

Operating Manual
for NDJ-1C Digital Viscometer

Main Installing Chart

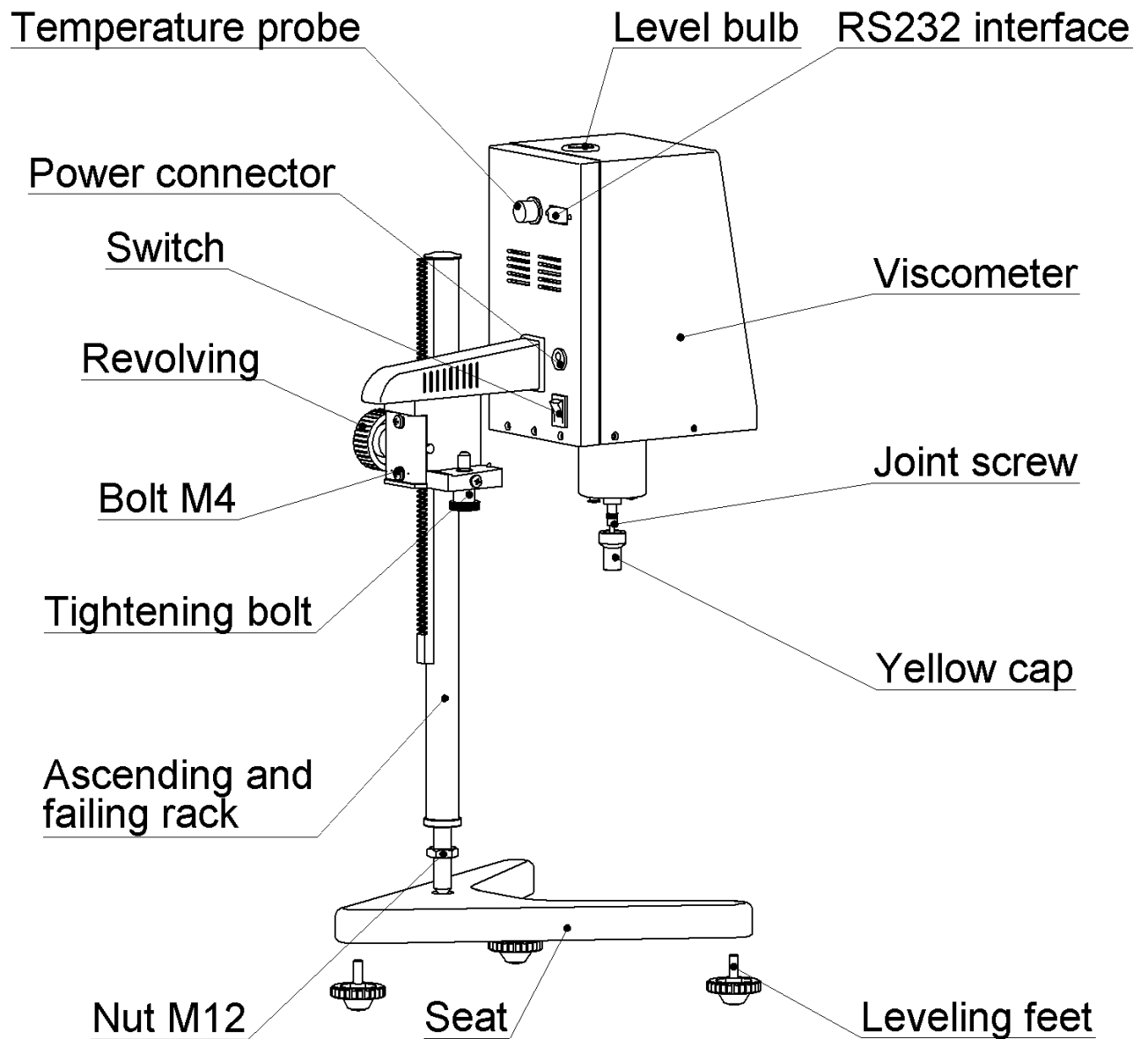


Figure 1

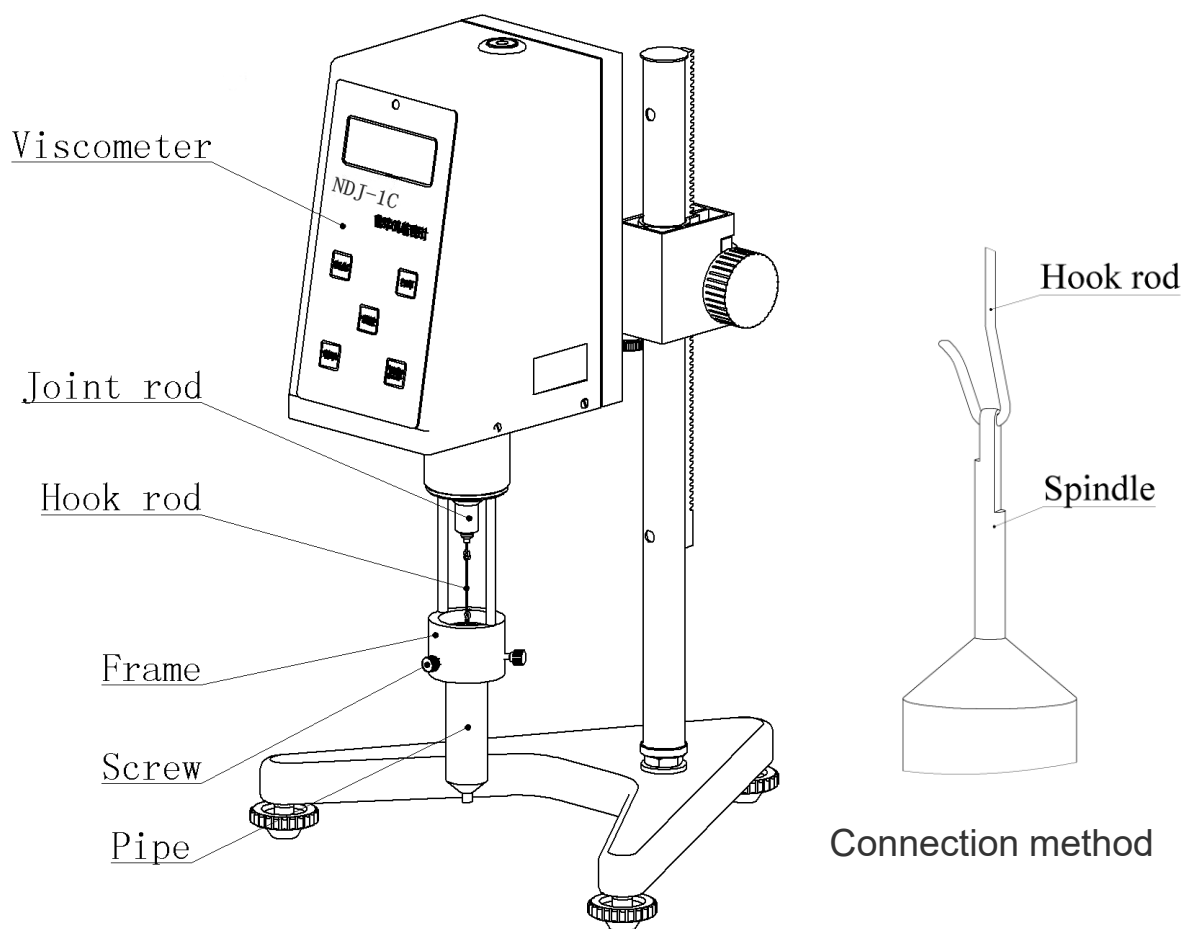


Figure 2

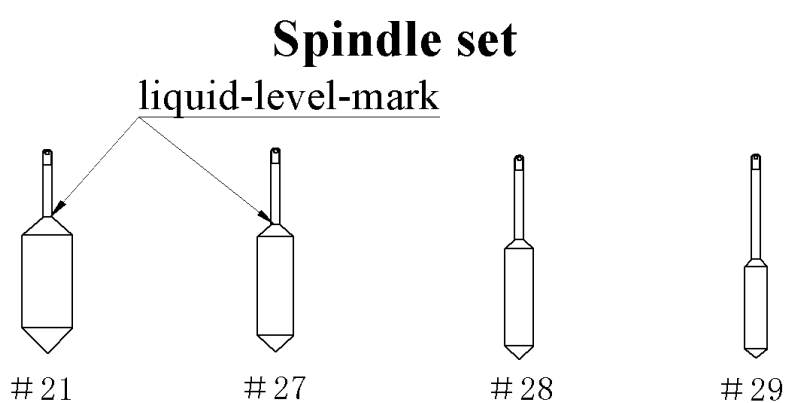


Figure 3

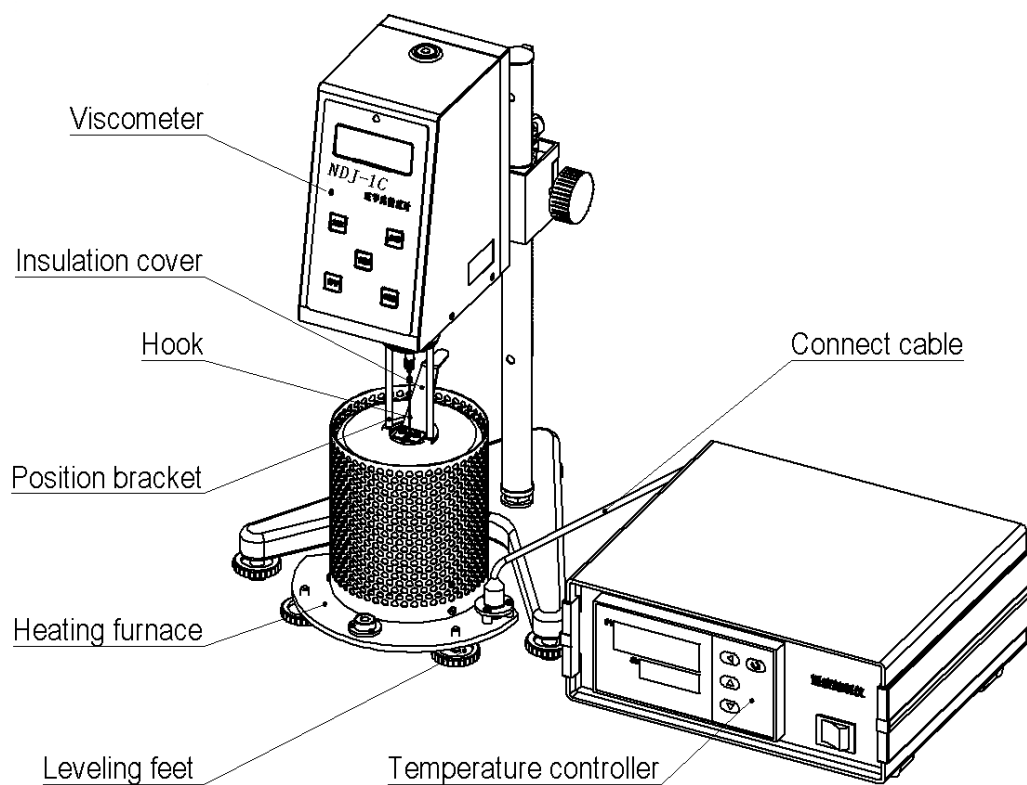


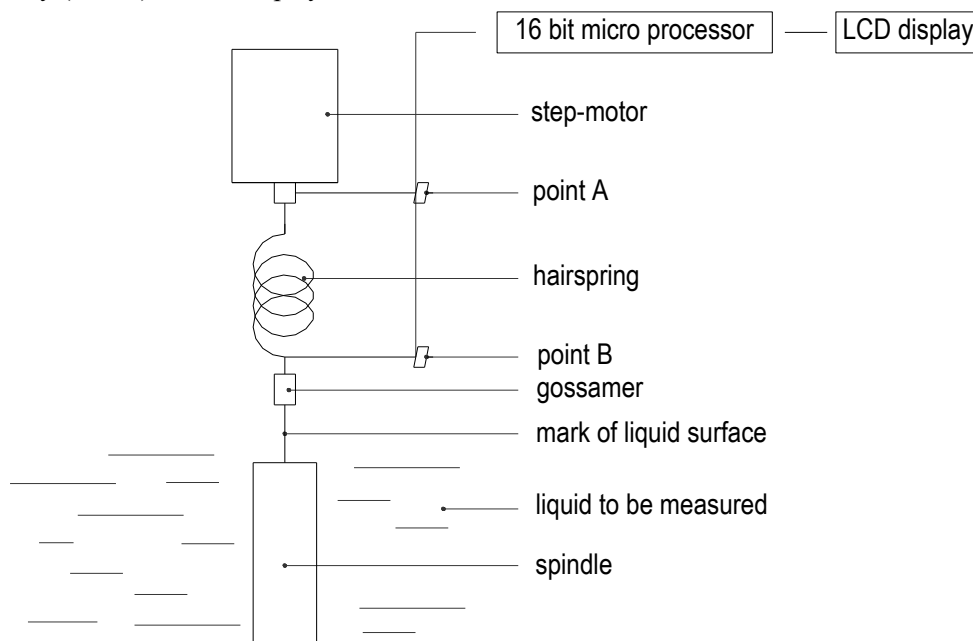
Figure 4

1. Main Technical Parameters

Model	NDJ-1C
Standard spindle	21、27、28、29
Measuring Range (mPa · s)	50~200,000
Speed range (r. p. m.)	5, 10, 20, 50, 100
Accuracy	±1%(FS) Newton liquid
Repeatability	±0.5% (FS) Newton liquid
Sample capacity (m L)	10~20
Temperature control range(°C)	10°C above ambient~250°C
Power	Power adapter(input:220V 50Hz)

2. Basic Structure and Operation Principle

2.1 As shown in the following diagram, point A, spring, point B, axis and spindle rotate at a constant speed driven by the step motor. If the spindle is not resisted by liquid, Point A is in the same position with the pointer B. On the contrary, if the rotor is resisted by viscous liquid, the spring produces the torque and will repel or balance with the viscous resistance for reaching the balance at large. At this moment, by transmitting the angle difference between point A and Point B measured by the photoelectrical load cell to 16-bit microprocessor for data processing, the viscosity (mPa·s) will be displayed on LCD screen.



2.2 The test standard for spindle: select any of 21、27、28、29 or accept 29 if it is difficult to choose.

2.3 It is applied to detect the viscosity of wax, hot melts, asphalt and polymers when a special thermostatic heater is employed.

3. Components and Ambient condition

3.1 Components

1	Digital viscosity meter	1 pce	2	Ascending and falling rack	1 set
3	Frame and pipe	1 set	4	Power adapter	1 pce
5	Standard spindle	1 set	6	Spanner	1 pce
7	Seat and leveling feet	1 set	8	RTD temperature probe	1 pce
9	Temperature controller	1 pce	10	Heating furnace	1 pce
11	Insulation cover	1 pce	12	Special tweezers	1 pce
13	Position bracket	1 pce	14	Connect cable	1 pce
15	Power cord	1 pce	16	Connection hook	2 set
17	Embedded micro printer	1 pce	18	Printer connecting cable	1 pce

3.2 Ambient condition

3.2.1 Ambient temperature: 20℃～30℃

3.2.2 Relative Humidity<80%

3.2.3 No EMP, Vibration and corrosive gas

4. Installation (Please install as per the installing chart)

- 4.1 Take out the seat, ascending and failing rack, viscometer, spindle support and so on;
- 4.2 Screw down the ascending and failing rack into the hole of the socket and tighten the screw with spanner.
- 4.3 By running the knob of the ascending and failing rack, check the agility and self-locking capacity of the collet of the ascending and failing rack. If loosening and tightening are found, you can adjust the bolt M4 on the back of the ascending and failing rack with the screw driver to make sure that it can be ascended and fallen. It will be better if it is screwed down more less tightened so as to prevent the viscosity meter from its going down after installed.
- 4.4 Install the viscosity meter on the ascending and failing rack and make it tighten with the bolt. The bolt that is unscrewed under the apparatus and remove and place the cap in yellow properly for next use. The cap in yellow plays a role in preventing the joint screw. It should cover the cap in yellow if it is not used for a longer time or being transported.
- 4.5 This system has two kinds of sample measurement, a method of assembly as shown in Figure 2, mainly used for measuring the liquid material at room temperature (Convenient with the use of other low constant temperature equipment); Another method as shown in Figure 4, is mainly used for measuring be solid at room temperature, high temperature heated into liquid substances.
- 4.5.1 According to figure 2 assembly.
- 4.5.1.1 Take the spindle from the accessory box, hook (short), frame, pipe etc., then frame is arranged on the lower end of the viscometer.
- 4.5.1.2 The spindle is Installed in the hook (short), in order to minimize the measurement error, assembly hook and the spindle must be shown in Figure 2 (right).
- 4.5.1.3 The hook (short) connected with the viscometer. The first rotating shaft to lightly lift and squeeze with your left hand, then the right hand pinch the hook (short), (looking down) clockwise connect and lightly tighten.
- 4.5.1.4 10 ~ 20 ml of the measured liquid is injected into the pipe, the pipe bottom loaded stent, when the liquid level to the spindle liquid-level-mark, tighten the three screws fixed to the pipe.
- 4.5.2 According to figure 4 assembly.
- 4.5.2.1 Remove the position bracket from the packing box and install in the viscometer (turn right into the mount, to the left than unloaded).
- 4.5.2.2 Take the spindle from the accessory box, hook (long), pipe etc.
- 4.5.2.3 The spindle is Installed in the hook (long), in order to minimize the measurement error, assembly hook and the spindle must be shown in Figure 2 (right).
- 4.5.2.4 The hook (long) connected with the viscometer. The first rotating shaft to lightly lift and squeeze with your left hand, then the right hand pinch the hook (long), (looking down) clockwise connect and lightly tighten.
- 4.5.2.5 Remove the temperature control instrument, the heating furnace from the packing box in Figure 4 shows position.
- 4.5.2.6 Adjust the leveling feet make the level bulb is located in the center of.
- 4.5.2.7 Connect cable temperature control instrument (input signal) and heating furnace.
- 4.5.2.8 Use special forceps will pipe from heating furnace to remove and wash, pour 10 ~ 20mL after the sample, by turning the revolving, the spindle immersed in liquid samples and to the spindle liquid-level-mark, as shown in Figure 3, and then covered with insulation cover.
- 4.6 By adjusting leveling feet to make sure that the bubble is in the middle of the viscometer on the top.
- 4.7 RTD temperature probe (Temp range: 0°C ~ 100°C), can be connected with the corresponding interface with the. The temperature probe can measure the sample environmental temperature.
- 4.8 The power adapter output end is inserted into the power jack viscometer, the AC power plug the other end of the insert (110 ~ 240V, 50 ~ 60Hz) power socket, the connection right after the power can be switched on the host side switch
- 4.9 The viscometer is equipped with an embedded micro printer. One end of the printer connecting line is inserted into the 232 output interface of the back of the host, and the other end is inserted

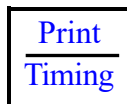
into the 25 core port of the temperature controller.

5. Function of keys

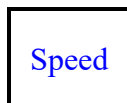
5.1 The viscometer



Reset the applied program



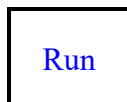
Printing/Timing function



Selection of the motor rotating speed

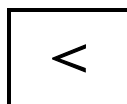


Spindle Selection. The viscous value maximum measured under the current rotating



Start to measure

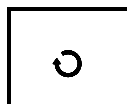
5.2 The temperature controller



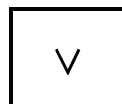
Shift key



Increase key



Set key

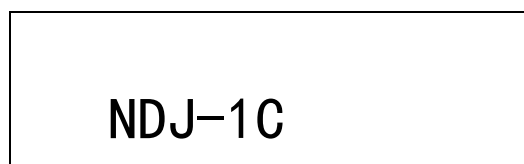


Decrease key

6. Content Description on screen (Examples are given as follows: the specific operation data are different)

6.1 The viscometer

It is displayed when switching on and resetting the apparatus



28.5°C	100.0 RPM	0.0%
	500.0	SP 21
		mPa • S

28.5°C The current room temperature detected by RTD (Only with RTD)
 SP 21 Spindle with code 21
 100.0RPM The current rotating speed.
 mPa • s Unit of dynamic viscosity
 500.0 Represents the maximum viscosity that can be measured.
 0.0% The % torque

After press the <Run> key appears as follows
 Automatic measurement state

28.5°C	100.0RPM	64.1%
	320.1	SP 21
		mPa • S

Normal measurement, hundred meter torque between 10~90 to normal. If not within this range, viscosity meter will issue the alarm, prompt the user to change the speed or spindle

6. 2 The temperature controller

PV	
SV	

PV: The actual measured value
 SV: The set temperature value

7. Operating Procedures

7.1 Make sure that the set-up steps have been finished.

7.2 Open the temperature controller switch, display window in SV data set temperature value is the last operation, display window data in the PV rapid rise and reach the display window SV within the set temperature value.

7.3 If you need to set temperature, press < ^ > or < v > keys can increase or decrease the data, thereby setting required working temperature, then the display window in PV data will quickly reach the display window SV within the set temperature value, if the set temperature than low temperature showed slower window data change export in PV.

7.4 Note: instrument open longer time after the power switch, if the window PV the measured temperature value is still under the changes frequently and vary greatly, can according to the following steps:

7.4.1 Long press< ⏻ > Press and hold for 2 seconds, release when window PV shows "At" and window SV shows "OFF";

7.4.2 Press the< ▲ >key to change the "OFF" appearing in window SV to "on";

7.4.3 Press the <  >key to confirm, and the window SV will start to display a flashing "At". Wait for several tens of seconds before "At" disappears. At this time, the data displayed on the window PV may still fluctuate up and down. Wait for it to stabilize before it can work normally.

7.5 When the work is finished, close the switch, temperature controller automatically save the last set temperature.

7.6 When the sample is heated to dissolve enough long time, turn on the power switch viscometer, the screen bright, viscometer in a wait state, the motor does not work.

7.7 Input the spindle code, the displayed spindle code will be changed once the <spindle> key is pressed and the code is circulated among 21→27→28→29→0. The input is over when the selected spindle code is displayed.

7.8 Selecting the rotating speed:

the displayed speed of the speed will be changed once the <speed> key is pressed and it is circulated among the speed level specified (e.g. 5.0→10.0→20.0→50.0→100.0). The selection of the rotating speed is over when the speed of the selected speed is displayed.

7.9 Adjust the leveling feet make the level bulb is located in the center of, the viscometer to maintain the level of state.

7.10 Press <Run> key, the viscometer starts to measure and displays the viscosity value.

7.11 In the course of measurement, if you need to change the spindle, you can press the <Reset>key. At this moment, the motor stops and the viscometer is on standby. After the spindle is changed, you can continue to measure with the procedures from 7.7 to 7.10 mentioned above.

7.12 Pressing <Print/Timing> key to perform printing or timing measurement function.

Select the printing and timing measurement function: Switch on the power of the viscometer, and then press <Print/Timing> key when the viscometer is not in measuring state. Once "P:XX:XX" is displayed on the screen, the printing setting is selected. Press <Print/Timing> key again, once "T:XX:XX" is displayed on the screen, the timing setting is selected.

7.12.1 Setting the time interval for printing

Press the <Print /Timing>key, P:00:05→P:00:10,····→P:05:00 will be circulated. P:00:05 stands for printing every 5 seconds, P:00:10 stands for printing every 10 seconds, ····· P:05:00 stands for printing every 5 seconds. The rest result can be known by this way.

After the printer is connected, press the <Print /Timing> key to start the printing. "on" will be printed out and the printing will be performed at the interval time set. To stop printing, press the <Print /Timing> key again, "off" will printed out and the printing stops.

7.12.2 Setting timing measurement

Since the spindle, rotating speed and measurement time should be selected in measuring the "non Newton liquid". The operator can set different measurement time according to the properties of the samples. The detailed procedure is given as follows:

Press the <Print /Timing> key before it comes into the measurement state. Do not release the "Print /Timing" key until the LCD display has changed from "P:00:00" to "T:00:00", and then a cursor will be found flickering on the screen.

Press the <Print /Timing>key, T:00:00→T:00:05,····→T:20:00 will be circulated. It should be noted that "T:00:00" stands for no timing; "T:00:10" stands for ten-second measurement; "T:05:00" stands for five-minute measurement and so on.

Since the timing measurement has been selected and set, when the measurement time reaches a certain value for each measurement, the viscometer meter will stop measuring. And the LCD screen will display the current viscosity and be locked as well. This function provides the operators the convenience to record, compare and analyze the progress and result of the "non Newton liquid" measurement.

In case that this function has to be cancelled, set the measurement time to "T:00:00" in the same procedures above.

7.13 Attention should be paid to sample should make constant temperature at the test temperature measurement process, in order to keep showing the value of stable and accurate. The sample should have enough time to reach the equilibrium temperature, sample test required.

7.14 The measurement work is completed, first close the viscometer power, slowly will viscometer

rise, moved to the spindle from the heating furnace, remove the spindle wash.

7.15 Close the temperature controller switch.

7.16 Use special forceps will pipe from heating furnace to remove and clean, cleaning spindle, pipe in the process of preventing scald.

7.17 The cleaned pipe back into the heating furnace, clean the spindle if not temporary, into the accessory box standby.

8. Cautions

8.1 Keep the connecting side of the joint bolt with the spindle and the screw thread itself clean. Otherwise, it will effect the shacking degree of the spindle.

8.2 You should hold the ascending and failing rack in your hand when it is on raise and down to prevent it from dropping due to its deadweight.

8.3 After changing the spindle, you should input the new number of the spindle. The spindle that is used and changed should be cleaned first and then put on the rack of the spindle. Do not leave the spindle on the meter and clean it.

8.4 When the liquid is changed, you should clean (wipe up) the spindle and the screw to avoid the error caused by the interblended liquid for measurement.

8.5 The viscosity meter is matched with the spindle. Do not interblend several viscosity meters with the spindles

8.6 Do not dismantle and adjust the spare parts in the viscosity meter with liberty.

8.7 When the viscosity meter is moved and transported, the yellow cap should be on the joint screw and the bolt should be screwed down and packed in the box.

8.8 After the spindle is installed, you do not circumrotate it for a longer in case of no liquid to prevent it from being damaged.

8.9 The suspended and confused liquid, high polymer and the other more condensed liquid have a lot of “ non Newton liquid”. Their viscous values are varied with the shear speed and the time. Therefore, their checking results under the different spindles and rotating speed are different. This is the normal case. It is not the error caused by the meter. Normally, you should regulate the spindle ,rotating speed and time to measure the non Newton liquid.

9. The following points you should pay more attention for more accurate data

9.1 Clean the spindles and the pipe before measurement.

9.2 Measurement of the spindle position is adjusted to the center of pipe, and the surface dip to the spindle liquid-level-mark. In order to ensure the flat surface markers by sample surface and the spindle, the first water quantitative estimation experiment sample amount needed:

9.2.1 Use special forceps to pipe is removed from the furnace, into the water after the pipe back into the heating furnace.

9.2.2 The position bracket is mounted on the viscometer (turn right into the mount, to the left than unloaded). The selection of spindle and hook screw joint screw.

9.2.3 Regulation of viscometer slowly decreased gradually, the spindle gradually immersed in the measured liquid, when the liquid level reaches the liquid-level-mark of the spindle, record the location of position bracket position.

9.2.4 Pour water into the graduated beaker, record amount of sample in the experiment.

9.3 Putting the spindle into the liquid to be measured for an enough longer time and keep the same temperature for both.

9.4 When measured, the spindle is placed in the center of the screw. Make the mark on the spindle and liquid surface at the same level. Adjust the viscometer to be horizontal.

9.5 You should turn off the apparatus at time when the measurement at high speed is changed into the measurement at low speed at one or keep a less longer time at the low speed to overcome the error that may be caused by the circumvolved inertia of the liquid.

9.6 When measuring the low viscosity, 21 of the spindle is chosen, and 29 of the spindle for the

high viscosity.

9.7 The measure time for the viscosity measured at low speed is relatively longer.

9.8 The viscosity meter can be replaced by revolving the ascending and failing rack when you need to change the spindle and liquid to be measure in process of the measurement. Make sure to adjust the viscometer to be horizontal.

9.9 Test the viscometer frequently with standard viscosity liquid to check the performance.

10. Sampling measurement for unknown viscosity

10.1 The General Principle for Measurement: For the sample with high viscosity, you should choose the little dimensioned spindle 28、 29 and slow rotating speed. For the sample with low viscosity, you should choose the large dimensioned spindle 21、 27 and fast rotating speed. When measured ,the mark measured by the percentage meter between 10% and 90% is the normal value. The viscous value measured within this range is the correct value.

10.2 In general, you can choose from spindle 29 and low speed 5 RPM start measurement.

10.3 Estimation of the measured liquid (sample) viscosity range, according to the principle of operation, first select the spindle, then select the speed, the same selection of 21 spindle, rotating speed 100RPM, display the maximum range is 500 mPa•s, when the speed is 10RPM, the maximum range is 5000 mPa•s, range expand ten times.