A / G11/2A / 11/2NPT / Flange
Process Temperature	(-40 ~ 120) °C
Process Pressure	(-0.1 ~ 4.0) Mpa
Accuracy	±5mm
Antenna/Material	Stainless Steel 304, 316L/PTFE
Antenna Dimension	Φ20mm / Φ25mm / Φ50mm
Explosion Proof	Exia IICT6 / Exd IICT6
Housing	Aluminum: IP67 Plastic: IP66
Output	(4~20)mA/HART/RS485 (Modbus)
Display	LCD, Can Display Curve(Standard)
Power Supply	2-wire: (DC24V) 4-wire: (DC24V or AC220V)

2. Installation Guide

The following guidelines apply to the cable and the rod probe measurement of solid particles and liquid objects. A coaxial tubular probe is only applicable to the liquid material.

2.1 Installation site:

The right diagram is cable type radar installation, which is mainly used to measure solid particles.

As far as possible away from the inflowing and discharging port.

The probe must not touch any of the vessel wall for the entire range for metal and plastic .

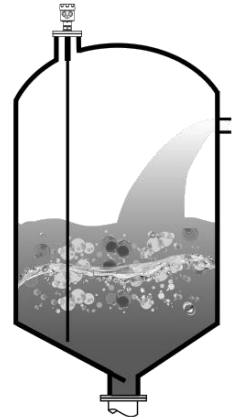
Mounting at 1/4 diameter of the vessel is recommended.

The minimum distance between the cable probe or rod probe should not less than 300mm.

The bottom of the probe to bottom of vessel should greater than 50mm.

The minimum distance between the probes to the obstacle should not less than 200mm.

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom



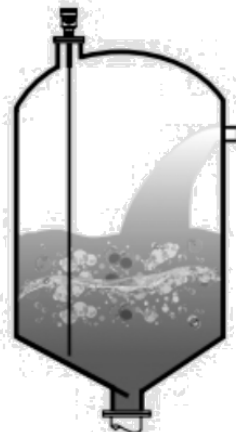
The right diagram is the cable radar installation, which is mainly used to measure liquids.

Any medium with a dielectric constant greater than 1.8 can be measured.

Generally used to measure the viscosity $\leq 500\text{cst}$ and less prone to adhesion medium.

The maximum range of the rod type radar can reach 6 meters.

It has a strong inhibition of steam and foam, and the measurement is not affected



The right diagram is double pole radar installation, mainly used to measure liquids.

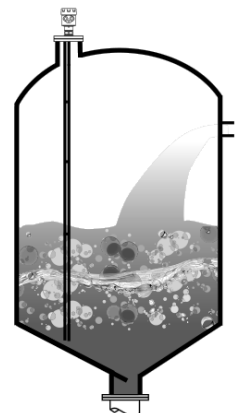
Small dielectric constant liquid can be measured by the double rod type.

Any medium with a dielectric constant greater than 1.6 can be measured.

Generally used to measure the viscosity $\leq 500\text{cst}$ and less prone to adhesion medium.

The maximum range of the rod type radar can reach 6 meters.

It has a strong inhibition of steam and foam, and the measurement is not affected



2.2 Installation Method

Reasonable installation can ensure long-term usage and reliable, accurate measurement.

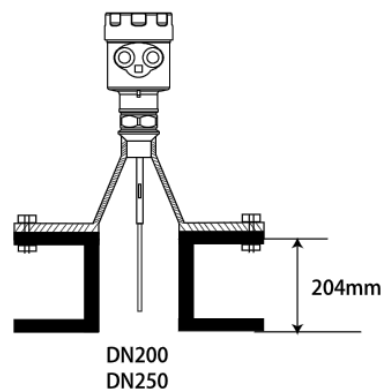
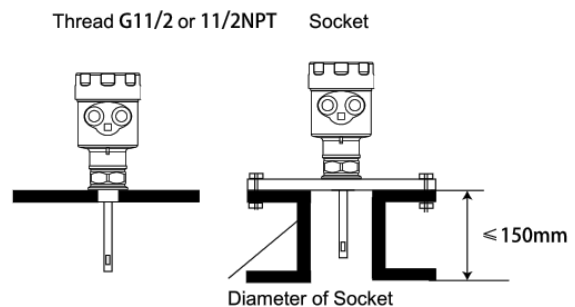
Instruments apply threaded connection, the thread length shall not exceed 150mm, and the short pipe installation can be applied.

The short tube diameter should be between 2" to 6", and then the installation pipe height should be less than 150mm.

If it's installed on the longer pipe, cable probe should be fixed at the bottom of the bracket to avoid the probe cable in contact with the short end of the tube.

- Installation of DN200 or DN250 in the pipe

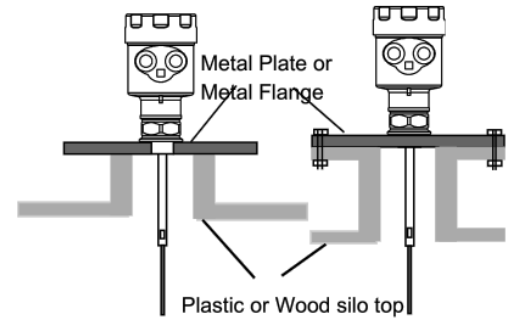
When the meter needs to be installed in a short tube with greater than 200mm diameter, echo generated in the short tube wall, which will cause measurement errors in the situation of a low dielectric permittivity. Therefore, as for the pipe with diameter of 200mm or 250mm, it is needed the special flange with a "horn Interface".



- Installed on plastic pot

Watch out!

Whether it is cable or rod-type instrument, the process connecting surfaces should be metal. When it's installed on plastic pot, and the pot top is plastic or other non-conductive material, then metal flange is needed for the instrument, if adopt threaded connection, the metal plate should be equipped.



- Distance between the instrument probe and the tank wall

The distance between the meter probe and the tank wall is suggested to be 1/6~1/4 of the tank diameter(the mini. value is greater than 300mm, while it's at least 400mm for concrete tank)

for probe length selection, the distance between the probe bottom and the tank bottom is about 30mm

Note:

- Do not install the radar at the next discharge port (Figure I)
- Avoid other devices inside the tank to come into contact with the microwave conductivity components (Figure II)
- Avoid cable to come into contact with short tube installation(Figure III)

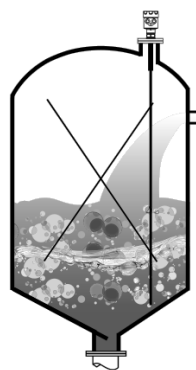
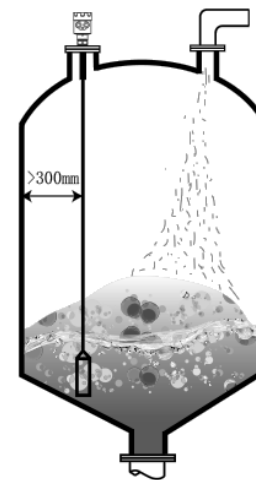


Figure I

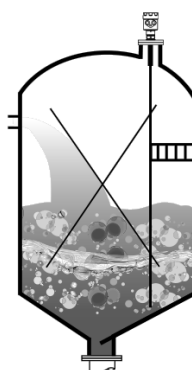


Figure II

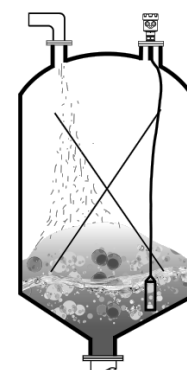


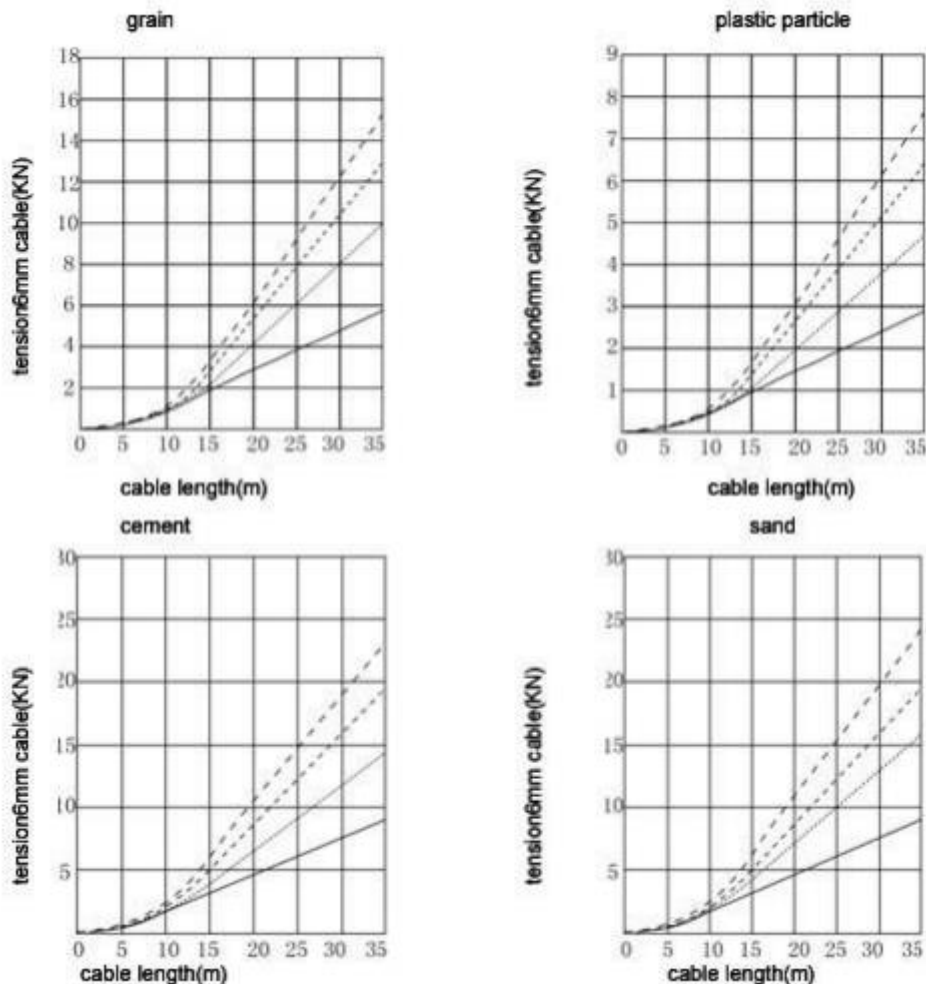
Figure III

The down pull suffered by cable

During the process of charging and discharging, the media will have down pull on the cable and the force strength depends on the following factors:

1. Cable length
2. Material density
3. Silo diameter
4. Cable diameter

The following is the pressure that generate by typical medium of 6mm cable probe



Optimization of the interference

- **Interference echo suppression:** The software can realized the suppression of the interference echo, and thus achieve the ideal measurement results

- **The bypass pipe and waveguide pipe (for liquid only)** the bypass pipe, waveguide pipe or the tubular to avoid interference, if the viscosity is less than 500cst.

Corrosive media measurement

For corrosive media measurement, the rod probe can be selected with plastic sleeve or tetra fluoride sleeve.

Fixation of the guided wave radar probe ends

- **There's two fixed ways for the probe end to be applied in fixed occasions:** one is insulated fixation; another is non-insulated fixation.

- Insulation fixation indicate that the measured media that with lower dielectric constant and fixed in metal tank bottom needs insulation fixed;

- Non-insulated fixation refers to the measured media with high dielectric permittivity, the tank is non-metallic materials, low dielectric constant material and the material with similar dielectric permittivity that compared to the measured media, and then non-insulation fixation can be applied.

※ **Note:** If the user cannot determine the dielectric constant of the medium and the tank, please contact the manufacturer.

3 Electrical Connection

3.1 Power Supply

(4~20)mA/HART(2-wire) Power supply and current signal are carried by the same two-wire connection cable. See the Technical

Specifications of this guide for detailed requirement on power supply. A safety barrier should be placed between power supply

and instrument for intrinsically safe version.

(4~20)mA/Modbus(4-wire) Power supply and current signal are carried by two 2-wire connection cables respectively. See the Technical Specifications of this guide for detailed requirement on power supply. Earth-connected current output can be used for standard version of level instruments, while the explosion proof version must be operated with a floating current output. Both instruments and earth terminals should be connected with ground firmly and securely.

Normally you can either choose to connect with the earth terminal on vessel or adjacent ground in case of plastic vessels.

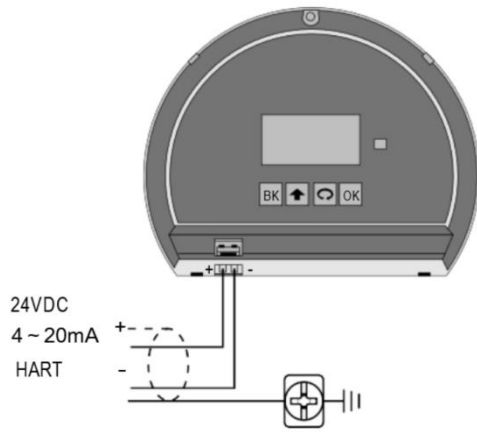
3.2 General Introduction

Standard 2-wire cable with outside diameter of 5...9mm, which assures the seal effect of cable entry, can be used as feeder cable. You are recommended to use screened cables in the event of electromagnetic.

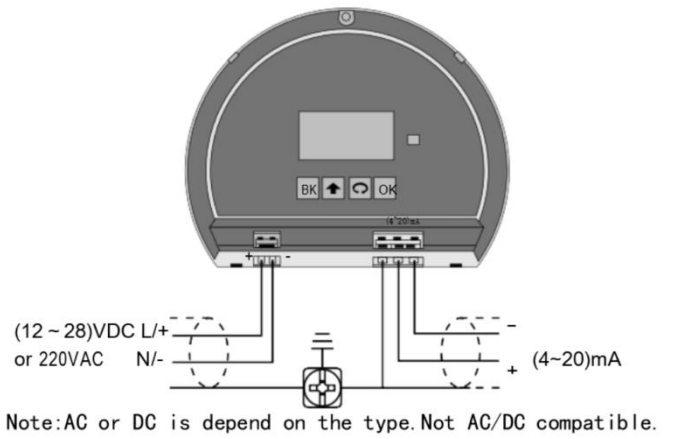
(4~20)mA/Modbus((2-wire) Standard 2-wire cable can be used for power supply

(4~20)mA/Modbus((4-wire) Connection cable with special earth wire can be used as feeder cable.

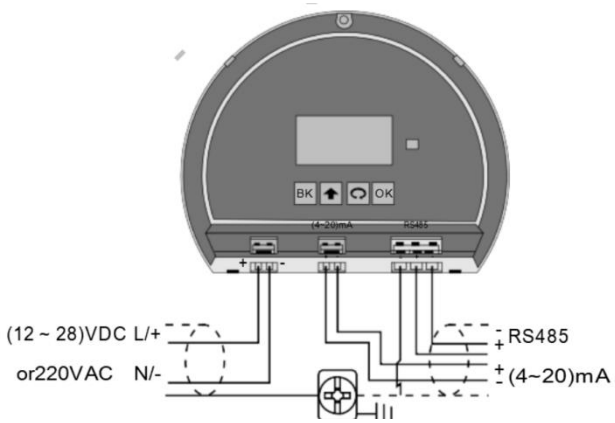
The two ends of shielded cable must be connected with earth terminal. The shielded cable must be connected with inner earth terminal directly inside the transducer, while the outside earth terminal on housing must be connected with ground. In the event of earth-connected current, the shielding side of shielded cable must be connected to ground potential via a ceramic capacitor (e.g. : 1nF 1500V) in order to dampen the low frequency grounding current and avoid the disturbance caused by high frequency signals



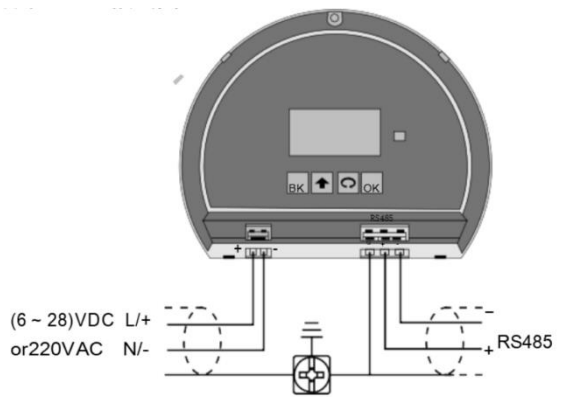
2-wire



4-wire



4-wire with RS485 and 4-20mA output



4-wire with RS48 output

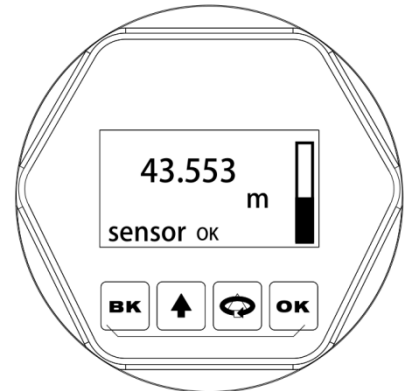
4 Adjustment with display module

4.1 Adjustment with display module

Brief Introduction :

Shown as the figure right, there are four buttons in the indication face board, by pressing which, you can set and debug the instrument. Menu languages are selectable. After setting or Scaling, LCD indicates measured values, which can be read clearly through a glass window.

Following bellows are functions of the four buttons:



Interpretation of terms :

Programming interpretation: Using the four buttons at the indication board can perform parameters setting, debugging and test, etc.
Structure of programming menu: For the structure of menu, please refer to the attached table one.
The movement of the horizontal arrows to right can be done by button **“OK”**.
The movement of the vertical arrow downwards can be performed by button **“SELECTION”**.
Button **“BK”** for the movement to left for the horizontal arrow.

“OK”	Enter editing state Confirm settings Parameter modification saves
“SELECTION”	Selecting a setting item Selecting digits of edited parameters Indicating the content of the selected parameter Note: hereinafter the button is called as “KEY SELECTION” for easy-understanding.
“↑”	Amending values of parameters Selecting model of indication
“BK”	Exit from editing state Returning back to the previous menu Shifting between measured values and chart of echoes during operation

Submenu :

Basic setting: Basic setting includes the settings for basic parameters, lower position adjustment, higher position adjustment, the character of the medium, damping time, signal threshold, output mapping, Scaledgunitessre, Scaling, setting length of probe, dead band, sensor label.

Display: includes indicating content, LCD contrast.

Diagnostics: perform checking and test. Mainly include measuring peak value, measuring state, select chart, ECHO GRAPH and simulation.

Service: including false echo, current output, reset, measuring unit, language, HART working mode, copying sensor data, cipher, and deviation of distance.

Info: basic information includes type of sensor, series number, production date, version of software.

Instrument in the running state press the **"OK"** button to enter programming state, display programming main menu. Each parameter editor to finish, with **"OK"** button confirmation, otherwise the editor is invalid. When done editing, press the BK key to exit programming state, to return to running status. The editor at any time can press the BK key to give up programming, exit parameters of programming state.

Editing method (character/ figure parameter programming): when entering character/ figure programming state, the first digit of the edited parameter will become black, at this time, press button **"f"** to change the character or figure until the required character or figure appear. Press button **"SELECTION"**, character or figure will turns black in order, then edit them one by one. When finish, press button **"OK"** for confirmation.

Optional parameters editing: optional parameter is defined as a plurality of selected parameters in the editing item, which can selected by user.

Press button **"SELECTION"**, move the arrow the position where the needed parameter is. Press button **"OK"** for confirmation.

Note: the figure at right top corner is menu number.

Basic settings

(After this part is set up, the instrument can work normally)

1.1. Min. adjustment:

Min. Adjustment(Low Position Adjustment) is for measuring range setting. It determines the proportion of output current linearity corresponding relationship together with Max. adjustment. In main menu, when the menu number is 1, press button OK, enter the submenu of basic settings. LCD indicates as follows:

Min. adjustment **1.1**
0.00%
35.000m (d)
1.346m (d)

Press button OK, enter programming Min. percentage, refer to the previous stated character/figure parameter editing method in parameter editing method to edit the percentage value and distance value. After editing, press button OK for confirmation, or press button BK for quitting editing.

1.2. Max. adjustment:

Max. Adjustment(High position adjustment) is for measuring range setting. It determines the proportion of output current linearity corresponding relationship together with Min. adjustment. When LCD indicates the menu number 1.1, press button SELECTION, enter Max. adjustment. LCD indicates as follows:

Max. ADJUSTMENT **1.2**
100.00%
0.000m (d)
1.346m (d)

At this time, you can edit the Max. adjustment with button OK.

1.3. Medium:

When LCD indicates menu number 1.2, press button SELECTION, enter medium properties editing. Medium properties menu is for selecting solid, liquid or micro DK, thus further select material property to some other factors affect the measurement. LCD indicates as follows:

MEDIUM **1.3**
LIQUID

MEDIUM
LIQUID **1.3**
SOLID MICRO DK

1.3.1 Fast level change: When select liquid or solid in the medium properties, press button OK, enter quick change menu. LCD indicates:

Fast level change **1.3.1**
Yes

Press button OK again and enter quick change menu. LCD indicates as follows:

Fast level change **1.3.1**
Yes
No

1.3.2. First echo: When select liquid or solid in medium properties, while LCD indicates menu 1.3.1, press key SELECTION to select the next menu and enter the first wave selection menu. LCD indicates as follows:

First echo **1.3.2**
NORMAL

Press button OK again, enter the first wave selection menu, LCD indicates as follows:

First echo	1.3.2
NORMAL	Bigger
Small	Biggest
Big	

There are five methods of the first wave selection by press button SELECTION:

NORMAL: DO NOTHING FOR THE FIRST ECHO AMPLITUDE (DEFAULT)	
WEAKEN: THE FIRST WAVE AMPLITUDE WEAKEN	10dB
LITTLE STRONGER: THE FIRST WAVE STRENGTHEN	10dB
STRONGER: THE FIRST WAVE STRENGTHEN	20dB
STRONGEST: THE FIRST WAVE STRENGTHEN	40db

1.3.3. (Liquid) Agitated surface: When the medium is liquid, LCD indicates the menu number 1.3.2, press button SELECTION to select the next menu and enter the menu of Agitated surface, LCD indicates as follows:

Agitated surface	1.3.3
No	

Press button OK again and enter the menu of Agitated surface, LCD indicates as follows:

Agitated surface	1.3.3
Yes	
No	

1.3.3. (Solid) Large angle repose: When the medium is solid, LCD indicates the menu number 1.3.2, press button SELECTION to select the next menu and enter the menu of Large angle repose, LCD indicates as follows:

Large angle repose	1.3.3
NORMAL	

Press button OK again and enter Large angle repose selection menu, LCD indicates as follows:

Large angle repose	1.3.3
Yes	
No	

1.3.4. (Liquid) Foaming: When LCD indicates the menu number 1.3.3, press button SELECTION select the next menu and enter form menu, LCD indicates as follows:

Foaming	1.3.4
No	

Press button OK again, enter form selection menu, LCD indicates as follows:

Foaming	1.3.4
Yes	
No	

1.3.4. (Solid) Power: When LCD indicates the menu number 1.3.3, press button SELECTION select the next menu and enter Power selection menu, LCD indicates as follows:

Power	1.3.4
No	

Press button OK again, enter Power selection menu, LCD indicates as follows:

Power	1.3.4
Yes	
No	

1.3.5. Low DK: When LCD indicates 1.3.4, press button OK and enter DK adjustment menu, LCD indicates as follows:

Low DK	1.3.5
No	

Press button OK again and enter liquid DK adjustment menu, LCD indicates as follows:

Low DK	1.3.5
Yes	
No	

Press button SELECTION to select "Yes" and set the measurement when DK value is small. LCD indicates as follow, then input accurate empty cans empty high value. This value will be used to judge the position of the tank bottom in order to decrease the reflection from the bottom, LCD indicates as follows:

LOW DK	1.3.5
Yes. DISTANCE WHEN TANK IS EMPTY	3.00m

1.3.6. (Liquid) Guided wave pipe setting: When LCD indicates the menu number 1.3.5, press button SELECTION and enter the guided wave pipe setting menu, LCD indicates as follows:

Measure in tube	1.3.6
No	

Press button OK, enter Measure in tube selecting menu, LCD indicates as follows:

Measure in tube	1.3.6
Yes	
No	

Press button SELECTION and select "Yes", and press button OK to enter guided wave pipe diameter setting menu, LCD indicates:

Measure in tube	1.3.6
GUIDED WAVE PIPE DIAMETER	0000mm

Note: Measure in tube can keep valid only when a guided wave pipe is mounted.

1.3.7 Micro DK: When select the medium properties as micro DK, press button OK to enter micro DK setting, LCD indicates as follows:

MICRO DK SETTING	1.3.1
DISTANCE WHEN TANK EMPTY	10.00m
MEDIUM LEVEL	0.00m
DK 0.020m(d)	1.00

When select medium property as micro DK, it is used for the case, when the dielectric constant is less than 1.4, the echoes directly from medium surface is very weak, or the measurement cannot be performed. With the method of bottom reflection the medium level can be measured. Then you have to input two values of the parameters listed below:

1. distance when tank empty.
2. medium actual level value or the dielectric constant of the medium to be measured, these two values are related, it is ok to input one of them. The accuracy of the mentioned above values can directly influence the accuracy of the measurement result.

Note: Please carefully choose "MICRO DK". It is not suitable for the most of measurement. After selecting MICRO DK, according to the situation of echoes, the instrument will adopt using direct echo method or bottom reflection method to get the measurement result.

1.4 Damping :

Damping : When LCD indicates the menu number 1.3, press button SELECTION, enter damping time setting menu, LCD indicates as follows:

DAMPING : **1.4**
2S

Press button OK, enter parameter edit mode. Press button " ↑ " to set the figures. Press button SELECTION to select the figure digit to be edited. Then press button OK for confirmation.

1.5. Mapping curve:

Mapping curve: Mapping curve is used for selection between nonlinearity Mapping curve and linearity mapping set from a host computer. When LCD indicates the menu number 1.4, press button SELECTION to enter Mapping curve editing menu. LCD indicates as follows:

Mapping curve **1.5**
LINEAR

Press button OK to enter parameter selection mode. Press button SELECTION to select linearity or other selectable mapping modes, for example, linearity, horn, etc. Press button OK for confirmation after editing. When select linearity Mapping curve, it will be used for selecting different units.

1.6. Scaled unit:

Scaled unit: When LCD indicates the menu number 1.5, press button SELECTION to enter Scaled unit setting menu. LCD indicates as follows:

Scaled unit **1.6**
HEIGHT **m**

Press button OK to enter parameter selection mode, then press button SELECTION for confirmation, and select the corresponding unit, press button OK for confirmation. When select linearity Mapping curve, it will be used for determining concrete mapping relationship.

1.7. Scaling:

Scaling: When LCD indicates the menu number 1.6, press button SELECTION to enter Scaling setting menu. LCD indicates as follows:

Scaling **1.7**
0%= **0.00 m**
100%= **10.00 m**

Press button OK, the area of parameter become black, press button SELECTION to set the decimal point, press button OK for confirmation. The parameters area corresponds to 0% become black. Press button SELECTION and button " ↑ " for setting parameters. Then press button OK for confirmation. For setting the values corresponding to 100%, the steps and methods are the same.

1.8. Range:

Range: In order to get correct measuring result, measuring range has to be set.

When LCD indicates the menu number 1.7, press button SELECTION to enter measuring range setting menu. LCD indicates as follows:

RANGE **1.8**
10.000m(d)

Press button "OK", the corresponding parameters turn black, press button SELECTION or button "↑" for setting parameters, then press button OK for confirmation.

1.9. Near blanking:

Near blanking: When there is a fixed obstacle close to the propagator, it interferes the measurement, when the maximum medium level cannot be up to the obstacle, using Near blanking setting can avoid measurement mistake.

When LCD indicates the menu number 1.8, press button SELECTION to enter Near blanking setting menu. LCD indicates as follows:

Near blanking **1.9**
0.300m(d)

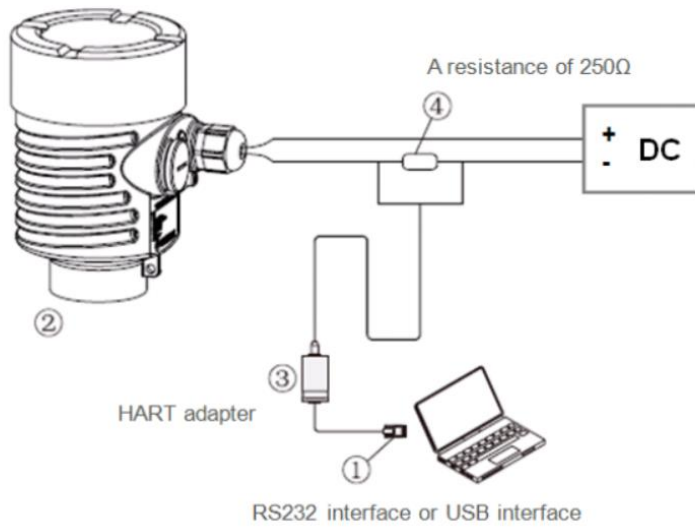
Press button OK, the corresponding parameters turn black, press button SELECTION or button "↑" for setting parameters, and press button OK for confirmation.

1.10. Sensor tag:

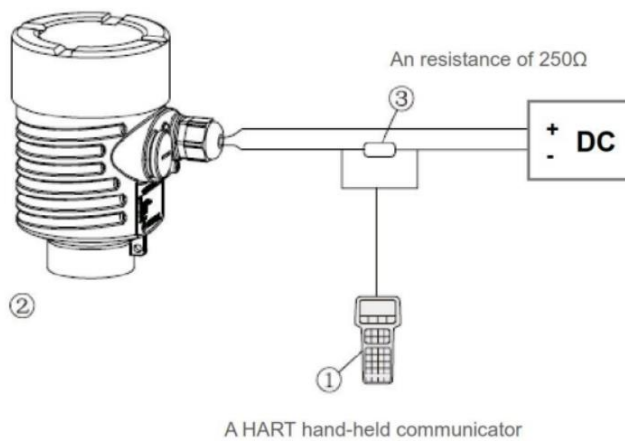
When LCD indicates the menu 1.9, press button SELECTION to shift the menu to sensor tag indicating item, LCD indicates as follows:

SENSOR TAG **1.10**
SENSOR

4.2 Adjustment with HART software



4.3 Adjustment with HART handheld programmer



SELECTION TABEL

BRLD70

1	normal type
2	Corrosion-resistant, bushing PFA
3	Double rod (cable)
4	Coaxial type
5	High temperature and pressure type
Explosion Proof Approval	
P	Standard(Without Approval)
I	Intrinsically Safe (Exia IICT6)
D	Flameproof (Exd IICT6)
G	Intrinsically Safe+Flameproof(Exia IICT6 Exd IICT6)
Shape of Antenna/Material	
A	Cable /Stainless Steel 316L/304 , PTFE, ceramics
B	Rod /Stainless Steel 316L/304 , PTFE, ceramics
Process Connection	
See the Process Connection diagram	
Temperature/Pressure	
P	(-40~120)℃/(-0.1~4.0)MPa
G	(-40~250)℃/(-0.1~4.0)MPa
H	(-200~600)℃/(-0.1~4.0)MPa
Electronic	
A	2-wire24VDC/(4~20)mA/HART
B	4-wire24VDC/(4~20)mA/Modbus
C	4-wire220VAC/(4~20)mA/Modbus
Housing/Protection	
L	Aluminium/IP67
P	Plastic/IP65
D	Double chamber
Q	Stainless Steel 316L/IP67
Cable Entry	
M	M20×1.5
N	1/2 NPT
Remote Display	
B	Yes
X	No
Rod/Cable Length	
X	5digit (mm)