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## User's Manual

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Conductivity/Resistivity Controller

## **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-EC4-MYEN2

## **Safety Precautions**

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

### **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.
- Do not 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.



- Do not 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

| Serial number | Name                                | Quantity | Remarks |
|---------------|-------------------------------------|----------|---------|
| 1             | Conductivity/Resistivity controller | 1        |         |
| 3             | Manual                              | 1        |         |
| 4             | 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

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## Chapter I Introduction

Conductivity/Resistivity controller is one of the intelligent on-line chemical analyzers, which is widely used in the continuous monitoring on conductivity and temperature of thermal power, chemical engineering and fertilizer, metallurgy, environment protection, pharmacy, biochemistry, food and tap water as well as other solution.

### Characteristic

- 4~20mA
- RS485 communication (MODBUS-RTU protocol)
- Manual and auto temp compensation
- High/Low relay
- Buzzer/switchable backlight

### Technical Parameters

|                    |  |
|--------------------|--|
| Screen size        | 2.8 inch   |
| Dimension          | Overall dimension:<br>100mm*100mm*150mm(H*W*D)<br>Cutout dimension: 92.5mm*92.5mm(H*W)   |
| Weight             | 0.65Kg   |
| Ingress protection | IP54   |
| Measure variables  | EC/TDS/Resistivity   |
| Measure range      | 0.01 electrode: 0.02~20.00 $\mu$ S/cm<br>0.1 electrode: 0.20~200.0 $\mu$ S/cm<br>1.0 electrode: 2.00~2000 $\mu$ S/cm<br>10.0 electrode: 0.02~20.00mS/cm<br>Measure range for extended range controller:<br>0.01 electrode: 0.20~200.0 $\mu$ S/cm |

|                          |   |
|--------------------------|---|
|                          | 0.1 electrode: 2.00~2000 $\mu$ S/cm<br>0.1 electrode: 0.02~20.0mS/cm<br>10.0 electrode: 0.20~200.0mS/cm<br>Temperature range:-10~130°C                          |
| Temperature compensation | NTC10K/PT1000<br>Temperature compensation: manual/automatic   |
| Accuracy                 | EC/TDS/Resistivity: $\pm$ 1%FS<br>NTC10K: (-10~5°C) $\pm$ 2°C; (5~60°C) $\pm$ 0.2°C; (60~130°C) $\pm$ 2°C<br>PT1000: (-10~5°C) $\pm$ 2°C; (5~130°C) $\pm$ 0.2°C |
| Output                   | 4~20mA output<br>maximum loop is 750 $\Omega$ , $\pm$ 0.2%FS  |
| Communication protocol   | MODBUS-RTU RS485  |
| Alarm relay              | Pickup/Breakaway AC250V/3A  |
| Relative humidity        | 10~85%RH(No condensation)   |
| Operating temperature    | 0~60°C  |
| Power supply             | 220VAC $\pm$ 10% 50Hz/60Hz  |
| Storage conditions       | Temperature: -15~65°C<br>Relative humidity: 5~95%RH(No condensation)  |

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## Chapter II Installation

### 2.1 Instrument installation

The installation site 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°C during the work.
- 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

92.5mm\*92.5mm installation hole is opened at the instrument cabinet or installation panel. The instrument is inserted into the installation hole and the screw is fixed, refer to the following drawing.

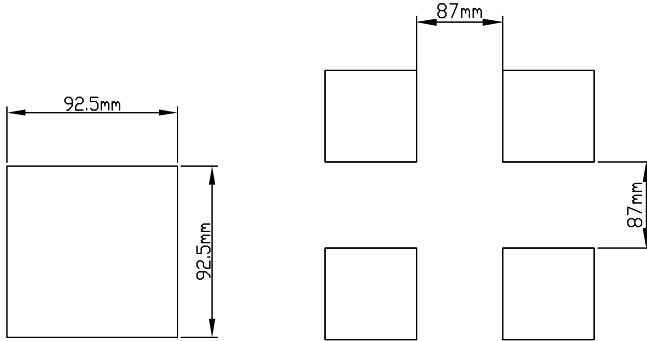


Figure 1 Dimension of installation

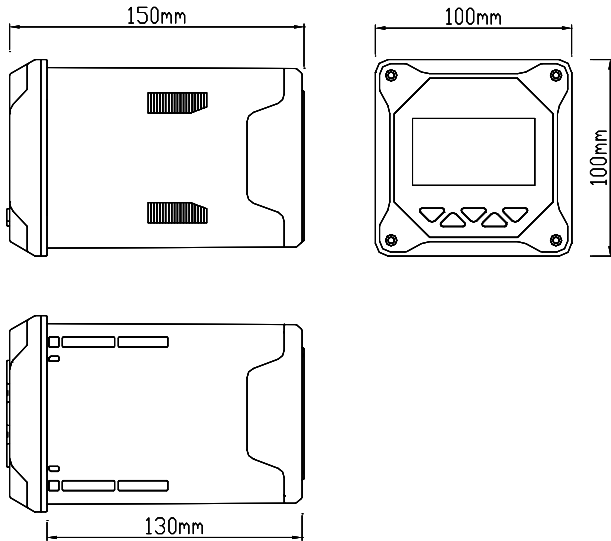


Figure 2 Dimension of product

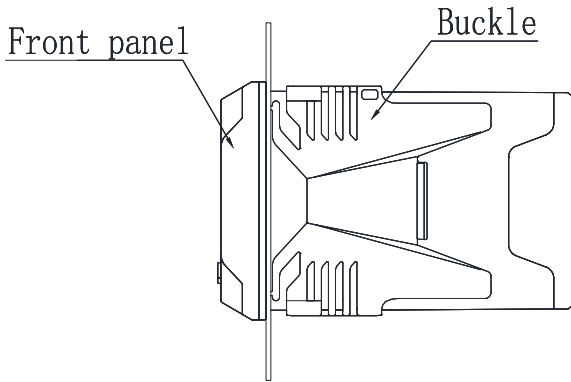


Figure 3

## 2.2 Electrode installation

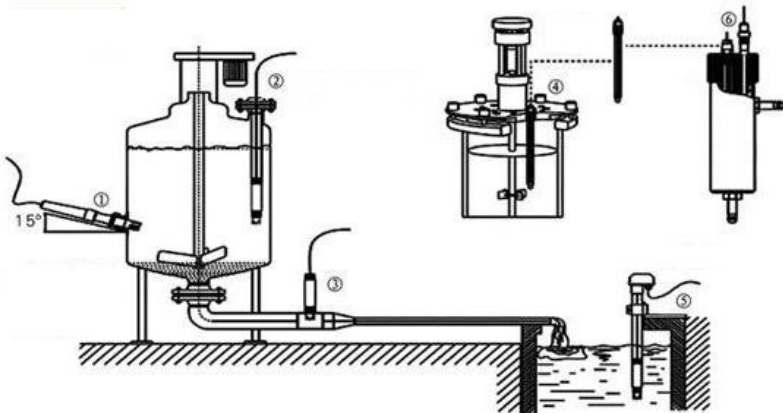


Figure 4 Installation method

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

## 2.3 Wiring

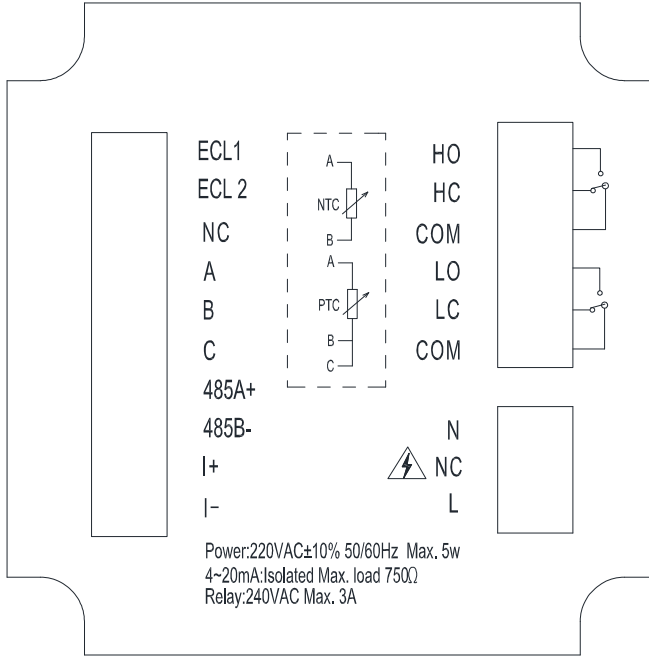


Figure 5 Wiring diagram

### Identification of terminal

- ECL1: Measuring
- ECL2: Reference
- NC: Unidentified
- A: Temperature compensation terminal A, NTC10K and PT1000
- B: Temperature compensation terminal B, NTC10K and PT1000
- C: Temperature compensation terminal C, PT1000

- 485A + : RS485 communication interface A +
- 485B - : RS485 communication interface B -
- I + : 4~20mA output +
- I - : 4~20mA 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

## Chapter III Navigation keys

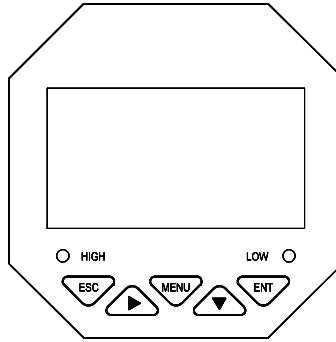







Figure 6

Table 1 Definition of buttons

| Sign  | Name of the key | Function description  |
|---|-----------------|---|
|    | MENU            | Enter the MENU on the “monitoring page”<br>Exit the MENU on the “menu page”   |
|    | EXIT            | Check related warning status on the “monitoring page”;<br>Return to previous level page in the up& down level page<br>linked to “menu page” |
|  | RIGHT           | Enter the menu under “monitoring interface”<br>Exit the menu under “monitoring interface”   |
|  | DOWN            | Relevant menu is selected under the “menu interface”<br>Relevant numerical value is modified under the setup status                         |
|  | ENTER           | Enter the sub-menu or confirm modification on the “menu Page”   |



## Chapter IV System menu

### EC Monitoring page

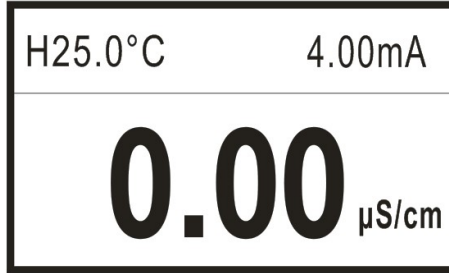


Figure 7

### TDS Monitoring page

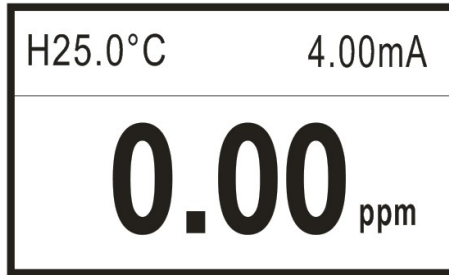




Figure 8


Push  to enter password verification page, input password to enter the home page.

Push  to enter alarm inquiry page, to inquire the current warning configuration information.

## Password verification page

----- User Password -----

Password: 0000

Input password and push  to enter home page.

Initial password is 0000, which can be modified via password modification function.

## Page of main menu

----- Main Menu -----

1. System Setting
2. Signal Setting
3. Online Calibration
4. Remote Setting
5. Alarm Setting
6. Information Inquiry

**System Setting:** settings of language, buzzer and backlight, modification of password and factory settings.

**Signal Setting:** constant of electrode, TDS factors and temperature offset factor settings, unit switch and temperature offset switch.

**Online Calibration:** correction of temperature and calibration of conductivity signal.

**Remote Setting:** settings of RS485 parameters and 4~20mA transmission output.

**Alarm Setting:** settings of parameters of high and low warning.

**Information Inquiry:** current version number.

## System Setting page

### ----- System Setting -----

- 1.Language
- 2.Buzzer
- 3.Backlight setting
- 4.Change Password
- 5.Factory setting

Language: Chinese or English.

Buzzer: ON/OFF setting

Backlight setting:ON/OFF setting

Change Password: password modification and log-in with new password.

Factory setting: return to factory settings

## Signal Setting page

### -----Signal Setting -----

- 1.Electrode constant
- 2.Unit switch
- 3.TDS Coefficient
- 4.Temp Switch
- 5.Temp Coefficient

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

Unit switch: conversion unit, ppm or us/cm: Total dissolved solid

(TDS) for ppm and conductivity (EC) of solution for us/cm.

TDS Coefficient: conversion coefficient of conductivity

and hardness, 0.5 as default.

Temp Switch: auto temperature compensation NTC10K or PT1000 or manual temperature compensation, temperature range:-10°C~130.0°C.



Temp Coefficient: temperature compensation coefficient, 0.02 as default.

### **Online calibration page**

-----Online calibration -----

1. Temp Modification
2. EC calibration

Temp Modification: correction of auto temperature compensation value, in a range of  $\pm 20.0^\circ\text{C}$ .

EC calibration: calibration at single point in 1413us/cm solution, only applicable to calibration of 1.0 electrode and 10.0 electrode. Set up temperature compensation method, auto or manual compensate (temperature has a great impact on accuracy during calibration). Then enter conductivity calibration page, put the connected electrode into 1413us/cm standard solution. Click  to confirm calibration. (Click  to clear calibration value).

### **Remote setting page**

-----Remote setting -----

1. RS485 setting
2. Current transmission

RS485 setting: settings of 485 communication address and baud rate.

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Current transmission: settings of 4mA corresponding value and 20mA corresponding value of 4-20mA output.

## **Alarm Setting page**

### -----Alarm Setting -----

1. EC high alarm
2. EC low alarm
3. TDS high alarm
4. TDS low alarm
5. ER high alarm
6. ER low alarm

EC high alarm: when the measured value is higher than high alarm pull-on value, high alarm relay pickup; when the measured value is lower than high alarm breakaway value, high alarm relay breakaway.

EC low alarm: when the measured value is lower than low alarm pull-on value, low alarm relay pickup; when the measured value is higher than lower alarm breakaway value, low alarm relay breakaway.

TDS high alarm: when the measured value is higher than high alarm pull-on value, high alarm relay pickup; when the measured value is lower than high alarm breakaway value, high alarm relay breakaway.

TDS low alarm: when the measured value is lower than low alarm pull-on value, low alarm relay pickup; when the measured value is higher than lower alarm breakaway value, low alarm relay breakaway.

ER high alarm:when the measured value is higher than high alarm pull-on value, high alarm relay pickup; when the measured value is lower than high alarm breakaway value, high alarm relay breakaway.

ER low alarm:when the measured value is lower than low alarm pull-on value, low alarm relay pickup; when the measured value is higher than lower alarm breakaway value, low alarm relay breakaway.

**Information inquiry page**

-----Information inquiry-----

Version information

Information inquiry: inquire the current version of hardware, with strong trace-ability

**Chapter V 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.

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          | Conductivity value (unit: us/cm, to be divided by 100) | Read only        |
| 0x0002  | short         | 4 bytes   | 0x03          | Temperature value (unit: °C, to be divided by 100)     | Read only        |
| 0x0003  | unsigned long | 4 bytes   | 0x03          | TDS value (unit: ppm, to be divided by 100)            | Read only        |
| 0x0005  | unsigned long | 4 bytes   | 0x03          | Resistivity value(unit:MΩ*cm, to be divided by 100)    | Read only        |

Example of conductivity reading

Computer sends: 00 03 00 00 00 02 C5 DA

Conductivity meter returns: 00 03 04 00 00 00 00 EA F3

Return command annotation:

00 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 00 00 is the returned conductivity value, 0.00us/cm, unit: us/cm. The value obtained The range: 0.00~20000.00us/cm.

EAF3 is the CRC16 check code, which is varying depending on different data;

Example of conductivity reading:

Information inquiry: inquire the current hard software version, high trace-ability.

Computer sends: 00 03 00 02 00 01 24 1B

Conductivity/Resistivity meter returns: 00 03 02 00 FA 05

C7

Return command annotation:

00 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, 2bytes;

00 FA is the returned temperature value, 25.0°C,

unit: °C. The value obtained shall be divided by 10 to get the current temperature value.

The range: -10.0~130.0°C.

05C7 is the CRC16 check code, which is varying depending on different data.



## Chapter VI Troubleshooting

1.No display at the controller?

Solution: check if the power supply is correctly connected.

2.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.

3.Conductivity/Resistivity controller can not be calibrated?

Solution: the standard solution preparation is not correct or the electrode is damaged.

4.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.

5.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.

6.Max value displayed?

Solution:When it show the Max value on the display,the measurement value is over range