Version:2020-02

ION Controller

6000 Series

800 Series

Content

Unpacking instruction

Check for any damages on the content after unpacking.
Read the manual before installing and operating the instruments.
Confirm the wiring connections with the wiring diagram before switching on the power to avoid damages and injuries.

Safety precaution

1. The instrument must be operated by trained professional and technical personnel.
2. Avoid installing in a high humidity, high temperature, corrosive and in direct with sunlight environment.
3. Separate instrument signal cables from power lines and machine that produces high noise interference.

Instrument application

Widely used in industrial measuring of the temperature and ion, such as wastewater treatment, environmental monitoring, electroplate factory, etc.

Product content

1. 6000 series
1 meter, 1 operational manual, 1 quality check form, and four sets of mounting kits (Fixed box, fixed bar and screw).

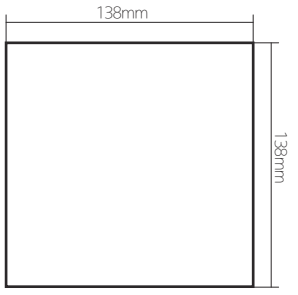
2. 800 series
1 meter, 1 operational manual, 1 quality check form, and two sets of mounting kits

Specifications

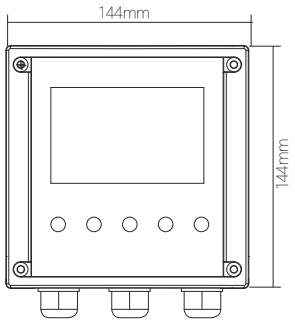
Functions	ION
Measuring range	0–20000 / 0.00-20.00
Resolution	1ppm / 0.01ppm
Accuracy	+/-1ppm, +/-0.01ppm
mV input range	0.00-1000.00mV
Temp. compensation	Pt 1000/NTC10K
Temp. range	-10.0 to +130.0℃
Temp. compensation range	-10.0 to +130.0℃
Temp. resolution	0.1℃
Temp. accuracy	±0.2℃
Ambient temperature range	0 to +70℃
Storage temp.	-20 to +70℃
Input impedance	$>10^{12}\Omega$
Display	Back light,dot matrix
ION 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
MAX. 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 data
Language selection	English/ traditional Chinese/ simplified Chinese
USB port(for 6000 series only)	Download records and update program
IP Rating	IP65
Power supply	From 90 to 260VAC, power consumption<5 watts
Installation	panel/wall/pipe installation
Weight	6000 series:0.85Kg/ 800 series:0.55Kg

Instrument installation

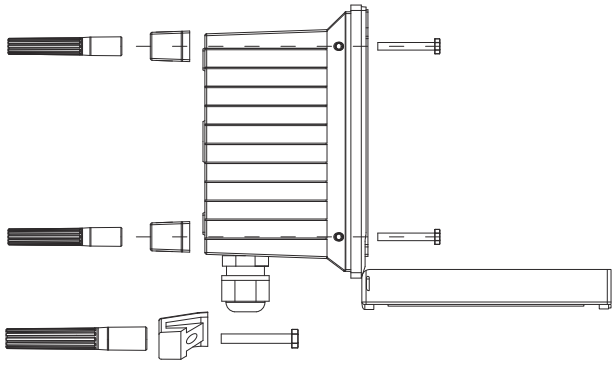
6000series : The instrument can be panel, wall or pipe mounted installation.
Panel Installation: Make a 138x138 mm square cutout and insert the instrument.
Screw in the fixed block with the screws and fixed bar.



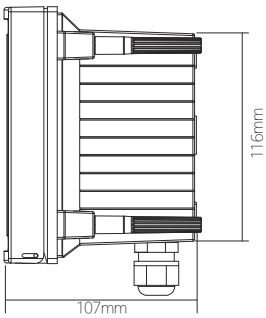
Cutout size - 6000 series

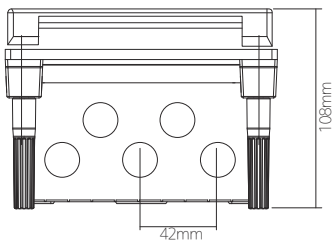


Front view – 6000 Series

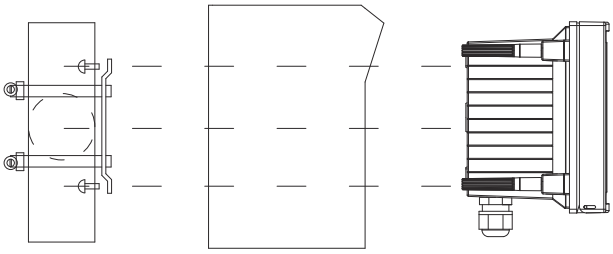


Exploded view – 6000 Series





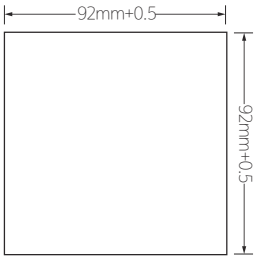
Side and bottom view – 6000 Series



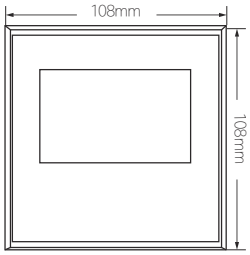
Wall and pipe installation – 6000 Series

Instrument installation

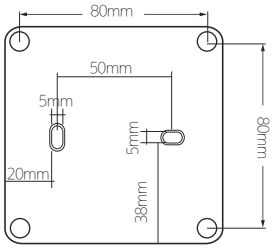
800 Series:The instrument can be panel, wall or pipe mounted installation.
To install 800 series on panel, make a 92x92 mm square cutout and insert the instrument then screw in the fixed HOLDER.



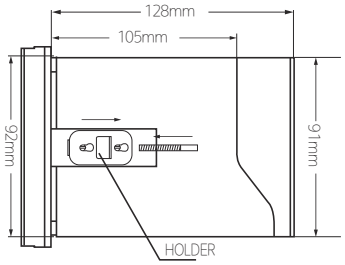
Cutout size - 800 series



Front view – 800 Series



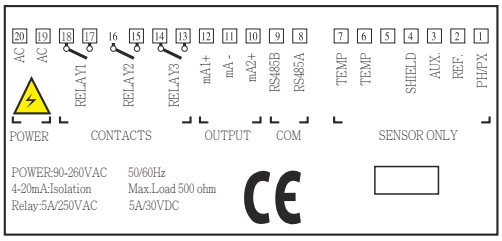
Back view – 800 series



Side view – 800 series

Connection label

6000 Series



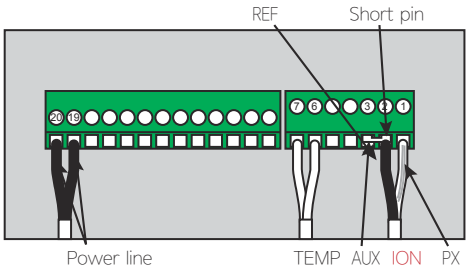
Notice

1. User must strip the ION wire to remove the black rubber conductor.

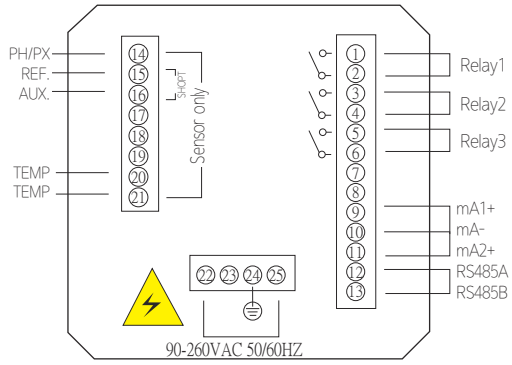
Rubber conductor not removed Rubber conductor removed

2. Connection electrode (short pin 2 and 3)

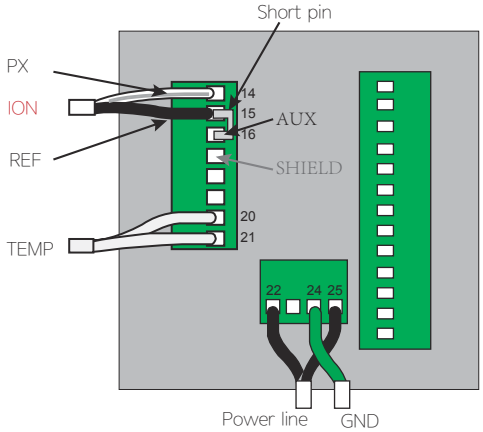
Electrode connection figure



Connection label (800 series)

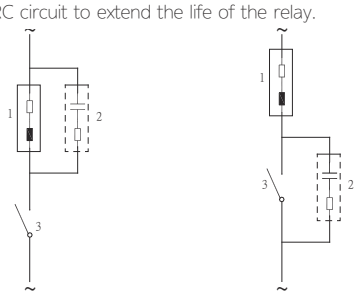


Electrode connection figure (800 series)

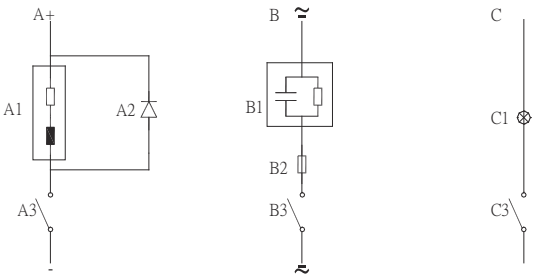


Relay contact protection

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.

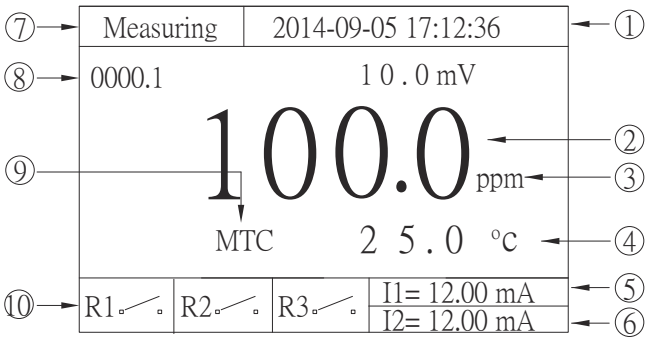


AC protection, use for inductive load
1. Load
2. RC eliminate spark, using in 220VAC, R=100 ohm1W,
3. Relay contact



DC protection: A1 - Inductive load || A2 - 1N4007 || A3 - Relay contact
AC/DC protection: B1 - Capacitive load || B2: 0.8 Ohm/1W (DC24V) ||B3 - Relay contact
Resistive load: C1 - Lamp bulb ||C3 - Relay contact

Measurement display



1. Date and time
2. Main measurement display
3. Unit
4. Temperature and unit
5. Current output 1
6. Current output 2
7. Measurement status and error indicator (Does not show when meter is in keeping mode)
8. Count down timer - Cycle time/ clean time (Displays "delay" when relay3 has delay function enabled)
9. Temperature compensation (ATC - Automatic or MTC – Manual)
10. Relay status indicator

Note:
If the ppm readings are under or over the range, it will display 0.00/99999
If the temperature readings are under or over the range, it will display -99.9/999.9.

Buttons

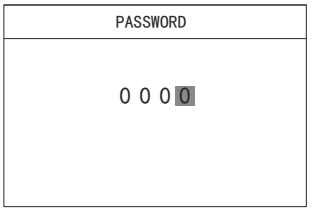
Key name	Meas. status	Setting status	Cal. status	Record status
MODE	Enter password	Exit	Exit	Exit
SHIFT	none	Move digit	Mode digit	Mode digit
UP	Enter record	Inc	Inc	Inc
DOWN	None	Dec	Dec	Dec
ENTER	ON/OFFback light	Enter	Enter	Enter

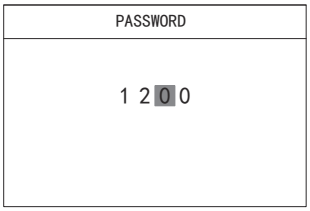
Keeping mode

1. Activates during startups, setting, calibration, record, and cleaning.
2. Relay will return to default status – All relays will not be energized (Inactive).
3. Current output:
a) Fixed current – Values set on output test
b) Last current – Hold the last output before entering Keeping mode.
4. Keeping mode will be deactivated 10 seconds after returning to measurement mode.

Setting

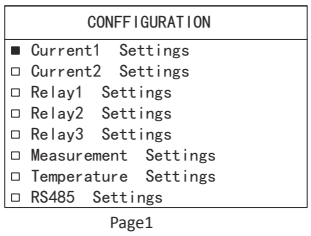
Press MODE key to enter the password menu and then press UP/DOWN/SHIFT key to input password 1200 then press ENTER will enter to setting mode or press MODE key to exit. Controller will return to measurement mode after 10 minutes of inactivity.



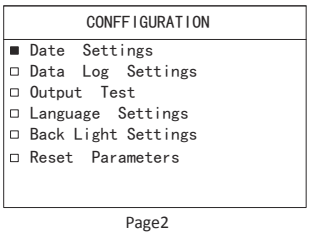


Main display

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



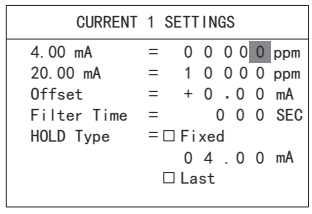
Page1



Page2

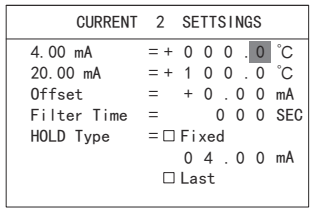
Note:
1. Error on measurement page indicates that input data is not in the correct range.
2. Press ENTER on setting pages to save any changed data.
3. Press MODE to return to the previous page.
4. Meter will return to measurement mode after 10 minutes of inactivity.

Current 1 settings



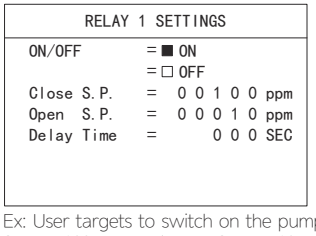
1. Set the ppm value to the corresponding 4.00mA and 20.00mA point.
2. The minimum range between 4.00mA and 20.00 mA at least is 100ppm.
3. Set the offset current of ppm, the range is±1.00mA.
4. The filter time range is 0-120 seconds. The low pass filter of software will be activated when the current 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



1. Set the temperature value to the corresponding 4.00mA and 20.00mA point.
2. The minimum range between 4.00mA and 20.00 mA is 10.0℃.
3. Set the offset current of temperature (The maximum range is±1.00mA).
4. The filter time range is 0-120 seconds. The low pass filter of software will be activated when the current from one point to another point if user sets the filter time.
5. Set the current 2 output mode (fixed / last) during keeping mode.

Relay 1 settings



1. Press UP/DOWN key to ON/OFF (enable/ disable) relay1.
2. Close set point: Target value to activate relay.
3. Open set point: Target value to deactivate relay.
4. Delay time: Relay will only be activated when this timer time out. Timer range from 0 to 120 seconds.

Ex: User targets to switch on the pump at 100ppm and switch off at 10ppm. Set close S.P. to 100ppm and open S.P. to 10ppm.

Relay 2 settings

```
RELAY 2 SETTINGS
ON/OFF      = ■ ON
              = □ OFF
Close S.P.  =  0 0 0 1 0 ppm
Open  S.P.  =  0 0 1 0 0 ppm
Delay Time  =      0 0 0 SEC
```

1. Press UP/DOWN key to ON/OFF (enable/disable) relay2.
2. Close set point: Target value to activate relay.
3. Open set point: Target value to deactivate relay.
4. Delay time: Relay will only be activated when this timer time out. Timer range from 0 to 120 seconds.

Ex: User targets to switch on the pump at 10ppm and switch off at 100ppm. Set close S.P. to 10ppm and open S.P. to 100ppm.

Relay 3 settings

```
RELAY 3 SETTINGS
ON/OFF      = ■ ON
              = □ OFF
Period Time = 0 0 0 1 . 0 HOUR
Clean Time  =    0 0 1 0 SEC
Delay Time  =      0 0 0 SEC
Function    = □ Rinsing
              □ Interval Alarm
              □ Error Alarm
```

1. ON/OFF : Press UP/DOWN key to ON/OFF(enable/disable) relay 3.
2. Period time : Rinsing or interval function only.
3. Clean time : Relay operation period.
4. Delay time : Relay will only be activated when this timer time out.
5. Function : Press UP/DOWN key to select Rinsing/Interval/Error.

Notice:

1. Rinsing: Relay will be activated when period time out. Relay will remain activated throughout cleaning time. Period time will restart when cleaning is completed.
2. Interval alarm: Relay will be activated when period time out. Relay will remain activated until user resets the alarm. Period time will restart.
3. Error alarm: Relay will be activated when an error is detected. Timer is not available for this function.

Measurement settings

```
MEASUREMENT SETTINGS
Unit        = ■ ppm
              □ mg/L
Range       = □ 0-20000
              □ 0-20.00
Offset      = + 0 .0 0 ppm
Filter      =      0 0
```

1. Unit: select the display unit
2. Range: select the measuring range
3. Offset: offset for the readings.
4. Filter: average the readings.

Temperature setting (Page 1)

```
TEMPERATURE  SETTSINGS
Automatic   = ■ Auto
              □ Manual
Probe       = □ Pt 1000
              □ NTC 10K
Offset      =     + 0 . 0 ℃
Manual Meas. = + 0 2 5 . 0 ℃
Manual Cal. =     2 5 . 0 ℃
```

1. Automatic: select ATC or MTC
2. Probe: select probe type.
3. Offset: offset for the readings.
4. Manual measuring: the temperature is for measuring mode when it uses MTC.
5. Manual calibration: the temperature is for calibration mode when it uses MTC.

Temperature setting(Page 2)

```
TEMPERATURE  SETTSINGS
Display     = ■ YES
              □ NO
```

6. Display: display the temperature on measuring mode or not.

RS485 settings

```
RS485  SETTSINGS
ID Address  = 0 0 1
Baud Rate   = □  9600
              = □ 19200
              = □ 34800
```

1. ID Address: 1-255
2. Baud Rate: Press UP/DOWN key to select preferred baud rate.

Date settings

```
DATE  SETTSINGS
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. Clock will continue to run for about 1 week after power down.

Data log settings

```
DATA  LOG  SETTSINGS
OFF/ON      = ■ ON
              □ OFF
Display Type = □ Record
               □ XY Chart
Reset Record = □ Yes
               = □ No
Save Period  = 0 6 0 SEC
```

1. ON/OFF: Enable or disable data logging function.
2. Display Type: Select data logging display mode.
3. Reset Record: Erase all recorded data.
4. Saving Period: Recording interval.

Notice: Reset record will take around 10 seconds.

Output test

```
OUTPUT  TEST
Current1    =  0 4 . 0 0 mA
Current2    =  0 4 . 0 0 mA
Relay1      = □ CLOSE
              □ OPEN
Relay2      = □ CLOSE
              = □ OPEN
Relay3      = □ CLOSE
              = □ OPEN
```

1. Current 1: Injects current ranging from 4.00-20.00mA to the output. Press UP/DOWN to set.
2. Current 2: Injects current ranging from 4.00-20.00mA to the output. Press UP/DOWN to set.
3. Relay 1: Open or close contact. Press UP/DOWN to select.
4. Relay 2: Open or close contact. Press UP/DOWN to select.
5. Relay 3: Open or close contact. Press UP/DOWN to select.

Notice: This function for testing the output only.

Language settings

```
LANGUAGE  SETTSINGS
Language    = ■ English
              = □ 繁體中文
              = □ 简体中文
```

Language preference. Press UP/DOWN key to select the language.

Back light settings

```
BACK LIGHT SETTING
Back Light  = ■ 60 Seconds
              = □ Manual
```

60 seconds : The back light will turn off when no key is be pressed in 60 seconds.
Manual: User needs to press the ENTER key to turn on/off the back light in measuring mode

Reset parameters

RESET PARAMETERS	
Reset Type	= ■ Current = □ Relay1 = □ Relay2 = □ Relay3 = □ All

Reset all parameters. Press UP/DOWN key to select the targeted preference to reset.

Notice: The reset will not affect the calibrated parameters.

Record query

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

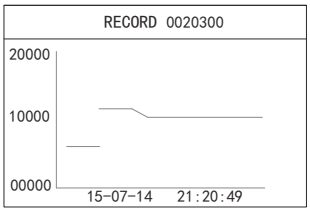
INPUT RECORD START NUMBER
0 1 0 3 0 0

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

Display (ppm) data in detail view

RECORD 0020300		
15-08-14	00100	ppm
21:20:49	025.0	°C
15-08-14	00100	ppm
21:20:59	025.0	°C
15-08-14	00110	ppm
21:21:09	025.0	°C
15-08-14	00110	ppm
21:21:19	025.0	°C
15-08-14	00100	ppm
21:21:29	025.0	°C

Display (ppm) data in XY chart view



Calibration

Press MODE key to enter the password menu. Then, press UP/DOWN/SHIFT key to input password 1100. Pressing ENTER will proceed to calibration mode or press MODE to exit. If no key is pressed for over 10 minute, then it will go back to measurement mode.

PASSWORD
0 0 0 0

PASSWORD
1 1 0 0

Main display

CALIBRATION
■ Calibration □ Reset Parameters

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

1. Calibration: Calibrate the ppm
2. Reset parameters: Clears all the calibrated parameters to the default setting

Calibration

Range: 0-20000

CALIBRATION
Slope = 56.00 mV/dec
Press ENTER

Display the slope of last calibration

First point calibration

CALIBRATION	
0 0 1 0	2 3 0.0 mV 2 5.0 ℃
Input buffer and press ENTER	

1. Put the electrode to the first buffer.
2. Press UP/DOWN key to input the correct buffer and then press ENTER to start calibration.
3. User can press ENTER to go to next when the reading is stable.
4. Display the mV on the right side.
5. If the mV is over +/-900mV or temperature is over 0.0-60.0℃ then it will display error message on the button of LCD.

Slope calibration

CALIBRATION	
0 0 1 0 0	1 7 0.0 mV 2 5.0 ℃
Input buffer and press ENTER	

1. Put the electrode to the second buffer.
2. Press UP/DOWN key to input the correct buffer and then press ENTER to start calibration.
3. User can press ENTER to go to next when the reading is stable.
4. Display the idea mV on the right side.
5. If the mV is over +/-1000mV or temperature is over 0.0-60.0℃ then it will display error message on the button of LCD.

CALIBRATION	
0 0 1 0 0	1 7 0.0 mV 2 5.0 ℃
Slope = 58.00 mV/dec	

Finished the calibration then press to go to calibration menu .

Range: 0.00-20.00

CALIBRATION
Buffer = ■ 0.1 ppm / 1.0 ppm □ 0.5 ppm / 5.0 ppm □ Manual calibration
Select buffer and press ENTER

1. User needs to select the buffer type in range 0.00-20.00.
2. It will display the slope after finished the calibration when user selects the 0.1-1.0 and 0.5-5.0 buffer.
3. If user wants to use the buffer different with the 0.1 and 0.5 then select the "Manual calibration"

First point calibration

CALIBRATION	
0.1 0	2 3 0.0 mV 2 5.0 ℃
Wait stable and press ENTER	

1. Put the sensor into the first point buffer and wait the reading is stable
2. If the reading is stable then press ENTER to go to Next page

Slope calibration

CALIBRATION	
0 1.0 0	1 7 0.0 mV 2 5.0 ℃
Wait stable and press ENTER	

1. Clean the sensor with deionized water.
2. Put the sensor into the second buffer and wait the reading is stable.
3. If the reading is stable then press ENTER to finish the calibration.

CALIBRATION	
01.00	170.0 mV 25.0 ℃
Slope = 58.00 mV/dec	

Display the slope.

Reset parameters

RESET PARAMETERS
Reset

This will reset all the calibrated parameters to default.

USB function

Press MODE key to enter the password menu. Press UP/DOWN/SHIFTkey to input password (1300). Press ENTER will proceed to USB setting or press MODE key to exit. If no key is be pressed for over 10 minutes, it will go back to measurement mode.

PASSWORD
0000

PASSWORD
1300

USB setting menu

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

USB SETTINGS
■ Download records □ Update program

1. To download records, plug in a USB flash disk into the USB port and then download all of the records. It takes around 10 minutes to download 500,000 records or 1 minute to download 50,000 records.
2. To update program, save the correct file to the USB flash disk. Plug it to the USB port. Enter the update program function to update it.

Default settings

ION 20.00mA corresponding	100	ppm	range: 100 - 20000
ION 4.00mA corresponding	0	ppm	range: 0 - 19900 difference : 100
Temp. 20.00mA corresponding	100.0	℃	range: 0.0 - 130
Temp. 4.00mA corresponding	0.0	℃	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 ION close S.P.	100	ppm	range: 0 - 20000
Relay 1 ION open S.P.	10	ppm	range: 0 - 20000 difference : 1
Relay 1 delay time	0	second	range: 0 - 120
Relay 2 ION close S.P.	10	ppm	range: 0 - 20000
Relay 2 ION open S.P.	100	ppm	range: 0 - 20000 difference : 1
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

Save time	60	second	range: 5 - 120
ID address	1		range: 1 - 255
Baudrate	9600		range: 9600,19200,38400
ION offset	0	ppm	range: +/- 100
Temp. Offset	0.0	℃	range: +/- 5.0
Manual Temp.for measurement	25.0	℃	range: -10.0 - 130.0
Manual Temp. for calibration	25.0	℃	range: 0.0 - 60.0
Language	English		range: English/traditional Chinese /simple Chinese
Filter	1		range: 0 - 10
Temp. compensation	MTC		range: ATC/MTC
Temp. probe	Pt1000		range: Pt1000, NTC10K
Record type	record		range: record/XY chart

Password

Press MODE key
1100: Calibration mode
1200: Setting mode
1300: USB mode

*If no key is be pressed within 10 minutes, it will return 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 come in standard with Modbus-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	ION reading1	reading: Floating
(02)	0x02	ION current	reading: X 0.01
(03)	0x03	Temperature	reading: X 0.1
(04)	0x04	Temperature current	reading: X 0.01
(05)	0x05	Error code	reading: X 1
(06)	0x06		
(07)	0x07		
(08)	0x08		
(09)	0x09	Model type	fixed to 4

03:definition

Address

(00)	0x00	ION20000 20.00mA corresponding	reading: float
(02)	0x02	ION20000 4.00mA corresponding	reading: float

(04)	0x04	ION20 20.00mA corresponding	reading: float
(06)	0x06	ION20 4.00mA corresponding	reading: float
(08)	0x08	Temp.20.00mA corresponding	reading:X0.1
(09)	0x09	Temp. 4.00mA corresponding	reading:X0.1
(10)	0x0A	Current 1 offset	reading:X0.01
(11)	0x0B	Current 2 filter	reading:X1
(12)	0x0C	Current 1 filter	reading:X1
(13)	0x0D	Current 2 filter	reading:X1
(14)	0x0E	Current 1 fixed current	reading:X0.01
(15)	0x0F	Current 2 fixed current	reading:X0.01
(16)	0x10	Current 1 HOLD type	reading:X1 0=fixed,1=last
(17)	0x11	Current 2 HOLD type	reading:X1 0=fixed,1=last
(18)	0x12	Relay1 ION20000 close S.P.	reading:float
(20)	0x14	Relay1 ION20000 open S.P.	reading:float
(22)	0x16	Relay1 ION20 close S.P.	reading:float
(24)	0x18	Relay1 ION20 open S.P.	reading:float
(26)	0x1A	Relay1 delay time	reading:X1
(27)	0x1B	Temp. offset	reading:X0.1
(28)	0x1C	Relay2 ION20000 close S.P.	reading:float
(30)	0x1E	Relay2 ION20000 open S.P.	reading:float
(32)	0x20	Relay2 ION20 close S.P.	reading:float
(34)	0x22	Relay2 ION20 open S.P.	reading:float
(36)	0x24	Relay2 delay time	reading:X1
(37)	0x25	Relay3 clean period	reading:X0.1
(38)	0x26	Relay3 clean time	reading:X1
(39)	0x27	Relay3 delay time	reading:X1
(40)	0x28	Relay3 function	reading:X1 0:clean,1:period alarm ,2:Error alarm
(41)	0x29	Record saving time	reading:X1
(42)	0x2A	ION20000 offset	reading: float
(44)	0x2C	ION20 offset	reading: float
(46)	0x2E	Manual temp. for measurement	reading:X0.1
(47)	0x2F	Manual temp. for calibration	reading:X0.1
(48)	0x30	Temp. compensation	reading:X1 0=Auto,1=manual
(49)	0x31	Temp. probe	reading:X1 0=Pt1000,1=NTC10K
(50)	0x32	Language	reading:X1 0=English,1=traditional Chinese,2=simple Chinese
(51)	0x33	Filter	reading:X1