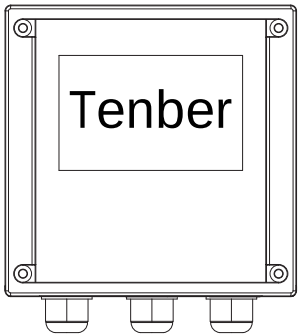
# POP-3301 Dual-Display pH/ORP Controller

Operating Manual




144 Series

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## Safe Operation

Please read the following instructions for safe operation carefully before use:

1. Before use, please observe whether the appearance of the instrument is damaged due to transportation and extrusion; 2. The instrument must be operated by trained professional technicians; 3. The operating manual must be read thoroughly before use to avoid incorrect wiring that may cause safety issues and damage to the instrument; 4. After all wiring is completed, it must be carefully checked before powering on and confirming that the connected equipment is correct; 5. Please install the instrument away from high temperature, high humidity and corrosive environments, and away from direct sunlight; 6. Avoid using a power supply that generates surge interference. If there is surge interference, please separate the instrument power supply from the power supply of other interfering equipment.

## Intended Use

The instrument is used for pH/ORP and temperature measurement in industry, such as: wastewater, environmental monitoring, fermentation, food production process, dosing pump proportion control/frequency control, etc.; the instrument can be installed on the panel, wall, or pipeline; the instrument provides 2 current outputs with a maximum load of 500 ohm; the instrument provides 3 control relays, and the maximum withstand voltage and current of the relay is 5A/250VAC or 5A/30VDC.

## Package Contents and Warranty

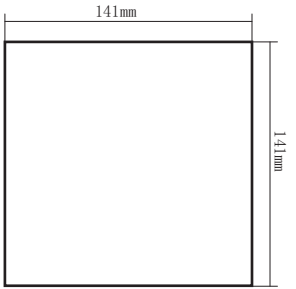
144 series: product packaging, including 1 instrument and 4 sets of brackets (screws, fixing blocks, fixing rods)

# Specifications

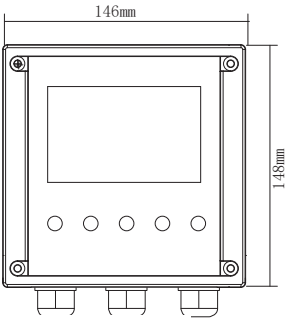
| Function | pH | ORP |
|---|---|---|
| Measurement range | -2.00 to +16.00 pH | -2000 to +2000 mV |
| Resolution | 0.01 pH | 1 mV |
| Accuracy | +/-0.01 pH | +/-1 mV |
| Specifications shared by pH and ORP | | |
| Temperature compensation | Pt1000 / NTC10K | |
| Temperature measurement range | -10.0 to +130.0 deg C | |
| Temperature compensation range | -10.0 to +130.0 deg C | |
| Temperature resolution / accuracy | 0.1 deg C / +/-0.2 deg C | |
| Operating temperature | 0 to +70 deg C | |
| Storage temperature | -20 to +70 deg C | |
| Input impedance | >10^12 ohm | |
| Display | Large backlit color LCD | |
| Current output 1 (pH/ORP) | Isolated 4-20 mA output; max. load 500 ohm | |
| Current output 2 (pH/ORP) | Isolated 4-20 mA output; max. load 500 ohm | |
| Current output accuracy | +/-0.05 mA | |
| RS485 | Modbus RTU standard protocol | |
| Communication rate | 9600 / 19200 / 38400 | |
| Relay contact rating | 5 A / 250 VAC; 5 A / 30 VDC | |
| Cleaning | ON: 1-1000 s; OFF: 0.1-1000.0 h | |
| Multifunction relay | Cleaning / periodic alarm / error alarm (not available on 96 model) | |
| Relay delay | 0-120 s | |
| Data logging | 500,000 records | |
| USB (optional) | Download records and update software; up to 32 GB | |
| Protection rating | IP65 | |
| Power | 90-260 VAC; <5 W | |
| Installation | Panel / wall / pipe | |
| Weight | 144 Series: 0.85 kg | |

Instrument
Installation

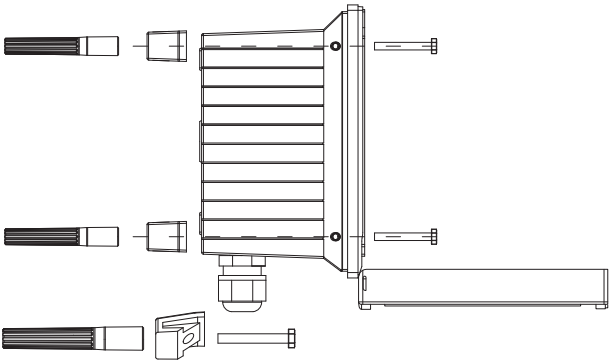
144 series: The instrument can be installed in panel type, pipe type or wall-mounted type. Panel installation: Open a 141mmx141mm square hole on the distribution box panel, place the instrument from the front of the distribution box panel, insert the screws from the back cover, and lock the fixing block and rod from the rear of the distribution box panel.




144 Series Opening Dimensions

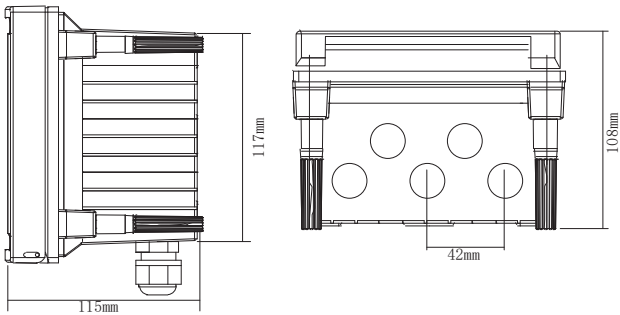



Panel Dimensions

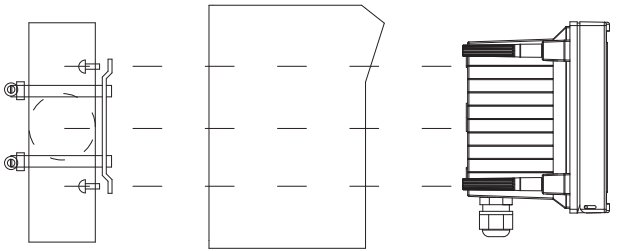


144 Series Bracket Installation

Terminal Labels



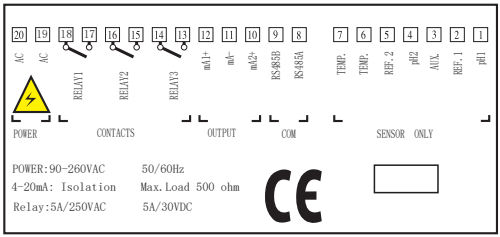

144 Series Dimensional Drawing



144 series wall mounting and pipeline installation

Terminal Labels

## 144 Series



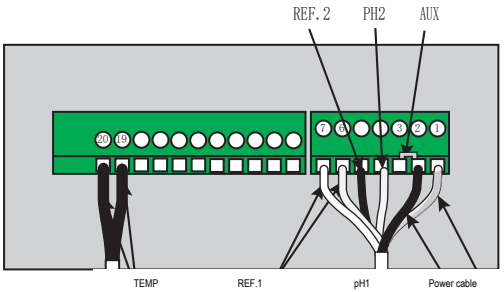

Note: Strip the pH electrode wire and remove the black conductive rubber inside the outer sheath.

Black conductive rubber not removed

Black conductive rubber removed

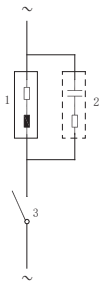
2. The two-wire electrode (2, 3/4, 5 must be connected to a short-circuit piece) and the three-wire electrode (including the ground pin) are connected in different ways, please see the wiring label.

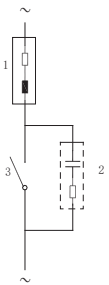
144 series electrode wiring diagram



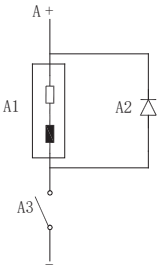
Relay Contact Protection Diagram

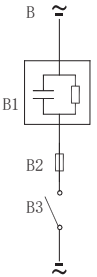
Relay contacts receiving electrical sparks will affect the service life, especially in inductive and capacitive loads. In order to suppress sparks and arc effects, an RC circuit should be used to extend the service life of the relay.

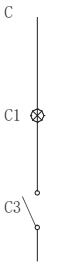



AC Protection for Inductive Loads 1. Load 2. RC Spark Eliminator for 220VAC, R=10 Ohms 1 Watt, C=0.1630V 3. Relay Contacts

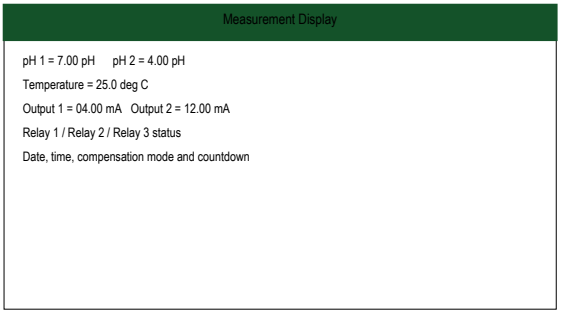



A DC protection, A1: Inductive load A2: 1N4007, A3: Relay contact B AC and DC protection, B1: Capacitive load, B2: 0.8 ohm/1 watt (DC 24V), B3: Relay contact C Resistive load, C1: Light bulb, C3: Relay contact

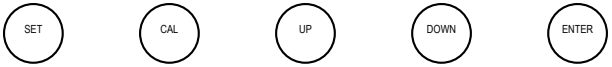
# Display Description - Dual-Channel Mode




1-2. Channel 1 and channel 2 values and units. 3. Temperature and unit. 4-5. Current outputs 1 and 2. 6. Date and time. 7. Countdown for cycle/cleaning time; “Delay” is shown when relay 3 has a delay. 8. Temperature compensation mode. 9-11. Relay 1, relay 2 and relay 3 status indicators.

Out-of-range display: pH: -9.99 / 99.99; ORP: -9999 / 9999; temperature: -99.9 / 999.9.

## Key Description and Hold Mode




| Key | Measure | Settings | Calibration | Records |
|---|---|---|---|---|
| SET | Password | Exit | Exit | Exit |
| CAL | Calibration | Move digit | Move digit | Move digit |
| UP | View records | Increase | Increase | Increase |
| DOWN | - | Decrease | Decrease | Decrease |
| ENTER | Backlight | Confirm | Confirm | Confirm |

## Hold Mode

Hold mode is active during calibration, settings, record viewing and relay cleaning. Relays are open (inactive); output current follows the Fixed or Last setting; the displayed measurement is held. Hold remains active for about 10 seconds after returning to measurement mode and for about 10 seconds after power-up.

Fixed Current: select 4.00-20.00 mA as the hold output. Last Current: maintain the last measured output current. All relays are open (inactive) in hold mode.

# Settings

Press SET, use UP/DOWN and SHIFT to enter password 0001, then press ENTER. Press SET to exit. After 10 minutes without a key press, the instrument returns to measurement mode.

| Password |
| --- |
| 0000 |

| Password |
| --- |
| 0001 |

Main Screen - select a function with UP/DOWN and press ENTER.

| Settings 1/2 |
| --- |
| Measurement Settings |
| Output Settings |
| Relay Settings |
| Data Logging Settings |
| Output Test |
| Calibration |
| General Settings |

| General Settings |
| --- |
| Date and Time |
| Language |
| Backlight |
| Version |
| Restore Factory Settings |

If a value is outside its permitted range, “Error” appears at the top of the display. Press ENTER to save each value. Press SET to exit at any time. The instrument returns to measurement mode after 10 minutes without input.

# Measurement Settings

| Channel 1 |
| --- |
| Parameter Settings |
| Temperature Settings |

| Parameter Settings |
| --- |
| Mode = pH |
| Electrode = Glass |
| Offset = +0.00 pH |
| Filter = 01 |

Select pH or ORP. Select glass electrode for pH (not applicable in ORP mode). Offset range: +/-1.00 pH or +/-100 mV. Filter range: 0-10.

| Channel 2 |
| --- |
| Parameter Settings |
| Temperature Settings |

| Temperature Settings |
| --- |
| Compensation = Manual |
| Probe = Pt1000 |
| Offset = +0.0 deg C |
| Manual measurement = 25.0 deg C |
| Manual calibration = 25.0 deg C |
| Display = Yes |

Select Automatic or Manual temperature compensation and the matching Pt1000 or NTC10K probe. Automatic offset range: +/-5.00 deg C. Manual measurement and calibration temperatures are entered separately. When using Automatic compensation, connect the selected probe; otherwise temperature output may be incorrect. The 144 model has one parameter setting and one temperature setting.

# Output Settings - Channel 1

**Current Output Settings**

Current Output 1

Other Current Output

Communication

**Current Output 1 - pH**

Mode = pH

Output = 4-20 mA

4 mA = 0.00 pH

20 mA = 14.00 pH

Offset = 0.00 mA

Filter = 1 s

Hold = Fixed; 4.00 mA

**Current Output 1 - ORP**

Mode = ORP

4 mA = -2000 mV

20 mA = +2000 mV

Offset = 0.00 mA

Filter = 1 s

Hold = Fixed; 4.00 mA

**Current Output 1 - Temperature**

Mode = Temperature

4 mA = 0.0 deg C

20 mA = 100.0 deg C

Offset = 0.00 mA

Filter = 1 s

Hold = Fixed; 4.00 mA

Set the values corresponding to 4.00 mA and 20.00 mA. Minimum span: 1.00 pH, 100 mV ORP or 10 deg C. pH/ORP values may be set in reverse order. Output offset range: +/-1.00 mA. Filter time: 0-120 s; a longer time smooths the output but slows its response. Hold mode: Fixed Current or Last Current. When Fixed is selected, enter the fixed output current.

# Output Settings - Channel 2

**Current Output Settings**

Current Output 2

Other Current Output

Communication

**Current Output 2 - pH**

Mode = pH

Output = 4-20 mA

4 mA = 0.00 pH

20 mA = 14.00 pH

Offset = 0.00 mA

Filter = 1 s

Hold = Fixed; 4.00 mA

**Current Output 2 - ORP**

Mode = ORP

4 mA = +2000 mV

20 mA = -2000 mV

Offset = 0.00 mA

Filter = 1 s

Hold = Fixed; 4.00 mA

**Current Output 2 - Temperature**

Mode = Temperature

4 mA = 0.0 deg C

20 mA = 100.0 deg C

Offset = 0.00 mA

Filter = 1 s

Hold = Fixed; 4.00 mA

Set the values corresponding to 4.00 mA and 20.00 mA. Minimum span: 1.00 pH, 100 mV ORP or 10 deg C. pH/ORP values may be set in reverse order. Output offset range: +/-1.00 mA. Filter time: 0-120 s; a longer time smooths the output but slows its response. Hold mode: Fixed Current or Last Current. When Fixed is selected, enter the fixed output current.

# Communication and Relay Settings - Channel 1

**Output Settings**

Current Output A

Current Output B

Communication

**Communication Settings**

Address = 001

Baud rate = 9600

Communication address: 1-255. Select baud rate with UP/DOWN.

**Relay Settings**

Relay A

Relay B

Multifunction Relay

**Relay A Settings**

Status = Enabled

pH: Close +10.00; release +4.00

ORP: Close +1000 mV; release +400 mV

Delay = 000 s

Select Enabled or Disabled. Close point: the relay operates when channel 1 reaches the set pH/ORP value. Release point: the relay releases at its set value. Delay: 0-120 s before operation after the close point is reached. Example: to run a pump at pH 10.00 and stop it at pH 4.00, set close point to 10.00 and release point to 4.00.

# Relay Settings - Channel 2 and Multifunction Relay

| Relay Settings |
| --- |
| Relay A |
| Relay B |
| Multifunction Relay |

| Relay B Settings |
| --- |
| Status = Enabled |
| pH: Close +10.00; release +4.00 |
| ORP: Close +1000 mV; release +400 mV |
| Delay = 000 s |

Use the same setup as channel 1. For channel 2, the relay follows pH2/ORP2.

| Relay Settings |
| --- |
| Relay A |
| Relay B |
| Multifunction Relay |

| Relay 3 Settings |
| --- |
| Status = Disabled |
| Cycle = 0001.0 h |
| Cleaning = 0010 s |
| Delay = 000 s |
| Function = Error Alarm |

Relay 3: select Enabled/Disabled. Cycle time: 0.1-1000.0 h. Cleaning time: 1-1000 s after the cycle expires. Delay: 0-120 s. Function: Cleaning, Periodic Alarm or Error Alarm. Cleaning runs for the set cleaning time, then restarts the cycle. Periodic Alarm activates at each cycle expiry. Error Alarm activates when a measurement error occurs and remains active until the error clears.

# Data Logging Settings

**Data Logging Settings**

Settings

View Logged Data

Download Records

**Logging Parameters**

Status = Off

Display mode = Record

Interval = 01 min

Clear records = No

**View Logged Data**

Select starting record

Example = 000000

Press ENTER to view

**Download Records**

Insert USB drive

Press ENTER to download

# Data Logging Instructions

| Settings | View Logged Data | Download Records |
| --- | --- | --- |
| Status = On / Off | Enter starting record | Insert USB drive |
| Display = Record / Graph | Record view = 5 per page | Select Download Records |
| Interval = 1-60 min | Graph view = 150 per page | Press ENTER |
| Clear records = Yes / No | | |

Use UP/DOWN to select a function and press ENTER to open Data Logging Settings. 1. Turn data logging on or off. 2. Select Record or Graph display. 3. Set the logging interval from 1 to 60 minutes. 4. Choose whether to clear all records. 5. To view records, enter the starting record number. 6. To download, insert a USB drive and select Download Records.

When logging is enabled, measurements are stored at the selected interval. Record view displays 5 records per page; Graph view displays 150 records per page. Clearing all records takes about 10 seconds. Downloading approximately 500,000 records takes about 10 minutes; 50,000 records takes about 1 minute.

# Record Display and Output Test

**pH Record 0010300**

24-01-14 07.00 pH 25.0 deg C

21:20:49

24-01-14 04.00 pH 25.0 deg C

21:20:49

5 records per page

**pH Graph 0010300**

Range = 0-14 pH

150 records per page

**ORP Record 0020300**

24-01-14 0750 mV

21:20:49

24-01-14 0350 mV

21:20:49

5 records per page

**ORP Graph 0020300**

Range = -2000 to +2000 mV

150 records per page

**Output Test**

Output A = 04.00 mA

Output B = 04.00 mA

Relay A = Release

Relay B = Release

Relay 3 = Release

Test current outputs A and B over 4.00-20.00 mA. Select relay A/B with UP/DOWN to test operation. Use this function to verify current output and relay operation.

# Calibration - pH

| Calibration |
| --- |
| Channel 1 |
| Channel 2 |

| Calibration |
| --- |
| Automatic calibration |
| Manual input |
| Restore factory calibration |

Select a function with UP/DOWN and press ENTER. Before calibration, restore the calibration values to their factory settings. Automatic: select the first, second or third standard solution. Manual: enter the standard values. Restore: return calibration values to factory settings.

| Calibration Results |
| --- |
| Slope 1 = 59.16 mV/pH |
| Efficiency 1 = 100.0% |
| Slope 2 = 59.16 mV/pH |
| Efficiency 2 = 100.0% |

| First-Point Calibration |
| --- |
| Standard = 6.86 / 7.00 |
| Temperature = 25.0 deg C |
| Select solution; press ENTER |

Place the electrode in the first standard solution. Select its value with UP/DOWN and press ENTER to start. If waiting takes too long, press ENTER to force calibration. The right side shows the ideal pH value. An error appears if the electrode value is outside pH 7.00 +/-1.5 pH or temperature is outside 0.0-60.0 deg C. Efficiency below 80% indicates an aged electrode; check and replace it.

# Automatic pH Calibration - Points 2 and 3

| Second-Point Calibration |
| --- |
| Standards = 1.68 / 4.01 |
| Measured pH = 4.00 |
| Temperature = 25.0 deg C |
| Select solution; press ENTER |

| Calibration Complete |
| --- |
| Slope 1 = 58.00 mV/pH |
| Efficiency 1 = 99.0% |
| Press ENTER for point 3 |

Place the electrode in the second standard. Select the standard with UP/DOWN and press ENTER. When stable, press ENTER to continue. The right display shows the ideal pH. Error limits: standard pH range +/-30% and temperature 0.0-60.0 deg C.

| Third-Point Calibration |
| --- |
| Standards = 9.18 / 10.01 / 12.45 |
| Measured pH = 12.15 |
| Temperature = 25.0 deg C |
| Select solution; press ENTER |

| Calibration Complete |
| --- |
| Slope 2 = 58.00 mV/pH |
| Efficiency 2 = 99.0% |
| Status = Pass |
| Electrode condition = Good |

Place the electrode in the third standard and select its value with UP/DOWN. Press ENTER to start; press ENTER when stable to complete. The right display shows the ideal pH. Error limits: standard pH range +/-30% and temperature 0.0-60.0 deg C. Efficiency below 80% indicates electrode aging; replace the electrode.

# Manual pH Calibration - Points 1 and 2

**Calibration Results**

Slope 1 = 59.16 mV/pH

Efficiency 1 = 100.0%

Slope 2 = 59.16 mV/pH

Efficiency 2 = 100.0%

**First-Point Calibration**

Enter standard value = 7.00 pH

Temperature = 25.0 deg C

Press ENTER to start

Place the electrode in the first standard solution. Enter its value with UP/DOWN, then press ENTER. When stable, press ENTER to continue to the next point. The right display shows the ideal pH. Error limits: pH 7.00 +/-1.5 pH and temperature 0.0-60.0 deg C.

**Second-Point Calibration**

Enter standard value = 4.01

Measured pH = 4.00

Temperature = 25.0 deg C

Press ENTER when stable

**Calibration Complete**

Slope 1 = 58.00 mV/pH

Efficiency 1 = 99.0%

Press ENTER for point 3

Place the electrode in the second standard. Enter its value with UP/DOWN and press ENTER. When stable, press ENTER to complete this point. Error limits: pH 0.00-14.00 and temperature 0.0-60.0 deg C. Efficiency below 80% indicates electrode aging; replace the electrode.

# Manual pH Calibration - Point 3 and ORP Setup

| Third-Point Calibration |
| --- |
| Enter standard value = 10.01 |
| Measured pH = 4.00 |
| Temperature = 25.0 deg C |
| Press ENTER when stable |

| Calibration Complete |
| --- |
| Slope 2 = 58.00 mV/pH |
| Efficiency 2 = 99.0% |
| Status = Pass |

Place the electrode in the third standard. Enter its value with UP/DOWN, press ENTER, then press ENTER again when stable. Error limits: pH 0.00-14.00 and temperature 0.0-60.0 deg C. Efficiency below 80% indicates electrode aging; replace the electrode.

| Restore Factory Calibration |
| --- |
| Restore = Yes / No |

Restores calibration values to the factory state. Other settings are not changed.

| ORP Calibration |
| --- |
| Manual calibration |
| Restore factory calibration |

Select a function with UP/DOWN and press ENTER. Manual calibration requires entering the standard solution value.

# ORP Calibration and Date/Time

**Manual ORP Calibration**

Standard = 086 mV

Measured = 088 mV

Press ENTER when stable

**Calibration Complete**

Status = Pass

Place the electrode in the standard solution. Enter the standard value with UP/DOWN. When the left reading stabilizes, press ENTER. The right side displays the ideal ORP value.

**Restore Factory Calibration**

Restore = Yes / No

Restores calibration to the factory state without changing other settings. Channel 2 calibration follows the same procedure; channel 1 controls pH1/ORP1, channel 2 controls pH2/ORP2.

**Date and Time Settings**

Year = 2024

Month = 01

Day = 14

Hour = 21

Minute = 09

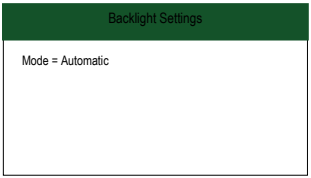
Second = 17

Use UP/DOWN to set date and time. The clock is retained for about two days after power loss.

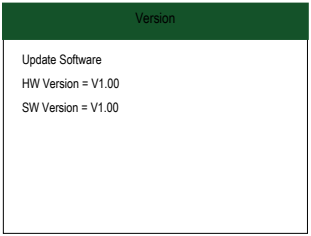
# General Settings - Language, Backlight and Version




Sets the display language to Simplified Chinese.




Select automatic backlight-off after 60 seconds or manual backlight operation.




Displays current hardware and software versions. To update, copy the new software to a USB drive, insert it, and select Update Software. Update takes about 30 seconds.

# General Settings - Restore Factory Settings

**Restore Factory Settings**

Measurement = No

Current outputs = No

Relays = No

Communication = No

Restore all = No

Select individual groups or Restore All. This does not reset pH/mV calibration values.

## Factory Default Values

| Parameter | Default | Range / Options |
|---|---|---|
| pH1 20 mA value | 14.00 pH | -2.00 to 16.00 |
| pH1 4 mA value | 0.00 pH | -2.00 to 16.00 |
| ORP1 20 mA value | 2000 mV | -2000 to 2000 |
| ORP1 4 mA value | -2000 mV | -2000 to 2000 |
| pH2 20 mA value | 14.00 pH | -1.00 to 16.00 |
| pH2 4 mA value | 0.00 pH | -2.00 to 15.00 |
| ORP2 20 mA value | -2000 mV | -2000 to 2000 |
| ORP2 4 mA value | 2000 mV | -2000 to 2000 |
| Current output 1/2 offset | 0.00 mA | +/-1.00 |
| Current output 1/2 filter | 0 s | 0-120 s |
| Current output 1/2 fixed current | 4.00 mA | 4.00-20.00 |
| Current output 1/2 hold mode | Last | Fixed / Last |
| Relay 1 pH close / release | 10.00 / 4.00 pH | -2.00 to 16.00; min gap 0.01 |
| Relay 1 ORP close / release | 1000 / 400 mV | -2000 to 2000; min gap 1 |
| Relay 1 delay | 0 s | 0-120 s |

## Factory Default Values (continued)

| Parameter | Default | Range / Options |
|---|---|---|
| Relay 2 pH close / release | 4.00 / 10.00 pH | -2.00 to 16.00; min gap 0.01 |
| Relay 2 ORP close / release | 400 / 1000 mV | -2000 to 2000; min gap 1 |
| Relay 2 delay | 0 s | 0-120 s |
| Relay 3 cycle / cleaning / delay | 1.0 h / 10 s / 0 s | 0.1-1000 h / 1-1000 s / 0-120 s |
| Relay 3 function | Error Alarm | Cleaning / Periodic / Error |
| Logging interval | 60 s | 5-120 s |
| Communication ID | 1 | 1-255 |
| Baud rate | 9600 | 9600 / 19200 / 38400 |
| pH1 / pH2 offset | 0.00 pH | +/-1.00 |
| ORP1 / ORP2 offset | 0 mV | +/-100 |
| Measurement units | pH | pH / ORP |
| Temperature offset | 0.0 deg C | +/-5.0 |
| Manual measurement temperature | 25.0 deg C | 0-60 deg C |
| Manual calibration temperature | 25.0 deg C | 0-60 deg C |
| Display language | Simplified Chinese | Simplified Chinese |
| Filter | 1 | 0-10 |
| Temperature compensation | Manual | Automatic / Manual |
| Temperature probe | Pt1000 | Pt1000 / NTC10K |
| Data storage display | Record | Record / Graph |

## Password

Press SET. SHIFT: user electrode calibration. 0001: function settings. After 10 minutes without a key press, the instrument exits and saves changed parameters.

# Error Codes and RS485 Communication

## Error Codes

| | |
|---|---|
| Error 01 | Memory error |
| Error 02 | Measured value above maximum |
| Error 03 | Measured value below minimum |
| Error 04 | Temperature above maximum |
| Error 05 | Temperature below minimum |
| Error 06 | Output 1 >20.5 mA; limit 22.00 mA |
| Error 07 | Output 1 <3.8 mA; limit 3.5 mA |
| Error 08 | Output 2 >20.5 mA; limit 22.00 mA |
| Error 09 | Output 2 <3.8 mA; limit 3.5 mA |
| Error 10 | Data logger fault |
| Error 11 | ADC fault |
| Error 12 | Factory data missing |

RS485 uses standard Modbus RTU. Measurement values are floating point; other values are signed 2-byte integers (-32767 to 32767), represented in hexadecimal with the most significant bit as the sign.

### Master Request Frame

| Field | Length | Example |
|---|---|---|
| Instrument ID | 1 byte | 0x01 |
| Function | 1 byte | 0x03 |
| Start address | 2 bytes | 0x0001 |
| Quantity | 2 bytes | 0x0001 |
| CRC16 | 2 bytes | 0xD5CA |

### Slave Response Frame

| Field | Length | Example |
|---|---|---|
| Instrument ID | 1 byte | 0x01 |
| Function | 1 byte | 0x03 |
| Byte count | 1 byte | 0x02 |
| Data | N bytes | 0x02 0xBC |
| CRC16 | 2 bytes | 0xB895 |

Baud rate: 9600 (fixed); data bits: 8; parity: none; stop bits: 1. Function 03: read settings. Function 04: read measurements.

# RS485 Register Map - Function 04 and Function 03

## Function 04 - Read Measurement Values

| Dec | Hex | Register | Format |
|---|---|---|---|
| 00 | 0x00 | Model | Fixed M |
| 01 | 0x01 | Model | Fixed 13 |
| 02 | 0x02-03 | pH1 measurement | Float |
| 04 | 0x04-05 | pH2 measurement | Float |
| 06 | 0x06 | Temperature | x0.1 |
| 07 | 0x07 | Output 1 current | x0.01 |
| 08 | 0x08 | Output 2 current | x0.01 |
| 09 | 0x09 | Unit 1 | x1 |
| 10 | 0x0A | Unit 2 | x1 |
| 11 | 0x0B | Error code | x1 |
| 12 | 0x0C | Status | x1 |

## Function 03 - Read Setting Values

| Dec | Hex | Register | Format |
|---|---|---|---|
| 00 | 0x00 | pH1 output 1, 20 mA value | x0.01 |
| 01 | 0x01 | pH1 output 1, 4 mA value | x0.01 |
| 02 | 0x02 | ORP1 output 1, 20 mA value | x1 |
| 03 | 0x03 | ORP1 output 1, 4 mA value | x1 |
| 04 | 0x04 | pH2 output 1, 20 mA value | x0.01 |
| 05 | 0x05 | pH2 output 1, 4 mA value | x0.01 |
| 06 | 0x06 | ORP2 output 1, 20 mA value | x1 |
| 07 | 0x07 | ORP2 output 1, 4 mA value | x1 |
| 08 | 0x08 | Temperature output 1, 20 mA value | x0.1 |
| 09 | 0x09 | Temperature output 1, 4 mA value | x0.1 |
| 10 | 0x0A | pH1 output 2, 20 mA value | x0.01 |
| 11 | 0x0B | pH1 output 2, 4 mA value | x0.01 |
| 12 | 0x0C | ORP1 output 2, 20 mA value | x1 |
| 13 | 0x0D | ORP1 output 2, 4 mA value | x1 |
| 14 | 0x0E | pH2 output 2, 20 mA value | x0.01 |
| 15 | 0x0F | pH2 output 2, 4 mA value | x0.01 |
| 16 | 0x10 | ORP2 output 2, 20 mA value | x1 |
| 17 | 0x11 | ORP2 output 2, 4 mA value | x1 |
| 18 | 0x12 | Temperature output 2, 20 mA value | x0.1 |
| 19 | 0x13 | Temperature output 2, 4 mA value | x0.1 |
| 20 | 0x14 | Output 1 offset | x0.01 |
| 21 | 0x15 | Output 2 offset | x0.01 |
| 22 | 0x16 | Output 1 filter time | x1 |

# RS485 Register Map - Function 03 (continued)

## Function 03 - Read Setting Values (continued)

| Dec | Hex | Register | Format |
|---|---|---|---|
| 23 | 0x17 | Output 2 filter time | x1 |
| 24 | 0x18 | Output 1 fixed current | x0.01 |
| 25 | 0x19 | Output 2 fixed current | x0.01 |
| 26 | 0x1A | Output 1 hold mode: 0 fixed, 1 last | x1 |
| 27 | 0x1B | Output 2 hold mode: 0 fixed, 1 last | x1 |
| 28 | 0x1C | Relay 1 pH close point | x0.01 |
| 29 | 0x1D | Relay 1 pH release point | x0.01 |
| 30 | 0x1E | Relay 1 ORP close point | x1 |
| 31 | 0x1F | Relay 1 ORP release point | x1 |
| 32 | 0x20 | Relay 1 delay | x1 |
| 33 | 0x21 | Relay 2 pH close point | x0.01 |
| 34 | 0x22 | Relay 2 pH release point | x0.01 |
| 35 | 0x23 | Relay 2 ORP close point | x1 |
| 36 | 0x24 | Relay 2 ORP release point | x1 |
| 37 | 0x25 | Relay 2 delay | x1 |
| 38 | 0x26 | Relay 3 cycle time | x0.1 |
| 39 | 0x27 | Relay 3 cleaning time | x1 |
| 40 | 0x28 | Relay 3 delay | x1 |
| 41 | 0x29 | Relay 3 function: 0 clean, 1 periodic, 2 error | x1 |
| 42 | 0x2A | Record interval | x1 |
| 43 | 0x2B | Measurement unit 1: 0 pH, 1 ORP | x1 |
| 44 | 0x2C | Measurement unit 2: 0 pH, 1 ORP | x1 |
| 45 | 0x2D | pH1 offset | x0.01 |
| 46 | 0x2E | ORP1 offset | x1 |
| 47 | 0x2F | pH2 offset | x0.01 |
| 48 | 0x30 | ORP2 offset | x1 |
| 49 | 0x31 | Temperature offset | x0.1 |
| 50 | 0x32 | Manual measurement temperature | x0.1 |
| 51 | 0x33 | Manual calibration temperature | x0.1 |
| 52 | 0x34 | Temperature compensation: 0 auto, 1 manual | x1 |
| 53 | 0x35 | Probe: 0 Pt1000, 1 NTC10K | x1 |
| 54 | 0x36 | Language: 0 English, 1 Simplified Chinese | x1 |
| 55 | 0x37 | Filter | x1 |