RLS6000

Radar Level Instruments

Instructions Manual

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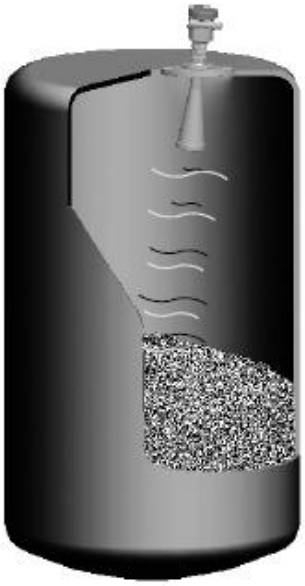
1. Measurement Principle



Principle

The extremely narrow microwave pulse emitted by the antenna on radar level instrument can travel at the speed of light and part of its energy, which is reflected off the surface of target medium, is received by the very same antenna. The time lapse between pulse emission and reception by the antenna is proportional to the distance between the surface of target medium and the reference point on antenna. However, due to the fact that the electromagnetic wave is transmitted at extremely high speed, which leads to the tiny time lapse (nanosecond level) and makes it difficult to be identified, RLS 6000 series of radar level instrument have adopted a special demodulation technology, enabling itself to detect the time lapse between pulse emission and reception correctly, and eventually generate accurate measurement result.

Features

The guided wave radar level instrument, adopted 26GHz as transmittion frequency, which make this series have specialties as below:Small beam angle, which centralize energy, make RLS 6000 high ability of anti-jamming, hence high accuracy and reliable.Small antenna size, easy to mount and easy to equip extra dust protection Small blind zone, good accuracy even for small vessels.Shorter wave-length, suitable for small power.

Equipped with advanced microprocessor and unique EchoDiscovery echo processing technology, the radar level instrument can be used under various hazardous process conditions

The guided wave radar level instrument, with pulses as its working tool and extremely low emission power, can be mounted on various metal or nonmetal vessels, harmless towards the environment and human beings.

2 Product Overview

	RLS 6100	RLS 6200
		
Application:	Liquid Level measurement in liquids, especially highly erosive liquids	Liquid Level measurement in liquids, under certain temperature and pressure, mildly erosive liquids
Max Measurement Range::	10m； 30m（Horn 80mm）	30m
Measurement Accuracy:	±5mm	±3mm
Process Temperature:	(-40～130)° C	(-40～80)° C (-40～130)° C (-60～250)° C (-60～400)° C
Process Pressure:	(-0.1～0.3)MPa	Normal (-0.1～4)MPa
Frequency Range:	26GHz	26GHz
Signal Output:	(4～20)mA/HART	(4～20)mA/HART
Power:	2-wire（DC24V） 4-wire（DC24V/AC220V）	2-wire（DC24V） 4-wire（DC24V/AC220V）
LCD:	Optional	Optional
Housing:	A/B/C/D[1]（See the page4）	A/B/C/D[1]
Process Connection:	F	G/H/I/J/K [2]
Flange Accessories:	L	L/M/N/P[3]
Antenna:	R	S/T/V[3]

Notes:

1、Intrinsically Safe couldn't use "A"

2、Huff must use antenna "T", process Connection must use "I"; High temp. Process Connection must use "J" "K"

RLS 6300	RLS 6700	RLS 6800
		
Liquid Level measurement of highly erosive medium under certain pressure/ temperature limit and suitable for	Solid Normal Temperature/Normal Pressure	Solid strong dew/dust/crystal
20m	15m	70m
±3mm	±10mm	±15mm
(-40～150)° C	(-40～80)° C (-40～120)° C (-60～250)° C	(-40～80)° C (-40～120)° C (-60～250)° C (-60～400)° C
(-0. 1～0. 5)MPa	Normal (-0. 1～4) MPa	Normal (-0. 1～4) MPa
26GHz (4～20)mA/HART 2-wire (DC24V) 4-wire (DC24V/AC220V)	26GHz (4～20)mA/HART 2-wire (DC24V) 4-wire (DC24V/AC220V)	26GHz (4～20)mA/HART 2-wire (DC24V) 4-wire (DC24V/AC220V)
Optional	Optional	Optional
A/B/C/D[1]	A/B/C/	A/B/C/D[1] (See the page4)
	G/H/I/J/K [2]	G/H/I/J/K [2]
U	L/M/N/P[3]	L/M/N/P[3]
	S/T/V[3]	S/T/V[3]

Housing

				
Serial number	A	B	C	D
Material	Plastic	Aluminum Alloy	Aluminum Alloy （Two-chamber）	Stainless steel （316L）
Specialty		Economic Suitable for explosion-protection	（Intrinsically safe + Flameproof Approval）	Ship Approval

Process Connection

								
Serial number	E	E1	F	G	H	I	J	K
Material	Stainless Steel	Stainless Steel	PTFE	PP (Huff)	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
Pressure	(-0.1~4)MPa	(-0.1~4)MPa	(-0.1~0.3)MPa	Normal Pressure	(-0.1~4)MPa	(-0.1~0.5)MPa	(-0.1~4)MPa	(-0.1~40)MPa
Temperature	(-60~130)℃	(-60~250)℃	(-40~130)℃	(-40~80)℃	(-60~150)℃	(-60~130)℃	(-60~250)℃	(-60~400)℃

Flange Accessories

				
Serial number	L	M	N	P
Material	(PTFE/PP) Flange	Stainless Steel Flange	PP Gimbal Flange	Stainless Steel Gimbal Flange
Specialty	Rust tolerated	High temp./High Pressure	Normal Temperature/ Normal Pressure	High temp./Normal Pressure

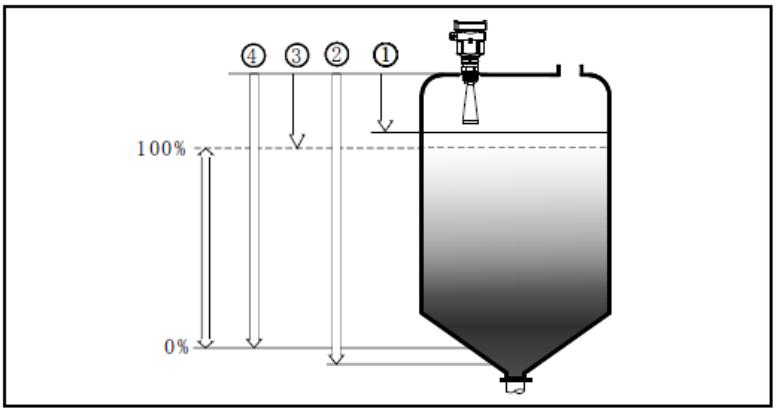
Antenna

						
Serial number	R	S	T	U	V	W
Material	PTFE	PP (PTFE shield)	Stainless Steel	PTFE	Stainless Steel (PTFEshield)	Stainless Steel
Specification	Φ44/Length137 Φ44L/Length237	Φ98/Length280 Φ98L/Length440	Φ48/Length140 Φ78/Length227 Φ98/Length288 Φ98L/Length474 Φ123/Length620	DN50/ DN80/ Dn100	Φ98/300 Φ98L/480 Φ123/625	Φ196 Φ246
Specialty	Rust tolerated	Normal Temp. Normal Pressure	Temp. tolerated/ Pressure tolerated	Rust tolerated/ Pressure tolerated	Normal Temp. Normal Pressure	Temp tolerated Pressure tolerated

Basic Requirements

There is a certain existing beam angle while the antenna transmitting microwave pulses. There should beno barriers between the lower edge of antenna and surface of measuredmedium. Therefore it is highly recommended to avoid facilities inside vessels, such asladders, limit switches, heating spirals, struts and etc, during the mounting process. “False echo learning” must be carried out during the installation in this case.Furthermore, microwave beams must NOT intersect the filling streams. Be cautions duringthe installation: the highest level of target medium must NOT enter into blanking zone; the instrument must keep certain distance to vessel walls; every possible measure needs to be taken to position the instrument so that the direction of antenna emission is perpendicular to the surface of measured medium. The installation of instruments in xplosion 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

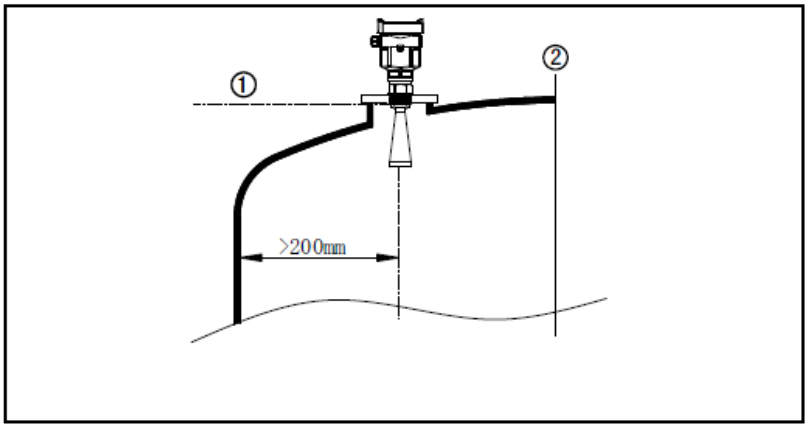


The reference plane is the thread or flange surface

1. Blanking Zone(menu1.9)
2. Empty(menu1.8)
3. Max. Adjustment(menu1.2)
4. Min. Adjustment(menu1.1)

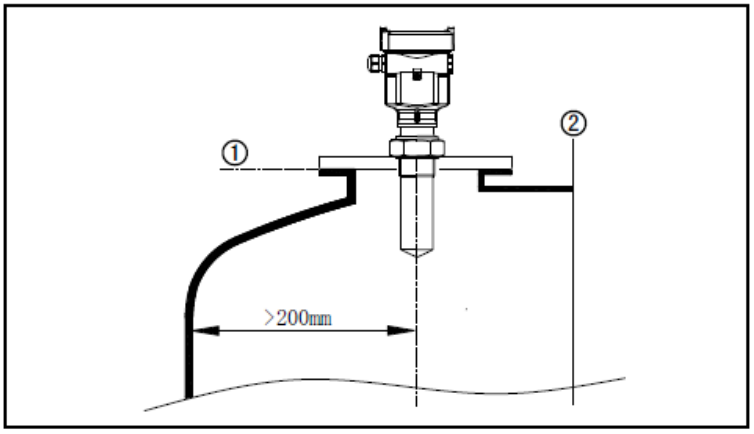
Note：The highest level of measured medium must not enter into vlanking zone while radar level measurement instrument is in operation.

Mounting Position

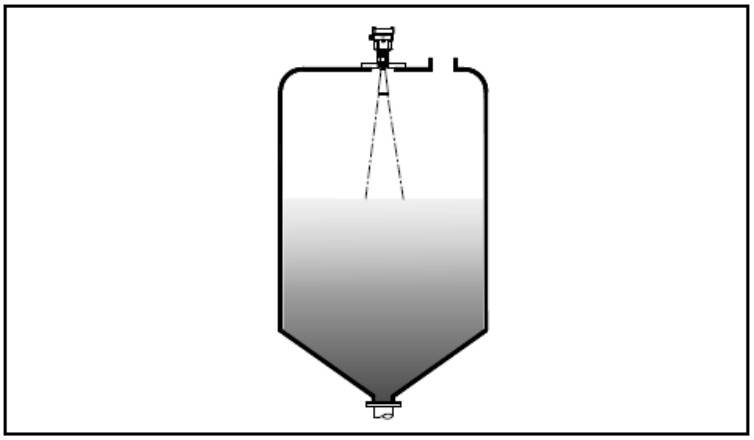


Minium distance of 500mm between instrument and vessel wall during installation

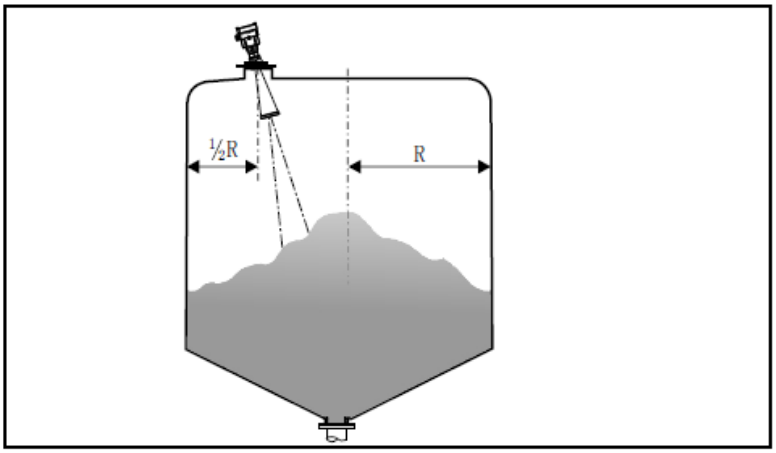
1.Reference Plane
2.Center of Vessel or Symmetrical Axis



1.Reference Plane
2.Center of Vessel or Symmetrical Axis

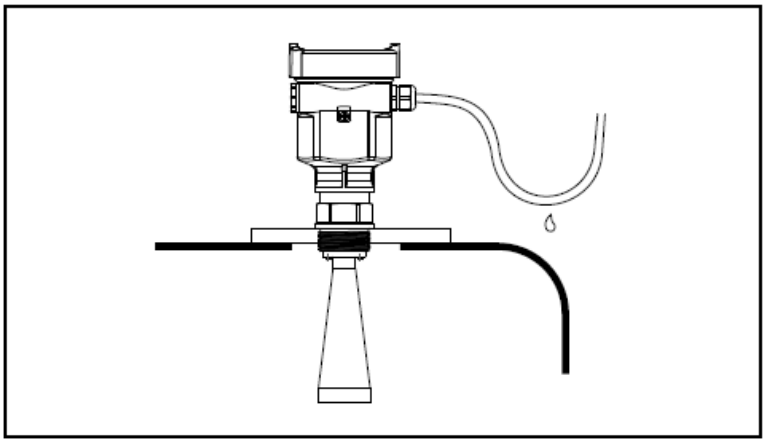


The best mounting position for a conical vessel with flat top is the center of its top, as the effective measurement can reach the bottom of vessel.



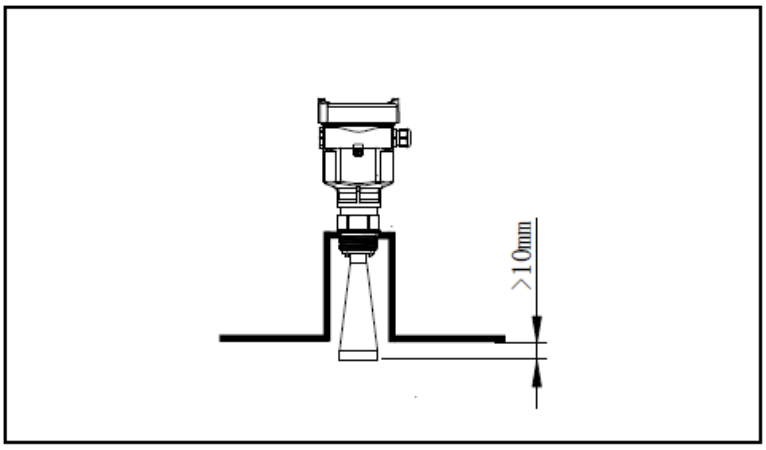
Installation with Gimbal

- Damp-proof



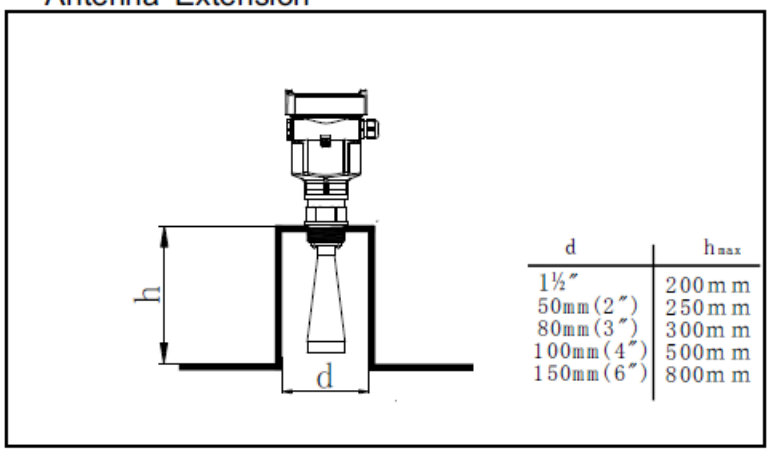
In order to avoid dampness under outdoor or humid indoor conditions or for those instruments mounted on cooling/heating vessels, seal rings used on cables should be screwed tight, plus the cable must be bended downward outside cable entry, indicated on the diagram below

- Antenna Extension



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

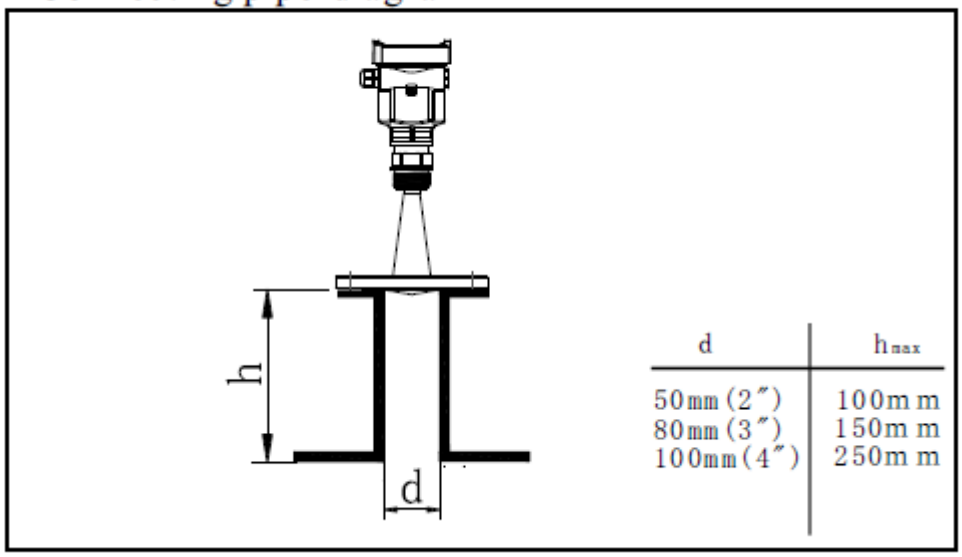
Antenna Extension



d	h_{max}
1½″	200mm
50mm(2″)	250mm
80mm(3″)	300mm
100mm(4″)	500mm
150mm(6″)	800mm

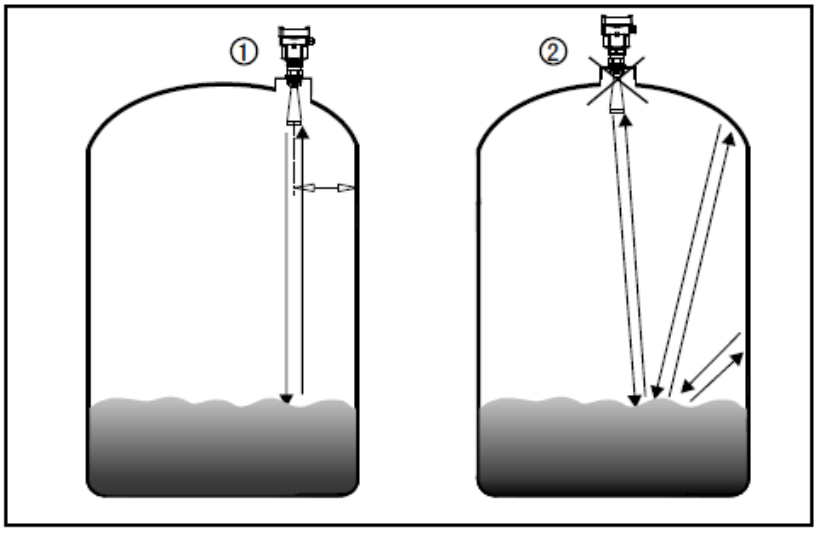
If the senser is mounted in a socket extension that is too long, strong false echoes are generated which enterfere with the measurement. Make sure that the horn antenna protrudes out of the socket piece.

Connecting pipe diagram

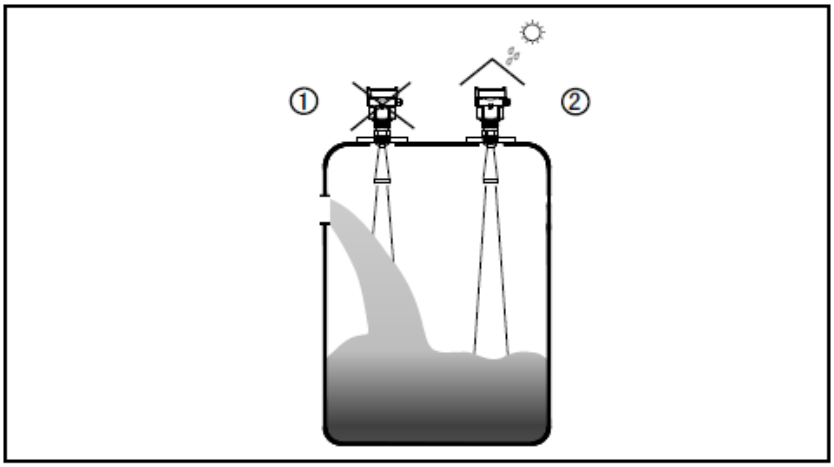


d	h_{max}
50mm(2″)	100mm
80mm(3″)	150mm
100mm(4″)	250mm

- Rights and Wrongs in Mounting

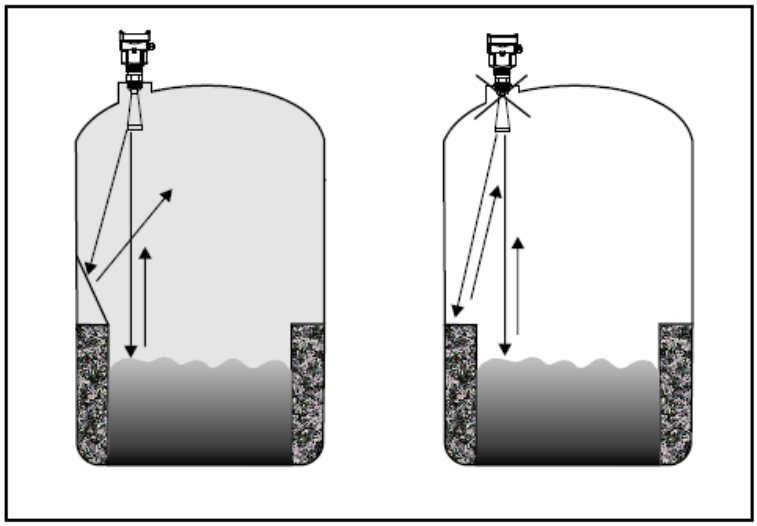


1.Correct
2.Wrong:Instruments are mounted in the center of concave or arched vassel tops, which results in multiple echoes.



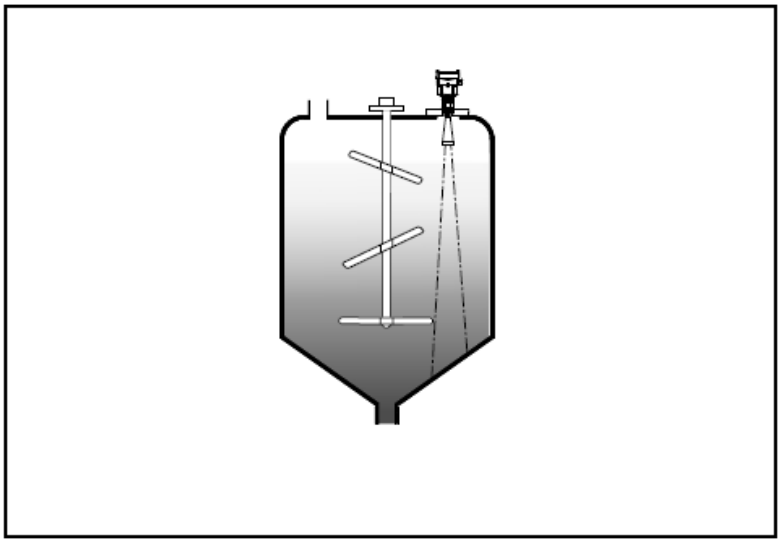
1.Wrong: Mount the instrument in/above filling stream, which results in the measurement of filling stream not the target medium.
2.Correct:

- Reflector installation



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.

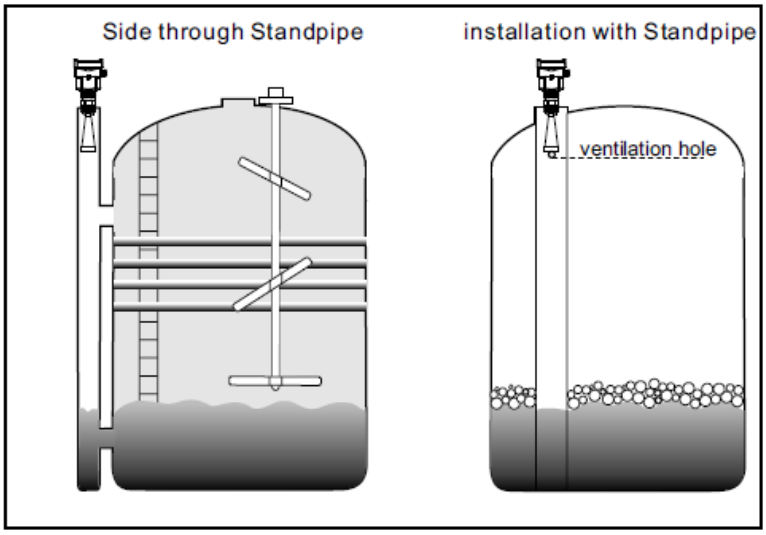
- Agitator



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

By using standpipe, the influence of foams can be reduced.



Note: You must NOT mount instrument inside standpipe while measuring adhesive medium.

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.

4 Electrical Connection

● Power Supply

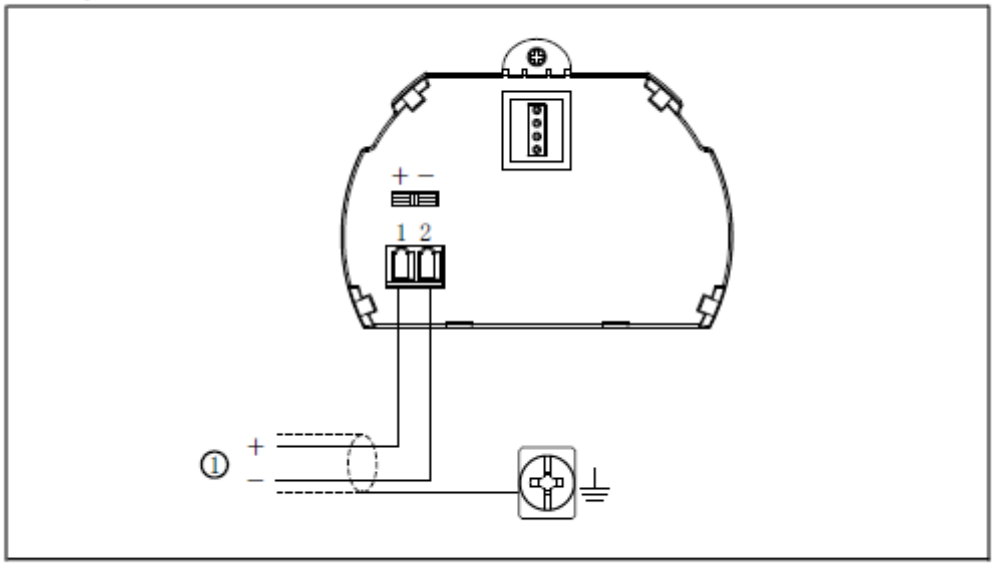
20mA/HART(2-Wire)	Power supply and current signal are carried by the same two-wire connection cable. See the Technical Specifications of this guide for detailed requirement on power supply. A safety barrier should be placed between power supply and instrument for intrinsically safe version.
20mA/HART(4-wire)	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.

● Cable Connection

General Introduction 4~20mA/HART	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 Connection cable with special earth wire can be used as feeder cable. Connection cable with special earth wire can be used as feeder cable.
20mA/HART(4-wire) Shielding & Grounding	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. : 1μF 1500V) in order to dampen the low frequency grounding current and avoid the disturbance caused by high frequency signals

● Wiring Diagram

2-wire

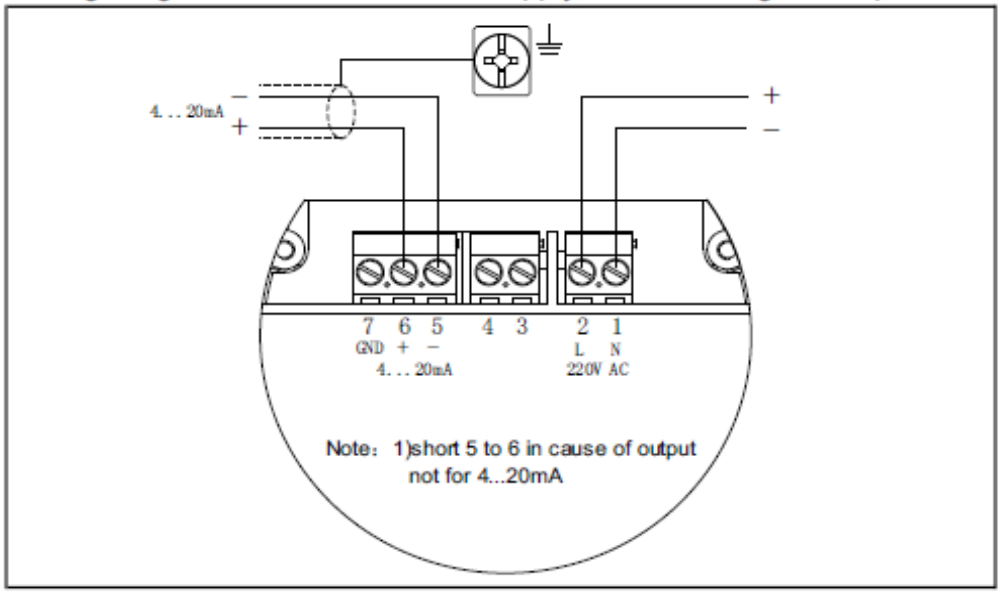


2-wire wiring used for HART (electronic unit B)

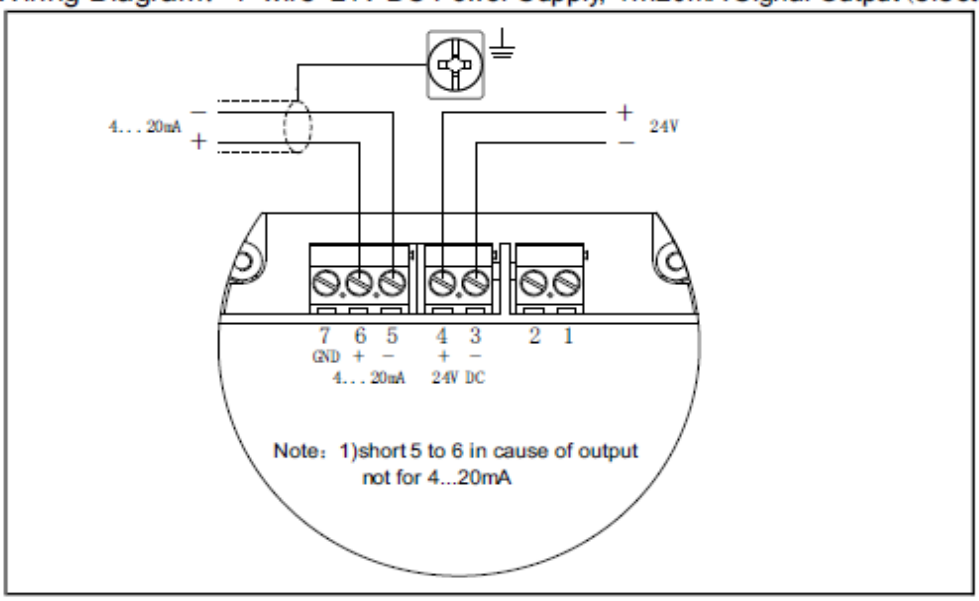
1) Power Supply and Signal Output

4-wire/2-chamber

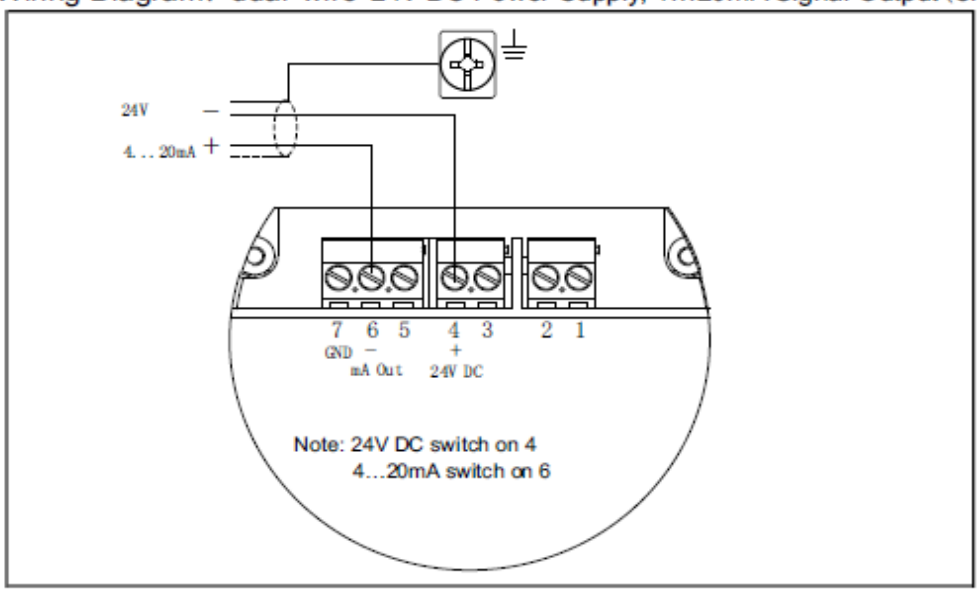
Wiring Diagram：220V AC Power Supply, 4…20mA Signal Output (electronic unit D)



Wiring Diagram：4-wire 24V DC Power Supply, 4…20mA Signal Output (electronic unit C)



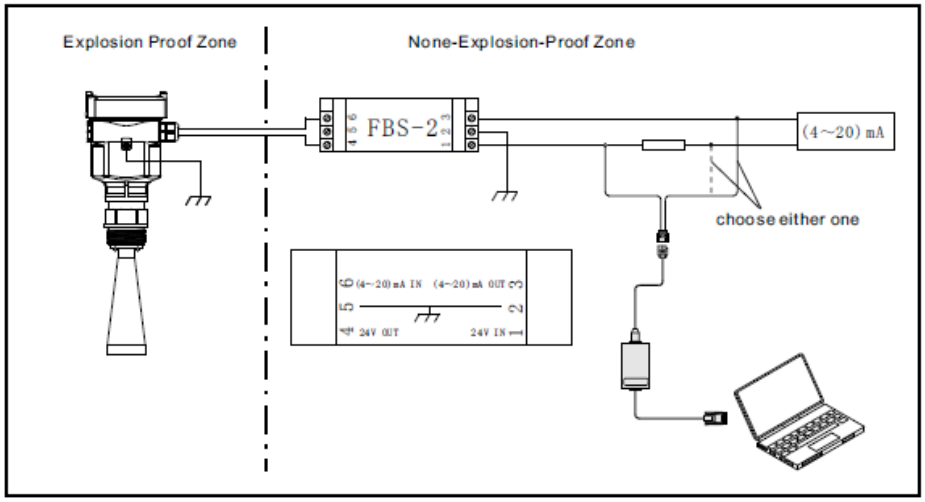
Wiring Diagram：dual-wire 24V DC Power Supply, 4…20mA Signal Output (electronic unit E)

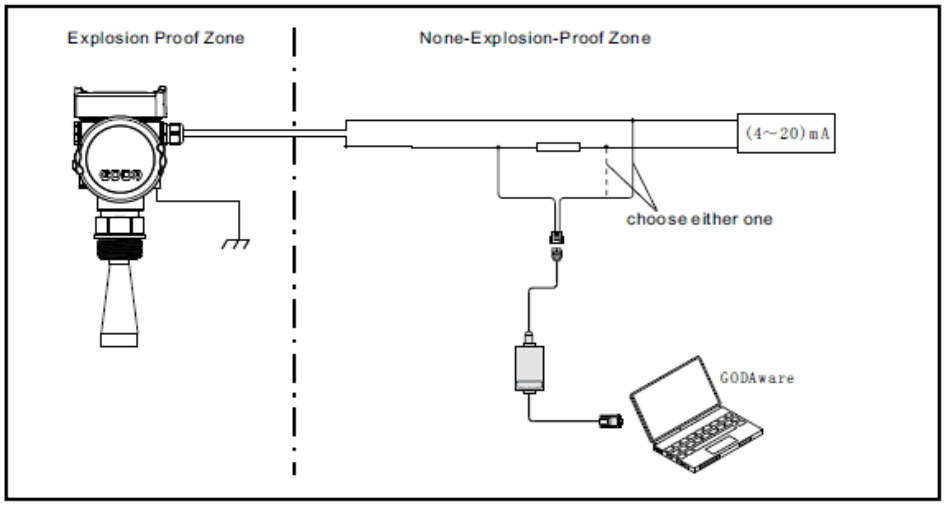


- Explosion Proof Connection

This product is an intrinsic safety explosion proof version (Exia ⅡC T6) 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 ⅡC T6.You are required to use FBS-2 series (intrinsic safety explosion proof: [Exia] ⅡC，voltage of power supply: 24V DC□5%，short-circuit current: 135mA，operating current: 4...20mA) of safety barriers, which are supplementary to this product, for the power supply of this product.

All connection cables must be screened with max. length of 500m. Stray capacitor≤0.1μF/Km,stray inductance ≤1mH/Km. The level measurement instrument must be connected to ground potential and unapproved supplementary devices are not allowed to use.





Adjust with Intrinsically Safe+Flameproof Approval

5 Adjustment Instructions

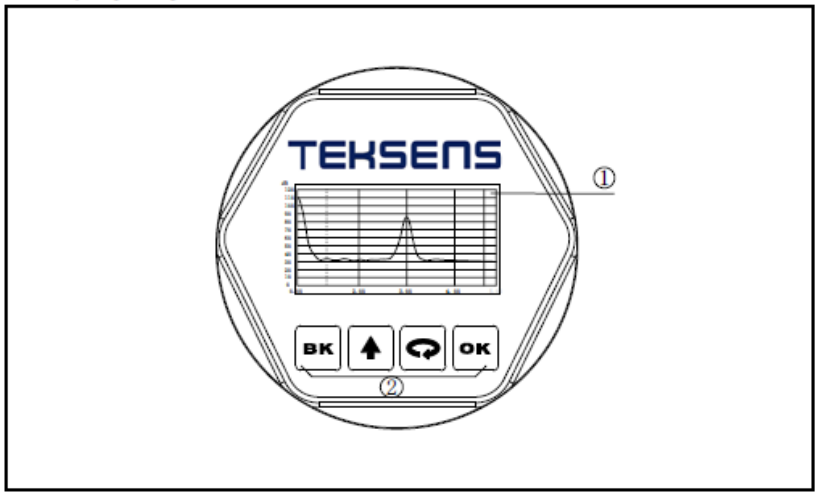
Adjustment Methods

Three adjustment methods available for **RLS 6000**

1.Display/Adjustment Module
2.Adjustment software
3.HART handheld programmer

ViewPoint is a pluggable display/adjustment module. The adjustment can be done through operating with four buttons on ViewPoint. Optional menu operation languages are available for selection. ViewPoint is only used for display after adjustment in that the measurement results can be seen clearly through the glass window.

Display/Adjustment Module



1 LCD 2 Adjustment Keypad

[OK]Keypad
-Enter programming mode;
-Confirm programming options;
-Confirm modifications to parameters.

[ ]Keypad
-Choose programming options;
-Choose the digit of parameters to edit;
-Display the contents of parameters.

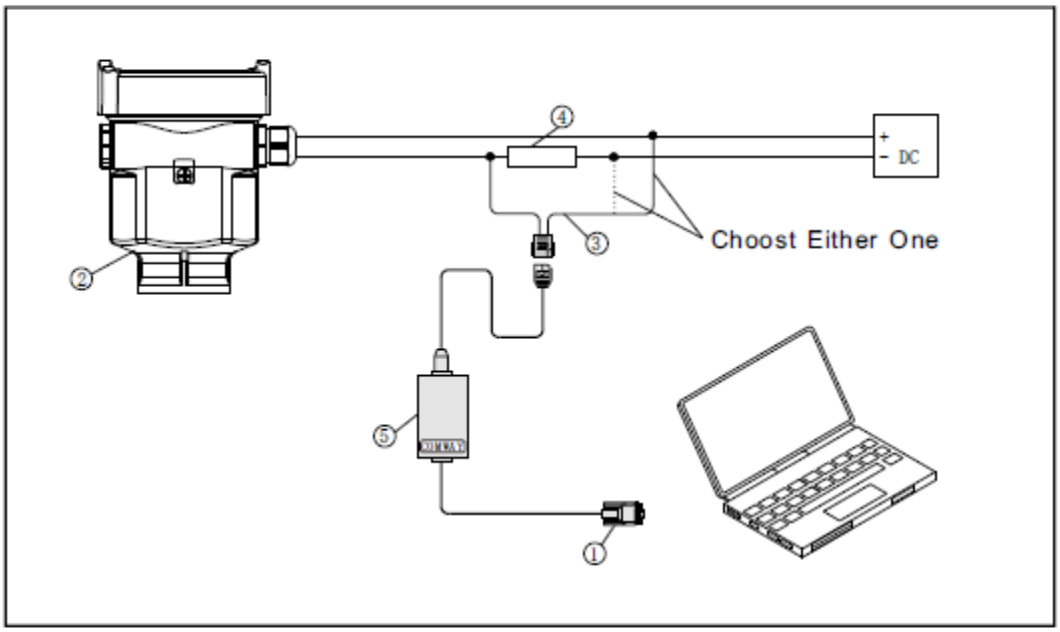
[ ]Keypad
-Modify parameter values.

[BK]Keypad
-Programming mode exit;
-Return to higher menu level.

Shortcut
[BK]Display Echo wave

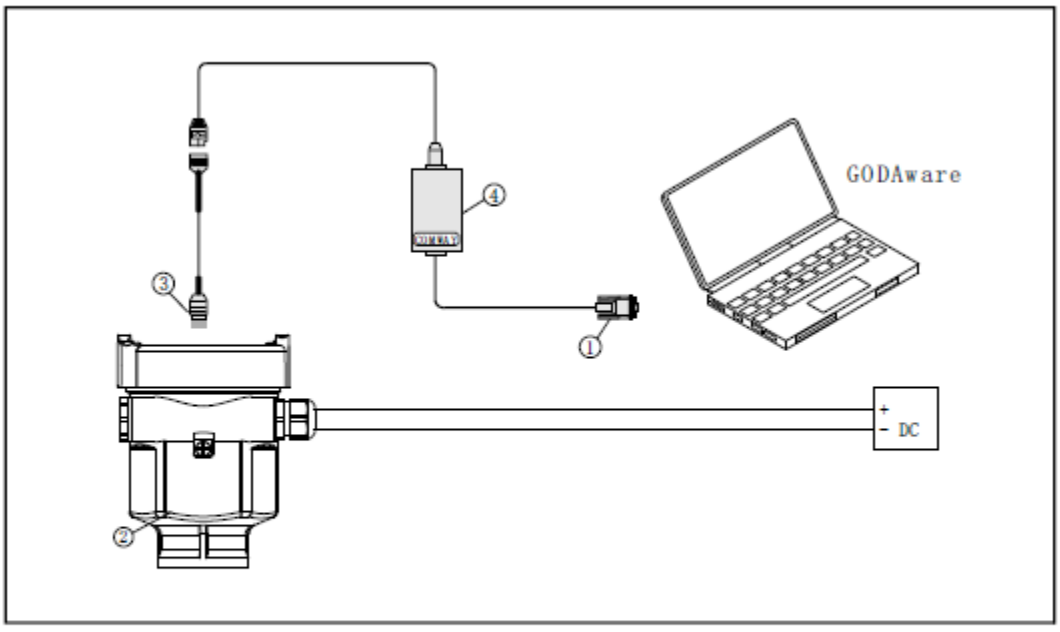
- **Software**

Connect with another unit throuth HART.



1 RS232 Connect Cable/USB port
2 **RLS 6000**
3 **HART** port adapter used on COMWAY convertor
4 250 ohm Resistance
5 COMWAY Convertor

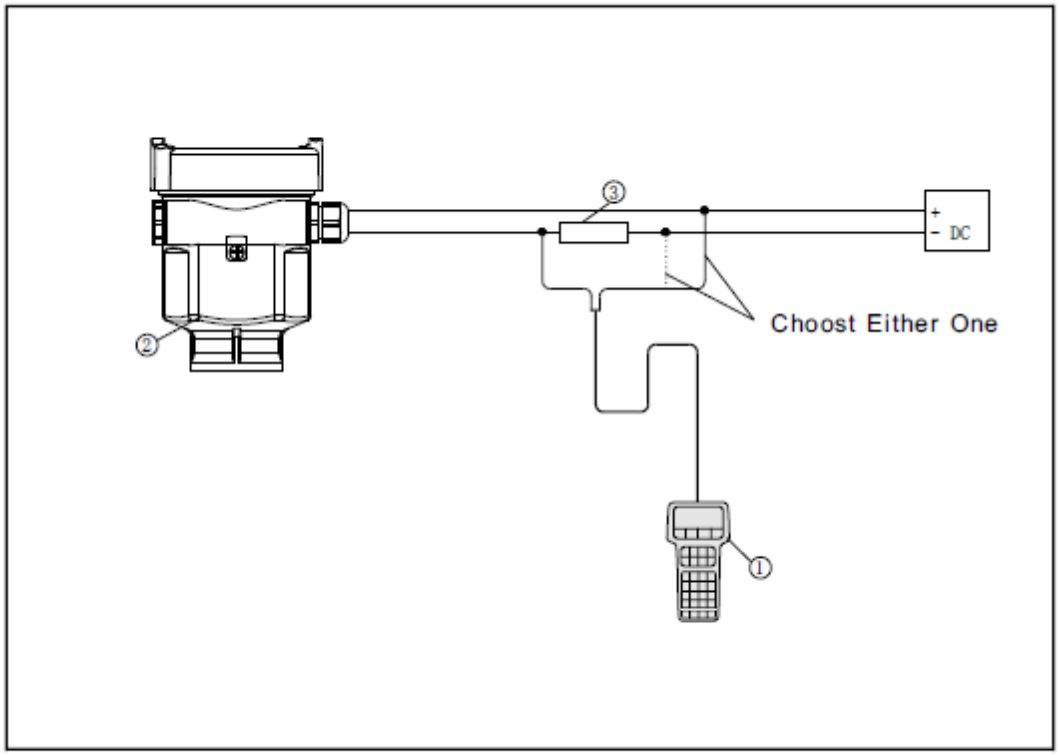
Connect with another unit throuth I^2C.



1 RS232 Connect Cable/USB port
2 **RLS 6000**
3 I^2C adapter port used on MOMWAY convertor
4 COMWAY Convertor

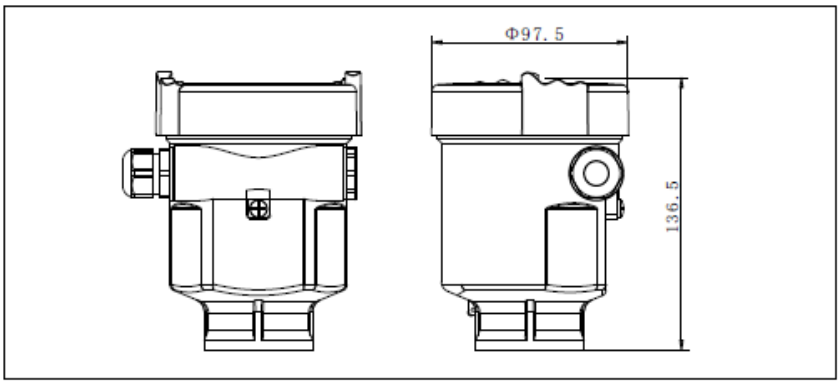
HART Handheld Programmer

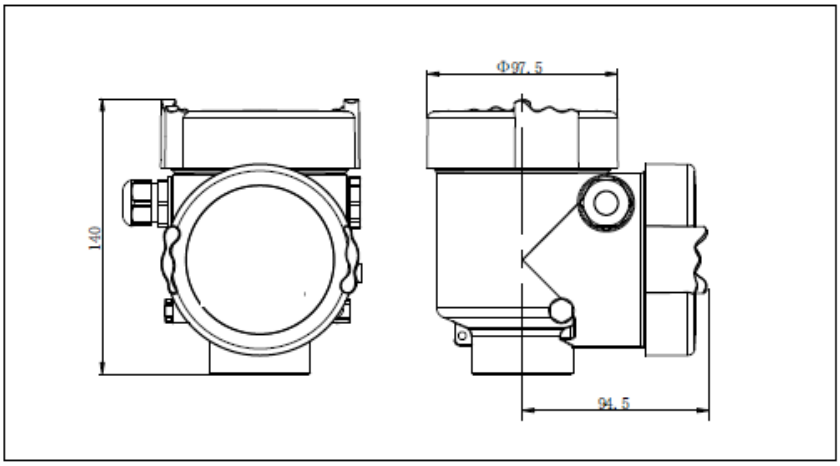
Adjust **RLS 6000** with HART Handheld Programmer



1 RS232 Connect Cable/USB port
2 **RLS 6000**
3 250 ohm Resistance

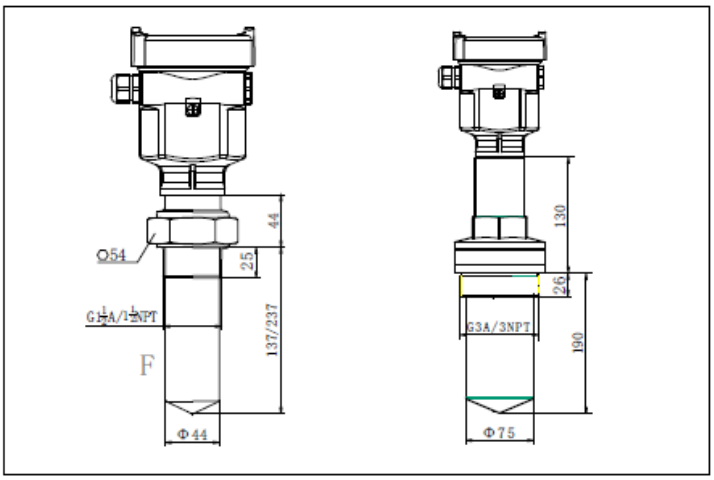
6 Dimension（Unit：mm）



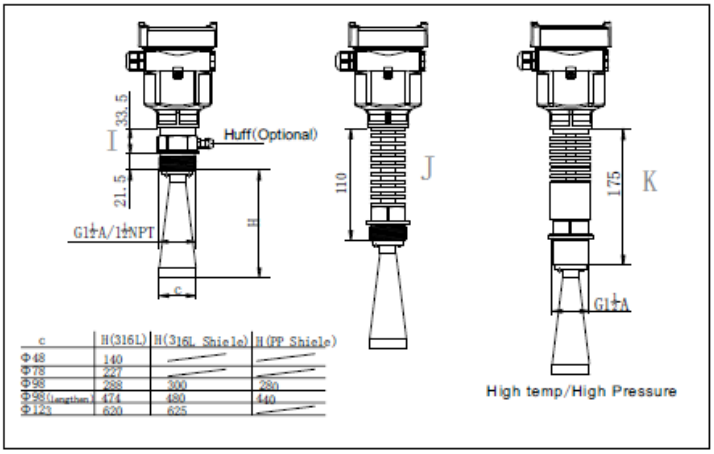


Housing A/B/G
Material：PBT/AL/316L

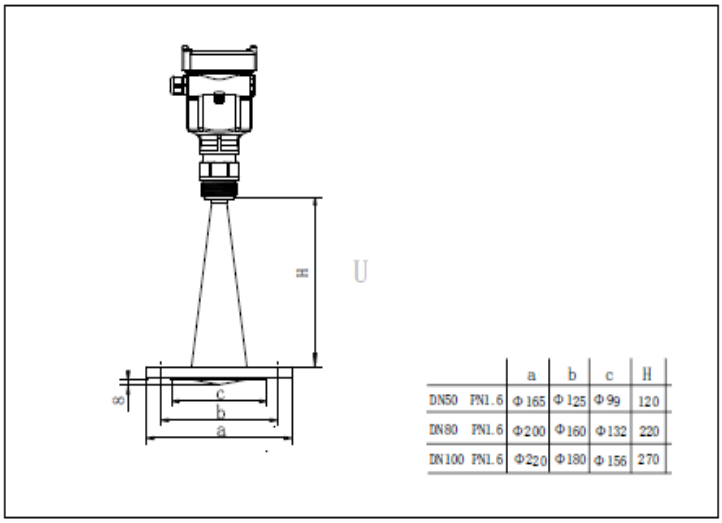
HORN ANTENNA



Threaded Vision

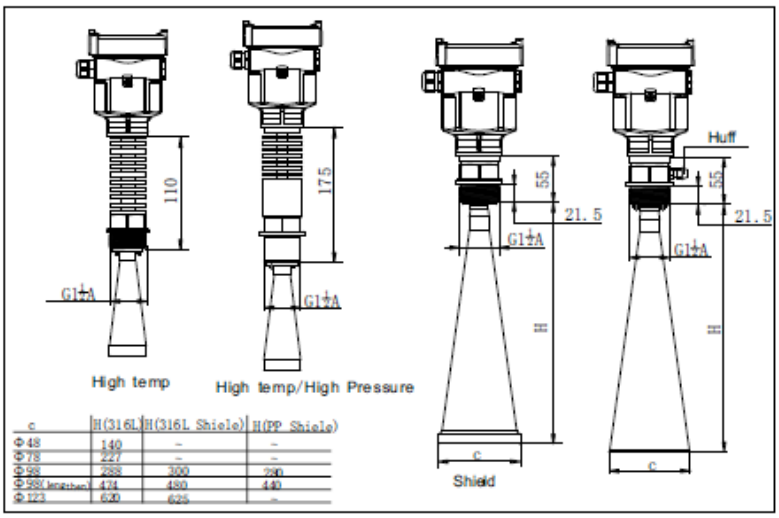


c	H(316L)	H(316L Shield)	H(PP Shield)
Φ48	140		
Φ78	227		
Φ98	288	300	280
Φ98(Lengthen)	474	480	440
Φ123	620	625	



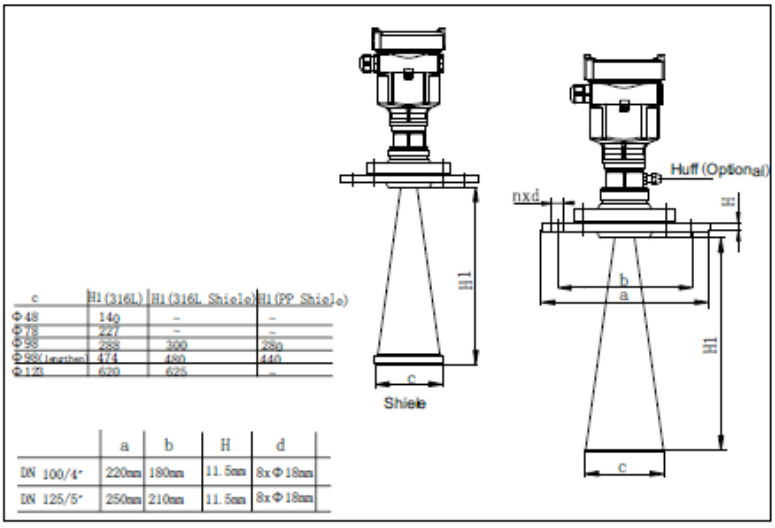
	a	b	c	H
DN50 PN1.6	Φ165	Φ125	Φ99	120
DN80 PN1.6	Φ200	Φ160	Φ132	220
DN100 PN1.6	Φ220	Φ180	Φ156	270

Flange Version



c	H(316L)	H(316L Shield)	H(PP Shield)
Φ48	140	-	-
Φ78	227	-	-
Φ98	288	300	290
Φ98(lengthen)	474	480	440
Φ123	620	625	-

Threaded Vision

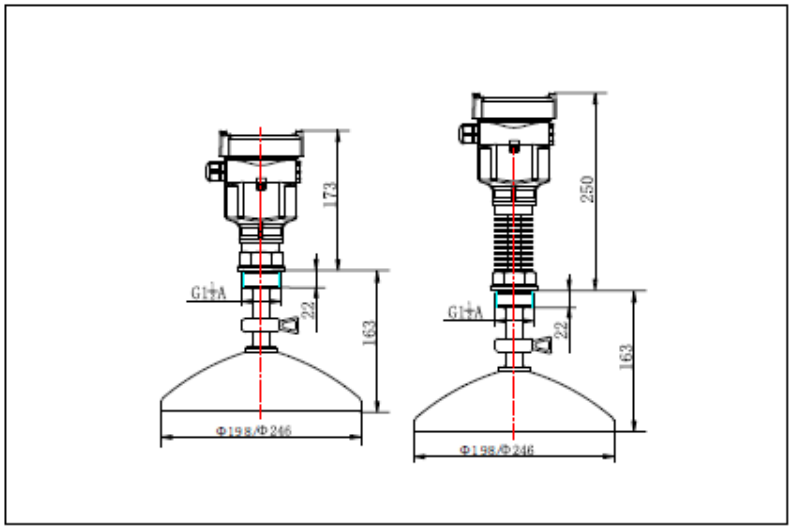


c	H1(316L)	H1(316L Shield)	H1(PP Shield)
Φ48	140	-	-
Φ78	227	-	-
Φ98	288	300	290
Φ98(lengthen)	474	480	440
Φ123	620	625	-

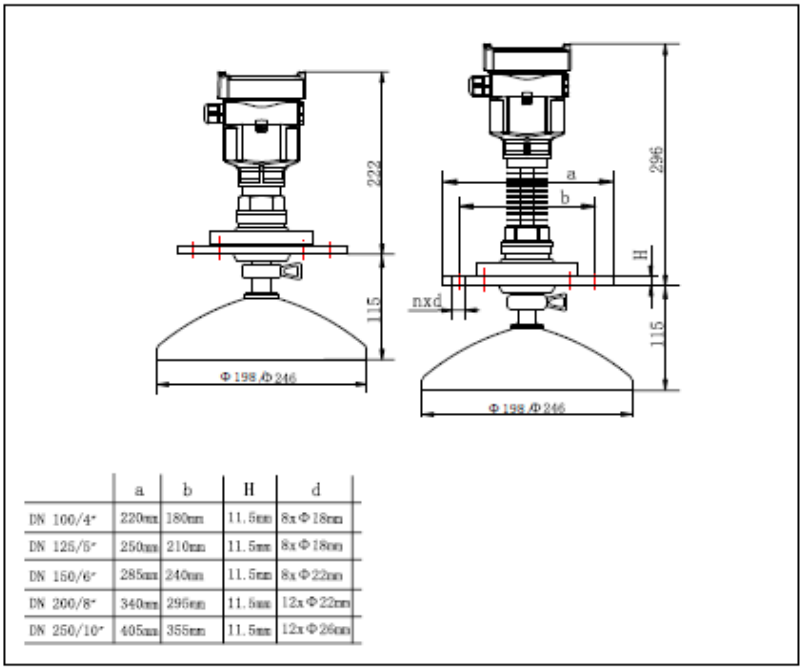
	a	b	H	d
DN 100/4"	220mm	180mm	11.5mm	8xΦ18mm
DN 125/5"	250mm	210mm	11.5mm	8xΦ18mm

Gimbal Flange

PARABOLIC ANTENNA



Threaded Vision



	a	b	H	d
DN 100/4"	220mm	180mm	11.5mm	8xΦ18mm
DN 125/5"	250mm	210mm	11.5mm	8xΦ18mm
DN 150/6"	285mm	240mm	11.5mm	8xΦ22mm
DN 200/8"	340mm	296mm	11.5mm	12xΦ22mm
DN 250/10"	405mm	355mm	11.5mm	12xΦ26mm

Gimbal Flange

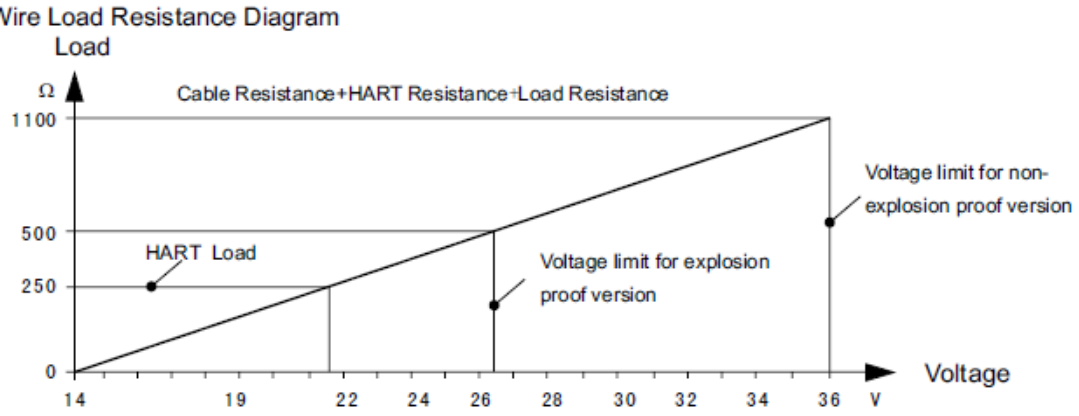
7 Technical Specifications

- General Parameters

	6100	6200	6300	6700	6800
Process Connection	ThreadG1½A	ThreadG1½A		ThreadG1½A	
		Thread1½NPT	Flange 316L	Flange 316L	
				Thread1½NPT	
Material	PTFE	Stainless Steel 316L PTFE	PTFE	Stainless Steel316L PTFE	PTFE

	Housing	Plastic PBT-FR; Aluminium,Stainless Steel 316L
	Seal ring between housing and housing cover	Silicone
	ViewPoint window on housing	Polycarbonate
	Ground terminal	Stainless Steel
Weight	Weight	
	- **6100**	1kg（Depend on process connections and housings）
	- **6200**	2kg（Depend on process connections and housings）
	- **6300**	3kg（Depend on process connections and housings）
	- **6700**	7kg（Depend on process connections and housings）
	- **6800**	6kg（Depend on process connections and housings）
Power	Standard Version	(16～26)V DC
2-wire	Intrinsic Safe Version	(21.6～26.4)V DC
	Power Consumption	max.22.5mA
	Ripple Allowed	
	—<100Hz	Uss<1V
	—(100～100K)Hz	Uss<10mV
4-wire/2-chamber	Intrinsic Safe+Explosion-Proof	(22.8～26.4)V DC, (198～242)V AC
	Power Consumption	max.1VA，1W
Parameters on Cable	Cable Entry/Plug	One cable entry of M20x1.5（cable diameter of 5～9m），one binding of M20x1.5
	Spring Connection Terminal	Applicable for cables with cross section of 2.5mm²
Output	Output Signal	4...20mA/HART
	Resolution	1.6μA
	Fault Signal	Constant current output: 20.5mA; 22mA; 3.9mA
	-2-wire load resistance	See diagram below
	-4-wire load resistance	Max. 500ohm
	Integration Time	0...40sec, adjustable

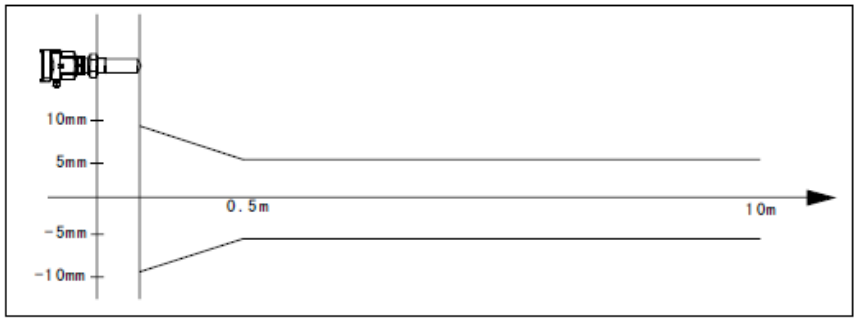
2-Wire Load Resistance Diagram



- Characteristic parameter

Blanking Distance	End of Antenna	
Max Measurement Distance	**6100**	10m（liquid）
	6200	30m（liquid）
	6300	20m（liquid）
	6700	15m（solid）
	6800	70m（solid）
Microwave Frequency	26GHz	
Measurement Interval	About 1sec（Depend on parameter settings）	
Adjustment Time[1)]	About 1sec（Depend on parameter settings）	
Resolution of Display	1mm	
Accuracy	See the diagram below	
Temperature for Storage/Transport	(−40～100)℃	
Process Temperature （Probe）		
– **6100**	(−40～130)℃	
– **6200**	(−60～400)℃	
– **6300**	(−40～150)℃	
– **6700**	(−40～200)℃	
– **6800**	(−60～400)℃	
Relative Humidity	<95%	
Pressure	Max. 40MPa	
Vibration Proof	Mechanical vibration10m/s 10m²/s， 10～150Hz	

RLS6100

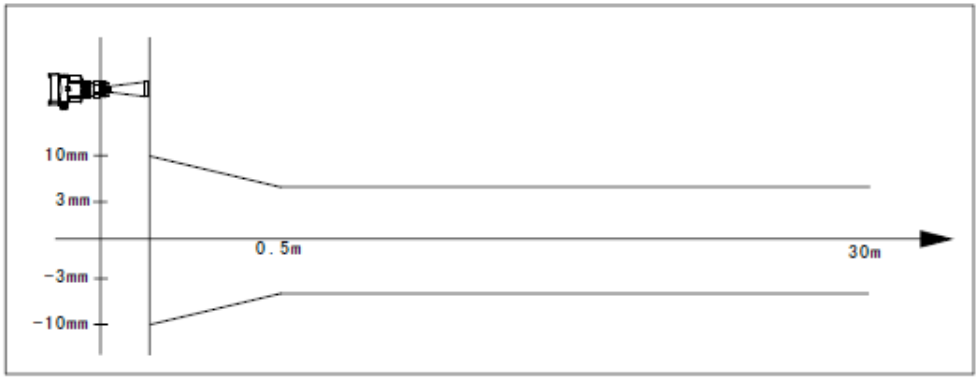


3dB Beam Angle 22°

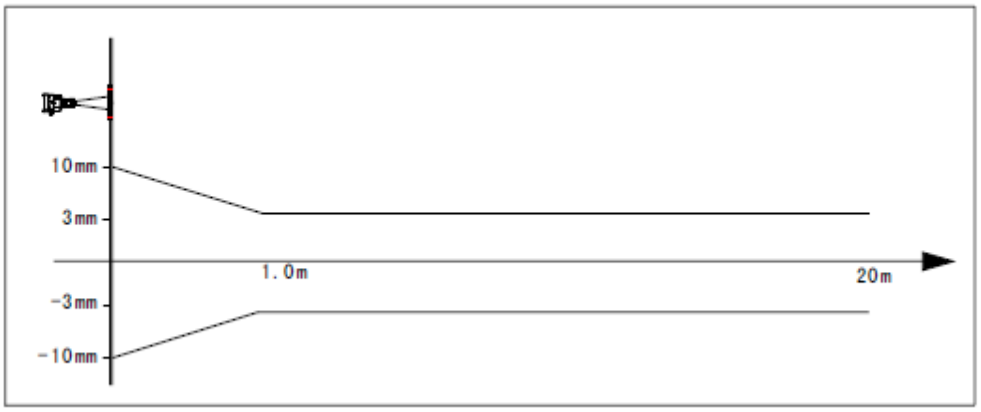
Accuracy See the diagram left

1) The generation of accurate measurement results needs longer time than usual in the event of drastic level changes(mx. Error 10%).

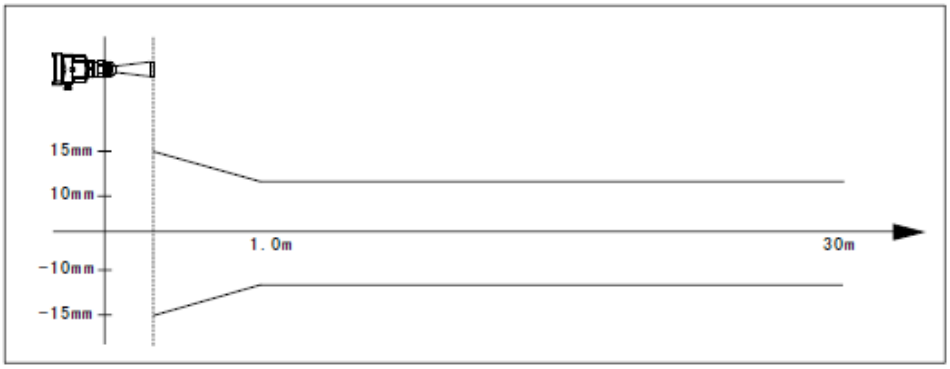
RLS6200	3dB Beam Angle	
	-Φ48mm	18°
	-Φ75mm	12°
	-Φ98mm	8°
	-Φ123mm	6°
	Accuracy	See the accuracy illustration diagram below



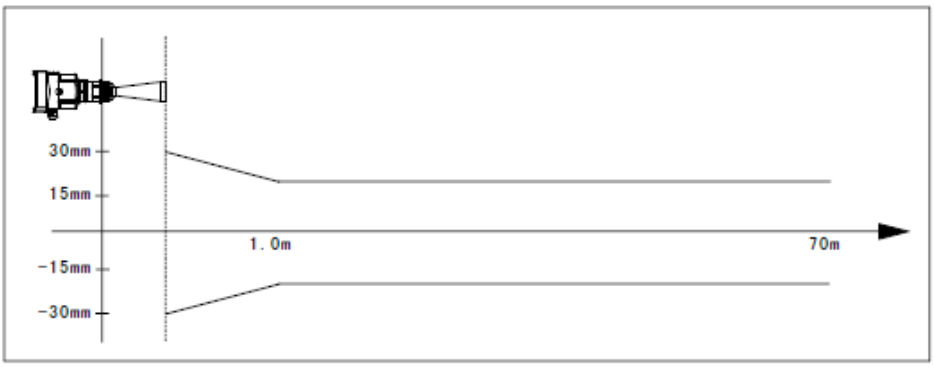
RLS6300	3dB Beam Angle	
	-flangeDN50	18°
	-flangeDN80	12°
Accuracy		See the accuracy illustration diagram below



RLS6700	3dB Beam Angle	
	-Φ48mm	18°
	-Φ75mm	12°
	-Φ98mm	8°
	-Φ123mm	6°
	-Φ196mm	5°
	-Φ246mm	4°
	Accuracy	See the accuracy illustration diagram below



RLS 6800	3dB Beam Angle	
	-Φ48mm	18°
	-Φ75mm	12°
	-Φ98mm	8°
	-Φ123mm	6°
	-Φ196mm	5°
	-Φ246mm	4°
	Accuracy	See the accuracy illustration diagram below



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