

HZ1151

Automatic Apparent Viscosity Tester



Huazheng Electric Manufacturing (Baoding) Co., Ltd

Dear user:

Thank you for choosing HZ1151 Automatic Apparent Viscosity Tester.

We hope that this instrument can make your work easier and more enjoyable, so that you can get the feeling of office automation in the test and analysis work.

Before using the instrument, please read this manual, and operate and maintain the instrument according to the manual to prolong its service life. "Just a light press, the test will be completed automatically" is the operating characteristics of this instrument.

If you are satisfied with this instrument, please tell your colleagues; if you are not satisfied with this instrument, please call (0312) 6775656 to tell you to serve you at all times-Baoding Huazheng Electric Manufacturing Co., Ltd., our company will definitely make you satisfied !

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I. Brief Introduction Of The Instrument

The engine-oil apparent viscosity tester is designed and manufactured according to the Test Methods GB/T 6538 & ASTM D5293, which is appropriate for measuring the apparent viscosity of engine-oil in the range of $-5 \sim -30^{\circ}\text{C}$ under the conditions of shear stress of about $1200 \sim 20,000 \text{ mPa}\cdot\text{s}$ and shear rate of $105 \sim 10^4 \text{ S}^{-1}$. The instrument applies fully automatic temperature control equipment, users only need to operate on the color touch screen to conduct test and analysis conveniently and quickly. Meanwhile, it applies the latest intelligent control system, which improves the stability and reliability of the instrument and makes the accuracy of temperature control more precise, higher test accuracy.

II. Technical Parameters

1. Power: AC $220\text{V} \pm 10\%$ $50\text{Hz} \pm 5\%$
2. Machine power: 2KW
3. Heating power: 800W
4. Temperature measuring range: $-50 \sim 100^{\circ}\text{C}$
5. Accuracy of measuring temperature: $\pm 0.1^{\circ}\text{C}$
6. Scope of refrigeration: $-60^{\circ}\text{C} \sim$ room temperature
7. Ambient temperature: $-40 \sim 30^{\circ}\text{C}$
8. Measuring range: $1200 \sim 20000 \text{ mPa}\cdot\text{s}$

III. Structure And Principle

The engine-oil apparent viscosity tester is composed of master control system, stator temperature automatic control system, stator measuring unit, motor speed measurement system, bath temperature automatic control system, refrigeration system and cold bath circulation system, etc. The instrument applies advanced microcomputer control, touch screen human-computer interaction, automatic calculation, display, and printing, which greatly facilitates the detection work of testing personnel.

The instrument applies the principle of fuzzy control, using the multistage compressor to achieve the temperature control of refrigeration equipment, which can accurately and precisely control the cold bath and stator temperature with the high control precision, and the temperature can also be set by the system in compliance with the user's requirement and follow the nonlinear curve to reach the setting temperature. The temperature measurement system adopts a high-precision thermal resistance, which

can accurately measure the temperature, with accurate temperature measurement and high precision.

The color touch screen is applied by the system for human-computer interaction, microcomputer automatic control, users can conveniently set instrument parameters, and quickly perform determinations, which has the function of real-time monitoring system working parameters, printing and storing the experimental results, as well as the function of inquiry, which can conveniently query the historical data of various oil products.

The instrument is designed in compliance with the GB/T6538 standard, and users can apply this instrument to measure apparent viscosity. The instrument has a calibration function, which can easily and quickly calibrate each part of the system. During the test, standard oil can be initially applied by the user to calibrate the instrument. Once the calibration is completed, the interrelation intervening the viscosity and the motor speed can be drawn. The apparent viscosity of the oil to be measured can be obtained by automatic curve fitting during the test.

The instrument has the following characteristics:

1. Compact structure, attractive appearance and convenient operation.
2. It applies fuzzy temperature control principle, higher accurate temperature control and faster response speed.
3. It applies color touch screen and microcomputer control, which is convenient for users.
4. Automatic or manual printing of experimental results, convenient for filing and archiving.
5. It applies precise algorithms to automatically calculate the apparent viscosity of engine-oil.

IV. Introduction Of Stator Measuring Unit

The stator measuring unit is composed of five parts, including the stator oil cup, constant torque motor rotor, temperature measurement system, circulating cold bath system and heating system. An electronic motor drives a rotor closely matched with the stator, and the test specimen is filled in the gaps between the rotor and stator. A temperature sensor is placed near the inner wall of the stator oil cup, the test temperature is controlled by adjusting the circulating cold bath temperature flowing through the stator, and a low-power DC heater is assembled on the stator to adjust the temperature of the stator and make the temperature stable in case of the temperature of the stator changes slightly.

During the test, an appropriate amount of oil sample is added to the stator oil cup to start-up the motor, and the rotor is rotated together. By debugging the motor torque, the motor torque is kept constant, and correct the rotor speed as a function of the apparent viscosity of the engine-oil. Once the calibration is completed, the viscosity of the test specimen is determined by the calibration data and the rotation speed of the rotor.

The two sockets of the master control system are respectively connected with the cold bath circulating pump and negative pressure cleaning pump. Two cold bath circulation interfaces are connected with the circulating cold bath through rubber connecting tube to cool down the stator.

V. Assembly And Debugging Method

- (1) Once unpacking the instrument, please check the accessories according to the packing list. In case of there is any damage or missing, please contact the manufacturer in time;
- (2) The instrument should be transported vertically, and the inclination of the instrument should not be greater than 30 degrees during handling process, and it should be installed in a place away from light and 0.2m away from the wall. The installation of the instrument should be stable, otherwise noise will be generated after the compressor starts;
- (3) Place the circulating cold bath next to the instrument, and connect the coolant inlet and outlet of the circulating cold bath with the coolant inlet and outlet on the rear of the main engine with rubber connecting pipe, and ensure that the coolant does not leak;
- (4) Check the volume of alcohol in the circulating cold bath before use. If the alcohol is less than the height of the copper tube in the cold bath, alcohol should be added and cover the injection hole; (in case of the first time to add alcohol, the circulating pump should be activated to discharge the air in the silica gel pipe, and then turn off the circulating pump.)
- (5) Plug one end of the circulating pump control line into the socket on the rear of the circulating cold bath system, and plug the other end into the socket on the rear of the main engine;
- (6) Firmly connect the temperature sensor plug on the rear of the stator measuring unit;

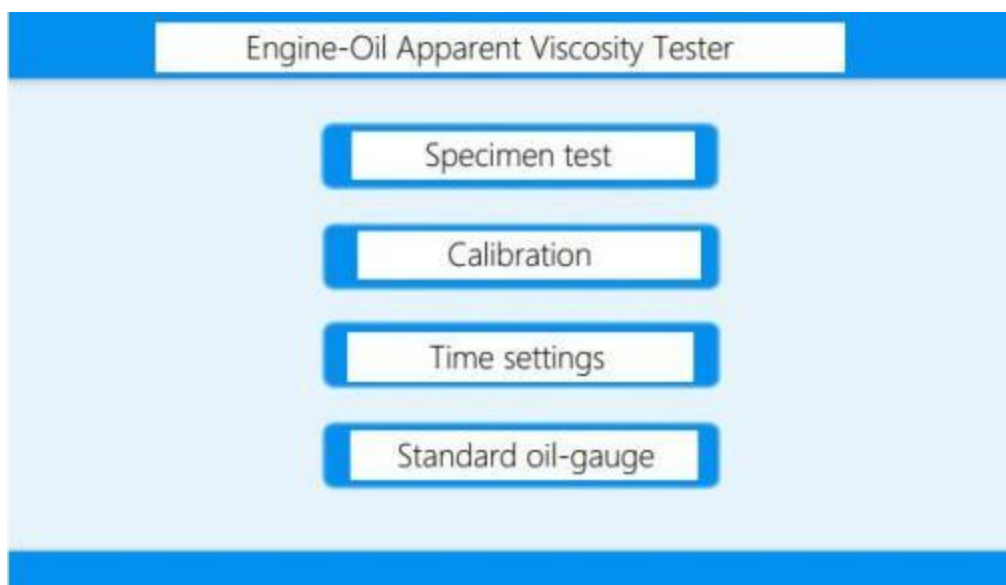
(7) While the tester switch is off, insert the power plug into the power socket of the tester.

VI. Operating Instructions

- 1 The circulating pump and negative pressure pump can be operated in the interface of specimen test, current calibration, and constant calibration.
- 2 The setting temperature of the cold bath automatically displayed after setting the stator temperature is for reference only and can be debugged in compliance with the test status.

1 Power on

- (1) Turn on the power of the circulating cold bath system, debug the bath temperature setting value, and then turn on the refrigeration switch.
- (2) Turn on the power of the main engine.
- (3) Enter the main operation interface as follows:

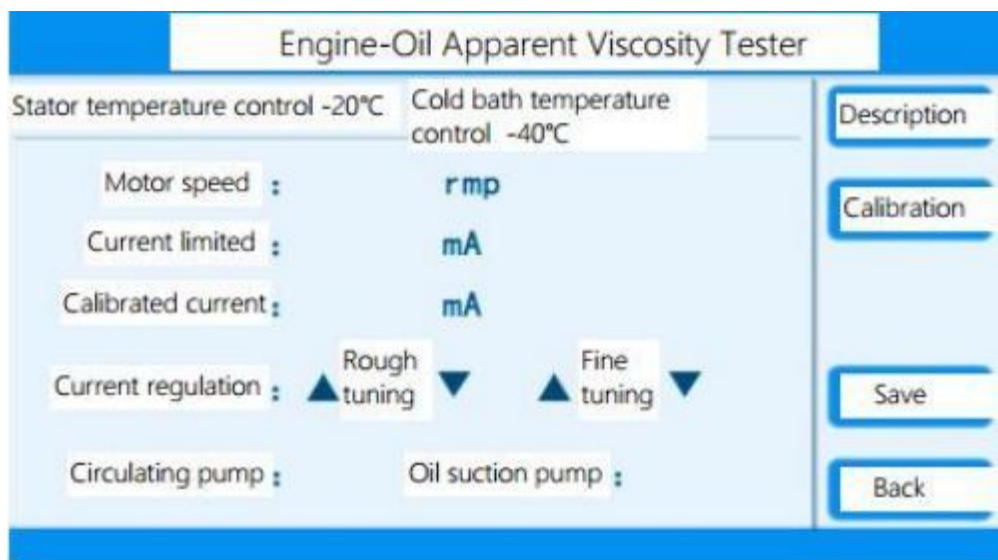


2 Oil sample injection

- (1) Take out 10-20ml of oil by using a dropper. Sampling is performed in compliance with the *GB/T 4756 Method* to obtain representative samples without suspended solids and water. When sampling from container at a temperature that below the dew-point temperature of the room, allow the sample to be heated to the room temperature prior to opening the container. If there are suspended solids in the sample, a filter or centrifuge machine should be applied to remove solid particles larger than 5 μm . In case of the sample is vibrated, air will be entrained, which will result in erroneous viscosity results.
- (2) Dripping the sample into the stator cup, and make sure that the gap between the stator and the rotor is filled with oil sample, the liquid surface is 1mm over the rotor. When the sample overflows from both sides of the rotor, turn the rotor manually to ensure that the sample completely penetrates the surfaces of the rotor and stator.
- (3) Turn the rotor manually to make the sample evenly distributed in the stator cup.
- (4) When the cleaned or tested sample needs to be discharged, unplug the rubber cap on the copper pipe, connect the silicone tube of the negative pressure pump, and turn on the negative pressure pump to discharge. After emptying, unplug the silicone tube and turn off the negative pressure pump.

3 Electric current calibration

- (1) In case of starting-up a new instrument or replacing some drive components (motors, belts, etc.) of the viscosity pool, the drive current needs to be measured. The drive current is required to be tested every month during the initial few months of instrument using until the variable of the drive current is less than 20mA for several consecutive months, thereafter, check it every three months.
- (2) In the current calibration interface, set the cold bath temperature on the cold bath thermostat. When the temperature is reached, add 3500mPa · s calibration oil, set the stator temperature to -20°C , and set the stator temperature on the stator thermostat to -20°C ;



- (3) Click the calibration button, the circulating pump will be turned on automatically and the timing will start at this time. The motor will be turned on after 180s timings and stopped automatically when the timing reaches 360s. During the process, observe the motor speed and adjust the motor current to make motor speed as stable as possible at 240rpm when the timing is around 240s. Meanwhile, click the save button to save the electric current values as required. If the save is successful, a red font will appear next to the save button as a reminder.

4 Constant calibration

- (1) Once the electric current calibration is completed, take out three calibration oils including the viscosity range of the sample being tested, put them into the stator cup, set the calibration temperature and standard oil viscosity value, and select, click the calibration button, and then the motor speed corresponding to each calibration oil is automatically tested and recorded. The constants are automatically calculated once the calibration of the three samples are completed. Click save button as required.

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If there is anything unclear, please press the Description button to view the calibration instructions.

Calibration temperature °C Cold bath temperature °C

Circulating pump : Oil suction pump :

Standard oil viscosity value	Calibration option	Calibration constant
mPa. s		b0=
mPa. s		b1=
mPa. s		b2=

Description

Calibration

View

Save

Back

(2) Constants can be viewed.

(3) The constants at -20°C can be copied as the constant at other temperature points. This function is applied to quick calibration. If accurate calibration is required, it requires to be calibrated once at each temperature point.

5 Specimen test

- (1) Take samples about 5 ml with a dropper and inject the samples into the stator cup with a needle from the side tube;
- (2) Input the "Oil product number", "Test technician", and "Test temperature"; set the values of stator thermostat and cold bath thermostat. Click the start button to test.
- (3) Once the test is completed, the motor speed is automatically recorded, the motor and circulating pump will be shut down.

Engine-Oil Apparent Viscosity Tester			
If there is anything unclear, please check the test descriptions before the test.			
Oil product No. :		Test technician No. :	
Test temperature :	°C	Cold bath temperature :	°C
Motor speed :	rpm	Motor current :	mA
Apparent viscosity :	mPa. s		
High viscoelastic oil selection :			
Circulating pump :		Oil suction pump :	
			Description Start Print View Back

- (4) When there is an abnormal oil sample, or machine abnormality, etc., which may lead to abnormal rotation speed, the system will automatically detect and alarm, and remind in the eye-catching position of the screen by red font, and meanwhile the buzzer will alarm.

6 Save and print

- (1) Once the test is completed, the apparent viscosity corresponding to the test specimen can be automatically calculated, and stored, displayed, and printed. The storage content includes: test technician, oil product no., test date, test temperature, motor speed and apparent viscosity.
- (2) The test results can be printed and viewed.
- (3) When viewing the test results, you can scroll page forward and backward to query, print, and delete the currently viewed record.

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← Page Up	Historical data view	Page Down →	
Apparent viscosity :	mPa. s		Print
Motor speed :	rmp		Send
Test temperature :	°C		Delete
Oil product No. :			Back
Test technician No. :			
Date :	/ /	: :	

7 Standard oil-gauge

Standard oil input is for inquiry only, which is divided into 2 pages.

8 Time settings

Date and time can be set.

VII. Attentions

- 1 Please read the Operation Manual carefully before use to avoid misoperation.
- 2 In case of the system automatically prompts that an error occurs, please follow the instructions to troubleshoot.
- 3 It should avoid water entering the metal bath during operation, otherwise it must be cleaned before testing.
- 4 The instrument has been calibrated before delivery. Do not touch or disassemble the precision parts during operation.
- 5 Please set the test parameters accurately, otherwise the test results may be unreliable.
- 6 The refrigeration equipment cannot be started and stopped consecutively, and the interval between two services time is more than 10 minutes.
- 7 The instrument bath must be filled with medium before it can be powered on, otherwise the heater will be damaged.
- 8 If the instrument is not applied for a long time, the medium in the bath should be discharged. Wipe the instrument clean with dry rags to avoid affecting the service life of the instrument due to the presence of medium. When using it next time, attention should be paid to filling the medium before use.

VIII. Packing List

No.	Item	Qty
1	Apparent Viscometer	1
2	cold bath	1
3	Suction pump	1
4	Standard oilCL160 (50ml)	1
5	Standard oilCL250 (60ml)	1
6	standard oil CL320 (50ml)	1
7	Syringe 10ml	10
8	alcohol catheter	2
9	Refrigeration equipment connection line	1
10	Main engine connection line	1
11	Blow bottle	1
12	Blow cap	1
13	power cable	1
14	fuse tube	1
15	user's Guide	1
16	Packing List	1
17	certificate	1