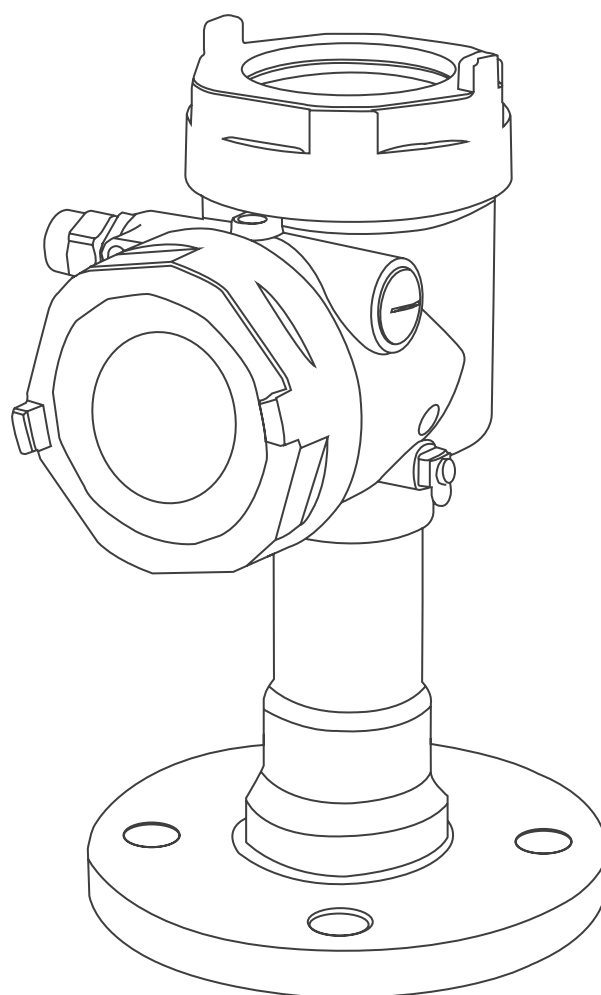


SL90 Radar Level Meter

Selection Manual





SL90 Radar Level Meter

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01 | Product overview

SL90 series sensors are high-frequency radar level measuring instruments. The new and fast microprocessor can analyze the signal with higher speed and lower beam energy. They can be installed in all kinds of metal and nonmetal containers, reactors or solid silos under complex measurement conditions, and can be used for non-contact continuous measurement of liquid, slurry and particle level. They are suitable for the working conditions with great changes of dust, temperature and pressure. The radar level meter has no harm to the human body and the environment. It is also not affected by the specific gravity of the medium, not affected by the change of the dielectric constant, and does not require on-site calibration.



02 | Structure and working principle

The radar level antenna emits a narrow microwave pulse, which is transmitted downward through the antenna. After the microwave touches the surface of the measured medium, it is reflected back, and then received by the antenna system and transmitted to the electronic circuit, which is automatically converted into the level signal (Because the propagation speed of microwave is very fast, the time taken for the electromagnetic wave to reach the target and return to the receiver is almost instantaneous.)

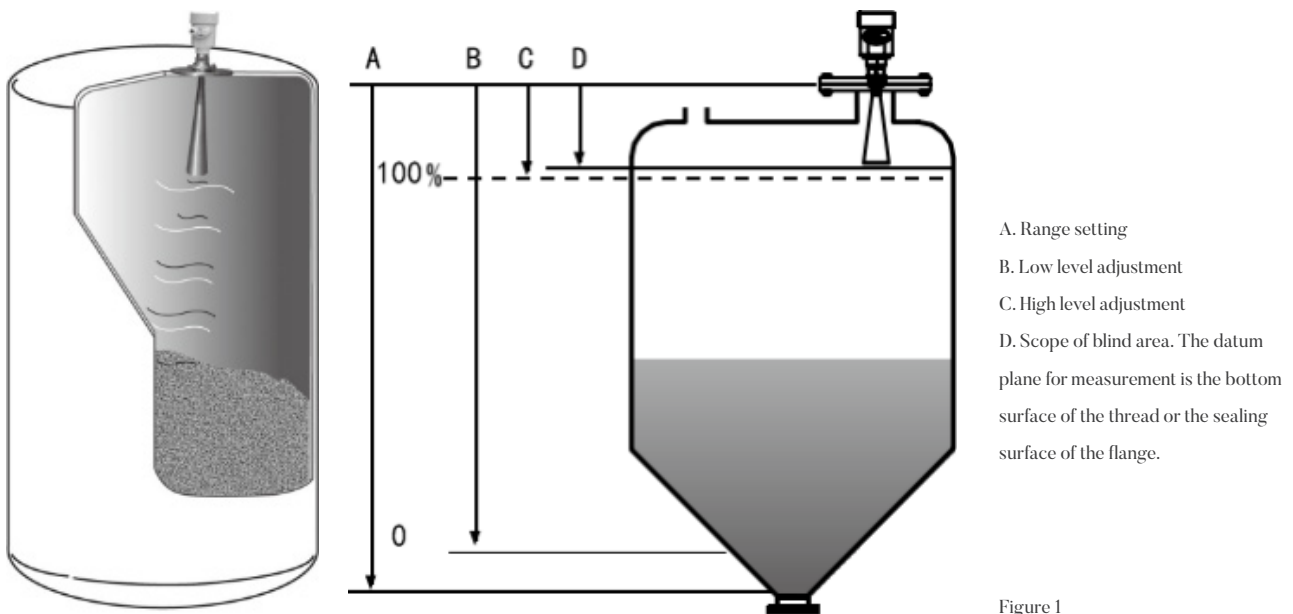


Figure 1



03 | Product advantages

- ▶ Non-contact radar without wear or contamination
- ▶ Small antenna size for easy installation
- ▶ Shorter wavelength for better reflection on inclined solid surface
- ▶ Smaller blind area resulting in better measuring results for small tanks
- ▶ Small beam angle and concentrated energy which not only enhances the echo ability, but also helps to avoid interference
- ▶ Almost unaffected by corrosion and foam
- ▶ Almost unaffected by changes in water vapor, temperature and pressure in the atmosphere
- ▶ Serious dust environment does not affect the operation of electromagnetic waves
- ▶ High signal-to-noise ratio for better performance even in the case of fluctuations
- ▶ High frequency which is the best choice for measuring solid and low dielectric constant media



04 | Technical parameters

4.1 Technical parameters of the level meter

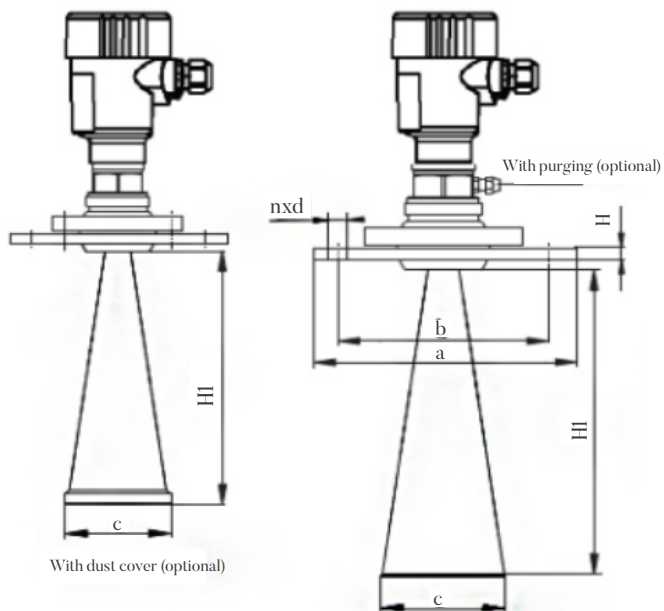


Table 1:

Technical parameters		
Connection mode	Thread G1½ "A /Thread 1½ "NPT/flange	
Antenna profile	Stainless steel/PTFE	
Sealing material	Silicone rubber	
Grounding terminal material	Polycarbonate	
Housing window material	Stainless steel	
Cable parameters	Cable entry/plug	1 M20 × 1.5 cable entry
		(Cable diameter 6-12mm) 1 blind plug M20 × 1.5
	Terminal	Conductor cross-section 2.5mm ²
Microwave frequency	Guided wave, 26GHz, 80GHz, 120GHz	
Communication interface	HART communication protocol	
Measurement interval	Approx. 1 second (depending on the parameter setting)	
Adjustment time	Approx. 1 second (depending on the parameter setting)	
Display resolution	1mm	
Working storage and transportation temperature	(-40 ~ 80)°C	
Output parameters	Output signal	(4 ~ 20) mA
	Communication protocol	HART
	Resolution	1.6uA
	Integration time	(0 ~ 36)s
Relative humidity	<95%	
Pressure	Max. 4MPa	
Shockproof	Mechanical vibration 10m/s ² , (10 ~ 150)Hz	
Supply voltage	Standard	(4 ~ 20)mA/AC 220V/DC 24V (four-wire system)
		(4 ~ 20)mA/DC 24V (two-wire system)
	Intrinsically safe type	(4 ~ 20)mA/DC 24V (four-wire system)
		(4 ~ 20)mA/DC 24V (two-wire system)
Power consumption	Max. 22.5mA / 1W	
Protection level	IP67/IP66	
Field display	Four-digit LCD programmable	
Explosion class	Exia IIC T6 Ga/ Exd IIC T6 Gb	
Signal output	4 - 20mA /HART (2-wire/4-wire) RS485 /Modbus	



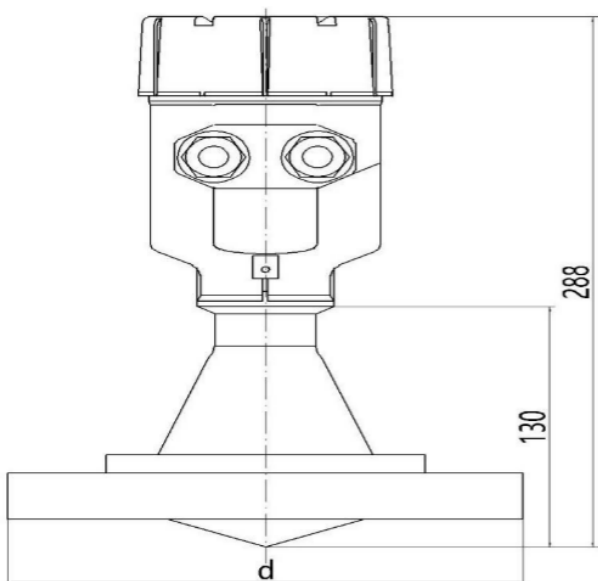
5.1 SL90-20



c	H1(316L)	H1(316L with cover)
Φ48	140	/
Φ78	227	/
Φ98	288	300
Φ98 (lengthened)	474	480
Φ123	620	525

Figure 2

5.2 SL90-21



Flange diameter	d/mm
DN80	Φ200
DN100	Φ220
DN123	Φ250
DN150	Φ285

Figure 3

5.3 SL90-22

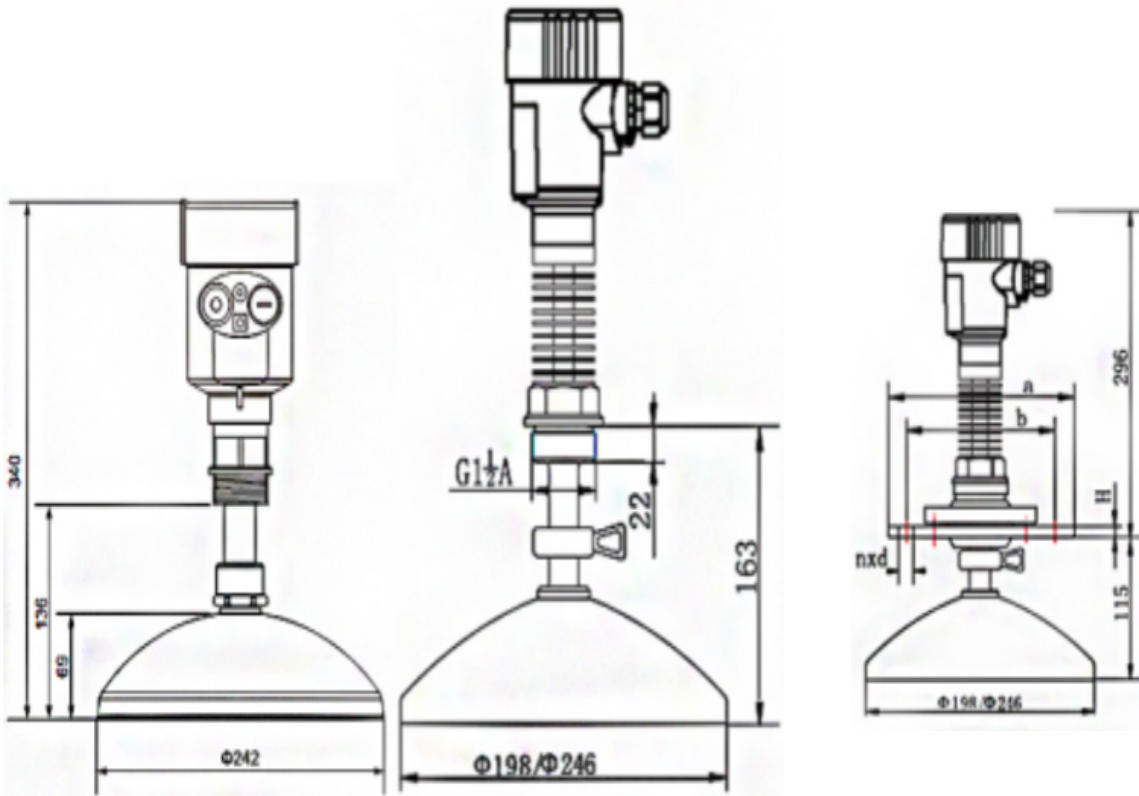


Figure 4

5.3 SL90-23

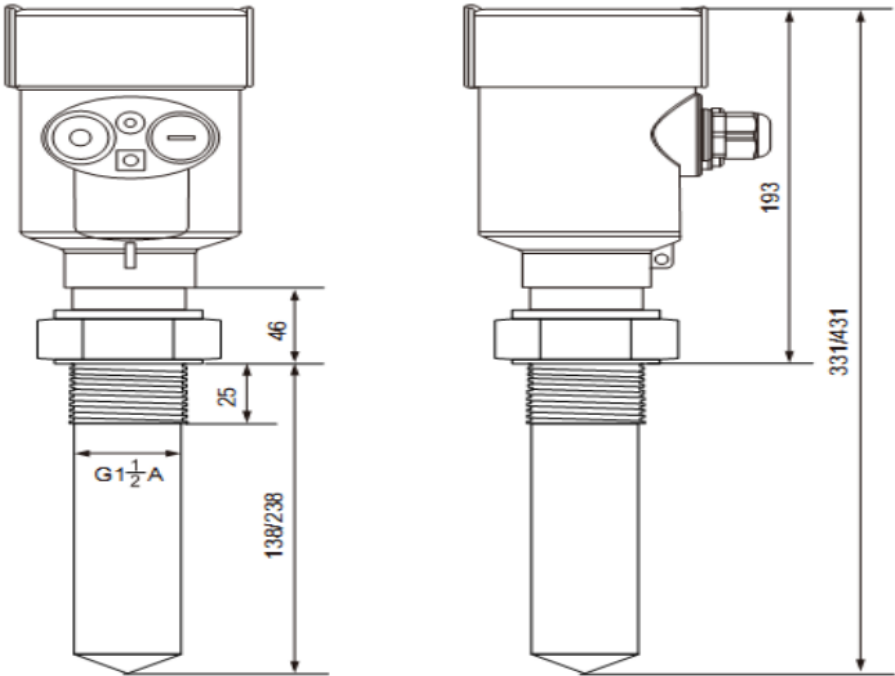


Figure 5

5.3 SL90-24

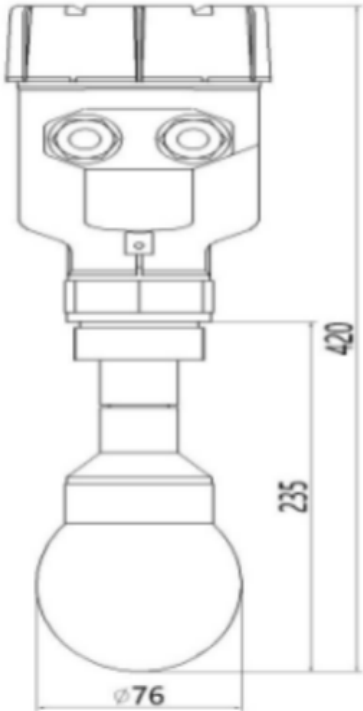


Figure 6

5.4 SL90-25

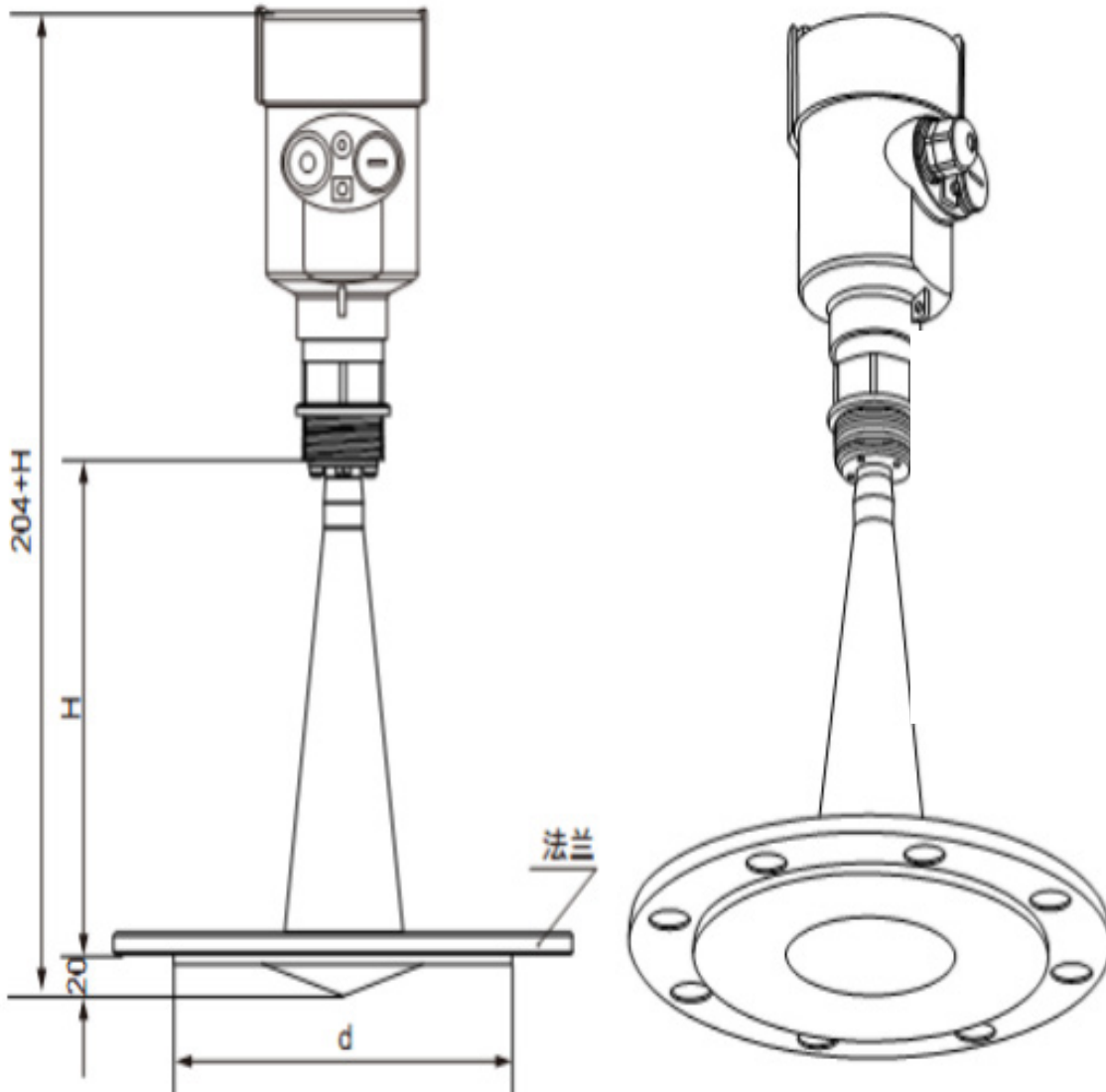


Figure 7

Flange diameter	Flare diameter D	Flare diameter H	Teflon disk d
DN50	Φ46	140	99
DN80	Φ76	227	132
DN100	Φ96	288	156



6.1 Product selection

Table 2:

SL90	Radar level meter	
Type	1	Guided wave
	2	26G
	3	80G
Permit	P	Standard type (not explosion-proof)
	I	Intrinsically safe type (Exia IIC T6 Ga)
	G	Flameproof type (Exd IIC T6 Gb)
Process connection	S	Thread
	F	Flange
	E	Other
Calibre	XXX	DN50, DN80, DN100, DN125, DN150
Antenna type	0	Horn
	1	Plane
	2	Paraboloid
	3	Rod
	4	Drop shape
	5	Lens
	6	Cable probe
	7	Bar probe
Antenna material	8	Other
	R4	304
	RL	316L
	Rp	PTFE
Process temperature	E	Other
	V	(-40~130)°C
Field display	K	(-40~230)°C
	0	Without
	1	With



07 | How to select and precautions

7.1 The following parameters shall be provided for selection:

- ▶ Working conditions: temperature, pressure, medium, measuring range
- ▶ Tank shape: arch top, flat top, open top, flat bottom, cone bottom, arc bottom
- ▶ Tank condition: Whether it contains strong corrosive media components (hydrochloric acid, CL ions, etc.), whether it is easy to crystallize (ammonia), whether it is stirred, foam, steam, condensation, sticky material, dust, etc. Whether there is a large source of interference on site, mainly electromagnetic interference. Know the dielectric constant.

7.2 Precautions for selection:

- ▶ The temperature of the medium is measured. The measuring range of common radar level meter is (-40 to 130)°C. When the temperature is higher than 130°C, the high temperature type is selected, and when the temperature is more than 200°C, nitrogen purging function is required.
- ▶ The physical properties of the measuring medium need to be determined, including corrosivity, crystallization, etc. Different models shall be selected according to the specific physical characteristics.
- ▶ When there is mixing in the tank, it is necessary to implement the specific mixing specifications, including the number of fan blades, the distance between the fan blade and the pipe wall, and the radius parameters of the fan blade. When installing the radar level meter, the mixing fan should be avoided as far as possible.
- ▶ The measuring range of tank is directly related to the precision parameters of the meter, which must be accurately determined.



08 | Meter installation diagram

8.1 Installation method

8.1.1 Installation location

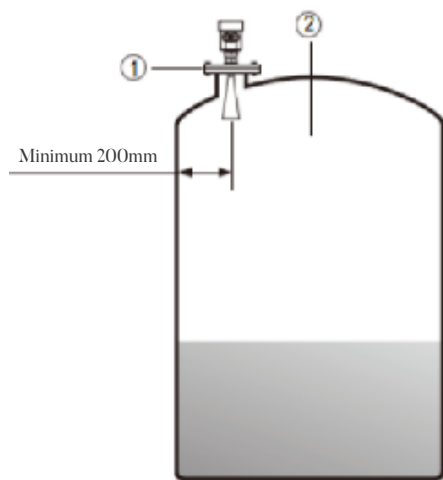


Figure 15: The meter should be installed at 1/4 or 1/6 of the tank diameter.

Note: Minimum distance from the tank wall shall be at least 200mm.

① Reference plane ② Center of container or axis of symmetry

8.1.2 Conical tank



Figure 16: The conical tank with flat top can be installed in the middle of the tank top to ensure that the measurement to the conical bottom.

8.1.3 Storage tank with stockpile

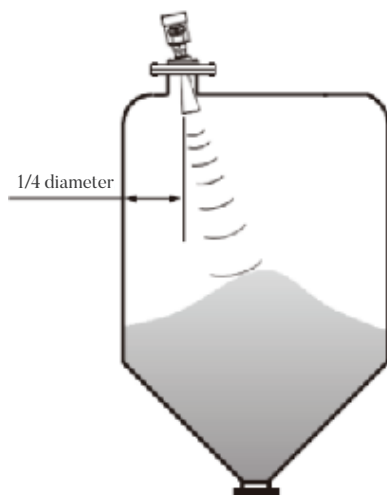


Figure 17: The antenna should be aligned vertically with the material surface. If the material surface is not flat and the pile angle is large, a universal flange must be used to adjust the angle of the horn so that the horn should be aligned with the material surface as much as possible. (Because the inclined solid surface will cause echo attenuation and even loss of signal)

8.1.4 Measurement in wave guide

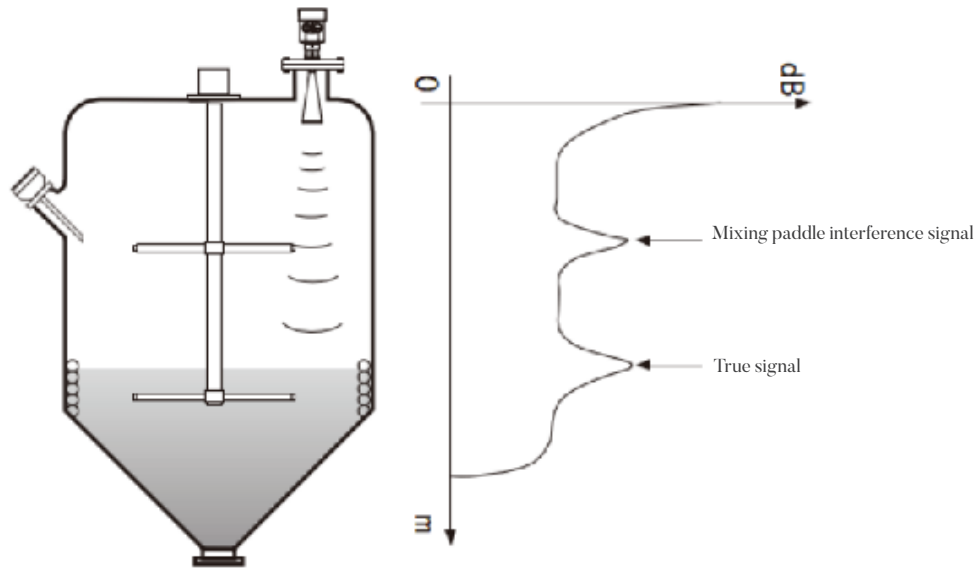
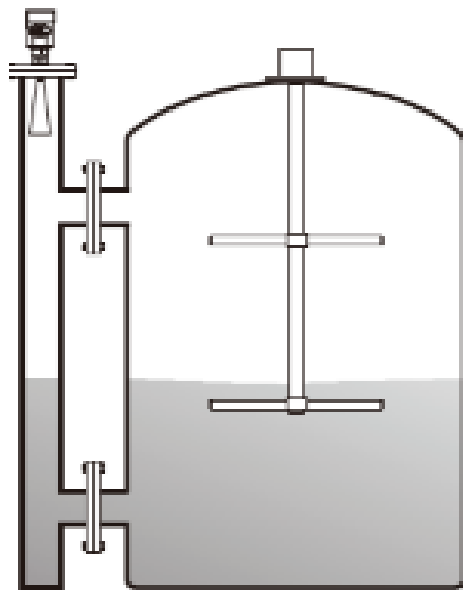


Figure 21: Obstacles in the area radiated by the emitted microwave beam, such as human ladders, limit switches, heating equipment, brackets, etc., will cause interference and cause measurement errors. If it is affected, it is necessary to add a wave guide to measure.

Bypass pipe installation



Wave guide installation

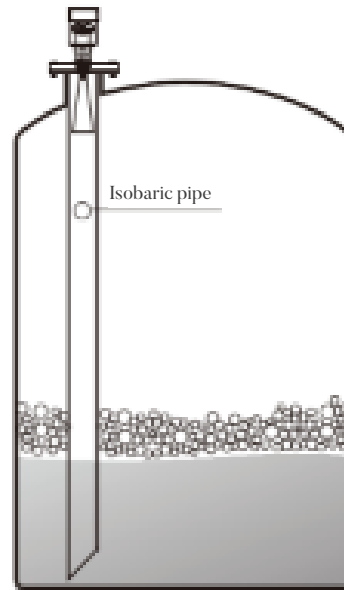


Figure 22: The use of wave guide (wave-guide or by-pass pipe) can avoid the influence of obstacles, foam, and liquid surface fluctuations in the container on the measurement.

Note: The diameter of isobaric hole is (5 - 10) mm. The diameter of the wave guide is at least 50mm and the inner wall should be smooth. The wave guide can only measure the medium with good mobility, and viscous media cannot be measured with a wave guide.

8.4 Container nozzle

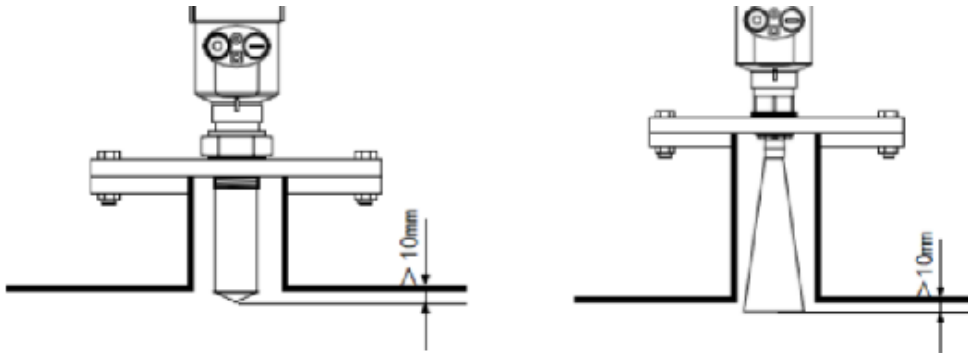
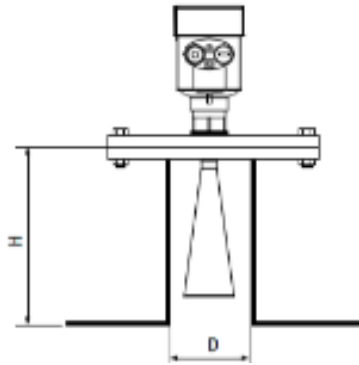


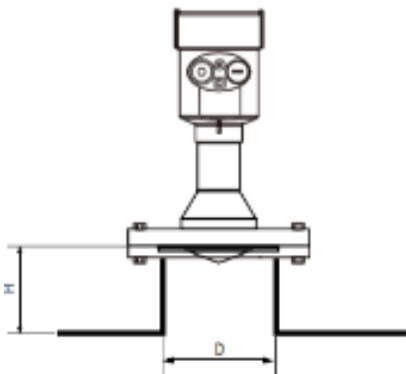
Figure 23: Radar installation has strict requirements on the length of container nozzle. In general, the horn antenna needs to extend beyond the nozzle, because the reflected wave generated at the end of the nozzle may affect the measurement results. Requirements for nozzle height: the antenna must extend at least 10 mm into the tank.



D	Hmax
50mm(2)	200mm
80mm(3)	300mm
100mm(4)	450mm
125mm(5)	700mm

Figure 24: For 26G high-frequency radar, if the measured medium has good reflection characteristics, the container nozzle can also be longer than the antenna. The standard length of the container nozzle is shown in the table below. In this case, the end of the nozzle must be ground flat. There must be no burr and other protrusions. If necessary, "false echo learning" function can be used to eliminate the reflection at the end of small nozzle, and good measurement results can also be obtained.

Schematic diagram of HBRD906 nozzle



Moisture-proof

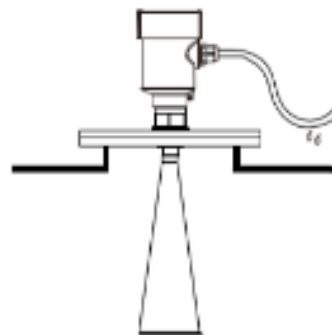


Figure 25: For the meters installed outdoors or in damp rooms and on refrigerated or heated tanks, the cable envelope shall be tightened in order to prevent moisture, and the cable shall be bent downward at the inlet, as shown in the figure.



9.1 Debugging mode

There are three ways to debug the SL90 series products:

1. Display/Key
2. Upper computer debugging
3. HART hand-held programmer

9.2 Display/Key

The meter is debugged through the 4 buttons on the display screen, and the language of the debug menu is selectable. After debugging, it is generally only used for display, and the measured value can be read out very clearly through the glass window.

- ① LCD ② Key

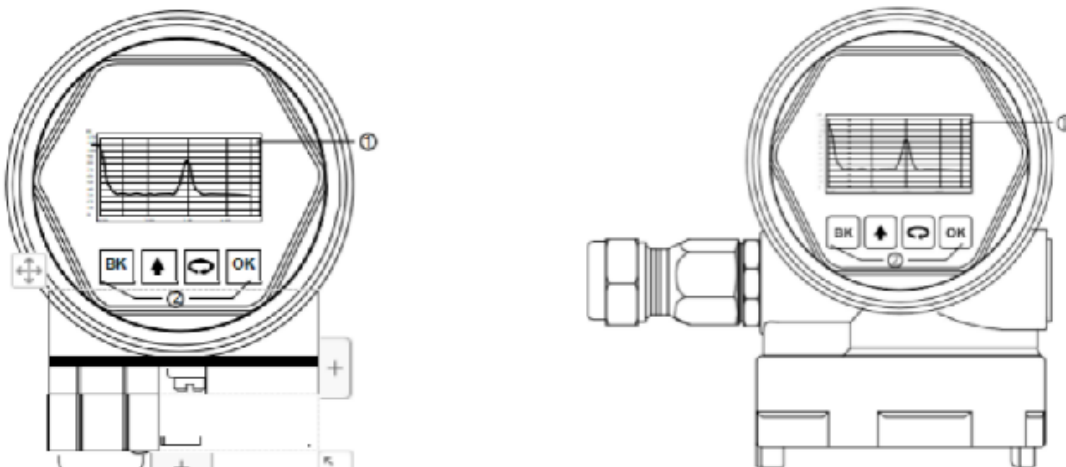


Figure 31

9.3 Upper computer debugging

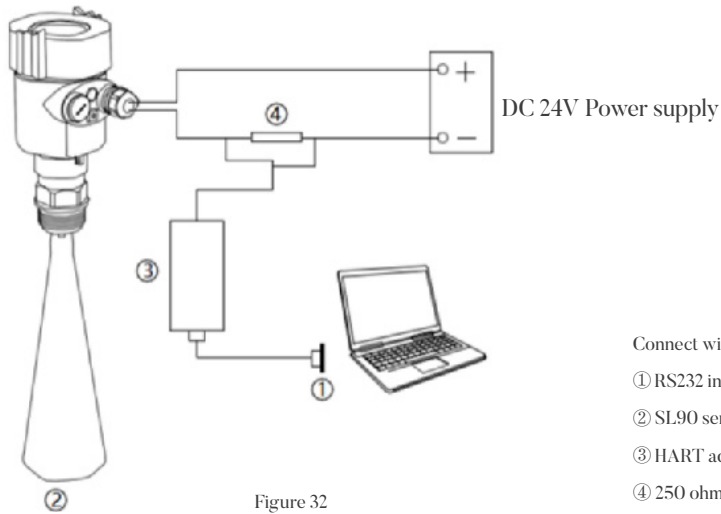


Figure 32

Connect with the upper computer through HART

- ① RS232 interface/or USB interface
- ② SL90 series
- ③ HART adapter
- ④ 250 ohm resistance

9.4 Programming with HART hand-held programmer

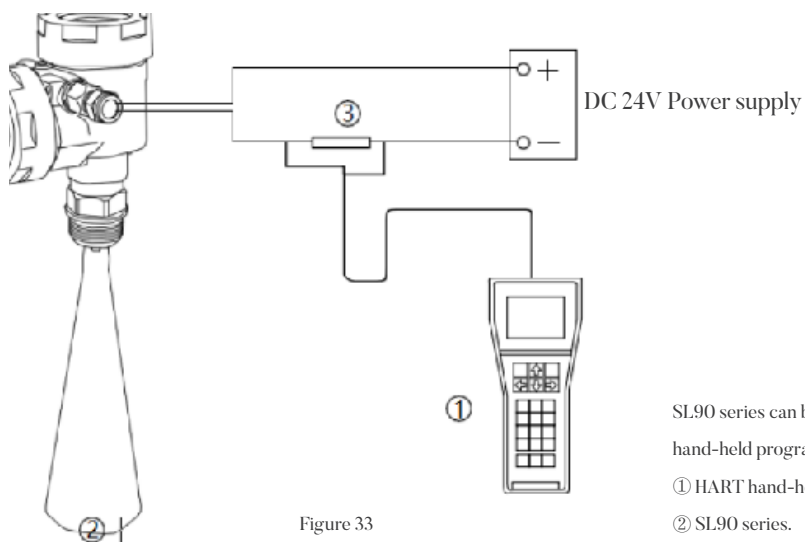


Figure 33

SL90 series can be used for programming by HART hand-held programmer

- ① HART hand-held programmer
- ② SL90 series.
- ③ 250 ohm resistor

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