Radar Level Transmitter

SK-R800N

User's Manual (Ver: 2.0)

Shaanxi 01000373

13L169-61

Shaanxi ShengKe Electronic Technology Co., Ltd

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Caution: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

To satisfy RF exposure requirements, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation.

To ensure compliance, operations at closer than this distance is not recommended.

Catalogue

1. Radar Level Transmitter Warranty and Service Scope

Since the date of shipment, the Radar Level Transmitter has a one-year warranty. This warranty is limited to the original purchaser or the user of the designated dealer and does not apply to any human reasons. Such as the transmitter has been damaged due to misuse, alteration, negligence, or accident, or abnormal use.

Free repairs are provided for faulty Radar Level Transmitter returned within the warranty. For the customer who wants to obtain the warranty service, please contact the after-sales service department and attach a description of the fault. After permission from our company, send the radar to the after-sales service department.

If the Radar Level Transmitter has expired or it is confirmed that the malfunction is caused by misuse, modification, negligence, accident and use under abnormal conditions, a maintenance cost budget will be provided according to the relevant maintenance fee standard, and maintenance will be carried out after approval. After the Radar Level Transmitter is repaired, it is sent back to the customer, and the customer needs to pay for the repair and transportation costs.

2. Unpacking Inspection and Precautions

2.1 Unpacking inspection

- User manual
- Radar Level Transmitter certificate
- Radar Level Transmitter packing list
- Radar Level Transmitter
- Check the name, model, etc. on the nameplate
- Check whether the shell is in good condition, and observe whether the glass cover of the display screen is broken
- Check other accessories according to the packing list

Check whether the specifications, models and accessories are correct and complete according to the Radar Level Transmitter packing list. If you have any questions, please contact the customer service center for replacement.

2.2 Precautions

- Please read this manual before installing the Radar Level Transmitter.
- Modifications due to product upgrades will not be notified please refer to the actual product.

3. Storage and Transportation

3.1 Storage condition

- Allowable storage temperature：–40℃～+85 ℃
- Use the original packing.

3.2 Transport the product to the measuring location

- Transport the measuring equipment to the measuring location within the original packing.
- Prevent collision, moisture and chemical corrosion during transportation and storage.

4. Product Description

4.1 Product overview

76-81GHz frequency modulated continuous wave (FMCW) radar product (also called millimeter wave radar), using millimeter wave band with higher frequency than Ku-band radar, long-distance imaging and multi-spectral imaging in remote target detection and strong smoke and dust environment. It has important applications, and can detect smaller targets than microwave radar and achieve more precise positioning, with higher resolution and stronger confidentiality.

As a 80GHz band radar used in the industrial measurement field, It has the incomparable advantages of other ordinary microwave pulse radars and guided wave radars. The extremely narrow beam and penetrating ability are more effective. Adapt to ultra-complex working conditions without compromising measurement performance.

4.2 Technical Parameters

Radar Level Transmitter	Two-wire system
Working Frequency	76-81GHz
Measuring range	0~30m
Accuracy	±0.02%FS
Signal output	4～20mA
Power supply	DC 24V (22V~30V)
Process pressure	-1~3bar
Communication	HART
Ambient temperature	-40℃～+85℃
Storage temperature	-40℃～+85℃
Ambient humidity	（0%～95%）RH
Explosion-proof mark	Ex db ia IIC T6 Gb
Electrical Interface	M20×1.5(F), 1/2NPT
Beam Angle	±2.9°
Display	128 × 64 LCD Screen, Debug module
Debugging Methods	Local display/ PC programme
Size	diameterϕ96mm × Height221mm
Mounting thread	G2”
Lens	PTFE
Mounting Method	Stainless steel flange / plastic flange
Migration/Offset	±9.9m
Weight	2KG
Protection level	IP65
Sealing material	FKM
Housing	Cast Aluminum
Optional accessorizes	Flange (SS304/SS316/PTFE/PP)

5. Scope of application

5.1 Medium

In general, the dielectric constant of the measured medium is required to be greater than “4”, so that it can have a good reflection section.

5.2 Radar Level Transmitter ambient temperature

The ambient temperature range of the Radar Level Transmitter is: -40℃～+85℃. It is recommended to use the instrument protection box in the northern area. In areas with strong direct sunlight, it is recommended to install the instrument in a cool place or use a sun visor, so as to avoid excessive temperature in the instrument caused by exposure to the sun, and to provide good ventilation and heat dissipation.

5.3 Explosion-proof and protection level

The Radar Level Transmitter adopts an explosion-proof structure with aluminum alloy casting and sealing and epoxy spraying on the surface.

Suitable for harsh environments containing explosive mixed gases, medium-concentration corrosive gases and “0-95%” humidity range.

Explosion-proof grade：Ex db ia IIC T6 Gb.

6. Radar shape structure

6.1 Radar level transmitter shape structure

- Radar level transmitter shape structure figure is shown as in Figure 1.

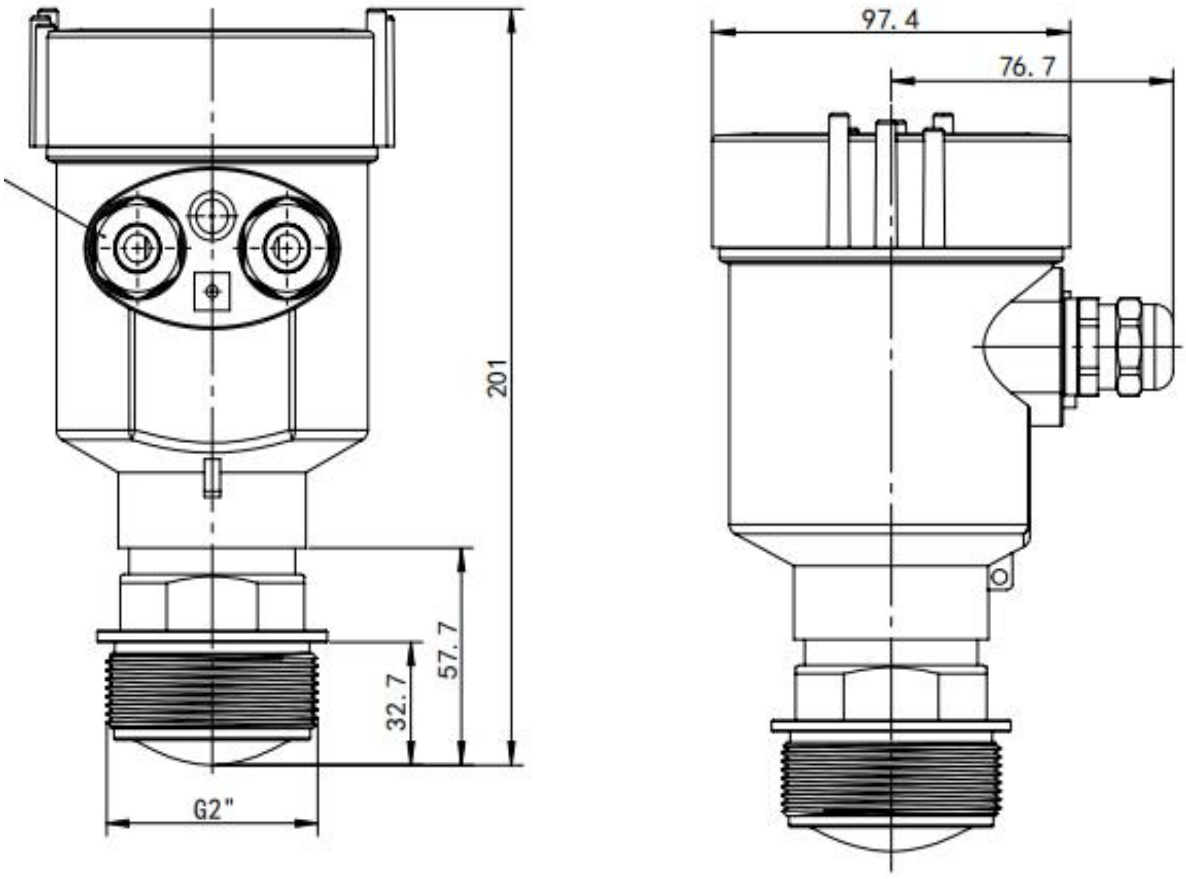


Figure 1 Radar level transmitter shape structure

7. Radar Level Transmitter interface

- Radar Level Transmitter interface figure is shown as in Figure 2.

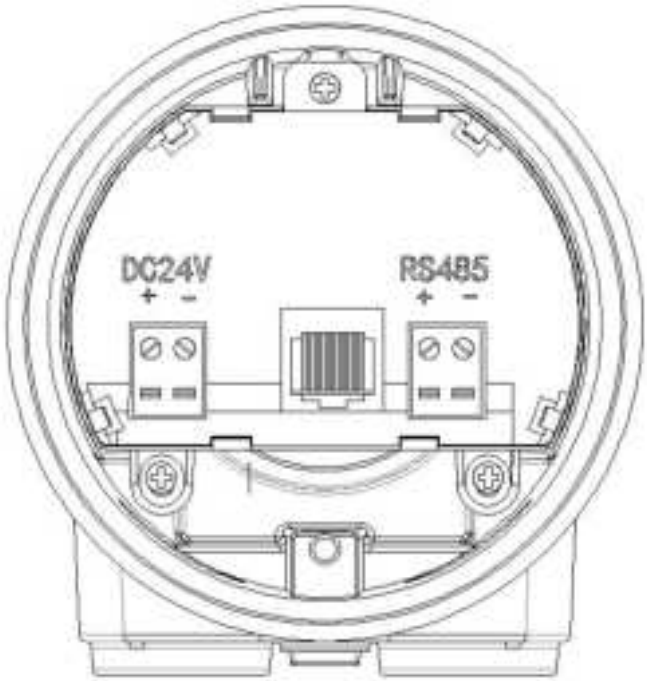


Figure 2 Radar Level Transmitter interface figure

- **Interface description**

Interface	Description
DC 24V （+）	24VDC(+)Power supply positive
DC 24V （-）	24VDC(-) Power supply negative
RS-485 （+）	RS - 485 communication positive
RS-485 （-）	RS - 485 communication negative

8. Radar debugging parameter description

8.1 Parameter setting man-machine interface

The radar uses a key-mode for parameter setting, and the key functions are shown in Figure 3.

Figure 3 key mode figure

Key function：

Key	**Function**
ESC	Back / Enter echo wave interface
UP	Up shift/ Increase key
DN	Down shift / Decrease key
OK	OK key / Enter setting parameter interface

8.2 LCD main interface of Radar Level Transmitter

Figure 4 LCD main interface of Radar Level Transmitter figure.

①	Work instructions	Flashing reminder when working
②	Level display	Level value（m/mm/cm/inch/ft）
③	Error code	00：No error（Does not show error） 01：No target detected 02：Level value jumped 08：Communication error
④	Temperature	Display the temperature value when the temperature display function is turned on.

8.3 LCD Wave interface of Radar Level Transmitter

Figure 5 LCD wave interface of Radar Level Transmitter figure.

①	Gap value
②	Echo quality

③	Echo position

8.4 Radar Level Transmitter parameter menu

8.4.1 User parameter menu description

User Para	Basic setup	Range
		Migration/Offset
		Show Type
		Pos: 4ma
		Pos: 20ma
		Blind area
		Damping Time
		Device ID
		Baud Rate
	Backup Para	
	Restore Para	

8.4.2 User Parameter setup scope and definition

Basic setup：

Range（500~50000）mm: Depends on the working conditions; indicates the farthest distance that the radar can measure.

Offset（-9999~9999）mm: Depends on the working conditions.

Show Type： Level /Ullage.

(Pos: 4ma): Level corresponding to 4mA current output, unit: mm.

(Pos:20ma)： Level corresponding to 20mA current output, unit: mm.

Blind area: The value range is “200mm” to the measuring range, which can be

set according to specific working conditions.

Damping time: In order to improve the stability of the measured output value, a larger [Damping time] can be set to stabilize the measured value and increase the anti-interference ability. For example, if the damping time is “10”, the measured level changes step by step at time “t”, and the measured output value will follow the actual position of the measured object after “10” seconds.

Device ID: The address of the slave during RS485 communications, that is, the address of the local machine (value range: “1-99”, the default value is “1”).

Baud rate: The baud rate of this machine during RS485 communications is “9600” by default. Please do not change the default value.

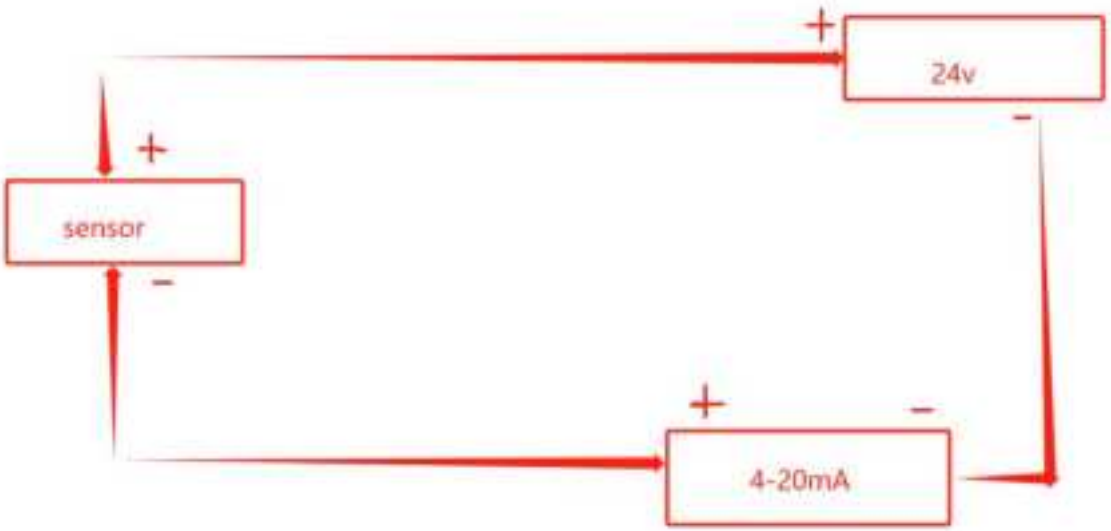
Backup Parameter：

After the working parameters are backed up, if you forget the original working parameters after manually modifying the parameters and forget the original working parameters, you can "**Restore Parameter**" in the menu.

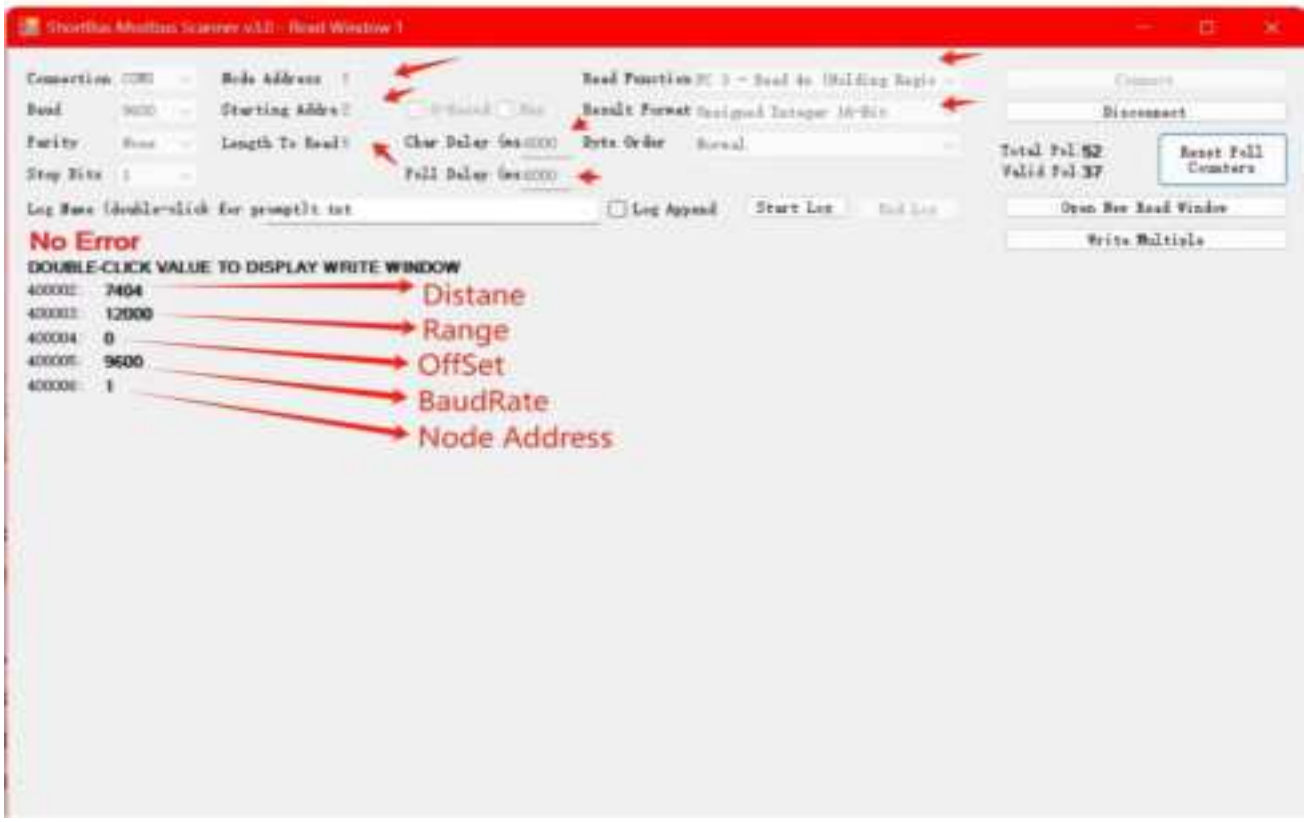
Restore Parameter：

Used to restore the backed up user parameters.

9. Wire connection



10. Modbus (RS485) connection



1: Read Paras, Use Command 0x03

Register List:

Address	Description	Data Type	Remark
0002H	Current Level	16 bit uinsigned integer	Unit: mm
0003H	Measure Range	16 bit uinsigned integer	Unit: mm
0004H	Base Offset	16 bit signed integer	Unit: mm
0005H	Baudrate	16 bit uinsigned integer	Unit: bps
0006H	Device ID	16 bit uinsigned integer	Value: 1-255

2: Write Paras, Use Command 0x10

Register List:

Address	Description	Data Type	Remark
0003H	Measure Range	16 bit uinsigned integer	Unit: mm
0004H	Base Offset	16 bit signed integer	Unit: mm
0005H	Baudrate	16 bit uinsigned integer	Unit: bps
0006H	Device ID	16 bit uinsigned integer	Value: 1-255

11. Radar Level Transmitter installation and Debugging

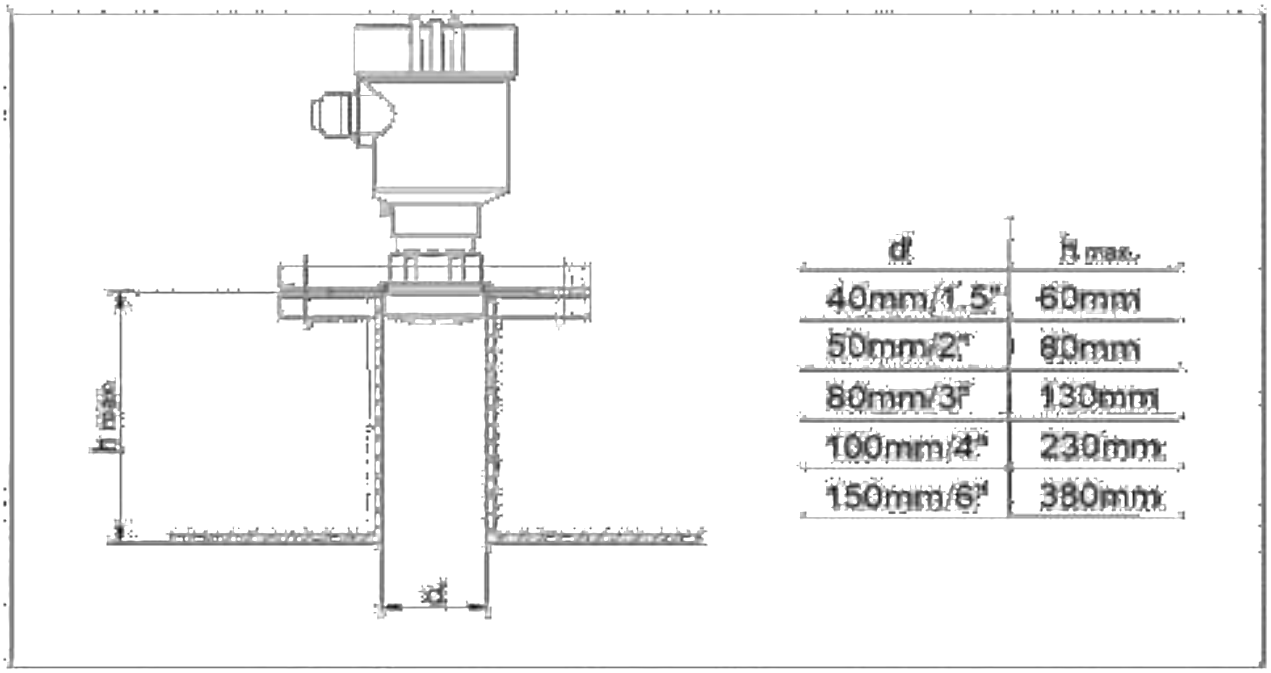
11.1 Preparation before installation

● Understand the internal structure and pipeline arrangement of the storage tank, and obtain information such as the diameter and range of the tank.

● Tools needed: flat-blade screwdriver (3*75mm), wire stripper (7mm²), hand-held knife, pipe wrench, DC 24V power supply.

● When the tools are ready, unpack the product and check the packing list to determine whether the materials are complete.

11.2 Radar Level Transmitter installation location selection



- Avoid installing the radar in a central location or close to the edge of the container, otherwise it is likely to produce false readings.

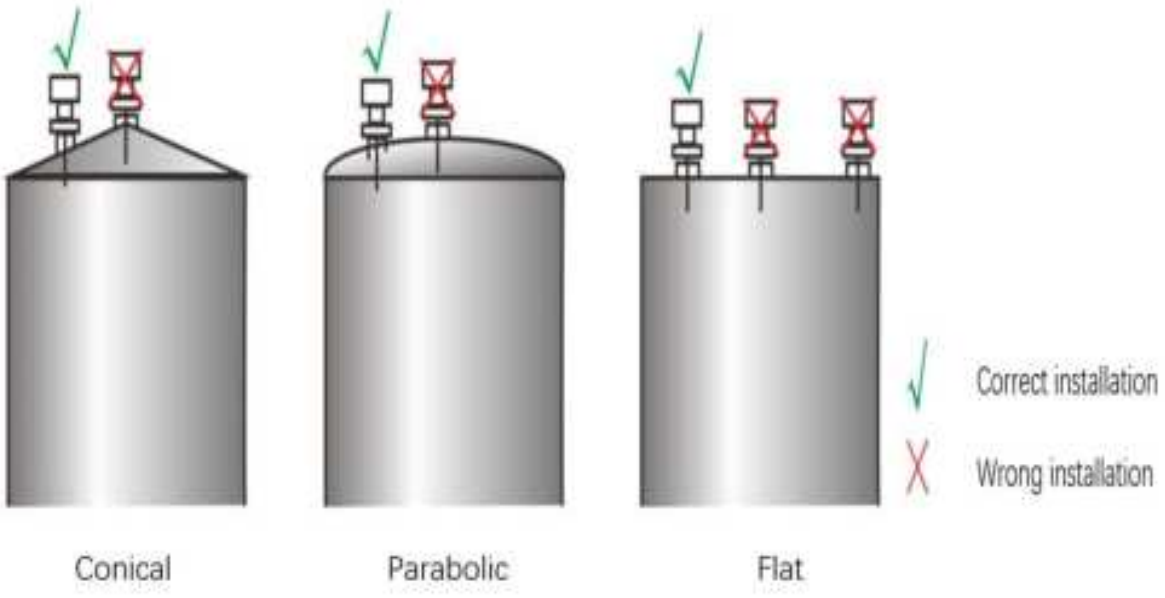


Figure 6 Radar installation location diagram

● Avoid false wave diagram

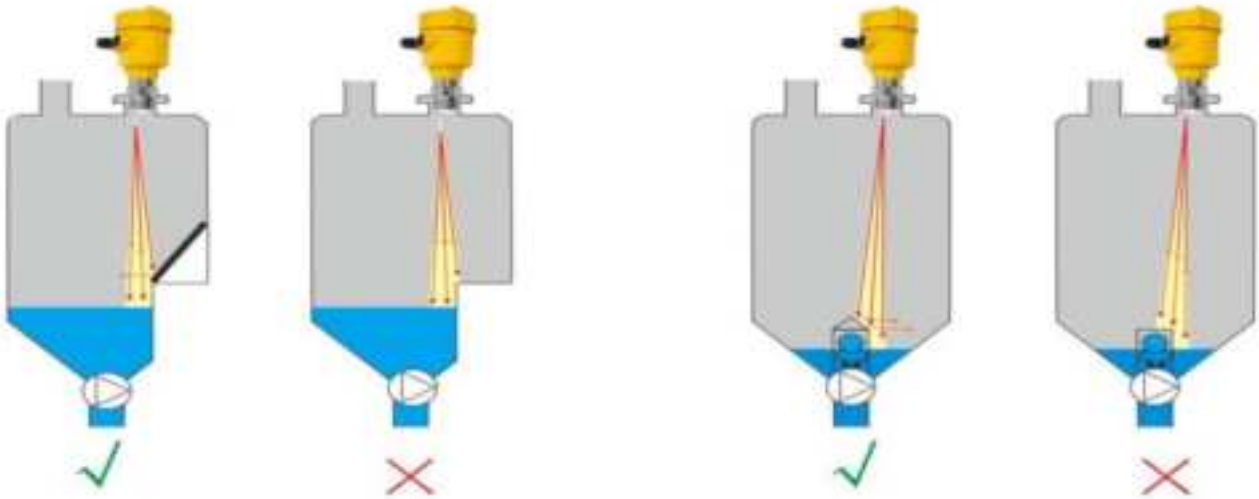


Figure 7 False wave diagram

● Treatment of stairs and grille tanks

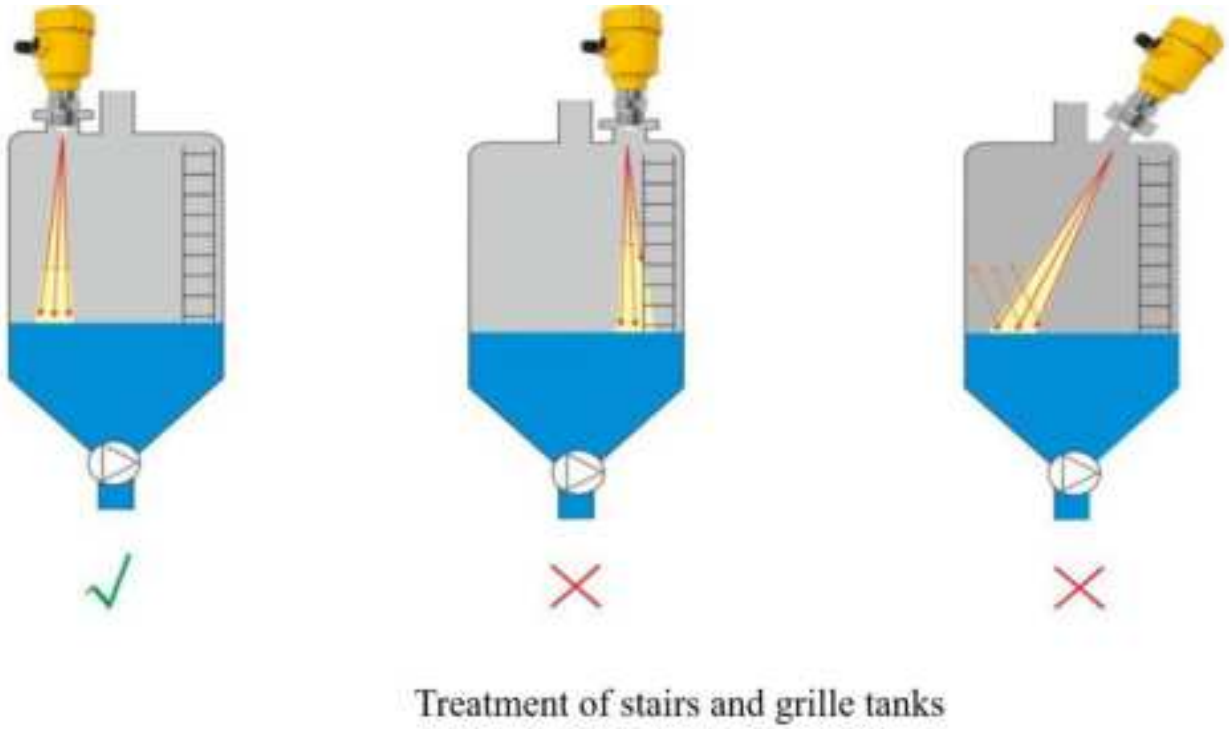


Figure 8 Treatment of stairs and grille tanks diagram

● Treatment of wall hanging and grille tanks

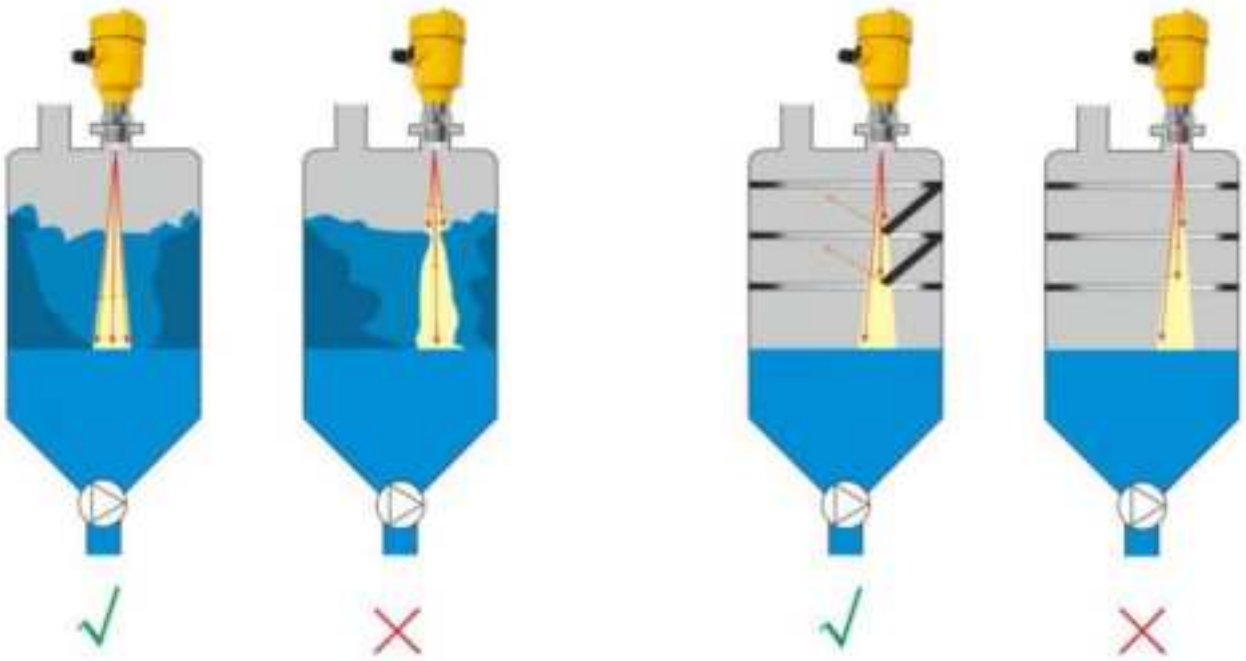


Figure 9 Treatment of wall hanging and grill tanks diagram

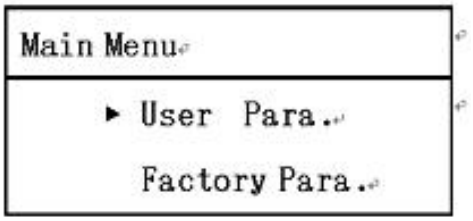
11.3 Software configuration instructions

● **Instrument connection**

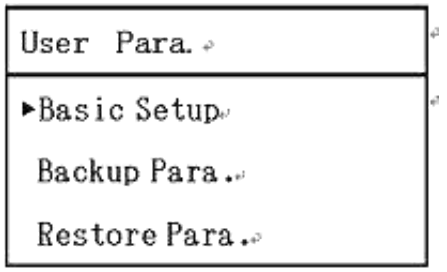
The power cord is connected to the DC24V terminal of the instrument, please pay attention to the positive and negative poles, and do not connect them wrongly.

● **Set instrument parameters**

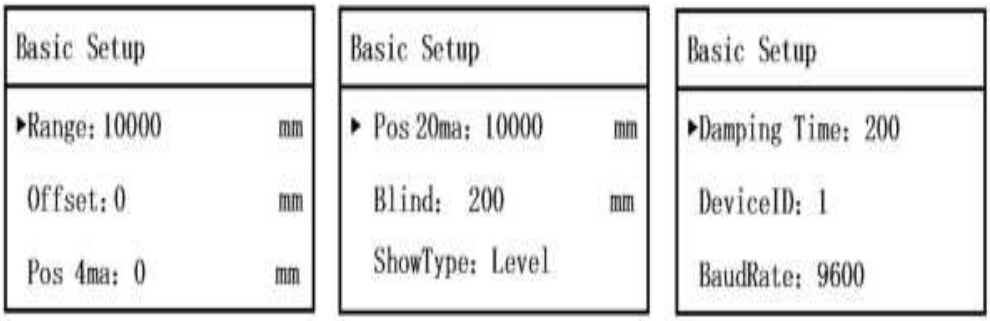
Facing the display window of the instrument, press the "**OK**" button, the transmitter will display "**Main menu**" , as shown in the figure below：



Press the "**OK**" button to enter the "**User Para**".



Press **"OK"** button to enter **"Basic Setup"**.



Set the "**Range**" according to the working conditions, press **"OK"**, after the range value is reversed, use the "**Upshift**" and "**Downshift**" button to input the range value, and then press the **"OK"** button to confirm.

Press ”**Downshift”** button to select **"Offset"**, press "**OK**" to reverse the migration value, enter the migration value, and press "**OK**" to confirm.

The same steps can be used to modify:

"**Pos: 4ma**"

"**Pos: 20ma**"

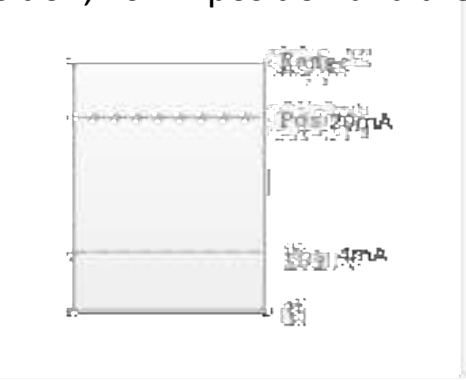
"**Blind area**"

"**Damping Time**".

After the modification, press the "**Backspace**" key to return to the "**User Para**" interface.

When the display type is set to level, the main interface shows the actual level value. When the display type is set to Ullage, the main interface displays the Ullage measured by the radar. Set the display type as required.

Pos:4ma and **Pos:20ma** must be within the range. The relationship between the 4mA position, 20mA position and the range is shown in the figure below:



If the level lower than **Pos: 4ma**, the main interface shows that the level is “0”, and if the level higher than **Pos: 20ma**, the main interface shows that the level is **Pos:20ma**.

12. Maintenance and Repair

- Please pay attention to keep the Radar Level Transmitter clean, try to be waterproof, moisture-proof, corrosion-proof and avoid violent collisions and blows from other objects.
- Please avoid direct sunlight to the main body of the Radar Level Transmitter,

stay away from heat sources and pay attention to ventilation. If the ambient temperature exceeds the rated temperature, appropriate cooling protection measures should be taken.

- When the ambient temperature is too low, an instrument protection box or other protective devices can be used for anti-freezing protection, and pay attention to keeping the radar level transmitter dry.
- The radar level transmitter should be checked regularly.(The detection cycle is determined by the user according to the specific situation)

13. Fault handling

Errors	Reason	Solution
No display	Power supply error	Check whether the DC 24V voltage and current meet the requirements.
	Wiring error	Check if the wiring is correct.
Value unstable	Too much fluctuation	Change the installation position of the radar or reduce the fluctuation of the object to be measured.
	Weak Signal	Try angle calibration or rotate the radar installation position.
	Strong electromagnetic interference	Connect the instrument to the ground or shield.

Error code:

E01: Liquid level not found.

E02: Liquid level jump is too large.

E04: Abnormal capacitor charging.

E40: Screen communication failure.

E08: Actual liquid level does not match 4-20mA position.(High, Low)