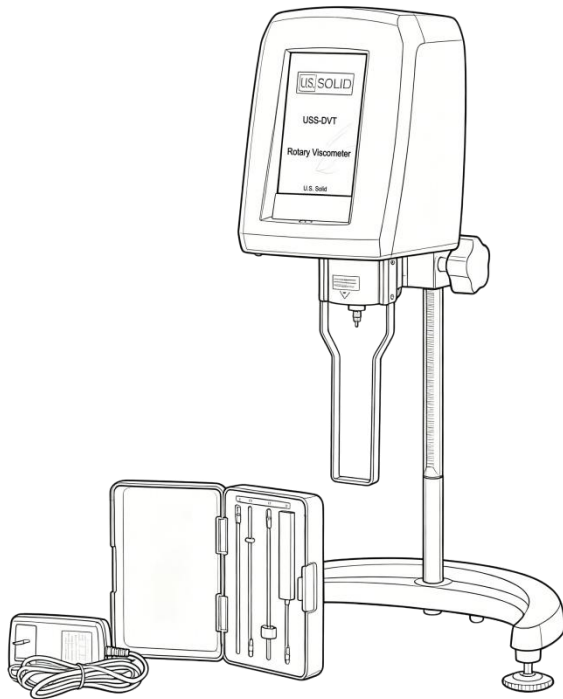




# Instruction Manual

## USS-DVT01 Rotary Viscometer



This manual should be made available to all users of this equipment. For best results, and for maximum durability of the equipment, carefully read and follow all instructions. Failure to do so can lead to serious injury or catastrophic damage to the user, machine, supplies, or surrounding areas. A safety suggestions must be followed closely, and extreme precaution must be taken to assure proper use of the equipment by only qualified personnel who have read this guide.

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# I.Product Overview & Working Principle

Thank you for choosing U.S. Solid Touch Screen Viscometer. For smooth and safe operations, please read and understand this manual.

The brand new touch screen viscometer is an intelligent instrument based on ARM technology, replacing the traditional operation mode with keys and a small-size LCD. This series is integrated with a high-performance step motor and a driver running accurately and stably as per the program setting, and the motor drives the rotor to rotate through a torque sensor at a constant speed. When the rotor meets any viscous resistance in the liquid tested, the force is fed back to the torque sensor, processed and computed internally, and displayed as a viscosity value.

Comparing with similar instruments, this series of instruments has many advantages such as convenient operation, direct reading, rich display, high measuring accuracy, stable rotating speed, high interference resistance and wide working voltage (100V~240V, 50/60Hz), etc. Its LCD display with blue backlight provides high brightness for clear data visibility.

For operation, the measuring value percentage of the full range can be displayed, with range overflow warning and automatic scanning functions. The user can select the optimal rotor and speed combination,

save identified testing conditions, and use them conveniently for future testing.

It serves as a precision instrument for measuring both the absolute viscosity of Newtonian liquids and the apparent relative viscosity of non-Newtonian liquids. Widely used in solvent, adhesive, emulsion, biochemical product, paint, cosmetics, ink, paper pulp, food, grease, coatings, resins, and chemical materials.

## II. Main Technical Performance

Model	USS-DVT01001	USS-DVT01003	USS-DVT01005
Measurement Range	10 to $6 \times 10^6$ mPa·s	100 to $4 \times 10^7$ mPa·s	200 to $8 \times 10^7$ mPa·s
Measurement Accuracy	±1% (Newtonian Liquid)		
Standard rotors	L1, L 2, L3, L 4	R2, R3, R4, R5, R6, R7	
Rotor Speed	0.1~200 stepless speed change, 2000 optional rotating speed steps		
Temperature Measuring	YES	YES	YES
RS232 Connector	YES	YES	YES
Power Supply	AC 110V/60Hz or AC 220V/50Hz		
Working Environment	Temperature: 5 °C to 35 °C Relative Humidity: ≤80%		

- Unit conversion: 1 Pa·s = 1000 mPa·s, 1 P = 100 mPa·s, 1 cP = 1 mPa·s
- Ultra-low viscosity adapter, referred to as No.0 rotor
- In Auto mode, the TIMING function does not work

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### III.Packing List

Please verify the following items immediately after unpacking. Contact us if anything is missing.

No.	Name	QTY	Std
1	Digital display viscometer main machine	1 set	✓
2	Main machine connecting rod	1 piece	✓
3	Elevating pole and elevating slider	1 set	✓
4	Triangle base	1 piece	✓
5	Rotor protective frame	1 piece	✓
6	Rotors	1 set	✓
7	Power cable	1 piece	✓
8	Open-end wrench	1 piece	✓
9	Allen wrench	1 piece	✓
10	Instruction manual	1 piece	✓
11	Touch screen stylus	1 piece	✓

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## IV. Instrument Structure & Components

Front of Main Unit(Fig.1):

No.	Component	Description
1	Level indicator	Shows if instrument is level
2	LCD Display	High brightness with blue backlight
3	Protection bracket	Rotor guard mounting position
4	Base	With two adjustable leveling feet
5	Rotor connector (universal joint)	Connects rotor
6	Rotor	Replaceable
7	Level adjustment knob	For leveling
8	Lifting column	Adjust host lifting

Back Side of Main Unit(Fig.2):

No.	Component	Description
1	RS232 & USB interface	For data output to computer/printer
2	Power switch	Main power on/off
3	Temperature probe socket	For optional temperature probe
4	Power socket	AC power input
5	Connecting rod hole	For attaching the handle

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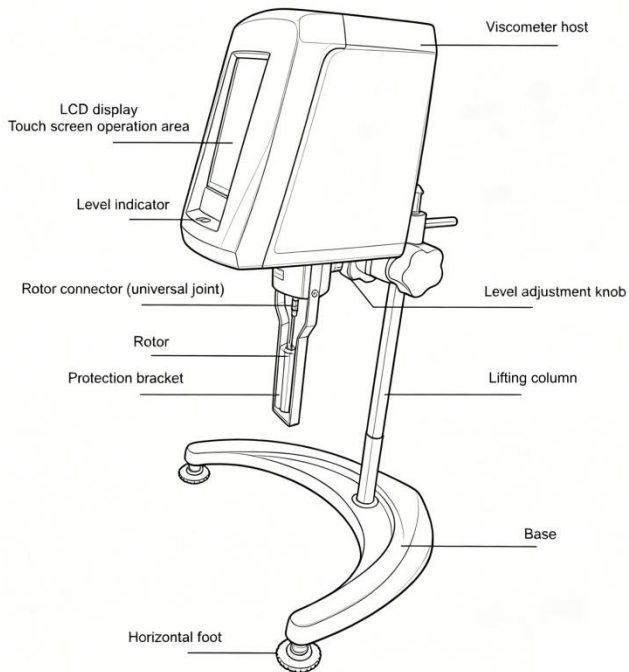


Fig. 1

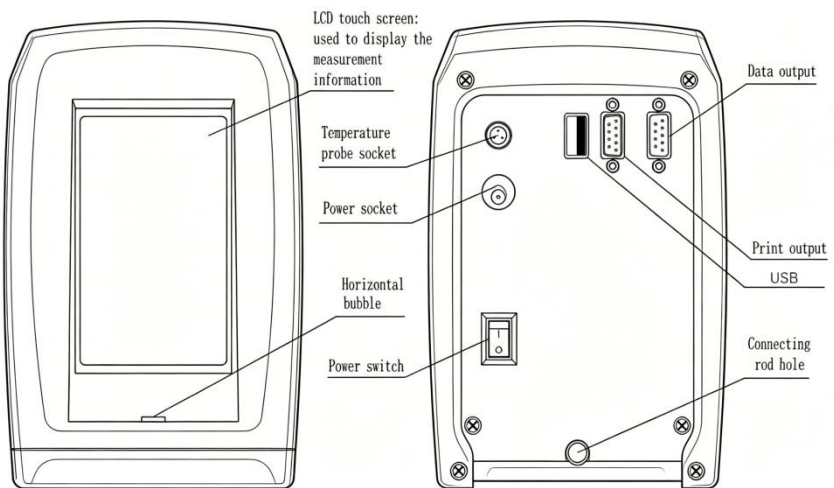


Fig. 2

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# V.Environment & Installation

## 5.1 Environmental Conditions:

- Ambient temperature:  $5^{\circ}\text{C}\sim 35^{\circ}\text{C}$  (recommended:  $20^{\circ}\text{C}\pm 0.5^{\circ}\text{C}$ )
- Relative humidity:  $\leq 80\%$
- Power supply: AC 100~240V (50/60Hz)
- Ensure the power supply frequency error range conforms to the specified voltage to maintain measurement accuracy.
- No strong electromagnetic interference, no strenuous vibration, no corrosive gas.

## 5.2 Installation Requirements

- Ensure working area is clean and dry.
- Place on a level and stable workbench.
- Set up in a vibration-free location.
- Keep away from magnets or magnetic field-generating equipment.
- Avoid using the instrument in areas prone to explosive hazards
- Avoid prolonged use in high humidity or dusty environments.

## VI. Instrument Installation

Please follow the steps below to assemble the instrument:

Step 1 :

Take out the base, lifting column, viscometer host, host connecting rod, power adapter and other components from the box in turn as shown in Fig.3.

Step 2 :

Insert the lifting column into the hole of the base, ensuring the toothed surface faces the front of the base. Tighten the nut with a wrench to secure the column and prevent rotation.

Step 3 :

Rotate the lifting handwheel to adjust vertical movement. If too tight or loose, adjust via the tightening screw on the front of the lifting seat to achieve slight tightness, preventing the viscometer head from descending under its own weight.

Step 4 :

Remove the screws on the connecting rod, insert the milling plane down into the mounting hole at the bottom of the host. Connect and tighten with the hex screw.

Step 5 :

Insert the host with the connecting rod into the mounting hole of the lift slider, straighten it, and tighten the fixed knob.

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Step 6 :

Adjust the three leveling feet below the base so that the level bubble in front of the instrument is centered in the black circle.

Step 7 :

Remove the red transport protective cap under the instrument head, and connect the power supply. Power on the instrument. Verify the instrument is level. Assembly is complete.

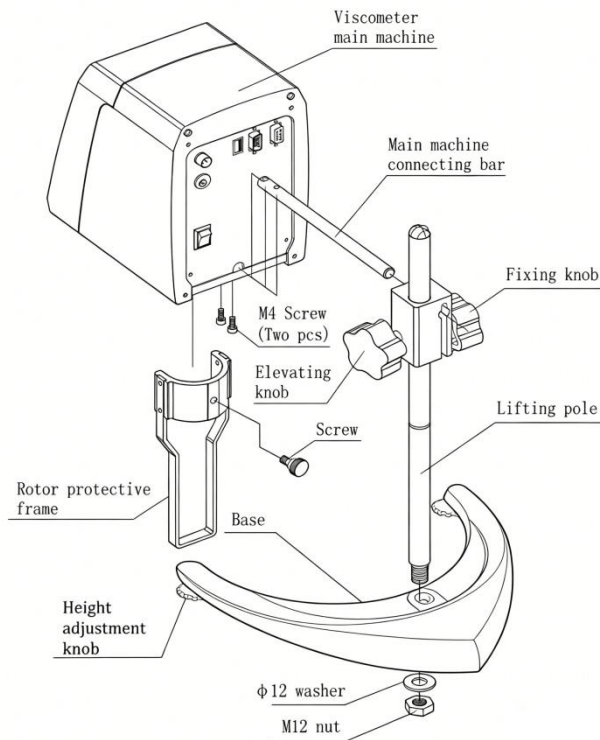


Fig. 3

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## Rotor Configuration:

The L1 ~ L4 rotors and rotor protection frames that come with the machine are shown in Fig.4.

The R2 ~ R7 rotor and the rotor protection frame provided with the machine are shown in Fig.5.(USS-DVT01005 is not equipped with a rotor protection frame)

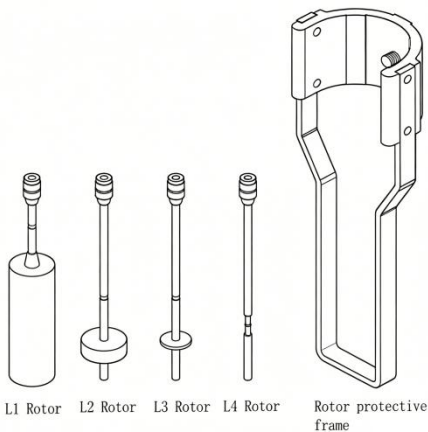


Fig. 4

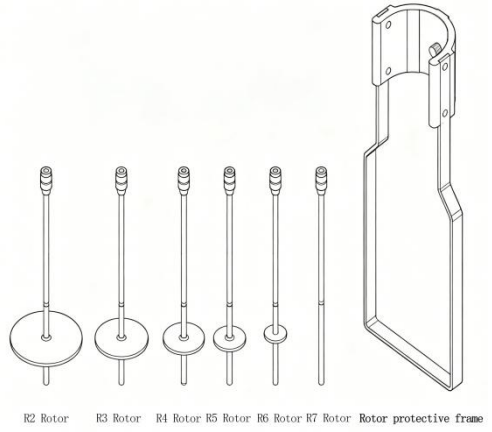


Fig. 5

## VII.Preparation Before Test

Please complete the following preparations before performing viscosity testing:

1. Sample container preparation:

- USS-DVT01001: Transfer sample into a round flat-bottom container at least 60mm in diameter, height >10 cm.
- USS-DVT01003 / 01005: Container diameter at least 100mm, height >10 cm.


2. Mount the rotor protective frame (if applicable): Attach the protective frame to the silver casing under the instrument.

3. Install the rotor: Select a suitable rotor, and clockwise (counter-thread/left-thread) screw it to the shaft connector under the main machine.

4. Adjust liquid level: Rotate the elevating knob to slowly lower the instrument, immerse the rotor, and align the liquid level mark (concave or convex line on the rotor pole) to the level of the tested liquid.

5. Check level: Check that the front horizontal bubble of the instrument is at the level position.

6. Control temperature: Accurately control the liquid temperature; ensure the ambient temperature remains constant during measurement.

 **IMPORTANT:** Never transversally pull the shaft connector when attaching or detaching the rotor. The rotor and universal joint are connected in left thread (counter-thread); must be performed in the correct rotating direction.

## VIII. Instrument Operation

After powering on, the instrument displays the initial interface and then enters the main menu after 3 seconds. The main menu has 4 options(Fig.6):

Viscosity Test: Parameter setting, viscosity measurement and related data display.

Stored Test: Directly use previously saved test conditions for viscosity testing.

Manage Results: Delete saved viscosity test data and USB disk export management

Setting: Modify machine time, date, and temperature correction.

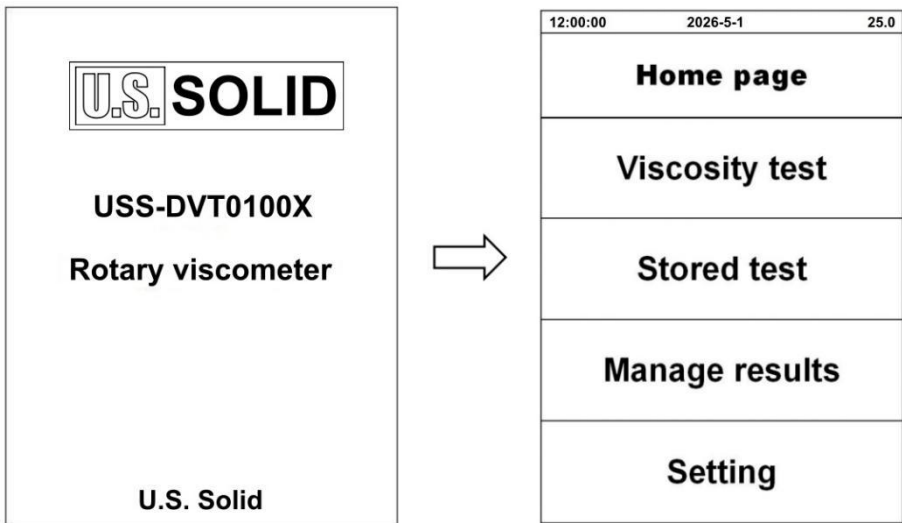


Fig. 6

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## 8.1 Viscosity Test

1) Click "Viscosity Test" to enter the test interface(Fig.7).

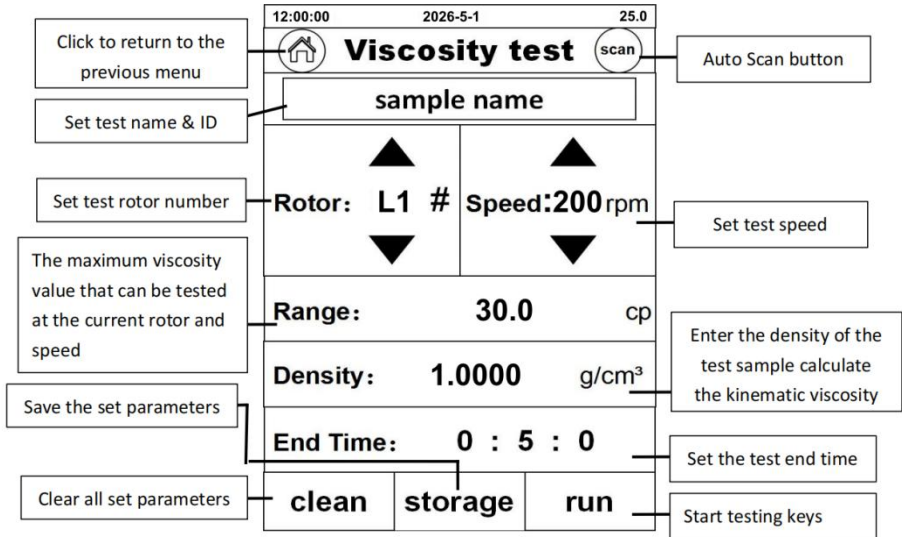


Fig. 7

2) Parameter setting: Before testing, set parameters: "Sample name" (defaults to date/time if not set), "Rotor", and "Speed" are required; "End Conditions" and "Sample Density" are optional. Rotor/speed selected by "▼ ▲" button; other parameters entered via virtual keyboard.

Example: If the viscosity value of the measured sample is known to be about 7mpa.s, the following combinations can be selected: L1, 200RPM. After the parameter setting is completed, the parameter can be saved in the built-in storage. In the next test, the parameter can

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be directly used to perform the viscosity test through the "stored condition test".

3) Start the test: After setting parameters, click "Run" to start. The interface shows(Fig.8):

Viscosity: Viscosity value; "ERROR" if out of range.

Temp: Temperature sensor value (requires optional probe; 0.0° C if not inserted).

Rotor: Currently selected rotor number.

Speed: Current speed (stepless adjustment without stopping).

Shear rate: Shear rate value under current conditions.

Shear stress: Current shear stress value.

Bar trend: Current torque %; red dashed lines at 10% and 90%.

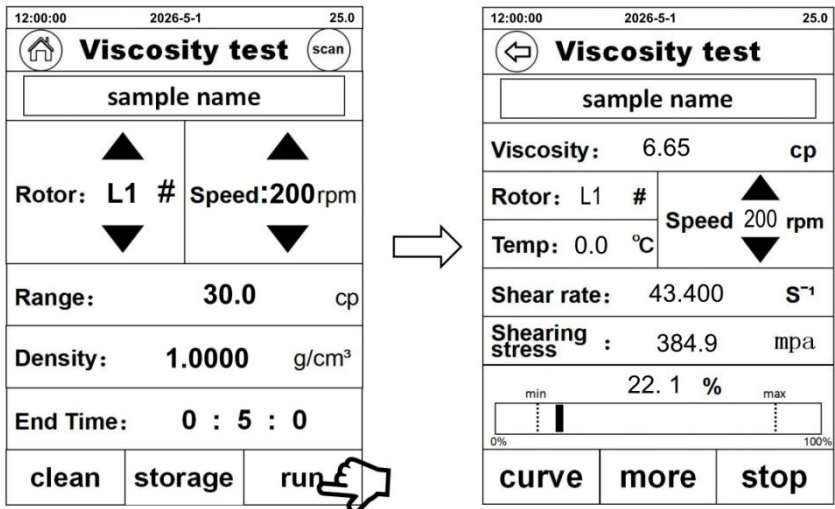


Fig. 8

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4) Curve display: Click "Curve" during testing to switch from list to coordinate system display(Fig.9). Click the icon in the upper left or "List" to return.

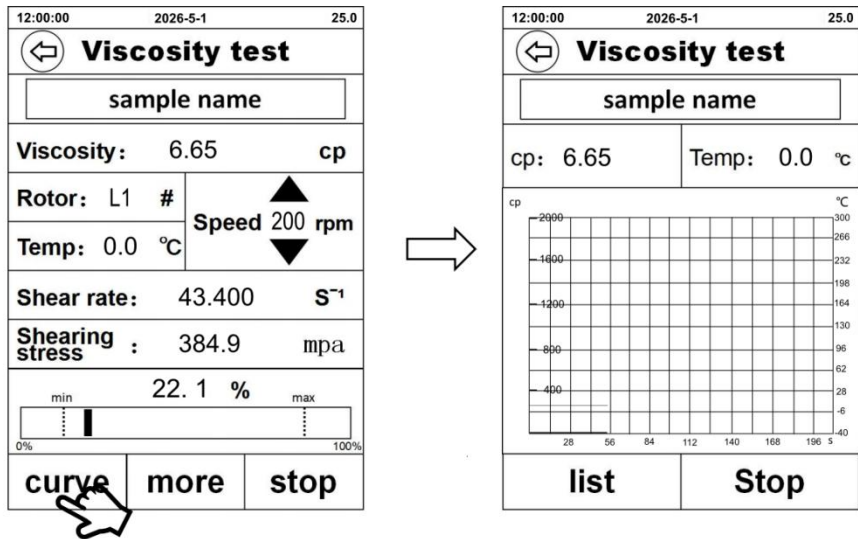


Fig. 9

5) More parameters: Click "More" during testing to view: dynamic viscosity, end condition, remaining time, density, kinematic viscosity(Fig.10).

Dynamic viscosity: The viscosity value measured by this rotational viscometer.

End condition: Set a period of time, from the start of the test, the test will automatically stop after this time. At this time, the data is still

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on the test interface, which is equivalent to measuring the viscosity value at a regular time.

Remaining time: remaining end test time.

Density: The density of the test sample filled before the test, which is used to convert the kinematic viscosity value.

Kinematic viscosity: The kinematic viscosity value of the measured sample, which is equivalent to the dynamic viscosity value divided by the density.

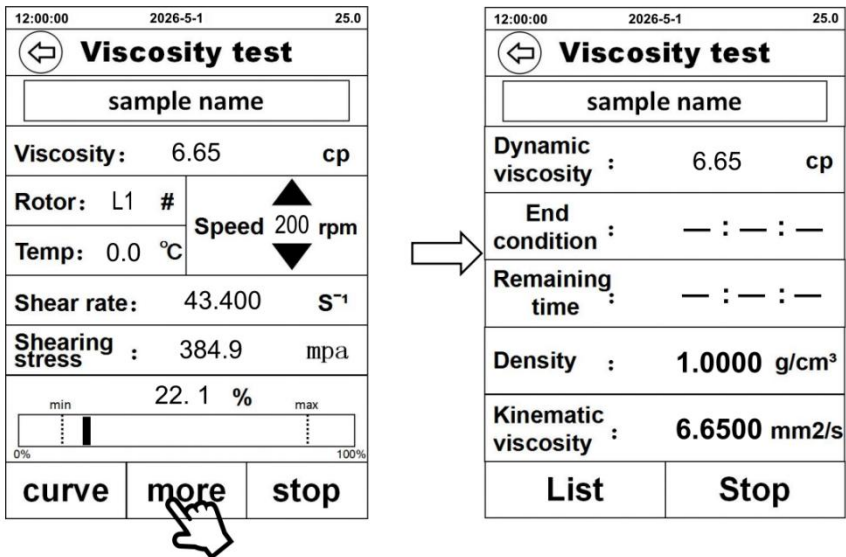


Fig. 10

6) End the test: After finishing, click "Stop" to enter test data interface. Click "Storage" → "Enter" to save to instrument memory; or connect an external printer and click "Print"(Fig.11).

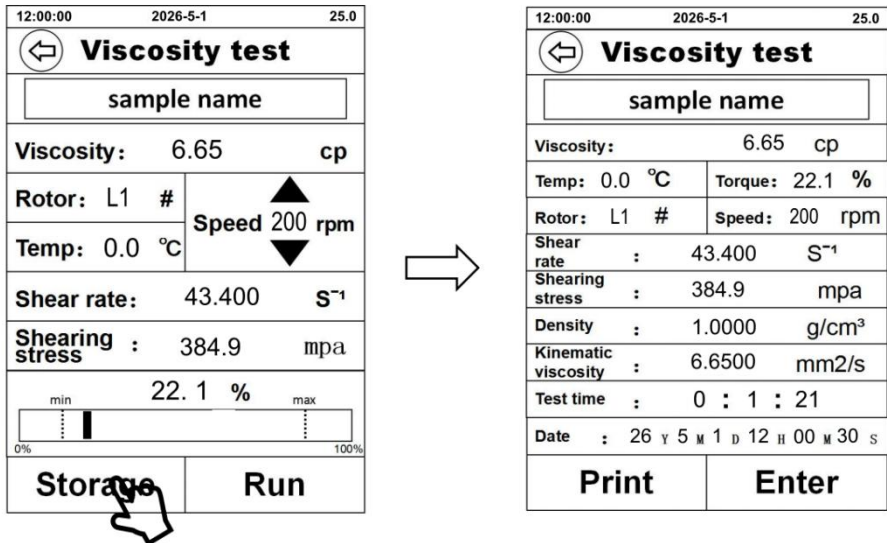


Fig. 11

7) Automatic scan: This function provides the best rotor-speed combination(Fig.12). Click "Auto Scan" in the upper right corner, install any rotor, click "Start". When the result is "Suitable", click "Use" to apply directly. If not, follow on-screen instructions to change rotors.

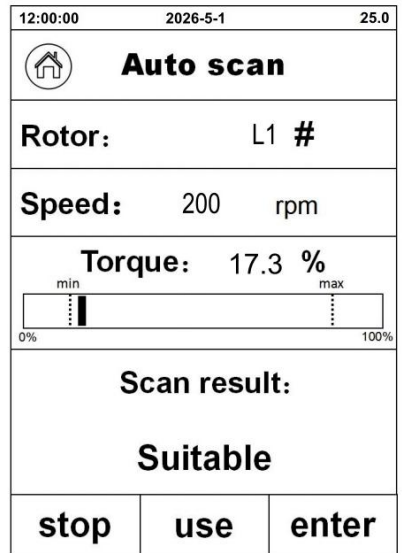
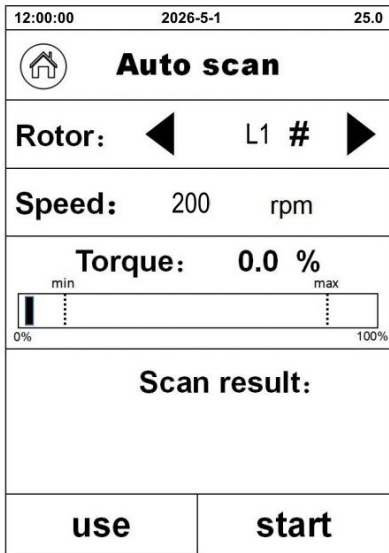


Fig. 12

## 8.2 Stored Test

After clicking "Stored Test", saved test condition records are displayed(Fig.13). Select and use directly. Click "Edit" to delete stored test conditions.

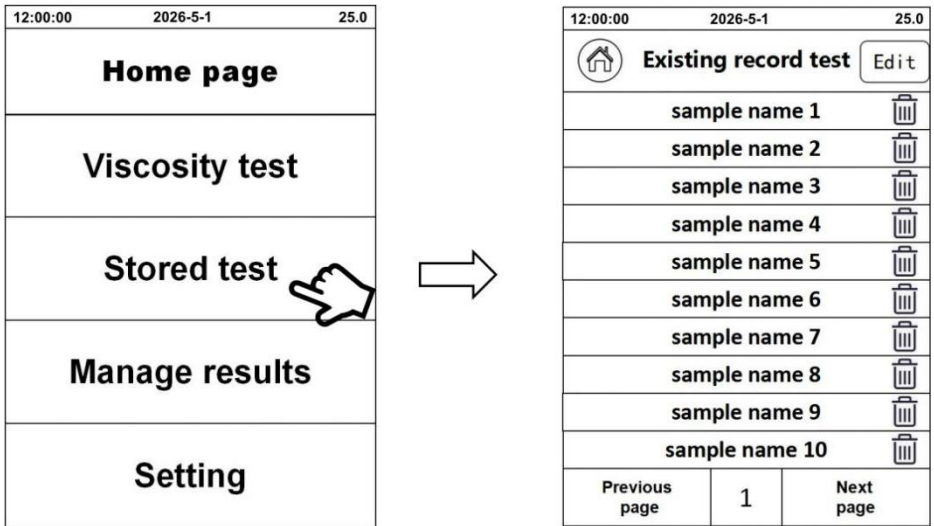


Fig.13

### 8.3 Manage Results

After clicking "Manage Results", saved test records are displayed(Fig.14). Select records to view, delete, or export via USB disk(Fig.15).

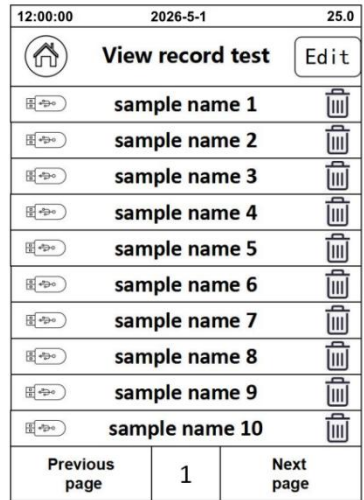
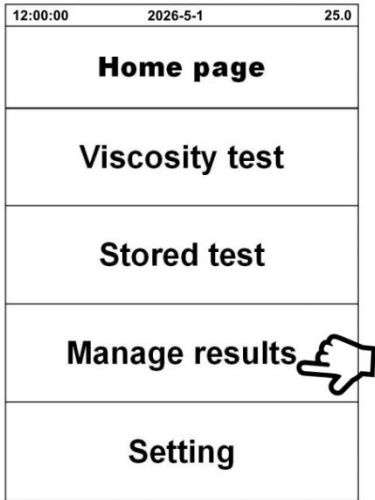


Fig. 14

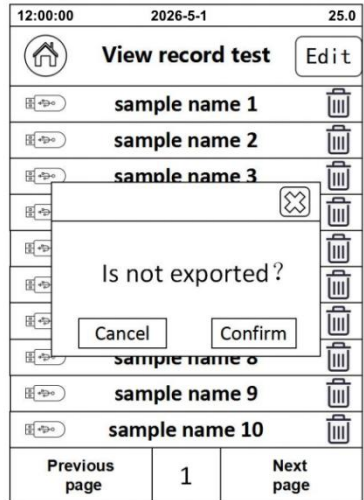
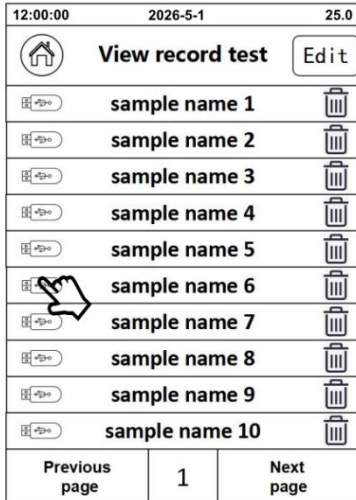


Fig. 15

### 8.4 Settings(Fig.16)

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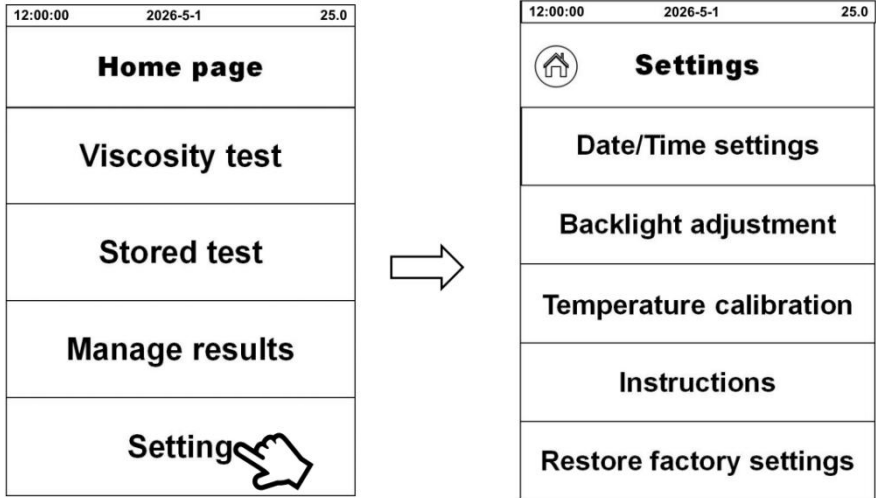


Fig. 16

- 1) Time and date settings: Click "Date/Time Settings" to directly adjust the values(Fig.17).

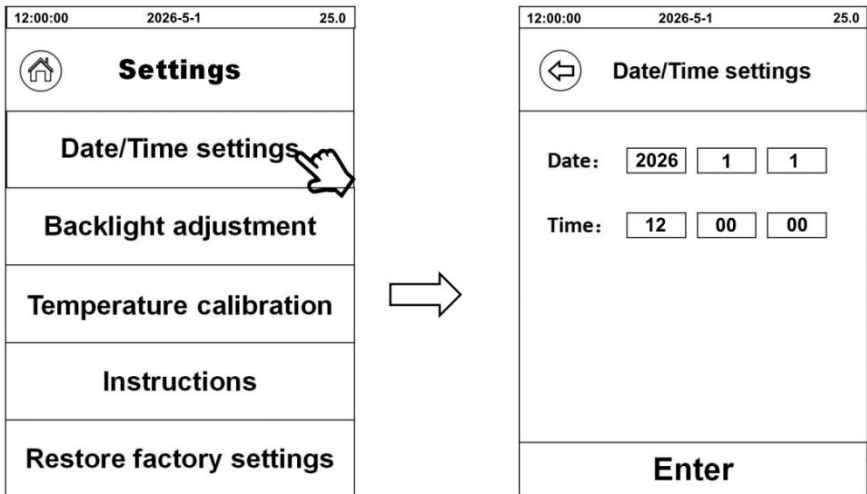


Fig. 17

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2) Backlight adjustment: Click "Backlight Adjustment", adjust screen brightness by "-" "+" or dragging the circular button(Fig.18).

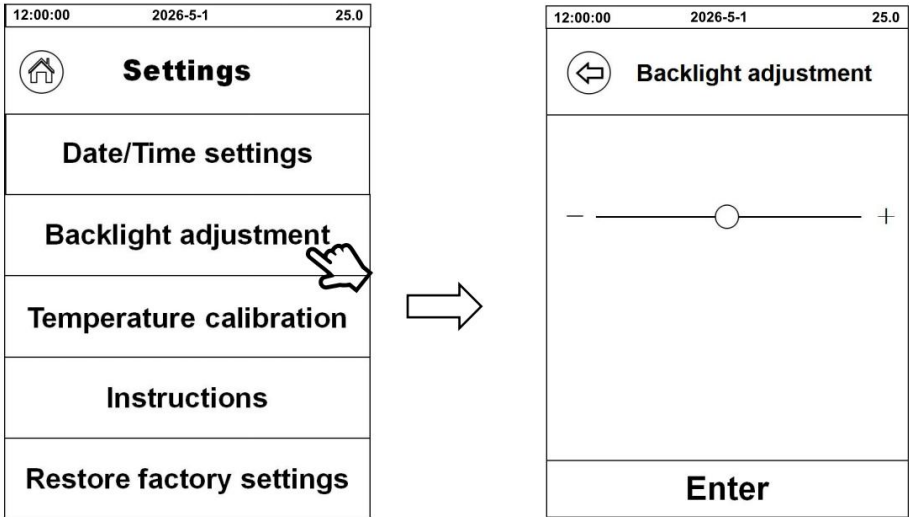


Fig. 18

3) Temperature calibration: Allows users to self-calibrate the temperature sensor value (requires optional temperature sensor)(Fig.19).

4) Instructions: Briefly describes installation and basic operation for beginners.

5) Restore factory settings: Click "Restore Factory Settings" then "OK"; the instrument returns to factory state and all internal records will be cleared(Fig.20).

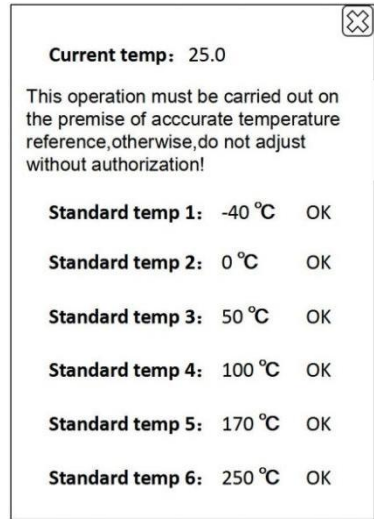
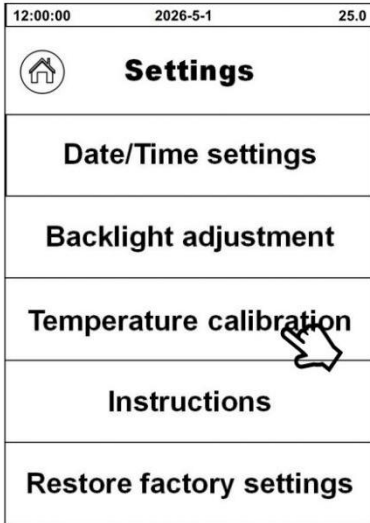


Fig. 19

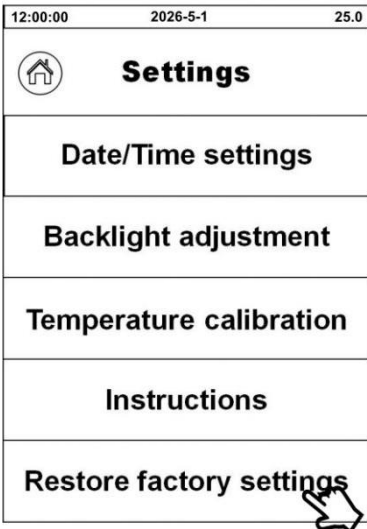


Fig. 20

## 8.5 Key Operating Notes

- The torque percentage must be within 10%~90%. "ERROR" will be displayed if too high or too low; change rotor or adjust speed.
- When always 10%~90% at different speeds with the same rotor, use the speed where the intermediate percentage is near 50%.
- High viscosity: small rotor + low speed; Low viscosity: large rotor + high speed.
- Unknown viscosity: assume high viscosity, test with rotors from small to large, speed from low to high.

## 8.6 Model-Specific Notes

- USS-DVT01001: Comes with L1~L4 rotors and protective frame. Container diameter  $\geq 60\text{mm}$ .
- USS-DVT01003: Comes with R2~R7 rotors and protective frame. Container diameter  $\geq 100\text{mm}$ .
- USS-DVT01005: Comes with R2~R7 rotors, NO protective frame. Container diameter  $\geq 100\text{mm}$ .

## IX. Safety Precautions & Maintenance

### 9.1 Safety Operation Rules

1. Only personnel with relevant training should operate this instrument. Adhere to applicable safety, personal safety, and accident prevention regulations.
2. Be mindful of the magnetic field's impact on the environment, especially on data memory and pacemakers.
3. Place the instrument on a stable, clean, non-slip, dry, and fireproof surface. Avoid exposure to corrosive gases.
4. Ensure the power cord does not touch the instrument's panel surface.
5. Use appropriate protective equipment based on the processing medium to prevent hazards like liquid splashes or the release of toxic or combustible gases.
6. Inspect the instrument and accessories before each use to ensure they are undamaged.
7. When handling toxic and volatile substances, use airtight containers and work in a suitable fume hood.
8. Ensure the instrument's power supply frequency error range conforms to the specified voltage to maintain measurement accuracy.

9. Handle the rotor carefully during installation and removal. Before disassembling, gently lift the connector at the lower part of the instrument. Keep connecting parts, rotor connection end surfaces, and threads clean.
10. After installing the rotor, avoid rotating it without liquid to prevent damage to the rotor tip and bearings.
11. Keep the measuring rotor clean. Clean promptly after each use. Disassemble and clean with suitable organic solvent; never clean while attached to the instrument. Avoid using metal knives to prevent surface scratches. Store properly in storage box after cleaning.
12. During movement and transport, secure the rotor connector with the red protective cap.
13. Before powering on the instrument, always remove the red protective cap to prevent damage.
14. Do not disassemble or adjust the instrument's parts arbitrarily, and do not add lubricating oil on your own.

## 9.2 Nine Keys to Accurate Measurement

1. Precisely control the temperature of the liquid
2. Immerse the rotor in the liquid for sufficient time at a consistent temperature

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3. Ensure the uniformity of the liquid
4. Center the rotor in the container during measurement
5. Prevent air bubbles from adhering to the rotor's bottom
6. Use a protective frame during measurement (if equipped)
7. Maintain cleanliness of the rotor
8. Follow operational instructions strictly
9. Use Rotor #0 for liquids below 11 mPa·s (optional)

### 9.3 Important Notes

- Viscosity is a function of temperature. Temperature fluctuation must be controlled within  $\pm 0.1^{\circ}\text{C}$ ; a thermostatic bath can be equipped if necessary.
- The torque percentage must always be within 10%~90%.
- The rotor is connected via left thread: install by rotating clockwise, remove by rotating counterclockwise.
- Many suspensions, emulsions, polymers are "non-Newtonian fluids" — apparent viscosity varies with shear rate and time. Variations in results are normal and do not indicate instrument inaccuracy. Specify rotor type, speed, and duration when measuring non-Newtonian liquids.

- When transporting or handling the instrument, protect the universal joint with the plastic cap.

## Contact

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You can email us at [service@ussolid.com](mailto:service@ussolid.com)

You can call one of our friendly customer service representative at +1(216) 223-8827

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