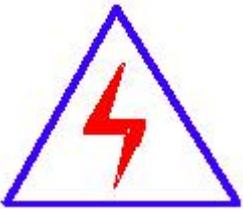


Dear Client

Thank you for Purchasing our **HTYZL-H Automatic Tension Tester**. Please read the manual in detail prior to first use, which will help you use the equipment skillfully.



Our aim is to improve and perfect the company's products continually, so there may be slight differences between your purchase equipment and its instruction manual. You can find the changes in the appendix. Sorry for the inconvenience. If you have further questions, welcome to contact with our service department.



The input/output terminals and the test column may bring voltage, when you plug/draw the test wire or power outlet, they will cause electric spark. PLEASE CAUTION RISK OF ELECTRICAL SHOCK!

Company Address:

- ◆ T4, No. 41, High-tech 2 Road, East Lake High-tech Development Zone, Wuhan
- ◆ Sales Hotline: 86-27- 87457960
- ◆ After Service Hotline: 86-27- 87459656
- ◆ Fax: 86-27- 87803129
- ◆ E-mail: qiao@hvtest.cc
- ◆ Website: www.hvtest.cc

◆ **SERIOUS COMMITMENT**

All products of our company carry one year limited warranty from the date of shipment. If any such product proves defective during this warranty period we will maintain it for free. Meanwhile we implement lifetime service. Except otherwise agreed by contract.

◆ **SAFETY REQUIREMENTS**

Please read the following safety precautions carefully to avoid body injury and prevent the product or other relevant subassembly to damage. In order to avoid possible danger, this product can only be used within the prescribed scope.

Only qualified technician can carry out maintenance or repair work.

--To avoid fire and personal injury:

Use Proper Power Cord

Only use the power wire supplied by the product or meet the specification of this produce.

Connect and Disconnect Correctly

When the test wire is connected to the live terminal, please do not connect or disconnect the test wire.

Grounding

The product is grounded through the power wire; besides, the ground pole of the shell must be grounded. To prevent electric shock, the grounding conductor must be connected to the ground.

Make sure the product has been grounded correctly before connecting with the input/output port.

Pay Attention to the Ratings of All Terminals

To prevent the fire hazard or electric shock, please be care of all ratings and labels/marks of this product. Before connecting, please read the instruction manual to acquire information about the ratings.

Do Not Operate without Covers

Do not operate this product when covers or panels removed.

Use Proper Fuse

Only use the fuse with type and rating specified for the product.

Avoid Touching Bare Circuit and Charged Metal

Do not touch the bare connection points and parts of energized equipment.

Do Not Operate with Suspicious Failures

If you encounter operating failure, do not continue. Please contact with our maintenance staff.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in Explosive Atmospheres.

Ensure Product Surfaces Clean and Dry.

—Security Terms

Warning: indicates that death or severe personal injury may result if proper precautions are not taken

Caution: indicates that property damage may result if proper precautions are not taken.

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I. Overview

Automatic interfacial tension tester, in accordance with GB6541-86 "Petroleum products oil to water interfacial tension measurement method" (circle method) standard requirements, measure the surface tension of various liquids (liquid-gas interface) and the interface between mineral oil and water Tension (liquid-liquid interface). The instrument adopts a color touch screen display and a non-marked button with full Chinese character menu prompts. It has a high degree of automation, reliable work, good repeatability, and extremely simple operation. All tests can be completed by simply pressing the menu prompts after turning on the machine.

II. Technical parameters

Display method: color touch screen display, Chinese character menu prompt, Chinese character menu compiles all test and calculation contents in GB6541 standard. Measuring range: 2~200 millinewtons/m

Sensitivity: 0.1 millinewtons/meter

Accuracy: 0.1 millinewtons/meter

Resolution: 0.01 millinewtons/m

Repeatability: 0.3%

Applicable temperature: 10~30°C (typical value: 25°C)

Applicable humidity: (20~75)% RH

Power supply: AC 220V±5% 50Hz

Power: 20VA

Dimensions: 185×260×360 (mm) Weight: 15 kg

III. working principle

The working principle of the instrument is to apply the high-frequency induction micro-displacement automatic balance measurement system to the torsion balance, that is, when the force acting on the platinum ring changes, the balance bar connected with the platinum ring is in the two eddy current probes. Displacement occurs in the two eddy current probes, causing the differential transformer to lose balance, and the input signal of the differential amplifier in the circuit also loses balance. After being amplified by the amplifier, the output is amplified by the platinum ring. The electric signal that changes with the force, this signal is sent to the microprocessor for processing, and the actual tension of the tested sample is automatically calculated according to the international GB6541.

IV. Structural features (Figure 1)

1. Color LCD touch screen
2. Sample cup
3. Ring frame rod 7. Power socket
4. Platinum ring: for measuring sample
5. Sample tray
6. Machine foot: adjust the level of the instrument

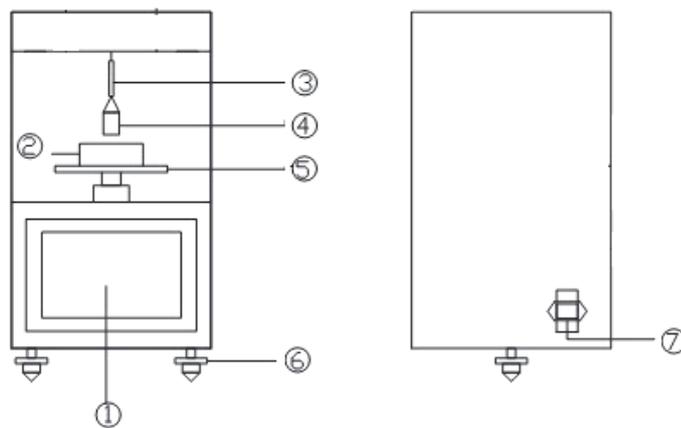


Figure 1

V. installation and level adjustment

Place the host on a stable platform with no wind flow, as shown in Figure 2, unscrew the two fixing screws on the back of the instrument, remove the upper top plate, and install the control magnet, ring frame rod, and platinum as shown in Figure 3. Ring (Platinum ring is inserted into the ring frame rod first, and the outer flame part of the alcohol lamp is burnt and clean before installation. Note: Do not touch the burnt and clean platinum ring). Adjust the three machine feet so that the level bubble on the sample pan is in the center, and finally put the upper top plate back in place and fix it with screws.

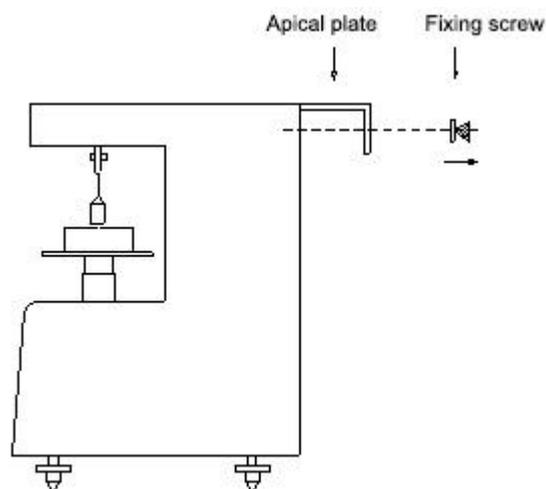


Figure 2

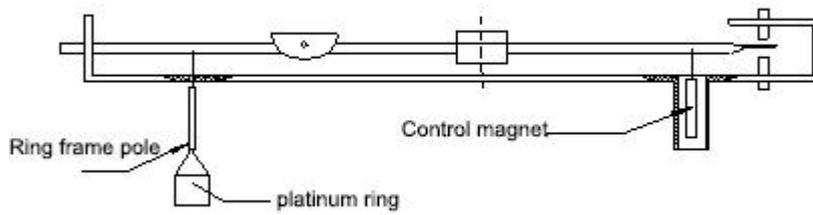


Figure 3

VI. Instrument Operation

After turning on the power, turn on the power switch. The instrument enters the following startup interface.



Press any key or automatically switch to the main menu page after 5 seconds.



Sample test: enter the sample test interface to perform sample test. Pure water

calibration: enter the pure water calibration interface and perform a pure water calibration test.

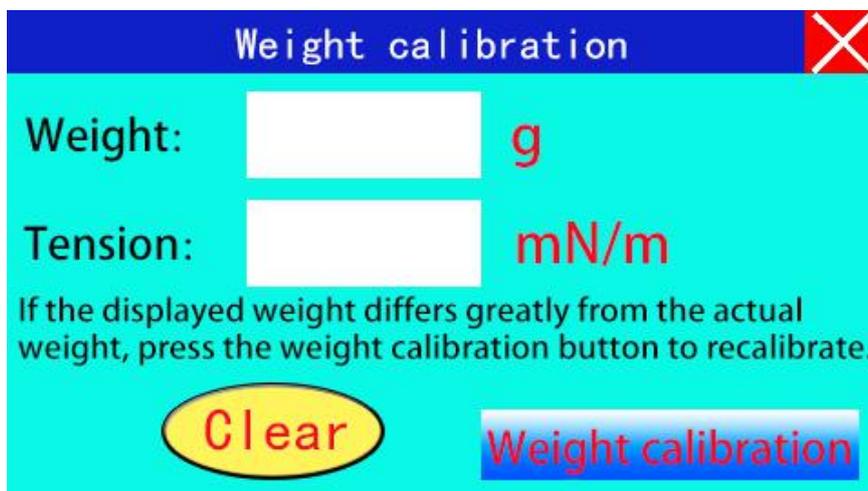
Parameter setting: Enter the parameter setting interface to set related parameters.

Historical record: Enter the historical record interface to view historical data.

Weight calibration: Enter the weight calibration interface. Perform instrument calibration and calibration.

Time setting: Enter the time setting interface, you can modify the system time.

1.0 Click on 'weight calibration' to enter the weight calibration interface:



1.1 After hanging the platinum ring and the inductor magnet, the "weight" of the

instrument normally displays within 0.050g. If the value is too large or lower than 0g, please check the position of the torque wire and the inductor magnet (whether it is in the center of the inductor).

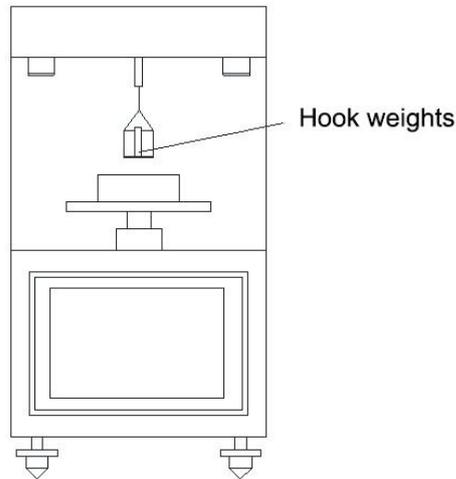


Figure 4

1.2 Click the "Reset" button and hang the 1.0g hook-shaped weight on the platinum ring according to Figure 4. The weight of the weight should display $1.000\text{g} \pm 0.010\text{g}$. If the weight of the weight is not correct, please press the "weight calibration" button to recalibrate.

2.0 Click 'Parameter Setting' to enter the parameter setting interface

The screenshot shows a software interface titled 'Parameter settings' with a red 'X' close button in the top right corner. The interface has a cyan background and contains the following fields and controls:

- Platinum wire radius: mm
- Platinum ring radius: mm
- Heavy liquid density: g/ml
- Light liquid density: g/ml
- Print switch
- A blue 'SAVE' button

2.1 Platinum wire radius: the radius of the platinum ring wire. Normally it is 0.30 mm.

Click the data box to pop up the numeric keyboard, enter the data.

2.2 Platinum ring radius: the radius of the platinum ring. Normally it is 9.8 mm. Click

the data box to pop up the numeric keyboard, enter the data.

2.3 Density of heavy liquid: The density of the sample with heavy density (for example, water is 1.000). Click the data box to pop up the numeric keyboard, enter

the data.

2.4 Light liquid density: the density of light samples (for example, transformer oil is 0.875). Click the data box to pop up the numeric keyboard, enter the data.

2.5 After setting the parameters, press the "Save button" to save the current parameters. Press the "X" button to return to the previous menu. (All data has been entered and confirmed when leaving the factory, and there is no need to modify it if there are no special circumstances.)

3. Pure water calibration

3.1 Preparations (implementing Article 4.1 of BG6541) Clean the sample cup with petroleum ether, then wash with acetone and water respectively, and then wash with hot chromic acid lotion to remove oil stains, and finally rinse with water and distilled water. If the sample is not used immediately, it should be poured into a clean On the cloth. Clean the platinum ring with petroleum ether, rinse with methyl ethyl ketone, and heat it in the oxidizing flame of an alcohol lamp. Note: To clean the platinum ring, it should be removed from the rod of the ring frame. When removing and installing the platinum ring, be sure to handle it gently. After installing the platinum ring, make sure that each part of the platinum ring is on the same plane (Figure 5).). Hang the cleaned platinum ring. Pour pure water into the clean sample cup to the middle scale

mark of the sample cup. Place the sample cup in the middle of the sample pan.

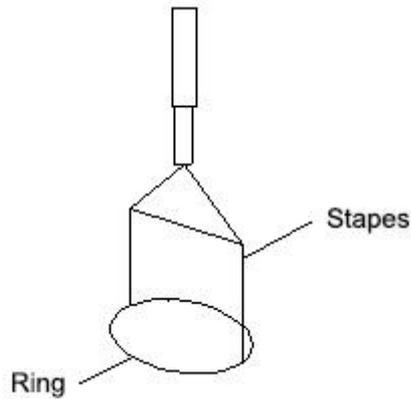
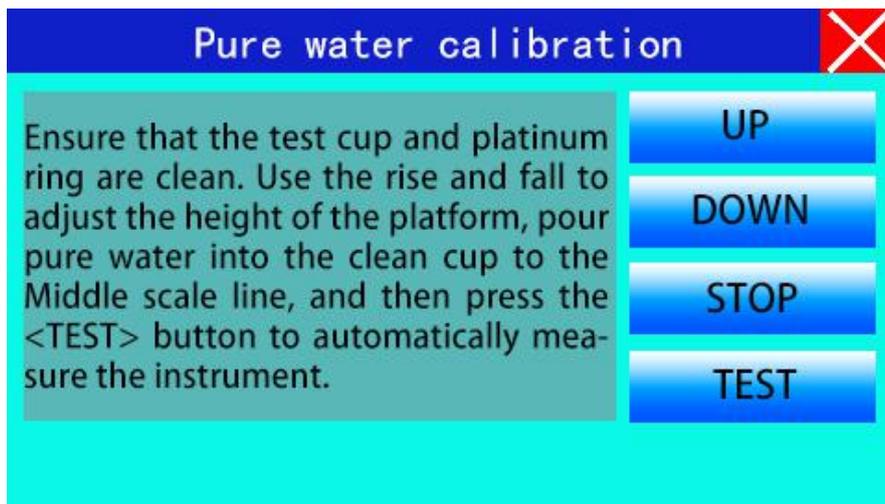
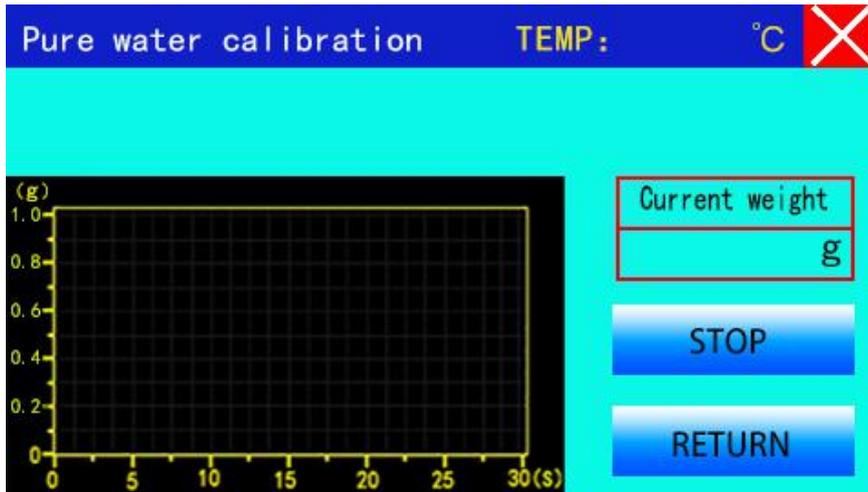


Figure 5

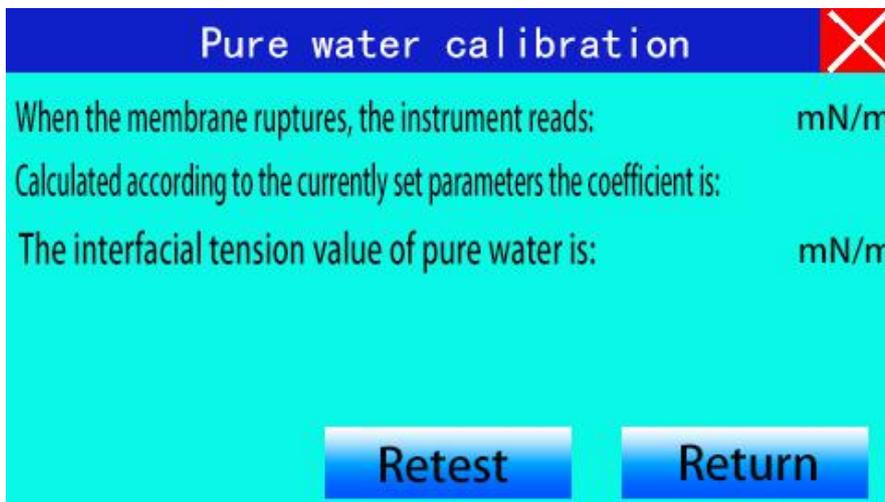
3.2 Click "Pure Water Calibration" to enter the pure water calibration interface



3.3 Click 'Up' to increase the sample tray, and click 'Down' to decrease the sample tray. Click 'start', the instrument will automatically adjust the position of the sample tray and switch to the following interface



To stop the test, click 'Stop'. Click 'Return' to stop the current operation and return to the menu selection interface. After the countdown is over, the pure water test will start automatically and the tension dynamic curve will be displayed. After the test, the instrument will calculate the result according to the set parameters and display it on the interface.



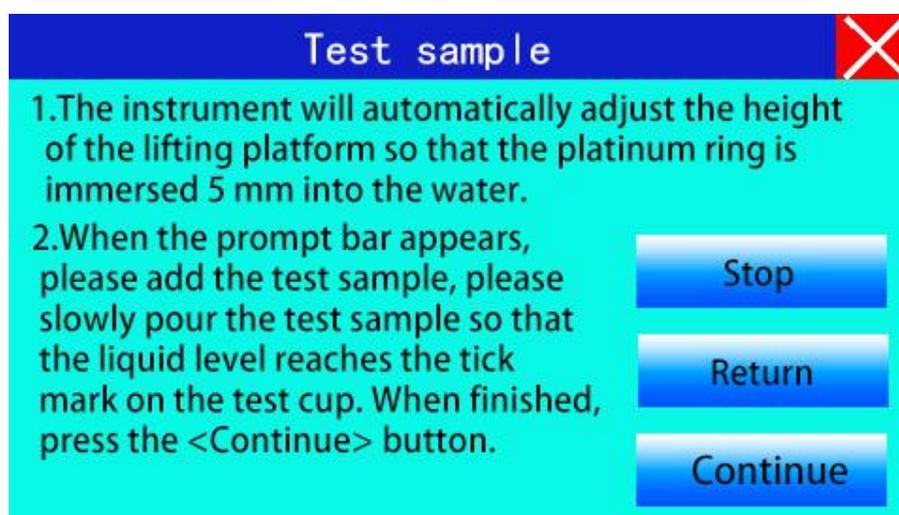
Click "retest" to return to the pure water calibration interface to continue testing. Click 'Return' to return to the menu selection interface.

3.4 According to Article 5.3 of GB6541, the calibration value of pure water should be between 71 and 72 millinewtons/m. If there is a difference, please repeat Article 1.1, 1.2 and 3.1 of this manual and burn the platinum ring on the alcohol lamp to Clean. (Pour absolute ethanol into the tension cup before making the oil sample, replace

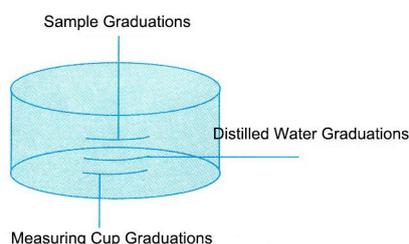
pure water with alcohol, and repeat the pure water calibration test to improve the cleanliness of the platinum ring. The tension value of absolute ethanol above 22 indicates the cleanliness of the platinum ring Basically, it can be replaced with pure water for pure water calibration until the calibration value reaches between 71 and 72 millinewtons/m) 3.5 After passing the pure water calibration, press the "return" key to return to the menu selection interface.

4. Sample test

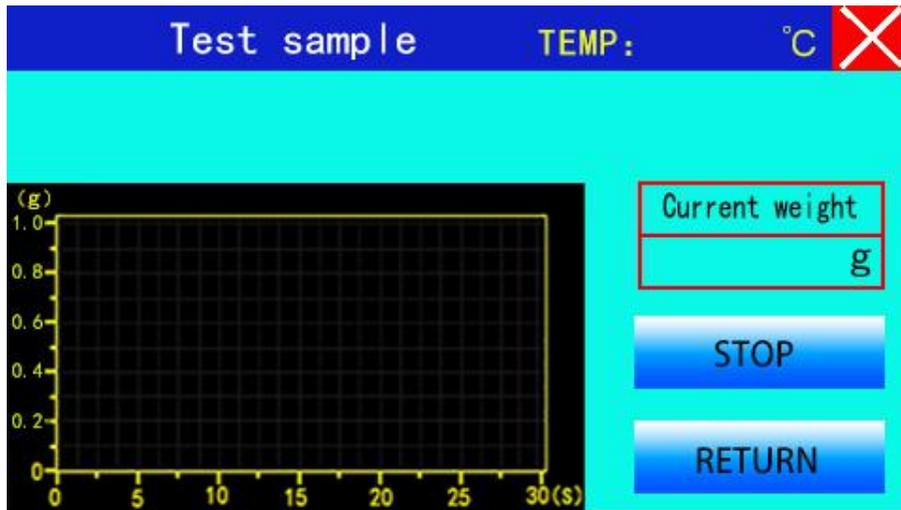
4.1 Click "Sample Test" to enter the sample test interface



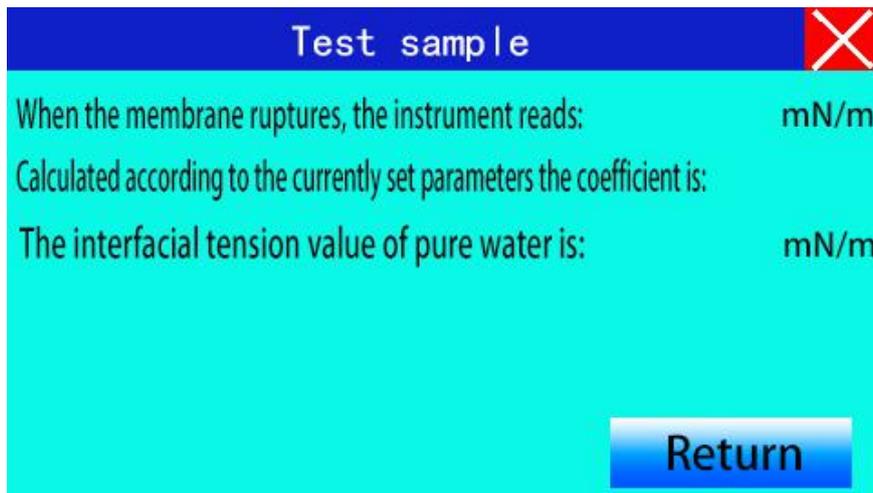
The distilled water and sample pouring position are shown in the figure below:



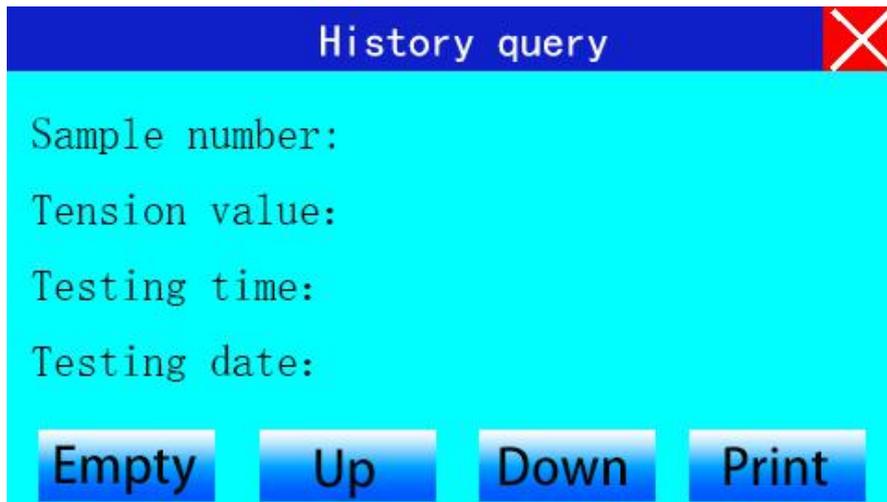
After adding the sample according to the prompts, click "Continue", the tension test will be automatically delayed after 30 seconds, and the tension dynamic curve will be displayed.



If you need to pause the test, click the "Stop" button. Click 'Return' to stop the current operation and return to the menu selection interface. At the end of the test, the instrument will display the calculation result of the set parameters to the interface. Test results are automatically stored in history.



Click "retest" to return to the pure water calibration interface. Click 'Return' to return to the menu selection interface. 5.0 Click "History Data" to enter the history record interface



6.0 Click "Previous" or "Next" to view historical records. Click 'Empty' to delete historical data.

7. Calculation basis for the results displayed by the instrument

The interfacial tension (millinewtons/m) of the sample is calculated according to the

$$F = 0.7250 + \sqrt{\frac{0.03678 \times M}{r_0^2 (\rho_0 - \rho_1)}} + P \dots \dots \dots (2)$$

$$P = 0.04543 - \frac{1.679 \times r_1}{r_0} \dots \dots \dots (3)$$

formula $\sigma = M \times F \dots \dots (1)$: Among them: M—the value displayed on the display for the first time, millinewtons/meter;

F—Coefficient, calculated according to formula (2).

Where:

ρ_0 —the density of water at 25 (g/ml)

ρ_1 —The density of the sample at 25 (g/ml)

P—constant, calculated according to formula (3)

r_0 —The average radius of platinum ring (mm 0 meters)

r_1 —The radius of platinum wire (mm)

VII. Packing List

1. Host	1
2. Platinum ring	1
3. Set of pendant	1
4. Weight (1g)	1
5. Tension cup	1
6. Power cord	1
7. Printing paper	1
8. Product manual	1
9. Inspection report	1
10. Certificate	1