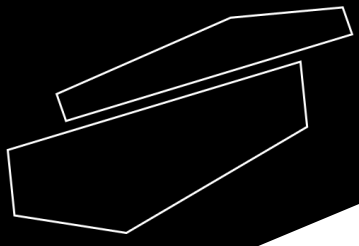
METRIA

Digital Viscometer, VDM2

Please read the User Manual carefully before use, and follow all operating and safety instructions!



user manual

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User Manual

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VD2M Digital Viscometer

Preface

Users should read this Manual carefully, follow the instructions and procedures, and beware of all the cautions when using this instrument.

Service

In order to guarantee this equipment works safely and efficiently, it must receive regular maintenance. In case of any faults, do not try to repair it yourself. If help is needed, you can always contact your supplier or Labbox via **www.labbox.com.**

Please provide the customer care representative with the following information:

- Serial number
- Description of problem
- Your contact information

Warranty

This instrument is warranted to be free from defects in materials and workmanship under normal use and service, for a period of 12 months from the date of invoice. The warranty is extended only to the original purchaser. It shall not apply to any product or parts which have been damaged on account of improper installation, improper connections, misuse, accident, or abnormal conditions of operation.

For claim under the warranty please contact your supplier.

Precautions

- Only personnel with appropriate training should operate and use this instrument.
- Comply with all relevant safety regulations, including those for personal protection and accident prevention.
- Be aware of strong magnetic fields and their effects on the surrounding environment, especially on data storage devices and pacemakers.
- Place the instrument on a stable, clean, non-slip, dry, and fire-resistant surface, and keep it away from corrosive gases.
- Do not allow the instrument's power cord to touch the panel surface.
- Select the correct protective equipment for the medium being processed; failure to do so may result in splashing liquids or release of toxic or flammable gases.
- Inspect the instrument and its accessories before each use to ensure they are undamaged.
- When handling toxic or volatile media, use airtight containers and operate within a suitable fume hood.
- Ensure the power supply voltage and frequency are within the specified tolerance range; deviations can affect measurement accuracy.
- Handle the rotor with care during installation and removal. Before disassembling, gently lift the connector at the bottom of the instrument. Keep the rotor connection surfaces and threads clean to ensure proper seating and stable rotation.
- Never run the rotor "dry" (without liquid) after installation, as this may damage the rotor tip and bearings.
- Keep the measuring rotor (including the outer cylinder) clean and free of debris. Clean it promptly after use. Do not clean the rotor while it is installed in the instrument. For stubborn residues (e.g., paint or adhesive), use an appropriate organic solvent. Never use metal tools, which can scratch the rotor surface and skew results. After cleaning, store the rotor in its protective case.
- When transporting the instrument, screw on the yellow protective cap to support the rotor connector.
- Always remove the yellow protective cap before powering on the instrument to avoid damage.
- Do not disassemble, adjust, or lubricate internal components yourself.
- Many suspensions, emulsions, polymers, and other viscous liquids are non-Newtonian: their apparent viscosity varies with shear rate and time. Different rotors, speeds, or test durations will produce different results; this is normal and does not indicate instrument inaccuracy. (When reporting non-Newtonian measurements, always specify the rotor, speed, and time used.)
- To ensure accurate viscosity measurements:
    - Precisely control the sample temperature.
    - Immerse the rotor fully and allow sufficient time for thermal equilibrium.
    - Ensure the liquid is homogeneous.
    - Center the rotor in the container during measurement.
    - Avoid air bubbles on the rotor by careful immersion.
    - Use a protective guard when required.
    - Keep the rotor clean.
    - Follow the operating instructions rigorously.
    - Use the 0# rotor for liquids with viscosity below 15 mPa·s.

Overview

The VD2M is a digital rotary viscometer that features advanced mechanical design, refined manufacturing processes, and microcomputer control technology. Data collection is accurate, and the high-brightness blue backlit LCD ensures clear data presentation.

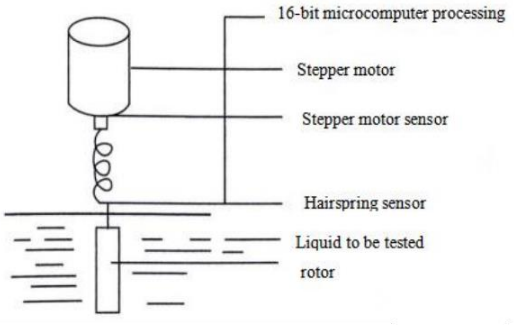


Figure 1

This instrument features high measurement sensitivity, reliable test results, user-friendly operation, and an attractive design. It is a precision device for measuring the absolute viscosity of Newtonian fluids and the apparent relative viscosity of non-Newtonian fluids. It can be widely applied to greases, paints, plastics, pharmaceuticals, foodstuffs, coatings, adhesives, resins, chemical raw materials, and other products.

This digital viscometer uses a variable-speed motor to rotate the rotor at a constant speed. As the rotor spins in a fluid, the fluid exerts viscous torque on the rotor: the higher the fluid's viscosity, the greater the torque. A sensor detects this torque, and the microcomputer processes the data to calculate the sample's viscosity.

The instrument employs microcomputer technology to easily set the measurement range (rotor number and speed), process sensor data digitally, and clearly display, during measurement, the rotor number, speed, viscosity value, and percentage of full scale.

The instrument features four rotor types (1# to 4# rotor) and eight speeds (0.3, 0.6, 1.5, 3, 6, 12, 30, and 60 rpm), providing 32 combinations to measure viscosities of various fluids within its range.

Product Structure

Overall Structure:

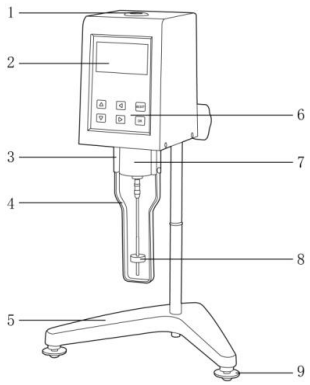


Figure 2

1 Leveling bubble for the viscometer head, 2 LCD, 3 Outer cover, 4 Rotor protection frame, 5 Machine base, 6 Operation keypad, 7 Rotor connector, 8 Roto, 9 Horizontal rotation knob

Support Structure:

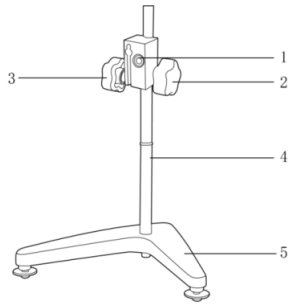


Figure 3

1 Lifting and tightening adjustment screw (with hexagonal head plate), 2 Lifting handwheel, 3 Machine-head locking handwheel, 4 Vertical shaft column, 5 Base

Rear of Instrument:

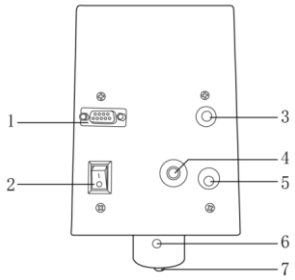


Figure 4

1 Printer/computer interface (optional), 2 Power switch, 3 Temperature sensor probe port, 4 Mounting hole for machine-head handle, 5 Power-cord inlet, 6 Protective-frame mounting hole, 7 Protective cap

Rotor Kit:

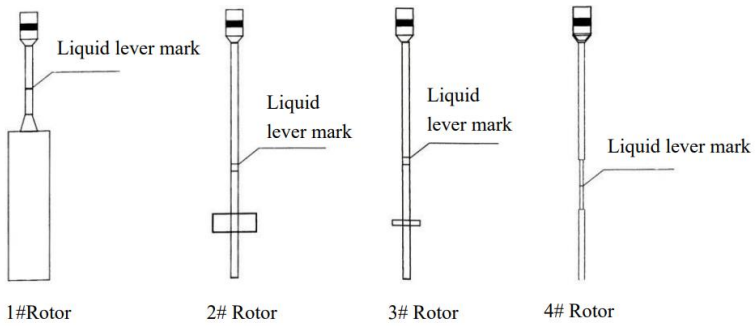


Figure 5

Product Features

The VD2M digital-display viscometer offers the following features:

- A lifting system driven by a helical rack and pinion mechanism.
- A universal joint at the rotor connection interface.
- Transmission gears made of high-performance, wear-resistant engineering plastics.
- Rotors manufactured from imported, high-quality 304 stainless steel.
- A digital blue backlit LCD screen.
- Microcomputer control technology for accurate data collection.

Product Parameters

Model	VD2M
Measurement Range	1 – 2 x 10^6 mPa·s
Rotor Specification	1# – 4# (0# optional for viscosities down to 0.1 mPa·s)
Rotor Speeds (rpm)	0.3, 0.6, 1.5, 3, 6, 12, 30, 60
Automatic Range Selection	Yes
Operation Panel	Chinese/English selection
Reading-Stabilized Cursor	The reading is stable when the vertical bar and square cursor fill the display
Measurement Accuracy	±2 % (Newtonian liquids)
Power Supply	AC 220 V ± 10 %, 50 Hz ± 10 %
Working Environment	5 °C – 35 °C; RH ≤ 80 %
Dimensions (W x D x H)	370 x 325 x 280 mm
Net Weight	6.8 kg

Installation

Selection of Working Environment
The working environment should meet the following requirements:

- The workspace must be clean and dry.
- The instrument must be placed on a level, stable workbench.
- The workbench should be located where there is no vibration.
- Keep the instrument away from magnetic objects or equipment that generate magnetic fields.
- Do not use the instrument in areas with explosive hazards.
- Avoid using the instrument for prolonged periods in environments with high humidity or heavy dust.

Instrument Installation

- Unpack the shipping carton and the instrument's storage box. Verify all components against the packing list in the manual's appendix.
- Insert the toothed vertical shaft column into the round hole in the base, ensuring the gear teeth face the front. Tighten the retaining nut on the column with a wrench to prevent rotation.
- Turn the lifting handwheel to raise and lower the head assembly. If the handwheel feels too tight or loose, adjust the tightening screw on the front of the lifting seat until slightly snug—this prevents the viscometer head from falling under its own weight. Insert the head's handle into its fixed round hole, level the head, and secure it with the locking handwheel.
- Unscrew and remove the yellow protective cap beneath the viscometer head.
- Adjust the three leveling screws on the base so that the bubble in the head's level vial is centered.

Product Use

- Place the sample liquid in a beaker or straight-walled container with a minimum diameter of 70 mm and a minimum height of 125 mm.
- Precisely control the liquid's temperature.
- Level the instrument: verify that the leveling bubble is centered and that the instrument is horizontal; install the protective frame.
- Consult the measurement-range table and select the appropriate rotor. Screw the rotor into the connector (turn left to install; turn right to remove).
- Slowly turn the lifting knob to lower the rotor into the liquid until the rotor's tip aligns with the liquid-level mark (center of the groove).
- Keyboard operation and display interface:
    - Turn on the power switch located on the back of the instrument; it will enter standby mode. The display will show prompts in Chinese and English. The initial screen is shown in Figure 6. Use the ◄ or ► keys to select your preferred language, then press the OK key to confirm. When the cursor highlights "1#," use ◄ or ► to choose the desired rotor number. Five options are available: 1#, 2#, 3#, 4#, and 0#.

Figure 6

- Press the ▲ or ▼ key to move the cursor to the speed field. The default speed is 0.3 rpm. Use ◄ or ► to select the required speed. The model VD2M offers nine: 0.3, 0.6, 1.5, 3, 6, 12, 30, 60 rpm, and auto. After selecting the rotor and speed, press OK. The rotor will begin to spin and the measurement will start.
- If you are unsure which rotor or speed to use, select the "auto" gear. After confirming the rotor, press OK. The instrument will begin measuring and automatically adjust the speed to find the optimal setting. Once complete, it will display the viscosity result or prompt you to change the rotor. The speed is shown in rpm, the viscosity in mPa·s, the rightmost vertical bar indicates the sampling progress, and the percentage represents the measured viscosity as a fraction of the gear's full scale.
- Move the cursor to the clock field and press ▲ or ▼ to toggle between "Display" and "Set." Select Display and press OK to view the current hour, minute, second, year, month, and day. Select Set and press OK to adjust the time and date.
- During measurement, press "Reset" to stop. Press OK to resume measuring with the last selected rotor and speed.
- Before measuring, estimate the sample's viscosity range and choose the appropriate rotor and speed using the range table.
- If the sample's approximate viscosity is unknown, assume a higher viscosity. Start with the smallest rotor (highest number) and lowest speed, then work toward larger rotors (lower numbers) and higher speeds.
- The instrument features an over-range alarm. If the reading exceeds 100 %, "Over" will appear. For best accuracy, maintain the range percentage between 10 % and 90 % (ideally around 50 %).
- In any mode, pressing "Reset" returns the instrument to its initial state and the interface to the user's selected settings.
- Measurement Range Table (mPa·s):

Speed Rotor	60 rpm	30 rpm	12 rpm	6 rpm	3 rpm	1.5 rpm	0.6 rpm	0.3 rpm
0# rotor	10	20	50	100	-	-	-	-
1# rotor	100	200	500	1000	2000	4000	10000	20000
2# rotor	500	1000	2500	5000	10000	20000	50000	100000
3# rotor	2000	4000	10000	20000	40000	80000	200000	400000
4# rotor	10000	20000	50000	100000	200000	400000	1000000	2000000

- Example: If you are unsure which rotor and speed to use, select the "auto" gear. For example, suppose you have chosen rotor #4 and pressed OK; the speed setting will then default to auto. Press OK again and the instrument will automatically search for the optimal speed. When the search is complete, the display will show either the viscosity result or a prompt to change rotors. If it indicates rotor #3, swap in rotor #3, then press OK to begin the measurement. The viscosity value will then be displayed.

- Conversion of common viscosity units:
  - 1 centipoise (1 cP) = 1 mPa·s
  - 100 cP = 1 poise (1 P)
  - 1 Pa·s = 1000 mPa·s
  - 1 Pa·s = 10 dPa·s
  - Therefore: 1 Pa·s = 1000 cP = 1000 mPa·s = 10 P = 10 dPa·s

- Relationship between dynamic and kinematic viscosity:
  - Formula: $\eta = \nu \cdot \rho$
  - η: dynamic viscosity of the sample (mPa·s)
  - ν: kinematic viscosity of the sample (mm^2/s)
  - ρ: density of the sample at the same temperature (g/cm^3)

- Influence of pressure and temperature:
  - Liquids: Increasing pressure or decreasing temperature increases viscosity; decreasing pressure or increasing temperature decreases viscosity.
  - Gases: Pressure has little effect; increasing temperature increases viscosity, and decreasing temperature decreases viscosity.

- Viscosity units:
  - SI unit: Pascal·second (Pa·s)
  - CGS unit: Poise (P), where 1 P = 1 g/(cm·s) = 0.1 Pa·s
  - Note: The poise is named after the French scientist Jean Léonard Marie Poiseuille (1799–1869).

Nota importante para los aparatos electrónicos vendidos en España

Important note for electronic devices sold in Spain

Remarque importante pour les appareils électroniques vendus en Espagne

Instrucciones sobre la protección del medio ambiente y la eliminación de aparatos electrónicos:

Los aparatos eléctricos y electrónicos marcados con este símbolo no pueden desecharse en vertederos.
De conformidad con la Directiva 2002/96/ CE, los usuarios de la Unión Europea de aparatos eléctricos y electrónicos, tienen la oportunidad de retornar el instrumento para su eliminación al distribuidor o fabricante del equipo después de la compra de uno nuevo. La eliminación ilegal de aparatos eléctricos y electrónicos es castigada con multa administrativa.

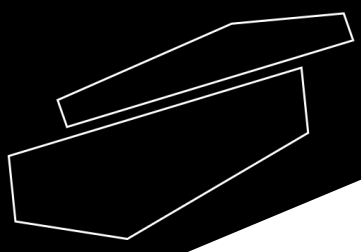
Nota importante para los aparatos electrónicos vendidos en Francia

Important note for electronic devices sold in France

Remarque importante pour les appareils électroniques vendus en France

Informations sur la protection du milieu environnemental et élimination des déchets électroniques :

Les appareils électriques et électroniques portant ce symbole ne peuvent pas être jetés dans les décharges.
En réponse à la règlementation, Labbox remplit ses obligations relatives à la fin de vie des équipements électriques de laboratoire qu'il met sur le marché en finançant la filière de recyclage de Récylum dédiée aux DEEE Pro qui les reprend gratuitement (plus d'informations sur www.recylum.com).
L'élimination illégale d'appareils électriques et électroniques est punie d'amende administrative.



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