FERTRON

USER MANUAL

ECM0033 - Conductivity Meter

Contents

● Overview

ECM-0033 series conductivity transmitter can be used with different constant conductivity electrodes, with measurement, display, transmission, alarm, automatic cleaning and other functions, can meet all kinds of online conductivity monitoring needs.

◎ 1 probe input channel for 2-cell analog conductivity probe.

◎ 1 thermistor input channel f or Pt100, Pt1000, NTC2.2k, NTC10k or NTC22k.

◎ Provide professional parameter setting function, convenient for professional users to use according to specific needs

◎ Temperature correction available.

◎ Tag setting available

◎ Two 4-20mA outputs are available to transmit the main measurement parameters and temperature measurements

◎ Provides 3 relay outputs (upper/lower alarm and automatic cleaning), support normal open and normal closed connection

◎ Provides operation password management permission to prevent parameter Settings from being easily tampered

◎ Modbus RS485 communication provided

◎ Support Chinese/English menu display (factory default is Chinese)

◎ IP67 protection grade of the whole machine, which can be installed and used in outdoor environment.

---------------------------------- **Main specification** ----------------------------------

Function	Display/Transmission/Alarm/self-clean	Com. Port	RS-485
Screen	3.5' monochrome (320*240)	IP Level	IP67
Input	1 analog conductivity probe	Dimension	113.5*118*140.5mm
Thermis tor	NTC10k/NTC2.25k[*1]/Pt100/Pt1000	Alarm	Hi/Lo alarm (hysteresis

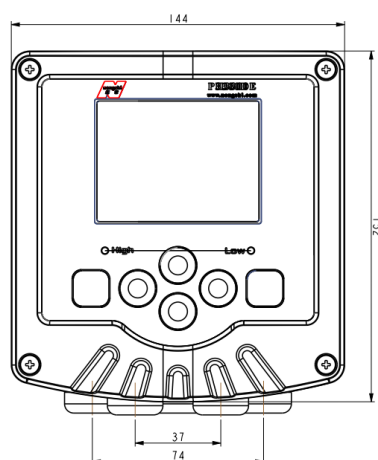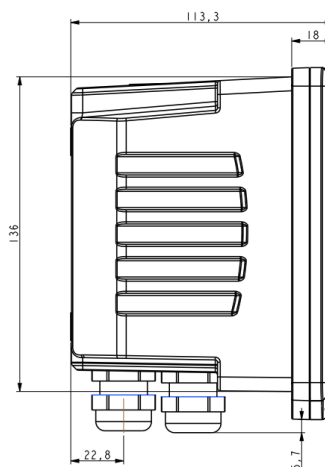| Inpu t	Accuracy ：±0.3℃（-10~120℃）	& delay configurable)	
Analog Output	2channel（4-20)mA Output Accuracy ：±0.2% (max load 500Ω)	Power Supply	220Vac±10 %（Default） (24VDC Optional)
Relay Output	3-way normally ope n/normally closed contact output 250Vac/30Vdc/3A(Max)	Mounting	Panel/Pipe/Wall mounting (cutout: 136*136mm)

● **Assembly**

①

②
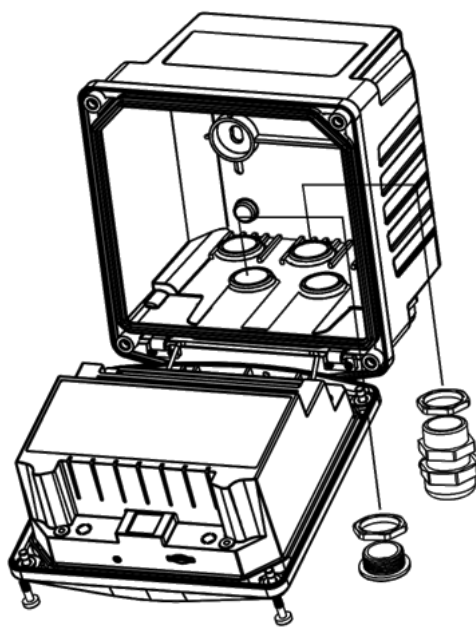
Part① ：M20 cable gland*5

（with locknut）

Part② ：M20screw plug*3

（with locknut）

● **Dimension Drawings**

144

152

37

74

113,3

18

136

22,8

5,7

4

32 mm/ 1.26"

80 mm/3.15"

72 mm/2.83"

6 mm/ 0.236"

80 mm/ 3.15"

136 mm $^{+0.5\ mm}$
5.35" $^{+0.02"}$

136 mm $^{+0.5\ mm}$
5.35" $^{+0.02"}$
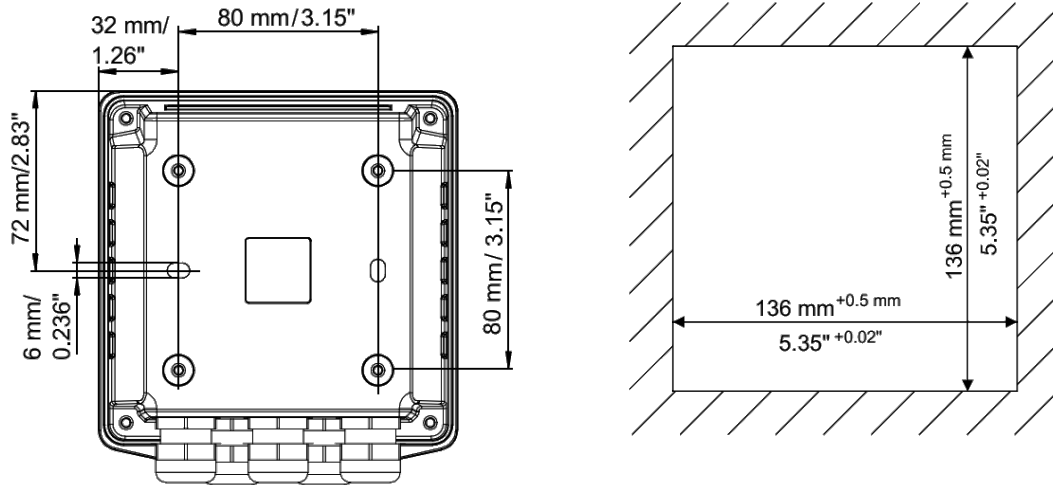
● Pipe Mounting

Step 1 : Fix the mounting bracket (optional) to the back cover with 4 M4*8 screws (with spring washer).

Step 2 : Lock the bracket to the pipe (Ø40~60mm) with 2 metal clamps.
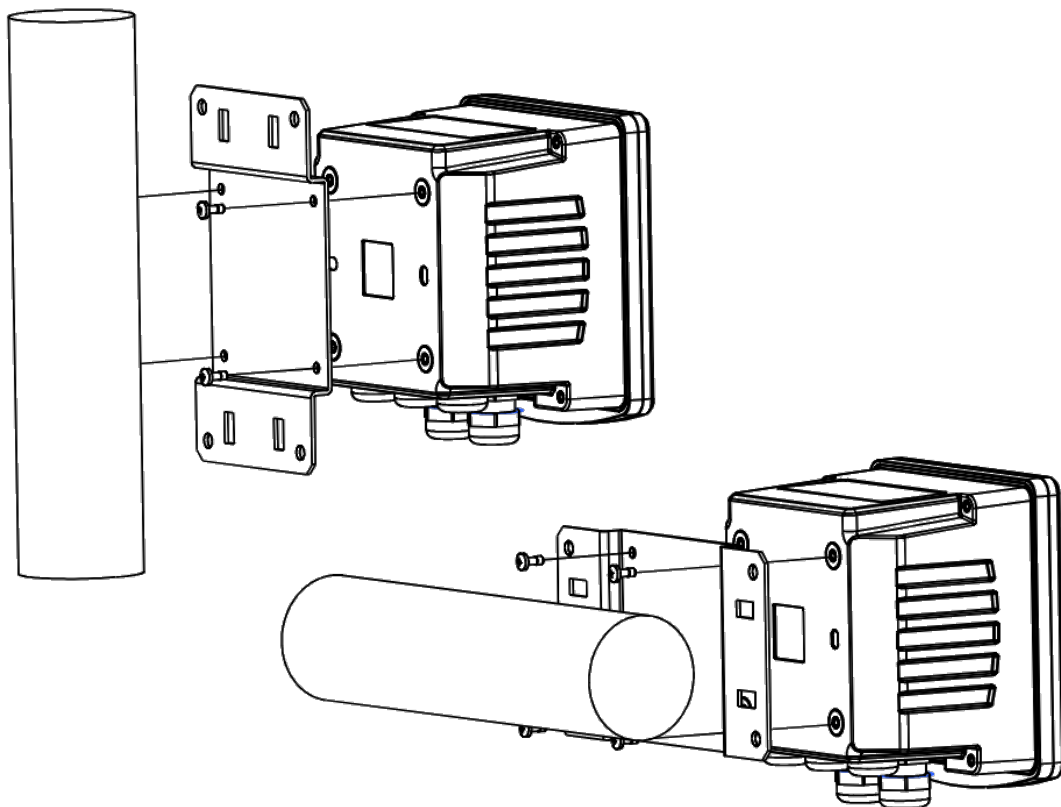
● Wall Mounting

Step 1：Fix the mounting bracket (optional) to the back cover with 4 M4*8 screws (with spring washer).

Step 2：Fix the bracket to the drilled wall by 4 expansion bolts.

● Panel Mounting

Step 1：Insert the meter tail in to the opening through the front of the panel cabinet （136*136mm ，Positive bias 0.5mm）；

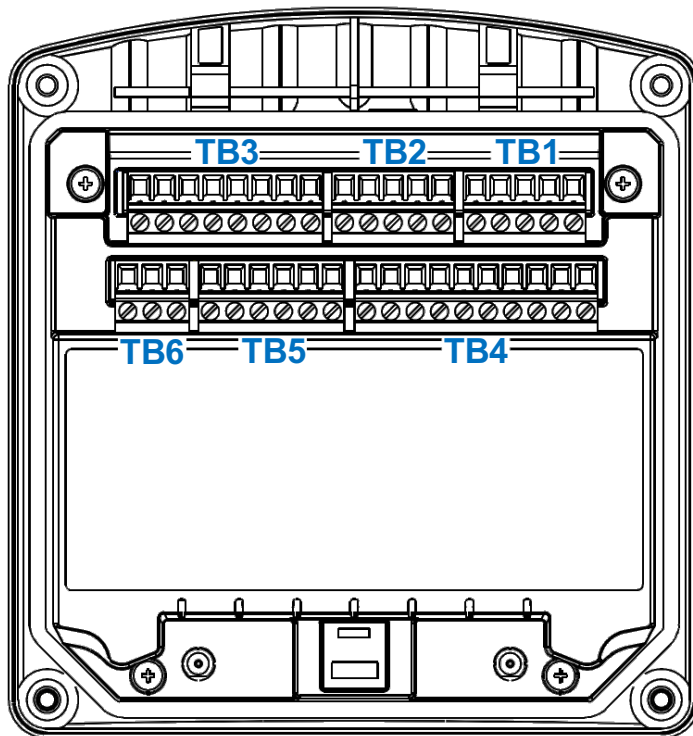Step 2：Secure the four compression locks to the meter using four M4*10 screws (with spring pads) ；

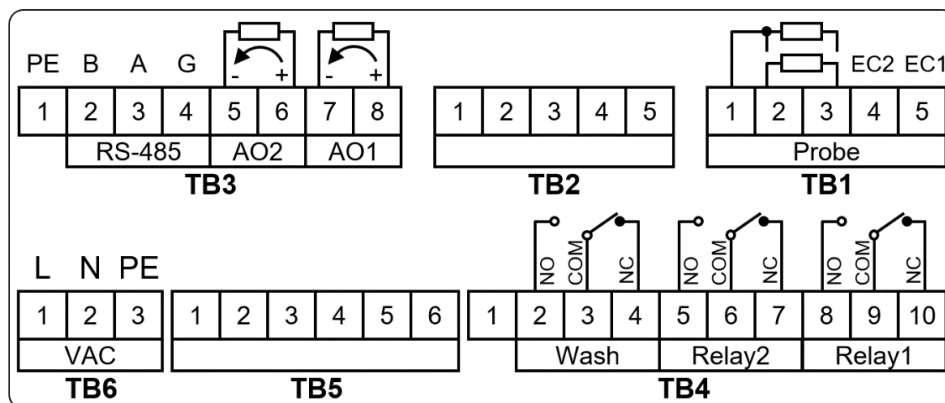Step 3：Screw the M4*16 screws on the four compression locks until they touch the cabinet panel .

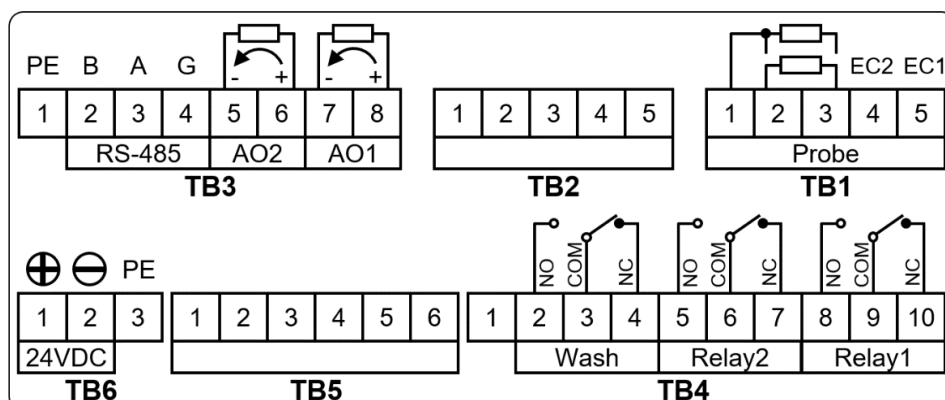（Note: Screw M4*16 screws to contact the panel, excessive locking may cause abnormal deformation of the lock ）
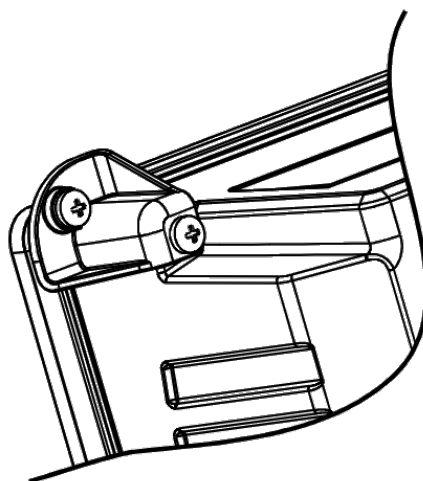
● Terminal Block Definitions

The terminal inside

the instrument

	PE	B	A	G	-	+	-	+								EC2	EC1
	1	2	3	4	5	6	7	8		1	2	3	4	5	1	2	3	4	5

RS-485 | AO2 | AO1 — **TB3**   **TB2**   Probe — **TB1**

L	N	PE							NO	COM	NC	NO	COM	NC	NO	COM	NC
1	2	3	1	2	3	4	5	6	1	2	3	4	5	6	7	8	9	10

VAC — **TB6**   **TB5**   Wash | Relay2 | Relay1 — **TB4**

AC powered version

	PE	B	A	G	-	+	-	+								EC2	EC1
	1	2	3	4	5	6	7	8		1	2	3	4	5	1	2	3	4	5

RS-485 | AO2 | AO1 — **TB3**   **TB2**   Probe — **TB1**

⊕	⊖	PE							NO	COM	NC	NO	COM	NC	NO	COM	NC
1	2	3	1	2	3	4	5	6	1	2	3	4	5	6	7	8	9	10

24VDC — **TB6**   **TB5**   Wash | Relay2 | Relay1 — **TB4**

DC powered version

TB1	
Terminal block	
1	Thermistor 3（Third wire）
2	Thermistor 2
3	Thermistor 1
4	EC probe input 2
5	EC probe input 1

TB2	
Terminal block	
1	/
2	/
3	/
4	/
5	/

（ TB2: Not used)

TB3	
Terminal block	
1	Ground
2	RS485A / -
3	RS485B / +
4	Communication GND
5	AO2-
6	AO2+
7	AO1-
8	AO1+

TB4	
Terminal block	
1	/
2	（Cleaning） Normally-open contact 3
3	（Cleaning） Common terminal 3
4	（Cleaning） Normally-closed contact 3
5	（Low alarm） Normally-open contact 2
6	（Low alarm） Common terminal 2
7	（Low alarm） Normally-closed contact 2
8	（High alarm）Normally-open contact 1
9	（High alarm） Common terminal 1
10	（ High alarm ） Normally-closed contact 1

TB5	
Terminal block	
1	/
2	/
3	/
4	/
5	/
6	/

TB6		
Terminal block		
1	220VAC-L	Ac power supply
2	220VAC-N	model
3	Ground	220Vac±10%
1	24V+	Dc power supply
2	24V-	model
3	Protective earth	24Vdc±10%

When use NTC2.2k/10k/22k, please connect the two temperature signal cables to the TB1-3 and TB1-2 terminals.

When using 2 -wire Pt100 or Pt1000 thermistor, if there are two temperature lines,

please connect the 2 signal wires to the TB1-3 and TB1-2 terminals, and be sure to short the TB1-2 and TB1-1terminals to ensure that the meter can work correctly. （A piece of metal bridge is already included in the accessories of the meter ）.

● Keypad
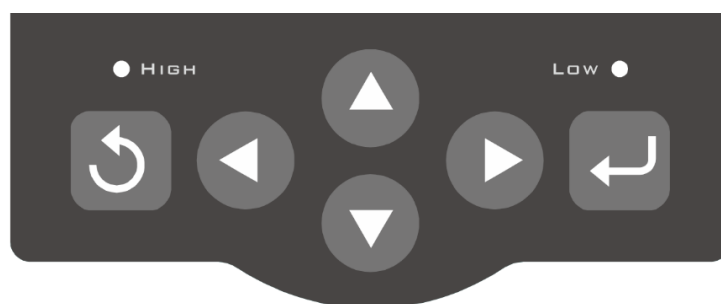
	Back		Up
	Confirm		Down
	Left		Right

● Main Interface

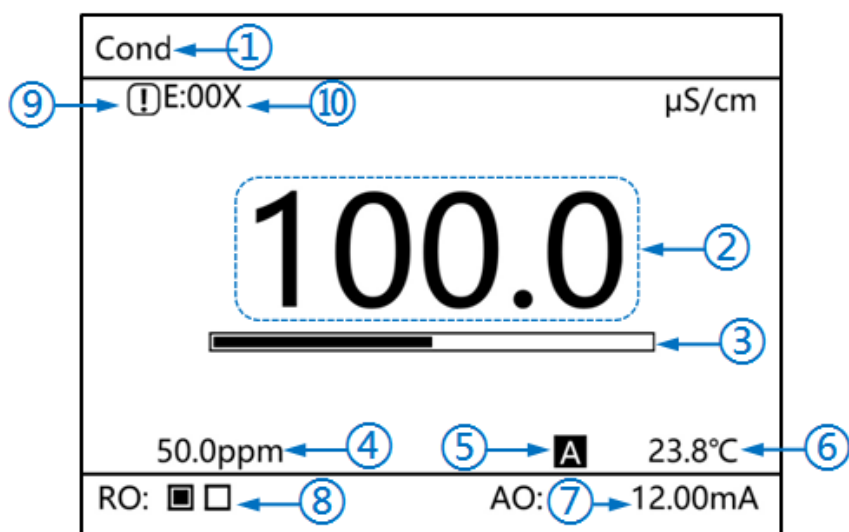① "Cond" default, can also be tag for the current measuring point.

② Normally the real -time measurement value of the conductivity is displayed. When the new configuration setting is enabled or the configuration setting is incorrect, or the data is invalid due to temperature measurement faults, the meaning of the prompt message displayed in this area is as follows:

Display	Indication
* ** ﹒	Transition state after enabling new configuration settings. Continuous display indicates the configuration is incorrectly set. (Display according to the decimals in the range limit setting)
﹒﹒﹒﹒﹒﹒	Invalid measured value caused by temperature measurement failure.

③ Bar graph for measured value compared to range limit setting.

④ TDS value .

⑤ Source of temperature value :

Display	Source of temperature value
A	Real-time measured by thermistor.
M	Manually set.

⑥ Temperature value (unit: ℃ default, ℉ optional).

⑦ The ou tput values of the 1st and 2nd current converter are displayed alternately (unit mA). When the current output is enabled, if there is a current circuit disconnection fault, the warning sign will appear on the left side of the current value in the main inte rface, as follows :

Dispaly	Indication
◄	(Open -circuit failure of the current loop detected.

⑦ Left/center/right indicates the status of relay 1 (upper limit alarm), relay 2 (lower limit alarm) and relay 3 (electrode cleaning), respectively

Display	Indication
■	The relay is activated. (Alarm on)
□	The relay is deactivated. (Alarm off)
⬛	The relay output is not enabled.

⑨：An exclamation mark ("!") will indicate the thermistor failure.

⑩：Following the above-mentioned "!", the error code will be displayed:

Error code	Indication
E:001	Open-circuit in Pt100 or Pt1000 loop detected.
E:002	Open-circuit in NTC10k loop detected.
E:004	Too large lead resistance of Pt100 or Pt1000 detected.
E:008	Short-circuit in NTC10k loop detected.
E:010	Too small resistance of thermis tor detected.

● System Information Setting

Press "Back" and "Confirm" simultaneously at the main interface to enter the setting menu of the meter (the password verification interface will appear first, press "Confirm" directly if the password is not set):
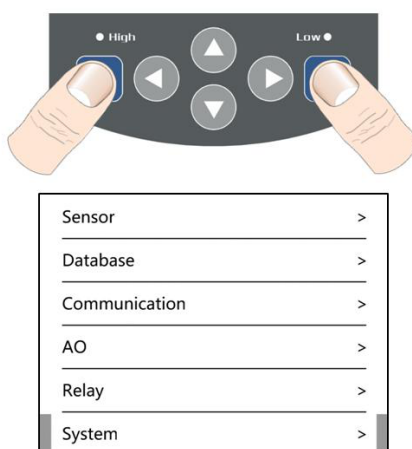
Select " System" option in the setting menu by "Up/Down" key, and press "Confirm" or "Right" to enter the system information setting sub -menu . All options are introduced as follow:

Language	English >
Password	****** >
Auto Unit	On >
Prime PARM.	Cond.Conductivity >

1、**"Language":** Available in "English" or " 简体中文 (Chinese simplified)" by the "Lef t/Right" or "Confirm" key, taking effect immediately.

2、**"Password":** Select it and press "Confirm", you can enter the password setting interface to set the operation password of the meter (position the data input cursor by "Left/Right" key, then use "Up/Down" key to select between number "0" to "9" in turn). When done, press "Confirm" to save. When pressing "Confirm" on the password setting or verification interface, the system will uniformly identify the unset parts as "0", e.g., if you press "Confirm" w hen displaying "**27**", then "002700" will be recognized as the actual input.

3、 Date： Select and confirm to set the system date. The default format is year-month -day.

4、 Time： Select this item and confirm to set the system time. The default format is time   -minute -second (24 -hour system). After setting the system time, press the Confirm key to take effect.

5、Enable (Date and time) : Select and confirm this item to enable the

new date and time.

● Conductivity Setting

After connecting the signal wire of the probe to meter, the essential settings should be done. Press "Back" and "Confirm" simultaneously at the main interface to enter the setting menu of the meter (the password verification interface will appear first, press "Confirm" directly if the password is not set):

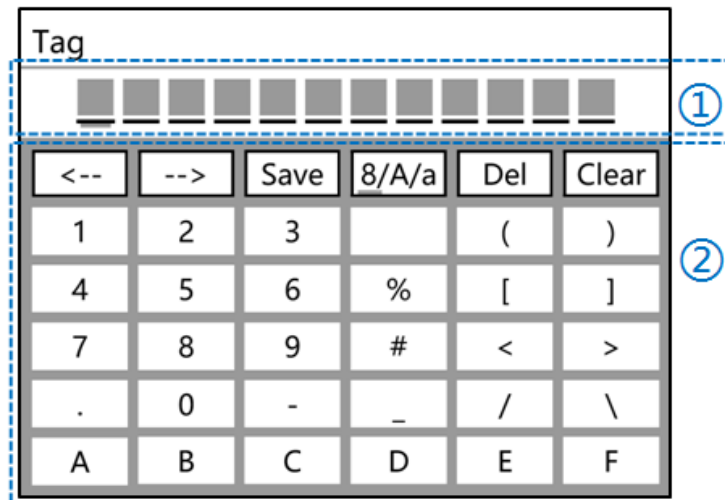| Sensor	>
Database	>
Communication	>
AO	>
Relay	>
System	>

Sensor Channel Setting

In the setting menu, select "S ensor" option and press "Confirm" or "Right" to enter the sensor channel setting sub-menu .

All available options are introduced as follow:

Type	Cond >
Tag	>
Parameters	>
Temperature Source	NTC10k >
Manual Input	25.00℃ >

1 "Type": Probe type.

2 "Tag": Tag of measuring point. Select it and press "Confirm" to enter the tag input interface as below (the tag supports up to 12 characters):
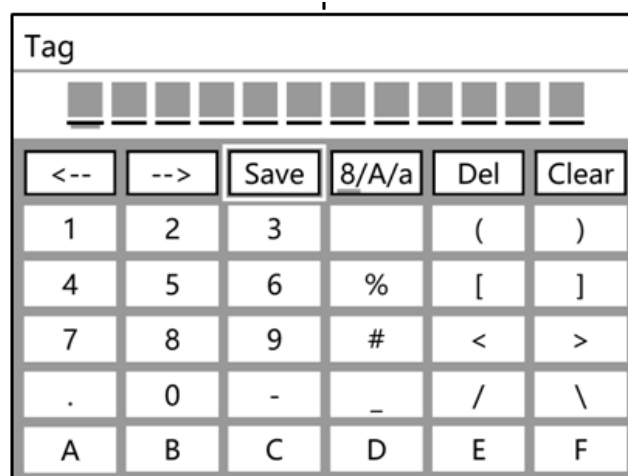
Tag					
▅▅▅▅▅▅▅▅▅▅▅▅					①
<--	-->	Save	8/A/a	Del	Clear
1	2	3		(	)
4	5	6	%	[	]
7	8	9	#	<	>
.	0	-	_	/	\
A	B	C	D	E	F

The digit input interface is divided into two areas:

Area ①: Result area for tag i nputting. When entering the tag input interface, the underline cursor is at the first character from the left by default, as shown in the figure above.

Area ②: Option area for tag inputting. When this area is not activated as shown in the figure above, p ress "Confirm" to activate it. After activation, the background highlight cursor selects "Save" option by default as below:

Tag					
▅▅▅▅▅▅▅▅▅▅▅▅					
<--	-->	Save	8/A/a	Del	Clear
1	2	3		(	)
4	5	6	%	[	]
7	8	9	#	<	>
.	0	-	_	/	\
A	B	C	D	E	F

When area ② is activated, press "Back" to return to the inactive state.

When area ② is activated, The sub-options are as follow:

Option	Result of conformation
<--	Cursor in area ① shifts to the left one character. (Selects the previous one)
-->	Cursor in area ① shifts to the right one character. (Selects the next one)
Save	Save the tag and return to the previous page
8/A/a	The underline cursor alternately selects "8", "A", and "a" inside the option, and the content of the rest of area ② alternates between numbers, capital letters and lower case letters correspondingly.
Del	Delete the selected character in area ①, and all chara cters on the right side will shift to the left by one position automatically.
Clear	Clear all characters in area ①.
The rest	Input the chosen option to the currently selected character in area ①.

There are two ways to set the tag:

No.1: In the case of area ② being inactive, use "left/Right" key to select the desired character of the tag in area ①, then use "Up/Down" key to cycle between lower case letters, capital letters, numbers and symbols to find the target option, and select the next tag character to continue setting by "Right" key. After setting all desired characters, press "Confirm" to activate the area ②. The background highlight cursor selects "Save" button by default, then press "Confirm" again to save the tag.

No.2: Activate area ② first, use "<--" or "-->" button to move the underline cursor in area ① to a desired position, then use arrow keys to find the target numbers, capital letters, lower case letters or symbols, and

press "Confirm" to update the selected content to Area ①. After set ting all desired characters, select "Save" button and press "Confirm" to save the tag.

"Parameters": Select it and press "Confirm" or "Right" to enter the parameter setting sub -menu for the probe and meter:

Cell Constant	1.00 >
	1.00 >
Ref. Temperature	25.00 ℃ >
Compensation Mode	Linear >
Temp. Coefficient	2.00% >
TDS Factor	0.50 >

The items here include regular ones as the cell constant of the connected probe, and professional parameters for conductivity measurement compensation, which are described below:

3.1、**"Parameters - Cell Constant":** Available in "0.01", "0.1", "1", "10" or "Custom" by the "Left/Right" or "Confirm" key. Make sure to set the correct cell constant according to the probe in use. If "Custom" options is chosen, the custom value can be furtherly set in the second row.

3.2、**"Parameters - Ref. Temperature":** Reference temperature for the conductivity measurement (25°C as default). Since the conductivity value are greatly affected by temperature, it is necessary to convert the measured conductivity into the value at the reference temperature through temperature compensation. 25 °C is most frequently used in practice .

3.3、**Compensation Mode":** The method adopted for temperature compensation for conductivity:

Options	Descriptions
Linear	Most commonly used. It is suitable for most measuring occasions other than ultra-pure water/deionized water, and unnatural water bodies
Non-linear	Suitable for ultra-pure water/deionized water, as well as natural water (seawater/lake/river, etc.) measurement occasions
None	Without temperature compensation, the actual conductivity measurement at the current temperature is displayed (Note: If the calibration is carried out without temperature compensation, the reference value of the electrical conductivity of the standard liquid at the calibration ambient temperature should be queried according to the temperature list on the outer package of the standard liquid according to the actual temperature of the calibration environment)

3.4、**"Parameters - Temp. Coefficient":** Compensation coefficient used in linear temperature compensation (2% as default). This coefficient is related to the composition of the measured sample, and the empirical values are as follows:

Sample	Temperature Coefficient
Acids	About 1.0% to 1.6%
Bases	About 1.8% to 2.2%
Salts	About 2.2% to 3.0%
Drinking water	About 2.0%
Pure water	About 5.2%

The selection of this param eter is professional, and it is recommended that professionals set it according to the actual situation. If you are not sure about the actual condition of the medium, it is recommended to keep the default value of 2% in most cases.

3.5、**"Parameters - TDS Factor":** Conversion coefficient from conductivity to TDS (0.5 as default). If you are not sure about the composition of the measured sample, 0.5 is most frequently used in practice.

4. Conductivity Correction: This option allows manual correction of the conductivity reading. Press the "Confirm" button to set the correction value. After this setting takes effect, the meter's conductivity reading will be the sum of the original conductance measurement and the manual correction value. (Note: The conductivity unit here depends on the conductivity unit of the "Conductance value of DB01 conductivity" item in the variable channel setting).

5. Temperature Type: Defines the source of the temperature value. Select this option, then use the "Left/Right" or "Confirm" key to choose between the following temperature sources: NTC10k, NTC2k2, NTC22k, Pt1000, Pt100 and Manual. *(1): The specific type of NTC2.25k supported by the instrument is R25℃ = 2.25kΩ, B25℃/50℃ = 3950.

6. Manual Value: When the Temperature Type is set to Manual, this option becomes available. After selecting "Manual Value", you can switch the temperature unit by pressing the "Shift Left/Right" button (°C by default, °F optional). Then press the "Confirm" button to set the specific temperature value.

7. Temperature Correction: When the Temperature Type is set to NTC10k, NTC2.25k, Pt1000, or Pt100, the Temperature Correction option becomes available.If the difference between the electrode's temperature reading and the actual temperature is significant, this function can be used to correct the measurement.Select "Temperature Correction".Switch the temperature unit (°C by default, °F optional) by pressing the "Left/Right" button. Then press "Confirm" to set the correction value. Once applied, the temperature reading will be the sum of the original measured value and the correction value.

Database Channel Setting

The next step is to set the database channel. After finishing the sensor channel set ting, press the "return" key to return to the setting menu of the meter (or, if you want to modify the displayed decimals of the measured value, press "Back" and "Confirm" simultaneously at the main interface to enter the setting menu):

Sensor	>
Database	>
Communication	>
AO	>
Relay	>
System	>

Select "Database " option with "up/down" key and press "Confirm", you can enter the database channel setting sub -menu as shown below:

Channel	DB01 Cond.Conductivity	>
Range Limit (Low)	0 µS/cm	>
Range Limit (High)	2000 µS/cm	>
Offset	0 µS/cm	>
Filter	0 s	>
	0 s	>

On the variable channel setting menu, the setting items are described as

follows ：

1 、"Channel:" indicates the signal source of the var iable channel. The default allocation rule is:

Database channel	Default signal source	Unit
DB01	Conductivity　Value	µS/cm　或　mS/cm
DB02	Temperature	℃
DB03	TDS Value	ppm　或　ppt
DB04	Conductivity　Reserved	Not in use

2 、**"Range Limit (Low)"/"Range Limit 　(High)":** Select one of these options and press "Left/Right" key, you can set the display unit of the chosen parameter, then press "Confirm" to enter the range setting interface and you can set the range and display decimals of the chosen database channel. T he range of DB01 channel will also be used for the bar graph display ratio calculation. The recommended ranges and display decimals for each parameter are as follow (can be changed according to your actual application requirements):

Sensor information			Range and display decimals Recommended	
Type	Parameter	Max range	Range limit (Low)	Range Limit (High)
Conductivity probe	Conductivity value	0 to 20　µS/cm	0.00	20.00
		0 to 200　µS/cm	0.0	200.0
		0 to 2000　µS/cm	0	2000
		0 to 20 mS/cm	0.00	20.00
		0 to 200　mS/cm	0.0	200.0
		0 to 500 mS/cm	0.0	500.00

Temperature	-20 to 150 ℃	0.0	150.0
TDS Value	0 to 10 ppm	0.00	10.00
	0 to 100 ppm	0.0	100.0
	0 to 1000 ppm	0	1000
	0 to 10 ppt	0.00	10.00
	0 to 100 ppt	0.0	100.0

(Note: The change of the range setting will cause the linkage change of the alarm value setting. If the alarm function is enabled, the alarm information in the "Relay Output" configuration option should be confirmed immediately after the change of the range setting. If necessary, the alarm setpoint or return setpoint in the alarm information should be updated as required)

On the range setting screen, press the Left/Right keys to locate the cursor, and the up/Down keys to locate the cursor. (decimal point) and "0~9" inturn , after the set ting press "confirm" to take effect.

3、**"Filter":** Filtering time constant in seconds. Selecting the first row and press "Confirm", you can set the first -order inertia filtering time of this parameter, the setting range is 0 to 255. The value in the second row stands for the display updating frequency for the parameter, and the setting range is 0 to 15, keeping default recommended.

After setting the sensor channel and database channel, press "back" to return to the main interface, then all setting takes effect.

● Conductivity Calibration

The meter supports single-point calibration for the conductivity. Press "Confirm" at the main interface, a check information will appear first to ask whether you need to perform the calibration:

```
Cond
                                          µS/cm
              Start Calibration?
              1502
              [====================        ]

     751ppm                   [A]     23.8℃
 RO: ■ □                      AO:      4.00mA
```

If you accidentally pressed t   he "Confirm" at the main interface, causing the above information to appear, you can press "Back" to return to the main interface.

If you really need to do the calibration, please press "Confirm" again (the password verification interface will appear first, press "Confirm" directly if the password is not set) to enter the calibration interface for the conductivity:

```
 Buffer Conductivity        86.0 µS/cm >

 Calibrate          1502                >

 Result                              OK
                 k=99.7%

 Quit                                   >
```

The last conduct ivity probe calibration result stored in the instrument is displayed in the "Result" column on the calibration interface. The factory default value is "k=100.0%". At the same time, the calibration interface provides the "Restore default" option, select this item and confirm that the electrode calibration results stored in the instrument can be restored to the default value. The following describes the calibration procedure:

Step 1: Setting the buffer conductivity. When selecting "Buffer Conductivity", you can firstly switch the unit between " µS/cm" and "mS/cm" by "Left/Right" key, then press "Confirm" to further set the desired conductivity value (position the data input cursor by "Left/Right" key, then use "Up/Down" key to select options between "." (decimal point) and number "0" to "9" in turn). When setting is done, press "Confirm" to save.

Step 2: Performing the single -point calibration. The cleaned probe should be placed in the buffer solution (1413µS/cm buffer for example) and stirred slowly for about 20s. The centered reading of the "Calibrate" option row is the real -time conductivity value measured by the probe. Then select "Calibrate" by "Up/Down" key and press "Confirm" to start the calibration:

Buffer Conductivity	1413µS/cm >
Calibrate	1502 >
Result	In Progress
Quit	>

The cursor will automatically jump to the "Result" option, and the last calibration result will no longer be displayed. When the message on the right side changes fro m "In Progress" to "OK", the calibration is done and the new calibration result will be displayed:

```
┌─────────────────────────────────────┐
│ Buffer Conductivity    1413 µS/cm > │
│ ─────────────────────────────────── │
│ Calibrate         1413           >  │
│ ─────────────────────────────────── │
│                                     │
│ Result                        OK    │
│                 k=93.8%             │
│ ─────────────────────────────────── │
│ Quit                             >  │
│                                     │
│                                     │
└─────────────────────────────────────┘
```

Till now, the single -point calibration for the conductivity is completed, select "Quit" option and press "Confirm" to return to the main interface.

● Analog Output

Press "Back" and "Confirm" simultaneously at the main interface to enter the setting menu of the meter (the password verification interface will appear first, press "Confirm" directly if the password is not set):

```
┌─────────────────────────────────────┐
│ Sensor                        >     │
│ ─────────────────────────────────── │
│ Database                      >     │
│ ─────────────────────────────────── │
│ Communication                 >     │
│ ─────────────────────────────────── │
│ AO                            >     │
│ ─────────────────────────────────── │
│ Relay                         >     │
│ ─────────────────────────────────── │
│ System                        >     │
└─────────────────────────────────────┘
```

Select "AO" option   by "Up/Down" key and press "Confirm" or "Right" key to enter the analog output setting sub‑menu:

Channel	AO 01 >
Source	Closed >
4mA Value	0.00 >
20mA Value	14.00 >
Sensor Fault Indication	Preset Value >
Preset Value	3.80mA >

The meter supports 2 analog outputs, and when the cursor is in the "Channel" option, you can select between the "AO1" and "AO2" options by using the "Left/ri   ght" or "Confirm" keys.

The "Source" option of the analog output channel represents the enabled status of the channel and the signal source. After selecting the "Source" option, you can use the "left/right" key or "Confirm" key to rotate the options. The   description is as follows:

NO.	Status	Source	Description
1	Not enabled	Closed	Analog output channel closed.
2	Manual output	Manual	Output the manually preset value of current.
3	Transmitter output	DB01 to DB04	Real-time measurement values are transmitted according to specific parameters (Usually DB01 or DB02) (DB01 is the conductivity value)（DB02 为温度值）

When "Source" option is set to "Manual", the "Preset Value" option at the bottom of the interface will become selectable as below:

Channel	AO 01 >
Source	DB01 Cond. Conductivity >
4mA Value	0 µS/cm >
20mA Value	2000 µS/cm >
Sensor Fault Indication	Preset Value >
Preset Value	3.80mA >

When the analog o utput channel is expected to perform the transmission output, the "source" option should select the variable channel corresponding to the measurement parameter, and the corresponding values of 4mA and 20mA can be set by the user (according to the actual application requirements, you can refer to the range setting of the parameter in the variable channel), as shown in the following figure:

Channel	AO 01 >
Source	DB01 Cond. Conductivity >
4mA Value	0 µS/cm >
20mA Value	2000 µS/cm >
Sensor Fault Indication	Preset Value >
Preset Value	3.80mA >

The configuration value of the "Source" option in the figure above is set to "Conductance value of DB01 conductance", indicating that the analog output channel will be used to transmit the conductivity measurement value

of the conductance electrode in the application range of (0~2000)µS/cm.

When the meter detects an abnormal electrode (such as a broken electrode line) , the post -monitoring system can be alerted through the associated analog output channel. The setting item is "Probe fault warning", which can be rotated by the "left/right" key or "Confirm" key to select four options as follows:

Options for sensor fault indication	Current output when thermistor failure detected
Preset Value	The manually preset value
4mA	4.00mA
20mA	20.00mA
Hold	Keep the last valid output value

After completing the AO setting and returning to the main interface, the new configurati on takes effect. You can check the real-time status of AO channel at the bottom right of the main interface. Once the current output is enabled, a warning sign will indicate an open -circuit failure of the current loop:

Display	Indication
	Open -circuit failure of the current loop detected.

● **Relay Output**

Press "Back" and "Confirm" simultaneously at the main interface to enter the setting menu of the meter (the password verification interface will appear first, press "Confirm" directly if the password is not set):

Sensor	>
Database	>
Communication	>
AO	>
Relay	>
System	>

Select "Relay" option by "Up/Down" key and press "Confirm" or "Right" key to enter the relay output setting sub-menu:

Channel	R01 >
Function	Closed >
Source	DB01 Cond. Conductivity >
Alarm Value	1800 µS/cm >
Hysteresis	20 µS/cm >
Delay	5 s >

The meter provides three single -pole double -throw relays. When the cursor is in the "Channel" option, you can select from the "R01", "R02", and "R03" channels by pressing the "Left/right" or "Confirm" keys. The options below are for the selected channels.

The "Function" option of the relay channel represents whether the channel is enabled and the designated function. When "Function" option is selected, you can use "Left/Right" or "Confirm" key to alternately select each option on the right side of it, as explained below:

NO.	Status	Function		Description
1	Closed	Closed		Relay output channel closed.
2	Manual	Manual		Output the manually preset state of the relay.
3	Alarm output	R01	High Alarm	Output an high alarm for specific parameters.
		R02	Low Alarm	Output an low alarm for specific parameters.
4	probe cleaning	R03	Automatic cleaning	Perform low alarm function for a desired parameter.

Relay for Alarm Output

When the alarm output function is expected to be realized through the relay, the "function" option of the relay output channel should be set by referring to the corresponding content in the above table, taking the "upper limit alarm" function of the "R01" channel as an example:

Channel	R01 >
Function	High Alarm >
Source	DB01 Cond. Conductivity >
Alarm Value	1800 µS/cm >
Hysteresis	20 µS/cm >
Delay	5 s >

The rest five options (scrolling to the bottom) are introduced as follows:

1, "source" : upper limit alarm signal source. After this item is selected, the variable channel ass ociated with the measurement parameter can be selected by the "Shift left/right" key or the "Confirm" key. The variable channel is usually set to DB01, that is, the conductivity value.

2. "Alarm Value" : Take the "Upper alarm" function of the "R01" channel as an example, "alarm value" is the high alarm threshold. Select this item

and confirm to further set the high alarm threshold. When the Lower Limit alarm function is performed on the R02 channel, Alarm Value indicates the low alarm threshold.

3. "back difference" : that is, the alarm back difference. Select this item and confirm to set the alarm return difference value. Take "R01" channel conductivity value "upper alarm" function as an example, once the conductivity measurement value is higher than the "alarm value" (1500 μS/cm in the figure above), the upper alarm takes effect; The alarm will only go off if the conductivity measurement falls below the "alarm value return difference". Similarly, after the lower limit alarm takes effect, the alarm will b e eliminated only when the measured value rises above the "alarm value + return difference".
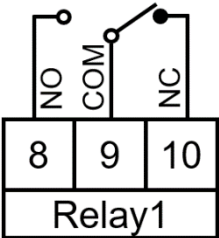
4、"Delay" : Alarm delay (unit: second). Select this item and confirm to set the alarm delay. The specific function is that when the measured value reaches the ala rm condition, the relay alarm output can be triggered only if the alarm condition is continuously maintained within the delay time.

5、"Minimum operation period" : refers to the minimum time interval between two state reversals of the relay contact, that is, from the last switching output state, it will maintain at least this time before switching state. This function helps to avoid frequent action of the contact in specific scenarios. Select this item and confirm that you can further set the duration (seconds). The default value is 0 s.

After completing the relay output configuration setting and returning to the main interface, the new configuration takes effect. You can view the real-time status of the analog output channel at the bottom left of the main interface. The 1st and 2nd square graphics from the left indicate the status of relay 1 (upper alarm) and relay 2 (lower alarm) respectively:

Display	Indication
■	The relay is activated. (Alarm on)
□	The relay is deactivated. (Alarm off)
▬	The relay output is not enabled.

Refer to the following table for different alarm output states (taking the output channel of relay No. 1 as an example, the physical terminals are located at terminals No. 8, No. 9 and No. 10 of TB4) :

R01 status	Actual contact status	
	Normally open contact TB4-8/9	Normally closed contactTB4-9/10
OFF	Break	Make
ON	Make	Break

Relay for Manual Output

When the "Function" option of relay output channel is set to "Manual" :

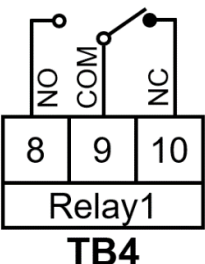| Channel	R01 >
Function	Manual >
Source	DB01 Cond. Conductivity >
Alarm Value	1800 µS/cm >
Hysteresis	20 µS/cm >
Delay	5 s >

The last options "Preset Value" (scrolling to the bottom) will be enabled:

Source	DB01 Cond. Conductivity >
Alarm Value	1800 µS/cm >
Hysteresis	20 µS/cm >
Delay	5 s >
Min. Changeovr Interval	0 s >
Preset Value	Off >

After completing the relay output configuration setting and returning to the main interface, the new configuration takes effect. You can view the real-time status of the analog output channel at the bottom left of the main interface. The 3 square graphics from left to right indicate the status of relay 1, relay 2 and relay 3:

Display	Indication
■	The relay is activated. (Manual output on)
□	The relay is deactivated. (Manual output off)
▬	The relay output is not enabled.

Refer to the table below for different output states of relay (take relay 1 for example):

	R01	Actual contact status	
NO COM NC 8 9 10 Relay1 TB4	status	Normally open contact TB4-8/9	Normally closed contact TB4-9/10
	OFF	Break	Make
	ON	Make	Break

Automatic cleaning of probes

When it is hoped to realize the automatic cleaning function of the electrode through the relay, the "Function" option of the "R03" relay output channel should be set to "automatic cleaning" by referring to the corresponding content in the above table, as follows:

Channel	R03 >
Function	Auto-clean >
Cycle	00-00:30 min >
Time	30 s >
Resume Delay	10 s >
Preset Value	Off >

The lower screen contains three valid options, which are described as follows:

1. "Cleaning cycle" : the time interval for automatic cleaning of the electrode. If this item is selected and confirmed, the cleaning interval can be set in the format of DD -HH:MM, that is, day -hour -minute.

2. "Cleaning duration" : the duration of each automatic cleaning (in seconds). Select and confirm this item to set the cleaning duration.

(Note: During automatic cleaning, the word "Hold" will be displayed on the main interface of the instrument, and the corresponding measurement reading will be maintained as the effective reading of the moment before cleaning start, and the analog output, that is, the current transmission value, will also be maint ained as the effective value of the moment before cleaning
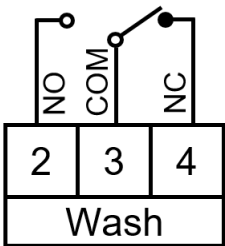
start.)

3. Recovery delay: indicates the delay from the end of cleaning to the time before normal measurement (unit: second). Select this item and confirm to set the delay.

After the relay output configuration is set and returned to the main interface, the new configuration takes effect and the first automatic cleaning is performed directly. The real-time status of the relay output channel can be viewed at the bottom left of the main interface:

Display	Indication
◼	The relay is activated. (Manual output on)
☐	The relay is deactivated. (Manual output off)
🖶	The relay output is not enabled.

Refer to the following table for different cleaning output states (No. 3 relay output channel, physical terminals are located at terminals 2, 3 and 4 of TB4) :

	R03	Actual contact status	
NO / COM / NC 2 / 3 / 4 Wash **TB4**	Status	Normally open contact TB4-2/3	Normally closed contact TB4-3/4
	OFF	Break	Make
	ON	Make	Make

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