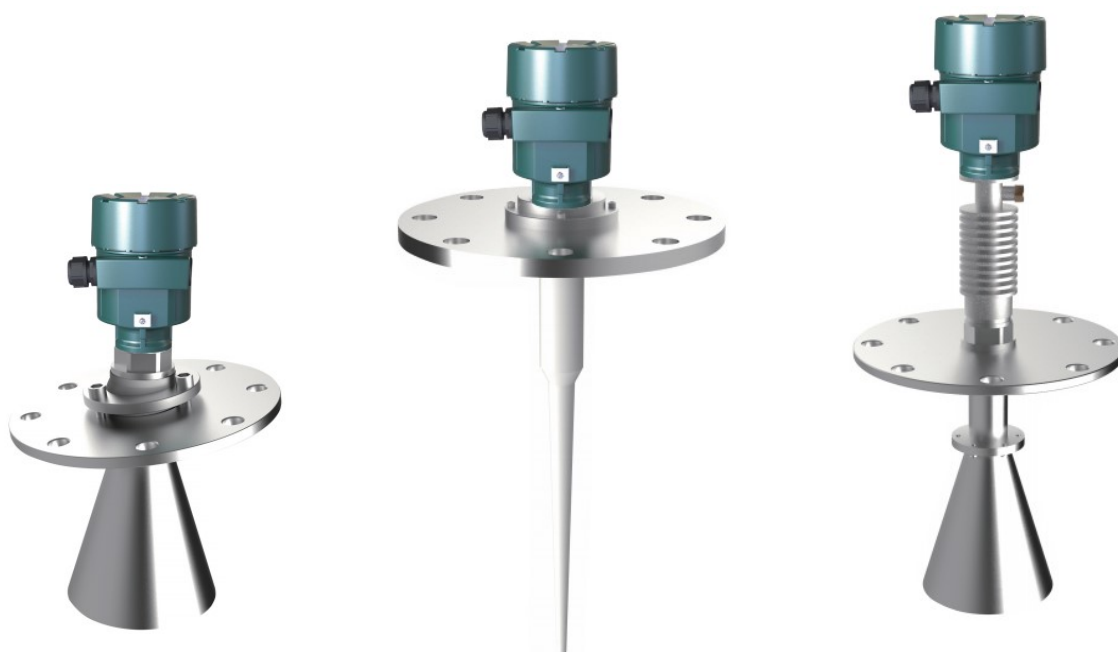




# INTELLIGENT NONCONTACT RADAR LEVEL TRANSMITTERS (6.8GHz)



丹东德泽科技有限公司

DANDONG VIRTUE RIVER TECHNOLOGY CO., LTD

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## Intelligent Noncontact Radar Level Transmitters (6.8GHz)

### 1. Product description

VRPWRD50 series transmitters are the advanced radar level measuring instruments. The max. measuring range is up to 30m. They can be used for level measurement for storage tanks, center buffer tanks or process containers. The output analog signal is 4~20mA.

#### • Features

- Advanced noncontact measurement
- Made of extremely stable materials
- Measuring level for liquids and solids
- Measuring for different mediums which dielectric constant  $>1.8$
- Measuring range is 0~30m
- 2-wire and loop powered. Voltage supply and signals output can be performed by a cable with two cores.
- 4-20mA, or digital signals
- Resolution 1mm
- Not be affected by noise, steam, dust or vacuum
- Not be affected by changes of medium density, viscosity or temperature.
- Process pressure is up to 4MPa
- Process temperature is up to 250°C

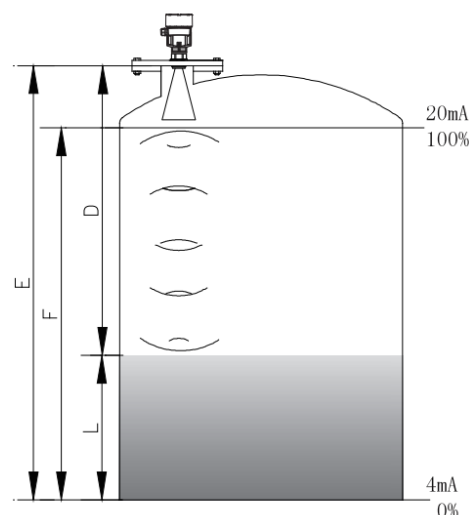
#### • Working principle

The electronic units generate microwave pulses which are emitted and received by the antenna systems. The radar wave travels at the velocity of light, the flying time will be converted into level signals via the electronic components. A special time extending method can make sure the stable and accurate measurement within extreme short time.

Even under some complicated working conditions with false echoes, the level signals can also be recognized and collected with the latest microprocessor technology and the debugging software.

#### ■ Input

The antenna receives the reflected micro pulses and then transmits them to the electronic circuit. The microprocessor will process the signals and recognize the reflected echo from the medium surface among them. The correct reflected echoes can only be recognized by the intelligent software, the precision can reach "mm" level. The distance  $D$  from the medium surface is proportional to the flying time  $T$ .



$D = C \times T/2$  (C is velocity of light)

Due to the distance E (from the instrument flange to the bottom of the tank, i.e. the height of the empty tank) is known, then the level L is:  $L = E - D$

Please refer to the figure on the right.

## ■ Output

By setting the empty tank height E as zero point, the full tank height F as full range point and other practical parameters, which will make the transmitter adapt to the measuring environment automatically, corresponding to output 4-20mA.

## 2. Introduction of transmitter

### VRPWRD51

- Features: PTFE Wave stick, suitable for small size of process connection.
- Application: Be suitable for simple process conditions, corrosive liquids, slurry, e.g. storage tanks for waste water, acid or alkali, and slurry.
- Measuring range (Maximum): 20m (Depends on working conditions, especially the dielectric constant of a medium)
- Process connection: thread or flange
- Medium temperature:  $-40^{\circ}\text{C} \sim 120^{\circ}\text{C}$
- Process pressure:  $-0.1 \sim 0.3\text{MPa}$
- Accuracy:  $\pm 8\text{mm}$
- Repeatability:  $\pm 2\text{mm}$
- Frequency range: 6.8GHz
- Signal output: 4-20mA/ HART (24V DC; 2-wire/ 4-wire),  
4-20mA/ HART (220V AC; 4-wire)
- Explosion proof: Ex ia IIC T6 Ga
- Enclosure protection grade: IP67



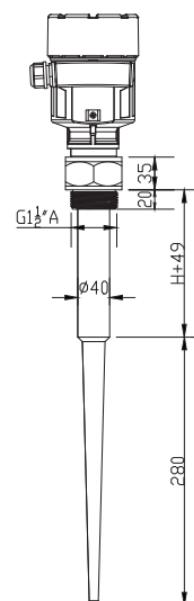
### Dimension of VRPWRD51

For the basic structure of radar level transmitter VRPWRD51

and the body dimensions, please refer to the schematic drawing and length table of the connection pipe to the probe at right bottom.

For the dimensions of the enclosure housing, please refer to the drawings in Section 6

Length of connection pipe H
50
100
150
200
250



## VRPWRD52

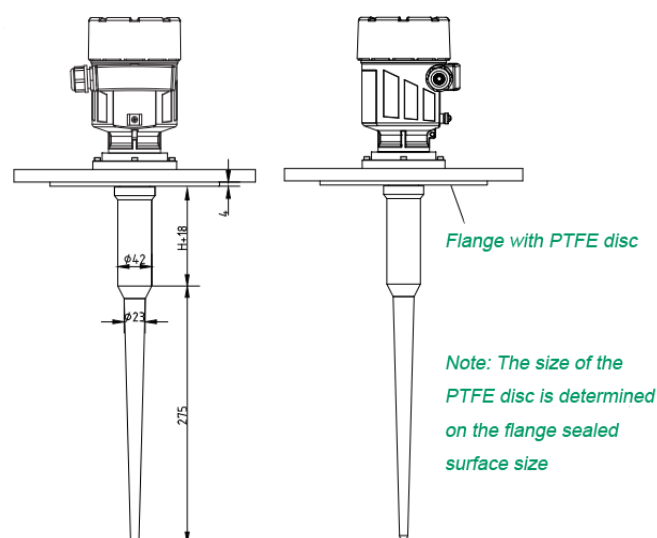
- Application: Be suitable for measurement of corrosive liquids or slurry, e.g. storage tanks for water, acid, alkali, or slurry.
- Measuring range (Maximum): 20m  
(Depends on working conditions, especially the dielectric constant of a medium)
- Process connection: flange
- Medium temperature:  $-40^{\circ}\text{C} \sim 150^{\circ}\text{C}$
- Process pressure:  $-0.1 \sim 1.6\text{MPa}$
- Accuracy:  $\pm 8\text{mm}$
- Repeatability:  $\pm 2\text{mm}$
- Frequency range: 6.8GHz
- Signal output: 4-20mA/ HART (24V DC; 2-wire/ 4-wire),  
4-20mA/ HART (220V AC; 4-wire)
- Explosion proof: Ex ia IIC T6 Ga
- Enclosure protection grade: IP67



## Dimension of VRPWRD52

For the basic structure of radar level transmitter VRPWRD52 and the body dimensions, please refer to the schematic drawing and length table of the connection pipe to the probe at right and below.

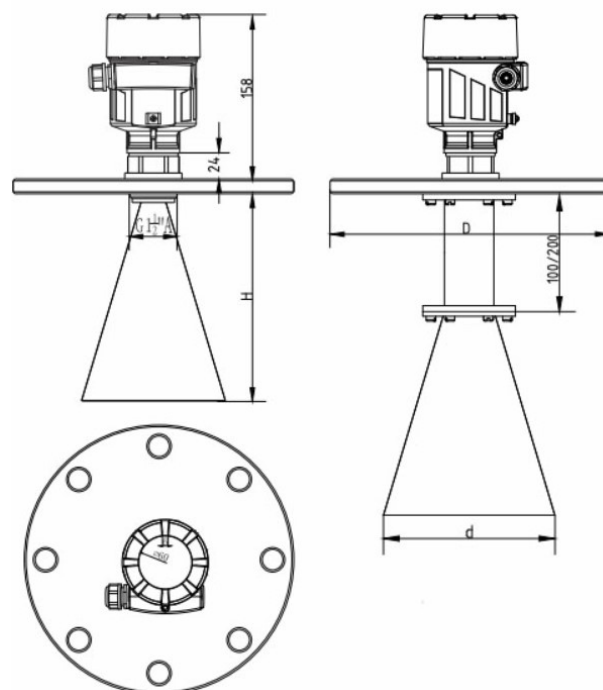
For the dimensions of the enclosure housing, please refer to the drawings in Section 6



Length of connection pipe H
50
100
150
200

## VRPWRD53

- Application: Be suitable for different tanks or containers of liquids or slurry, all storage tanks for liquids and slurry, e.g. crude oil, light oil, or volatile liquids.
- Measuring range (Maximum): 30m  
(Depends on working conditions, especially the dielectric constant of a medium)
- Process connection: flange
- Medium temperature:  $-40^{\circ}\text{C} \sim 250^{\circ}\text{C}$
- Process pressure:  $-0.1 \sim 2.0\text{MPa}$
- Accuracy:  $\pm 8\text{mm}$
- Repeatability:  $\pm 2\text{mm}$
- Frequency range: 6.8GHz
- Signal output: 4-20mA/ HART  
(24V DC; 2-wire/ 4-wire),  
4-20mA/ HART (220V AC; 4-wire)
- Explosion proof: Ex ia IIC T6 Ga
- Enclosure protection grade: IP67



## Dimension of VRPWRD53

For the basic structure of radar level transmitter VRPWRD53 and the body dimensions, please refer to the schematic drawing and horn size selection table at right and below.

For the dimensions of the enclosure housing, please refer to the drawings in Section 6

Horn Size Selection Table	
Horn diameter D	Horn height H (mm)
Ø76	105
Ø96	150
Ø146	240
Ø196	326
Ø242	410

## VRPWRD54

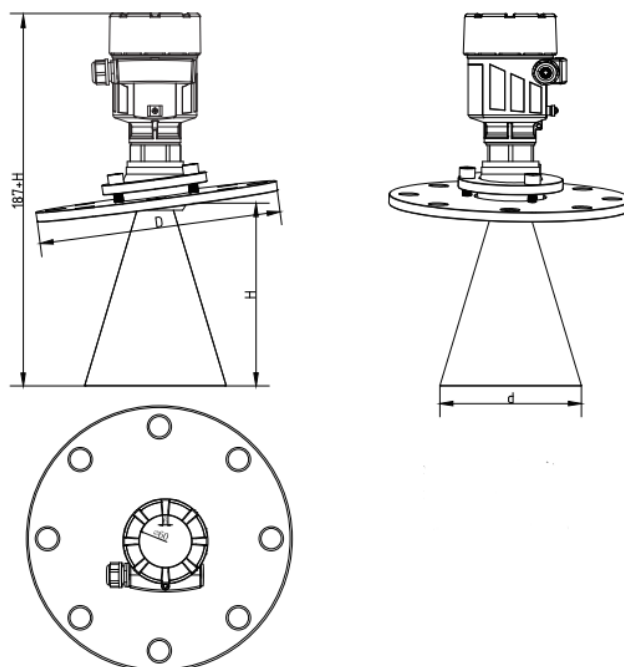
- Application: Be suitable for short measuring range level measurement for powdered material, solid particles, bulk material, e.g. raw coal, coal powder and coal coke.
- Measuring range (Maximum): 30m  
(Depends on working conditions, especially the dielectric constant of a medium)
- Process connection: universal flange
- Medium temperature:  $-40^{\circ}\text{C} \sim 250^{\circ}\text{C}$
- Process pressure: ATM
- Accuracy:  $\pm 15\text{mm}$
- Repeatability:  $\pm 2\text{mm}$
- Frequency range: 6.8GHz
- Signal output: 4-20mA/ HART (24V DC; 2-wire/ 4-wire),  
4-20mA/ HART (220V AC; 4-wire)
- Explosion proof: Ex ia IIC T6 Ga
- Enclosure protection grade: IP67



## Dimension of VRPWRD54

For the basic structure of radar level transmitter VRPWRD54 and the body dimensions, please refer to the schematic drawing and horn size selection table at right and below.

For the dimensions of the enclosure housing, please refer to the drawings in Section 6



Horn Size Selection	
Horn diameter D	Horn height H (mm)
Ø146	235
Ø196	326
Ø242	410

## VRPWRD55

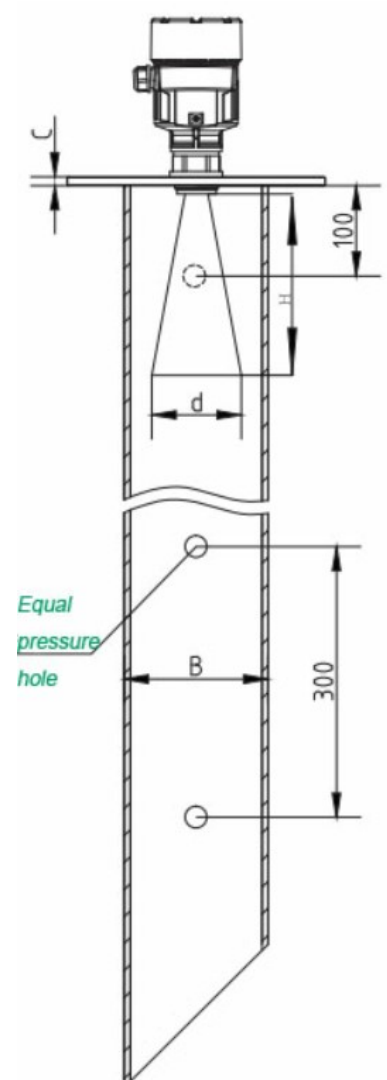
- Application: Be suitable for lower dielectric constant liquids and liquid level for some storage tanks with blenders.
- Measuring range (Maximum): 0~20m optional  
(Depends on working conditions, especially the dielectric constant of a medium)
- Process connection: flange
- Medium temperature: -40℃~250℃
- Process pressure: -0.1~2.0MPa
- Accuracy: ±8mm
- Repeatability: ±2mm
- Frequency range: 6.8GHz
- Signal output: 4-20mA/ HART (24V DC; 2-wire/ 4-wire),  
4-20mA/ HART (220V AC; 4-wire)
- Explosion proof: Ex ia IIC T6 Ga
- Enclosure protection grade: IP67



## Dimension of VRPWRD55

For the basic structure of radar level transmitter VRPWRD55 and the body dimensions, please refer to the schematic drawing and horn size selection table at right and below.

For the dimensions of the enclosure housing, please refer to the drawings in Section 6



Wave Guide Pipe Size Selection (mm)			
Size	Pipe outer dia. B	Horn diameter D	Horn height H
DN80	Ø51	---	---
DN100	Ø89	Ø76	105
DN150	Ø108	Ø96	150



## VRPWRD56

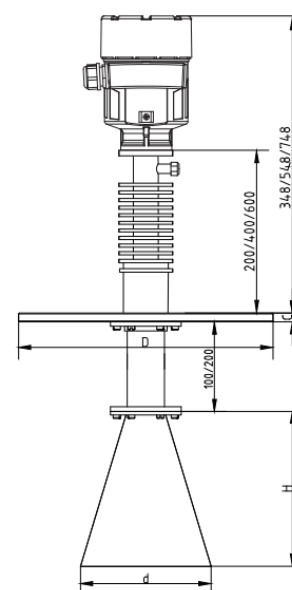
- Application: Be suitable for level measurement for blast furnace, some storage tanks with thick top, or tanks with a long mounting pipe.
- Measuring range (Maximum): 30m  
(Depends on working conditions, especially the dielectric constant of a medium)
- Process connection: flange
- Medium temperature:  $-40^{\circ}\text{C} \sim 800^{\circ}\text{C}$
- Process pressure: ATM
- Accuracy:  $\pm 15\text{mm}$
- Repeatability:  $\pm 2\text{mm}$
- Frequency range: 6.8GHz
- Signal output: 4-20mA/ HART (24V DC; 2-wire/ 4-wire),  
4-20mA/ HART (220V AC; 4-wire)
- Explosion proof: Ex ia IIC T6 Ga
- Enclosure protection grade: IP67



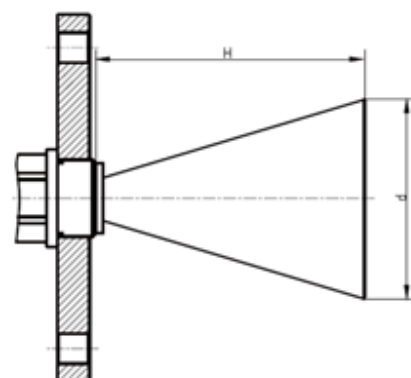
## Dimension of VRPWRD56

For the basic structure of radar level transmitter VRPWRD56 and the body dimensions, please refer to the schematic drawings and horn size selection table at right and below.

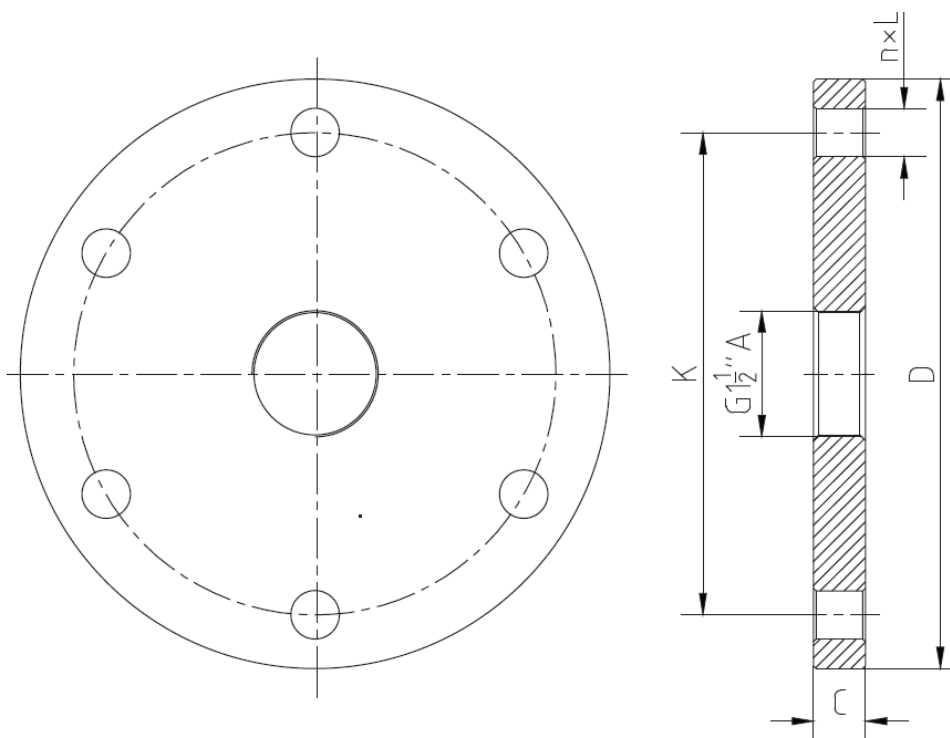
For the dimensions of the enclosure housing, please refer to the drawings in Section 6



Horn model selection	
Horn diameter d	Horn height H (mm)
Ø76	105
Ø96	150
Ø146	240
Ø196	326
Ø242	410

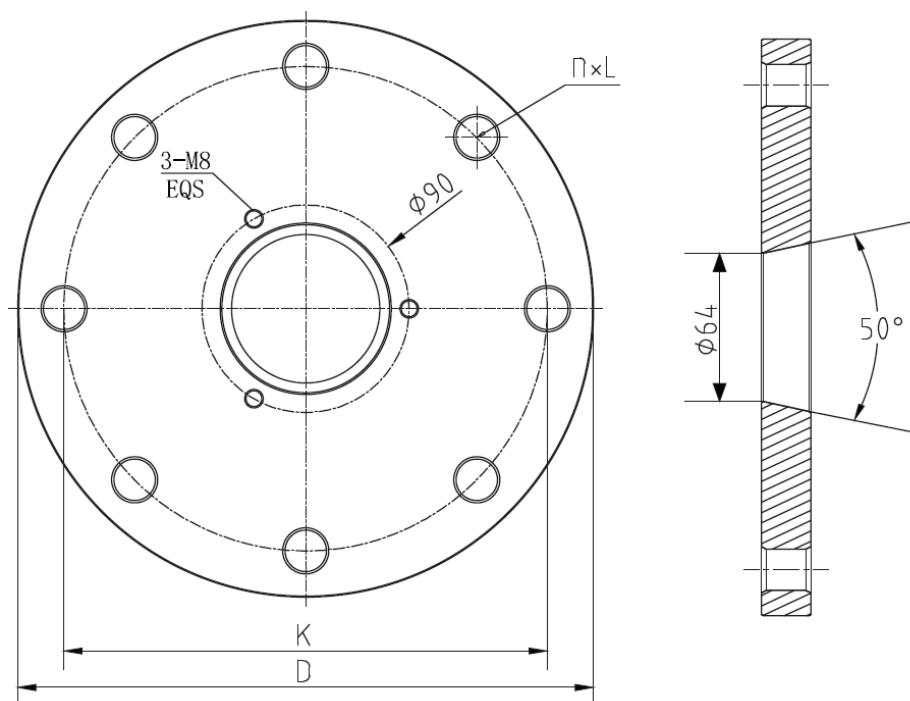


## Flange selection table



Flange Model (GB/T9119-2000)						Unit: mm
No.	Size	OD	Hole Center Distance K	Holes Quantity N	Hole Diameter L	Thickness C
1	DN50	Ø165	Ø125	4	Φ18	12
2	DN80	Ø200	Ø160	8	Φ18	
3	DN100	Ø220	Ø180	8	Φ18	
4	DN150	Ø285	Ø240	8	Φ22	
5	DN200	Ø340	Ø295	12	Φ22	
6	DN250	Ø405	Ø355	12	Φ26	

## Universal joint flange

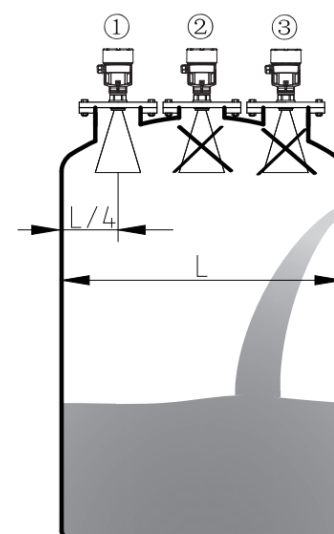


Flange Model (GB/T9119-2000)						Unit: mm
No.	Size	OD	Hole Center Distance K	Holes Quantity N	Hole Diameter L	Thickness C
1	DN125	Ø250	Ø210	8	Φ 18	12
2	DN150	Ø285	Ø240	8	Φ 22	
3	DN200	Ø340	Ø295	12	Φ 22	
4	DN250	Ø405	Ø355	12	Φ 26	

### 3. Installation guide

#### 3.1. Explanation of installation position

- It is suggested that the distance from the center line of the mounting pipe to the inner wall of a tank should be larger than 1/6 of tank diameter.
- The best installation position is as point ①, the minimum distance from the inner wall is 500mm.
- It is not allowed for instrument to be installed above the inlet shown as ③.
- It is not allowed for instrument to be installed at the center of the tank shown as ②.



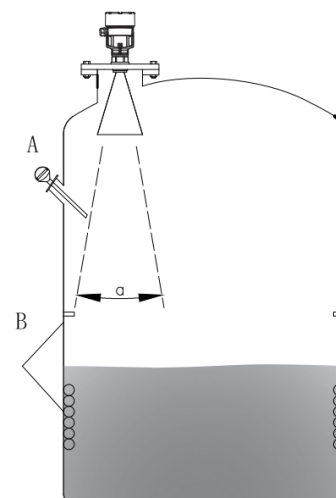
When the instrument is installed at the center, there will be multiple false echo which will lead to signal lost.

- If the distance between transmitter and tank wall cannot be kept, the medium adhering to the tank will cause to false echoes. When debugging the instrument, you should do spurious echo saving.

#### 3.2. Installation inside tank

The following objects should be kept away from the signal beam, e.g.  
A: limit switch, temperature sensor etc.

- B: symmetrically installed devices, e.g. vacuum ring, heating wire ring, reflector etc.
- When there are obstacles like A or B in a tank, the measurement should be done with a wave guide pipe.

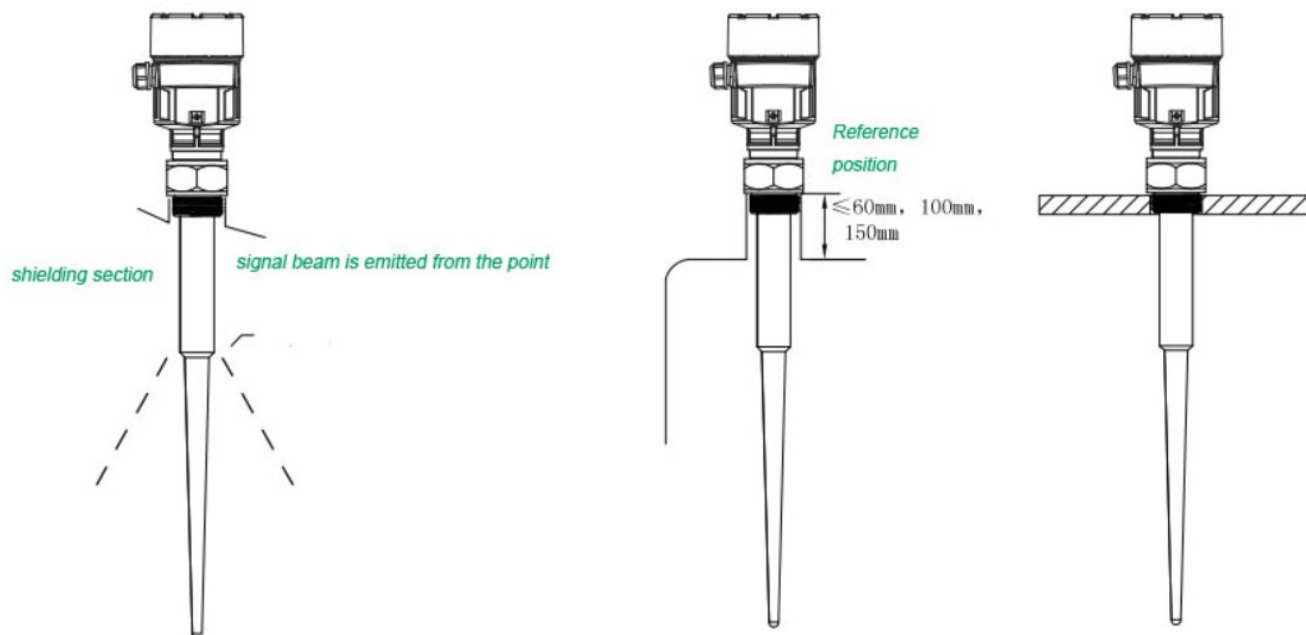


#### 3.3. Selection of the best position

- Antenna size: the larger antenna, the smaller beam angle, the weaker interference wave.
- Antenna adjustment: adjust the antenna to the best position for measurement.
- Wave guide pipe: wave guide pipe is used for avoiding the interference echoes.

#### 3.4. Installation attentions for stick-type radar

- The radar antenna cannot incline to the tank wall.
- To minimize the affection by temperature, a spring gasket should be installed within the connecting flanges.
- The emitting point must reach out of the mounting pipe.
- Make the stick-type antenna installed vertically, do not let signal beam toward the tank wall.



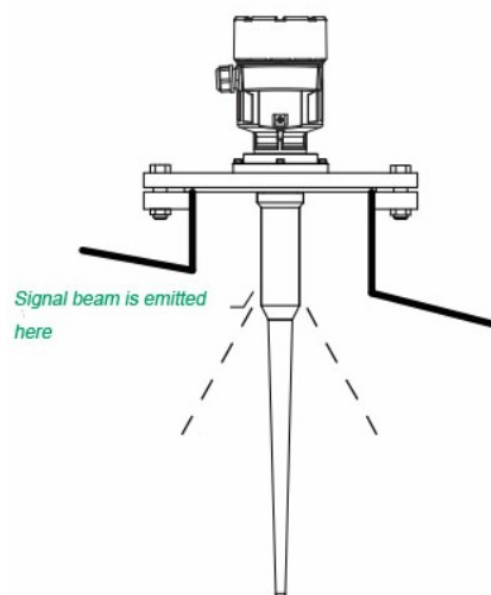
### 3.5. VRPWRD51 typical installation

- PTFE stick-type antenna is specially used to measure the corrosive liquid, e.g. acid or alkali. A sterile tank requires smaller installation size instrument which won't have chemical action with the medium. PTFE stick-type antenna can meet such request, and only needs small opening.
- When measure a liquid, the stick-antenna can be installed on the top of the tank, the opening size is: G1½A, or DN50~DN150, the length of the connection pipe should be shorter than 150mm.

Note: PTFE stick-type antenna has limit bearing ability for mechanical load. It is easy to be deformed or broken when it is under a bend force.

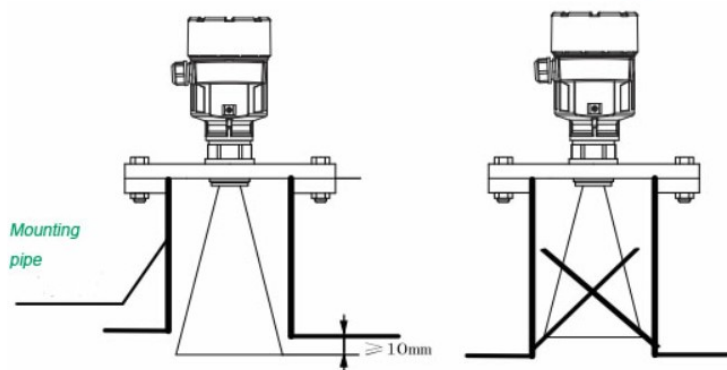
### 3.6. VRPWRD52 typically installation

- Wave beam emitting position must be inside the tank, short pipe length should be smaller than 150mm, the butt flange is optional with DN50~DN250.



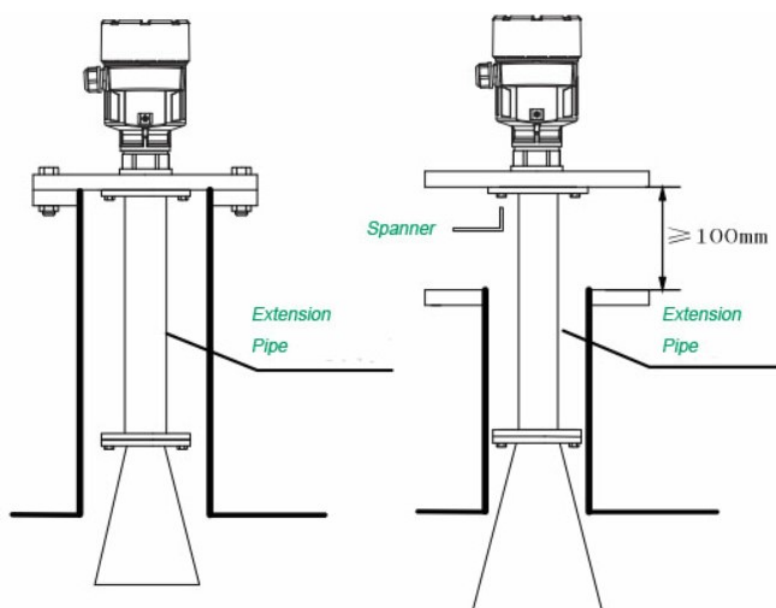
### 3.7. VRPWRD53 typically installation

- The horn antenna must be extended out of the mounting pipe. Otherwise, it is suggested to use an antenna extension pipe.
- The horn antenna must be adjusted vertically. Do not make the signal beam toward the tank wall.



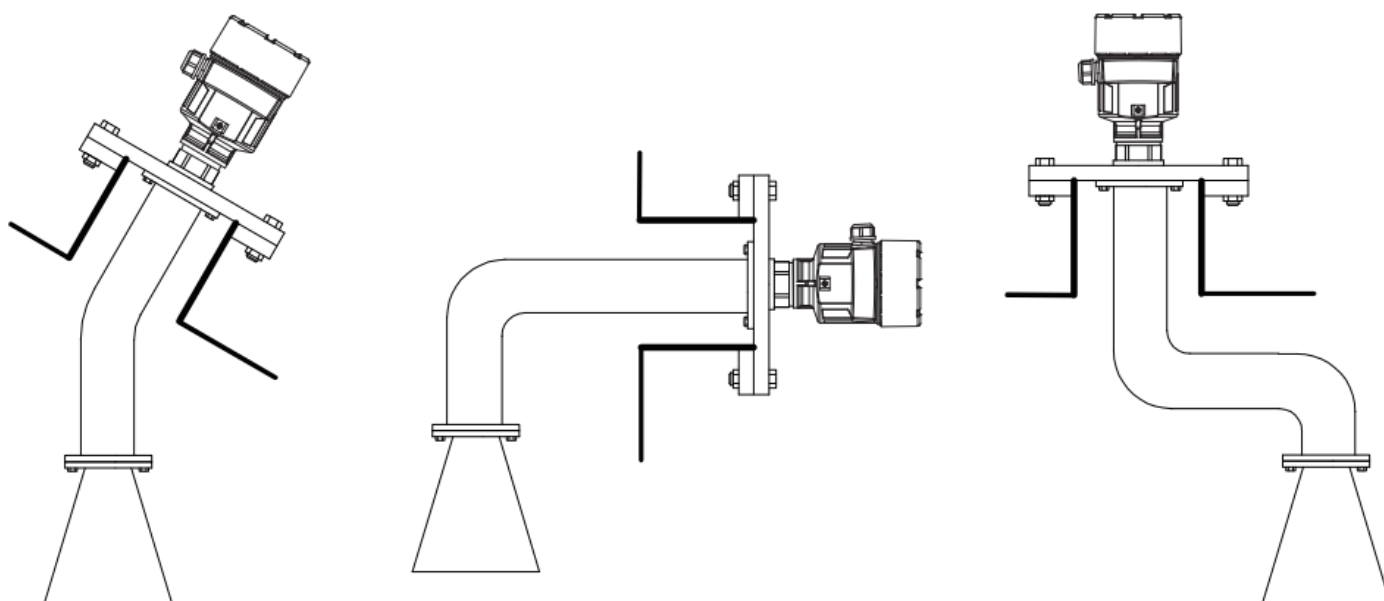
### 3.8. VRPWRD53 extending type and other type installation methods

- The antenna extension pipe should be used when the horn length is shorter than the mounting pipe.
- When the horn diameter is larger than the diameter of the mounting pipe, the antenna, including the extension pipe, needs to be installed inside the tank and the transmitter needs to be raised at least 100mm higher by the extension pipe.



### 3.9. Special extension pipe

- The antenna extension pipe can be made into the shape with an angle of 150°, 90° or even the shape of "S".



Measurement with the signals penetrating the wall of a plastic tank needs

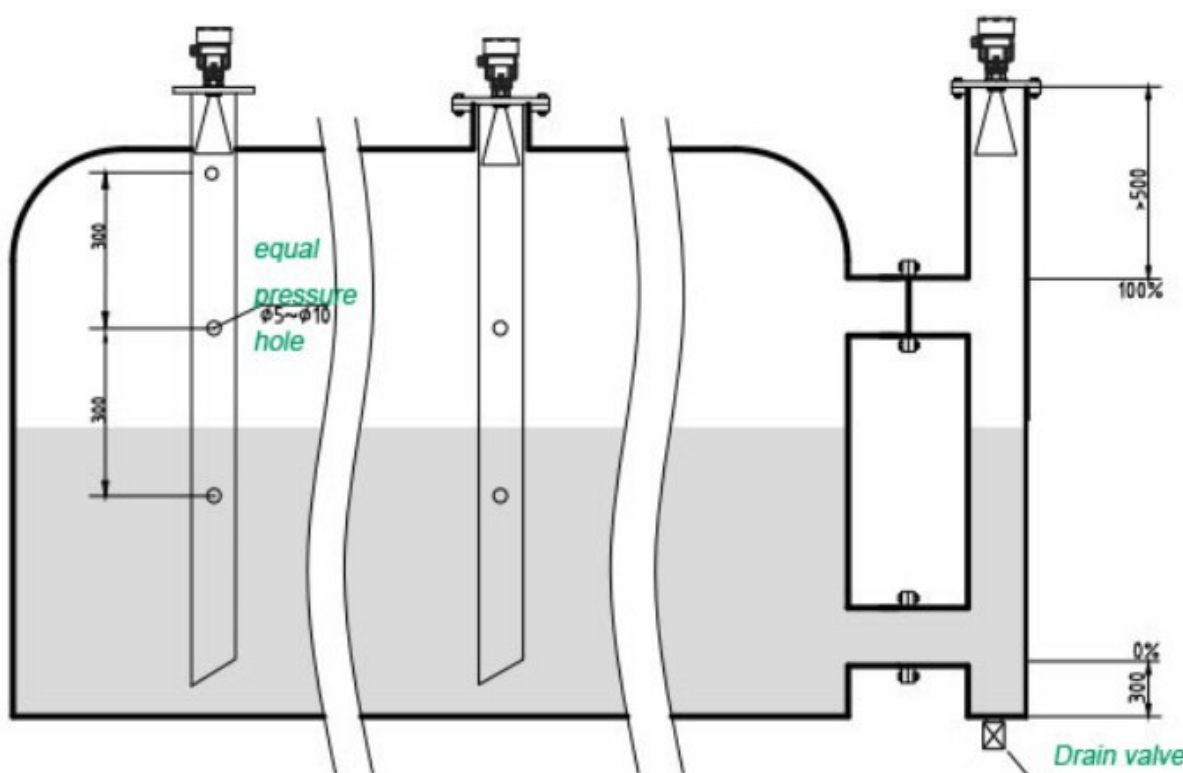
- Medium dielectric constant  $\epsilon_r > 10$
- The highest liquid level should be 20cm lower than the top of a tank.
- Distance between the horn and tank top should be larger than 100mm.
- It is suggested to use a rack with which the instrument position can be adjusted to the needed height.
- If it is possible, please avoid the instrument from being installed at the tank for cold storage or at an adhesive place. If it is not, appropriate protective measures should be taken in the space between the antenna and the tank.
- Choose the lower dielectric constant material for the tanks and appropriate thickness of the tank wall. The conductive material should not be allowed to be used.
- If possible, use an antenna with size DN250/10" .
- Do not install any interference components (e.g. pipe) within the wave beam range outside the tank.



## 4. Measurement inside a wave guide pipe

### 4.1. General introduction

- If the devices are complicated inside the tank, e.g. there is heating ring pipe, heating exchanging devices or very fast running blender, etc inside of the tank, a wave guide pipe for the antenna is required. If the medium produce continuously whirlpools or there is false echoes reflected inside, antenna with a wave guide pipe is also suggested to be used.
- Due to the radar signal is gathered inside the wave guide pipe, medium with much lower dielectric constant ( $\epsilon_r = 1.6 \sim 3$ ) can be measured.
- The wave guide pipe with its bottom open must reach to the lowest required liquid level, and then the measurement can be taken inside the pipeline.
- Besides installing wave guide pipes inside a tank, bypass pipes can also be installed outside a tank.
- If the measurement is taken via a wave guide pipe or a bypass pipe, the max. measuring range will be reduced 5~20% (e.g. DN50:15m, not the 20m, DN100:18m, not the 20m) due to changes of the radar signal running time.



#### 4.2. Adhesive medium

- Regarding to the adhesive medium,

the diameter of the wave guide pipe should be as large as possible. As to a non-adhesive medium, the wave guide pipe diameter is 50mm. As for slightly adhesive medium, the wave guide pipe diameter is generally 100mm or 150mm.

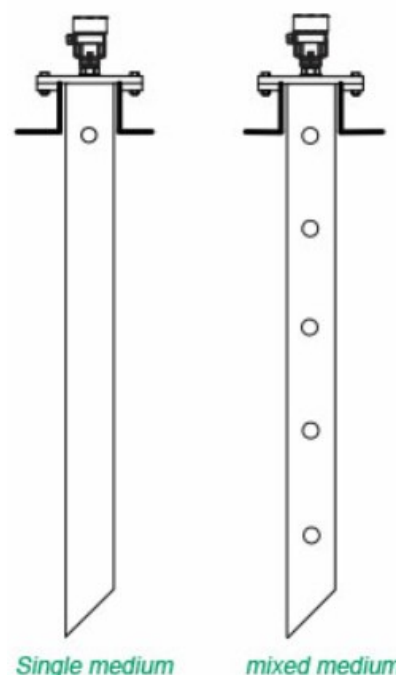
- If the medium has strong adhesive, then the measuring cannot be taken through wave guide pipe with size of DN50, DN80, DN100, DN150.

#### 4.3. Measurement for mixed medium with a wave guide pipe

- When measuring a mixed medium or mediums with separated layers inside a wave guide pipe, holes, round, oval or rectangle are required to be drilled on the wall of the wave guide pipe. The holes are used to make the mediums to be fully mixed.
- Wider rectangle holes usually cause false echoes. Therefore, width of the rectangle holes must be smaller than 10mm. In order to reduce the noise level of the signal, a round hole is better than a rectangle hole.

#### 4.4. Bypass pipe installation

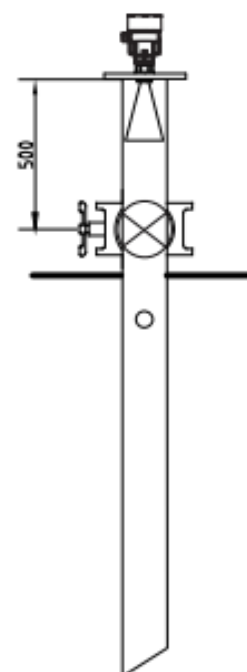
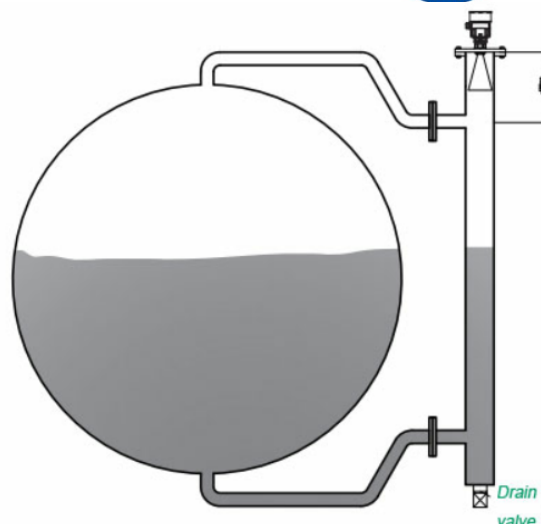
- When a transmitter is installed in a bypass pipe (e.g. the previous instrument is a float steel belt), the radar transmitter must be installed at a position at least 500mm higher than the





connection between the bypass pipe and tank top (please refer to the picture right). When the bypass pipe inner wall is not smooth, a measuring pipe should be set into it.

- When the medium dielectric constant is lower ( $\epsilon_r < 4$ ), then the length of the bypass pipe should be longer than a normal bypass pipe, the reason is that the radar signal can penetrate the medium with lower dielectric constant. When there is less medium left in the bypass pipe, the echoes reflected by the bypass bottom will be stronger than those reflected from the medium, therefore, the measuring errors often occur. For this case, extend the bypass pipe length (by 300~800mm), those signals possibly penetrating the less quantity of medium will be attenuated by the added medium due to the extended length. Or place a reflector at the bottom of the bypass pipe, to reflect the radar signals which arrive at the bottom away.

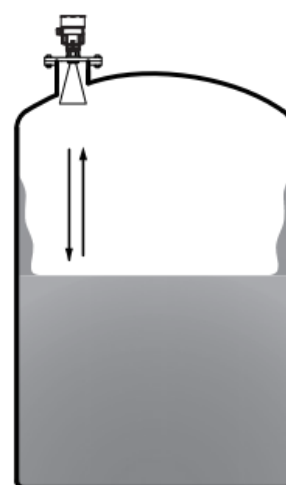


- When there is strong whirlpool (e. g. by stirring or the strong chemical reaction etc.) in a tank, it is suggested to use a wave guide pipe or a bypass pipe for measurement. Note that there should be no medium attached to the inner wall of the wave guide pipe or the bypass pipe. When the medium may be adhesive, please use a standard pipe with a diameter of 100mm or thicker.

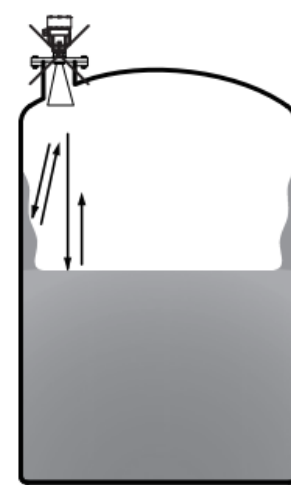
#### 4.5. Wave guide pipe with ball valve

- When there is a ball valve in the wave guide pipe, the transmitter maintenance can be done without opening the tank (e. g. for liquefied gases or some toxic mediums).

- The ball valve diameter must be in accordance with the diameter of the wave guide pipe, prevent the ball valve pass from affecting the measurement. The distance between the ball valve and the transmitter flanges should be at least 500mm.



Correct



wrong

## 5. Attentions for installation

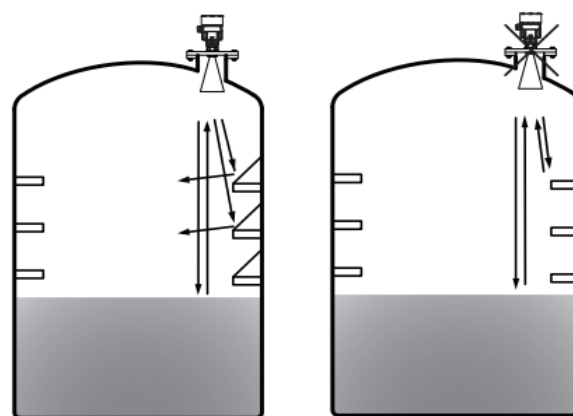
### 5.1. False echoes

Faulty installation often causes very large false echoes.

- Transmitter position cannot be too close to the tank wall. If the transmitter is very close to the tank wall, strong false echoes will be produced, which are possibly caused by attached medium, rivets, screws or even welds. Therefore, the transmitter must be kept certain distance from the tank wall.
- Transmitter should be towards the medium surface vertically. If the transmitter doesn't aim at the medium surface vertically, the echoes will get weaker. The axis of the radar transmitter must be towards the medium surface vertically. Please refer to the picture above.

When there is a ladder, a rack or a blender in a tank, they will cause false echoes, and affect the measurement. Therefore, these obstacles should be kept away in the application, or reflect the false echoes away by reflectors.

- Devices inside the tank, e.g. ladders, will cause false echoes. There should be no any obstacle to stop radar signals running when selecting installation positions.
- Racks inside the tank will produce strong false echoes, and using reflectors is a good option to avoid the false echoes.

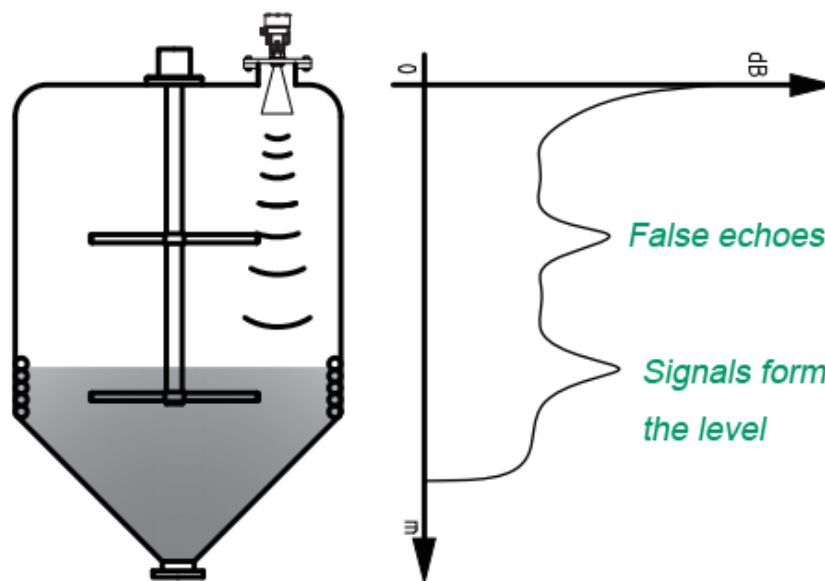


Correct

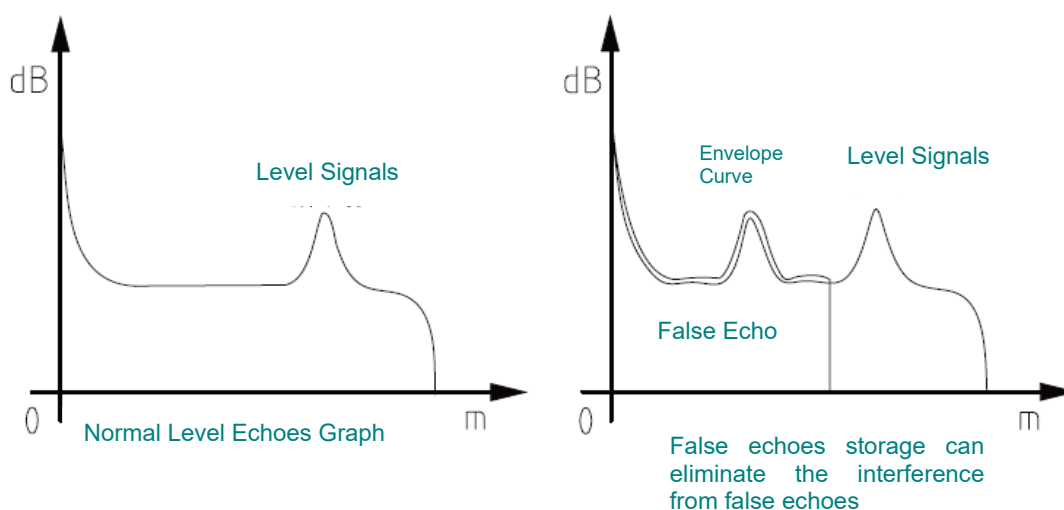
Wrong

## 5.2. Storage of false echoes

- If there is a blender, interfering the measurement, the storage of false echoes is required to eliminate the interference signals when interference from the blender cannot be kept away.



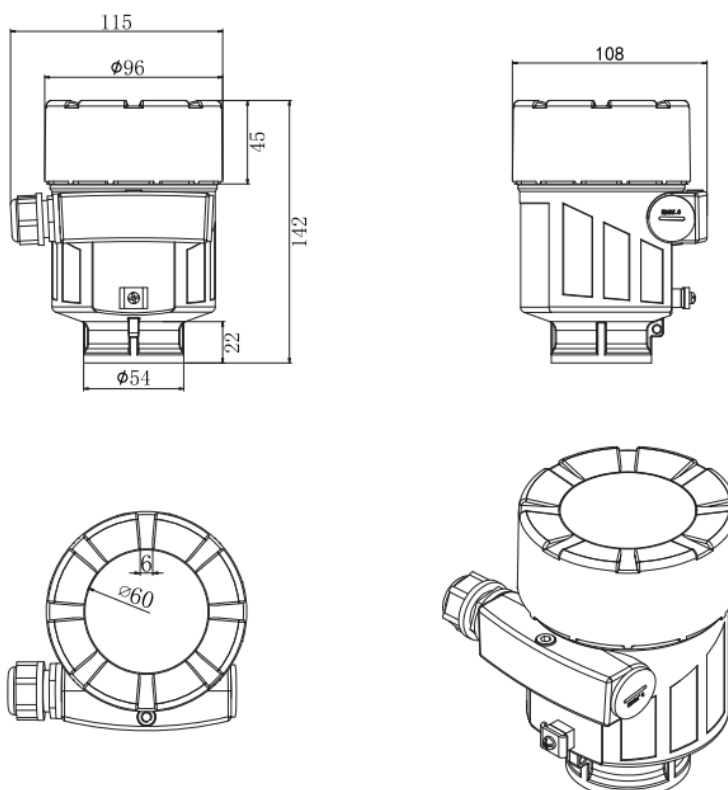
- In order to get the correct signals, the storage of false echoes can store the echoes shown in the below graph as the false echoes, and then the correct level signals will be received.



## 6. PWRD50 series dimensions

Housing material: Aluminium

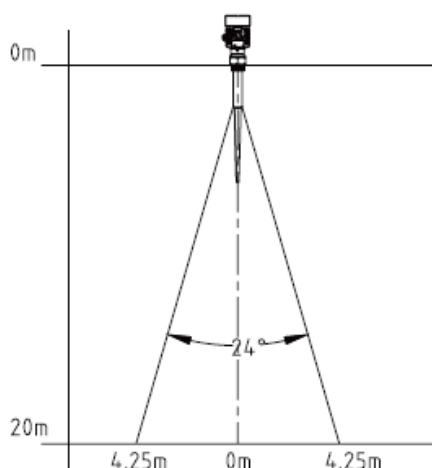
The dimensions of the electronic housing show as the drawings below:



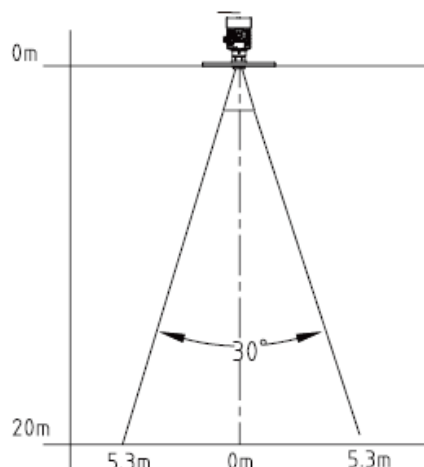
## 7. Emitting angle and false echo reflection

- Emission of radar wave beam focused via the antenna system looks like cone as the flashlight light beam, and the beam angel depends on the size of the antenna.

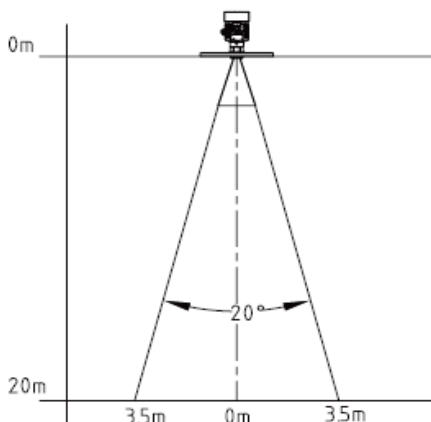
- Any object within the emitting beam will reflect the radar signals, especially for those objects such as tubes, racks or other devices, when they are several meters away from the instrument, they will produce very strong spurious echo reflection. e. g. the false echoes with the distance of 6 meters away from the radar are 9 times stronger than those of 18 meters.
- When false echoes come from a remote reflection surface, the radar's energy will be dispersed into a large area, then the reflected spurious signal will get weaker, it will not affect the measurement a lot, comparing to those false echoes returned back from vicinity.
- The signals must travel along the symmetric line which must be vertical to the medium surface. There should be no any device within the beam area, especially in the nearest area to the antenna, at 1/3 of the measuring range.
- The measurement will be best when there is no any obstacle within the beam and the radar signals can be emitted onto the medium surface vertically.



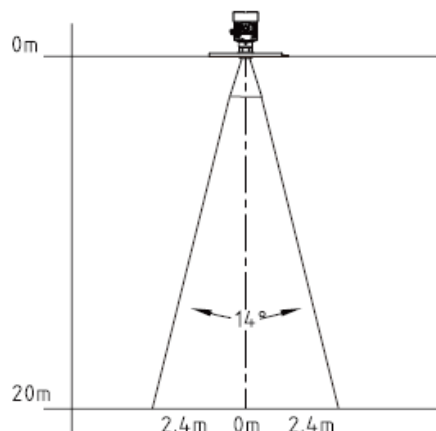
Emitting angle for rod antenna



Emitting angle for DN100 horn antenna



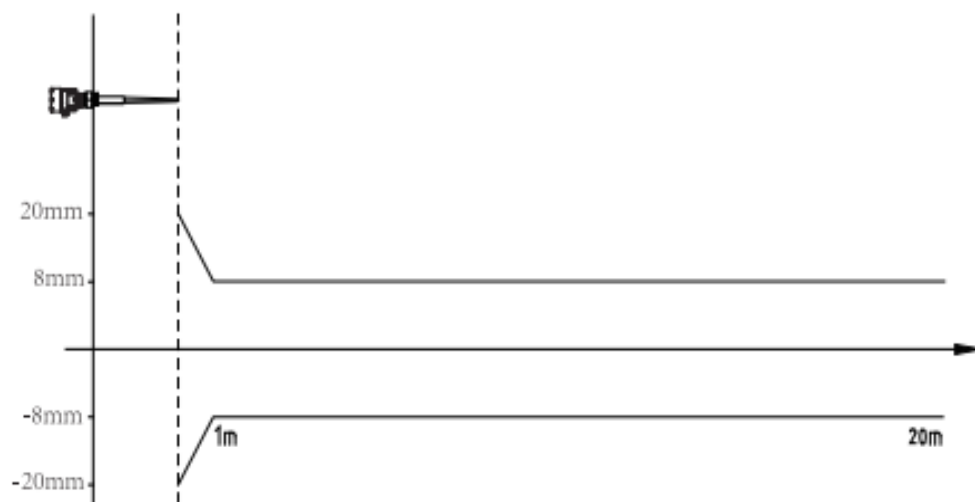
Emitting angle for DN150 horn antenna



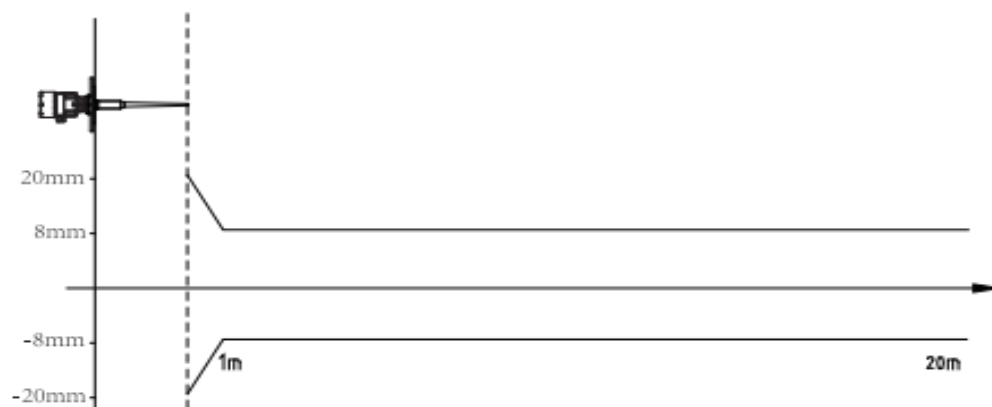
Emitting angle DN250 horn antenna

## 8. Transmitter linearity

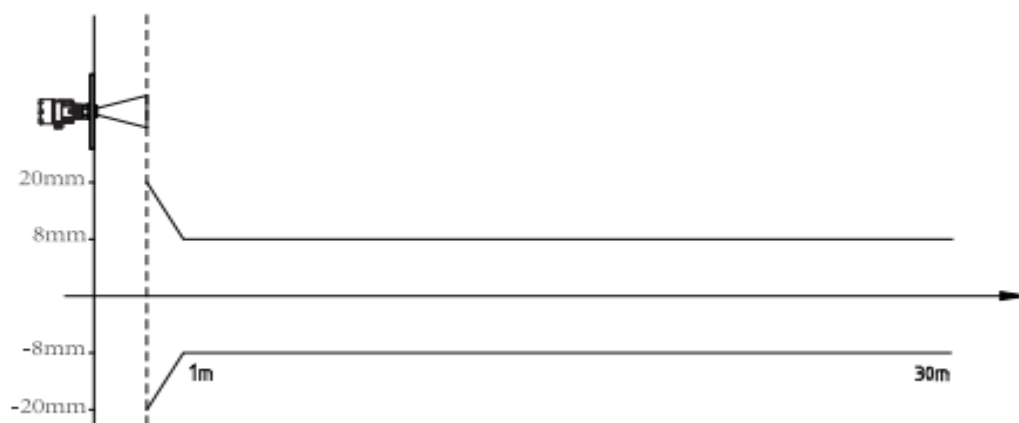
### VRPWRD51



### VRPWRD52



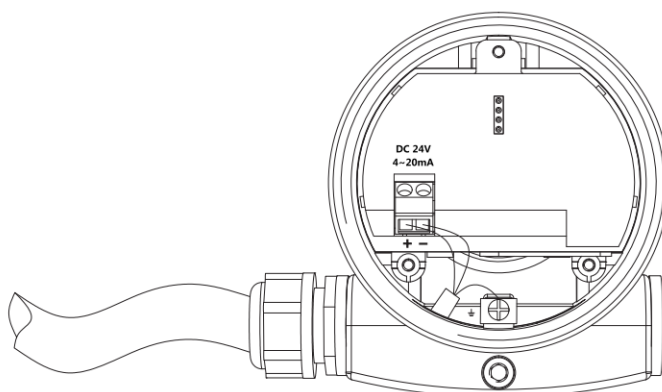
### VRPWRD53



## 9. Electric wiring

Two wires

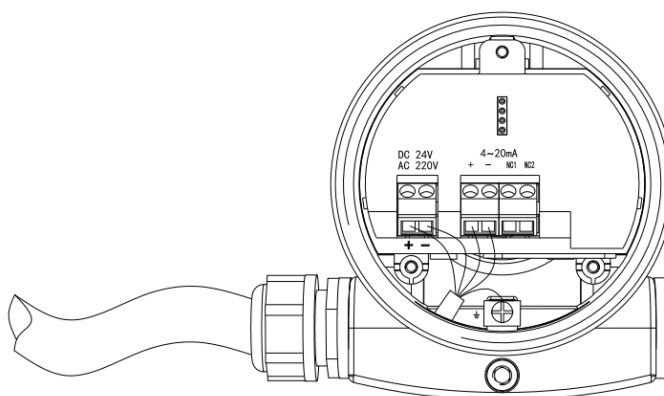
24 V DC power supply (12 V DC power supply is also available on request), 4 – 20mA output.



2-wires type (24V DC/4-20mA)

Four wires

220 V AC/50Hz or 24 V DC power supply (12 V DC power supply is optional on request)



4-wires type (220V AC/50HZ; 24V DC/12V DC 4-20mA)

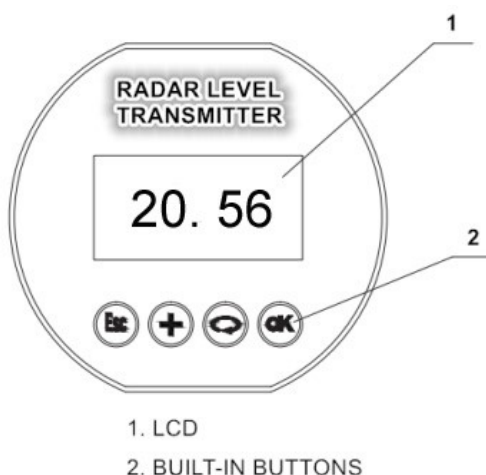
## 10. Calibration

VRPWRD50 can be calibrated by following methods

- Display/ programmer, with buttons (by a programmable module)
- Software PWSOFT
- HART hand hold communicator

### 10.1. Calibration with a built-in programmable module

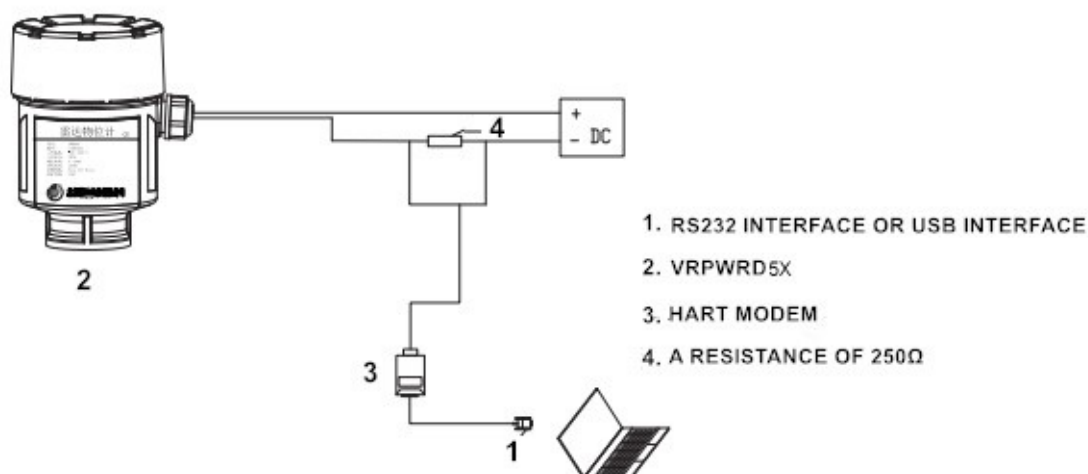
There are 4 buttons and 1 LCD display in the built-in programmable module with which calibration can be performed. The languages are optional. The calibration menu, parameters setting and signal curves shows on the built-in LCD display. Please refer to the picture on the top of the next page.



### 10.2. Calibration with PWSOFT software

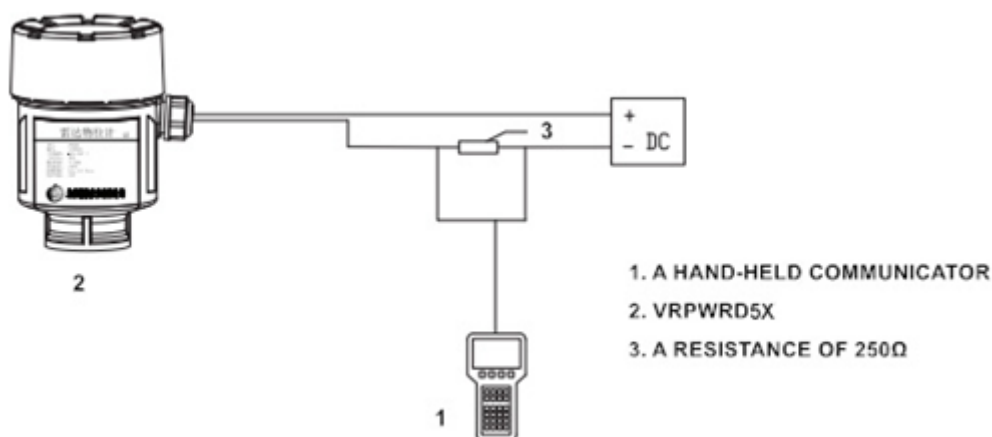
The radar transmitter can be debugged by a software no matter what kind of signal output, 4~20mA/ HART. A transmitter drive "CONNECTCAT" is required when the PWSOFT software is used.

Radar transmitter requires 24VDC during the debugging, at the same time it connects a resistance of 250ohm before the HART adapter. If it is an integrated HART adapter (which is equipped with a built-in resistance), the additional outside resistance will not be required. HART adapter can be connected in parallel with 4~20mA wire.



### 10.3. Calibration with a hand-held HART communicator

VRPWRD50 series radar level transmitters can also be calibrated with a hand hold HART communicator



## 11. Technical parameters

### General parameters:

Working frequency: 6.8GHz

Wave beam angle: 24°, VRPWRD51, VRPWRD52

20°, VRWKRD53/ 146mm, diameter of the antenna horn

16°, VRPWRD53/ 196mm, diameter of the antenna horn

14°, VRPWRD53/ 242mm, diameter of the antenna horn

Measuring range (Maximum): 0 ~ 30m (mainly depends on the dielectric constant of the measured medium and the inner structure of the tank)

Repeatability: ±2mm

Resolution: 1mm

Sample: echo sampling 55 times /s

Responding speed: >0.2s (depends on the application)

Current signal: 4~20mA

Accuracy: ±10mm

### Antenna material

VRPWRD51: PP or PTFE

VRPWRD52: PTFE

VRPWRD53: S.S

### Communication

HART protocol

### Process connection

VRPWRD51 (PP, PTFE rod-type antenna): G1½" A or 1½" NPT.

VRPWRD52 (PTFE rod-type antenna):

Flange with lining plate DN50, DN80, DN100, DN150, DN200, DN250

VRPWRD53 (horn antenna):



Flange DN50, DN80, DN100, DN150, DN200, DN250

### Power supply

Power supply: 24V DC (+/-10%), ripple voltage: 1Vpp

Power consumption: max. 22.5mA

### Environment condition

Temperature: -40℃~+70℃

Tank pressure: (gage pressure): -0.1 ~ 2MPa

### Explosion proof approval

Ex ia IIC T6 Ga

### Housing protection grade

IP67

### 2-wire connection

Input and signal output share one 2-wires (cores) cable.

### Cable entry

M20\*1.5 \* 2 or ½" NPT\* 2 (cable diameter is 5~9mm)



VRPWRD53 VERSION OF 2018



VRPWRD53 VERSION OF 2016



VRPWRD56 VERSION OF 2012



VRPWRD56 VERSION OF 2012



VRPWRD54 VERSION OF 2012



VRPWRD56 VERSION OF 2016

## 12. Model selection

### VRPWRD51

Code	Approvals				
P	Standard type (Non-explosion)				
I	Intrinsically safe type (Ex ia IIC T6 Ga)				
D	Explosion isolation type (Ex d IIC T6 Gb)				
Code	Antenna type/ Material/ Process temperature				
SP	Plastic stick/ PP/ (-40 ~ +100)℃				
SF	Plastic stick/ PTFE/ (-40 ~ +120)℃				
Code	Process connection/ Material				
GP	Thread G1½" A/ PA6				
NP	Thread 1½" NPT/ PA6				
Code	Flange matching/ Material				
Material Code Flange size		PP Face Flange	PTFE Face Flange	SS304 Face Flange	SS316L Face Flange
DN40, PN16 flange		AP	AF	AA	AB
DN50, PN16 flange		BP	BF	BA	BB
DN65, PN16 flange		CP	CF	CA	CB
DN80, PN16 flange		DP	DF	DA	DB
DN100, PN16 flange		EP	EF	EA	EB
DN125, PN16 flange		FP	FF	FA	FB
DN150, PN16 flange		GP	GF	GA	GB
DN200, PN16 flange		HP	HF	HA	HB
DN250, PN16 flange		JP	JF	JA	JB
ANSI 1.5", 50lb flange		APM	AFM	AAM	ABM
ANSI 2", 150lb flange		BPM	BFM	BAM	BBM
ANSI 2.5", 150lb flange		CPM	CFM	CAM	CBM
ANSI 3", 150lb flange		DPM	DFM	DAM	DBM



ANSI 4", 150lb flange	EPM	EFM	EAM	EBM
ANSI 5", 150lb flange	FPM	FFM	FAM	FBM
ANSI 6", 150lb flange	GPM	GFM	GAM	GBM
ANSI 8", 150lb flange	HPM	HFM	HAM	HBM
ANSI 10", 150lb flange	JPM	JFM	JAM	JBM
X	None			
Y	Special design			
<b>Code</b>	<b>Extension pipe length</b>			
A	50mm			
B	100mm			
C	150mm			
D	200mm			
Y	Special design			
<b>Code</b>	<b>Electronic unit</b>			
2	(4~20)mA/ 24V DC 2-wire			
3	(4~20)mA/ 24V DC 4-wire			
4	(4~20)mA/ 220V AC 4-wire			
5	(4~20)mA/ 24V DC/ HART/ 2-wire			
6	(4~20)mA/ 24V DC/ HART/ 4-wire			
7	(4~20)mA/ 220V AC/ HART/ 4-wire			
Y	Special design			
<b>Code</b>	<b>Housing/ Enclosure protection grade</b>			
L	Aluminum/ IP67			
G	Stainless steel 304/ IP67			
<b>Code</b>	<b>Cable entry</b>			
M	M20x1.5			
N	½" NPT			
<b>Code</b>	<b>Display/ Programmer</b>			
V	With			
X	Without			


## VRPWRD52

Code	Approvals			
P	Standard type (Non-explosion)			
I	Intrinsically safe type (Ex ia IIC T6 Ga)			
D	Explosion isolation type (Ex d IIC T6 Gb)			
Code	Antenna type/material/ Process temperature			
SF	Plastic stick/ PTFE/ (-40 ~ +120)℃			
Code	Flange matching/ Material			
Flange size	Material	304 Stainless steel	316 Stainless Steel	
	Code	PTFE lining plate	PTFE Lining plate	
DN50, PN16 flange		FBA	FBB	
DN65, PN16 flange		FCA	FCB	
DN80, PN16 flange		FDA	FDB	
DN100, PN16 flange		FEA	FEB	
DN125, PN16 flange		FFA	FFB	
DN150, PN16 flange		GFA	FGB	
DN200, PN16 flange		FHA	FHB	
DN250, PN16 flange		FJA	FJB	
ANSI 1.5",150lb flange		FAAM	FABM	
ANSI 2",150lb flange		FBAM	FBBM	
ANSI 2.5",150lb flange		FCAM	FCBM	
ANSI 3",150lb flange		FDAM	FDBM	



ANSI 4", 150lb flange	FEAM	FEBM
ANSI 5", 150lb flange	FFAM	FFBM
ANSI 6", 150lb flange	FGAM	FGBM
ANSI 8", 150lb flange	FHAM	FHBM
ANSI 10", 150lb flange	FJAM	FJBM
Y Special design		
<b>Code</b>	<b>Extension pipe length</b>	
A	50mm	
B	100mm	
C	150mm	
D	200mm	
Y	Special design	
<b>Code</b>	<b>Electronic unit</b>	
2	(4~20)mA/ 24V DC 2-wire	
3	(4~20)mA/ 24V DC 4-wire	
4	(4~20)mA/ 220V AC 4-wire	
5	(4~20)mA/ 24V DC/ HART/ 2-wire	
6	(4~20)mA/ 24V DC/ HART/ 4-wire	
7	(4~20)mA/ 220V AC/ HART/ 4-wire	
Y	Special design	
<b>Code</b>	<b>Housing/ Enclosure protection grade</b>	
L	Aluminum/ IP67	
G	Stainless steel 304/ IP67	
<b>Code</b>	<b>Cable entry</b>	
M	M20x1.5	
N	½" NPT	
<b>Code</b>	<b>Display/ Programmer</b>	
V	With	
X	Without	

## VRPWRD53


Code	Approvals			
P	Standard type (Non-explosion)			
I	Intrinsically safe type (Ex ia IIC T6 Ga)			
D	Explosion isolation type (Ex d IIC T6 Gb)			
Code	Process connection/ Material			
GA	Thread G1½" A/ SS304			
GB	Thread G1½" A/ SS316L			
NA	Thread 1½" NPT/ SS304			
NB	Thread 1½" NPT/ SS316L			
Code	Flange matching/ Material			
Material Code Flange size		SS304 Face Flange	SS316L Face Flange	
DN40, PN16 flange		AA	AB	
DN50, PN16 flange		BA	BB	
DN65, PN16 flange		CA	CB	
DN80, PN16 flange		DA	DB	
DN100, PN16 flange		EA	EB	
DN125, PN16 flange		FA	FB	
DN150, PN16 flange		GA	GB	
DN200, PN16 flange		HA	HB	
DN250, PN16 flange		JA	JB	
ANSI 1.5", 150lb flange		AAM	ABM	
ANSI 2", 150lb flange		BAM	BBM	
ANSI 2.5", 150lb flange		CAM	CBM	
ANSI 3", 150lb flange		DAM	DBM	
ANSI 4", 150lb flange		EAM	EBM	
ANSI 5", 150lb flange		FAM	FBM	
ANSI 6", 150lb flange		GAM	GBM	
ANSI 8", 150lb flange		HAM	HBM	
ANSI 10", 150lb flange		JAM	JBM	
X		None		
Y		Special design		



Code	Antenna type/ Material		
<div>Material</div> <div>SizeCode</div>		SS304	SS316L
Horn antenna, Φ 36mm		AA	AB
Horn antenna, Φ 46mm		BA	BB
Horn antenna, Φ 62mm		CA	CB
Horn antenna, Φ 76mm		DA	DB
Horn antenna, Φ 96mm		EA	EB
Horn antenna, Φ 121mm		FA	FB
Y		Special design	
Code	Anti-corrosive function		
A	With		
B	Without		
Code	High temperature adaptor/ Process temperature		
P	Without/ (-40 ~ +130)°C		
G	With/ (-40 ~ +250)°C		
Code	Electronic unit		
2	(4~20)mA/ 24V DC 2-wire		
3	(4~20)mA/ 24V DC 4-wire		
4	(4~20)mA/ 220V AC 4-wire		
5	(4~20)mA/ 24V DC/ HART/ 2-wire		
6	(4~20)mA/ 24V DC/ HART/ 4-wire		
7	(4~20)mA/ 220V AC/ HART/ 4-wire		
Y	Special design		
Code	Housing/ Enclosure protection grade		
L	Aluminum/ IP 67		
G	Stainless steel 304/ IP 67		
Code	Cable entry		
M	M20x1.5		
N	½" NPT		
Code	Display/ Programmer		
V	With		
X	Without		
Code	For strongly corrosive liquids		
F	Sealed antenna with anti-corrosion cover/ for antenna size of 96mm or 62mm		



## VRPWRD54

Code	Approvals			
P	Standard type (Non-explosion)			
I	Intrinsically safe type (Ex ia IIC T6 Ga)			
D	Explosion isolation type (Ex d IIC T6 Gb)			
Code	Process connection/ Material			
GA	Thread G1½" A/ SS304			
GB	Thread G1½" A/ SS316L			
NA	Thread 1½" NPT/ SS304			
NB	Thread 1½" NPT/ SS316L			
Code	Flange matching/ Material			
Material Flange size Code		SS304 Face Flange	SS316L Face Flange	
DN80, PN16 flange		DW	DB	
DN100, PN16 flange		EW	EB	
DN150, PN16 flange		FW	FB	
DN200, PN16 flange		GW	GB	
DN250, PN16 flange		JW	JB	
ANSI 3",150lb flange		DWM	DBM	
ANSI 4",150lb flange		EWM	EBM	
ANSI 5",150lb flange		FWM	FBM	
ANSI 6",150lb flange		GWM	GBM	
ANSI 8",150lb flange		HWM	HBM	
ANSI10",150lb flange		JWM	JBM	
X		None		
Y		Special design		
Code	Antenna type/ Material			






Size \ Code		Material	SS304	SS316L
Horn antenna Φ146mm			GA	GB
Horn antenna Φ196mm			HA	HB
Horn antenna Φ242mm			JA	JB
Y		Special design		
Code	Anti-corrosive function			
A	With			
B	Without			
Code	High temperature adaptor/ Process temperature			
P	Without/ (-40 ~ +130)℃			
G	With/ (-40 ~ +250)℃			
Code	Electronic unit			
2	(4~20)mA/ 24V DC 2-wire			
3	(4~20)mA/ 24V DC 4-wire			
4	(4~20)mA/ 220V AC 4-wire			
5	(4~20)mA/ 24V DC/ HART/ 2-wire			
6	(4~20)mA/ 24V DC/ HART/ 4-wire			
7	(4~20)mA/ 220V AC/ HART/ 4-wire			
Y	Special design			
Code	Housing/ Enclosure protection grade			
L	Aluminum/ IP 67			
G	Stainless steel 304/ IP 67			
Code	Cable entry			
M	M20x1.5			
N	½" NPT			
Code	Display/ Programmer			
V	With			
B	Back light			
X	Without			




## VRPWRD55

Code	Approvals		
P	Standard type (Non-explosion)		
I	Intrinsically safe type (Ex ia IIC T6 Ga)		
D	Explosion isolation type (Ex d IIC T6 Gb)		
E	Classification certificate (CCS)		
Code	Flange matching/ Material		
Flange size	Material	SS304	SS316L
	Code	Face Flange	Face Flange
DN50, PN16 flange		BA	BB
DN65, PN16 flange		CA	CB
DN80 PN16 flange		DA	DB
DN100 PN16 flange		EA	EB
DN125 PN16 flange		FA	FB
DN150 PN16 flange		GA	GB
ANSI 2",150lb flange		BAM	BBM
ANSI 2.5",150lb flange		CAM	CBM
ANSI 3", 150lb flange		DAM	DBM
ANSI 4",150lb flange		EAM	EBM
ANSI 5",150lb flange		FAM	FBM
ANSI 6",150lb flange		GAM	GBM
Y		Special design	
Size	Material	SS304 Wave guided pipe	SS316L Wave guided pipe
	Code		
DN50 PN16 Wave pipe		BC	BD
DN65 PN16 Wave pipe		CC	CD



DN80 PN16 Wave pipe	DC	DD
DN100 PN16 Wave pipe	EC	ED
DN125 PN16 Wave pipe	FC	FD
DN150 PN16 Wave pipe	GC	GD
ANSI 2" 150lb Wave pipe	BCM	BDM
ANSI 2.5" 150lb Wave pipe	CCM	CDM
ANSI 3" 150lb Wave pipe	DCM	DDM
ANSI 4" 150lb Wave pipe	ECM	EDM
ANSI 5" 150lb Wave pipe	FCM	FDM
ANSI 6" 150lb Wave pipe	GCM	GDM
Y Special design		
<b>Code</b>	<b>High temperature adaptor/ Process temperature</b>	
P	Without/ (-40 ~ +130)°C	
G	With/ (-40 ~ +250)°C	
<b>Code</b>	<b>Electronic unit</b>	
2	(4~20)mA/ 24V DC 2-wire	
3	(4~20)mA/ 24V DC 4-wire	
4	(4~20)mA/ 220V AC 4-wire	
5	(4~20)mA/ 24V DC/ HART/ 2-wire	
6	(4~20)mA/ 24V DC/ HART/ 4-wire	
7	(4~20)mA/ 220V AC/ HART/ 4-wire	
Y	Special design	
<b>Code</b>	<b>Housing/ Enclosure protection grade</b>	
L	Aluminum/ IP 67	
G	Stainless steel 304/ IP 67	
<b>Code</b>	<b>Cable entry</b>	
M	M20x1.5	
N	½" NPT	
<b>Code</b>	<b>Display/ Programmer</b>	
V	With	
X	Without	

## VRPWRD56

Code	Approvals			
P	Standard type (Non-explosion)			
I	Intrinsically safe type (Ex ia IIC T6 Ga)			
D	Explosion isolation type (Ex d IIC T6 Gb)			
Code	Process connection/ Material			
GA	Thread G1½" A/ SS304			
GB	Thread G1½" A/ SS316L			
NA	Thread 1½" NPT/ SS304			
NB	Thread 1½" NPT/ SS316L			
Code	Flange matching/ Material			
<div>Material Code</div> <div>Flange size</div>		SS304 Face Flange	SS316L Face Flange	SS304 Universal Flange
DN150, N16 flange		GA	GB	GW
DN200, N16 flange		HA	HB	HW
DN250, N16 flange		JA	JB	JW
ANSI 6", 150lb flange		GAM	GBM	GWM
ANSI 8", 50lb flange		HAM	HBM	HWM
ANSI10", 0lb flange		JAM	JBM	JW
X		None		
Y		Special design		
Code	Antenna type/ Material			
<div>Material Code</div> <div>Size</div>		SS304	SS316L	
Horn antenna Φ146mm		GA	GB	
Horn antenna Φ196mm		HA	HB	

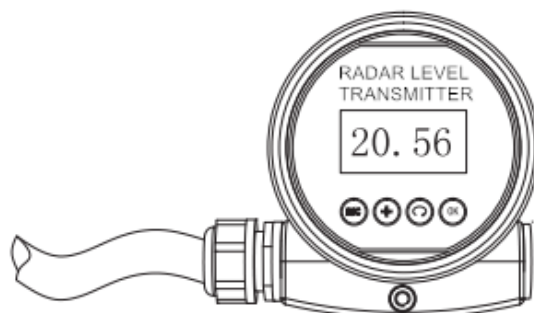


Horn antenna Φ242mm		JA	JB
Y	pecial design		
<b>Code</b>	<b>Cooling method</b>		
A	Without		
B	Gas		
C	Liquid		
<b>Code</b>	<b>High temperature adaptor/ Process temperature</b>		
1	Without		
2	1000mm/ (-40 ~ +500)°C		
3	1500mm/ (-40 ~ +600)°C		
4	2000mm/ (-40 ~ +800)°C		
Y	Special design		
<b>Code</b>	<b>Electronic unit</b>		
2	(4~20)mA/ 24V DC 2-wire		
3	(4~20)mA/ 24V DC 4-wire		
4	(4~20)mA/ 220V AC 4-wire		
5	(4~20)mA/ 24V DC/ HART/ 2-wire		
6	(4~20)mA/ 24V DC/ HART/ 4-wire		
7	(4~20)mA/ 220V AC/ HART/ 4-wire		
Y	Special design		
<b>Code</b>	<b>Housing/ Enclosure protection grade</b>		
L	Aluminum/ IP 67		
G	Stainless steel 304/ IP 67		
<b>Code</b>	<b>Cable entry</b>		
M	M20x1.5		
N	½" NPT		
<b>Code</b>	<b>Display/ Programmer</b>		
V	With		
X	Without		

## 13. Debug menu

### Calibration introduction:

Shown as the figure below, there are four buttons in the indication face board, by pressing which, you can set and debug the instrument. Menu languages are selectable. After setting or calibration, LCD indicates measured values, which can be read clearly through a glass window.



Following bellows are functions of the four built-in buttons:

Button “ESC”:

- Exit from editing state;
- Return to the previous menu;
- Shift between a measured value and an echo curve during operation;

Button “+”:

- Amend values of parameters;
- Select model of indication;

Button “↻”:

- Select a setting item
- Select digit of edited parameters
- Indicate the content of the selected parameter

Button “OK”:

- Enter editing state
- Confirm settings
- Save parameter modification

### Programming method:

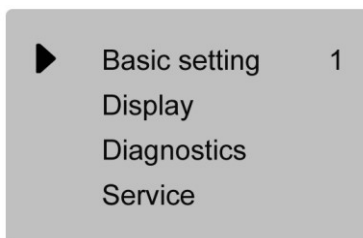
At any time when an instrument under running state press button **OK** to enter programming state, and display programming main menu. Each edited parameter can be confirmed by pressing button **OK**, otherwise, the editor is invalid. After an editing is finished, press button **ESC** to exit programming state, and return to running status. At any time during an editing, press button **ESC** to give up programming, exit programming state of parameters.

### Editing method of parameters (character/ figure programming):

when entering character/ figure programming state, the first digit of the edited parameter will

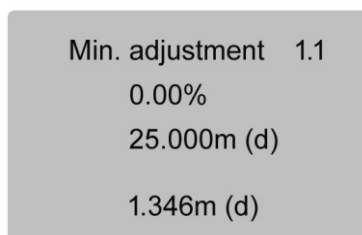


become black. At the time, press button to change the character or figure until the required character or figure appears. Then press button , character or figure will turn black in order, then edit them one by one. When the editing is finished, press button for confirmation. At any time when an instrument under running state, press button to enter programming state, and display programming main menu.



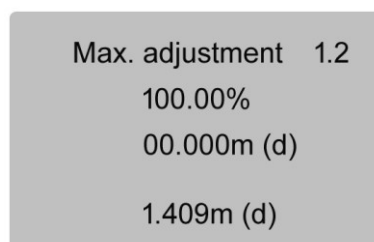
Note: the upper right corner of the screen, a digital representation of the menu number.

1.1.Min. adjustment: Min. adjustment is for measuring range setting. It together with Max. adjustment determines the proportion of output current linearity corresponding relationship. In main menu, when the menu number is 1, press button to enter the submenu of basic settings. LCD indicates as follows:



Press button to enter programming percentage of Min. level. Please refer to the aforementioned “character/ figure parameter editing method” in parameter editing method to edit the percentage value and distance value. After editing, press button for confirmation, or press button to quit the editing.

1.2. Max. adjustment: Max. adjustment is for measuring range setting. It together with Min. adjustment determines the proportion of output current linearity corresponding relationship. When LCD indicates menu number 1.1, press button to enter Max. adjustment. LCD indicates as follows:





At the time, you can edit the Max. adjustment with button

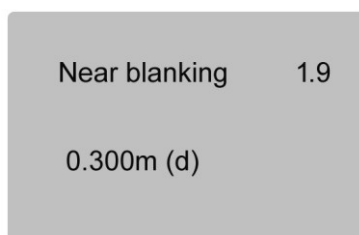
Note: Min. adjustment means the distance from bottom surface of process connection flange to tank bottom, which is 4mA. Max. adjustment means the distance from bottom surface of process connection flange to full level of medium, which is 20mA.

1.8. Range: measuring range must be set to get correct measuring result. When LCD indicates the menu number 1.7, press button to enter Range setting menu. LCD indicates as follows:



Press button , the corresponding parameter turns black, press button or button for setting parameters, then press button for confirmation.

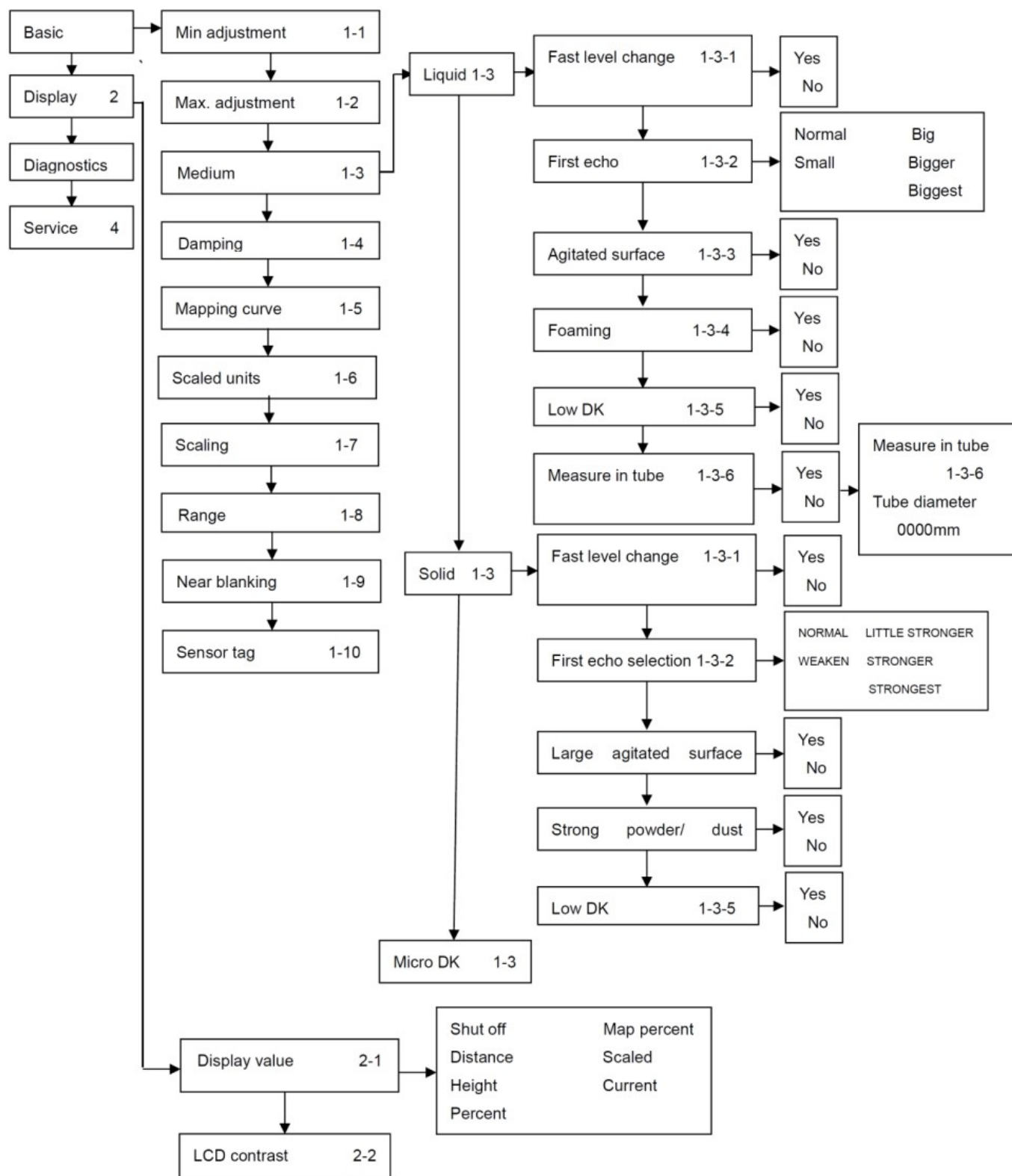
1.9. Near blanking: Near blanking setting can be used to avoid measurement error when a fixed obstacle which is close to the propagator interfere the measurement and meanwhile the maximum medium level is lower than the position of the obstacle. When LCD indicates menu number 1.8, press button to enter Near blanking setting menu. LCD indicates as follows:

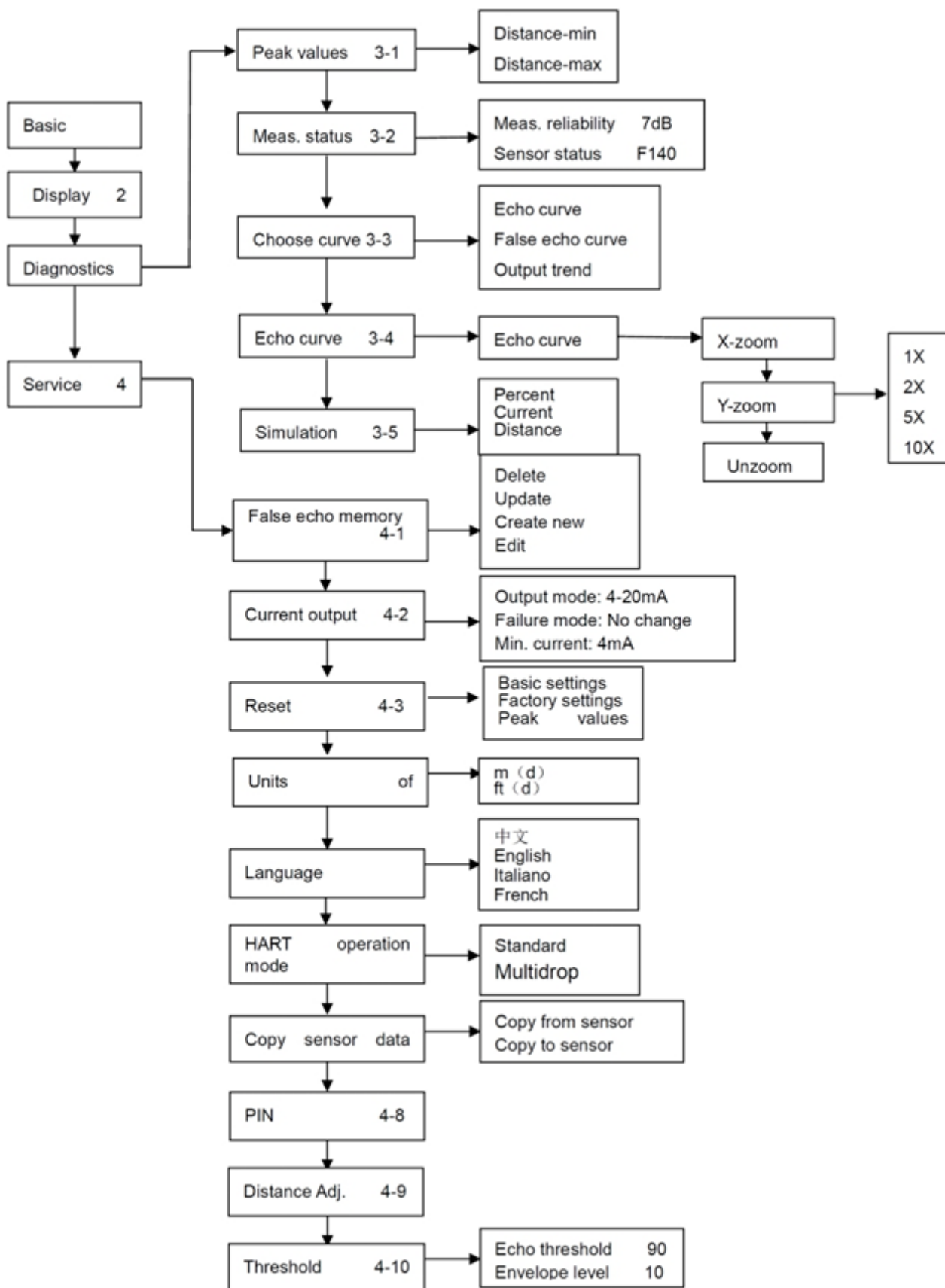


Press button , the corresponding parameter turns black. Press button or button for setting parameters and press button for confirmation.



## Menu diagram







## 14. Information requested when inquiry

### Customer information

Company: \_\_\_\_\_ Contact person: \_\_\_\_\_  
Address: \_\_\_\_\_ Post code: \_\_\_\_\_  
Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_  
Mobile phone: \_\_\_\_\_ E-mail: \_\_\_\_\_  
Date: \_\_\_\_\_

### Certificate

- ☐ Standard type (non-explosion proof) ☐ Intrinsically safe (Ex ib IIB T5)  
☐ Intrinsically safe (Ex ib IIC T6) ☐ Intrinsically safe type + marine approval (Ex ib IIC T6)  
☐ Intrinsically safe + flame proof type (Ex d ib IIC T6)

### Tank/ container information

Tank type:  
☐ Storage tank ☐ Reaction tank ☐ Separation tank ☐ Marine tank  
Tank structure:  
☐ Tank material: ☐ Tank pressure:  
Tank size: Height of tank: \_\_\_\_\_ m Diameter of tank: \_\_\_\_\_ m  
Top of the tank:  
☐ Arch type ☐ Flat top ☐ Open type ☐ Conic top  
Bottom of tank:  
☐ Tapered bottom ☐ Flat bottom ☐ Inclined bottom ☐ Arc bottom  
Installation:  
☐ Top installation ☐ Side installation ☐ Bypass installation ☐ Wave guide pipe installation  
Connection pipe for tank top installation (important information):  
Connection pipe height: \_\_\_\_\_ mm, connection pipe diameter: \_\_\_\_\_ mm

### Measuring medium

Medium name: \_\_\_\_\_ ☐ Liquid ☐ solid ☐ mix medium  
Medium temperature: \_\_\_\_\_ °C  
Dielectric constant:  
Sticky: ☐ Yes ☐ No Stirring: ☐ Yes ☐ No

### Process connection

Thread: (☐ G1½" ☐ 1½" NPT ☐ G2" A ☐ G1" A ☐ 1" NPT)  
☐ Flange (DN= \_\_\_\_\_ ) ☐ Flange (ANSI= \_\_\_\_\_ )

Power supply: ☐ 24V DC ☐ 220V AC  
Output: ☐ 4-20mA ☐ HART ☐ PROFIBUS PA  
Display: ☐ with ☐ Without



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辽宁省丹东市沿江开发区滨江中路 132 号太阳世纪广场 B 栋 1801 室

R.M.1801, Building B, Solar Century Plaza, No. 132, Binjiang Road (M.S.),  
Riverside Development Zone, Dandong City, 118002, Liaoning Province, P. R. China  
Tel.: +86-415-6199 871, Fax: +86-415-3118 579, [davidsong@v-river.com](mailto:davidsong@v-river.com)