

Rotational Viscometer User Manual



This instrument is a precision test instrument. Please refer to this manual before use.

1. warn:

1. The power supply shall meet the working requirements of the instrument.

2, power supply should have reliable grounding wire.

3. The instrument shell shall be reliably grounded.

Catalogue

1. Use and scope of application.....	3
2. Maintechnical indicators and parameters are.....	3
3. Working principle:.....	3
4. Unit under test.....	3
5. Operation and use.....	4
Vi. Precautions.....	7
7. Formula and parameter.....	8
Viii. Complete set of instruments and technical documents.....	8

1. Use and scope of application

The ND J-79 rotary viscometer is a precision instrument suitable for measuring the absolute viscosity of various Newtonian liquids and the apparent viscosity of non-Newtonian liquids. The viscometer can determine the viscosity of oil, resin, paint, ink, paste, cosmetics, cream, medicine, asphalt, etc. For different viscosity of the liquid or different determination requirements can choose different measurement units for determination. The viscometer has a small size, light weight, easy to use, simple maintenance, durable, and rapid and reliable determination of liquid viscosity.

2. Main technical indicators and parameters

1. Measuring range: $1 \sim 10^6 \text{ mPa} \cdot \text{s}$;
2. Measurement error: $\pm 5\%$ (for Newtonian body);
- 3, the tester: division, unit;
- 4, Speed: 750r/min, 75r/min, 7.5r/min;
5. Power supply: $\sim 220\text{V } 50\text{Hz}$;
- 6, external dimensions: 170140440mm;
7. Weight of the instrument: 15 kg.

3. operational principle

The instrument is driven by a miniature synchronous motor that rotates at a constant speed of 750 r/min, almost unaffected by changes in load and supply voltage. The shell of the motor is mounted with suspension type, which drives the cylinder to rotate through the rotating shaft. When the cylinder rotates in the tested liquid, the viscous resistance, thus producing the reaction force and the deflection of the motor shell. The motor shell is connected with two metal sylls installed with one front and one reverse, and the rotation of the shell makes the wire produce torque.

When the torque of the filament and the viscous torque reach a balance, the pointer connected with the motor shell points out a certain value on the dial, which is proportional to the viscous resistance of the cylinder, so the scale reading by the cylinder factor represents the value of the dynamic viscosity.

4. unit under test

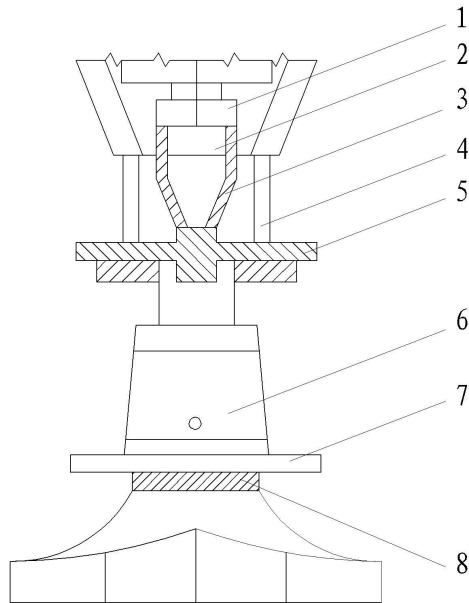
The ND J-79 rotary viscosity gauge has two test units, each consisting of a measuring vessel and several cylinders with rotating shafts.

Unit 1 has three cylindrical cylinders (1[#]、10[#]、100[#]), The measurement container is equipped with a water trap, which can be constant temperature water. The upper part of the measuring container is provided with two screw holes, one for inserting a bimetallic thermometer and the other sealed with a screw, or a glass thermometer with the appropriate seal (but not provided in this unit). The suspension is a left-handed tumble nut with a hook.

Unit 1 has four cylindrical cylinders (0.1[#]、0.2[#]、0.4[#]、0.5[#]), The measuring container is a long cylinder with a water sleeve, and a special bracket with a bimetallic thermometer. Hydrostatic water flows through the bracket and then into the unit measuring container. Bimetal thermometer and hook roller nut are shared with unit.

5. Operation and use

1. Method of removing the shock absorber (see Figure 1):
 - (1) Release the two fixing plate screws 4.
 - (2) Gently remove the fixing plate 5 and remove the shock absorber 3.



1, reducer support 2, coupling 3, shock absorber support 4, fixed plate screws
5, fixed plate 6, unit tester 7, instrument bracket 8, tester nut

graph 1

2. Power supply:

The power voltage of the viscosity meter is 220V, the frequency is 50Hz AC, and the voltage in the instrument is reduced to 7V. When the instrument is connected, the power cord is first connected to the instrument and then plugged into the power socket.

3. Left roller nut (inverted tooth) connection:

II, III The unit uses a left-handed roller nut with hooks. When dismantling the left rotary roller nut, use the hand to hold the rubber wood disc, so that the motor shaft is stuck, which is convenient to spin or remove the left rotary roller nut.

4. Zero point correction (zero adjustment):

When the viscosity gauge passes the factory, the position of the pointer should be between 5 and 10 boxes. The zero-hour motor should screw gently in the case of no-load rotation, and the pointer will slowly return to zero. If the pointer has returned to zero, can not turn the zero screw again, at this time should be reverse out, otherwise it is easy to break

the zero spring blade, please pay attention. The zero point correction during the test should be repeated three times under no load to confirm that the zero position is correct, and the zero adjustment is over before the test. The zero screw shall be withdrawn after the test.

5. Connection of the rotating cylinder:

The rotating elements of the first unit are attached with a wire shaft hook, and the motor transfers torque to the cylinder through the hook shaft. This method is adopted to avoid distortion of the hook.

The cylinder of the unit is connected by a U-shaped spring located in the cylinder and the rotating shaft. The U-shaped spring can be removed from the hook shaft of the cylinder. When the cylinder is reinstalled, both ends of the spring should be extended into the cylinder.

6. Test method of each unit:

Determination ations with unit:

Unit 1 is the absolute system, which is used for the precise determination of high viscosity. It has three standard cylinders with their respective factors of 1,10,100.

The measurement range of each standard drum is shown in the following table:

Transducer (factor)	Measuring range (mPa • s)	rate of shear
1	$10 \sim 10^2$	2028 Seconds ⁻¹
10	$10^2 \sim 10^3$	344 Seconds ⁻¹
100	$10^3 \sim 10^4$	176 Seconds ⁻¹

Required fluid volume: approximately 15 ml.

The viscosity value is the factor of the cylinder used multiplied by the scale reading for the viscosity of milliparca / s (mPa • s).

Determination steps:

Carefully pour the measured liquid into the test container until the

liquid level reaches the lower edge of the conical surface, insert the drum into the liquid until completely submerged, then place the test container on the instrument bracket and hang the drum hook on the left rotary roller nut of the instrument. At this time, start the motor, the cylinder rotates and shakes from the beginning to the alignment center, to accelerate the alignment center, move the tester back and forth on the bracket, and can be read when the pointer is stable. If the reading is less than 10 cells, the cylinder with a larger diameter should be replaced.

Determination by using the speed reducer:

When measuring the high viscosity solution with the unit (over 10000 mPaSc • seconds), two reducer as additional devices with speed ratios of 1:10 and 1:100, and the rotation speed of the cylinder is correspondingly reduced to 1 / 10 and 1 / 100 of the original value, i. e., to 75 rpm and 7.5 rpm.

1:10 and 1:100 reducer factors of 10 and 100 and applicable to 100 rotor.

The factors of the reducer are 10 and 100, and the measurement range for the cylinder with factor 100 is shown in the following table:

Reducator factor (drum 100)	Measuring range (mPa • s)	rate of shear
10	$10^4 \sim 10^5$	About 18 seconds ⁻¹
100	$10^5 \sim 10^6$	About 2 seconds ⁻¹

The calculation of the viscosity value after the reducer: the cylinder factor is multiplied by the factor of the reducer and multiplied by the scale reading to obtain the viscosity value in millipascal • seconds.

Installation and fixing of the speed reducer:

Set the coupling of the input end of the reducer into the output shaft of the motor, and engage with the coupling on the output shaft of the motor, and fix the reducer at the end of the thin rod (the thin rod projects

downward beside the motor shaft) by rolling the bolt. Then rotate the left rotary roller nut on the output shaft of the reducer and readjust the zero.

Determination ations with unit:

Unit 1 is the absolute system, which is used for the precise determination of low viscosity, and it has four cylinders, each with a factor of 0.1, 0.2, 0.4, 0.5.

The measurement range of each drum is shown in the following table:

Transducer (factor)	Measuring range (mPa · s)	rate of shear
0.1	1~ 10	About 3550 seconds ⁻¹
0.2	2~ 20	About 1850 seconds ⁻¹
0.4	4~ 40	About 1000 seconds ⁻¹
0.5	5~ 50	About 850 seconds ⁻¹

Required liquid volume: approximately 70 ml.

The viscosity value is the factor of the cylinder used multiplied by the scale reading, which enables the viscosity expressed by mesascal in seconds. Unit is not available with the reducer.

Determination steps: the same as in unit.

Vi. Precautions

1. The viscosity gauge is a precision test instrument. Please read this manual in detail before use, and you must strictly follow the conditions and steps specified in the manual in use and maintenance.

2. The instrument must be used within the specified voltage (220V \pm 10%) and frequency (50Hz), otherwise the rotation speed and the measurement accuracy will be affected. If the power grid frequency is not at 50Hz, the actual viscosity must be obtained according to the following correction formula.

Standard frequency (50Hz)

$$\text{Actual viscosity} = \frac{\text{indicated value viscosity}}{\text{Frequency of power grid used}}$$

3. The power supply shall meet the requirements of the instrument; according to the relevant national regulations, the grounding end shall have reliable grounding wire.

4. The power cord must be inserted into the instrument and connected on the power.

5. The instrument shall be adjusted and corrected and verified by the measurement department before leaving the factory, so the parts of the instrument shall not be disassembled at will, and the gossamer is strictly prohibited to be disassembled.

6. When the instrument leaves the factory, avoid crushing the agate bearing in transportation, so there is a shock absorber device, which can be removed when used.

7. Before and after use, the inner wall of the rotating cylinder and the tester should be washed and dried to ensure the measurement accuracy of the instrument.

8, the instrument storage should be often kept dry.

Note: Many of the suspension, emulsion, high polymer and other high viscosity liquids are "non-Newtonian liquids", and the apparent viscosity often changes with the shear speed and time. Therefore, measured at different rotors, speeds and time, the inconsistent results are normal, not inaccurate. General non-Newtonian liquids shall determine the rotor, speed and time.

Warning: when the instrument fails, the power supply should be cut off immediately, please repair and remove the fault before continuing to use, to prevent accidents!

7. Formula and parameters

(1) Relevant formulas and code names

1, dynamic viscosity (apparent viscosity) η

$$\eta = \text{Pascal} \cdot \text{Sec} = 1000 \text{ mPascal} \cdot \text{sec} (\text{Pa} \cdot \text{s} = 1000 \text{ mPa} \cdot \text{s})$$

2, the shear stress τ on the cylinder surface

$$\tau = M / 2 \pi h r^2 \text{Newton} / \text{m}^2$$

3. The shear stress of the tested liquid is τ'

$$\tau' = \tau \times A. \text{Newton} / \text{m}^2$$

4, and the shear rate, D

$$D = 2\omega / 1 - (r/R)^2 \text{second}^{-1}$$

5. Torque M

$$M = 4 \times 10^{-5} \text{Admito A Newton m}$$

6, the rotating cylinder length is h meters

7, the cylinder radius of r meters

8. The angular velocity is ω

$$\omega = 2 \pi n / 60 = \pi n / 30 \text{seconds}^{-1}$$

9, to determine the radius of R meters

10, the scale reading A

11, the motion viscosity of v

$$v = \eta / \rho \text{rice}^2 / \text{second}$$

12, the isothermal density of the fluid is $\rho \text{kg} / \text{m}^3$

Viii. Complete sets of instruments and technical documents

1. Complete sets of instruments

order number	name	unit	quantity
1	"NDJ-79" nose	short for Taizhou	1
2	Unit 1: Determination of the container	single	1

3	Unit 1, the cylinder rotor	single	3
4	Unit 1: Determination of the container	single	1
5	Unit 1, the cylinder rotor	single	4
6	Unit 111 thermometer rack	single	1
7	bimetal thermometer	branch	1
8	driving lever	root	1
9	Knurled nut cap (hook)	single	1
10	Short hook	single	1
11	Power plug line	root	1
12	Storage box	single	1

2. Technical documents

- (1) 1 copy of the IFU
- (2) One copy of the product qualification certificate
- (3) Product warranty card: 1 copy

Inspector: Packaging per:

Year month day, year month day