

ACRRD2100
ACRRD2200
ACTRD2300
ACTRD2400
ACTRD2500



Product Selection Guide

2 Product Overview

ACTRD2100



ACTRD2200



ACTRD2300



Application:	Level measurement in liquids, especially erosive liquids, under easy process condition	Level measurement under certain pressure /temperature limit and easy process condition	Level measurement of strong erosive medium under certain pressure/temperature limit and easy process condition
Measurement Range:	10m	30m	20m
Measurement Accuracy:	G1 ½ A	K3mm	K3mm
Process Connection:	PVDF	G1 ½ A	Flange/Clip
Antenna Material:	-40...130 °C	Stainless Steel316L/PTFE	PTFE
Process Temperature:	-1.0...3bar	-40...200 °C	-40...150 °C
Process Pressure:	26GHz	-1.0...40bar	-1.0...16bar
Frequency Range:	2-wire/4-wire	26GHz	26GHz
Signal Output:	4...20mA/HART	2-wire/4-wire 4...20mA/HART	2-wire/4-wire 4...20mA/HART

ACTRD2400

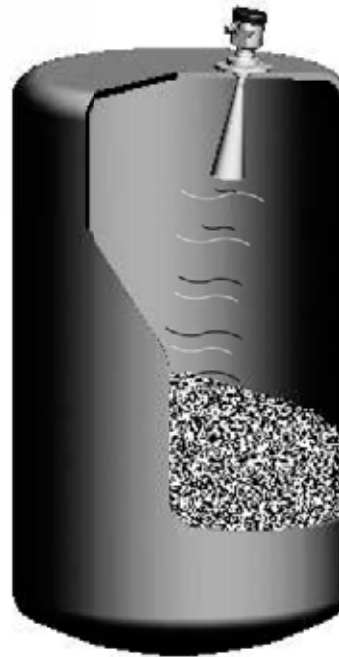


ACTRD2500



Application:	Storage/process vessels under hazardous process condition	Storage/process vessels under hazardous process condition
Max Measurement Range:	70m	70m
Measurement Accuracy:	K15mm	K15mm
Process Connection:	Flange 316L/G1 ½ A	Flange 316L/G1 ½ A
Antenna Material:	Stainless Steel316L/PTFE	Stainless Steel316L/PTFE
Process Temperature:	-40...200 °C	-40...200 °C
Process Pressure:	-1.0...16bar	-1.0...16bar
Frequency Range:	26GHz	26GHz
Signal Output:	2-wire/4-wire 4...20mA/HART	2-wire/4-wire 4...20mA/HART

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, GDRD50 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

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

The false echo storage function enables the instrument to detect the true echo with the presence of multiple false echoes and eventually generate accurate measurement results.

There are multiple options available in choosing various process connection and detection component, which enables ACTRD2000 series radar level instrument to be applied in a broad array of hazardous applications, such as high temperature, high pressure, small dielectric constant and etc.

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.

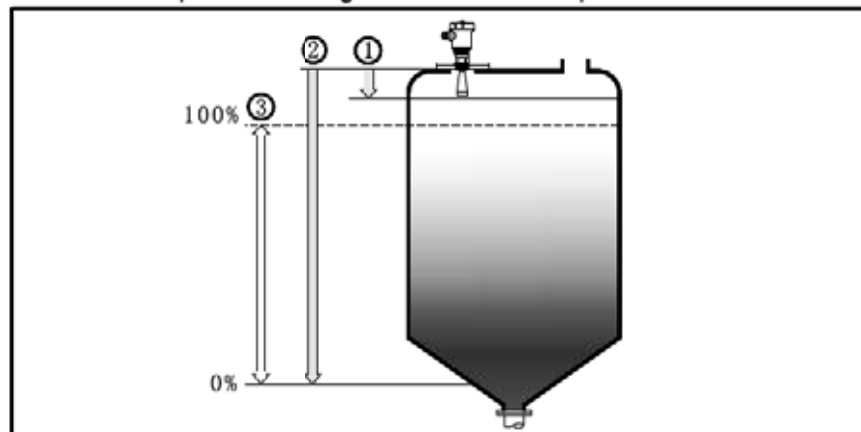
3 Mounting Requirement

Basic Requirement There is a certain existing beam angle while the antenna transmitting microwave pulses. There should be no barriers between the lower edge of antenna and surface of measured medium. Therefore it is highly recommended to avoid facilities inside vessels, such as ladders, limit switches, heating spirals, struts and etc, during the mounting process. A false echo storage must be carried out during the installation in this case. Furthermore, microwave beams must Not intersect the filling streams. Be cautions during the installation when: 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 explosion proof area must abide by relevant local or federal safety regulations. Aluminium 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.

Measurement blanking zone: the area between measurement reference plane and the antenna end. (See the illustration below)

Illustration

The thread or seal plane of flange is the reference plane for measurement.

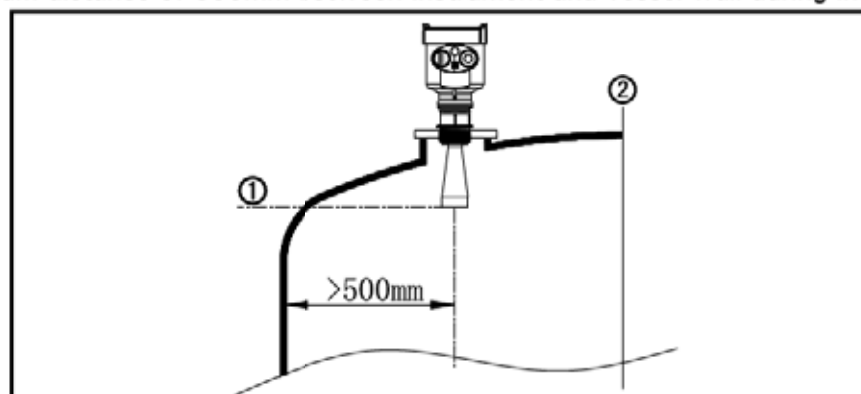


- 1 Blanking Zone
- 2 Empty (Max. Measurement Distance)
- 3 Max. Measurement Range

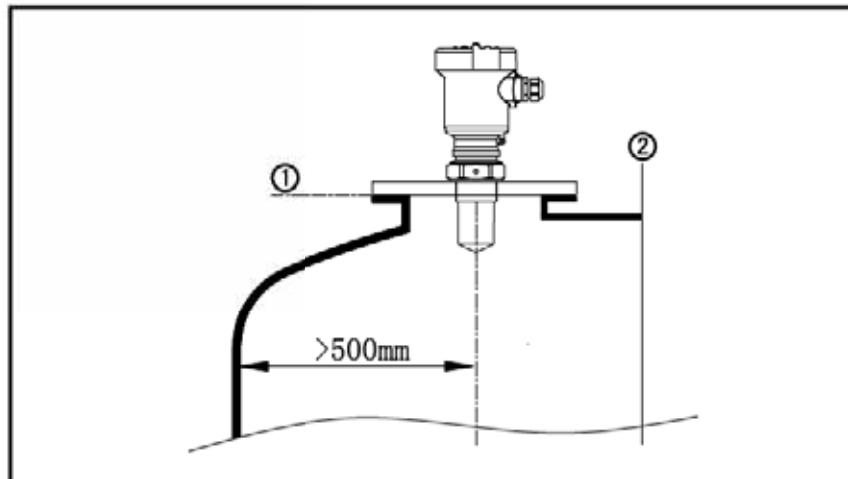
Note: The highest level of measured medium must not enter into blanking zone while radar level measurement instrument is in operation.

Mounting Position

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



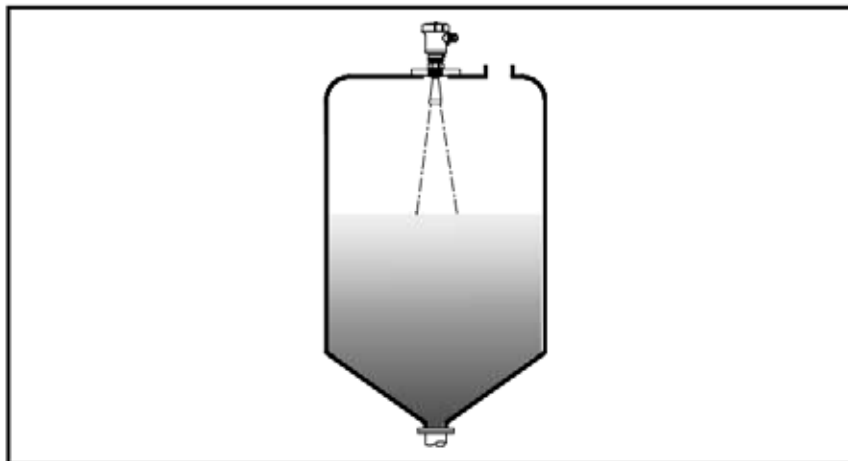
- 1 Reference plane
- 2 Center of vessel or symmetrical axis



1 Reference Plane

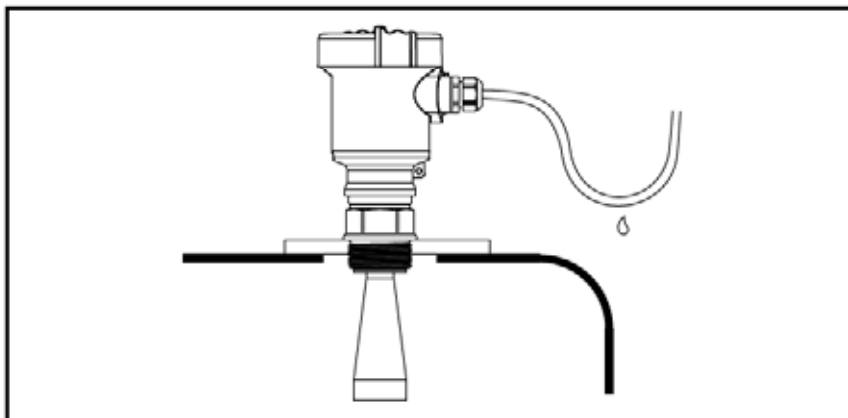
2 Center of vessel or symmetrical axis

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.



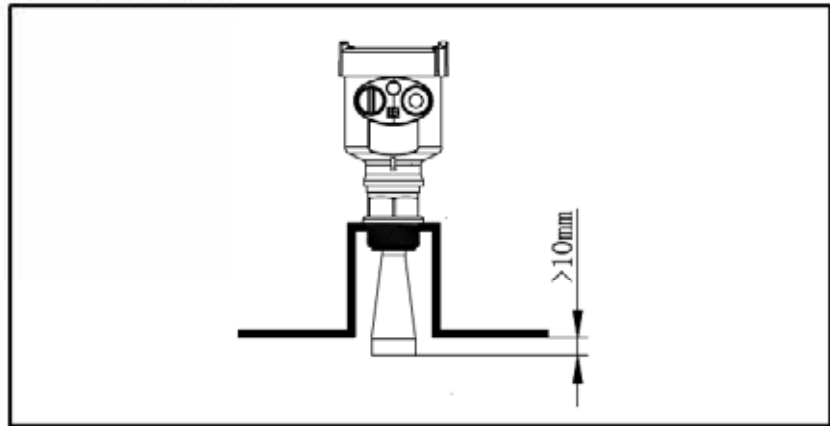
Damp-proof

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:



Socket

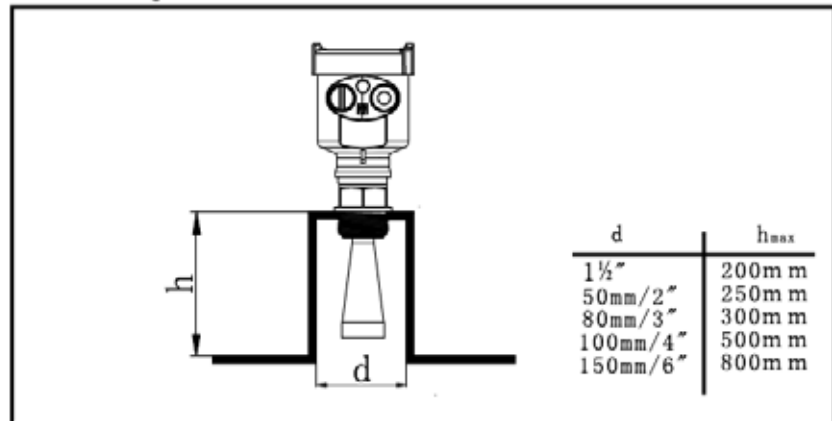
The transducer end must at least protrude 10mm out of socket.



Example: ACTRD2100

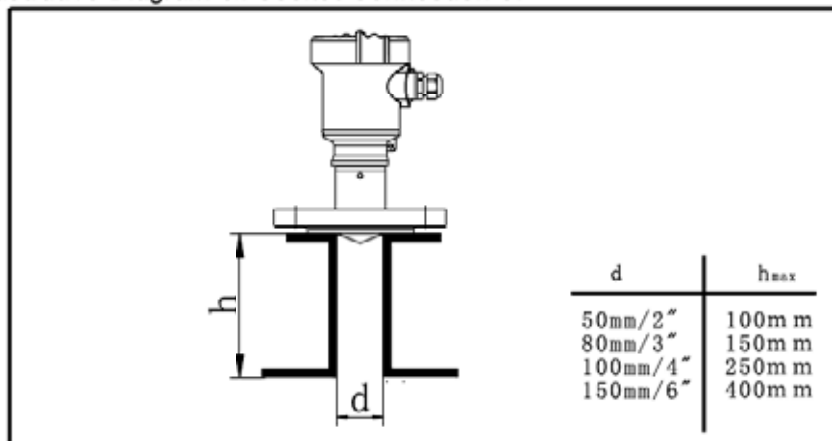
In case of strong reflective properties of target medium and big socket diameter, you can mount instruments on sockets higher than the antenna length. The recommended values for socket heights are shown in the illustration below. The socket end should be smooth and burr-free, if possible also rounded. Moreover, false echo storage must be carried out afterwards.

Illustrative Diagram on Socket Connection of ACTRD2200

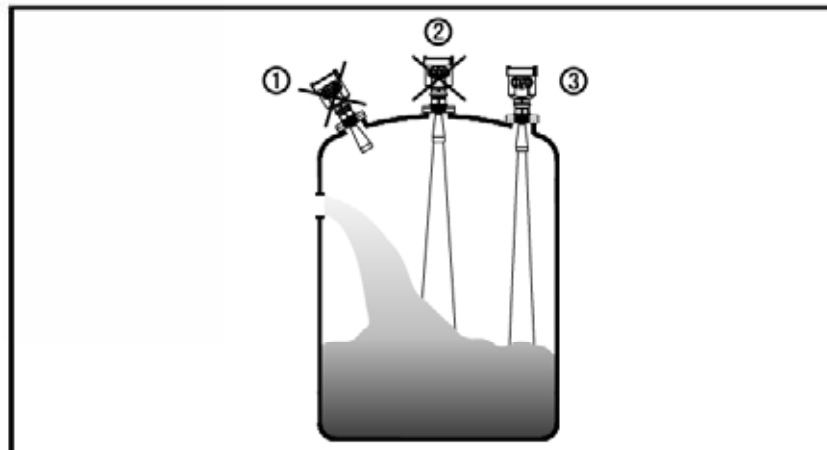


Example: GDRD56

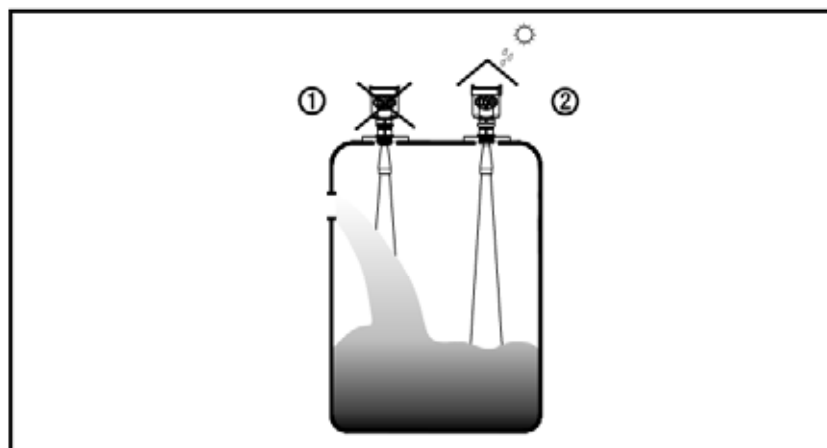
Illustrative Diagram on Socket Connection of ACTRD2300



Illustrative Diagram
on Installation



- 1 Wrong: Fail to turn the antenna perpendicular to the surface of target medium.
- 2 Wrong: Instruments are mounted in the center of concave or arched vessel tops, which results in multiple echoes.
- 3 Correct

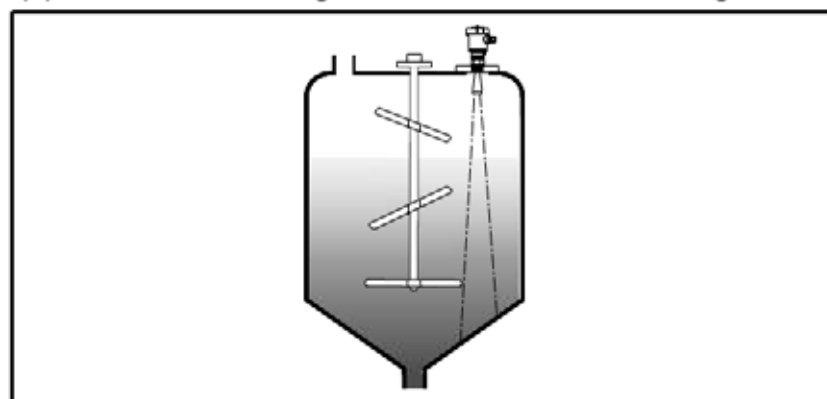


- 1 Wrong: Mount the instrument in/in/above filling stream, which results in the measurement of filling stream not the target medium
- 2 Correct

Note: Sun shield or rain-proof is required for outdoor mounting

Agitator

If there are agitators in vessels, instrument must be mounted as far away from agitators as possible. Once installation completed, a false echo storage 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.

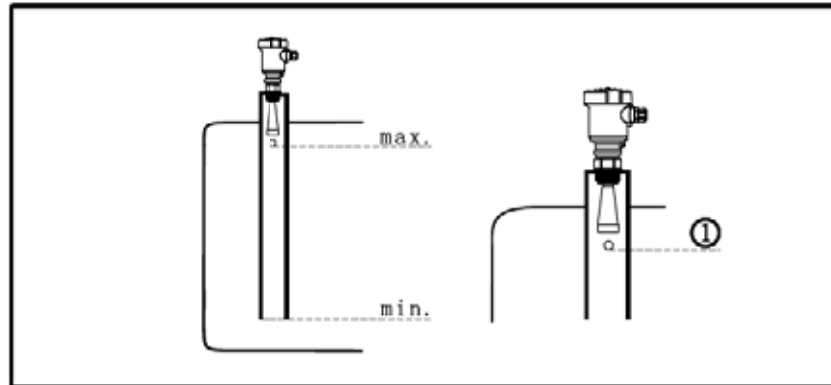


Foam

Due to the action of filling, stirring or other processes inside vessels, dense foams are formed on the surface of some liquid medium, which could attenuate emitting signals considerably. You are advised to mount the instrument inside a standpipe or opt for a guided wave radar level instrument if the generation of foam incurs measurement errors.

Installation with Standpipe

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.



1 Venthole of diameter 5...10mm

If the measurement is undertaken by GDRD5X inside the standpipe 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.

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

4 Electrical Connection

Power Supply

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

4. . . 20mA/HART(4-wire) Power supply and current signal are carried by two 2-wire connection cables respectively. See the Technical Specifications of this catalogue 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.

Installation of Connection

Cables

General Introduction 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 turbulence.

4. . . 20mA/HART(2-wire) Standard two-wire cable can be used as feeder cable.

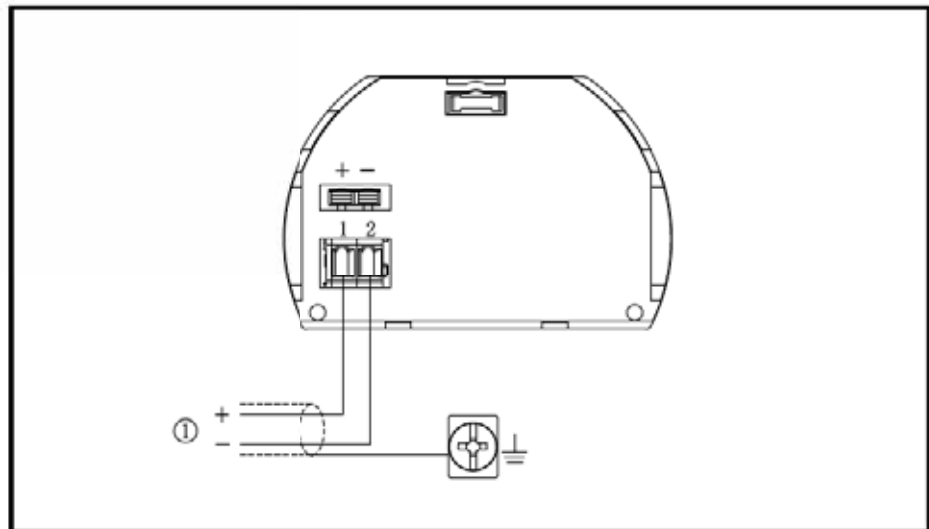
4. . . 20mA/HART(4-wire) The connection cable with special earth wire should be used as feeder cable.

Screening & Grounding

The two ends of screened cable must be connected with earth terminal. The screened 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 evaluation side of screened cable must be connected to ground potential via a ceramic capacitor (e.g. : 1 μ F 1500V) in order to dampen the low frequency grounding current and avoid the disturbance caused by high frequency signals

Wiring Diagram

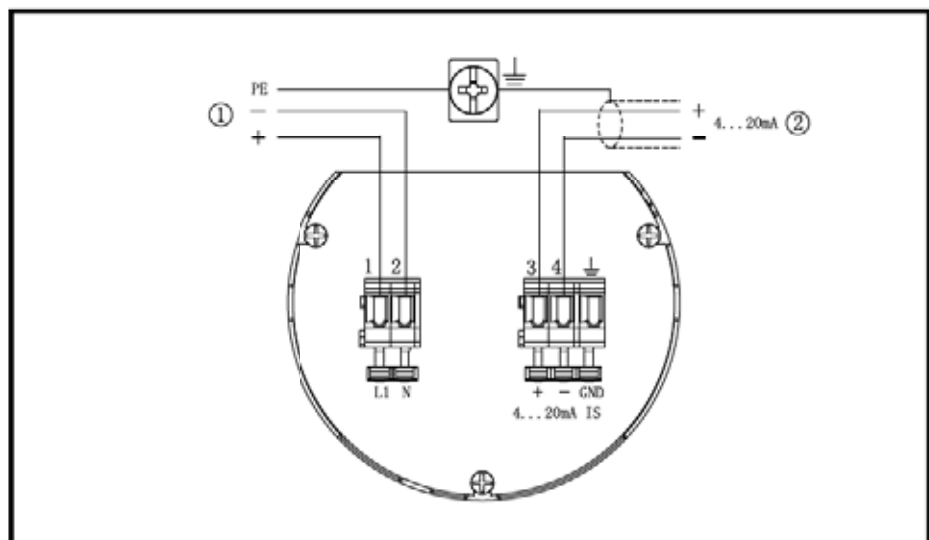
2-wire



2-wire wiring used for HART

- 1) Power supply and signal output

4-wire/2-chamber Structure



Wiring plan suitable for 4-wire/2-chamber structure

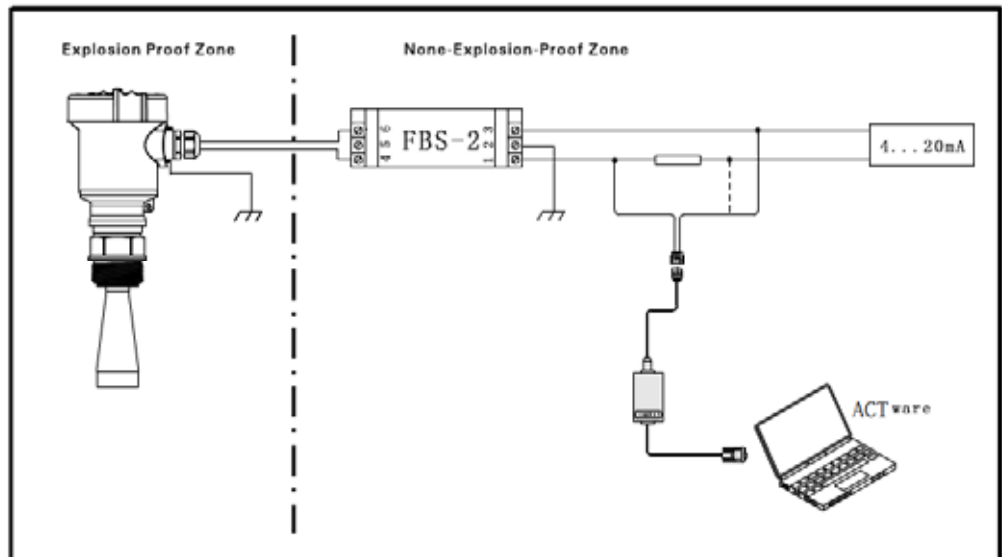
- 1) Power supply
- 2) Signal output

Explosion Proof Connection

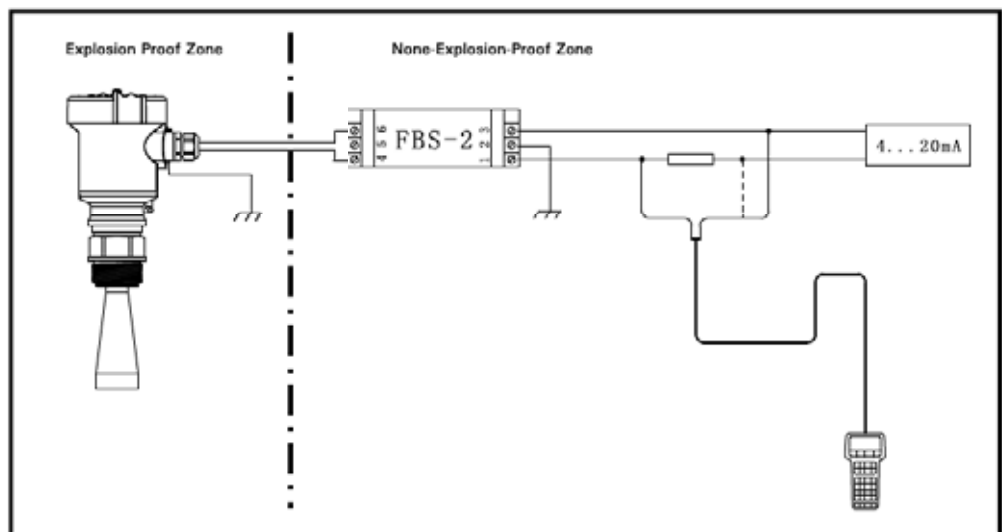
This product is an intrinsic safety explosion proof version (Exia II c T6) with aluminium housing and plastic-encapsulated internal structure aimed to prevent sparks resulted from transducer and circuit malfunction from leaking out. It is applicable for the non-contact continuous level measurement of flammable medium under the level of explosion proof inferior to Exia II c T6.

You are required to use FBS-2 series (intrinsic safety explosion proof: [Exia] II B, voltage of power supply: 24V DCK5%, short-circuit current: 100mA, 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 $\leq 0.1 \mu F/Km$, stray inductance $\leq 1mH/Km$. Ultrasonic level measurement instrument must be connected to ground potential and unapproved supplementary devices are not allowed to use.



Adjust with ACTware



Adjust with HART handheld programmer

5 Adjustment Instructions ACTRD2XXX

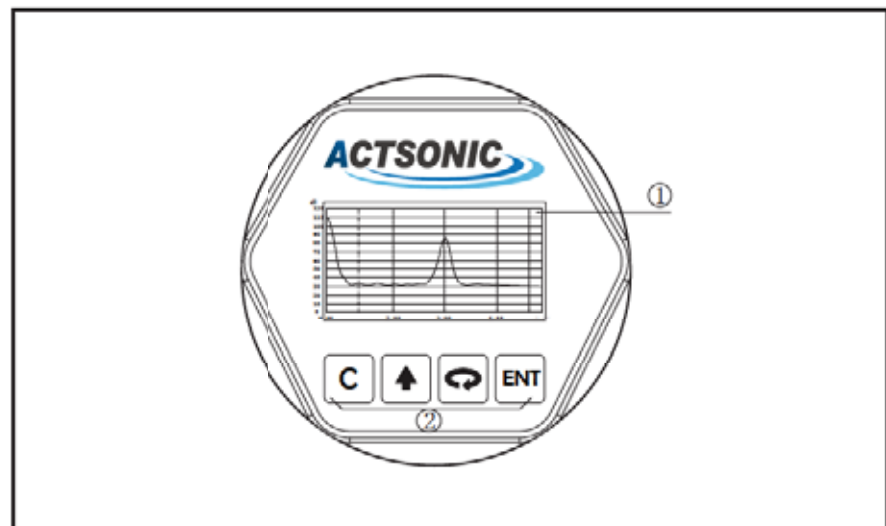
Adjustment Methods

Three adjustment methods available for

- 1 Display/adjustment module
- 2 An adjustment software- **ACTware**
- 3 HART handheld programmer

Display/Adjustment Module

ViewPoint is a pluggable display/adjustment module, which can be mounted on **ACTRD2XXX** from two different angles(displaced by 180 degree). 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.



- 1 LCD 2 Adjustment Keypad

[**ENT**]

- Enter programming mode;
- Confirm programming options;
- Confirm modifications to parameters.

[]

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

[]

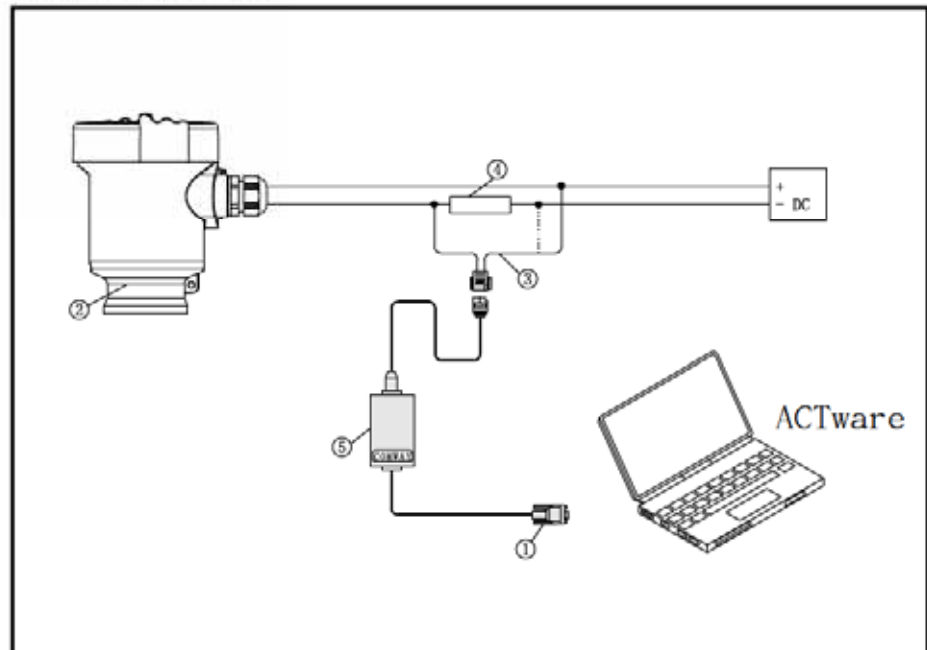
- Modify parameter values.

[**C**]

- Programming mode exit;
- Return to higher menu level.

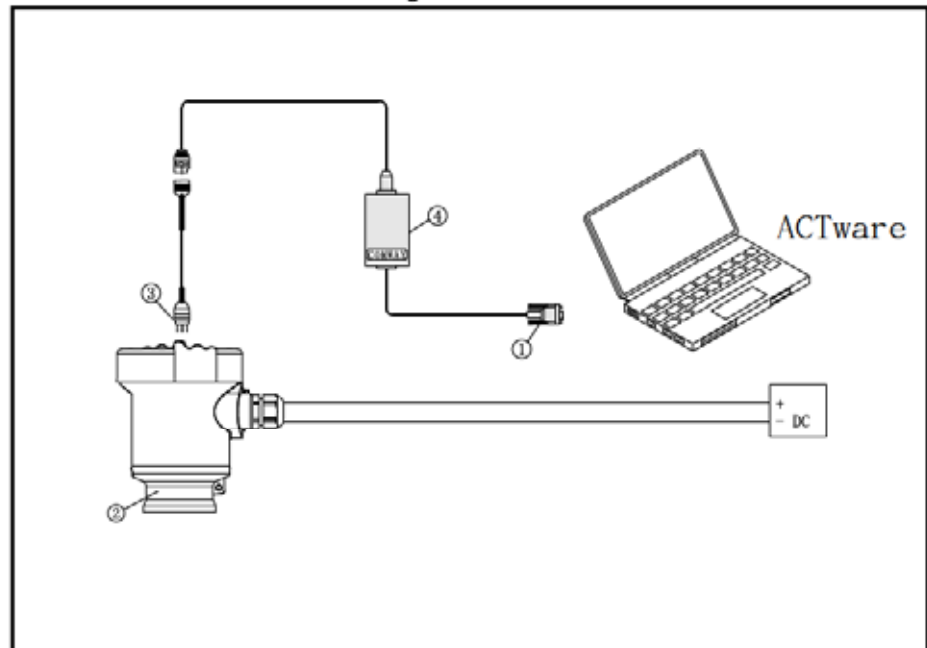
ACTware

Connect with another unit through HART



- 1 Rs232 connection cable
- 2 ACTRD2xxx
- 3 HART adapter used on COMWAY convertor
- 4 Resistance 250ohm
- 5 COMWAY convertor

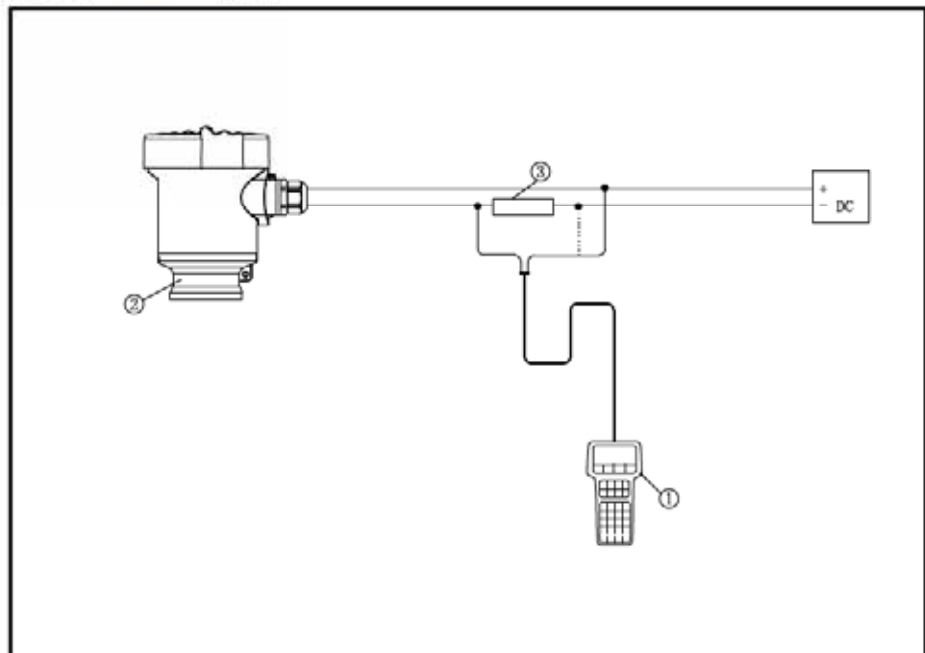
Connect with another unit through I²C



- 1 Rs232 connection cable
- 2 ACTRD2xxx
- 3 I²C adapter used on COMWAY convertor
- 4 COMWAY convertor

HART Handheld Programmer

Adjust ACTRD2xxx with HART Handheld Programmer

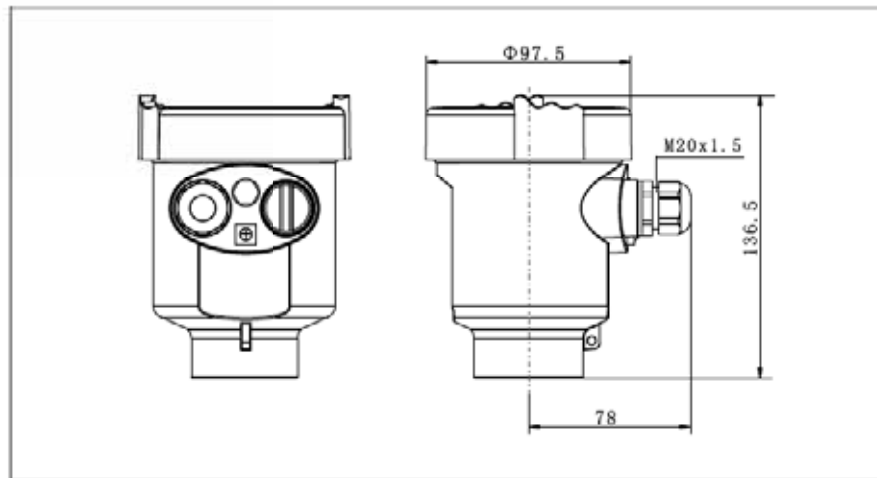


- 1 HART handheld programmer
- 2 ACTRD2xxx
- 3 Resistance 250ohm

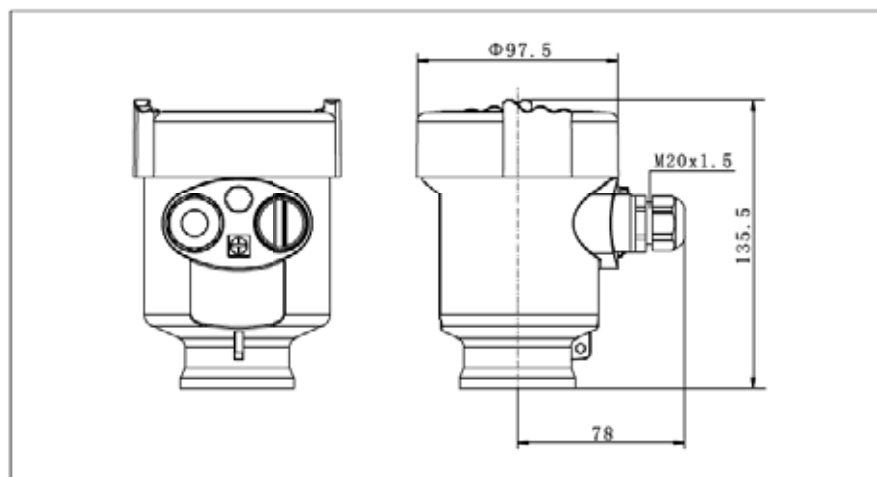
6 Dimensional Drawings (Unit: mm)

Housing

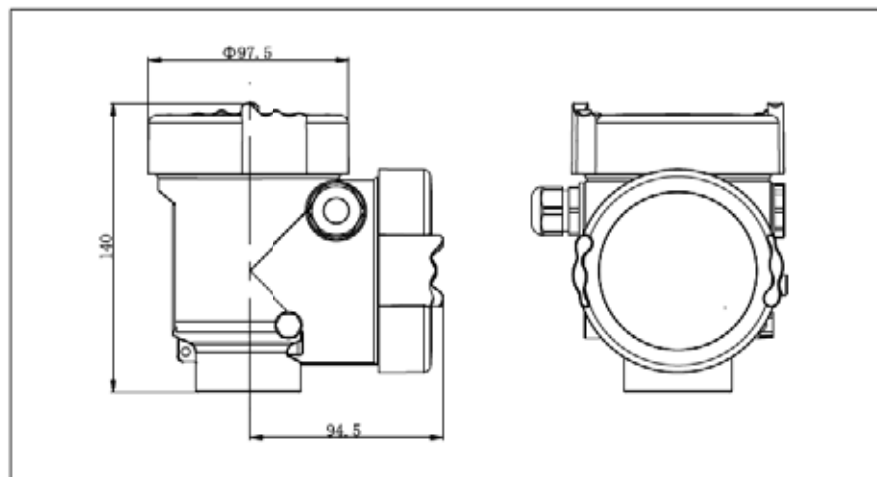
Material: AL/316L



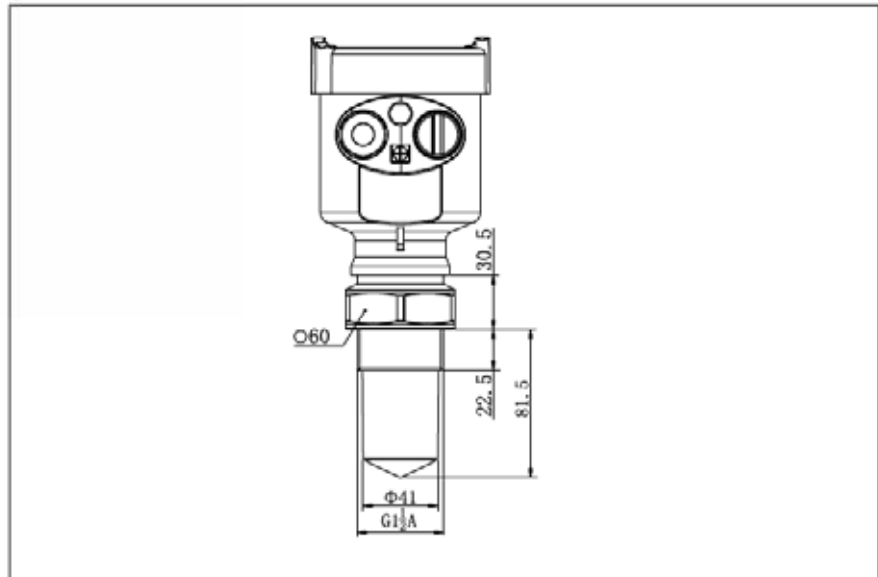
Material: PBT-FR



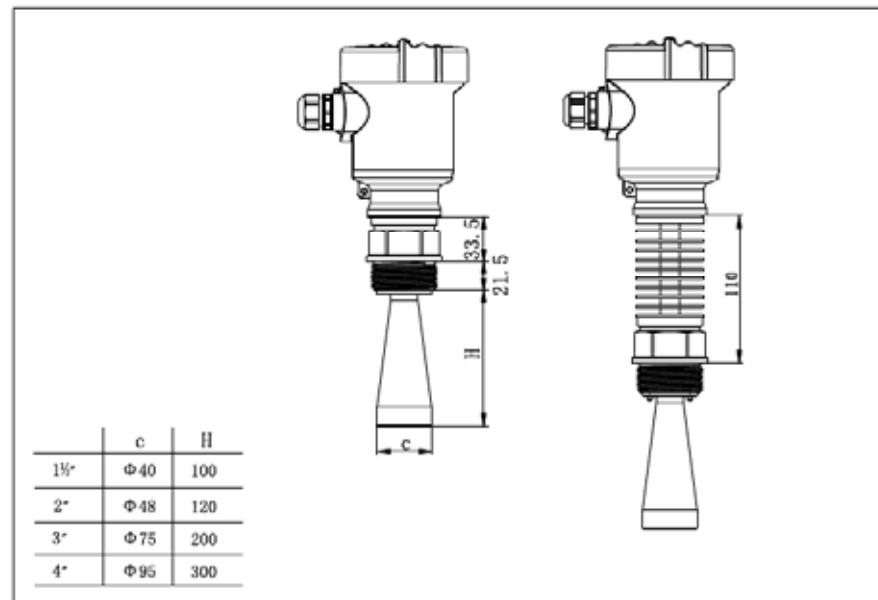
Material:AL(two-chamber)



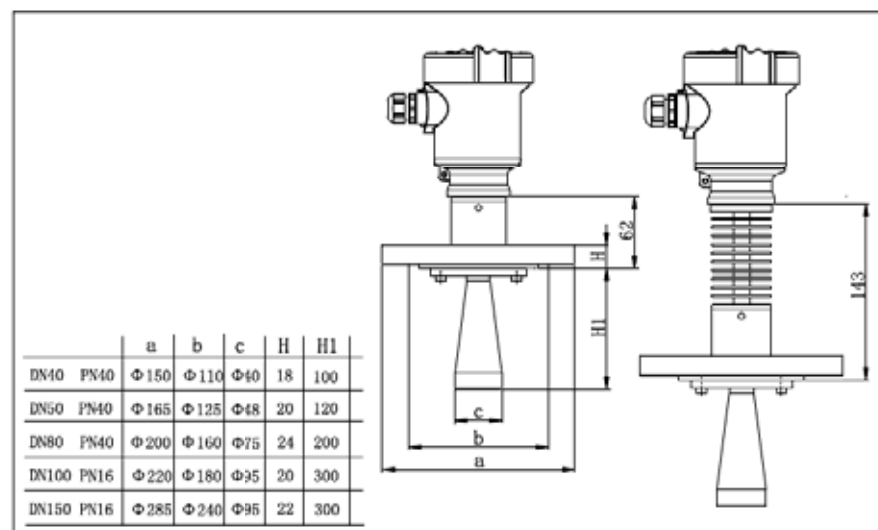
Threaded Version
ACTRD2100



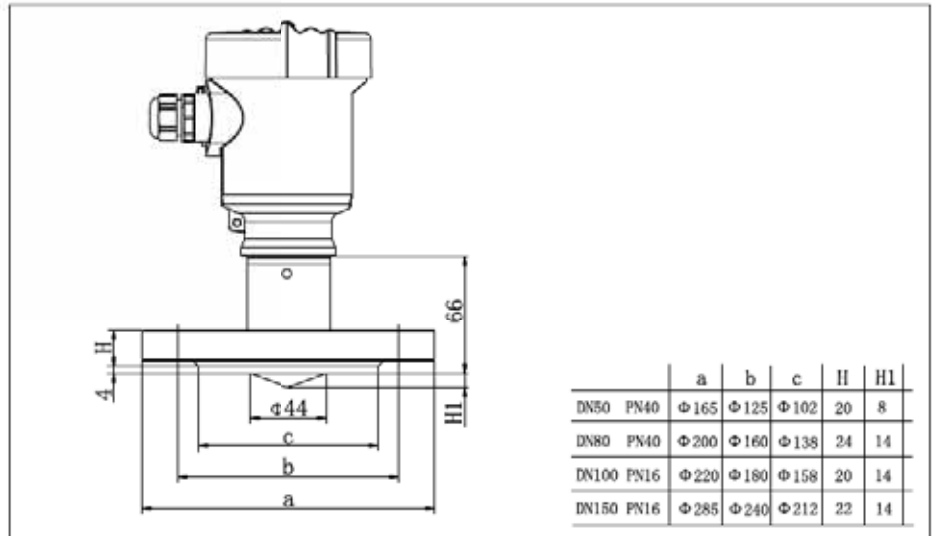
Threaded Version
ACTRD2200



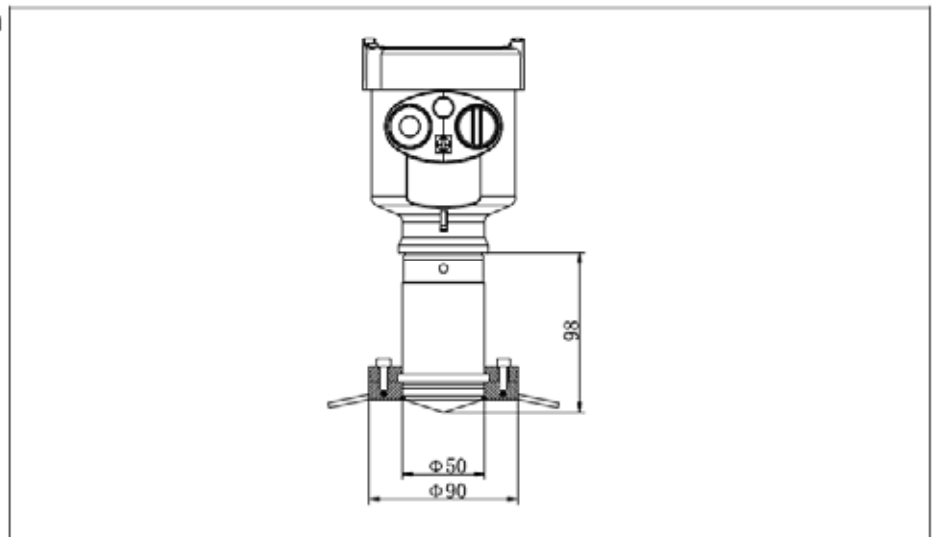
Flange Version
ACTRD2200



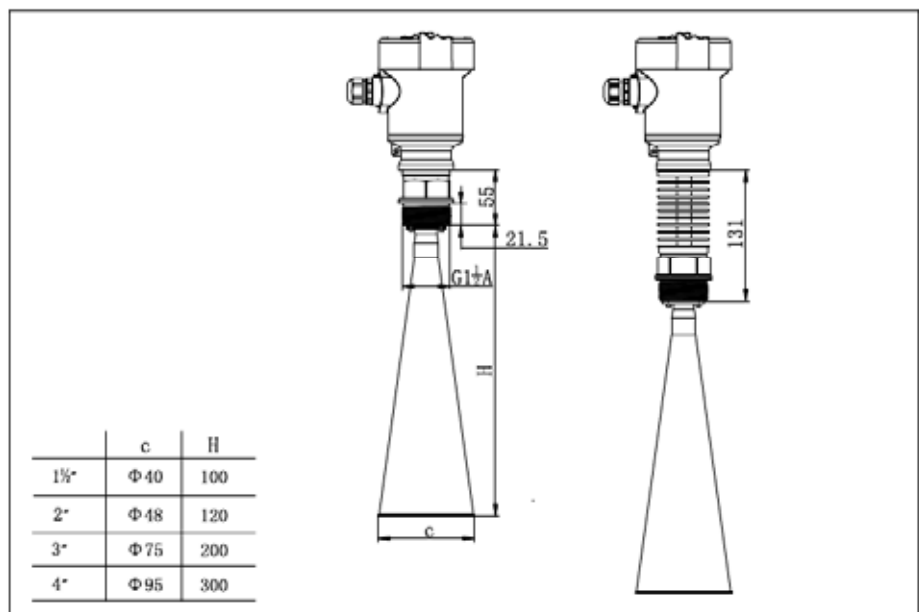
ACTRD2300 Flange Version



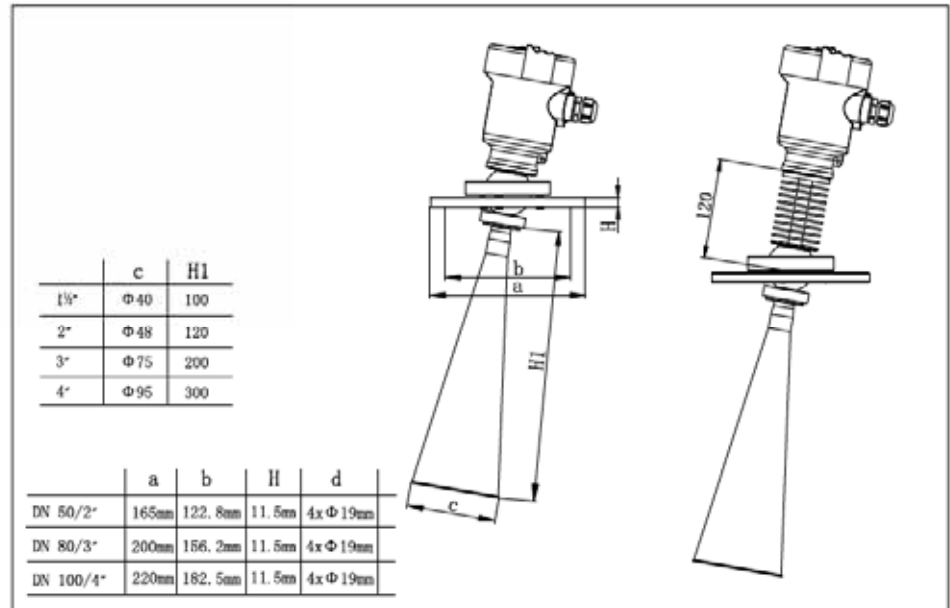
ACTRD2300 Clip Connection (Sanitary Version)



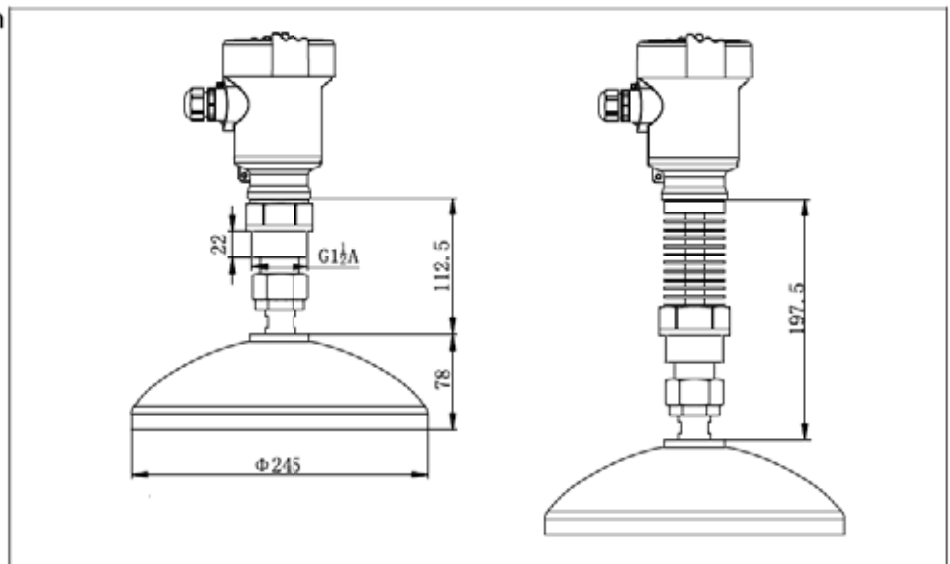
ACTRD2400 Threaded Version



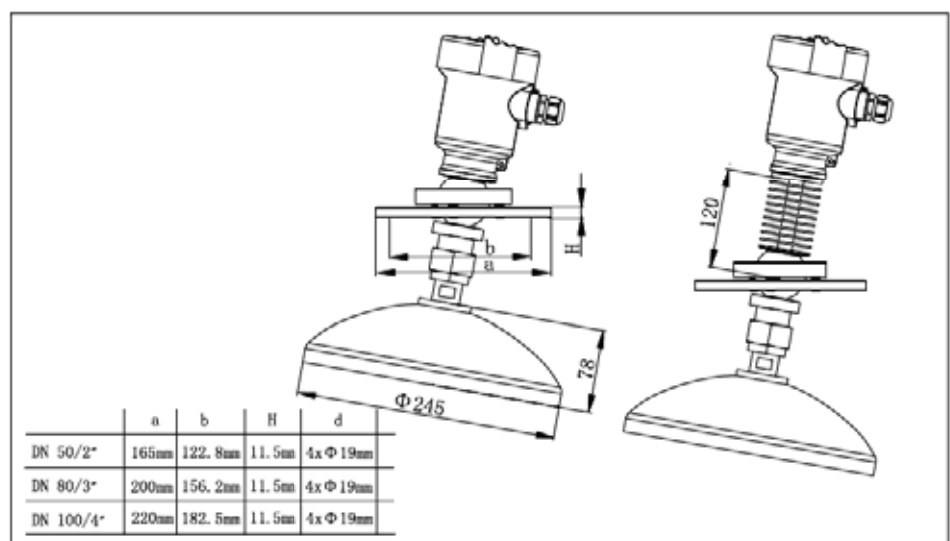
ACTRD2400 Flange Version



ACTDR2500 Threaded Version



ACTRD2500 Flange Version



Technical Specifications

General Parameters

Model	ACTRD2100	ACTRD2200	ACTRD23000	ACTRD2400	ACTRD2500
Process Connection	Thread G1 ½ A	Thread G1 ½ A	Thread G1 ½ A		
			Flange 316L	Flange 316L	Flange 316L
			Sanitary Version/Clip316L		
Antenna Material	PVDF	Stainless Steel316L/PTFE	PTFE	Stainless Steel316L/PTFE	Stainless Steel316L/PTFE

Material:

-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

ACTRD2100	kg (Depend on process connection and housing)
ACTRD2200	kg (Depend on process connection and housing)
ACTRD2300	kg (Depend on process connection and housing)
ACTRD2400	kg (Depend on process connection and housing)
ACTRD2500	kg (Depend on process connection and housing)

Power

-Standard version 16... 36V DC

2-Wire

-Intrinsic safe version 15... 30V DC

Power consumption max.22.5mA

Ripple Allowance

-<100Hz U_{ss}<1V

-<100Hz... 100KHz U_{ss}<10mV

-Intrinsic safe+explosion-proof 20... 72VDC, 20...253VAC, 50/60Hz

4-wire/2-chamber

Power consumption max.4VA, 2W

Output Signal 4... 20mA/HART

Resolution 1.6 μ A

Default Signal Constant current output: 20.5mA; 22mA; 3.8mA

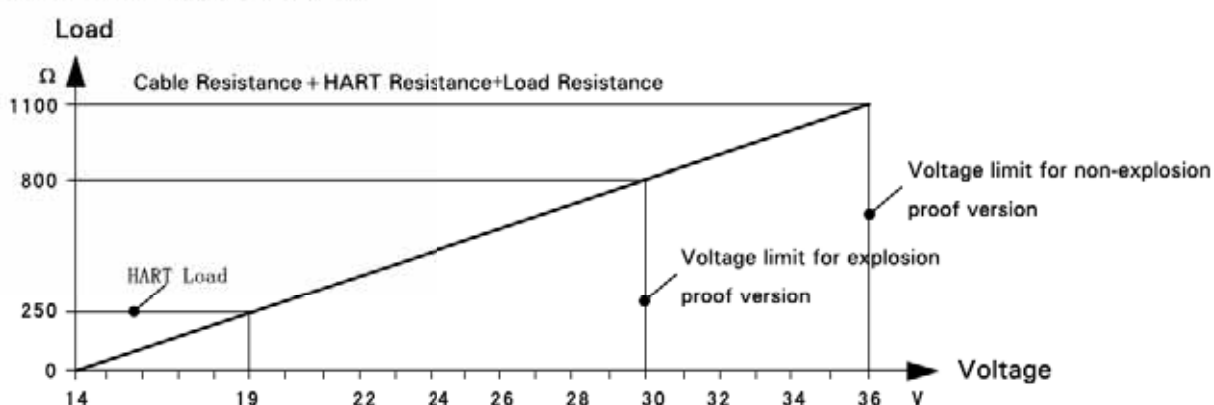
-2-wire load resistance See diagram below

-4-wire load resistance Max. 500ohm

Output

Integration Time 0... 20sec, adjustable

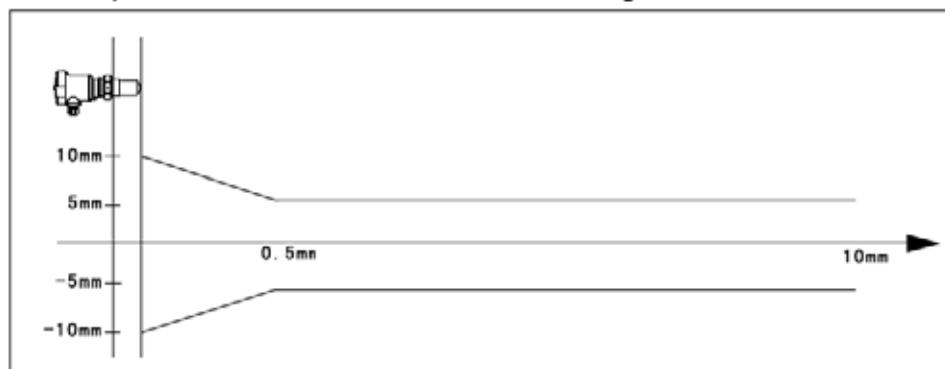
2-wire Load Resistance Diagram



Characteristic Parameters

Blanking Distance	End of Antenna
Max. Measurement Distance	
ACTRD2100	10m (Liquids)
ACTRD2200	30m
ACTRD2300	20m (Liquids)
ACTRD2400	70m
ACTRD2500	70m
Microwave Frequency	26GHz
Measurement Interval	About 1sec (Depend on parameter settings)
Adjustment Time	About 1sec (Depend on parameter settings)
Resolution of Display	1mm
Accuracy	See the accuracy illustration diagram below
Temperature for Storage/Transport	-40...+80°C
Process Temperature (Probe)	
ACTRD2100	-40...+130°C
ACTRD2200	-40...+200°C
ACTRD2300	-40...+150°C
ACTRD2400	-40...+200°C
ACTRD2500	-40...+200°C
-Relative Humidity	< 95%
-Pressure	0.1MPa
Vibration Proof	Mechanical vibration 10m/s ² , 10... 150Hz
Beam Angle	22°
Accuracy	See the diagram below

ACTRD2100



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

ACTRD2200

Beam Angle

-Φ 40mm

-Φ 48mm

-Φ 75mm

-Φ 95mm

Accuracy

Depend on the size of antenna

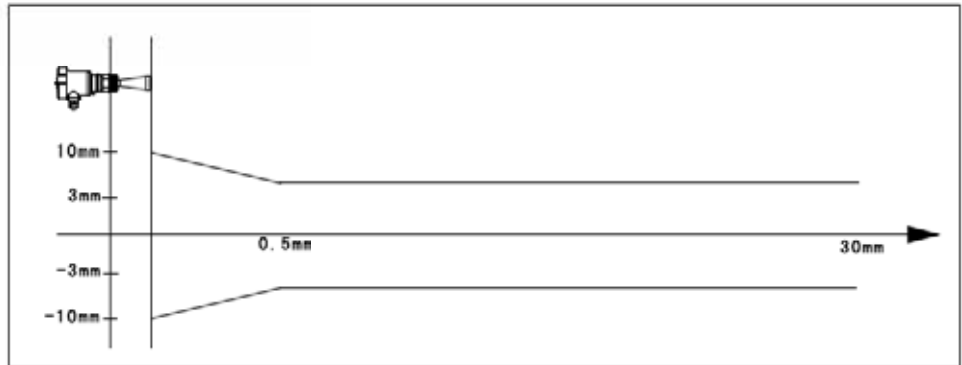
22°

18°

10°

8°

See the diagram below



ACTRD2300

Beam Angle

-Clip 2"

-Clip 3" 4"

-Flange DN50, ANSI 2"

-Flange DN80... DN150,

ANSI 3"... 6"

Accuracy

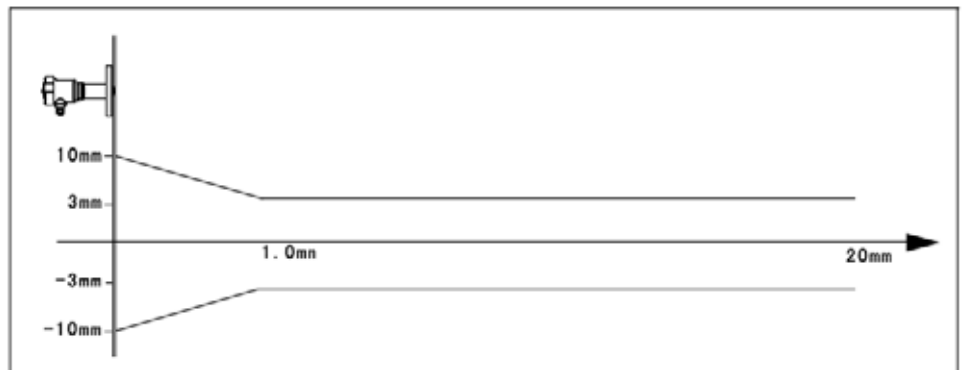
18°

10°

18°

10°

See the diagram below



ACTRD2400

Beam Angle

-Φ 40mm

-Φ 48mm

-Φ 75mm

-Φ 95mm

Accuracy

Depend on the size of antenna

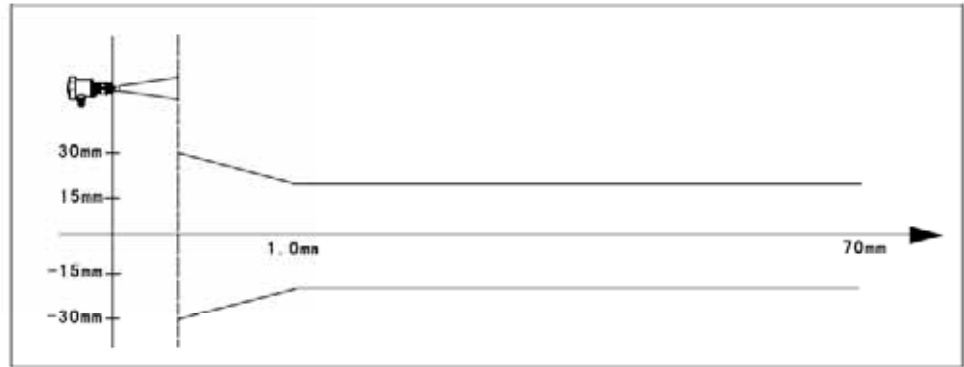
22°

18°

10°

8°

See the diagram below



ACTRD2500

Beam Angle

 - Φ 40mm

 - Φ 48mm

 - Φ 75mm

 - Φ 95mm

Accuracy

Depend on the size of antenna

22°

18°

10°

8°

See the diagram below


Parameters on Cable
Cable Entry/Plug

 One cable entry of M20X1.5
 (cable diameter of 5...9mm) ,
 one binding of M20X1.5

Spring Connection Terminal

 Applicable for cables with cross section
 of 2.5mm²

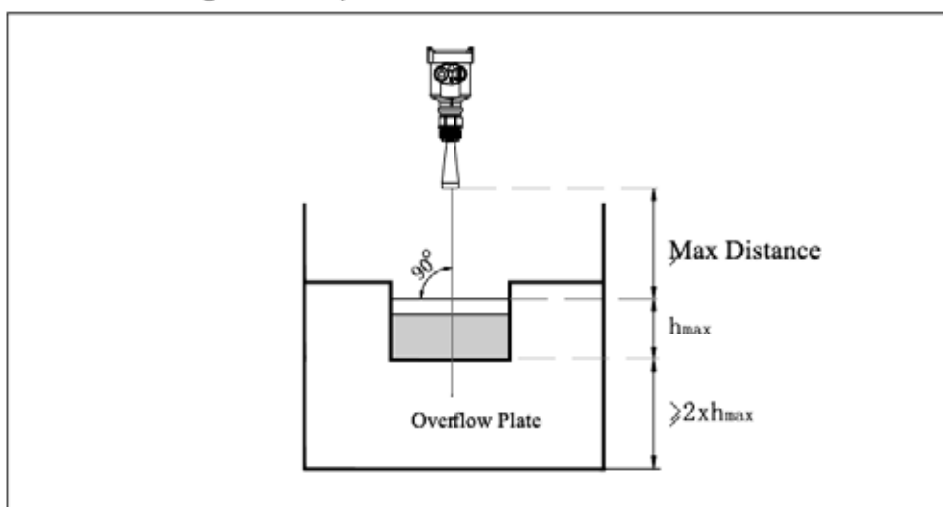
Open Channel Flow

Application in the measurement of open channel flow

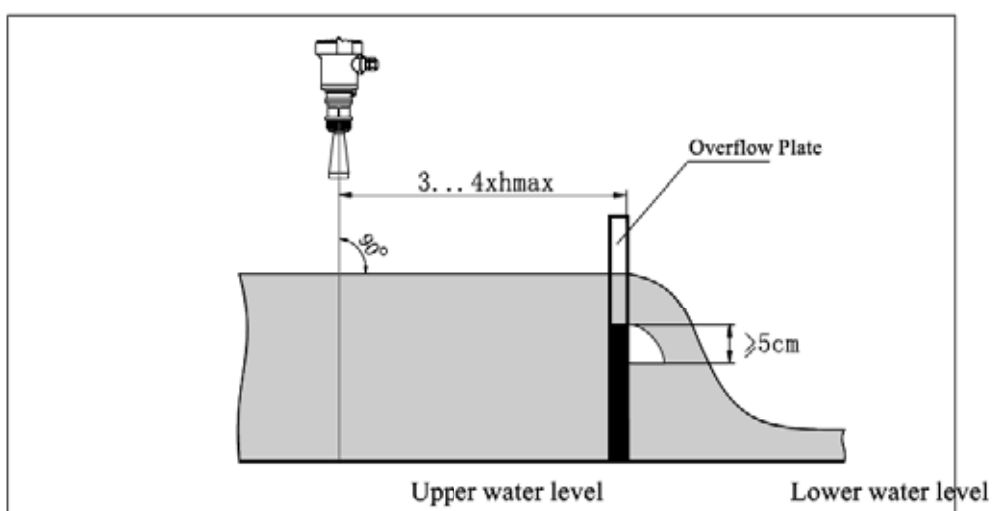
According to the provisions stated in *Open Channel Weirs & Flumes Flowmeter (JJG-1990)* of *National Metrological Verification Regulation*, the volume of liquid flow can be calculated through measuring the liquid level in weirs and flumes among open channels with level instrument given the condition that the weirs and flumes placed in open channels are both approved in the regulation.

Radar level instrument offers nonlinear output mapping function, which enables users to utilize the GODAware to setup the nonlinear output mapping according to the certain relation between liquid level and volume of liquid flow and eventually complete the measurement of open channel flow.

Schematic Diagram of Open Channel Flow



Measurement of Open Channel Flow



Measurement of Open Channel Flow