Dependable Products From People You Trust

Model 800E Viscometer

#130-00-C - with Carrying Case
#130-00-C-H - with Carrying Case, Heat Cup, and Calibration Fluid, 115 Volt
#130-00-1-C-H - with Carrying Case, Heat Cup, and Calibration Fluid, 230 Volt
#130-00-C-T - with Carrying Case, Heat Cup, Calibration Fluid, and Tablet, 115 Volt
#130-00-1-C-T - with Carrying Case, Heat Cup, Calibration Fluid, and Tablet, 230 Volt

Instruction Manual

Updated 10/28/2024
Ver. 1

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Introduction

The Model 800E Viscometer represents the next evolution in oilfield rheology. This instrument is capable or measuring the rheology properties of drilling fluids, completion fluids, and cement in either the field or laboratory. The optional heat cup enables temperature control of the fluid, and the optional tablet provides wireless control over testing parameters.

Description

The Model 800E Viscometer determines the flow characteristics of drilling fluids and cement slurries in terms of shear rate and shear stress over various time and temperature ranges at atmospheric pressure. Speeds are easily changed with a control knob, and shear stress values are displayed on a lighted magnified dial for ease of reading.

The Viscometer's motor speed is continuously monitored and automatically adjusted to maintain a constant shear rate under varying input power and fluid shear conditions. The eight precisely regulated test speeds (shear rates in rpm) are as follows: 3 (Gel), 6, 30, 60, 100, 200, 300, and 600. A higher stirring speed is also provided. Speeds may be changed with a control knob selection, without stopping the motor.

Components

#130-00-C Model 800E Viscometer

#130-00-015	Torsion Shaft
#130-00-021	Wrench for Bob Shaft and Bearing
#130-00-030	Carrying Case
#130-10-30-4	Power Supply, 15 VDC
#130-21	Cup, Stainless Steel
#130-75-28	Allen Key, 1/16", 1.75" Long
#132-56	Rotor Sleeve, R1, 303 Stainless Steel
#132-57	Shield
#132-58	Bob, B1, 303 Stainless Steel
#134-05-2	Shielded Bearing for Bob Shaft
#134-10	Torsion Spring Assy, F1
#152-37	AC Power Cord, 115 Volt
#152-38	AC Power Cord, 230 Volt

#130-00-C-H Model 800E Viscometer with Heat Cup and Calibration Fluid

#130-00-10	Heat Control Box
#130-76-10	Universal Heat Cup, 115 Volt
#130-76-10-1	Universal Heat Cup, 230 Volt
#132-80	Calibration Fluid, 100 cP, 16 oz
#130-00-031	Carrying Case

#130-00-C-T Model 800E Viscometer with Heat Cup, Calibration Fluid, and Tablet

#500-300-098 Tablet, 8" Display

Optional:

#132-56-C	R1 Closed-Cup Rotor; 316 Stainless Steel (For completion and fracturing fluid testing.)
#132-80	Calibration Fluid, Certified, 100 cP, 16 oz

Additional Bobs, Sleeves, and Springs:

#132-58-1	B2 Bob, 303 Stainless Steel
#132-58-2	B3 Bob, 303 Stainless Steel
#132-58-3	B4 Bob, 303 Stainless Steel
#132-58-4	B5 Bob, 303 Stainless Steel
#132-58H	B1 Bob, Hastelloy®
#132-56H	R1 Sleeve, Hastelloy®

#134-10-2	F0.2 Torsion Spring Assembly (Green)
#134-10-3	F0.5 Torsion Spring Assembly (Yellow)
#134-10-4	F2.0 Torsion Spring Assembly (Red)
#134-10-5	F3.0 Torsion Spring Assembly (Purple)
#134-10-6	F4.0 Torsion Spring Assembly (White)

Specifications

Instrument Geometry	True Couette Coaxial Cylinder
Speed Accuracy (rpm)	.1
Motor Speeds (rpm)	8 Fixed Speeds (600, 300, 200, 100, 60, 30, 6, and 3)
Readout	Direct Dial
Power Requirements	12 - 24 VDC

Range of Measurement

Rotor - Bob	**R1B1**	**R1B2**	**R1B3**	**R1B4**	**R1B5**
Rotor Radius, RR, (cm)	1.8415	1.8415	1.8415	1.8415	1.8415
Bob Radius, RB, (cm)	1.7245	1.2276	0.8622	0.8622	1.5987
Bob Height, L, (cm)	3.8	3.8	3.8	1.9	3.8
Shear Gap, (cm)	0.117	0.6139	0.9793	0.9793	0.2428
R Ratio, RB/RR	0.9365	0.666	0.468	0.468	0.8681
Shear Rate Constant k_R (sec^{-1} per rpm)	1.7023	0.377	0.2682	0.2682	0.8503
Shear Stress Constant for Effective Bob Surface k_S (cm^{-3})	0.01323	0.02610	0.05290	0.10600	0.01541
Overall Instrument Constant, K, with Standard F1.0 Spring, $\eta=Kf\Theta/N$	300	2,672	7,620	15,200	349

Max. Shear Stress, SS_{MAX}, (Dyne / cm^2)	**Constant k_T**	**R1B1**	**R1B2**	**R1B3**	**R1B4**	**R1B5**
F 0.2 (Green)	77.2	330	651	1,320	2,644	384
F 0.5 (Yellow)	193	840	1,657	3,359	6,730	977
F 1.0 (Blue)	386	1,680	3,314	6,717	13,460	1,955
F 2.0 (Red)	772	3,360	6,629	13,435	26,921	3,910
F 3.0 (Purple)	1,158	5,040	9,943	20,152	40,381	5,865
F 4.0 (White)	1,544	6,720	13,257	26,870	53,841	7,819
F 5.0 (Black)	1,930	840	16,571	33,587	67,302	9,774
F 10.0 (Orange)	3,860	16,800	33,143	67,175	134,603	19,548

Shear Rate Range	R1B1	R1B2	R1B3	R1B4	R1B5
Shear Rate Constant, K_R, (sec^{-1} per rpm)	1.7023	0.3770	0.2682	0.2682	0.8503
Shear Rate, (sec^{-1} or 1/s) 3 rpm	5.11	1.13	0.80	0.80	2.56
6 rpm	10.21	2.26	1.61	1.61	5.11
30 rpm	51.07	11.31	8.05	8.05	25.54
60 rpm	102.14	22.62	16.09	16.09	51.07
100 rpm	170.23	37.70	26.82	26.82	85.12
200 rpm	340.46	75.40	53.64	53.64	170.23
300 rpm	510.69	113.10	80.46	80.46	255.35
600 rpm	1021.38	226.20	160.92	160.92	510.69

Viscosity Ranges<a> (cP)	R1B1	R1B2	R1B3	R1B4	R1B5
Minimum Viscosity<b> @600 rpm	0.5<c>	4.5	12.7	25	1.2
Maximum Viscosity<d> @3 rpm	33,000	293,920	838,200	1,672,000	38,390

<a> Computed for standard Torsion Spring (F 1.0). For other torsion springs, multiply by F factor.
<b> Lower viscosities can be measured, however one must take into account the effect of bearing drag, Taylor vortices, zero offset, etc. when looking at the expected accuracy of the reading.
<c> For practical purposes the minimum viscosity is limited to 0.5 cP due to Taylor Vortices.
<d> Maximum viscosity is based on Maximum Shear Stress and Minimum shear rate (rpm). However, due to practical and physical limitations, it may be difficult to take these measurements.

Shear Stress Conversions
To convert from units on left side to units on top, multiply by factor @ intercept.

	Centipoise (cP)	Poise (P)	g/(cm*s)	$(mN*s)m^2$	mPa*s	(lb*s) $100\ ft^2$
Centipoise (cP)	1	0.01	0.01	1	1	0.002088
Poise (P)	100	1	100	100	100	0.2088
g/(cm*s)	100	1	100	100	100	0.2088
$(mN*s)m^2$	1	0.01	0.01	1	1	0.002088
mPa*s	1	0.01	0.01	1	1	0.002088
(lb*s) $100\ ft^2$	478.93	4.789	4.789	478.93	478.93	1

Shear Stress Conversions To convert from units on left side to units on top, multiply by factor @ intercept.					
	Dyne/cm^2	Pa	lb/100ft^2	lb/ft^2	DR
Dyne/cm^2	1	0.1	0.2084	0.002084	0.1957
Pa	10	1	2.084	0.02084	1.957
lb/100ft^2	4.788	0.4788	1	0.01	0.939
lb/ft^2	478.8	47.88	100	1	93.9
DR	5.107	0.5107	1.065	0.01065	1

What Bob & Spring Should I Use?

There is often confusion or misunderstanding about what a viscometer can actually measure. For example, a viscometer with an R1 B1 F1 combination can measure water fairly well at 100 rpm and higher, but at 3 rpm, the readings would be shaky at best. While on the other hand, a linear fluid with a viscosity of 15,000, could not get past 6 rpm with the same combination.

To estimate which spring might be best, use the formula below to calculate a Minimum Spring factor, where one establishes the maximum rpm the fluid is going to be tested at, as well as what the expected “Apparent Viscosity” of the fluid at that rpm. If the Factor comes out as .87, then an F 1.0 spring should be used. If it comes out as .16, then an F 0.2 spring would be best. To cover all ranges, it may be necessary to use more than one spring.

$$\text{Minimum Spring Factor (F)} = \frac{\text{rpm(max)} * \text{AV(max)}}{\text{BOB(F)}*90{,}000}$$

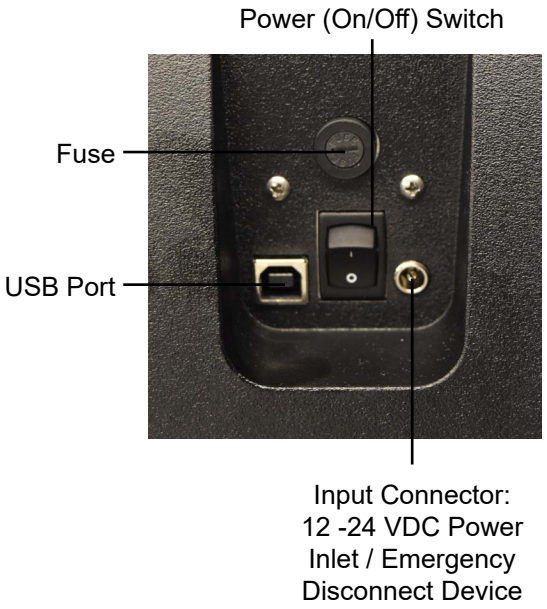
Bob (F)	
R1B1	1.0
R1B2	8.9
R1B3	25.4
R1B4	50.7
R1B5	2.4

Safety

Explanation of Symbols	
	**Caution: Risk of Danger -** This symbol directs the operator to consult the instruction manual for safety related warnings. (ISO-7000-0434) **Whenever this symbol is used on the equipment, the user must consult the manual to determine the nature of the hazard and any actions which have to be taken.**
	**Fuse:** This is the internationally recognized symbol for a user-replaceable fuse. This symbol will be followed by information required to guide the user to choose the proper replacement fuse.
	Direct Current (DC): This symbol indicates an input (or output) that is direct current only. (IEC 60417-5013)
 Note	**Note:** This symbol will indicate important notes and helpful hints for the operation of the equipment.
	Polarity: This symbol indicates that the equipment receives positive voltage on the center pin of the connector and the return voltage is on the outer case.
 Tip	**Tip:** This symbol is used to identify operational information and best practices to obtain the most reliable data.
	**Caution:** Note - This symbol is used to indicate statements in the manual which warn against actions which may cause damage to the equipment during routine service or maintenance

Electrical Requirements

The Model 800E Viscometer is powered by a DC power source. The power supply is capable of providing 15 volts DC. The equipment is current limited to 3 amps by a user-replaceable fuse.



When connecting the equipment to your power source, make sure that the power supply is connected to the center pin of the connector.

The equipment is supplied with a user-replaceable fuse. This fuse must only be replaced by a 3-amp fuse.

Environmental Conditions

The equipment is designed for use in normal environmental conditions:

- Indoors
- At or below an altitude of 2,000 m (6,562 ft)
- In temperatures between 5° and 40°C (41°–104°F)
- With a maximum relative humidity of 80% for temperatures up to 31°C (88°F) decreasing linearly to 50% relative humidity at 40°C (104°F)
- This equipment has not been rated according to IEC 60529

Installation

Note

The Model 800E Viscometer should be used in a location where it will not be subjected to excessive moisture. It should be placed on a flat, stable surface in a well-ventilated environment.

Caution – Risk of Danger: This equipment produces sound pressure in excess of 85 dBA. Protective measures (such as hearing protection, noise-reducing baffles, or a hood) should be considered.

Equipment Operation

Caution – Risk of Danger: The power cord and the DC inlet are the emergency disconnect devices. Do not position the equipment such that it is difficult to operate the emergency disconnect devices.

Caution – Risk of Danger: In normal operation, this equipment may liberate the potentially poisonous gasses listed below. However, the list below is dependent upon the chemical makeup of the sample fluids presented for testing. Care should be taken to ensure that: no unexpected or anomalous chemicals are contained or added to the test samples; the test environment is adequately ventilated; and, when necessary, appropriate personal protective equipment is employed.

- Hydrogen Sulfide (H_2S)
- Methane (CH_4)
- Carbon Dioxide (CO_2)
- Sulfur Dioxide (SO_2)

Caution – Risk of Danger: The samples presented for testing may contain flammable substances. The following risk-reduction procedures must be followed to ensure the safe operation of the equipment.

- Always use in a well-ventilated area.
- Keep away from open flames.

Caution – Risk of Danger: If this equipment is operated in a manner not specified by the manufacturer (OFITE), the protections provided by the equipment may be impaired.

Caution – Risk of Danger: This equipment may operate unexpectedly if the equipment is energized when the Speed Selector Knob and Power (On/Off) Switch are left in the “On” position. Care should be taken to ensure both switches are in the “Off” position prior to energizing the equipment. Also, care should be taken to ensure that the Speed Selector Knob is in the “Off” position prior to turning the Power (On/Off) Switch to the “On” position.

Speed Selector Knob

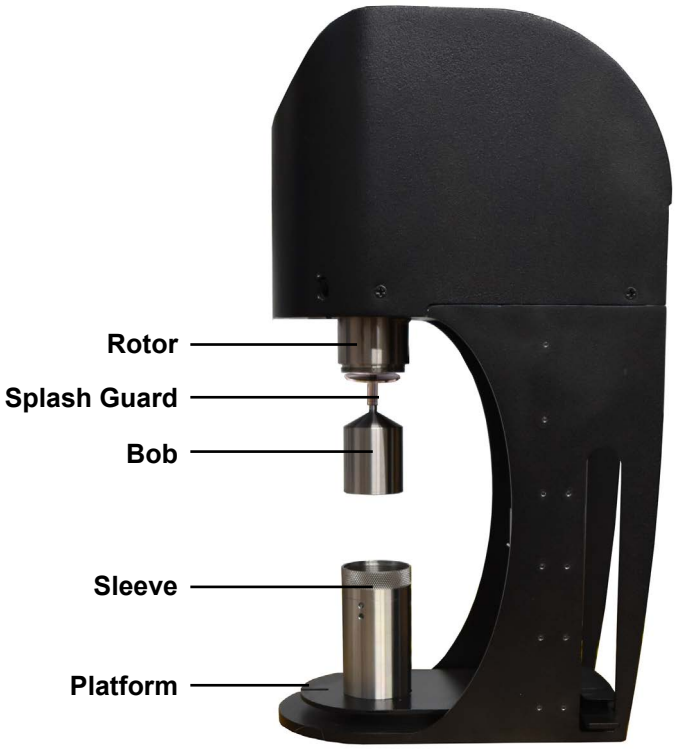
Setup

The Viscometer is a precision instrument. Any damage to the bob shaft, bearings, or transducer will greatly affect the accuracy of the readings. Always handle the Viscometer with care, especially when installing and removing the bob.

Important

Always remove the bob from the shaft before shipping the Viscometer. Failure to do so will damage the bob shaft.

1. Connect the instrument to a 12 - 24 VDC current-limited power source.
2. With the instrument turned off, place the splash guard onto the bob shaft with the tube end pointed down towards the bob. Push it all the way up.
3. Screw on the appropriate bob with the tapered end up towards the splash guard.
4. Place the sleeve onto the rotor over the bob. The threads ensure the sleeve will attach evenly and uniformly each and every time.
5. The power switch is located on the back panel. Turn the unit on.
6. Place a properly prepared sample of test fluid in a sample cup and immerse the rotor sleeve exactly to the fill line on the sleeve by raising the platform.



Calibration

The Model 800E Viscometer can lose calibration while in service if the bob shaft bearings become contaminated or if the bob shaft itself is bent. If the dial does not read zero when it should or if there is excessive dial deflection when the main shaft is turning, this may indicate that the bob shaft bearings are sticking. If the spring appears to be non-linear, the bob shaft may be bent. Your Viscometer will require servicing if it exhibits any of these symptoms.

According to API Recommended Practice 10B-2, viscometers being used for testing well cement should be calibrated quarterly. API Recommended Practice 13B-1 and 13B-2 specify viscometers being used for drilling fluids should be checked monthly.

Certified Calibration Fluids:

#132-84 Calibration Fluid, 20 CP, 16 oz (500 mL)
#132-81 Calibration Fluid, 50 CP, 16 oz (500 mL)
#132-80 Calibration Fluid, 100 CP, 16 oz (500 mL)
#132-83 Calibration Fluid, 200 CP, 16 oz (500 mL)
#132-82 Calibration Fluid, 500 CP, 16 oz (500 mL)

Procedure

1. Choose the certified calibration fluid using the temperature-viscosity chart supplied with the calibration fluid to cover the viscosity range of interest. Make sure the lot number on the chart matches the lot number on the fluid container. Each lot of standard fluid is individually certified. The viscosity will normally vary slightly from lot to lot.

2. Clean and dry the Viscometer bob, sleeve, and cup. Place the Viscometer and the calibration fluid side-by-side on the counter top in a room with a reasonably constant temperature (variation of less than 5°F ± 2.5°F). Allow the Viscometer and the fluid to stand at least two hours to equilibrate.

3. Operate the Viscometer in air for two to four minutes to loosen up the bearings. Observe the rotor sleeve for excessive wobbling and replace if necessary.

4. Fill the cup to the scribed line with calibration fluid and place it on the Viscometer stage. Move the stage upward until the fluid level is to the fill line on the sleeve.

Never immerse the sleeve in fluids above the fill line.

Viscometer Sleeve

5. Place a thermometer capable of ± 0.2°F (0.1°C) into the fluid. Operate the Viscometer at a low speed setting until the thermometer reading becomes stable to within ± 0.2°F (0.1°C) per 30 seconds. Note and record the temperature reading.

6. Once the temperature has stabilized, operate the Viscometer at 600 rpm and then at 300 rpm. Note and record the dial readings to the nearest 0.5 dial unit.

7. Using the temperature-viscosity chart supplied with the calibration fluid, determine the certified viscosity to the nearest 0.5 centipoise.

    a. Compare the 300 rpm reading to standard viscosity and record the deviation plus or minus.

    b. Divide the 600 rpm dial reading by 1.98, compare that to standard viscosity, and record the deviation plus or minus.

8. Deviations exceeding 1.5 dial units are not acceptable. If the deviation exceeds this tolerance, the Viscometer will require adjustments or calibration by a qualified technician.

9. Record the Viscometer serial number, date, and deviation. Mark on the Viscometer the date of calibration and a general indication of the calibration check status.

Operation

Measuring Viscosity

1. Mix the sample on the “STIR” setting for 10 seconds while heating or cooling the fluid. Monitor the temperature with a thermometer. Continue to mix until the sample reaches the target temperature.

2. Rotate the knob to one of the speed settings. When the dial reading stabilizes, record the reading and the temperature. Repeat this step for any other speeds that your test requires.

   Always start with the higher rpm and work your way down to the lowest rpm. For example, if you need readings at 100 rpm, 200 rpm, and 300 rpm, record the measurement at 300 rpm first, then 200 rpm, then 100 rpm, then gel strengths (if necessary).


Tip

Measuring Gel Strength

1. Rotate the knob to “GEL 1” for a 10-second gel or “GEL 2” for a 10-minute gel.

2. The Viscometer will mix the fluid at maximum speed, pause for 10 seconds or 10 minutes, beep, then turn the rotor at 3 rpm.

3. When you hear the beep, return to the Viscometer and observe the dial. Record the *maximum* dial deflection before the gel breaks.

   When measuring gel properties, the dial does not have to return to zero during the quiescent period. Therefore, it should not be forced back to the zero setting if it does not freely do so. When determining the maximum dial deflection, no allowance needs to be made if the dial did not start at zero. Only the maximum dial deflection is of interest. Rheological properties and characteristics of the sample will determine if the dial returns to zero during the quiescent periods of the gel measurements.


Note

API Testing

1. Mix the sample on the “STIR” setting for 10 seconds.

2. Set the speed to 600 rpm. Wait for the reading to stabilize and then record the dial reading and temperature.

3. Set the speed to 300 rpm. Wait for the reading to stabilize and then record the dial reading and temperature.

4. Stir the sample again for 10 seconds.

5. Rotate the knob to “GEL 1” and wait for the beep. Record the *maximum* dial deflection before the gel breaks. This is the 10 second gel strength.

6. For the 10 minute gel strength, rotate the knob to “GEL 2” and wait for the beep before recording the *maximum* dial deflection.

Calculations

Plastic Viscosity (PV), cP = 600 rpm reading – 300 rpm reading

Yield Point (YP), lb./100 ft^2 = 300 rpm reading – Plastic Viscosity (PV)

Apparent Viscosity (AV), cP = 600 rpm reading / 1.98

Gel Strength, 10 second, lb/100 ft^2 = the maximum dial deflection after 10 sec.

Gel Strength, 10 minute, lb/100 ft^2 = the maximum dial deflection after 10 min.

$$\eta = K F \frac{\Theta}{rpm}$$

η= Viscosity (cP)

K= Machine constant for the bob and rotor combination

F= Spring factor

Θ= Dial readings

rpm= Rotational speed

Machine constants:

R1B1= 300

R1B2= 2,672

R1B3= 7,620

R1B4= 15,200

R1B5= 349

Disassembly

Clean the Viscometer after every test.

1. Remove the sleeve from the rotor.
2. Remove the bob.
3. Once the bob is removed, remove the splash guard and wipe down the bob shaft. Clean all removed parts with soap and water and dry them thoroughly.

Keep the instrument upright at all times, especially when cleaning so that water does not get into the bearings.

Maintenance

Bob Shaft Bearing Replacement

From time to time, the bearings will need to be changed. Complete the following to determine if it is time to replace the bearings:

1. The Viscometer should have a zero dial reading when placed in an upright position with the sleeve not immersed in fluid prior to running tests.

2. With the instrument in this position, rotate the sleeve at 600 rpm. The dial reading in air should not exceed one.

3. Place water in a suitable container and immerse the rotor sleeve to the fill line.

4. Rotate the sleeve at 600 rpm. The dial reading in water should be between 1.5 and 3.0.

5. At 300 rpm, the dial reading in water should be between 0.5 and 2.0.

If the Viscometer fails to pass any one of the above tests, the bearings are bad and should be replaced by a qualified instrument technician.

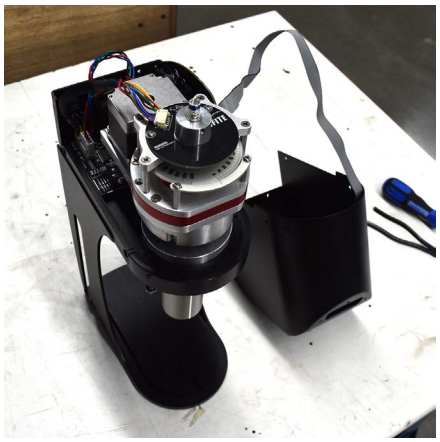
Bob Shaft Bearing Replacement

Important

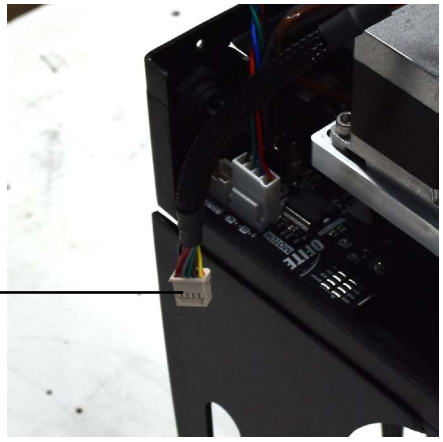
1. Unplug the power supply and remove the sleeve, bob, and splash guard.

   Use the bob shaft wrench to hold the shaft in place while unscrewing the bob.

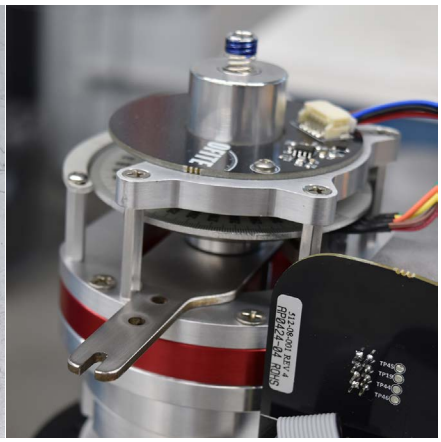
2. Remove the four screws on the bottom of the outer housing cover and gently lift the cover upward.



3. Unplug the transducer cable.

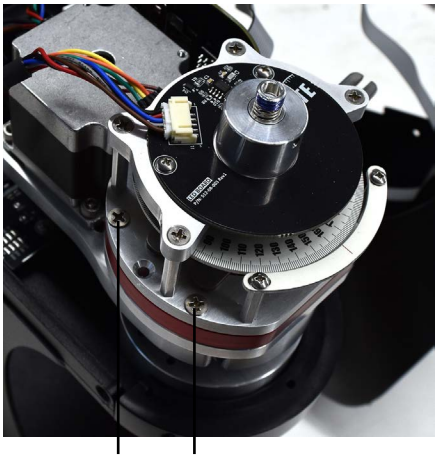


4. Place the Wrench against the flats on the bob shaft hub below the dial and secure it in place with the supplied screw.

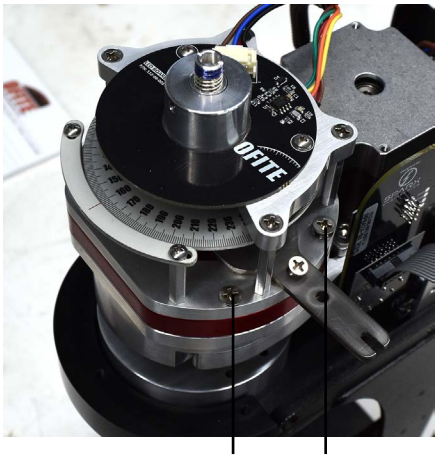


Wrench

5. Remove the four screws that secure the bob shaft housing assembly to the Viscometer frame.



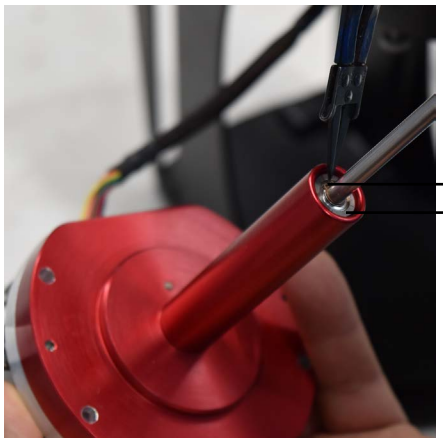
Screws



Screws

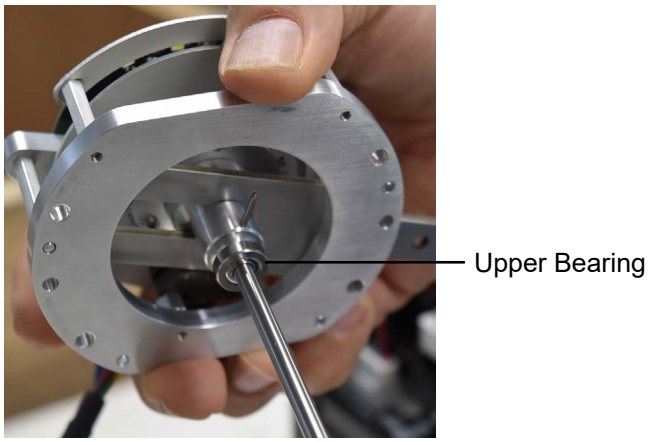
6. Gently lift the bob shaft housing assembly up and out of the Viscometer.

7. Remove the retaining ring from the lower bearing.



8. Pull the bearing guide and lower bearing down and off the bob shaft.

9. Remove both the upper and lower bearings from the bob shaft.



10. Place a new upper bearing into the bearing guide.

11. Insert the bob shaft into the bearing guide, making sure it goes through the bearing and out the bottom.

12. Place a new lower bearing onto the bob shaft and slide it up into the bearing guide.

13. Secure the lower bearing with a retaining ring.

14. Place the bob shaft housing assembly back onto the Viscometer frame.

15. Secure the bob shaft housing assembly with the four screws you removed earlier.

16. Remove the screw holding the wrench in place and remove the wrench.

17. Plug the transducer cable back into the port on the control board.

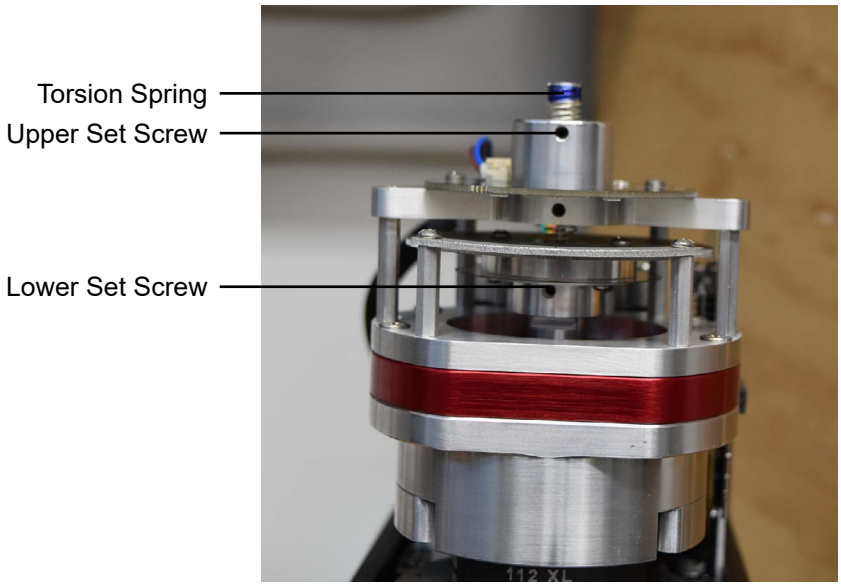
18. Carefully place the cover back on the unit and secure it with the four screws at the base.

19. Re-calibrate the Viscometer.

Maintenance

Torsion Spring Replacement

1. Unplug the power supply.
2. Remove the four screws on the bottom of the outer housing cover and gently lift the cover upward.
3. Loosen the upper set screw that holds the torsion spring in place one turn counterclockwise.
4. Loosen the lower set screw that holds the torsion spring in place one turn counterclockwise.

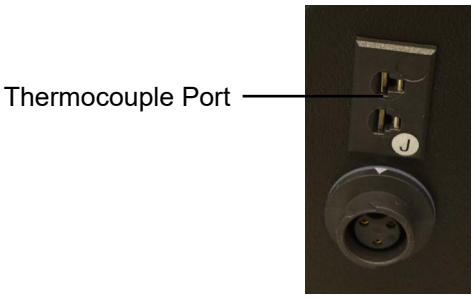


5. Gently lift the torsion spring up and out of the assembly.
6. Carefully place a new torsion spring into the assembly.
7. Tighten the lower set screw.
8. Turn the dial until it reads zero.
9. Tighten the upper set screw.
10. Place the housing cover back onto the frame and secure it with the four screws.
11. Re-calibrate the Viscometer.

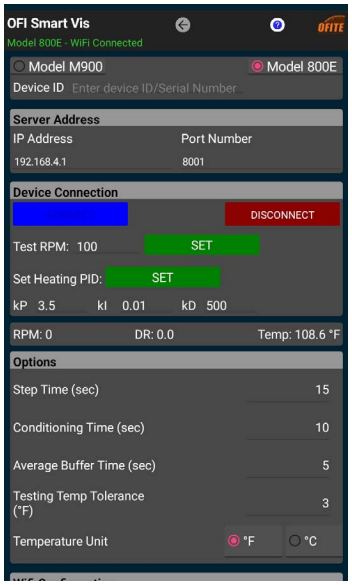
Software

Connecting to the Viscometer

1. Turn on the Model 800E Viscometer.
2. Plug a thermocouple into the port on the side.



3. On the tablet, go to the Settings app and find Wi-Fi.
4. Select the Wi-Fi network corresponding to your Model 800E unit (i.e.: 800E_######). The default password is “ofite000”.
5. Open the OFI Smart Vis app on the tablet.
6. Go to Settings screen.



7. Select Model 800E.
8. Set the IP address to 192.168.4.1 and the port number to 8001.
9. Tap the blue CONNECT button to connect to the Viscometer.

   The app will show the Wi-Fi status in the top left corner of every screen.

Note

Tip

10. To test the connection, enter a value in the “Test RPM” field and tap SET. If the rotor starts turning, the app has successfully connected to the Viscometer.

    If the Viscometer does not connect or if you receive an error message, turn the Viscometer off and back on.

11. On the bottom portion of the screen, set the following options:

    - Step Time (sec): the amount of time the rotor will turn during each step

    - Conditioning Time (sec): the amount of time the Viscometer will stir the sample before starting a step

    - Average Buffer Time (sec): the number of seconds at the end of each step in which the Viscometer measures and calculates the average dial reading

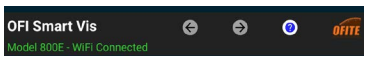
      Example: If the Step Time is 15 seconds, the Average Buffer Time is 5 seconds, and the rpm is set to 600, the Viscometer will turn the rotor at 600 rpm for 15 seconds and calculate the average dial reading during the last 5 seconds.

    - Testing Temp Tolerance (°F/°C): the range above or below the temperature setpoint where the Viscometer will proceed with the step

      Example: If your temperature setpoint is 120°F and your Testing Temp Tolerance is set to 3°F, the Viscometer will run the step if the sample temperature is between 117°F and 123°F.

    - Temperature Unit: choose either °F or °C

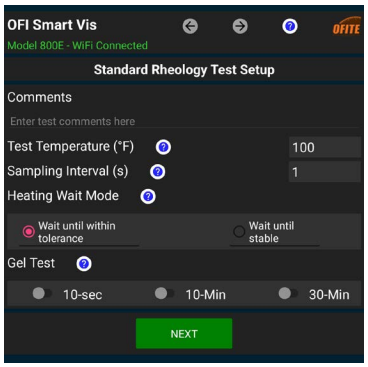
12. The Tool Bar at the top of each screen has buttons for navigation and help. The arrow buttons move you backwards and forwards through the sequence of screens. The question mark button opens a help page for the screen or field next to it.



Software

Standard Test

1. Make sure the tablet is connected to the correct Viscometer.
2. Go to Main Menu → Standard Rheology Test and select a test:
   - Standard Rheology Test: test at 600, 300, 200, 100, 6, and 3 rpm and selected gel test
   - Quick Rheology Test: like standard test but no gels
   - Continuous rpm Test: start at specific rpm and decrease speed in steps.
   - Last Saved Rheology Test: uses last data set in memory for analysis purposes only
   - Manual Rheology Test: user specified rpm and Temperature
   - Test Builder: create and perform custom test procedures



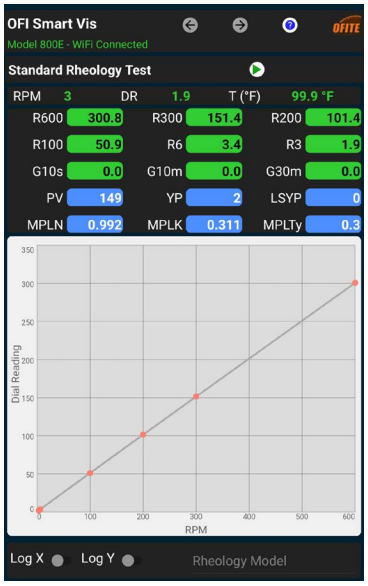
3. Enter test conditions for the test. Tap Next or ⊡ to proceed.
   a. Enter the test temperature.

      For heated tests, make sure Universal Heat Cup and Heater Control Box are connected to the Viscometer and set to App Control (see page 30 for instructions). Set the test temperature to 30°F (-1°C) to bypass heating.

   b. Select “Wait until within tolerance” to get an accurate temperature based on the tolerance set in Settings.

   c. Select a gel test.
4. On the next screen, tap the Play button to start the test.

Note



Completed Standard Rheology Test

5. Once the test is complete, tap to go to the Data Archival screen. This will automatically save the current test into the archive.

Tip

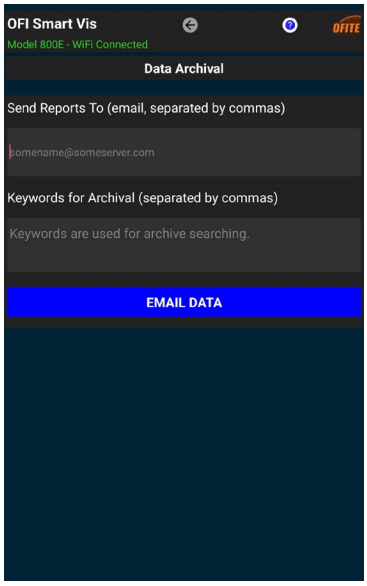
If you are performing a series of tests, each one can be archived and stored. After all testing is complete, the results from each test can be emailed.

6. On the Data Archival screen, tests can be saved to the App Database and emailed as a .csv file.

7. To email a test, enter an email address in the Send Reports To field and tap the Email Data button. The app will open the Mail app with the reports and email address filled in.

Tip

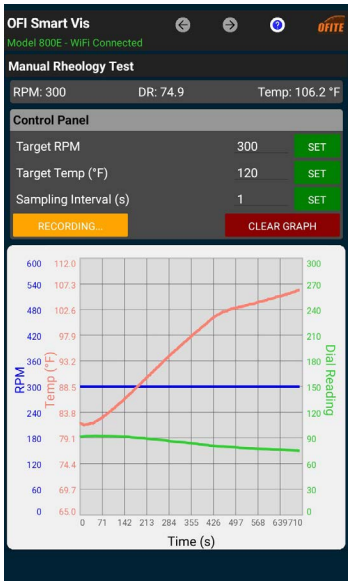
The Mail app will not be able to send the email while the tablet is connected to the Model 800E Viscometer. Open the Settings app and connect to a different Wi-Fi network to send the email.



Software

Manual Test

1. Make sure the tablet is connected to the correct Viscometer.
2. Go to Main Menu → Standard Rheology Test → Manual Rheology.
3. Set the following options:
   - Target rpm: rotational speed for the test
   - Target Temp: temperature for the test
   - Sampling Interval (s): how often the app will record a data point (in seconds)

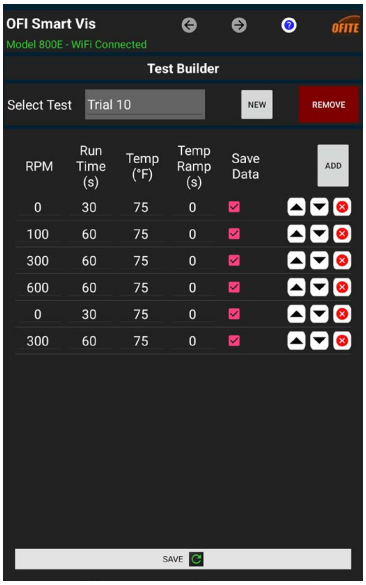


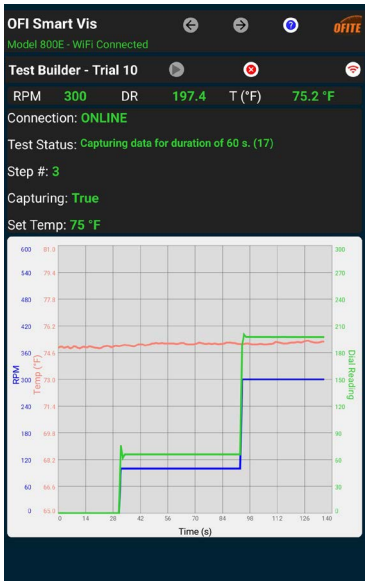
4. Tap Record to start recording.
5. Once the test is complete, tap NEXT to go to the Data Archival screen.
6. On the Data Archival screen, tests can be saved to the App Database and emailed as a .csv file.

Software

Custom Test Builder

1. Make sure the tablet is connected to the correct Viscometer.
2. Go to Main Menu → Standard Rheology Test → Test Builder.





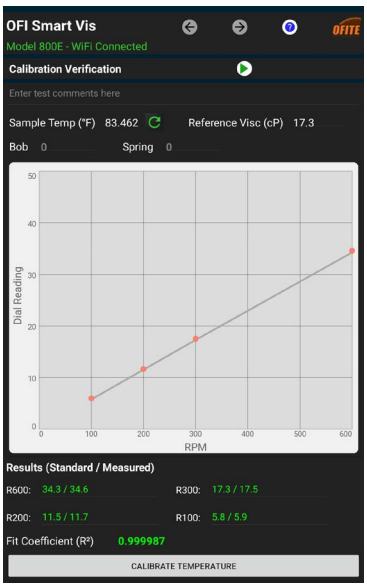
3. Select from saved tests in the drop-down menu or create a new test by clicking the New button.
4. Click Add to start adding steps for your test procedure.
5. Set the following options:
   - rpm: rotational speed for the step
   - Run Time (s): step duration (in seconds)
   - Temp (°F): step temperature
   - Temp Ramp (s): time to reach step temperature (in seconds)
6. Continue to add steps with the Add button. Steps are executed from top to bottom.
7. Use the arrows to change the order of steps or X to delete a step.
8. When you are finished adding steps, tap the Save button.
9. To start the test, tap . During the test, the screen will show which step is currently being performed.
10. Once the test is complete, click to go to the Data Archival page.
11. On the Data Archival screen, tests can be saved to the App Database and emailed as a .csv file.

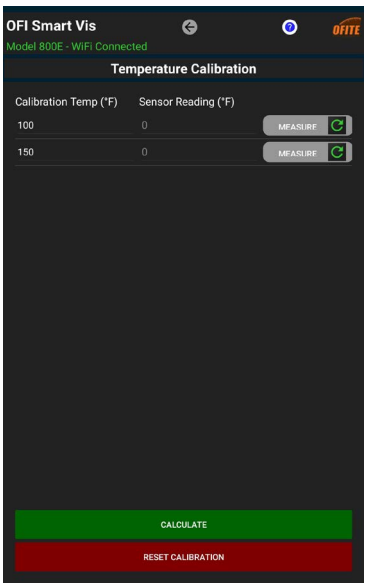
Software

Calibration

1. Make sure the tablet is connected to the correct Viscometer unit and that a thermocouple is connected.
2. Go to Main Menu → Calibrations.
3. Measure the sample temperature by tapping the green button.
4. Enter the Reference Visc. (cP) from temperature-viscosity chart for the calibration fluid.
5. Enter the bob and spring.
6. Tap the Play button to start the calibration.

   The app will go through 600, 300, 200, and 100 rpm. When the calibration is complete, it will show the results and fit coefficient.





Software

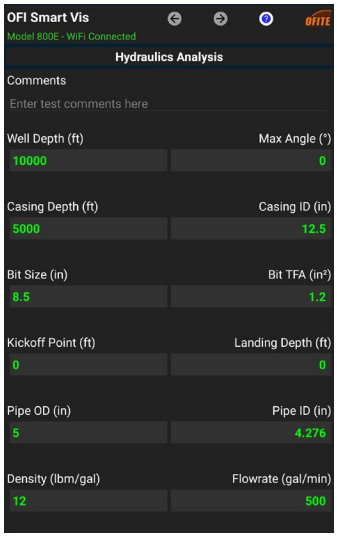
Hydraulics Analysis

Note

1. Go to Main Menu → Hydraulics Analysis.

2. Enter well data for hydraulics.

   The app can only accept one string of casing, one open hole section, and one BHA.



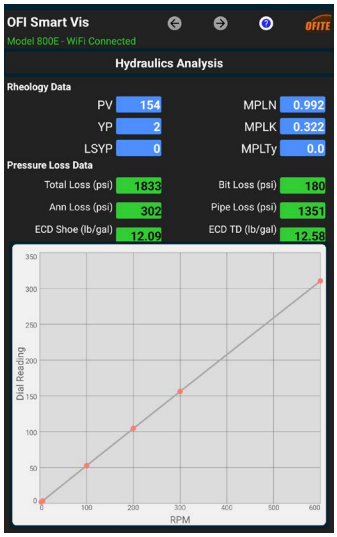
3. The app collects rheology data from a Standard Rheology Test, a Quick Rheology Test, or the Last Saved Rheology. Click ▣ to continue to tests.

4. Press the Play button to perform the test.

5. Tap ▣ to go to the Hydraulics Analysis Results screen.

6. Tap ▣ to go to the Data Archival screen.

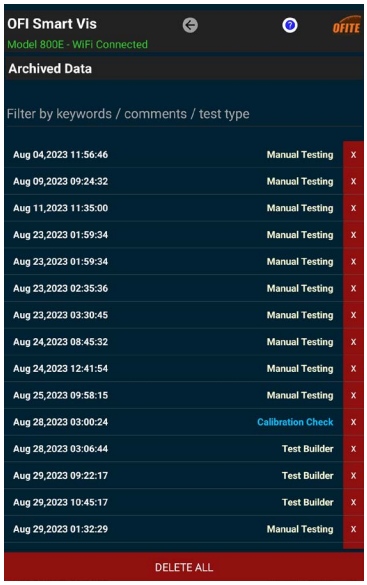
7. On the Data Archival screen, tests can be saved to the App Database and emailed as a .csv or .pdf file.



Software

Database

1. Go to Main Menu → Browse Database.
2. This screen shows a list of archived tests color coded based on the type of test. Tap an entry on the list to see the test results.
3. Click ▣ to go to the Data Archival page. From there you can email the test results.
4. To filter the list, enter a keyword in the field at the top of the screen.
5. To delete an entry, tap the red X. Or tap the “DELETE ALL” button to delete all archived entries.



Appendix

Heat Cup

The optional Universal Heat Cup controls the temperature of the test fluid up to 200°F (93°C). The temperature can be set either manually with a dial on the front of the Heat Cup, or automatically through the software.

1. Plug the Universal Heat Cup into the “Heat Cup” port on the Heat Control Box.
2. Use the supplied cable to connect the Model 800E Viscometer to the “Control Cable” port on the Heat Control Box.
3. Plug the Heat Control Box into a 115 VAC or 230 VAC power outlet.
4. To control the temperature manually, set the “CONTROL” switch to “CUP”. Then adjust the knob on the front of the Universal Heat Cup to set the temperature.
5. To control the temperature automatically with the software, set the “CONTROL” switch to “APP”. Then set the temperature in the app.

Warranty and Return Policy

Warranty:

OFI Testing Equipment, Inc. (OFITE) warrants that the products shall be free from liens and defects in title, and shall conform in all respects to the terms of the sales order and the specifications applicable to the products. All products shall be furnished subject to OFITE's standard manufacturing variations and practices. Unless the warranty period is otherwise extended in writing, the following warranty shall apply: if, at any time prior to twelve (12) months from the date of invoice, the products, or any part thereof, do not conform to these warranties or to the specifications applicable thereto, and OFITE is so notified in writing upon discovery, OFITE shall promptly repair or replace the defective products. Notwithstanding the foregoing, OFITE's warranty obligations shall not extend to any use by the buyer of the products in conditions more severe than OFITE's recommendations, nor to any defects which were visually observable by the buyer but which are not promptly brought to OFITE's attention.

In the event that the buyer has purchased installation and commissioning services on applicable products, the above warranty shall extend for an additional period of twelve (12) months from the date of the original warranty expiration for such products.

In the event that OFITE is requested to provide customized research and development for the buyer, OFITE shall use its best efforts but makes no guarantees to the buyer that any products will be provided.

OFITE makes no other warranties or guarantees to the buyer, either express or implied, and the warranties provided in this clause shall be exclusive of any other warranties including ANY IMPLIED OR STATUTORY WARRANTIES OF FITNESS FOR PURPOSE, MERCHANTABILITY, AND OTHER STATUTORY REMEDIES WHICH ARE WAIVED.

This limited warranty does not cover any losses or damages that occur as a result of:

- Improper installation or maintenance of the products
- Misuse
- Neglect
- Adjustment by non-authorized sources
- Improper environment
- Excessive or inadequate heating or air conditioning or electrical power failures, surges, or other irregularities
- Equipment, products, or material not manufactured by OFITE
- Firmware or hardware that have been modified or altered by a third party
- Consumable parts (bearings, accessories, etc.)

Returns and Repairs:

Items being returned must be carefully packaged to prevent damage in shipment and insured against possible damage or loss. OFITE will not be responsible for equipment damaged due to insufficient packaging.

Any non-defective items returned to OFITE within ninety (90) days of invoice are subject to a 15% restocking fee. Items returned must be received by OFITE in original condition for it to be accepted. Reagents and special order items will not be accepted for return or refund.

OFITE employs experienced personnel to service and repair equipment manufactured by us, as well as other companies. To help expedite the repair process, please include a repair form with all equipment sent to OFITE for repair. Be sure to include your name, company name, phone number, email address, detailed description of work to be done, purchase order number, and a shipping address for returning the equipment. All repairs performed as "repair as needed" are subject to the ninety (90) day limited warranty. All "Certified Repairs" are subject to the twelve (12) month limited warranty.

Returns and potential warranty repairs require a Return Material Authorization (RMA) number. An RMA form is available from your sales or service representative.

Please ship all equipment (with the RMA number for returns or warranty repairs) to the following address:

OFI Testing Equipment, Inc.
Attn: Repair Department
11302 Steeplecrest Dr.
Houston, TX 77065
USA

OFITE also offers competitive service contracts for repairing and/or maintaining your lab equipment, including equipment from other manufacturers. For more information about our technical support and repair services, please contact techservice@ofite.com.