

Interfacial tension tester

Operation Manual



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1、 Overview

The interfacial tension tester is used to measure the surface tension of various liquids (liquid-gas phase interface) and the interfacial tension of mineral oil and water (liquid-liquid phase interface) according to the requirements of ASTM D971 petroleum product oil to water interfacial tension measurement method (ring method). The instrument adopts color touch screen display, no Logo Button with full Chinese menu prompt, high degree of automation, reliable operation, good repeatability, and extremely simple operation. All tests can be completed by pressing menu prompt after startup.

2、 Technical parameters

Display method: color touch screen display.

Measuring range: 2 ~ 200 mN / m

Sensitivity: 0.1 mN / m

Accuracy: 0.1 mN / m

Resolution: 0.01mN / 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

External dimension: 185 × two hundred and sixty × 360 (mm)

Weight: 15kg

3、 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 to the platinum ring will displace in the two eddy current probes, causing the inductance generated in the two eddy current probes to change, thus causing the differential transformer to lose balance, and the input signal of the differential amplifier in the circuit will also lose balance, After being amplified by the amplifier, an electrical signal that changes with the force of the platinum ring is output. This signal is sent to the microprocessor for processing, and the actual tension of the tested sample is automatically calculated according to the standard.

4、 Structural features (Figure 1)

- | | |
|--|--|
| 1. Color LCD touch screen | 6. Machine foot: adjust the instrument level |
| 2. Sample cup | 7. Printer |
| 3. Ring frame rod | 8. Power socket |
| 4. Platinum ring: for measuring sample | |
| 5. Sample tray | |

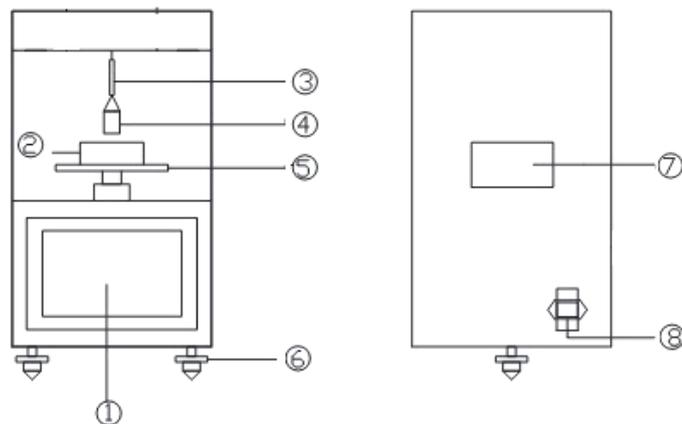


Figure 1

5、 Installation and leveling

Place the main machine on a stable platform without wind flow. As shown in Fig. 2, unscrew the two fixing screws on the rear side of the instrument, remove the upper top plate, and install the control magnet, ring frame rod and platinum ring according to the position shown in Fig. 3 (the platinum ring is inserted into the ring frame rod first, and can be installed only after the outer flame of the alcohol lamp is burned and cleaned. Note: do not touch the burned and clean platinum ring). Adjust the three machine feet so that the level bubble on the sample tray is in the center. Finally, put the upper top plate back and fix it with screws.

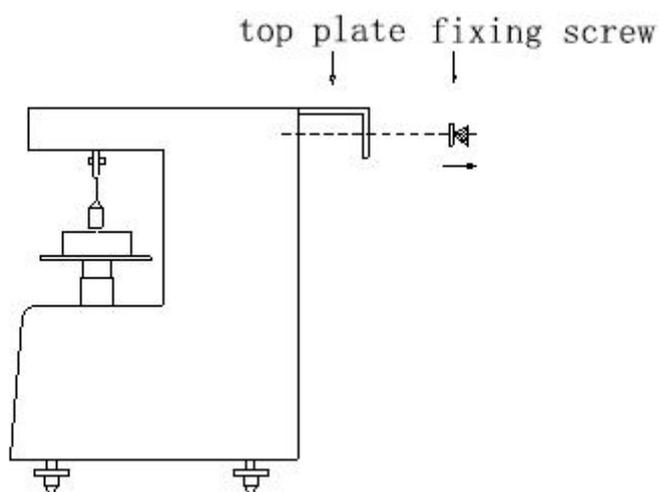


Figure 2

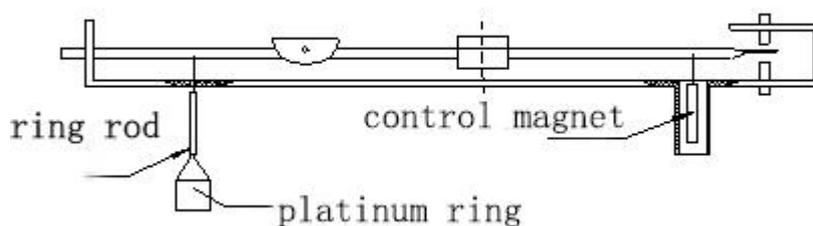


Figure 3

6、 Instrument operation

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



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



Sample test: enter the sample test interface to conduct sample test.

Pure water calibration: enter the pure water calibration interface to conduct pure water calibration test.

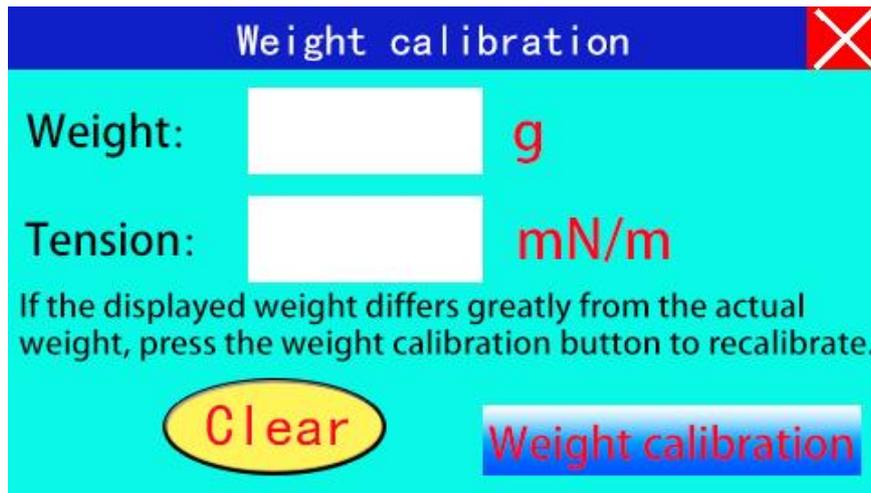
Parameter setting: enter the parameter setting interface to set relevant parameters.

History: enter the history interface to view historical data.

Weight calibration: enter the weight calibration interface. Calibrate and calibrate the instrument.

Time setting: enter the time setting interface to 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).

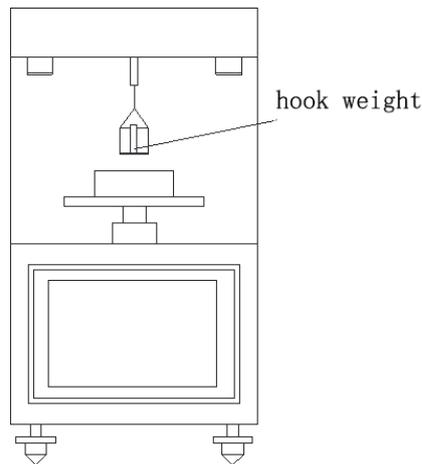
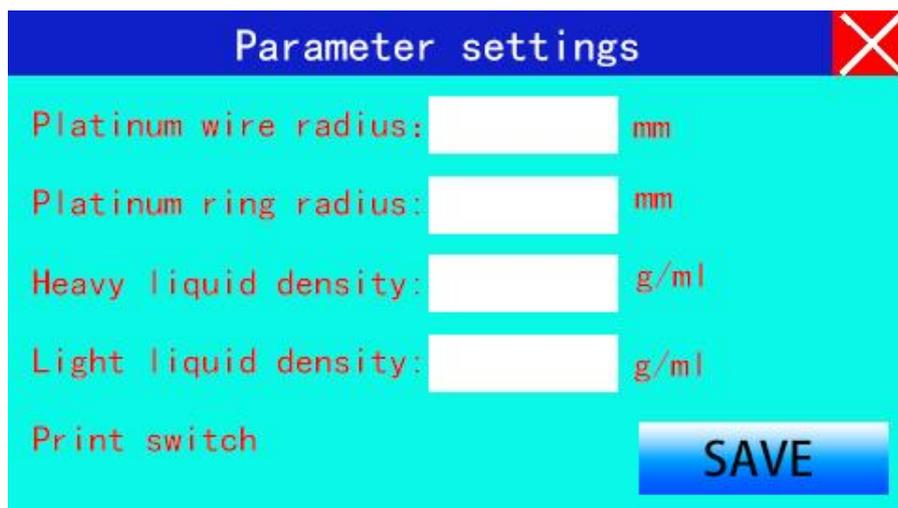


Figure 4

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



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.

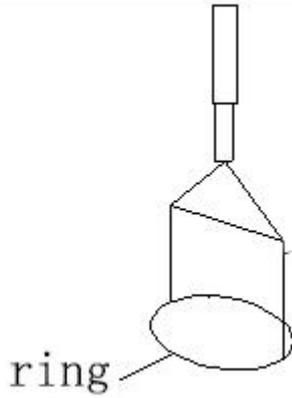
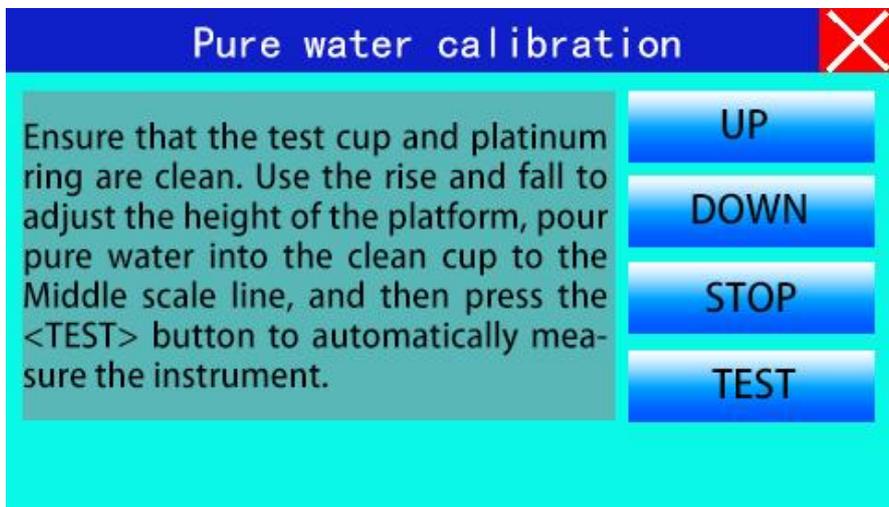
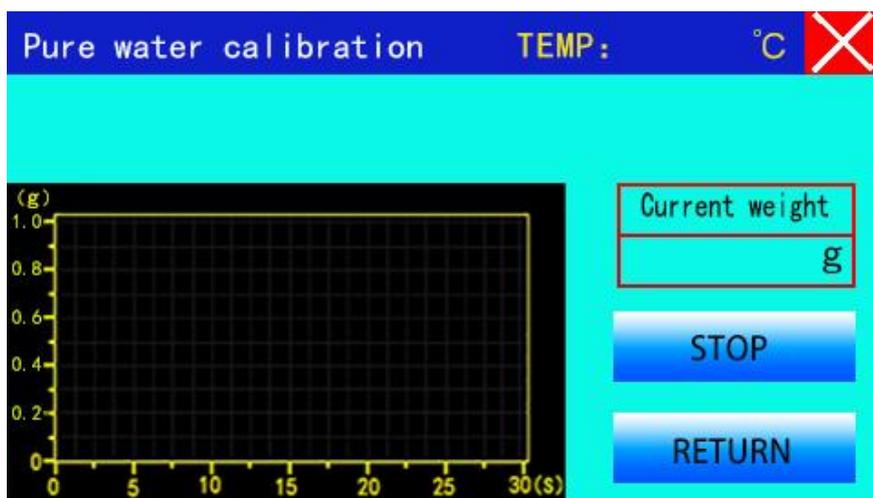


Figure 5

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

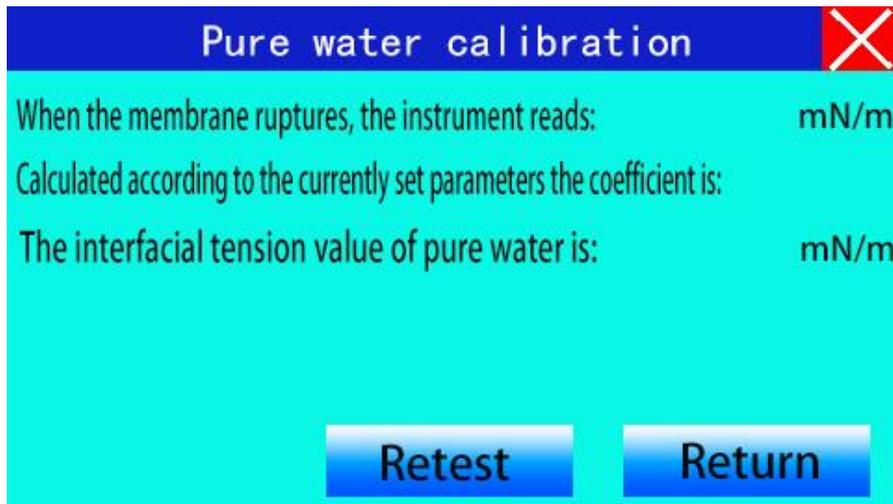


3.3 Click 'Up' to increase the sample tray, and click 'Down' to decrease the sample tray. Click 'start', the instrument will automatically adjust the position of the sample tray and switch to the following interface



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

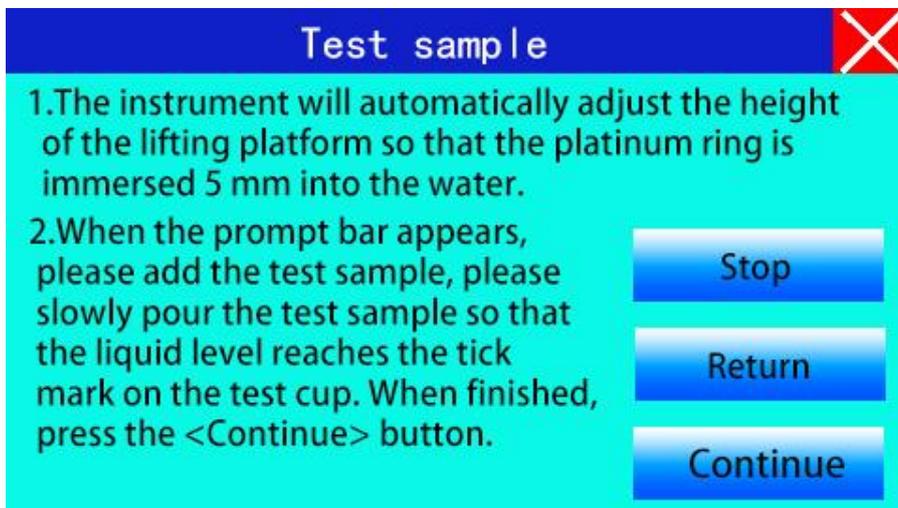


Click "retest" to return to the pure water calibration interface to continue testing. Click 'Return' to return to the menu selection interface.

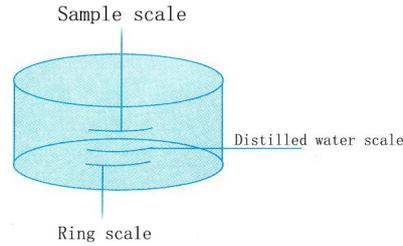
3.4 According to Article 5.3 of GB6541, the calibration value of pure water should be between 71 and 72 millinewtons/m. If there is a difference, please repeat Article 1.1, 1.2 and 3.1 of this manual and burn the platinum ring on the alcohol lamp to Clean. (Pour absolute ethanol into the tension cup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

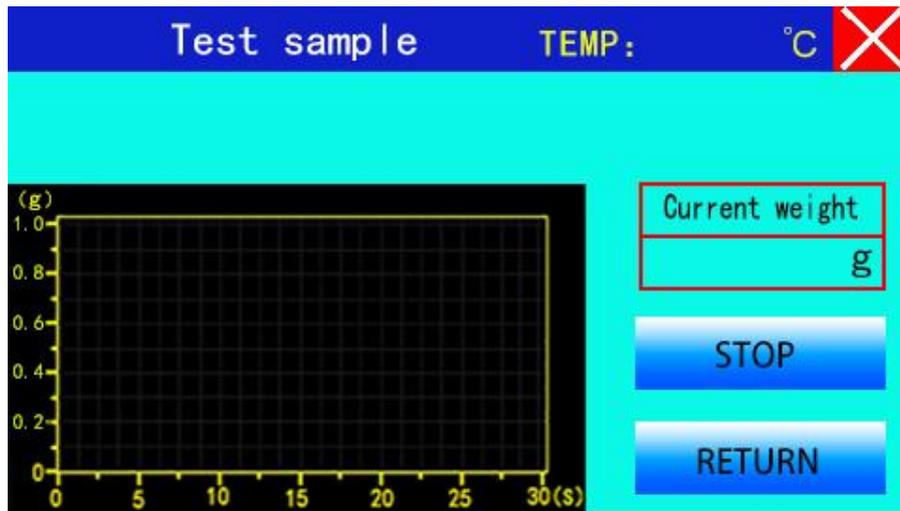
4.1 Click "Sample Test" to enter the sample test interface



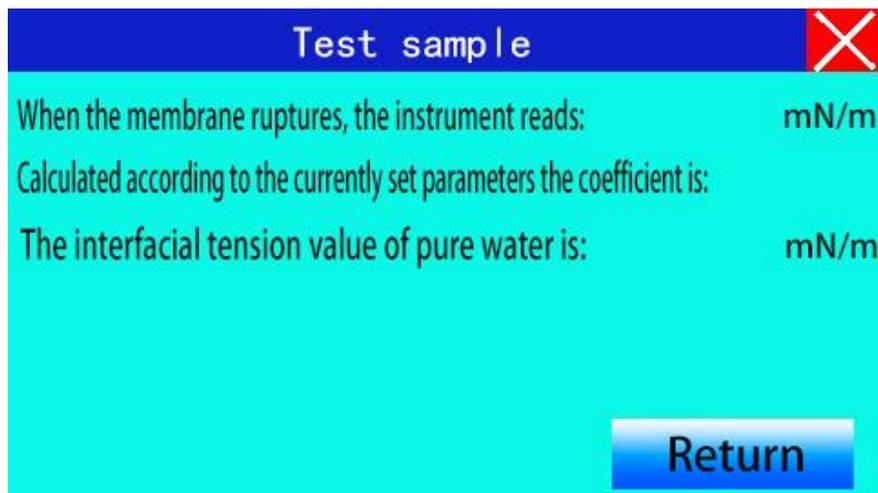
The distilled water and sample pouring position are shown in the figure below:



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 "Up or "Down" to view historical records.

7. Calculation basis for the results displayed by the instrument

The interfacial tension (millinewtons/m) of the sample is calculated according to the formula $\sigma = M \times F \dots (1)$:

Among them: M—the value displayed on the display for the first time, millinewtons/meter;

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

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

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)

Packing List

Host	1
Platinum ring	1
Set of pendant	1
Weight (1g)	1
Tension cup	1
Power cord	1