# Dissolved oxygen in aqueous solution Transmitter manual

**Fluorimetry**

**JXBS-3001-DO**

**Ver2.0**


威海精讯畅通电子科技有限公司

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# Charpter I Product Introduction

## 1.1 Brief Introduction

The dissolved Oxygen on-line analyzer is one of the intelligent on-line chemical analysis instruments, is widely used in thermal power, chemical fertilizers, metallurgy, environmental protection, pharmaceutical, biochemical, food and tap water and other solutions dissolved oxygen, saturation, oxygen partial pressure and temperature monitoring. This product uses the fluorescence method to dissolve the oxygen probe, the sensor product life is long, does not need the maintenance, the performance is good, the continuous monitoring data realizes the remote transmission monitoring and the record through the transformation output connection recorder, also can connect RS485 interface through the MODBUS-RTU protocol can be easily connected to the computer to achieve monitoring and recording. At the same time the equipment has 2-way relay interface, can set the alarm point output.

## 1.2 Function character

The probe of this product is a fluorescence probe, which uses the principle of fluorescence quenching to measure. The fluorescence method has been very active in recent years. It can overcome the shortcoming that the traditional methods can not

measure continuously on-line, free from magnetic field interference, no consumption electrode, high sensitivity, low detection limit, long life, in the sustainable on-line monitoring and other advantages have been widely used. With a wide measuring range, good linear, waterproof performance, easy to use, easy to install, board card Modular design, assembly configuration, using 2.4 inches 128 * 64 lattice screen, isolation transmission output, less interference, isolation of RS485 communication, measurement of dissolved oxygen, temperature measurement, upper and lower limit control, variable output, RS485 communication, configurable temperature manual, automatic compensation function, setting of high and low alarm function, and hysteresis, can be set Buzzer, LCD backlight switch function, increase the function of Universal Password.

## 1.3 Main parameter

| Parameter name | Parameter option |
|---|---|
| DC electric supply | 12-24V DC |
| Electric consumption | ≤0.15W（@12V DC , 25℃） |
| Measurement precision | 3%F.s |
| Measurement range | 0-20mg/L |
| IONIC resolution | 0.01mg/L |
| Output signal | RS485(Mondbus protocol)/4-20mA |

| | |
|---|---|
| | （choice） |
| Repeatability | ±2% |
| Probe size | 155mm*12mm（length*diameter） |
| Temperature supply | -20℃-80℃（manual/automatic） |
| Response speed | ≤15s |
| Relay alarm | Two-way normally open normally closed alarm relay |

• Note:The default length of the probe cable is 5 meters.

## 1.4 Product usage topology

A typical aqueous solution control system is shown below, including an integrated system with the control box as the core, in which the control box is connected to a dissolved oxygen probe and the output acquisition processing is displayed, at the same time, the device can output RS-485 signal or analog signal to the computer, PLC, SCM, etc. . At the same time, the back-end of the relay can do a variety of relay control and alarm, can control the pump or valve and other equipment.

# Charpter II Hardware connection

## 2.1 Pre-install equipment check

Pre-install equipment check list：

| Name | Quantity |
|---|---|
| **LCD Instrument Control Box** | 1 piece |
| **Conductivity probe** | 1 piece |
| **12V waterproof power supply** | 1 piece（choice） |
| **USB to 485 equipment** | 1 piece（choice） |
| **Warranty card/certificate of compliance** | 1 piece |

## 2.2 Interface function（Main function）

On the back of the instrument, there are 14 terminals. Next to each terminal is printed the number of terminals. The terminals have different functions, as shown in the following table


Terminal Main function:

| Terminal | Main function | Terminal | Main function |
|---|---|---|---|
| **8** | Power supply input plus | **1** | Relay1-COM |
| **9** | Power supply input minus | **2** | Relay1-OC |
| **10** | Electrodeinput1 | **3** | Relay2-COM |
| **11** | Electrode public terminal | **4** | Relay2-OC |
| **12** | Temperature supply input plus | **5** | - |
| **13** | Analog parameter output plus | **6** | 485-A |
| **14** | Temperature supply input minus | **7** | 485-B |

When in use, the probe wire will have a label on it, please follow the label, connect the warming wire to 12 and 14 Terminal (no polarity) , and connect the Electrodeplus to

Terminal 6, Electrode minus to Terminal 7, the Electrode connection has polarity, so please don't connect the reverse, if there is a shielded line, just connect the shield cable to the 14Terminal. Please take care not to connect in the wrong order, the wrong wiring will cause the equipment to burn out. Please do not bring live products near the signal Terminal, which may cause trouble。

## 2.3 Interface function（Second function）

Because the control box has a wide range of uses and functions, there is a second function definition in some interfaces. Please note that the second function is optional in certain situations.

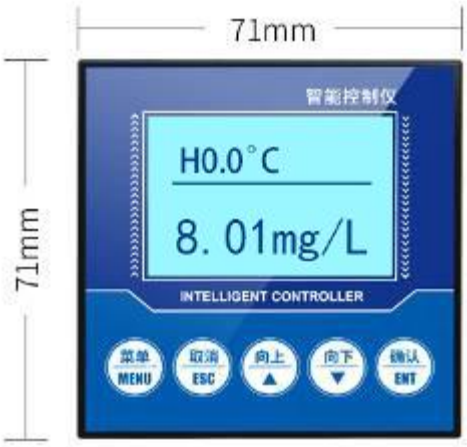
Terminal second function:

| Terminal | Second function | Terminal | Main function |
|---|---|---|---|
| **8** | none | **1** | none |
| **9** | none | **2** | none |
| **10** | none | **3** | none |
| **11** | none | **4** | none |
| **12** | none | **5** | Electrodeinput2 |
| **13** | Analog output | **6** | none |
| **14** | none | **7** | Electrode public terminal |

## 2.4 Control box installation

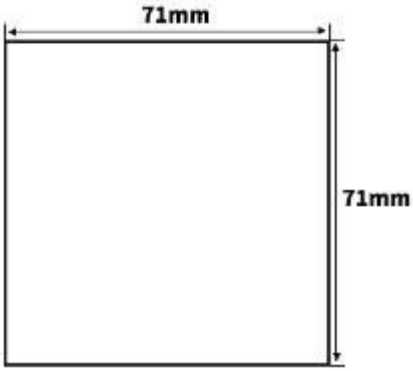
The installation mode of the control box sensor is the embedded installation mode. The dimensions of the product are shown in the figure below。

Transmitter front size




Transmitter side size


A rectangular incision is made on the instrument cabinet or installation panel during installation, as shown in the figure below. The installation can be completed by inserting the instrument into the instrument cabinet and fixing it with the mounting bracket of the instrument on the back.

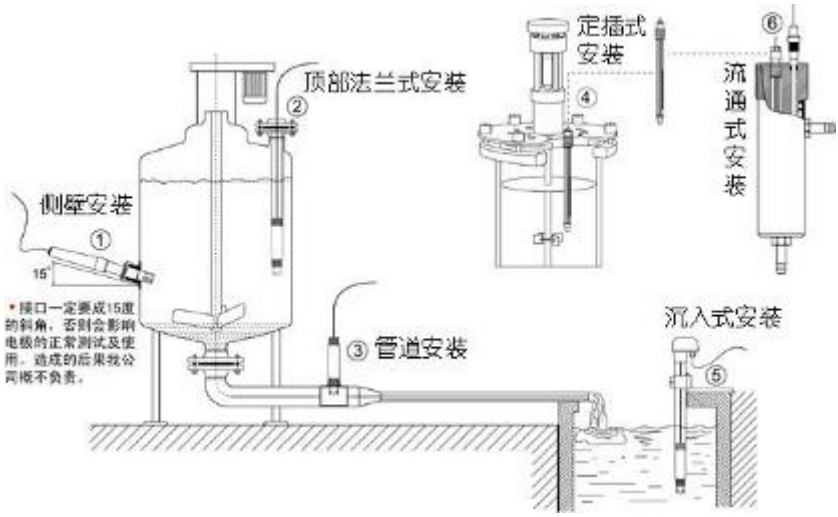


This instrument is disk mounted. Please install it indoors, away from wind, rain and direct sunlight. To prevent Temperature from rising inside the meter, install in a well-ventilated place. When installing this instrument, please do not tilt left or right, as far as possible horizontal installation.

This instrument is equipped with Relay switch output. It is usually used as alarm prompt. If the user uses this function to participate in the loop control, if the instrument failure may lead to a major accident or damage to other equipment, it is necessary to set up an emergency stop circuit and protection circuit complementary, otherwise the consequences, the company will not minus.

## 2.5 Electrode Installation

Electrodes are very sophisticated components that must be installed in the exact way plus is installed, and incorrect installation can result in Electrode damage or irreversible damage. The Electrode is installed using a pipe. Immersion. FLANGE CAN BE INSTALLED.




Please do not put electrodes directly into water. Select Electrode mounting bracket or flow cup mounting. Be sure to use raw material tape (3/4 thread) for waterproof sealing before installation to avoid water entering Electrode and short circuit of Electrode cable.

Make sure your Electrode is immersed in the test solution or wearing a protective cap with built-in protection during a long-term cold shutdown in winter. Add an antifreeze or bring back water for storage. Otherwise, it will shorten the service life.

# Charpter III Function and use of instrument

## 3.1 Product menu and press button

The first line show the temperature and analog electric this moment，



| LOGO | Key Name | Function |
|---|---|---|
| MENU | Menu | "monitor interface" button to enter the menu<br>Menu interface button to exit the menu |
| ESC | Cancel | You can return to the upper layer between the related upper and lower layers under the menu interface |
| ↑ | Up | Scroll data display under "monitor interface" |

| | | |
|---|---|---|
| | | Under menu interface, select the relevant menu<br>Set status to modify the associated value |
| ↓ | Down | Scroll data display under "monitor interface"<br>Under menu interface, select the relevant menu<br>Set Status to modify the associated value |
| NET | Confirm | Lock data display under "monitor interface"<br>"Menu interface" to enter the sub-menu or confirm the modification |

## 3.2 Setting status

In the normal display interface, use the [ menu ] key to enter the "input password" interface, the default password is four 0. Enter your password correctly, then press the "confirm" button to enter the "menu" interface. "system settings" : including, Buzzer and backlight settings, password changes and factory settings. "Signal Settings" include signal one and signal two; signals include the Electrode type and Temperature compensation. "Remote Setting" includes RS485 and current transmission; "alarm setting" includes dissolved oxygen level alarm;

"Information Query" includes hardware and software versions.

### 3.2.1 System setting

"BUZZER setting" : set the alarm buzzer switch. "backlight settings" : You can set the background brightness and brightness screen time. "Password Modification" : You can turn your password on or off and change it. Whether factory settings reverts to their factory presetting.

### 3.2.2 Signal setting

Electrode type:set electrode type, dissolved oxygen electrode and electric conductivity Electrode.

Temperature supply:Set automatic or manual temperature range-20-80℃

### 3.2.3 Remote setting

"Remote Settings" : contains 485 and analog communication mode. RS485: Sets the address and Baud rate of the 485 communication. Current transmission: Set 4-20mA output to 4mA and 20mA.

### 3.2.4 Alarm setting

Dissolved oxygen overstatement: When the measured value is greater than the overstatement

absorbed value, the overstatement Relay absorbed value, when the measured value is less than the overstatement disconnected value, the overstatement Relay disconnected. UNDERREPORTING OF DISSOLVED OXYGEN: When the measured value is less than the under reporting of absorbed value, under reporting Relay absorbed value, when the measured value is greater than the under reporting of disconnected value, under reporting Relay disconnected.

### 3.2.5 Information view


Version Information: Query the current version of hardware and software, strong trace ability.

# Charpter IV 485 Interface communication protocol

## 1.5 Communication primary parameter

| Parameter | Option |
|---|---|
| **Cod** | 8 bit binary system |
| **Data bit** | 8bit |
| **Parity bit** | none |
| **Stop bit** | 1bit |
| **Error checking** | CRC redundant cycle code |
| **Baud rate** | 2400bps/4800bps/9600 bps, default out-factory 9600bps |
| **Code** | 8 bit binary system |

## 4.1 Data frame format definition

Use Modbus-RTU communication rule , format following：

Start structure>=4byte

Address code= 1byte

Function code= 1byte

Data area= N byte

Error check= 16bit CRC code

Final structure>=4byte

Address code：The address for the transmitter is unique in the inquiry network (factory default 0x01)。

Function code： The instructions given by the host Function prompt that this transmitter only uses Function code 0x03(read memory data)。

Data area：Data area is specific query area， note: 16 bits data is higher that byte

CRC code：2 byte checking code。

Query frame

| Address code | Function code | Register start position | Register length | Check code low bit | Check code high bit |
|---|---|---|---|---|---|
| 1byte | 1byte | 2byte | 2byte | 1byte | 1byte |

Reply frame

| Address code | Function code | Efficient byte | First data area | Second data area | Nth data area |
|---|---|---|---|---|---|
| 1byte | 1byte | 1byte | 2byte | 2byte | 2byte |

## 4.2 Register address

| Register address | PLC configuration address | Option | Manufacture |
|---|---|---|---|
| 0001H | 40002 | Temperature(Single bit0.1℃) | Read only |
| 0002H | 40003 | Dissolved oxygen （Single bit0.01mg/L） | Read only |
| 0100H | 40101 | Equipment position(0-252) | Read and write |
| 0101H | 40102 | Baud rate(2400/4800/9600) | Read and |

## 4.3 Example and explanation of equipment protocol

### 4.3.1 Catch equipment position 0x01 dissolved oxygen

Query frame

| Address code | Function code | Start position | Data length | Check code low bit | Check code high bit |
|---|---|---|---|---|---|
| 0x01 | 0x03 | 0x00,0x02 | 0x00,0x01 | 0x25 | 0xCA |

Reply frame(Example: catch dissolved oxygen is 1.89mg/L)

| Address code | Function code | Efficient byte | Dissolved oxygen | Check code low bit | Check code high bit |
|---|---|---|---|---|---|
| 0x01 | 0x03 | 0x02 | 0x00 0xBD | 0x78 | 0x35 |

Dissolved oxygen：

00BD H(hexadecimal)=189=>Dissolved oxygen=1.89mg/L

### 4.3.2 Catch equipment position 0x01 Temperature data

Query frame

| Address code | Function code | Start address | Data area | Check code low bit | Check code high bit |
|---|---|---|---|---|---|
| 0x01 | 0x03 | 0x00,0x01 | 0x00,0x01 | 0xd5 | 0xca |

Reply frame

| Address code | Function code | Efficient byte | Temperature | Check code low bit | Check code high bit |
|---|---|---|---|---|---|
| 0x01 | 0x03 | 0x02 | 0x00 0xAF | 0xDB | 0xBF |

Temperature：

00AF H(hexadecimal)=175=>Temperature=17.5℃

### 4.3.3 Catch equipment position 0x01Temperature 、Dissolved oxygen concentration

Query frame

| Address code | Function code | Start address | Data length | Check code low bit | Check code high bit |
|---|---|---|---|---|---|
| 0x01 | 0x03 | 0x00,0x01 | 0x00,0x02 | 0x95 | 0xCB |

Reply frame

| Address code | Function code | Efficient byte | Temperature | Dissolved oxygen | Check code low bit | Check code high bit |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| 0x01 | 0x03 | 0x04 | 0x01<br>0x1b | 0x00<br>0x28 | 0xDB | 0xBF |

Temperature：

011B H(hexadecimal)=283=>Temperature=28.3℃

Dissolved oxygen：

0028 H(hexadecimal)=40=>Dissolved oxygen=0.40mg/L

# Charpter V Appendix

## 5.1 Warranty and after-sales

The warranty terms are in accordance with the after-sale terms of the sensors of Weihai Jingxun Changtong Electronic Technology Co. , Ltd. . The warranty is one year for the parts of the main circuit of the sensors, six months for the gas sensitive probes and three months for the accessories (housings/plugs/cables, etc.)。

## 5.2 Dissolved oxygen related national standard parameter

The attached data are from HJ506 Foshan 2009 national environmental protection standard

| Temperature | Under the standard gas pressure(101.325kPa) Oxygen solubility (mg/L) | Salt in the water increase every 1g/Kg Dissolved oxygen correction data [(mg/L)/(g/Kg)] | Temperature | Under the standard gas pressure(101.325kPa) Oxygen solubility (mg/L) | Salt in the water increase every 1g/Kg Dissolved oxygen correction data [(mg/L)/(g/Kg)] |
|---|---|---|---|---|---|

| /℃ | | | /℃ | | |
|---|---|---|---|---|---|
| 0 | 14.62 | 0.0875 | 21 | 8.91 | 0.0464 |
| 1 | 14.22 | 0.0843 | 22 | 8.74 | 0.0453 |
| 2 | 13.83 | 0.0818 | 23 | 8.58 | 0.0443 |
| 3 | 13.46 | 0.0789 | 24 | 8.42 | 0.0432 |
| 4 | 13.11 | 0.0760 | 25 | 8.26 | 0.0421 |
| 5 | 12.77 | 0.0739 | 26 | 8.11 | 0.0407 |
| 6 | 12.45 | 0.0714 | 27 | 7.97 | 0.0400 |
| 7 | 12.14 | 0.0693 | 28 | 7.83 | 0.0389 |
| 8 | 11.84 | 0.0671 | 29 | 7.69 | 0.0382 |
| 9 | 11.56 | 0.0650 | 30 | 7.56 | 0.0371 |
| 10 | 11.29 | 0.0632 | 31 | 7.43 | 0.0364 |
| 11 | 11.03 | 0.0614 | 32 | 7.30 | 0.0354 |
| 12 | 10.78 | 0.0593 | 33 | 7.18 | 0.0348 |
| 13 | 10.54 | 0.0582 | 34 | 7.07 | 0.0338 |
| 14 | 10.31 | 0.0561 | 35 | 6.95 | 0.0332 |
| 15 | 10.08 | 0.0545 | 36 | 6.84 | 0.0322 |
| 16 | 9.87 | 0.0532 | 37 | 6.73 | 0.0316 |
| 17 | 9.66 | 0.0514 | 38 | 6.63 | 0.0306 |
| 18 | 9.47 | 0.0500 | 39 | 6.53 | 0.0300 |
| 19 | 9.28 | 0.0489 | 40 | 6.43 | 0.0291 |
| 20 | 9.09 | 0.0475 | | | |

Oxygen solubility and salt data functional relation

| Electrical conductivity/ (mS/cm) | Salt of water/ (g/Kg) | Electrical conductivity/ (mS/cm) | Salt of water/ (g/Kg) | Electrical conductivity/ (mS/cm) | Salt of water/ (g/Kg) |
|---|---|---|---|---|---|
| 5 | 3 | 20 | 13 | 35 | 25 |
| 6 | 4 | 21 | 14 | 36 | 25 |
| 7 | 4 | 22 | 15 | 37 | 26 |
| 8 | 5 | 23 | 15 | 38 | 27 |
| 9 | 6 | 24 | 16 | 39 | 28 |
| 10 | 6 | 25 | 17 | 40 | 29 |

| | | | | | |
|---|---|---|---|---|---|
| 11 | 7 | 26 | 18 | 42 | 30 |
| 12 | 8 | 27 | 18 | 44 | 32 |
| 13 | 8 | 28 | 19 | 46 | 33 |
| 14 | 9 | 29 | 20 | 48 | 35 |
| 15 | 10 | 30 | 21 | 50 | 37 |
| 16 | 10 | 31 | 22 | 52 | 38 |
| 17 | 11 | 32 | 22 | 54 | 40 |
| 18 | 12 | 33 | 23 | | |
| 19 | 13 | 34 | 24 | | |

List 3 Saturated Water Vapor pressure and temperature functional relation

| Altitude h / m | Average gas pressure p/ hPa | Altitude h / m | Average gas pressure p/ hPa | Altitude h / m | Average gas pressure p/ hPa |
|---|---|---|---|---|---|
| 0 | 1013 | 1900 | 799 | 3800 | 630 |
| 100 | 1001 | 2000 | 789 | 3900 | 622 |
| 200 | 988 | 2100 | 779 | 4000 | 614 |
| 300 | 976 | 2200 | 769 | 4100 | 607 |
| 400 | 964 | 2300 | 760 | 4200 | 599 |
| 500 | 952 | 2400 | 750 | 4300 | 592 |
| 600 | 940 | 2500 | 741 | 4400 | 584 |
| 700 | 928 | 2600 | 732 | 4500 | 577 |
| 800 | 917 | 2700 | 723 | 4600 | 570 |

| Temperature/ ℃ | Saturated Water Vapor pressure/ hPa | Temperature/ ℃ | Saturated Water Vapor pressure/ hPa | Temperature/ ℃ | Saturated Water Vapor pressure/ hPa |
|---|---|---|---|---|---|
| 0 | 6.1 | 15 | 17.1 | 30 | 50.2 |
| 1 | 6.6 | 16 | 18.1 | 31 | 53.2 |
| 2 | 7.1 | 17 | 19.3 | 32 | 56.2 |
| 3 | 7.6 | 18 | 20.7 | 33 | 59.4 |
| 4 | 8.1 | 19 | 22.0 | 34 | 62.8 |
| 5 | 8.7 | 20 | 28.1 | 35 | 66.2 |
| 6 | 9.3 | 21 | 29.9 | 36 | 69.8 |
| 7 | 10.0 | 22 | 31.7 | 37 | 73.4 |
| 8 | 10.7 | 23 | 33.6 | 38 | 77.2 |
| 9 | 11.5 | 24 | 35.6 | 39 | 81.0 |
| 10 | 12.3 | 25 | 37.7 | 40 | 85.0 |
| 11 | 13.1 | 26 | 40.0 | | |
| 12 | 14.0 | 27 | 42.4 | | |
| 13 | 14.9 | 28 | 44.9 | | |
| 14 | 16.0 | 29 | 47.6 | | |