

Online Sodium Analyzer

DWG-5088Pro User Manual



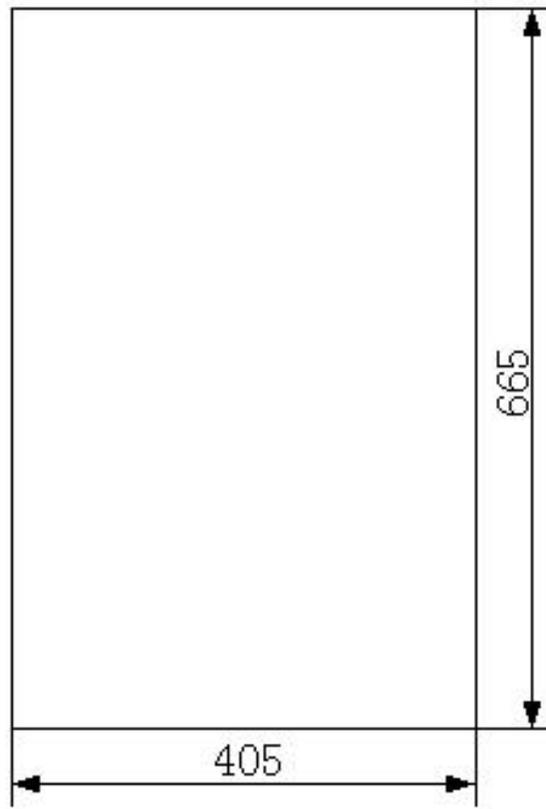
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- d. The working condition surround that installs an instrument should not have strong electromagnetic field and strong vibrating source;
- e. The instrument wants to install at the drying have no dust, have no the environment of causticity gas amid;

B. Fixed method:

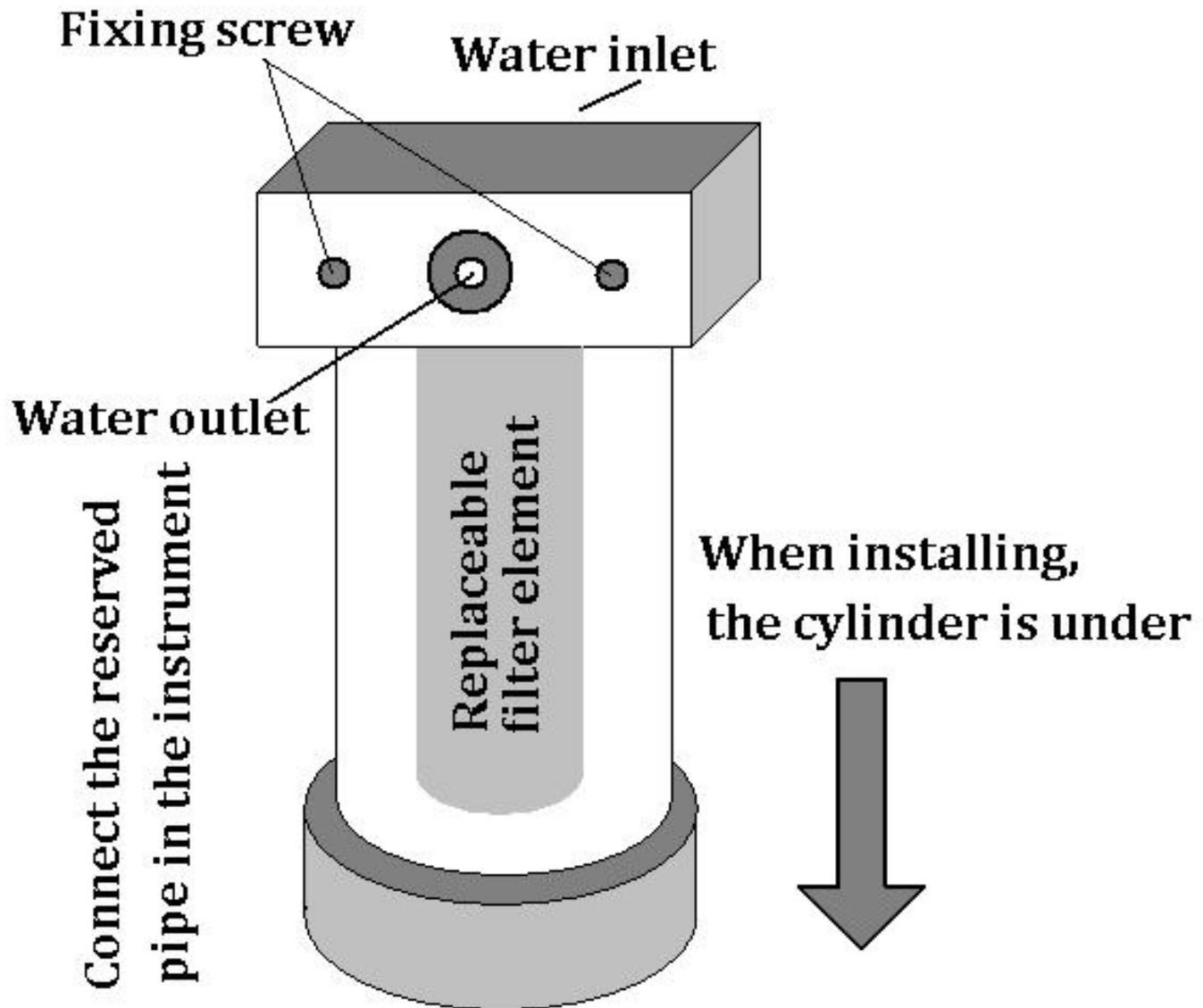
The instrument can install on various meter pan or the stationary packing block, at with dial setup, press chart to open hole, open hole size for;(665mm ×405 mm)



C. Connect the sampling pipe and the sewage pipe:

In order to prevent pipeline pollution and ensure the safe and reliable operation of the instrument, a water sample filter should be installed at the inlet of each water sample of the instrument, and the filter element should be replaced regularly according to the water quality.

Install the water sample filter at the water inlet under the side of the instrument, and fix the water sample filter from the inside of the instrument to the outside with the two screws attached.



The water sample interface of the instrument is a $\Phi 6$ locking hose joint, which can be directly connected to the $\Phi 6 \times 1$ hose; the attached adapter can also be used to connect the $\Phi 6$ stainless steel pipe; if other connection methods are required, please consult with the manufacturer when ordering.

After the filter is installed, the water should be flushed until there is no solid impurities in the outlet water, and then connect the outlet pipe of the filter to the joint under the flowmeter.

The waste water pipe is provided with the instrument. It can be directly connected to the waste pipe after it is inserted and fixed with the waste discharge port at the lower part of the instrument. Do not squeeze or bend to ensure smooth drainage.

Finally, the current connecting tube under the photoelectric detector head in front of the instrument should be adjusted upward (in the opposite direction), so as to reliably catch the wastewater discharged from the detector head and avoid splashing.

The instrument tries agent and mark kind feed and adopts a barometric mode and circulate

each barrel and its piping that try a barrel and mark kind all have certain press, therefore as to it's the piping connecting orifice section need particularly note, assure a connectivity firm, seal completely good, and need regular audit, discover damaged part in advance and avoid resulting in and try agent or mark kind leakage.

D. Cover the sodium measuring electrode with O-shaped sealing ring, insert it into the first electrode installation port on the right of the measuring cell, and tighten the electrode sleeve appropriately, subject to no water leakage.

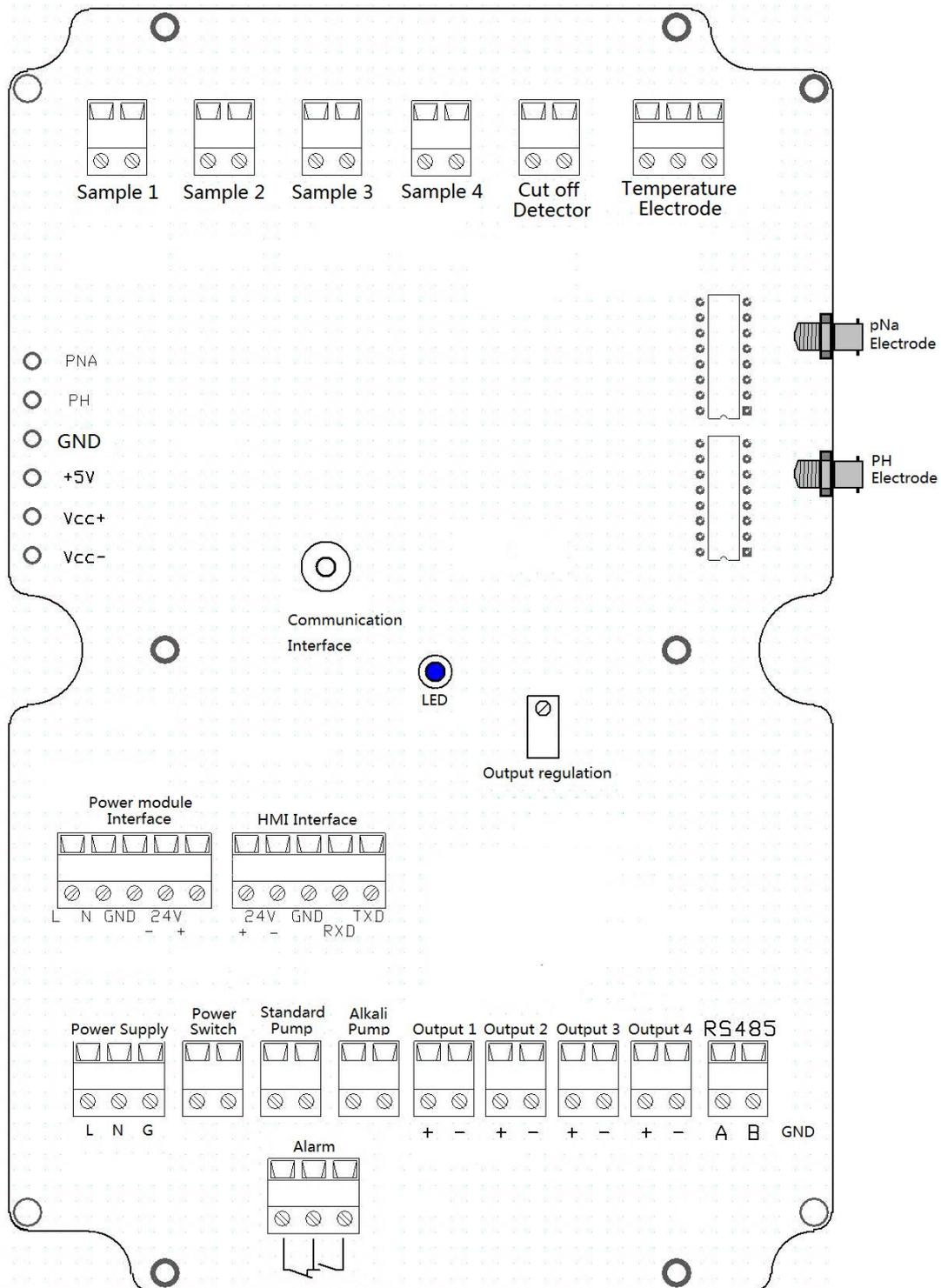
E. Set the pH composite electrode with O-type sealing ring, insert it into the second electrode installation port on the right of the measuring cell, and tighten the electrode sleeve appropriately, subject to no water leakage;

F. Put the O-type sealing ring on the temperature electrode, insert it into the third electrode installation port on the right of the measuring cell, and tighten it appropriately, subject to no water leakage;

G. Insert each electrode plug through the wire hole and into the corresponding socket on the right side of the monitor host. Note that the sodium measuring electrode socket is on the top and the pH composite electrode socket is on the bottom, and rotate it clockwise for a certain angle to lock it to prevent poor contact; the temperature electrode is connected to the terminal in the monitor host, and the instrument has been connected before leaving the factory.

H. Connect the AC power supply of the dial to the power terminal plug of sodium meter through 1A automatic air switch. After confirming that the connection is correct, close the automatic air switch and start debugging and operation;

The power and signal lines are connected as shown in the figure below.



a. Water sample 1: the sampling solenoid valve connected to water sample 1 is used for automatic switching of Multi-channel Instrument to the measured water sample.

b. Water sample 2: the sampling solenoid valve connected to water sample 2 is used for automatic switching of Multi-channel Instrument to the measured water sample.

c. Water sample 3: the sampling solenoid valve connected to water sample 3 is used for automatic switching of Multi-channel Instrument to the measured water sample.

d. Water sample 4: the sampling solenoid valve connected to water sample 4 is used for automatic switching of Multi-channel Instrument to the measured water sample.

- d. **Cut off detection:** connect the liquid level sensor to detect the liquid level in the water sample cup.
- e. **Temperature electrode (3, 2, 1):** connect the special temperature sensor according to the label.
- f. **Sodium electrode:** BNC connector, insert pNa electrode.
- g. **pH electrode:** BNC connector, insert pH composite electrode.
- h. **Power module interface:** connect the external switching power module.
- i. **HMI interface:** connect the special LCD touch screen to display the measurement process, measurement results and human-computer interaction interface.
- j. **Power supply:** connect with 220 V AC current, l connecting wire, n connecting neutral line, grounding can be suspended or grounded to public ground wire. If the electromagnetic interference on site affects the normal operation of the instrument, please ground the grounding terminal separately.
- k. **Switch:** connect the instrument power switch.
- l. **Standard sample pump:** connect the standard sample pump to automatically control the injection of standard sample during instrument calibration.
- m. **Alkali feeding pump:** connected with adjustable air pump, used for blowing diisopropylamine for stirring, so as to enhance the alkalization effect.
- n. **Alarm output:** a group of relay contacts, including normally open and normally closed contacts, which can be selected and used according to needs. The maximum capacity of contact is 220 V and current is 1a. If you need to control high-power load, please add intermediate relay.
- o. **Output 1 (+, -):** the positive and negative terminals of the first output current. The output current can be set arbitrarily in the range of 0-20mA.
- p. **Output 2 (+, -):** the positive and negative terminals of the first output current. The output current can be set arbitrarily in the range of 0-20mA.
- q. **Output 3 (+, -):** the positive and negative terminals of the first output current. The output current can be set arbitrarily in the range of 0-20mA.
- r. **Output 4 (+, -):** the positive and negative terminals of the first output current. The output current can be set arbitrarily in the range of 0-20mA.
- s. **RS485(A、B、Grounding):** RS485 communication interface, optional extension function, connecting other data acquisition and management equipment, supporting Modbus RTU communication protocol.

② Preliminary commissioning of instruments

- A. Connect the water sample to the sodium meter measuring system, and adjust the flow rate appropriately to reach the state that there is overflow in the overflow cup of water sample.
- B. Add an appropriate amount of diisopropylamine into the alkali liquor bottle to reach about 80% of the volume of the alkali liquor bottle, and tighten the bottle cap to ensure the sealing; **pay attention to that the thick blowing pipe must be inserted to the bottom of the bottle, and the fine alkali adding pipe should be above the liquid level.**
- C. Turn on the power switch of the meter and wait for the computer system in the instrument to start,

and the touch screen will display normally;

D. Calibrate pH and sodium measurements (see later).

E. After continuous operation for a period of time, slowly adjust the alkali adding pump after the pH value is stable, and observe the pH value of the water sample displayed until the pH value is stable above 10.5, and the instrument can be put into normal use.

4. Operation method

① The contents of display interface are shown in the figure below (taking dual channel instrument as an example).

There are two windows on the top of the interface to display the measurement data of channel 1 and channel 2 respectively. The * *. * MV at the top of the window is the electrode voltage value of the sodium electrode, the large number in the middle is the sodium ion concentration value of the water sample, and the four numbers in the bottom row are PNA value, pH value, temperature and output current.

There are five indicator lights on the right side of the window, which respectively indicate the five alarm states of water sample. When the water sample is cut off, the water temperature is too high, the water temperature is too low, and the measured value exceeds the set upper and lower limits, the corresponding indicator lights will flash.



The table in the middle of the interface shows the real-time curve of measurement results. The real-time curve of the first channel is red, and the real-time curve of the second channel is green.

The bottom line is the product model, manufacturer information and real-time date, time, etc.

In the lower right corner is the "menu" button, which is the only entrance for users to operate instruments and human-computer interaction.

② Basic operation method

A. Enter the function menu

In normal operation state, click the "menu" button in the lower right corner to display the main menu of instrument operation.



The functions of the menu options are as follows:

- Parameter setting: check and modify various operating parameters of the instrument and calibrate the output current of the instrument.
- System test: manually control the switch of solenoid valve, pump and indicator light to test whether the components work normally.
- Historical data: query historical survey data records in the form of data table.
- Calibration instrument: use standard PNA and pH water samples to calibrate instrument measurement parameters.
- Channel switch: according to the actual operation needs, start or stop the measurement of each channel of the instrument.
- Historical curve: query the historical measurement data records and view the change trend of parameters in the form of curve.

Click the icon on the main menu to enter the corresponding function operation.

B. Parameter setting

Click the "parameter setting" icon on the main menu to enter the parameter setting interface.

Name	Value	Unit	Name	Value	Unit	Name	Value	Unit
Na+ Standard 1	4.00	pNa	pNa-S	-59.12	mV/pNa	Calibration Output 1	20.51	mA
Na+ Standard 2	5.00	pNa	pNa-E0	390.00	mV	Calibration Output 2	20.52	mA
pH Standard 1	9.18	pH	pH-S	-59.12	mV/pH	Calibration Output 3	20.53	mA
pH Standard 2	6.86	pH	pH-E0	8.88	mV	Calibration Output 4	20.54	mA
Lower Range	0.0	ug/l	Lower Output	4.00	mA	Fault Output	2.00	mA
Upper Range	200	ug/l	Upper Output	20.00	mA	Lower Limit	0.00	ug/l
Unit (L)	ug/l	(M)	mg/l	(H)	g/l	Upper Limit	200	ug/l
Date	2 - 17 - 2022	Baud	57600	Batch		<input type="button" value="Discard"/> <input type="button" value="Save"/>		
Time	10 : 53	Address	18	16				

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Significance and setting method of each parameter:

- **Na+ standard 1:** pNa value of the first standard sample to be used in calibration of sodium measurement parameters.
 - **Na+ standard 2:** pNa value of the second standard sample to be used in calibration of sodium measurement parameters.
- Note: in order to reduce the mutual contamination of standard samples, the standard samples with higher PNA value should be regarded as "Na standard 1".**
- **pNa-S:** The voltage value of sodium electrode corresponding to each 1 pNa, which is automatically calculated and saved after the sodium electrode is calibrated, and can be manually modified.
 - **pNa-E0:** The corresponding voltage value of sodium electrode when pNa is 0. This value is automatically calculated and saved after the sodium electrode is calibrated, and can be manually modified.
 - **Lower limit:** the lower limit alarm value of sodium concentration, and the lower limit alarm signal will be sent when it is lower than the set value.
 - **Upper limit:** the upper limit alarm value of sodium concentration, and the upper limit alarm signal will be sent when it is higher than the set value.
 - **Lower range:** This parameter sets the lower range limit of the instrument output current and does not affect the measurement range.
 - **Upper range:** This parameter sets the upper range of the instrument output current and does not affect the measurement range.
 - **Lower output:** output current corresponding to "lower range".
 - **Upper output:** output current corresponding to "upper range".

The above four parameters jointly determine the output range of the instrument's transmission current, such as:

When the lower range and upper range are set to 0.00ug/l and 100.00ug/l respectively, and the lower limit output and upper limit output are set to 4.00ma and 20.00ma respectively,

it means that when the measurement result is 0.00-100.00ug/l, the corresponding output current is 4.00-20.00mA.

When the measurement result is lower than the set lower limit of measuring range, the current value of "lower limit output" is output; when the measurement result is higher than the set upper limit of measuring range, the current value of "upper limit output" is output.

- **Calibration output 1,2,3,4:** This parameter is used to calibrate the output current of the instrument. In the "parameter setting" state, the real-time output current value of "output 1" , "output 2", "output 3", "output 4" terminals can be accurately measured with the DC current level of the multimeter, and the values of "calibration output 1" , "calibration output 2", "calibration output 3", "calibration output 4" are changed to the measured current value and saved.
- **pH standard 1:** The pH value of the first standard sample to be used in the calibration of pH measurement parameters.
- **pH standard 2:** The pH value of the first standard sample to be used in the calibration of pH measurement parameters.
Note: in order to reduce the mutual pollution of standard samples, the standard samples with higher pH value should be regarded as "pH standard 1".
- **pH-S:**The electrode voltage value corresponding to each 1pH is automatically calculated and saved after pH calibration, and can be manually modified.
- **pH-E0:**The corresponding electrode voltage value when pH is 7.00. This value is automatically calculated and saved after pH calibration, and can be manually modified.
- **Year, month, day, hour, minute and week:** Used to set the system time.
- **Baud、Address:** RS485 communication parameters can be modified by the user according to the actual communication requirements.
- **Batch:** This is the factory number of the manufacturer. Please do not modify it.

Click the parameter to be modified to pop up the data input keyboard.

Name	Value	Unit	Name	Value	Unit	Name	Value	Unit
Na+ Standard 1	4.00	pNa	Na+ Standard 2	5.00	pNa	Calibration Output 1	20.51	mA
Na+ Standard 2	5.00	pNa	pH Standard 1	9.18	pH	Calibration Output 2	20.52	mA
pH Standard 1	9.18	pH	pH Standard 2	6.86	pH	Calibration Output 3	20.53	mA
pH Standard 2	6.86	pH	Lower Range	0.0	ug/l	Calibration Output 4	20.54	mA
Lower Range	0.0	ug/l	Upper Range	200	ug/l	Default Output	2.00	mA
Upper Range	200	ug/l	Unit (L)	ug/l		Lower Limit	0.00	ug/l
Date	2 - 17 - 2022		Address	18	16	Upper Limit	200	ug/l
Time	10 : 54							

MAX: 14 MIN: 0

6.86

7 8 9 Clr Esc

4 5 6 BS Del

1 2 3 ← →

. 0 - Enter

Discard Save

DWG-5088Pro Shanghai Boqu Instrument Co., Ltd. 02/17/2022 10:54:46 Exit

After inputting the required value, press the "enter" key to close the numeric input keyboard and select other parameters to modify.

After all parameters are modified, click "save parameters" button to save the setting results. If you do not need to save the modification results, click "do not save" to return to the main menu.

C. System testing

Click the "system test" icon on the main menu to enter the system test interface.



There are 8 buttons on this interface, corresponding to 4 sampling solenoid valves, 2 pumps, 1 alarm switch and 1 LED indicator. Click the button to open or close the corresponding parts, which is used to detect whether the action of each part is normal.

There is also a "Test Signal" button to test the input signal status. Click once, and the instrument will read the signals of sodium electrode, pH electrode and temperature electrode and display them.

There is a "Sample break" indicator on the right side of the upper row, which shows the status of the cut-off detector. It can only be observed and cannot be operated.

D. Calibration instrument

Click the "Calibration instrument" icon on the main menu to enter the calibration instrument interface, where the measurement parameters and the last calibration time are displayed.

After washing the standard bottle with the prepared standard sample, put the standard sample in and tighten the bottle cap.

Na+ Value <input type="text" value="4.00"/> pNa <input type="button" value="Start"/> Voltage <input type="text" value="-118.4"/> mV <input type="button" value="Comfirm"/> S= <input type="text" value="-58.66"/> E0= <input type="text" value="116.30"/> mV Calibration Last time <input type="text" value="3"/> / <input type="text" value="2"/> / <input type="text" value="2022"/> <input type="text" value="15"/> o'clock Measurement Na+ Standard sample <input type="button" value="Start"/> <input type="text" value="0.00"/> pNa <input type="button" value="Stop"/>	pH Value <input type="text" value="9.18"/> pH <input type="button" value="Start"/> Voltage <input type="text" value="-128.5"/> mV <input type="button" value="Comfirm"/> S= <input type="text" value="-59.04"/> E0= <input type="text" value="0.22"/> mV Calibration Last time <input type="text" value="2"/> / <input type="text" value="18"/> / <input type="text" value="2022"/> <input type="text" value="8"/> o'clock Measurement pH Standard sample <input type="button" value="Start"/> <input type="text" value="0.00"/> pH <input type="button" value="Stop"/>	
Please select the next action.		<input type="button" value="Save"/>
DWG-5088Pro Shanghai Boqu Instrument Co., Ltd. 02/18/2022 12:48:26		<input type="button" value="Exit"/>

Click the "start calibration" button below the selected standard sample, and the instrument starts to test the standard sample.

Na+ Value <input type="text" value="4.00"/> pNa <input type="button" value="Start"/> Voltage <input type="text" value="-118.4"/> mV <input type="button" value="Comfirm"/> S= <input type="text" value="-58.66"/> E0= <input type="text" value="116.30"/> mV Calibration Last time <input type="text" value="3"/> / <input type="text" value="2"/> / <input type="text" value="2022"/> <input type="text" value="15"/> o'clock Measurement Na+ Standard sample <input type="button" value="Start"/> <input type="text" value="0.00"/> pNa <input type="button" value="Stop"/>	pH Value <input type="text" value="9.18"/> pH <input type="button" value="Start"/> Voltage <input type="text" value="-128.5"/> mV <input type="button" value="Comfirm"/> S= <input type="text" value="-59.04"/> E0= <input type="text" value="0.22"/> mV Calibration Last time <input type="text" value="2"/> / <input type="text" value="18"/> / <input type="text" value="2022"/> <input type="text" value="8"/> o'clock Measurement pH Standard sample <input type="button" value="Start"/> <input type="text" value="0.00"/> pH <input type="button" value="Stop"/>	
Please click "confirm" after the sample value is stable.		<input type="button" value="Save"/>
DWG-5088Pro Shanghai Boqu Instrument Co., Ltd. 02/18/2022 12:59:18		<input type="button" value="Exit"/>

After clearing the flow path, flushing the flow path and injecting the standard sample, the instrument displays the sampling value of the current standard sample. When the displayed sampling value is stable, click the "Confirm" button below to complete the sampling of this standard sample, and calculate the s value and E0 value, waiting for the next standard sample calibration.

<p>Na+ Standard 1 Standard 2</p> <p>Value <input type="text" value="4.00"/> pNa <input type="text" value="5.00"/> pNa</p> <p><input type="button" value="Start"/> <input type="button" value="Start"/></p> <p>Voltage <input type="text" value="-118.4"/> mV <input type="text" value="-178.1"/> mV</p> <p><input type="button" value="Confirm"/> <input type="button" value="Confirm"/></p> <p>S= <input type="text" value="-59.77"/> E0= <input type="text" value="120.70"/> mV</p> <p>Calibration Last time <input type="text" value="3"/> / <input type="text" value="2"/> / <input type="text" value="2022"/> <input type="text" value="15"/> o'clock</p> <p>Measurement Na+ Standard sample <input type="button" value="Start"/> <input type="text" value="0.00"/> pNa <input type="button" value="Stop"/></p>	<p>pH Standard 1 Standard 2</p> <p>Value <input type="text" value="9.18"/> pH <input type="text" value="6.86"/> pH</p> <p><input type="button" value="Start"/> <input type="button" value="Start"/></p> <p>Voltage <input type="text" value="-128.5"/> mV <input type="text" value="8.5"/> mV</p> <p><input type="button" value="Confirm"/> <input type="button" value="Confirm"/></p> <p>S= <input type="text" value="-59.04"/> E0= <input type="text" value="0.22"/> mV</p> <p>Calibration Last time <input type="text" value="2"/> / <input type="text" value="18"/> / <input type="text" value="2022"/> <input type="text" value="8"/> o'clock</p> <p>Measurement pH Standard sample <input type="button" value="Start"/> <input type="text" value="0.00"/> pH <input type="button" value="Stop"/></p>
<p>Calibration is successful, Please select the next action.</p> <p><input type="button" value="Save"/></p>	
<p>DWG-5088Pro Shanghai Boqu Instrument Co., Ltd. 02/18/2022 13:00:07 <input type="button" value="Exit"/></p>	

Use the same method to calibrate other standard samples.

When calibrating the pH electrode, it is necessary to carefully take out the electrode and immerse it into the container containing the corresponding standard solution to keep the standard solution submerged in the electrode head.

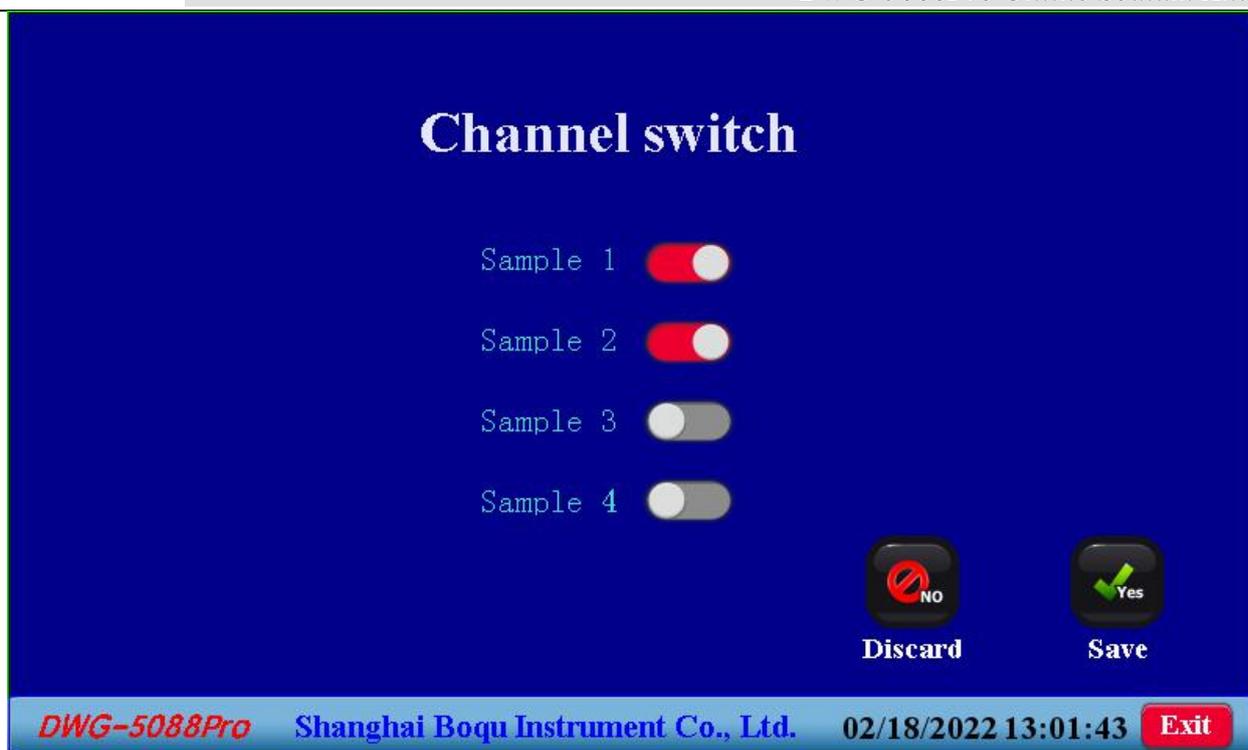
After all calibration work is completed, click "Save " to return to the main menu.

If you are not satisfied with the calibration results, please click "Exit" to return to the main menu without saving the calibration results.

E. Channel switch

When there is no water sample in a channel on site, the multi-channel instrument can choose to close one or more channels.

Click the "channel switch" icon on the main menu to enter the channel selection interface.



Click the switch on the right side of water sample 1 and water sample 2 to open or close the corresponding channel, and the closed channel will no longer be measured and displayed.

Note: do not close all channels at the same time, otherwise the first channel will be opened automatically by default.

F. Query historical data

Click the "historical data" icon on the main menu to enter the historical data query interface.

Unit: ug/l		Historical data query				Select date
Date	Time	Sample 1	Sample 2	Sample 3	Sample 4	2022/02/18
22/02/18	13:00	321800.0	304584.0	56.1	56.	
22/02/18	12:55	321800.0	304584.0	56.1	56.	
22/02/18	12:50	321800.0	304584.0	56.1	56.	
22/02/18	12:45	321800.0	304584.0	56.1	56.	
22/02/18	12:40	321800.0	307488.0	56.1	56.	
22/02/18	12:35	321800.0	310408.0	56.1	56.	
22/02/18	12:30	321800.0	333192.0	56.1	56.	
22/02/18	12:25	335824.0	333192.0	56.1	56.	
22/02/18	12:20	316536.0	333192.0	56.1	56.	
22/02/18	12:15	324624.0	333192.0	56.1	56.	
22/02/18	12:10	324624.0	322808.0	56.1	56.	
22/02/18	12:05	324624.0	324624.0	56.1	56.	
22/02/18	12:00	324624.0	324624.0	56.1	56.	
22/02/18	11:55	324624.0	324624.0	56.1	56.	

In this state, you can drag the scroll bars on the right and bottom of the data table to view the historical data of the day. The contents of the historical data table may vary slightly depending on the batch of instruments purchased.

If you need to query the historical data of other dates, click the date selection box in the upper right corner and select the date to be queried in the drop-down list.

After the query is completed, click "Exit" in the lower right corner to return to the main menu.

F. Query history curve

Click the "historical curve" icon on the main menu to enter the historical curve query interface.



You can drag the scroll bar below the curve to view the historical curve of the day back and forth. Click any position on the curve, and the measured value of corresponding time will be displayed in the right data box.

Click the date selection box in the upper right corner and select the date in the drop-down list to query the historical curve of other dates.

G. How to return to measurement

After the operation is completed, click the "Exit" button in the lower right corner to directly return to the measurement state.

5. Precautions for use

① Notes on instruments

- A. After the power is turned on, the instrument should display the model and logo. If there is no display, the power should be turned off immediately.
- B. The lead wire of the electrode and the connecting plug at the back of the instrument should not be wet, otherwise the measurement accuracy will be seriously affected.
- C. Before the instrument is put into operation, the electrode shall be activated or the instrument shall be calibrated as required.
- D. When using, the bottles containing standard samples should be repeatedly rinsed with sodium free water.

E. When measuring, if the pH value indicated by the instrument is less than 10.5, please check the alkalization effect before measuring. If the alkalization is normal, please check the pH electrode and recalibrate the pH.

F. In the measurement of low concentration Na^+ , special attention should be paid to the washing of electrode to avoid inaccurate measurement results caused by electrode pollution.

② Notice about electrode

A. The PNA electrode newly purchased or not used for a long time should be cleaned with cotton dipped in essence, then washed with water, and then immersed in 5% HCl solution for 10 minutes, then removed and washed with distilled water. Finally, it was immersed in the alkalized pna4 solution for several hours to restore the normal performance of the electrode.

B. Do not touch the sensitive membrane of electrode by hand to avoid contamination or breakage of electrode.

C. If the electrode response is slow and the positioning time is too long, please consider replacing the new electrode.

D. When it is not used for a short time, the measuring electrode should be placed in the positioning solution.

E. When it is not used for a long time, the measuring electrode should be put dry.

F. The electrode plug must be kept dry to ensure the measurement accuracy.

6. Complete set of instruments

➤ Online Sodium Analyzer host	1
➤ Online sodium ion measuring electrode	1
➤ Online pH composite electrode	1
➤ Temperature sensor	1
➤ Flow path system	1
➤ Instruction manual	1
➤ Certificate	1
➤ Packing list	1

Note: in case of any change, it shall be subject to the packing list of the instrument.

The electrode is a consumable, even if it is not used, its life will be reduced.

Therefore, the electrode may not be delivered with the instrument (according to the user's requirements). Please contact the manufacturer ten days in advance when installing and using. The manufacturer will send it to you by express.

7. appendix

Appendix I Preparation method of pNa standard solution

- ① Preparation of pNa2 stock solution
 - a. 1.1690g of analytical pure NaCl was accurately weighed and dried at 250 °C for 1-2 hours.
 - b. It was dissolved in a 2 l volumetric flask with reagent grade sodium free water, and stored in a polyethylene plastic bottle after accurate constant volume.
- ② Preparation of pNa4 standard solution

Take appropriate amount of pNa2 stock solution and dilute it to 100 times with reagent grade sodium free water.
- ③ Preparation of pNa5 standard solution

Appropriate amount of pna4 stock solution was taken and diluted to 10 times with reagent grade sodium free water.
- ④ Preparation of pNa6 standard solution

Take appropriate amount of pna5 standard solution and dilute it to 10 times with reagent grade sodium free water.
- ⑤ Preparation of pNa7 standard solution

Appropriate amount of pna6 stock solution was taken and diluted to 10 times with reagent grade sodium free water.

Appendix II Comparison table of pNa value and Na + concentration

pNa	Na ⁺ mg/L	pNa	Na ⁺ mg/L	pNa	Na ⁺ ug/L	pNa	Na ⁺ ug/L	pNa	Na ⁺ ug/L
2.00	230	2.40	91.6	2.80	36500	3.20	14500	3.60	5780
2.01	225	2.41	89.5	2.81	35600	3.21	14200	3.61	5650
2.02	220	2.42	87.4	2.82	34800	3.22	13900	3.62	5520
2.03	215	2.43	85.4	2.83	34000	3.23	13500	3.63	5390
2.04	210	2.44	83.5	2.84	33300	3.24	13200	3.64	5270
2.05	205	2.45	81.6	2.85	32500	3.25	12900	3.65	5150
2.06	200	2.46	79.7	2.86	31700	3.26	12600	3.66	5030
2.07	196	2.47	77.9	2.87	31000	3.27	12400	3.67	4920
2.08	191	2.48	76.2	2.88	30300	3.28	12100	3.68	4810
2.09	187	2.49	74.4	2.89	29600	3.29	11800	3.69	4700
2.10	183	2.50	72.7	2.90	29000	3.30	11500	3.70	4590
2.11	179	2.51	71.1	2.91	28300	3.31	11300	3.71	4480
2.12	175	2.52	69.5	2.92	27700	3.32	11000	3.72	4380
2.13	171	2.53	67.9	2.93	27000	3.33	10800	3.73	4280
2.14	167	2.54	66.3	2.94	26400	3.34	10500	3.74	4190
2.15	163	2.55	64.8	2.95	25800	3.35	10300	3.75	4090
2.16	159	2.56	63.3	2.96	25200	3.36	10000	3.76	4000
2.17	156	2.57	61.9	2.97	24700	3.37	9810	3.77	3910
2.18	152	2.58	60.6	2.98	24100	3.38	9590	3.78	3820
2.19	149	2.59	59.1	2.99	23600	3.39	9370	3.79	3730
2.20	145	2.60	57.8	3.00	23000	3.40	9160	3.80	3650
2.21	142	2.61	56.5	3.01	22500	3.41	8950	3.81	3560
2.22	139	2.62	55.2	3.02	22000	3.42	8740	3.82	3480
2.23	135	2.63	53.9	3.03	21500	3.43	8540	3.83	3400
2.24	132	2.64	52.7	3.04	21000	3.44	8350	3.84	3330
2.25	129	2.65	51.5	3.05	20500	3.45	8160	3.85	3250
2.26	126	2.66	50.3	3.06	20000	3.46	7970	3.86	3170
2.27	124	2.67	49.2	3.07	19600	3.47	7790	3.87	3100
2.28	121	2.68	48.1	3.08	19100	3.48	7620	3.88	3030
2.29	118	2.69	47.0	3.09	18700	3.49	7440	3.89	2960
2.30	115	2.70	45.9	3.10	18300	3.50	7270	3.90	2900
2.31	113	2.71	44.8	3.11	17900	3.51	7110	3.91	2830
2.32	110	2.72	43.8	3.12	17500	3.52	6950	3.92	2770
2.33	108	2.73	42.8	3.13	17100	3.53	6790	3.93	2700
2.34	105	2.74	41.9	3.14	16700	3.54	6630	3.94	2640
2.35	103	2.75	40.9	3.15	16300	3.55	6480	3.95	2580
2.36	100	2.76	40.0	3.16	15900	3.56	6330	3.96	2520
2.37	98.1	2.77	39.1	3.17	15600	3.57	6190	3.97	2470
2.38	95.9	2.78	38.2	3.18	15200	3.58	6060	3.98	2410
3.39	93.7	2.79	37.3	3.19	14900	3.59	5910	3.99	2360

pNa	Na ⁺ ug/L								
4.00	2300	4.40	916	4.80	365	5.20	145	5.60	57.8
4.01	2250	4.41	895	4.81	356	5.21	142	5.61	56.5
4.02	2200	4.42	874	4.82	348	5.22	139	5.62	55.2
4.03	2150	4.43	854	4.83	340	5.23	135	5.63	53.9
4.04	2100	4.44	835	4.84	333	5.24	132	5.64	52.7
4.05	2050	4.45	816	4.85	325	5.25	129	5.65	51.5
4.06	2000	4.46	797	4.86	317	5.26	126	5.66	50.3
4.07	1960	4.47	779	4.87	310	5.27	124	5.67	49.2
4.08	1910	4.48	762	4.88	303	5.28	121	5.68	48.1
4.09	1870	4.49	744	4.89	296	5.29	118	5.69	47.0
4.10	1830	4.50	727	4.90	290	5.30	115	5.70	45.9
4.11	1790	4.51	711	4.91	283	5.31	113	5.71	44.8
4.12	1750	4.52	695	4.92	277	5.32	110	5.72	43.8
4.13	1710	4.53	679	4.93	270	5.33	108	5.73	42.8
4.14	1670	4.54	663	4.94	264	5.34	105	5.74	41.9
4.15	1630	4.55	648	4.95	258	5.35	103	5.75	40.9
4.16	1590	4.56	633	4.96	252	5.36	100	5.76	40.0
4.17	1560	4.57	619	4.97	247	5.37	98.1	5.77	39.1
4.18	1520	4.58	606	4.98	241	5.38	95.9	5.78	38.2
4.19	1490	4.59	591	4.99	236	5.39	93.7	5.79	37.3
4.20	1450	4.60	578	5.00	230	5.40	91.6	5.80	36.5
4.21	1420	4.61	565	5.01	225	5.41	89.5	5.81	35.6
4.22	1390	4.62	552	5.02	220	5.42	87.4	5.82	34.8
4.23	1350	4.63	539	5.03	215	5.43	85.4	5.83	34.0
4.24	1320	4.64	527	5.04	210	5.44	83.5	5.84	33.3
4.25	1290	4.65	515	5.05	205	5.45	81.6	5.85	32.5
4.26	1260	4.66	503	5.06	200	5.46	79.7	5.86	31.7
4.27	1240	4.67	492	5.07	196	5.47	77.9	5.87	31.0
4.28	1210	4.68	481	5.08	191	5.48	76.2	5.88	30.3
4.29	1180	4.69	470	5.09	187	5.49	74.4	5.89	29.6
4.30	1150	4.70	459	5.10	183	5.50	72.7	5.90	29.0
4.31	1130	4.71	448	5.11	179	5.51	71.1	5.91	28.3
4.32	1100	4.72	438	5.12	175	5.52	69.5	5.92	27.7
4.33	1080	4.73	428	5.13	171	5.53	67.9	5.93	27.0
4.34	1050	4.74	419	5.14	167	5.54	66.3	5.94	26.4
4.35	1030	4.75	409	5.15	163	5.55	64.8	5.95	25.8
4.36	1000	4.76	400	5.16	159	5.56	63.3	5.96	25.2
4.37	981	4.77	391	5.17	156	5.57	61.9	5.97	24.7
4.38	959	4.78	382	5.18	152	5.58	60.6	5.98	24.1
4.39	937	4.79	373	5.19	149	5.59	59.1	5.99	23.6

pNa	Na ⁺ ug/L								
6.00	23.0	6.40	9.16	6.80	3.65	7.20	1.45	7.60	0.578
6.01	22.5	6.41	8.95	6.81	3.56	7.21	1.42	7.61	0.565
6.02	22.0	6.42	8.74	6.82	3.48	7.22	1.39	7.62	0.552
6.03	21.5	6.43	8.54	6.83	3.40	7.23	1.35	7.63	0.539
6.04	21.0	6.44	8.35	6.84	3.33	7.24	1.32	7.64	0.527
6.05	20.5	6.45	8.16	6.85	3.25	7.25	1.29	7.65	0.515
6.06	20.0	6.46	7.97	6.86	3.17	7.26	1.26	7.66	0.503
6.07	19.6	6.47	7.79	6.87	3.10	7.27	1.24	7.67	0.492
6.08	19.1	6.48	7.62	6.88	3.03	7.28	1.21	7.68	0.481
6.09	18.7	6.49	7.44	6.89	2.96	7.29	1.18	7.69	0.470
6.10	18.3	6.50	7.27	6.90	2.90	7.30	1.15	7.70	0.459
6.11	17.9	6.51	7.11	6.91	2.83	7.31	1.13	7.71	0.448
6.12	17.5	6.52	6.95	6.92	2.77	7.32	1.10	7.72	0.438
6.13	17.1	6.53	6.79	6.93	2.70	7.33	1.08	7.73	0.428
6.14	16.7	6.54	6.63	6.94	2.64	7.34	1.05	7.74	0.419
6.15	16.3	6.55	6.48	6.95	2.58	7.35	1.03	7.75	0.409
6.16	15.9	6.56	6.33	6.96	2.52	7.36	1.00	7.76	0.400
6.17	15.6	6.57	6.19	6.97	2.47	7.37	0.981	7.77	0.391
6.18	15.2	6.58	6.06	6.98	2.41	7.38	0.959	7.78	0.382
6.19	14.9	6.59	5.91	6.99	2.36	7.39	0.937	7.79	0.373
6.20	14.5	6.60	5.78	7.00	2.30	7.40	0.916	7.80	0.365
6.21	14.2	6.61	5.65	7.01	2.25	7.41	0.895	7.81	0.356
6.22	13.9	6.62	5.52	7.02	2.20	7.42	0.874	7.82	0.348
6.23	13.5	6.63	5.39	7.03	2.15	7.43	0.854	7.83	0.340
6.24	13.2	6.64	5.27	7.04	2.10	7.44	0.835	7.84	0.333
6.25	12.9	6.65	5.15	7.05	2.05	7.45	0.816	7.85	0.325
6.26	12.6	6.66	5.03	7.06	2.00	7.46	0.797	7.86	0.317
6.27	12.4	6.67	4.92	7.07	1.96	7.47	0.779	7.87	0.310
6.28	12.1	6.68	4.81	7.08	1.91	7.48	0.762	7.88	0.303
6.29	11.8	6.69	4.70	7.09	1.87	7.49	0.744	7.89	0.296
6.30	11.5	6.70	4.59	7.10	1.83	7.50	0.727	7.90	0.290
6.31	11.3	6.71	4.48	7.11	1.79	7.51	0.711	7.91	0.283
6.32	11.0	6.72	4.38	7.12	1.75	7.52	0.695	7.92	0.277
6.33	10.8	6.73	4.28	7.13	1.71	7.53	0.679	7.93	0.270
6.34	10.5	6.74	4.19	7.14	1.67	7.54	0.663	7.94	0.264
6.35	10.3	6.75	4.09	7.15	1.63	7.55	0.648	7.95	0.258
6.36	10.0	6.76	4.00	7.16	1.59	7.56	0.633	7.96	0.252
6.37	9.81	6.77	3.91	7.17	1.56	7.57	0.619	7.97	0.247
6.38	9.59	6.78	3.82	7.18	1.52	7.58	0.606	7.98	0.241
6.39	9.37	6.79	3.73	7.19	1.49	7.59	0.591	7.99	0.236

Appendix III Preparation of pH buffer solution

- pH1.679 Standard buffer solution: Weigh 2.61g of GR potassium hydrogen Tetraoxalate and dissolve it in 1000ml of redistilled water.
- pH4.005 Standard buffer solution: Weigh 10.21g GR potassium hydrogen phthalate and dissolve it in 1000ml redistilled water.
- pH6.685 Standard buffer solution: Weigh 3.4g GR potassium dihydrogen phosphate and 3.55g GR disodium hydrogen phosphate and dissolve them in 1000ml redistilled water.
- pH9.180 Standard buffer solution: Weigh 3.81g GR sodium borate and dissolve it in 1000ml redistilled water.
- pH12.454 Standard buffer solution: Add excess calcium hydroxide powder (more than 2 g per liter) into polyethylene bottle containing heavy distilled water, shake violently for 30min, and take the clear solution for use.

Appendix IV Comparison table of pH value and temperature of buffer solution

Temperature (°C)	Potassium hydrogen Tetraoxalate (0.05mol/kg)	Potassium hydrogen phosphate phthalate (0.05mol/kg)	Phosphate mixture (0.25mol/kg)	Sodium borate (0.01mol/kg)	Calcium hydroxide (25°C saturated)
0	1.666	4.000	6.984	9.464	13.423
5	1.668	3.998	6.951	9.395	13.207
10	1.670	3.997	6.923	9.332	13.003
15	1.672	3.998	6.900	9.276	12.810
20	1.675	4.001	6.881	9.225	12.627
25	1.679	4.005	6.865	9.180	12.454
30	1.683	4.011	6.853	9.139	12.289
35	1.688	4.018	6.844	9.102	12.133
37	1.691	4.022	6.841	9.088	12.059
40	1.694	4.027	6.838	9.068	11.984
45	1.700	4.039	6.836	9.040	11.841
50	1.707	4.050	6.833	9.011	11.705
55	1.715	4.065	6.835	8.986	11.574
60	1.723	4.080	6.836	8.962	11.449

Appendix V Precautions in use

- The shelf life of the glass electrode is one year. After leaving the factory for one year, whether it is used or not, its performance will be affected, so it should be replaced in time.
- The pH electrode used for the first time or unused for a long time must be immersed in 3mol / L potassium chloride solution for 24 hours before use.
- The unused sodium electrode used for the first time or put aside for a long time should be cleaned with cotton dipped in essence, then washed with water, and then immersed in 5% HCl solution for 10 minutes, then removed and washed with distilled water. Finally, the electrode was immersed in the alkalized pna4 solution for several hours to restore the normal performance of the electrode.
- When the instrument is not used for a long time, please cut off the AC power supply to avoid accidents.