

HZZL-3 Automatic Oil Interfacial Tension Tester



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I. Main functions and features

Intermolecular Forces formed liquid surface tension. Numbers of tension reflect on liquid sample's physics and chemical properties, it is one of the most important index to product quality. Intermolecular Forces formed liquid surface tension. Numbers of tension reflect on liquid sample's physics and chemical properties, it is one of the most important index to product quality.

1. It used electromagnetic force -balance-type transducer, improving the accuracy of the measurement
2. Demarcated one point and you can adjust the instrument, and it's very convenient.
3. the instrument can show current weight values and tension Equivalence
4. Integrated temperature detection circuit, automatic temperature compensation for test results;
5. 240×128 dot matrix LCD screen, no logo button, with screen protection function;
6. Historical records with time stamps, store up to 255;
7. Built-in high-speed thermal micro printer, beautiful and fast printing, with offline printing function;
8. the instrument has RS232 interface equipment, it can connect to computer, and it convenient for data processing.

II. Technical characteristics

◆ Measuring range: 0-200mN/m
◆ accuracy: 0.1%(test result)±0.1 mN/m
◆ precision: 0.1mN/m
◆ sensibility: 0.1mN/m
◆ mains voltage: AC220V±20% 50HZ±10%
◆ maximum power dissipation: 20W
◆ suit ambient temperature: 10~30℃(25℃the best)
◆ suit ambient humidity: ≤85% RH
◆ overall dimensions: 200×300×330(mm)

◆ weight: 6kg

When the platinum ring is pulled up from the "liquid-gas" interface or the "liquid-liquid" interface, a circular liquid column membrane will be formed under the platinum ring. As the ring continues to rise, the liquid column membrane ruptures. In this process The maximum force value detected by the electromagnetic force balance sensor is converted into the tension value by the following formula.

$$M=mg/2L \quad L= \text{Pt circle's circumference}$$

The test value will effect by many factor:

- (1) Pt circle's average radius and the Pt wire's radius
- (2) Liquid sample and other medium's density contrast
- (3) The purity of the liquid, the electrolyte impurities will seriously reduce the tension value.
- (4) Ambient temperature.

Since the liquid column formed at the platinum ring is not cylindrical, a correction factor F must be introduced. The calculation formula for the correction factor F given by Zuidema and waters:

$$F=0.725+(0.03678*M/R_h^2/(P_0-P_1)+0.04534-1.679*Rs/R_h)^{1/2}$$

修正后的最终结果

为 The final result after correction is: $\gamma = M \times F$

In the formula:

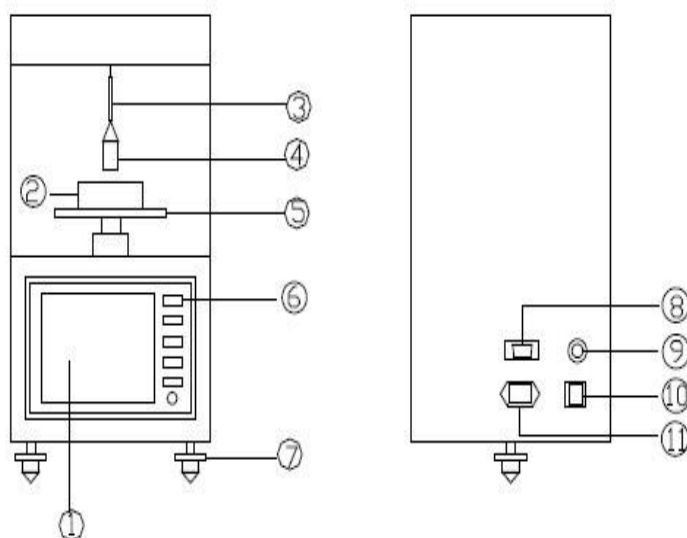
P0----- Lower liquid density, unit: g/mL

P1-----Upper liquid density or gas density, unit: g/mL

Rs-----the average radius of platinum wire, unit: mm

Rh-----average radius of platinum ring, unit: mm

III. Method of operation



Frontview

back view

(1)screen (2) sample container (3) Pt circle staff (4) Pt circle (5) Testboard (6) Button

(7) under-chassis (8) RS232 interface (9)fuse

(10)switch (11) electrical source

The instrument should be placed on a flat and stable table, adjust the three adjustment feet, observe the horizontal bubble, and make the bubble in the middle position. There must be no strong magnetic field interference around the instrument. Avoid wind blowing on the platinum ring during the test. The temperature of the test environment should be kept constant. Do not place the instrument in an environment with high humidity and corrosive gases.

Menu and key operation instructions

The buttons of the instrument are non-identified buttons. Under different display interfaces, the buttons have different function definitions, which are determined by the corresponding displayed menus. This design reduces the number of buttons, the key function definition is clear, and the human-machine interface is more friendly.

In the following key operation instructions, the numbers or figures highlighted in black are the contents of the current adjustment and modification.

1. Start-up screen: The LCD screen display is as follows:

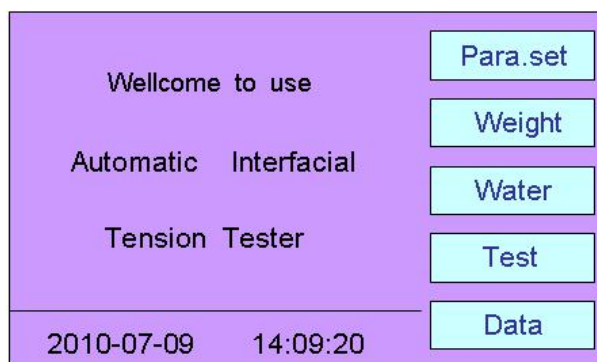


Figure 6-1

Connect the instrument power cord, open the power switch, that is to enter the BOOT display screen. At present, there are five functional items to choose from:

"Parameter Setting" : enter the parameter setting screen

"weight calibration" : Enter the instrument calibration screen

"pure water calibration" : enter the pure water calibration screen

"sample determination" : enter the sample test screen

"history" : enter the stored data screen

2. Parameter setting screen



Figure 6-2

In the current display screen, press the "item" key to select the parameter to be modified, the "tab" key cursor moves horizontally between the current parameter values, the "increase" key to adjust the current parameter value, press the "exit" key to save Parameters and return to the startup screen as shown in Figure 6-1.

The meaning of each parameter is explained as follows:

Density of heavy liquid-density of lower liquid, unit: g/mL

Light liquid density-upper liquid density or gas density unit: g/mL

Platinum wire radius-the radius of the platinum wire ring Unit: mm

Platinum ring radius-the average radius of the platinum ring unit: mm

Current temperature-ambient temperature Unit: °C

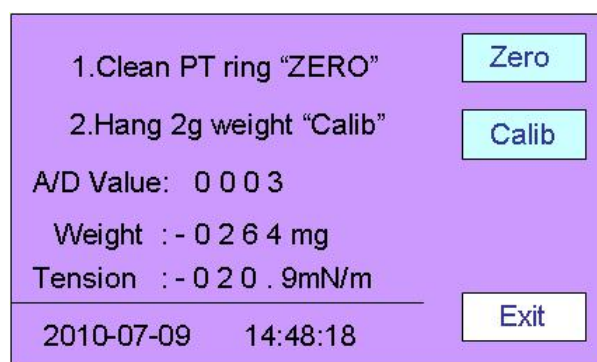
What needs special explanation is:

(1) When testing the surface tension, the light liquid density is the density of the air; when testing the interfacial tension, the light liquid density is the density of the upper liquid

(2) The temperature indicated by the value of the current temperature may deviate from the current actual temperature. The user only needs to enter the current actual temperature here. The instrument will automatically calculate the difference between them and save it as a correction factor. The temperature displayed later The value will be corrected by this difference.

3.Weight calibration interface

Use Weights to calibrate the instrument as follows:



1.Clean PT ring "ZERO"	Zero
2.Hang 2g weight "Calib"	Calib
A/D Value: 0 0 0 3	
Weight : - 0 2 6 4 mg	
Tension : - 0 2 0 . 9mN/m	
2010-07-09 14:48:18	Exit

Figure 6-3

This operation has a greater impact on the accuracy of the instrument, so caution is required. Performed in two steps:

The first step: ensure that the instrument is adjusted to a level state and the platinum ring is clean. After the instrument reading changes little, gently press "zero" to complete the instrument zero operation.

Step 2: Hang the hook weight for full-scale calibration on the platinum ring beam. When the reading of the meter changes relatively small, gently press the "Calibration" key to complete the full-scale calibration operation.

The "Exit" key stores the weight calibration result and returns to the setting main screen as shown in Figure 6-1.

4. Pure water calibration screen

The calibration here refers to the calibration of pure water, that is, to test whether the instrument is accurate by testing the surface tension of pure water. The instrument automatically defaults to the lower layer liquid as water and the upper layer as air.

According to the current ambient temperature value, look up the table to obtain the water density at this temperature, and perform temperature compensation on the result.

Because the surface tension of pure water at 25 degrees Celsius is 71mN/m-72mN/m.

Users can judge whether the instrument works normally according to the result of pure water calibration.

According to the prompts on the LCD screen, the following screens will appear in sequence:

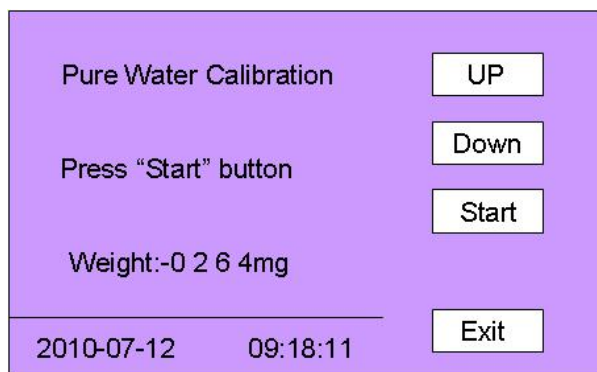


Figure 6-4

Press the "up" and "down" keys to adjust the height of the test bench so that it can be put into the sample cup.

After pressing "Start", the instrument automatically raises the test stand and immerses the platinum ring 5 mm below the liquid.

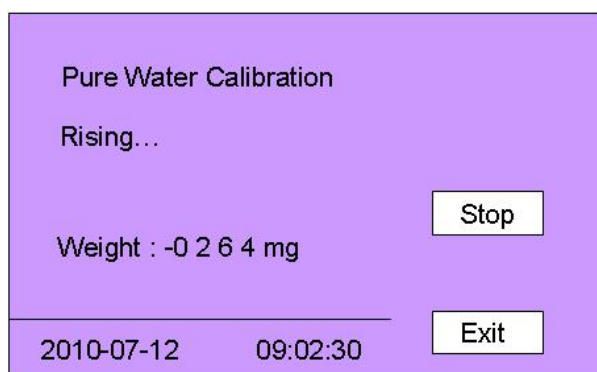


Figure 6-5

After an automatic delay of 30 seconds, the instrument automatically descends slowly on the test bench to start the measurement process.

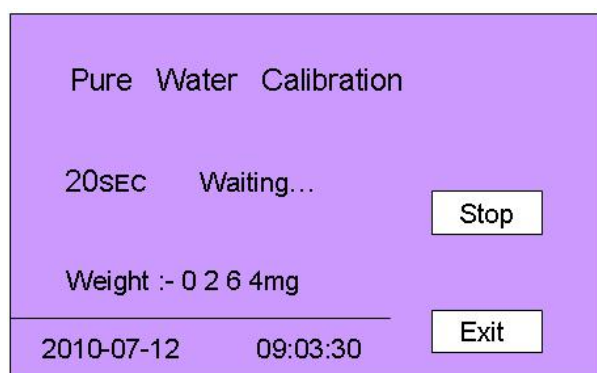


Figure 6-6

After the measurement is completed, the measured tension value is displayed. As shown below.

Pure Water Calibration	
Measurement Result	
Tension: 7 1.2mN/m	Redo
Weight :- 0 0 0 7mg	Print
2010-07-12 09:03:30	Exit

Figure 6-7

The "Retest" button returns to Figure 6-3

"Print" will output the current record to the printer and print it.

"Exit" Return to Figure 6-1

5. Sample measurement screen

Sample Determination	UP
Press "Start" button	Down
Weight:-0 2 6 4mg	Start
2010-07-12 09:15:27	Exit

Sample Determination	
Rising...	
Weight : -0 2 6 4 mg	Stop
2010-07-12 09:50:30	Exit

Sample Determination	
Add sample slowly	
Weight:-0 2 6 4mg	Go on
2010-07-12 09:49:27	Exit

Figure 6-8, 6-9,6-10

press the "up" and "down" keys to adjust the height of the test bench so that it can be put into the measuring cup.

After pressing "Start", the instrument automatically raises the test stand and immerses the platinum ring 5 mm below the liquid.

Sample Determination	
22SEC	Waiting...
Weight : -0 2 6 4 mg	<input type="button" value="Stop"/>
2010-07-12 09:57:30	<input type="button" value="Exit"/>

Figure 6-11

Prompt the user to add the upper layer liquid (if the surface tension is measured, press "Continue"), after adding the upper layer liquid, press the "Continue" button to measure the sample.

Sample Determination	
Measuring . . .	
Weight : 0 9 1 4 mg	<input type="button" value="Stop"/>
2010-07-12 09:57:30	<input type="button" value="Exit"/>

Figure 6-12

Sample Determination	
Measurement	Result
Tension: 9 5.1mN/m	<input type="button" value="Redo"/>
Weight :- 0 0 0 7mg	<input type="button" value="Print"/>
2010-07-12 09:03:30	<input type="button" value="Exit"/>

Figure 6-13

According to the national standard, keep the interface for 30 seconds. After 30 seconds,

the instrument automatically descends slowly on the test stand and starts the measurement.

When the liquid film ruptures, the measured tension value is calculated and displayed.

The "Retest" button returns to Figure 6-8. "Print" will output the current record to the printer and print it.

"Exit" returns to Figure 6-1

6. History screen

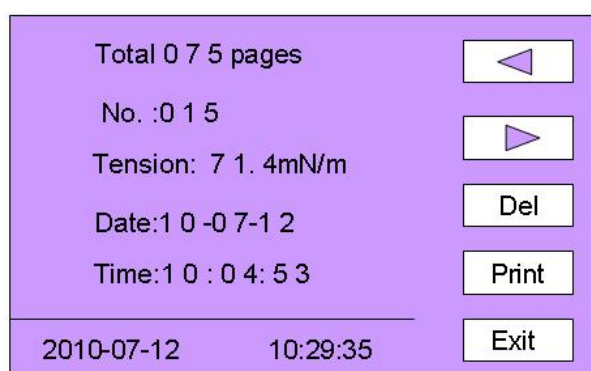


Figure 6-14

"Previous page" displays the previous history record, the record number is decremented by one, press this key for a long time to quickly page forward.

"Next page" displays the next history record, the record number increases by 1, long press the key, and quickly page backward.

"Delete" deletes the current history record and displays the next record. If the current record is the last record, the previous record is displayed and the record number is reduced by 1.

"Print" outputs the current record to the printer and prints it.

"Exit" returns to the startup screen as shown in Figure 6-1.

Each historical record contains 3 items:

- 1 tension value,
- 2 detection date,
- 3 detection time;

VI.Matters needing attention

1. Working environment:

The working environment of the instrument should meet the requirements mentioned in Chapter 4.

2. Platinum ring:

The plane of the ring should be parallel to the page on the north side, and the ring should have a certain roundness. The platinum ring should be clean, and it can be cleaned with

detergent, and then rinsed with pure water, and then the platinum wire is heated in the oxidation flame of the alcohol lamp to orange-red.

3. Test cup:

The test cup should be clean, and it can be cleaned and washed, then rinsed with hot water, and finally rinsed with pure water, and drained before use.

4. Obtaining pure water:

It is best to use distilled water that has been purified multiple times. Tests have shown that some commercially available purified drinking water can meet the experimental requirements.

5. Calibration of the instrument:

After the instrument is subjected to a large impact, or after moving, the weight in the setting items should be calibrated.

V.Fault check and treatment

	Phenomenon	Reason	Disposal methods
1	The weight cannot be calibrated	The polarity of the magnetic cylinder is wrong	Stick to the correct polarity Replace the magnetic cylinder
2	LCD screen does not display	LCD cable is not plugged in	Plug in the LCD screen cable
3	No response at boot	The switch is not in good contact Blown fuse	Replace the switch Replace the fuse
4	Test data is too small	Parameter setting is incorrect Platinum ring is not clean	Set the parameters correctly Clean the platinum ring
5	The data is abnormal	Weight calibration is incorrect	Recalibrate the weight

VI. Packing List

No.	Item	Qty
1	Main engine	1
2	Platinum circle	1
3	Pendant	2
4	Weight (2g)	1
5	Tension cup	2
6	Fuse pipe	2
7	Print paper	1
8	Power line	1