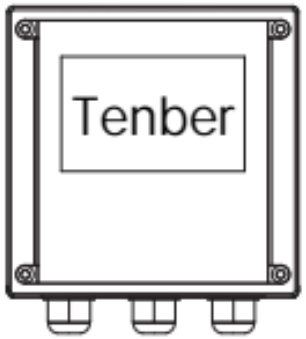
Tenber 高精度水质仪表

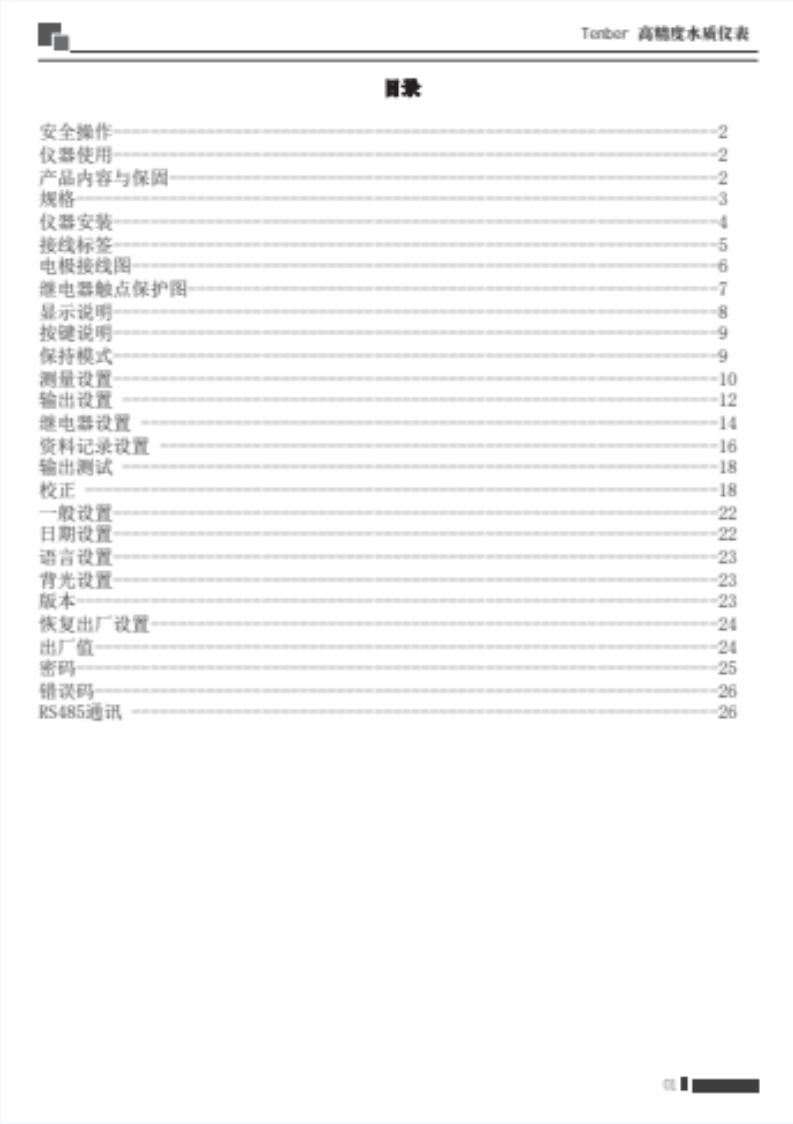
PHS-3301系列 PH/ORP说明书



144系列

Original visual reference: page 1

Tenber
PHS-3301 series PH/ORP
Tenber
144 series



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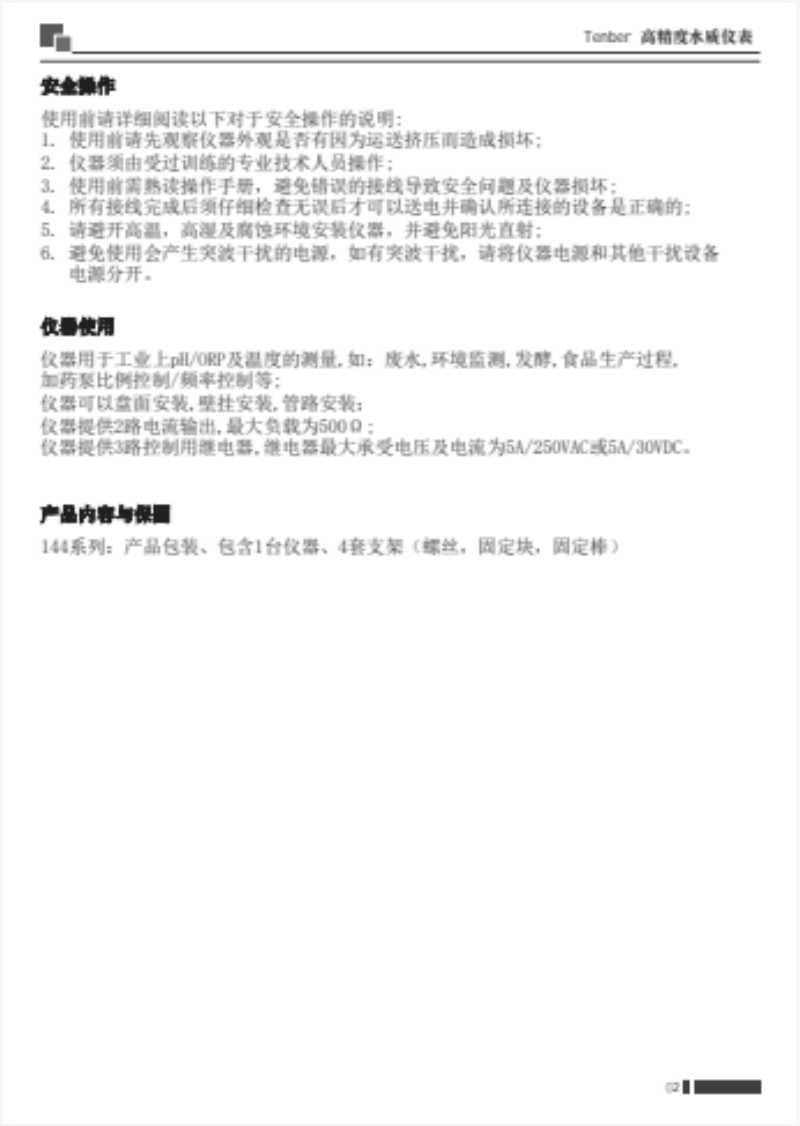
Directory

01


Tenber 高精度水质仪表

安全操作

使用前请详细阅读以下对于安全操作的说明：
1. 使用前请先观察仪器外观是否有因为运送挤压而造成损坏；
2. 仪器须由受过训练的专业技术人员操作；
3. 使用前需熟读操作手册，避免错误的接线导致安全问题及仪器损坏；
4. 所有接线完成后须仔细检查无误后才可以送电并确认所连接的设备是正确的；
5. 请避开高温，高湿及腐蚀环境安装仪器，并避免阳光直射；
6. 避免使用会产生突波干扰的电源，如有突波干扰，请将仪器电源和其他干扰设备电源分开。

仪器使用

仪器用于工业上pH/ORP及温度的测量，如：废水，环境监测，发酵，食品生产过程，加药泵比例控制/频率控制等；
仪器可以盘面安装，壁挂安装，管路安装；
仪器提供2路电流输出，最大负载为500Ω；
仪器提供3路控制用继电器，继电器最大承受电压及电流为5A/250VAC或5A/30VDC。

产品内容与保固

144系列：产品包装、包含1台仪器、4套支架（螺丝，固定块，固定棒）

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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 and technical personnel;

3. Read the operation manual carefully before use to avoid incorrect wiring that may cause safety problems and damage to the instrument;

4. After all wiring is completed, it must be carefully checked before power can be supplied and the connected equipment must be confirmed to be correct;

5. Please install the instrument away from high temperature, high humidity and corrosive environment, and avoid direct sunlight;

6. Avoid using power supplies that can produce surge interference. If there is surge interference, please separate the instrument power supply from other interfering equipment.

Power supply is separated.

Instrument use

The instrument is used for measuring pH/ORP and temperature 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, on the wall, or in pipelines;

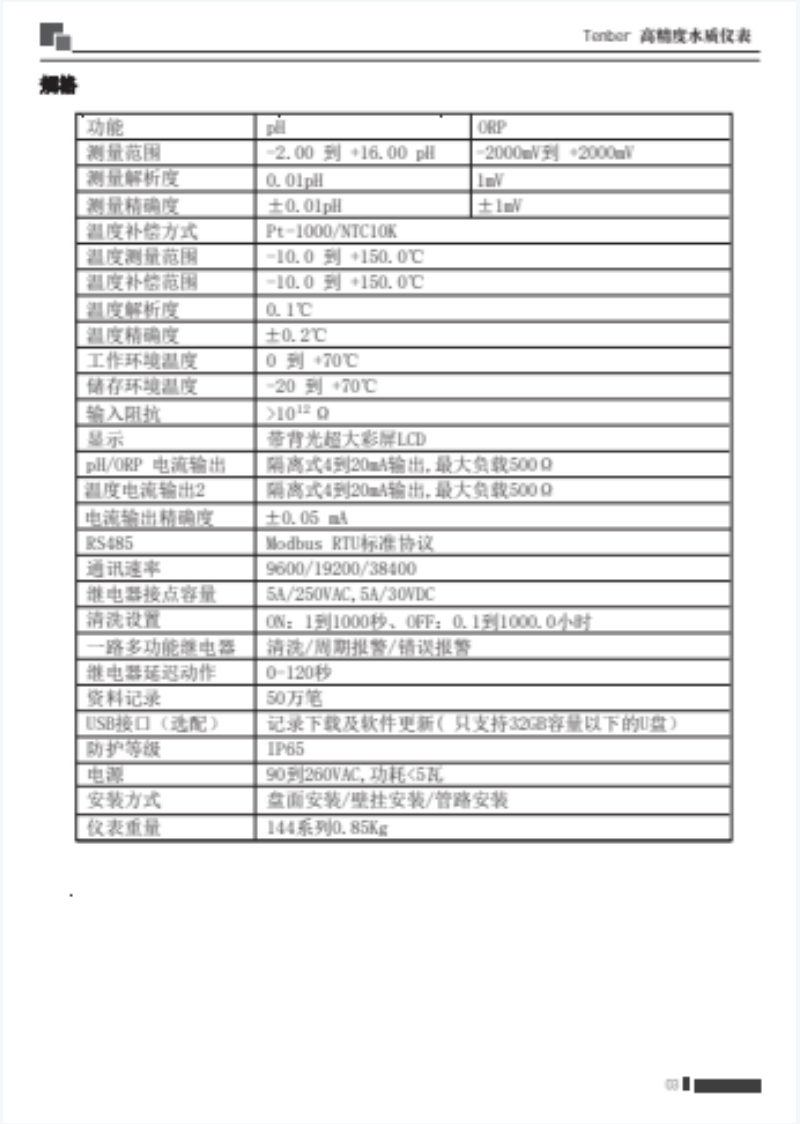
The instrument provides 2 current outputs with a maximum load of 500Ω;

The instrument provides 3-way control relays. The maximum voltage and current the relay can withstand is 5A/250VAC or 5A/30VDC.

Product Contents and Warranty

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

02



Tenber 高精度水质仪表

规格

功能	pH	ORP
测量范围	-2.00 到 +16.00 pH	-2000mV到 +2000mV
测量解析度	0.01pH	1mV
测量精确度	±0.01pH	±1mV
温度补偿方式	Pt-1000/NTC10K	
温度测量范围	-10.0 到 +150.0℃	
温度补偿范围	-10.0 到 +150.0℃	
温度解析度	0.1℃	
温度精确度	±0.2℃	
工作环境温度	0 到 +70℃	
储存环境温度	-20 到 +70℃	
输入阻抗	$>10^{12}$ Ω	
显示	带背光超大彩屏LCD	
pH/ORP 电流输出	隔离式4到20mA输出,最大负载500Ω	
温度电流输出2	隔离式4到20mA输出,最大负载500Ω	
电流输出精确度	±0.05 mA	
RS485	Modbus RTU标准协议	
通讯速率	9600/19200/38400	
继电器接点容量	5A/250VAC,5A/30VDC	
清洗设置	ON：1到1000秒，OFF：0.1到1000.0小时	
一路多功能继电器	清洗/周期报警/错误报警	
继电器延迟动作	0-120秒	
资料记录	50万笔	
USB接口（选配）	记录下载及软件更新（只支持32GB容量以下的U盘）	
防护等级	IP65	
电源	90到260VAC,功耗<5瓦	
安装方式	盘面安装/壁挂安装/管路安装	
仪表重量	144系列0.85Kg	

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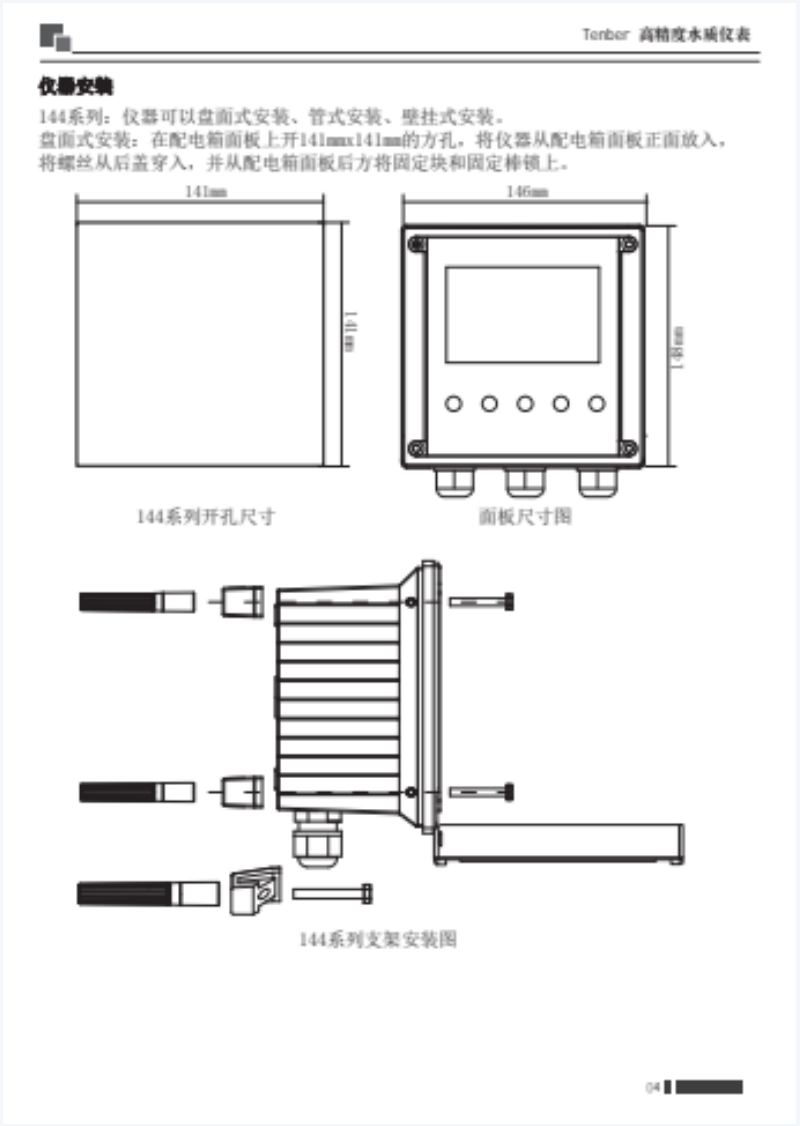
Tenber
Specifications
Function pH ORP
Measuring range -2.00 to +16.00 pH -2000mV to +2000mV
Measurement resolution 0.01pH 1mV
Measurement accuracy ±0.01pH ±1mV
Temperature compensation method Pt-1000/NTC10K
Temperature measurement range -10.0 to +150.0℃
Temperature compensation range -10.0 to +150.0℃
Temperature resolution 0.1℃
Temperature accuracy ±0.2℃
Working environment temperature 0 to +70℃
Storage ambient temperature -20 to +70℃
Input impedance >10 12 Ω
Display Large color screen LCD with backlight
pH/ORP current output Isolated 4 to 20mA output, maximum load 500Ω
Temperature current output 2 Isolated 4 to 20mA output, maximum load 500Ω
Current output accuracy ±0.05 mA
RS485 Modbus RTU standard protocol
Communication rate 9600/19200/38400
Relay contact capacity 5A/250VAC, 5A/30VDC
Cleaning settings ON: 1 to 1000 seconds, OFF: 0.1 to 1000.0 hours
One way multi-function relay cleaning/periodic alarm/error alarm
Relay delay action 0-120 seconds
500,000 data records
USB interface (optional) Record download and software update (only supports U disks with a capacity of less than 32GB)
Protection grade IP65
Power supply 90 to 260VAC, power consumption <5 watts
Installation method: panel installation/wall installation/pipe installation
Instrument weight 144 series 0.85Kg
03



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Tenber

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, and place the instrument from the front of the distribution box panel.

Insert the screws through the back cover, and lock the fixing block and fixing rod from behind the distribution box panel.

141mm 146mm

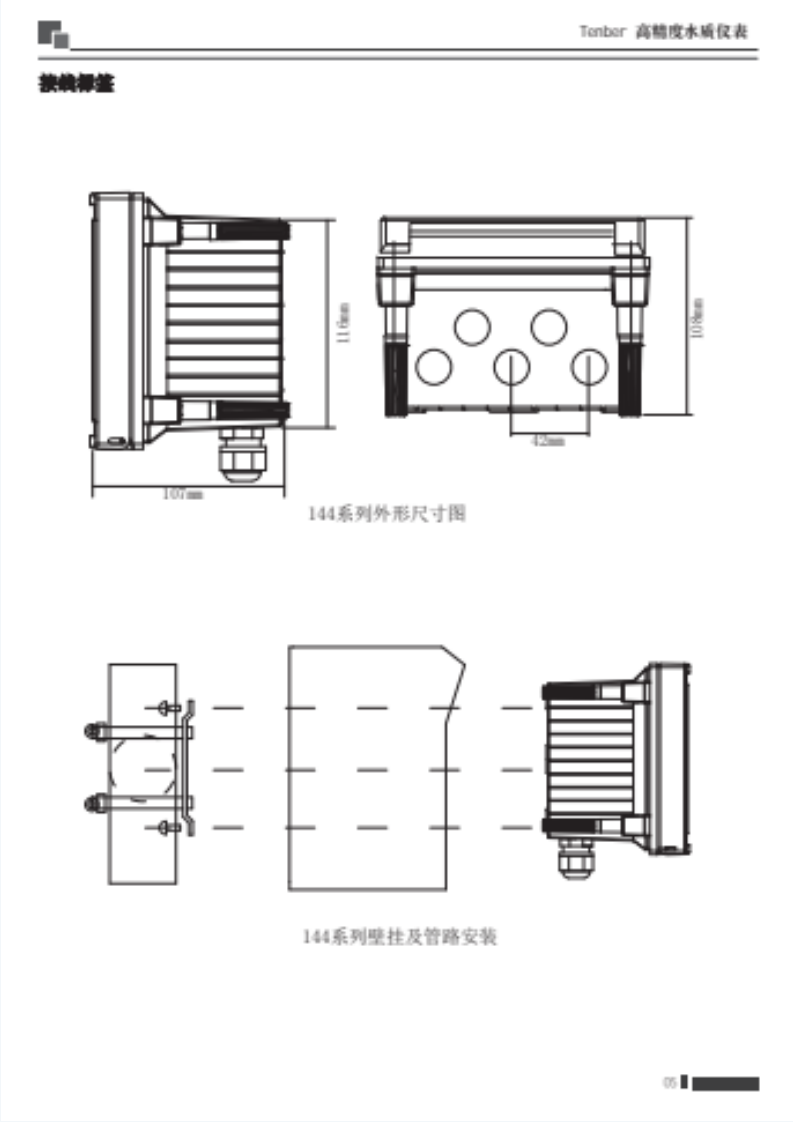
141mm

148mm

144 Series Opening Dimensions Panel Dimensions Drawing

144 series bracket installation diagram

04



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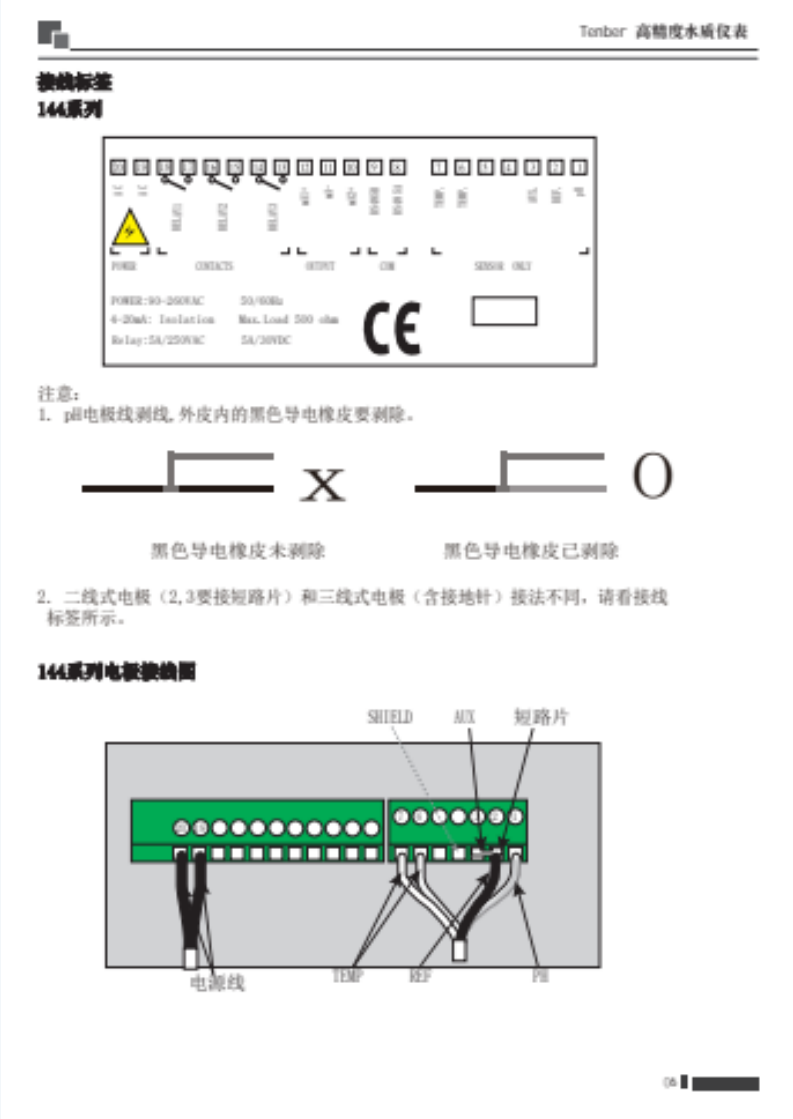
Tenber
Wiring labels
116mm 108mm
42mm
107mm
144 Series Dimensional Drawing
144 series wall mounting and pipeline installation
05



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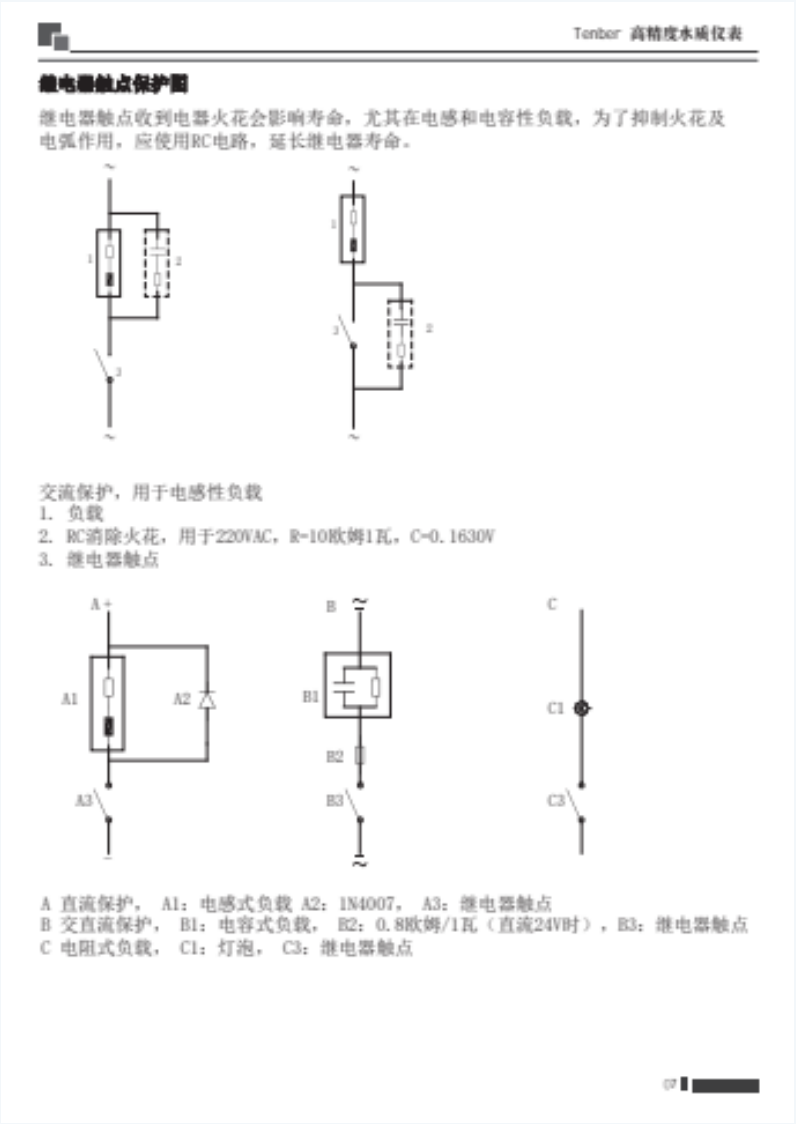
Tenber
Wiring labels
144 series
19 18 17
mA-
TEMP. TEMP. AUX. REF.
RS485A
AC AC
mA1+ mA2+
RS485B
pH
RELAY1 RELAY2 RELAY3
POWER CONTACTS OUTPUT COM SENSOR ONLY
POWER:90-260VAC 50/60Hz
4-20mA: Isolation Max.Load 500 ohm
Relay:5A/250VAC 5A/30VDC
Note:
1. Strip the pH electrode wire and remove the black conductive rubber inside the outer sheath.
x O
The black conductive rubber has not been peeled off The black conductive rubber has been peeled off
2. The two-wire electrode (2 and 3 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 method.
shown on the label.
144 series electrode wiring diagram
SHIELD AUX short circuit disc
7 6 3 2 1
20 19
Power cord TEMP REF PH
06



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Relay contact protection diagram

Relay contacts receiving electrical sparks will affect their service life, especially in inductive and capacitive loads. In order to suppress sparks and

For arc action, an RC circuit should be used to extend the life of the relay.

~ ~

1

1 2

3 2

3

~ ~

AC protection for inductive loads

1. Load

2. RC spark elimination, for 220VAC, R=10 ohm 1 watt, C=0.1630V

3. Relay contacts

A+ B C

A1 A2 B1

C1

B2

A3 B3 C3

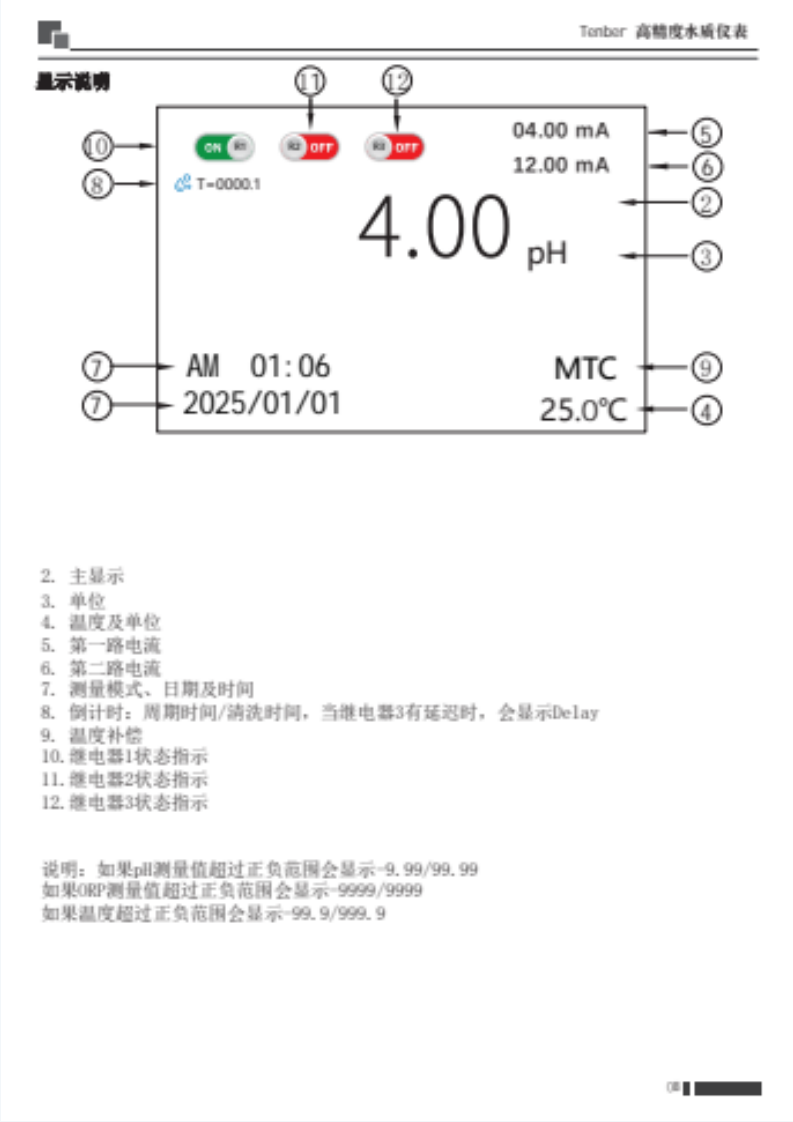
-

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 (at 24V DC), B3: relay contact

C resistive load, C1: light bulb, C3: relay contact

07



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Tenber
Show description 11 12
04.00 mA 5
10 R1 R2 R3
12.00 mA 6
8T=0000.1
2
pH 3
7 AM 01:06 MTC 9
7 2025/01/01 25.0℃ 4
2. Main display
3. Unit
4. Temperature and units
5. The first current
6. Second current
7. Measurement mode, date and time
8. Countdown: cycle time/cleaning time, when relay 3 has a delay, Delay will be displayed
9. Temperature compensation
10.Relay 1 status indication
11.Relay 2 status indication
12.Relay 3 status indication
Note: If the pH measurement value exceeds the positive and negative range, -9.99/99.99 will be displayed.
If the ORP measurement value exceeds the positive and negative range, -9999/9999 will be displayed.
If the temperature exceeds the plus or minus range, -99.9/999.9 will be displayed.
08

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Button description

SET CAL UP DOWN ENTER

Button Measurement status Setting status Calibration status Recording status

SET Enter password screen Leave Leave Leave

CAL Enter Calibration Move numeric position Move numeric position Move numeric position

UP Enter record Increase number Increase number Increase number

DOWN None Decrease number Decrease number Decrease number

ENTER Turn on/off backlight Confirm Confirm Confirm

hold mode

Hold mode is a safe mode, mainly used for calibration mode, setting mode, record viewing mode and relay

Cleaning mode, in hold mode, the relay is open (not working), the current is based on the setting (fixed current/maximum

current), the measurement display value is fixed and does not change.

When entering the above four modes, it will enter the hold mode.

When leaving the above four modes and returning to the measurement mode, it will take about 10 seconds before leaving the hold mode.

After the instrument is turned on, it will enter the hold mode, and it will take about 10 seconds to leave the hold mode and enter the measurement mode.

Output current in hold mode: There are two modes to choose from

Fixed current output

final current output

Fixed current: Users can set 4.00-20.00mA as the output current in hold mode

Last current: When entering hold mode, the current will stop at the last measured output current

Relays in hold mode: all on (not working)

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Tenber

settings

Press the SET key and use the UP/DOWN key. After entering the password 0001, press the ENTER key to enter the settings. You can also press

If the SET key is not pressed for more than 10 minutes, it will automatically return to the measurement mode.

Password Password

0000 0001

Home screen

Press the UP/DOWN key to select the function, and press the ENTER key to enter the function setting:

Settings 1/2 General Settings

Measurement settings Date settings

Output settings Language settings

Relay settings Backlight settings

Data Record Settings Version

Output settings Restore factory settings

Correction

General settings

First page Second page

Description:

1. During setting, when the entered value is not within the specified range, "error" will appear at the top of the display;

2. After inputting the value, press the ENTER key to save it;

3. When setting, you can press the SET key to leave at any time;

4. In setting mode, if the button is not pressed for more than 10 minutes, it will automatically return to measurement mode.

10

1. 测量单位选择，按UP/DOWN键选择；
2. 电极种类选择，按UP/DOWN键选择，当测量单位是ORP时无效；
3. 偏移量输入，范围±1.00pH或±100mV；
4. 滤波设置：范围0-10。

说明：当发现读值不稳定时，可以试着适当的调高滤波值，但是也会同时使得读值变化缓慢。

1. 自动/手动温度补偿选择，按UP/DOWN键选择；
2. 温度探棒种类，按UP/DOWN键选择；
3. 温度偏移量，范围±5.00℃(只用于自动)；
4. 手动温度测量输入；
5. 手动温度校正输入；
6. 温度显示：测量画面是否显示温度。
7. 当温补选择自动且仪器未接温度探棒时，或者温度探棒显示错误时，温度输出会不正确，所以当选择自动时，一定要接上温度探棒；
8. 当选择自动温度补偿时，要确认连接的温度探棒和选择的探棒种类是一致的；
9. 手动温度测量：当选择手动温度补偿时，测量的温度补偿采用这个温度值；
10. 手动温度校正：当选择手动温度补偿时，校正的温度补偿采用这个温度值。

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Measurement settings

Measurement settings Parameter settings

Parameter settings Mode = pH

Temperature setting Electrode type = Glass electrode

Offset = +0.00 pH

filter = 01

1. To select the measurement unit, press the UP/DOWN key to select;

2. To select the electrode type, press the UP/DOWN key to select. It is invalid when the measurement unit is ORP;

3. Offset input, range ±1.00pH or ±100mV;

4. Filter settings: range 0-10.

Note: When you find that the reading value is unstable, you can try to increase the filter value appropriately, but it will also cause the reading value to change at the same time.

Slowly.

Measurement settings Temperature settings

Parameter setting Temperature compensation mode = Manual

Temperature setting Probe type = Pt 1000

Offset = +0.0°C

Manual temperature measurement = +025.0 ℃

Manual temperature correction = 25.0°C

display = yes

1. Automatic/manual temperature compensation selection, press the UP/DOWN button to select;

2. Temperature probe type, press the UP/DOWN key to select;

3. Temperature offset, range ±5.00℃ (only for automatic);

4. Manual temperature measurement input;

5. Manual temperature correction input;

6. Temperature display: Whether the temperature is displayed on the measurement screen.

7. When automatic temperature compensation is selected and the temperature probe is not connected to the instrument, or the temperature probe displays an error, the temperature output will be incorrect.

Correct, so when selecting automatic, be sure to connect the temperature probe;

8. When selecting automatic temperature compensation, make sure that the connected temperature probe is consistent with the selected probe type;

9. Manual temperature measurement: When manual temperature compensation is selected, the measured temperature compensation uses this temperature value;

10. Manual temperature correction: When manual temperature compensation is selected, the corrected temperature compensation uses this temperature value.

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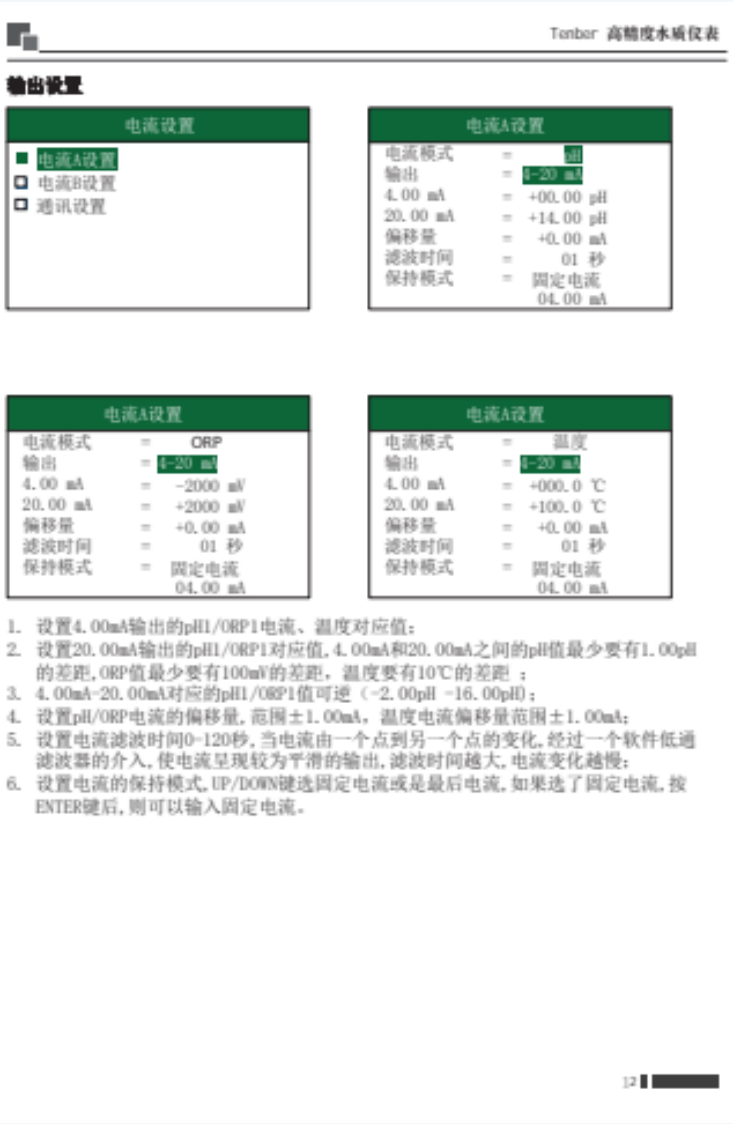

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Output settings

Current setting Current A setting

Current A setting Current mode = pH

Output = 4-20 mA

Current B setting

4.00 mA = +00.00 pH

Communication settings

20.00 mA = +14.00 pH

Offset = +0.00 mA

Filter time = 01 seconds

Hold mode = fixed current

04.00 mA

Current A setting Current A setting

Current Mode = ORP Current Mode =

Output = 4-20 mA Output = 4-20 mA

4.00 mA = -2000 mV 4.00 mA = +000.0 ℃

20.00 mA = +2000 mV 20.00 mA = +100.0 ℃

Offset = +0.00 mA Offset = +0.00 mA

Filter time = 01 seconds Filter time = 01 seconds

Hold mode = fixed current Hold mode = fixed current

04.00 mA 04.00 mA

1. Set the corresponding values of pH1/ORP1 current and temperature of 4.00mA output;

2. Set the corresponding value of pH1/ORP1 for 20.00mA output. The pH value between 4.00mA and 20.00mA must be at least 1.00pH.

There must be at least a 100mV difference in the ORP value, and a 10°C difference in temperature;

3. The pH1/ORP1 value corresponding to 4.00mA-20.00mA is reversible (-2.00pH -16.00pH);

4. Set the pH/ORP current offset range to ±1.00mA, and the temperature current offset range ±1.00mA;

5. Set the current filter time to 0-120 seconds. When the current changes from one point to another, it passes through a software low-pass

The intervention of the filter causes the current to present a smoother output. The longer the filtering time, the slower the current changes;

6. Set the current holding mode. Use the UP/DOWN button to select fixed current or final current. If fixed current is selected, press

After pressing the ENTER key, the fixed current can be input.

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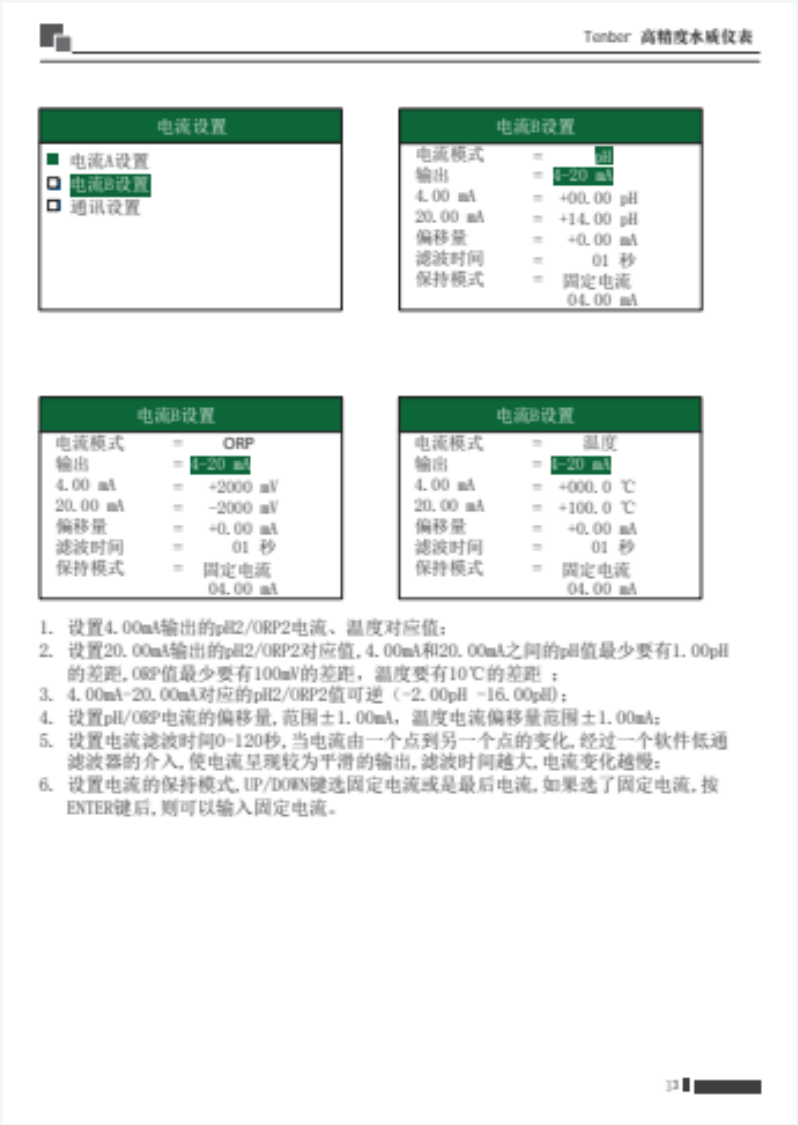

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Current setting Current B setting

Current A setting Current mode = pH

Output = 4-20 mA

Current B setting

4.00 mA = +00.00 pH

Communication settings

20.00 mA = +14.00 pH

Offset = +0.00 mA

Filter time = 01 seconds

Hold mode = fixed current

04.00 mA

Current B setting Current B setting

Current Mode = ORP Current Mode =

Output = 4-20 mA Output = 4-20 mA

4.00 mA = +2000 mV 4.00 mA = +000.0 ℃

20.00 mA = -2000 mV 20.00 mA = +100.0 ℃

Offset = +0.00 mA Offset = +0.00 mA

Filter time = 01 seconds Filter time = 01 seconds

Hold mode = fixed current Hold mode = fixed current

04.00 mA 04.00 mA

1. Set the corresponding values of pH2/ORP2 current and temperature for 4.00mA output;

2. Set the corresponding value of pH2/ORP2 for 20.00mA output. The pH value between 4.00mA and 20.00mA must be at least 1.00pH.

There must be at least a 100mV difference in the ORP value, and a 10°C difference in temperature;

3. The pH2/ORP2 value corresponding to 4.00mA-20.00mA is reversible (-2.00pH -16.00pH);

4. Set the pH/ORP current offset range to ±1.00mA, and the temperature current offset range ±1.00mA;

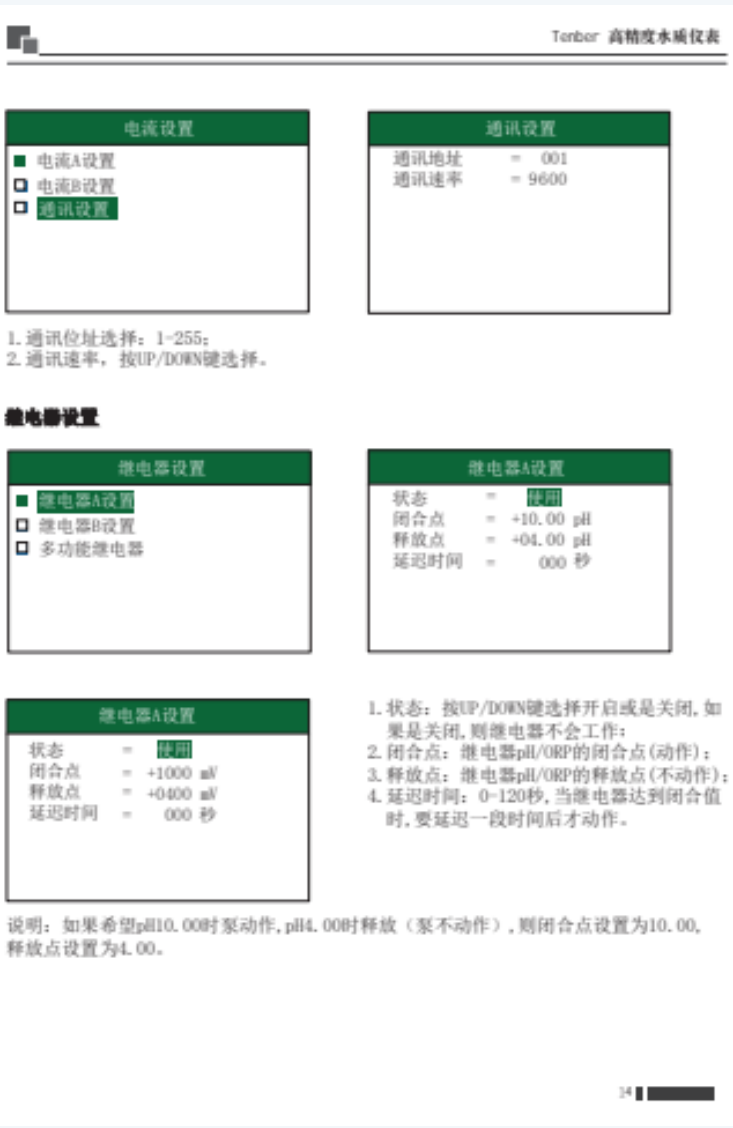
5. Set the current filter time to 0-120 seconds. When the current changes from one point to another, it passes through a software low-pass

The intervention of the filter causes the current to present a smoother output. The longer the filtering time, the slower the current changes;

6. Set the current holding mode. Use the UP/DOWN button to select fixed current or final current. If fixed current is selected, press

After pressing the ENTER key, the fixed current can be input.

13



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Current settings Communication settings

Current A setting communication address = 001

Current B setting communication rate = 9600

Communication settings

1. Communication address selection: 1-255;

2. Communication rate, press UP/DOWN key to select.

Relay settings

Relay settings Relay A settings

Relay A Setting Status = Used

Closing point = +10.00 pH

Relay B settings

Release point = +04.00 pH

Multifunctional relay

Delay time = 000 seconds

Relay A setting 1. Status: Press the UP/DOWN key to select on or off, such as

If it is closed, the relay will not work;

Status = Use 2. Closing point: closing point (action) of relay pH/ORP;

Closing point = +1000 mV 3. Release point: Release point of relay pH/ORP (no action);

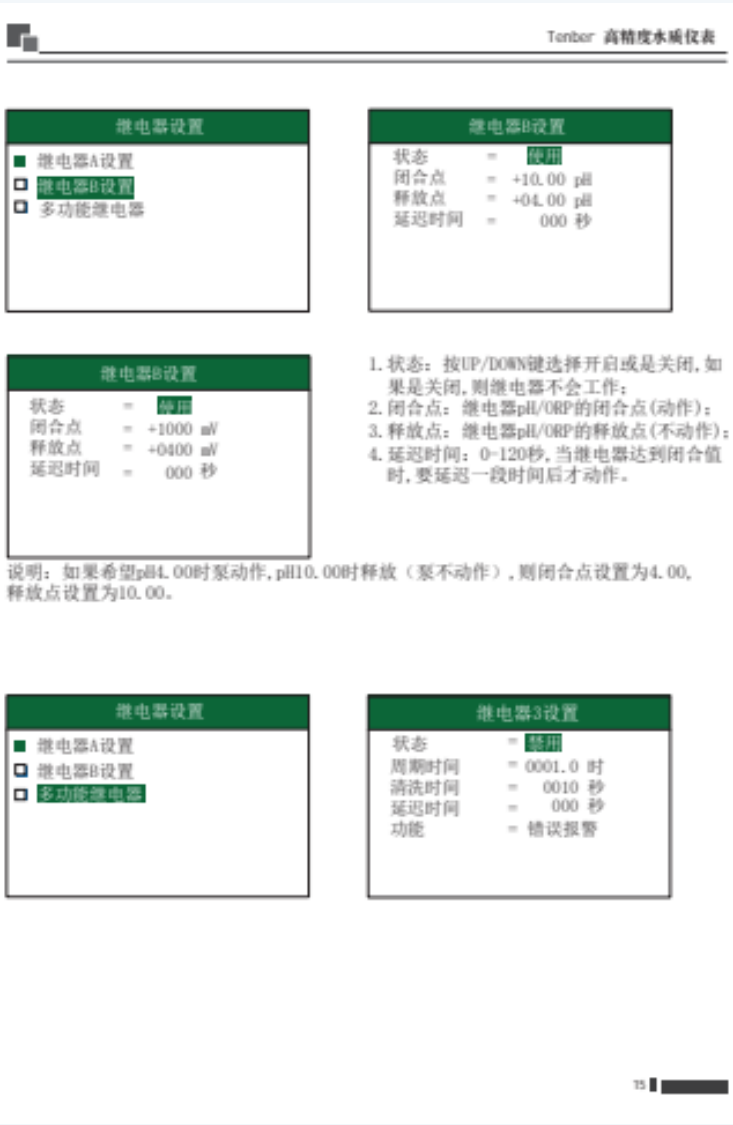
Release point = +0400 mV 4. Delay time: 0-120 seconds, when the relay reaches the closing value

When delay time = 000 seconds, it will take a delay for a period of time before taking action.

Note: If you want the pump to operate when pH is 10.00 and release when pH is 4.00 (the pump does not operate), then the closing point is set to 10.00.

The release point is set to 4.00.

14



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Relay settings Relay B settings

Relay A Setting Status = Used

Closing point = +10.00 pH

Relay B settings

Release point = +04.00 pH

Multifunctional relay

Delay time = 000 seconds

Relay B setting 1. Status: Press the UP/DOWN key to select on or off, such as

If it is closed, the relay will not work;

Status = Use 2. Closing point: closing point (action) of relay pH/ORP;

Closing point = +1000 mV 3. Release point: Release point of relay pH/ORP (no action);

Release point = +0400 mV 4. Delay time: 0-120 seconds, when the relay reaches the closing value

When delay time = 000 seconds, it will take a delay for a period of time before taking action.

Note: If you want the pump to operate at pH 4.00 and release at pH 10.00 (the pump does not operate), then the closing point is set to 4.00.

The release point is set to 10.00.

Relay settings Relay 3 settings

Relay A Setting Status = Disabled

Relay B setting cycle time = 0001.0

Multifunctional relay cleaning time = 0010 seconds

Delay time = 000 seconds

Function = Error Alarm

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Tenber

1. Switch: Press the UP/DOWN key to select on or off. If it is off, the relay will not work;
2. Cycle time: cleaning cycle or cycle alarm time;
3. Cleaning time: When the cleaning cycle comes, the time to start cleaning;
4. Delay time: When the relay reaches the closing value, it will delay for a period of time before acting;
5. Mode: Press the UP/DOWN key to select cleaning, periodic alarm, and error alarm.

Data record settings

Data logging settings Data logging settings

Data Logging Settings Status = Off

Query data record display mode = record

Download history storage interval = 01 minutes

Clear Records = No

Data record settings Enter starting record

Data record settings

Query data records

Download record 000000

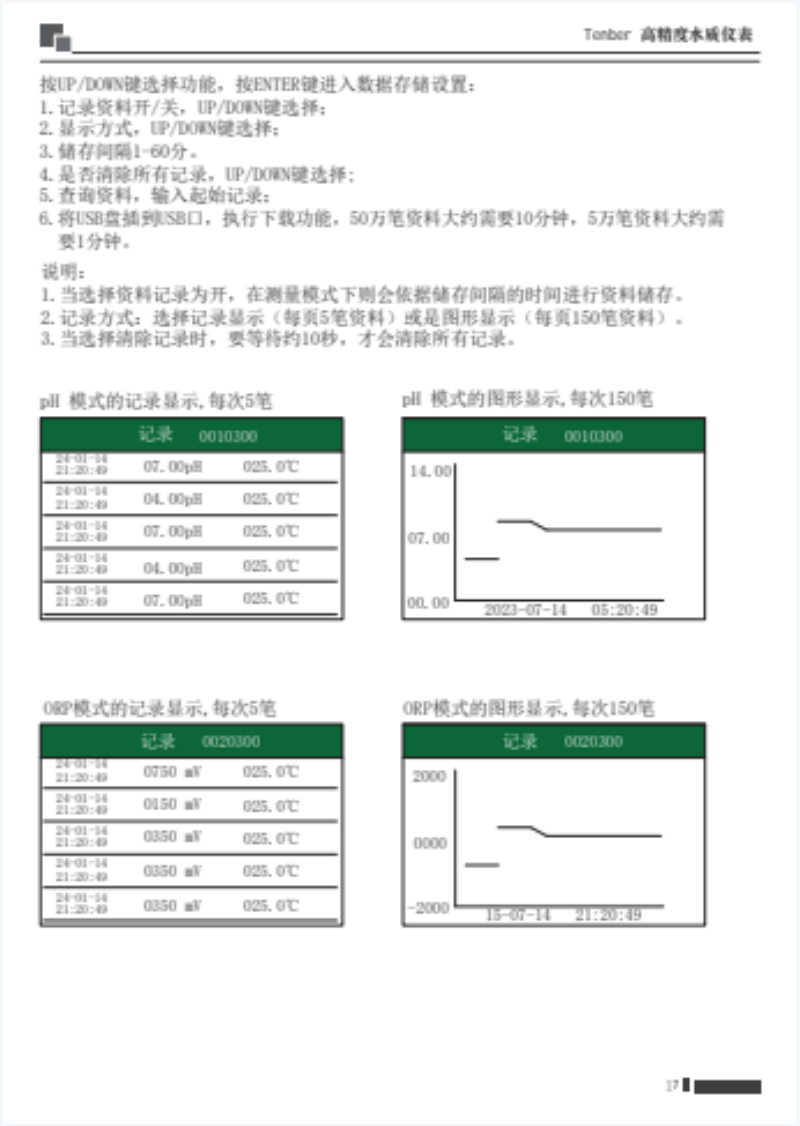
Data logging settings Read data

Data record settings Download records

Query data records

Download history

16



Original visual reference: page 18

Tenber

Press the UP/DOWN key to select the function, and press the ENTER key to enter the data storage settings:

1. Record data on/off, UP/DOWN key selection;
2. Display mode, UP/DOWN key selection;
3. The storage interval is 1-60 minutes.
4. Whether to clear all records, press the UP/DOWN key to select;
5. Query data and enter the starting record;
6. Insert the USB disk into the USB port and execute the download function. It takes about 10 minutes to download 500,000 data and about 50,000 data.

It takes 1 minute.

Description:

1. When the data recording is selected to be on, data will be stored according to the storage interval time in the measurement mode.
2. Recording method: Choose record display (5 data per page) or graphic display (150 data per page).
3. When you choose to clear records, you have to wait for about 10 seconds before all records are cleared.

Record display of pH mode, 5 pens each time Graphic display of pH mode, 150 pens each time

Record 0010300 Record 0010300

24-01-14

21:20:49 07.00pH 025.0℃ 14.00

24-01-14

21:20:49 04.00pH 025.0℃

24-01-14

21:20:49 07.00pH 025.0℃ 07.00

24-01-14

21:20:49 04.00pH 025.0℃

24-01-14

21:20:49 07.00pH 025.0℃ 00.00 2023-07-14 05:20:49

Record display in ORP mode, 5 pens each time Graphic display of ORP mode, 150 pens each time

Record 0020300 Record 0020300

24-01-14

21:20:49 0750 mV 025.0℃ 2000

24-01-14

21:20:49 0150 mV 025.0℃

24-01-14

21:20:49 0350 mV 025.0℃ 0000

24-01-14

21:20:49 0350 mV 025.0℃

24-01-14

Original page 18 - translation continued

21:20:49 0350 mV 025.0℃ -2000 15-07-14 21:20:49
17

Original visual reference: page 19

Tenber
Output test
Output test 1. Current A output test: 4.00-20.00 mA;
2. Current B output test: 4.00-20.00 mA;
Current output A = 04.00 mA
3. Relay A test, UP/DOWN key selection;
Current output B = 04.00 mA
4. Relay B test, UP/DOWN key selection.
Relay A = release point
= Description: This function is used to test current output and relays
Relay B release point
Multifunction relay = release point
Is it working properly?
Calibration (pH calibration)
Press UP/DOWN key to select function, press ENTER key to enter
Correction
Calibration (before calibration, you must restore the factory settings
Calibrate again)
automatic correction
1. Automatic correction: select the appropriate first
Manually enter corrections
Click the second or third point standard solution for calibration;
Restore factory settings 2. Manual calibration: the values of the three-point standard solution must be entered manually;
3. Restore factory settings: Restore the factory calibration values.
Note: The first point must be corrected, the second and third points can be selected
Select one or both for calibration
Note: If the electrode efficiency is lower than 80%, or the calibration waiting time is too long to automatically lock, the electrode should be checked.
Check whether the pole is aged. If it is aged, it should be updated in time.
automatic correction
First point correction
Calibration First point calibration
Standard solution
Slope1 = 5 9 . 1 6 mV/pH
Efficiency 1 = 1 0 0 . 0 % 6 . 8 6 7 . 0 0 pH
Efficiency 2 = 1 0 0 . 0 % 7 . 0 0 2 5 . 0 ℃
Press the confirm button. Select the standard solution and press the confirm button.

Original page 19 - translation continued

1. Place the electrode into the first standard solution;
2. Use the UP/DOWN key to select the first standard solution, and then press the ENTER key to start automatic calibration;
3. If the waiting time is too long, you can press the ENTER key to force correction;
4. The current ideal pH value is displayed on the right;
5. If the value of the electrode exceeds PH7.00+/-1.5 PH or the temperature exceeds 0.0-60.0℃, it will be displayed below the display

Error.

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Original visual reference: page 20

Tenber

Second point calibration Calibration completed

Second point correction Second point correction

Standard solution

1 . 6 8 4 . 0 0 pH Slope 1 = 5 8 . 0 0 mV/pH

4 . 0 1 2 5 . 0 ℃ Efficiency 1 = 9 9 . 0 %

Select the standard solution and press the confirm key. Press the confirm key to enter the third point calibration.

1. Place the electrode into the second standard solution;

2. Use the UP/DOWN key to select the second standard solution, and then press the ENTER key to start automatic calibration;

3. If the waiting time is too long, you can press the ENTER key to force correction;

4. The current ideal pH value is displayed on the right;

5. If the value of the electrode exceeds the standard PH range of 30%, or the temperature exceeds 0.0-60.0°C, an error will be displayed at the bottom of the display.

Note: When the efficiency is lower than 80%, it means that the electrode is aging and new electrodes should be replaced in time.

The third point of calibration is completed.

The third point of calibration is completed.

9 . 1 8 Slope 2 = 5 8 . 0 0 mV/pH

10 .0 1 1 2 .15 pH

Efficiency 2 = 9 9 . 0 %

12.4 5 2 5. 0℃

status = passed

Select the standard solution and press the OK button. The electrode is good.

1. Place the electrode into the third standard solution;

2. Use the UP/DOWN key to select the third standard solution, and then press the ENTER key to start automatic calibration;

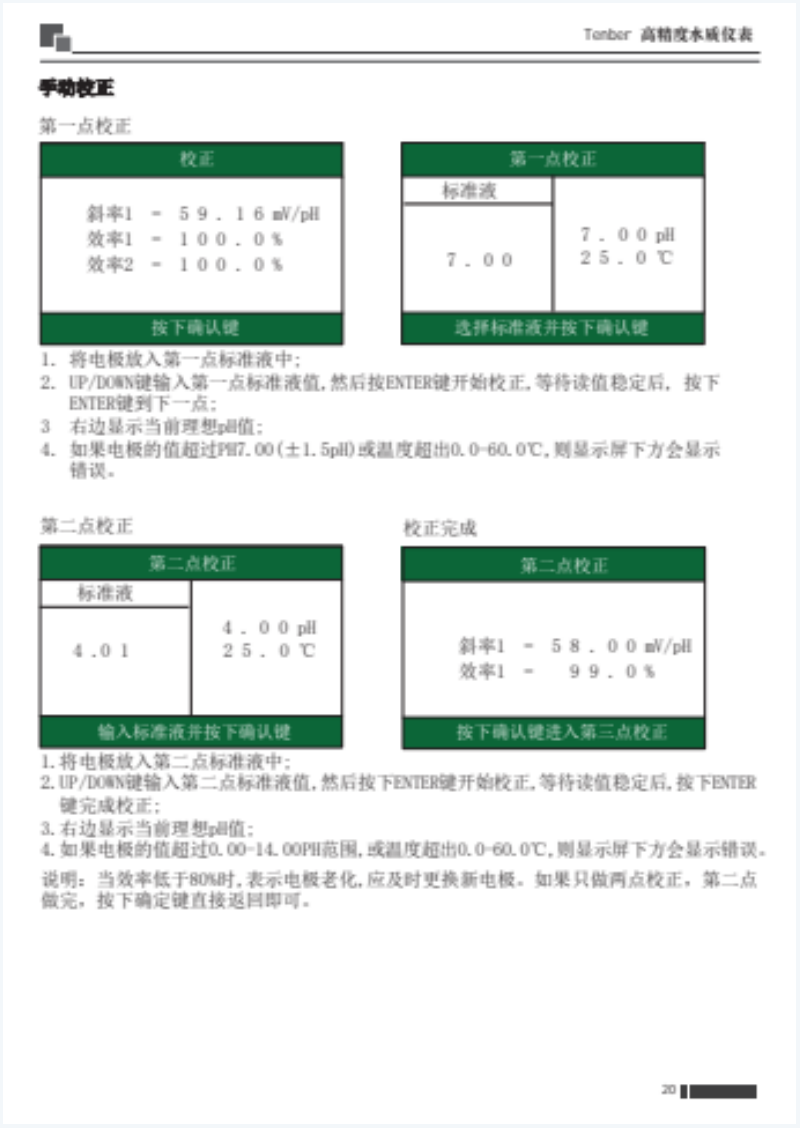
3. If the waiting time is too long, you can press the ENTER key to force correction;

4. The current ideal pH value is displayed on the right;

5. If the value of the electrode exceeds the standard PH range of 30%, or the temperature exceeds 0.0-60.0°C, an error will be displayed at the bottom of the display.

Note: When the efficiency is lower than 80%, it means that the electrode is aging and new electrodes should be replaced in time.

19



Original visual reference: page 21

Tenber

Manual correction

First point correction

Calibration First point calibration

Standard solution

Slope1 = 5 9 . 1 6 mV/pH

Efficiency1 = 1 0 0 . 0 % 7 . 0 0 pH

Efficiency 2 = 1 0 0 . 0 % 7 . 0 0 2 5 . 0 ℃

Press the confirm button. Select the standard solution and press the confirm button.

1. Place the electrode into the first standard solution;

2. Use the UP/DOWN key to input the first point standard liquid value, then press the ENTER key to start the calibration. After the reading value stabilizes, press

ENTER key to go to the next point;

3 The current ideal pH value is displayed on the right;

4. If the value of the electrode exceeds PH7.00 (±1.5pH) or the temperature exceeds 0.0-60.0℃, the bottom of the display will display

Error.

Second point calibration Calibration completed

Second point correction Second point correction

Standard solution

4.00pH

4.0 1 2 5 . 0 ℃ Slope 1 = 5 8 . 0 0 mV/pH

Efficiency 1 = 9 9 . 0 %

Enter the standard solution and press the confirm key. Press the confirm key to enter the third point calibration.

1. Place the electrode into the second standard solution;

2. Use the UP/DOWN key to input the second standard liquid value, then press the ENTER key to start the correction. After the reading is stable, press ENTER.

key to complete the correction;

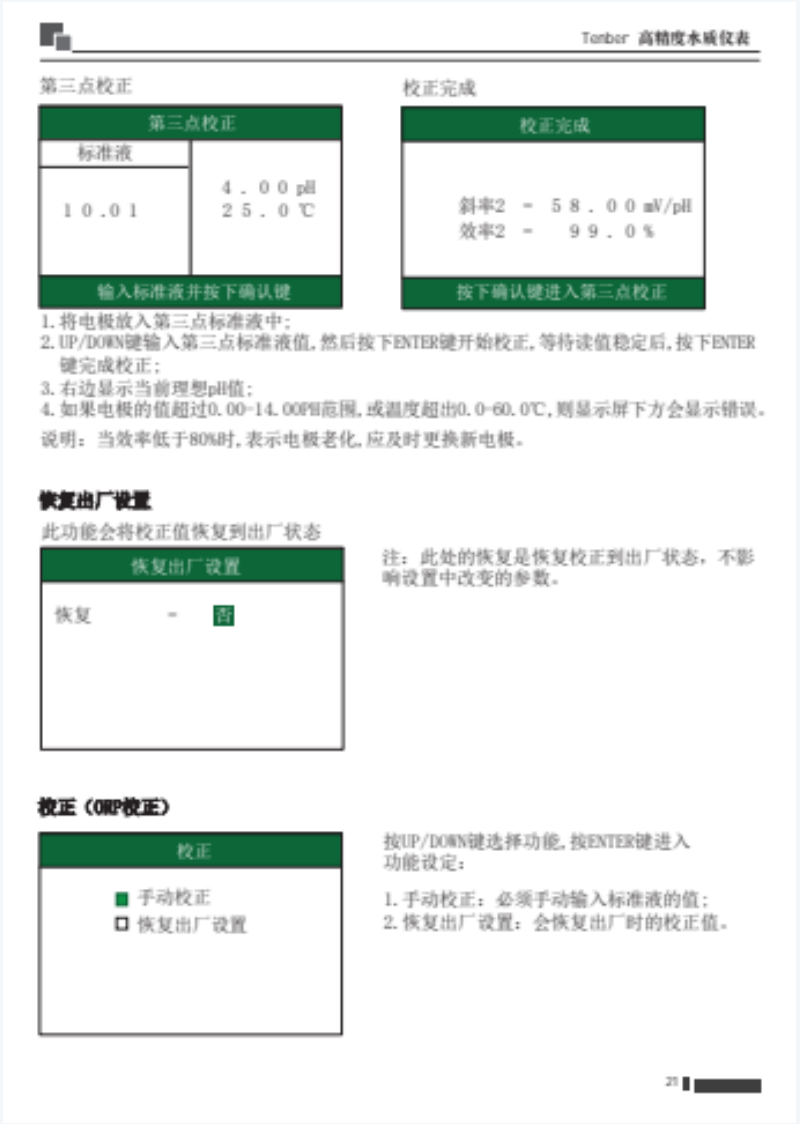
3. The current ideal pH value is displayed on the right;

4. If the value of the electrode exceeds the range of 0.00-14.00PH, or the temperature exceeds 0.0-60.0℃, an error will be displayed at the bottom of the display.

Note: When the efficiency is lower than 80%, it means that the electrode is aging and new electrodes should be replaced in time. If only two points of correction are done, the second point

When finished, press the OK button to return directly.

20



Original visual reference: page 22

Tenber

The third point of calibration is completed.

The third point of calibration is completed.

Standard solution

4.00pH

1 0 .0 1 2 5 . 0 ℃ Slope 2 = 5 8 . 0 0 mV/pH

Efficiency 2 = 9 9 . 0 %

Enter the standard solution and press the confirm key. Press the confirm key to enter the third point calibration.

1. Place the electrode into the third standard solution;

2. Use the UP/DOWN keys to input the third point standard liquid value, then press the ENTER key to start the correction. After the reading is stable, press ENTER.

key to complete the correction;

3. The current ideal pH value is displayed on the right;

4. If the value of the electrode exceeds the range of 0.00-14.00PH, or the temperature exceeds 0.0-60.0℃, an error will be displayed at the bottom of the display.

Note: When the efficiency is lower than 80%, it means that the electrode is aging and new electrodes should be replaced in time.

Factory reset

This function will restore the correction value to the factory state

Note: The recovery here is to restore the calibration to the factory state and does not affect the

Factory reset

The parameters changed in the settings will be affected.

Restore = No

Correction (ORP correction)

Press UP/DOWN key to select function, press ENTER key to enter

Correction

Function settings:

Manual calibration 1. Manual calibration: the value of the standard solution must be entered manually;

Restore factory settings 2. Restore factory settings: The factory calibration values will be restored.

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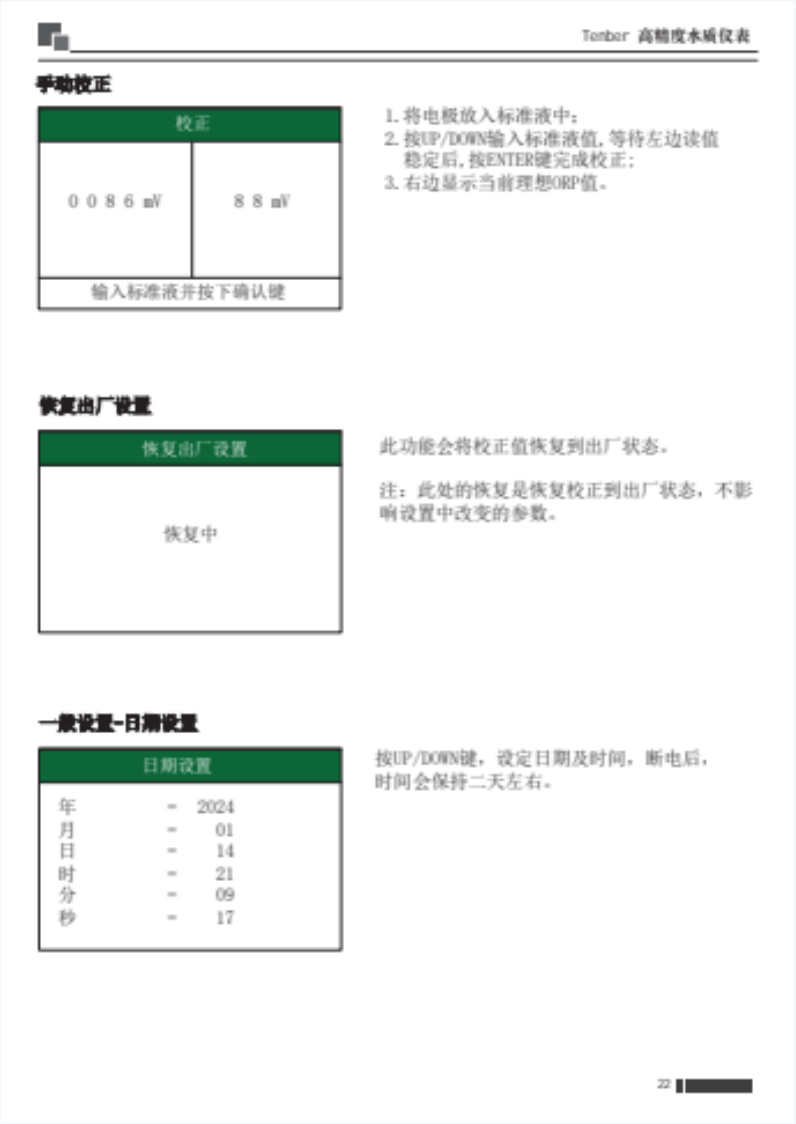

Original visual reference: page 23

Tenber
Manual correction
Calibration 1. Place the electrode into the standard solution;
2. Press UP/DOWN to enter the standard liquid value and wait for the reading on the left
After stabilization, press the ENTER key to complete the correction;
3. The current ideal ORP value is displayed on the right.
0 0 8 6 mV 8 8 mV
Enter the standard solution and press the confirm key
Factory reset
Restore factory settings This function will restore the calibration values to factory settings.
Note: The recovery here is to restore the calibration to the factory state and does not affect the
The parameters changed in the settings will be affected.
Recovering
General Settings-Date Settings
Date setting: Press the UP/DOWN button to set the date and time. After power off,
The time will last about two days.
year = 2024
month = 01
day = 14
hours = 21
points = 09
seconds = 17
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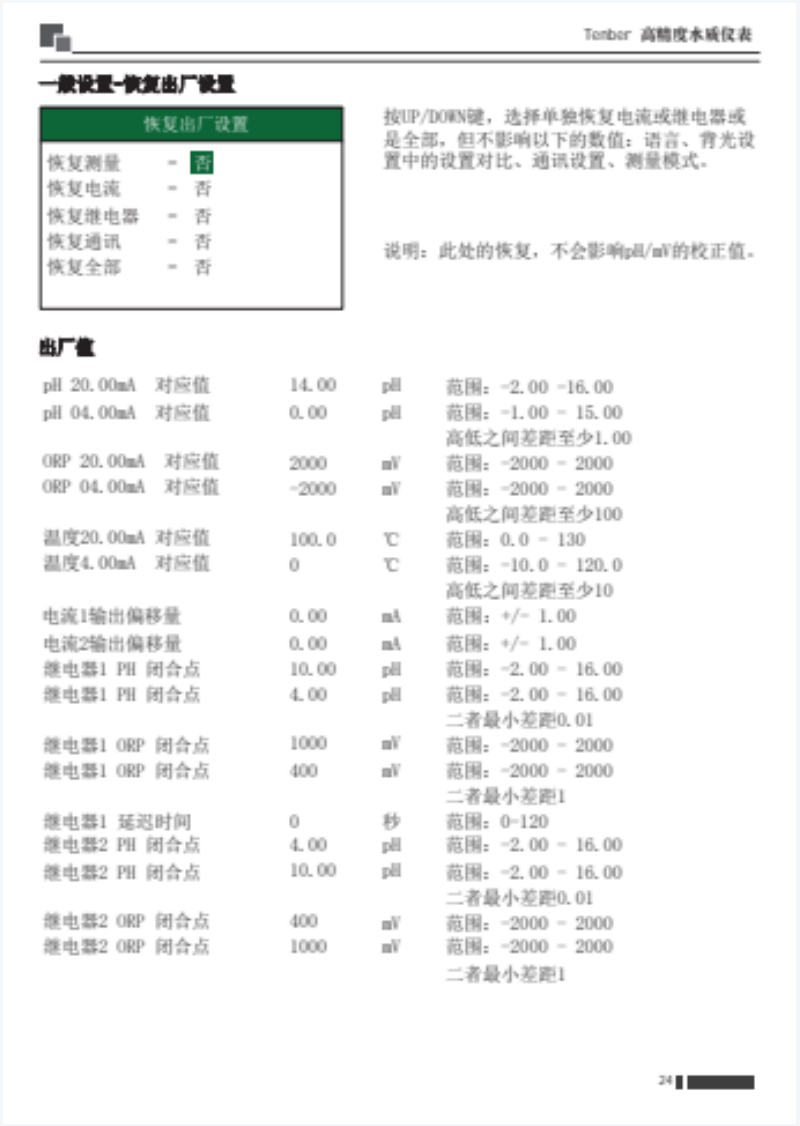
Tenber
General Settings-Language Settings
Language settings Display language is set to Simplified Chinese
Language Settings = Simplified Chinese
General Settings-Backlight Settings
Backlight setting: Press the UP/DOWN button and select to automatically turn off the backlight in 60 seconds or use Manual backlight.
Backlight setting = Auto
General Settings-Version
Version Displays the current version model and can be inserted when updating the software.
U disk, select software update, put the new software into the USB disk, and execute
Version update: It takes about 30 seconds to update the software.
HW Version V1.00
SW Version V1.00
23



Tenber 高精度水质仪表

一般设置-恢复出厂设置

恢复出厂设置	
恢复测量	否
恢复电流	否
恢复继电器	否
恢复通讯	否
恢复全部	否

按UP/DOWN键，选择单独恢复电流或继电器或是全部，但不影响以下的数值：语言、背光设置中的设置对比、通讯设置、测量模式。

说明：此处的恢复，不会影响pH/mV的校正值。

出厂值

pH 20.00mA 对应值	14.00	pH	范围：-2.00 -16.00
pH 04.00mA 对应值	0.00	pH	范围：-1.00 - 15.00
			高低之间差距至少1.00
ORP 20.00mA 对应值	2000	mV	范围：-2000 - 2000
ORP 04.00mA 对应值	-2000	mV	范围：-2000 - 2000
			高低之间差距至少100
温度20.00mA 对应值	100.0	℃	范围：0.0 - 130
温度4.00mA 对应值	0	℃	范围：-10.0 - 120.0
			高低之间差距至少10
电流1输出偏移量	0.00	mA	范围：+/- 1.00
电流2输出偏移量	0.00	mA	范围：+/- 1.00
继电器1 PH 闭合点	10.00	pH	范围：-2.00 - 16.00
继电器1 PH 闭合点	4.00	pH	范围：-2.00 - 16.00
			二者最小差距0.01
继电器1 ORP 闭合点	1000	mV	范围：-2000 - 2000
继电器1 ORP 闭合点	400	mV	范围：-2000 - 2000
			二者最小差距1
继电器1 延迟时间	0	秒	范围：0-120
继电器2 PH 闭合点	4.00	pH	范围：-2.00 - 16.00
继电器2 PH 闭合点	10.00	pH	范围：-2.00 - 16.00
			二者最小差距0.01
继电器2 ORP 闭合点	400	mV	范围：-2000 - 2000
继电器2 ORP 闭合点	1000	mV	范围：-2000 - 2000
			二者最小差距1

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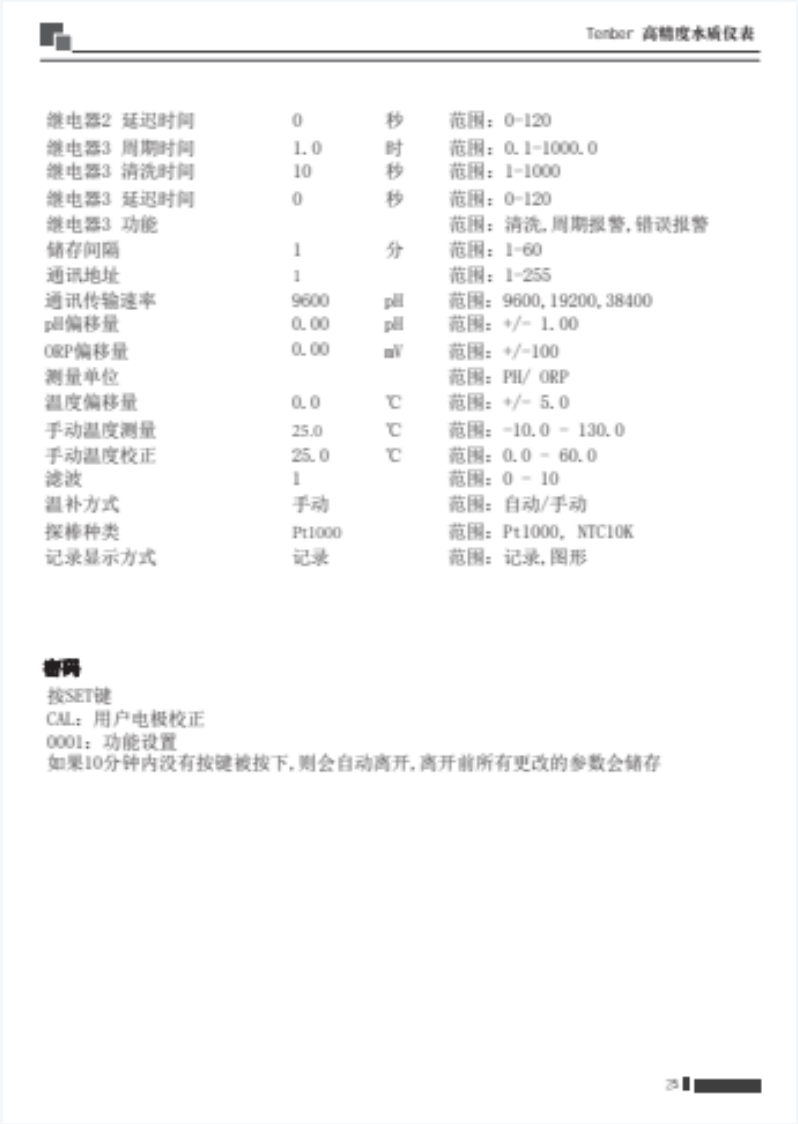
Original visual reference: page 25

Tenber
General settings-restore factory settings
Restore factory settings Press the UP/DOWN key and select individual restore current or relay or
is all, but does not affect the following values: language, backlight settings
Restore measurement = No Centered setting comparison, communication settings, measurement mode.
Recovery Current = No
Recovery Relay = No
Restore communication = No
Note: The recovery here will not affect the correction value of pH/mV.
Restore All = No
Factory value
pH 20.00mA corresponds to 14.00 pH range: -2.00 -16.00
pH 04.00mA corresponding value 0.00 pH range: -1.00 - 15.00
The difference between high and low is at least 1.00
ORP 20.00mA corresponds to 2000 mV range: -2000 - 2000
ORP 04.00mA corresponding value -2000 mV range: -2000 - 2000
The difference between high and low is at least 100
Temperature 20.00mA corresponding value 100.0 ℃ Range: 0.0 - 130
Temperature 4.00mA corresponding value 0 ℃ range: -10.0 - 120.0
The difference between high and low is at least 10

Current 1 Output Offset 0.00 mA Range: +/- 1.00
Current 2 Output Offset 0.00 mA Range: +/- 1.00
Relay 1 PH closing point 10.00 pH range: -2.00 - 16.00
Relay 1 PH closing point 4.00 pH range: -2.00 - 16.00
The minimum difference between the two is 0.01
Relay 1 ORP closing point 1000 mV Range: -2000 - 2000
Relay 1 ORP closing point 400 mV Range: -2000 - 2000
The minimum difference between the two is 1
Relay 1 delay time 0 seconds Range: 0-120
Relay 2 PH closing point 4.00 pH range: -2.00 - 16.00
Relay 2 pH closing point 10.00 pH range: -2.00 - 16.00
The minimum difference between the two is 0.01
Relay 2 ORP closing point 400 mV Range: -2000 - 2000
Relay 2 ORP closing point 1000 mV Range: -2000 - 2000
The minimum difference between the two is 1
24



Tenber 高精度水质仪表

继电器2 延迟时间	0	秒	范围：0-120
继电器3 周期时间	1.0	时	范围：0.1-1000.0
继电器3 清洗时间	10	秒	范围：1-1000
继电器3 延迟时间	0	秒	范围：0-120
继电器3 功能			范围：清洗,周期报警,错误报警
储存间隔	1	分	范围：1-60
通讯地址	1		范围：1-255
通讯传输速率	9600	pH	范围：9600,19200,38400
pH偏移量	0.00	pH	范围：+/- 1.00
ORP偏移量	0.00	mV	范围：+/-100
测量单位			范围：PH/ ORP
温度偏移量	0.0	℃	范围：+/- 5.0
手动温度测量	25.0	℃	范围：-10.0 - 130.0
手动温度校正	25.0	℃	范围：0.0 - 60.0
滤波	1		范围：0 - 10
温补方式	手动		范围：自动/手动
探棒种类	Pt1000		范围：Pt1000, NTC10K
记录显示方式	记录		范围：记录,图形

密码

按SET键
CAL：用户电极校正
0001：功能设置
如果10分钟内没有按键被按下,则会自动离开,离开前所有更改的参数会储存

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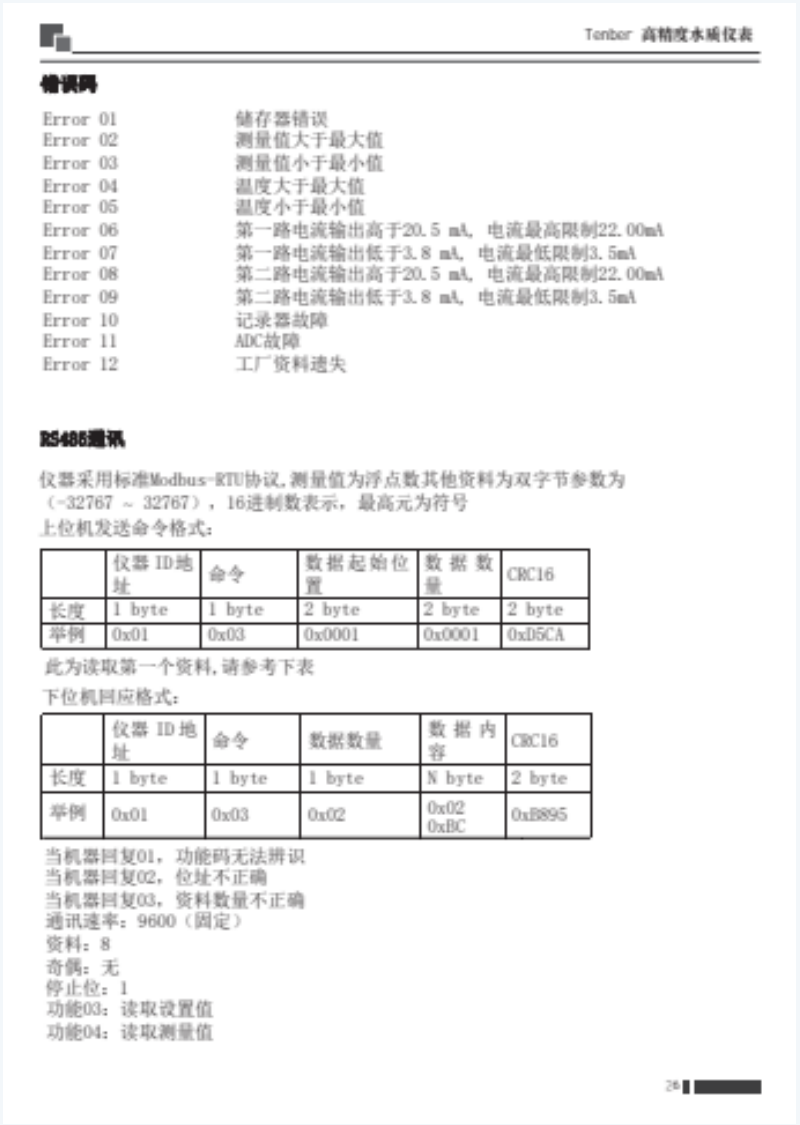
Original visual reference: page 26

Tenber
Relay 2 delay time 0 seconds Range: 0-120
Relay 3 cycle time 1.0 hours Range: 0.1-1000.0
Relay 3 cleaning time 10 seconds Range: 1-1000
Relay 3 delay time 0 seconds Range: 0-120
Relay 3 function range: cleaning, periodic alarm, error alarm
Storage interval 1 minute Range: 1-60
Correspondence address range: 1-255
Communication transmission rate 9600 pH range: 9600, 19200, 38400
pH Offset 0.00 pH Range: +/- 1.00
ORP offset 0.00 mV Range: +/-100
Measurement Unit Range: PH/ORP
Temperature offset 0.0 °C Range: +/- 5.0
Manual temperature measurement ℃ range: -10.0 - 130.0
Manual temperature correction 25.0 ℃ Range: 0.0 - 60.0
Filter 1 Range: 0 - 10
Temperature compensation method manual range: automatic/manual
Probe type range: Pt1000, NTC10K
Record display mode Record range: record, graphics
Password
Press SET key
CAL: User electrode calibration
0001: Function settings
If no button is pressed within 10 minutes, it will automatically leave and all changed parameters before leaving will be stored.
25



Tenber 高精度水质仪表

错误码

Error 01	储存器错误
Error 02	测量值大于最大值
Error 03	测量值小于最小值
Error 04	温度大于最大值
Error 05	温度小于最小值
Error 06	第一路电流输出高于20.5 mA，电流最高限制22.00mA
Error 07	第一路电流输出低于3.8 mA，电流最低限制3.5mA
Error 08	第二路电流输出高于20.5 mA，电流最高限制22.00mA
Error 09	第二路电流输出低于3.8 mA，电流最低限制3.5mA
Error 10	记录器故障
Error 11	ADC故障
Error 12	工厂资料遗失

RS485通讯

仪器采用标准Modbus-RTU协议，测量值为浮点数其他资料为双字节参数为（-32767 ~ 32767），16进制数表示，最高元为符号

上位机发送命令格式：

	仪器ID地址	命令	数据起始位置	数据数量	CRC16
长度	1 byte	1 byte	2 byte	2 byte	2 byte
举例	0x01	0x03	0x0001	0x0001	0xD5CA

此为读取第一个资料，请参考下表

下位机回应格式：

	仪器ID地址	命令	数据数量	数据内容	CRC16
长度	1 byte	1 byte	1 byte	N byte	2 byte
举例	0x01	0x03	0x02	0x02 0xBC	0xB895

当机器回复01，功能码无法辨识
当机器回复02，位址不正确
当机器回复03，资料数量不正确
通讯速率：9600（固定）
资料：8
奇偶：无
停止位：1
功能03：读取设置值
功能04：读取测量值

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Tenber

error code

Error 01 Storage error

Error 02 The measured value is greater than the maximum value

Error 03 The measured value is less than the minimum value

Error 04 The temperature is greater than the maximum value

Error 05 The temperature is less than the minimum value

Error 06 The current output of the first channel is higher than 20.5 mA, and the maximum current limit is 22.00mA.

Error 07 The current output of the first channel is lower than 3.8 mA, and the minimum current limit is 3.5mA.

Error 08 The current output of the second channel is higher than 20.5 mA, and the maximum current limit is 22.00mA.

Error 09 The current output of the second channel is lower than 3.8 mA, and the minimum current limit is 3.5mA.

Error 10 Recorder failure

Error 11 ADC failure

Error 12 Factory data is missing

RS485 communication

The instrument adopts the standard Modbus-RTU protocol, and the measured values are floating point numbers and other data are double-byte parameters.

(-32767 32767), hexadecimal number representation, the highest element is the symbol

The command format sent by the host computer:

Instrument ID Ground Data starting bit Number of data

Command CRC16

Address setting quantity

Length 1 byte 1 byte 2 byte 2 byte 2 byte

Example 0x01 0x03 0x0001 0x0001 0xD5CA

This is the first data to be read, please refer to the table below

Response format of slave computer:

Instrument ID in data

Command Data quantity CRC16

address content

Length 1 byte 1 byte 1 byte N byte 2 byte

Example 0x01 0x03 0x02 0x02 0xB895

0xBC

When the machine replies 01, the function code cannot be recognized

When the machine replies 02, the address is incorrect

When the machine replies 03, the number of data is incorrect

Communication rate: 9600 (fixed)

Information: 8

Original page 27 - translation continued

Parity: None
Stop bit: 1
Function 03: Read setting value
Function 04: Read measured value
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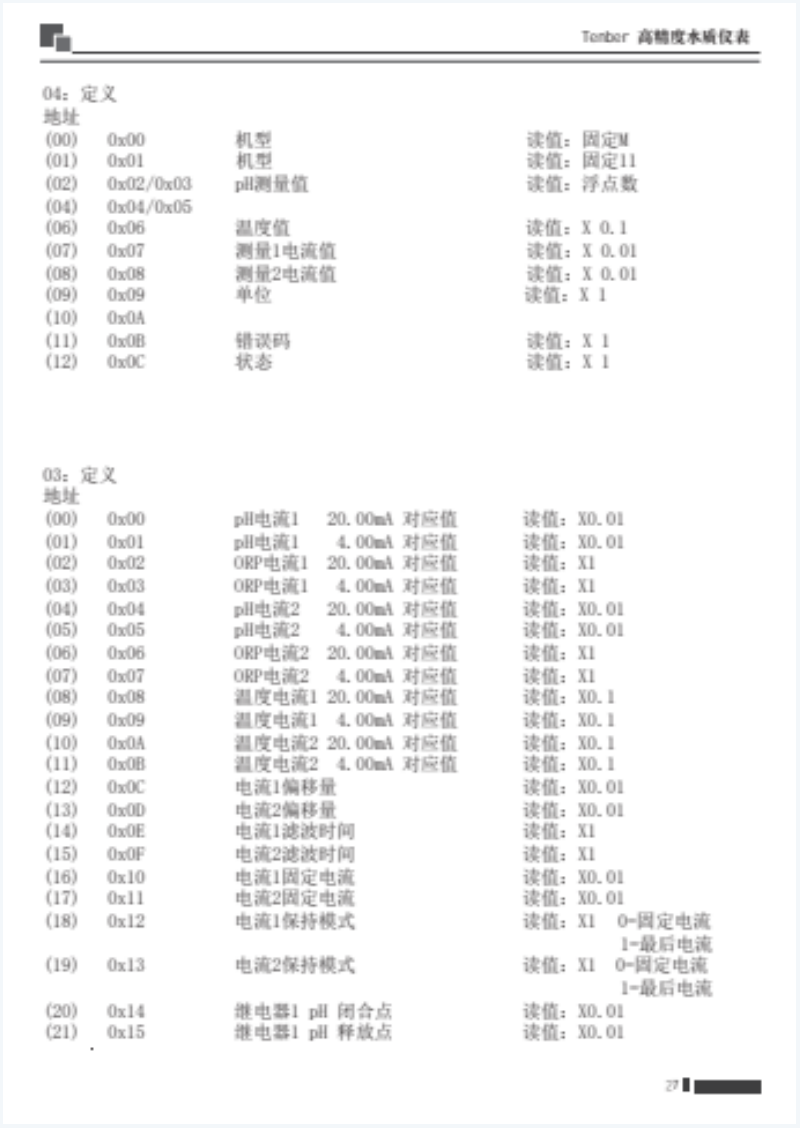

Tenber 高精度水质仪表

04：定义

地址			
(00)	0x00	机型	读值：固定M
(01)	0x01	机型	读值：固定11
(02)	0x02/0x03	pH测量值	读值：浮点数
(04)	0x04/0x05		
(06)	0x06	温度值	读值：X 0.1
(07)	0x07	测量1电流值	读值：X 0.01
(08)	0x08	测量2电流值	读值：X 0.01
(09)	0x09	单位	读值：X 1
(10)	0x0A		
(11)	0x0B	错误码	读值：X 1
(12)	0x0C	状态	读值：X 1

03：定义

地址			
(00)	0x00	pH电流1 20.00mA 对应值	读值：X0.01
(01)	0x01	pH电流1 4.00mA 对应值	读值：X0.01
(02)	0x02	ORP电流1 20.00mA 对应值	读值：X1
(03)	0x03	ORP电流1 4.00mA 对应值	读值：X1
(04)	0x04	pH电流2 20.00mA 对应值	读值：X0.01
(05)	0x05	pH电流2 4.00mA 对应值	读值：X0.01
(06)	0x06	ORP电流2 20.00mA 对应值	读值：X1
(07)	0x07	ORP电流2 4.00mA 对应值	读值：X1
(08)	0x08	温度电流1 20.00mA 对应值	读值：X0.1
(09)	0x09	温度电流1 4.00mA 对应值	读值：X0.1
(10)	0x0A	温度电流2 20.00mA 对应值	读值：X0.1
(11)	0x0B	温度电流2 4.00mA 对应值	读值：X0.1
(12)	0x0C	电流1偏移量	读值：X0.01
(13)	0x0D	电流2偏移量	读值：X0.01
(14)	0x0E	电流1滤波时间	读值：X1
(15)	0x0F	电流2滤波时间	读值：X1
(16)	0x10	电流1固定电流	读值：X0.01
(17)	0x11	电流2固定电流	读值：X0.01
(18)	0x12	电流1保持模式	读值：X1 0=固定电流 1=最后电流
(19)	0x13	电流2保持模式	读值：X1 0=固定电流 1=最后电流
(20)	0x14	继电器1 pH 闭合点	读值：X0.01
(21)	0x15	继电器1 pH 释放点	读值：X0.01

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04: Definition

address

(00) 0x00 model reading value: fixed M

(01) 0x01 model reading value: fixed 11

(02) 0x02/0x03 pH measurement value Reading value: floating point number

(04) 0x04/0x05

(06) 0x06 Temperature value Reading value: X 0.1

(07) 0x07 Measure 1 current value Reading value: X 0.01

(08) 0x08 Measure 2 current value Reading value: X 0.01

(09) 0x09 Unit Reading: X 1

(10) 0x0A

(11) 0x0B error code reading value: X 1

(12) 0x0C status reading value: X 1

03: Definition

address

(00) 0x00 pH current 1 20.00mA corresponding value Reading value: X0.01

(01) 0x01 pH current 1 4.00mA corresponding value reading: X0.01

(02) 0x02 ORP current 1 20.00mA corresponding value reading value: X1

(03) 0x03 ORP current 1 4.00mA corresponding value reading value: X1

(04) 0x04 pH current 2 20.00mA corresponding value reading: X0.01

(05) 0x05 pH current 2 4.00mA corresponding value reading: X0.01

(06) 0x06 ORP current 2 20.00mA corresponding value reading value: X1

(07) 0x07 ORP current 2 4.00mA corresponding value reading value: X1

(08) 0x08 Temperature current 1 20.00mA corresponding value Reading value: X0.1

(09) 0x09 Temperature current 1 4.00mA corresponding value Reading value: X0.1

(10) 0x0A Temperature current 2 20.00mA corresponding value Reading value: X0.1

(11) 0x0B Temperature current 2 4.00mA corresponding value Reading value: X0.1

(12) 0x0C Current 1 offset reading value: X0.01

(13) 0x0D Current 2 offset reading value: X0.01

(14) 0x0E Current 1 filter time reading value: X1

(15) 0x0F Current 2 filter time reading value: X1

(16) 0x10 Current 1 fixed current reading value: X0.01

(17) 0x11 Current 2 fixed current reading value: X0.01

(18) 0x12 Current 1 hold mode Reading value: X1 0=fixed current 1=last current

(19) 0x13 Current 2 hold mode reading value: X1 0=fixed current

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1=last current
(20) 0x14 Relay 1 pH closing point Reading value: X0.01
(21) 0x15 Relay 1 pH release point Reading value: X0.01
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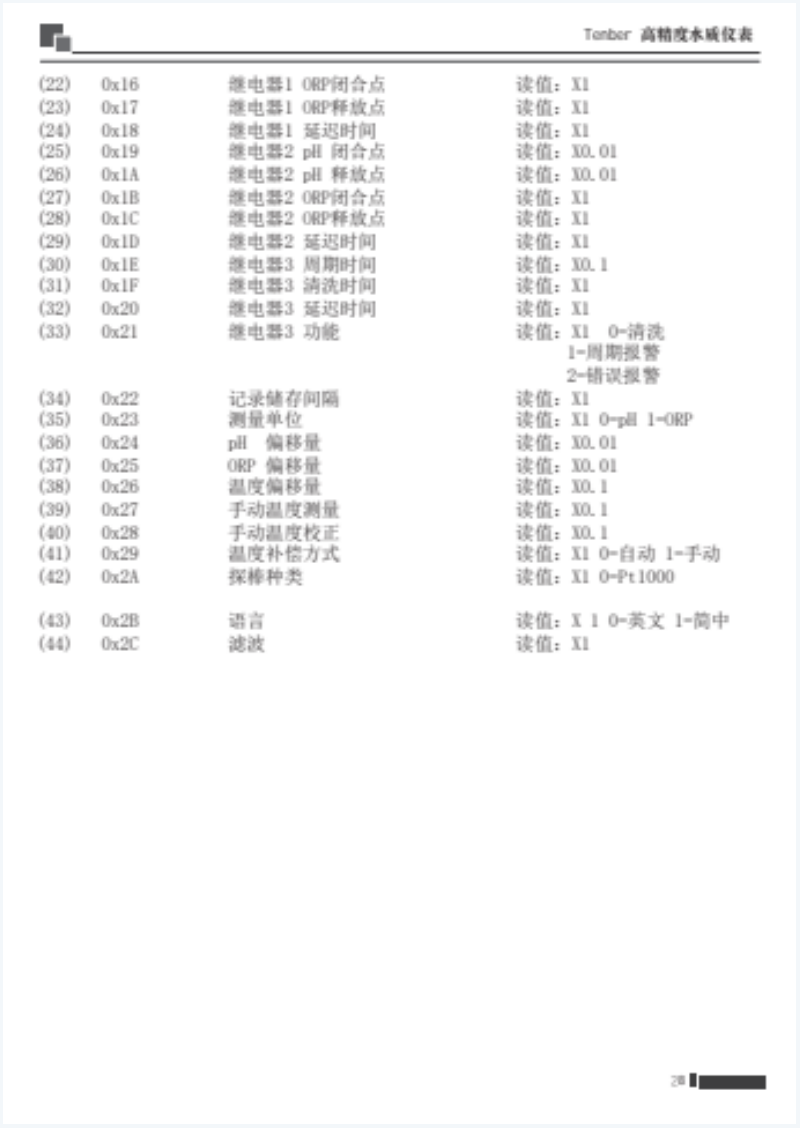

Tenber 高精度水质仪表

(22)	0x16	继电器1 ORP闭合点	读值：X1
(23)	0x17	继电器1 ORP释放点	读值：X1
(24)	0x18	继电器1 延迟时间	读值：X1
(25)	0x19	继电器2 pH 闭合点	读值：X0.01
(26)	0x1A	继电器2 pH 释放点	读值：X0.01
(27)	0x1B	继电器2 ORP闭合点	读值：X1
(28)	0x1C	继电器2 ORP释放点	读值：X1
(29)	0x1D	继电器2 延迟时间	读值：X1
(30)	0x1E	继电器3 周期时间	读值：X0.1
(31)	0x1F	继电器3 清洗时间	读值：X1
(32)	0x20	继电器3 延迟时间	读值：X1
(33)	0x21	继电器3 功能	读值：X1 0-清洗 1-周期报警 2-错误报警
(34)	0x22	记录储存间隔	读值：X1
(35)	0x23	测量单位	读值：X1 0-pH 1-ORP
(36)	0x24	pH 偏移量	读值：X0.01
(37)	0x25	ORP 偏移量	读值：X0.01
(38)	0x26	温度偏移量	读值：X0.1
(39)	0x27	手动温度测量	读值：X0.1
(40)	0x28	手动温度校正	读值：X0.1
(41)	0x29	温度补偿方式	读值：X1 0-自动 1-手动
(42)	0x2A	探棒种类	读值：X1 0-Pt1000
(43)	0x2B	语言	读值：X 1 0-英文 1-简中
(44)	0x2C	滤波	读值：X1

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(22) 0x16 Relay 1 ORP closing point Reading value: X1

(23) 0x17 Relay 1 ORP release point reading value: X1

(24) 0x18 Relay 1 delay time Reading value: X1

(25) 0x19 Relay 2 pH closing point Reading value: X0.01

(26) 0x1A Relay 2 pH release point Reading value: X0.01

(27) 0x1B Relay 2 ORP closing point Reading value: X1

(28) 0x1C Relay 2 ORP release point Reading value: X1

(29) 0x1D Relay 2 delay time reading value: X1

(30) 0x1E Relay 3 cycle time reading value: X0.1

(31) 0x1F Relay 3 cleaning time reading value: X1

(32) 0x20 Relay 3 delay time reading value: X1

(33) 0x21 Relay 3 function Reading value: X1 0=Cleaning

1=Periodic alarm

2=Error alarm

(34) 0x22 Record storage interval Reading value: X1

(35) 0x23 Measurement unit Reading value: X1 0=pH 1=ORP

(36) 0x24 pH offset reading: X0.01

(37) 0x25 ORP offset reading value: X0.01

(38) 0x26 Temperature offset reading value: X0.1

(39) 0x27 Manual temperature measurement reading: X0.1

(40) 0x28 Manual temperature correction Reading value: X0.1

(41) 0x29 Temperature compensation mode Reading value: X1 0=Automatic 1=Manual

(42) 0x2A Probe type Reading value: X1 0=Pt1000

(43) 0x2B Language Reading value: X 1 0=English 1=Simplified Chinese

(44) 0x2C filter reading value: X1

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