

Instruction Manual for Automatic surface/Interfacial Tension Meter

Model:BZY100 & BZY200

1. Introduction

With more than ten years of experience in technology update and manufacturing research and development, the company has launched a new generation of liquid surface/interfacial tension meter. The specially designed and developed electromagnetic force sensor ensures high accuracy and repeatability of measurement. Platinum plate method/platinum ring method can be used together, no secondary calculation is required, and it meets many national and international standards. The instrument has the following notable features:

- 1) The tailor-made high-precision electromagnetic force sensor is the basis for ensuring the good performance of the instrument.
- 2) The machine adopts a 4.3-inch touch screen, and all operations and information are completed or displayed on the screen.
- 3) It has a password management function to ensure data traceability and prevent data modification and accidental deletion.
- 4) Users can calibrate the data with standard samples (distilled water and pure ethanol) to ensure the accuracy of the measurement.
- 5) Display real-time measurement curves, can save multiple sets of data, support external printers, and support Chinese/English interchange operations.

1.1 What is surface tension?

It is well known that we can explain the properties of liquids in terms of the mutual attraction between molecules. This intermolecular attraction is called molecular cohesion or van der Waals force. Surface tension, interfacial tension and similar phenomena are the basic physical phenomena used to explain molecular cohesion.

Specifically, the molecules that make up the liquid experience different forces on the surface than in the bulk. The forces on the molecules in the bulk are symmetrical and balanced. The molecules on the surface, on the other hand, are attracted by the molecules in the bulk without the opposite balancing force. That is to say, it is subjected to a force that is pulled into the body. That is to say, try to reduce the surface area, so that this unbalanced state tends to the equilibrium state. The thermodynamic statement is: To minimize the surface energy of the system, this force is called "surface tension", which is also the free energy per unit area (J/m^2), that is, the interface that forms or expands per unit area. Minimum energy required. Its value is consistent with the surface tension (N/m). Due to habit, surface tension is commonly used to express surface free energy, which plays a crucial role in the physical and chemical phenomena of liquid surfaces. In daily life, the dew on the lotus leaf in the morning and the curved water surface in the cup are all surface tension phenomena.

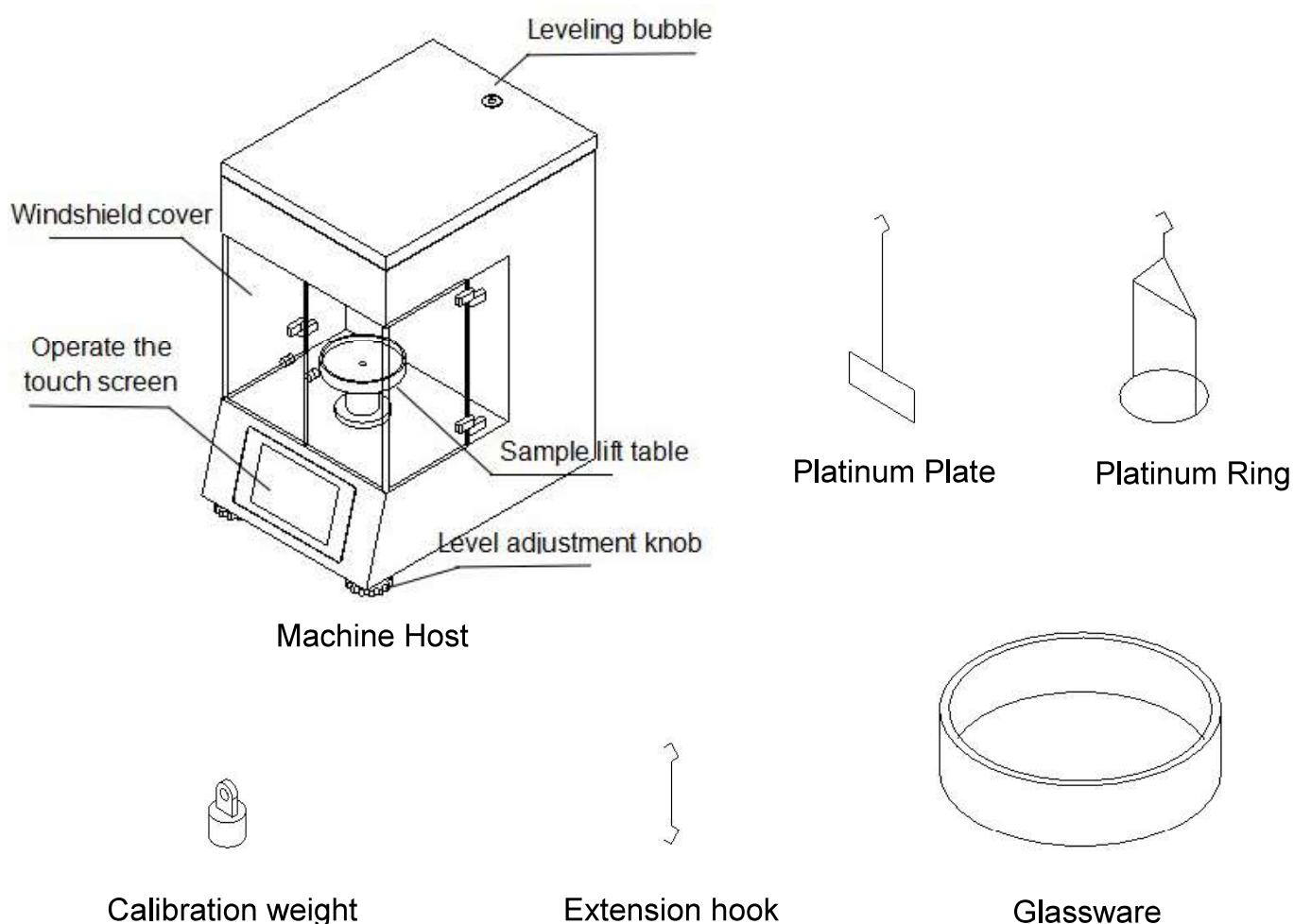
1.2 List of instrument components

Please check and confirm that you have received the components in the form below, if there is any omission, please contact our company or your local agent immediately. Any drop or damage caused by transportation must be reported to the carrier in time.

Component Name	Quantity	Note	Component Name	Quantity	Note
Host	1		Glassware	2	
Calibration weight	1		Tweezers	1	
Extension hook	2		Power cable	1	
Platinum Plate*	1	Standard configuration default two choose one	Operation Manual	1	
Platinum Ring*	1		Alcohol lamp	1	No liquid alcohol

*Note: The configuration of the plate or ring needs to be specified when ordering, the budget is sufficient, it is recommended to configure both the plate and the ring.

Schematic diagram of main components



1.3 Technical Parameters

Model	BZY100	BZY200
Test Method*	Du Nouy Ring Method & Wilhelmy Plate Method	
Test Range	0—1000mN/m	0—1000mN/m
Resolution	0.1mN/m	0.01mN/m
Operation Method	Automatic lifting and lowering of sample stage Automatic measurement	
Display Method	4.3-inch touch screen data direct reading	
Data Method	Support data storage/view/print	
Measure Time	Normally within 60 seconds	
Data Output**	RS232 (Printer)	
Dimensions	28*20*36cm(L*W*H)	
Net Weight	8kg	
Power Supply	110V or 220V、30W	

Ring size: Pt wire radius is 0.185mm, ring radius is 9.55mm, ring circumference is 60mm.

*Note: The plate/ring test method needs to be specified when ordering. The standard configuration is to choose one from the other. If the budget is sufficient, it is recommended to configure both the plate and the ring.

**Note: The printer is not included in the standard configuration, please purchase it as required.

1.4 Preparation before the test

The surface tensiometer has a high degree of integration, so the assembly of the instrument is relatively easy. But before assembling, please confirm whether the following items have been completed:

- 1) The laboratory should be clean, free of dust and vibration, and the wind should not blow directly against the instrument;
- 2) Confirm whether there is tap water in the laboratory, because tap water needs to be used for cleaning during the experiment;
- 3) Confirm whether the laboratory can use open flames, because alcohol lamps are

required during the experiment. If it does not meet the requirements, it is recommended to replace the laboratory or take other workarounds;

4) Working environment temperature: 10~40℃, the temperature fluctuation is not more than 2℃/h; Relative humidity: 20%-80%, no condensation

5) Confirm that the power supply voltage does not exceed $\pm 5\%$ of the voltage indicated by the machine, and install the corresponding socket for grounding;

6) Check whether the parts listed in Section 1.2 are complete, if there is any defect, please contact our company in time;

7) Confirm that you have understood the basic knowledge of the surface tensiometer, and are familiar with the basic operation of the instrument;

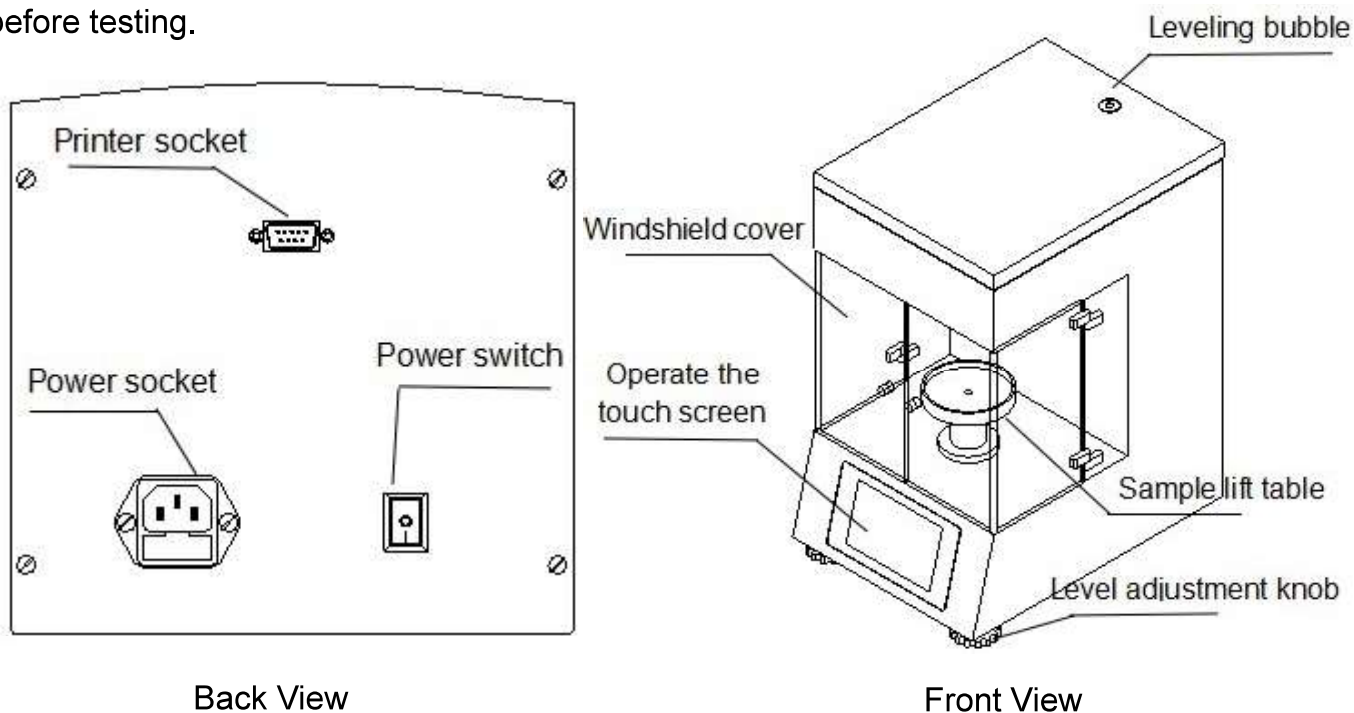
Step 1: Open the box, take out the host and all accessories;

Step 2: Find a vibration-free and clean tabletop, it is recommended to use special laboratory furniture;

Step 3: Adjust the leveling: After placing the instrument on a stable table, observe whether the Leveling bubble in the upper cover of the machine is in the middle. If it does not meet the requirements, it means that there is no leveling, then you need to do a good job of adjusting the leveling status;

Adjustment method: Turn the Leveling adjustment knob until the water bubble is in the middle of the bubble;

Step 4: Turn on the power supply, and the screen can be lit and stable for 30 minutes before testing.




2. Operation guide for each function


2.1 Power on

When the power is turned on, the instrument will perform the process of power-on self-test: first, the company name, machine name and machine model will be displayed on the screen. The whole process lasts for about 5 seconds, and then jump to the main interface, as shown in the following diagram:

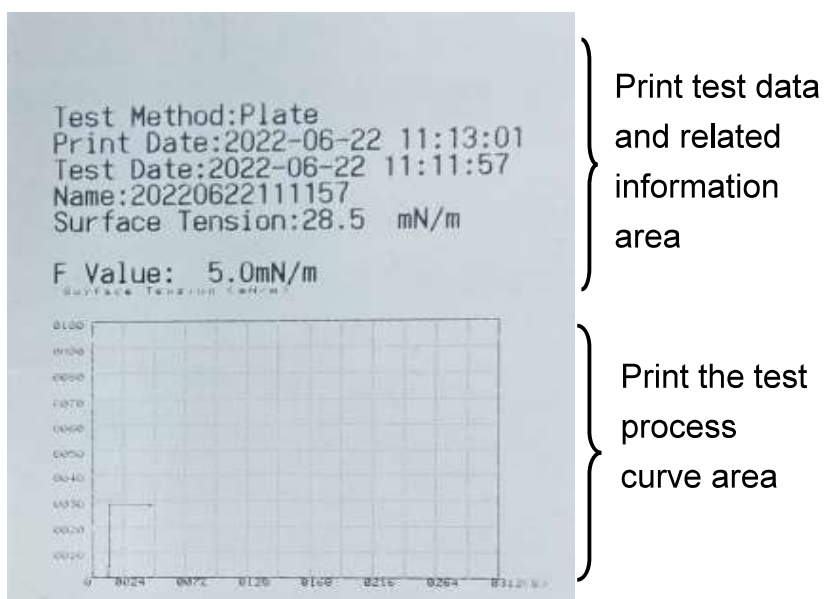


Status bar: Display date and time information, and display the working state of the machine.

: Indicates that the machine is currently logged in as an administrator. (The specific functions of the administrator login will be described in detail in the subsequent "Instrument Settings")

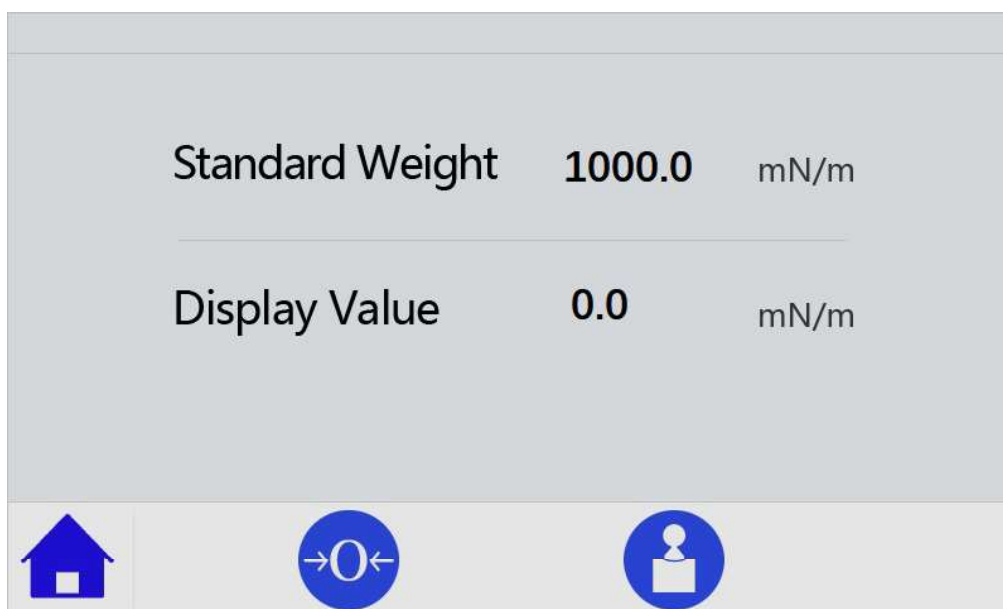
: Indicates that the machine is connected to the printer at this time, disconnect the printer, the icon disappears.

The schematic diagram of the printed content is shown in the right figure:






2.2 Menu key function operation description

2.2.1 Weight Calibration: When the machine is used or moved for the first time every day, the weight calibration operation should be performed on the machine first. Click the "Standard Weight CAL" icon to display the following figure.



Standard Weight 1000.0 mN/m: Random calibration weight mass。

Display Value: The actual measured value is displayed in real time. The default value is 0.0 and 0.00. The value depends on the purchased machine model.

Icon	Notes
	Back to main interface key
	Tare key
	Calibration key

The specific weight calibration steps are as follows:

- 1) Turn on the host for 30 minutes before the formal test, and the machine measurement system needs to be powered on and stable.
- 2) Place the extension hook under the machine hook, click the tare button, and the display value shows 0.0.
- 3) Click the calibration button, the displayed value shows the character "CAL", and prompts "Please hang the calibration weight", follow the prompt and place the calibration weight under the extension hook.
- 4) If the weight shakes after hanging, please gently lean against the weight with tweezers

to keep it still and not shake. Wait for about 5 seconds, the prompt "Calibrating, please wait....."

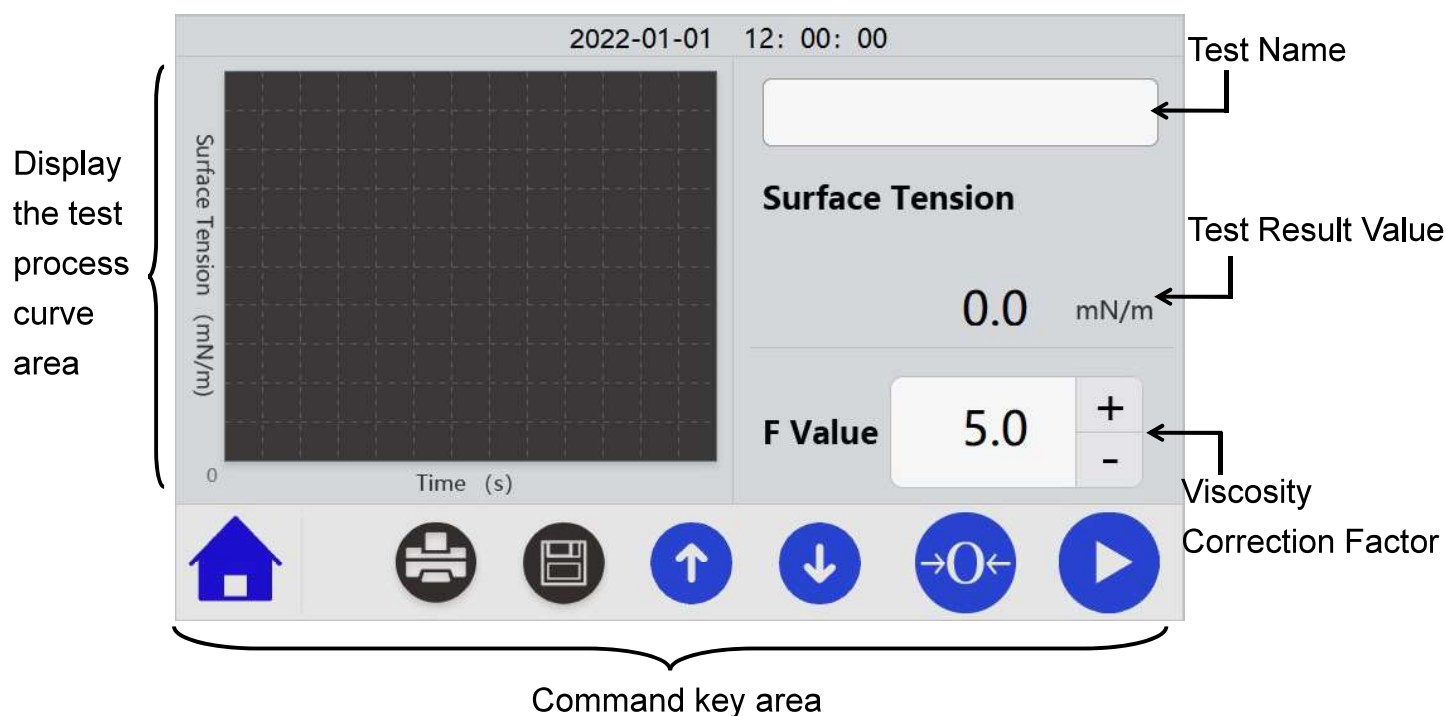
5) Continue to wait for about 6 seconds according to the prompt, the display number shows 1000.0 (allowable deviation of ± 0.1), and prompts "calibration completed, please remove the weight".

6) Remove the weight according to the prompt operation, the displayed value shows 0.0 (± 0.1 deviation is allowed), and the weight calibration is completed. If the weight is removed, and the displayed value exceeds the range of 0.1 to -0.1, please perform the operations from 2) to 5) again.








2.2.2 Plate Method Test:

The platinum plate method for testing liquid surface/interfacial tension is a simple and fast method that has emerged in the past 30 years. Because of its sheet structure, it is not easy to deform, it allows to detect the surface tension of samples with a certain viscosity, and the whole process of plate method testing can be monitored in real time.

On the main interface, click the "Wilhelmy Plate Method Test" icon to display the following diagram:



Icon	Notes	Icon	Notes
	Back to main interface key		Down key
	Print key		Descent in progress

	Save key		Drop to the lowest position
	Up key		Tare key
	Ascent in progress		Start test key
	Stop test key		

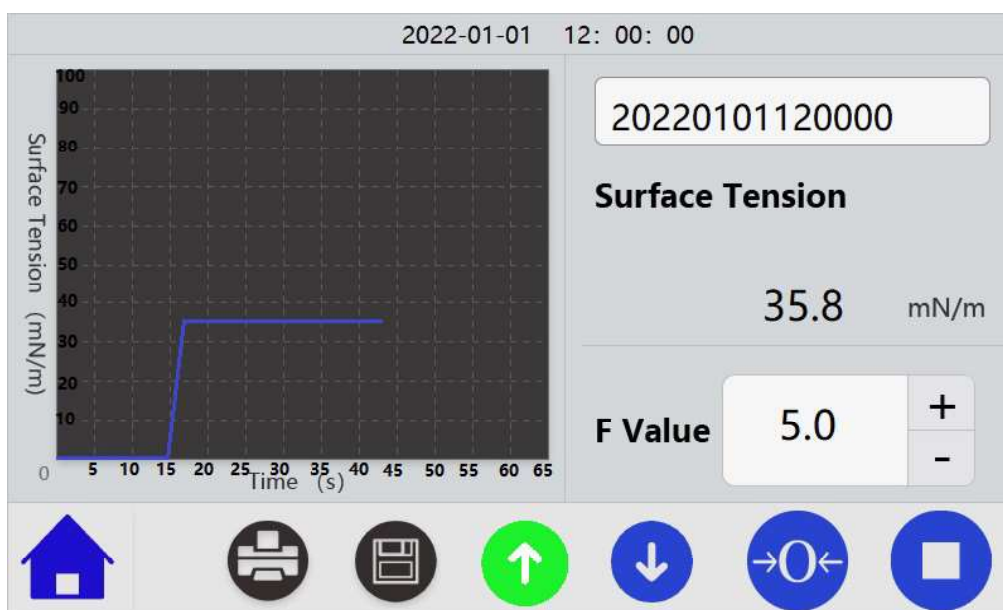
2.2.2.1 Preparation before starting the test

1) Ensure that the platinum plate and glassware are clean before each test. (Very important) Please do as follows: Use tweezers to pick up the platinum plate and rinse it with running water. When rinsing, pay attention to maintaining a certain angle with the water flow, Do not let the water flow punch to deform the shape of the platinum plate. If the test sample was oily in the last experiment, please use a special degreasing solvent to clean the platinum plate. This method can ensure the best cleaning effect. The glassware containing the samples should also follow the platinum plate cleaning method and be cleaned and ready for use.

2) Take a small amount of sample to pre-wet the inner wall of the glassware, and pour the sample out after wetting to ensure the validity of the measured data. Re-pour the sample with a height of 5mm to 7mm into the vessel, and place the vessel on the tray for testing.

3) Burn the platinum plate with an alcohol lamp, generally at an angle of 45 degrees to the horizontal plane, until the entire body of the platinum plate is burned into a red incandescent state, and the burning time is about 20-30 seconds. Wait about 15 seconds, let the platinum plate cool to room temperature, place the platinum plate under the extension hook for testing. (Pay attention to observe the distance between the liquid level and the platinum plate. Hang the platinum plate so that it cannot touch the sample. If it touches the sample, please perform the steps of cleaning the platinum plate again, and click the "Down key" to lower the tray height or reduce the sample volume.)

2.2.2.2 Standard Test Process



1) Please check whether it is prepared according to the requirements of 2.2.2.1. If you ignore this step, it will directly affect the accuracy of the test data.

2) The default display name of the test is: date + time format, supports inputting the name in other letters and numbers format, click the name column to set the name. The name setting must be modified before the test is started, and modification is not supported after the test is started.

3) Close the windproof door, click the "Tare Key", and then click the "start test Key".

4) The machine starts to measure data automatically, and the left area displays the measurement curve in real time, which is represented by a blue line. The up key automatically switches to the ascent in progress, and the start test key automatically switches to the stop test key state.

5) When the sample to be tested touches the platinum plate, the tray automatically stops rising, the liquid wets the surface of the platinum plate, and the whole measurement process is in progress in real time.

6) The test value is displayed in the "Surface Tension" column in real time, and the test value is displayed dynamically throughout the whole process. (As shown in FIG)

7) Viscosity correction coefficient, the F value is set to 5.0 by default, and the F value can be set in the range of 0 to 9.9. To set the F value, modification must be allowed before the test is started, and modification is not supported after the test is started.

The viscosity of the tested sample is less than or equal to 500mPa.s, and the F value is set to 5.0.

The viscosity of the tested sample is greater than 500mPa.s, and the F value is set to 8.0. For details, please refer to 2.2.2.3, Medium-viscosity Measurement Procedure.

The sample to be tested is an immiscible liquid test, such as oil and water, and the F value

is set to 0.5. For details, please refer to 2.2.2.4, Interfacial Tension Measurement Procedure.

8) After the start test key automatically switches to the stop test key state, it means that the machine has entered the measurement state. At this time, in the command key area, only the tare key and the stop test key can perform operations, and the other keys have no response.

9) Click the "stop test Key", the machine automatically switches to the "start test Key" state, which means the test is completed or the test is stopped. At this time, command key area, and all keys can perform operations.

***Note: When the tray is rising to the highest position, the tray will make a "click" sound every 10 seconds. If the displayed Surface Tension value is greater than or equal to the set F value, click the "start test key" and there is no response.**

2.2.2.3 Procedure for testing medium viscosity samples

This method is applied to the measurement of liquids with a viscosity of 500 to 2000mPa.s. The measurement time exceeds 3 minutes, and the measurement value will become stable (excluding the properties of the liquid itself that change with time), such as glycerin, adhesives, etc.

1) Please check whether it is prepared according to the requirements of 2.2.2.1. If you ignore this step, it will directly affect the accuracy of the test data.

2) Clean the platinum plate, pre-wet 3mm height with the sample to be tested (not too high, and if the "surface tension" display value exceeds 5mN/m after hanging the plate, Gently scrape with a roll paper until the displayed value is less than 5mN/m) and set the F value to 8.0.

3) Close the windproof door and click the "start test key", when the sample to be tested touches the platinum plate, the tray will automatically stop rising, the liquid will wet the surface of the platinum plate, and the entire measurement process is in progress in real time.

4) After the displayed test value is stable, the data can be read.

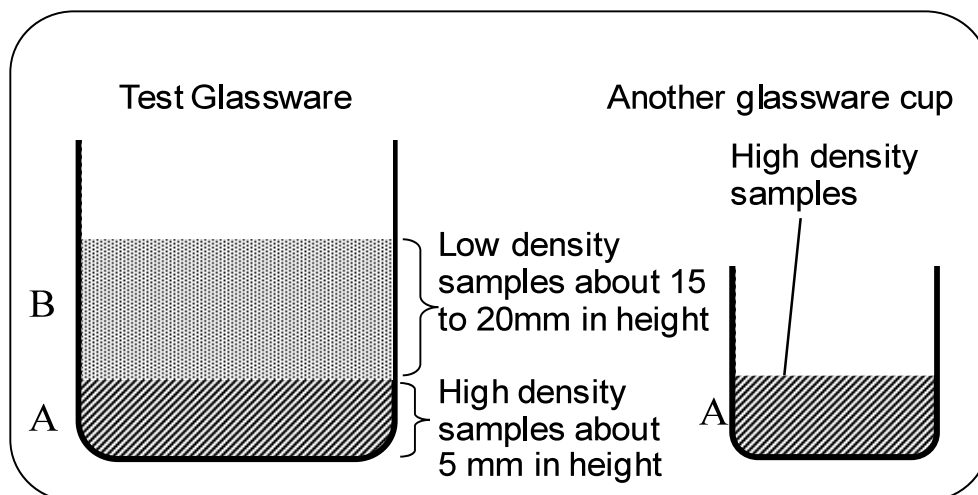
5) Click the "Stop Test key" to complete the test. Click the down key, when the sample is separated from the platinum plate, click the "start test key" to measure and read the tension value of the sample again, and repeat this operation 3 times to calculate the average value of the sample.

Note: If the tested sample contains surfactant or the tested sample is a mixture, the surface tension value will change to a certain extent, and the time for the final stable value to appear will vary from sample to sample. If the displayed surface tension value is greater than or equal to the set F value, there will be no response when you click the "Start Test key".

2.2.2.4 Steps for testing two-phase liquid interfacial tension

This method is applied to the measurement of the interfacial tension higher than 2mN/m. If it is lower than this lower limit, it is recommended to use the platinum ring method for measurement. If the interfacial tension value is lower than 0.5mN/m, it is recommended to use other detection principles for machine measurement, such as the rotating drop measurement method.

Measure the interfacial tension when the specific gravity of sample A > sample B (such as water-benzene, water-oil, etc.), as shown in the following diagram:

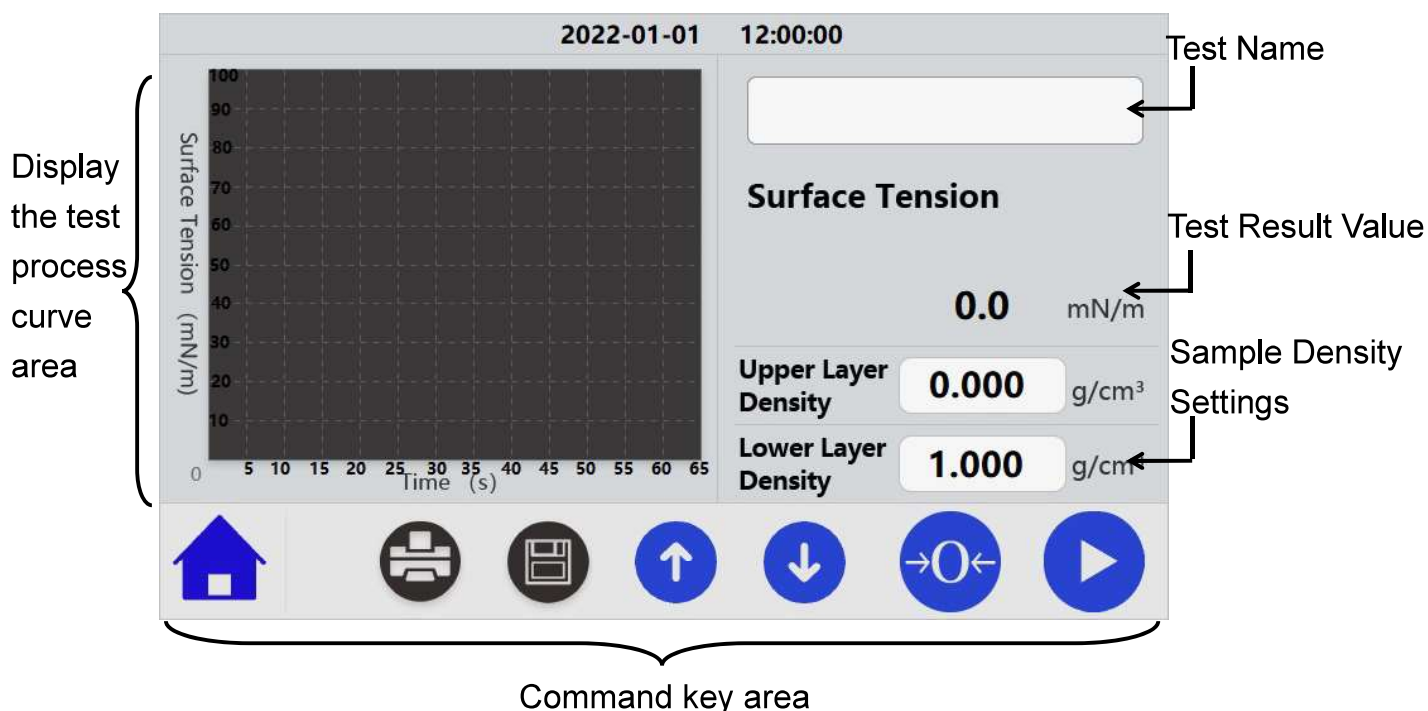


- 1) Check whether the glassware and platinum plate have been cleaned according to the requirements in 2.2.2.1, and the platinum plate has been burned. If you ignore this step, it will directly affect the accuracy of the test data.
- 2) Pour sample A with a height of about 5mm into the test glassware, and then slowly pour sample B into the test glassware along the wall of the cup (it is recommended to drip with a pipette if conditions permit), with a height of about 15 to 20mm.
- 3) Load the sample glassware, place it on the tray, and set the F value to 0.5.
- 4) Take another glassware with a small amount of sample A, immerse the platinum plate in sample A, and make the platinum plate leave the liquid surface of sample A at an inclined angle.
- 5) Adjust the height of the tray so that the platinum plate hangs under the extension hook, and ensure that the platinum plate stays in sample B and does not touch sample A. If sample A is in contact, clean the platinum plate and start over until this goal is achieved.
- 6) Close the windproof door, click the "Tare key", and the display value will return to zero. Click the "start test key", when the platinum plate touches the interface between A and B samples, the tray automatically stops rising, the liquid wets the surface of the platinum plate, and the whole measurement process is in progress in real time.
- 7) After the displayed test value is stable, click the "Stop Test Key" to complete the test, and the data can be read.

2.2.3 Ring Method Test

The platinum ring method for testing liquid surface/interfacial tension is a detection method that was introduced a long time ago. When the measurement liquid and the surface of the platinum plate self-loathing, the liquid cannot wet the surface of the plate well. It is recommended to use the ring method for measurement, and the ring method test data is stable and reliable.

On the main interface, click the "Do Nouy Ring Method Test" icon, the following diagram will be displayed:



Icon	Notes	Icon	Notes
	Back to main interface key		Down key
	Print key		Descent in progress
	Save key		Drop to the lowest position
	Up key		Tare key
	Ascent in progress		Start test key
	Stop test key		

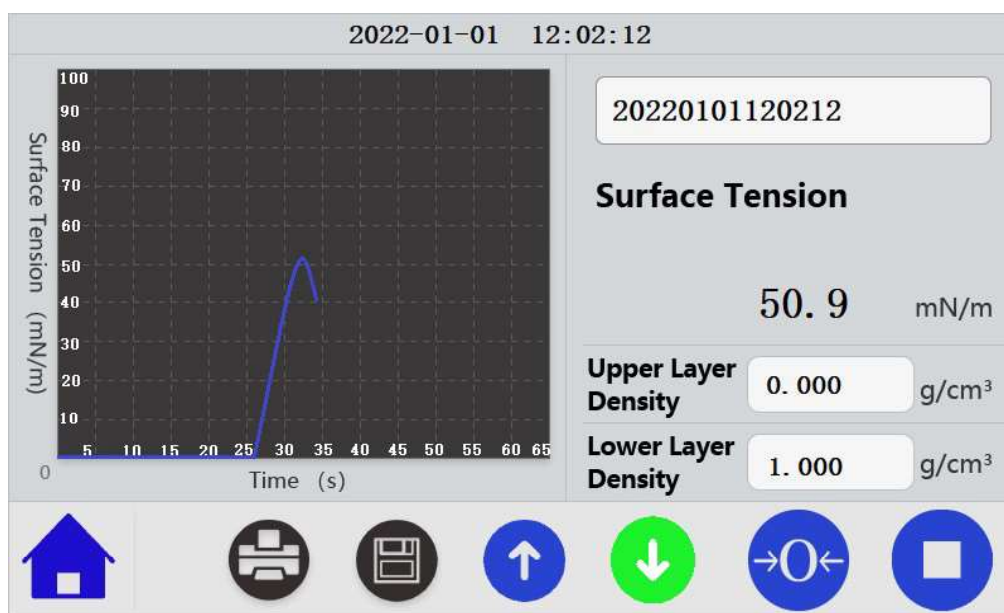
2.2.3.1 Preparation before starting the test

1) Ensure that the platinum ring and glassware are clean before each test. (Very important) Please do as follows: Use tweezers to pick up the platinum ring and rinse it with running water. When rinsing, pay attention to maintaining a certain angle with the water flow, Do not let the water flow punch to deform the shape of the platinum ring. If the test sample was oily in the last experiment, please use a special degreasing solvent to clean the platinum ring. This method can ensure the best cleaning effect. The glassware containing the samples should also follow the platinum ring cleaning method and be cleaned and ready for use.

2) Take a small amount of sample to pre-wet the inner wall of the glassware, and pour the sample out after wetting to ensure the validity of the measured data. Re-pour the sample with a height of 5mm to 7mm into the vessel, and place the vessel on the tray for testing.

3) Burn the platinum ring with an alcohol lamp, generally at an angle of 45 degrees to the horizontal plane, until the entire body of the platinum ring is burned into a red incandescent state, and the burning time is about 20-30 seconds. Wait about 15 seconds, let the platinum ring cool to room temperature, place the platinum ring under the extension hook for testing. (Pay attention to observe the distance between the liquid level and the platinum ring. Hang the platinum ring so that it cannot touch the sample. If it touches the sample, please perform the steps of cleaning the platinum ring again, and click the "Down key" to lower the tray height or reduce the sample volume.)

2.2.3.2 Test surface tension steps



1) Check whether it is prepared according to the requirements of 2.2.3.1. If this step is ignored, it will directly affect the accuracy of the test data.

2) Close the windproof door, click the "Up key" to lift the tray up slowly, and visually immerse the platinum ring into the tested sample to a depth of about 2mm, click the "ascent in progress" key to stop the tray from running. Click the "tare key" to return the surface tension value display to zero.

3) "Upper Layer Density" defaults to 0, and "Lower Layer Density" defaults to 1. The ring method tests the surface tension, the density of the upper layer is 0 by default, and the density of the lower layer is input. To test the density of the upper and lower layers of the interfacial tension, set it according to the actual density value of the sample to be tested, and the density value will be substituted into the internal calculation of the program, which directly affects the test value. Density value The machine allows the setting range of 0 to 10. To set the density value, it must be modified before the test is started, and modification is not supported after the test is started.

4) The default display name of the test is: date + time format, supports inputting the name in other letters and numbers format, click the name column to set the name. The name setting must be modified before the test is started, and modification is not supported after the test is started.

5) Click the "start test key", the machine starts to automatically measure data, the left area displays the measurement curve in real time, represented by a blue line, the down button automatically switches to the state of descending running, and the start test button automatically switches to the stop test key state. (As shown above)

6) When the start test key automatically switches to the stop test key state, it means that the machine has entered the measurement state. At this time, in the command key area, only the tare key and the stop test key can perform operations, and the other keys have no response.

7) The "surface tension" data is displayed in real time at this time, and the displayed value gradually increases as the tray slowly descends. When the platinum ring and the measured liquid are about to be separated, the displayed value is the maximum value, which is the final result and will be retained and displayed on the screen.

8) As the tray continues to descend, the platinum ring is separated from the measured liquid, the stop test key automatically switches to the start test key state, and the tray automatically stops descending, indicating the end of the measurement. At this time, command key area, and all keys can perform operations.

***Note: When the tray is rising to the highest position, the tray will make a "click" sound every 10 seconds. If the platinum ring cannot touch the sample to be tested at this time, the extension hook may not be attached. Due to the structure of the platinum ring, it is easily**

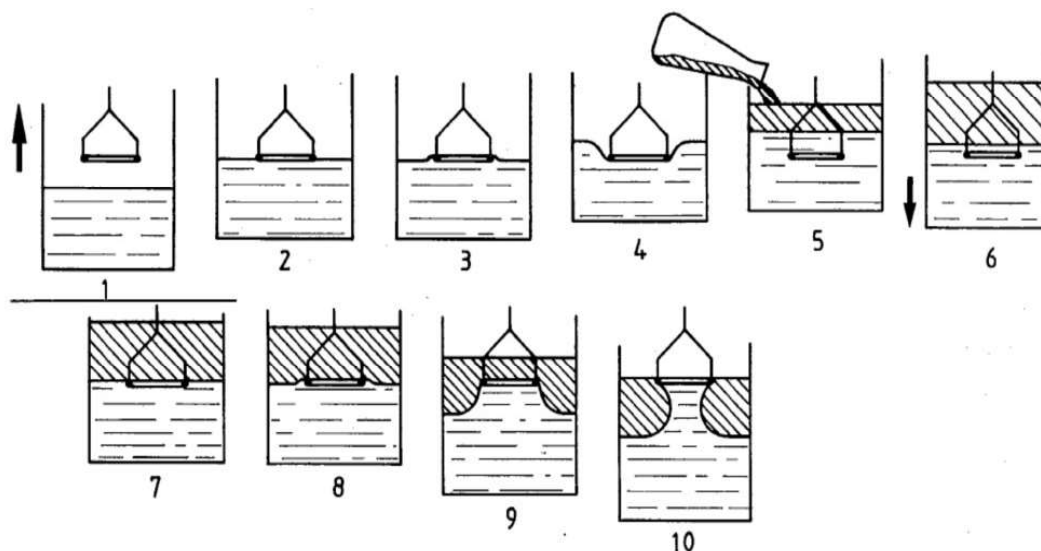
affected by external forces and its shape changes, resulting in deviations in the measurement data. Therefore, attention should be paid to daily use and maintenance. When the viscosity of the tested sample exceeds 200mPa.s, it is recommended not to use the platinum ring method for measurement, otherwise the measurement data will not be true.

"Surface Tension" displays "└───┐" symbol, which means that the result obtained by the machine is a negative number, which has no practical significance. Please press the "tare key" to display the zero value, and then perform subsequent test operations.

2.2.3.3 Steps for testing interfacial tension

This operation method is applied to the measurement of interfacial tension higher than 0.5mN/m. If it is lower than this lower limit, it is recommended to use other detection principles for machine measurement, such as rotating drop measurement method. The density value of the upper and lower liquids needs to be known before the measurement.

The whole test process is shown in the following figure:



- 1) Check whether the glassware and platinum ring have been cleaned according to the requirements in 2.2.3.1, and the platinum ring has been burned. If this step is ignored, it will directly affect the accuracy of the test data.
- 2) Pour the lower liquid with a height of about 5 to 7 mm into the test glassware. Place the vessel on the tray and click the "up key", after visually immersing the platinum ring in the lower liquid at a height of about 2mm, click the "ascent in progress" key to stop the tray from running.
- 3) Slowly pour the upper layer of liquid along the wall of the cup (it is recommended to drip with a pipette) into the test glassware, with a height of about 18mm. (Note that the platinum ring cannot be touched at the moment)
- 4) After setting the density values of the upper and lower layers respectively, click the "tare

key", and the "surface tension" data display will return to zero.

5) Close the windproof door, click the "start test key", the machine starts to automatically measure data, the left area displays the measurement curve in real time the blue line indicates, that the down key automatically switches to the state of descending running, and the start test key automatically switches to stop test key state.

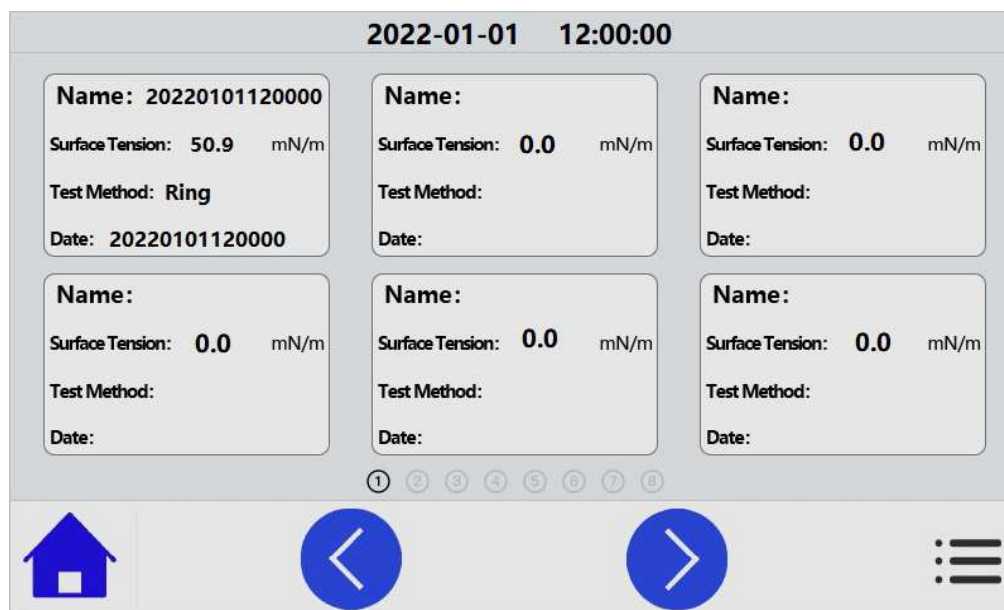
6) After the start test key automatically switches to the stop test key state, it means that the machine has entered the measurement state. At this time, in the command key area, only the tare key and the stop test key can perform operations, and the other keys have no response.

7) The data of "surface tension" is displayed in real time at this time, and the displayed value gradually increases as the pallet slowly descends. When the platinum ring slowly passes through the upper and lower interface layers from the lower liquid, and is about to break the interface liquid film, the displayed value is the maximum value, which is the final result and will be retained and displayed on the screen.

8) The tray continues to descend, the platinum ring breaks the interface liquid film, the stop test key automatically switches to the start test key state, and the tray automatically stops descending, indicating the end of the measurement. At this time, the key area is commanded, and all keys can perform operations.





2.2.4 Data Management

It can save 48 groups of measurement data, which is convenient for viewing and saving data, and can support printing and deletion. Click the "Data Management" icon on the main interface to display the following diagram:



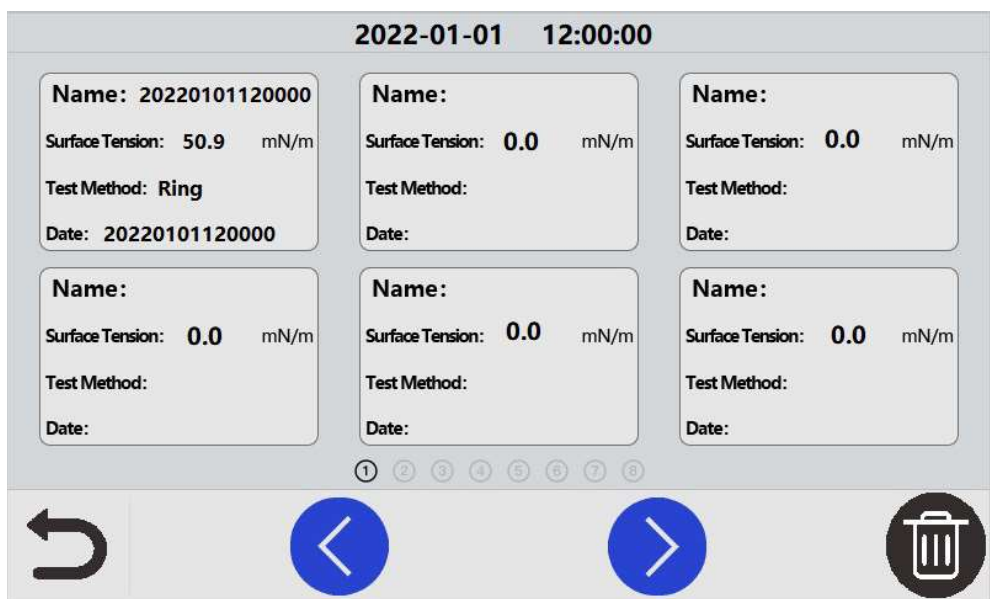
Data storage area: a total of 8 pages, each page can display 6 sets of data, the saved





data are sorted in sequence, each page displays the brief information of the saved data, and the "surface tension" where there is no saved data shows 0.0 mN/m. (As shown in the figure above, a set of data has been saved)

Icon	Notes
	Back to main interface key
	Page left key
	Page right key
	Hide delete key (You need to log in as an administrator, otherwise click will not respond)

2.2.4.1 Data deletion

After logging in as an administrator, return to the "Data Management" interface, and click "Hide Delete Key" (the specific functions of administrator login will be described in detail in the subsequent "Instrument Settings") to display the following diagram:

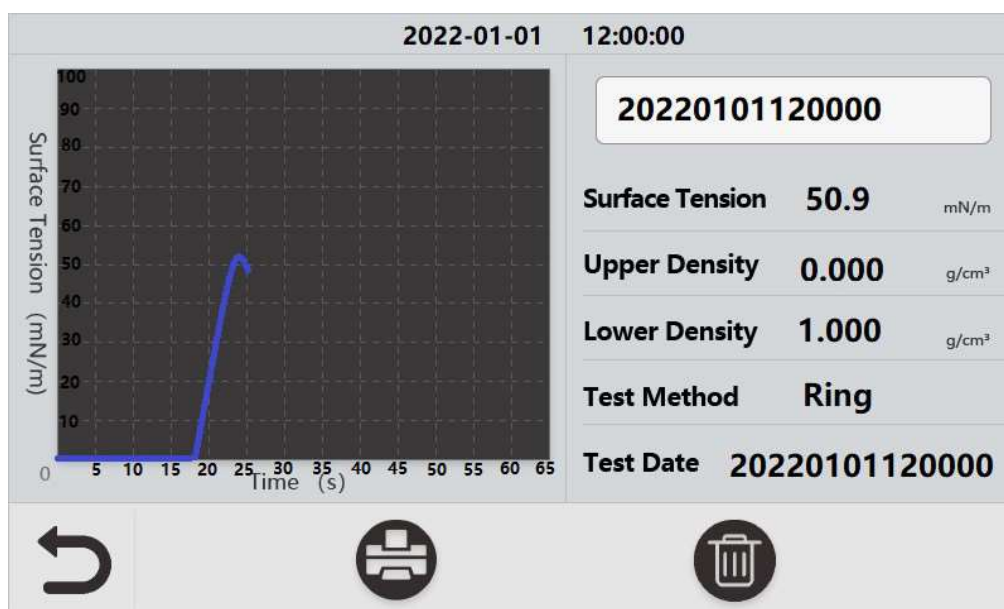


Icon	Notes
	Back to main interface key
	Page left key
	Page right key
	Delete key

- 1) Click on the data to be deleted. After the selection is complete, a red small hook will appear in the upper left corner of the data. Click the data again, and the red small hook will disappear.
- 2) Click the "Delete key", a dialog box "Delete data" will pop up, select "Cancel" will not execute the delete command, select "OK" to pop up the "Executing operation, please wait....." interface, data been deleted.
- 3) Click "Return to the main interface key" to exit the delete interface and return to the main interface.

2.2.4.2 Data View

Click the "Data Management" icon on the main interface to enter the data management interface, and click on a set of saved data to view. The following diagram is displayed:

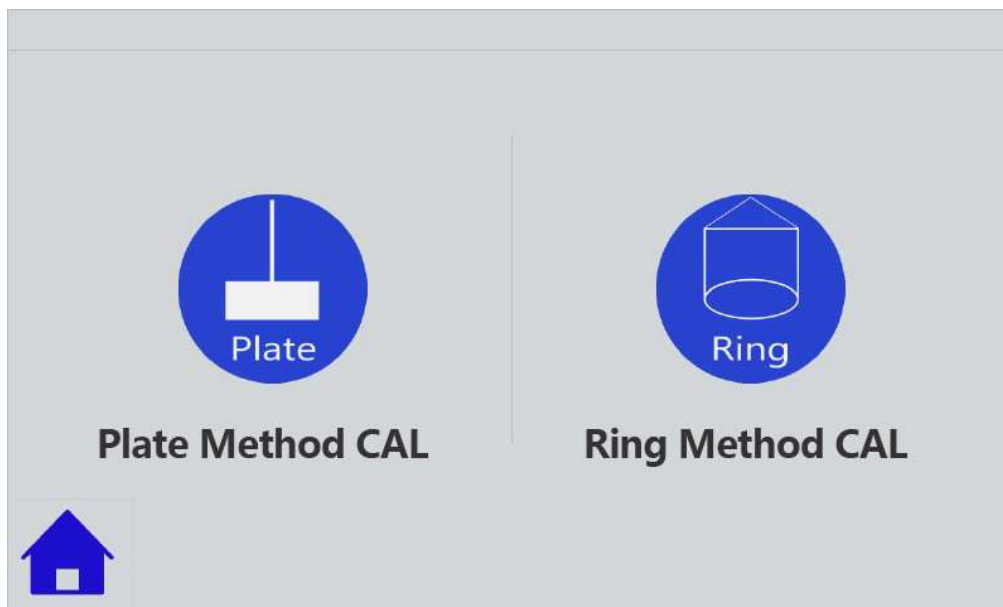


Icon	Notes
	Back to main interface key
	Print key
	Delete key

2.2.5 Data CAL

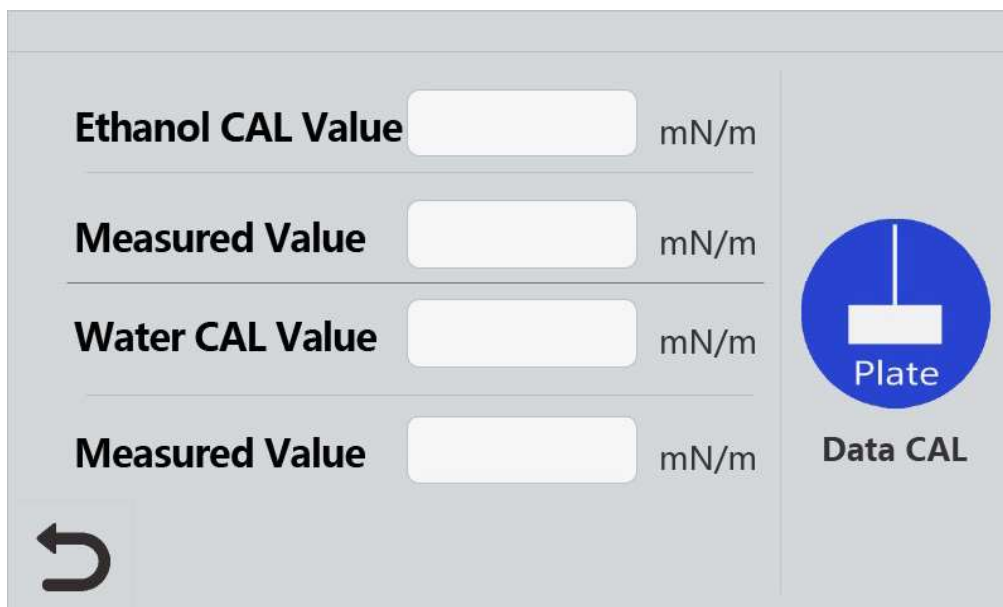
Used to correct plate/ring for wear and tear due to long-term use and test deviations due to slight changes in shape. **Before performing this procedure, verify that the plate or ring test for distilled water and absolute ethanol is operating normally and that**



repeatable data can be obtained as required by the plate/ring measurement procedure above. It includes plate method and ring method calibration respectively. Select the measurement mode to be calibrated and enter the corresponding calibration interface. Click the "Data Calibration" icon on the main interface to display the following diagram:



2.2.5.1 Plate Method Cal

Click on "Plate Method Cal" to display the following diagram:



Icon	Notes
	Back to the previous menu key
	Data Cal key

Name	Name explanation
Ethanol CAL Value	Ethanol surface tension value to be calibrated to (calibration value)
Measured Value	The surface tension value of ethanol actually measured by the machine (value to be calibrated)
Water CAL Value	Water surface tension value to be calibrated to (calibration value)
Measured Value	The surface tension value of water actually measured by the machine (value to be calibrated)

- 1) Enter each value in turn, allowing the input range of 10 to 80.
 - 2) Enter the calibration value and value to be calibrated of ethanol and water, and the deviation should be less than plus or minus 2, otherwise the calibration of the value will not be Correction.
 - 3) Check whether the above input values meet the requirements, make sure they are correct, and click the "Data Cal key".
 - 4) The correction of the surface tension data measured by the plate method is completed, and it can be tested in the "Wilhelmy Plate Method Test".
- *Note: The measured ethanol and water need to be prepared to be analytical reagent grade.

2.2.5.2 Ring Method CAL: Click "Ring Method CAL" to display the following diagram

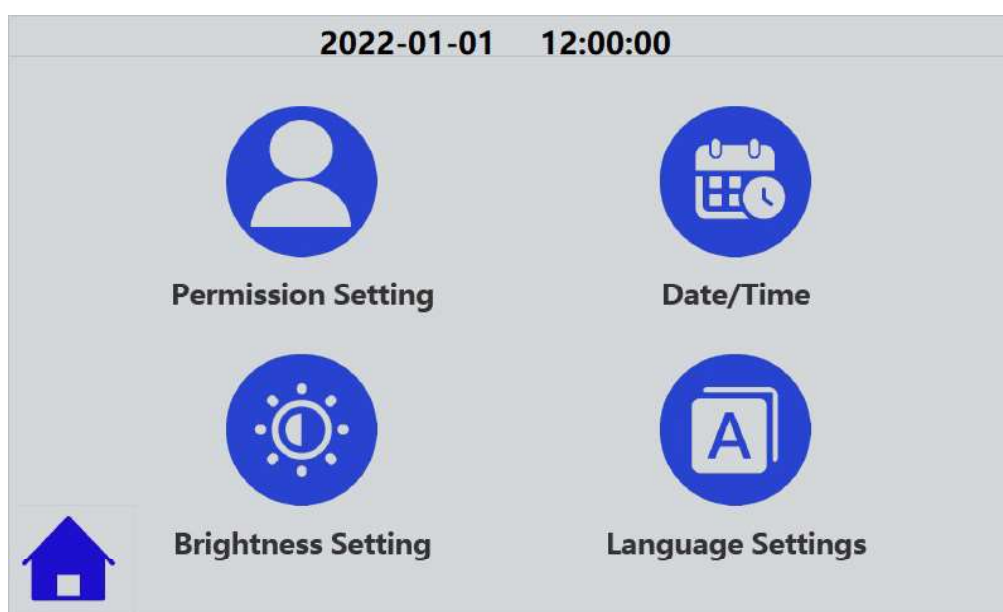
Icon	Notes
	Back to the previous menu key
	Data Cal key

Name	Name explanation
Ethanol CAL Value	Ethanol surface tension value to be calibrated to (calibration value)
Measured Value	The surface tension value of ethanol actually measured by the machine (value to be calibrated)
Water CAL Value	Water surface tension value to be calibrated to (calibration value)
Measured Value	The surface tension value of water actually measured by the machine (value to be calibrated)

- 1) Enter each value in turn, allowing the input range of 10 to 80.
 - 2) Enter the calibration value and value to be calibrated of ethanol and water, and the deviation should be less than plus or minus 2, otherwise the calibration of the value will not be Correction.
 - 3) Check whether the above input values meet the requirements, make sure they are correct, and click the "Data Cal key".
 - 4) The correction of the surface tension data measured by the plate method is completed, and it can be tested in the "Wilhelmy Plate Method Test".
- *Note: The measured ethanol and water need to be prepared to be analytical reagent grade.

2.2.6 Instrument Setting

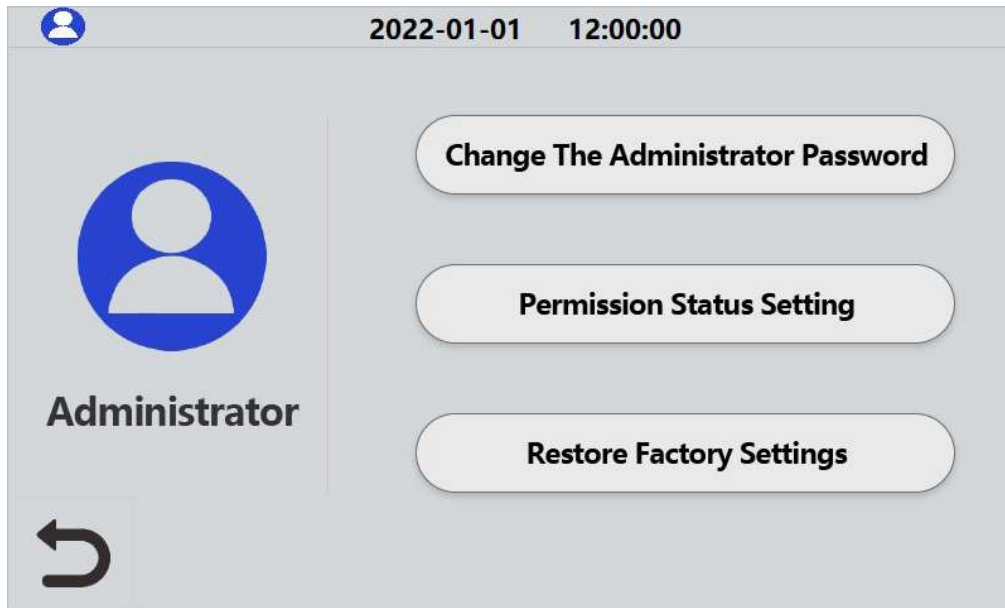
The setup menu within the machine has several control methods and functions. Click the "Instrument Setting" icon on the main interface, the following diagram will be displayed:



2.2.6.1 Permission setting

It is used to set the operator's authority. The factory defaults to operate as a visitor. The visitor's authority can only use the machine to measure, but cannot delete data and modify the machine time. Click the "Permission Setting" icon, and a request for a password will pop up. The factory default password for the administrator is "999999". Enter the default password and click the OK button to display the following diagram:

***Note: If the administrator password is entered incorrectly, nothing happens after clicking the OK button.**



1) "Change the administrator password": support to modify the administrator password, the password length is 6 digits. If you have modified the administrator password, please remember it to avoid inconvenience in subsequent use. If you forget the administrator password, please write to call to ask.

2) "Permission Status Setting": used to set the administrator login status. There are two options. "Only once" means that the machine is in the state of administrator privileges before restarting. If the machine is restarted, it will return to the state of guest. "Always keep" means that the machine is always in the state of administrator privileges, and it will not be affected after the machine is restarted, unless the subsequent settings are changed again.

3) "Restore factory settings": delete all saved data and restore to factory state.

2.2.6.2 Date/Time: Set the date and time of the machine system. To set this parameter, you need to log in as an administrator, otherwise the click will be invalid.

2.2.6.3 Brightness setting: Set the brightness of the machine display screen.

2.2.6.4 Language settings: Set the machine operating language, Chinese/English is optional.

3. Machine use precautions and troubleshooting

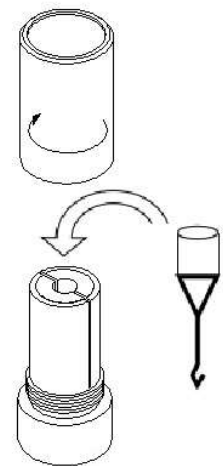
3.1 Precautions for use:

At the beginning of the design of the machine, the test method has been optimized and the machine structure has been integrated to the maximum, thereby reducing the probability of machine failure. Please read this operation manual carefully before using the machine to reduce the inconvenience of subsequent use.

1) Before plugging in the power supply, please confirm the voltage specified by the machine to avoid damage to the machine. The power socket must have a ground terminal.

2) The surface of the platinum plate is treated with a special process, so the surface cannot be worn or scratched, otherwise the measurement data will be deviated. If the platinum plate is very deformed or damaged, please repurchase the accessories. After each test, the platinum plate must be cleaned and then burned with an alcohol lamp. It cannot be directly burned with an alcohol lamp without cleaning. This operation will cause the surface of the platinum plate to become black, which will directly affect the accuracy of the measurement data.


3) Due to its special structure, the platinum ring is easily changed its shape by external force, so be careful not to change its shape during use, otherwise it will lead to deviations in the measurement data. If the platinum ring has been deformed, please put it back into the platinum ring container (see the diagram on the right) and compact it. If the platinum ring is very deformed or damaged, please repurchase the accessories. After each test, the platinum ring must be cleaned and then burned with an alcohol lamp. It cannot be directly burned with an alcohol lamp without cleaning. This operation will cause the surface of the platinum ring to become black, which will directly affect the accuracy of the measurement data.



4) There are precision load cells inside the machine. Try to avoid placing the machine in vents and direct sunlight areas. The desktop should be firm and stable.

5) The hook of the machine should not be impacted by external force, otherwise the sensor will be damaged.

3.2 Malfunction and Exclusion steps

Serial number	Fault phenomenon	Exclude
1	The machine does not respond when powered on	<ol style="list-style-type: none"> 1. Check whether the power socket is in good contact 2. Check whether the machine fuse is blown (the fuse is integrated with the machine power socket) 3. The above has been confirmed to be correct, please contact the company for after-sales service
2	The test has not started, the data keeps beating	<ol style="list-style-type: none"> 1. The machine has not been warmed up for enough time 2. The place where the machine is placed does not meet the requirements of point 4 in section 3.1 of the manual 3. The above has been confirmed to be correct, please contact the company for after-sales service
3	Surface tension data bar display 	Press the "tare key" to display zero
4	Test standard sample (water or alcohol) data deviation is large	<ol style="list-style-type: none"> 1. Failure to wash and burn plate or ring and glassware as required by the manual 2. The test standard sample fails to meet the requirements of the manual (analytical reagent grade, and the recommended water to be prepared is small bottled drinking distilled water) 3. The standard weight CAL operation is not performed 4. The platinum plate or ring has been damaged and needs to be replaced 5. After restoring the factory settings, re-test
5	When the weight is calibrated, there is no response after clicking the calibration	<ol style="list-style-type: none"> 1. The machine has not been warmed up for enough time, and the numbers are constantly beating 2. The place where the machine is placed does not meet the requirements of point 4 in section 3.1 of the manual, and the numbers are constantly beating

4. Appendix: Various liquid interfaces and surface tension values (reference)

Common Liquid Surface/Interfacial Tension Data

Liquid	mN/m		temperature °C
	Surface Tension	interfacial tension with water	
anhydrous ethanol	24.0	N/A	0
anhydrous ethanol	22.3	N/A	20
anhydrous ethanol	21.2	N/A	30
anhydrous ethanol	20.4	N/A	40
Octane	21.69	51.68	20
Dodecane	25.44	52.90	20
Hexane	27.46	53.77	20
benzene	28.88	35.0	20
carbon tetrachloride	26.77	45.0	20
Octanol	27.53	8.5	20
Butanol	24.6	1.6	20
aniline	42.9	5.9	20
ether	17.0	10.7	20
Ethyl acetate	23.9	3	20
mercury	484	426	20

Density, viscosity and surface tension data of water at different temperatures

°C	g/cm ³	mPa.s	mN/m
5	0.99999	1.519	74.92
10	0.99973	1.307	74.22
11	0.99963	1.271	74.07
12	0.99952	1.235	73.93
13	0.99940	1.202	73.78
14	0.99927	1.169	73.64
15	0.99913	1.139	73.49
16	0.99897	1.109	73.34
17	0.99880	1.081	73.19
18	0.99862	1.053	73.05
19	0.99843	1.027	72.90
20	0.99823	1.002	72.75
21	0.99802	0.9779	72.59
22	0.99780	0.9548	72.44
23	0.99756	0.9325	72.28
24	0.99732	0.9111	72.13
25	0.99707	0.8904	71.97
26	0.99681	0.8705	71.82
27	0.99654	0.8513	71.66
28	0.99626	0.8327	71.50
29	0.99597	0.8148	71.35
30	0.99567	0.7975	71.18
40	0.99224	0.6529	69.56
50	0.98807	0.5468	67.91
60	0.98326	0.4677	66.17