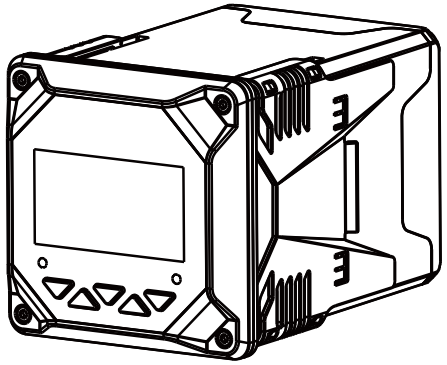
Conductivity/Resistivity Controller



Supmea

Headquarters

5th floor,Building 4,Singapore Hangzhou Science Technology Park,No. 6 street,

Hangzhou Economic Development Area,Hangzhou 310018,China

Singapore

2 Venture Drive #11-30 Vision Exchange Singapore

info@supmea.com

www.supmea.com

Supmea Automation Co.,Ltd.

Preface

Thank you for purchasing Conductivity/Resistivity Controller. Please read this manual carefully before operating and using it correctly to avoid unnecessary losses caused by false operation.

Note

- Modification of this manual's contents will not be notified as a result of some factors, such as function upgrading.
- We try our best to guarantee that the manual content is accurate, if you find something wrong or incorrect, please contact us.
- This product is forbidden to use in explosion-proof occasions.

Version

U-SUP-MDA-EC-EN4

Safety Precautions

In order to use this product safely, be sure to follow the safety precautions described.

About this manual

- Please submit this manual to the operator for reading.
- Please read the operation manual carefully before applying the instrument. On the precondition of full understanding.
- This manual only describes the functions of the product. The company does not guarantee that the product will be suitable for a particular use by the user.

Precautions for protection, safety and modification of this product

- To ensure safe use of this product and the systems it controls, Please read carefully the operation manual and understand the correct application methods before putting into operation, to avoid unnecessary losses due to operation mistakes. If the instrument is operated in other ways not described in the manual, the protections that the instrument give may be destroyed, and the failures and accidents incurred due to violation of precautions shall not be borne by our company.
- When installing lightning protection devices for this product and its control system, or designing and installing separate safety protection circuits for this product and its control system, it needs to be implemented by other devices.
- If you need to replace parts of the product, please use the model specifications specified by the company.
- This product is not intended for use in systems that are directly related to personal safety.Such as nuclear power equipment, equipment using radioactivity, railway systems, aviation equipment, marine equipment, aviation equipment and medical equipment.If applied, it is the responsibility of the user to use additional equipment or systems to ensure personal safety.

- Do not modify this product.
- The following safety signs are used in this manual:

Hazard, if not taken with appropriate precautions, will result in serious personal injury, product damage or major property damage.

Warning:Pay special attention to the important information linked to product or particular part in the operation manual.

- Confirm if the supply voltage is in consistent with the rated voltage before operation.
- Don't use the instrument in a flammable and combustible or steam area.
- To prevent from electric shock, operation mistake, a good grounding protection must be made.
- Thunder prevention engineering facilities must be well managed: the shared grounding network shall be grounded at is-electric level, shielded, wires shall be located rationally, SPD surge protector shall be applied properly.
- Some inner parts may carry high voltage. Do not open the square panel in the front except our company personnel or maintenance personnel acknowledged by our company, to avoid electric shock.
- Cut off electric powers before making any checks, to avoid electric shock.
- Check the condition of the terminal screws regularly. If it is loose, please tighten it before use.
- It is not allowed to disassemble, process, modify or repair the product without authorization, otherwise it may cause abnormal operation, electric shock or fire accident.
- Wipe the product with a dry cotton cloth. Do not use alcohol, benzine or other organic solvents. Prevent all kinds of liquid from splashing on the

product. If the product falls into the water, please cut off the power immediately, otherwise there will be leakage, electric shock or even a fire accident.

- Please check the grounding protection status regularly. Do not operate if you think that the protection measures such as grounding protection and fuses are not perfect.
- Ventilation holes on the product housing must be kept clear to avoid malfunctions due to high temperatures, abnormal operation, shortened life and fire.
- Please strictly follow the instructions in this manual, otherwise the product's protective device may be damaged.

- Don’t use the instrument if it is found damaged or deformed at opening of package.
- Prevent dust, wire end, iron fines or other objects from entering the instrument during installation, otherwise, it will cause abnormal movement or failure.
- During operation, to modify configuration, signal output, startup, stop, operation safety shall be fully considered. Operation mistakes may lead to failure and even destruction of the instrument and controlled equipment.
- Each part of the instrument has a certain lifetime, which must be maintained and repaired on a regular basis for long-time use.
- The product shall be scrapped as industrial wastes, to prevent environment pollution.
- When not using this product, be sure to turn off the power switch.
- If you find smoke from the product, smell odor, abnormal noise, etc., please turn off the power switch immediately and contact the company in time.

Disclaimer

- The company does not make any guarantees for the terms outside the scope of this product warranty.
- This company is not responsible for damage to the instrument or loss of parts or unpredictable damage caused directly or indirectly by improper operation of the user.

Package contents

No.	Name	Quantity	Note
1	Conductivity/Resistivity Controller	1	
2	Manual	1	
3	Certificate	1	

After opening the box, please confirm the package contents before starting the operation. If you find that the model and quantity are incorrect or there is physical damage in appearance, please contact us.

Contents

Chapter 1 Introduction

Conductivity/Resistivity controller is widely used in thermal power, chemical fertilizer, metallurgy, environmental protection, pharmaceutical, biochemical, food and tap water industries, etc. The controller mainly continuously monitors the conductivity / total dissolved solids / resistivity and temperature in the solution.

1.1. Characteristic

- (4~20) mA isolated transmission output, which is less affected by interference.
- RS485 communication（MODBUS-RTU protocol）.
- Manual and auto temp compensation.
- High/low alarm (relay).
- Buzzer/LCD backlight switch.

1.2. Technical parameters

Table1

Screen size	2.8 inches 128*64 lattice screen.
Overall dimension	100mm×100mm×150mm
Cutout dimension	92.5mm×92.5mm
Weight	0.58kg
Ingress protection	IP54 or IP65
Measure variables	EC/TDS/ER
Measure range	0.01 electrode: (0~20.00)μS/cm / (0.05 ~ 18.18)MΩ*cm 0.1 electrode: (0.20~200.0)μS/cm 1.0 electrode: (2.00~2000)μS/cm, maximum 20000uS/cm 10.0 electrode: (0.02~20.00)mS/cm
	Temperature range: -10℃~130℃
Accuracy class	2.0
Temperature compensation	NTC10K / Pt1000 Temperature compensation: manual/automatic
Basic error of electronic unit	EC/TDS/ER: ±1%FS NTC10K: ±0.3℃ PT1000: ±0.3℃
Output	Isolated,(4 ~ 20)mA, maximum loop is 750Ω, ±0.2%FS
RS485 output	Isolated, MODBUS-RTU RS485
Relay	2 channels, Pickup/Breakaway AC250V/3A
Relative humidity	(10~85)%RH(No condensation)
Working temperature	(0~60)℃
Power supply	AC：220VAC±10% 50Hz/60Hz DC：24VDC±10%
Consumption	≤5W
Storage conditions	Temperature: (-15~65)℃ Relative humidity: 5%~95%(No condensation)

Chapter 2 Installation

2.1. Instrument installation

The installation location and method of the instrument are explained, the part shall be carefully read during the installation.

Notes for installation

- The instrument is panel mounted.
- It shall be installed inside the building so as to avoid wind and rain as well as direct sunlight.
- Please install it at the place with good ventilation in order to prevent the internal temperature of the instrument from rising.
- Don't lean to left or right when the instrument is installed, horizontal installation shall be realized as possible.

The following places shall be avoided during the installation

- The place where the environment temperature exceeds 60℃ during the operation.
- The place where the environment humidity exceeds 85% during the work.
- The vicinity of the electromagnetic occurring sources.
- The sites with strong mechanical vibration.
- The site where the temperature is changed a lot and the moisture condensation is easily formed.
- Places with lots of lampblack, steam, moisture, dust and corrosive gas.

Installation

Install a 92.5 * 92.5 mounting hole on the instrument cabinet or mounting panel, The thickness of the installation panel is 1.5mm~13mm.

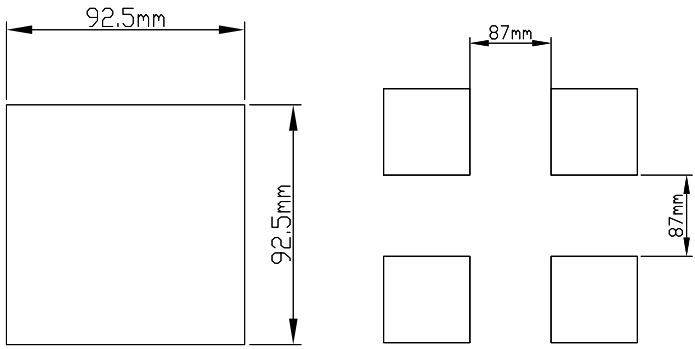


Fig.1

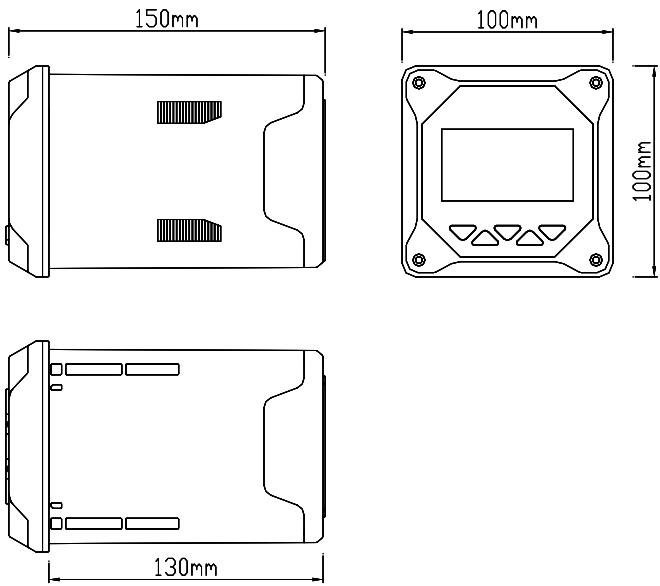


Fig.2

The instrument into the mounting hole and then buckle on the Snap, as shown below

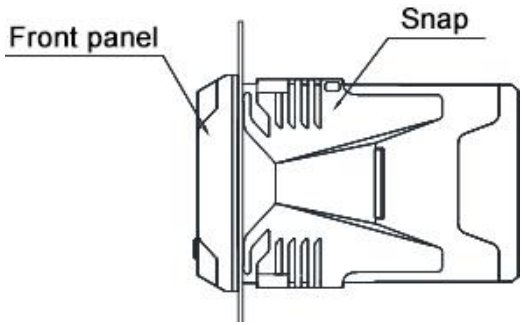


Fig.3

2.2. Electrode installation

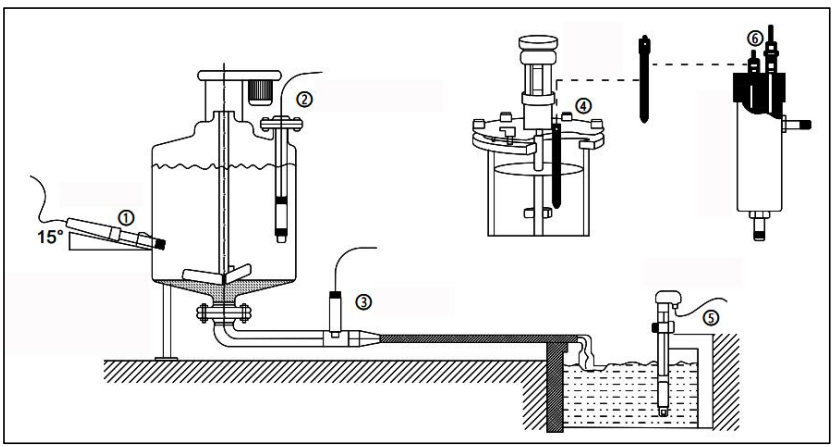


Fig.4 Schematic diagram of common installation method

①Side wall installation ②Flange mounted at the top ③Pipe installation ④Top installation ⑤Submersible installation ⑥Flow-through installation

The interface must be in 15°oblique angle, or it will affect the normal test and use of the electrode. We won't be responsible for any results due to this.

2.3. Wiring

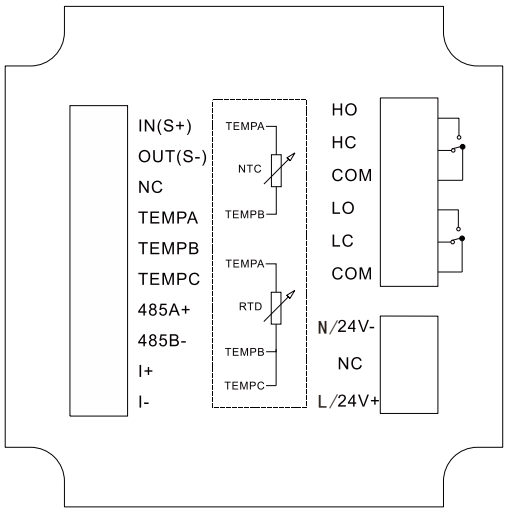


Fig.5 Wiring diagram

Terminal assignment

- IN(S+): Conductivity electrode IN (S+)
- OUT(S-): Conductivity electrode OUT (S-)
- NC: Unidentified
- TEMPA: Temperature compensation terminal A,NTC10K and Pt1000/Pt100 connect here
- TEMPB: Temperature compensation terminal B,NTC10K and Pt1000/Pt100 connect here
- TEMPC: Temperature compensation terminal C, Pt1000/Pt100 three-wire temperature grounding, Pt1000/Pt100 two-wire need to be connected to TEMPB, When connected to NTC10K, C terminal is not connected.
- 485A + : RS485 communication interface A +
- 485B – : RS485 communication interface B –
- I + : (4~20) mA output +
- I – : (4~20) mA output –
- HO: High alarm normally open
- HC: High alarm normally closed
- COM: High alarm common terminal
- LO: Low alarm normally open

- LC: Low alarm normally closed
- COM: Low alarm common terminal
- N: AC220V neutral wire
- NC: Unidentified
- L: AC220V live wire
- 24V+：24VDC+
- 24V-：24VDC-

Chapter 3 Navigation keys

3.1. Button display

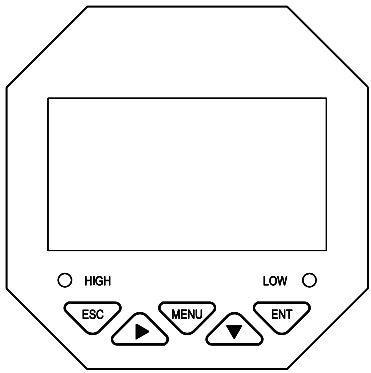
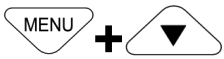


Fig.6 Display diagram

Table 2 Definition of buttons

Sign	Button name	Function description
	ESC	Under "Monitoring page" - Alarm view Under "Menu page" - Return to the previous page Under "Calibration page" - Skip this item
	RIGHT	Make a recurrent selection of digit of parameters modify the original indication value
	MENU	Under “Monitoring page” - Enter the MENU Under “Menu page” - Exit the MENU
	DOWN	Under “Menu page” - Select the related menu Modify the values in the configuration state

Sign	Button name	Function description
	ENTER	Under “Menu page” - Enter the sub-menu or confirm modification
	SHORTCUT KEY	Press and hold to enter the online calibration function interface
	SHORTCUT KEY	Press and hold to enter the alarm setting function interface
	SHORTCUT KEY	Press and hold to enter the electrode constant setting function interface

Chapter 4 System menu

4.1. Monitoring page

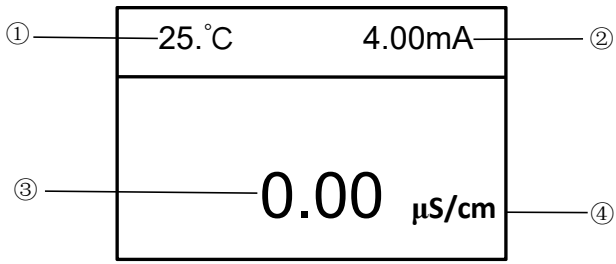


Fig.7 Monitoring page

①:Temperature

②:Output current

③:Measured value

④:Unit

4.2. Alarm inquiry page

Push [ESC] to enter alarm inquiry page, to inquire the current warning configuration information

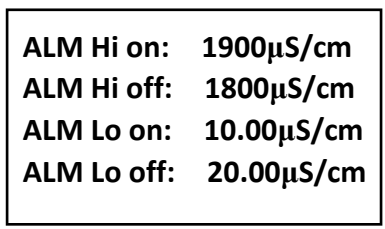


Fig.8 Alarm inquiry page

4.3. Password verification page

Push [MENU] to enter password verification page;

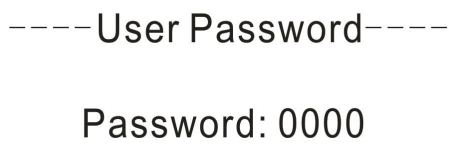


Fig.9 Password verification page

- Input password and push [ENTER] to enter home page.
- Initial password is 0000, which can be modified via password modification function.
- Please contact us if you forget your password.

4.4. Main Menu

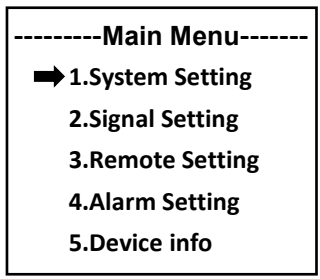


Fig.10 Main menu

- System Setting: settings of language, buzzer and backlight, modification of password and factory settings.
- Signal Setting: constant of electrode, online calibration, unit select, TDS coefficient, temperature compensation, temperature offset, temperature coefficient electrode compensation and electrode select.
- Remote Setting: settings communication and (4~20)mA transmission output.
- Alarm Setting: settings of parameters of high and low warning.
- Device info: device information query.

Chapter 5 Setting

5.1. System Setting

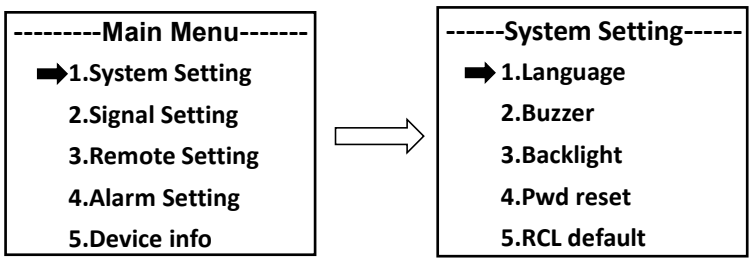


Fig.11 System Setting

（1）Language

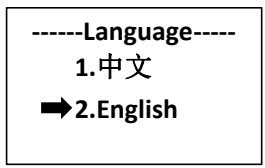


Fig.12 Language

Set the type of language, Chinese and English can be set.

（2）Buzzer

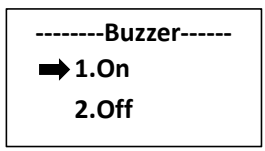


Fig.13 Buzzer

Set the switch of the buzzer when alarming.

（3）Backlight

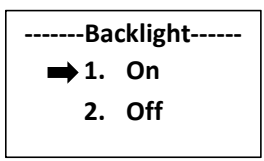


Fig.14 Backlight

Set the backlight on and off.

（4）Password reset

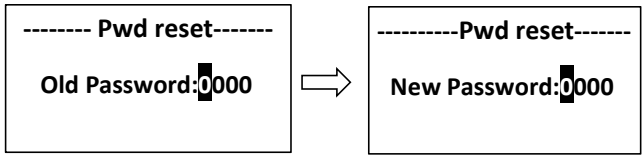


Fig.15 Password reset

Change the password and log in with the new password.

（5）Recall default

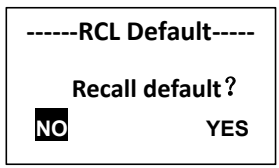


Fig.16 Recall default

Restore to factory settings.

5.2. Signal Setting

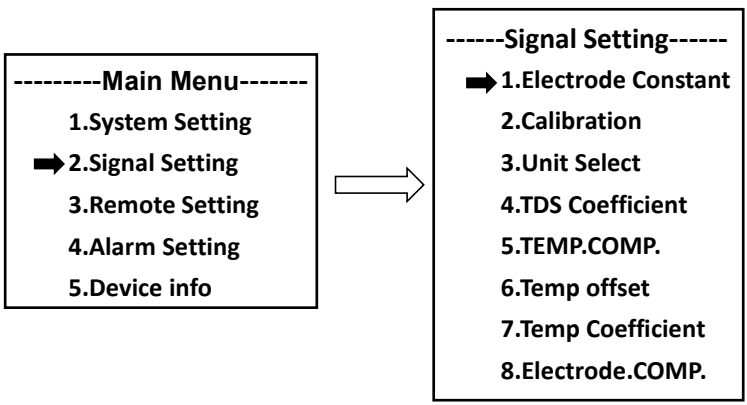


Fig.17 Signal Setting

（1）Electrode Constant

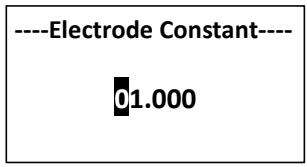


Fig.18 Electrode Constant

Set the electrode constant, normally of 4 types: 0.01, 0.1, 1.0, 10.0.

（2）Calibration

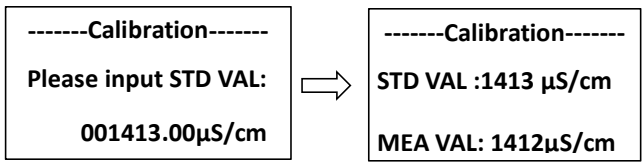


Fig.19 Calibration

Online calibration: single point calibration of any standard solution can be carried out. First, set the temperature compensation mode to automatic compensation or manual compensation (the temperature has a great impact on the accuracy during calibration), then enter the conductivity calibration input interface and input the calibration solution value to be calibrated (common standard solutions are 147.0 μ s / cm, 1413 μ s / cm and 12.88ms/cm, which can be calibrated according to the field standard), press ENT to enter the conductivity calibration interface, and then put the connected electrode into the standard solution. After the indication is stable, press ENT to calibrate. (press ▶ to clear the calibration value, and the calibration range is 0.5 ~ 1.5 times of the standard solution value)

（3）Unit Select

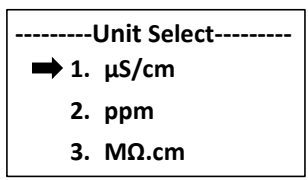


Fig.20 Unit Select

The unit can selected to ppm, μ s / cm or m Ω * cm. When switching to ppm, TDS of solution is measured; when μ s / cm is switched, conductivity (EC) of solution is measured; when m Ω * cm is switched, resistivity (ER) of solution is measured.

（4）TDS Coefficient

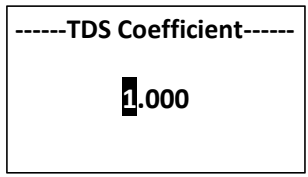


Fig.21 TDS Coefficient

The conversion coefficient of conductivity and total dissolved solids, 0.5 by default, and the setting range is 0.4 ~ 1.0.

（5）Temperature compensation

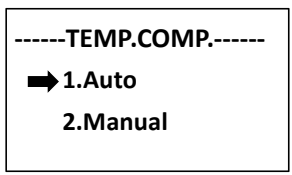


Fig.22 Temperature compensation

Automatic temperature compensation or manual temperature compensation can be set. Automatic temperature compensation, temperature electrode NTC 10K, Pt1000 can be set. Manual temperature compensation: temperature setting range -10℃~130 ℃.

（6）Temperature offset

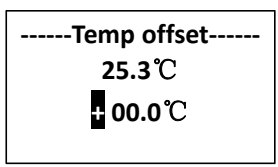


Fig.14 Temperature offset

The temperature value of automatic temperature compensation can be corrected,

and the correction range is ±20.0°C.

（7）Temperature coefficient

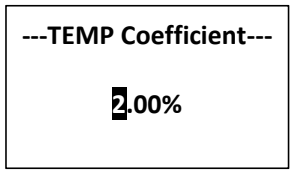


Fig.23 Temperature coefficient

Temperature coefficient, 2.00%as default, and the setting range is 0.00% ~ 3.00%.

（8）Electrode compensation

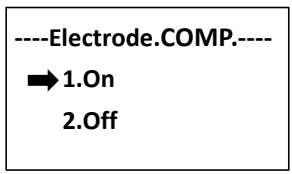


Fig.24 Electrode compensation

Set the Electrode compensation on or off.

5.3. Remote Setting

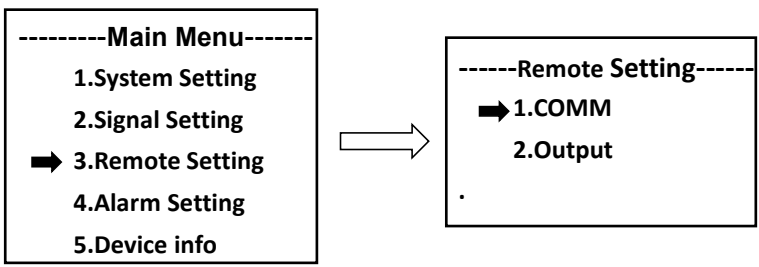


Fig.25 Remote Setting

（1）Communication

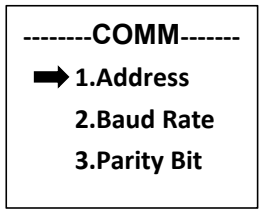


Fig.26 Communication

The address (1~247) , baud rate (2400bps, 4800bps, 9600bps,19200bps or 38400bps) and parity bit (N81,N82,E81,O81) of RS485 communication can be set.

（2）Output

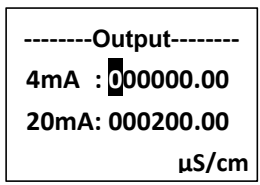


Fig.27 Output

Output:settings of 4mA corresponding value and 20mA corresponding value of (4~20)mA output.

5.4. Alarm Setting

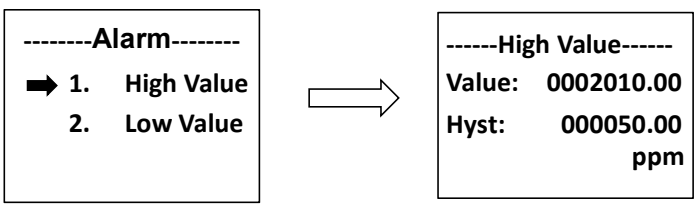


Fig.28 Alarm Setting

High Value: When the measured value is greater than the high alarm pull-in value, the high alarm relay pulls in, and when the measured value is less than the high alarm cut-off value, the high alarm relay is disconnected.

Low Value: When the measured value is less than the low alarm pull-in value, the low alarm relay is closed, and when the measured value is greater than the low alarm cut-off value, the low alarm relay is disconnected.

Hyst: Hysteresis prevents repeated alarm when the measures date fluctuates from the alarm point. The high or low alarm and hysteresis figure is showed in Figure 23. At high alarm, when the actual measurement value is larger than or equal to the alarm value, the controller enters into the alarm state. When the input is reduced, the actual measurement value is less than the alarm value, but the recorder will not exit the alarm state immediately. Until the actual measurement value is less than the alarm value and Hysteresis value, will the controller exit the alarm state. The same is for low alarm.

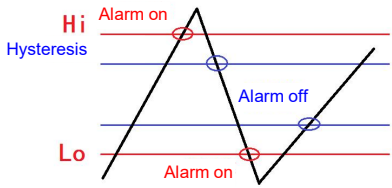


Fig.29 High- or low-level alarm and Hysteresis

- The alarm signal type will be automatically selected according to the current measured signal value. After setting, the alarm information will not be cleared due to the change of the measurement signal type. The alarm value of the same signal type only needs to be set once.

5.5. Device information

Software:
AEC02M1V1.01
Hardware:
B_EC6S_V1.00

Fig.30 Device information

Query the current hardware and software version.

Chapter 6 Communication

The instrument is provided with standard RS485 series communication interface, in accordance with international universal standard MODBUS-RTU communication protocol,supporting No.03 register reading and holding command, 06 writing single register command

Modbus standard format

Table 2 Command format

Definition	Address	Function code	Register address	Number of data	CRC check
Data	ADDR	0x03	M	N	CRC 16
Number of bytes	1	1	2	2	2

Table 3 Return format

Definition	Address	Function code	Data size	Data	CRC check
Data	ADDR	0x03	2*N	Data	CRC 16
Number of bytes	1	1	1	2*N	2

Table 4 Register address description

Address	Data type	Data size	Function code	Description	Access authority
0x0000	unsigned long	4 bytes	0x03	Actual values of conductivity, resistivity and TDS (unit: μ s / cm, m Ω * cm, ppm, to be divided by 100)	Read only
0x0002	short	2 bytes	0x03	Temperature value (unit: ℃, to be divided by 10)	Read only
0x0003	unsigned char	1 byte	0x03/0x06	03 is read, 06 is the write function code, the communication address range is 1-254, and the default is 1	Read/Write

Address	Data type	Data size	Function code	Description	Access authority
0x0004	unsigned char	1 byte	0x03/0x06	03 for read, 06 for write function code, 0 = 2400, 1 = 4800, 2 = 9600, 3 = 19200	Read/Write

Example of conductivity reading

Computer sends: 01 03 00 00 00 02 C 4 0B

Conductivity meter returns: 01 03 04 00 00 12 34 F7 44

Return command annotation:

01 is the address of slave, which can be configured in the instrument;

03 is function code, reading and holding register;

04 is the length of data of returned conductivity value, 4 bytes;

00 00 12 34 is the returned conductivity value, 4.96us/cm, unit: us/cm. The current conductivity value is obtained by dividing the value by 100, range: 0.00~60000.00us/cm.

F7 44 is the CRC16 check code, which is varying depending on different data;

Example of baud rate writing

Computer sends: 01 06 00 04 00 02 49 CA

Command sends: **01** is the address of slave, which can be configured in the instrument;

06 is function code, writing register;

00 04 is the baud rate register address

00 02 is set to 9600 baud rate

49 CA is the CRC16 check code, which is varying depending on different data;

Conductivity meter returns: 01 06 00 04 00 02 49 CA

If the return code value is consistent with the sending code value, the setting is

successful.

Example of temperature reading

Computer sends: 01 03 00 02 00 01 25 CA

Conductivity meter returns: 01 03 02 00 FA 38 07

Return command annotation:

01 is the address of slave, which can be configured in the instrument;

03 is function code, reading and holding register;

02 is the length of data of returned temperature value, 2 bytes;

00 FA is the returned temperature value, 25.0℃. The current temperature value is obtained by dividing the value by 10, range: -10.0 ~ 130.0℃

38 07 is the CRC16 check code, which is varying depending on different data.

Response format of error return code:

Exception code	Name	Description
01H	Illegal function code	The slave receives an executable function code
02H	Illegal data address	1. The address of the data cannot be recognized by the slave 2. The combined address of data address and data quantity is invalid
03H	Illegal data value	1. The amount of data is out of range 2. Data length error 3. Illegal data value

Example of error return code:

Computer sends: 01 03 00 05 00 02 D4 0A

Conductivity meter returns: 01 83 02 C0 F1

Error return code comments:

01 Slave address

83 0x80 + the function code issued by the host. If the function code issued by the host is 01, the function code of the exception response is 0x81; if the function code issued by the host is 03, the function code of the exception response is 0x83

02 exception code indicates, 02 as shown in the above table, represents the following two kinds of errors:

(1) The address of the data cannot be recognized by the slave;

(2) The combined address of data address and data quantity is invalid

C0 f1 is a CRC16 check code, which is varying depending on different data;

Chapter 7 Troubleshooting

- No display at the controller?
  Solution: check if the power supply is correctly connected.
- Fluctuation of the displayed value?
  Solution: check if there are frequency converters and other interference equipment at the surrounding environment, notice to keep away from these interference equipment or adopt shield measures.
- Conductivity controller can not be calibrated?
  Solution: the standard solution preparation is not correct or the electrode is damaged.
- The instrument can not measure accurately after calibration with a standard solution of conductivity of 1413us/cm?
  Solution:if the standard solution is contaminated, exchange the standard solution for calibration again.
- The response of the figure is slow?
  Solution:the electrode is covered by dirt, the response will become slow, please clean according to the corresponding methods based on the types of the pollutants, it's normal phenomenon if it's slow in winter.
- Max value displayed?
  Solution:When it show the Max value on the display,the measurement value is over range.

Chapter 8 Warranty & After-sales Service

We promise to the customer that the hardware accessories provided during the supply of the instrument have no defects in material and manufacturing process. From the date of the purchase, if the user's notice of such defects is received during the warranty period, the company will unconditionally maintain or replace the defective products without charge, and all non customized products are guaranteed to be returned and replaced within 7 days.

Disclaimers:

- During the warranty period, product faults caused by the following reasons are not in the scope of Three Guarantees service
- Product faults caused by improper use by customers.
- Product faults caused by disassembling, repairing and refitting the product.