

# ATO

## PH/ORP

### PH/ORP Meter

User Manual



# Catalogue

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## Preface

Thanks for buying the PH tester.

The installation, function, setup, wiring method and operation instruction is introduced in the manual. Please carefully read the manual in advance in order to correctly use the instrument. Please properly keep the instruction at the place where it can be read at any time after read so as to provide reference during the operation.

## Notice

The content is forbidden to copy and publish.

The change of the manual content won't be exceptionally notified due to the continuous improvement of the performance and function.

We do our best to ensure the accuracy and completeness of the content. Please contact us if mistakes and omission exist.

## User instructions

Please abide by the operation specification and notes of the instruction book during the use.

The instrument only has one electrode input end, PH electrode shall be installed when the PH mode is selected and OPR electrode shall be installed in the ORP mode.

The warranty period of the glass electrode is 1 year in order to ensure more accurate measurement, the performance will be affected 1 year after leaving the factory no matter it's used or not, which shall be timely exchanged.

The PH electrode of the first time use or it's not used for a long time

must be soaked in 3mol/L Potassium Chloride Solution for 24 hours before the use.

The electric preheating time of the instrument shall be above about half a minute before the calibration work is performed.

It shall be washed to clean in the distilled water (or deionized water) during the measurement; the water shall be dried by filter paper so as to prevent the sundries from being taken in to the test solution.

Please contact the manufacturer if the instrument can't normally work or it's broken during the use, the self-repair is forbidden.

## Chapter I Brief introduction on products

The online monitoring PH/ORP value is independently researched and developed, which is delivered to the monitoring room with teletransmission by RS485 or current converter so as to record and store.

PH/ORP tester is one of the intelligent on-line chemical analyzers, which is broadly used in the continuous monitoring on PH value or OPR value and temperature of thermal power, chemical engineering and fertilizer, metallurgy, environment protection, pharmacy, biochemistry, food and tap water as well as other solution.

The teletransmission monitoring and recording of continuous monitoring data is realized through the converter output connection recorder, and the monitoring and recording is realized by easily linking to

the computer with MODBUS-RTU protocol through connecting RS485 interface.

The low voltage DC24V is added according to the water industry environment and characteristics combined with international power supply standard.

## Characteristics

- Board of modular design makes the assembly and configuration more convenient.
- 2.4 inch 12864 lattice screen is adopted.
- Isolated transmitting output is adopted so as to make the interference degree smaller.
- Isolated RS485 communication is adopted.
- The measurement, temperature measurement, top and bottom limitation control, transmitting output and RS485 communication of PH/ORP is performed.
- Function of configurable manual or automatic temperature compensation.
- High and low warning function as well as retardation can be set.
- The buzzer and LCD backlight switch function can be set.
- The function of all-powerful password is added.
- The watchdog of industrial control can guarantee that the instrument won't crash.

## Technical index

- Isolated transmitting 4-20mA output can be set, the maximum loop is 750Ω, 0.1%FS
- Measurement range: PH (0-14 pH) ;ORP(-1000-+1000 mV or (-2000-+2000 mV))
- Precision: ±0.02 pH; ±1mV
- Resolution ratio: ±0.01 pH; ±1mV
- Stability: ≤0.02 pH/24H; ≤3 mV/24H
- Input impedance: ≥10<sup>12</sup>
- Temperature measurement scope: 0-100°C, precision: ±0.5°C, NTC 10K
- Temperature compensation: 0-100°C manual/automatic
- RS485function, compatible with standard MODBUS-RTU communication protocol
- Power supply: AC220V±10%, 50Hz or DC 24V
- Alarm relay: AC250V, 3A

## Chapter II Fixed installation

### 2.1 Instrument installation

The installation site and method of the instrument are explained, the part shall be carefully read during the installation.

## Notes for installation

The instrument is panel mounted.

It shall be installed inside the building so as to avoid wind and rain as well as direct sunlight.

Please install it at the place with good ventilation in order to prevent the internal temperature of the instrument from rising.

Don't lean to left or right when the instrument is installed, horizontal installation shall be realized as possible (retroversion < 30°).

The following places shall be avoided during the installation

The place that's exposed to direct sunlight and the vicinity of the hot tools.

The place where the environment temperature exceeds 60°C during the work.

The place where the environment humidity exceeds 85% during the work.

The vicinity of the electromagnetic occurring sources.

The sites with strong mechanical vibration.

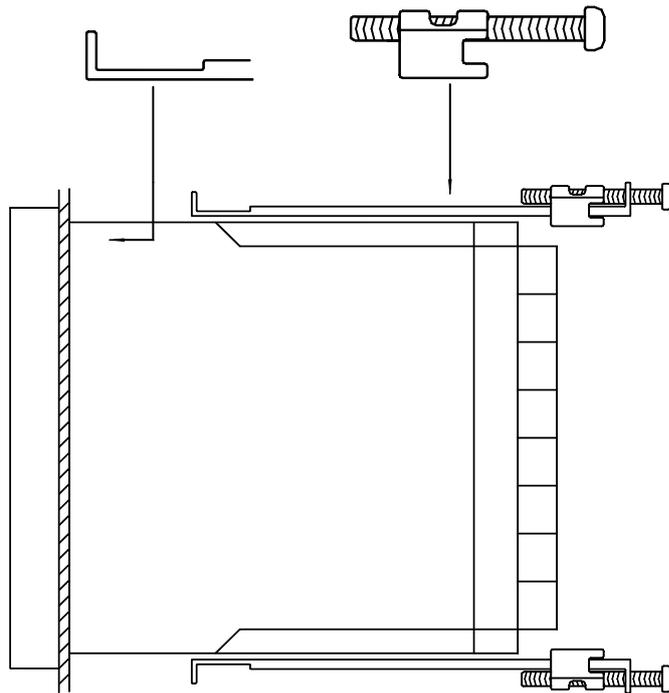
The site where the temperature is changed a lot and the moisture condensation is easily formed.

Places with lots of lampblack, steam, moisture, dust and corrosive gas.

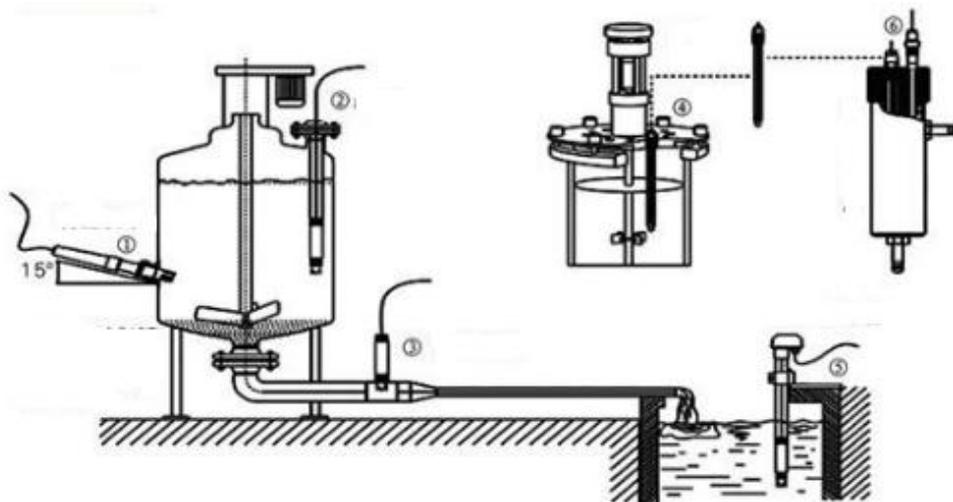
## Installation method

A 91\*91 installation hole is opened at the instrument cabinet or installation panel

The instrument is inserted into the installation hole and the screw is fixed, refer to the following drawing



## 2.2 Electrode installation

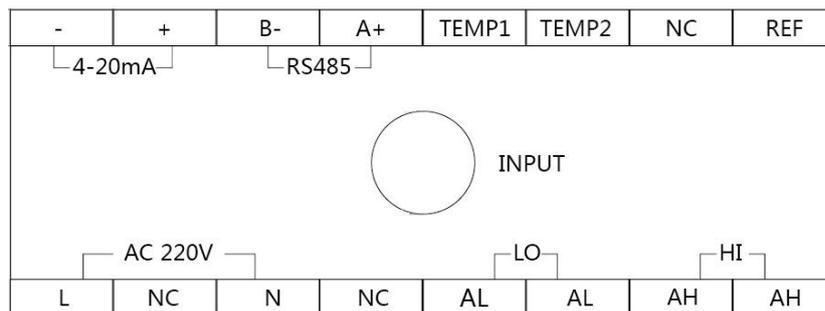


- ①Side wall installation    ②Flange mounted at the top    ③Pipe installation    ④Top installation  
 ⑤Submersible installation    ⑥Flow-through installation

The interface must be in 15° oblique angle, or it will affect the normal test and use of the electrode. We won't be responsible for any results due to this.

## Sketch map of the common installation method

## 2.3 Instrument wiring



Wiring diagram

### Definition of the port

- INPUT: measuring terminal of the electrode
- REF: reference terminal of the electrode
- NC: undefined
- TEMP2: temperature compensation terminal 2
- TEMP1: temperature compensation terminal 1
- RS485(A+):RS485 communication interface A+
- RS485(B-):RS485 communication interface B-
- 4-20mA(+):4-20mA output end+
- 4-20mA(-):4-20mA output end -
- AC220V(L) or (DC24V-): AC220V live wire or

(DC24Vnegative especially special model)

- AC220V(N) or (DC24V+) :AC220V live wire or (DC24V positive especially special model)
- LO(AL): low alarm
- HI(AH): high alarm

## Notice

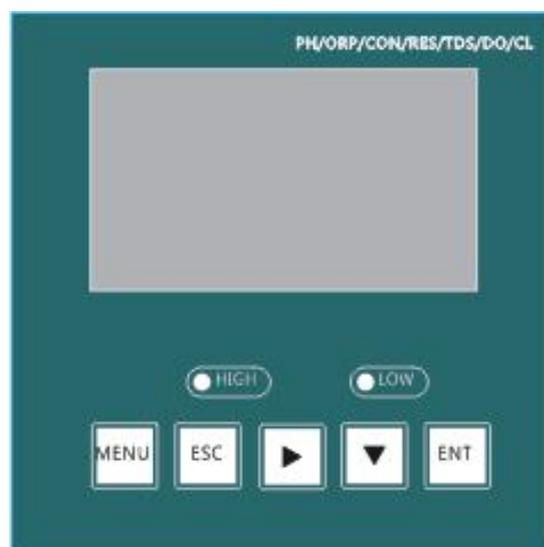
Please confirm that the instrument is not electrified before connecting the signal line in order to avoid electric shock.

Please use double insulation line in order to avoid fire disaster.

Please don't take electric products near to the signal terminal, which may cause the fault.

## Chapter III Operation of keys

### Key distribution



## Definition of keys

identification	Name of the key	Function description
	Menu	Enter the menu under “monitoring interface” Exit the menu under “monitoring interface”
	ESC	Check relevant alarm status under the “monitoring interface”  The relevant up and bottom layer of interface under the “menu interface” returns to the up layer  “Calibration interface” presents the calibration item is skipped
	Right displacement	The digit of recurrent selection parameter
	Down displacement	Relevant menu is selected under the “menu interface”  Relevant numerical value is modified under the setup status
	ENT	Enter the submenu or confirm modification under the “menu interface”

## Chapter IV Instrument picture and operation

### Monitoring picture

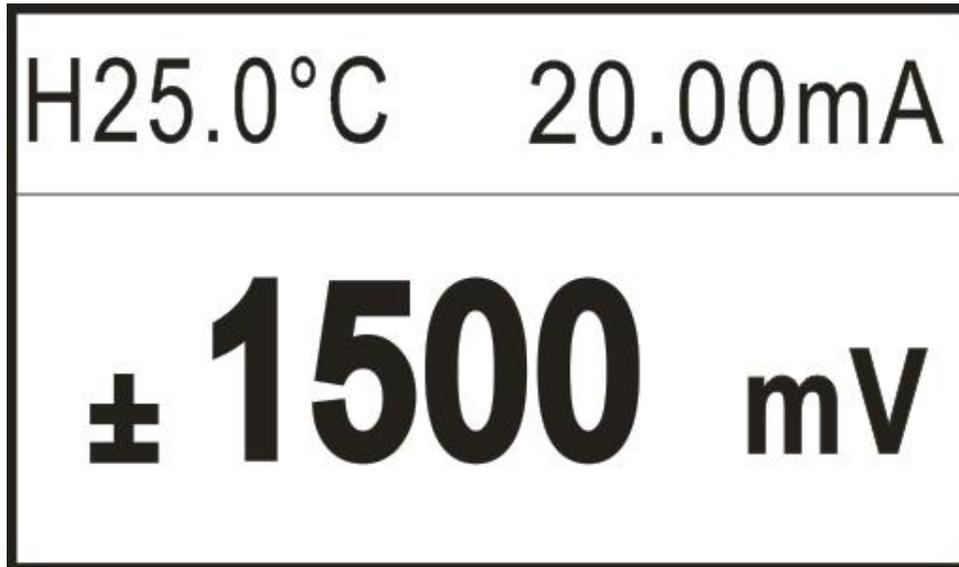
The instrument is equipped with monochrome lattice LCD , the resolution ratio is 128\*64.

Use Menu to enter the picture of password authentication, input password to enter the picture of the main menu.

Use ESC to enter the alarm inquiry picture so as to inquire the current alarm set information.



PH monitoring picture



ORP monitoring picture

### Password verification picture

Use the ENT to enter the picture of the main menu after input the password.

The initial password is 0000, which can be changed by using the function of password change.

Please contact us if the password is forgotten.

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

Password: 0000

Picture of main menu

-----**Main Menu**-----

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

System Setting: the setup of buzzer and backlight, password change and factory reset.

Signal Setting: switchover of electrode type and manual/automatic switchover of temperature compensation.

Online Calibration : calibration or correction of PH and ORP signal.

Remote setting: parameter setup of RS485 and current transmitting output.

Alarm setting: parameter of high alarm and low alarm.

Information inquiry: current version number.

## Chapter V Configuration setup

## System Setting

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

1. Buzzer
2. Change Password
3. Factory setting

Buzzer: set the switch of the buzzer during the alarm.

Change Password: change the password and use the new password to log in.

Factory setting: return to the set before leaving the factory.

## Signal Setting

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

1. Electrode type
2. Temperature compensation

Electrode type: set the type of the electrode, two types of PH electrode and ORP electrode.

Temperature compensation: set automatic or artificial temperature compensation, the temperature scope is 0-99.9°C.

## Online calibration

## -----Online calibration-----

1. PH calibration
2. PH modification
3. ORP calibration
4. ORP modification

PH calibration: after entering the PH calibration picture, firstly put PH electrode into 4.00 PH standard solution, standing for a moment, after the reading is stable, press the ENT, then put the PH electrode into the 6.86/ 7.00 PH standard solution, standing for a moment, after the reading is stable, press the ENT, finally put the PH electrode into 9.18/10.01 PH standard solution, standing for a moment, after the reading is stable, press the ENT, after the reading is successfully calibrated, the calibration process of PH is completed.

PH modification: the measured PH is modified between two PH value.

ORP calibration: after entering the calibrated picture, firstly put the ORP electrode into the 86mV standard solution, standing for a moment, after the reading is stable, press the ENT, then put the ORP electrode into the 256mV standard solution, standing for a moment, after the reading is stable, press the ENT, after the reading is successfully calibrated, the

calibration process of ORP is over.

ORP modification: the measured ORP is modified between 300mV.

## Remote setting

### -----Remote setting-----

1. RS485
2. Current transmission

RS 485: set the address and baud rate of 485 communication.

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

## Alarm Setting

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

1. PH high Alarm
2. PH low Alarm
3. ORP high Alarm
4. ORP low Alarm

PH high alarm: when the measured value is bigger than the high alarm pull-on value, the high alarm relay will actuate; when the measured value is smaller than high alarm cut-off value, the high alarm relay will disconnect.

PH low alarm: when the measured value is smaller than the low alarm pull-on value, the low alarm relay will actuate; when the measured value is bigger than low alarm cut-off value, the low alarm relay will disconnect.

ORP high alarm: when the measured value is bigger than the high alarm pull-on value, the high alarm relay will actuate; when the measured value is smaller than high alarm cut-off value, the high alarm relay will disconnect.

ORP low alarm: when the measured value is smaller than the low alarm pull-on value, the low alarm relay will actuate; when the measured value is bigger than low alarm cut-off value, the low alarm relay will disconnect.

## **Information inquiry**

### -----Information inquiry-----

Version information: inquire the current version of hardware, with strong traceability.

## **Chapter VI. Communication**

The instrument provides standard RS485 serial communication interface, adopts international common standard MODBUS-RTU communication protocol and supports No.3 reading so as to keep the holding register order.

## Address of register

The communication data and register address as the following table:

Address	Data type	Function code	Explanation	Access right
0x0000	unsigned short	0x03	PH value (default in two decimals)	Read only
0x0001	unsigned short	0x03	Temperature value (default in one decimal)	Read only
0x0002	short	0x03	ORP value (signed integer )	Read only

## Communication case

Sent by computer: 00 03 00 00 00 01 85 DB

Returned from PH/ORP table: 00 03 02 02 AE 05 58

Annotation of the return command: 00 is 485address;

03is function code;

02 is the data length of return PH value: 2 bytes;

02 is the 686 of the return PH value (hexadecimal high bytes);

AE is the 686 of the return PH value

(hexadecimal low bytes);

05 58 is the checked value of CRC;

## Chapter VII Product maintenance

1. The storage of pH glass electrode, short-term: it's stored at the buffered solution of pH=4; long-term: it's stored at the buffered solution of pH=7.

2. The washing glass electrode spherical bulbs of the pH glass electrode possibly lengthen the response time of the electrode due to contamination. CCl<sub>4</sub> or soap solution can be used to wipe the dirt, then it can be continued to use after being soaked in the distilled water for a whole night. It can be soaked for 10~20 minutes by 5% HF solution when the contamination is serious, then immediately use water to wash clean, finally It's used after being soaked in the 0.1N HCl solution for a whole night.

3. Treatment of glass electrode aging: the aging of glass electrode is related to the progressive change of the substratum structure. The response of the old electrode is slow, the membrane resistance is high, and the slope is low. The external substratum is etched by hydrofluoric acid, which can usually improve the electrode performance. If the internal and external substratum can be regularly cleaned by this method, the service life of the electrode is almost unlimited.

4. The best storage solution for the storage silver-silver chloride

electrode of the reference electrode is saturation potassium chloride solution, the high concentration potassium chloride solution can prevent the silver chloride from being deposited at the solution border and keep the solution border at the working condition. This method can also be used for the storage of combined electrode.

5. The problems of regenerated reference electrode are mostly caused by the blocking of solution border, which can be solved by the following methods:

(1) Solution border is soaked: the mixed liquor of 10% saturation potassium chloride solution and 90% distilled water is heated to 60-70°C, the electrode is soaked for about 5cm, it's soaked for 20 minutes to 1 hour. This method can eliminate the crystal at the electrode terminal.

(2) Soaked by ammonia: the stronger ammonia water can be used to eliminate when the solution border is blocked by silver chloride. The specific method is to wash clean the electrode, then it's soaked for 10~20 minutes in ammonia water after the solution is evacuated, but the ammonia water can't enter the internal part of the electrode. The electrode is picked out and washed clean y distilled water, which can be continued to use by adding internal solution.

(3) Vacuum method: use soft tube to cover the solution border of the reference electrode, use current getter pump to suck the internal solution until penetrate the solution border, and then the mechanical blocking

materials are removed.

(4) Solution border is boiled: the solution border of silver- silver chloride reference electrode is soaked in boiled water for 10~20 seconds. Notice that the electrode shall be cooled to room temperature before the next boiling.

(5) The mechanical method of abrasive paper can be adopted to eliminate the blocking when the above mentioned methods are invalid, this method possibly blocks the grinded sand grains into the solution border and cause permanent blocking.

## **Chapter VIII Fault analysis and exclusion**

1. No display at the controller?

Answer: check if the power line is correctly connected, if the power is on.

2. Up and down bounce of the displayed number?

Answer: check if there are frequency converters and other interference equipments at the surrounding environment, notice to keep away from these interference equipments or adopt shield measures.

3. The PH instrument can't be calibrated?

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

4. The test of standard solution PH4.00, PH6.86 and PH9.18

calibration is not correct?

Answer: if the standard solution is contaminated, exchange the standard solution for calibration again.

5. The response of the figure is slow?

Answer: the electrode spherical bulb is covered by dirt, the response will become slow, please clean according to the corresponding methods based on the types of the pollutants, it's normal phenomenon if it's slow in winter.