



S-RD RADAR LEVEL METER 90 Series

User Manual

(Version 21)



CONTENTS

I. Product Overview	1
II. Installation Requirements	2
2.1 Illustration	2
2.2 Installation Requirement	3
III. Electrical Connection	9
IV. Debugging	
V. Structure Drawing	
VI. Technical Parameters	15
VII. Operation Instructions	16
1. Basic Setting	
1.1 Min. adjustment	
1.2 Max.adjustment	
1.3 Medium	17
1.4 Damping Time	24
1.5 Range Setting	24
1.6 Near Blanking	25
1.7 Sensor Tag	
2. Display	25
2.1 Display Content	26
2.2 LCD Contrast Adjustment	
3. Diagnostics	27
3.1 Measured Peak	
3.2 Measurement Status	
3.3 Choose Curve	
3.4 Echo Curve	
3.5 Simulation	
4. Service	31
4.1 False Echo Memory	
4.2 Current Output	
4.3 Reset	34



35
40

I. Product Overview

This series of radar level meter adopts 26G high frequency radar sensor, its maximum measurement range can reach up to 70 meters. The new fast microprocessors have higher speed and efficiency, it also can do signal analysis, the instrumentation can be used for reactor, solid silo and very complex measurement environment.



• Principle

Radar level meter's antenna microwave pulse is narrow and its direction is downward. Microwave exposure to the medium surface then reflected back. While antenna system receives microwave, it will send the signal to electronic circuit automatically and convert it into level signals (because the microwave propagation speed, electromagnetic wave to reach the target and the reflected back to the receiver this time is almost instantaneous).



Datum measurement: Screw the thread or fix the sealing surface of the flange. Note: Make sure the radar level meter the highest level wouldn't enter the measuring blind area (Figure D shown below).

• The Characteristics of 26G Radar Level Meter:



II. Installation Requirements

2.1 Illustration





Note:

The reference surface for measurement: the bottom surface of the thread or the sealing surface of the flange.

When using radar level meter, make sure that the highest material level cannot enter the blind area of the measurement (the area shown in D (Blind Area) in the figure).

When setting the range parameter, be sure to include the height of the conical part of the tank (refer to A in the figure).

2.2 Installation Requirement

Installed at 1/4 or 1/6 of the diameter away from tank wall.

Note: The minimum distance from the tank wall should be 200mm.

Note: ① Datum plane

② The center of the container or symmetrical



The top plane of the conical tank can be installed in the middle of the tank top, It is guaranteed to measure to the bottom of the cone.

When there is a stock in tank, the antenna should be vertically aligned with the material surface.

If the material level is uneven, level meter installation direction must be adjusted by universal flange.

The angle of the horn makes the horn aim at the material surface as much as possible. (Because the inclined solid surface will cause echo attenuation, Even the problem of signal loss)



Stir

When there is stirring in the tank, keep the meter away from the stirrer if necessary. After installation, "false echo learning" should be carried out under agitation,

In order to eliminate the false echo effect generated by the stirring blade. If foam or waves rise due to stirring, the installation should use wave guide pipe.

False echo storage

When there is a stirring blade in the tank that interferes with the radar measurement, if the stirring blade cannot be avoided, a false return is required.

Wave storage eliminates interference signals generated by false waves.



If you want to get the normal level echo, the false echo storage can store the echo signal between the envelope curve in the figure below, the storage is defined as a false signal, and a normal level echo signal is obtained.



Normal material level echo drawing





Use guide wave pipe installation (guide wave pipe or by-pass pipe), can avoid obstacles and foam influence.

Due to feeding, mixing or other process handlings in container, it will generate foam on the surface so signal will be attenuate.

If bubbles caused measurement errors, should install the sensor in the guide wave pipe, oruse guided wave radar level meter.

Measuring inside the guide wave pipe, the guide wave minimum diameter is 50mm.

In the connection guide wave pipe, should avoid big cracks and welding. In addition, carry out "virtual False echo learning".

Note: while measure adhesive medium, should not use guide wave pipe.

Design requirements for guide wave pipe

- Metal material, smooth inside the tube;
- Preferably stretched or longitudinal welded stainless steel pipe;
- The weld must be as flat as possible and coaxial with the hole;

• While using pre-welded flanges or extending the sleeves and using a ball valve, the transition pipe must be aligned on the inside and fix after accurate matching;

The gap on the transition pipe is ≤0.1mm;

• Do not weld along the pipe wall. The inner wall of the guide wave pipe must remain flat and smooth. If user accidentally weld the inside, you should remove the uneven places and weld bead. Otherwise it will cause serious interference echo, so as to bring convenience to the attachment of the medium;



386

Guide wave pipe must reach at least the desired minimum filling height because the measurement can only be carried out in the tube;
Aperture ≤5mm, any number single side or full pass;

The antenna diameter of the sensor should be as consistent as possible with the inner diameter of the pipe;
The diameter should be consistent throughout the length;





Typical wrong installation:

The conical tank cannot be installed above the inlet.At the same time: when installing outdoors, user should take sun-shading and rain-proof measures

(1) Correct (2) Wrong

The meter cannot be installed in the middle of an arched or round tank top. In addition to generate indirect echo, but also influenced by the echo, multiple echoes may be larger than the signal threshold of true echoes, because they can be concentrated through the top. Therefore, it cannot be installed in the central location.

① Correct ② Wrong



Deflect the obstacle signal away

When there are obstacles in the tank that affect the measurement, it is necessary to install a reflecting plate to measure normally.

• Adapter height requirements: it needs guarantee that the antenna extends into the tank at least 10mm.



III. Electrical Connection

Supply Voltage

Cable Requirements

The power supply cable can use ordinary two-core cable, and the outer diameter of the cable should be $(8 \sim 12)$ mm to ensure the sealing of the cable entrance. Should use shielded cable if there has electromagnetic interference.

(4 \sim 20) mA /HART (two wire system)

The power supply and output current signal same two-core shielded cable. Refer to technical data for specific power supply voltage range. For intrinsic safety type, a safety barrier must be added between the power supply and the instrument.

(4 \sim 20) mA /HART (four wire system)

The power supply and the current signal are separated, refer to technical data for specific power supply voltage range, a two- core shielded cable is used for each one.

RS485/Modbus

Separate the power supply and the 485 signal line using a two-core shielded cable. For the specific power supply voltage range, refer to the technical data.

Connection Type

The wiring diagram of 24V two-wire system as below:



• Safety Guidance

Please comply with the requirements of local electrical installation regulations! Please abide by local regulations and requirements for personnel health and safety. All operations on the electrical components of the instrument must be completed by formal trained professionals.

Please check the nameplate of the meter to ensure that the product specifications meet your requirements. Please make sure that the power supply voltage is consistent with the requirements in the nameplate.

Protection Class

This instrument fully meets the requirements of protection class IP66/67. Please ensure the waterproof of the cable sealing head. Such as the following figure:

How to ensure that the installation meets the requirements of Ip67:

Make sure that the sealing head is not damaged. Make sure that the cable is not damaged.

Make sure that the cable meets the requirements of the electrical connection specifications.

Before entering the electrical interface, bend the cable downward to ensure water will not flow into the shell, see 1

Please tighten the cable sealing head, see (2)Please block the unused electrical interface with blind plug, see (3)

IV. Debugging

• Three debugging methods:

① LCD display /Button

(2) Upper Computer debugging

(1)

③ HART handheld programmer

• LCD Display /Button

Debug the meter through 4 buttons on the display screen. The language of the debugging menu is selectable. After debugging, It is generally only used for display, and the measured value can be read very clearly through the screen.



• Computer Debugging

Connect with computer via HART

- (1) USB
- (2) Radar level meter
- (3) HART adapter
- (4) 250 Ω Resistor



• HART Hand-held Programmer

- (1) HART handheld programmer
- (2) Radar level meter
- (3) 250 Ω Resistor

V. Structure Drawing





901





Bell height H	140	227	288
Horn Antenna Diameter D	$\Phi 46$	$\Phi76$	$\Phi 96$
Flange	DN50	DN80	DN100

903



Flange	Horn Antenna Diameter D	Bell height H
DN80	Φ76	227
DN100	Ф96	288
DN125	Φ121	620







Bell height H	227	288	620
Horn Antenna Diameter D	$\Phi76$	$\Phi 96$	$\Phi 121$
Flange	DN80	DN100	DN125



906

Flange	Horn Antenna Diameter D	Bell height H	PTFE Plate D
DN50	$\Phi 46$	140	66
DN80	$\Phi76$	227	132
DN100	$\Phi 96$	288	156

SMERI - Misuratore di livello radar S-RD - Manuale inglese

14

VI. Technical Parameters

	The outer	r shel		
The seal between the	shell and the shell		Silicone rubl	ber
Casing window Polycarbonate		te		
The ground terminal Stainless steel		el		
	The power sup	ply vo	oltage	
	The standard	(16 ~	~ 26) V DC	
	Intrinsically safe	(21.6	5 ~ 26.4) V DC	
Two wire system	Power max 22.5mA / 1W		1	
	- <100Hz Uss <iv allowa<="" td=""><td>Allowable ripple</td></iv>		Allowable ripple	
	(100~100K) Hz Uss <l0mv< td=""><td></td></l0mv<>			
	The cable pa	rame	ters	
Cable entrance /	1 M20xl.5 cable er	ntrand	ce	
plug	1 blind plug			
Terminal	Conductor cross section 2.5mm ²			
	Output para	amete	ers	
The output signal	(4 ~ 20) mA/RS485	5		
Communication protocol	HART			
Resolution	1.6μΑ			
	Constant current output; 20. 5mA			
Fault signal	22mA			
	3.9mA			
The integral time	(0~50) s, adjustat	ole		
Blind area	the ends of the an	tenna	1	
The maximum distance	80 meters			
Microwave	26GHz			
Communication interface	HART communicat	ion p	rotocol	
The measurement interval	about 1 second (d	epend	ding on the pa	arameter settings)
Adjust the time	about 1 second (d	epeno	ding on the pa	arameter settings)

Display resolution	1 mm
Working storage and transportation temperature	(-40∼100) °C
Process temp	perature (the temperature of the antenna part)
901	(-40∼130)℃
902/903/904/905	(-40∼250)℃
906	(-40∼150)℃
Pressure	Max.4MPa
Seismic	Mechanical vibration $10m/s^2$, (10 ~ 150) Hz

VII. Operation Instructions

1. Basic Setting.



1.2 Max.adjustment

Max adjustment for the range setting. It determines the current output linear corresponding relationship with the low position. When the display menu

number is 1.1, press the button to enter the high adjustment.

LCD display as below



1.3 Medium

When the display menu number 1.3, press the button to enter the programming menu of medium.

LCD display as below



1.3.1 Fast Level Change

When set the medium as liquid or solid, press the button to enter the Fast level change.



1.3.2 First Echo

When set the medium as liquid or solid, the screen display 1.3.1, press the

button to select the next 🔎 menu to e

menu to enter the first echo.



First echo	1.3.2
Normal Big Small Bigger ▶ Biggest	First Highest Multiple

I CD display as below

Press the button to select the processing of the first echo. There are 7 kinds of methods:

Normal: the amplitude of the first wave is not processed (the default value) Small: the first wave amplitude decreased by 10dB Big: the amplitude of first wave enhanced 10dB

Bigger: the first wave amplitude enhanced 20dB Biggest: the first wave amplitude enhanced 40dB

First: only identify the first valid echo (not recommend use)

Highest: identify the highest signal of echo curve, regardless of the wave width Multiple: reserve

1.3.3 (liquid) Surface Wave

When the material properties for liquid, the screen shows 1.3.3, press the

button to select the next menu to enter the surface fluctuation menu. LCD display as below



1.3.3 (solid) Pile Angle

 \mathbf{S}

When the material is solid, the liquid crystal display menu for 1.3.3, press the

button to select the next menu to enter the heap angle large menu



1.3.4 (liquid) Foam

When the liquid crystal display menu is 1.3.4, press the the next menu into the liquid level bubble menu

button to select





1.3.4 (solid) Dust Strong

When the liquid crystal display menu is 1.3.4, press the the next menu to enter the dust strong selection menu.

button to select



90 Series Radar Level Meter Press the other the DK value to adjust the menu. Low Dk 1.3.5 Yes NO

Press the button to select "yes", for DK hours of measurement setting, LCD display as below, then it needs manually enter a high value of empty tank, the value of location of the bottom tank to reduce reflection of bottom.



1.3.5 Micro DK

Select the material properties for micro DK, press the button to enter the LCD display of the micro DK settings

Micro DK setup	1.3.5
Empty Span	10.00m
True Level	0.00m
DK	1.00
0.020m	(d)

When choose material properties is micro DK, generally used for dielectric constant less than 1.4, when the medium surface direct wave is very weak, or can not be measured, and the tank bottom reflection method can measure material height, then need to input the following parameters:

1.Empty Span: Empty tank height, empty tank or empty containers' empty high value materials.

2.True level: Actual material level or tested material dielectric constant, the two parameter correlation, enter one is ok, the above parameters precision directly affects measurement results of precision value.

Note: Choose "Micro DK" carefully, most of the measurement is not appropriate, while choose "micro DK", the system will determine and judge to adopt direct echo or bottom reflection method is used to get the result of the measurement.

1.3.6 (liquid) Guided Wave Tube Setting OK When the liquid crystal display menu is 1.3.6, press the button to enter the guide wave tube setting menu. 1.3.6 Measure in tube Yes **Tub Diamet** 0mm OK button to enter the guide wave tube to measure the choice Press the menu. 1.3.6 Measure in tube Yes NO OK button and select "yes", then press the Press the button to enter into the guide wave pipe diameter setting menu. 136 Measure in tube Tube Diamet 0000mm

Note: the guide wave tube setting must be guided wave tube in the presence

of the case can be set effectively.

1.4 Damping Time

When the LCD menu number is 1.3, press the button, enter the damping time set menu.



1.5 Range Setting

In order to get the correct measurement results, it is necessary to set the scale range of the instrument, when the menu number is displayed as 1.4, press the



1.6 Near Blanking

When there has fixed obstacles near the sensor surface and interfere the measurement, and when the max material level will not reach the obstacles, user could use the blanking setting function to avoid the measurement error.

When the LCD display menu number is 1.5, press the button to enter the setting menu of the blind zone menu.



1.7 Sensor Tag

When the LCD display menu number is 1.9, press the button to move the menu to the sensor tag display item.

LCD display as below

 Sensor tag
 1.7

 SENSOR
 SENSOR

 Press the
 OK

 button to enter the parameter edit state, press the button to confirm after edition.

2 Display

This feature is used to set display information.

When it is in main screen, press the button to move the arrow to the display.





3.1 Measured Peak

It display the distance peak value during the measurement, this parameter could be cleared by using service menu 4.4 reset. When the LCD shows the

main menu, press the

button and move the arrow to diagnostics item.

Peak Values ^{3.1} Distance-min 0.000m(d) Distance-max 2.109m(d)

3.2 Measurement Status

On the page of menu 3.1, press the button, move on to the next diagnostic measurements, display the sensor measurement status

3.2 Meas.status Me.reliability 21db Sensor status E14

3.3 Choose Curve

On the page of menu 3.2, press the key to enter the waveform curve display function.



button and move the arrow to the curve which need to display, Press the

press the

button to confirm.

3.4 Echo Curve

On the page of menu 3.3, press the curve.

Curve zoom function:

OK

Curve zoom is used to amplify the curve on the time axis and amplitude for a clearer observation.

OK

key, the LCD displays the selected

OK

OK When the curve is displayed on the LCD, press the key to enter the curve zoom edit menu.

> LCD display as below 3.4.1 Echo Curve X-zoom Y-zoom Unzoom

Press the

the

button, select zoom direction or Unzoom, press the button to confirm.



button for confirmation, the selected area curve will be enlarge to full

screen. Press the button to exit curve display.

3.5 Simulation

OK

The simulation function is the simulation output of 4...20mA current. It is used to check whether the current output function of the meter is normal or not. Meanwhile, it can also be used for system debugging. When the LCD shows



Note: Description of the three alternative menu items

Percentage: output current according to the given percentage value. For example, 100% corresponds to output 20mA, 0% corresponds to output 4mA. **Current:** Output current according to the given current value. For example, 16.6mA corresponds to output 16.6mA.

Empty Span: output current according to the given empty span value. (The corresponding relationship between this value and the current value is adjusted by 1.1 low position and 1.2 high position)

4. Service

The service menu includes more specialized functions for trained personnel. Mainly include false echo learning, reset and instrument parameter storage.

When the LCD shows the main menu, press the \checkmark key to move to the service item,

key to move the arrow

LCD display as below Basic settings Display Diagnostics Service Info

4.1 False Echo Memory

When there is a fixed obstacle in the measurement range that interferes with the measurement, the false echo learning function can be used to overcome its influence (refer to the installation position diagram). When the LCD display

main menu 4.1, press the button, enter service sub-menu.





Prompt to enter the real echo distance value. After entering the distance value, press OK to confirm.LCD display "Please wait". The instrument will start the false echo learning, and then return to the false echo learning menu after completion.

Note: update false echo curve and creates new false echo curve differences: create a new false echo curve, clear the false echo curve after the real echo, but update the false echo curve, the false echo curve will keep same after real echo.

To edit the false echo curve, press the

button, move the arrow to the

needed item, press the button to confirm, this function could edit or change the created false echo to suitable for special condition, enter false echo edit LCD display as below: (note: this menu required special well trained engineer operation):



Curve edit every time two points, start and end is the location coordinates of will edit curve, the AMP value after it is the value need revise(note: when the range coordinates after input or edit, the corresponding AMP will update automatically according to the present save data, which will work as the

reference of AMP edit); after two coordinates well edit, press the

OK

to confirm. The instrument will connect the line according to the two points automatically, then generate new false echo curve and replace the old curve;



4.2 Current Output

This setting is used to set the current output mode When the LCD display 4.1,

SAVE?

press the 🔛 button.



Output mode 4-20mA or 20-4mA optional. 4-20mA means low level is 4mA, high level is 20mA; 20-4mA means low level is 20mA, high level is 4mA. When the LCD display current output menu 4.2, press the button, move the arrow to the button to confirm. current output place, then press the 4.2 Current output 4-20mA 20-4mA Failure mode button, select the needed setting, press the Press the button to confirm the selection. Failure mode is used to select when there is a fault alarm, the output current can not be changed, 20.5mA, 22mA or 4.0mA. In LCD display current output button, move the arrow to the failure mode, select menu 4.2, press the OK button to confirm. press the LCD display as below 4.2 Current output No change 20.5mA 22.0mA 4.0mA button, select the needed setting, press the Press the button to confirm your choice.

4.3 Reset

There're four reset functions available: basic settings, factory settings, peak

values measurement, total flow reset.

Basic settings is to make the parameters of instrument basic setting to the default setting;

Factory settings is to make the make all the instrument settings back to factory default setting;

Peak value measurement reset is to clear total of the measured peak value in the diagnosis;

Total flow reset used when the instrument used as open channel flow meter, clear the total flow.

-

When display current output (menu 4.2), press the	button, enter rese	t
function.		

LCD display as below	
Reset	4.3
Select reset 🕨	

Press the button, enter the reset selection menu, you need to select the appropriate reset function reset. Unit of measurement



4.4 Units of Measurement

Units of measurement available to users by using metric or British



measurement. When the LCD display reset menu (menu 4.3), press the button, enter measurement units settings.



Press the button, enter the measuring unit selection menu, you need to select the appropriate units of measurement.

4.5 Language

Language has Chinese, English, French, Italy, four language options. When the

LCD display measuring unit (menu 4.5), press the button, enter the language settings.

LCD display : English

Press the button, enter the language selection menu, select the language you want.

4.6 HART Working Mode

When two or more instruments with HART communication interface to connect to the host computer, it needs to set the instrument to multidrop working mode. When the LCD display measurement units (menu 4.5), press

the button, enter HART operation mode menu.



Press the button to select standard or multi-drop working mode. When select standard working mode, the address is 0.when choose HART operation mode as multi-drop.



Address changed to 1~15; working current of 4mA and 8mA optional, press

button to confirm. the

4.7 Password

Passwords used to protect instrument parameters, after start the password function, when change any flow meter parameters need input password, after input correct password, the password protection function are limited to cancel, user could change the instrument parameters. When the LCD display HART

button, enter password function. operation mode, press the

LCD display as below					
PIN	4.7				
Enable?					

OK

button to start the password function and set the password or Press the prohibit password function

4.8 Distance adj.

Distance adjustment setting use to change instrument measurement error, that is the actual distance value and display value difference, when the LCD

display menu 4.7, press the 🔛 button, enter distance adjustment menu setting.

Distance adj	4.8
+0.000m(d)	

(Note: this menu need well trained engineer operation)

4.9 Threshold Setting

It use to set the effective echo threshold big or small, the bigger threshold

setting, it requires stronger effective echo range, it is much better to eliminate small signal noise interference, but need to notice: if change threshold value larger than effective echo amplitude, it will result in misunderstanding. This menu including echo threshold and envelope level, the default amplitude of echo threshold is 60mV, default value of envelop is 5mV.



4.10 AUTOGAIN

Echo wave signal strength auto gain adjustment (suggest to reserve)



5. Information

Information menu including basic information about production, such as product serial no, date, software version etc. When LCD display main menu,

press the button, move the arrow to the information item.



5.1 Sensor Type

Serial Number



5.2 Date of Manufacture

Software Version



VIII. Troubleshooting

Error Code	Error	Solution
Err11	Power supply faulty	Use a multimeter to check whether the power supply of the product is outside the normal range, please make sure that the power supply of the product is within the normal range
Err12	HART faulty	Check whether the load resistance (250 ohm) wiring is correct or not, and then check whether the communication between the product and the host computer is normal or not.

Err13	MODBUS RS485 faulty	First check RS485 communication wire positive and negative terminal is corrected connected according to indication, and confirm RS485 shift to RS232 communication shift module is work normal or not, the hardware connection make sure no problem, then make sure RS485 MODBUS instruction is send by instruction table info. or not.
Err14	Without receive effective echo wave signal	Check echo curve menu and make sure echo wave is exist or not, make sure the product enter blind zone or not, check range setting could satisfy actual application, then check the installation position could meet the requirements or not.
Err15	Internal memory data read/write error	Send back to factory .
Err16	Device temperature exceeds the permitted range	It indicates electronic databank actual working temperature beyond -40℃~+85℃, please make sure product within normal operating range.
Err17	Device EEPROM data read/write error	Send back to factory.
Err18	System component parameters not match	Send back to factory.

