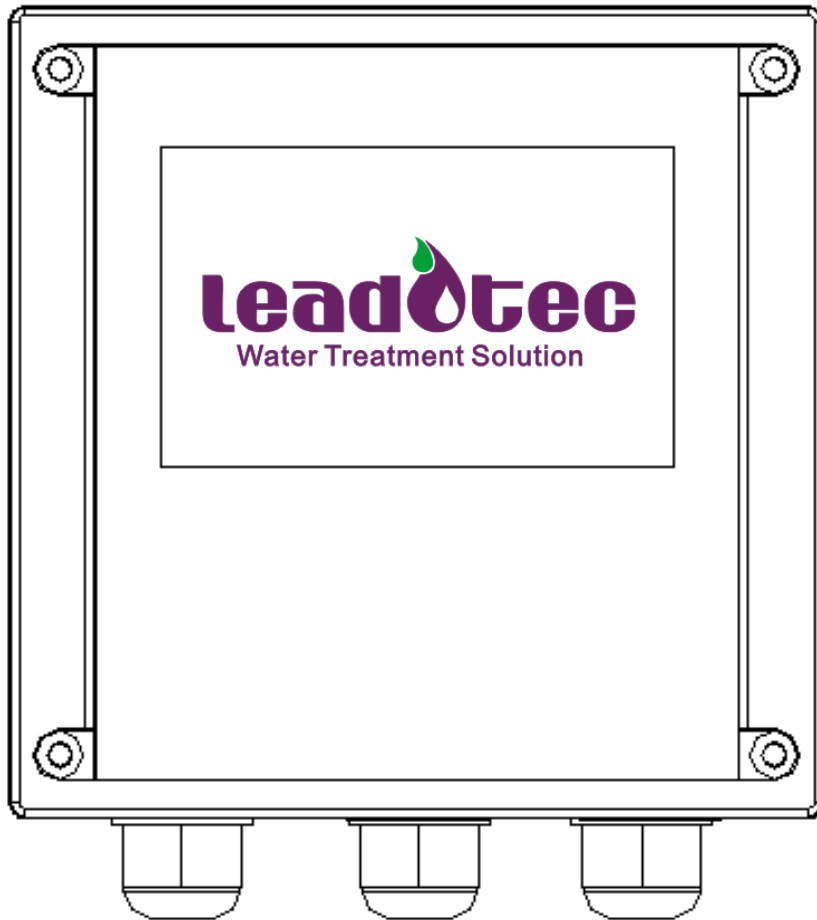


# Free Chlorine Controller

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## **Safe operation procedures**

Read the following instructions before using the instrument.

1. After unpacking the instrument please check for damage due to shipping.
2. The instrument must be operated by trained professional and technical personnel.
3. Read the manual carefully to avoid incorrect wiring connection that can cause equipment damage and safe problem.
4. After wiring carefully check all are correct then can power on and make sure the others equipments are correct.
5. Please avoid installing in a high humidity, high temperature, corrosive and in a direct sunlight environment.
6. Please separate the power lines of instrument from other machines that produces high noise in the power lines.

## **Instrument use**

Instruments are used in industrial measuring of the temperature and Free Chlorine, such as wastewater treatment, environmental monitoring, swimming pool, waterworks, food production process, etc.

The instrument can be panel, wall or pipe mounted.

The instrument provides two current outputs. The maximum load is 500 Ohm.

The instrument provides 3 relays. It can pass though a maximum of 5 Amps at 250 VAC or 5 Amps at 30VDC.

## **Product content**

6000 series, the product package contains 1 instrument, the printed manual, 4 sets of holder.(fixed block, fixed bar, screw)

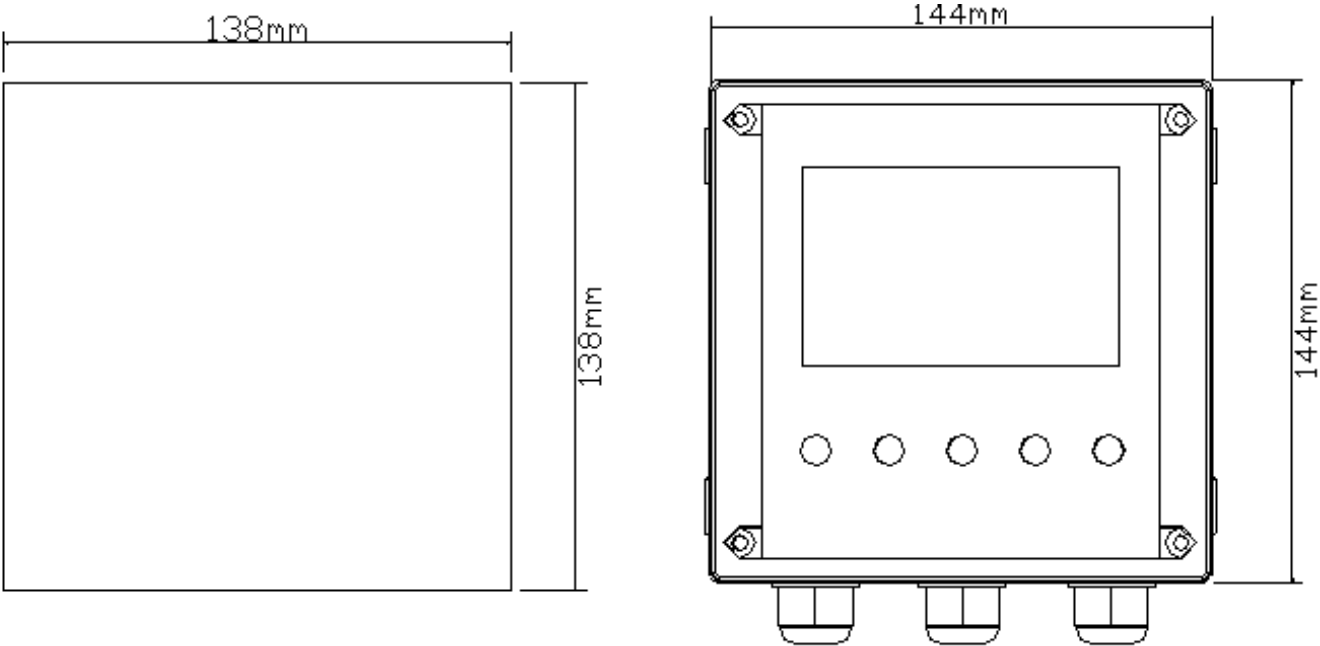
800 series, the product package contains 1 instrument, the printed manual, 2 holders

## Specifications

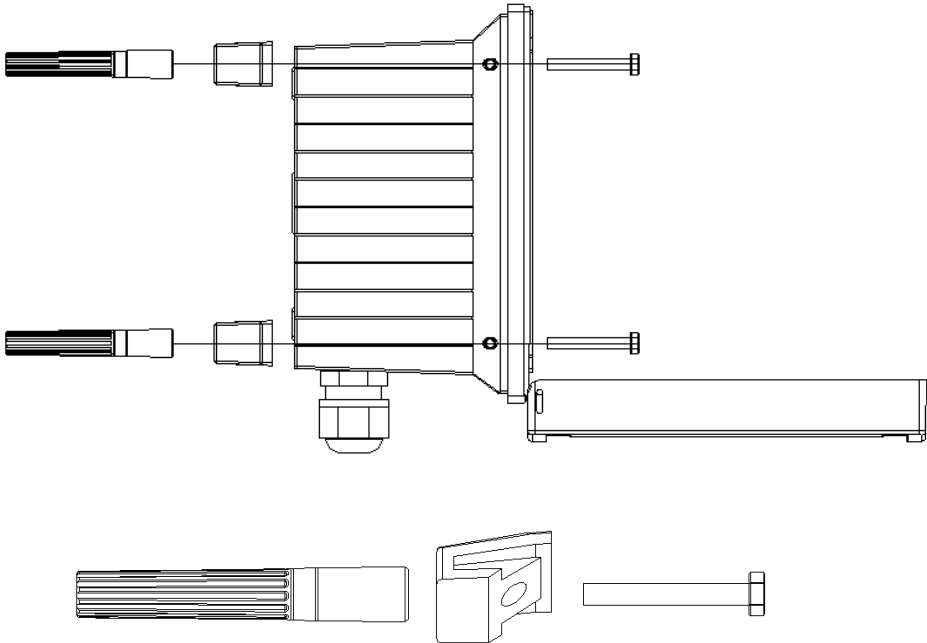
Functions	FCL	HOCL
Measuring range	0.00 to 20.00 ppm	0.00to 20.00 ppm
Resolution	0.01 ppm	0.01 ppm
Accuracy	±0.05 ppm	±0.05 ppm
Temp. compensation	Pt-1000/NTC22K	
Temp. range	-10.0 to +130.0°C	
Temp. compensation range	-10.0 to +130.0°C	
Temp. resolution	0.1°C	
Temp. accuracy	±0.2°C	
Current range of electrode	-2.0 to +1500 nA (for 6000 series only)	
Accuracy of electrode current	±0.5 nA	
Polarization range	0 to -1000mV(for 6000 series only)	
Ambient temperature range	0 to +70°C	
Storage temp.	-20 to +70°C	
Display	Back light, dot matrix	
FCL current output1	Isolated, 4 to 20mA output , max. load 500Ω	
Temp. current output 2	Isolated, 4 to 20mA output , max. load 500Ω	
Current output accuracy	±0.05 mA	
RS485	Mod bus RTU protocol	
Baud rate	9600/19200/38400	
Maximum relay contacts capacity	5A/250VAC 、 5A/30VDC	
Cleaning setting	ON: 1 to 1000 seconds, OFF: 0.1 to 1000.0 hours	
One multi function relay	clean/period alarm/error alarm	
Relay delay	0-120 seconds	
Data logging capacity	500,000	
Language selection	English/traditional Chinese/simplified Chinese	
Waterproof grade	IP65	
Power supply	From 90 to 260 VAC, power consumption < 5 watts	
Installation	panel/wall/pipe installation	
Weight	6000 series:0.85Kg/ 800 series:0.55Kg	

## Instrument installation

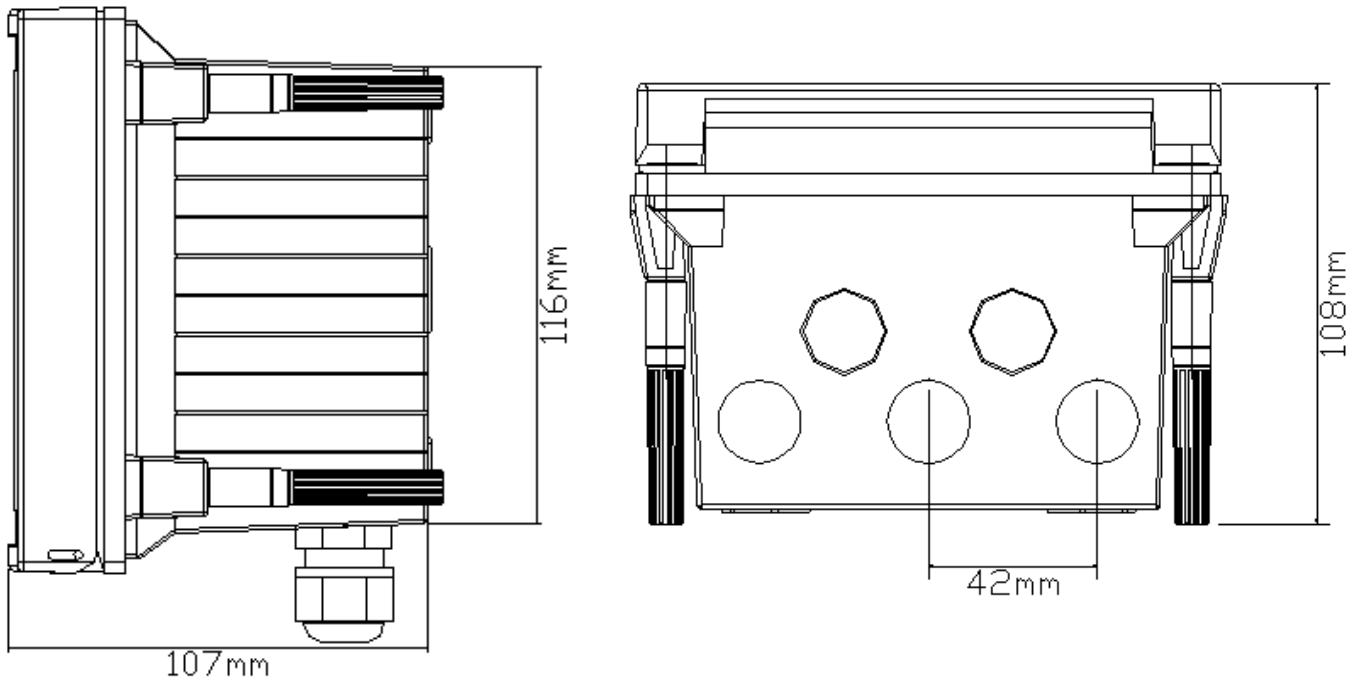
6000 series : The instrument can be panel, wall or pipe mounted installation.  
Panel Installation: Make a 138x138 mm square cutout and insert the instrument. Screw in the fixed block with the screws and fixed bar.



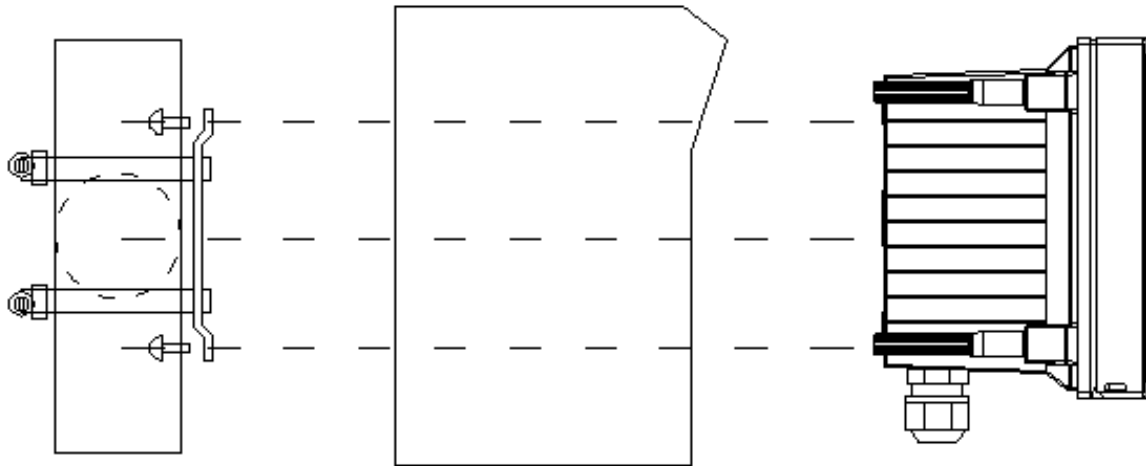
6000 series cutout size



6000 series installation figure



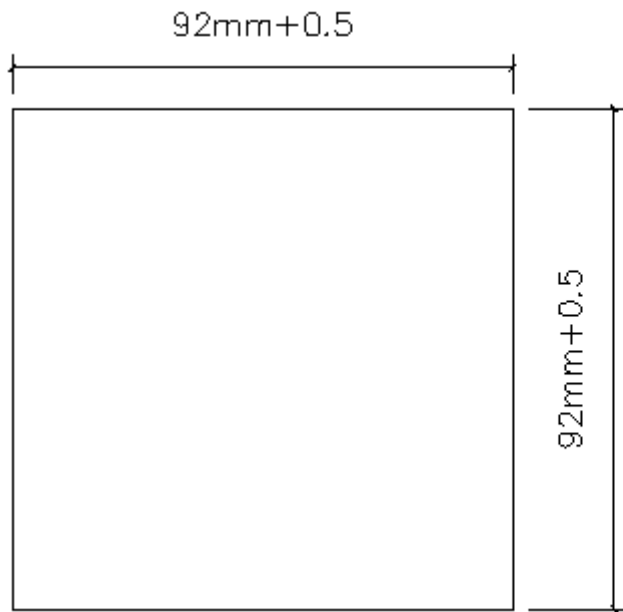
6000 series dimension



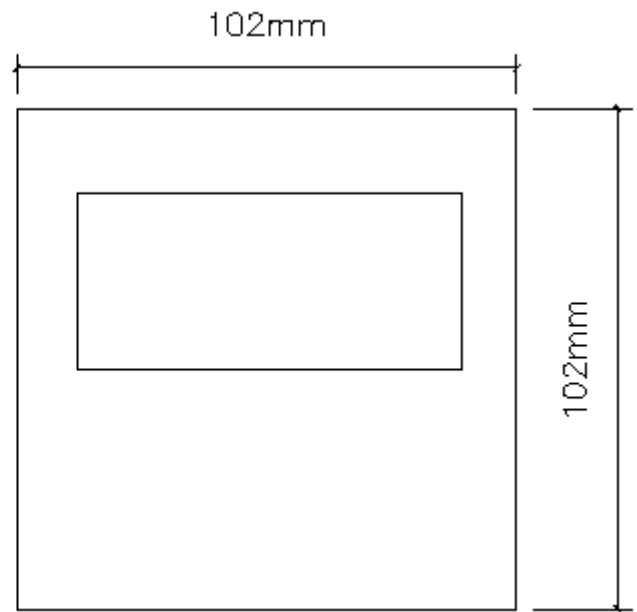
6000 series wall and pipe installation

800 series : The instrument can be panel, wall or pipe mounted installation.

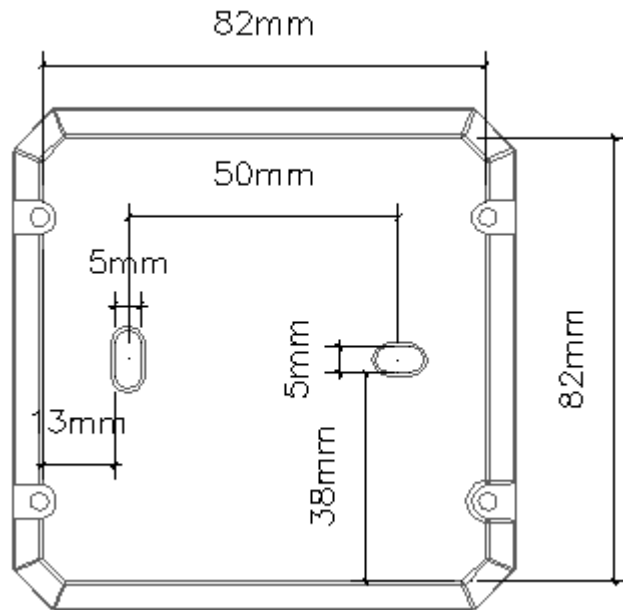
Panel Installation: Make a 92x92 mm square cutout and insert the instrument then screw in the fixed HOLDER.



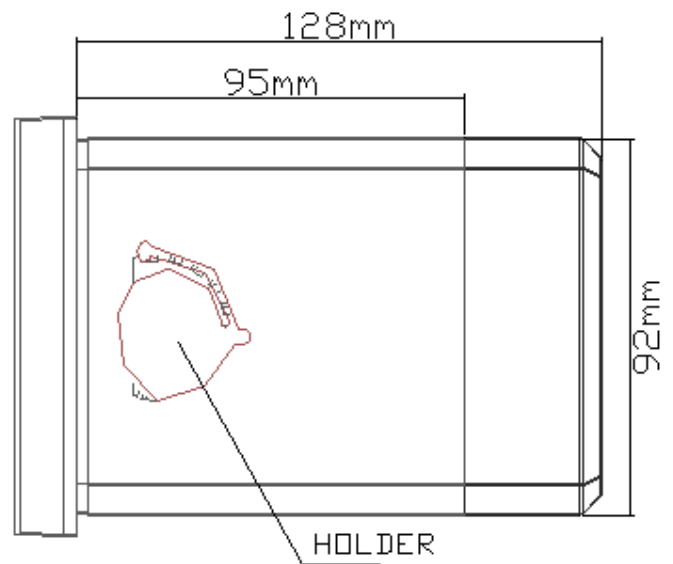
800 series panel cutout size



800 series front



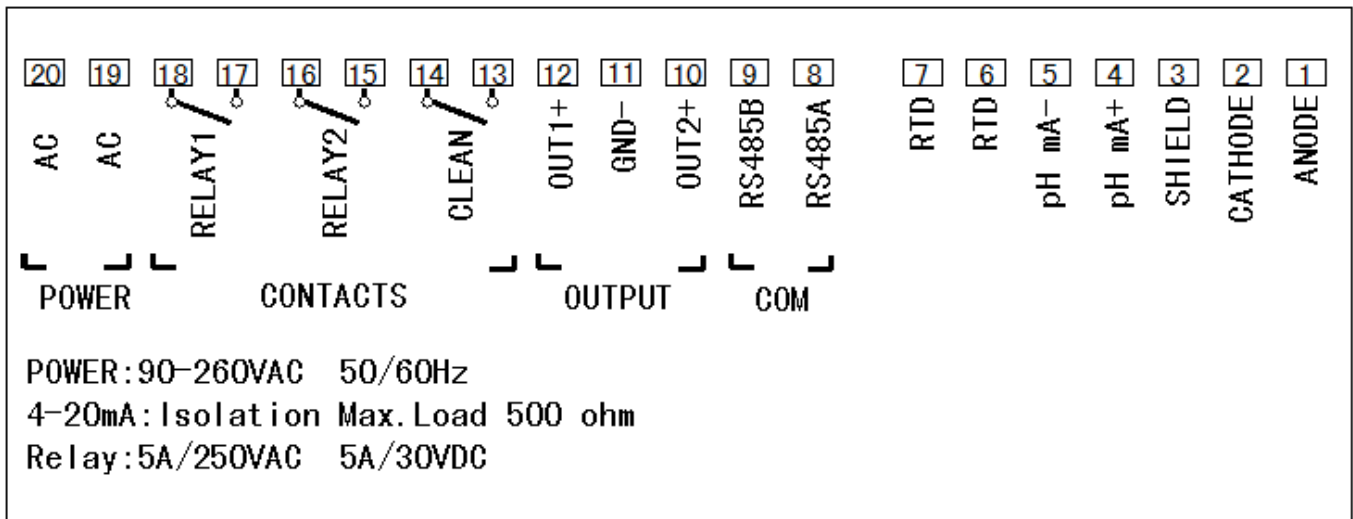
800 series back (for wall/pipe mounting)



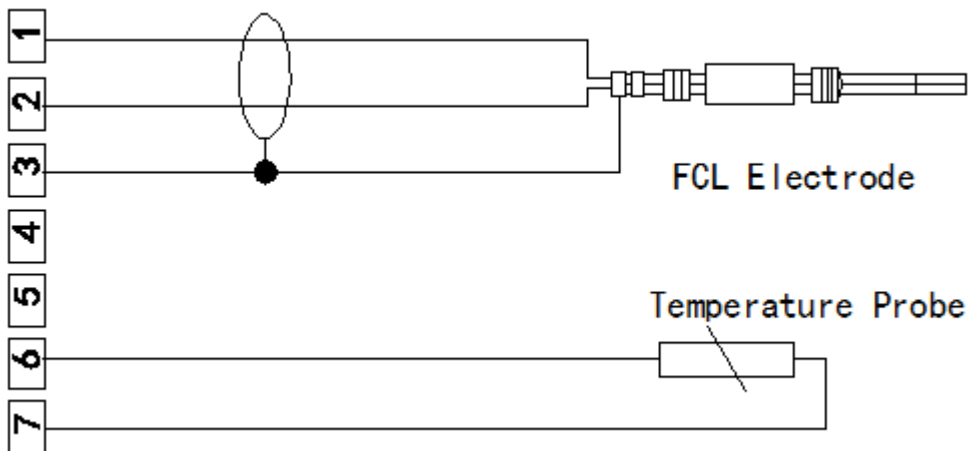
800 series dimension

## Connection label

### 6000 Series

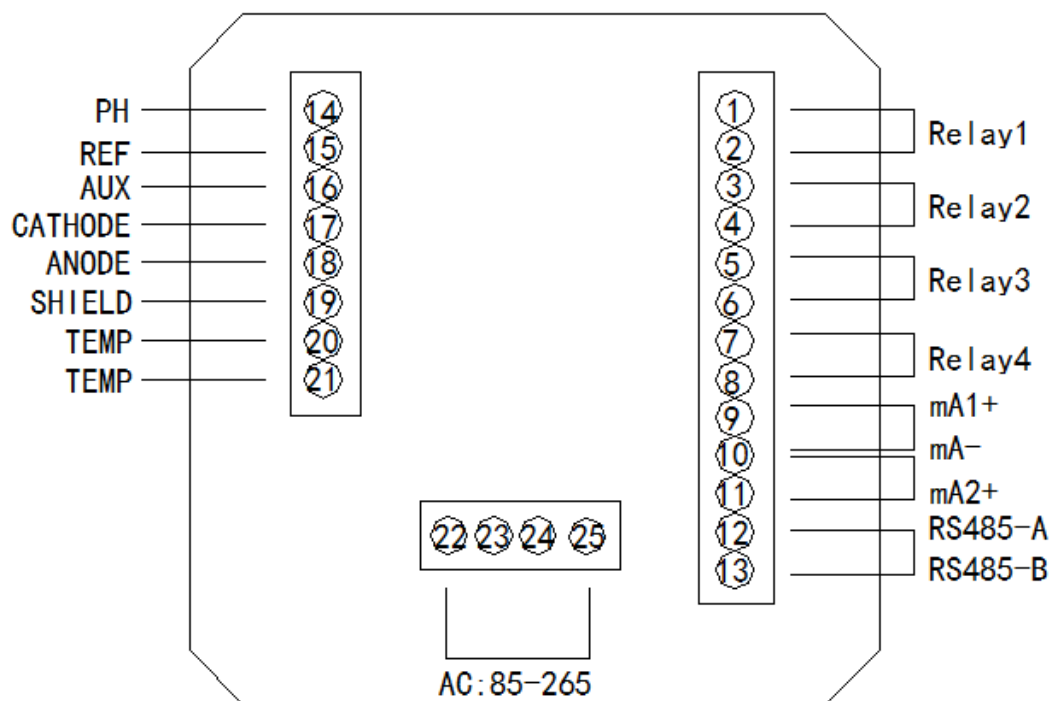


## Electrode connection figure

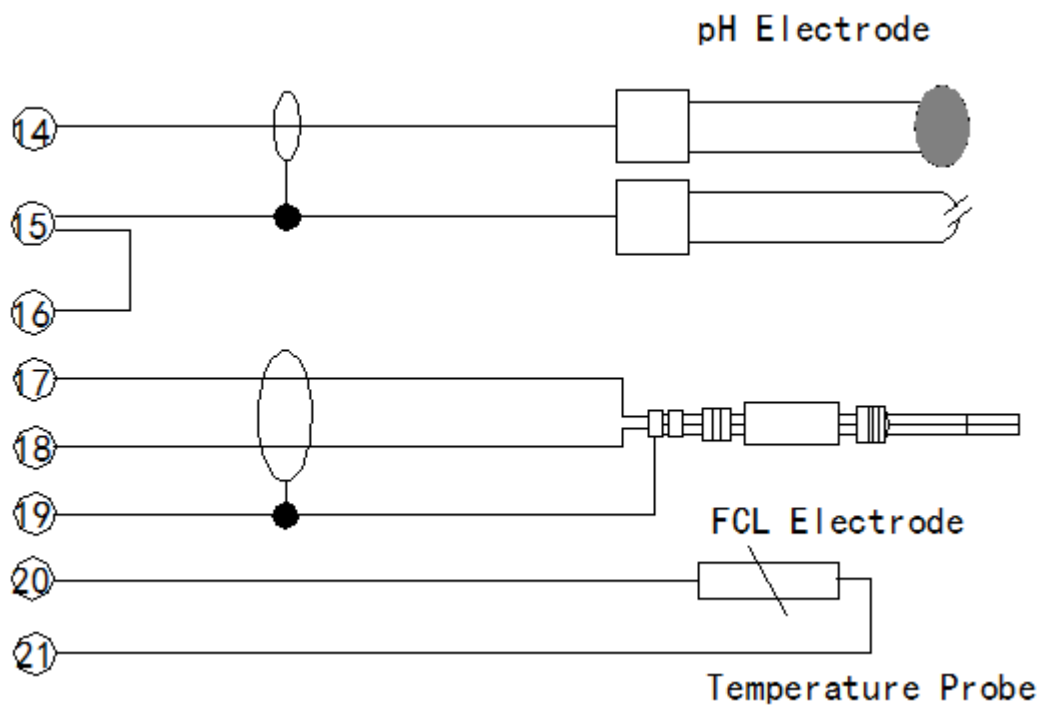




## 800 Series

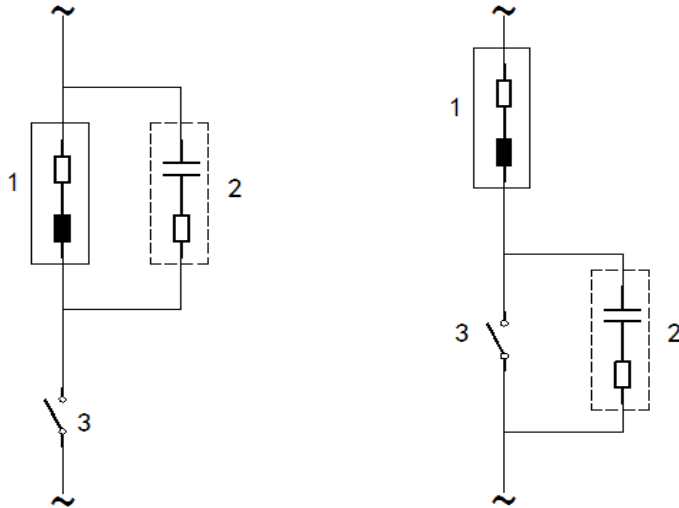


## Electrode connection figure



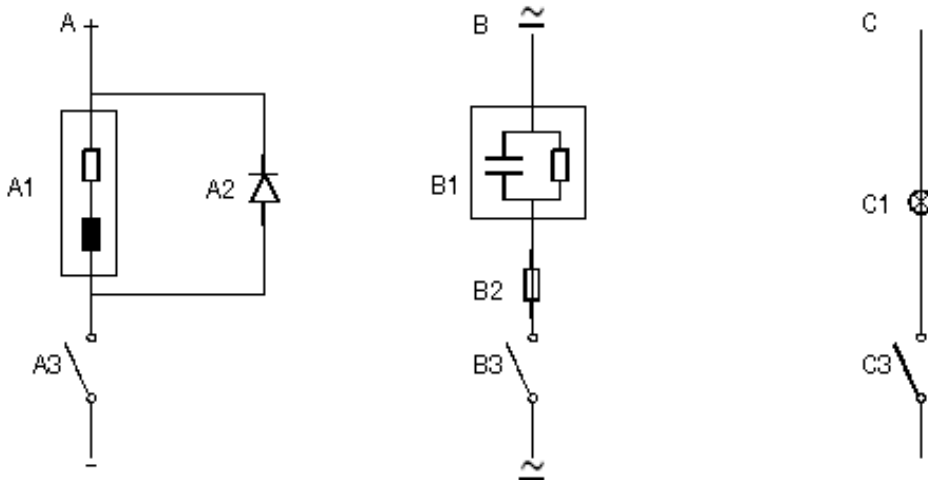
## Relay contact protection

Electrical spark at the relay contact may affect the life of the relay, especially in an inductive and capacitive load. In order to inhibit the spark and arc, user should use an RC circuit to extend the life of the relay.



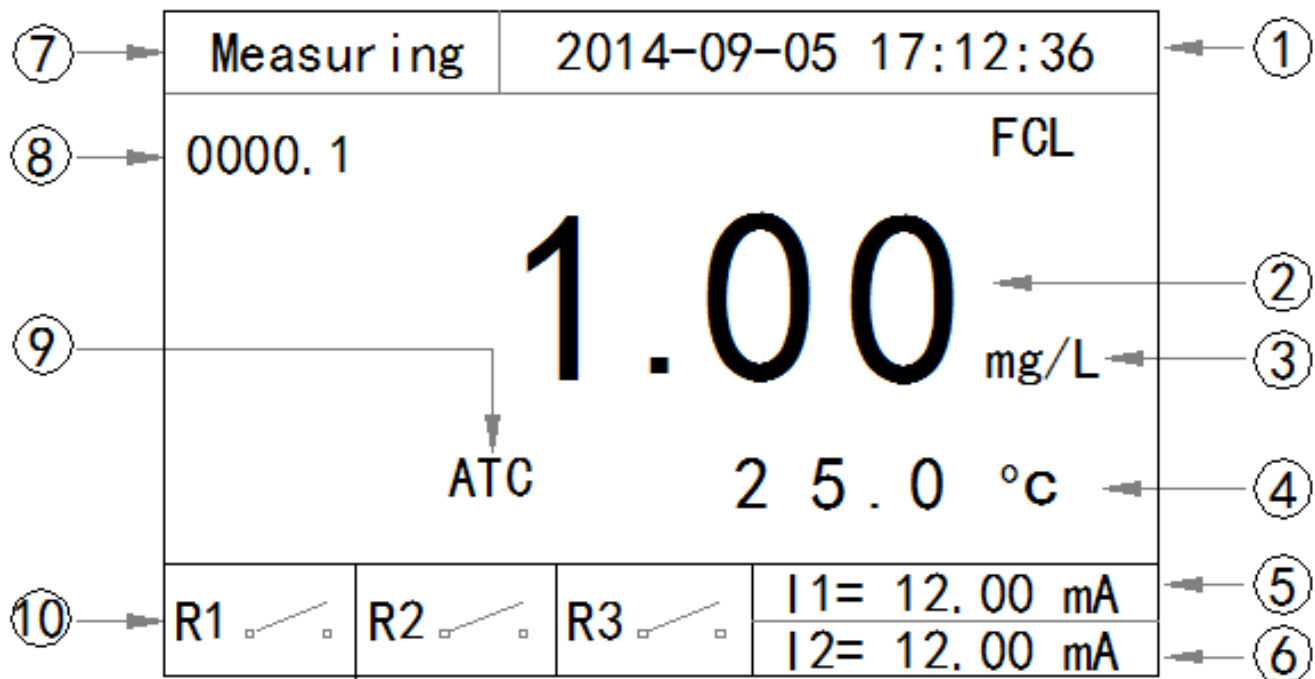
AC protection, use for inductive load

1. load
2. RC eliminate spark, using in 220VAC,  $R=100\ \text{ohm}$  1W,
3. Relay contact



- A. DC protection ,A1: inductive load    A2: 1N4007, A3: relay contact
- B. AC/DC protection ,B1: capacitive load ,B2: 0.8 Ohm/1W ( DC24V ) ,B3: relay contact
- C. Resistive load ,C1:lamp bulb ,C3:relay contact

## Display



1. Date and time
2. Main display
3. Unit
4. Temperature and unit
5. First current output
6. Second current output
7. Measurement status and Error indicator, there is no display if meter is in keeping mode
8. Count down timer: cycle time/clean time, it also displays the “delay” when relay3 has a delay enabled.
9. Temp. compensation: auto(ATC) or manual(MTC)
10. Relay indicator

### Note:

If the FCL readings are under or over the range, it will display 0.0/999.9

If the pH readings are under or over the range, it will display -9.99/99.99. (800 series only)

If the temperature readings are under or over the range, it will display -99.9/999.9.

## Key



MODE



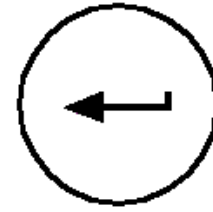
SHIFT



UP



DOWN



ENTER

Key name	Meas. status	Setting status	Cal. status	Record status
MODE	Enter password	Exit	Exit	Exit
SHIFT	none	Move digit	Mode digit	Mode digit
UP	Enter record	Inc	Inc	Inc
DOWN	None	Dec	Dec	Dec
ENTER	ON/OFF back light	Enter	Enter	Enter

## Keeping mode

Keeping mode is a safe mode. It is for Calibration, Setting, Record and Clean. In this mode all the relays are open( inactive), current output follows the setting by user(last current or fixed current).

The instrument will enter keeping mode when user presses into Calibration, Setting, Record or the instrument works in clean mode.

It will in keeping mode around 10 seconds when it goes back to measurement mode form the above mentioned 4 modes then left keeping mode.

The instrument will go into the keeping mode when turn on the power.

Current output in keeping mode:

User has two choices: fixed current output or last current output.

Fixed current: User can set the output current from 4.00 to 20.00mA when instrument goes into keeping mode.

Last current: User can set the output current keep at the last current when instrument goes into keeping mode.

Relays in keeping mode: All relays are opened.(inactive)

## Setting

Press MODE key to enter the password menu and then press UP/DOWN/SHIFT key to input password 1200 then press ENTER will enter to setting mode or press MODE key to exit. If no key is be pressed and over 10 minutes then it will go back to measurement mode.

PASSWORD
0 0 0 0

PASSWORD
1 2 0 0

## Main display

Press UP/DOWN key to choose functions, press ENTER key enter the function.

CONF IGURATION
<input checked="" type="checkbox"/> Current1 Settings
<input type="checkbox"/> Current2 Settings
<input type="checkbox"/> Relay1 Settings
<input type="checkbox"/> Relay2 Settings
<input type="checkbox"/> Relay3 Settings
<input type="checkbox"/> Measurement Settings
<input type="checkbox"/> Temperature Settings
<input type="checkbox"/> pH Settings

Page1

CONF IGURATION
<input checked="" type="checkbox"/> RS485 Settings
<input type="checkbox"/> Date Settings
<input type="checkbox"/> Date Log Settings
<input type="checkbox"/> Output Test
<input type="checkbox"/> Language Settings
<input type="checkbox"/> Reset Parameters

Page2

### Notices:

1. When the input data is not in correct range then it will display ERROR on the top of LCD
2. After input data user needs to press ENTER to save the data.
3. Press MODE to exit.
4. No key is be pressed in 10 minutes then it will go back to measurement mode.

## Current 1 settings

CURRENT 1 SETTINGS	
4.00 mA	= 00.00 ppm
20.00 mA	= 01.00 ppm
Offset	= +0.00 mA
Filter Time	= 000 SEC
HOLD Type	= <input type="checkbox"/> Fixed 04.00 mA <input type="checkbox"/> Last

CURRENT 1 SETTINGS	
4.00 mA	= 00.00 mg/L
20.00 mA	= 01.00 mg/L
Offset	= +0.00 mA
Filter Time	= 000 SEC
HOLD Type	= <input type="checkbox"/> Fixed 04.00 mA <input type="checkbox"/> Last

1. Set the corresponding 4.00mA to ppm/mg/L.
2. Set the corresponding 20.00mA to ppm,mg/L, the difference between 4.00mA and 20.00 mA at least 1.00.
3. Set the offset current, the range is  $\pm 1.00$ mA.
4. The filter time range is 0-120 seconds, the low pass filter of software will active when the current from one point to another point if user sets the filter time.
5. Set the current 1 output mode(fixed / last) when instrument enter into keeping mode.

## Current 2 settings

CURRENT 2 SETTINGS	
4.00 mA	= +000.0 °C
20.00 mA	= +100.0 °C
Offset	= +0.00 mA
Filter Time	= 000 SEC
HOLD Type	= <input type="checkbox"/> Fixed 04.00 mA <input type="checkbox"/> Last

1. Set the corresponding 4.00mA to temperature.
2. Set the corresponding 20.00mA to temperature, the difference at least between 4.00mA and 20.00 mA is 10.0°C.
3. Set the offset current of temperature, the range is  $\pm 1.00$ mA.
4. The filter time range is 0-120 seconds, the low pass filter of software will active when the current from one point to another point if user sets the filter time.
5. Set the current 2 output mode(fixed / last) when instrument enter into keeping mode.

## Relay 1 settings

RELAY 1 SETTSINGS	
ON/OFF	= <input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
Close S. P.	= 0 1 . 0 0 ppm
Open S. P.	= 0 0 . 8 0 ppm
Delay Time	= 0 0 0 SEC

RELAY 1 SETTSINGS	
ON/OFF	= <input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
Close S. P.	= 0 1 . 0 0 mg/L
Open S. P.	= 0 0 . 8 0 mg/L
Delay Time	= 0 0 0 SEC

1. Press UP/DOWN key to ON/OFF (enable/disable) relay1.
  2. Close set point: active point for ppm,mg/L.
  3. Open set point: inactive point for ppm,mg/L.
  4. Delay time: the range is 0-120 seconds. Relay needs to delay first then active if the measuring data is reach to close set point.
- Ex: If user wants turn on the pump at 1.00ppm and turn off it at 0.80ppm, then the close S.P. needs to set to 1.00ppm, Open S.P. sets to 0.80ppm.

## Relay 2 settings

RELAY 2 SETTSINGS	
ON/OFF	= <input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
Close S. P.	= 0 1 . 0 0 ppm
Open S. P.	= 0 0 . 8 0 ppm
Delay Time	= 0 0 0 SEC

RELAY 2 SETTSINGS	
ON/OFF	= <input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
Close S. P.	= 0 1 . 0 0 mg/L
Open S. P.	= 0 0 . 8 0 mg/L
Delay Time	= 0 0 0 SEC

1. Press UP/DOWN key to ON/OFF (enable/disable) relay2.
  2. Close set point: active point for ppm,mg/L.
  3. Open set point: inactive point for ppm,mg/L.
  4. Delay time: the range is 0-120 seconds. Relay needs to delay first then active if the measuring data is reach to close set point.
- Ex: If user wants turn on the pump at 0.80ppm and turn off it at 1.00ppm, then the close S.P. needs to set to 0.80ppm, Open S.P. sets to 1.00ppm.

## Relay 3 settings

RELAY 3 SETTINGS	
ON/OFF	= <input checked="" type="checkbox"/> ON = <input type="checkbox"/> OFF
Period Time	= 0 0 0 1 . 0 HOUR
Clean Time	= 0 0 1 0 SEC
Delay Time	= 0 0 0 SEC
Function	= <input type="checkbox"/> Rinsing <input type="checkbox"/> Interval Alarm <input type="checkbox"/> Error Alarm

1. Press UP/DOWN key to ON/OFF (enable/disable) relay3.
2. Period time: The period for Rinsing or interval function.
3. Clean time: When period is timeout then relay active.
4. Delay time: the range is 0-120 seconds. Relay needs to delay first then active if the period is timeout.

5. Function: press UP/DOWN key to choose Rinsing/Interval/Error.

Notice:

1. Rinsing: when period timeout then clean-relay will active, when clean time is timeout the repeat count for the period.
2. Interval alarm: When period timeout then clean-relay active until user resets the interval then the clean-relay inactive and repeat count for the period.
3. Error alarm: The clean-relay active when there is a error produce. No delay time function in this mode.

## Measurement settings

MEASUREMENT SETTINGS	
Mode	= <input checked="" type="checkbox"/> FCL <input type="checkbox"/> HOCL
Unit	= <input type="checkbox"/> mg/L <input type="checkbox"/> ppm
Offset	= + 0 . 0 0 ppm
Filter	= 0 0

MEASUREMENT SETTINGS	
Mode	= <input checked="" type="checkbox"/> FCL <input type="checkbox"/> HOCL
Unit	= <input checked="" type="checkbox"/> mg/L <input type="checkbox"/> ppm
Offset	= + 0 . 0 0 mg/L
Filter	= 0 0

1. Choose the mode for measuring, press UP/DOWN key to choose.
2. Choose the unit for measuring, press UP/DOWN key to choose.
3. Offset , range is  $\pm 1.00$ .
4. Filter: Range 0-10.

Notice:

If the reading is not stable then user can set the filter to average the readings.



## Temperature settings

TEMPERATURE SETTINGS	
Automatic	= <input checked="" type="checkbox"/> Auto <input type="checkbox"/> Manual
Probe	= <input type="checkbox"/> Pt 1000 <input type="checkbox"/> NTC 22K
Offset	= + 0 . 0 °C
Manual Meas.	= + 0 2 5 . 0 °C
Manual Cal.	= 2 5 . 0 °C

TEMPERATURE SETTINGS	
Display	= <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO

1. Temperature compensation setting, press UP/DOWN key to choose.
2. Temperature probe, press UP/DOWN key to choose.
3. Temperature offset ,the range is $\pm 5.00^{\circ}\text{C}$ .
4. Temperature for measuring when user set the temperature to manual.
5. Temperature for calibration mode when user sets the temperature to manual.

6. Temperature display: display the temperature on measurement mode or not.

### Notice:

1. When user chooses AUTO and doesn't connect temperature probe then the display will not correct.
2. When select the probe needs to make sure the probe type is correct.
3. Manual measurement: the instrument will use this temperature for compensation in measurement mode when user chooses Manual.
4. Manual calibration: the instrument will use this temperature for compensation in calibration mode when user chooses Manual.

## pH settings(for 6000 series)

pH SETTINGS	
ON/OFF	= <input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
Manual Meas	= 0 5 . 0 0 pH
Offset	= + 0 . 0 0 pH

1. Press UP/DOWN key to ON/OFF (enable/disable) pH compensation. If ON, it will use the auto pH compensation. If OFF, it will use the manual pH compensation.
2. Input the manual measurement pH compensation, the range is from 0.00pH to 14.00pH(for OFF only)
3. Offset , range is $\pm 1.00\text{pH}$  , for auto pH compensation only.

### pH settings(for 800 series)

pH SETTSINGS	
AUTO Comp.	= <input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
Display	= <input type="checkbox"/> ON <input type="checkbox"/> OFF
Manual Meas.	= 0 5 . 0 0 pH
Offset	= + 0 . 0 0 pH

1. Press Up/DOWN key to choose the pH compensation or not. If user choose ON then needs to connect the pH sensor to meter.
2. Choose pH display or not
3. If user choose no pH auto compensation then meter will use the Manual Measuring data to be the pH compensation.
4. Offset , range is  $\pm 1.00$ pH , for auto pH compensation only.

### RS485 settings

RS485 SETTSINGS	
ID Address	= 0 0 1
Baud Rate	= <input type="checkbox"/> 9600 <input type="checkbox"/> 19200 <input type="checkbox"/> 38400

1. ID address: 1-255.
2. Baud rate ,press UP/DOWN key to choose.

### Date settings

DATE SETTINGS	
Year	= 2 0 1 5
Month	= 0 8
Day	= 1 5
Hour	= 1 3
Minute	= 3 6
Second	= 0 4

Press UP/DOWN key to set the date. When power off the date will be kept for around 2 days.

## Data log settings

DATE LOG SETTINGS	
ON/OFF	= <input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
Display Type	= <input type="checkbox"/> Record <input type="checkbox"/> XY Chart
Reset Record	= <input type="checkbox"/> Yes <input type="checkbox"/> No
Save Period	= 0 6 0 SEC

1. Press UP/DOWN key to ON/OFF (enable/disable) this function.
2. Display type, press UP/DOWN key to choose
3. Erase all the records.
4. Saving period from 5 to 120 second.

Notice:

1. When user chooses ON, then it will save measuring data follow the save period time.
2. Display type: Record, display the detail of record(5 records in one page), XY chart, display a chart.(150 records in one page)
3. When reset the records, it will spend around 10 seconds.

## Output test

OUTPUT TEST	
Current1	= 0 4 . 0 0 mA
Current2	= 0 4 . 0 0 mA
Relay1	= <input type="checkbox"/> CLOSE <input type="checkbox"/> OPEN
Relay2	= <input type="checkbox"/> CLOSE <input type="checkbox"/> OPEN
Relay3	= <input type="checkbox"/> CLOSE <input type="checkbox"/> OPEN

1. Current 1 output: 4.00-20.00mA, press UP/DOWN to set.
2. Current 2 output: 4.00-20.00mA, press UP/DOWN to set.
3. Relay 1 output, press UP/DOWN to choose.
4. Relay 2 output, press UP/DOWN to choose.
5. Relay 3 output, press UP/DOWN to choose.

Notice: This function for testing the output only.

## Language settings

LANGUAGE SETTINGS	
Language	= <input checked="" type="checkbox"/> English <input type="checkbox"/> 繁體中文 <input type="checkbox"/> 简体中文

Press UP/DOWN key to choose the language.

**Reset parameters**

RESET PARAMETERS	
Reset Type	= <input checked="" type="checkbox"/> Current
	<input type="checkbox"/> Relay1
	<input type="checkbox"/> Relay2
	<input type="checkbox"/> Relay3
	<input type="checkbox"/> All

Press UP/DOWN key to choose the reset.

Notice: The reset will not affect the calibrated parameters.

**Record query**

Press UP key at the measurement mode to enter record query mode.

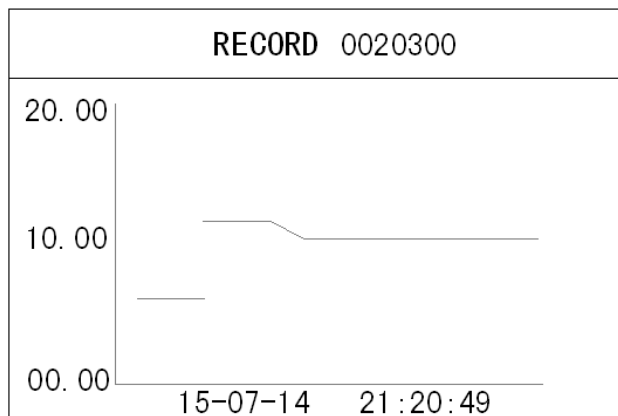
INPUT RECORD START NUMBER
0 1 0 3 0 0

Press UP/DOWN and SHIFT key to input record number then press ENTER key enter or press MODE key exit.

Display FCL/HOCL record at record

RECORD 0020300		
15-08-14	01.00	ppm
21:20:49	025.0	°C
15-08-14	01.00	ppm
21:20:59	025.0	°C
15-08-14	01.01	mg/L
21:21:09	025.0	°C
15-08-14	01.01	mg/L
21:21:19	025.0	°C
15-08-14	01.01	mg/L
21:21:29	025.0	°C

Display FCL/HOCL record at XY chart



## Calibration

Press MODE key to enter the password menu and then press UP/DOWN/SHIFT key to input password 1100 then press ENTER will enter to calibration mode or press MODE key to exit. If no key is be pressed and over 10 minutes then it will go back to measurement mode.

PASSWORD
0 0 0 0

PASSWORD
1 1 0 0

## Manu(for 6000 series)

CALIBRATION
<ul style="list-style-type: none"><li><input checked="" type="checkbox"/> Parameters Setting</li><li><input type="checkbox"/> Zero Calibration</li><li><input type="checkbox"/> Slope Calibration</li><li><input type="checkbox"/> Reset Parameters</li></ul>

Press UP/DOWN key to select the functions and then press ENTER key to enter.

1. Parameters setting: set the parameters.
2. Zero calibration: calibrate the zero point.
3. Slope calibration: calibrate the slope.
4. Reset parameters: reset all of the calibrated parameters to default.

## Manu(for 800 series)

CALIBRATION
<ul style="list-style-type: none"><li><input checked="" type="checkbox"/> PH Automatic CAL.</li><li><input type="checkbox"/> PH Manual CAL.</li><li><input type="checkbox"/> PH Reset Parameters</li><li><input type="checkbox"/> FCL Parameters Setting</li><li><input type="checkbox"/> FCL Zero CAL.</li><li><input type="checkbox"/> FCL Slope CAL.</li><li><input type="checkbox"/> FCL Reset Parameters.</li></ul>

Press UP/DOWN key to select the functions and then press ENTER key to enter.

1. Automatic calibration: follow the indication to select standard buffer.
2. Manual calibration: manual input standard buffer.
3. Reset parameters: reset all of the calibrated parameters to default.
4. Set the FCL parameters.

5. Zero calibration: calibrate the zero point.

6. Slope calibration: calibrate the slope.

7. Reset parameters: reset all of the calibrated parameters to default.

## Automatic calibration

CALIBRATION	
<input checked="" type="checkbox"/> 6.86 <input type="checkbox"/> 7.00	7.00 pH 25.0 °C
Select buffer and press ENTER	

### Stand calibration

1. Put the electrode to the first buffer.
2. Press UP/DOWN key to select the correct buffer and then press ENTER to start calibration.
3. User can press ENTER to go to next or wait for it auto lock.
4. Display the idea pH on the right side.
5. If the offset is over +/-1.5 pH or temperature is over 0.0-60.0°C then it will display error message on the button of LCD.

### Slope calibration

CALIBRATION	
<input type="checkbox"/> 1.68 <input checked="" type="checkbox"/> 4.01 <input type="checkbox"/> 9.18 <input type="checkbox"/> 10.01 <input type="checkbox"/> 12.45	4.00 pH 25.0 °C
Select buffer and press ENTER	

1. Put the electrode to the second buffer.
2. Press UP/DOWN key to select the correct buffer and then press ENTER to start calibration.
3. User can press ENTER to go to next or wait for it auto lock.
4. Display the idea pH on the right side.
5. If the offset is over 30% or temperature is over 0.0-60.0°C then it will display error message on the button of LCD.

### Display efficiency

CALIBRATION	
<input type="checkbox"/> 1.68 <input checked="" type="checkbox"/> 4.01 <input type="checkbox"/> 9.18 <input type="checkbox"/> 10.01 <input type="checkbox"/> 12.45	4.00 pH 25.0 °C
EFFICIENCY = 98.0 %	

If the efficiency is lower than 80%, that means the electrode is aged, user should Replace the new electrode.

## Manual calibration

### Stand calibration

CALIBRATION	
7.0 0	7.00 pH 25.0 °C
Input buffer and press ENTER	

1. Put the electrode to the first buffer.
2. Press UP/DOWN key input the standard buffer and then press ENTER key to start calibration. User can press ENTER to go to next or wait for it auto lock. If the input is over 7.00+/-1.5pH then it will display ERROR on the top of LCD.
3. Display the idea pH on the right side.
4. If the idea pH is over 7.00+/-1.5 pH or temperature is over 0.0-60.0°C then it will display error message on the button of LCD.

### Slope calibration

CALIBRATION	
4.0 1	4.00 pH 25.0 °C
Input buffer and press ENTER	

1. Put the electrode to the second buffer.
2. Press UP/DOWN key input the standard buffer and then press ENTER key to start calibration. User can press ENTER to go to next or wait for it auto lock. If the input is over 0.00 to 14.00pH then it will display "ERROR" on the top of LCD.
3. Display the idea pH on the right side.
4. If the input is over 0.00-14.00 pH, or temperature is over 0.0-60.0°C then it will display error message on the button of LCD.

### Display efficiency

CALIBRATION	
04.01	4.00 pH 25.0 °C
EFFICIENCY = 98.0 %	

1. If the efficiency is lower than 80%, that means the electrode is aged user should Replace the new electrode.
2. If the efficiency is lower than 50%, it will not accept this calibration

## Reset parameters

RESET PARAMETERS
RESET

This will reset all of the calibrated parameters to default.

## Parameters setting

PARAMETERS SETTING	
Pressure	= 1 0 1 3 mBAR
Zero Current	= + 0 0 . 0 nA
Slope	= 0 4 9 . 4 nA
Membrane	= 3 . 0 6 %
Polar. Volt.	= - 0 0 5 0 mV

1. Pressure range is from 500 to 9999 mbar.
2. Press UP/DOWN key to input the Zero current. The range is from -2.nA to +10.0 nA(for the known zero current)
3. Press UP/DOWN key to input the slope. The range is from +15.0nA to +200.0nA. (for the known slope current)
4. The membrane coefficient is from 0.01% to 9.99%
5. Press UP/DOWN key to input the polarization voltage, the range is from 0 to -1000mV( 800 Series no this function).

Notice: Make sure the polarization voltage is correct before connecting the FCL sensor.

## Zero calibration

ZERO CALIBRATION
+ 0 0 1 . 0 nA (25. 0 °C)
25. 0 °C
Wait stable and press ENTER

1. Put the FCL electrode into the flow cell that with zero free chlorine water and the flow is 150L/H.
2. Waiting for the current is stable then press ENTER to finish the calibration.

Notice:

1. The zero point current range is from -2nA to +10nA, if the current is over the range then make sure the FCL electrode is good.
2. If the temperature is over 0.0-60.0°C then it will display error message on the button of LCD.



## Slope calibration

SLOPE CALIBRATION
+0026.1 nA (25.0 °C) 25.0 °C
Wait stable and press ENTER

1. Put the FCL electrode into the flow cell that with known free chlorine water and the flow is 150L/H.
2. Waiting for the current is stable then press ENTER to go to next or Press MODE to exit

SLOPE CALIBRATION
+0026.1 nA (25.0 °C) 25.0 °C 01.00 mg/L
Input standard data

1. Input standard value, the range is form 0.5 to 20.00 ppm(mg/L).
2. Press ENTER to finish the calibration or press the MODE to exit.

### Notice:

1. The slope current is from +15nA to +1500nA(for 6000 series only),if the current is over the range, please make sure the FCL electrode is good.
2. If the temperature is over 0.0-60.0 °C then it will display error message on the button of LCD.

## Reset parameters

RESET PARAMETERS
RESET

This will reset all of the calibrated parameters to default.

## Default

FCL 20.00mA corresponding	1.00	ppm	range: 1.00 - 20.00
FCL 4.00mA corresponding	0.00	ppm	range: 0.00 - 19.00 difference : 1.00
HOCL 20.00mA corresponding	1.00	ppm	range: 1.00 - 20.00
HOCL 4.00mA corresponding	0.00	ppm	range: 0.00 - 19.00 difference : 1.00
Temp. 20.00mA corresponding	100.0	°C	range: 0.0 - 130
Temp. 4.00mA corresponding	0.0	°C	range: -10.0 - 120.0 difference : 10.0
Current 1 output offset	0.00	mA	range: +/- 1.00
Current 2 output offset	0.00	mA	range: +/- 1.00
Current 1 filter	0	second	range: 0 - 120
Current 2 filter	0	second	range: 0 - 120
Current 1 fixed output	4.00	mA	range: 4.00 - 20.00
Current 2 fixed output	4.00	mA	range: 4.00 - 20.00
Current 1 HOLD type	last		range: fixed/last
Current 2 HOLD type	last		range: fixed/last
Relay 1 FCL close S.P.	1.00	ppm	range: 0.00 - 20.00
Relay 1 FCL open S.P.	0.80	ppm	range: 0.00 - 20.00 difference : 0.01
Relay 1 HOCL close S.P.	1.00	ppm	range: 0.00 - 20.00
Relay 1 HOCL open S.P.	0.80	ppm	range: 0.00 - 20.00 difference : 0.01
Relay 1 delay time	0	second	range: 0 - 120
Relay 2 FCL close S.P.	0.80	ppm	range: 0.00 - 20.00
Relay 2 FCL open S.P.	1.00	ppm	range: 0.00 - 20.00 difference : 0.01
Relay 2 HOCL close S.P.	0.80	ppm	range: 0.00 - 20.00
Relay 2 HOCL open S.P.	1.00	ppm	range: 0.00 - 20.00 difference : 0.01
Relay 2 delay time	0	second	range: 0 - 120
Relay 3 period time	1.0	hour	range: 0 - 1000.0
Relay 3 clean time	10	second	range: 0 - 1000
Relay 3 delay time	0		range: 0 - 120
Relay 3 function	error alarm		range: clean/period alarm/ error alarm
Saving period	60	second	range: 5 - 120
ID address	1		range: 1 - 255
Baud rate	9600		range: 9600,19200,38400

FCL offset	0.00	ppm	range: +/-1.00
HOCL offset	0.00	ppm	range: +/-1.00
Unit	mg/L		range: mg/L,ppm
Mode	FCL		range: FCL/HOCL
Temp. Offset	0.0	°C	range: +/- 5.0
Manual Temp. for measurement	25.0	°C	range: -10.0 - 130.0
Manual Temp. for calibration	25.0	°C	range: 0.0 - 60.0
Language	English		range: English/traditional Chinese /simple Chinese
Filter	1		range: 0 - 10
Temp. compensation	ATC		range: ATC/MTC
Temp. probe	NTC22K		range: Pt1000, NTC22K
Record type	record		range: record/XY chart
pH	5.0	pH	range: 0.00 - 14.00
PH Offset	0.00	pH	range: +/-1.00
Pressure	1013	mBAR	range: 500 - 9999
Zero current	0.0	nA	range: -2.0 - 10.0
Slope	25.0	nA	range: 15.0 - 200.0
Membrane coefficient	3.06	%	range: 0.01 - 9.99
Polarization voltage	-50	mV	range: 0 – (-1000)(for 6000 series only)

### **Password**

Press MODE key

1100:Calibration mode

1200:Setting mode

If no key is be pressed and over 10 minutes then it will go back to measurement mode.

### **Error code**

Error 01	memory error
Error 02	reading is over maximum
Error 03	reading is under minimum
Error 04	temperature is over maximum
Error 05	temperature is under minimum
Error 06	current 1 output is over 20.5 mA,the maximum is 22.00mA
Error 07	current 1 output is under 3.8 mA, the minimum is 3.5mA
Error 08	current 2 output is over 20.5 mA,the maximum is 22.00mA
Error 09	current 2 output is under 3.8 mA, the minimum is 3.5mA
Error 10	record error

Error 11                      ADC damage  
 Error 99                      default parameters lost

**RS485 command**

The instrument use the standard Mod bus-RTU protocol, all of the data are word type(2 bytes), the range is -32767~32767 ,16 system.

PC command:

	ID address	command	Start address	Data number	CRC16
length	1 byte	1byte	2 byte	2 byte	2 byte
Ex.	0x01	0x03	0x0001	0x0001	0xD5CA

Instrument response:

	ID address	command	Data number	data	CRC16
length	1 byte	1 byte	1byte	N byte	2 byte
Ex.	0x01	0x03	0x02	0x02 0xBC	0xB895

If response is 01,the command is wrong.  
 If response is 02,the address is not correct.  
 If response is 03,data number is not correct.

command 03: read the settings  
 command 04: read the readings

04:definition  
 address

- |      |      |                     |                  |
|------|------|---------------------|------------------|
| (00) | 0x00 | mg/L,ppm reading    | reading : X 0.01 |
| (01) | 0x01 | mg/L,ppm current    | reading : X 0.01 |
| (02) | 0x02 | Temperature         | reading : X 0.1  |
| (03) | 0x03 | Temperature current | reading : X 0.01 |
| (04) | 0x04 | Error code          | reading : X 1    |
| (05) | 0x05 |                     |                  |
| (06) | 0x06 |                     |                  |
| (07) | 0x07 |                     |                  |
| (08) | 0x08 |                     |                  |
| (09) | 0x09 | Model type          | fix to 5         |

03:definition

Address

(00)	0x00	FCL 20.00mA corresponding	reading:X 0.01	
(01)	0x01	FCL 4.00mA corresponding	reading:X 0.01	
(02)	0x02	HOCL 20.00mA corresponding	reading:X 0.01	
(03)	0x03	HOCL 4.00mA corresponding	reading:X 0.01	
(04)	0x04	Temp. 20.00mA corresponding	reading:X 0.1	
(05)	0x05	Temp. 4.00mA corresponding	reading:X 0.1	
(06)	0x06	Current 1 offset	reading:X0.01	
(07)	0x07	Current 2 offset	reading:X0.01	
(08)	0x08	Current 1 filter	reading:X1	
(09)	0x09	Current 2 filter	reading:X1	
(10)	0x0A	Current 1 fixed current	reading:X0.01	
(11)	0x0B	Current 2 fixed current	reading:X0.01	
(12)	0x0C	Current 1 HOLD type	reading:X1	0=fixed,1=last
(13)	0x0D	Current 2 HOLD type	reading:X1	0=fixed,1=last
(14)	0x0E	Relay1 FCL close S.P.	reading:X0.01	
(15)	0x0F	Relay1 FCL open S.P.	reading:X0.01	
(16)	0x10	Relay1 HOCL close S.P.	reading:X0.01	
(17)	0x11	Relay1 HOCL open S.P.	reading:X0.01	
(18)	0x12	Relay1 delay time	reading:X1	
(19)	0x13	Relay2 FCL close S.P.	reading:X0.01	
(20)	0x14	Relay2 FCL open S.P.	reading:X0.01	
(21)	0x15	Relay2 HOCL close S.P.	reading:X0.01	
(22)	0x16	Relay2 HOCL open S.P.	reading:X0.01	
(23)	0x17	Relay2 delay time	reading:X1	
(24)	0x18	Relay3 clean period	reading:X0.1	
(25)	0x19	Relay3 clean time	reading:X1	
(26)	0x1A	Relay3 delay time	reading:X1	
(27)	0x1B	Relay3 function	reading:X1	0:clean,1:period alarm ,2:Error alarm
(28)	0x1C	Record saving time	reading:X1	
(29)	0x1D	Unit	reading:X1	0=ppm,1=mg/L
(30)	0x1E	Mode	reading:X1	0=FCL,1=HOCL
(31)	0x1F	FCL offset	reading:X0.01	
(32)	0x20	HOCL offset	reading:X0.01	
(33)	0x21	Temp. offset	reading:X0.1	
(34)	0x22	Manual temp. for measurement	reading:X0.1	
(35)	0x23	Manual temp. for calibration	reading:X0.1	
(36)	0x24	Temp. compensation	reading:X1	0=Auto,1=manual

(37)	0x25	Temp. probe	reading:X1	0=Pt1000,1=NTC22K
(38)	0x26	Language	reading:X1	0=English ,1=traditional Chinese,2=simple Chinese
(39)	0x27	Filter	reading:X1	
(40)	0x28	pH	reading:X0.01	
(41)	0x29	pH offset	reading:X0.01	
(42)	0x2A	Pressure	reading:X1	
(43)	0x2B	Zero current	reading:X0.1	
(44)	0x2C	Slope	reading:X0.1	
(45)	0x2D	Membrane coefficient	redaing:X0.01	
(46)	0x2E	Polarization voltage	reading:X (for 6000 series only)	