

BASI

Radars Level Meter



1. Product Description

BLRD81X series transmitters are 26GHz High-Frequency Radar Level Transmitters with analog signals 4-20mA, the Max. measuring distance is up to 70m. The antenna has been further optimized, and the latest update microprocessor can make higher speed signals analysis, which enables the level transmitters can be used in very complicated measuring applications such as reaction kettle or solid bunker.

Features

The Radar Level Transmitter adapts the emitting frequency of 26GHz, therefore it has the following features:

- Noncontact measuring, no abrasion, no contamination .
- Easy installation due to small size of antenna .
- Shorter wave length, which can get better reflect for the inclined solid surface. .
- Smaller measuring dead zone, which can get better measuring result for small tanks.
- Smaller beam angle, which makes the energy be more concentrated, enhancing the wave reflection ability which can keep signals more powerful to avoid obstacles. .
- Almost unaffected by corrosion and foams. .
- Almost unaffected by changes of steam, temperature and pressure in the air. .
- Even in heavy dust environment, the transmitter can also receive the real level return wave. .
- High SNR, which can make the instrument get better performance. .
- Frequency 26GHz is the best option for measuring solid and low dielectric constant medium.

Working principle

The Radar Level Transmitter antenna emits narrower micro wave pulses which will be transmitted via the antenna. The micro wave will be reflected back after touching the surface of a medium, then antenna system will receive it and transmit it into the electrical circuit, which will be automatically turned into the level signals.

2. Technical Specifications

General Parameters

Model	BLRD815	BLRD816	BLRD817	BLRD818	BLRD819
	Thread G1 ¹ / A	Thread G1 ¹ / A		Thread G1 ¹ / A	Thread G1 ¹ / A
		Thread 1 ¹ / NPT		Thread 1 ¹ / NPT	Thread 1 ¹ / NPT
		Flange	Flange	Flange	Flange
<i>Antenna</i>	PTFE	Stainless Steel	PTFE	Stainless Steel	Stainless Steel

<i>Housing</i>	Aluminium, Plastic, Stainless Steel	
<i>Seal ring of housing</i>	Silicone rubber	
<i>ViewPoint window on</i>	Tempered glass	
<i>Ground Terminal</i>	Stainless Steel	
	-BLRD815	(2~12)kg (Depend on process connections and housings)
	-BLRD816	(3~13)kg (Depend on process connections and housings)
	-BLRD817	(4~14)kg (Depend on process connections and housings)
	-BLRD818	(4~14)kg (Depend on process connections and housings)
	-BLRD819	(3~13)kg (Depend on process connections and housings)
<i>Power</i>		
	Standard Version	(16 ~ 36)V DC
	Intrinsic Safe Version	(21.6 ~ 26.4)V DC
	Power Consumption	max.22.5mA
	- <100Hz	U _{ss} <1V
	- (100 ~ 100K)Hz	U _{ss} <10mV
	Standard	(12~28)VDC / (198~242)VAC
	Frameproof	(22.8~26.4)V DC / (198~242)V AC
	Power Consumption	max.1VA,1W
<i>Parameters on Cable</i>	Cable Entry/Plug	M20x1.5 / 1/2NPT / 3/4NPT / G1/2 / G3/4
	Spring Connection Terminal	Wire cross section 2.5mm
<i>Output</i>	Output Signal	4~20Ma/HART/RS485(MODBUS)
	Resolution	1.6 uA/1mm
	Fault Signal	Constant current output; 20.5mA; 22mA; 3.9mA
	2-wire load resistance	See the diagram below
	4-wire load resistance	Max.500 Ω
	Integration Time	(0~40) S, adjustable

Characteristic parameter

Blanking Distance	End of Antenna	
Maximum measuring range	-BLRD815	10 m (solid)
	-BLRD816	35 m (solid)
	-BLRD817	20 m (solid)
	-BLRD818	70 m (solid)
	-BLRD819	30 m (solid)
Microwave Frequency	26GHz	
Measuring interval	approx. 1 second (depends on the parameter setting)	
Adjustable time	approx. 1 second (depends on the parameter setting)	
Display resolution	1mm	
Accuracy	See the accuracy diagram	
Temperature for Storage/Transport	(-40 ~ 70) °C	
Process temperature (probe temperature)	-BLRD815	(-40~130) °C
	-BLRD816	(-40~120) °C /(-60~250)°C /(-60~600)°C
	-BLRD817	(-40~150) °C
	-BLRD818	(-40~120) °C /(-60~250)°C /(-60~600)°C
	-BLRD819	(-40~120) °C /(-60~250)°C /(-60~600)°C
Relative Humidity	<95%	
Process Pressure	Max.40MPa / Max.40MPa	
Vibration Proof	Mechanical vibration 10m/s ² , (10-150) Hz	

3. Mounting Requirement

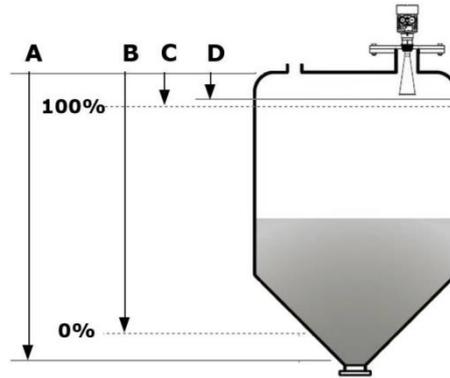
There is a certain existing beam angle while the antenna transmitting microwave pulses. There should be barriers between the lower edge of antenna and surface of measured medium. Therefore it is highly recommended to avoid facilities inside vessels, such as ladders, limit switches, heating spirals, struts and etc, during the mounting process. “False echo learning” must be carried out during the installation in this case. If the sensor is mounted in a socket extension, To ensure that the pulse signal launch at a certain angle, the signal does not touch the tube. Make sure that the horn antenna protrudes out of the socket piece (The end of antenna is fully inside the vessel) 。 Mount the sensor at least 200 mm away from the vessel

wall.,The optimal installation position for the arc tank is 1/2 to 1/3 of the radius (to the tank wall).When the radar is mounted, it should stay away from the feeding port and try to ensure that the radar pulse is vertical to the surface of the measured medium.However, the pulse signal cannot meet the feeding flow.To ensure that the medium can not accessible to radar blind zone. Improve the mounting position of radar and expand the diameter of the socket,if the environment is complex The installation of instruments in explosion proof area must abide by relevant local or federal safety regulations. Aluminum housing should be used for intrinsically safe explosion proof version, which is also applicable in explosion proof areas. The instrument must be connected with ground in this case.

Illustrations

Measuring reference: the bottom surface of threads or the sealing surface of a flange.

- A: Min. Adjustment(menu1.1)
- B: Max. Adjustment(menu1.2)
- C: Empty(menu1.8)
- D: Blanking Zone(menu1.9)



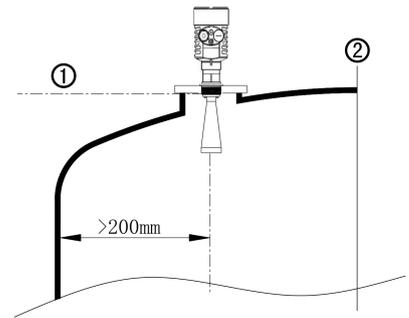
Note: when using the radar level transmitter, must keep the highest level of medium out of the dead zone (see area D shown in the drawing)

Install Position

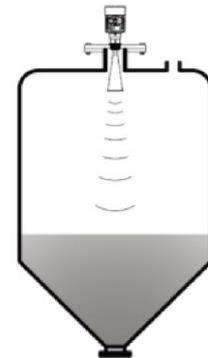
Minimum distance of 200mm between instrument and vessel wall during installation

1.Reference Plane

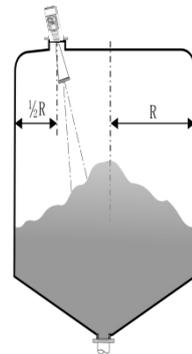
2.Center of Vessel or Symmetrical Axis



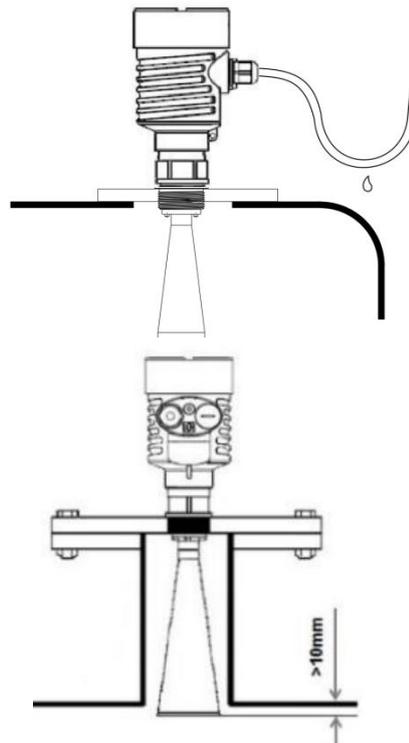
The best mounting position for a conical vessel with flat top is the center of its top, as the effective measurement can reach the bottom of vessel



Installation With Gimbal



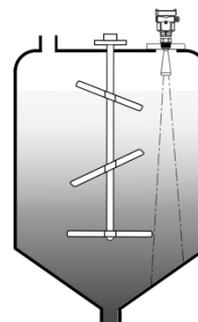
In order to avoid dampness under outdoor or humid indoor conditions or for those instruments mounted on cooling/heating vessels, seal rings used on cables should be screwed tight, plus the cable must be bended downward outside cable entry.



The transducer end must at least protrude 10mm out of socket.

Agitator

If there are agitators in vessels, instrument must be mounted as far away from agitators as possible. Once installation completed, a "false echo learning" should be carried out while agitators in motion to eliminate negative influence caused by false echo of agitators. You are advised to opt for installation with standpipe

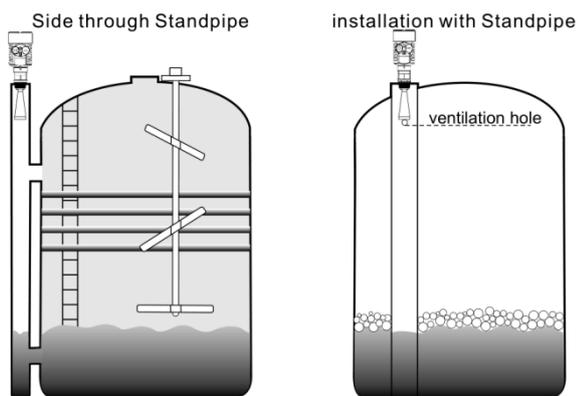


if foam or wave is generated due to the action of agitators.

Installation with Standpipe

You are advised to opt for installation with standpipe (or bypass tube) to avoid the influence on measurement caused by barriers inside vessels or foam generation.

It is advised to install antenna inside of the standpipe to avoid the error caused by foam.

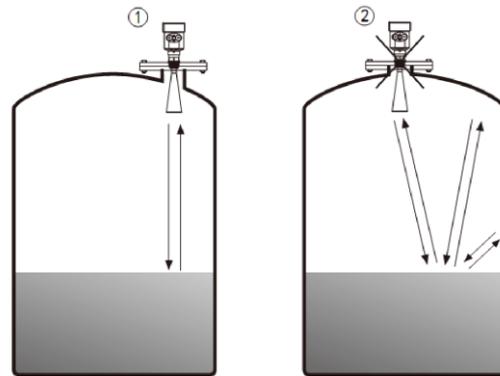


The minimum inner diameter of standpipe should be 50mm. Avoid large cracks or welding seam when connecting standpipe. False echo storage must be carried out as well in this case. You must NOT mount instrument inside standpipe while measuring adhesive medium.

Rights and Wrongs in Mounting

1. Correct

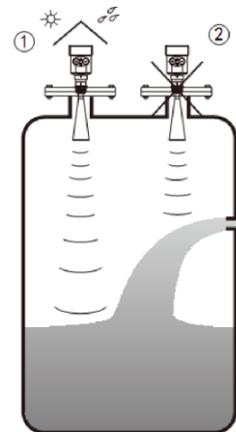
2. Wrong: Instruments are mounted in the center of concave or arched vessel tops, which results in multiple echoes.



1. Correct

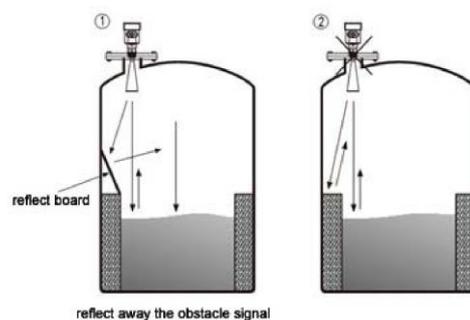
Note: the outdoor installation should be used for shading and rain proofing

2. Wrong: Mount the instrument in/above filling stream, which results in the measurement of filling stream not the target medium.



1. Correct

2. Wrong: If there are barriers in vessels? it is required to mount baffle-board, by doing this, the echo reflected by the barrier will be reflected out. And “False Echo Storage” will be applied.



4. Electrical Connection

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.

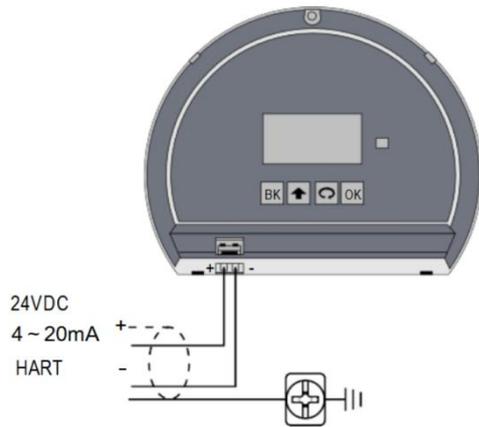
General Introduction

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.

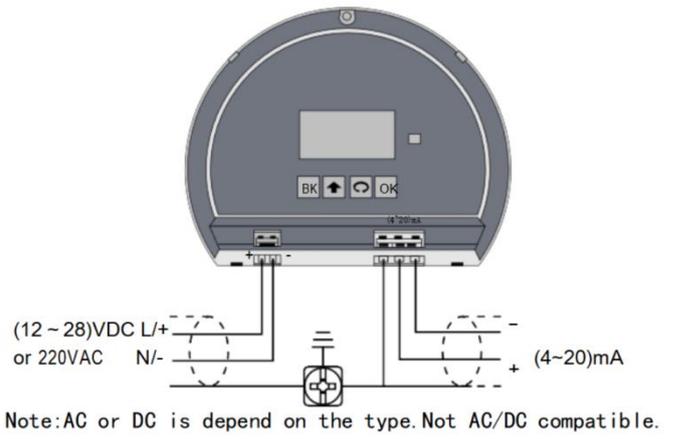
(4~20)mA/Modbus((2-wire) Standard 2-wire cable can be used for power supply

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

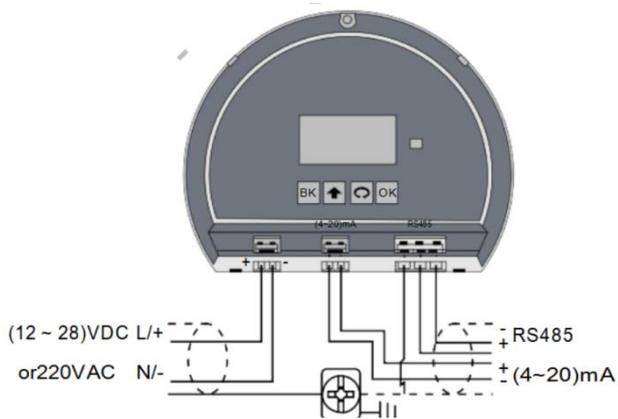
The two ends of shielded cable must be connected with earth terminal. The shielded cable must be connected with inner earth terminal directly inside the transducer, while the outside earth terminal on housing must be connected with ground. In the event of earth-connected current, the shielding side of 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



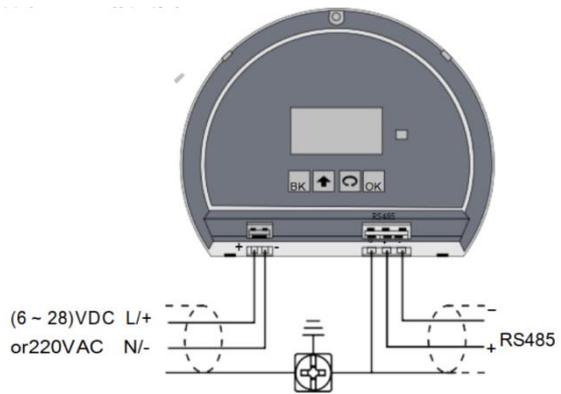
2-wire



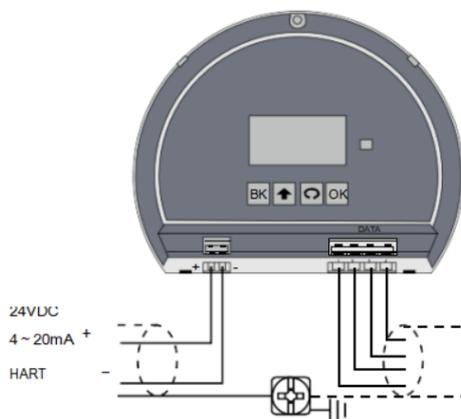
4-wire



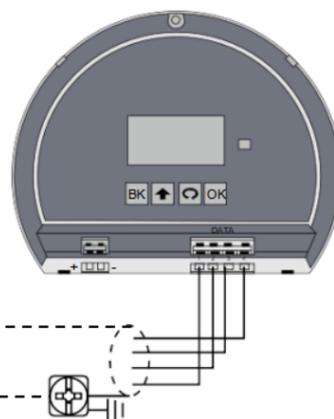
4-wire with RS485 and 4-20mA output

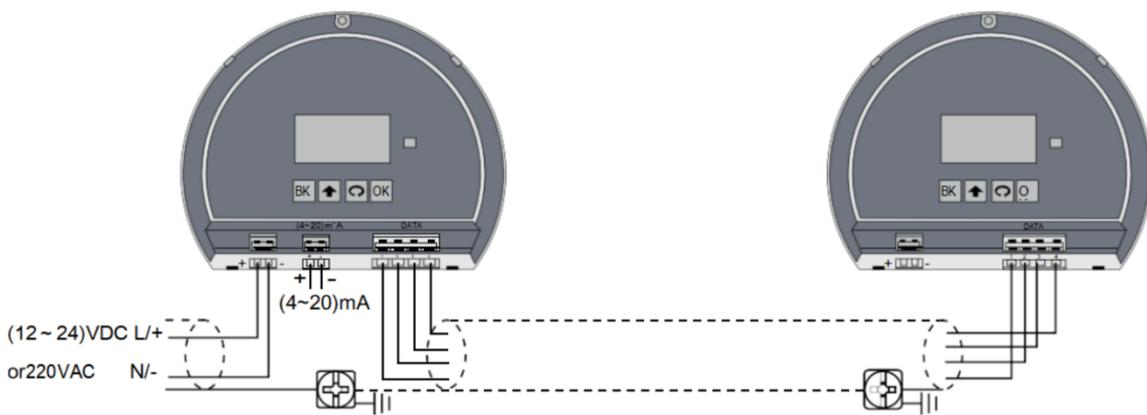


4-wire with RS485 output



2 - wire with remote display





4 - wire with remote display

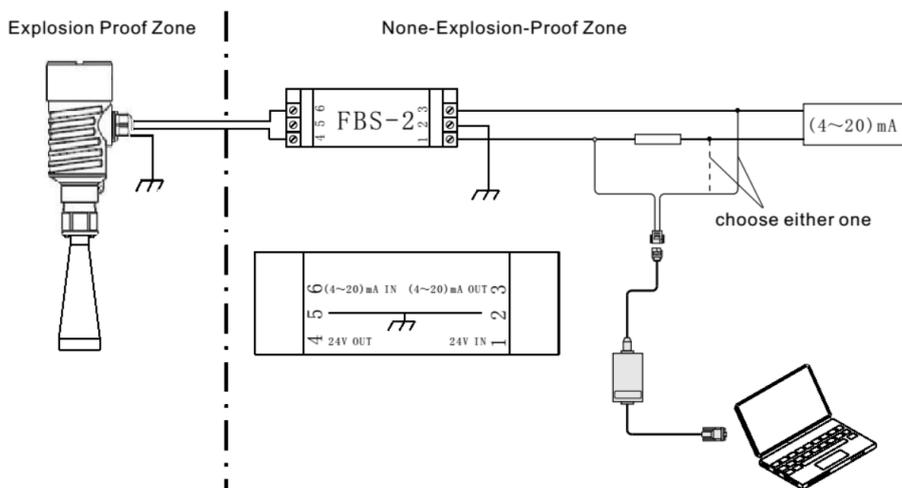
Explosion Proof Connection

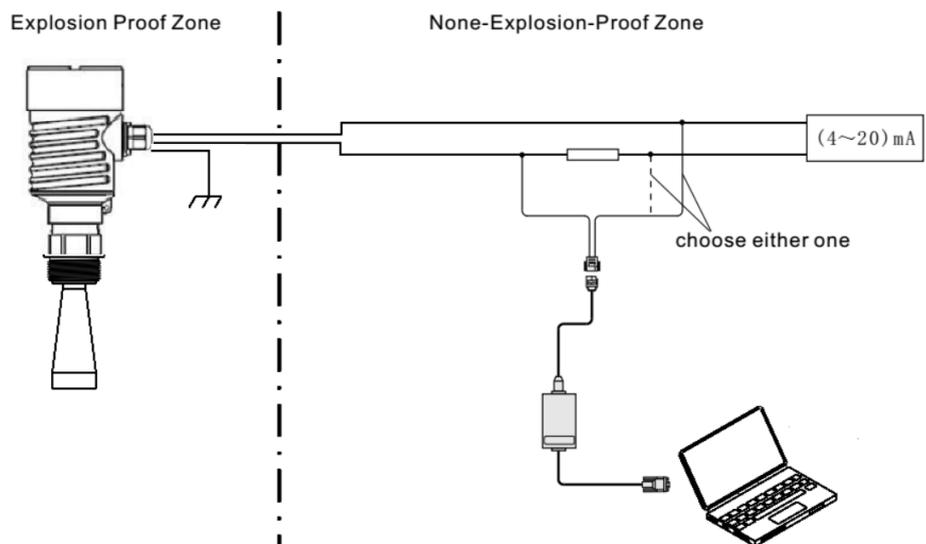
This product is an intrinsic safety explosion proof +Flameproof Approval version .Explosion Proof Approval : Exia II C T6 / Exd (ia) ia II CT6.With aluminium housing and plastic encapsulated internal structure aimed to prevent sparks resulted from transducer and circuit malfunction from leaking out. It is applicable for the non-contact continuous level measurement of flammable medium under the level of explosion proof inferior to Exia II C T6 / Exd (ia) ia II C T6

You are required to use intrinsic safety explosion proof:Ui: 28VDC, Li: 93mA, Pi: 0.65W, Ci: 0uF, Li:0mH of safety barriers

All connection cables must be screened with max. length of 500m. Stray capacitor $\leq 0.1\mu F / Km$ stray

inductance $\leq 1mH/Km$. The level measurement instrument must be connected to ground potential and unapproved supplementary devices are not allowed to use.





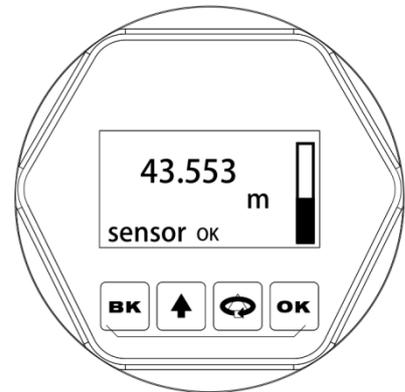
5. Adjustment with display module

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
“  ”	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**
LINEARITY

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. Scaledgunitessre:

Scaledgunitessre (Unit) : When LCD indicates the menu number 1.5, press button SELECTION to enter Scaledgunitessre setting menu. LCD indicates as follows:

Scaledgunitessre **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%= **0.00 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**
00.000m(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)

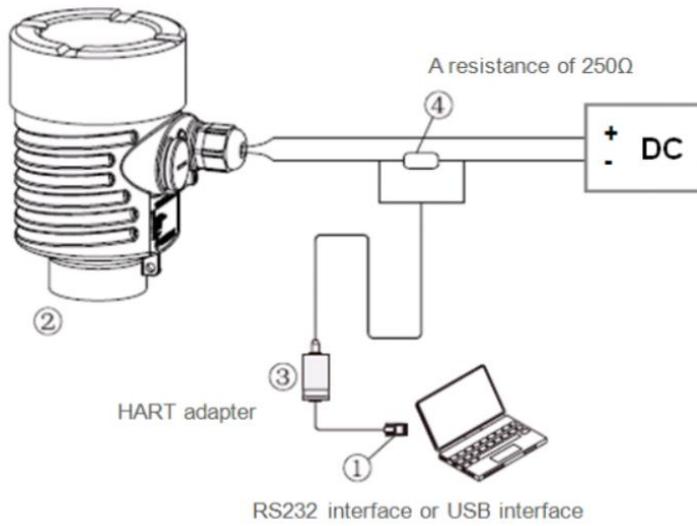
Press button OK, the corresponding parameters turn black, press button SELECTION or button "↑" for setting parameters, and press button OK for confirmation.

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

Adjustment with HART software



Adjustment with HART handheld programme

