JTR Guided Wave Radar Level Sensor

Operation Instruction

FineTek Co.,Ltd.
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1. Introduction

Thank you for purchasing FineTek products. This operation manual will describe(s) the product's characteristics, working principle, operation, maintenance and troubleshooting, helping users familiarize with the product and avoid mishap from incorrect usage.

- Before using the product, please read this operation manual carefully.
- If you require further clarifications or details, please contact our company.
- Product updates will be uploaded onto our company website at www.fine-tek.com; users may download the information from there.
- Please do not disassemble or repair the product yourself; otherwise the warranty will become invalid. Do send the item back to our company instead, or contact our customer hot-line for help.

Warning Symbol：

Danger→ indicates possibility of major or fatal disaster if operation is goes wrong.

Attention→ indicates possibility of a certain degree of injury & equipment damage if the operation goes wrong.

Electric Shock → indicates possibility of receiving an electric shock.

Fire → a warning that fire may occur

Prohibited → Forbidden operation.

2. Product warranty

2.1 New product warranty

- FineTek products are guaranteed a warranty period of 12 months starting from the date of delivery whereby the cost of testing, replacement parts, repairs and other expenses are waived.
- If product is damaged during delivery, you may request for a replacement within 7 days.
- If product needs to be sent back to FineTek for repairs, please avoid disassembling it yourself. In addition, product needs to be packed properly to avoid damage during shipping.
- Product warranty is only applicable to items that are used and installed accordingly. It does not cover items that are used extraordinarily or outside its scope of operations.
- The following conditions will result in product not be covered by warranty; testing, replacement parts & repair costs will be charged.
- The warranty period for part or whole product has expired.
- Product damage due to failure in using the operation manual properly or poor operating environment.
- Product damage due to force majeure (e.g. natural disasters), carelessness (e.g. scratch, fall, heavy blow), negligence (e.g. use of inappropriate voltage, corrosion, improper storage) or other abnormal factors.
- Customer or user had installed, modified or repaired the product not authorized or approved by FineTek.

2.2 Repair Warranty

All repaired products will be provided with a 6 months warranty period. During this period, free repair and servicing will be provided if the same problem surfaces again.

2.3 International Service Office

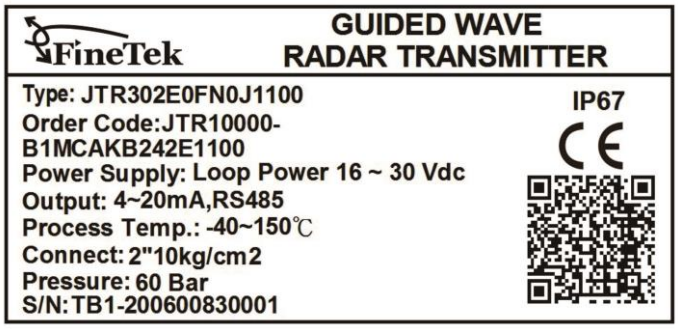
Company	Address	Telephon	Fax
Taipei Headquarters (Taiwan)	No.16, Tzuchiang St., Tucheng Industrial Park, New Taipei City 23678	+886 2-2269-6789	+886 2-2268-6682
Taichung Sales office (Taiwan)		+886 4-2465-2820	+886 4-2463-9926
Kaohsiung Sales office (Taiwan)		+886 7-333-6968	+886 7-536-8758
Fine automation Co., Ltd. (China)	No. 451, Duhui Road, Zhuanqiao Township, Minhang District, Shanghai City 201109	+86 021-64907260	+86 021-6490-7276
Aplus FineTek Sensor Inc.	355 S. Lemon Ave, Suite D Walnut, CA 91789	1 909 598-2488	1 909 598-3188
FineTek Pte Ltd. (Singapore Branch)	37 Kaki Bukit Place, Level 4 Singapore 416215	+65 6452-6340	+65 6734-1878
FineTek GmbH (Germany Branch)	Bei den Kämpen 26 21220 Seevetal-Ramelsloh, Germany	+49 (0) 4185 8083 0	+49 (0) 4185 8083 80
FineTek Co., Ltd. (Indonesia Branch)	PERGUDANGAN TUNAS BITUNG JL. Raya Serang KM. 13,8, Blok C3 No. 12&15, Bitung Cikupa, Tangerang 15710	+62 021-2958-1688	+62 021-2957-1988

3. Product Inspection

3.1 Configuration

3.1.1 Model Label

The model label includes the product specification such as type, power supply, output mode, ambient temperature, process temperature and process pressure.



3.1.2 Product contents

1. Sensor

2. Documents

- Operation manual
- Inspection certificate of measurement accuracy (Optional)

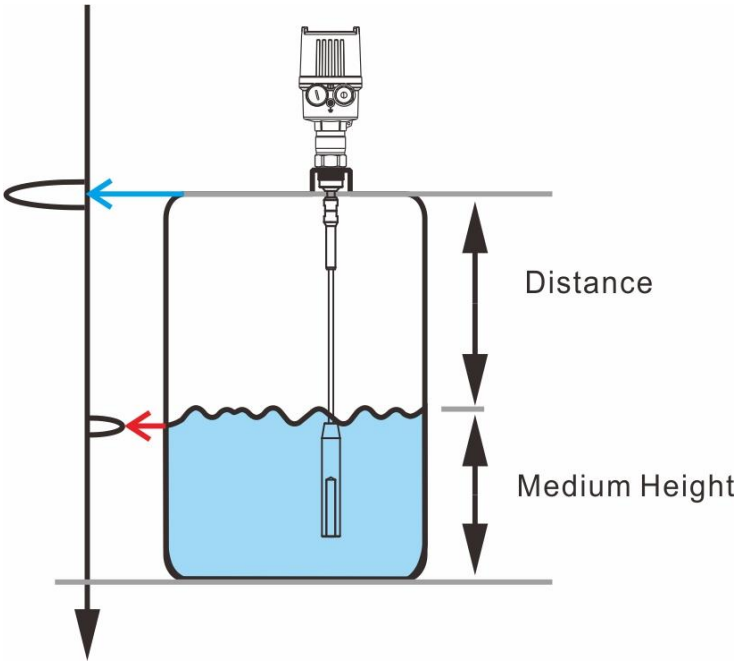
3.2 Safety Check

- Before unpacking, please check the package first for any damages or deformities. If yes, take photos for evidence.
- After unpacking, please check if the products inside are deformed or damaged or have quality issues. If yes, take photos for evidence.
- Check that the item and its quantity match your order.
- If there are any issues with your product, please contact our company within 7 days (attach photos); otherwise, free replacements or repairs will not be provided.

4. Product Introduction

4.1 Product Principles

The guided wave radar emits a high-frequency pulse wave to be transmitted along with the detection component (steel rope or connecting rod). When it comes in contact with the object to be measured, the pulse wave will be reflected and some of the energy will be reflected as well due to the different dielectric constant of air and the material. The time difference between the reflection wave and the emission wave can be used to calculate the distance between the surface of the measured object and the guided wave radar level sensor.



4.2 Advanced Functions

4.2.1 Bottom signal enhancement & tracking technology

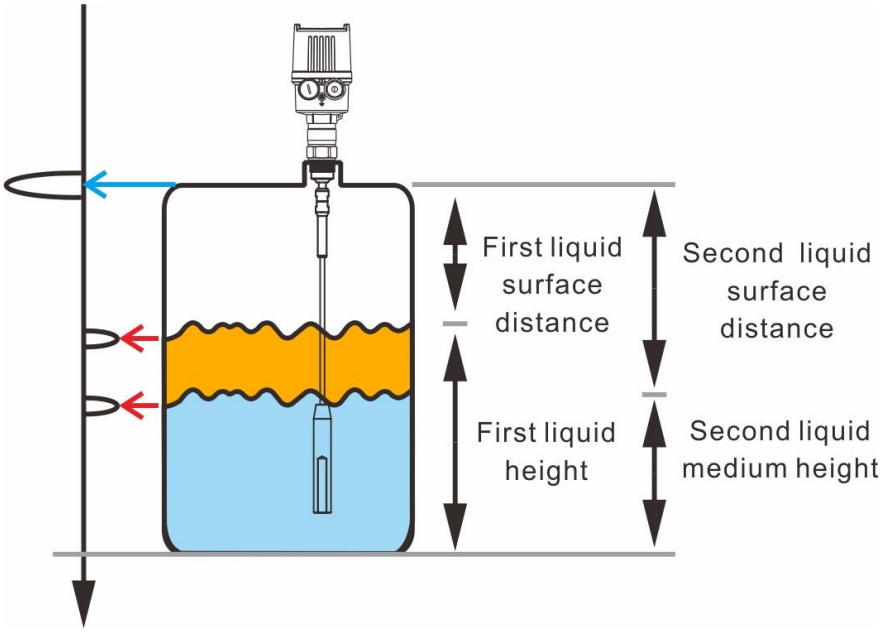
The product is equipped with a bottom tracking probe technology. This function is very useful in increasing the sensitivity when the dielectric constant of the measured object is low, such as the plastic particles, material fragments or that in the liquefaction container. When the dielectric constant is 3~10, the bottom tracking probe function will be enabled automatically as long as the echo signal is not detected. The measurement value is calculated based on the dielectric constant recorded the last time. In this case, the instrument accuracy depends on the stability of the dielectric constant.

If the dielectric constant of the media is lower than 3, the bottom tracking probe function will be enabled all the time. Under this circumstance, you must input the dielectric constant of the media, which is quite important for measurement.

※ Please check chapter “Bottom Tracking Probe Set up” for details of setting.

4.2.2 Dual-Level interface measurement

The high-frequency micro wave pulse travels along the steel rope or the connecting rod. When it reaches the media surface, a part of the micro wave pulse will be reflected. Another part will penetrate the media in the upper layer (L1), and the second reflection will take place on the interface between the upper (L2) and lower (L1) interface layers. The two periods of pulse running will be calculated by the PCB inside the instrument, which also outputs two levels.



※ Measurement condition of dual-level interface:
Media on the upper layer (L2):
L2 must be non-conducting media. The dielectric constant of the media in L2 or the actual distance towards the interface is known. The dielectric constant of the media in L2 must be larger than 1.6. The media must be stable without change or mixture. Moreover, it must be uniform. The minimum thickness of the media in L2 should be larger than 50mm (1.97-inch), and L2 must be clearly separated from the lower layer (L1). In case of emulsion phase or chipping layer, the maximum thickness should be 50mm (1.97-inch). It should be without foam on the surface if possible, so it will get better measurement results.

Media on lower layer (L1):
The dielectric constant of L1 must be 10 larger than that of L2 at minimum, and the conducting media is recommended. For example, if the dielectric constant of L2 is 2, the dielectric constant of L1 should be 12 at least.
Gas layer (L3): It is the mixture of air or gas.
Output signal setting of dual-level interface measurement:
This instrument requires applying the setting in “level measurement”, which should be applied in dual-level interface measurement. You may select dual-analog output version and adjust the settings.

5. Features

- It meets the measurement requirements of different temperatures, pressures and media.
- Based on the contact measurement, it can overcome the effects from steam, foam and stirring.
- 2-wire loop power for simple wiring
- Local LCM display for convenient on-site adjustment.
- Unique algorithm and echo processing technology can be applied in various complicated conditions.
- Echo wave graphics display function, to show the signal waveform inside the tank,can be used for background noise processing.

6. Specification

Model	JTR302	JTR30A	JTR301	JTR305
Applicable environment	Solid/Powder/Particle	Liquid/solid	Liquid	Low Dielectric Liquid
Measuring scope	Rod type:6m Cable type:20m	Rod type:6m	Rod type:6m Cable type:20m	Coaxial type:6m
Connection	1"PF	1"(3A)	3/4"PF	
Min. Dielectric coefficient	2.0			1.6
Ambient Temperature	-40~80℃(Applied for Ex-proof, as: ATEX、CSA、IECEx、TS：T2~T5 -40~70℃ / T6 -40~55℃, NEPSI：-40~60℃).			
Operating temperature	Standard type, -40~150℃ Hi-temperation type, -40~230℃			
Operating pressure	0~60 bar(25℃)			
Accuracy	±5 mm or ±0.1% F.S. Whichever is greater			
Analog output	4~20 mA			
Power supply	16~30 Vdc Loop Power,16~30 Vdc 4-wire, 5~10Vdc RS485 4-Wire			
Digital communication	HART 7.3 for 2-Wire, RS485(Modbus) for 4-Wire			
Housing material	Aluminum alloy			
Load Impedance	(VS-16)/0.022A Ohm for 2-wire; 300 Ohm for 4-wire>16V			
IP Protection rating	IP67			
Dead band	High constant coefficient (ε ＞10)：Upper dead band ＜100mm, Lower dead band ＜50mm Low constant coefficient (ε ＜10)：Upper dead band ＜500mm, Lower dead band ＜100mm			
Ex-PROOF (option)	NEPSI Ex ia IIC T2~T4 Ga IECEx Ex ia IIC T2~T6 Ga ATEX Ex II 1G Ex ia IIC T2~T6 Ga CSA Class I, Zone 0, AEx ia IIC T2~6 Ga; Class I, Division 1, Groups A, B, C & D, T2~6 TS Ex ia IIC T2~T6 Ga			

※ Must equipped with intrinsic safety barrier to form a standard intrinsically safe system (Ex ia).

Intrinsically safe parameters

TEX、CSA、IECEx、TS：

Model series	Power circuit	Input entity parameters	Output entity parameters
JTR30XD	Loop Power 16~30Vdc X 2 with HART, by 2-core wire via terminal blocks J1 and J2	Loop Power 1 In (V1+, V1-): Ui = 30V Ii = 100 mA Pi = 0.7W Ci = 0 Li = 0 Loop Power 2 In (V2+, V2-): Same as above	None
JTR30XB	Loop Power 16~30Vdc with HART, by 2-core wire via terminal blocks J1	Loop Power In (V+, V-): Ui = 30V Ii = 100 mA Pi = 0.7W Ci = 0 Li = 0	None
JTR30XH	4-Wire 16~30Vdc 4~20mA with RS485, by 2-core wire via terminal blocks J1 and J4 ∗ Note: Feedback signal parameter for 'RS-485 In' is: Uo = 5.88V Io = 12.5mA Po = 18.5mW Co = 43μF Lo = 3555μH	RS-485 In (D+, D-)∗: Ui = 12V Ii = 100mA Pi = 0.3W Ci = 0 Li = 0 Power In (V+, V-): Ui = 30V Ii = 100mA Pi = 0.7W Ci = 0 Li = 0	Analog Out 1 (I+, I-): Uo = 13.65V Io = 69mA Po = 0.236W Co = 0.79μF Lo = 7468μH Through 2-core wire via terminal block J2 Analog Out 2 (I2+, I2-): Uo = 13.65 V Io = 69mA Po = 0.236W Co = 0.79μF Lo = 7468μH Through 2-core wire via terminal block J3
JTR30XE	4-Wire 16~30Vdc 4~20mA with RS485, by 2-core wire via terminal blocks J1 and J4 ∗ Note: Feedback signal parameter for 'RS-485 In' is: Uo = 5.88V Io = 12.5mA Po = 18.5mW Co = 43μF Lo = 3555μH	RS-485 In (D+, D-)∗: Ui = 12V Ii = 100mA Pi = 0.3W Ci = 0 Li = 0 Power In (V+, V-): Ui = 30V Ii = 100mA Pi = 0.7W Ci = 0 Li = 0	Analog Out 1 (I+, I-): Uo = 13.65V Io = 69mA Po = 0.236W Co = 0.79μF Lo = 7468μH Through 2-core wire via terminal block J2
JTR30XF	4-Wire 5Vdc with RS485, by 2-core wire via terminal blocks J1 and J4 ∗ Note: Feedback signal parameter for 'RS-485 In' is: Uo = 5.88V Io = 12.5mA Po = 18.5mW Co = 43μF Lo = 3555μH	RS-485 In (D+, D-)∗: Ui = 12V Ii = 100mA Pi = 0.3W Ci = 0 Li = 0 Power In (V+, V-): Ui = 10V Ii = 300mA Pi = 0.7W Ci = 0 Li = 0	None

NEPSI：

Terminal Code (Power)	Max. Voltage Input Ui (V)	Max. Current Input Ii (mA)	Max. Power Input Pi (W)	Max. Internal equivalent parameter	
				Ci (μF)	Li (mH)
V1+，V1- V2+，V2-	30	100	0.7	0	0
V+，V-	30	100	0.7	0	0
	10	300			

Terminal Code (RS485)	Max. Voltage Input Ui (V)	Max. Current Input Ii (mA)	Max. Power Input Pi (W)	Max. Internal equivalent parameter	
				Ci (μF)	Li (mH)
D+，D-	12	100	0.3	0	0
	Max. Voltage Output Uo (V)	Max. Current Output Io (mA)	Max. Power Output Po (mW)	Max. External Parameter	
				Co (μF)	Lo (mH)
	7	15	25	See below	

Terminal Code (AO)	Max. Voltage Input Ui (V)	Max. Current Input Ii (mA)	Max. Power Input Pi (W)	Max. Internal equivalent parameter	
				Ci (μF)	Li (mH)
I+，I- I2+，I2-	15	70	0.25	0	0
	Max. Voltage Output Uo (V)	Max. Current Output Io (mA)	Max. Power Output Po (W)	Max. External Parameter	
				Co (μF)	Lo (mH)
	14	70	0.25	See below	

Terminal Code	Total	
	Co (μF)	Lo (mH)
D+，D- I+，I- I2+，I2-	0.5	1.0

Measuring range

JTR301 / JTR305				
Dielectric constant (ε_r)	Typical liquids	Steel wire cable type	Rod type	Coaxial type
1.6~2.0	● liquefied gas, e.g. propane ● solvent ● Freon ● palm oil	Need special model with S5 type float		6m
2.0~2.5	● mineral oils, fuels	12m	6m	6m
2.5~4.0	● benzene, styrene, toluene ● furan ● naphthalene	14m	6m	6m
4.0~7.0	● chlorobenzene, chloroform ● cellulose spray ● isocyanate, aniline	16m	6m	6m
＞7.0	● aqueous solutions ● alcohols ● ammonia	20m	6m	6m

JTR302			
Dielectric constant (ε_r)	Typical bulk solids	Steel wire cable type	Rod type
2.0~2.5	● portland cement ● plaster ● plastic granulate	12m	6m
2.5~4.0	● grain, seeds ● flour ● ground stones ● sand	14m	6m
4.0~7.0	● naturally moist stones, ores ● salt	16m	6m
＞7.0	● metallic powder ● carbon black ● coal	20m	6m

7. Installation

7.1 General Instructions

7.1.1 Lock instrument

When locking the instrument and the tank, the suitable hex wrench should be used to fasten it.

Note! During the installation, please apply force on the hex screw to fasten it. Don’t apply force on the instrument housing because it may damage the internal parts.

7.1.2 Moisture proof instructions

During the installation, you may take the following measures to protect the instrument from moisture:

- Use the appropriate cable (The standard cable for this instrument is 1/2"PF cable connector) Fasten the cable connector
- Direct the cable connector downwards when installing, so as to prevent moisture
- When connecting with the cable, leave a small segment of cable hanging down in front of the fixing header.
- Prevent moisture from entering the housing along the cable.

Please pay special attention to moisture proofing when the product is applied in the following environments:

- Outdoor installation
- Installation in areas with estimated high moisture (such as cleaning process equipment)
- Installation in cooling or heating containers

7.1.3 Operating conditions

When using the instrument, please check whether the specification of all parts meets the operating environment where it is exposed, including:

- Measuring sensor
- Connecting or fixing thread or flange
- Sealing material

Especially the following conditions in the specification:

- Operating pressure
- Operating temperature
- Properties of chemical media
- Abrasion and mechanical effects

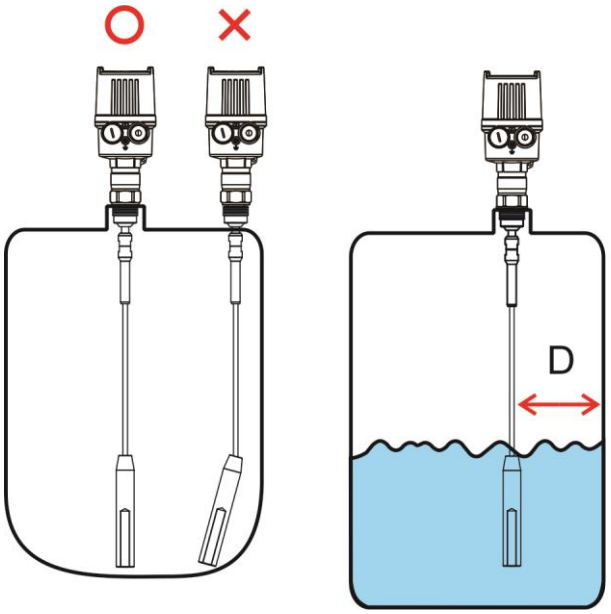
Note! If the instrument is applied in the pressure tank or the low-pressure container, it must be sealed when fixing during the installation. Before usage, it must be checked as to whether the operating temperature of the sealing material meets the ambient temperature.

7.2 Installation Instruction

7.2.1 Installation site

Pay attention to the following when installing JTR3 series products. When it is installed in a metal container, the distance between the container parts and the inner wall should be at least over 300mm. For non-metal containers, the distance to the inner wall should be at least over 500mm. During the operation, make sure the sensor doesn't get into contact with any device or tank wall. When using the sensor of a steel rope, it is recommended fixing the sensor bottom in the tank to reduce the vibration to the sensor. For the tanks with core shape at the lower part, it is recommended installing the product in the center of the container to measure the lowest point at the bottom.

※Please note the upper/lower blind area of the instrument. It can't measure the lowest point of the sensor.



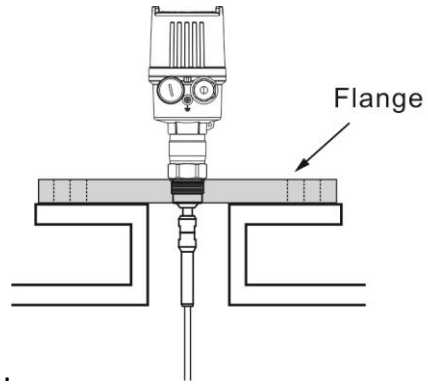
Metal Tank
D>300mm
Non-metal Tank
D>500mm

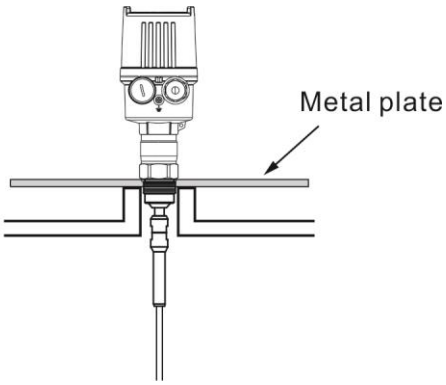
Note! When welding is required for the installation, please remove the electronic module of the sensor from the junction box before welding. It can prevent the damage on the electronic device due to the inductive coupling or other abnormalities.

Plastic container/glass container

The measuring principle of guided wave radar requires a metal plane at the process junction point. Therefore, when it is used in the plastic container, it requires an instrument with flange (since DN 50) or a metal plate (ø > 200 mm/8 in) placed under the process connection.

Note, the metal plate should be connected with the process connection directly. When installing the measuring sensor of the connecting rod or steel rope in the plastic container without a metal wall, the measuring value will be affected by the strong electromagnetic field (The interference emission based on EN 61326: Class A). In this case, please use the co-axis measuring sensor.





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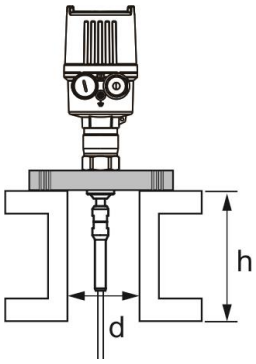
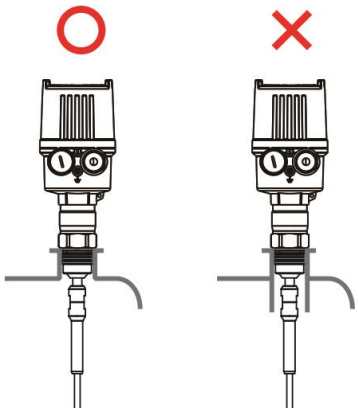
During the installation, don’t use extension pipe on the container. Kindly install the sensor and the container cap flush with the ground.



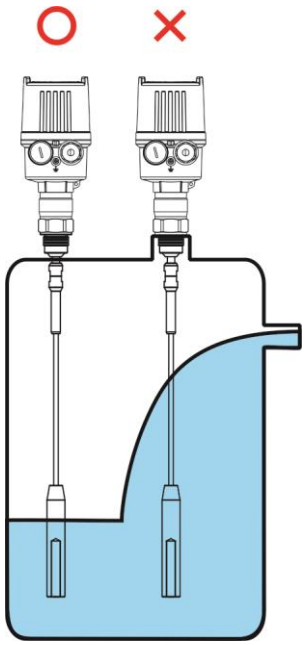
d	h
DN40~DN150	≤150
>DN150~DN1200	≤100

※ When welding the connector of the extension pipe, please make the edge of the extension pipe connector flush with container cap.



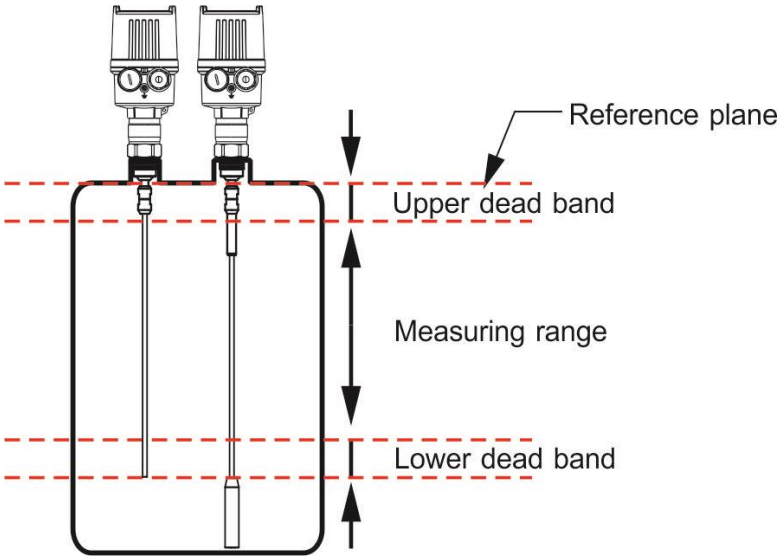
7.2.2 Feeding tank installation precautions

Please don’t install the instrument at the feeding port. The instrument must be in a position with stable media rather than a position with liquid flow. It can’t provide accurate measurement when the liquid flows in.



7.2.3 Blind area

The measuring range is from the bottom of flange or hread.



※ Note, t he measuring range is from the reference to the bottom of the sensor, but not including the upper/lower blind areas. For the default measuring range of the instrument, it is set based on the media, “water”.

8 Wiring Instruction

8.1 Preparations

8.1.1 Please note the following safety precautions before use:

The instrument wiring is only permitted when it is powered OFF.

If overvoltage occurs to the wire, please install overvoltage protection device to protect the instrument.

8.1.2 Connecting cable

The instrument can be connected with the general 2-core wire without the shielding layer available on the market.

If electromagnetic coupling phenomenon occurs to the installation and wiring environment, and the value exceeds the inspection value of EN61326-1 Standards applicable to the industrial field, the cable with shielding cable should be used. For the instrument with housing and cable screw thread connector, please use the cable with circular cross-section. Please check the external diameter of the cable applicable to the cable screw thread connector, so as to ensure the sealing on the cable screw thread connector (IP protection method). Please use the cable screw thread connector matching with the cable diameter.

Note!

When wiring, please follow the requirements of DIN EN 61140 VDE 0140-1(Protection against electric shock - Common aspects for installation and equipment), to guarantee the safety isolation between the power circuit and the grid circuit.

When the cable with shielding isolated mesh is used, it is recommended setting up the shielding isolated mesh on both sides of earth potential. In the sensor, the shielding isolated mesh must be directly connected with the internal grounding terminal. The external grounding terminal on the housing must be connected with the low impedance of the earth potential. For explosion-proof equipment, it should perform grounding based on the requirements on the license.

For the electroplating and KKS equipment (cathodic anticorrosion protection), the great potential difference should be considered. When the shielding isolated mesh is grounded on both sides, it may cause the current of the shielding isolated mesh to exceed the permitted scope.

8.1.3 Power supply

The product is connected with a 2-core wire to supply power and send current signal

Working voltage (Vs):

With display adjustment module: 16~30VDC

Load impedance:(Vs-Vmin)/0.022A

For example: When supplying 24VDC for the instrument with display adjustment module: (24-16)/0.022 = 363Ω

8.2 Wiring Instructions:

8.2.1 Connection methods

When wiring, make the 2-core wire go through the enclosure, and make a connection based on the positive/negative power supply as marked on the nameplate. A flathead screwdriver may be used for connection.

8.2.2 Wiring steps

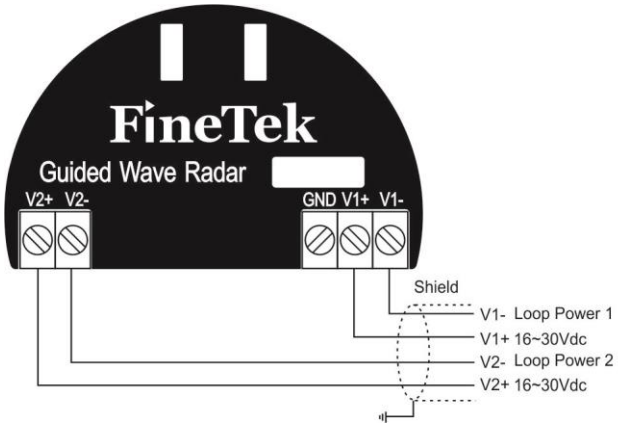
Please follow the steps below:

1. Remove the cover on the housing.
2. Remove the display module by rotating it counterclockwisely.
3. Loosen the fixing screw on the cable screw thread connector
4. Remove the jacket of about 10cm (4in) on the cable, and remove the insulation of 1cm (0.4in) at the core wire end.
5. Make the cable go through the cable connector, and insert it inside the housing.
6. Connect the wire to the terminal according to the wiring diagram
7. Pull it gently to check whether the wire is fixed firmly on the terminal
8. Connect the shielding with the terminal of the internal grounding wire, and connect the terminal of the external grounding wire with the electric potential compensation.
9. Fasten the fixing screw of the cable screw thread connector, and make sure the sealing ring is completely surrounding the cable
10. Re-assemble the display module.
11. Put on the housing cover to complete the electric connection

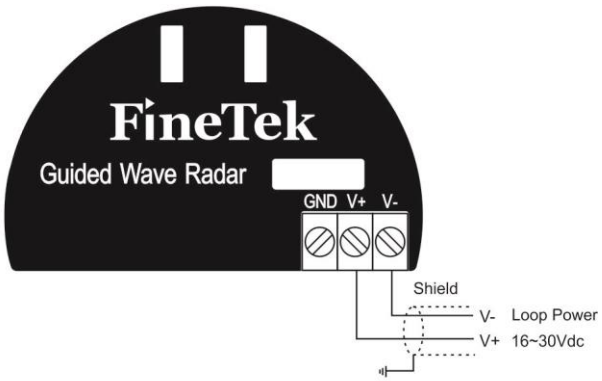
Wiring Diagram

2-wire type

JTR30XD series



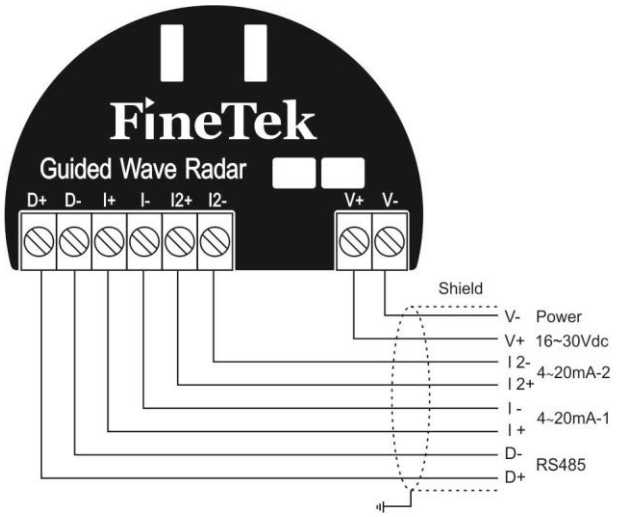
JTR30XB series



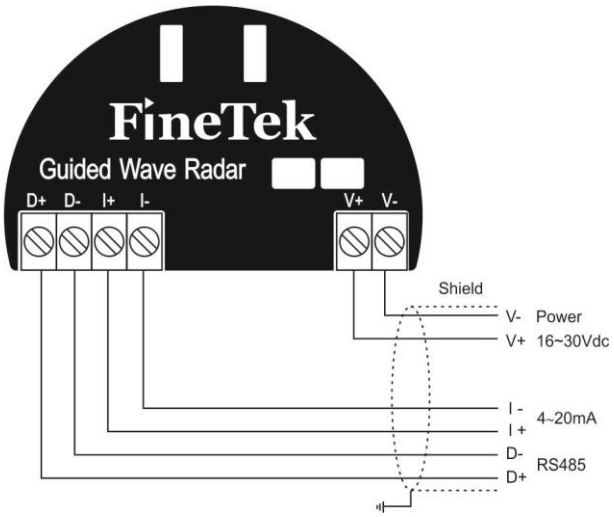
Note! For 2-wire loop power type: when equipped with two sets of analog outputs, each circuit should be operated independently. Parallel connection of the two circuits will cause abnormal current output.

4-wire type

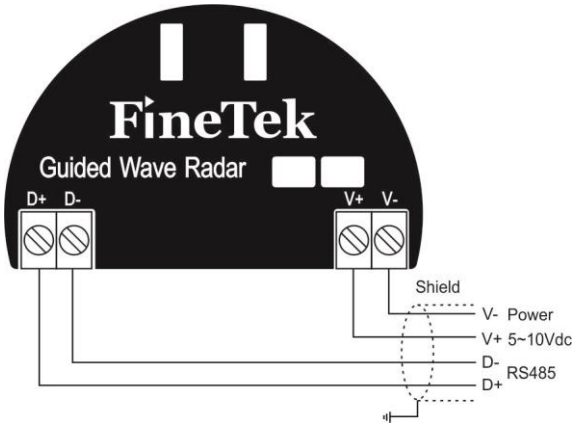
JTR30XH series



JTR30XE series



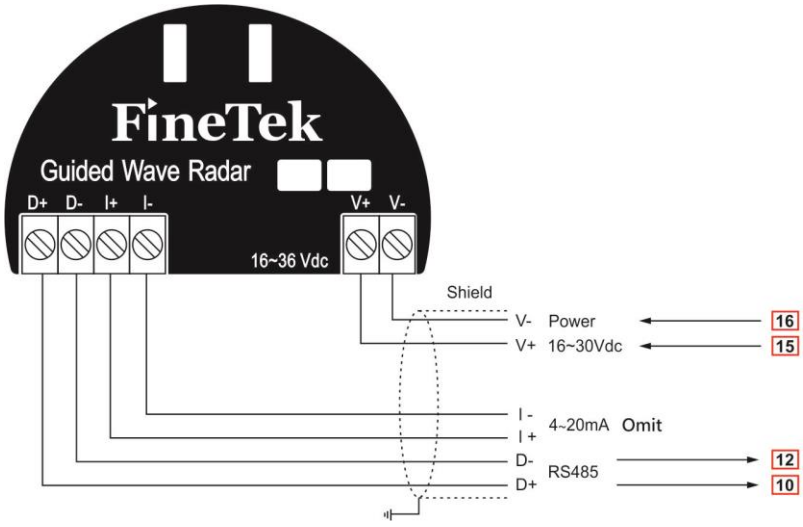
JTR30XF series



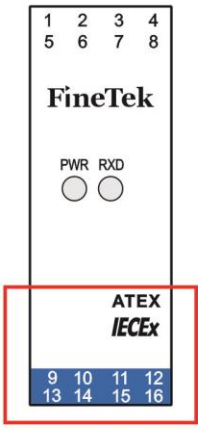
The example for working with safety barrier：

Digital Signal

JTR30XE

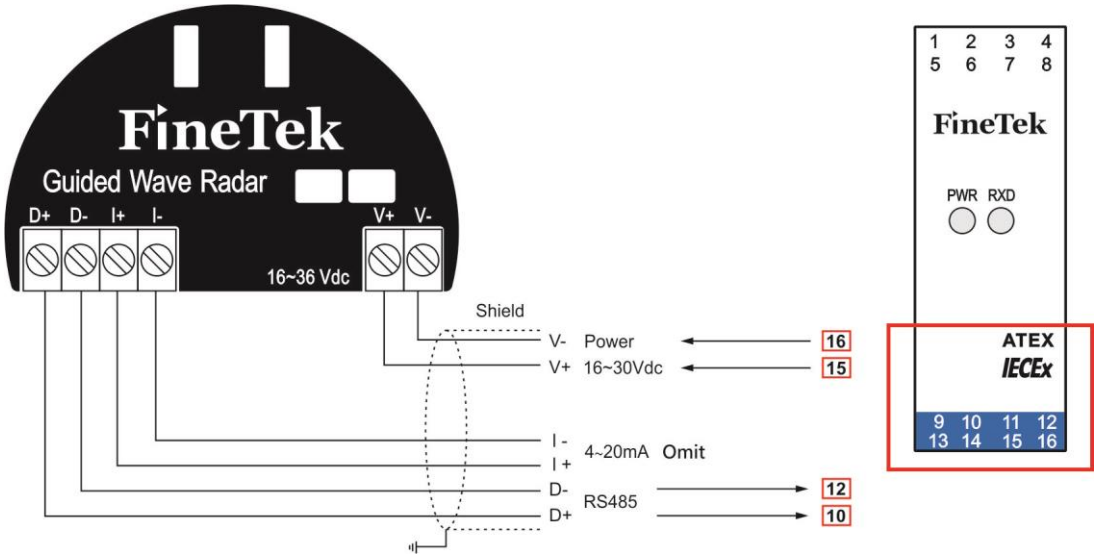


TXX200□□

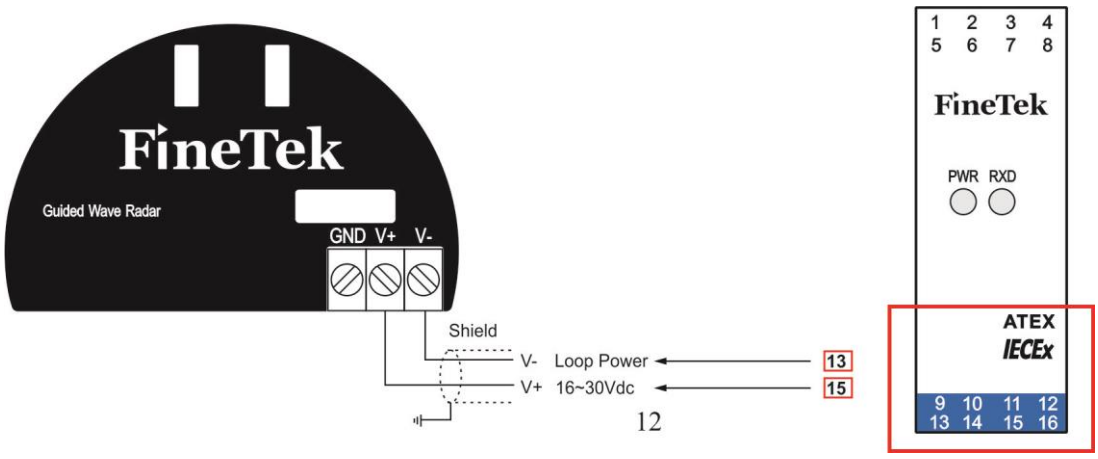


Analog Signal

JTR30XD (Loop power) TXX200□□



JTR30XB (Loop power) TXX200□□



12

8.3 Startup Instructions

After the instrument is connected with the power supply and powered ON again, it will start system initialization and self-diagnosis for about 30 seconds:

- Internal inspection of the electronic parts.
- It will show the model type, hardware and software version on the display module.

9. Display Module Adjustment and Setting

9.1 Operation Steps:

1. Rotate the housing cover counterclockwisely to remove it.
2. Adjust the display module on the electronic part at the required direction, rotate clockwisely to fix it.
3. Fasten the housing cover. The disassembly should follow the reverse direction.

[ENT] button： –Enter the menu–Confirm the selected content– Save the value

[>]button： –Select item in the menu – Select the edit field

[∧]button： –Add setting parameter value

[ESC]button： –Go back to the previous menu layer

9.1.1 Adjustment

The transmitter can be adjusted through the display module. LCM display can show the content of various menus.

The functions of the 4 buttons are as introduced above.

It will show the measurement value automatically if the buttons are not operated for 4 minutes.

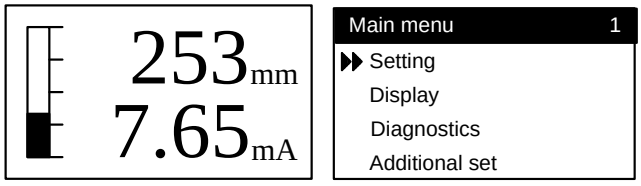
JTR3 series guided wave radar will perform a short self-diagnosis after it is powered ON. During the startup procedure, the current output is 4.0mA. Moreover, the display module will show the information as below:

- Model type
- Software version (SoftWare-Ver)
- Hardware version (HardWare-Ver)

9.2 Menus

The LCM display can show two data values and a percentage. The data values can be modified as distance or material height according to demands, which can be set to probe length/current/percent.

When a single media is measured, the two data values are corresponding to the same measurement value. When it is applied in the liquid interface, the upper part shows the first interface measurement value, while the lower part shows the second interface measurement value.



The main menu is divided into 5 parts, as introduced below:

Setting (1): It includes the parameter settings related to measurement, such as unit, probe length, and high/low level adjustment.

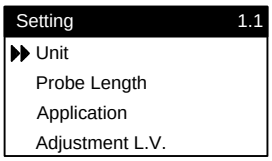
Display (2): It includes the language, display content of the measurement value, contrast.

Diagnostics (3): It includes information such as the measurement peak, echo curve, instrument status, etc.

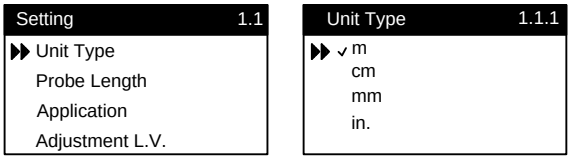
Additional Set (4): It includes the communication mode, reset, dielectric constant, etc.

Information (5): It includes the hardware and software version, the production date, etc.

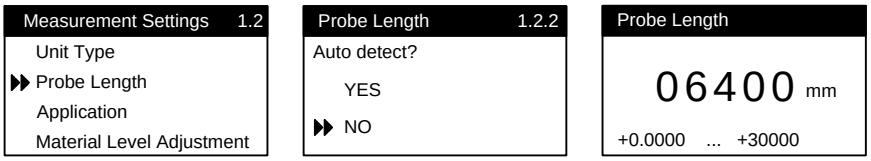
9.2.1 Measurement Settings Menu



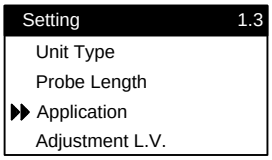
Measurement Settings (1) includes 6 parameters for setting, as introduced below:
Unit Type (1.1): It is to set the unit of measurement value shown on the LCM screen.
Probe Length (1.2): It is to set the length of sensing probe.
Application (1.3): It is to set the application model and dielectric constant of the media to be measured.
Adjustment L.V. (1.4): It is to set the upper/lower limit corresponding to 4-20mA and the percentage.
Filter Level (1.5): It is to set the output filter level.
Current Set (1.6): It is to set the current output direction (4~20mA/20~4mA).

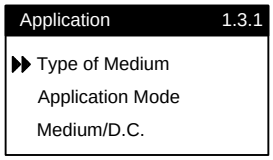


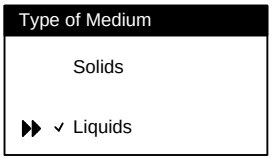
In the Unit (1.1) menu, user may adjust the unit of measurement value shown on the LCM display, with 5 available units, m/cm/mm/in/ft.

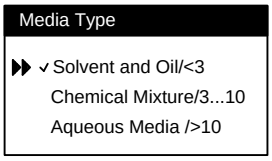


Probe Length (1.2) is applied in the bottom tracking probe mode, which can be filled after the probe is changed, or detected automatically by placing the instrument in an empty tank.
Note: The material height shown on the instrument is the probe length deducted with the distance from the material level to the flange reference plane.





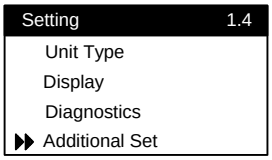


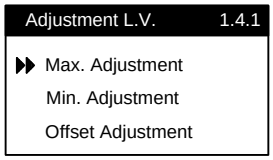


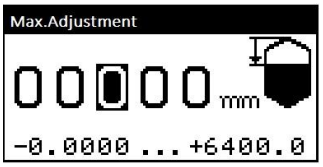
Application (1.3) menu provides settings based on application media and condition, including the following parameters:

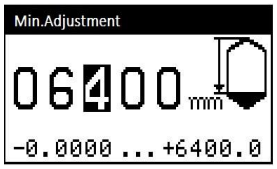
Media Type(1.3.1): It is to set solid or liquid media based on the measured media.

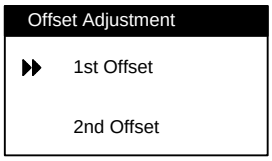
Media/ Dielectric Constant (1.3.2): For solid media, it is to set the media as [Dust, Wood Chips/<1.5, Particles, Cement /1.5…3, Object, Powder />3]；For liquid media, it is to set the media as [Solvent and Oil /<3, Chemical Mixture /3…10，Aqueous Media />10]。

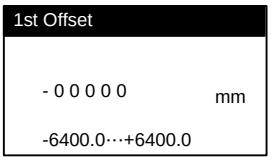


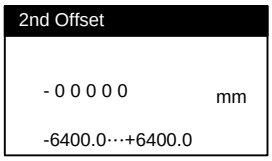










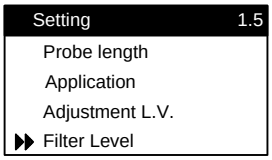


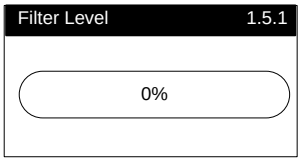
Material Level Adjustment (1.4) menu can be divided into High Level Adjustment (1.4.1) and Low Level Adjustment (1.4.2) used to set the upper/lower limit(0/100%) shown on the LCM display and upper/lower limit(4/20mA) of analog output.

Deviation Adjustment (1.4.3) refers to the difference between the measured signal and the actual material height. You may set this value to change the measured value.

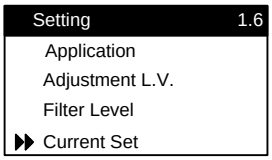
Note!

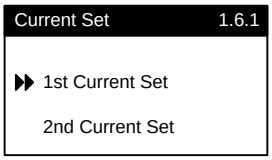
The parameter settings of High/Low Level Adjustment require inputting the distance from the bottom of flange.

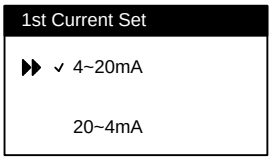




Filter Wave Setting (1.5) menu is used to adjust the filter wave degree of the output signal within 0%~100%, which is applied in fluctuating level. Note that the higher the percentage of the filter wave, the slower the output reaction time is.

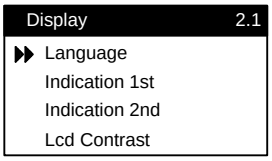




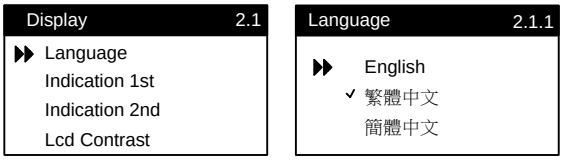


Current Settings (1.6) menu can be divided into 1st current set and 2nd current set. Wherein, the 2nd current set is only available for the models with dual-analog output. In this setting, the user may set the current output to correspond to the distance or the material height, with an output conversion of 4~20mA and 20~4mA.

9.2.2 Display settings Menu



Display Settings (2) menu provides 4 items for setting, with the functions as introduced below:
Language (2.1): It is to set the language shown on the LCM display.
Indication 1st (2.2): It is to set the display content shown on the upper part of the LCM display.
Indication 2nd (2.3):It is to set the display content shown on the lower part of the LCM display.
LCM Contrast (2.4): It is to set the display contrast shown on the LCM display.



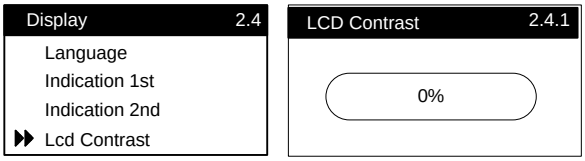
Language (2.1) menu is provided to set the language shown on the LCM display, English/Traditional Chinese/Simplified Chinese are available.

Display Content 1 (2.2) menu allows you to adjust the content shown on the upper part of the LCM display. The content shown on the upper part includes Distance (distance from the reflection plane and the flange reference plane) or Material Height (height between the reflection plane and the probe bottom). The content shown on the lower part includes Distance/Percentage/Current.

Display Content 2 (2.3) menu allows you to adjust the content shown on the upper part of the LCM display. The content shown on the upper part includes Distance (distance from the reflection plane and the flange reference plane) or Material Height (height between the reflection plane and the probe bottom). The content shown on the lower part includes Distance/Percentage/Current.

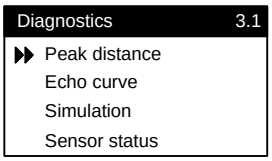
Note!

When it is applied in different interfaces, Display Content 2 shows the measured value of the second reflection interface.



Display Contrast (2.4) menu allows you to adjust the contrast of the LCM display.

9.2.3 Diagnostics



Diagnosis (3) menu provides 6 parameters for setting, with the function as introduced below:

Peak distance (3.1): It is to query and reset the measured peak value.◦

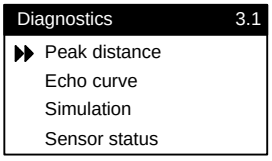
Echo curve (3.2): It is to view the echo curve of the measured signal.

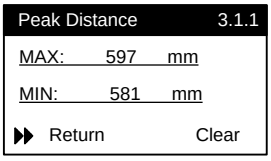
Simulation (3.3): It is to simulate the height of the measured media.

Sensor Status (3.4): It is to view the sensor status.

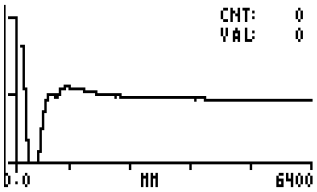
Trigger Default (3.5): It is the minimum level of echo signal.◦

Blind Distance (3.6): It is the distance from the bottom of flange that can't be measured.

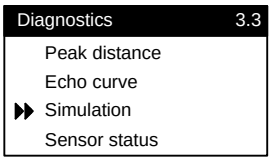


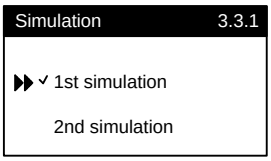


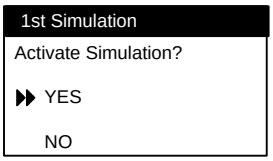
Peak distance (3.1) menu records the measured peak value after startup, which can be queried and reset in this menu.



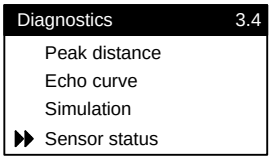
Echo Curve (3.2) menu shows the echo curve that is measured currently.

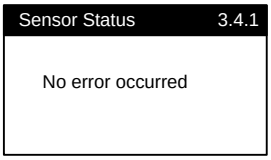




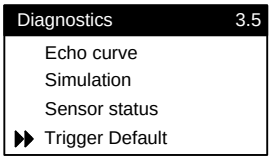


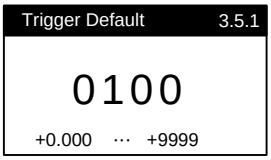
Simulation (3.3) menu provides settings in two phases. The first phase is to select whether to start the simulation function. The second phase is to input the target distance value to be simulated.



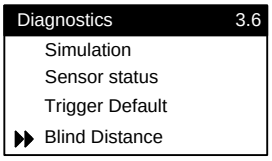


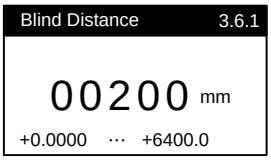
Sensor Status (3.4) menu allows you to query the current instrument status. Under normal status, it shows No Error. After self-diagnosis, it shows error code in case of error.





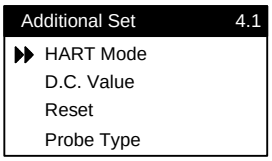
Trigger Default (3.5) menu is to set the minimum level for setting the echo signal.

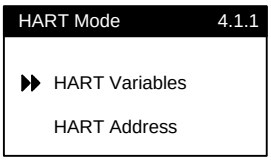


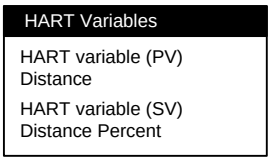


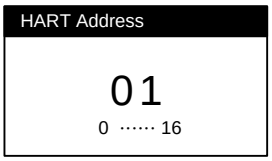
Blind distance(3.6) menu is to set the distance from the bottom of flange that can't be measured (200mm by default).

9.2.4 Additional Settings Menu

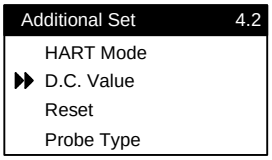


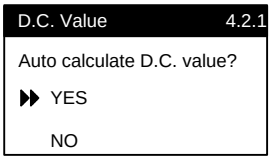


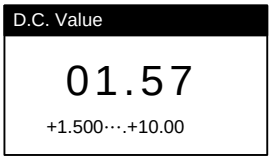




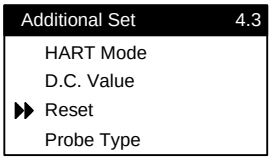
HART Mode(4.1.1) menu, the first layer is divided into HART Variable and HART Address. HART Variable submenu allows you to query the data of 4 HART variables, while HART Address submenu is to set the communication ID.

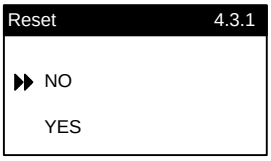




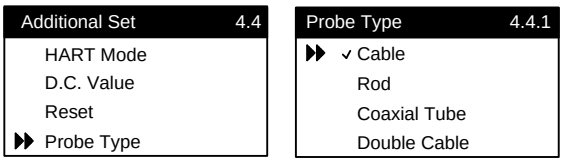


D.C. Value(4.2) menu is to set the dielectric constant of the media. It is used for the bottom tracking probe mode.





Reset (4.3) menu is to restore to the factory settings. After Yes is pressed, all parameters will be reset.

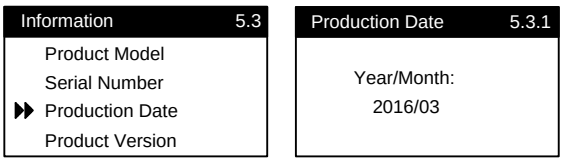


Probe Type (4.4) menu provides the available probe types, Cable, Rod, Coaxial Tube, Double cable and Double Rod.

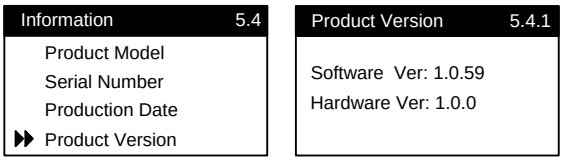
9.2.5 Product Information Menu

Product Model (5.1) menu allows you to view the product model of the instrument.

Serial No. (5.2) menu allows you to view the product serial number of the instrument.

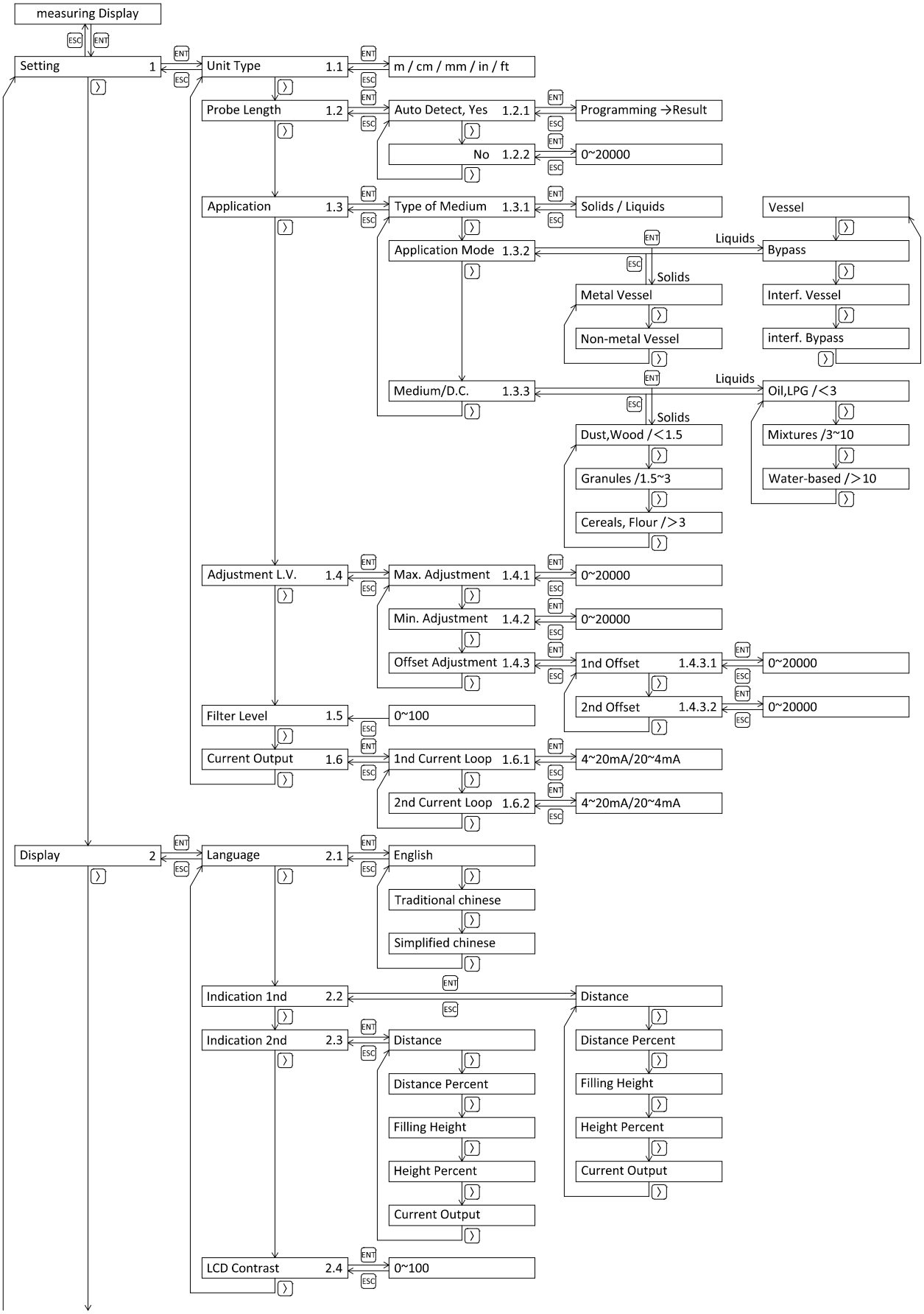


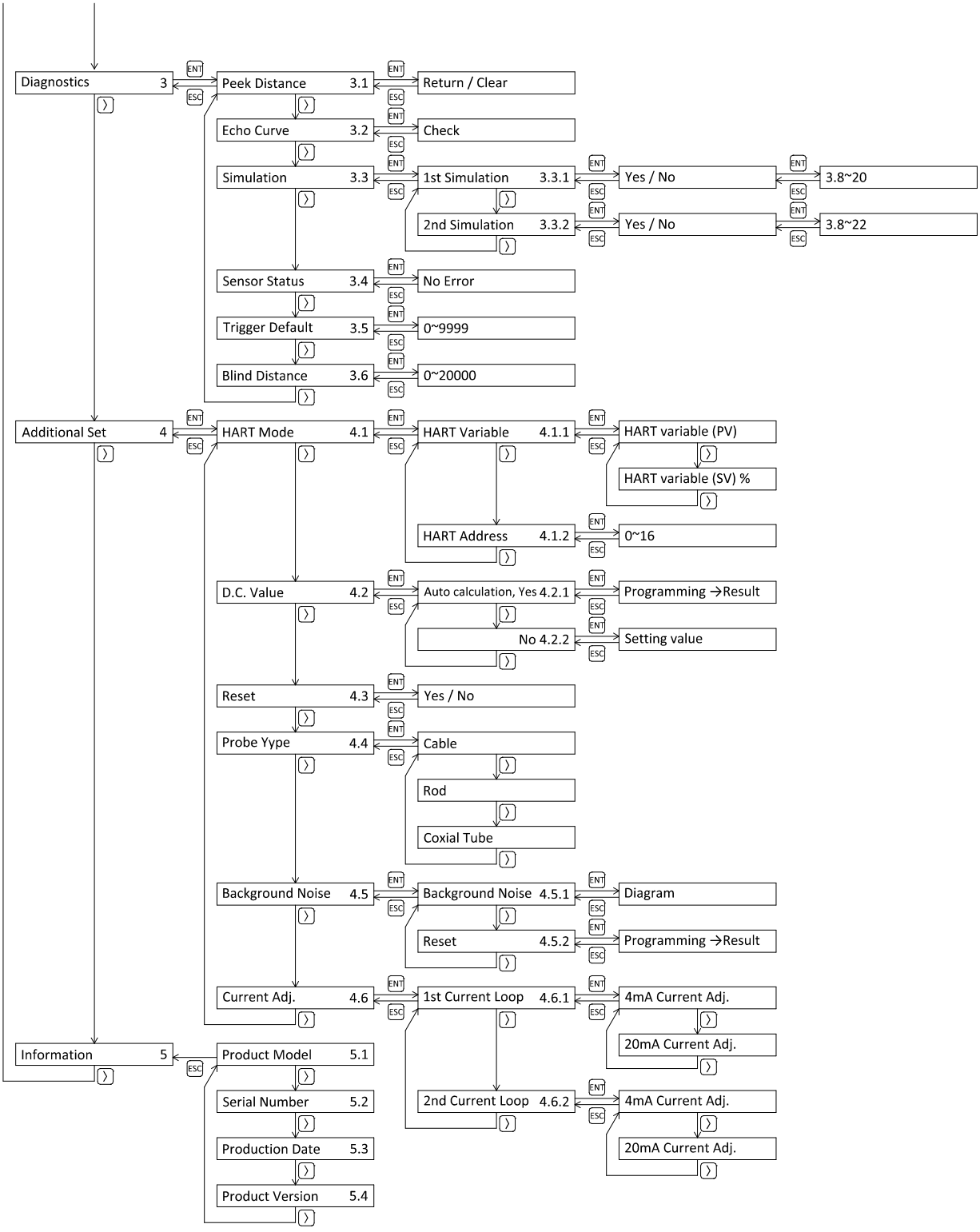
Production Date (5.3) allows you to view the production date of the instrument.



Production Version (5.4) allows you to view the product version of the instrument.

9.3 Parameter table list

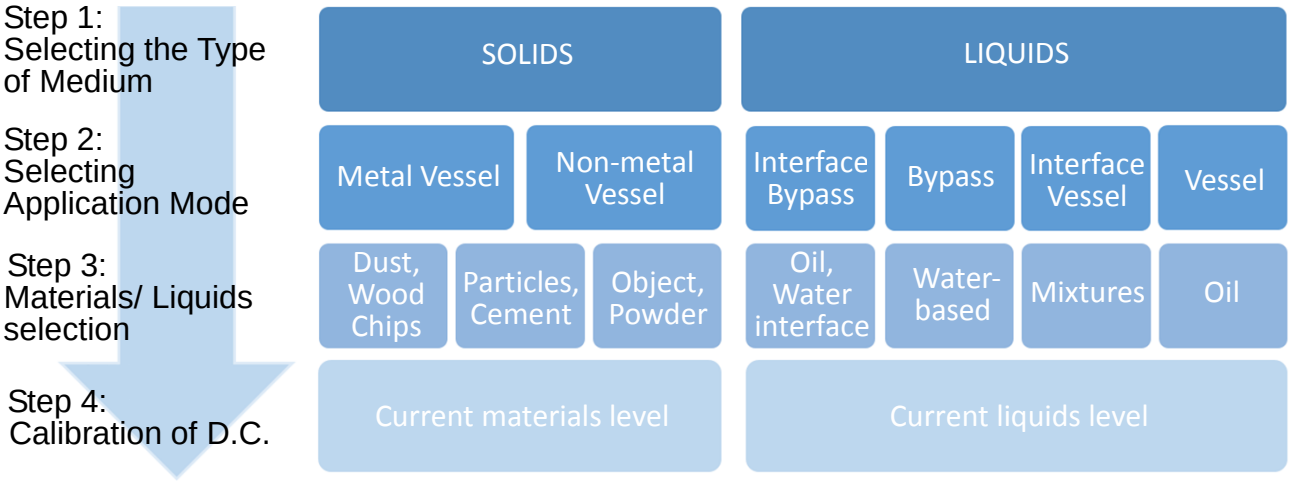



Diagnostics 3
Peek Distance 3.1
Return / Clear
Echo Curve 3.2
Check
Simulation 3.3
1st Simulation 3.3.1
Yes / No
3.8~20
2nd Simulation 3.3.2
Yes / No
3.8~22
Sensor Status 3.4
No Error
Trigger Default 3.5
0~9999
Blind Distance 3.6
0~20000
Additional Set 4
HART Mode 4.1
HART Variable 4.1.1
HART variable (PV)
HART variable (SV) %
HART Address 4.1.2
0~16
D.C. Value 4.2
Auto calculation, Yes 4.2.1
Programming →Result
No 4.2.2
Setting value
Reset 4.3
Yes / No
Probe Yype 4.4
Cable
Rod
Coxial Tube
Background Noise 4.5
Background Noise 4.5.1
Diagram
Reset 4.5.2
Programming →Result
Current Adj. 4.6
1st Current Loop 4.6.1
4mA Current Adj.
20mA Current Adj.
2nd Current Loop 4.6.2
4mA Current Adj.
20mA Current Adj.
Information 5
Product Model 5.1
Serial Number 5.2
Production Date 5.3
Product Version 5.4

9.4 Bottom Tracking Probe Set up

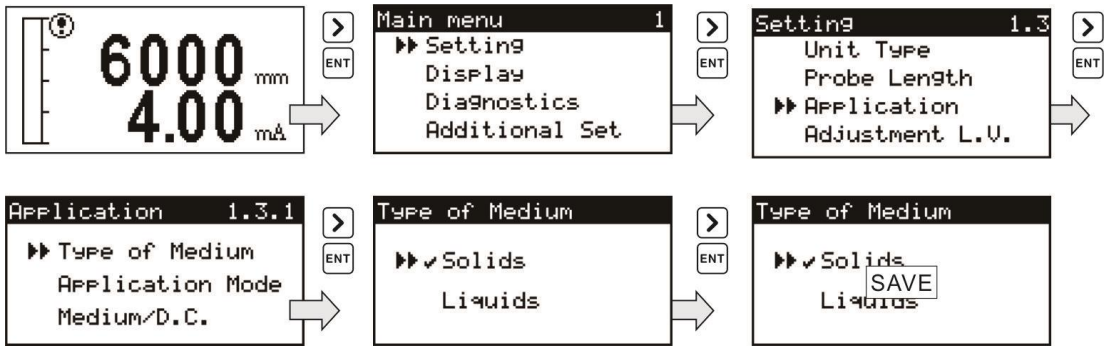
Please operate each setting in sequence as below.

Notice! Don't operate this mode when no materials contacted with probe (empty tank).



Step1：Selecting the Type of Medium

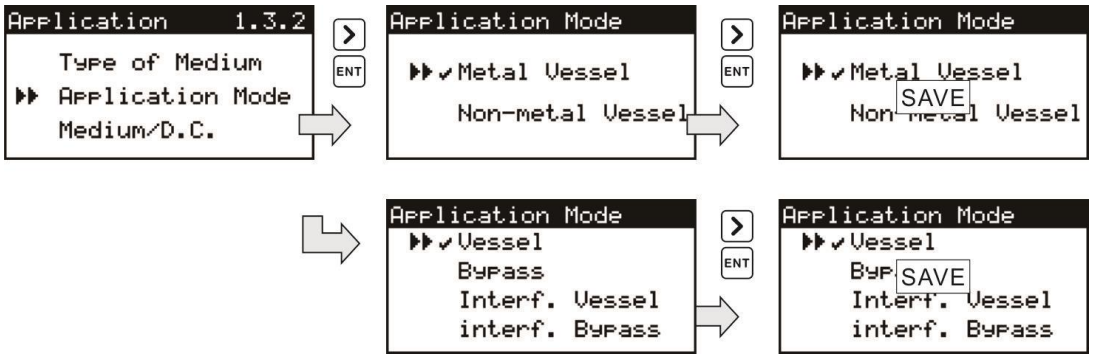
Menu 1.3.1 push [〉] to select, for example like: Solids and push [ENT] to save.



Step2: Selecting Application Mode

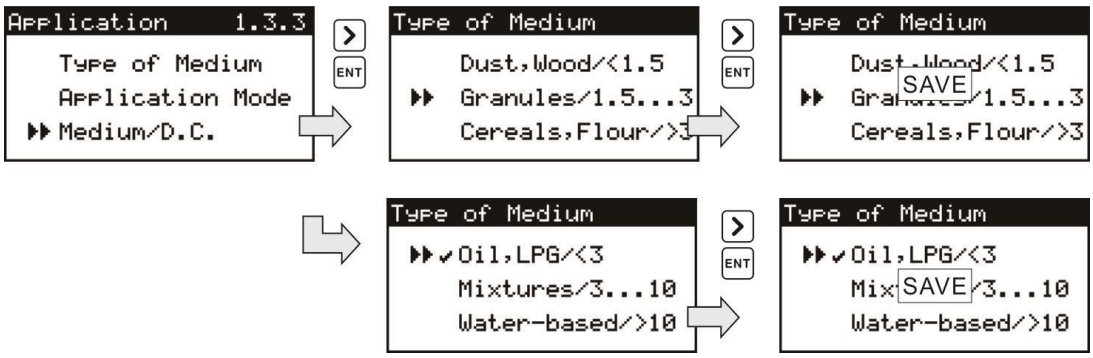
Menu 1.3.2 push [〉] to select, for example like: Metal Vessel and push [ENT] to save

When selecting "Liquids" in Menu 1.3.1, following to push [〉] for related options, like: Vessel and push [ENT] to save.



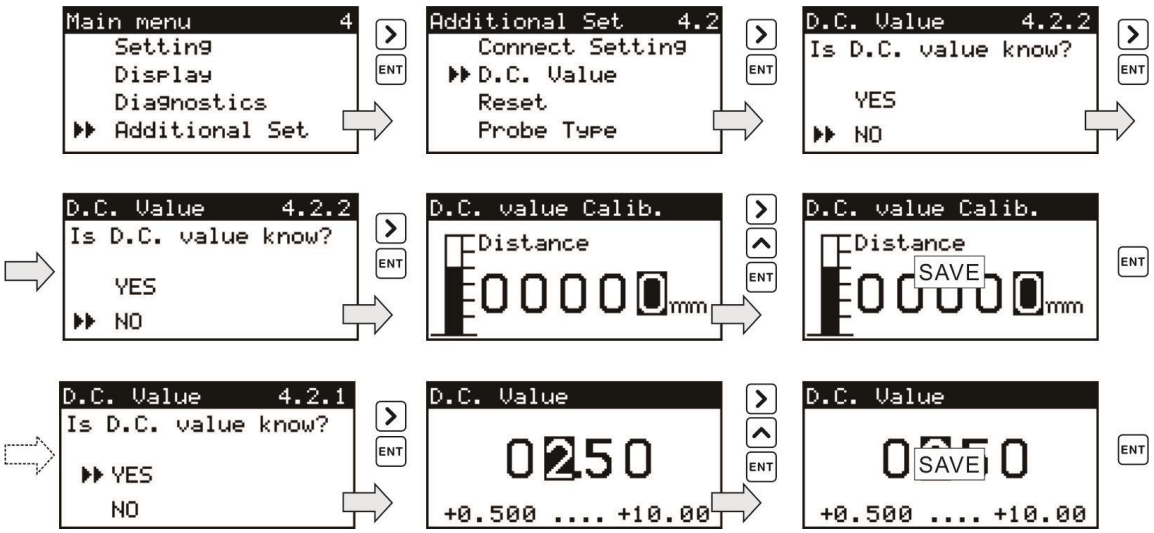
Step3: Selecting Medium or Dielectric Constant

Menu 1.3.3 push [〉] to select, for example like: Particles, Cement/1.5~3 and push [ENT] to saveWhen selecting “Liquids” in Menu 1.3.1, following to push [〉] for related options, like: Oil <3 and push [ENT] to save.



Step4: Calibration of D.C. (dielectric constant)

Menu 4.2.2 use [〉] and [へ] to key in information for current materials/ liquids level and push [ENT] to save. Can also select “YES” for known D.C. value, use [〉]、[へ] to key in and push [ENT] to save.



10. Warnings and Cautions

1. Intrinsic safe explosion system must request to use explosion proof model together with safety barriers that complied with Ex ia. So that it can be used in hazardous area.
2. Casing material is Aluminum. Installation should make precaution to prevent burn by shock or rub.
3. Please make precaution to avoid static and burn caused by non-metal material.
4. JTR connect with equipment in non-hazardous area, should follow the user's manual and wire correctly.
5. Shielded cable should be used when connect with external equipment. Shields should be well grounded.
6. Related components in the wiring circuit must reach requirements of "Intrinsically safe parameters".
7. Customer is not allowed to replace components by themselves. It's requested to contact manufacturer and solve problem together to avoid damage happened.
8. The relationship between ambient temperature and process temperature is as below：

NEPSI：

Temperature catagories	Ambient temperature (°C)	Medium(Process) temperature (°C)
T4	-40~60	-40~130
T3	-40~60	-40~190
T2	-40~60	-40~230

ATEX / CSA / IECEx / TS：

Temperature catagories	Ambient temperature (°C)	Medium(Process) temperature (°C)
T6	-40~55	-40~85
T5	-40~70	-40~100
T4	-40~70	-40~135
T3	-40~70	-40~150
T2	-40~70	-40~230

※Actual temperature resistance refers to the latest catalogue and comply with the explosive proof certificate and standards.

9. The product installation, use and maintenance shall follow the user's manual and the following standards：
   GB3836.13 (IEC 60079-19) "Electric Apparatus for Explosive Gas Atmospheres Part 13：Equipment repair, overhaul and reclamation".
   GB3836.15 (IEC 60079-14) "Electric Apparatus for Explosive Gas Atmospheres Part 15：Electrical installations design, selection and erection (Except for Coal Mine)".
   GB3836.16 (IEC 60079-17) "Electric Apparatus for Explosive Gas Atmospheres Part 16：Electrical installations inspection and maintenance (Except for Coal Mine)".
   GB3836.18 (IEC 60079-25) "Electric Apparatus for Explosive Gas Atmospheres Part 18：Intrinsically safe electrical systems".
   GB50257 "Electric Equipment Installation Engineering Code for Construction and Acceptance of Electric Device within Explosion and Fire Hazard Environments"

11.Troubleshooting

Abnormal	Cause	Solution
No LCM display No current output.	No power supply.	Check wiring and pin, and repair.
		Check power supply and open again.
	Power supply spec. is not complied.	Check product spec. and correct.
No LCM display Have current output.	LCM module in bad connection.	Remove LCM first Disconnect the power in 3 seconds and reconnect it again Then install LCM immediately. Contact sales if it's still not solved.
	LCM is not installed for a long time, Instrument not update LCM status.	
Not able to show the correct distance.	Signal is too low.	Press "ESC" to enter reflection page and check "L.V.", Reduce the trigger level under "L.V."
Measure the incorrect position.	Background noise is too big.	Operate and save the background noise under empty tank condition. Contact sales if it's still not solved.

12. Communication Protocol Table

Address	NUM	Format	Parameter	Value range
4128	4	FLOAT32	PFC_SOFTWARE_VERSION	0～99999
4132	2	FLOAT32	PFC_DISPLAY_VALUE	0～99999
4134	2	FLOAT32	PFC_2ND_DISPLAY_VALUE	0～99999
4136	2	FLOAT32	PFC_DISTANCE	0~35000
4138	2	FLOAT32	PFC_2ND_DISTANCE	0~35000
4140	2	FLOAT32	PFC_DISTANCE_PERCENTAGE	0~100
4142	2	FLOAT32	PFC_2ND_DISTANCE_PERCENTAGE	0~100
4144	2	FLOAT32	PFC_DISTANCE_CURRENT_MA	4~20
4146	2	FLOAT32	PFC_SET2_DISTANCE_CURRENT_MA	4~20
4148	2	FLOAT32	PFC_PEAK_DISTANCE_MAX_VALUE	0~35000
4150	2	FLOAT32	PFC_PEAK_DISTANCE_MIN_VALUE	0~35000
4152	2	FLOAT32	PFC_2ND_PEAK_DISTANCE_MAX_VALUE	0~35000
4154	2	FLOAT32	PFC_2ND_PEAK_DISTANCE_MIN_VALUE	0~35000
4206	12	UINT8	PFC_PRODUCT_MODEL[24]	----
4218	7	UINT8	PFC_PRODUCT_SERIAL[14]	----
4225	4	UINT8	PFC_PRODUCT_DATE[8]	----
4229	4	UINT8	PFC_HARDWARE_VERSION[8]	----
4233	2	FLOAT32	PFC_MIN_LEVEL	0～35000
4235	2	FLOAT32	PFC_MAX_LEVEL	0～35000
4237	2	FLOAT32	PFC_BLIND_DISTANCE	0～35000
4239	2	FLOAT32	PFC_DISTANCE_OFFSET1	-99999～+99999
4241	2	FLOAT32	PFC_DISTANCE_OFFSET2	-99999～+99999
4243	2	FLOAT32	PFC_PROBE_LENGTH	0～35000
4245	1	UINT16	PFC_LANGUAGE	0,1,2
4246	1	UINT16	PFC_FILTER_LEVEL	0~100
4247	1	UINT16	PFC_UNIT_TYPE	0,1,2,3,4
4248	1	UINT16	PFC_MATERIAL	0,1
4254	1	UINT16	PFC_DISPLAY_1_CONTEXT	0,1,2,3,4
4255	1	UINT16	PFC_DISPLAY_2_CONTEXT	0,1,2,3,4
4256	1	UINT16	PFC_CURRENT_OUTPUT_MODE_1ST	0~1.0
4257	1	UINT16	PFC_CURRENT_OUTPUT_MODE_2ND	0~1.0
4259	2	FLOAT32	PFC_CAL_MEDIUM_CONST	>1.5

4261	2	FLOAT32	PFC_CAL_LOW_COUNT	0~4096
4263	1	UINT16	PFC_CAL_LOW_POSITION	0~35000
4264	1	UINT16	PFC_CAL_PROBE_END_CNT	0~4096
4265	1	UINT16	PFC_CAL_PROBE_END_VALUE	0~4096
4268	1	UINT16	PFC_4_MA	0~65535
4269	1	UINT16	PFC_20_MA	0~65535
4270	1	UINT16	PFC_SET2_4_MA	0~65535
4271	1	UINT16	PFC_SET2_20_MA	0~65535
4273	1	UINT16	PFC_LOCK_CURRENT_FLAG	0,1
4274	1	UINT16	PFC_SET2_LOCK_CURRENT_FLAG	0,1
4275	2	FLOAT32	PFC_SIMULATED_CURRENT_MA	4~20
4277	2	FLOAT32	PFC_SET2_SIMULATED_CURRENT_MA	4~20
4285	1	UINT16	PFC_MODBUS_ID	1~255
4286	1	UINT16	PFC_MODBUS_BAUDRATE	1200~57600