PHMeter_manual_eg
V1_rev0
sep23

USER MANUAL

PHM0033 - pH / ORP Meter

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● Overview

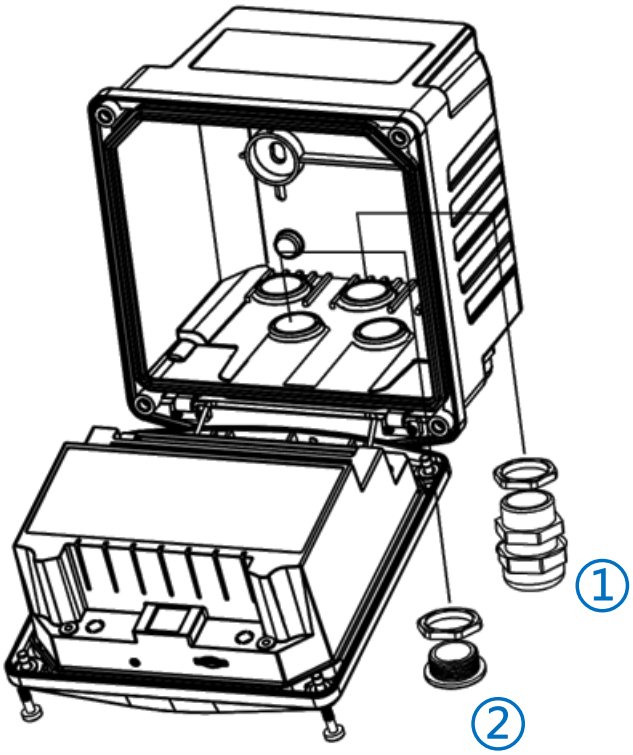
PHM0033 series pH/ORP meter can work with analog pH or ORP probes to meet versatile online pH or ORP monitoring applications.

- ◎ 1 probe input channel for analog pH or ORP probe.
- ◎ 1 thermistor input channel for NTC10k, Pt100 or Pt1000.
- ◎ Smart calibration design for pH probe. (Auto-recognition of Cal-points)
- ◎ Temperature correction available.
- ◎ Tag setting available.
- ◎ 2 current output channel for 4-20mA transmission.
- ◎ 3 SPDT relay output channel for Hi/Lo alarm.
- ◎ Operation password management authority provided.
- ◎ Modbus RS485 communication provided.
- ◎ English menu default, Chinese menu optional.
- ◎ IP67 protection level for whole meter housing achieved.

---------- Main specification ----------

Function	Display/Transmission/Alarm	Com. Port	Modbus RS485
Screen	3.5' monochrome (320*240)	IP Level	IP67
Probe Input	1 analog pH/ORP probe	Dimension	144*152*113.3mm
Thermistor Input	1 NTC10k (2-wire), or 1 Pt100 or Pt1000 (3-wire)	Alarm	Hi/Lo alarm (hysteresis & delay configurable)
Analog Output	2 channel 4-20mA ±0.2% (max load 500Ω)	Power Supply	(100-240)VAC Default (24VDC Optional)
Relay Output	3 SPDT for Hi/Lo alarm 250Vac/30Vdc/3A(max)	Mounting	Panel/Pipe/Wall mounting (cutout: 138*138mm)

● Assembly



Part ①:

M20 cable gland * 5

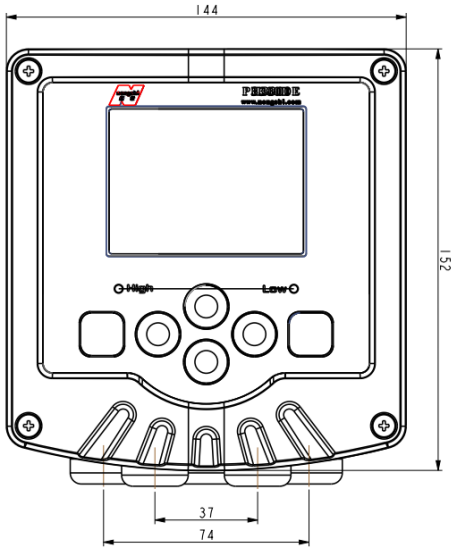
(with locknut)

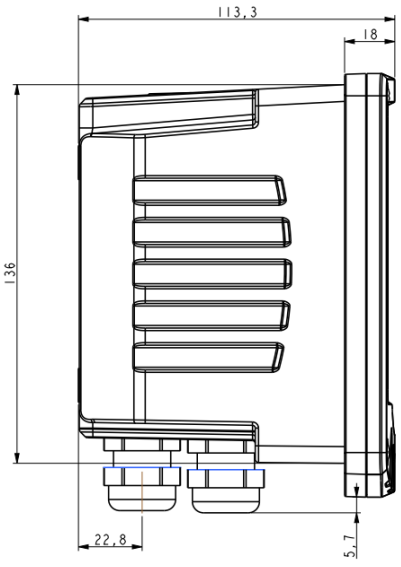
Part ②:

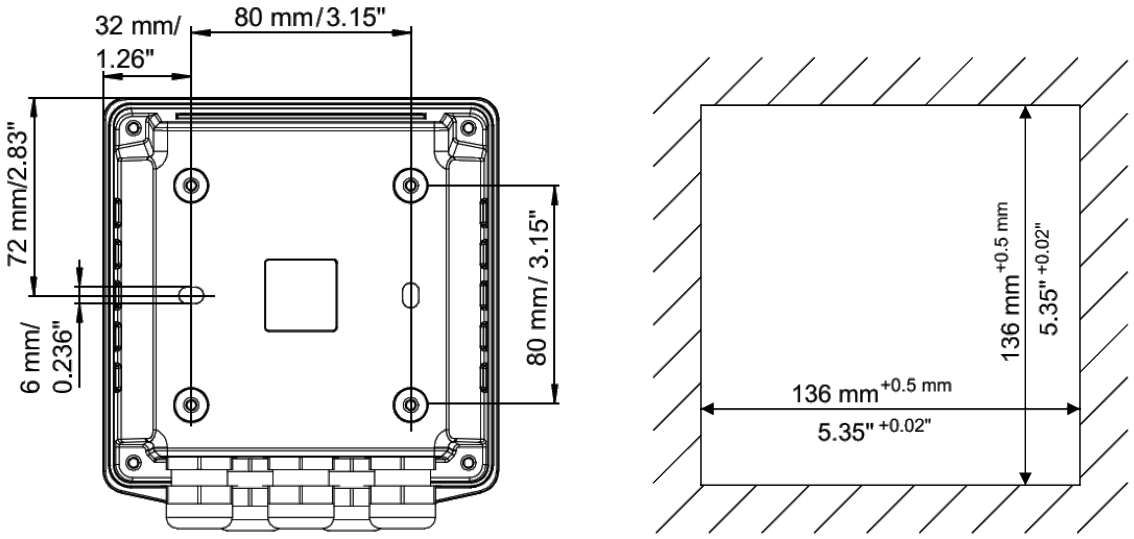
M20 screw plug * 3

(with locknut)

● Dimension Drawings



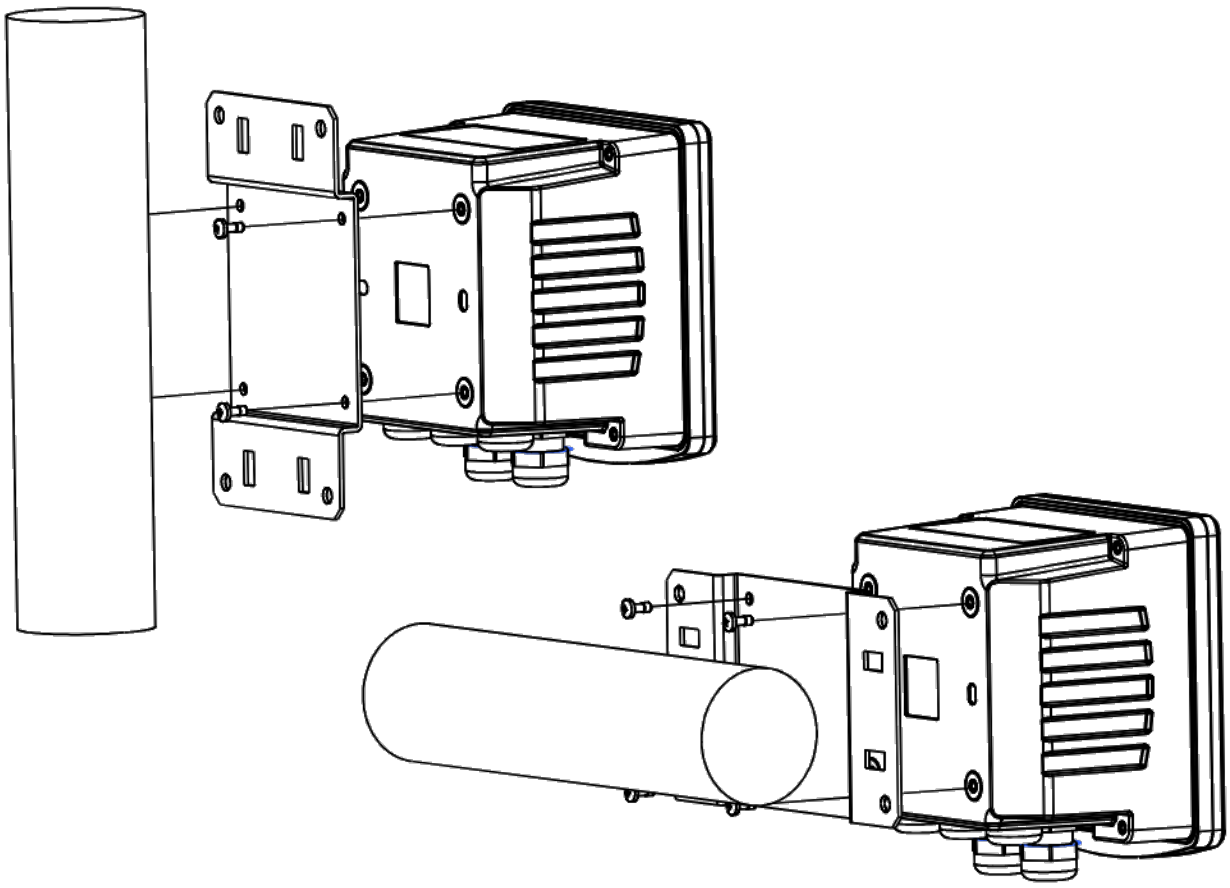




● Pipe Mounting

Step 1: Fix the mounting bracket (optional) to the back cover with 4 M3*8 screws (with spring washer).

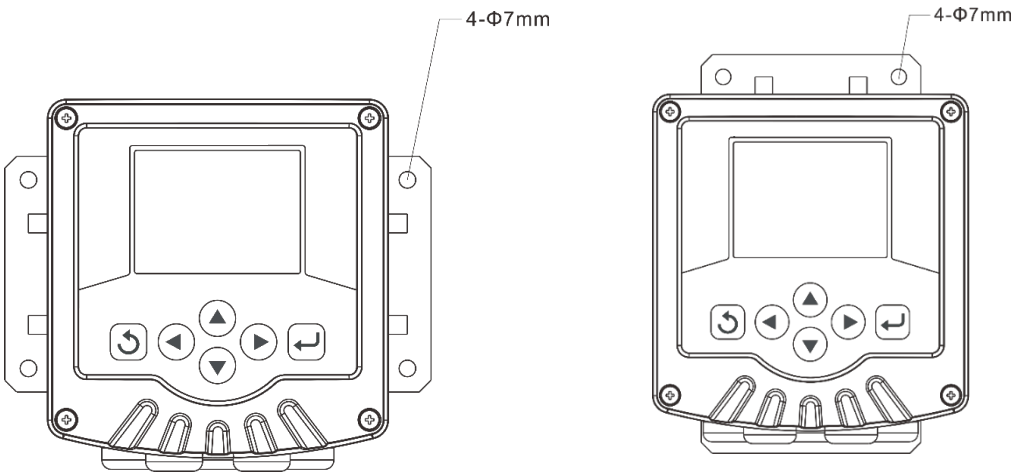
Step 2: Lock the bracket to the pipe (Ø40-60mm) with 2 metal clamps.



● Wall Mounting

Step 1: Fix the mounting bracket 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.

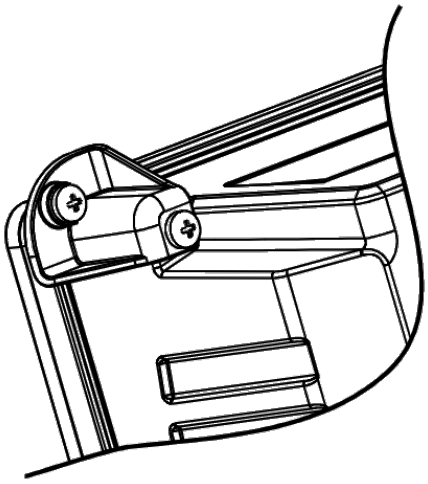


● Panel Mounting

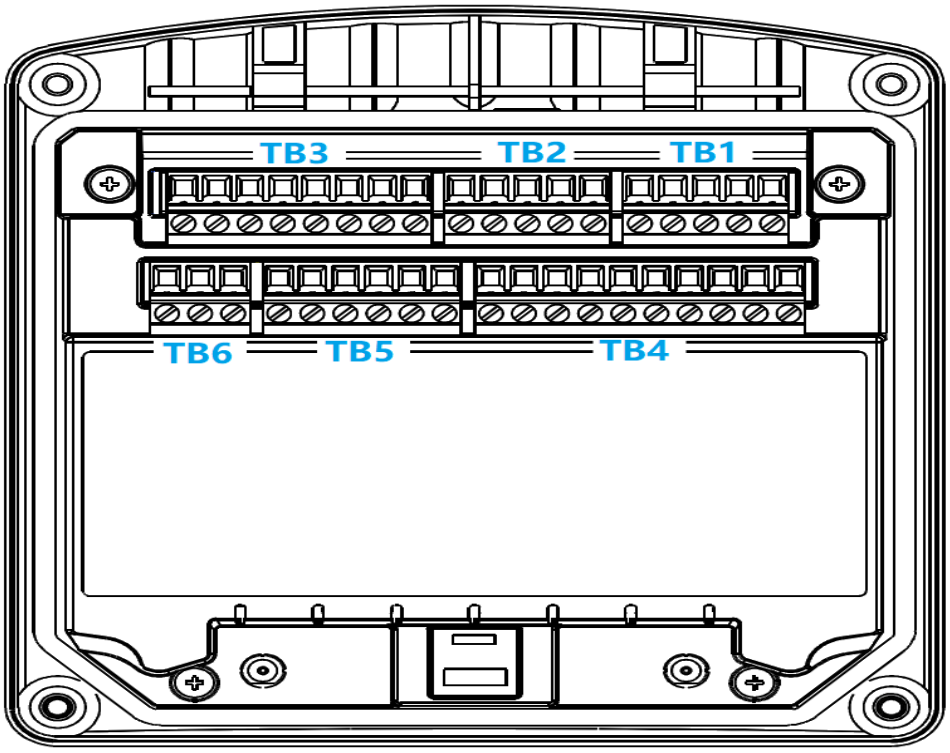
Step 1: Insert the tail of the meter into the cutout of the panel (138*138mm).

Step 2: Assemble the 4 compression locks to the meter with 4 M4*10 screws (with spring washer).

Step 3: Screw the M4*16 screw (already assembled in the compression locks) in until it reaches the back of the panel.



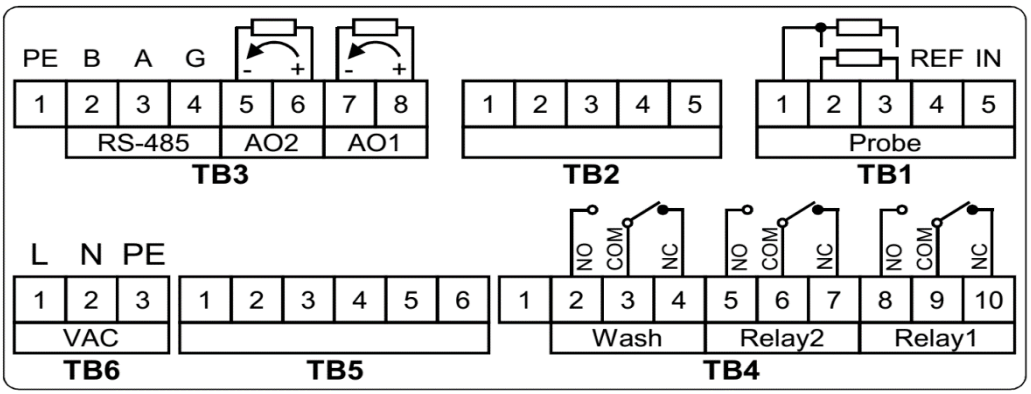
Terminal Block Definitions



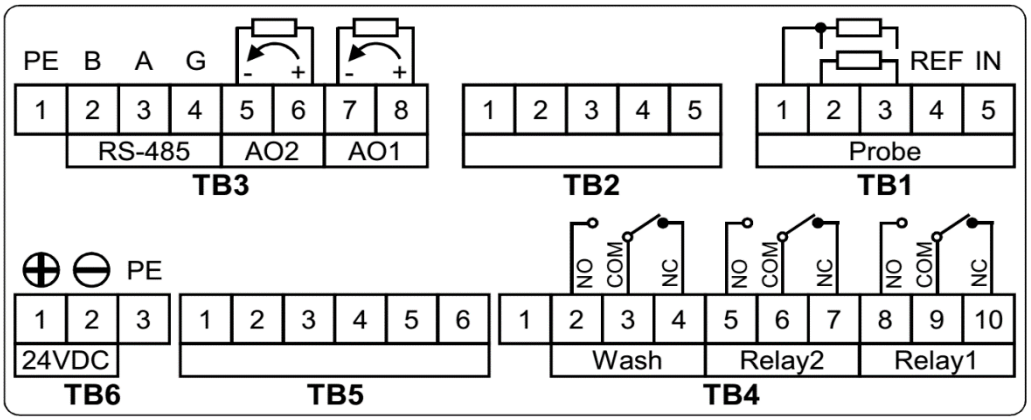
Terminal blocks

inside the meter

AC Powered Version



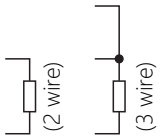
DC Powered Version



TB1

Wiring definitions

1	Temp (Line)
2	Temp signal
3	Temp signal
4	Reference
5	pH/ORP signal



TB2

Wiring definitions

1	/
2	/
3	/
4	/
5	/

TB3

Wiring definitions

1	PE
2	RS485A / -
3	RS485B / +
4	Ground
5	4-20mA output -
6	4-20mA output +
7	4-20mA output -
8	4-20mA output +

TB4

Wiring definitions

1	/
2	(washing) Normally-open contact 3
3	(washing) Common terminal 3
4	(washing) Normally-closed contact 3
5	(Lo) Normally-open contact 2
6	(Lo) Common terminal 2
7	(Lo) Normally-closed contact 2
8	(Hi) Normally-open contact 1
9	(Hi) Common terminal 1
10	(Hi) Normally-closed contact 1

TB5

1	/
2	/
3	/
4	/
5	/
6	/

TB6

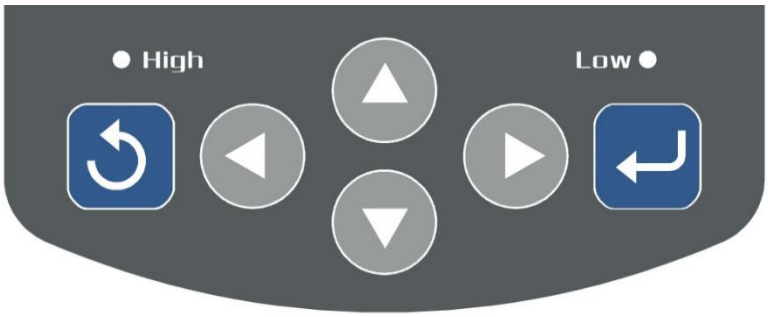
Wiring definitions

1	L	220Vac±10%
2	N	
3	Earth	
1	24V+	24Vdc±10%
2	24V-	
3	Earth	

(Note: The power terminal mark for the 24VDC version is different from the AC version)

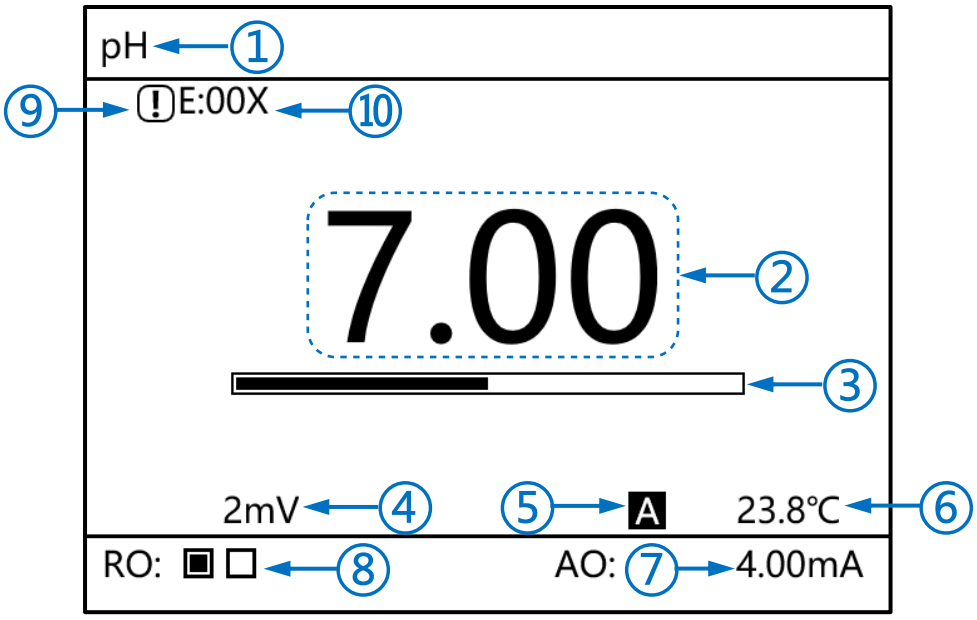
When using 2-wire NTC10k or 2.25K thermistor, please connect the 2 signal wires to the TB1-2 and TB1-3 terminals. When using 2-wire Pt100 or Pt1000 thermistor, please connect the 2 signal wires to the TB1-2 and TB1-3 terminals, meanwhile, short connect the TB1-1 and TB1-2 terminals to ensure that the 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 : "pH" or "ORP" default, can also be tag for the current measuring point.

② : Normally the real-time measured value of pH or ORP is displayed. When there are abnormal conditions, the meaning of the information displayed in this area is as follow:

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 pH/ORP measured value compared to range limit setting.

④ : Original voltage measured value for pH application, none for ORP.

⑤ : Source of temperature value:

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

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

⑦ : Current output value (unit: mA). 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.

⑧ : The left and right square shape respectively indicates the state of relay 1 (high alarm) and relay 2 (low alarm):

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

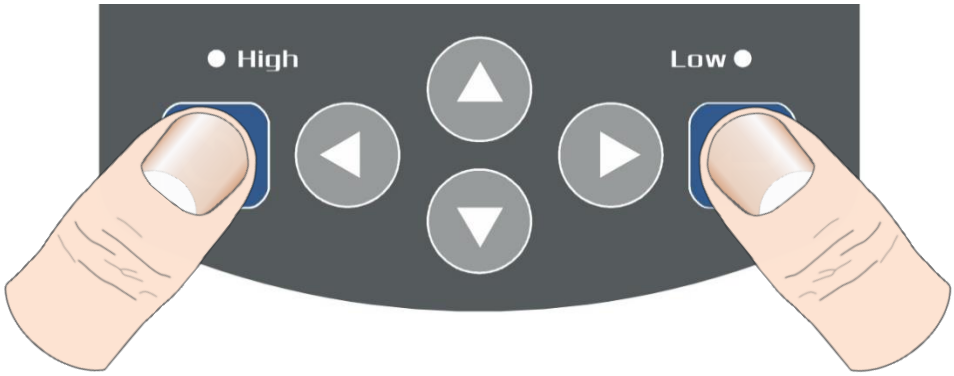
⑨ : An exclamation mark ("!") will indicate the thermistor failure.

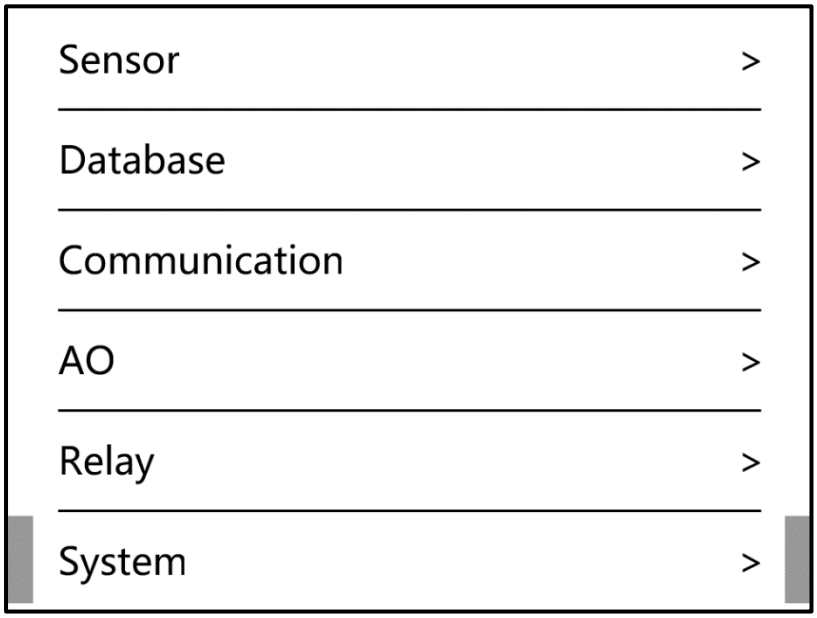
⑩ : Following the above-mentioned "!", the error code will be displayed:

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 thermistor detected.

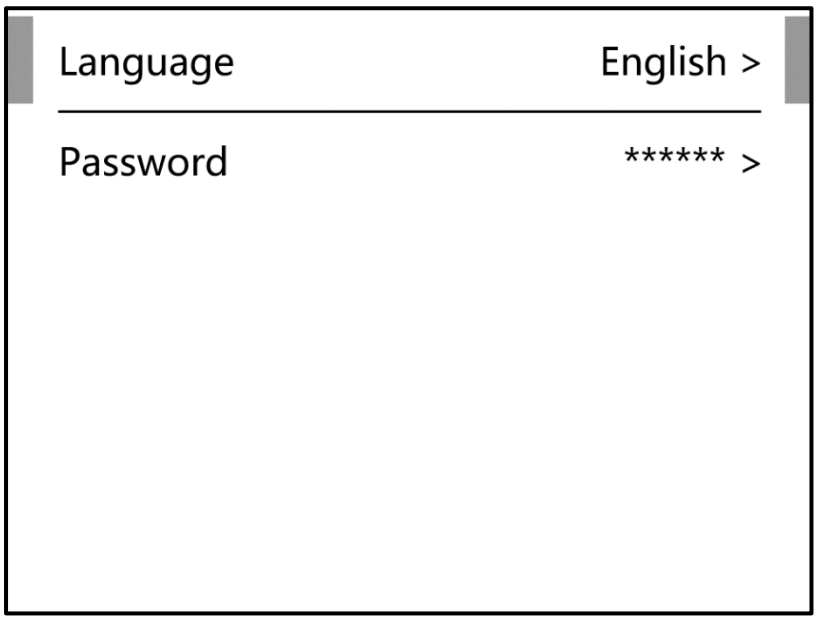
● System Information Setting

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:

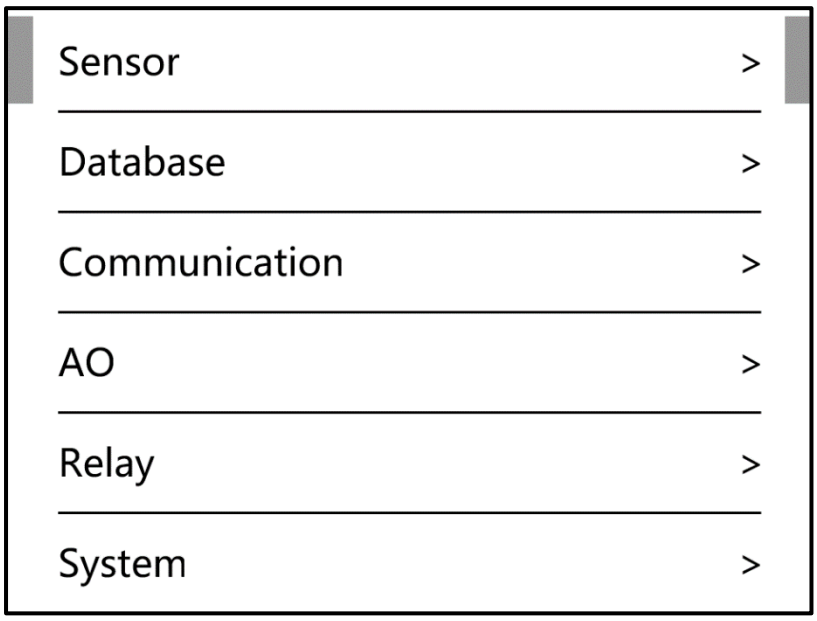


All options are introduced as follow:

"Password": Select it and press "Confirm", you can enter the password setting interface to set the 6-digit operation password of the meter (position the data input cursor by "Left/Right" key, then use "Up/Down" key to select options between number "0" to "9" in turn). When setting is done, press "Confirm" to save. When pressing "Confirm" on the password setting or verification interface, the system will uniformly identify the unset parts (reserved as "*") as "0", e.g., if you press "Confirm" in the state of displaying "**27**", the system will recognize "002700" as the actual input value.

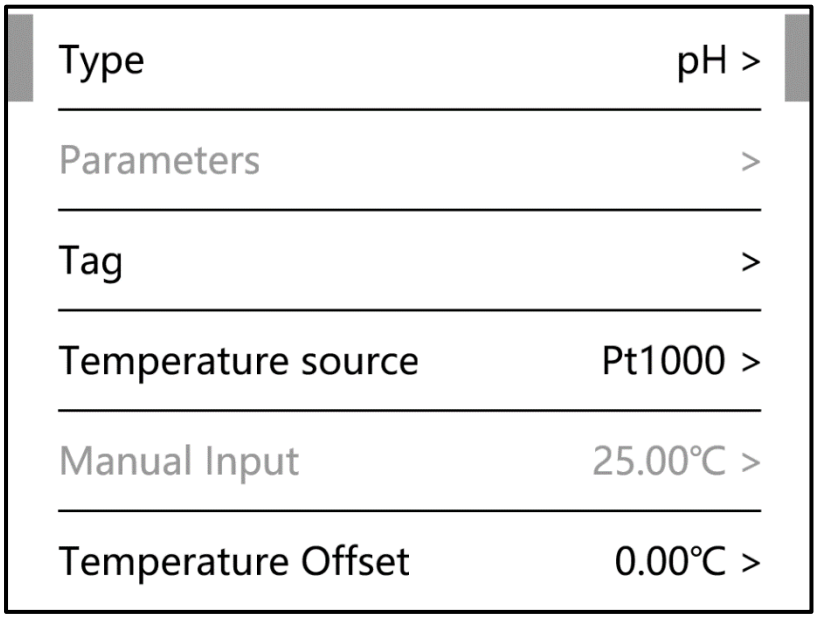
● pH Probe Setting

After connecting the signal wire of the analog pH probe to meter, the essential settings for the probe 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 Channel Setting

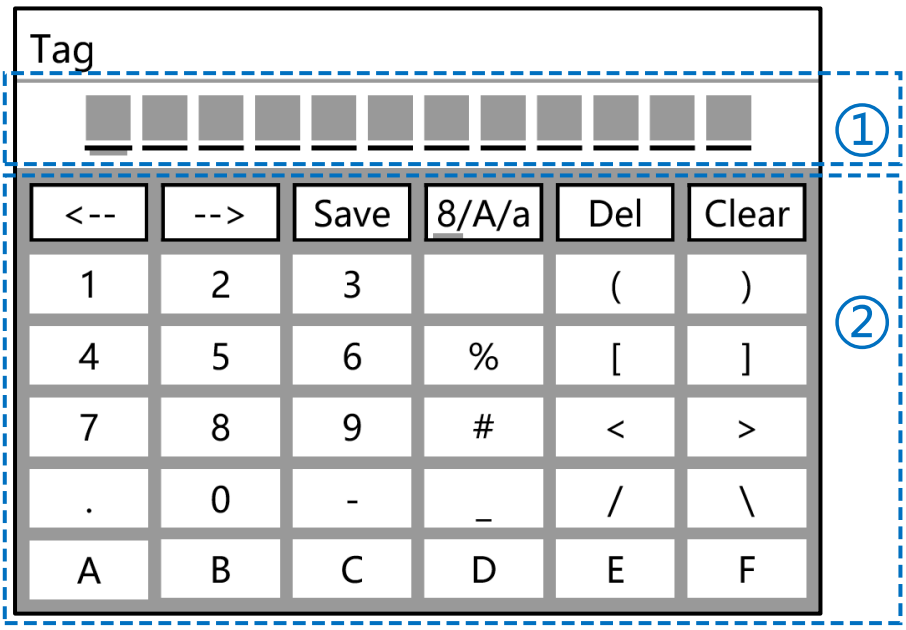
In the setting menu, select "Sensor" option and press "Confirm" or "Right" to enter the sensor channel setting sub-menu:



All options are introduced as follow:

"Type": Sensor type. When the cursor is located at "Type", you can use the "Left/Right" or "Confirm" key to choose between "pH" and "ORP". Be sure to pick "pH" when using pH probe.

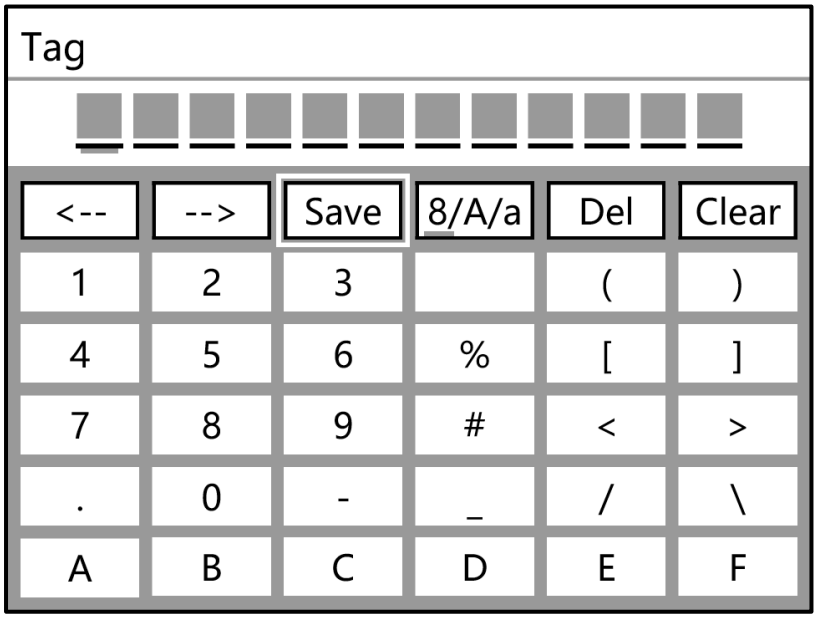
"Tag": Tag of measuring point. Select it and press "Confirm" to enter the tag input interface as below (the tag supports up to 12 characters):



The tag input interface is divided into two areas:

Area ①: Input result area for the tag. 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: Input option area for the tag. When this area is not activated as shown in the figure above, press "Confirm" to activate it. After activation, the background highlight cursor selects "Save" option by default as below:



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 characters 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 tofind the target numbers, capital letters, lower case letters or symbols, and press "Confirm" to update the selected content to Area ①. After setting all desired characters, select "Save" button and press "Confirm" to save the tag.

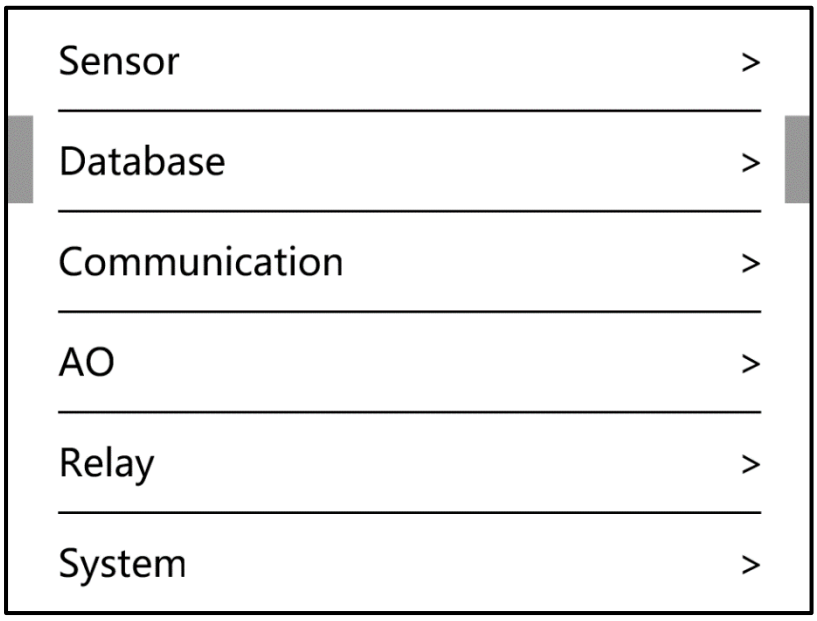
"Temperature Source": Source of temperature value. Select it and you can use the "Left/Right" or "Confirm" key to choose the temperature source between "NTC10k", "Pt1000", "Pt100" and "Manual".

"Manual Input": This option becomes selectable when the above-mentioned "Temperature Source" option is set to "Manual". After selecting "Manual input", you can firstly switch the temperature unit between "℃" and "°F" by "Left/Right" key, then press "Confirm" to further set the desired temperature value (position the data input cursor by "Left/Right" key, then use "Up/Down" key to select options between number "0" to "9" in turn). When setting is done, press "Confirm" to save.

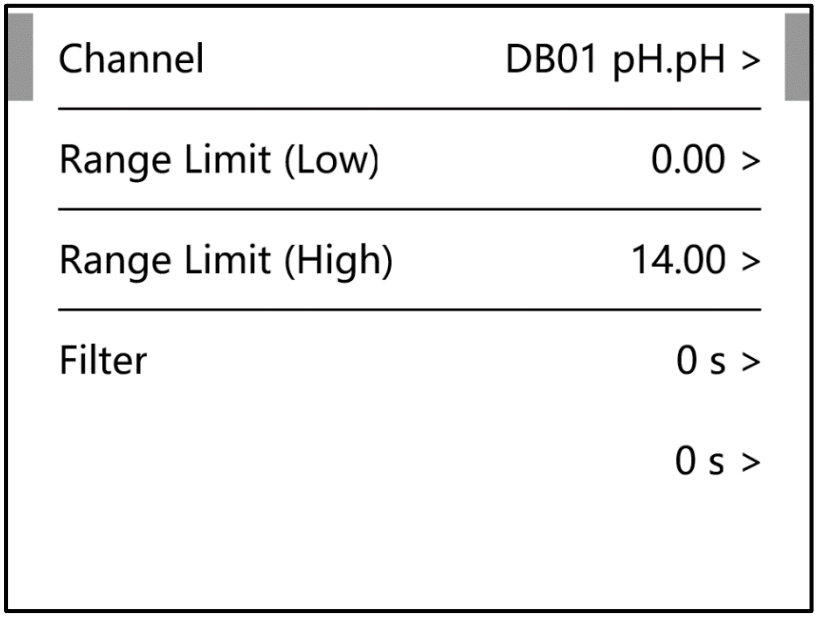
"Temperature Offset": This option becomes selectable when the above-mentioned "Temperature Source" option is set to "NTC10k", "Pt1000" or "Pt100". This offset can be used to fix the deviation between the measured temperature and the actual temperature. After selecting "Temperature Offset", you can firstly switch the temperature unit between "℃" and "°F" by "Left/Right" key, then press "Conffrm" to further set the desired offset value (position the data input cursor by "Left/Right" key, then use "Up/Down" key to select options between number "0" to "9" in turn). When setting is done, press "Confirm" to save, and the value of the temperature displayed in the main interface will be the sum of the measured temperature and the offset value.

Database Channel Setting

Normally there is no need to set the database channel. But if you want to modify the displayed decimals of the measured value, or a different type of probe is replaced for the meter, the essential settings for the database channel 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):



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



All options are introduced as follow:

"Channel": Database channel. When the cursor is located at "Channel", you can select one of the four database channel by "Left/Right" or "Confirm" key. The default assignment rule for database channel is (take pH meter application for example):

When "Type" of "Sensor" is set "pH"		Unit
Database channel	Default signal source	
DB01 pH.pH	pH measured value from pH probe	/
DB02 pH.Temperature	Temperature measured value from pH probe (or temperature value from manual input)	℃
DB03 pH.pH mV	Original voltage measured value from pH probe	mV
DB04 pH.Reserved		Not in use

"Range Limit (Low)"/"Range Limit (High)": Select one of these options and press "Confirm" to enter the range setting interface, then you can set the range and display decimals of the chosen database channel. The range of DB01 channel (pH value) 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)
pH probe	pH value	0-14	0.00	14.00
	Temperature	-20 to 120 ℃	-20.0	120.0
	Original voltage	-1500 to 1500 mV	-1500	1500

(Note: The change of the range limits setting will cause the linkage change of the alarm value setting. If the alarm function is enabled, the alarm setting in the "relay output" option should be confirmed immediately after changing the range limits setting)

In the range setting interface, you can position the data input cursor by "Left/Right" key, then use "Up/Down" key to select options between "-" (minus sign), "." (decimal point) and number "0" to "9" in turn. When setting is done, press "Confirm" to save.

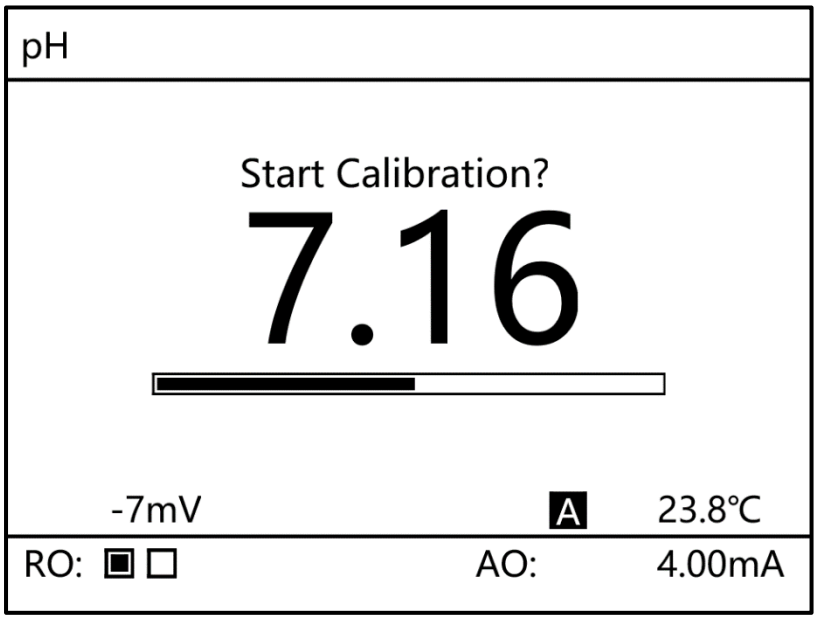
"Filter": Filtering time constant in seconds. Selecting the first row and press

"Confirm", you can set the first-order inertia filtering time of this parameter, the setting range is 0~255. The value in the second row stands for the display updating frequency for the parameter, and the setting range is 0~15, keeping default recommended.

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

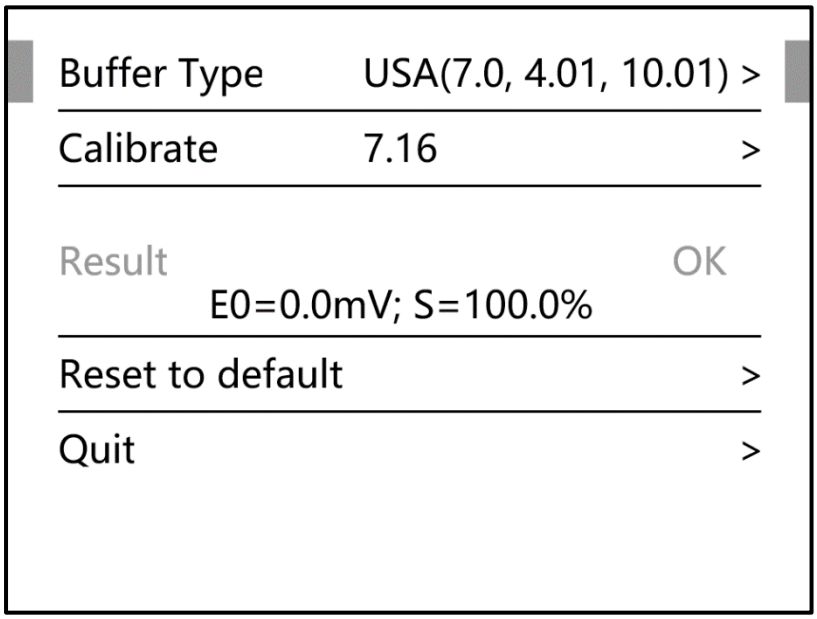
● pH Probe Calibration

The meter adopts an intelligent calibration design that automatically recognizes the calibration point, which allows the user to easily carry out the two-point or three-point calibration for the pH probe. Press "Confirm" at the main interface, a check information will appear first to ask whether you need to perform the calibration:



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

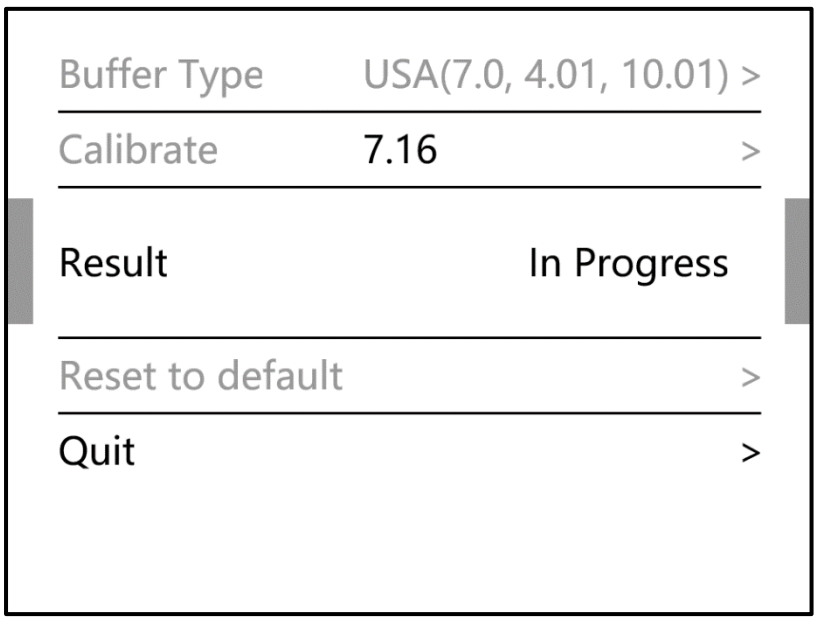
If you really need to calibrate the probe, please press "Confirm" again (the password verification interface will appear first, press "Confirm" directly if the password is not set) to enter the calibration interface of the pH probe:



The "Result" option row in the calibration interface displays the last calibration result stored by the meter. The factory default value is "E0=0.0mV; S=100.0%". Meanwhile, the "Reset to default" option is provided. Select "Reset to default" option and press "Confirm" will restore the calibration results stored in the meter to the default value. The operation process of the pH probe calibration is described as follow:

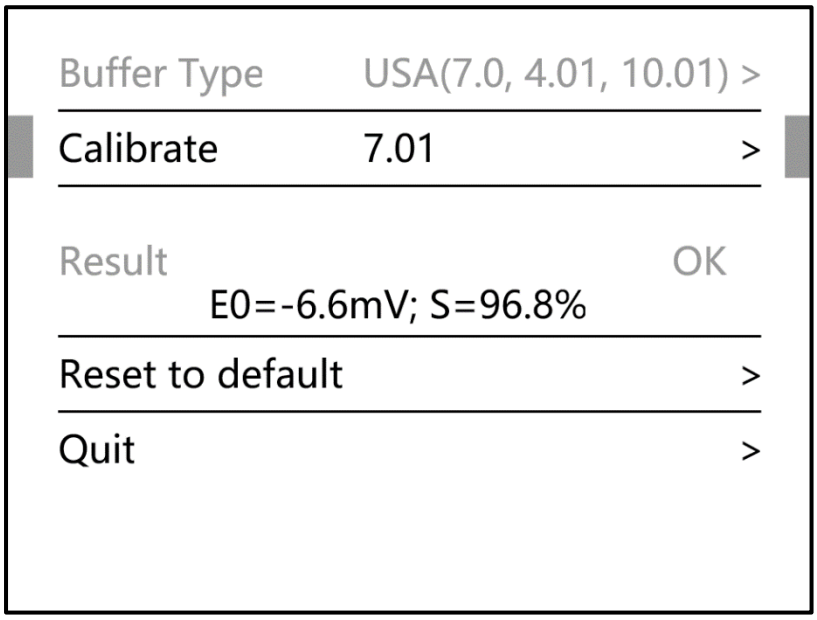
Step 1: Setting the buffer type. When "Buffer Type" option is selected, you can choose between "USA (7.0, 4.01, 10.01)" and "NIST (6.86, 4.0, 9.18)" options by "Left/Right" or "Confirm" key.

Step 2: Performing the first point calibration. The cleaned probe should be placed in a first point buffer solution (type "USA", pH7.0 for example) and stirred slowly for about 20s. The centered reading of the "Calibrate" option row is the real-time pH value measured by the probe. Then select "Calibrate" by "Up/Down" key and press "Confirm" to start the calibration of the first point:



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 from "In Progress" to "OK", the first point calibration is done and the new calibration result will be displayed:

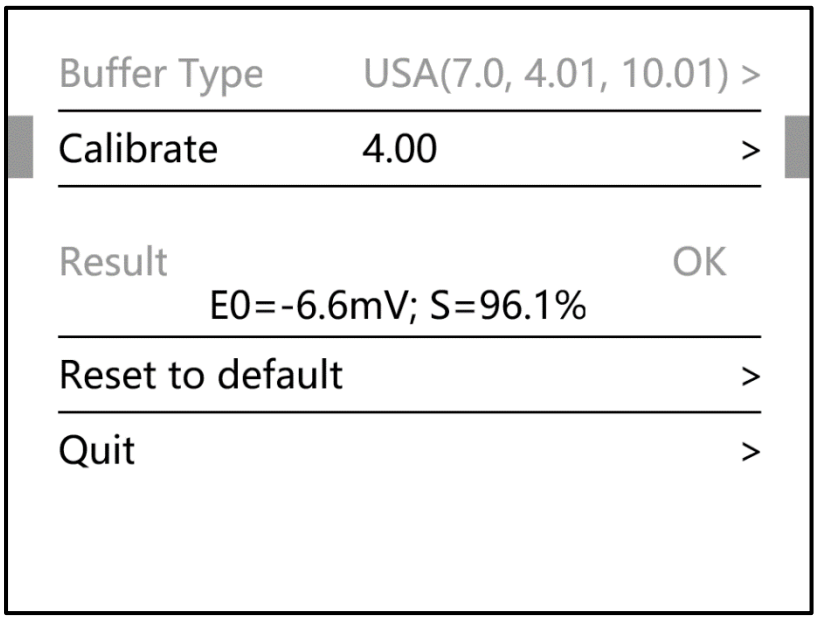
(Note: If the "Fault k, b" message appears, it means that the performance of the probe may have significantly deteriorated)



Step 2: Performing the follow-up calibration. The cleaned probe should be placed in the second point buffer solution (type "USA", pH4.01 for example) and stirred slowly for about 20s. Then select "Calibrate" option and press "Confirm" to

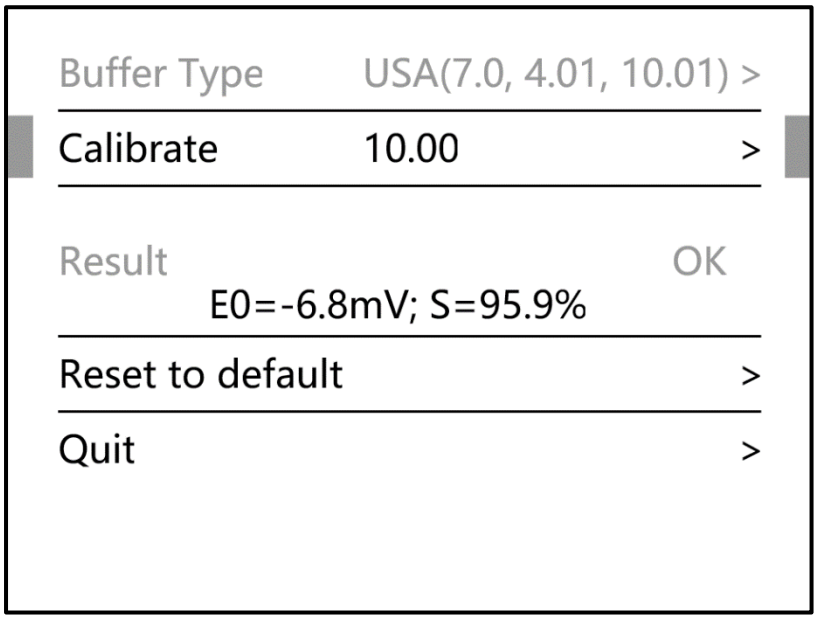
start the calibration of the second point. The cursor will automatically jump to the "Result" option, and the last calibration result will no longer be displayed. When the message on the right side changes from "In Progress" to "OK", the second point calibration is done and the new calibration result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

(Note: If the "Fault k, b" message appears, it means that the performance of the probe may have significantly deteriorated)



Till now, the two-point calibration of the pH probe is completed. If the third point calibration is not required, select "Quit" option and press "Confirm" to return to the main interface. If needed, the cleaned probe should be placed in the third point buffer solution (type "USA", pH10.01 for example) and stirred slowly for about 20s. Then select "Calibrate" option and press "Confirm" to start the calibration of the third point. 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 from "In Progress" to "OK", the third point calibration is done and the new calibration result will be displayed:

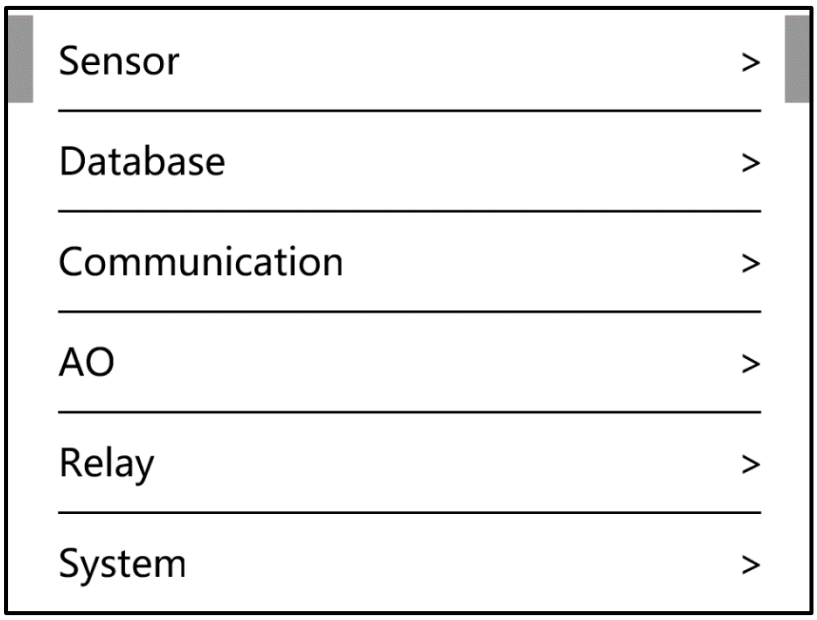
(Note: If the "Fault k, b" message appears, it means that the performance of the probe may have significantly deteriorated)



Till now, the three-point calibration of the pH probe is completed, select "Quit" option and press "Confirm" to return to the main interface.

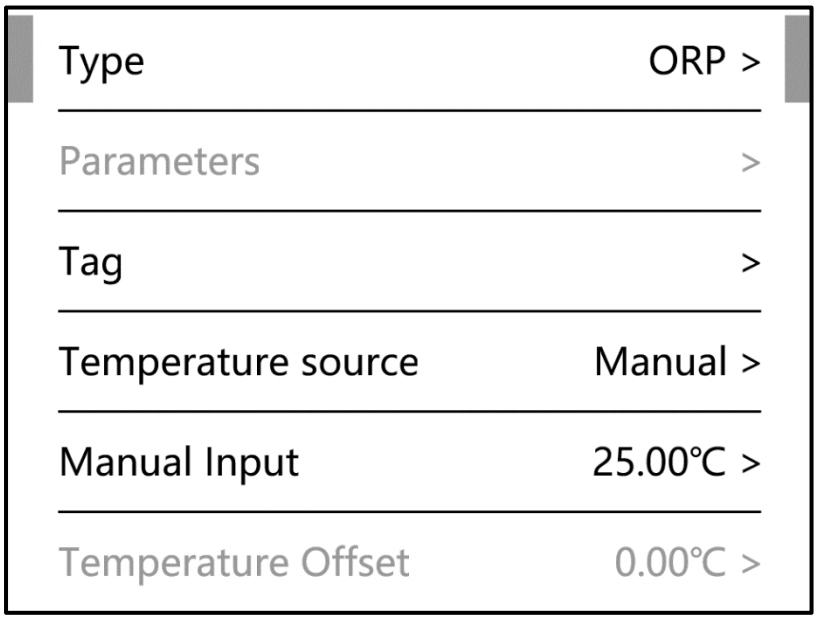
● ORP Probe Setting

After connecting the signal wire of the analog ORP probe to meter, the essential settings for the probe 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 Channel Setting

In the setting menu, select "Sensor" option and press "Confirm" or "Right" to enter the sensor channel setting sub-menu:



All options are introduced as follow:

"Type": Sensor type. When the cursor is located at "Type", you can use the "Left/Right" or "Confirm" key to choose between "pH" and "ORP". Be sure to pick "ORP" when using ORP probe.

"Tag": Tag of measuring point. Please refer to the "Tag" function description on page 14 for operating instructions.

"Temperature Source": Source of temperature value. Select it and you can use the "Left/Right" or "Confirm" key to choose the temperature source between "NTC10k", "Pt1000", "Pt100" and "Manual".

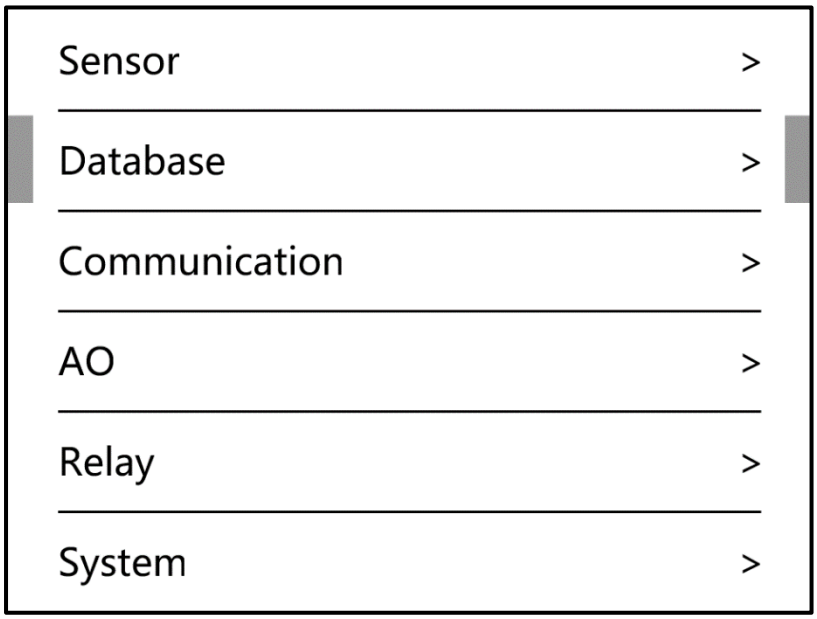
"Manual Input": This option becomes selectable when the above-mentioned "Temperature Source" option is set to "Manual". After selecting "Manual input", you can firstly switch the temperature unit between "℃" and "°F" by "Left/Right" key, then press "Confirm" to further set the desired temperature value (position the data input cursor by "Left/Right" key, then use "Up/Down" key to select options between number "0" to "9" in turn). When setting is done, press "Confirm"

to save.

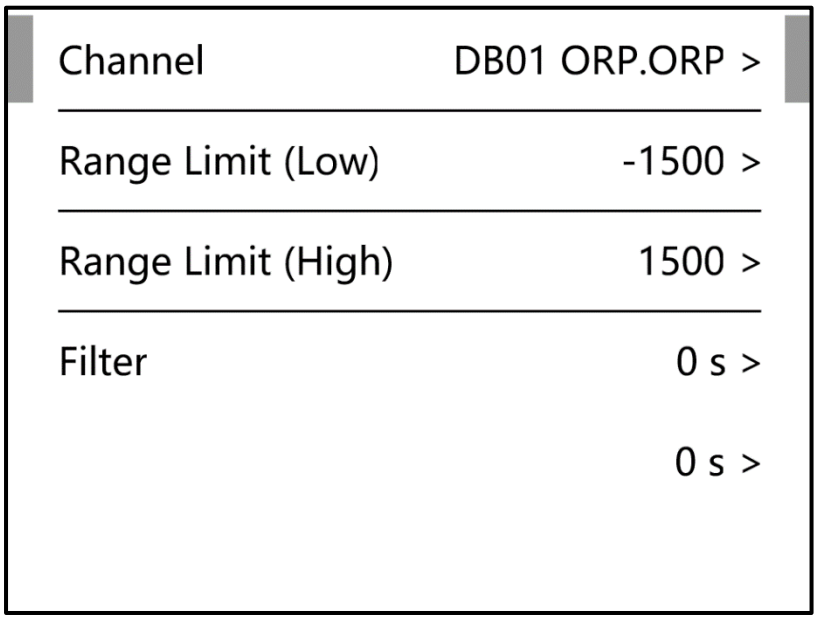
"Temperature Offset": This option becomes selectable when the above-mentioned "Temperature Source" option is set to "NTC10k", "Pt1000" or "Pt100". This offset can be used to fix the deviation between the measured temperature and the actual temperature. After selecting "Temperature Offset", you can firstly switch the temperature unit between "°C" and "°F" by "Left/Right" key, then press "Confirm" to further set the desired offset value (position the data input cursor by "Left/Right" key, then use "Up/Down" key to select options between number "0" to "9" in turn). When setting is done, press "Confirm" to save, and the value of the temperature displayed in the main interface will be the sum of the measured temperature and the offset value.

Database Channel Setting

Normally there is no need to set the database channel. But if you want to modify the displayed decimals of the measured value, or a different type of probe is replaced for the meter, the essential settings for the database channel 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):



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



All options are introduced as follow:

"Channel": Database channel. When the cursor is located at "Channel", you can select one of the four database channel by "Left/Right" or "Confirm" key. The default assignment rule for database channel is (take ORP meter application for example):

When "Type" of "Sensor" is set "ORP"		Unit
Database channel	Default signal source	
DB01 ORP .ORP	ORP measured value from ORP probe	mV
DB02 ORP .Temperature	Temperature measured value from ORP probe (or temperature value from manual input)	℃
DB03 ORP .Reserved		Not in use
DB04 ORP .Reserved		Not in use

"Range Limit (Low)"/"Range Limit (High)": Select one of these options and press "Confirm" to enter the range setting interface, then you can set the range and display decimals of the chosen database channel. The range of DB01 channel (ORP value) 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)
ORP probe	ORP value	-1500 to 1500 mV	-1500	1500
	Temperature	-20~120 ℃	-20.0	120.0

(Note: The change of the range limits setting will cause the linkage change of the alarm value setting. If the alarm function is enabled, the alarm setting in the "relay output" option should be confirmed immediately after changing the range limits setting)

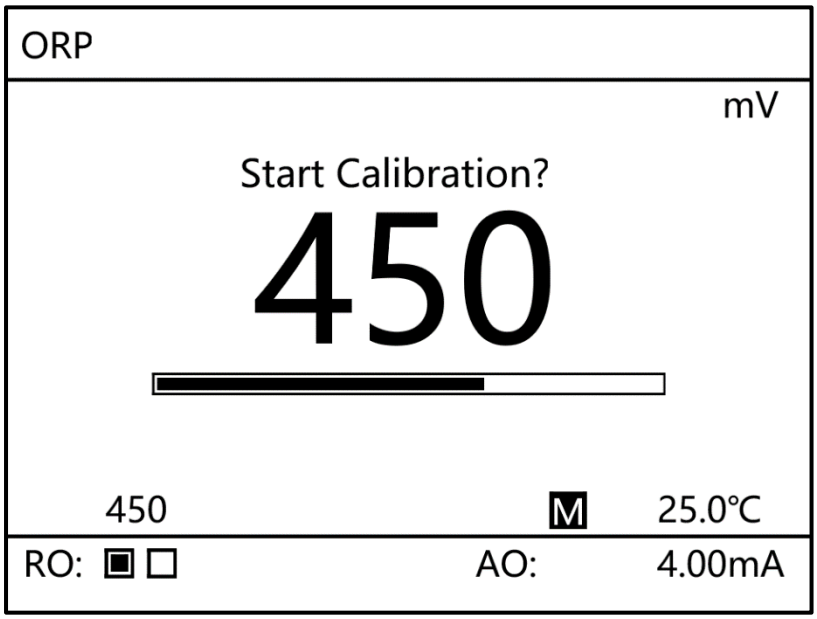
In the range setting interface, you can position the data input cursor by "Left/Right" key, then use "Up/Down" key to select options between "-" (minus sign), "." (decimal point) and number "0" to "9" in turn. When setting is done, press "Confirm" to save.

"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 0~255. The value in the second row stands for the display updating frequency for the parameter, and the setting range is 0~15, keeping default recommended.

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

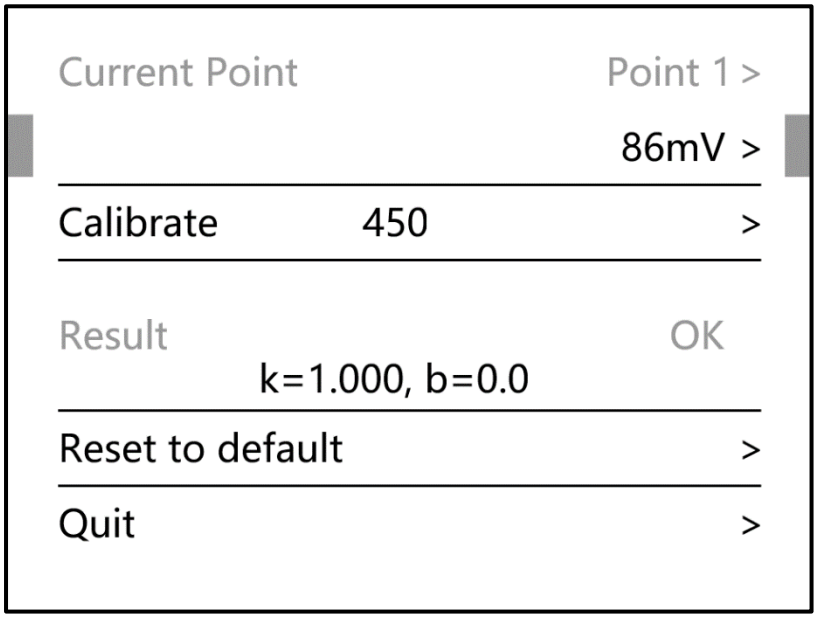
● ORP Probe Calibration

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



If you accidentally press the "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 calibrate the probe, 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 of the ORP probe:

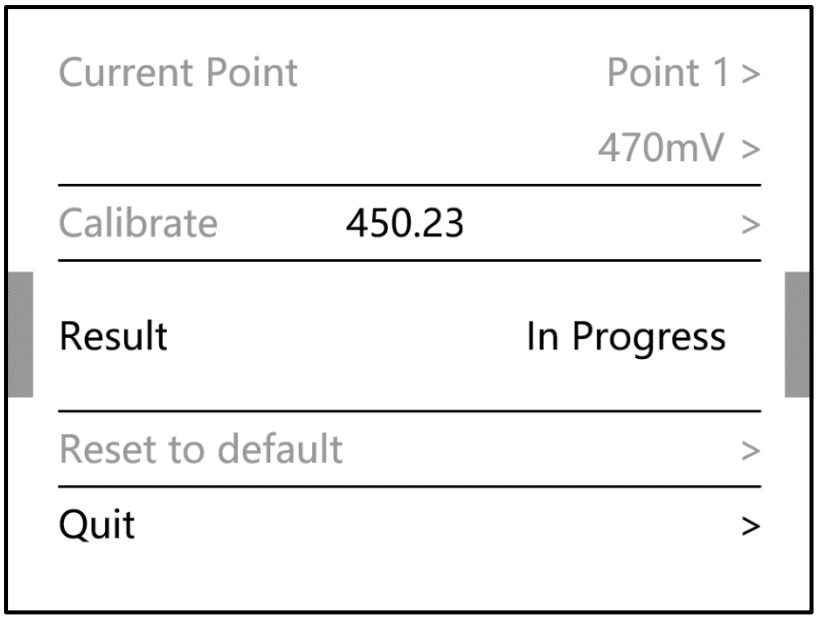


The "Result" option row in the calibration interface displays the last calibration result stored by the meter. The factory default value is "k=1.000, b=0.0". Meanwhile, the "Reset to default" option is provided. Select "Reset to default"

option and press "Confirm" will restore the calibration results stored in the meter to the default value. The operation process of the ORP probe calibration is described as follow:

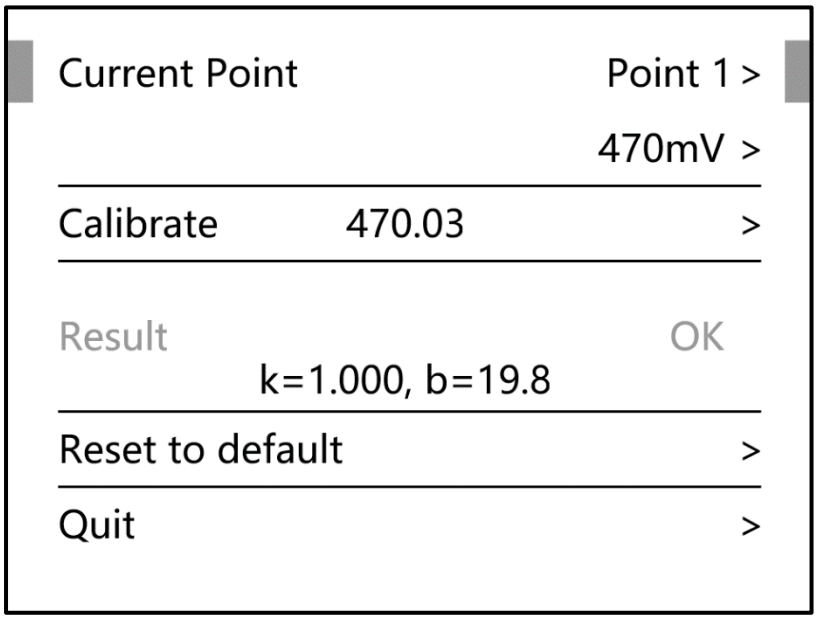
Step 1: Setting the ORP value of the ORP buffer solution. When entering the calibration interface, the cursor will be located at the buffer ORP value setting option for point 1. Press "Confirm" to further set the desired value (position the data input cursor by "Left/Right" key, then use "Up/Down" key to select options between "-" (minus sign) and number "0" to "9" in turn). When setting is done, press "Confirm" to save.

Step 2: Performing the first point calibration. The cleaned probe should be placed in a first point buffer solution (470mV ORP buffer for example) and stirred slowly for about 20s. The centered reading of the "Calibrate" option row is the real-time ORP value measured by the probe. Then select "Calibrate" by "Up/Down" key and press "Confirm" to start the calibration of the first point:



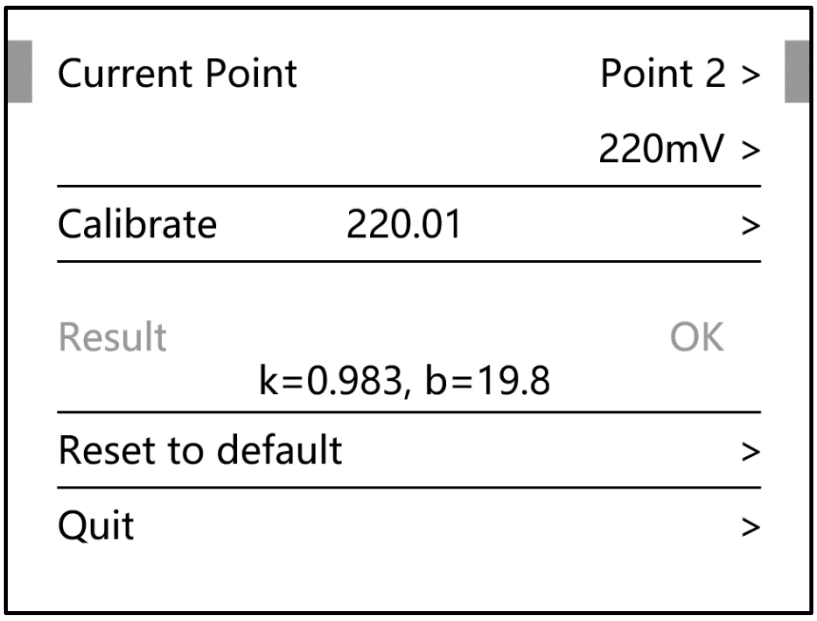
The cursor will automatically jump to the "Result" option, and the last calibration result will no longer be displayed. When the message on the right side changes from "In Progress" to "OK", the first point calibration is done and the new calibration result will be displayed:

(Note: If the "Fault k, b" message appears, it means that the performance of the probe may have significantly deteriorated)



Till now, the single-point calibration of the ORP probe is completed. If the second point calibration is not required, select "Quit" option and press "Confirm" to return to the main interface. If needed, the cleaned probe should be placed in the second point buffer solution (220mV ORP buffer for example) and stirred slowly for about 20s. Then select "Calibrate" option and press "Confirm" to start the calibration of the second point. 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 from "In Progress" to "OK", the second point calibration is done and the new calibration result will be displayed:

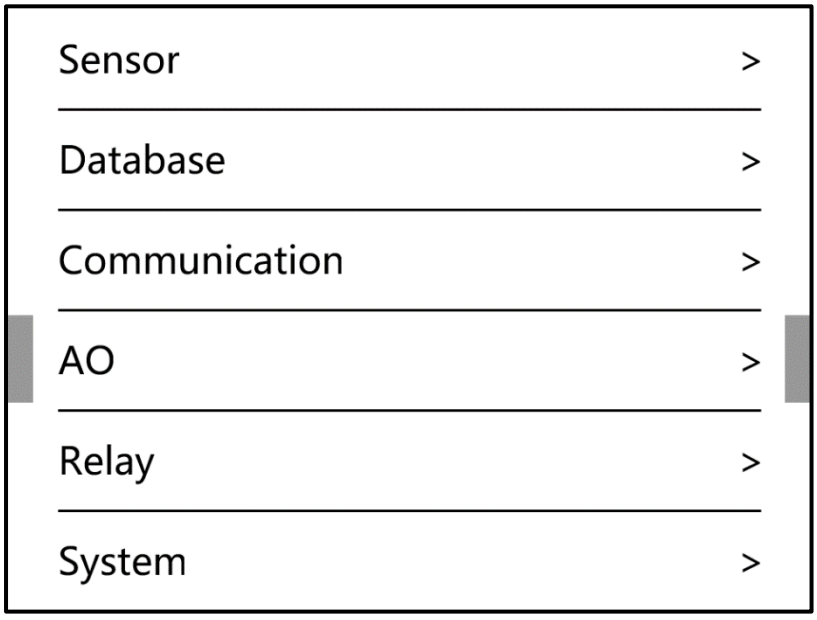
(Note: If the "Fault k, b" message appears, it means that the performance of the probe may have significantly deteriorated)



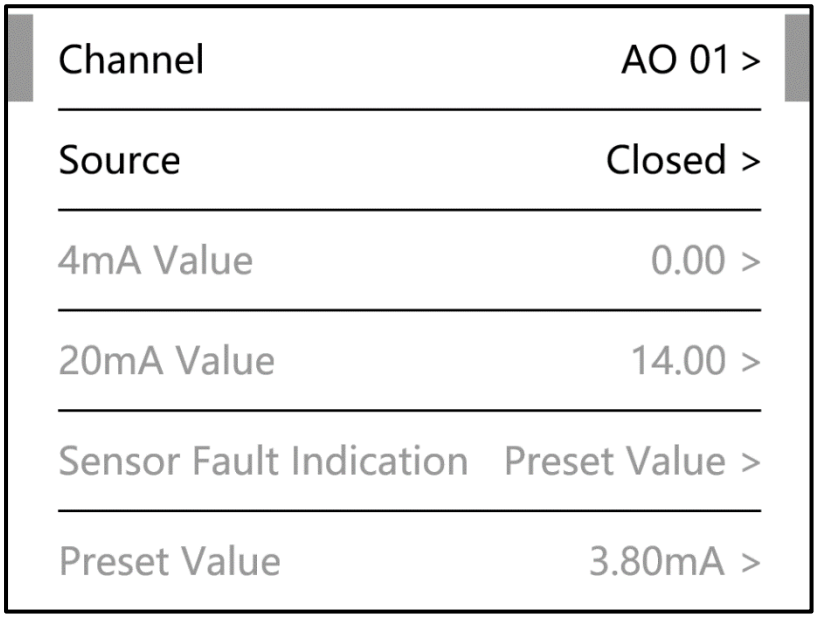
Till now, the two-point calibration of the ORP probe is completed, select "Quit" option and press "Confirm" to return to the main interface.

● Analog Output

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



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

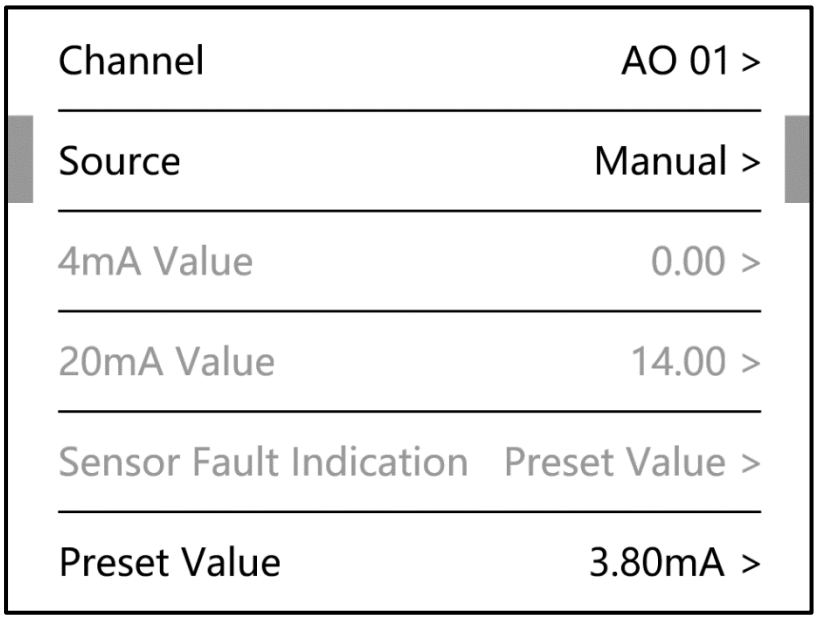


The meter provides two AO channels. When the cursor is located at "Channel", you can use the "Left/Right" or "Confirm" key to choose between "AO 01" and "AO 02".

The "Source" option of the AO channel represents whether the channel is enabled and signal source of it. When "Source" 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:

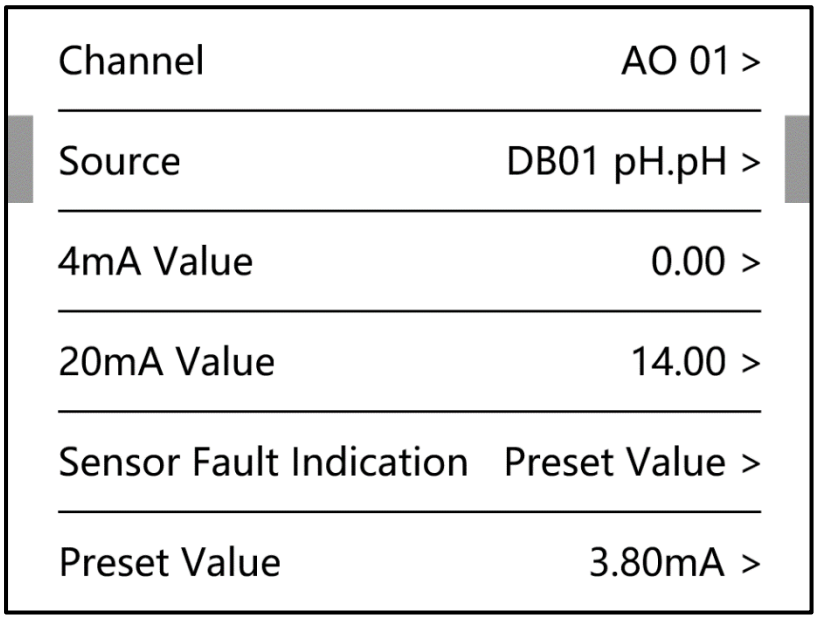
Status	Source	Description
Not enabled	Closed	Analog output channel closed.
Manual output	Manual	Output the manually preset value of current.
Transmitter	DB01 to DB03	Transmit the measured value of a desired parameter to 4-20mA. DB01 is the primary measured value. DB02 is usually temperature measured value. DB03 is the other measured value from the digital probe.

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



Then you can select "Preset Value" option and press "Confirm" to further set the preset value for manual output (position the data input cursor by "Left/Right" key, then use "Up/Down" key to select options between number "0" to "9" in turn). When setting is done, press "Confirm" to save.

If transmission output is needed, the "source" option should be set to the database channel representing the desired parameter. The boundary for 4mA and 20mA can be set according to the actual application requirements. The interface is as below (taking pH application for example):



The "source" option is set to "DB01 pH.pH" in the figure above, indicating that

the "AO 01" channel is used to transmit the pH measured value according to the application range of 0 to 14.

When performing transmission, if the system detects a thermistor failure, a specific value of the output current can be used to make an indicating to the monitoring system which the current loop is connected to. When "Sensor Fault Indication" option is selected, you can choose the desired setting by "Left/Right" or "Confirm" key, as described below:

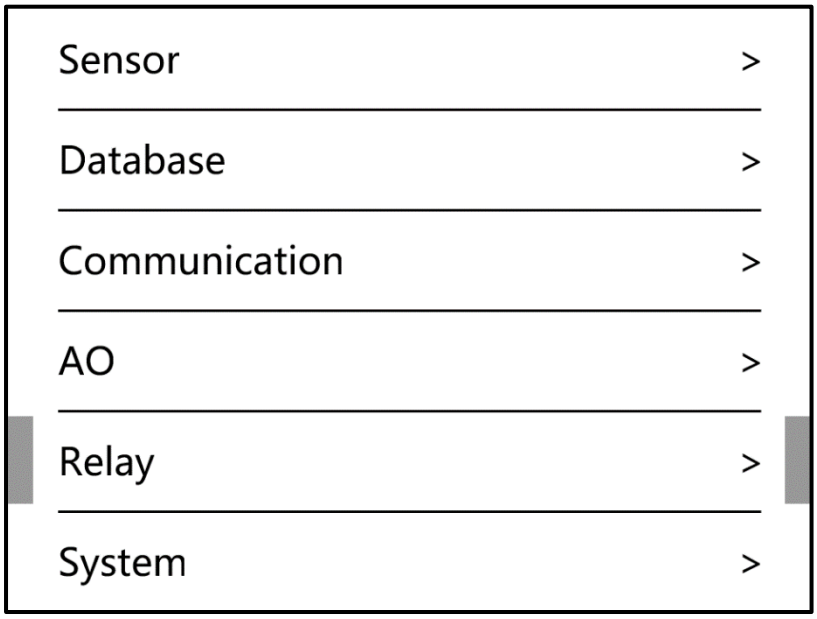
Options for sensor fault indication	Current output when thermistor failure detected
Preset Value	The manually preset value
4mA	4.00mA
20mA	20.00mA
Hold	Keep the last valid output value

After completing the AO setting and returning to the main interface, the new configuration 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:

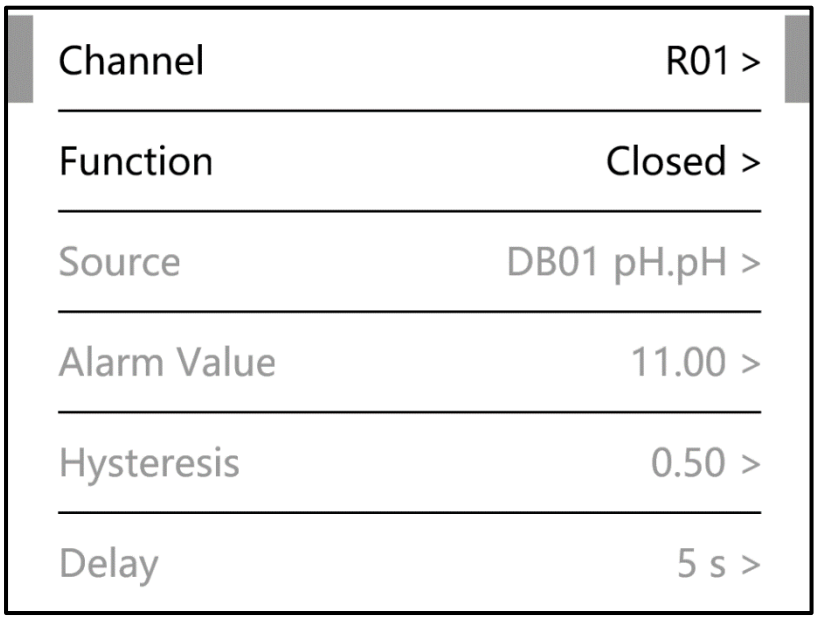
Display	Indication
	Open-circuit failure of the current loop detected.

● Relay Output (Including auto-clean control)

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



The meter provides three SPDT relays. When the cursor is located at "Channel" option, you can select "R01", "R02" or "R03" by using "Left/Right" or "Confirm" key. When the relay channel is selected, the options below are all for the chosen channel.

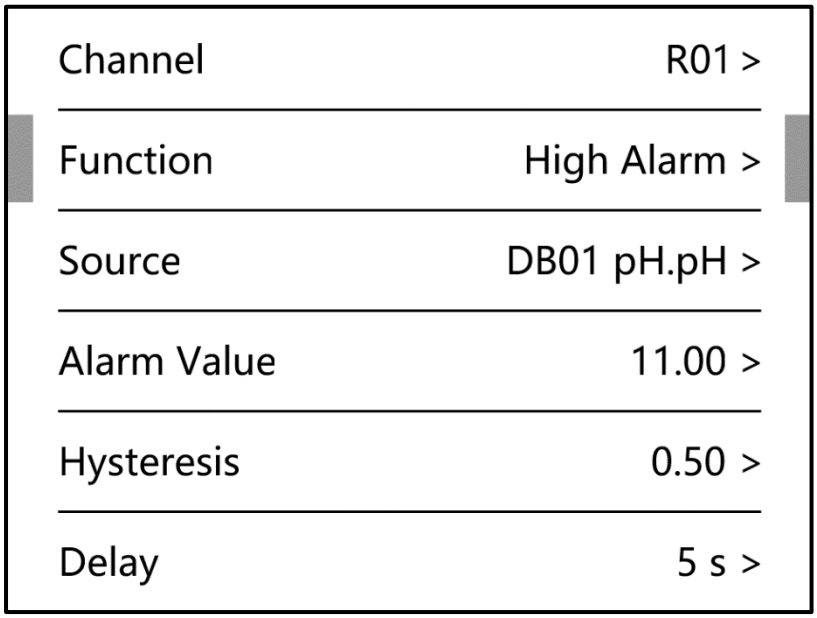
The "Function" option of the relay channel represents whether the channel is enabled and the designated function. When "Function" option is selected, you can use "Left/Right" or "Confirm" key to alternately select each option on the right

side of it, as explained below:

Status	Function		Description
Not enabled	Closed		Relay output channel closed.
Manual output	Manual		Output the manually preset state of the relay.
Alarm	R01	High Alarm	Perform high alarm function for a desired parameter.
	R02	Low Alarm	Perform low alarm function for a desired parameter.
Auto-clean	R03	Auto-clean	Perform auto-clean output according to configuration.

Relay for Alarm Output

If alarm output function is needed, please refer to the corresponding content in the above table to set the "Function" option of the relay output channel:



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

"Source": The signal source of the alarm (high alarm for "R01" and low alarm for "R02"). When the cursor is located at "Source" option, you can select from DB01 to DB03 (in pH application) by "Left/Right" or "Confirm" key. In the figure above, the "DB01 pH.pH" is selected, indicating that the high alarm signal source of "R01" is designated as the pH measured value from the pH probe.

"AIarm Value": The threshold value to trigger the alarm (high alarm for "R01" and low alarm for "R02"). Select it and press "ConÞrm" to further set the desired threshold value (position the data input cursor by "Left/Right" key, then use "Up/Down" key to select options between "-" (minus sign) and number "0" to "9" in turn). When setting is done, press "Confirm" to save.

"Hysteresis": The alarm hysteresis. Select it and press "Confirm" to further set the hysteresis value (position the data input cursor by "Left/Right" key, then use "Up/Down" key to select options between number "0" to "9" in turn). When setting is done, press "Confirm" to save. A hysteresis value requires the measured value to return within the threshold by a specified value before the relay is deactivated.

"Delay": Delay time for triggering an alarm in seconds. Select it and press "Confirm" to further set the desired length of time (position the data input cursor by "Left/Right" key, then use "Up/Down" key to select options between number "0" to "9" in turn). When setting is done, press "Confirm" to save. A time delay requires the threshold to be exceeded continuously for the specified length of time before activating the relay. The relay will not be activated if the alarm condition disappears before the delay period is over. The default value for "Delay" option is "5s".

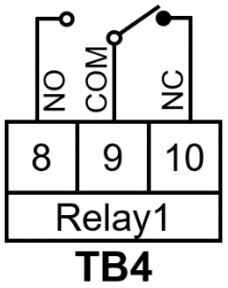
"Min. Changeover Interval": The minimum time interval between the two different states of the relay output. That is, from the time when the relay switched the output state, the state will be maintained for at least the specified length of time before the new output state switching instruction is actually executed. This function helps to avoid frequent actions of contacts on critical conditions in specific scenarios. Select "Min. Changeover Interval" option and press "Confirm" to further set the desired duration in seconds (position the data input cursor by "Left/Right" key, then use "Up/Down" key to select options between number "0" to "9" in turn). When setting is done, press "Confirm" to save. The default is "0s".

After completing relay output setting and returning to the main interface,

the new configuration takes effect. You can check the real-time state of relay output channel at the bottom left of the main interface. The left and middle square shape respectively indicates the state of relay 1 (high alarm) and relay 2 (low alarm):

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

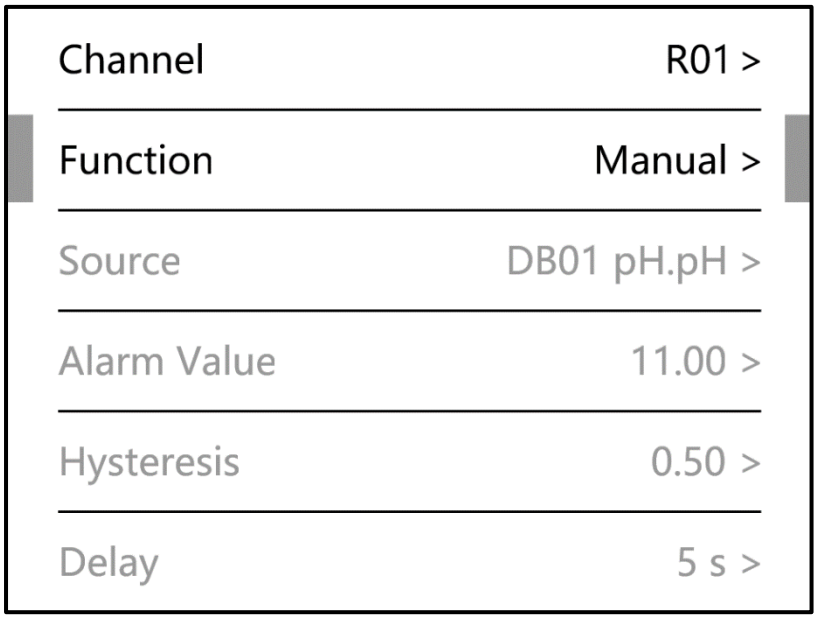
Refer to the table below for states of relay (taking relay 1 for example):



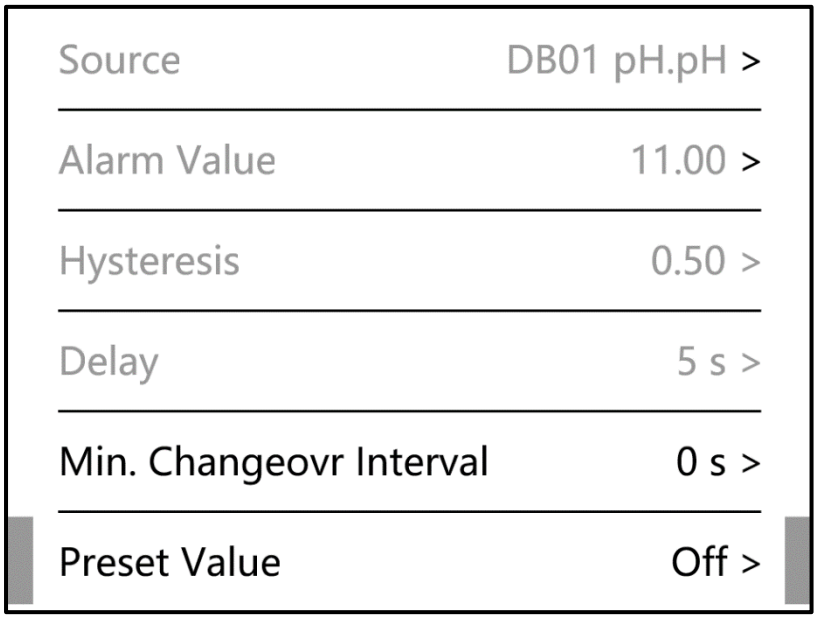
State of Relay 1 (R01)	Actual state of contacts between	
	NO1 and COM1	NC1 and COM1
Alarm off	Break	Make
Alarm on	Make	Break

Relay for Manual Output

When "Function" option is set to "Manual" (taking relay 1 for example):



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

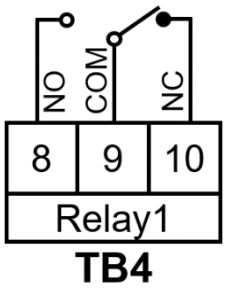


Select "Preset Value" option and you can use the "Left/Right" or "Confirm" key to choose between "Off" and "On".

After completing relay output setting and returning to the main interface, the new configuration takes effect. You can check the real-time state of relay output channel at the bottom left of the main interface. The left and middle square shape respectively indicates the state of relay 1 and relay 2:

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

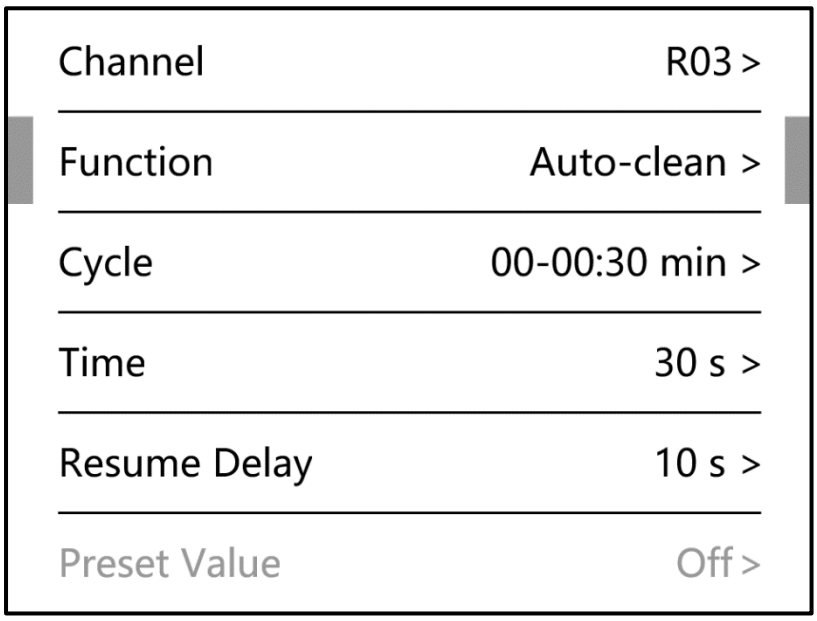
Refer to the table below for states of relay (taking relay 1 for example):



State of Relay 1 (R01)	Actual state of contacts between	
	NO1 and COM1	NC1 and COM1
Manual off	Break	Make
Manual on	Make	Break

Relay for Auto-Clean Control

If auto-clean control is needed, please refer to the corresponding content in the table on page 50 to choose channel R03 and set the "Function" option to "Auto-clean":



The rest three options are introduced as follows:

"Cycle": The interval between two auto-cleaning process for the probe. Select it and press "Confirm" to enter the interval setting interface. The time format is "DD-HH:MM" (day-hour:minute). Press "Confirm" to save the setting.

"Time": Duration of each auto-clean process in seconds. Select it and press "Confirm" to enter the duration setting interface. Press "Confirm" to save the setting.

(Note: During auto-cleaning process, the word "hold" will be displayed in the main interface above the probe reading, the probe reading and the analog output will remain as the last value before the cleaning starts.)

"Resume Delay": The delay (in seconds) from the end of cleaning to returning to normal measurement. Select it and press "Confirm" to enter the duration setting interface. Press "Confirm" to save the setting.

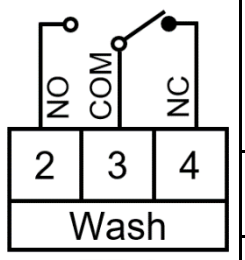
(Note: During the delay, the word "hold" will be displayed in the main interface above the probe reading, the probe reading and the analog output will remain as the last value before

the cleaning starts. when delay is completed, the word "hold" in the main interface will disappear, the probe reading and the analog output will resume.)

After completing relay output setting and returning to the main interface, the new configuration takes effect and the first cleaning is performed directly. You can check the real-time state of relay 3 at the bottom left of the main interface. The third square shape from left indicates the state of relay 3:

Display	Indication
■	The relay is activated. (Cleaning being carried out)
□	The relay is deactivated. (No cleaning was carried out)
▬	The relay output is not enabled.

Refer to the table below for states of auto-clean relay (R03) output:



State of Relay 3 (R03)	Actual state of contacts between	
	NO3 and COM3	NC3 and COM3
Off	Break	Make
On	Make	Break