

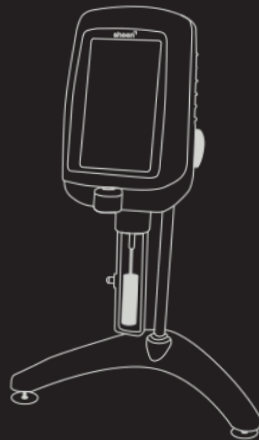


sheen

Digital Multi Spindle

DV2600 - Viscometer

Operating Instructions
(V1.1 0623)



IMPORTANT!

Before taking this instrument in use we strongly advise you to read this manual carefully.



This product is RoHS 2 compliant (2011/65/EU)

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1 GENERAL

1.1 Importance of operating manual

This manual is written in order to become familiar with all the functions and possible applications of the instrument. It contains important instructions about how to use the instrument safely and economically; according to the purpose designated. Following these instructions is not only essential to avoid risks. It also reduces repair costs and down-time and increases the products reliability and service-life. Anyone who works with the instrument should follow the instructions in this manual, particularly the safety related instructions. Additionally local rules and regulations relating to environmental safety and accident prevention should be observed.

1.2 User-responsibility

The user should

- a) Only allow persons to work with the instrument who are familiar with the general instructions on how to work safely and to prevent accidents. The use of the instrument should have been instructed duly. The safety chapter and the warnings in this manual should have been read and understood; acknowledged as evidenced by their signature.
- b) Regularly check the safety-awareness of personnel at work.

1.3 Responsibility of personnel

Before commencing work anyone appointed to work with the instrument should pay attention to the general regulations relating to working safety and accident prevention. The safety chapter and the warnings in this manual should have been read and understood; acknowledged as evidenced by their signature.

1.4 Dangers

This instrument has been designed and constructed in accordance with state-of-the-art technology and the acknowledged safety regulations. Nevertheless, working with the instrument may cause danger to the life and health of the operator or to others, or damage to the instrument or other property. Therefore the instrument should only be used for its designated purpose, and in a perfect technical condition. Any defect that could have a negative effect on safety should be repaired immediately.

1.5 Designated purpose

The Sheen Multi Spindle is exclusively designed to be used to measure the viscosity of paint and relate products in P or cP in laboratory and production environment. The design is setup for use with Sheen pindles and is carefully calibrated to conform to use according ISO 2884-2. Other applications constitute improper use. Industrial Physics will not be held liable for damage resulting from improper use.

1.6 Copyright

The copyright of this operating manual remains with Sheen.

This operating manual is intended solely for the user and his personnel. Its instructions and guidelines may not be duplicated, circulated or otherwise passed on to others, neither fully, nor partly. Infringement of these restrictions may lead to legal action may be taken if this restrictions are infringed upon.

1.7 Manufacturer's/Supplier's address




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2 SAFETY INSTRUCTIONS

2.1 Meaning of Symbols

The following symbols for dangers are used in this instruction manual.

Symbol	Explanation	Warning
 Danger	Possible immediate danger to the life or health of personnel	If this guideline is not noted it can lead to severe danger to health, up to fatal injury
 Warning	A dangerous situation could be caused	Non observance of this guideline can lead to injury or to damage to equipment.
 NOTE	Special tips and particular information	Guidelines to make optimal use of the instrument.

2.2 Availability of Safety Information

The instruction manual should be kept at the place where the instrument is operated.

In addition to the information contained in the instruction manual, general and local regulations for accident prevention and environmental protection shall be kept available and observed.

Always ensure all guidelines in respect of safety and dangers on the instrument are in readable condition.

In case of danger the instrument has to be switched off. Then eliminate danger.

2.3 Training of Personnel

- Anyone who operates the instrument should be trained properly.
- It has to be clear who has which responsibility regarding commissioning, set-up of maintenance and repairs, installation, and operation.
- Anyone who hasn't finished training should be supervised by an experienced person while working with the instrument.

2.4 Dangers from Electrical Energy

- Work on the electrical supply may only be done by a qualified electrician.
- The electrical equipment of the instrument must be checked regularly. Loose connections and cable damaged by heat must be corrected immediately.
- Always make sure the instrument's power is turned off while adjusting any electrical component.

2.5 Points of special danger - Sheen Digital multi Spindle



Danger

**The Sheen Digital Multi Spindle reaches high rotational speeds.
Do not touch moving parts during testing.**

**Contacting a moving spindle may cause injuries.
Though the Sheen Digital Multi Spindle is limited in strength it can still
cause pain.**

2.6 Care, Maintenance, Repairs

- Always make sure the instrument is connected to an earthed socket.
- Maintenance and inspection should be carried out at the correct intervals.
- Operating personnel should be informed before starting with maintenance or repair work .
- Always make sure the instruments power is turned off and the instrument is not connected to a socket while adjusting any electrical component whenever maintenance, inspection or repair work is done.
- Do not open the instrument. In case of malfunction always consult the manufacturer.
- Never touch electronics or circuit boards when not ESD secured.

2.7 Modifications to the Equipment

- Any modifications or additions or alterations to the instrument may solely be made with permission from the manufacturer.
- All measures involving modifications require written confirmation of approval from Industrial Physics.
- Instruments which are not in fault-free condition must immediately be switched off.
- Only use replacement parts from the original supplier. Parts used from other sources aren't guaranteed to take the loading and meet the safety requirements.

2.8 Cleaning of the Instrument and Disposal of Materials

- When in use it is not always possible to avoid some spill of paint on the work surface.
- Try to keep the instrument as clean as possible to prevent distortions of functions.
- To clean the instrument properly use a suitable solvent to dispose remains of paint or ink.
- Wear gloves during cleaning; Don't spill an overdose of solvent during cleaning.
- Cleaning materials must always be used and disposed of correctly.

3 TRANSPORT AND STORAGE

3.1 Packing

Please take note of pictorial symbols on the packing.

3.2 User: Check on Receipt

Check packing for damage

After unpacking check complete supply.

3.3 Reporting Transport Damage and Documentation

Any damage should be documented as accurately as possible (possibly photographed) and reported to the relevant insurers or, in the case of sales "delivered to customers works", to the supplier.

3.4 Storage and Protective Measures when not in use

The instrument must be stored in a dry ($\pm 40\%rH$) place at a temperature between 10 - 40°C.

The storage period should not be longer than 3 months. Store instrument in the original packing if possible.

4 SCOPE OF SUPPLY

- DV2600 - Sheen Multi Spindler*
- Manual
- Main body
- Six RV Spindles in protective case and table top holder
- Temperature probe
- The lifting rod and base
- 12V 1.5A AC adapter
- Spindle protection frame
- Allen key
- Certificate

*Calibration oils have to be ordered separately.



① Main body



② RV Spindles



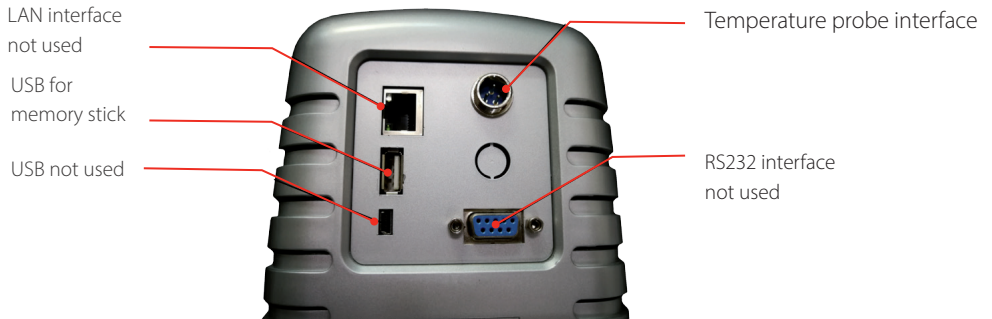
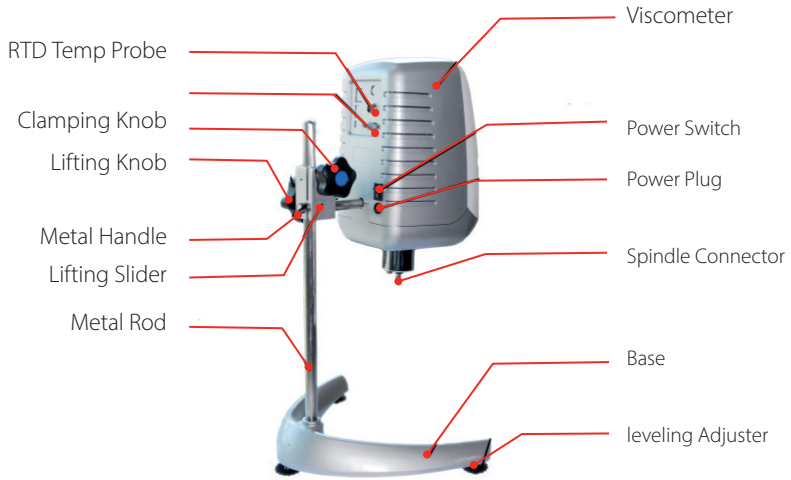
③ Lifting rod and base



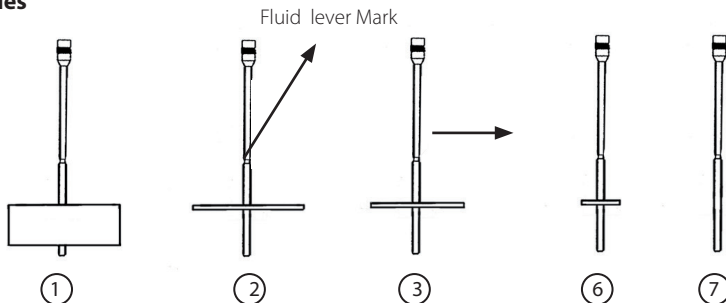
④ AC adapter



⑤ Protection frame

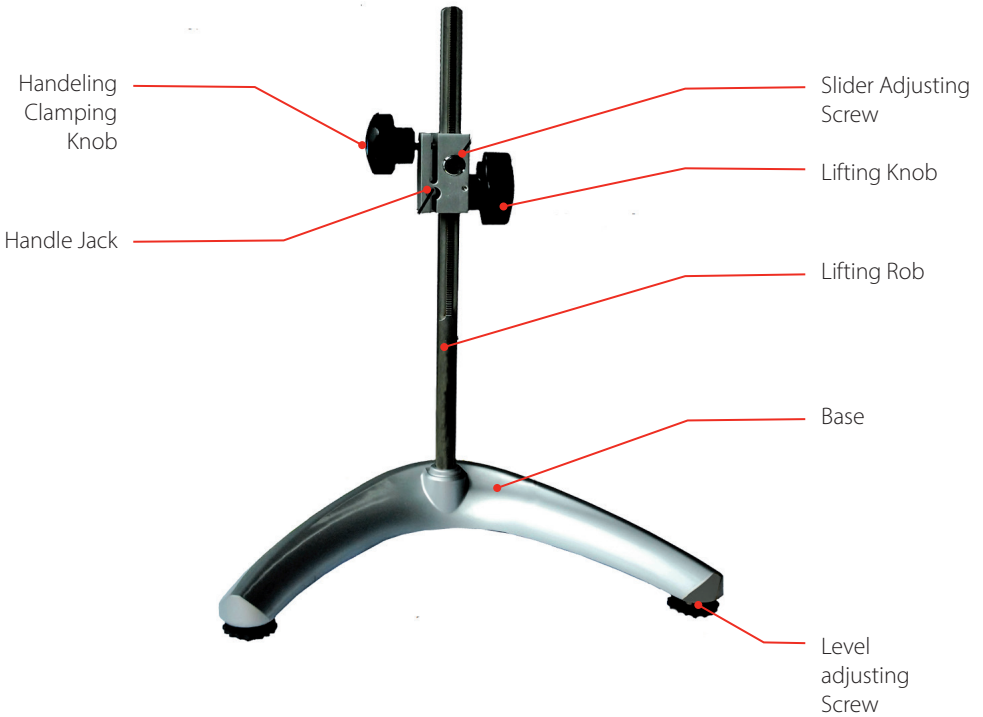
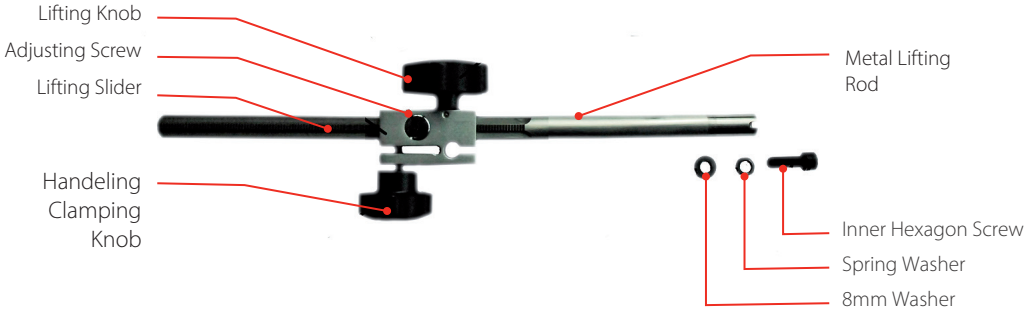


RV Spindles



Number: ① optional

5. ASSEMBLY DIAGRAM



The metal lifting rod and the base assembly diagram.

6. PREPARATION BEFORE USE

1. Remove parts of a viscometer from the packing box, such as the base, the metal lifting rod, the host, the spindle frame, protection frame, power adapter, RTD temp probe etc.
2. Insert the lifting rod into the middle hole of the base and keep the gap at the bottom of the lifting rod being correspondent with the groove in the middle hole. Then fix the lifting rod on the reverse side of the base with the M8 hexagon screw and spring washer. Please tighten M8 screws with a wrench. Screw two level adjustment feet respectively into the two ends of the base with equal screwing distance as far as possible.
3. Turn the knob on the lifting rod to check flexibility and self-locking of the lifting clamp. If it is too loose or too tight, adjust the adjustment screw in front of the lifting rod with a screwdriver enabling it to lift vertically (It is advisable to be a little tighter.) to avoid the automatic fall of the viscometer. Note: the adjustment has been made on the factory.
4. Insert the metal handle of the intelligent touch viscometer into the small round hole on the slider, rotate the handle to clamp the knob, and keep the level position on the middle horizontally. Clamp the handle to make the viscometer firmly mounted on the lifting frame. Remove the black cap below the instrument and put it aside (it must be installed during the instrument maintenance and transportation). The black cap can protect the connecting screw, so it must be installed during a long time of no use or transportation.
5. Adjust two level adjustment feet until the level at the top is in a central location.
6. Please install the RTD temp probe into the RTD temp probe interface .
7. Make sure the viscometer power switch is on "OFF" . Connect the power adapter to the viscometer DC power socket. Insert the other side into the 220V AC power supply socket. If you want to disconnect the AC power adapter, first remove the AC power plug from the socket, and then remove the DC power plug from the viscometer.



7. PARAMETERS

Type	DV2600
Measurement range	100 -13M mPa.s
Spindles	2#, 3#, 4#, 5#, 6#, 7# 1# is optional
Measurement accuracy 1	1.0% of full range
Repeatability	0.2% of full range
Power Supply	AC100-240V, 50Hz/60Hz Output DC12V 1.5A

8. SCREEN

First screen display type and version, as FIG. 1



FIG. 1

The main menu, as FIG.2.

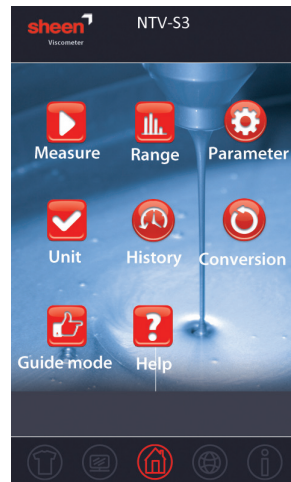


FIG. 2

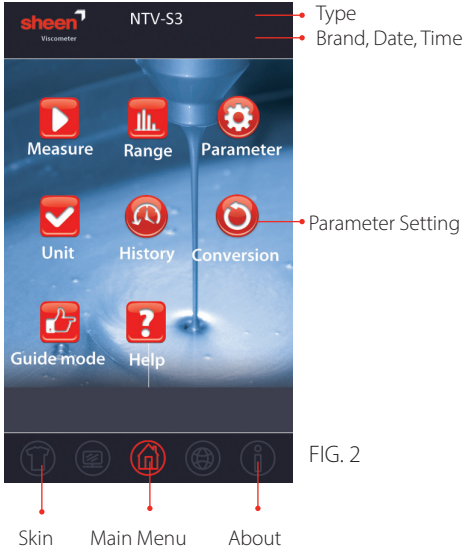


FIG. 2

Set the detection parameters in the main menu.

1. Choose range(spindles and rotation speed), as FIG.3.

Spindle \ Speed	30.0	60.0
	RPM	RPM
RV 1	333	166
RV 2	1333	666
RV 3	3333	1666
RV 4	6666	3333
RV 5	13333	6666

Unit: mPa.s

Choose range →

FIG. 3

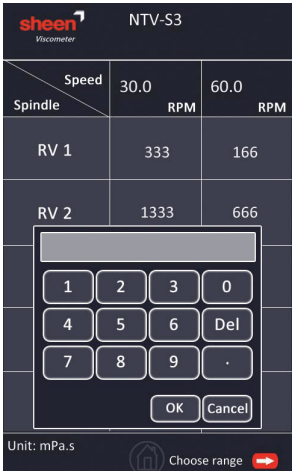


FIG. 4

The speed of S series is optional. (They are recognized that each spindle tests full range at 10 or 60 RPM.)

- e.g.
- a. To change the speed, you can point at "10" to enter numeric keyboard by a touch pen(FIG.4), then enter 20 RPM in the data frame, and click to confirm. Then the full range of each spindle at 20 RPM will be displayed.
 - b. To select the range of 300, click "300" by a touch pen, the enter parameters: Spindle No.1, 20RPM, Full range of 300.

The shutdown saves the last parameter.

2. Parameter Setting

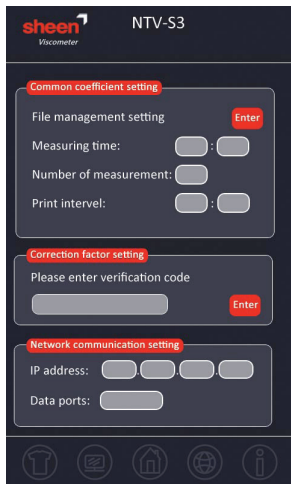





FIG. 5

- 1) Measure Time: is to set the end time of the detection. The default time is 00:00. Click the box Min ,enter the number from the digital keyboard and press OK, then the value of minute is entered. The input of "second" is the same. Then press  to return the main menu.
- 2) Measure number: is the average number of viscosity value. E.g., if the measure number is 3, the "average viscosity" in the lower right corner of the detection main screen will show the average viscosity value of 3 times. It can be generally used in the average viscosity detection of "Newtonian fluid", and "non-Newtonian fluid" within the same periods. To test 3 average values, first press the "measure" button, measure the viscosity of samples and press "stop" button to get a single final numerical value as viscosity. Repeat 2 more times to get 3 average viscosity value.
- 3) Print Interval: If a user is equipped with a micro printer, please install the connection line and printing paper as required(thermal printing paper, pay attention to the front and the back), then set print interval, such as 15 seconds. When the viscometer starts measurement, click . The printer will print the value every 15 seconds.

- 4) Correction Factor Setting: the default verification code is 0. If a user is qualified with all conditions of standard viscosity measurement, connect with manufactures for the true verification code and do the correction for each spindle.
- 5) Network Communication Setting: the default IP address is 192.168.1.252. if user equipment collides with it, then the network can not be connected. The IP address should be changed for normal communication. Generally parameter "252" can be changed.
- 6) File Management Setting: click the button  to enter (FIG.6).

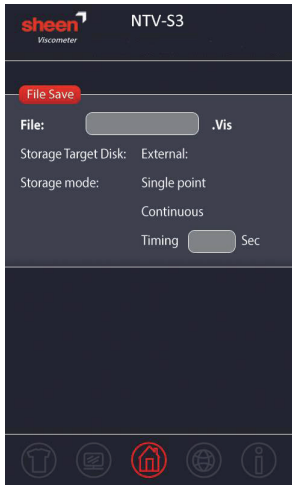


FIG. 6

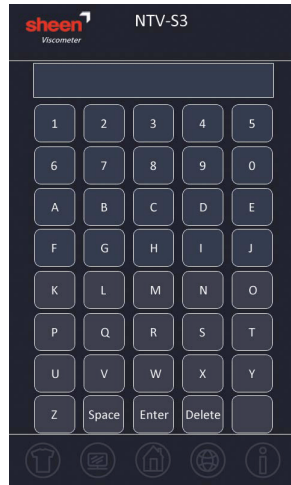










FIG. 7

Click at the input box of files name, as FIG.7. Input the name (at most 6characters and click to confirm. There are 3 kinds of storage mode, which are single point, continuous and timing.
 Click "Single point", the viscometer will collect data at a single point hen meet the conditions users can click  repeatedly, to save data at different single points.
 Click "Continuous", the viscometer will collect data at many points based on time.
 During the process, Click  will turn to  button to save data dynamically.

When the collection ends, click  and  .
 Click "Timing data collection" to input time, which is the time interval of data collection and storage.
 During the process, click  to save data dynamically. When the collection ends, click  and  .

3. Unit: click the unit icon, as FIG. 8.

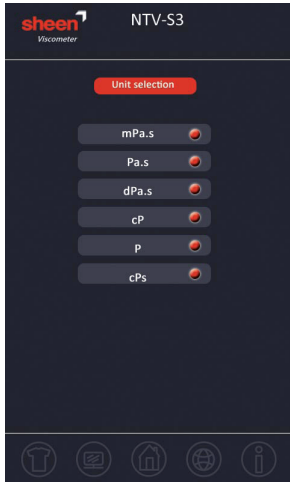


FIG. 8

Click the needed box units with the touch pen and return to the main menu.

Note: Only mPa.s, cPs, cP can be used in the full range less than 100.

8.1 Kinematic viscosity conversion

Enter the sample density first to learn the kinematic viscosity of the sample.

Click the conversion icon, as FIG.9.

Click the number box and enter the correct sample density.

Kinematic viscosity calculation can be a part of the detection process.

Return to the main menu.

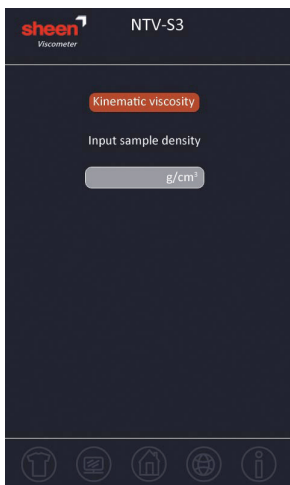


FIG. 9

8.2 Click the “viscosity” icon after parameter setting, as FIG. 10.

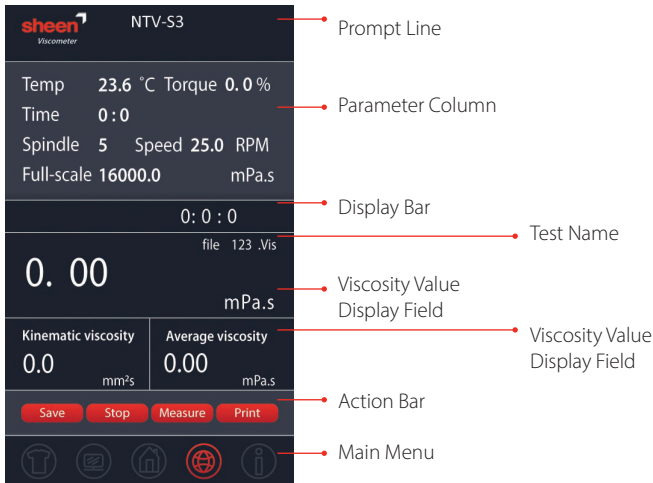


FIG. 10

Check whether the parameters in the parameter column are correct. Get the sample prepared for the test. In the parameter column:

Temp is real-time temperature detected by RTD probe. It displays 0.0 °C without the RTD probe. Torque is the deflection of torque sensor with the range of 0-100%. If the torque reading is between 20 and 100%, NTV-E series can obtain the result in needed accuracy. If the torque is below 20%, a “dudu” sound will occur. Adjust the detection parameters timely according to the percentage of data.

Viscosity is calculated based on the detected torque with the specific spindle and rotation speed. Timing is the countdown from the beginning of the measurement. The test will stop when the countdown stops. Full range is the maximum measuring range able to be calculated by the combination of spindle type and speed. If it exceeds the current measuring range of the spindle and the speed, the screen will be displaying 100% with “dudu” sound.

10. PREPARATION

- A) Viscometer: Install the viscometer according to the installation steps; use two adjusting screws of the base to adjust the level, and confirm level state by the gradiometer in front of the viscometer. Detect the horizontal position before each test or in the test process.
- B) Sample: the measured fluid (sample) must be placed in a container. LV is suitable for 400ml type spindle in high beaker (diameter greater than or equal to 70mm). We recommend you choose the appropriate spindle with specific container. Replace container can be used for convenience, but it may have a certain impact on the measurement precision. Our viscometer is matched with the form container. The result of replace container is repeatable, but it may not be the real standard viscosity value. The LV spindle is used with protection framework installed. If not, the results can be repeatable but may not be the true viscosity value.

When you compare data with others, please check whether the protective frame is used, whether the sample container, the spindle, the spindle speed and the sample temperature is consistent. In the viscosity test, many samples need specific temperature, when users adjust the temperature of samples, the temperature of spindles and containers should be the same.

- C) The spindle and rotation speed: NTV-S series can test fluid in the range of 1- 80M (M means million cP). For an unknown fluid, repeated experiments are usually needed to select the spindle and spindle speed. The suitable selection can make viscometer torque in the range of 20%-100%. There are two general rules in the trial process: 1) viscosity range is inversely proportional to spindle size. 2) viscosity range is inversely proportional to spindle speed. In other words, for the test of high viscosity, choose a small volume and low speed spindle. If the spindle and spindle speed make the torque greater than 100%, please reduce speed or choose smaller spindle. When the test proves that several spindle and speed combinations can reach the test results, any of these combinations can be used. Non-Newtonian fluid viscosity value tested may change with the spindle and speed. To compare the viscosity data, please make sure to use the same test, i.e. using the same device, spindle, speed, container, temperature and test time.

11. ATTENTION

- (1) Slightly and carefully raise the connecting screw when installing and uninstalling the spindle. Avoid excessive force and lateral force in order to avoid spindle bending.
- (2) Don't put the viscometer equipped with spindle side or upside down.
- (3) Keep the connecting end face of connecting screw and the spindle and the thread clean, or it will affect the spindle vibration.
- (4) Support viscometer with hand when it's lifting to prevent falling due to weight.
- (5) Please enter a new range after replacing the spindle. The used spindle should be timely cleaned (wiped up) and put back the spindle rack. Please do not clean spindle remaining on the instrument.
- (6) When the liquid is changed, please clean (wipe up) the spindle and spindle protection framework to avoid the measurement error caused by the confusion of the measured ones.
- (7) Match the instrument and the special spindle one to one. Please don't confuse the instrument and the spindle.

- (8) Please do not disassemble and adjust the instrument freely.
- (9) During the moving and transporting process, you should install the black cap to the connecting screw, tighten the screws and put them into the packing box.
- (10) Please do not rotate the spindle in the absence of liquid for a long time so as not to damage the shaft tip.
- (11) There are a lot of non-Newtonian liquids among suspension, emulsion, polymer and other high viscosity liquid, the viscosity value of which varies with changes of the shear rate, time and other conditions. It's normal that the results in different cases of spindle, rotating speed and time are not consistent. It's not the error of instrument. Generally, the spindle, rotation speed and time should be specified in measurement of non-Newtonian liquid.
- (12) To get highly accurate results, the flowing steps can be done:
- Control the temperature of the liquid to be measured accurately.
 - Immerse the spindle long enough in the liquid to be measured so that the two temperature can be consistent.
 - Keep the uniformity of the liquid.
 - Place the spindle in the center of container and install the protective frame before the test.
 - Ensure the cleanness and shaking degree of the spindle.
 - When high-speed measurement turns into low-speed immediately, the test should be stopped; or the measure time at low rotation speed should be a little longer to overcome the error due to the rotation inertia caused by the liquid rotation.
 - Determination of low viscosity match with spindle No.1; high viscosity with spindle No.4.
 - The measure time at low rotation speed should be a little longer.
 - Check and adjust the horizontal position of the viscometer in time after changing the position of viscometer by turning lifting chuck for the need of changing spindle or the liquid to be measured in the measurement process.
 - Keep the AC power supply well grounded, eliminating the damage in the internal circuit caused by static electricity.

Note: in the process of operation, is strictly prohibited in the rotation of the spindle, the spindle will be gradually immersed in the sample, especially for high viscosity samples, so as to avoid damage to the internal structure of the instrum6. View historical data: click "historical data" icon (FIG.11).

Conformity Declaration

Industrial physics Inks & Coatings B.V., hereby declares that the product(s) mentioned on this declaration have been produced according and comply with our internal standards and if applicable with the relevant international standards.

The product(s) have been tested according the appropriate quality instruction, which is part of IPIC's quality system, which is annually audited by DNV GL – Business Assurance as the independent national accredited body, and has been found conform to the Management System Standard NEN-EN-ISO 9001:2015, traceable through Certificate Number: 258308-2018-AQ-NLD-RvA

Product	Sheen Digital Multi Spindle
Manufacturer	Nirun Instruments
Reference Standard	
Applicable safety standards	The machine conforms to all applicable safety guidelines for CE marking.

Remco Wever



Industrial physics Inks & Coatings B.V.
Molenbaan 19
2908 LL Capelle aan den IJssel
The Netherlands

Made in: Capelle aan den IJssel, 28 June 2021

13. DISCLAIMER

The right of technical modifications is reserved.

The information given in this manual is not intended to be exhaustive and any person using the product for any purpose other than that specifically recommended in this manual without first obtaining written confirmation from us as to the suitability of the product for the intended purpose does so at his own risk. Whilst we endeavor to ensure that all advice we give about the product (whether in this manual or otherwise) is correct we have no control over either the quality or condition of the product or the many factors affecting the use and application of the product. Therefore, unless we specifically agree in writing to do so, we do not accept any liability whatsoever or howsoever arising for the performance of the product or for any loss or damage (other than death or personal injury resulting from our negligence) arising out of the use of the product. The information contained in this manual is liable to modification from time to time in the light of experience and our policy of continuous product development.

