Automated HTHP Consistometer

#120-35 - Model 2025, 25,000 PSI, 400°F
#120-40 - Model 2040, 40,000 PSI, 600°F

Instruction Manual
Updated 1/13/2017
Ver. 7.0

OFI Testing Equipment, Inc.
11302 Steeplecrest Dr. · Houston, Texas · 77065 · U.S.A.
Tele: 832.320.7300 · Fax: 713.880.9886 · www.ofite.com

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</table>
During cementing operations, the time required for a cement slurry to set is of primary concern. Under an ideal situation, minimal time would be required to successfully pump the slurry, which immediately upon placement, begins to develop compressive strength. However, if insufficient time is allowed to fully pump the cement, it will be necessary to drill the cement remaining in the casing string. Remedial operations such as this are very costly. Conversely, cements that are successfully placed, but require considerable time to cure, consume valuable rig time, which is also quite costly. Laboratory tests should be conducted under simulated reservoir conditions to examine the actual thickening time of the slurry. The OFITE HTHP Consistometer was specifically engineered to determine the thickening time of well cements under simulated downhole pressures and temperatures.

A cement is mixed and poured into the slurry cup assembly. The slurry cup is placed into the test vessel and pressure is increased via an air-driven hydraulic pump. A PID temperature controller governs an internal heater, which maintains the necessary temperature profile, while a magnetic drive mechanism rotates the slurry cup assembly. A potentiometer controls an output voltage, which is directly proportional to the amount of torque the cement exerts upon an API-approved paddle. The included software controls the instrument and records temperature, pressure, and cement consistency as a function of time.

- Computerized Data Acquisition and Control system provides detailed test information in convenient formats and can control multiple units from one computer. RS-232, and Ethernet connections available.
- Automatic temperature and pressure control
- External cooling jacket aids cooling of test cell
- Automatic, programmable speed motor (0–300 RPM) powered by a magnetic drive
- Easy-to-use two-piece lift-off cap for pressure cell
- Drip tray next to cap provides a place to set the cap between tests without dripping oil on the unit casing
- Convenient oil reservoir features a cap with built-in funnel to help prevent spills, a removable top and bottom that make cleaning easy, and a sloping bottom that collects sediment for easy removal
- Visual indicator provides an at-a-glance status update during testing
- Small footprint saves valuable lab space
- Temperature, pressure, and consistency alarms provide automatic shutdown for safety
- Conforms to API Specification 10 guidelines

- Air/Nitrogen Supply (100–120 PSI/689.5–827.4 kPa)
- Water Supply for Cooling (40 PSI/276 kPa)
- Water Drain
- 220 Volt, 50/60 Hz, 25 Amp electrical power supply
Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Size</td>
<td>22.5” × 27.5” × 70”</td>
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<tr>
<td>Weight</td>
<td>Approximately 450 lb</td>
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<tr>
<td>Crated Size</td>
<td>26” × 34” × 76”</td>
</tr>
<tr>
<td>Crated Weight</td>
<td>Approximately 750 lb</td>
</tr>
<tr>
<td>Temperature Controller</td>
<td>Digital with 0.1° Resolution</td>
</tr>
<tr>
<td>Pressure Indicator</td>
<td>Digital transducer with 1 PSI (0.1 MPa) resolution. Analog gauge.</td>
</tr>
<tr>
<td>Slurry Cup</td>
<td>Variable Speed: 0 – 300 RPM</td>
</tr>
<tr>
<td>Max Temperature</td>
<td>(For tests above 400°F, refer to page 15)</td>
</tr>
<tr>
<td>Model 2025</td>
<td>400°F (204.4°C)</td>
</tr>
<tr>
<td>Model 2040</td>
<td>600°F (315.5°C)</td>
</tr>
<tr>
<td>Maximum Pressure</td>
<td></td>
</tr>
<tr>
<td>Model 2025</td>
<td>25,000 PSI (173 MPa)</td>
</tr>
<tr>
<td>Model 2040</td>
<td>40,000 PSI (276 MPa)</td>
</tr>
</tbody>
</table>

Components

#120-001 Mineral Oil, 1 Gallon  (For tests at or below 400°F)
#120-004 Phenylmethylsiloxane Silicone Fluid, PM-125, 1 gallon  (For tests over 400°F)
#120-00-1 Tool Kit (Includes slurry cup stand, slurry cup tool, lifting tongs for heater shield, and lifting tongs for potentiometer)
#120-102 Rupture Disk, 28,000 PSI (193 MPa), Model 2025
#120-103 Rupture Disk, 45,000 PSI (310 MPa), Model 2040
#120-148 Retaining Ring for Cap (For Model 2025)
#120-149 O-ring for Cap, Viton (For Model 2025)
#120-201 Thermocouple, Bath (For Model 2040)
#120-203 Thermocouple, Slurry Cup (For Model 2040)
#120-208-1 Thermocouple, Slurry Cup (For Model 2025)
#120-35-004 Backup Ring for Cap (For Model 2025)
#120-35-015 Drip Tray, Stainless Steel
#120-35-033 Air Filter
#120-35-058 Chart Recorder (Optional)
#120-35-132 Oil Filter
#120-40-032 High Pressure Filter
#120-40-033 Filter Element for High Pressure Filter
#120-401 O-ring for Cell Cap, Metal
#120-401-V O-ring for Cell Cap, Viton (For Model 2040. For tests below 10,000 PSI and below 300°F only.)
#120-35-031 O-ring for Oil Reservoir, Viton
#120-50-037 Air Regular
#120-519 Slurry Cup without Expansion Chamber, Model 2025
#120-521 Slurry Cup with Expansion Chamber, Model 2040
#120-628 Potentiometer Assembly
#120-75-10 Slotted Weight Set
#120-75-9 Weight Hanger
| #130-75-28  | Allen Key, ¼", 1¼" Long |
| #130-77-027-1 | Pump |
| #141-28 | Hose Kit |
| #141-15 | Air Hose, 6', Qty: 2 |
| #141-19 | Air Hose Adapter, Qty: 6 |
| #141-27 | Drain Hose, Stainless Steel |
| #143-01 | Gauge, 0–200 PSI |
| #171-45-4 | Thermocouple, Bath (For Model 2025) |

**Potentiometer Components:**

| #120-602 | Calibration Spring |
| #120-603 | Potentiometer Body |
| #120-604 | Potentiometer Resistor |
| #120-605 | Contact Spring |
| #120-606 | Potentiometer Contact Arm |
| #120-607 | Contact Strip |
| #120-608 | Grounding Cable Retaining Screw |
| #120-609 | Grounding Contact Spring |

**Slurry Cup Components:**

| #120-501 | Slurry Cup Sleeve |
| #120-502 | Molded Diaphragm (For tests at or below 400°F) |
| #120-40-502 | Diaphragm (For tests above 400°F) |
| #120-502-1 | Flat Diaphragm, Buna (For tests below 200°F) |
| #120-503 | Paddle Pin |
| #120-504 | Pivot Bearing |
| #120-505 | Pivot Bearing Gasket |
| #120-506 | Paddle |
| #120-508 | Diaphragm Retaining Ring |
| #120-509 | Drive Disk |
| #120-510 | Drive Bar |
| #120-512 | Drive Pin |
| #120-513 | Gasket for Bottom Cap |
| #120-514 | Drive Disk Set Screw, 6-32 × 3, Stainless Steel |

**Optional:**

<p>| #120-35-SP | Spare Parts Kit |
| #120-001 | Mineral Oil, 1 Gallon, Qty: 2 |
| #120-102 | Rupture Disk, 28,000 PSI, Qty: 2 |
| #120-202 | Heater, 4,000 Watt |
| #120-204 | Heater Gaskets, Qty: 2 |
| #120-208-1 | Thermocouple for Slurry Cup, Qty: 2 |
| #120-35-031 | O-ring for Oil Reservoir, Viton, Qty: 2 |
| #120-401-V | O-ring for Cell Cap, Viton, Qty: 12 |
| #120-501 | Slurry Cup Sleeve |
| #120-502 | Molded Diaphragm, Qty: 25 |
| #120-503 | Paddle Pin, Qty: 12 |
| #120-504 | Pivot Bearing, Qty: 6 |
| #120-505 | Pivot Bearing Gasket, Qty: 5 |
| #120-506 | Paddle for Slurry Cup, Qty: 4 |
| #120-507 | Paddle Shaft for Slurry Cup, Qty: 10 |</p>
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<th>Part Number</th>
<th>Description</th>
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<td>#120-509</td>
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<td>Drive Bar for Slurry Cup</td>
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<td>#120-511</td>
<td>Shear Pin for Slurry Cup, Qty: 24</td>
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<td>Calibration Spring, Qty: 3</td>
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<td>Resistor for Potentiometer, Qty: 4</td>
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<td>Contact Arm for Potentiometer, Qty: 6</td>
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<td>#120-607</td>
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<td>#120-608</td>
<td>Retaining Screw for Potentiometer</td>
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<td>#120-684</td>
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<td>Fuse, 10 Amp, 5 mm × 20 mm, Qty: 5</td>
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<td>#120-40-SP</td>
<td>Spare Parts Kit</td>
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<td>#120-10-1</td>
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<td>#120-103</td>
<td>Rupture Disk, 45-50 KSI, Qty: 2</td>
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<tr>
<td>#120-202</td>
<td>Heater, 4000 Watt</td>
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<td>#120-204</td>
<td>Heaters Gaskets, Qty: 2</td>
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<td>#120-401</td>
<td>O-ring for Cell Cap, Metal, Qty: 10</td>
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<tr>
<td>#120-501</td>
<td>Slurry Cup Sleeve</td>
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<td>#120-502</td>
<td>Molded Diaphragm, Qty: 25</td>
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<td>Pivot Bearing, Qty: 6</td>
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<tr>
<td>#120-505</td>
<td>Pivot Bearing Gasket, Qty: 5</td>
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<tr>
<td>#120-506</td>
<td>Paddle for Slurry Cup, Qty: 4</td>
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<tr>
<td>#120-508</td>
<td>Diaphragm Retaining Ring, Qty: 2</td>
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<tr>
<td>#120-509</td>
<td>Drive Disk for Slurry Cup</td>
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<tr>
<td>#120-510</td>
<td>Drive Bar for Slurry Cup</td>
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<td>#120-511</td>
<td>Shear Pin for Slurry Cup, Qty: 24</td>
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<td>#120-512</td>
<td>Drive Pin for Slurry Cup, Qty: 12</td>
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<td>#120-514</td>
<td>Drive Disk Set Screw, Qty: 10</td>
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<tr>
<td>#120-520</td>
<td>Paddle Shaft, 9 ⅛&quot;, Qty: 10</td>
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<tr>
<td>#120-521</td>
<td>Slurry Cup with Extension</td>
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<tr>
<td>#120-602</td>
<td>Calibration Spring, Qty: 3</td>
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<td>Potentiometer Resistor, Qty: 4</td>
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<td>#120-606</td>
<td>Potentiometer Contact Arm, Qty: 6</td>
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<td>#120-607</td>
<td>Contact Strip, Qty: 6</td>
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<tr>
<td>#120-608</td>
<td>Grounding Cable</td>
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<td>#120-684</td>
<td>Bearing, Bronze, Large, Qty: 2</td>
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<td>#122-072</td>
<td>Fuse, 1 Amp, 5 mm × 20 mm, Qty: 5</td>
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<td>#122-073</td>
<td>Fuse, 2 Amp, 5 mm × 20 mm, Qty: 5</td>
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<tr>
<td>#130-75-28</td>
<td>Allen Key, ¼&quot;, Qty: 2</td>
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</table>
Quick Start
Starting a Test

1. Before turning on the Consistometer, make sure the MOTOR, PUMP, HEAT, COOL, and AIR TO CYLINDER switches are all off and the CYLINDER switch is set to DRAIN.

2. Turn the MAIN switch on.

3. Turn the MOTOR switch to MANUAL.

4. Slowly lower the slurry cup into the test cell until the drive table engages with the drive pins on the bottom.

5. Lower the potentiometer into the test cell so that it sits on top of the slurry cup.

6. Turn the MOTOR switch to AUTOMATIC.

7. Carefully lower the cell cap into the test cell and tighten it.

   **Important**
   
   **If are using a metal o-ring and you tighten the cell cap past the marked position, you must use a new o-ring for the next test.**

8. Plug the thermocouple into the port near the test cell. Insert the thermocouple into the hole in the top of the cell cap and tighten the thread gland finger tight and loosen it ¼ of a turn.

9. Close the pressure release valve by turning it clockwise.

10. Turn the CYLINDER switch to FILL. When the cell is full, oil will leak out of the thermocouple fitting on the cell cap. Tighten the fitting to seal the cell.

11. Turn the PUMP switch to AUTOMATIC. Turn the DC VOLT and HEAT switches on. Turn the COOL switch to AUTOMATIC.

12. Load the test:

   a. If you will be using the software to run the test, select a Test Profile and click the Start Test button on the Main Screen.

   b. If you will be using the onboard controls to run the test, first select a test to run, then select option 1 “Run/Edit Test” from the Main menu and press the Scroll Wheel in to start the test. This will start the motor.

13. Push the scroll wheel on the Control Panel to start the test.
Quick Start
Completing a Test

When the test is complete, the red light on the Status Indicator will turn on and an alarm will sound. To acknowledge the alarm, push the Scroll Wheel.

1. Turn the HEAT, MOTOR, and DC VOLT switches off.

2. When the cell temperature has reached 150°F, turn off the PUMP switch and slowly open the Pressure Release valve.

   **Never release pressure while the temperature is above 200°F (93.3°C).**

3. Turn the CYLINDER switch to DRAIN and turn the AIR TO CYLINDER switch on. This will allow air into the test cell and force the oil back into the reservoir.

4. When you hear air venting from the Consistometer, turn off the AIR TO CYLINDER switch.

5. Remove the thermocouple from the cell cap.

6. Unscrew the cell cap and remove it from the test cell.

7. Remove the potentiometer and the slurry cup from the test cell.

8. Turn the COOL switch off.

9. Return the cell cap to the test cell to prevent dust and other material from entering the cell.

10. Turn the MAIN switch off.
**Instrument Controls**

- Status Indicator
- Temperature Controller
- Potentiometer Indicator
- Chart Recorder (Optional)
- Switches
- Scroll Wheel
- Exit Button
- Screen
- Thermocouple Storage
- Thermocouple Port
- Cell Cap
- Pressure Release Valve
- Air Pressure Regulator
**Temperature Controller:**
The Eurotherm temperature controller shows the current temperature, pressure, and setpoints. The temperature shown is the reading from either the bath or slurry thermocouple, depending on the “Control Temp” value set in “Testing Options”. See page 36 for more information.

![Temperature Controller](image)

**Potentiometer Indicator:**
The Potentiometer Indicator shows the DC voltage coming from the potentiometer. This voltage is directly related to the consistency of the test slurry (in Bc). The potentiometer has a range of 0 to 15 volts.

**Status Indicator:**
The lights on the Status Indicator correspond to the consistency of the sample. The threshold values can be set in either the onboard controls or in the software. There are three setpoints, specified in Bearden units of consistency (Bc).

- Max Bc for Green Light: When the consistency is below this value, the green light will be on.
- Max Bc for Green and Yellow: When the consistency is below this value, the green and yellow lights will both be on.
- Max Bc for Red Light: When the consistency is below this value, the yellow light only will be on. When the consistency is above this value, the red light will be on and the test will stop.

Refer to page 38 for instructions on setting these values.

The Status Indicator also indicates an alarm condition. If an alarm is triggered, all three lights on the status indicator will blink until the alarm is acknowledged.
**Chart Recorder:**
The chart recorder keeps a running log of each test. This is an optional feature and may not be included with your equipment.

Refer to the manufacturer documentation for more information.

**Switches:**

- **MOTOR:** Sets control of the motor. When set to MANUAL, the motor will turn at 150 RPM until stopped. When set to AUTOMATIC, the motor will turn according to the parameters of the test that is currently running. If no test is running, the motor will be stopped. When set to OFF, the motor will not turn at all.

- **DC VOLT:** Controls power to the potentiometer. The potentiometer should be turned off when there is no oil in the cell to prevent it from overheating.

- **CYLINDER:** Controls the flow of oil into the cell. When FILL is selected, oil flows into the cell for testing. When DRAIN is selected, oil flows out of the cell and back into the reservoir.

- **PUMP:** Controls power to the pump. The pump adds pressure to the cell as long as this switch is set to MANUAL. When AUTOMATIC is selected, the pump is controlled by the electronic control board. When OFF is selected, the pump will not run at all.

- **HEAT:** Controls power to the heaters. The heaters are controlled by the electronic control board. Turning this switch on gives heat control to the control board.

- **COOL:** Controls the cooling system. The cooling system is on and cooling the cell as long as this switch is set to MANUAL. When AUTOMATIC is selected, the cooling system is controlled by the electronic control board. When OFF is selected, the cooling system will not run at all.

- **AIR TO CYLINDER:** When this switch is on, air enters the cell and forces the oil out into the reservoir.

- **CHART RECORDER:** Controls power to the chart recorder.

- **MAIN:** Controls power to the entire system. When this switch is off, all other electronic systems in the Consistometer are also off.
Test Control:
The on-board control panel consists of a display screen, a Scroll Wheel, and an Exit button.

The Scroll Wheel turns clockwise and counterclockwise. Turning the wheel scrolls through menu and parameter options. Pushing the Scroll Wheel in signals acceptance.

The Exit button cancels any pending input and returns to the Main Menu.

Refer to page 31 for more information about the onboard control panel.

Thermocouple:
The Consistometer uses two thermocouples for reading temperature. One is inside the unit cabinet and measures the temperature of the oil bath around the slurry cup.

The other is outside the unit cabinet. This one must be inserted into the top of the cell cap so that it reaches down into the slurry cup and measures the temperature of the slurry.

When the thermocouple is not in use, store it in the port on the right-hand side of the cabinet to protect it from damage.
Pressure Release Valve:
This valve releases the pressure in the test cell. To release the pressure, slowly turn the valve counterclockwise. Always make sure the pump is turned off and the cell temperature is below 200°F before releasing the pressure.

Always release the pressure very slowly to avoid pulling cement into the plumbing.

Air Pressure Regulator:
This regulator provides air pressure to the pump. When air pressure is increased, each pump stroke adds more pressure to the test cell. If you notice the pump repeatedly overshooting the pressure target, reduce the air pressure and try again. If the pump seems to be pumping for too long, try adding more air pressure.

To adjust the air pressure, pull the black locking ring out and turn the regulator clockwise to increase pressure or counterclockwise to decrease it. When you are finished, push the locking ring back in. The gauge set in the regulator shows the current pressure.
1. Carefully remove the instrument from the wooden crate.

2. Once the unit is in place, lock the casters by depressing the lever on the side. This will prevent the unit from moving.

3. Make sure all valves are closed and all switches are off. Connect an air or nitrogen (100–120 PSI/690–827 kPa) supply to the air supply on the back of the instrument.

   This unit uses ¼" NPT female connectors for all supply lines.

4. Connect the drain and coolant supply lines, also on the back of the unit.

5. The consistometer has two power inlets. The large power cable on the back of the cabinet provides power to the heaters. The lower inlet on the left-hand side of the cabinetpowers the rest of the electronics.

   To protect the electronics from a power outage, plug the inlet on the side of the cabinet into an uninterruptible power supply (UPS). Then plug the heater power cable into a 230 volt power source. In the event of a power outage, the heaters will shut off, but the rest of the electronics will continue to work and the test will keep running.

   Above the electronics power inlet is a power outlet. To run the Consistometer without the protection of a UPS, plug the electronics power inlet into the power outlet above it. This will run the Consistometer using power from the heater.
6. Turn the Main power switch on.

7. Set the date and time. See page 37.

8. To fill the oil reservoir, open the front cabinet door and remove the oil reservoir cap. Pour approximately four liters (or until full) of oil into the reservoir. Replace the cap. Make sure the seal is air tight. Use the sight glass on the side of the reservoir to check the oil level.

9. Turn the “Main Power” switch On.

10. Set the time and date on the on-board controller if they are not already set. See page 37 for instructions.

11. Calibrate the potentiometer before connecting the Consistometer to a computer. See page 38.

Mineral Oil (#120-001) is recommended for tests up to 400°F. For tests above 400°F, use only Phenylmethilsiloxane Silicone Fluid (#120-004).
Operation
Filling the Slurry Cup

Three diaphragms are available for the slurry cup. For tests below 400°F, use OFITE part number 120-502. For tests above 400°F, use OFITE part number 120-40-502. For tests below 200°F, use OFITE part number 120-502-1.

1. With the slurry cup disassembled, examine the threads on the inside of the sleeve. The end with the larger set of threads is the top.

2. Coat the surface of the paddle and the inside of the slurry cup with a high-temperature grease to facilitate cement removal.

3. Insert the paddle assembly all the way into the top of the sleeve.

   The slurry cup for the Model 2040 has a longer shaft (#120-520) and an expansion chamber (#120-521) to accommodate cement expansion at higher temperatures. See pages 59 and 60 for diagrams of the two slurry cups.

4. Slide the slurry cup lock ring on top of the paddle assembly with the two notches facing upward. Tighten the locking ring completely using the provided slurry cup tool.

![Sleeve](image1)
![Paddle](image2)
![Base](image3)
![Locking Ring](image4)

Note
5. Prepare the cement slurry as stated in API Specification 10.

6. Pour the cement into the slurry cup through the open bottom of the sleeve.

7. Place the metal o-ring around the threads of the base. Apply high-temperature grease to the o-ring and base surface. Screw the base onto the cup and tighten with the slurry cup tool.

   The slurry cup should contain enough cement slurry that it leaks out of the hole in the center of the base. If it does not, remove the base and refill the slurry cup. Do not add cement through the hole in the base.

8. Screw the pivot bearing into the hole in the center of the base and tighten.

9. Wipe the entire slurry cup clean to ensure that no cement remains on the outside.
Operation
Starting a Test

1. Before turning on the Consistometer, make sure the MOTOR, PUMP, HEAT, COOL, and AIR TO CYLINDER switches are all off and the CYLINDER switch is set to DRAIN.

2. Turn the MAIN switch on.

3. Turn the MOTOR switch to MANUAL. This will start the motor.

4. Slowly lower the slurry cup into the test cell. When the slurry cup is lowered all the way, the drive table will engage with the drive pins on the bottom.

5. Lower the potentiometer into the test cell so that it sits on top of the slurry cup. Make sure the three contacts on the potentiometer engage with the contacts on the inside of the test cell.

   The slurry cup and potentiometer both have two holes near the top for the lift tongs (provided). Use the lift tongs to easily lower the slurry cup and potentiometer into the test cell.

6. Turn the MOTOR switch to AUTOMATIC.

7. Carefully lower the cell cap into the test cell and tighten it.

8. Plug the thermocouple into the port near the test cell. Insert the thermocouple into the hole in the top of the cell cap and tighten the thread gland finger tight. Then loosen it ¼ of a turn.

9. Close the pressure release valve by turning it clockwise.

10. Turn the CYLINDER switch to FILL. This will begin filling the cell with mineral oil. When the cell is full, oil will leak out of the thermocouple fitting on the cell cap. When this happens, tighten the fitting to seal the cell.
11. Turn the PUMP switch to AUTOMATIC. Turn the DC VOLT and HEAT switches on. And turn the COOL switch to AUTOMATIC.

12. Load the test:

   a. If you will be using the software to run the test, click the Start Test button on the Main Screen. This will open the “Load Test Infos” screen and start the motor. Refer to page 21 for more information about the software.

   b. If you will be using the onboard controls to run the test, first select a test to run, then select option 1 “Run/Edit Test” from the Main menu and press the Scroll Wheel in to start the test. This will start the motor. Refer to page 31 for more information about the onboard controls.

13. Push the scroll wheel on the Control Panel to start the test.
**Operation**

**Completing the Test**

When the slurry consistency reaches the maximum consistency set in the options (see page 36), the heater, motor, and pump will automatically turn off and the cooling system will turn on. The red light on the Status Indicator will turn on and an alarm will sound. To acknowledge the alarm, push the Scroll Wheel.

1. Turn the HEAT, MOTOR, and DC VOLT switches off.

2. If the Chart Recorder is recording the test, open the door and push the "REC" button to stop it.

3. Wait for the cell to cool. When the cell has cooled, turn off the PUMP switch and slowly open the Pressure Release valve.

   **Important**

   *Never release pressure while the temperature is above 190°F.*

   If the pump switch is in the automatic position, the consistometer will maintain pressure above 5,000 PSI as long as the temperature above 190°F.

   Always release the pressure very slowly to avoid pulling cement into the plumbing.

4. Turn the CYLINDER switch to DRAIN and turn the AIR TO CYLINDER switch on. This will allow air into the test cell and force the oil back into the reservoir.

5. When you hear air venting from the Consistometer, turn off the AIR TO CYLINDER switch.

6. Remove the thermocouple from the cell cap.

7. Unscrew the cell cap and remove it from the test cell.

8. Remove the potentiometer and the slurry cup from the test cell.

9. Turn the COOL switch off.

10. Return the cell cap to the test cell to prevent dust and other material from entering the cell. Turn the MAIN switch off.
To open the software, double-click the “HTHP Consistometer” icon on the desktop. The “Manage Devices” screen will automatically open. From this screen you assume control of an HTHP Consistometer that is connected to the network via Ethernet or directly connected to your computer via RS-232 (serial). This screen can also be accessed by selecting “Manage Devices” from the “Utilities” menu.

1. If the HTHP Consistometer is connected via Ethernet, make sure the “Enable Ethernet Comms” option is selected. If it is connected via serial, make sure “Enable Serial Comms” is selected.

2. If your instrument does not show up in the list at the top of the screen, click the “Search for Devices” and “Refresh” buttons. If the device still doesn’t show up, check the connection and try again. If the software is still unable to locate the device, contact OFITE support.

3. Locate the device you want to manage. Right-click the device and click “Select Default Device” to assume control.

4. If another user already has control of the device, you have the option of requesting control. When you request control, the other user has 60 seconds to deny control, otherwise, control will automatically be transferred to you.

5. Click “Done” to return to the main screen.
The Main Screen of the software shows you all of the data for the current test.

**Cell Display**

- **Elapsed Time**: Elapsed time since the beginning of the test.
- **Pressure**: Pressure currently in the test cell.
- **Sample Temp**: The temperature inside the slurry cup.
- **Bath Temp**: The temperature of the oil inside the test cell.
- **Consistency**: The consistency of the slurry (in Bc).
- **Consistency**: The raw signal from the potentiometer (Volts).
- **Heater Power**: This is the percentage of power being output by the heaters.
- **Autoscroll ON/OFF**: This allows the user to control display the data manually or scroll the data automatically.
- **Cursor Options**: Here you can change cursor settings within the graph.
  
  a. **Cursor On/Off**: With this option ON, a window will open to display the data based on the location of the cursor.

<table>
<thead>
<tr>
<th>X</th>
<th>Temp</th>
<th>Consistency</th>
<th>Pressure</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:20:57</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
b. **Autoscale ON/OFF:** With this option on, it will fit the scale so that all available data points in the graph can be visible. With it off, the graph will continue to scroll and the data points outside of the display can only be visible by manually scrolling.

c. **Minor Ticks ON/OFF:** Minor Ticks ON will display more grid lines at smaller increment distance.

d. **Major Ticks ON/OFF:** Major Ticks ON will display fewer grid lines at a larger interval distance.

e. **Set Chart Ticks:**

   - **X-Axis:** Allows the user to manually plot the desired data points and can be toggled between minutes and hours.

   - **Y-Axis:** Allows the user to set data points based on increments of: Consistency, Temperature, Pressure, and Motor RPMs.

![Set Chart Ticks](image)

**Test Profile Index:** Here you can select a test to run. Below the list of test profiles you can see the settings of the selected profile. Refer to page 24 for more information about these settings.

Tests can be stored on either the control board inside the Consistometer or on the hard drive of the computer running the software. In the Test Profile Index, tests stored on the control board are labeled with “BOARD:”.

**Start Test:** After selecting a Test Profile, click this button to begin testing.
The control board on the Consistometer can hold up to eight test configurations. Additional test profiles can be stored on the computer. With the Onboard Test Profile Builder, you can create and edit tests on the control board.

1. Select Utilities → Test Profile Builder → Onboard Test Profiles.

2. Select a Test Profile to edit and click Next. The API Schedule 5 test in the first memory slot cannot be edited.

3. Enter a name for the Test Profile and click Next.

4. There are two types of tests: normal and hesitation squeeze. The two types have different parameters. Enter each parameter and click Next.

For normal tests, select “Hesitation Test” off and set the following parameters:

a. Surface Retention Time - This is a time period before the test begins. The motor will be on but the heater and pressure will be off. This will simulate the time cement waits on the surface before being sent downhole. During this period, the timer on the onboard control panel will start at a negative value and count up to 0.

b. Starting Temperature: The initial temperature set point for the test.

c. Time to Bottom Hole Temperature: This is the amount of time (in minutes) the test will take to fully heat and pressurize the slurry.

d. Bottom Hole Temperature: This is the final test temperature.

e. Start Pressure: The initial pressure for the test.

f. Bottom Hole Pressure: This is the final test pressure.
For hesitation squeeze tests, select “Hesitation Test” on and set the following parameters. The graph below represents a hesitation squeeze test with the parameters labeled.

a. Motor On Time: The amount of time (in minutes) the motor is on during a squeeze.

b. Motor Off Time: The amount of time (in minutes) the motor is off during a squeeze.

c. Number of Cycles: The number of on/off cycles the motor will go through. Enter 0 to have the cycles continue infinitely.

If the cycles are complete before the other steps, the motor will continue at 150 RPM until the end of the test.

d. Surface Retention Time - This is a time period before the test begins. The motor will be on but the heater and pressure will be off. This will simulate the time cement waits on the surface before being sent downhole. During this period, the timer on the onboard control panel will start at a negative value and count up to 0.

e. Starting Temp: The starting temperature of the test. The test does not begin until the temperature is at or above this level. Enter “0” to start the test immediately.

f. Time to Squeeze Temp: The amount of time (in minutes) the test will take to heat the slurry to the Squeeze Temperature.
g. Squeeze Temperature: The first temperature set point.

h. Total Time to Final Pressure: The amount of time (in minutes) the test will take to pressure the slurry to Final Pressure.

i. Start Pressure: The initial pressure for the test.

j. Final Pressure: The pressure set point.

k. Time to Static Temperature: The amount of time (in minutes) the test will take to heat the slurry to Bottom Hole Static Temperature.

l. Bottom Hole Static Temperature: The second temperature set point.
With the Custom Test Profile Builder, you can create and edit tests on the computer.

1. Select Utilities → Test Profile Builder → Custom Test Profiles.

2. Either select a test from the list on the left-hand side of the screen, or click “New Test” to build a new test.

3. Enter a test name.

4. Each test profile has three main parameters: temperature, pressure, and motor speed. For each parameter, there are a series of steps. Each step specifies the setpoint and other options for that parameter.

   To add a line, click the Temperature, Pressure, or Motor tab and then click the “Add” button. As you add lines to the test profile, the graph below will change to reflect the new data.

   To change the scale of the graph, double-click the maximum value on the axis and enter a new value. The graph will automatically rescale to fit the new value.

When building a test at temperatures above 200°F, be sure to apply a minimum of 5,000 PSI to prevent the sample from boiling.

   a. Temperature - First choose Sample or Bath. This will specify which thermocouple to use for determining temperature. There are three types of temperature settings:

      i. **Hold** - This will hold the current temperature for a set number of minutes. You will be prompted for the hold time.
ii. **Ramp** - This will increase the temperature up to the target in a set number of minutes. You will be prompted for the ramp time and target temperature.

iii. **Step** - This will increase the temperature up to the target as fast as possible. You will be prompted for the target temperature.

The maximum temperature setpoint allowed is 400°F (204.4°C) on the Model 2025 and 600°F (315.6°C) on the Model 2040.

b. Pressure - There are three types of pressure settings:

i. **Hold** - This will hold the current pressure for a set number of minutes. You will be prompted for the hold time.

ii. **Ramp** - This will increase the pressure up to the target in a set number of minutes. You will be prompted for the ramp time.

iii. **Step** - This will increase the pressure up to the target as fast as possible. You will be prompted for the target pressure.

The maximum pressure setpoint allowed is 25,000 PSI (172.4 MPa) on the Model 2025 and 40,000 PSI (275.8 MPa) on the Model 2040.

c. Motor - There are three types of motor settings:

i. **Motor Off** - This will turn the motor off for a set number of minutes. You will be prompted for the time period.

ii. **Motor On** - This will turn the motor on. You will be prompted for the time period and target speed (RPM).

iii. **Motor Cycling** - This will vary the motor speed between two targets. You will be prompted for the number of cycles (click the “Infinite Cycling” checkbox to allow cycling to continue until the next step), two target speeds (RPM), and two time periods.

The maximum motor speed is 300 RPM.

d. **Hold for Consistency** - Every test will end when the slurry reaches the consistency in the “Consistency #3” field in the setup screen (see page 29 for details). However, some test profiles may finish all steps before the slurry has completely thickened. When the **Hold for Consistency** option is checked, the test will continue until the slurry has reached the final consistency. If this option is not checked, the test will end when all the steps of the test profile are complete, even if the final consistency has not been reached.
To change the software settings, select “Setup” from the “Utilities” menu.

**Temperature Unit:** °F or °C. Changing this setting will change the temperature units on the Eurotherm temperature controller.

**Pressure Unit:** Select psi or MPa. Changing this setting will change the pressure units on the Eurotherm Temperature Controller.

**When the pressure units are changed, the HTHP Consistometer will automatically reboot. Do not change this option during a test.**

**Average Parameters:** This will round off all data values to the nearest whole number.

**DAQ Time:** The time interval to collect data.

**Archive Path:** Select a folder to store test data.

**Chart Logo File:** Select a logo file (.jpg) to display on the graph.

**Motor RPM:** The rotational speed of the motor.

**COOL ON Temp:** After a test, the cooling system will engage if the temperature is above this setting (°F). The COOL switch must be set to AUTO.

**Consistency #1:** The consistency at which the yellow light comes on.

**Consistency #2:** The consistency at which the green light turns off.

**Consistency #3:** The consistency at which the yellow light turns off and the red light comes on. When the consistency reaches this value, the test will stop automatically to prevent damage to the equipment.

**Machine Name:** This name will print on the chart to identify which Consistometer generated the data.

**Temperature Control:** Sample of Bath. Determines which thermocouple is used to control temperature.

**Print to Printer:** At the end of a test, the software will automatically save an image file of the test graph. Select this option to also print the graph to the default printer.
The HTHP Consistometer software stores all data from old tests. To view data from a previous test, select “Open Data Archive” from the “File” menu. Select a directory to view available tests. Then choose a test to view the data.

From this screen you can view and print the chart. You can also modify the test information and zoom in on a portion of the graph to create a new chart.

The software also archives the data from potentiometer calibrations. To view data from a previous calibration, select “Open Calibration Archive” from the “File” menu. Select a calibration from the list to view the graph.
The HTHP Consistometer is designed to be fully operational with or without a computer. In standalone mode, the user can still create, modify, and run tests; calibrate the various components; and set testing options.

The on-board control panel consists of a display screen, a Scroll Wheel, and an Exit button. It is also equipped with a back up battery supply which allows a memory to be stored if the main power cord is disconnected.

The Scroll Wheel turns clockwise and counterclockwise. Turning the wheel scrolls through menu and parameter options. Pushing the Scroll Wheel in signals acceptance.

The Exit button cancels any pending input and returns to the previous menu.

The first line of the display screen is used to display status and error messages. Below is a list of status messages. Refer to page 69 for a list of error messages.

- **READY TO TEST:** The instrument is idle, there are no errors, and it is ready to start a test.

- **PLEASE WAIT:** The instrument is starting up and the hardware is initializing.

- **RUNNING TEST:** A test is currently running and there are no errors.

- **TEST FINISHED:** The slurry consistency has reached the maximum value specified in the options. To acknowledge this message, press the scroll wheel.

- **ENTER TO START TIMER:** The instrument is waiting on user input to begin testing. While this message is displayed, the motor will be running.
Main Menu

1. Run/Edit Test - run or edit the selected test
2. Select New Test - select a new test to run or edit
3. Run API Schedule 5 - a shortcut to run a commonly used test
4. Copy Test to Temp - copy a test to a temporary slot for editing
5. Utilities - Testing options, calibrations, and error code history
The on-board control panel has eight slots for storing tests. The first slot is reserved for a pre-defined API Schedule 5 test. This test cannot be edited. The API Schedule 5 test has the following parameters:

- Motor Speed: 150 RPM
- Starting Pressure: 1,000 PSI
- Starting Temperature: 80°F
- Final Temperature: 125°F
- Final Pressure: 5160 PSI
- Time to Bottom Hole: 28 Minutes

The next three slots contain pre-defined test that can be edited either through the on-board controls or through the software.

- Slot 1: API Schedule 5
- Slot 2: Casing / Liner
- Slot 3: Squeeze
- Slot 4: Hesitation Squeeze

The remaining four slots are temporary slots for custom tests. You can either create a new test or edit an existing test by copying it to a temporary slot using the “Copy Test to Temp” feature described on page 35.

In order to run or edit a test, you must first load the test into memory using the “Select New Test” option.

Selecting a New Test:

1. Push the Scroll Wheel to access the Main Menu.
3. Select a test from the list. Push to enter.

Once a test is selected, it can be run, edited, or copied.
Running a Test:

1. Push the Scroll Wheel to access the Main Menu.
2. Scroll to option 1, “Run/Edit Test”. Push the Scroll Wheel to select.
3. Push the Scroll Wheel to run the test.
4. Prepare the slurry cup and test cell for testing. See page 16 for instructions.
5. Push the Scroll Wheel to start the test.

Editing a Test:

1. Push the Scroll Wheel to access the Main Menu.
2. Scroll to option 1, “Run/Edit Test”. Push the Scroll Wheel to select.
3. Scroll to the parameter you want to change. Push the Scroll Wheel to select.
4. Scroll to select a new value. Push the Scroll Wheel to enter.
5. Repeat steps 3 and 4 for every parameter you want to change.

The API Schedule 5 test in Slot #1 cannot be edited. However, it can be copied into a temporary slot.

There are two types of tests: normal and hesitation squeeze. The two types have different parameters.

**Normal:**

- Surface Retention Time: Time period before the test begins where the motor is on but the heater and pressure are off.
- Starting Temp: The initial temperature set point for the test.
- Starting Pressure: Initial pressure for the test.
- Time to Bottom Hole: This is the amount of time (in minutes) the test will take to fully heat and pressurize the slurry.
- Bottom Hole Temp: This is the final test temperature.
- Bottom Hole Pressure: This is the final test pressure.
**Hesitation Squeeze:**

- Surface Retention Time: Time period before the test begins where the motor is on but the heater and pressure are off.

- Starting Temp: The initial temperature set point for the test.

- Time to Squeeze Temp: The amount of time (in minutes) the test will take to heat the slurry to Squeeze Temp.

- Squeeze Temp: The first temperature set point.

- Starting Pressure: Initial pressure for the test.

- Total Time to Final: The amount of time (in minutes) the test will take to pressure the slurry to Final Pressure.

- Final Pressure: The pressure set point.

- Total Time to Bottom ST: The amount of time (in minutes) the test will take to heat the slurry to Bottom Hole Static Temperature.

- Bottom Hole Static Temperature: The second temperature set point.

- Squeeze Motor On Time: The amount of time (in minutes) the motor is on during a squeeze.

- Squeeze Motor Off Time: The amount of time (in minutes) the motor is off during a squeeze.

- Squeeze Cycle Count: The number of times the cycle will repeat.

**Copying a Test:**

To copy a test into a temporary memory slot for editing:

1. Push the Scroll Wheel to access the Main Menu.


3. Scroll to the test you want to copy. Push the Scroll Wheel to enter.

4. Push the Scroll Wheel to access the Main Menu again.

5. Scroll to option 4, “Copy Test to Temp”. Push the Scroll Wheel to enter.

6. Select a temp slot from the list. Push the Scroll Wheel to enter.

7. Push the Scroll Wheel to access the Main Menu again.


9. Scroll to the temp slot you chose in step 6. Push the Scroll Wheel to select. The test has now been copied into a temporary slot.
Utilities Menu

1. Testing Options
2. Calibrate Potentiometer - See page 38.
3. Calibrate Pressure - See page 41.
4. Calibrate Sample Temp - See page 42.
5. Calibrate Bath Temp - See page 42.
6. Error Code History
7. Set Time/Date

Testing Options

1. Temp Units: Deg F / Deg C
2. Display Temp: Bath / Sample - Specifies whether the display screen on the front panel will display the reading from the bath thermocouple or the sample thermocouple. (Note: The Eurotherm temperature controller will always show the reading specified in “Control Temp”.)
3. Control Temp: Bath / Sample - Specified whether the temperature controller uses the reading from the bath thermocouple or the sample thermocouple to control the heaters.
4. Press Units: PSI / MPa (Changing this option will reboot the Consistometer.)
5. Test RPM - Sets the rotational speed of the slurry cup. (1 – 300 RPM)
6. Cooling OFF Temp: After a test, when the temperature reaches this point, the cooling will be turned off.
7. Max Bc for Green Light: The consistency at which the yellow light comes on.
8. Max Bc for Green and Yellow Lights: The consistency at which the green light turns off.
9. Min Bc for Red Light: The consistency at which the yellow light turns off and the red light comes on.
Set Time/Date

1. Scroll the wheel to “5. Utilities” and press the wheel to enter.

2. Scroll the wheel counter-clock wise to “7. Set Time/Date” and press the wheel to enter.

3. The cursor will blink on the hour section. Scroll the wheel until the hour is set to the current local hour and press the wheel to set the hour.

4. The cursor will then blink on the minute. Scroll the wheel until the minute section is set to the current local minute and press the wheel to set the minute.

5. The cursor will then blink on the “AM/PM” section. Scroll the wheel to select AM or PM and press the wheel to set it.

6. The cursor will then blink on the day section of the date (Day/Month/Year). Scroll the wheel to select the current local day and press the wheel to set the day.

7. The cursor will then blink on the month section of the date (Day/Month/Year). Scroll the wheel to select the current local month and press the wheel to set the month.

8. The cursor will then blink on the year section of the date (Day/Month/Year). Scroll the wheel to select the current local year and press the wheel to set the year.

The time and date is now set.

Note

The on-board control panel is equipped with a back up battery supply which will store the date if the main power cord is disconnected.
To ensure accurate readings, the potentiometer should be calibrated at least once a month or whenever any component of the potentiometer is changed. Also, calibrate the potentiometer when the software or firmware are updated.

1. Place the potentiometer on the calibration stand. Place the stand on the edge of the Consistometer and plug it into the port on the underside of the control panel.

2. Connect the wire clamps to the contacts. From the groove going clockwise around the unit, connect yellow, then black, then blue. The contacts are labelled for the correct color. BL = Blue. BK = Black. YL = Yellow.

3. Slide the weight into the groove and wrap the cord clockwise around the unit one full turn.

4. Let the cord hang over the wheel and off the table.

5. Attach the hook to the cord.
6. On the control panel, push the scroll wheel in to access the Main Menu.

Make sure the “15 VDC” switch is turned on.

If the software is running, the control panel will be disabled. Make sure the software is closed before running a calibration.

7. Scroll to option 5, “Utilities” and push the scroll wheel in to enter.

8. Scroll to option 2, “Calibrate Pot” and push to enter.

From here you can scroll through the details of the last calibration.

9. Push the scroll wheel to begin the calibration.

10. Push the scroll wheel to start the calibration. The screen will prompt you to add weights to the potentiometer. After you add the weight, steady the cord to minimize the amount of swinging. Firmly tap the surface of the calibration stand to settle the weights and stabilize the potentiometer.

When adding weights, remember that the hook weighs 50 grams. Therefore, to test the potentiometer at 200g, you only need to add 150g to the hook.

11. Lift the weight about two inches directly upward and release it. Allow it to fall straight down. When the reading stabilizes, push the scroll wheel to accept it.

12. Continue adding weights when prompted. Push the scroll wheel to accept each one.

13. After all weights have been recorded, the results will display on the screen. Press either the Scroll Wheel to accept the results or Exit to reject them and start over.

**You must press the Scroll Wheel at the end to save the calibration. If you do not save it, the instrument will use the last saved calibration data.**

You can also turn the Scroll Wheel to view each calibration point. If the calibration fails, scrolling through the points will show you which point cause the failure.

The API specifies that each calibration point must be within 5 Bc of the standard. If any calibration point is outside this range, the entire calibration will fail.
### Calibration Value Chart

<table>
<thead>
<tr>
<th>Torque Equivalent g•cm</th>
<th>Mass of Reference Weights g ± 0.1 g</th>
<th>Slurry Consistency $B_c$ ± 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>260</td>
<td>50</td>
<td>9</td>
</tr>
<tr>
<td>520</td>
<td>100</td>
<td>22</td>
</tr>
<tr>
<td>780</td>
<td>150</td>
<td>35</td>
</tr>
<tr>
<td>1,040</td>
<td>200</td>
<td>48</td>
</tr>
<tr>
<td>1,300</td>
<td>250</td>
<td>61</td>
</tr>
<tr>
<td>1,560</td>
<td>300</td>
<td>74</td>
</tr>
<tr>
<td>1,820</td>
<td>350</td>
<td>87</td>
</tr>
<tr>
<td>2,080</td>
<td>400</td>
<td>100</td>
</tr>
</tbody>
</table>

*a For a potentiometer mechanism with a different radius, an appropriate table with equivalent tolerances shall be used*
The pressure should be calibrated at least yearly or whenever the pressure transducer has been replaced.

1. Push the Scroll Wheel to access the Main Menu.

2. Scroll to option 5, “Utilities”. Push the Scroll Wheel to enter.


4. Open the Pressure Release Valve to vent the test cell of all pressure. When the reading on the display stabilizes, push the Scroll Wheel to accept the value.

5. The system will now engage the Calibration Shunt Resistor. Wait for the “Cal Shunt Resistor” value to stabilize, then scroll until the Pressure value is the same as the “Cal Shunt Resistor” and push the Scroll Wheel to accept.
The HTHP Consistometer has two thermocouples. One measures the temperature of the bath, the other measures the temperature of the sample. Both will require calibration quarterly or if either thermocouple is replaced.

1. Push the Scroll Wheel to access the Main Menu.

2. Scroll to option 5, “Utilities”. Push the Scroll Wheel to enter.

3. To calibrate the sample thermocouple, scroll to option 4, “Calibrate Sample Temp”. To calibrate the bath thermocouple, scroll to option 5, “Cal Bath Temp”. Push the Scroll Wheel to enter.

4. Place the thermocouple in a dry block calibrator.

5. Set the calibrator to the value displayed on the screen.

6. Scroll to adjust the offset and make the two temperature readings the same. Push the Scroll Wheel to save the calibration.
**Preventative Maintenance**

**Cleaning**

**Slurry Cup**

After every test, immediately disassemble the slurry cup and clean it thoroughly with soap and water. Be sure to remove any residual cement before it hardens. Hardened cement on any of the parts can cause irreparable damage.

**Magnetic Drive**

After every test, examine the inside of the test cell for any cement or other debris. Use a shop vacuum to remove any excess cement or debris that has settled into the bottom of the chamber. Additionally, remove the magnetic drive from the cell and clean off any excess cement that has accumulated on the shaft.

It is recommended that you periodically flush the test cell with mineral oil to clean out any contaminants that may have collected over time.

1. Make sure all switches are off and all valves are closed.
2. Open the test cell and remove the slurry cup and potentiometer if they are still in place.
3. Locate the cover and gland beneath the test cell and remove them.
4. Pull the slurry cup table and rotor assembly up through the test cell opening.
5. Clean any abrasive particles from the rotor assembly and lay the assembly on a clean, flat, non-magnetic surface.
6. Place a pail or bucket underneath the test cell. Flush the test cell and magnetic drive with mineral oil. Use a soft-bristle brush to remove any debris.
7. Thread the slurry cup table onto the rotor shaft assembly.

Pour a small amount of mineral oil into the vessel. This will act as a cushion when inserting the rotor assembly.

8. Insert the rotor assembly into the drive housing. Press down on the slurry cup table until it falls into place.

9. Replace the cover and gland underneath the test cell before beginning another test.

Filters

The instrument has an air filter and an air dryer. Both are located inside the cabinet on the left-hand side (see photo on page 47). Periodically check both of these for accumulated water. Unscrew the plug on the bottom and let the water drain.

The instrument has two oil filters. Both are inside the cabinet. The high-pressure filter is on the right-hand side and the low-pressure filter is on the bottom below the cell (see photo on page 47). The low-pressure filter should be replaced yearly. The high-pressure filter should be cleaned when the flow of oil back into the reservoir is obstructed (see page 48 for instructions).
1. The potentiometer should be kept as clean as possible. Periodically submerge the unit in solvent to remove cement and other materials.

2. To install a new resistor:
   
   a. Remove the four small screws holding the shaft-bearing retainer to the potentiometer assembly.
   
   b. Remove the contact arm.
   
   c. Carefully lift the damaged resistor away from the potentiometer. Clear the resistor groove of any foreign material.
   
   d. Carefully place the new resistor into the groove and ensure that it is centered between the two terminating contacts.
e. Push the resistor completely into the groove with either a mallet or a piece of wood. It is very important to ensure that the resistor is completely inserted into the groove and that the upper surface is level.

f. Install a new contact arm and if necessary, bend the arm either up or down to obtain consistent contact with the resistor.

g. Re-install the shaft-bearing retainer and calibrate the potentiometer before use.

3. To install a new calibration spring:

a. Remove the contact arm and the shaft-bearing retainer.

b. Carefully lift the calibration spring from the potentiometer assembly.

c. Install the new spring. When properly installed, it should tighten when the center shaft is rotated counterclockwise.

d. Install a new contact arm and make adjustments as necessary to obtain consistent contact with the resistor.

e. Loosen the three adjustment screws on the underside of the potentiometer assembly and rotate the spring adjuster until the spring rests at a relaxed state.

f. Ensure that the contact arm aligns with the contact strip and tighten the three set screws.

g. Rotate the center shaft to ensure that the spring does not bind or rub the potentiometer housing.

h. Replace the shaft-bearing retainer and calibrate the potentiometer.
If you hear the pump running but no pressure is building in the test cell:

1. Make sure the “Pressure Release Valve” is completely closed.

2. Make sure the AIR TO CYLINDER switch is off.

3. Make sure the CYLINDER switch is set to FILL.

4. The Consistometer has a rupture disk to prevent damage due to over pressurization. If the pressure inside the cell exceeds 28,000 PSI for the Model 2025 Consistometer or 45,000–50,000 PSI for the Model 2040 Consistometer, the disk will rupture and release the pressure. If this happens, the cell cannot be pressurized until the rupture disk has been replaced.

The rupture disk is located inside a square block just upstream from the filter on the inlet side of the pump. To replace the rupture disk, remove this block, discard the ruptured disk, and install a new disk. Then re-install the block into the plumbing line.
Preventative Maintenance
Oil Filter

When a test is complete, it should take several minutes to drain the test cell of oil. If it takes more than five minutes to completely drain the cell, the high-pressure filter may be clogged and need to be cleaned and replaced.

1. Locate the high-pressure filter inside the cabinet on the right-hand side.

2. Before removing the filter, observe the direction arrow on the side. This will be important later when re-installing the filter.

3. Carefully disconnect the pipe from the hex fitting.

4. Remove the filter pieces from the hex fitting.

5. Clean the pieces of the filter with compressed air. This will blow out any dirt and debris.

6. Carefully place the filter pieces back inside the fitting in the same order in which they were removed.

7. Reconnect the fitting to the plumbing.

Make sure the directional arrow is pointing the same direction as before the fitting was removed. Installing the filter backwards could damage the equipment.

If the high-pressure filter is dirty, it could mean that the oil in the reservoir is also dirty. Observe the oil through the sight glass on the front of the reservoir. If the oil is cloudy, it should be replaced.

1. Make sure all pressure is released from the system and that the cell is open.

2. Make sure the “Fill Cell” valve is set to “Vent”.

3. Remove the reservoir cap.

4. On the bottom of the reservoir is a drain valve. Place a container underneath the drain and open the valve.

5. When the reservoir is empty, close the drain valve.

6. Pour approximately 4 liters of mineral oil into the reservoir. When full, the oil level in the sight glass should be about 1" from the top.

7. Replace the reservoir cap. Make sure the seal is tight.
Pressure Regulator
During a test, the computer will be continuously adjusting the pressure inside the cell. As the pressure increases due to thermal expansion, the computer will allow pressure to bleed. Likewise, if pressure begins to drop, the computer will add pressure to keep it within the target range.

There is a secondary **Regulator (#120-50-037)** which controls the air pressure to the pressure relief valve.

This regulator comes calibrated and requires no adjustment unless a part within this system has been replaced.

If the user must gain access to the regulator, simply remove the stainless steel drip tray (#120-35-015) on top of the cabinet. The regulator and gauge will be located underneath the tray. To set the regulator to the proper pressure, apply pressure to the system and begin opening the regulator between 40–50 PSI (276–345 kPa). If the pressure relief valve does not open, continue adjusting the regulator to a higher pressure as needed to obtain optimal operation of the relief valve.

Air Regulator (#120-50-037)

Gauge, 0-200 PSI (#143-01)
## Troubleshooting

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>There is no power to the machine</td>
<td>The main power cord is not plugged in.</td>
<td>Make sure the main power cord(s) is firmly plugged into the wall and the machine.</td>
</tr>
<tr>
<td></td>
<td>The battery backup cable is not plugged in.</td>
<td>Make sure the battery backup cable is firmly plugged into the side of the machine.</td>
</tr>
<tr>
<td></td>
<td>The fuse for the main power supply is blown.</td>
<td>Check and replace the fuse, see 64.</td>
</tr>
<tr>
<td></td>
<td>The main circuit breaker has tripped.</td>
<td>Check and reset the breaker.</td>
</tr>
<tr>
<td><strong>Heating / Cooling</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The unit is not heating</td>
<td>The heater switch is not on.</td>
<td>Turn the heater switch on.</td>
</tr>
<tr>
<td></td>
<td>The heater circuit breaker has tripped.</td>
<td>Check and reset the heater breaker.</td>
</tr>
<tr>
<td></td>
<td>The Solid State Relay (SSR) is bad.</td>
<td>Replace the SSR (Contact OFITE).</td>
</tr>
<tr>
<td></td>
<td>The heat assembly is not working.</td>
<td>Check the wiring to the heat assembly and correct if necessary (Contact OFITE). Replace the heater assembly (Contact OFITE).</td>
</tr>
<tr>
<td>The unit is overheating</td>
<td>The thermocouple is not plugged in completely.</td>
<td>Check the thermocouple and make sure the connections are secure. Replace the thermocouple assembly.</td>
</tr>
<tr>
<td></td>
<td>The thermocouple assembly is damaged.</td>
<td>Check the temperature ramp profile in the software and/or on the Eurotherm temperature controller.</td>
</tr>
<tr>
<td></td>
<td>The temperature controller is not programmed correctly.</td>
<td>Press the run/hold button until the light goes off. Replace the Eurotherm temperature control (Contact OFITE).</td>
</tr>
<tr>
<td>Symptom</td>
<td>Cause</td>
<td>Remedy</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Heating / Cooling (Continued)</td>
<td>The heat assembly is not working.</td>
<td>Check the wiring to the heat assembly and correct if necessary (Contact OFITE).</td>
</tr>
<tr>
<td></td>
<td>Heater will not turn on if the unit is running on battery backup.</td>
<td>Replace the heater assembly (Contact OFITE).</td>
</tr>
<tr>
<td>The unit is not able to maintain temperature or the temperature is cycling uncontrollably</td>
<td>The coolant water is on.</td>
<td>Turn off the cooling water.</td>
</tr>
<tr>
<td></td>
<td>The thermocouple is not plugged in.</td>
<td>Plug in the thermocouple.</td>
</tr>
<tr>
<td></td>
<td>The thermocouple wires have been reversed.</td>
<td>Switch the wires on the thermocouple leads.</td>
</tr>
<tr>
<td>The unit is not cooling</td>
<td>The unit is not cooling.</td>
<td>Make sure the cooling water is switched on at the source.</td>
</tr>
<tr>
<td></td>
<td>Make sure the cooling switch is set to Manual.</td>
<td>Make sure the auto cool function is programmed correctly in the software.</td>
</tr>
<tr>
<td></td>
<td>Make sure the auto cool function is programmed correctly in the software.</td>
<td>Make sure the cooling lines are free from obstructions.</td>
</tr>
<tr>
<td></td>
<td>The cooling solenoid is not functioning (Contact OFITE).</td>
<td>The cooling solenoid is not functioning (Contact OFITE).</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>The thermocouple is bent.</td>
<td>Replace the thermocouple.</td>
</tr>
<tr>
<td></td>
<td>The shaft on the slurry cup is bent and/or damaged.</td>
<td>Replace the slurry cup shaft.</td>
</tr>
<tr>
<td>Pressure</td>
<td>The cell cap o-ring is leaking.</td>
<td>Replace the cell cap o-ring.</td>
</tr>
<tr>
<td></td>
<td>There is a leak at one of the fittings.</td>
<td>Trace the tubing and tighten the leaking connection.</td>
</tr>
<tr>
<td></td>
<td>The pressure release valve (PRV) is damaged.</td>
<td>Replace the PRV.</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pressure (Continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The regulator (black valve)</td>
<td>leaking.</td>
<td>Replace the regulator.</td>
</tr>
<tr>
<td>The mag drive shaft o-ring</td>
<td>leaking.</td>
<td>Replace the mag drive shaft o-ring (Contact OFITE).</td>
</tr>
<tr>
<td>The heater element seal</td>
<td>leaking.</td>
<td>Replace the heater element seal (Contact OFITE).</td>
</tr>
<tr>
<td>The unit will not build</td>
<td>cell cap o-ring is leaking.</td>
<td>Replace the cell cap o-ring.</td>
</tr>
<tr>
<td>pressure</td>
<td>There is a leak at one of the fittings.</td>
<td>Trace the tubing and tighten the leaking connection.</td>
</tr>
<tr>
<td>The regulator (black valve)</td>
<td>leaking.</td>
<td>Replace the regulator.</td>
</tr>
<tr>
<td>The pump is broken (not</td>
<td>cycling, constantly cycling).</td>
<td>Replace the pump.</td>
</tr>
<tr>
<td>The Rupture Disk is blown.</td>
<td>Replace the Rupture Disk see page 47.</td>
<td></td>
</tr>
<tr>
<td>Pressure Release Valve</td>
<td>is open.</td>
<td>Completely close the Pressure Release Valve.</td>
</tr>
<tr>
<td>The Air To Cylinder switch</td>
<td>is on.</td>
<td>Switch it to “Off”.</td>
</tr>
<tr>
<td>Cylinder Switch is in the</td>
<td>“Off” or “Drain” Position.</td>
<td>Switch it to “Fill”.</td>
</tr>
<tr>
<td><strong>Potentiometer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The consistency/voltage</td>
<td>resistor is not level.</td>
<td>Carefully remove and reinstall the resistor so that the upper edge is flat and level.</td>
</tr>
<tr>
<td>readings fluctuate.</td>
<td>The resistor has excess powder coating from the factory.</td>
<td>Use an emery cloth to clean the upper and lower edge of the resistor.</td>
</tr>
<tr>
<td>The consistency/voltage</td>
<td>contact arm is not touching the resistor.</td>
<td>Check the contact arm to ensure that it contacts the entire length of the resistor. Bend the arm if necessary.</td>
</tr>
<tr>
<td>readings are zero</td>
<td>resistor wire is broken.</td>
<td>Replace the resistor wire.</td>
</tr>
<tr>
<td>The potentiometer</td>
<td>potentiometer spring is damaged or worn out.</td>
<td>Replace the potentiometer spring.</td>
</tr>
</tbody>
</table>
Two o-rings are available for the cell cap on the Model 2040 Consistometer. The rubber o-ring is easier to use, but is not suitable for tests involving high temperature or pressure. The metal o-ring is more durable, but requires extra attention when tightening the cell cap. Once you have chosen an o-ring, place it into the test cell in the o-ring groove.

The o-ring (either metal or rubber) must be replaced after any test above 500°F (260°C).

The installation of the metal seal ring in the HTHP Consistometer is a straightforward procedure. If done correctly, the seal ring life can be extended indefinitely. The key will be to tighten the chamber lid to crush the o-ring just enough to prevent the cell from leaking.

If the o-ring is over crushed, the upper surface of the o-ring will be level with the inside lip. This will prevent the mandrel from making a good seal and keep the cell from leaking.

1. Mark the cell body and cap to indicate full closure. If the cell assembly has these markings, skip to Step 2.
   a. Place the mandrel in the cell with no o-ring installed.
   b. Screw on the cap until the cap stops on top of the mandrel.
   c. Using a Sharpie, make a light mark indicating where the cap and body line up.
   d. Remove the cap and mandrel.

2. Install the o-ring into the o-ring groove inside the cell. Ensure the o-ring is sitting flush with the o-ring groove.
3. Close the cell and screw the cell cap down hand tight. The arrows will not line up.

4. Use a mallet to help tighten the lid down. For the first attempt, tighten the lid down half the distance from the previous stopping point.

5. Remove the lid and check the o-ring. If the o-ring can spin freely in the groove, the o-ring has not been crushed enough. Replace the lid and continue tightening with the mallet. Remove the lid and check the o-ring. Continue this process until the o-ring is set.

6. Once the o-ring is set, make a mark with a permanent marker that lines up with the mark on the upper lid.

7. Fill the cell with oil and perform a pressure test. Manually increase the pressure in steps of 5,000 PSI up to 25,000 PSI. Hold the pressure at each step for 10 minutes to ensure that the cell is not leaking from around the cell lid.

8. If the cell leaks from around the o-ring, drain the cell and use the mallet to deliver a couple of blows to tighten the lid a bit more.

9. Close up the cell and fill it with oil. Repeat the pressure test procedure until the cell is able to hold pressure.

Please note, the arrows may or may not line up when the cell is properly sealed. The cell should be marked at the final position of the arrow on the lid to indicate the final position of the cell. If the cell is ever tightened past this mark, the mark will need to be removed and the cell will need to be marked at the new position.
One final check to make on the cell o-ring will be to physically check and make sure the upper surface of the o-ring sticks up above the o-ring ledge around the entire circumference of the cell.

If the o-ring is damaged and unable to seal, the o-ring will need to be replaced.
Before and after every test, carefully examine the o-ring on the cell cap. Replace it if it shows signs of damage or wear. This procedure only applies to the Model 2025 Consistometer (#120-35).

1. Unscrew the cell cap and raise it above the cell.

2. Remove the retaining ring from around the bottom of the cell cap. The o-ring and backup ring should fall off easily.

3. Apply high-temperature grease to the cell cap where the backup ring will sit. Also apply grease to the o-ring.

4. Place the backup ring (#120-35-004) onto the cell cap with the narrow side pointing up towards the threads.

5. Place the new o-ring (#120-149) onto the cell cap beneath the backup ring.

6. Place the retaining ring around the bottom of the cell cap so that it holds the o-ring and backup ring in place.

7. Apply anti-seize compound to the cell cap threads.
Appendix
Slurry Cup Diagram

#120-521 Slurry Cup Assembly With Expansion Chamber

- Shear Pin (#120-511)
- Drive Disk (#120-509)
- Expansion Chamber Lid (#120-522)
- Diaphragm Support (#120-515)
- Diaphragm Retaining Ring (#120-508)
- Paddle Pin (#120-503)
- Sleeve (#120-501)
- Base (#120-516)
- Drive Pin (#120-512)
- Pivot Bearing (#120-504)
- Drive Bar (#120-510)
- Drive Disk Set Screw (#120-514)
- Paddle Shaft (#120-520)
- Molded Diaphragm
  - #120-502 - Below 400°F
  - #120-40-502 - Above 400°F
- Paddle (#120-506)
- Gasket (#120-513)
- Pivot Bearing Gasket (#120-505)
#120-519 Slurry Cup Assembly Without Expansion Chamber

- Shear Pin (#120-511)
- Drive Disk (#120-509)
- Locking Ring (#120-517)
- Diaphragm Support (#120-515)
- Diaphragm Retaining Ring (#120-508)
- Paddle Pin (#120-503)
- Paddle Shaft (#120-507)
- Molded Diaphragm (#120-502) - Below 400°F
  (#120-40-502) - Above 400°F
- Diaphragm Retaining Ring
- Paddle Pin
- Paddle
- Sleeve (#120-501)
- Gasket (#120-513)
- Base (#120-516)
- Drive Pin (#120-512)
- Pivot Bearing Gasket (#120-505)
- Pivot Bearing (#120-504)
1. WHS Nut, 4-40, \( \frac{3}{8}'' \times \frac{3}{16}'' \), Qty. 4
2. #120-619 Screw, Phillips, Pan Head, 2-56 × .125L
3. #120-616 Set Screw, Hex, 6-32 × .1875L, Qty. 3
4. #120-610 Screw, Phillips, Pan Head, 4-40 × .375L, Qty. 5
5. #120-614 Screw, Phillips, Countersink, 6-32 × .75L, Qty. 3
6. WHS Screw, Phillips, Pan Head, 4-40 × 1.5L, Qty. 4
7. #120-608 Screw, Hex Socket, 10-32 × .5L
8. #120-622 Set Screw, Hex, 8-32 × .25L, Qty. 2
Appendix
Calibration Stand Diagram

- Calibration Stand Base (#120-35-040A)
- Calibration Stand Shaft (#120-35-040D)
- Calibration Stand Block (#120-35-040C)
- Calibration Stand Pulley (#120-35-040E)
- Calibration Stand Wedge Block (#120-35-040K)
- Calibration Stand Pulley Arm (#120-35-040B)
- Rubber Feet, Qty. 4 (#171-44)
Appendix

Potentiometer Adjustment

The calibration spring has a zero point. If the contact arm is behind the zero point, the potentiometer will register a negative reading. If the contact arm drifts behind the zero point, it will be necessary to adjust the position of the spring.

1. Remove the potentiometer from the consistometer.

2. Loosen the three set screws on the bottom of the potentiometer.

3. Locate the spring holder on the top of the potentiometer. It may be positioned beneath the shaft bearing retainer. Push the spring holder to rotate the spring within the body of the potentiometer.

4. When the contact arm is again in front of the zero point, tighten the set screws to secure it in place.

5. The contact arm may drift while tightening the set screws. Recheck the position of the contact arm before using the potentiometer.
If there is no power to the machine, it could be that the fuse for the main power supply is blown or that the main circuit breaker has tripped.

1. Check the breaker switches and make sure they are in the on position.

2. Open the fuses holders to check the condition of the fuses. If they have blown, replace them.

The battery back up also has fuses that can be blown as well. If they are blown, they can be replaced as shown below.
Appendix

Chart Recorder

The OFITE HTHP Consistometer includes a digital chart recorder for displaying and recording test data. It features a removable drive for easily transferring test data to a PC for processing. The unit is setup to automatically record data onto the disk during the test. However, for this feature to work, you must have the disk inserted into the drive when the unit is powered on. Otherwise, the data must be manually archived at the end of the test.

![Image of chart recorder]

Eject Button
Recorder Disk

It is strongly recommended that you carefully study the instruction manual provided by the manufacturer before using this equipment.

To manually archive test data:

1. Press the “Menu” button.
2. Press “Operator” from the menu.
3. At the top of the screen, press “Security” and then choose “Log In”.
4. You will then be prompted for a UserID. Touch the UserID field and choose “Engineer” from the list.
5. Now touch the “Password” field. At the bottom of the screen, choose “Numeric” as the input method and then type “100” and press “OK”.
6. At the top of the screen, choose “Archive” and then choose “Local”.

Important

Menu Button
7. Now choose the data you wish to archive and press the appropriate button.

When the archive process starts, you will see a blinking green light at the top, right-hand side of the screen. When this light stops blinking, the archive process is complete.

The chart recorder is shipped to you with a pre-programmed configuration file. It is highly recommended that you do not change any of these settings. However, in case of emergency, it is possible to restore your configuration from the disk that is shipped with the unit.

1. Log in as “Engineer” as described in steps 1 through 5 above.

2. At the top of the screen, press “Save/Restore” and choose “Restore”.

3. Make sure all four options are selected, then touch the “File Name” field.

4. Press the up arrow to access the root directory.

5. Select “mediacard” and press the down arrow to access the disk.

6. Choose the file titled “config for consistometer” and press “Open”.

7. When the progress bar at the top of the screen stops, the restore process is complete.
To transfer the test data to a PC:

1. Remove the disk from the chart recorder and insert it into the appropriate drive on the PC.

2. From the Start Menu, select “Programs” then “Eurotherm” and then click “Review”. This will open the Eurotherm Review software application.

3. From the “File” menu, select “Transfer” and then click “Files”.

4. Click the “Browse” button, then choose the appropriate drive for your removable media. Open the “History” folder and select the files you wish to transfer.

5. Type a name in the “Name” field and click “OK”.

   At this point you will receive a warning message. Click “OK” again.

6. When the file transfer is complete, go to the “File” menu and click “New Chart”.

7. Click “Add Point”.

8. From the “Instrument” drop-down menu, choose the name you selected in step 5.
9. Choose “Group 1” from the “Log Group” menu.

10. Now, select the Point IDs you wish to display on the chart. Hold down the “CTRL” button to select more than one. Click “OK”.

11. The software will now create the chart based on the data collected from the test.

12. To jump directly to a specific data point, click the “Go To” button at the top of the screen. Choose the data point you wish to view and click “OK”.
Appendix

Errors

When the Universal Control Board in the HTHP Consistometer detects a hardware error, it will display the error code on the display screen. To acknowledge an error, press the scroll wheel. The test will continue despite the error.

Below is a list of error codes that could be displayed. If you encounter any of these errors, contact OFITE technical services for assistance.

0x0060: Unable to program the stepper motor controller. Check connector P5 on the Universal board.

0x4000: Eurotherm 3504 controller not found. Check the RS-485 cabling and connector P4 on the Universal board. The 3504 should be at MODBUS device address 1 and 19200 baud (the factory defaults). It also requires an RS-485 module in its COMS HA slot.

0x4001: Eurotherm 3504 firmware version is unknown. Upgrade the consistometer with firmware that supports the firmware version in the 3504.

0x4002: Eurotherm 3504 controller’s module 1 is not in Analog Input module. The 3504 must have this module in this slot for correct operation.

0x4003: Eurotherm 3504 controller’s module 2 is not in Triple Logic output module. The 3504 must have this module in this slot for correct operation.

0x4004: Eurotherm 3504 controller’s module 3 is not in Analog Input module. The 3504 MUST have this module in this slot for correct operation.

0x4005: Eurotherm 2408i indicator not found. Check the RS-485 cabling and controller P4 on the Universal board. The 2408i should be at MODBUS address 1 and 19200 baud (the factory defaults) or at MODBUS address 2 and 19200 baud. It also requires an RS-485 module in its COMS HA slot.

Below is a list of non-hardware errors.

RS-485 COM ERROR: There is a problem communicating with the Eurotherm 3504 and / or the Eurotherm 2408i.

TEMP CONTROL ERROR: The temperature controller is unable to properly regulate the temperature. This is usually caused by the HEATER switch being turned off during a test. However, it can also be caused by a heater failure.
The sample temperature is above the instrument’s operational limit. This error will turn off the heaters and the pump until the temperature returns to a safe level. This error indicates a major problem in the heater control circuit. Contact OFITE technical services for assistance.

This error applies to the bath temperature.

The pressure controller is unable to properly regulate the pressure. The following conditions can cause this error:
- The PUMP switch is not set to AUTOMATIC
- Loss of air pressure to the pump
- Incorrect air pressure setting

The pressure is more than 2,000 PSI (13.8 MPa) above the setpoint. The heaters and pumps will be turned off until the pressure returns to a safe level. Allow the cell to cool to below 200°F (93.3°C) and then manually release the pressure. This error indicates a problem in the pressure control circuit. Contact OFITE technical services for assistance.

The potentiometer is not sending voltage information to the control board. There are two likely causes. The DC VOLT switch may be turned off during a test. Or the contact arm on the potentiometer has lost contact with the resistor.

The sample thermocouple is unplugged. The heaters and pump will be turned off until the sample thermocouple is plugged back in.

The bath thermocouple is unplugged. The heaters and pump will be turned off until the bath thermocouple is plugged back in.

The pressure transducer is disconnected. The heaters and pump will be turned off until the pressure transducer is reconnected.

The Eurotherm 2408i has lost the connection to the potentiometer.

The MOTOR switch is not set to AUTOMATIC during a test.

The motor has stalled during a test. If the motor has stalled on accident, it can be restarted by turning it off for two seconds and then turning it back on. However, if there is excessive drag in the drive train or the cement slurry hardens, the instrument will have to be repaired.

To restart a stalled motor, the MOTOR switch must be off for at least two seconds. Flipping the switch quickly will not restart the motor.
Appendix

Multiple Instruments

It is possible to control multiple HTHP Consistometers from a single computer. To setup the software for multiple HTHP Consistometers, repeat the following procedure for each instrument.

1. Plug each instrument into a separate serial port on the computer.
2. On the computer, navigate to the “C:\Program Files (x86)” folder.
3. Locate the “HTHP Consistometer” folder and select it.
4. Hold down the CTRL key and then hit “C”. Then hold down the CTRL key and hit V. This will create a duplicate of the folder called “HTHP Consistometer - Copy”.
5. Choose a name to identify the new instrument.
6. Rename the new folder with the name of the instrument.
7. Locate the program file (.exe) inside the folder and rename it with the name of the instrument.

For convenience, create a shortcut to this file on the desktop.
8. Open the software using the new program file.
9. Change the “Archive Path” to a new folder.

Each instrument must have its own Archive Path.
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.