INDUSTRIAL CONDUCTIVITY METER

User's Manual

Mode: EC-6801X

Basic Safety Guidelines:

Personnel requirements:

● Only trained professional technicians are allowed to install, debug, operate, and maintain the measurement system.

● Technical personnel performing specific operations must be authorized by the factory.

● Only electricians are allowed to make electrical connections to the equipment.

● Technical personnel must read the "Operation Manual", understand and comply with its various regulations.

● Only authorized personnel with professional training are allowed to troubleshoot measurement points.

Note: *Only manufacturers or their service providers are allowed to directly perform maintenance operations not described in the operating manual.*

Workplace Safety:

Users are responsible and must comply with the requirements of the following safety standards.

- Installation Guide
- Local standards and regulations
- Explosion protection regulations

Product Safety:

The product design meets the strictest safety requirements and can work safely through factory testing. It is necessary to comply with relevant regulations and international standards.

● Power can only be supplied after all wiring is completed and checked for accuracy to avoid danger.

● Please avoid installing this transmitter in high temperature, high humidity, and corrosive environments, and avoid direct sunlight exposure.

● The electrode signal transmission line must use special cables. It is recommended to use the cables provided by our company, and do not replace them with ordinary wires.

● When using a power supply, interference caused by power surge should be avoided, especially when using a three-phase power supply, the ground wire should be used correctly. If there is power surge interference, the power supply of the transmitter and control devices such as the dosing machine, mixer, etc. can be separated, that is, the transmitter can use a separate power supply, or a surge absorber can be connected to all electromagnetic switches and power control device coil ends to eliminate the surge.

● When using the output contacts of this transmitter for alarm or control loads for safety and protection reasons, please make sure to connect an external relay with sufficient current resistance to carry it, to ensure the safety of instrument use.

● To make the measurement more accurate, the instrument needs to calibrate the electrodes regularly. After one year of leaving the factory, its performance will be affected regardless of whether it is used or not, and it should be replaced in a timely manner.

● If the instrument is found to be working abnormally or damaged during use, please contact the dealer and do not repair it on your own.

● This instrument only has one electrode input terminal. When replacing sensors with different electrode constants, please set a new electrode constant on the instrument.

● Before performing calibration work, please power on the instrument and preheat it for about 10 minutes.

Content

1. Performance Characteristics

The EC-6801X Industrial Conductivity (TDS) Instrument can continuously measure and control the TDS values of various industrial water uses. This device is widely used in scientific experimental equipment, chemical industry, pharmaceuticals, environmental protection, metallurgy, paper making, food, beverage, and water supply industries.

The main features of this product are:

● Factory standard configuration with Chinese interface, language menu, and the ability to switch between Chinese and English;

● Can measure conductivity, resistivity, total dissolved solids, and salinity;

● Can freely set temperature compensation mode, temperature compensation coefficient, etc;

● Dual relay for high and low limit alarms, with adjustable hysteresis;

● Instrument mode isolation transmission port, with a maximum loop resistance greater than 300 Ω;

● Support RS485 digital communication based on Modbus (RTU);

● The LCD backlight can be selected in energy-saving mode and automatically turned off at a fixed time;

● High performance CPU with good electromagnetic compatibility performance;

● Password management function to prevent accidental operations by non professionals;

2. Main Parameters

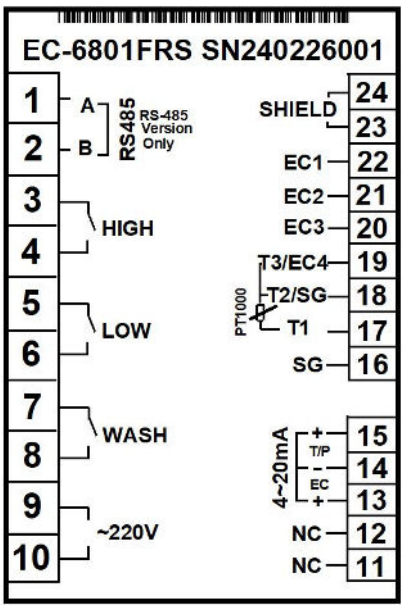
Model		EC-6801X
Tested parameters		Conductivity, temperature
Measure range	K=0.01	0.02～20 uS/cm
	K=0.1	0.2～200 uS/cm
	K=1	2～2000 uS/cm
	K=10	20～20000 uS/cm
	Four-pole conductivity sensor	200～200000 uS/cm (Customizable)
Temperature range	0～130℃ (Resolution 0.1℃)	
Accuracy	+ 1% FS	
Stability	±1%（FS）/24h	
Display Method	128 * 64Dot matrix LCD	
Temperature Compensation	0–100 ℃ manual/ automatic (PT1000)	
Working pressure	10 Bar	

Medium temperature	0-100 ℃
Temperature compensation element	PT1000
Operating temperature	-10℃~60℃
Storage temperature	-20℃~70℃
Digital signal output	RS485 output (customization required)
Cable Length	Standard 5 meters, customizable
Analog signal output	4-20mA isolation protection output maximum loop resistance 300 Ω
Alarm in	One set of high and low limit alarm contacts (3A/250 V AC), normally open contact relay
Thread	Default 3/4" up and down connection
Power Supply	AC 220V±10% 50Hz
Power consumption	≤3W
Ambient Condition	Temperature 0～ 60 ℃； Humidity≤85%RH
Shell Material	ABS
Display screen material	PMMA
Material	Stainless Steel
External dimensions	96mm×96mm×110mm（high × wide × deep）
Dimension	92×92mm（high × wide）
Weight	0.8kg

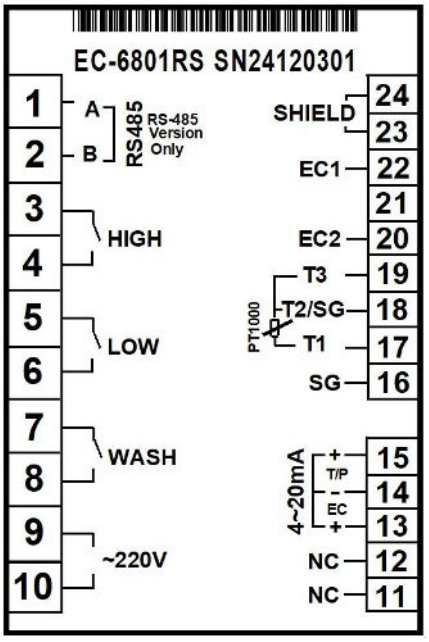
3. Wiring Instructions

3.1 Backboard Display

3.1.1 EC-6801F Backboard



3.1.2 EC-6801 Backboard



3.2 Backboard Contacts

3.2.1 EC-6801F Backboard Contact Description

NO.	Contact	Wiring instructions
24, 23	SHIELD	Shielding wire
22	EC1	Four-poles EC sensor: connected to conductivity sensor Two-poles EC sensor: need to be short circuited with EC2 and connected to a conductivity sensor
21	EC2	Four-poles EC sensor: connected to conductivity sensor Two-poles EC sensor: need to be short circuited with EC1 and connected to a conductivity sensor
20	EC3	Four-poles EC sensor: connected to conductivity sensor Two-poles EC sensor: need to be short circuited with EC4 and connected to a conductivity sensor
19	EC4/T3	Four-poles EC sensor: Connected to the conductivity electrode, the common end for conductivity and temperature Two-poles EC sensor: need to be short circuited with EC3 and connected to a conductivity sensor The other end of the temperature measurement line needs to be short circuited to EC4/T3 in a two wire system
18	T2/SG	The other end of the temperature measurement line needs to be short circuited to EC4/T3 in a two wire system
17	T1	Common end of temperature measurement line
16	SG	Solution grounding terminal (internally short circuited to REF)
15	4-20mA 2	Temperature 4-20mA output terminal +
14	COM	4-20mA output terminal -
13	4-20mA 1	Conductivity 4-20mA output terminal +

12, 11	NC	Undefined
10, 9	220V	220V Power supply
8, 7	WASH	Cleaning contacts
6, 5	Lo	Low point control normally open contact
4, 3	Hi	High point control normally open contact
2	RS485B	485 communication interface B
1	RS485A	485 communication interface A

3.2.2 EC-6801 Backboard Contact Description

NO.	Contact	Wiring instructions
24, 23	SHIELD	Shielding wire
22	EC1	Connect one end of the conductivity electrode
21	NC	Undefined
20	EC2	Connect the other end of the conductivity electrode
19	T3	Connect the other end of the temperature probe. When the two-wire connection is used, this contact does not need to be connected. This contact must be short-circuited with T2 (a short-circuit sheet is included when leaving the factory).
18	T2/SG	Connect the other end of the temperature probe. When the two-wire connection is used, this contact must be paired with T1.
17	T1	Common end of temperature measurement line
16	SG	Solution grounding terminal (internally short circuited to REF)
15	4-20mA 2	Temperature 4-20mA output terminal +
14	COM	4-20mA output terminal -
13	4-20mA 1	Conductivity 4-20mA output terminal +
12, 11	NC	Undefined
10, 9	220V	220V Power supply
8, 7	WASH	Cleaning contacts
6, 5	Lo	Low point control normally open contact
4, 3	Hi	High point control normally open contact
2	RS485B	485 communication interface B
1	RS485A	485 communication interface A

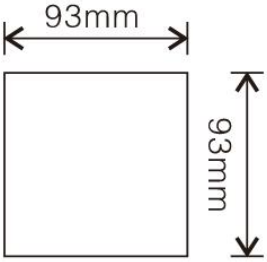
4. Instrument Installation

4.1 Instrument Installation Method

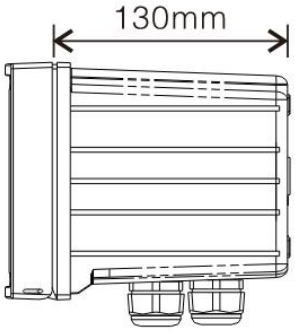
Controller fixation: The controller can be disk mounted, pipeline mounted, or wall mounted.

Panel installation: Please leave a 93*93mm square hole on the distribution box panel in advance and insert the plastic clip into the groove on the side of the instrument panel for fixation.

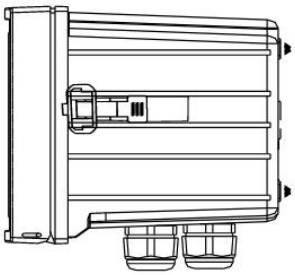
4.1.1 Panel Type Installation



Hole size

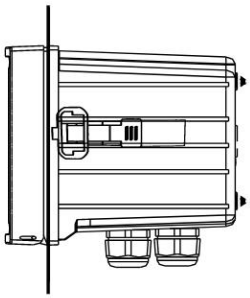


Side View

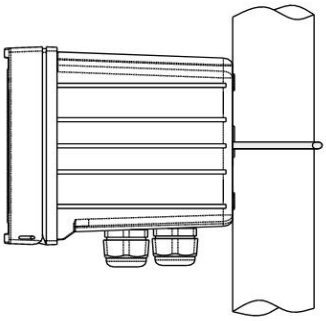


Holder

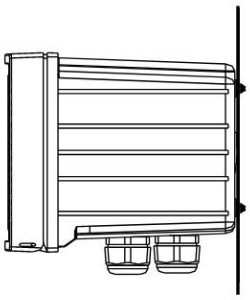
4.1.2 Installation Method



Disk installation
Secure with plastic clips.

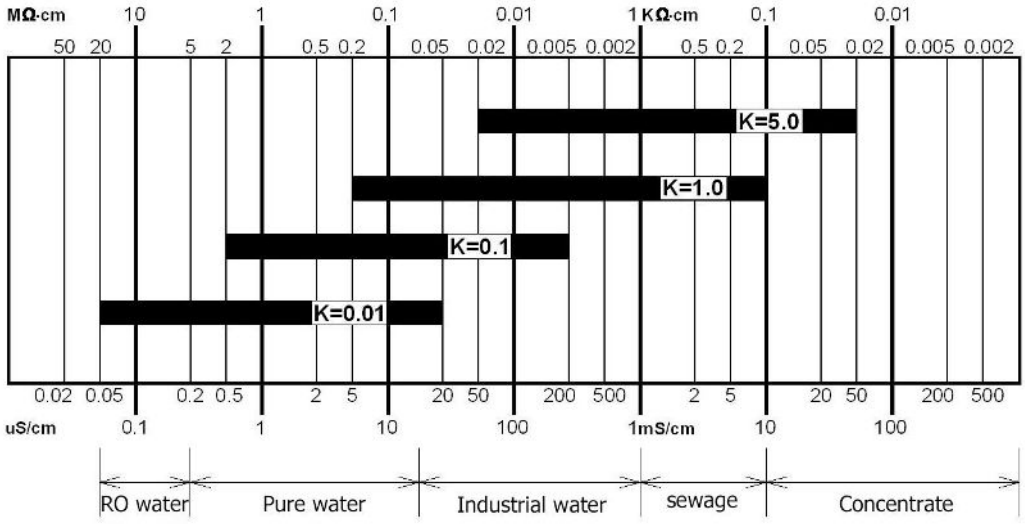


Tube installation
Fix with U-shaped tube.

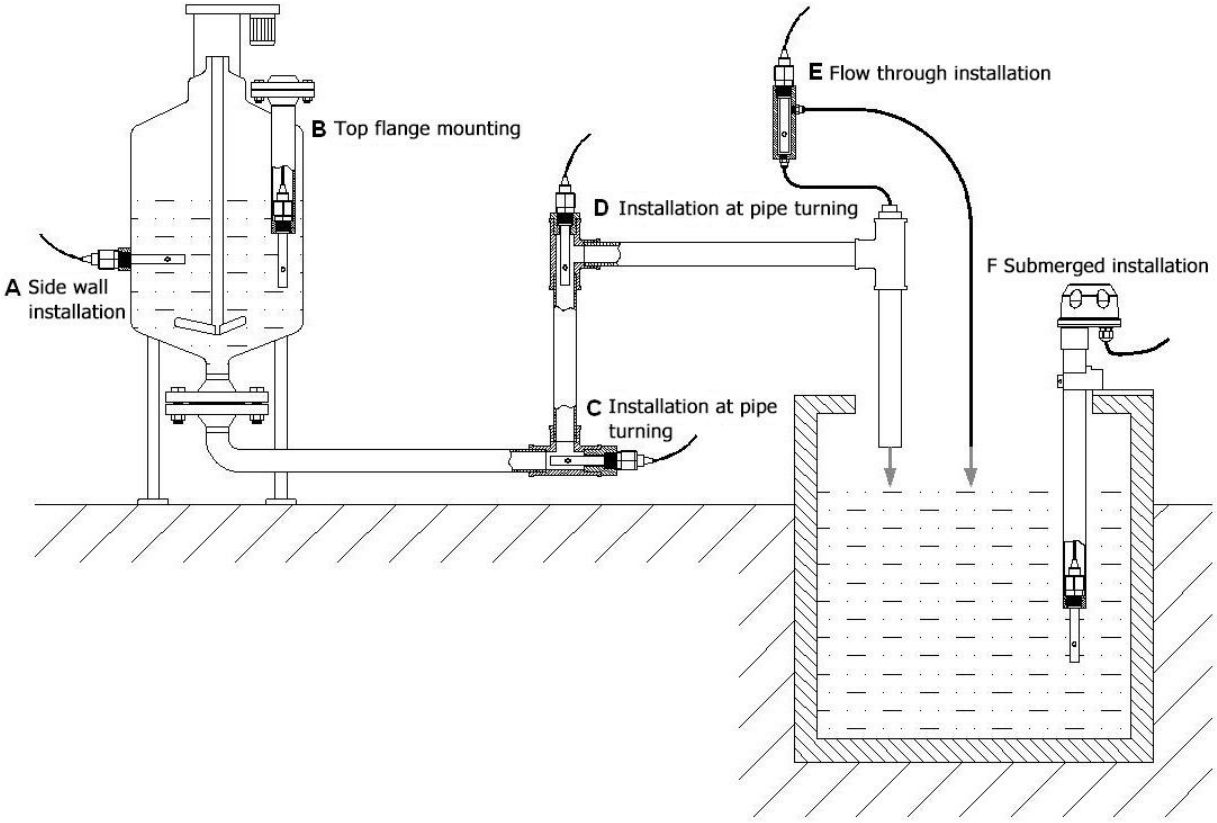


Wall mounted installation
Fix with 4 M5 screws.

4.2 Selection Of K Value



4.3 Sensor Installation



Common installation methods of sensors

Installing the sensor is a very careful work. The wrong installation method can not obtain accurate measurement data. Please carefully select the installation position and think about the installation method when installing the sensor, so as to avoid distortion of measurement data.

1) In fig. A, the electrode joint is too long and the extension part is too short, so it is easy to form a dead cavity in the sensor, resulting in measurement error. It should be installed according to fig. B (go deep in the direction of FLOW).

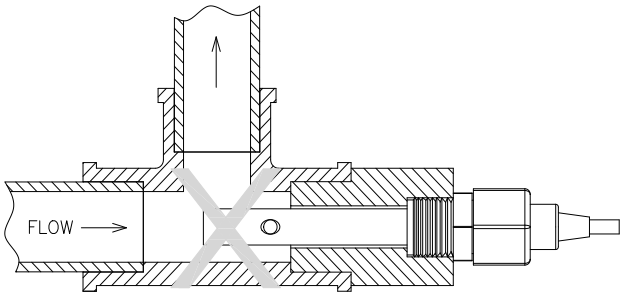


Fig. A Incorrect installation method

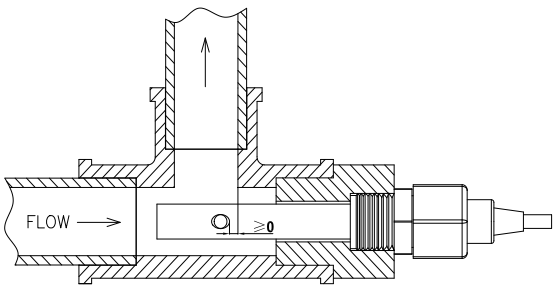
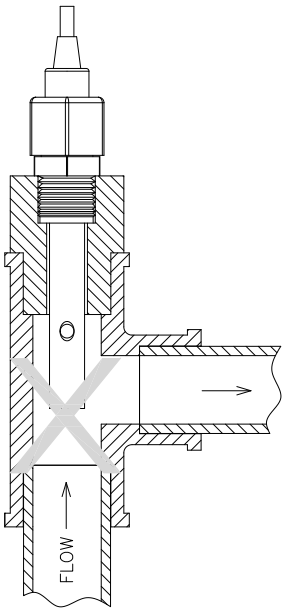


Fig. B correct installation method

2) The installation method in fig. A will make the flow cell form an air chamber, resulting in measurement error and stability. It shall be installed according to fig.



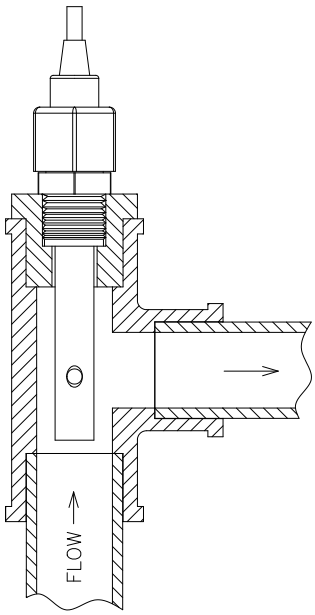
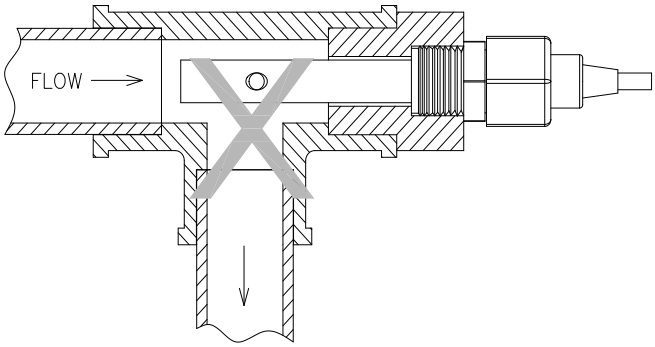


Fig. A Incorrect installation method **Fig. B correct installation method:** The circular hole

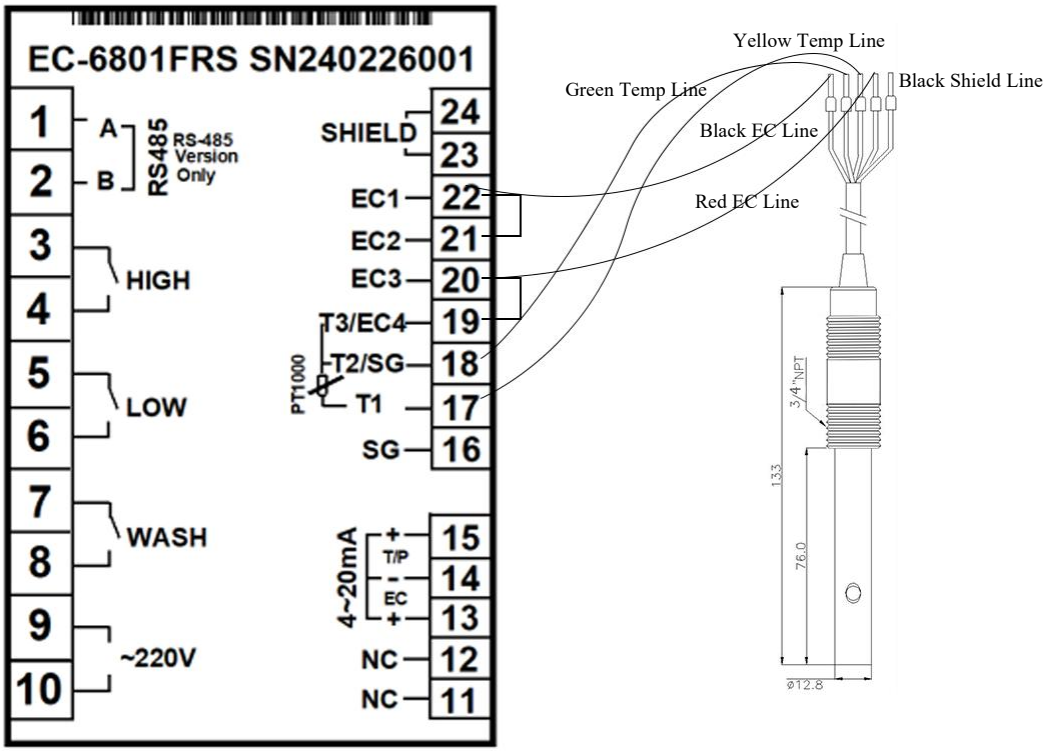
3) Other common installation errors.



The installation method in the drawing will cause measurement error or instability due to the inability of water to full fill the pipeline or the accumulation of gas at high places.

4.4 Sensor Size And Wiring

4.4.1 EC-6801F and Conductivity Sensors



1) Yellow temperature: connected to temperature common terminal **T1**;

2) Green temperature: connect to **T2/SG or T3/EC4**, and short circuit to **T3/EC4** when using a two wire system;

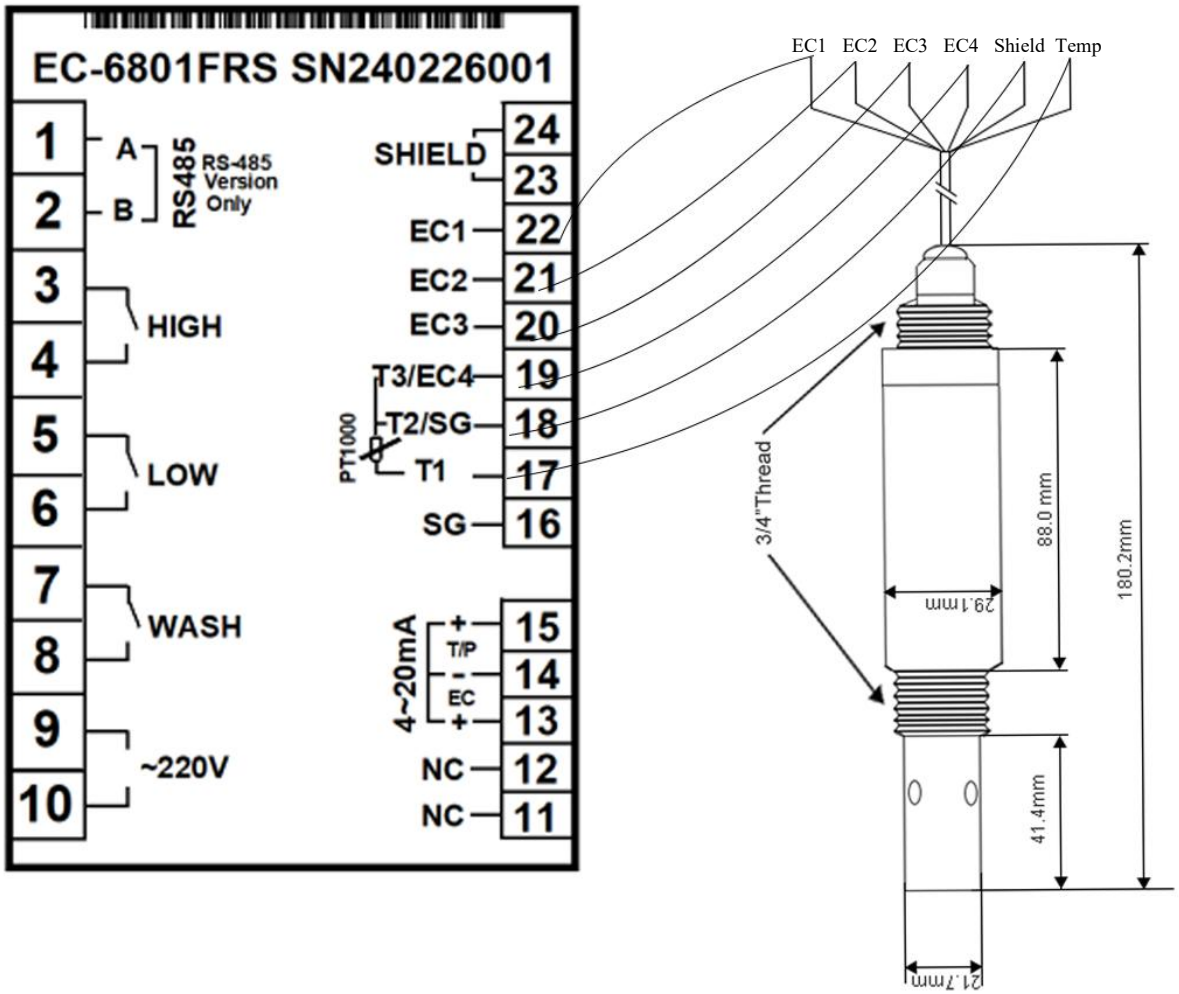
3) Black measurement: connect one end of **EC1 or EC2**;

4) Red measurement: connect one end of **EC3 or T3/EC4**;

5) Black shielded wire: optional.

Note: When connecting a two pole conductivity sensor, EC1 and EC2 should be short circuited, while EC3 and EC4 should be short circuited too.

4.4.2 EC-6801F and Four-Poles Conductivity Sensors

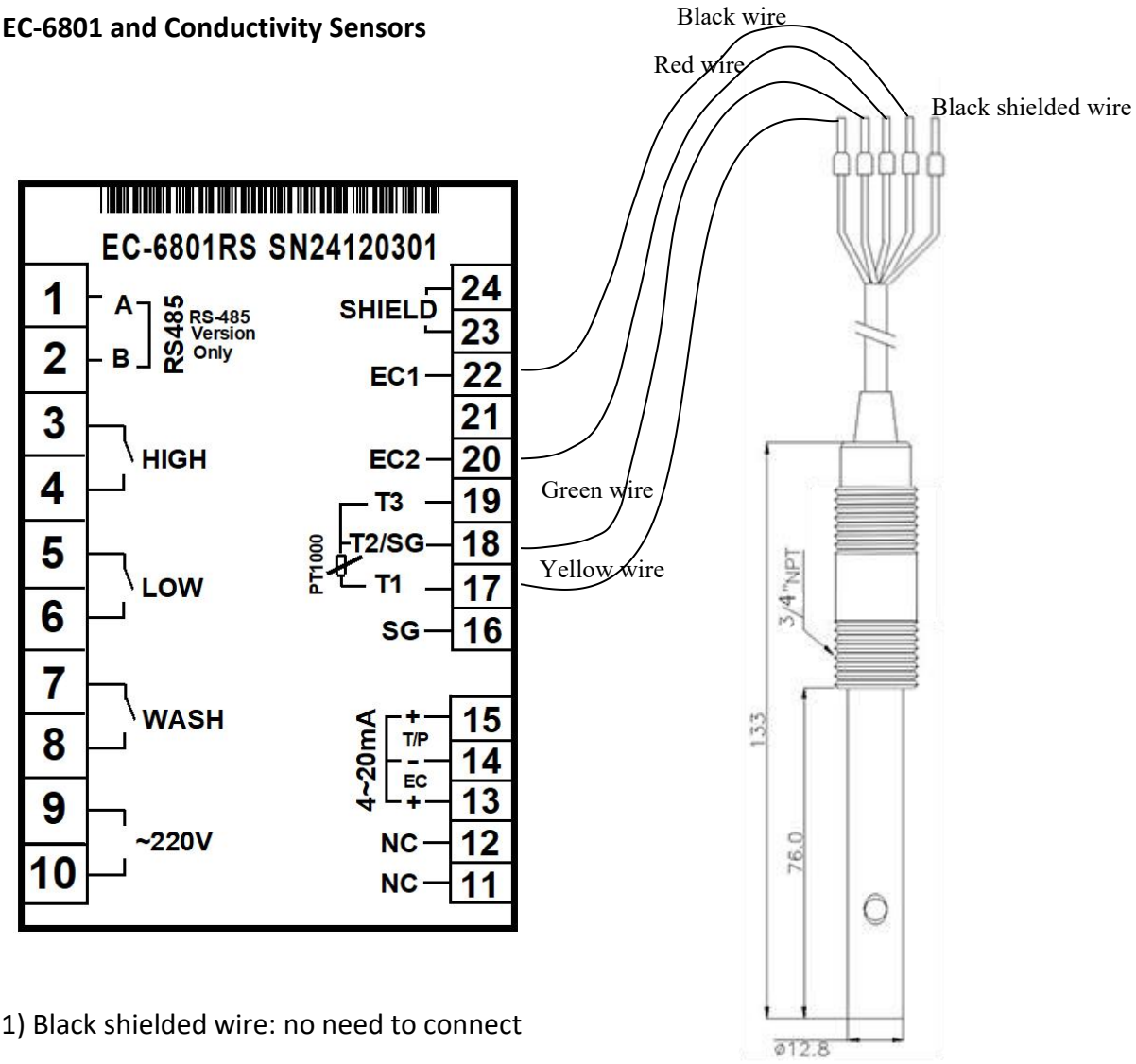


1) EC1, EC2, EC3, and EC4 wires correspond to the meter head interface

2) Temperature line connect to T1

3) When the shielded wire is connected to T2/SG and the two wire is used for temperature compensation, T2 and T3 need to be short circuited.

4.4.3 EC-6801 and Conductivity Sensors



1) Black shielded wire: no need to connect

2) Green temperature line: Connect to T2 or T3.

Note： When using two-wire temperature compensation, T2 and T3 need to be short-circuited.

3) Yellow temperature wire: Connect to temperature common terminal T1

4) Red measurement wire: Connect to EC2

5) Black measurement wire: Connect to EC1

4.5 Attention

1) The conductivity cell should be installed in the pipeline where the flow rate is stable and bubbles are not easily generated. It can be installed by side flow to avoid inaccurate measurement.

2) Concentric tubular electrodes should be installed horizontally, diagonally, or vertically with their front end facing the flow direction and penetrating into flowing water bodies; Electrodes with other structural shapes prevent measurement data from being disrupted during lateral installation in the measurement chamber due to turbulence induced drainage pressure.

3) The measurement signal belongs to weak electrical signals, and its collection cable must be

routed independently. It is prohibited to connect it with the power and control lines in the same group of cable joints or terminal boards. It is also prohibited to thread and tie it together with the power and control lines to avoid interference with the measurement or breakdown of the instrument measurement unit when damaged.

4) The electrode cables before leaving the factory are standard fixed length and specialized cables. Other specifications of cables cannot be replaced arbitrarily. Any unauthorized modification or alteration that does not meet the requirements will cause measurement errors. If the measurement cable needs to be extended, please agree with the manufacturer before supply.

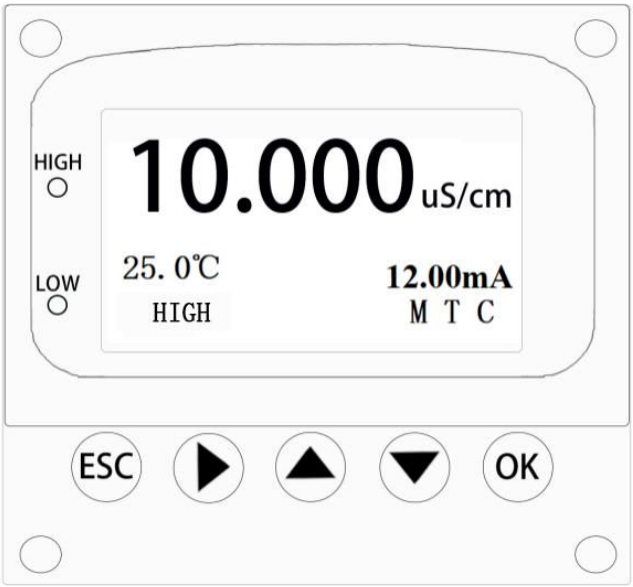
5) Please keep the electrode measurement section clean during installation, and do not use hands or unclean objects to directly contact the surface. Contact with oil, grease, or adhesive objects may result in inaccurate measurements for a long time.

6) The conductivity cell is a precision measurement component that cannot be decomposed, cannot change the shape and size of the electrode, and cannot be cleaned with strong acid or alkali, soaked, or mechanically scratched. These operations will cause changes in the electrode constant, affecting the measurement accuracy of the system.

7) To ensure installation safety, power on the device only after checking for errors.

5. Setting

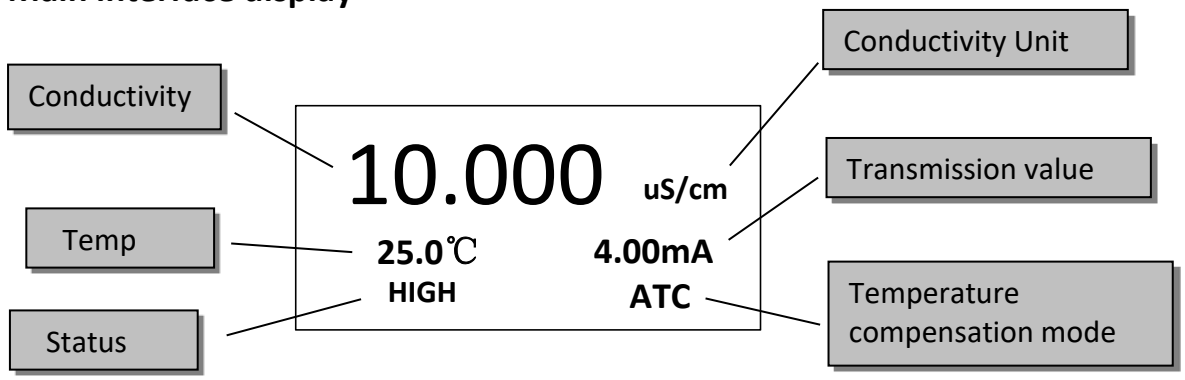
5.1 Introduction of screen soft keyboard functions



Key prompt	Function	Function Description
ESC	Return	Enter the settings menu on the measurement page, and return to the previous level on non measurement pages.
▶	Right shift	Number of loop selection parameters.

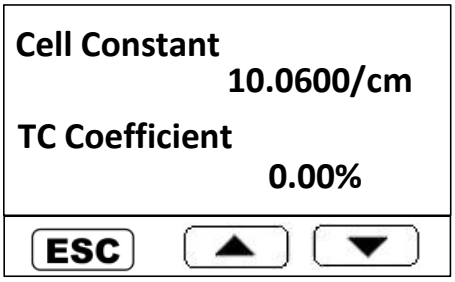
▲	Up	Move the menu option up to increase the selected digit size.
▼	Down	Move the menu option down to reduce the selected digit size.
OK	Enter	View the setting parameters on the measurement page, and confirm the options or parameters on the non measurement page.

5.2 Main interface display

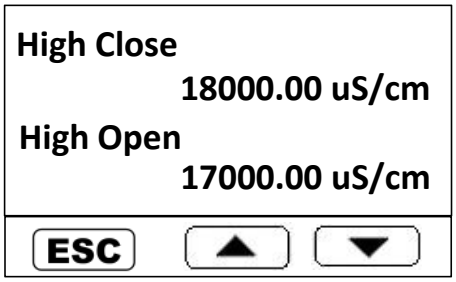


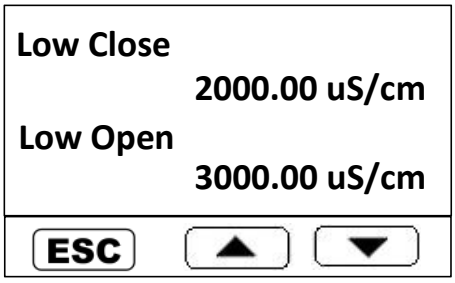
Note: *You can switch to the browsing interface by clicking "* OK *" on the main interface, and you don't need to enter the "Menu Settings" interface to browse and set parameters.*

5.3 Browsing interface display



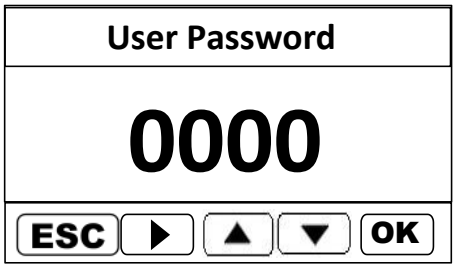
Note: *The browsing interface can poll and view the parameter status through "* ▲ *" or "* ▼ *", and switch back to the main interface through "* ESC *".*



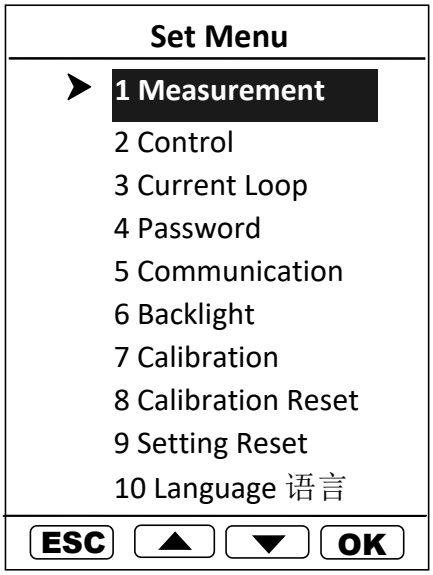


5.4 Main menu interface display

Main menu interface display: After entering the password, enter the factory default password "**1000**" on the main menu interface. Under the main display interface, press the "ESC" button to enter the user login interface.

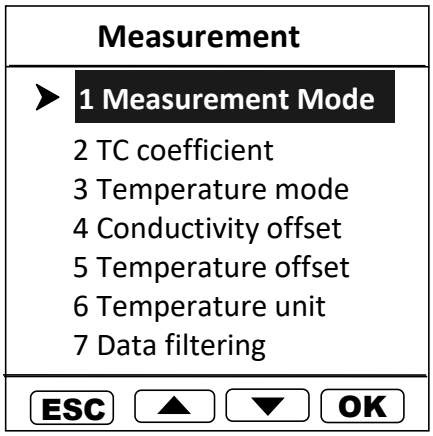


After entering the password, enter the "Settings Menu" interface. The menu description of this interface is shown in the table below:



S/N	Menu name	Introduction of menu contents
1	Measurement	Measurement mode, temperature compensation coefficient, temperature compensation mode, conductivity offset, temperature offset, temperature unit and data filtering can be set;
2	Control	Set the control of conductivity overrun;
3	Current Loop	Set the initial range migration of conductivity transmission volume;
4	Password	Reset the login password;
5	Communication	Set address, baud rate and frame format；
6	Backlight	Set the backlight to be normally on or delayed off;
7	Calibration	Calibration of the conductivity electrodes was performed;
8	Calibration Reset	Restore the calibration setting before leaving the factory;
9	Settings Reset	Return the parameters of the instrument to the parameter state before leaving the factory;
10	Language 语言	Switch between Chinese and English.

5.5 Measurement parameter interface



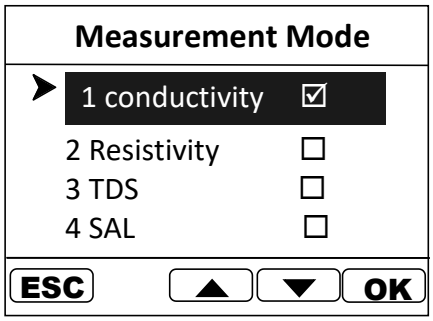
The functions of each option for "measurement" are as follows:

S.N.	Menu Item	Description
1	Measurement mode	Choose to measure conductivity, resistivity, TDS, or salinity.
2	TC coefficient	Set temperature compensation coefficient
3	Temperature mode	Select "Manual" or "Automatic" temperature compensation.
4	Conductivity offset	Set conductivity offset value
5	Temperature offset	Set temperature offset value
6	Temperature unit	Temperature can be presented in ℃ or ℉
7	Data filtering	Digital filtering level, optional from Level 0-9

Note: The options vary under different measurement modes.

By pressing " ▲ " or " ▼ ", you can choose to enter the "electrode type" or "temperature compensation" parameter settings. Press " OK " to enter.

5.5.1 Measurement mode

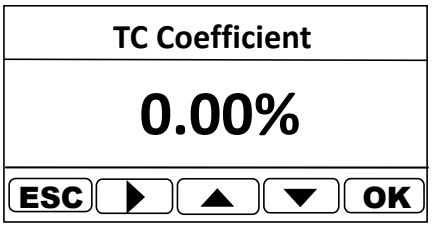


The functions of each option in "measurement mode" are as follows:

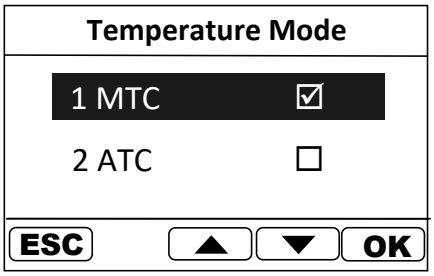
S.N.	Menu Item	Description
1	Conductivity	Conductivity measurement(uS/cm、mS/cm)
2	Resistivity	Resistivity measurement(MΩ•cm)
3	TDS	TDS measurement(ppm)
4	SAL	Salinity measurement(ppt)

The measurement of TDS and SAL depends on the measurement results of conductivity, so to accurately measure TDS and SAL, it is necessary to ensure that the measurement of conductivity is accurate.

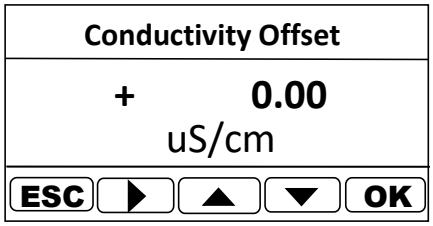
5.5.2 TC coefficient



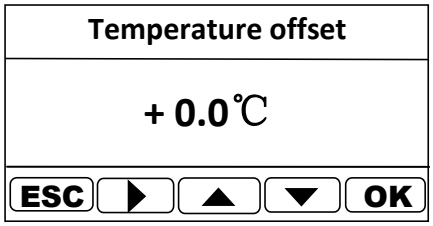
5.5.3 Temperature mode



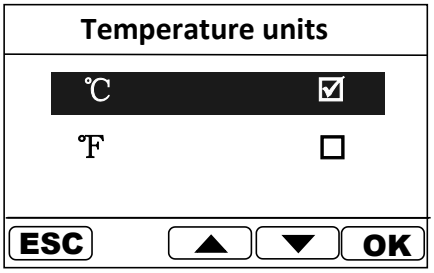
5.5.4 Conductivity offset



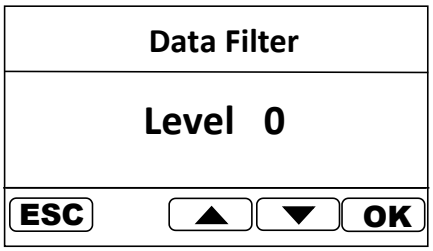
5.5.5 Temperature offset



5.5.6 Temperature units



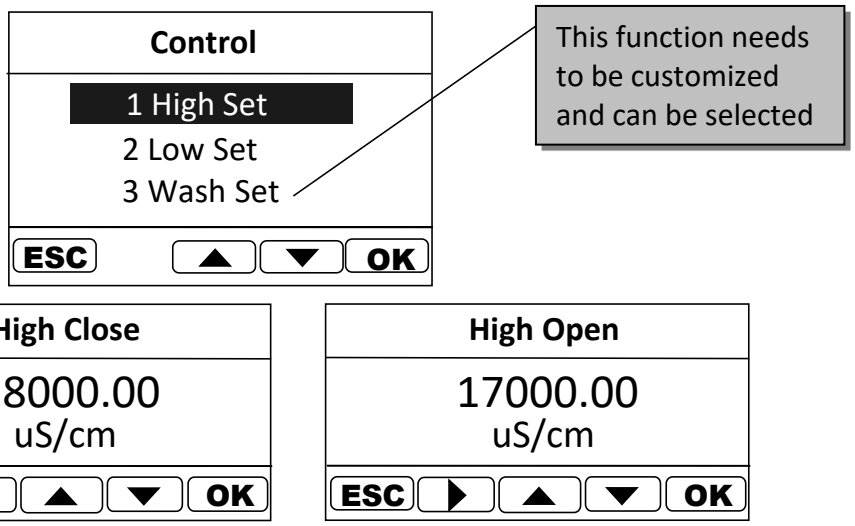
5.5.7 Data Filter



5.6 Control interface

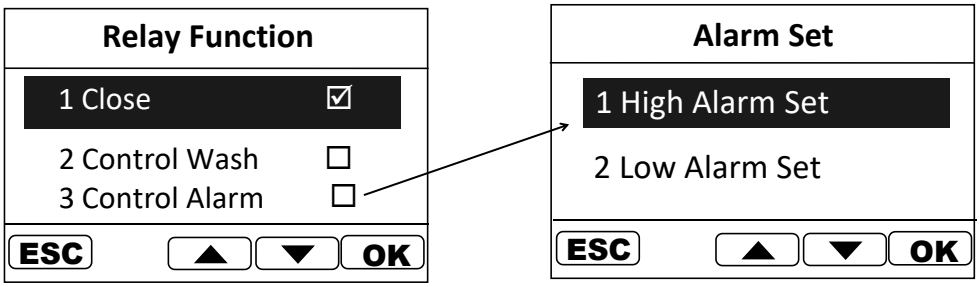
5.6.1 high/low alarm setting

By "▲" or "▼", you can choose to enter the "high alarm setting" or "low alarm setting" parameter interface. Press " OK " to enter and then set the alarm value.



When driving inductive loads, please install an intermediate relay to prevent the contact from being broken and ionized by the back electromotive force of the inductor, which may burn out the contact.

5.6.2 Wash Set Interface

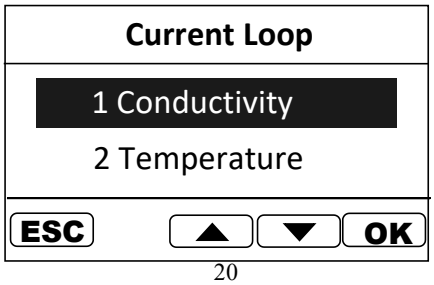


Note:

1. Control cleaning by setting the "Wash Time Interval" and "Wash Time";

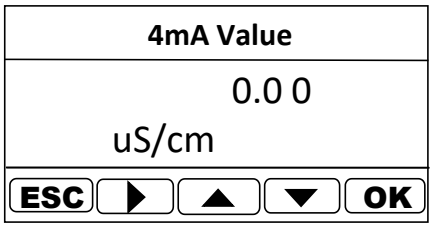
2. The control alarm can be set with "High/Low Alarm Open" and "High/Low Alarm close".

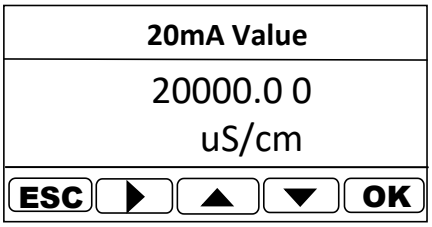
5.7 Current Loop interface



There are two 4-20mA output channels in total, and the signal source "Conductivity" or "Temperature" should be set first when selecting the channel.

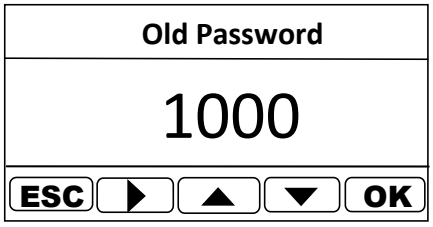
Taking conductivity transmission as an example, select "conductivity transmission" and press the " OK " button to enter the "4mA corresponding value" modification page; After completing the modifications, press the " OK " button to enter the "20mA corresponding value" modification page; After modification, pressing the " OK " key will save the parameters.

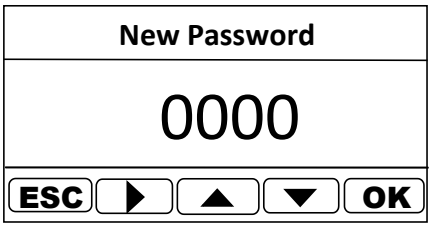




The setting of "temperature" is similar to this.

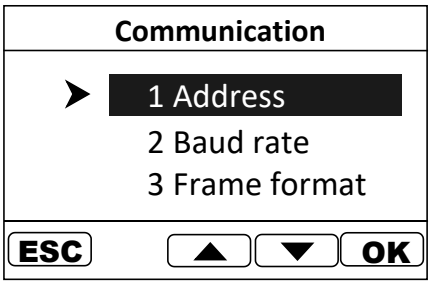
5.8 Password interface





Note: *First, enter the old password (**factory default is 1000**). If entered correctly, you can enter the "New Password" interface. After changing the password, press " OK " to save.*

5.9 Communication Interface

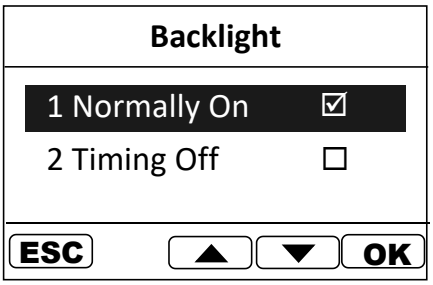


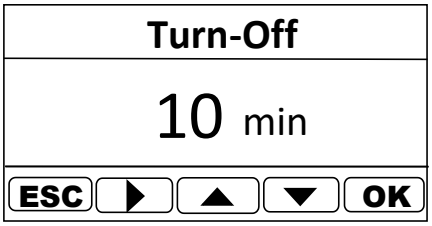
The functions of the "Communication Settings" options are as follows:

S.N.	Menu Item	Description
1	Address	Set communication address, can be set from 1 to 127
2	Baud Rate	Set communication baud rate, optional 4800、9600、19200、38400
3	Frame Format	Set RTU/ASCII format

Note: *The default device address is 1, the baud rate is 9600, and the frame format is RTU; For detailed communication protocols, please refer to relevant communication protocol documents.*

5.10 Backlight Setting





The functions of the "**backlight settings**" options are as follows:

S.N.	Menu Item	Description
1	Normally On	The LCD screen backlight will not turn off.
2	Timing Off	The backlight of the LCD screen will be turned off according to the set time, which can be set to 1-99 minutes.

5.11 Factory Default Parameters

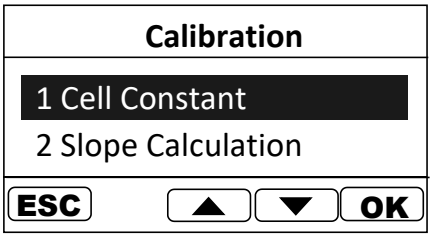
Menu	Set Range	Factory Default
Temperature mode	ATC、MTC	ATC
MTC temperature	-20-120℃	25℃
Data filter	Level 0-9	Level 4
Communication address	1-127	1
Communication baud rate	4800、9600、19200、38400	9600
Conductivity High Alarm Close	1.00uS/cm - 200000.00uS/cm	18000.00uS/cm
Conductivity High Alarm Open	0.00uS/cm - Conductivity High Alarm Close	17000.00uS/cm
Conductivity Low Alarm Close	0.00-199999.00uS/cm	2000.00uS/cm
Conductivity Low Alarm Open	Conductivity Low Alarm Close-200000.00uS/cm	3000.00uS/cm
Resistivity High Alarm Close	1.00 -999.99 MΩ • cm	90.00 MΩ • cm
Resistivity High Alarm Open	0.00 MΩ • cm -Resistivity High Alarm Close	80.00 MΩ • cm
Resistivity Low Alarm Close	0.00-999.00 MΩ • cm	10.00 MΩ • cm
Resistivity Low Alarm Open	Resistivity Low Alarm Close-999.99 MΩ • cm	20.00 MΩ • cm
TDS High Alarm Close	0.50-100000.00ppm	9000.00ppm
TDS High Alarm Open	0.00ppm- TDS High Alarm Close	8000.00ppm
TDS Low Alarm Close	0.00-99999.50ppm	1000.00ppm
TDS Low Alarm Open	TDS Low Alarm Close-100000.00ppm	2000.00ppm
Salinity High Alarm Close	1.00-999.99ppt	90.00ppt
Salinity High Alarm Open	0.00ppt-Salinity High Alarm Close	80.00ppt
Salinity Low Alarm Close	0.00-999.00ppt	10.00ppt
Salinity Low Alarm Open	Salinity Low Alarm Close-999.99ppt	20.00ppt
Corresponding value of conductivity 4mA	0.00-200000.00uS/cm	0.00uS/cm

Corresponding value of conductivity 20mA	Corresponding value of conductivity 4mA - 200000.00uS/cm	20000.00uS/cm
Corresponding value of Resistivity 4mA	0.00-999.99 MΩ • cm	0.00 MΩ • cm
Corresponding value of Resistivity 20mA	Corresponding value of resistivity 4mA -999.99 MΩ • cm	100.00 MΩ • cm
Corresponding value of TDS 4mA	0.00-100000.00ppm	0.00 ppm
Corresponding value of TDS 20mA	Corresponding value of total dissolved solid 4mA-100000.00ppm	10000.00 ppm
Corresponding value of SAL 4mA	0.00-999.99ppt	0.00 ppt
Corresponding value of SAL 20mA	Corresponding value of salinity 4mA-999.99ppt	100.00 ppt
Corresponding value of Temperature 4mA	-20.0-120.0℃	0.0℃
Corresponding value of Temperature 20mA	Corresponding value of temperature 4mA-120.0℃	70.0℃
Backlight Setting	Normally on, timing off	Normally On
Password change	0000-9999	1000

5.12 Calibration

5.12.1 Conductivity Mode

The page for electrode calibration varies depending on the measurement mode.

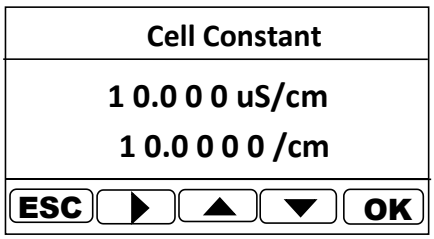


The functions of each option for "calibration" are as follows:

S.N.	Menu Item	Description
1	Cell Constant	Set the cell constant;
2	Slope Calculation	Calibrate the measured value of the current conductivity.

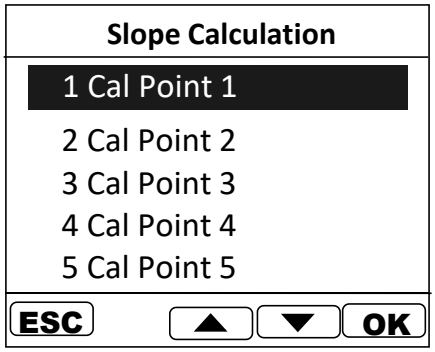
5.12.1.1 Cell constant

Select "Cell Constant" and press " OK to enter the "Cell Constant" modification page. After modification, press " OK " to save, and press " ESC " to abandon.



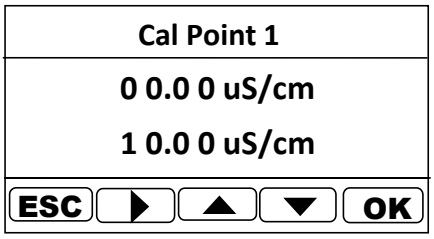
5.12.1.2 Slope calibration

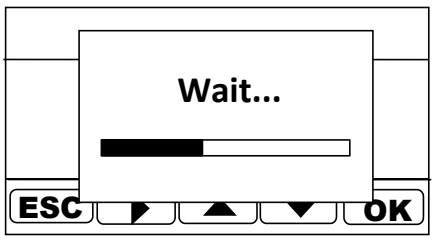
You can choose 1-point calibration or 5-point calibration.

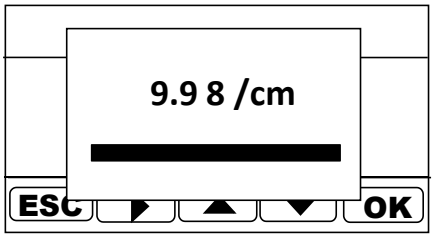


1) 1-point calibration

Before calibration, please ensure that there are no attachments to the sensor. Select one of the calibration points and the corresponding standard solution with known conductivity values. Place the sensor in the standard solution and input the conductivity value of the standard solution. After the value stabilizes, press the " OK " button to start calibration.



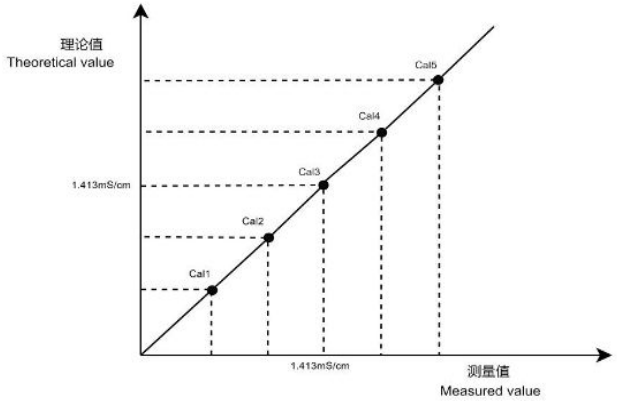




2) 5-point calibration

5-point calibration is similar to 1-point calibration, only providing more calibration points to calibrate measurement data.

There are 5 calibration buffer zones Cal1 to Cal5 in the device, and users can calibrate the values of Cal1 to Cal5 with different standard solutions. When users calibrate a certain Cal, the program will automatically count the calibrated Cals and use this to establish a correction curve.



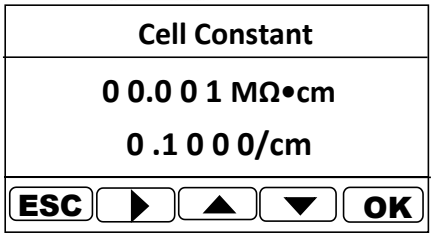
It should be noted that users can calibrate the values from Cal1 to Cal5 as needed, but calibration must follow the rules of Cal5>Cal4>Cal3>Cal2>Cal1 and be carried out under the same environmental conditions.

Before calibration, please ensure that there are no attachments to the sensor. Place the sensor in a standard solution with a known conductivity value and input the conductivity value of the standard solution. After the value stabilizes, press the " OK " button to start calibration. The process is the same as a single point calibration.

Note: *If the calibration data is 0 after entering a certain Cal, it indicates that the Cal has not been calibrated; If it is not zero, it indicates that calibration data already exists for the Cal.*

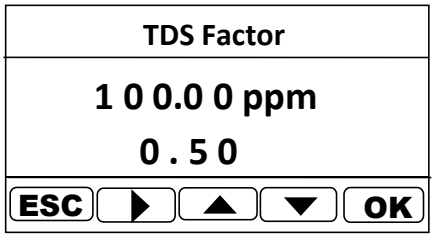
5.12.2 Resistivity mode

After selecting "Calibration", press the " OK " button to enter the "Cell Constant" modification page. After making the changes, press " OK " to save, and press " ESC " to discard.



5.12.3 Total Dissolved Solids (TDS) Mode

Select "Cablation" and press the " OK " button to enter the "TDS Factor" modification page.



The TDS factor affects the ratio of conductivity to total dissolved solids, and the formula is:

TDS=Cond × TDS factor

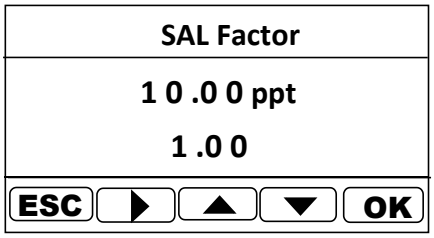
among

TDS - Total Dissolved Solids (ppm)

Cond - Conductivity (uS/cm)

5.12.4 Salinity (SAL) Mode

After selecting "Calibration", press the " OK " button to enter the "SAL Factor" modification page.



The SAL factor affects the output ratio of salinity, and the formula is:

SAL=f (Cond) × SAL Factor.

among

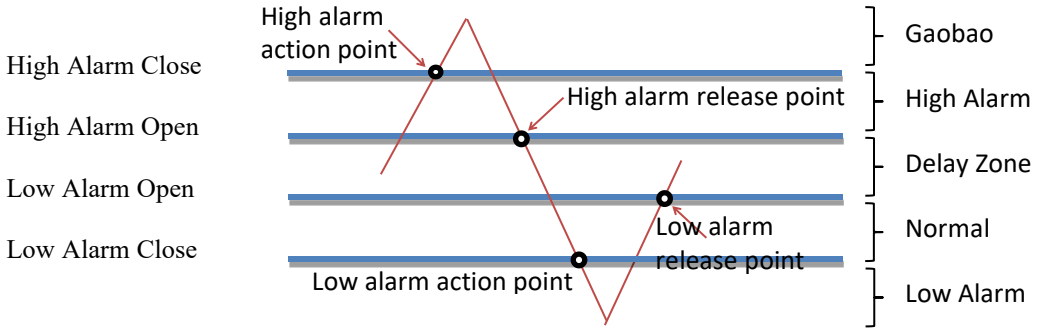
SAL - Salinity (ppt)

F (x) - Conversion function of conductivity and salinity

Cond - Conductivity (uS/cm)

5.13 Relay Alarm

The operating rules of high and low alarm relays are as follows:



When driving inductive loads, please install an intermediate relay to prevent the contact from being broken and ionized by the back electromotive force of the inductor, which may burn out the contact.

6. Maintenance

6.1 Maintenance

● The input end of the instrument (measuring electrode socket) must be kept dry and clean to prevent dust and water vapor from entering.

● Electrodes should be avoided from long-term immersion in protein solutions and acidic fluoride solutions, and contact with organic silicone oil should be avoided.

● To make the measurement more accurate, it is necessary to regularly calibrate the electrodes and clean them with distilled water.

● The instrument should be placed in a dry environment or control box to avoid leakage or measurement errors caused by water droplets splashing or moisture.

6.2 Calibration

● Before calibration work, please check if the instrument wiring is correct and preheat for 20 minutes when powered on.

● Prepare one or five standard solutions.

● Clean the electrode with distilled water and dry it with filter paper. Then insert the electrode

into the standard buffer and gently stir a few times until the instrument displays a stable value.

● Enter the electrode calibration interface through the menu, and the actual measurement value will be displayed on the upper screen and the value of the standard solution will be displayed on the lower screen. After the actual measurement value is stable, press the "OK" button to perform calibration. A pop-up window will display the electrode constant to indicate successful calibration.

● If you choose 5-point calibration, repeat the above two steps and calibrate four points separately. After each standard solution is labeled, the electrode must be cleaned with distilled water and dried with filter paper before being placed in the next standard solution.

● After the above calibration is completed, the solution temperature calibration interface will be automatically entered. If it is an automatic temperature compensation, the solution temperature value measured by the electrode will be displayed. If it is a manual temperature compensation, the solution temperature can be entered by pressing the button, and pressing "OK" will save the parameters to complete the calibration. If you press "ESC" at this time, you will exit to the main interface, and the parameters previously calibrated will not be saved.

7. 4-20mA Current Output Formula

● When the machine leaves the factory, the output current is defined as: 0 uS/cm is the corresponding value of 4 mA; 20 /200 /2000 /20000 uS/cm is the corresponding value of 20mA;

● I = (D - 4 mA corresponding value） × (16 / (20 mA corresponding value - 4 mA corresponding value)) + 4.00;

● I = (D - 0 ） × (16 / 20/200/2000/20000) + 4.00;

● Note: I represents the output current value, 4 mA ≤ I ≤ 20 mA;

● D is the conductivity value displayed by the instrument, 0.00 uS/cm ≤ D ≤ 20.00 /200.00 /2000.00 /20000 uS/cm;

8. Fault Diagnosis And Troubleshooting

When the measurement data is incorrect and unstable during system operation, the first step is to determine whether the problem is caused by instruments or sensors. The simplest method for on-site processing is:

● Distinguish whether the problem is from the instrument or the sensor. Remove the black wire from the terminal of the instrument and check if the conductivity display of the instrument is zero and stable, which proves that the instrument is normal. It is preliminarily determined that the problem is from the installation of the sensor.

● Determine whether the interference source is from the instrument or the sensor. Remove the black and red wires of the sensor and observe if the conductivity meter displays a stable zero point. If the display is normal, eliminate the interference from the instrument.

● The measurement data of conductivity value has a significant deviation. To determine whether the measurement data is correct, remove the sensor from the pipeline and use a clean beaker for sampling and measurement (see notes). Compare it with laboratory instruments to eliminate temperature compensation factors. When the measurement results are basically consistent, it can be determined that the installation form of the sensor needs to be rectified; If there is still a significant difference in the offline measurement results, it is important to check the parameter settings of the instrument (this method is not suitable for pure water).

Note: *High purity water and ultrapure water cannot choose the comparison method of open sampling measurement. This is because in the process of preparing high and ultrapure water, not only the ion components in the water body are removed, but also the gas components are removed. When high purity water is exposed to the air, a large amount of carbon dioxide immediately dissolves back into the water, At the same time, the impurities on the inner walls of the vessels and the dust in the air will also dissolve back in the water, resulting in multiple errors. High purity water can only be verified using closed, flowing, and side flow flow channels. Measuring high purity water in an open laboratory measurement form is a cognitive error.*

Common faults and troubleshooting table

Problems	Possible causes	Exclusion method
No display on the controller	A. The power is not connected;	A. Check whether there is voltage between the power terminals of the instrument;
Unstable display	A. Wrong sensor wiring; B. There are bubbles in the pipeline; C. Unstable water quality;	A. Rectify according to the instructions; B. Rectify the pipeline or select another measuring point; C. Use a stable water source to eliminate the cause of the instrument.
Large reading error	A. Constant setting error; B. The cell constant changes; C. The flow velocity at the measuring point is inappropriate; D. Incorrect sensor installation.	A. Reset the cell constant; B. Replace the new sensor or recalibrate the cell constant; C. Install the sensor at a suitable flow rate; D. Install according to the sensor installation instructions.

Attachment 1. Common Instructions for RS485 Protocol

Bytes	8-bit binary Each 8-bit byte in the message contains two 4-bit hexadecimal characters (0-9, A-F)
Bits in each byte	1 starting bit 8 data bits, first send least significant bit No parity bit 1 stop bit
BAUD	9600bps
Command	03: Read data; 10: Write data
Factory default slave address	01

SEND:

Bytes	01	03	00 00	00 0D	84 0F
	Address	Function Code	Starting Address	Register Number	CRC Code

GET: 01 03 1A 00 01 86 A0 00 00 09 C4 01 12 A8 80 01 03 66 40 00 1E 84 80 00 2D C6 C0 02 00 8A 49

Data interpretation:

1A : Number of data

00 01 86 A0 : Conductivity value: 100.000uS/cm

00 00 09 C4 : Temperature value: 25.00 ℃

01 12 A8 80 : High alarm suction value: 18000.000uS/cm

01 03 66 40 : High alarm disconnection value: 17000.000uS/cm

00 1E 84 80 : Low alarm suction value: 2000.000uS/cm

00 2D C6 C0 : Low alarm disconnection value: 3000.000uS/cm

02 : Alarm status: low alarm

(0x00: no alarm, 0x01: high alarm, and 0x02: low alarm).

00 : Measurement mode: Conductivity

(0x00 is the conductivity mode, 0x01 is the resistivity mode, 0x02 is the TDS mode, and 0x03 is the salinity mode).

8A 49 : CRC code

Note:

Measurement value: composed of integer and decimal parts, with a significant decimal number of 3 places.

Temperature value: Keep two decimal places, and if the highest digit is 1, it is a negative number.

SEND:

01	03	00 00	00 0D	84 0F
Address	Function Code	Starting Address	Register Number	CRC Code
01 12 A8 80	01 03 66 40	00 1E 84 80	00 2D C6 C0	EF FA
High alarm suction value: 18000.000uS/cm	High alarm disconnection value: 17000.000uS/cm	Low alarm suction value: 2000.000uS/cm	Low alarm disconnection value: 3000.000uS/cm	CRC CODE

GET:

01	10	00 04	00 08	10	0E 6C
Address	Function code	Starting address	Number of registers	Byte count	CRC CODE