User Manual

Conductivity Monitor/ Controller

EC-9900

Initial password：0000

Shanghai ChiMay Technology Co., Limited

www.chimaytech.com
www.shchimay.com

Safety and matters needing attention

1. Please read this manual carefully before installation to avoid safety problems and instrument damage caused by wrong records.

2. Please avoid high temperature, high humidity and corrosive environment to install the controller, and avoid direct sunlight exposure.

3. Special wires shall be used for the transmission line of electrode signal. It is suggested touse the wires provided by our company instead of general wires.

4. When using the power supply, it should avoid interference from the power supply, especially when using the three-phase power supply, the ground wire should be used correctly (if there is a power surge phenomenon occurs, the controller's power supply and control devices such as: dosing machine, mixer, etc. can be separated, that is, the transmitter uses a separate power supply.)

5. The controller output contacts carry alarm and control functions. For safety and protection reasons, please be sure to connect external relays with sufficient current value to protectthe safety of the instrument.

Catalog

Ⅰ Overview

Basic function

1. Language: Chinese or English.(other can be customized)
2.Temperature compensation: PT1000, NTC10K and manual temperature compensation are available in three temperature compensation modes.
3.Two 4-20MA outputs, corresponding to Conductivity/Resistance/TDS value and temperature, using isolation technology, strong anti-interference ability.
4.The high and low points of the 3 sets of relays can be switched freely, and the hysteresis can be adjusted freely to avoid relays on and off frequently.
5.Password management function is to prevent the wrong operation by non-professional personnel.
6.Menu prompt function, greatly facilitates the user's operation.

Instrument technical parameters

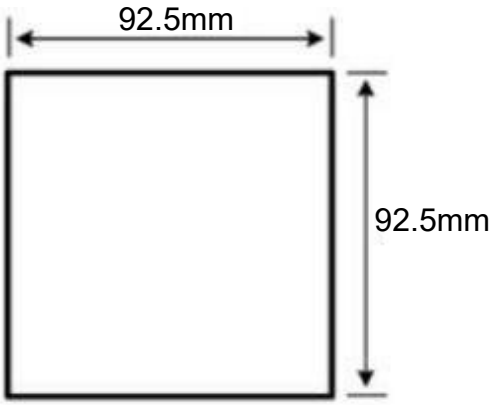
- Measuring range: 0.05uS/cm – 200mS/cm; 0.00 MΩ·cm～20.00 MΩ·cm; 0-2000ppm
- Accuracy: ±0.01 uS/cm; ±1ppm
- Resolution: 0.01uS/cm; 1ppm
- Temperature compensation: 0–120℃ Manual / Auto (PT1000/NTC10K)
- Signal output: 4-20mA isolation protection output， independent corresponding Conductivity/Resistance or temperature, maximum load is 500Ω.
- Alarm output: 3 groups can randomly correspond to high and low point alarm (3A/250 V AC), normally open contact relay.
- Power supply: AC100-240V or DC24V.
- Power consumption：≤ 7W
- Environmental condition:
  (1)temperature 0~50 ℃ （2）humidity ≤ 85%RH
- Dimensions: 96×96×72mm（H×W×D）
- Hole: 92×92mm（H×W）

Ⅱ Combination and installation

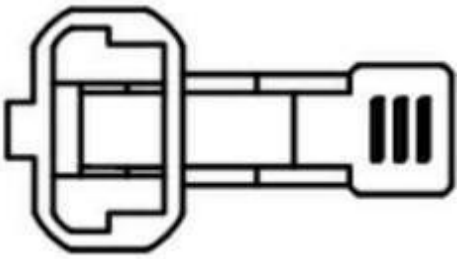
2.1 Main engine fixed

This controller can be plated, wall-mounted installation.

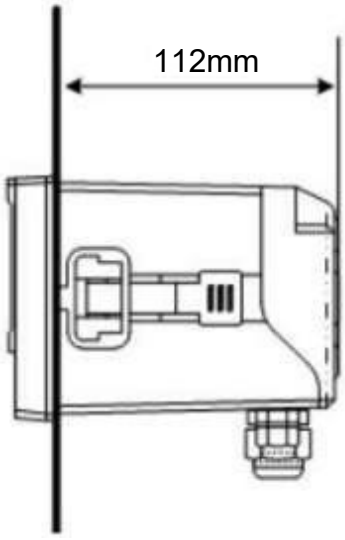
2.2 Panel mounting reference drawing

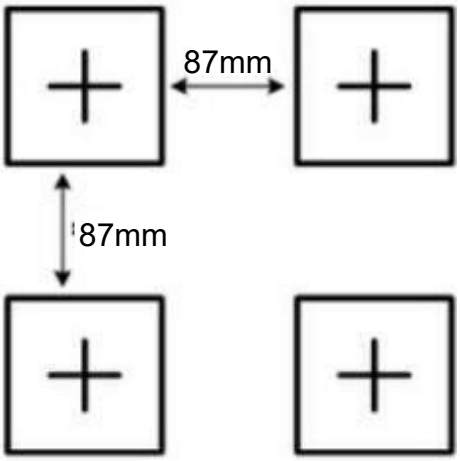


Cut off dimensions



Mounting clips

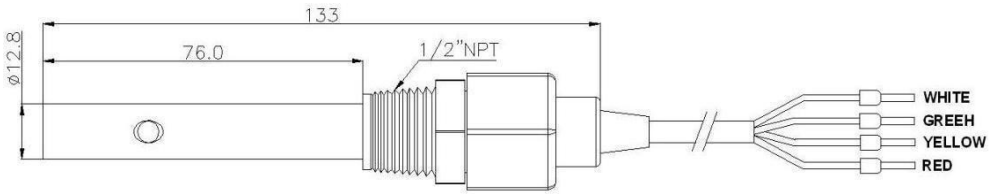




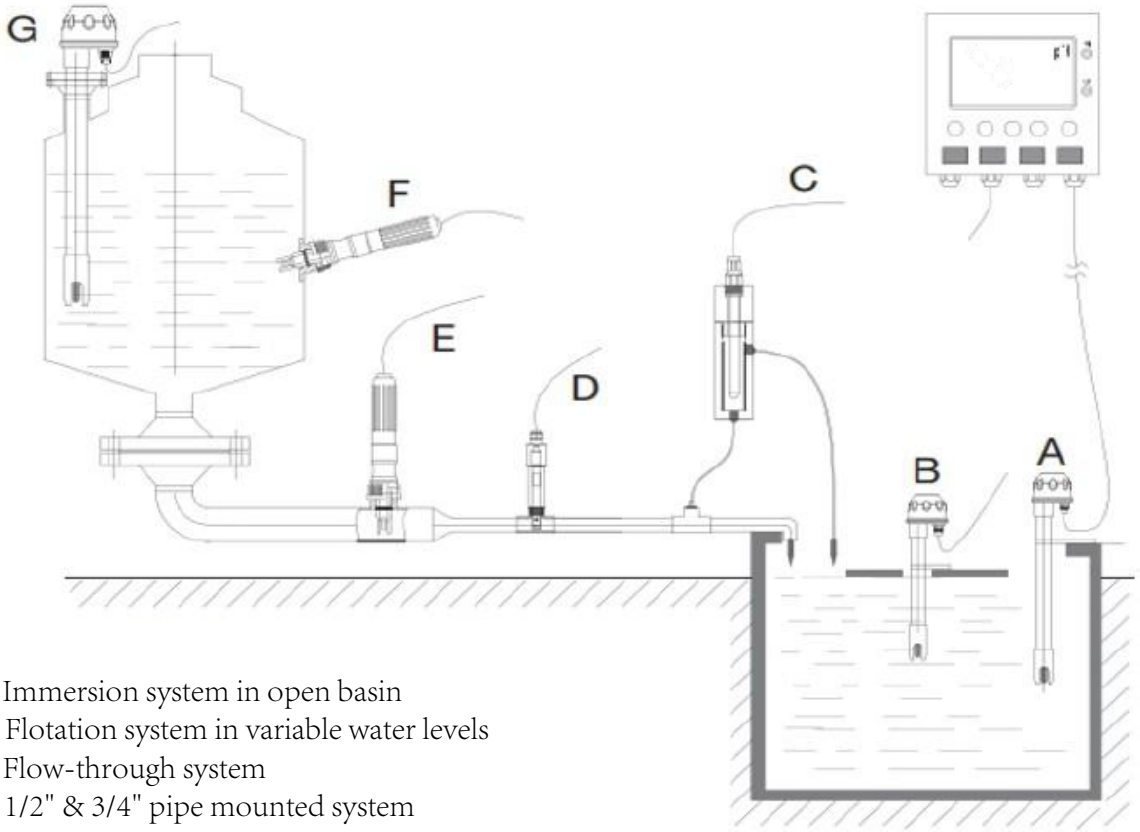
Control box cut-off dimensions

2.3 Electrode mounting

2.3.1 Electrode shape and installation form



KS-1 Conduvtivity sensor

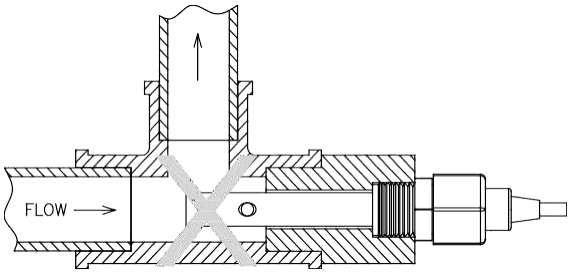


A Immersion system in open basin
B Flotation system in variable water levels
C Flow-through system
D 1/2" & 3/4" pipe mounted system
E 1" pipe mounted system
F Side-entry system in vessel
G Top-entry system in closed vessel

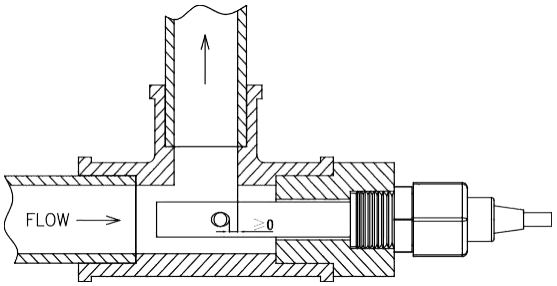
2.3.2 Common installation methods

Installation of sensors is a very careful work, please install sensors must carefully select the installation site, deliberate installation methods, so as to avoid the measurement data distortion.

1) The electrode joint in figure A is too long, and the extension part is too short. The dead cavity is easy to be formed in the sensor, resulting in measurement error. It should be installed according to figure B (go deep into the water direction=FLOW)

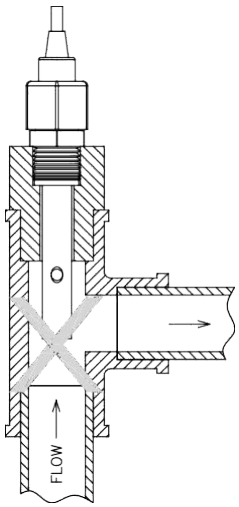


A

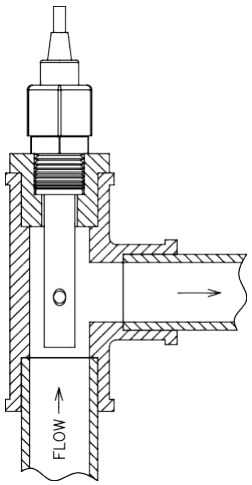


B

2) The installation mode of A will lead to the formation of the air cavity in the conductivity cell, resulting in measurement errors and instability, and should be installed as shown in figure B.

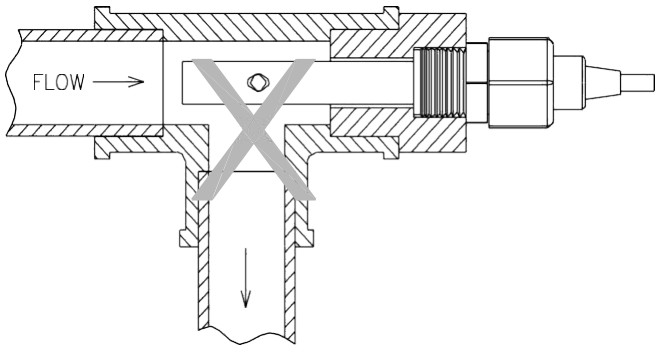


A WRONG



B The small round hole of the conductivity cell is located in the water outletwindow.

3) Other common wrong installation methods:



The measurement error or instability can be caused by the flow cannot guarantee the full pipe or high gas accumulation.

2.3.3 Installation precautions and maintenance

1) The flow cell should be installed in the pipeline where the flow rate is stable and it is not easy to produce bubbles. It can be installed in the way of side flow, so as to avoid inaccurate measurement.

2) The concentric tubular electrode paperback, oblique or vertical installation should be installed in the direction of FLOW and deep into the flowing water body; other structural shape electrodes prevent the dissipation pressure due to turbulence in the measurement room when electrode side direction installation and cause measurement data disorder.

3) The measurement signal is weak signal acquisition, the cable must be independent of the line. It is prohibited to connect with power line and control line in the same group of cable connectors or terminal boards and prohibited to wear pipe and tie with power line and control line, avoid interference with measurement or damage, breakdown instrument measurement unit.

4) The cable of the electrode is standard length and special cable before leave the factory. When the measuring cable needs to be lengthened, please make anagreement with the manufacturer before supply.

5) Please keep the electrode measurement part clean when installed. Don't touch the surface directly with hands or dirty objects. After contact with greasy dirt, grease and glue, the accurate value can’t be measured for a longtime.

6) The conductivity cell is a precise measuring component. It can’t be decomposed and change the shape and size of the electrode. It can’t be cleaned, soaked and mechanically scraped by strong acid or alkali. These operations will lead to the change of electrode constant and affect the measurement accuracy of the system.

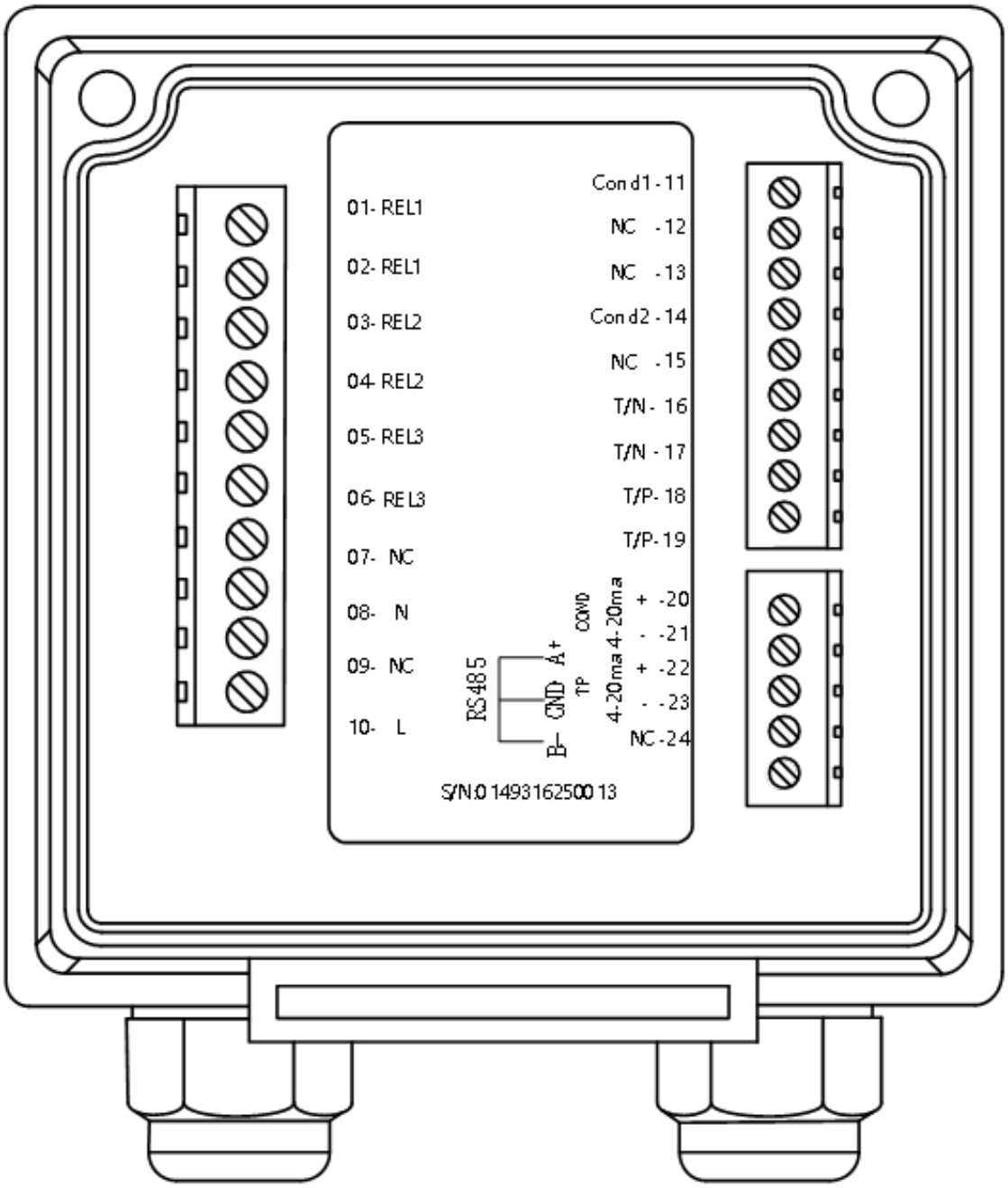
7) The measuring cable is the special cable, and the other specifications of cable can’t be changed at will. All the incorrect change and change without permission will result in the error of measurement.

8) The instrument is made of precision integrated circuits and electronic components. It should not be installed in direct sunlight. It should be placed in a dry environment or in the control box to avoid leakage or measurement errors caused by water droplets sputtering or moisture.

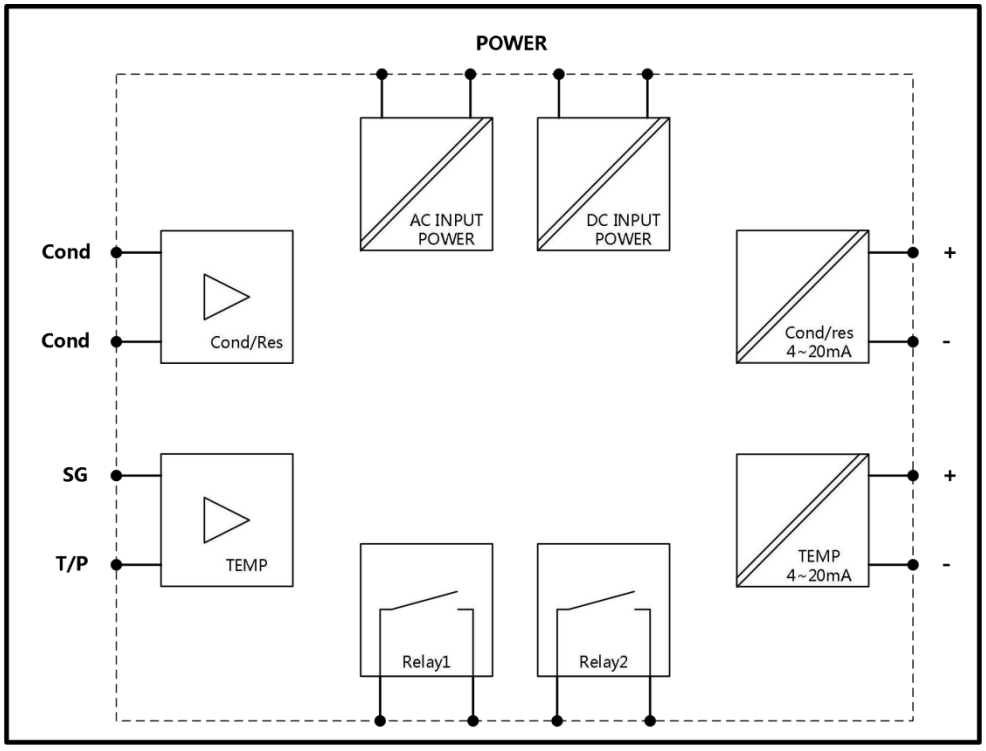
9) In order to ensure the safe operation of the installation, connect the power after the installation has been checked correctly.

Ⅲ Electrode and electrical wiring

3.1 Back panel wiring diagram



3.2 Back contact function diagram

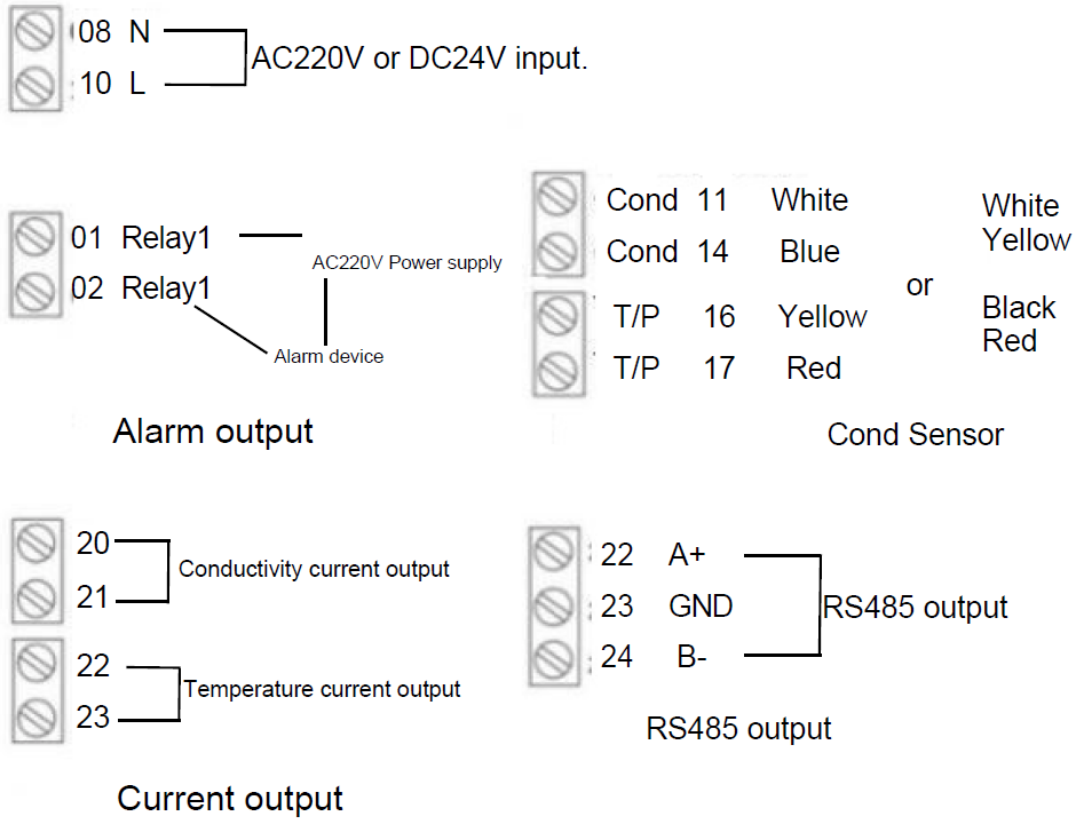


3.3 Backplane terminal contact description

01 REL1: First alarm control, external relay
02 REL1: First alarm control, external relay
03 REL2: Second alarm control, external relay
04 REL2: Second alarm control, external relay
05 REL3: Third alarm control, external relay
06 REL3: Third alarm control, external relay
07 NC:NC
08 AC:AC power supply 220VAC(N)/DC:24V+
09 NC:NC
10 AC:AC power supply 220V(L)/DC:24V-
11 Cond1: Conductivity electrode
12 NC: NC
13 NC:NC
14 Cond2:conductivity electrod
15 NC: NC
16 T/NTC:NTC10K temperature resistance interface1
17 T/NTC: NTC10K temperature resistance interface 2
18 T/P: PT1000 temperature resistance interface1
19 T/P: PT1000 temperature resistance interface2
20 Cond-ma(+): conductivity current output+
21 Cond-ma(-): conductivity current output-
22 T-ma(+): temperature current output+/RS485 A
23 T-ma(-): temperature current output-
24 NC/RS485 B.

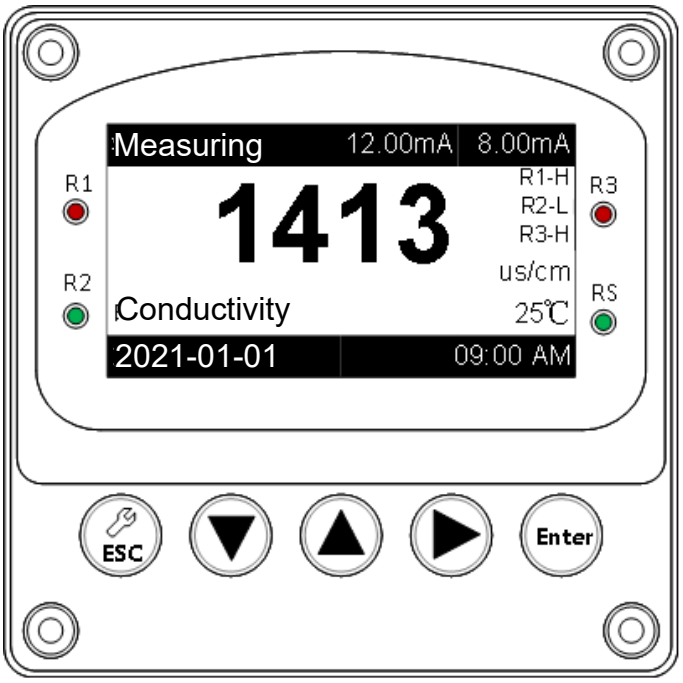
20 Cond-ma(+):conductivity current output positive end
21Cond-ma(-):conductivity current output negative end
22 T-ma(+):Temperature current output positive end/RS485 A connector
23 T-ma(-):Temperature current output negative end
24 NC:NC /RS485 B connector

Note: This instrument supports two groups of 4-20MA or one group of 4-20mA and one group of RS485.
AC: 100~240VAC ± 10% 50/60hz;
DC: 24V;
Power: 7W.
Relay: withstand voltage 240VAC, maximum current 0.5A
Output current: 500 Ω maximum resistance.



Ⅳ Panel introduction

4.1Panel introduction



4.2 Key description

To prevent improper operation by non-users, enable password protection when entering parameter settings and corrections. Each function description is as follows:

ESC ： Trigger the setting interface in the measurement mode, return to the previous menu under the setting interface.

▼： Switching and numerical adjustment of menus under the setting interface.

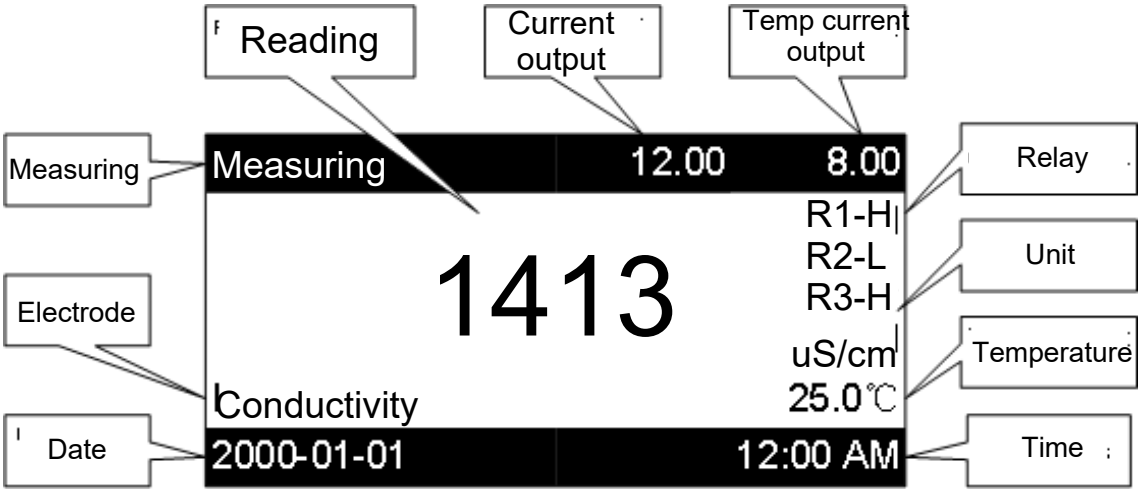
▲： Switching and numerical adjustment of menus under the setting interface.

▶： View historical alarm information in measurement mode, enter the next level menu under the setting interface, and the shortcut key of the alarm information interface.

Enter: View the basic parameters in measurement mode, and the settinginterface is used to enter the next level menu, the shortcut key of the system information interface.

4.3 Display description

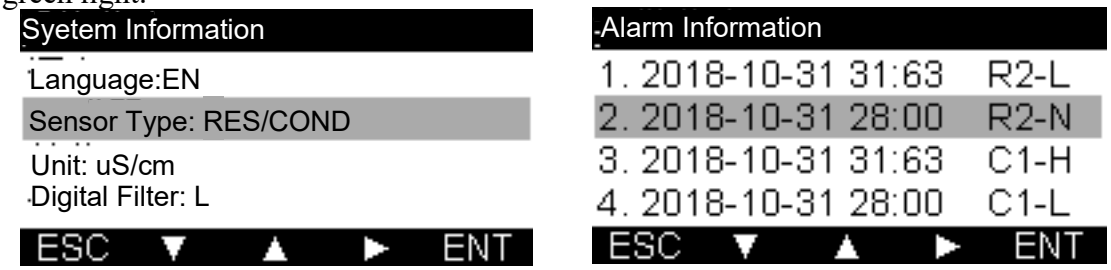
In the display mode of system measurement, it will be shown as follows:



Indicator light description：

R1:Action indicator of relay 1,the high displays the red light, the low displays the green light.

R2:Action indicator of relay 2,the high displays the red light, the low displays the green light.



The figure above shows the display interface of system information and alarm information respectively.

System information： All setting parameters of the meter are displayed in the system information. Press Enter to enter the system information interface.

Alarm information： Up to 60 relay alarm messages can be stored. Press the button ► to enter the alarm information interface.

Ⅴ Menu introduction

According to the different functions, the controller is divided into four first-level menus, each first-level menu includes two-level or even multiple secondary menus, each menu has a number, which is easy to view and set the instrument parameters. And the secondary menu will display the setting parameters of the controller in the upper right of the screen according to the function, and the user can know the instrument parameters without entering the subordinate menu.

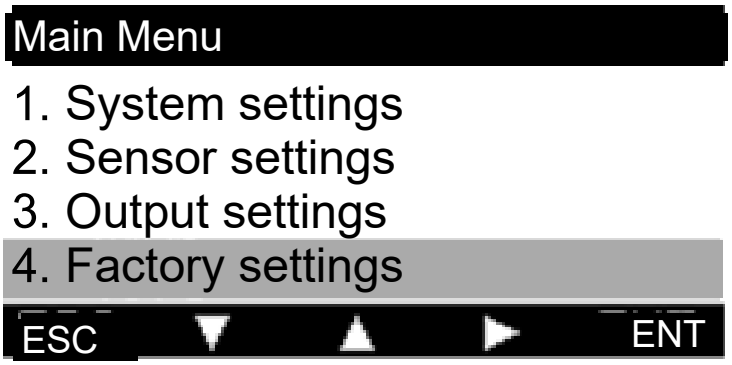
The main menu included four first-level menus:
1. System settings
Language, password, data, backlight.

2. Sensor settings
Display mode, coefficient, digital filtering, temperature mode, temperature settings, Compensate, TDS settings.

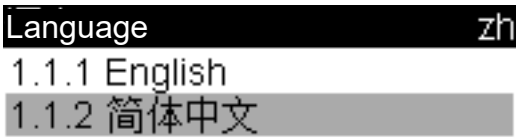
3. Output settings
Relay 1, Relay 2, Relay 3, Current 1, Current 2(Modbus RTU).

4. Factory reset
Setting reset, alarm reset.

Main menu



5.1 System settings

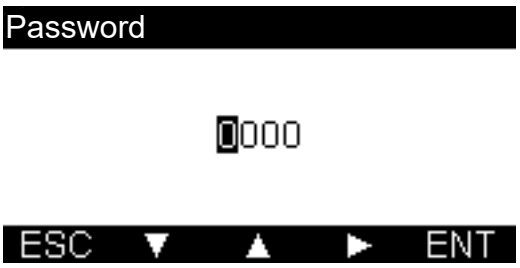


Menu 1.1 Language

This instrument supports Chinese and English two languages, two languages can switch freely.

For example: select simplified Chinese and press Enter key to confirm, the whole display interface of the instrument will be changed into simplified Chinese.

Note：In order to prevent the user from misoperation, after the customer selects the parameter and presses the "Enter", there will be four prompts “ESC”, “OK”, “NO” and “Enter” at the bottom of the screen, corresponding to the four buttons of the controller. The user needs to reconfirm whether the parameter is correctly selected. If yes, press the button ▼that is “OK”, otherwise press ▲ is “NO”.



Menu 1.2 Password

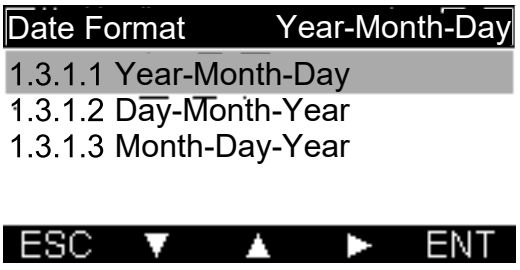
The default password of this instrument is 0000. You can change the password according to your own needs. After changing the password, the user will enter the new password after entering the setup menu next time.

Menu 1.3 Date

This menu consists of two sub-menus.

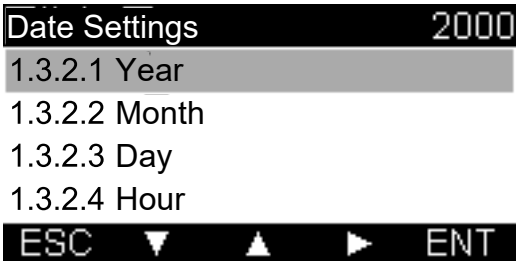
1.3.1 Date format

1.3.2 Date setting



Menu 1.3.1 Date format

The meter supports the selection of three date formats, and you can select the appropriate date format according to your needs.

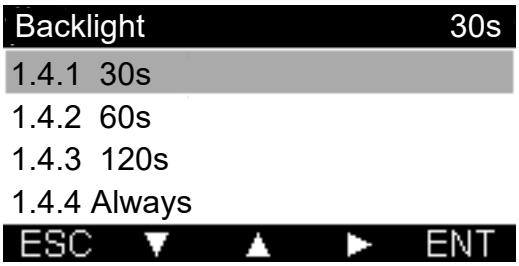


Menu 1.3.2 Date setting

Enter the date setting menu to set the year, month, day, hour, minute, and so on. After successful setting, the system time of the meter will automatically change to the set time.

Menu 1.4 Backlight

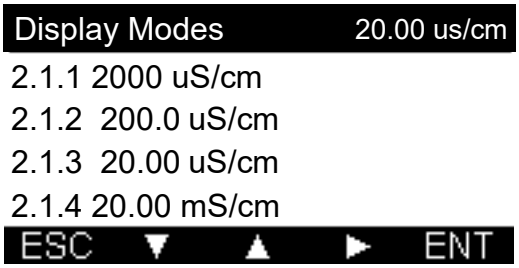
This instrument supports four kinds of backlight time, the user can set the corresponding backlight time according to the demand. The screen will darken when the meter reaches backlight time.



5.2 Sensor settings

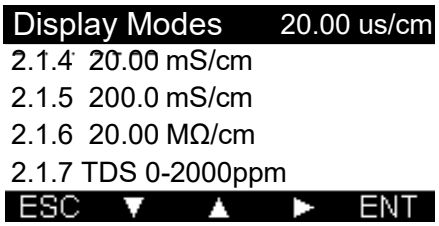
Menu 2.1 Display mode

This instrument supports 6 display modes, each display mode represents different measurement accuracy and measurement unit selection.



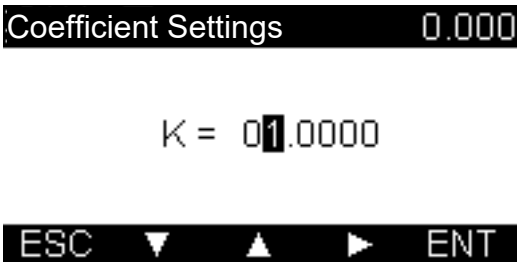
Remarks：

2000us/cm: measuring range is **0-2000us/cm,** the unit is **us/cm.**
200.0us/cm: measuring range is **0-200us/cm,** the unit is **us/cm.**
20.00us/cm: measuring range is **0-20.00us/cm,** the unit is **us/cm.**
20.00ms/cm: measuring range is **0-20.00ms/cm,** the unit is **ms/cm.**
200.0ms/cm: measuring range is **0-200.0ms/cm,** the unit is **ms/cm.**
20.00mΩ/cm: measuring range is **0-20.00mΩ/cm,** the unit is **mΩ/cm.**
2000ppm: measuring range is **0-2000ppm,** the unit is **ppm.**



Menu 2.2 Coefficient settings

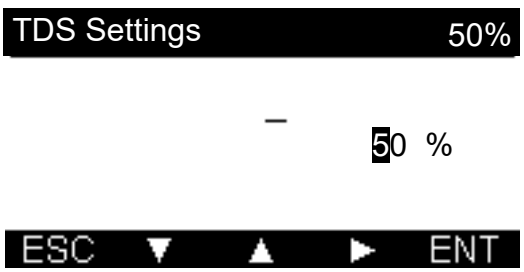
This controller chooses the suitable electrode coefficient according to the measuring range of water sample. The electrode coefficient is determined by the manufacturer and can be fine-tuned to achieve the purpose of correction.



Note:

Coefficient=0.01→ 0.05-20uS/cm
Coefficient=0.1→ 0.1-200uS/cm
Coefficient=1.0→ 1.0-20.00mS/cm
Coefficient=10.0→ 10-200mS/cm

The user must determine the electrode coefficien t before adjusting the coefficient, and then adjust the coefficient within the appropriate adjustment range to achieve the purpose of correction.

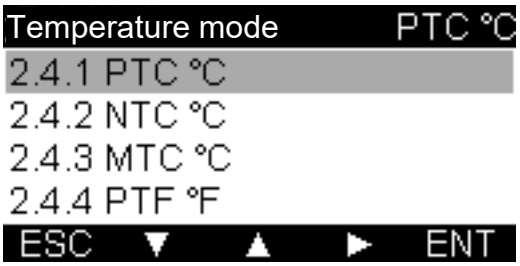


Menu 2.3 Digital filtering

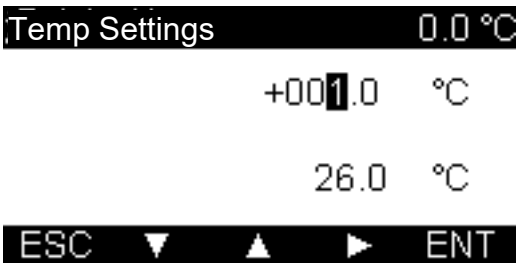
The measured value of the meter is filtered by means of averaging, and three digital filtering methods are supported.
Low point: average every 5s.
Midpoint: average every 10s.
High point: average every 20s.
Note: The rate of change of the low point is higher than the rate of change of the high point.

Menu 2.4 Temperature mode

The meter supports two types of temperature compensation, PT1000 and NTC10K. It can freely set two temperature display modes: Celsius and Fahrenheit.



Note 2.4.1 PTC℃： PT1000 temperature probe, Celsius display mode.
2.4.2 NTC℃： NTC10K temperature probe, Celsius display mode.
2.4.3 MTC℃： manual mode， Celsius display mode.
2.4.4 PTF℉： PT1000 temperature probe， Fahrenheit display mode.
2.4.5 PTF℉： NTC10K temperature probe， Fahrenheit display mode.
2.4.6 MTF℉： manual mode， Fahrenheit display mode.



Menu 2.5 Temperature settings

The temperature adjustment is divided into two parts, the upper part is the temperature adjustment value, and the lower part is the adjusted temperature display value. Press Enter key, the temperature display of the meter will be the adjusted value.

Menu 2.6 Compensation

You can freely set the temperature compensation

parameter according to the actual situation. After pressing the Enter key to confirm, the measured value will change according to the temperature compensation parameter.

Note:The temperature compensation reference temperature of the instrument is fixed at 25 °C, and the calculation formula is:

$$Ct = C25\{1+\alpha(T-25)\}$$

C25 is COND/Resistance value at 25 ° C. α is temperature compensation coefficient

T is temperature of the solution to be tested

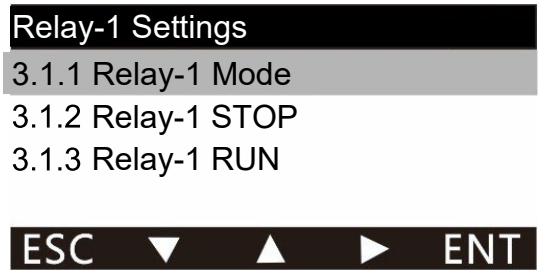
Ct is temperature of T ℃

5.3 Output settings

Relay 1, Relay 2, Relay 3, Current 1, Current 2, Modbus RTU(optional).

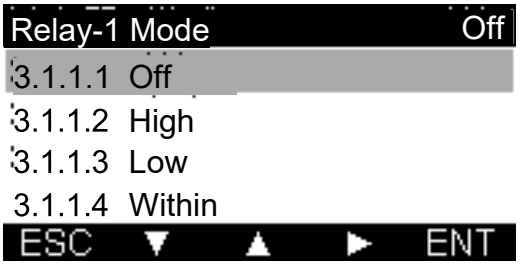
Menu3.1 Relay1 Settings

3.1.1Relay-1Mode
3.1.2Relay-1STOP
3.1.3Relay-1RUN



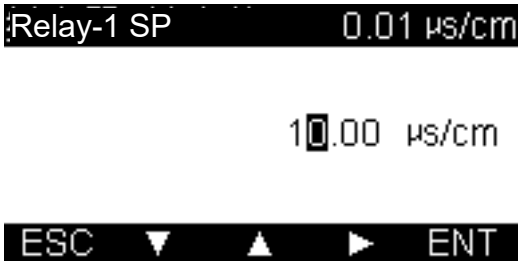
Menu 3.1.1 Relay 1 Mode

The relay is divided into three modes: off, high and low. Users can set the corresponding relay mode according to their needs, press Enter to confirm.



Menu 3.1.2 Relay-1 SP1

The user can freely set the trigger value within the range allowed by the meter and press Enter to confirm.

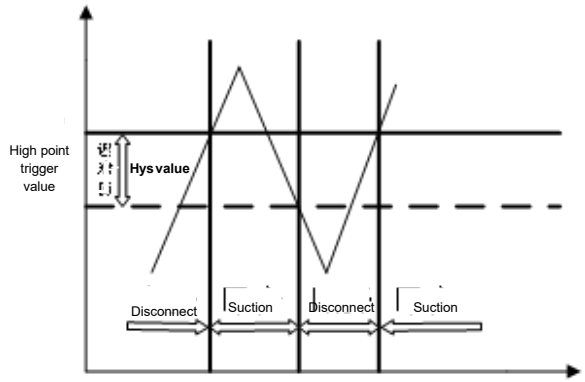


Menu 3.1.4 Relay-1 Hys

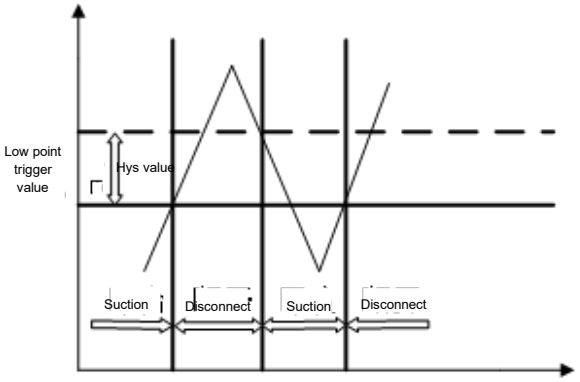
The user can freely set the hysteresis value within the range allowed by the meter and press Enter to confirm.

Note:

Greater than (or less than) the alarm trigger value is pulled in. Below (or greater than) the hysteresis value is released. The relay action diagram is as follows:



An example of the high point mode is:
Relay 1 mode = high point.
Relay 1 trigger value = 3000uS/cm.
Relay 1 lag value = 100uS/cm.
The working state of this setting relay is that when the display value is higher than 3000uS/cm, the relay is suction, and when it is lower than 2900us/cm, the relay is disconnected.
In high point mode, Disconnect value = trigger value-Hys value



An examples of low-point mode:
Relay 1 mode = low point.
Relay 1 trigger value = 2000uS/cm.
Relay 1 lag value = 100uS/cm.
The working state of this setting relay is that the relay is suction when the display value is lower than 2000uS/cm and disconnected when it is higher than 2100uS/cm.
In low point mode, disconnect value = trigger value + Hys value

Menu 3.2 Relay 2

Menu 3.3 Relay 3

The setting of relay 2 / 3 is the same as the setting principle of relay 1, please refer to the setting of relay 1.

Menu 3.4 Current-1 Set

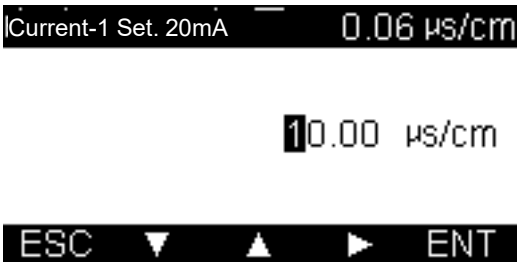
3.4.1 Current-1 Mode
3.4.2 Current-1 Set. 4mA
3.4.3 Current-1 Set. 20mA
3.4.4 Current-1 Cal. 4mA
3.4.5 Current-1 Cal. 20mA

Menu 3.4.2 Current-1 4mA

The user can freely set the current 1-4mA setting value. After pressing Enter, the system willautomatically save the settings.

Menu 3.4.3 Current-1 Set. 20mA

The user can freely set the current 20ma setting value. After pressing Enter, the system will automatically save the settings.



Note：The conductivity value and current valueset in 4-20mA correspond to each other, andthe calculation formula is：

outMa =（20.00-4.00）/（endMa - startMa）*（hold- startMa）+ 4.00

outMa is the value of output current

startMa is conductivity value set by 4mA

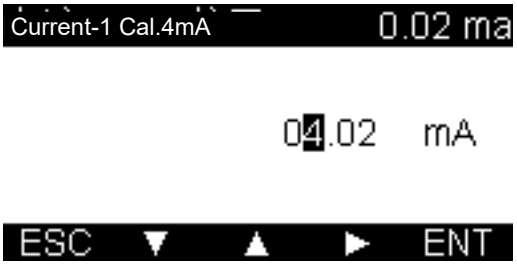
endMa is conductivity value set by 20mA

Hold is present measured value

For example, 4mA=0.00uS/cm, 20mA=20.00uS/cm, when the conductivity is 10.00uS/cm, the current output is 12.00mA.

Menu 3.4.4 Current-1 Cal. 4mA

After entering the calibration interface, the current output value will be displayed on the screen. The ammeter will measure the output current value of the current 1 and adjust the current value on the screen to be the same as the current value measured by the ammeter.



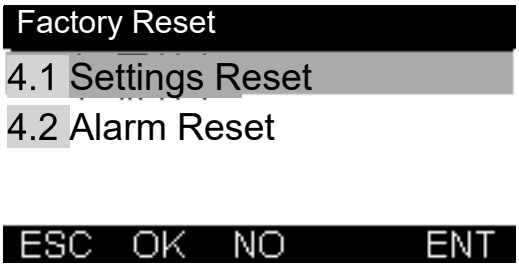
Menu 3.4.5 Current-1 Cal. 20mA

The setting principle of 20mA is the same as that of 4mA. Please refer to 4mA forcorrection.

5.4 Factory Reset

Menu 4.1 Settings Reset

Press Enter to confirm, all the parameter settings of the meter will be restored to the default value.

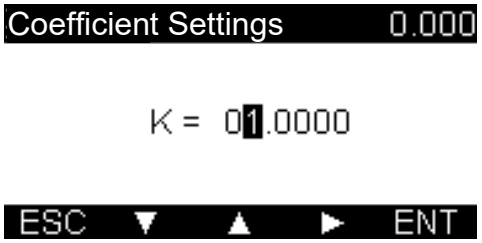


Menu 4.2 Alarm Reset

After pressing Enter key, the alarm information of the meter will be cleared.

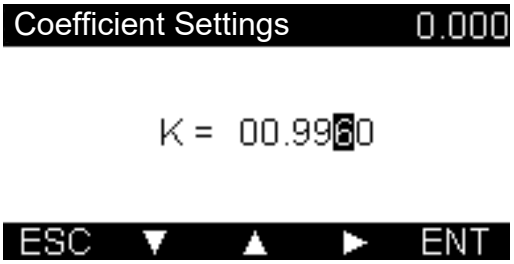
Ⅵ Calibration

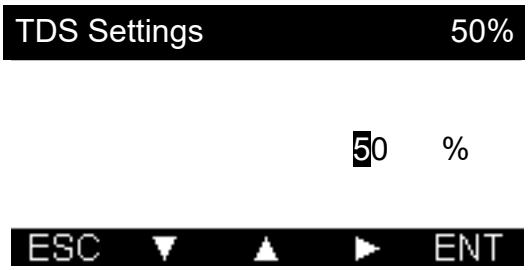
The calibration of this control instrument is corrected by electrode coefficient, enters the 2.2 coefficient menu, selects the electrode coefficient of the electrode as (1.0 coefficient), dips the electrode into the correction liquid (such as 1413uS/cm).



Adjust the value of the electrode coefficient by

▼ /▲ / ► button (such as adjusting the coefficient to 0.996) press **Enter** to confirm, so that the measured value and the actual correction liquid value is consistent with the correction can be completed.





Ⅶ Default factory setting

Menu name	Range setting	Factory default
Measurement unit	us/cm / MΩ.cm	us/cm
Digital filtering	Low/middle/high point	Low point
Temperature compensation	PTC/NTC/Manual	Manual
Manual temperature compensation	0.0 ~ 100.0 ℃	25.0 ℃
High alert trigger value	0.00 ~ 20.00 uS/cm	15.00 uS/cm
High alert hysteresis value	0.00 ~ 20.00 uS/cm	1.00 uS/cm
Low alert trigger value	0.00 ~ 20.00 uS/cm	5.00 uS/cm
Low alert hysteresis value	0.00 ~ 20.00 uS/cm	1.00 uS/cm
4mA corresponding value	0.00 ~ 20.00 uS/cm	0 uS/cm
20mA corresponding value	0.00～ 20.00uS/cm	20.00 uS/cm
user password	0 ~ 9999	0000（general password:6666）
Backlight	30s~Always	30s

Maintenance

	Possible factors	Check method
1.Without display	A. The power is not on. B. Meter fault.	A. Check for 220V voltage between (01) (03) B. Request professional maintenance.
2.Instability of display	A. The electrode wiring is wrong. B. Bubbles in the line C. Unstable water quality D. The power supply has stronginterference.	A. Check the cables B. Pipeline rectification or alternative measurement points C. Eliminating Instrument Reasons with Stable Water Source D. TV Reasons and Measures for Power Supply
3.Reading errors	A. The constant is set incorrectly B. Changes in electrode constants C. Measuring the rate of flow is too fast or dead water	A. Resetting Constants B. Replacement of new electrodes C. Install the electrode at a slower flow rate
4.The controller has a value after the electrode leaves the water	A. Reduced electrode permeable or cable insulation B. There's a foreign body between the electrodes. C. Terminals are affected by moisture	A. Replacing new electrodes B.C. To find out the causes and deal with them
5.Alarm is ringing, relay does not work	A.Relay steam, Contact does do not switch position B.Relay no sound	A. Replacement of relays (contact ablation) B. Circuit failure, repairing

ModbusRTU Communication Protocol

Settings： 9600 N 8 1 Protocol：MODBUS RTU FC CODE：0x03 Reading 0x06 Modify				
FC	**ADD**	**Name**	**Format**	**Expound**
03	1008	Main data(pH, ORP, EC, DO, CL, etc)	IEEE754 32-bit	Conductivity
03	1009			Resistance
03	1010	Temperature	IEEE754 32-bit	Temperature
03	1011			
03	1012	Main data Unit	INT16	Check list
03	1013	Temperature Unit	INT16	Check list
03/06	3600	Device address	INT16	Range: 1-255,（Unknow address modification by 00 AA 2C 01 FD 04. 01 is add,FD is 04CRC16 check）
03/06	3601	Baud rate	INT16	0:2400 1:4800 2:9600 3:19200
03/06	3100	Relay 1 output settings	INT16	0：no output 1：main data high point 2：main data low point 3：temperature high point 4：temperature low point
03/06	3101	Relay 1 trigger value	IEEE754 32-bit	
03/06	3102			
03/06	3103	Relay 1 hysteresis value	IEEE754 32-bit	
03/06	3104			

03/06	3200	Relay 2 output settings	INT16	1: main data high point 2: main data low point 3: temperature high point 4: temperature low point
03/06	3201	Relay 2 trigger value	IEEE754 32-bit	
03/06	3202			
03/06	3203	Relay 2 hysteresis value	IEEE754 32-bit	
03/06	3204			
03/06	3300	Current 1 output settings	INT16	0: no output 1: measuring value 2: temperature
03/06	3301	Current 1-4ma corresponding value	IEEE754 32-bit	
	3302			
03/06	3303	Current 1-20ma corresponding value	IEEE754 32-bit	
	3304			

Example: Reading
Sending command(Hexadecimal)

01	03	03	F0	00	02	C4	7C
Add	FC Code	Register Add	Register Add	Register Length high	Register Length low	CRC-high	CRC-low

Received:

01	03	04	00	00	40	E0	CA	7B
Add	FC Code	Data length	4 byte floats				CRC-high	CRC-low

Note:Floating-point data is a 32-bit IEEE754 format above the table as an example, divided into two 16-bit register data transmission, the last16-bit register(0000)first pass,the first 16-bit register(40 E0)data pass, each16-bit format highrt is first, lower is after. For example, now that Conductivity is 7.00, the 16-step of floating points is displayed as 40E00000, and the transfer order is 000040E0.

Unusual response format description:
If the sensor does not perform the upper computer command correctly, the following format information is returned:

	Add	FC Code	CODE	CRC-check
Data	ADDR	COM+80 H	xx	CRC 16
Byte	1	1	1	2

a)CODE:
01-Illegal function code
02-Illegal data address bit
03-Illegal data
b)COM:The received function code

0	无单位	1	PH
2	MV 毫伏	3	V 伏
4	uS/cm	5	ms/cm
6	Ω 欧姆	7	KΩ千欧
8	MΩ/cm 兆欧	9	mg/L
10	ppm	11	% 百分比
12	‰ 千分比	13	nA 纳安
14	mA 毫安	15	NTU
16	FTU	17	EBC
18	JTU	19	mm/a 毫米/年
20	Mpy 密耳/年	21	mil/a 密耳/年
22	uA/cm² 微安/厘米²	23	mg/(dm·d) 毫克/（分米·日）
24	Mdd毫克/（分米·日）	25	g/(m·h) 克/（米·时）
26	g/(m·d) 克/（米·日）	27	℃ 摄氏度
28	℉ 华氏度	29	° K 开尔文温度
30	Year 年	31	Month 月
32	Day 日	33	Hour 时
34	Minute 分	35	Second 秒
36	Bar	37	pH-TI

ChiMay

For other question, feel free to contact us.

Thank you for choosing ChiMay!

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