



FvLuoky RADAR
Radar level Gauge

FRL21 Series

User Manual

FY/JC 110 A / O 15/11 v 1.6



FuYi Intelligent Instrument (Shanghai) Co., Ltd.

CONTENT

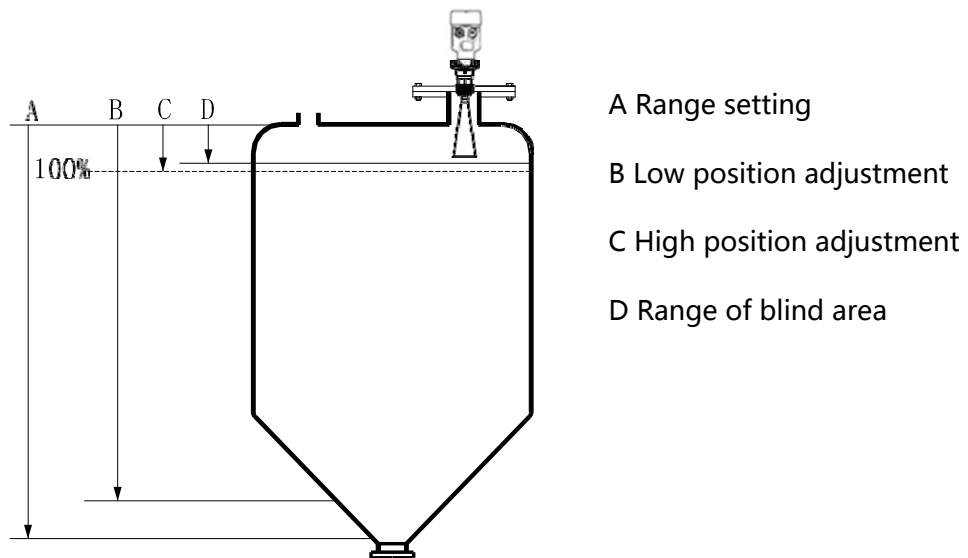
Summary.....	1
Introduction of instrument.	3
Instrument installation.....	5
Electrical connection.	10
Instrument debugging.....	14
Structure size.....	16
Selection Code.....	18

1.Summary

FRL21 radar level gauge , using imported chips and high frequency chips from the US , dual loop microcomputer processing technology , adopt for measure liquid level 、 position measurement and control , High sensitivity electronic components make the measurement more accurate and stable.

Measuring Principle

The antenna of the radar level gauge emits narrower microwave pulses , downward transmission by antenna , the microwave is reflected back when it touches the surface of the measured medium. , It is again received by the antenna system and transmitted to the electronic circuit part to be automatically converted into liquid level signal.



The datum of measurement is : Sealing surface of threaded ground or flange

Note : when using the radar level gauge , make sure that the highest material level is not allowed to enter the blind area (the area shown in D).

Characteristic

The radar level meter uses up to 26GHz transmitting frequency, with the advantages as below:

- 1) Non contact measurement, no wear and no pollution..
- 2) The antenna is small in size and easy to install..
- 3) Shorter wavelengths have better reflection on inclined solid surfaces..
- 4) The measurement of the blind area is smaller, and it will achieve good results for the small tank measurement..
- 5) The beam angle is small and the energy is concentrated, which enhances the echo ability while avoiding the distractors..
- 6) Hardly affected by the change of water vapor and temperature and pressure in the atmosphere.
- 7) The instrument can also read the real echo accurately.
- 8) High SNR can achieve better performance even under fluctuating conditions.
- 9) 26GHz frequency is the best choice for measuring solid and low dielectric constant.

2. Introduction of instrument

FRL21-R



Apply : Various strong corrosive

Measure range : 20 meters

Process link : thread、flange

Medium temperature : -40 ~ 120°C

Process pressure : -0.1 ~ 0.MPa

Precision : $\pm 3\text{mm}$

Frequency range : 26GHz

Explosion-proof grade : Exd IIC T4

IP grade : IP67

Output signal : 4 ...20mA/HART(two wire / four wire)
RS485/Modbus

FRL21-L



Apply : Solid material, process container or strong dust.

Crystallization and condensation

Measure range : 70 米

Process link : thread、flange

Medium temperature : -40 ~ 250°C

Process pressure : constant pressure

Precision : $\pm 15\text{mm}$

Frequency range : 26GHz

Explosion-proof grade : Exd IIC T4

IP grade : IP67

Output signal : 4 ...20mA/HART(two wire / four wire)
RS485/Modbus

FRL21-B



Apply : Solid material, process container or strong dust.

Measure range : 70 meters

Process link : flange

Medium temperature : -40 ~ 150°C

Process pressure : constant pressure

Precision : ±3mm

Frequency range : 26GHz

Explosion-proof grade : Exd IIC T4

IP grade : IP67

Output signal : 4 ...20mA/HART(two wire / four wire)

RS485/Modbus

FRL21-L



Apply : Hygienic liquid and strong corrosive liquid

Process link : thread, flange

Medium temperature : -40 ~ 150°C

Process pressure : constant pressure

Precision : ±2mm

Frequency range : 26GHz

Explosion-proof grade : Ex d II C T4

IP grade : IP67

Output signal : 4 ...20mA/HART(two wire / four wire)

RS485/Modbus

FRL21-C



Apply : Hygienic liquid and strong corrosive liquid

Measure range : 30 meters

Process link : thread, flange

Medium temperature : -40 ~ 150°C

Process pressure : constant pressure

Precision : ±2mm

Frequency range : 26GHz

Explosion-proof grade : Ex d II C T4

IP grade : IP67

Output signal : 4 ...20mA/HART(two wire / four wire)

RS485/Modbus

3 . Instrument installation

The preparation before setting

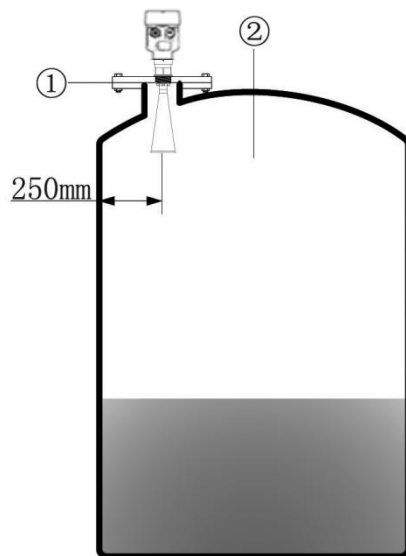
Please pay attention to the following items to ensure proper installation of the meters. :

Pls reserve the enough space.

Please avoid installation occasions with strong vibration. .

To ensure fast, convenient and safe installation of this instrument, please follow the following installation instructions.!

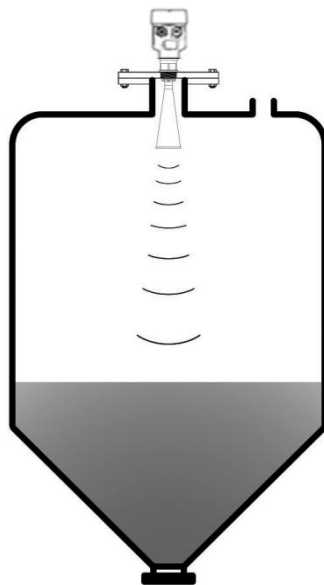
Installation guidance It is installed at the 1/4 or 1/6 diameter of the storage tank, and the minimum distance from the tank wall is greater than that of the tank wall about 250mm



Note : ①base level

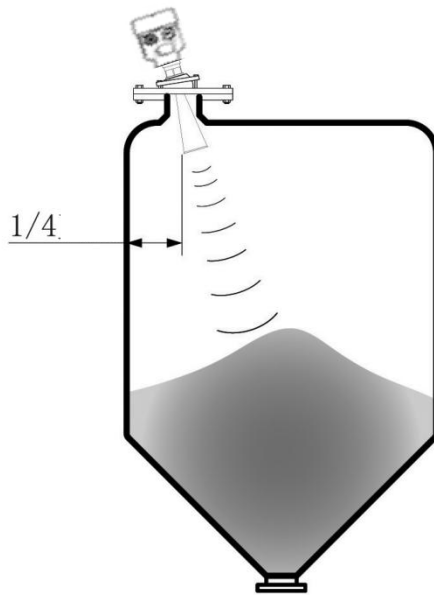
②Central or symmetrical axis of container

Conical tank The top plane can be mounted in the middle of the tank top to ensure that it is measured to the bottom of the cone.



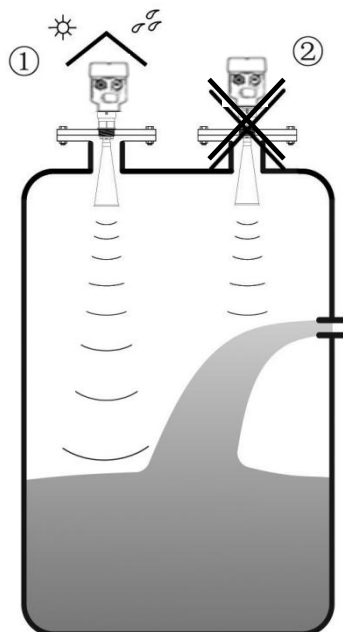
Stockpile storage tank

The antenna should be vertically aligned to the material surface. If the material surface is uneven and the stack angle is large, the universal flange must be used to adjust the angle of the horn antenna so that the horn antenna can be aligned to the material surface as far as possible.



Typical wrong installation :

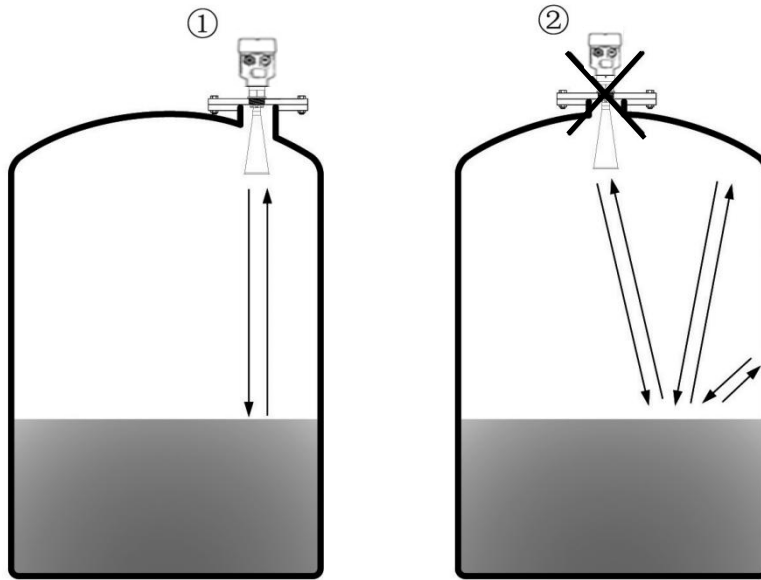
It cannot be installed above the inlet. Meanwhile, attention should be paid to the installation of sunshade and rain prevention measures to extend the service life of the meter.



Note : ① Correct
② Wrong

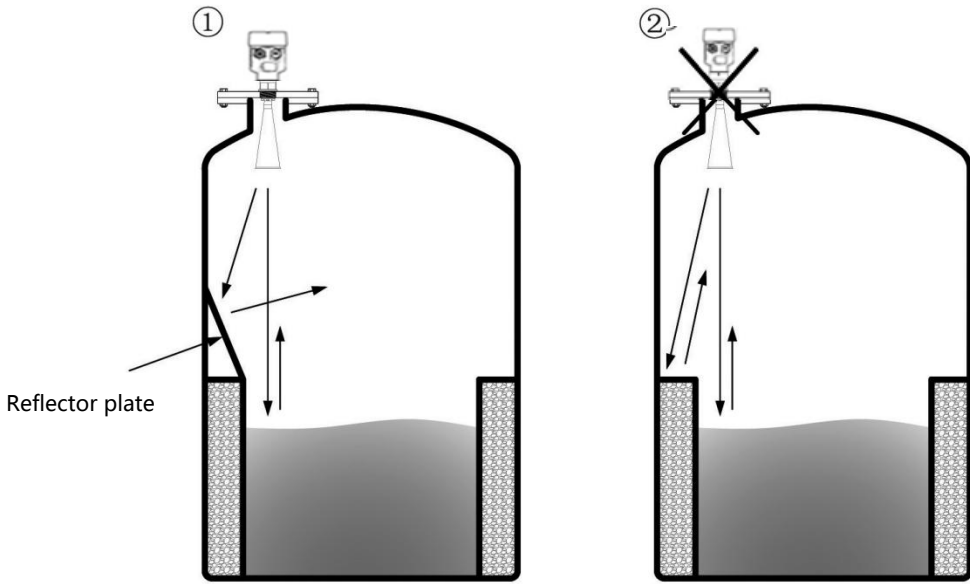
The instrument can not be installed in the middle of the arch tank roof. In addition to indirect echo, it will also be affected by multiple echoes.

Multiple echoes may be larger than the true echo signal, because the top can concentrate multiple echoes. So it cannot be installed in the center.



- ① Correct
- ② Wrong

When the obstacles in the tank affect the measurement, the reflector can be added to the normal measurement.

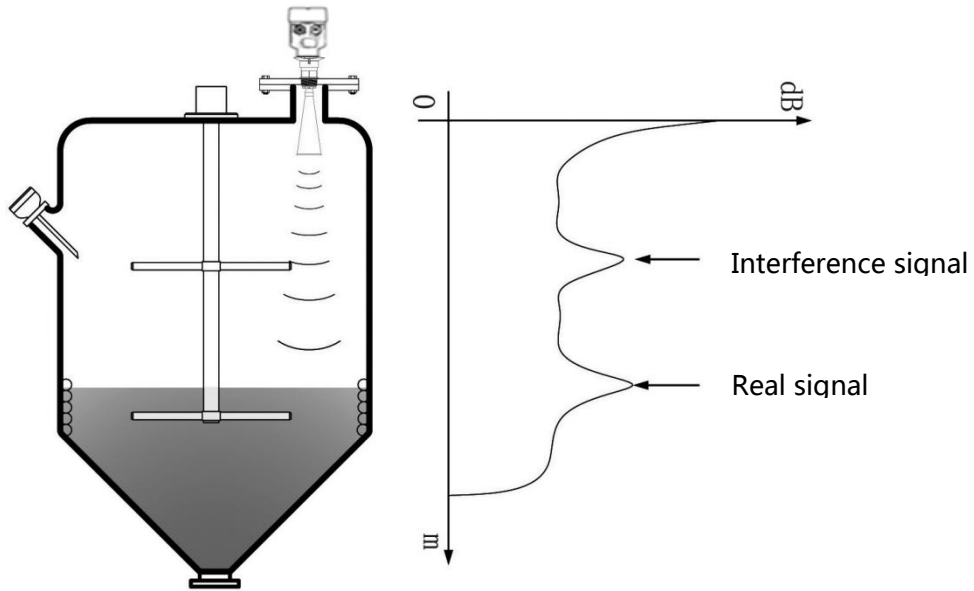


- ① Correct
- ② Wrong

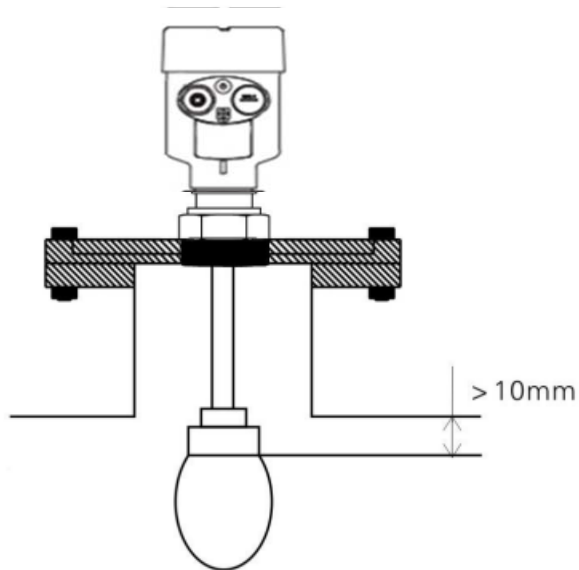
Refracting the obstacle signal

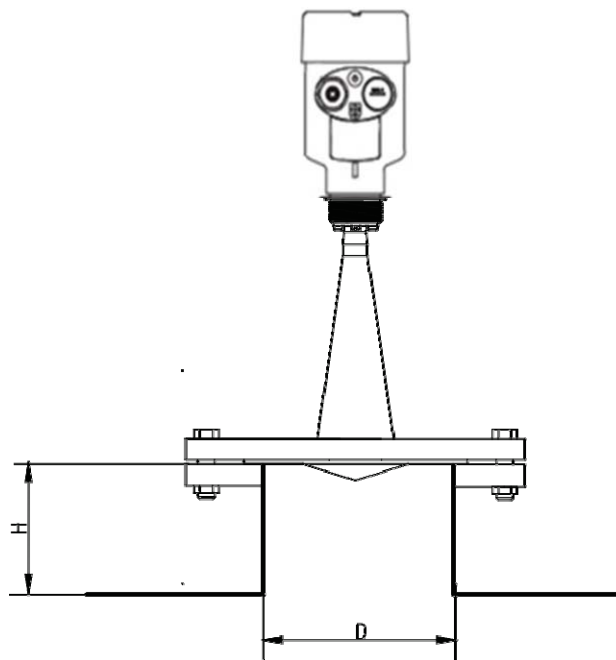
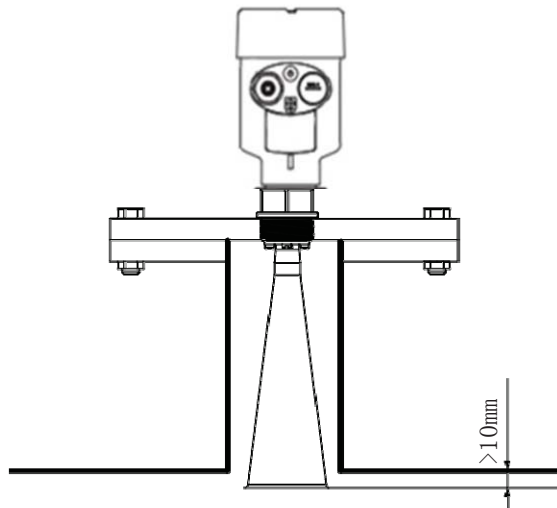
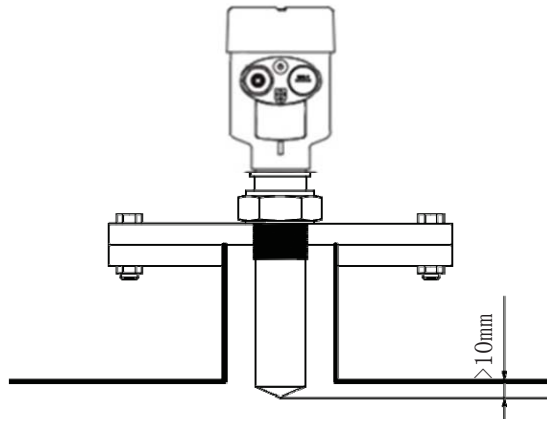
Measurement in guided wave tube

There are obstacles in the radiation area of the emitted microwave beam. , e.g : People's ladder, limit switch, heating equipment, support and so on will cause interference, resulting in measurement errors. Guided waves are required for measurement if affected.



Takeover height requirement: the antenna must be extended to at least 10mm of the tank.





D	H _{max}
50mm	100mm
80mm	150mm
100mm	200mm

4 . Electrical connection

Power supply voltage

(4 ~ 20)mA / HART(two wire system)

A two core cable is shared between the power supply and the output current signal. Refer to technical data for specific power supply voltage range. For the intrinsically safe type, there must be a safety barrier between the power supply and the instrument.

(4 ~ 20)mA / HART(four wire system)

The power supply and the current signal are separated, using a two core cable respectively. Refer the specific power supply voltage range for technical data..

RS485 / Modbus

The power supply and Modbus signal lines are separated by using one shielded cable with two cores. Check the technical data for specific supply voltage range..

Installation of connecting cables

General introduction

Cable diameter : 5~9mm(M20×1.5)
3.5mm~8.7mm(½NPT)

Two or four-core cables are usually used for wiring. Shielded cables are needed for sensor conductors because electromagnetic interference often occurs in electric drive devices, power lines or transmitters..

(4 ~ 20)mA / HART(two wire system)

Ordinary two core cable can be used in power supply cable..

(4 ~ 20)mA / HART(four wire system)

Cables should be provided with useful earth wires for power supply cables..

RS485 / Modbus

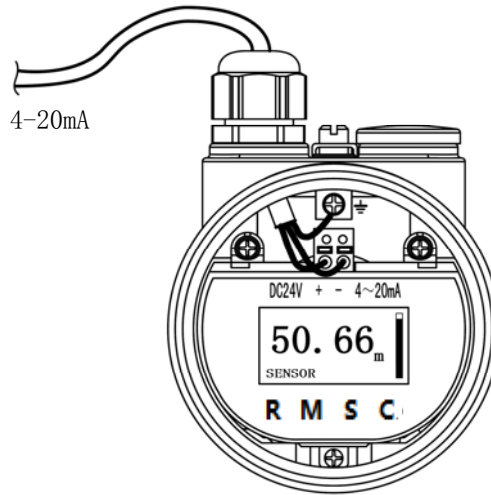
Shielded cables should be used in power supply cables.

Shielding and wiring of cables

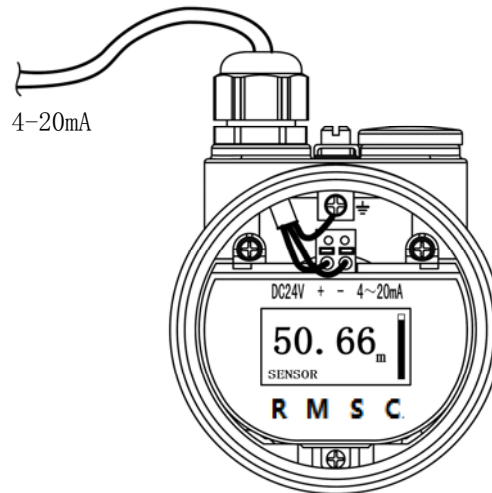
Ideally, the two ends of the shielded wire are grounded. But it should be noted that there will be grounding compensation current shielded by sensor cable. When both ends are grounded, a capacitor with grounded potential can be connected to the grounded end (e.g. inside the switch cabinet). (for example: 1UF; 1500V). Use earthing as low resistance as possible. (Note: if the instrument is used in the explosion proof area, the grounding of both ends must not be used due to the potential output)..

Connection mode

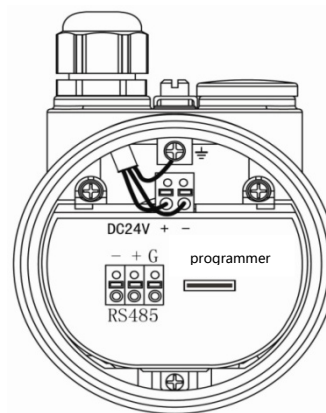
24V the two wire wiring diagram is as below



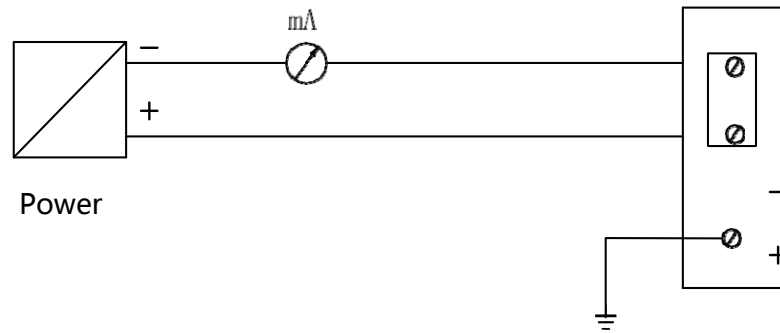
24V four wire wiring diagram is as below



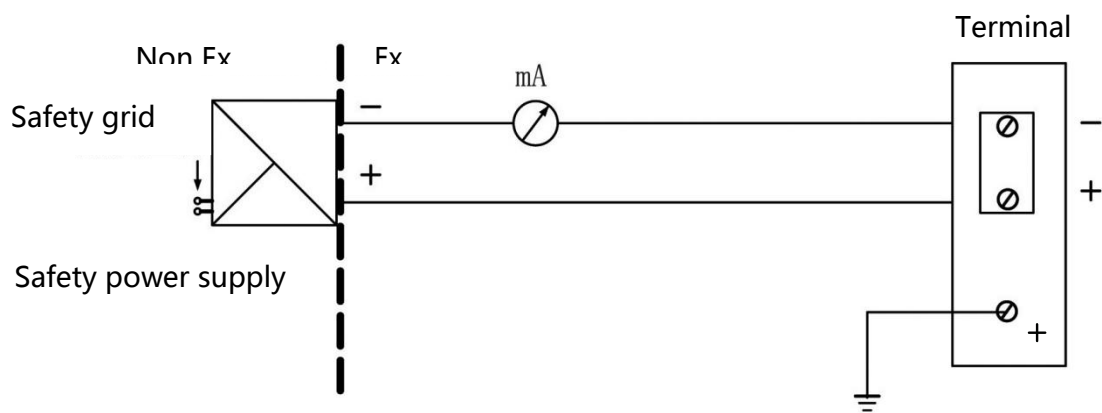
24V RS485/Modbus wire wiring diagram is as below



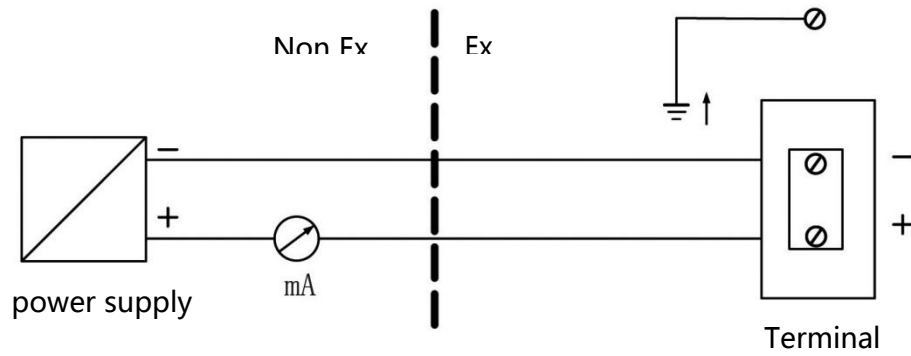
Standard type (non explosion proof)



Intrinsically safe explosion protection



Flameproof explosion-proof



Safety guidance

All electrical connections must be carried out under the condition of power failure. Please follow the instructions in the Instrument Instructions.!

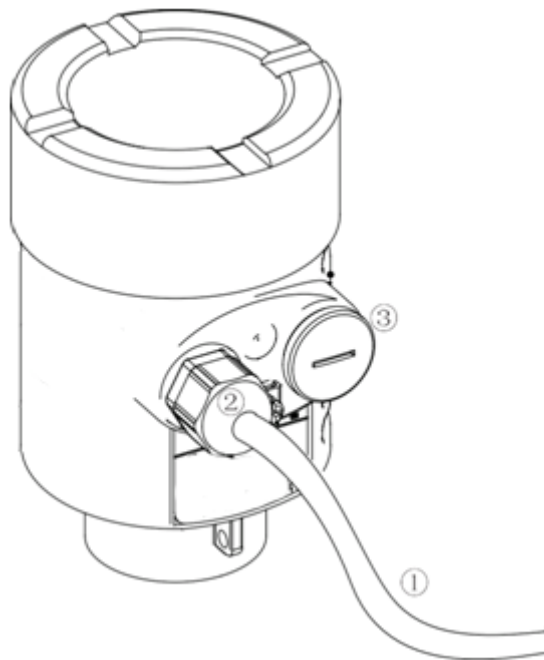
Please comply with the requirements of local electrical installation procedures.

Please observe the local regulations on the health and safety of persons. All operations on electrical components of instruments must be completed by trained professionals. ;

Please check the nameplate of the instrument to ensure that the specifications are in line with your requirements. Please ensure that the supply voltage is consistent with the requirements on the instrument nameplate.

IP Grade

This instrument fully meets the requirement of protection grade IP67. Please ensure the waterproof property of the cable head. Check the diagram as below :



How to ensure installation meets IP67 requirements :

1. Please ensure that the sealing head is not damaged.
2. Please make sure that the cable is not damaged.
3. Please ensure that the cables used comply with the electrical connection specifications.
4. Before entering the electrical interface, bend the cable downward to ensure that the water will not flow into the shell. See ①
5. Please tighten the cable sealing head. , see②
6. Please unplug the unused electrical interface. , see③

5. Instrument debugging

Debugging method

There are 3 kinds of debugging methods for FRL21 system:

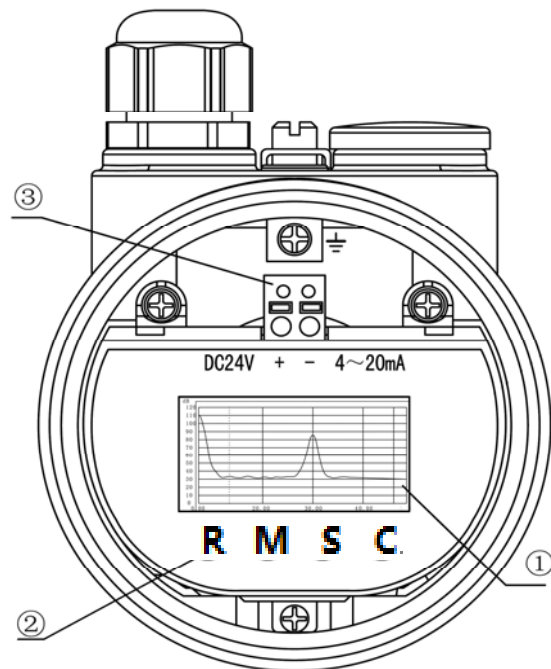
- 1 . Display / Button
- 2 . Debugging of host computer
- 3 . HART handheld programmer

Display / Button

The instrument is debugged by displaying 4 keys on the screen. The language of the debug menu is optional. After debugging, it is usually used for display only. The measured values can be read very clearly through the glass window.

Display / Button

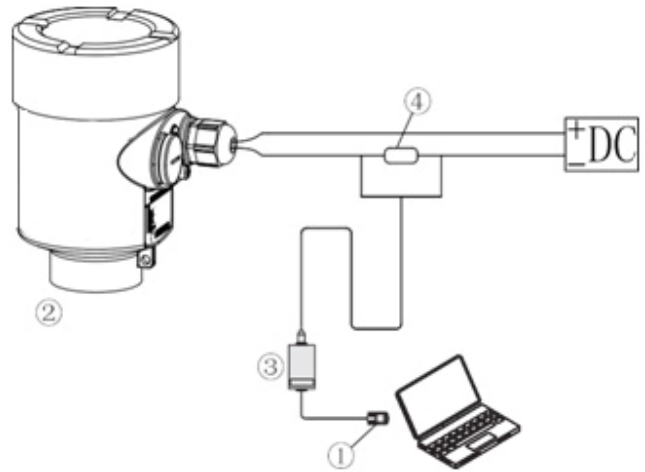
- ① LCD
- ② Button
- ③ Terminal



Debugging of host computer

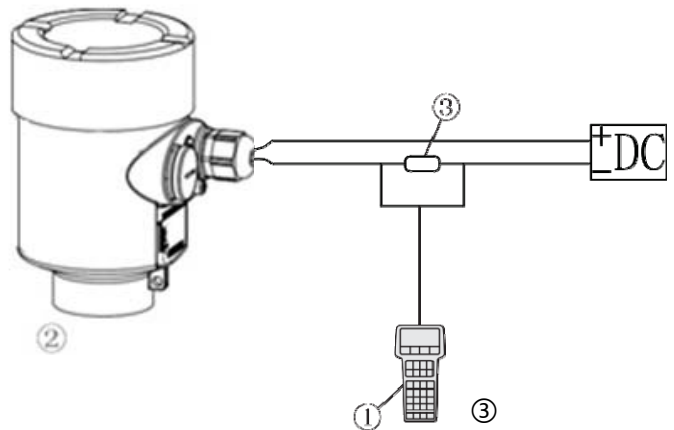
Connect to host computer through HART.

- ① RS232 interface or USB interface
- ② FRL21
- ③ HART adapter
- ④ 250 Ohm resistance



HART Handheld programmer programming

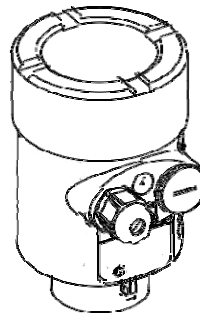
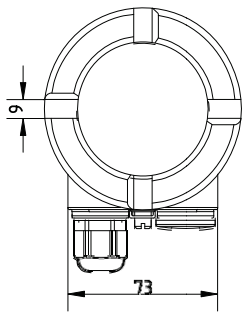
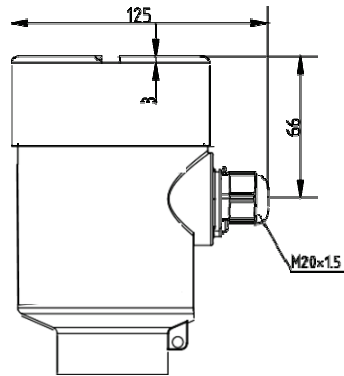
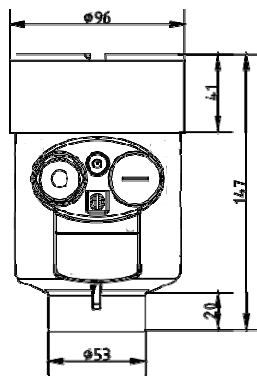
- ① HART Handheld programmer
- ② FRL21
- ③ HART adapter
- ④ 250 Ohm resistance



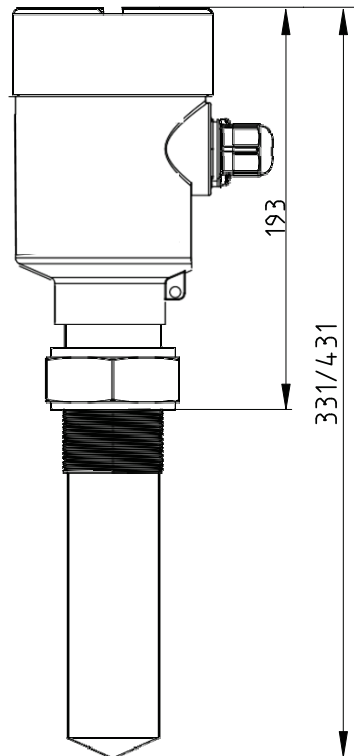
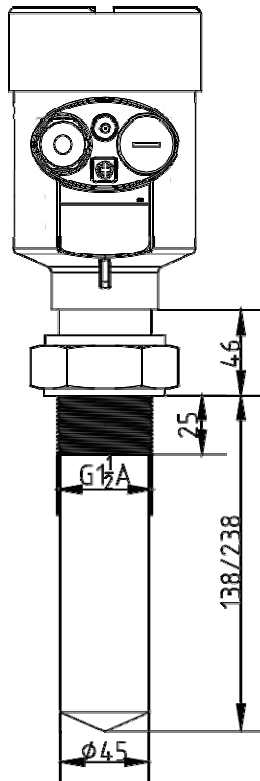
H

6 . Structure size (Unit: mm)

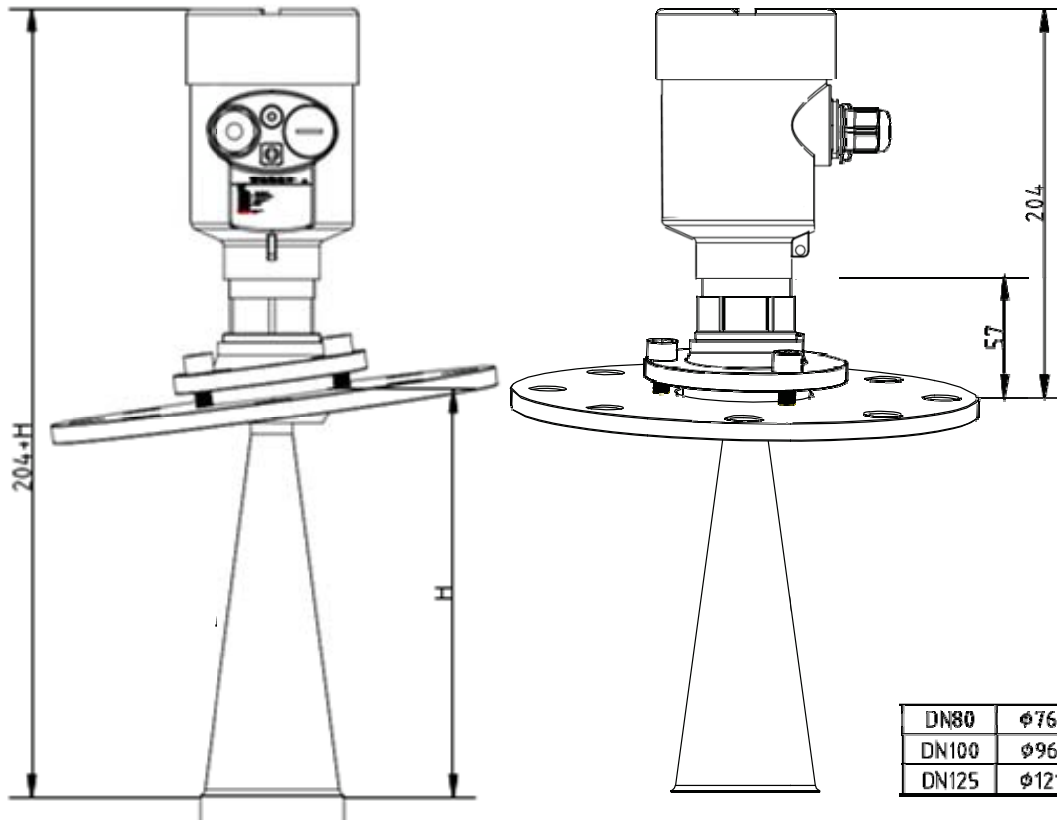
Shell size



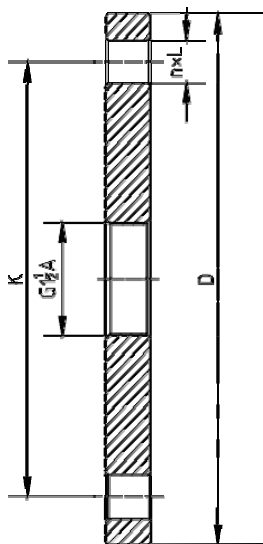
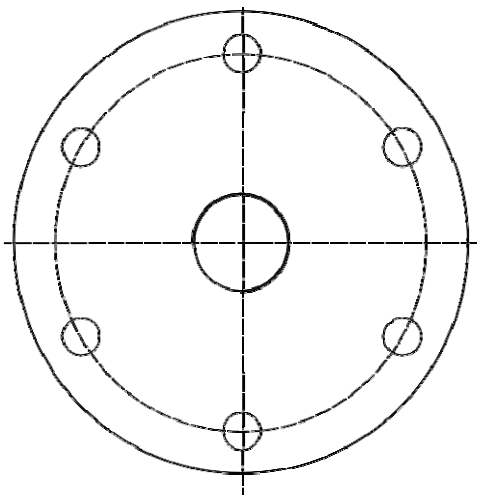
FRL21-R



FRL21-L



Outside drawing of flange



1	DN50	φ165	φ125	4	18
2	DN80	φ200	φ160	8	18
3	DN100	φ220	φ180	8	18
4	DN150	φ285	φ240	8	22
5	DN200	φ340	φ295	12	22
6	DN250	φ405	φ355	12	26

GB/T9119-2010

8. Selection Code

Sensor code						Transmitter code				optional	Description	
FRL21	-X	X	-X	X	X	X	-X	X	-X	X	-X	—Range (M)
Type	-L										Low frequency radar	
	-H										High frequency radar	
	-D										Guided wave radar	
EX type	—										Standard form	
	Ex										CT4	
Probe form	-L										Horn type	
	-R										Rod type	
	-B										Ball type	
	-C										Cable type	
	-G										Pole type	
Probe material	N										SUS 304	
	L										SUS 316L	
	F										SUS 304+PTFE	
Structure +grade	1										One type+ IP65	
	2										Split type +IP67	
Temperature range	1										-40~+100°C	
	2										-40~+150°C	
	3										-40~+250°C (Heat sink)	
	4										-40~+500°C (Heat sink)	
Supply + output	-1										220V AC+4~20MA	
	-2										24V DC +4~20MA (Two-line system)	
Communication output	0										RS485	
	1										HART	
Electrical interface	-M										M20*1.5	
	-G										G1/2"	
Accuracy class	A										±10mm	
	B										±5mm	
Accessory											flange , signal wire (_m)	

Illustration

Model : FRL21-H-LN11-21-MA-10M (DN200 PP flange)

High frequency ultrasonic level meter, probe form : Horn type, Probe material : SUS 304, Structure : One type protection grade: IP65, Temperature range : -40~+100°C , power supply: 24V DC, signal output : 4-20ma, Communication output : HART, Electrical interface: G1/2 " , precision: ±10mm, PP flange with DN200 and L bracket



FuYi Intelligent Instrument (Shanghai) Co., Ltd.

Tel : 021-5227 8523 Fax : 021-5227 8525

E-mail: Sales@fvlucky.com

[http://www. fvlucky.com](http://www.fvlucky.com)