TEKSENS

UNICERT ISO 9001

GUIDED WAVE RADAR
LEVEL TRANSMITTER

INDEX

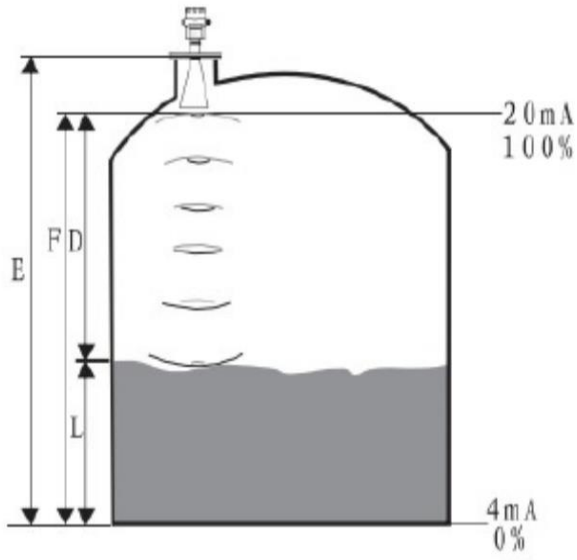
1. Product description

1.1. Working principle

Guided wave radar transmitter works on the principle of time and travel (TDR). Radar wave travels at the velocity of light. The flying time is converted into level signal via the electronic components. The probe emits high frequency wave pulse which travels along a cable probe or a rod probe. When the wave pulse reaches the medium surface, it will be reflected and received by the receiver, and then the distance signal will be converted into level signals.

Input

The reflected wave pulse travels back along the cable and arrives at theelectronic unit.The microprocessorwill process the signals and recognize the returned waves from medium surface.The identification of correct return wave signals can be done by the intelligent software. The distance D from the medium surface is proportional to the travel time:



D=C X T/2 (C is velocity of light)

Due to the empty tank distance D is known, and then the level L is:

L=E-D

Output

By setting of empty tank height E as zero point, the height of full tank F as full range point, and other applicable parameter, the instrument will adapt into the working environment automatically and correspond to output 4-20Ma.

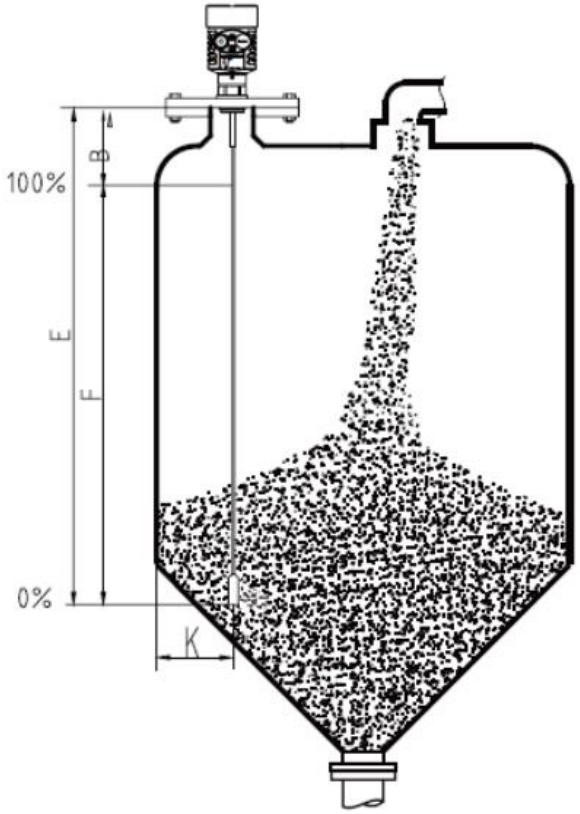
1.2. Measuring range

F----measuring range

E----distance of empty tank

B----dead zone on the top

K----min. distance between probe and tank wall



Dead zone at top refers to the min. Distance between the highest medium position and the measuring reference position (point).

Dead zone at bottom refers to the distance which cannot be measured accurately nearby the bottom of the cable. The distance between the dead zone at the top and the dead zone at the bottom is the effective measuring distance.

Note

Level measurement in a tank can be effectively performed only when the medium level within the top dead zone and the bottom dead zone

2. Introduction of transmitter

8100

Application	liquid and solid powder.
Measuring range	30m
Process connection	thread, flange
Process temperature	-40℃~+250℃
Process pressure	-0.1~2MPa
Accuracy	±3mm
Frequency range	100MHZ~1.8GHz
Explosion prof	Ex ia IIC T6 Gb
Enclosure protection grade	IP67
Signal output	4-20mA/ HART (2-wire)

8200

Application	liquid
Measuring range	6m
Process connection	flange, thread
Medium temperature	-40℃~+250℃
Process pressure	-0.1~2MPa
Accuracy	±3mm
Frequency range	100MHZ~1.8GHz
Explosion prof	Ex ia IIC T6 Gb
Enclosure protection grade	IP67
Signal output	4-20mA/ HART (2-wire)

8300

Application	solid powder
Measuring range	30m
Process connection	thread, flange
Medium temperature	-40℃~+250℃
Process pressure	-0.1~2MPa
Accuracy	±3mm
Frequency range	100MHZ~1.8GHz
Explosion prof	Ex ia IIC T6 Gb
Enclosure protection grade	IP67
Signal output	4-20mA/ HART (2-wire)

8400

Application	liquid
Measuring range	6m
Process connection	thread, flange
Medium temperature	-40℃~+400℃
Process pressure	-0.1~40MPa
Accuracy	±3mm
Frequency range	100MHZ~1.8GHz
Explosion prof	Ex ia IIC T6 Gb
Protection grade	IP67
Signal output	4-20mA/ HART (2-wire)

8500

Application	corrosive liquids
Measuring range	6m (for rod probe)/ 20m (for cable probe)
Process connection	flange
Medium temperature	-40℃~+120℃
Process pressure	-0.1~2.0MPa
Accuracy	±3mm
Frequency range	100MHZ~1.8GHz
Explosion prof	Ex ia IIC T6 Gb
Protection grade	IP67
Signal output	4-20mA/ HART (2-wire)

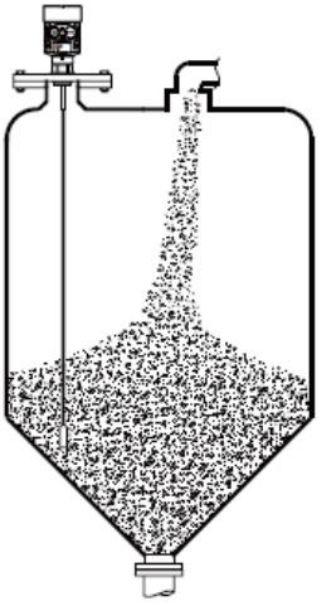
8600

Application	liquids with lower dielectric constant or liquids with wave surface
Measuring range	6m
Process connection	thread, flange
Medium temperature	-40℃~+250℃
Process pressure	-0.1~2Mpa
Accuracy	±3mm
Frequency range	100MHZ~1.8GHz
Explosion prof	Ex ia IIC T6 Gb
Protection grade	IP67
Signal output	4-20mA/ HART (2-wire)

3. Installation guide

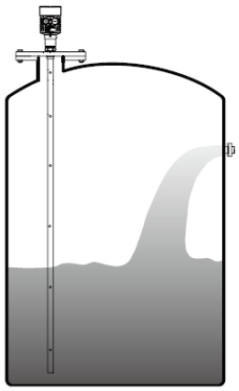
The following installation guide is suitable to the level measurement for both liquids and solids with cable probe or rod probe. Coaxial tube probe is only suitable to liquids.

3.1. Mounting position

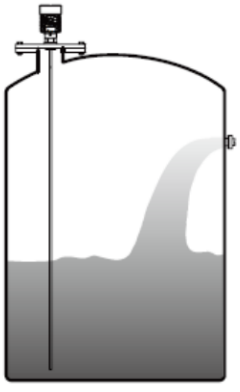


Away from the medium inlet and outlet as far as possible.
For metal tanks and plastic tanks, it is not allowed for probe to touch the inner wall along its whole length. Do not mount the level transmitter in the middle of a metal tank. 8600
For cable probe or rod probe, the probe must be kept away from inner wall at least 300mm.
The distance from probe bottom end to the bottom of a tank is approx. 50mm.
Probe should keep away from any obstacle inside a tank at lease 300mm.
When bottom of a tank is tapered, the transmitter can be mounted in the middle of tank top.
So it can measure the level of medium to the bottom of the tank.

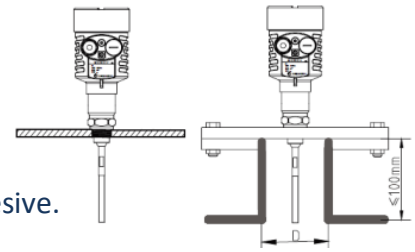
3.2. This drawing on the right is for the installation of a guided wave radar transmitter with rod probe, mainly for liquid level measurement.



Features:
It can measure any liquid which dielectric constant is ≥1.9. λ
Generally it can measure a liquid which viscosity is ≦500cst and is not adhesive. The maximum measuring range of rod probe guided wave radar can be up to 6 m. Measurement will not be affected when there is steam and foam in a tank.

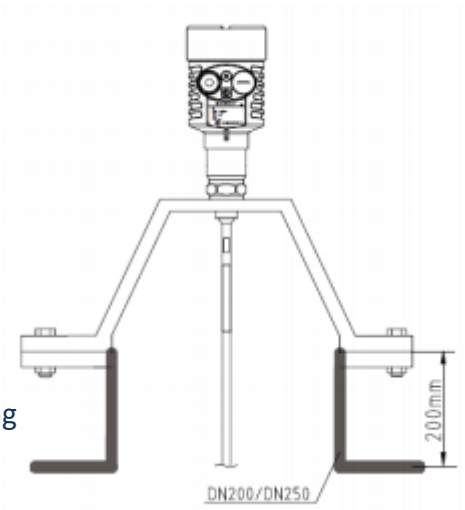


3.3. This drawing on the right is for the installation of a guided wave radar transmitter with a coaxial probe, mainly for liquid level measurement.



Coaxial tube radar can be used for liquids with low dielectric constant to ensure the exact measurement.
It can measure any liquid which dielectric constant is ≥1.6.
Generally it can measure a liquid which viscosity is ≦500cst and not adhesive.
The maximum measuring range of coaxial probe radar can be up to 6m.
Measurement will not be affected when there is steam and foam in a tank.

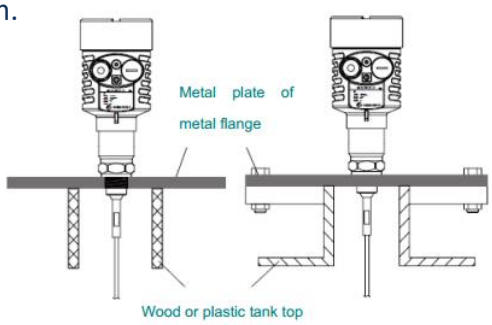
3.4. Installation methods



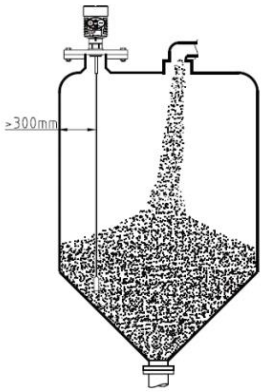
Properly installation of the transmitter can make correct and reliable measurement. The transmitter can be mounted with thread, and the installation height should be higher than 100mm. It can also be mounted on a short pipe with the diameter of 2”~6”.

The installation height of the short pipe should be ≦100mm. When the instrument has to be mounted on a longer short pipe, the cable probe should be fixed at the bottom end of it, or use the centering frame to fix the probe so as to avoid it from contacting the short pipe end.

Mounting on a short pipe DN200 or DN250 When the transmitter has to be mounted in a short pipe which diameter is >200mm, there will be echoes inside the short pipe wall, this will cause the error especially when the medium has low dielectric constant. Therefore, a special flange with “horn” is required for the short pipe which diameter is 200mm or 250mm.



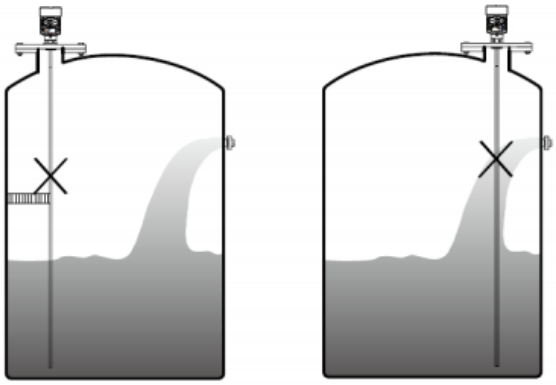
Installation on a plastic tank Note: whichever cable probe or rod probe, the connection surface must be metal if want to keep the transmitter normal work. When a transmitter is mounted on a plastic tank, metal flange is required for the transmitter if the tank top is also plastic material or other nonconductive materials. When the process connection is thread, a metal board is required.



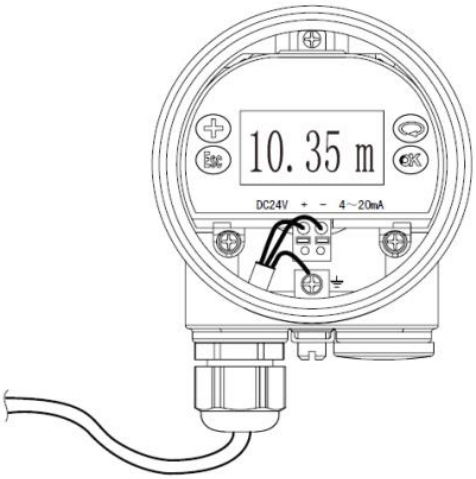
Distance between probe and tank wall It is suggested the min. distance between a transmitter probe and wall side is at least more than 300mm, for the concentrate tank at least Metal plate of metal flange Wood or plastic tank top 500mm, the distance between probe bottom and tank bottom is larger than 50mm.

Attention

Keep anything inside a tank away from the micro wave sensing components (see the picture on the right). Radar is not allowed to be mounted above the medium inlet (see the picture on the right).



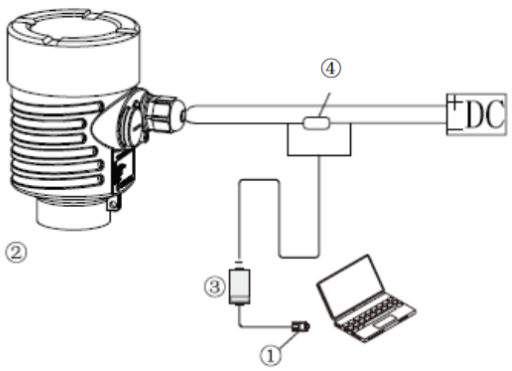
4. Wiring (see the picture below)



5. Calibration

5.1. Calibration with PC and software

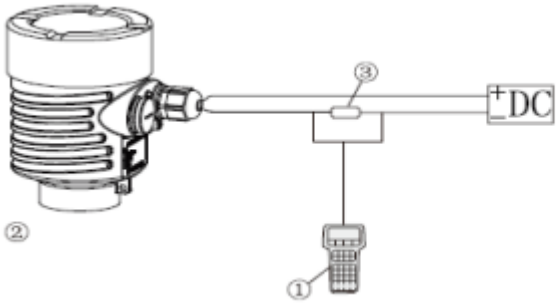
All radar transmitters can be debugged by software via a PC no matter what kind of output signals it is, 4 – 20mA/ HART. A transmitter drive “CONNECTCAT” is required when using the software for the debugging.



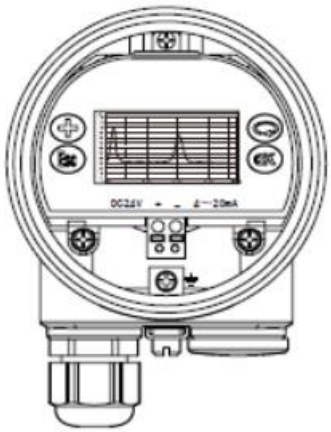
① RS232 interface or USD interface
② Connected with a sensor
③ HART adapter
④ A resistance of 250 Ω

Radar transmitter requires 24V DC when debugging via software, at the same time to connect a250 ohm resistance in the front of the HART adapter.If it is an integrated HART resistance (integrated resistance is 250ohm), then the additional outside resistance is not required, HART adapter can be connected in parallel to 4~20mA wire.

5.2. Calibration with a HART hand-hold communicator

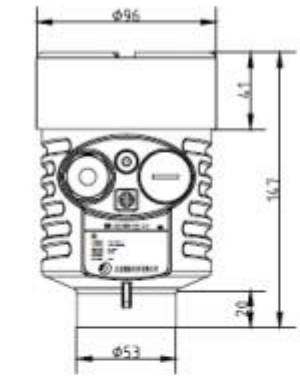


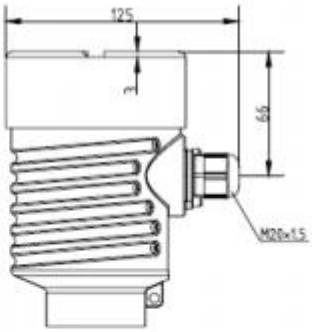
① A HART hand-hold communicator
② Connected with a sensor
③ A resistance of 250 Ω

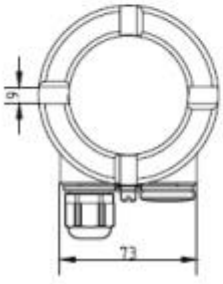


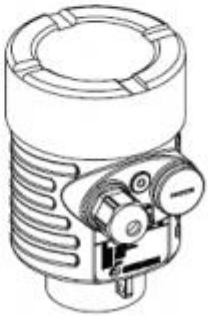
5.3. Calibration with programmer module (PWPM) PWPM is composed of 4 buttons and 1 LCD display, which can display the setting menu and parameters setting

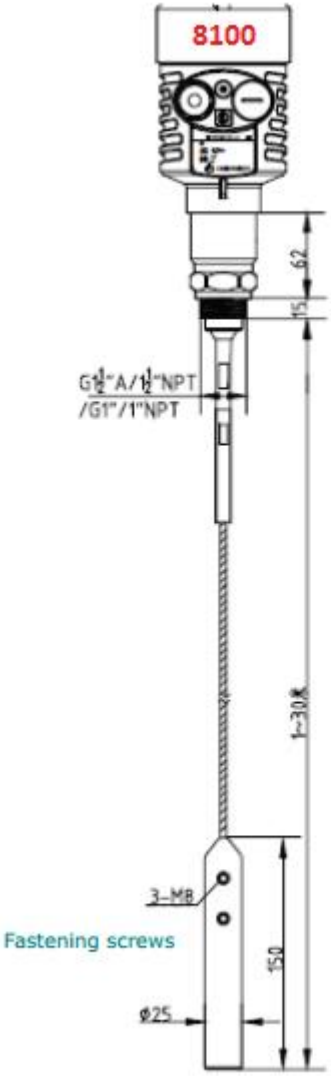
5. 8000 Series Dimensions
Housing Material - AL

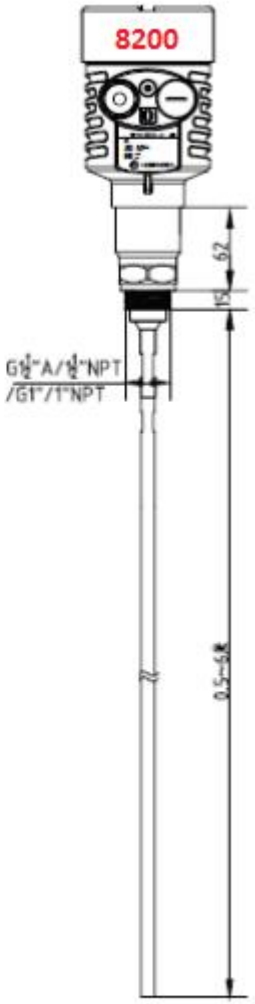


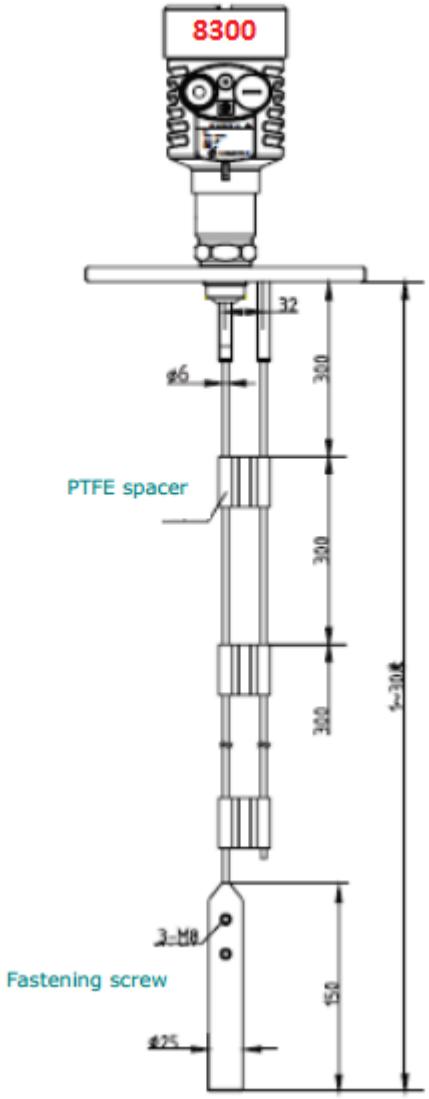


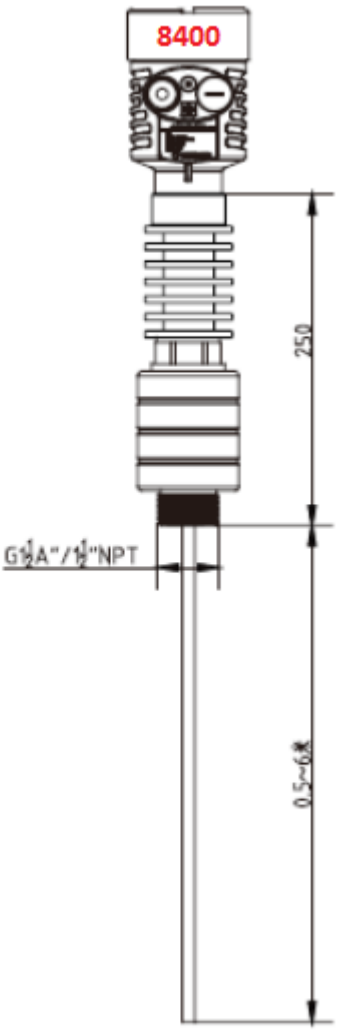


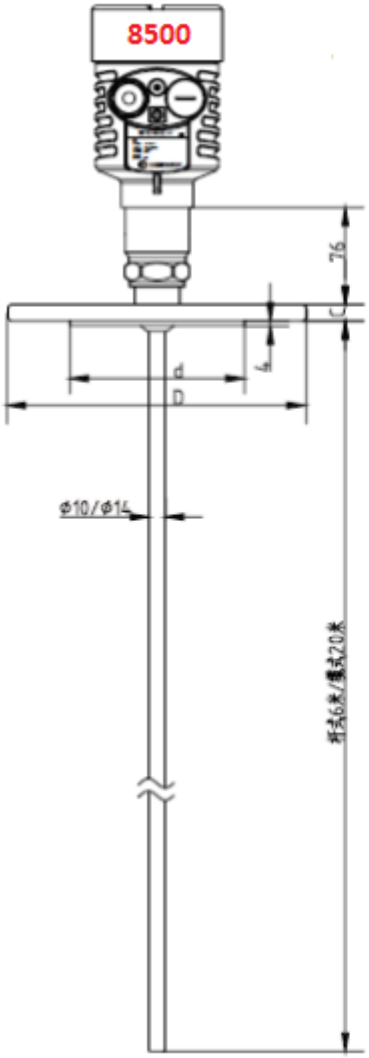


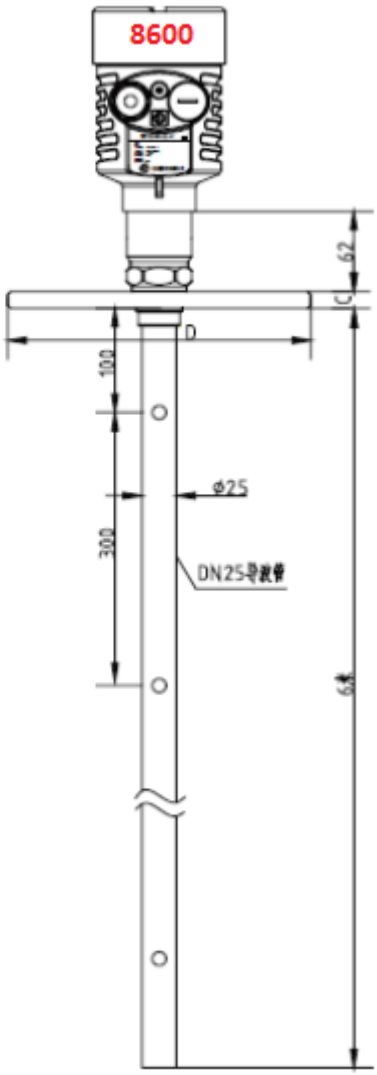

8100
62
15
G½"A/½"NPT
/G1"/1"NPT
1=30R
3-M8
Fastening screws
150
ø25

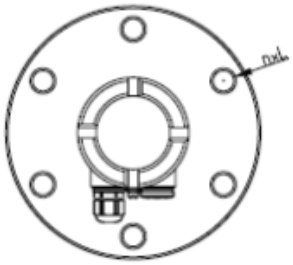

8200
62
15
G½"A/½"NPT
/G1"/1"NPT
27
0.5=6R


8300
32
ø6
350
PTFE spacer
350
350
1~30m
3-M8
Fastening screw
150
ø25


8400
250
G¾A"/1½"NPT
0.5~6m



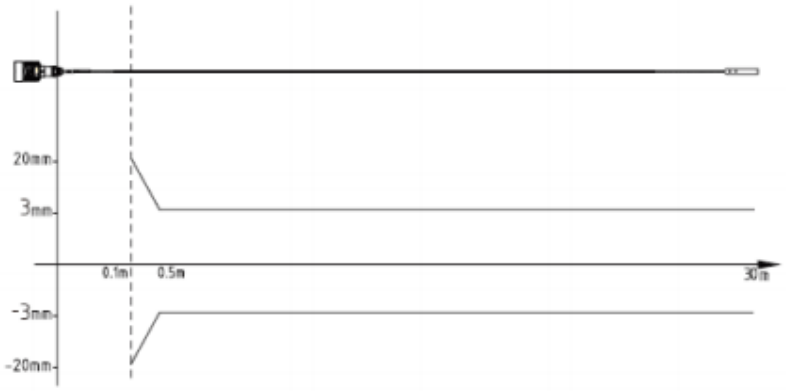




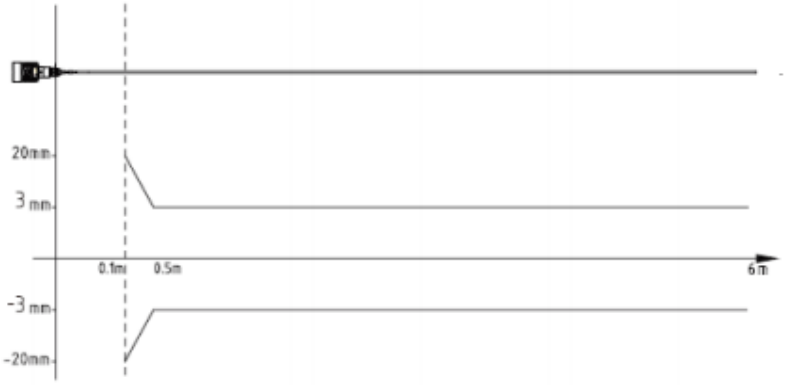
Flange Selection Table (GB/T9119-2000)						
No.	Size	OD	Hole center distance K	Holes quantity n	Hole Diameter L	Sealed surface d
1	DN50	Ø165	Ø125	4	18	99
2	DN80	Ø200	Ø160	8	18	132
3	DN100	Ø220	Ø180	8	18	156
4	DN150	Ø285	Ø240	8	22	211
5	DN200	Ø340	Ø295	12	22	266
6	DN250	Ø405	Ø355	12	26	319

7. Linearity

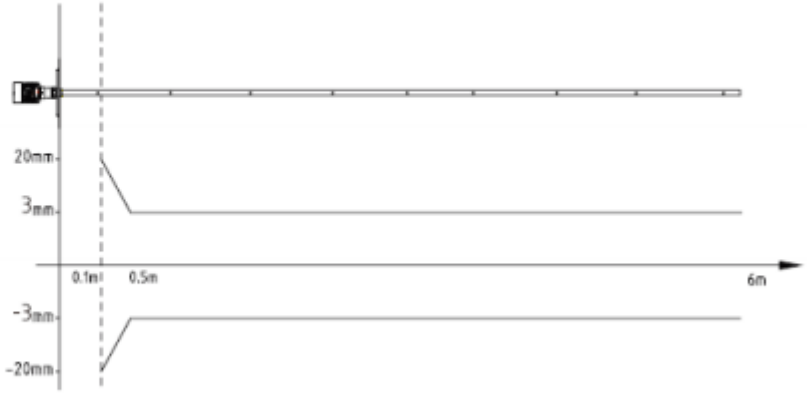
Cable Probe



Rod Probe



Coaxial tube probe



8. Technical data

General parameters

Working frequency	100MHZ~1.8GHz
Measuring range	0~30m for cable probe; 0~6m for rod probe or coaxial probe;
Repeatability	±2mm Resolution: 1mm
Sample	echo sampling 55 times /s
Responding time	>0.2s (depends on the application) Current signal output: 4~20mA
Accuracy	±3mm
Communication	HART protocol
Process connection	Thread, G1″ A or G1½″
	Flange, DN50, DN80, DN100, DN150, DN200, DN250
Process pressure	-0.1~2MPa
Power supply	24V DC (+/-10%), ripple voltage: 1Vpp
Power consumption	Max.22.5mA
Ambient temperature	-40℃~+70℃
Explosion proof approval	Ex ia IIC T6 Gb
Enclosure protection grade	IP67
2-wire connection	input and signal output share one 2-wire shielded cable.
Cable entry:	M20*1.5 * 2 or ½"NPT*2 (cable diameter is 5~9mm)
Measuring range	The following table shows the relationship between different mediums and the measuring range.

Medium group	DK(ε)	Solid particles	Liquid	Measuring range
1	1.4~1.6		cold concentrate, e.g. N2CO2	3m (only for coaxial probe)
2	1.6~1.9	White lime Specials Cement Sugar	Liquefied gas, e.g. Propane Solvent Freon12/Freon Palm oil	20m
3	1.9~2.5	Normal cement, Plaster	Mineral oil, fuel	20m
4	2.5~4	Grain, seeds Stone Sand	Benzene, styrene, Toluene Furan Naphthalene	25m
5	4~7	Moist stone, mineral Salt	Chlorobenzene, Chloroform Cellulose spray Isocyan hydrochloric Acid. Aniline	30m
6	>7	Metal powder Carbon black Coal	Liquid with water Alcohol Liquid ammonia	30m

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