



Manual No.:14787

# Touchscreen Rotational Viscometer

USS-DVT70001 and USS-DVT70002

## User Manual



Product photograph

| Model        | Published viscosity range |
|--------------|---------------------------|
| USS-DVT70001 | 1-100,000 mPa·s           |
| USS-DVT70002 | 1-2,000,000 mPa·s         |

Read before installation and use. This manual covers assembly, standard and optional No. 0 spindle testing, touchscreen operation, records, presets, and maintenance for these two models.

## Contents

| Section                                    | Page |
|--------------------------------------------|------|
| 1. Getting Started and Safe Use            | 3    |
| 2. Models and Specifications               | 4    |
| 3. Instrument and Stand Structure          | 5    |
| 4. Rear Connections and Spindles           | 6    |
| 5. Assemble and Level the Instrument       | 7    |
| 6. Prepare the Sample and Fit the Spindle  | 8    |
| 7. Power On and Navigate                   | 9    |
| 8. Set the Main Screen Parameters          | 10   |
| 9. Select the Spindle and Speed            | 11   |
| 10. Measure and View the Curve             | 12   |
| 11. Finish Save and Print a Result         | 13   |
| 12. Browse and Delete Historical Records   | 14   |
| 13. View a Stored Result                   | 15   |
| 14. Save and Recall Measurement Presets    | 16   |
| 15. Configure Instrument Settings          | 17   |
| 16. Optional No. 0 Measuring Assembly      | 18   |
| 17. Install and Use the No. 0 Accessory    | 19   |
| 18. Complete Standard Measurement Workflow | 20   |
| 19. Measurement Quality and Repeatability  | 21   |
| 20. Troubleshooting                        | 22   |
| 21. Cleaning Storage and Delivery Check    | 23   |
| 22. Test Record and Service                | 24   |

## 1. Getting Started and Safe Use

### Before First Use

Only trained personnel should operate this instrument. Read the instructions and the safety data sheet for each sample and cleaning agent. Inspect the instrument, spindle set, guard, probe, adapter, and stand for damage before connecting power.

1. Use only the supplied compatible power adapter and the specified supply. Fully insert the plug. Keep electrical connections and hands dry.
2. Operate in a clean, dry, normal room-temperature environment, away from vibration, corrosive gases, electromagnetic interference, excessive dust, and prolonged high humidity. Do not use in an explosive atmosphere.
3. Use suitable protection for splash hazards and for toxic or flammable vapors. Consider magnetic-field sensitivity of nearby equipment, data media, and medical devices.
4. Remove the yellow protective cap before powering the instrument for operation. Refit it for movement or transport to support the spindle coupling.
5. Support the head while adjusting its height. Secure the lift and head clamp so the head cannot fall.
6. Keep hair, clothing, and fingers clear of rotating parts. Stop before changing spindles or moving the measuring assembly.
7. Never rotate an installed spindle without liquid. Dry running can damage the pivot and bearings.
8. Support the coupling gently upward during fitting or removal. Do not pull down, apply side loads, or force the thread. Keep mating faces clean.

### Care and Service

Remove the spindle before cleaning it. Never wash a spindle while it is attached to the head. Do not scrape precision surfaces with metal tools. Do not dismantle or adjust internal parts or add lubricant. Contact authorized service if the instrument is damaged or faulty.

## 2. Models and Specifications

| Specification                 | USS-DVT70001                | USS-DVT70002                    |
|-------------------------------|-----------------------------|---------------------------------|
| Published range (mPa·s)       | 1-100,000                   | 1-2,000,000                     |
| Available speeds (rpm)        | 6, 12, 30, 60               | 0.3, 0.6, 1.5, 3, 6, 12, 30, 60 |
| Viscosity accuracy            | ±2% for Newtonian liquids   | ±2% for Newtonian liquids       |
| Repeatability                 | ±1% for Newtonian liquids   | ±1% for Newtonian liquids       |
| Standard spindles             | Nos. 1, 2, 3, 4             | Nos. 1, 2, 3, 4                 |
| Optional low-viscosity system | No. 0 spindle and accessory | No. 0 spindle and accessory     |

### Shared Specifications

| Item            | Specification                                              |
|-----------------|------------------------------------------------------------|
| Input rating    | AC 100-240 V, 50/60 Hz, 1.0 A                              |
| Power           | 12 W                                                       |
| Display         | 5-inch touchscreen                                         |
| Speed control   | Fixed / automatic                                          |
| Result storage  | 50 test records                                            |
| Preset storage  | 5 measurement presets                                      |
| Timer           | Timed or continuous; 00h00m00s means continuous            |
| Temperature     | PT100 sensor; interface standard; accuracy ±0.2°C          |
| Data connection | RS232 interface and communication cable listed as standard |
| Net weight      | 4.8 kg                                                     |
| Dimensions      | 276 × 270 × 500 mm                                         |

One mPa·s equals one cP. Display resolution is specified as 0.01 for single-digit viscosity values and 1 for values of 10 and above; this is not the accuracy rating.

The published model range is not available at every spindle/speed combination. Confirm the displayed working range and the required measuring accessory for the intended low-viscosity test. Do not assume the minimum is achievable with every standard spindle.

### 3. Instrument and Stand Structure

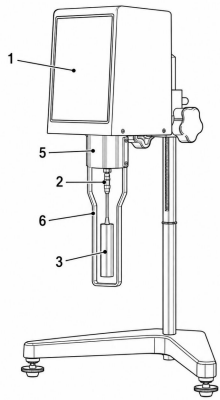


Figure 1. Instrument

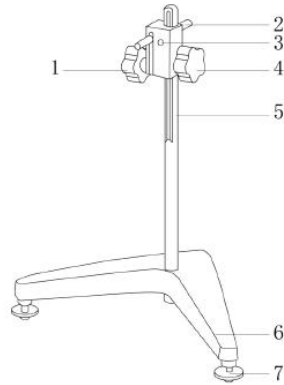


Figure 2. Stand

| Instrument number | Part                                    |
|-------------------|-----------------------------------------|
| 1                 | Touchscreen                             |
| 2                 | Spindle coupling                        |
| 3                 | Measuring spindle                       |
| 4                 | Bubble level (not visible in this view) |
| 5                 | Lower housing                           |
| 6                 | Spindle guard                           |

| Stand number | Part                                       |
|--------------|--------------------------------------------|
| 1            | Head locking handwheel                     |
| 2            | Head mounting rod                          |
| 3            | Lift tension adjustment screw; use hex key |
| 4            | Lift handwheel                             |
| 5            | Support column                             |
| 6            | Base                                       |
| 7            | Leveling feet / wheels                     |

### 4. Rear Connections and Spindles

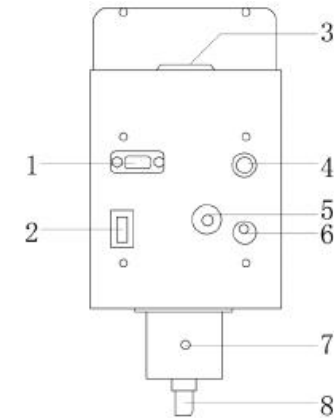


Figure 3. Rear connections and shipping protection

| Number | Part                          |
|--------|-------------------------------|
| 1      | PC / printer interface, RS232 |
| 2      | Power switch                  |
| 3      | Bubble level                  |
| 4      | Temperature probe connector   |
| 5      | Head mounting socket          |
| 6      | Power input                   |
| 7      | Guard mounting hole           |
| 8      | Yellow protective cap         |

#### Standard Spindle Set

Nos. 1-4 are the standard set. Read the number marked on the spindle handle and select the same number on screen. Each standard spindle has a liquid-level mark; immerse to the middle of the groove. No. 0 requires the dedicated optional low-viscosity assembly.

RS232 is not USB. Use compatible cables and the correct Print / Communication mode. Never connect a temperature probe or adapter to an unrelated port.

## 5. Assemble and Level the Instrument

1. Unpack carefully and check the components against Section 21 and the packing slip. Report missing or damaged items before use.
2. Place the base on a stable, clean, dry bench without vibration or corrosive gases.
3. Insert the toothed column into the round base opening, with the teeth facing the front of the base. Tighten the column bolt using the hex key to prevent rotation.
4. Turn the lift handwheel through its travel. If too tight or loose, adjust the tension screw at the front of the lift. Keep enough resistance to prevent the head descending under its own weight.
5. Insert the head mounting rod into the head holder. Keep the head approximately horizontal and tighten the locking handwheel.
6. Unscrew and remove the yellow protective cap below the head. Store it for transport.
7. Adjust the two base leveling screws until the head bubble is centered. Recheck level after installing the guard or moving the instrument.
8. Connect the compatible PT100 probe and power adapter to their labeled connectors. Keep the probe clear of the spindle. Verify that every mounting part is secure before power-on.

### Protect the Coupling

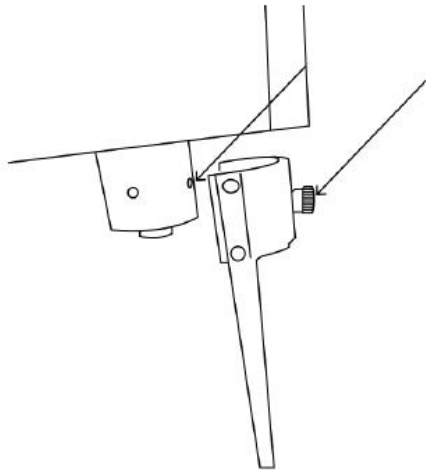


Figure 4. Lower housing and stand mounting detail

Support the head while lowering it. Avoid sudden movement or impacts to the spindle coupling. Do not force the lift or use the spindle to move the head.

## 6. Prepare the Sample and Fit the Spindle

1. Prepare a homogeneous sample without trapped air in a clean cylindrical vessel at least 70 mm in diameter and 120 mm high. These dimensions apply to standard spindles, not the No. 0 accessory.
2. Control the sample temperature with a suitable water bath or other compatible temperature-control equipment. The instrument measures temperature; it does not itself regulate the sample temperature.
3. Install the spindle guard and recheck that the bubble is centered.
4. Select a spindle suited to the expected viscosity. Remove the protective cap and inspect the coupling thread and spindle end face for contamination.
5. Gently support the coupling upward. Align the spindle thread, then turn the spindle clockwise when viewed from above to install it. Turn counterclockwise from the same top view to remove it. Do not force the connection.
6. Support the head and lower it slowly until the sample surface reaches the middle of the spindle immersion groove. Center the spindle in the vessel and prevent contact with the guard, probe, or container.
7. Allow sample and spindle temperature to stabilize. Confirm the physical spindle number, level, immersion, and free clearance before Start.

### Rotation Direction Depends on Viewpoint

| Action  | Viewed from above, looking down along the spindle |
|---------|---------------------------------------------------|
| Install | Clockwise                                         |
| Remove  | Counterclockwise                                  |

The coupling uses a left-hand thread. The directions above follow the specified top view; looking upward from below reverses the apparent direction. Never pull the shaft down or push the spindle sideways.

## 7. Power On and Navigate



Figure 5. Startup reference

|                     |                |       |
|---------------------|----------------|-------|
| 2025.05.12          |                | 15:47 |
| <b>Main Screen</b>  |                |       |
| Settings            | Records        |       |
| Test name           | [ Enter name ] |       |
| Spindle             | [ Select ]     |       |
| Speed               | [ Select ] rpm |       |
| Range               | -- mPa.s       |       |
| Sample density      | -- g/cm3       |       |
| Kinematic viscosity | -- mm2/s       |       |
| Timer               | 00h 00m 00s    |       |
|                     |                |       |
| Load Preset         | Save Preset    | Start |

Figure 6. Main screen reference

1. Confirm that assembly is secure and the yellow cap has been removed. Turn on the rear power switch.
2. Wait for initialization. The startup screen displays the instrument brand logo.
3. On the Main Screen, use Settings for system preferences or Records to view saved test results.
4. Enter a test name, spindle, speed, and timer. Enter sample density when kinematic viscosity is required. Review the displayed range before Start.

Load Preset recalls a saved method; Save Preset stores the current method. Neither button saves a completed measurement result. Use Save on the Measurement Result screen for that purpose.

The English diagrams preserve the source screen functions while expanding labels for readability. They are translated reference diagrams, not photographs of a particular firmware version.

## 8. Set the Main Screen Parameters

| Field or button     | Operation                                                                                                  |
|---------------------|------------------------------------------------------------------------------------------------------------|
| Test name           | Enter an identifiable sample or test name                                                                  |
| Spindle             | Open the list and select the installed spindle number                                                      |
| Speed               | Choose a supported speed for the model                                                                     |
| Range               | Calculated automatically from spindle and speed; review before testing                                     |
| Sample density      | Enter the actual density at the test temperature in g/cm <sup>3</sup> when calculating kinematic viscosity |
| Kinematic viscosity | Calculated result in mm <sup>2</sup> /s based on viscosity and entered density                             |
| Timer               | Enter the duration; 00h00m00s selects continuous running                                                   |
| Settings            | Open common instrument settings                                                                            |
| Records             | Read stored measurements                                                                                   |
| Load Preset         | View and recall up to 5 saved methods                                                                      |
| Save Preset         | Store the current test settings; up to 5 presets                                                           |
| Start               | Begin measurement after confirming the parameters                                                          |

### Density and Kinematic Viscosity

Kinematic viscosity (mm<sup>2</sup>/s) = dynamic viscosity (mPa·s) ÷ density (g/cm<sup>3</sup>). Use the density of the actual sample at the test temperature. Do not enter water density merely to fill the field. An incorrect density produces an incorrect kinematic result.

### Timed and Continuous Tests

A nonzero timer selects a timed test. Zero hours, zero minutes, and zero seconds selects continuous running; the operator must use Stop. Confirm this setting each time a preset is recalled.

## 9. Select the Spindle and Speed

| Model        | Selectable speeds in rpm                 |
|--------------|------------------------------------------|
| USS-DVT70001 | 6, 12, 30, 60 and auto                   |
| USS-DVT70002 | 0.3, 0.6, 1.5, 3, 6, 12, 30, 60 and auto |

## When the Viscosity Is Known

Use the supplied spindle/range information to choose a combination that includes the expected viscosity. Confirm the current Range on the Main Screen. For a given spindle, lowering speed generally increases the maximum measurable viscosity.

## When the Viscosity Is Unknown

1. Treat the first trial conservatively as a high-viscosity test. Begin with a smaller measuring spindle, normally a higher number, and a low speed available on your model.
2. Monitor the range percentage / torque. Change one setting at a time and stop before replacing the spindle.
3. If necessary, move from higher-numbered to lower-numbered spindles, and from lower to higher speeds, while checking the working range.

| Expected viscosity | General starting direction                          |
|--------------------|-----------------------------------------------------|
| Higher             | Smaller spindle, higher spindle number, lower speed |
| Lower              | Larger spindle, lower spindle number, higher speed  |

## Torque Acceptance

Use results within 10%-90% of range; the operating guidance recommends aiming as close as practical to 50%. A reading above 100% displays EEE. Stop and select a suitable spindle/speed combination before accepting a result.

The rated control modes include fixed and automatic. Use the delivered controls and instructions for automatic operation; automatic control does not remove the need to verify torque, spindle identity, and range.

## 10. Measure and View the Curve

|                                                           |           |       |
|-----------------------------------------------------------|-----------|-------|
| 2025.05.12                                                |           | 15:47 |
| <b>Viscosity Measurement</b>                              |           | Back  |
| Name                                                      | Sample A  |       |
| Viscosity                                                 | -- mPa.s  |       |
| Spindle / Speed                                           | 1 / 6 rpm |       |
| Torque                                                    | -- %      |       |
| Temperature                                               | -- C      |       |
| Kinematic viscosity                                       | -- mm2/s  |       |
| Time                                                      | 00:00:00  |       |
| <div> <div></div> <div>0100</div> <div>0100%</div> </div> |           |       |
| Stop                                                      | Curve     |       |

Figure 7. Live measureme

2025.05.12

15:47

Viscosity Measurement

Back

Name

Sample A

Viscosity

-- mPa.s

Temperature

-- C

Viscosity

Temperature

|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

0

Elapsed time

t

Stop

Figure 8. Viscosity and temperature curve

1. From the Main Screen, verify settings and tap Start. Confirm that the spindle rotates smoothly without touching surrounding parts.
2. Read viscosity, spindle, speed, torque, temperature, kinematic viscosity, and elapsed time. Check that torque is within 10%-90%.
3. Tap Curve to view the viscosity and temperature trends against elapsed time. Check the axes and units before interpreting the plot.
4. Tap Stop to stop measurement immediately when required. Use the on-screen Back control to return as available; stop rotation before changing the measuring hardware.

A curve helps reveal drift, but a flat trace alone does not prove correct temperature, immersion, or spindle selection. Record the same test conditions when comparing samples.

## 11. Finish Save and Print a Result

|                           |          |       |  |
|---------------------------|----------|-------|--|
| 2025.05.12                |          | 15:47 |  |
| <b>Measurement Result</b> |          | Back  |  |
| Name                      | Sample A |       |  |
| Viscosity                 | -- mPa.s |       |  |
| Spindle                   | 1        |       |  |
| Speed                     | 6 rpm    |       |  |
| Torque                    | -- %     |       |  |
| Temperature               | -- C     |       |  |
| Density                   | -- g/cm3 |       |  |
| Kinematic viscosity       | -- mm2/s |       |  |
|                           |          |       |  |
| Print                     |          | Save  |  |

Figure 9. Measurement result

1. Let the timed test finish or tap Stop during a continuous test. Check the final sample identification and measurement conditions.
2. Choose Save to store the current result. The instrument creates a dated record, so set the system date and time correctly before testing.
3. Choose Print to send the result to a compatible connected printer. Select Print mode in Settings first.
4. Open Records from the Main Screen and verify that the intended result is present before discarding the sample or ending the session.

Result storage is limited to 50 tests. Preserve important data before deleting records. A printed result, a saved result, and a saved preset are separate actions.

## 12. Browse and Delete Historical Records

|                          |     |            |        |
|--------------------------|-----|------------|--------|
| 2025.05.12               |     | 15:47      |        |
| <b>Stored Data</b>       |     | Back       |        |
| <input type="checkbox"/> | No. | Date       | Name   |
| <input type="checkbox"/> | 01  | 2025/05/12 | Sample |
| <input type="checkbox"/> | 02  | 2025/05/12 | Sample |
| <input type="checkbox"/> | 03  | 2025/05/12 | Sample |
| <input type="checkbox"/> | 04  | 2025/05/12 | Sample |
| <input type="checkbox"/> | 05  | 2025/05/12 | Sample |
| <input type="checkbox"/> | 06  | 2025/05/12 | Sample |
| <input type="checkbox"/> | 07  | 2025/05/12 | Sample |
| <input type="checkbox"/> | 08  | 2025/05/12 | Sample |
| <input type="checkbox"/> | 09  | 2025/05/12 | Sample |
| <input type="checkbox"/> | 10  | 2025/05/12 | Sample |
| 1/5                      |     |            |        |
| Clear All                |     | Delete     | Next   |

Figure 10. Stored data first page

|                          |     |            |               |
|--------------------------|-----|------------|---------------|
| 2025.05.12               |     | 15:47      |               |
| <b>Stored Data</b>       |     | Back       |               |
| <input type="checkbox"/> | No. | Date       | Name          |
| <input type="checkbox"/> | 11  | 2025/05/12 | Sample        |
| <input type="checkbox"/> | 12  | 2025/05/12 | Sample        |
| <input type="checkbox"/> | 13  | 2025/05/12 | Sample        |
| <input type="checkbox"/> | 14  | 2025/05/12 | Sample        |
| <input type="checkbox"/> | 15  | 2025/05/12 | Sample        |
| <input type="checkbox"/> | 16  | 2025/05/12 | Sample        |
| <input type="checkbox"/> | 17  | 2025/05/12 | Sample        |
| <input type="checkbox"/> | 18  | 2025/05/12 | Sample        |
| <input type="checkbox"/> | 19  | 2025/05/12 | Sample        |
| <input type="checkbox"/> | 20  | 2025/05/12 | Sample        |
| 2/5                      |     |            |               |
| Clear All                |     | Delete     | Previous Next |

Figure 11. Stored data following page

1. Tap Records on the Main Screen to open the stored-data list.
2. Tap a record to view its complete parameters and result. Use Previous and Next to move through the available pages.
3. To delete selected records, tick the boxes beside them and tap Delete. The top Select All box selects the entries on the current page.
4. Use Clear All only when you intend to erase all stored historical results. This operation cannot be undone.
5. Use Back to return to the previous menu.

Check the selected rows carefully before deletion. Select All on one page and Clear All are not equivalent. Preserve required results before either operation.

## 13. View a Stored Result

|                     |               |
|---------------------|---------------|
| 2025.05.12          | 15:47         |
| <b>Stored Data</b>  | Back          |
| Name                | Sample A      |
| Viscosity           | -- mPa.s / cP |
| Spindle             | 1             |
| Speed               | 6 rpm         |
| Torque              | -- %          |
| Temperature         | -- C          |
| Density             | -- g/cm3      |
| Kinematic viscosity | -- mm2/s      |
|                     |               |
| Print               | Delete        |

Figure 12. Stored data detail

| Control | Action                                             |
|---------|----------------------------------------------------|
| Back    | Return to the stored-data list                     |
| Print   | Send this record to a compatible connected printer |
| Delete  | Delete this individual record                      |

Review the test name, viscosity, spindle, speed, torque, temperature, sample density, and kinematic viscosity. A record is useful only when its sample identity and test conditions are correct.

The displayed values in the English reference are placeholders. Do not copy example values into a sample report or treat them as instrument specifications.

## 14. Save and Recall Measurement Presets

|                       |                  |
|-----------------------|------------------|
| 2025.05.12            | 15:47            |
| <b>Viscosity Test</b> | Back             |
| Name                  | Sample A         |
| Date / Time           | 2025/05/12 15:47 |
| Spindle               | 1                |
| Speed                 | 6 rpm            |
| Range                 | -- cP            |
| Sample density        | -- g/cm3         |
| Kinematic viscosity   | -- mm2/s         |
| Timer                 | 00:10:00         |
| 2/5                   |                  |
| Clear All             | Delete           |
| Previous              | Next             |

Figure 13. Saved preset reference

1. On the Main Screen, set the test name, spindle, speed, density as needed, and timer.
2. Tap Save Preset to store the current method. The instrument supports up to 5 presets.
3. Tap Load Preset to view saved methods. Use Previous and Next to locate the intended entry and follow the displayed selection control to recall it.
4. Verify every recalled parameter against the actual spindle and sample before Start.
5. Use Delete only to remove an unwanted preset. Back returns to the previous menu. If Clear All is present, treat it as deletion of the displayed preset collection and check the scope before confirming.

A preset is a reusable measurement setup, not a saved test result. Changing a preset does not establish that previously stored results used the new settings.

## 15. Configure Instrument Settings

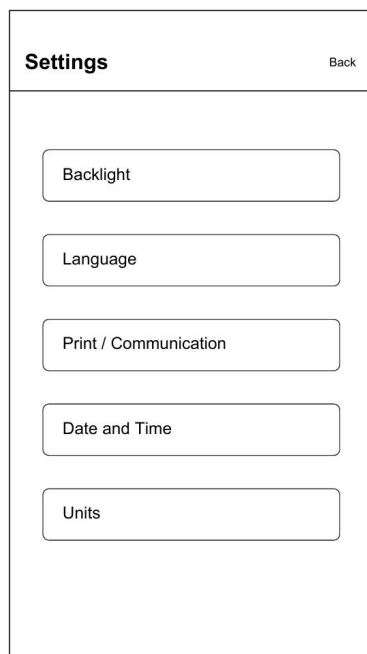


Figure 14. Settings menu

| Menu item             | Operation                                        |
|-----------------------|--------------------------------------------------|
| Backlight             | Adjust screen brightness for clear viewing       |
| Language              | Choose English or Chinese                        |
| Print / Communication | Select the intended RS232 function               |
| Date and Time         | Set the correct clock and date for dated records |
| Units                 | Choose °C or °F and mPa·s or cP                  |

Set Print / Communication before using the connected equipment. A cable alone does not establish compatibility with every printer or computer application. Use the compatible connection and software provided for the instrument.

## 16. Optional No. 0 Measuring Assembly

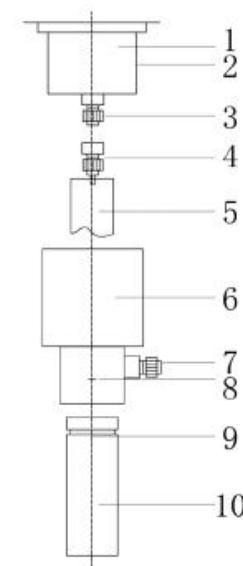


Figure 15. No. 0 low-viscosity assembly

| Number | Part                        |
|--------|-----------------------------|
| 1      | Instrument lower housing    |
| 2      | Sleeve fixing screw hole    |
| 3      | Spindle coupling screw      |
| 4      | Spindle coupling nut        |
| 5      | No. 0 spindle               |
| 6      | Mounting sleeve             |
| 7      | Outer-cylinder fixing screw |
| 8      | Red liquid-level mark       |
| 9      | Triangular locating groove  |
| 10     | Outer sample cylinder       |

This is an optional accessory, not the standard Nos. 1-4 spindle set. Confirm that the spindle, sleeve, cylinder, and fixing hardware form the complete compatible system before use.

## 17. Install and Use the No. 0 Accessory

### Closed Bottom Cylinder

1. Stop rotation. Remove the yellow protective cap. Align the No. 0 spindle with the coupling screw and gently turn clockwise when viewed from above to install. Support the coupling and avoid impact to the precision pivot.
2. Slide the mounting sleeve over the lower housing beneath the head. Tighten its fixing screw so the sleeve is vertical and secure.
3. Add 20-25 mL of sample to the closed-bottom outer cylinder. Ensure the sample covers the spindle measuring portion.
4. Insert the outer cylinder into the mounting sleeve and tighten the cylinder fixing screw.
5. Look through the side round opening while securing the cylinder. Ensure the conical screw tip seats in the groove at the cylinder top and the triangular mark is centered in the opening. This establishes concentric alignment.
6. Select No. 0 on screen, set an appropriate supported speed and timer, and review the displayed range. Stabilize temperature, then Start and assess torque. Stop before removing the cylinder.

### Open Bottom Cylinder

1. Fit the No. 0 spindle and mounting sleeve as above. Fit and secure the open-bottom outer cylinder using the same locating checks.
2. Do not use the closed-cylinder 20-25 mL filling step. Place the spindle and outer cylinder together in a separate vessel containing the sample.
3. Adjust the lift until the sample surface is level with the red mark on the mounting sleeve. This is the specified immersion reference for the open-bottom arrangement.
4. Confirm centering, level, temperature, screen settings, and range, then measure. Stop before changing or removing the assembly.

Do not interchange the standard spindle groove and the No. 0 sleeve red mark. Keep the cylinder concentric and prevent the rotating spindle from touching it.

## 18. Complete Standard Measurement Workflow

1. Check the model, standard spindle set, guard, probe, and supply. Assemble and level the stand and head.
2. Remove the yellow cap before power-on. Select the physical spindle using the expected viscosity and the model speed list.
3. Prepare a homogeneous, bubble-free sample in a vessel at least 70 mm in diameter and 120 mm high. Control its temperature.
4. Install the guard. Support the coupling and fit the spindle clockwise from the top view. Recheck level.
5. Lower the spindle slowly until the sample reaches the middle of its immersion groove. Center it and keep the probe clear.
6. Wait for a stable sample and spindle temperature. Turn on the instrument and wait for initialization.
7. Set the test name, matching spindle number, and supported speed. Review the calculated Range.
8. Enter actual sample density if kinematic viscosity is needed. Set the timer: 00h00m00s for continuous measurement, or a nonzero duration for a timed test.
9. Tap Start. Check smooth rotation, viscosity, temperature, and torque. Aim near 50% torque and stay within 10%-90%. EEE means overrange.
10. Tap Curve when a trend view is needed. Use consistent speed, spindle, temperature, and duration for comparative tests.
11. Allow the timer to finish or tap Stop. Review the Measurement Result and Save it. Print separately if required.
12. Verify the result in Records. Stop rotation before raising the head. Remove the spindle gently, clean and dry it, and store it safely.

Use the dedicated procedure in Sections 16-17 for No. 0. Do not apply standard-beaker immersion instructions to the closed-bottom No. 0 cylinder.

## 19. Measurement Quality and Repeatability

| Check                   | Why it matters                                                             |
|-------------------------|----------------------------------------------------------------------------|
| Spindle identity        | The screen number must match the installed spindle                         |
| Torque                  | Use 10%-90%, preferably near 50%; low torque magnifies relative error      |
| Temperature             | Viscosity changes with temperature; compare at the same stable temperature |
| Immersion and centering | Incorrect geometry, wall contact, or wrong fill can distort readings       |
| Level                   | Recheck after moving the head or replacing the sample                      |
| Sample condition        | Bubbles, particles, contamination, or evaporation can change the result    |
| Time and speed          | Use a defined duration and shear condition                                 |
| Clean surfaces          | Residue, bent spindles, and scratches can affect flow and rotation         |

### Newtonian and Non-Newtonian Samples

For a Newtonian liquid, viscosity is independent of shear rate at a fixed temperature. Many suspensions, emulsions, polymer solutions, and adhesives are non-Newtonian. Their apparent viscosity changes with speed and time; differing results under different test conditions do not automatically indicate a faulty instrument.

### Performance Checks

After a period of use or relocation, inspect the full system and check performance with an appropriate viscosity reference oil under its specified conditions. Verify temperature, range, immersion, and cleanliness before judging instrument accuracy. Do not change internal calibration yourself.

A higher model maximum does not mean a higher accuracy grade. Both models have the same stated  $\pm 2\%$  viscosity accuracy and  $\pm 1\%$  repeatability for Newtonian liquids.

## 20. Troubleshooting

| Symptom                               | Check and corrective action                                                                                     |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| No power or display                   | Check the correct adapter, supply, connector, and rear switch. Stop use if the cable is damaged.                |
| EEE or overrange                      | Stop and select a spindle/speed combination with a suitable maximum range.                                      |
| Torque below 10%                      | Review range and sample viscosity; choose a suitable larger spindle or higher available speed.                  |
| Unstable or unexpected result         | Check temperature, bubbles, level, immersion, centering, spindle code, cleanliness, and sample time dependence. |
| Spindle wobble or scraping            | Stop immediately. Check for bent parts, dirty coupling faces, loose mounting, and vessel or guard contact.      |
| Head slips downward                   | Support the head; secure the clamp and adjust lift tension before further use.                                  |
| Temperature absent or implausible     | Check the PT100 probe and connector. Inspect for damage; request service if unresolved.                         |
| Test does not stop automatically      | Check whether the timer is 00h00m00s, which means continuous running. Use Stop.                                 |
| Saved result cannot be found          | Check whether Save was used on Measurement Result rather than Save Preset. Check record list pages.             |
| Kinematic result is incorrect         | Check actual sample density, its units and temperature, and the underlying viscosity result.                    |
| Printing or communication fails       | Check the RS232 cable, compatible device/software, and Print / Communication setting.                           |
| No. 0 accessory gives erratic results | Check cylinder alignment, locating screw/groove, correct fill or red-mark immersion, and spindle clearance.     |

These checks are practical diagnostic guidance. If the fault remains, stop use and contact authorized service. Do not open the instrument or alter internal settings to compensate for an unexplained error.

## 21. Cleaning Storage and Delivery Check

### Clean After Each Test

1. Stop rotation before removing the spindle or cylinder. Support the coupling gently during removal.
2. Remove residue promptly, particularly after paint or adhesive tests. Use a cleaning agent compatible with the sample and measuring parts; soak when suitable.
3. Never clean the spindle on the instrument. Keep solvent out of the head and connectors. Do not scrape with knives, blades, or other hard tools.
4. Clean the end faces and threads, dry the measuring parts, and store them in the protective case without bending or sideways loading.
5. For movement or transport, remove the spindle and refit the yellow cap to support the coupling. Remove the cap again before operation.

### Delivery Checklist

| Item                       | Quantity |
|----------------------------|----------|
| Measuring head             | 1        |
| Nos. 1-4 spindles          | 1 set    |
| Power adapter              | 1        |
| Spindle guard              | 1        |
| Base                       | 1        |
| Temperature probe          | 1        |
| Lift column                | 1        |
| Hex key                    | 1        |
| Open-end wrench            | 1        |
| Head mounting rod / handle | 1        |
| User manual                | 1        |

The specifications also list an RS232 communication cable as standard. Check it against the packing slip. No. 0 accessories and external printer or bath are included only when ordered.

## 22. Test Record and Service

| Record field                      | Value |
|-----------------------------------|-------|
| Model / serial number             |       |
| Sample / batch / operator         |       |
| Date and time                     |       |
| Spindle / accessory               |       |
| Speed (rpm)                       |       |
| Vessel / volume / immersion       |       |
| Sample temperature                |       |
| Density and reference temperature |       |
| Timer / actual test duration      |       |
| Viscosity and units               |       |
| Torque (%)                        |       |
| Kinematic viscosity and units     |       |
| Saved record or print reference   |       |

### Requesting Service

Provide your contact details, model and serial number, a clear description of the problem, purchase month/year and sales channel, and photographs where useful. Include the spindle, speed, temperature, torque, and sample conditions for a measurement complaint.

Keep the purchase receipt and supplied warranty documents. Warranty coverage and return arrangements are those provided with your order. Obtain service or return instructions before shipping; use protective packaging and secure the coupling with its transport cap.

### Unit Reference

1 mPa·s = 1 cP. 1 Pa·s = 1,000 mPa·s. 1 mm<sup>2</sup>/s = 1 cSt. Kinematic viscosity equals dynamic viscosity divided by density when the units are mPa·s and g/cm<sup>3</sup>.