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Recording Atmospheric Consistometer

Part No. 120-80 (115V)
Part No. 120-80-1 (220V)

Instruction Manual

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Ver. 2.1

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Intro

The Model 80 Recording Atmospheric Consistometer is designed to condition cement slurries as specified within API Specification 10. Determination of rheological properties, examination of free water content, and evaluation of the API fluid loss test all require that the cement slurry be conditioned by an atmospheric consistometer. The OFITE Model 80 was specifically developed to perform these duties.

Description

A cement slurry is prepared according to the procedure outlined in the API Specification 10 and then placed in the slurry containers of the Model 80 Recording Atmospheric Consistometer. The slurry is stirred at 150 RPM by an API-designed paddle assembly. The temperature is controlled by a microprocessor, which displays the process temperature via a digital indicator. Consistency, measured in Bearden Units of Consistency, is determined by measuring the deflection of a calibrated spring. This deflection is created by the amount of torque that the cement slurry exerts on the paddle, which is a function of the consistency of the cement. The API defines 100 Bc as 2,080 g-cm of torque.

Features

- Electronic chart recorder displays real-time data
- Maximum Operating Temperature: 190°F (90°C)
- Microprocessor temperature controller with digital display
- Unit operates at atmospheric pressure
- Heat transfer fluid is circulated
- 1,500-Watt Heater
- Slurry container rotational speed is 150 rpm
- Dual sample container design
- Two alarms indicate termination of the test
- Cooling coils
- Stainless steel temperature bath
- Deadweight calibration unit
- Size: 30 × 16 × 18 inches (76.2 × 40.6 × 45.7 cm)
- Weight: 105 lbs (47.7 kg)
- Crated Size: 23 × 20 × 22 inches (58.4 × 50.8 × 55.9 cm)
- Crated Weight: 170 lbs (77.2 kg)

Requirements

- Water Supply for Cooling
- Water Drain
- 220 Volt, 50/60 Hz, 2.2 KVA Power Source
- 120 Volt, 50/60 Hz, 4.4 KVA Power Source

Components

#120-001 Mineral Oil; 1 Gallon; Qty: 3
#120-60-2 Frame Corner; Qty: 24
#120-60-4 Frame Bracket Catch Lip; Qty: 4
#120-60-5 Frame Extrusion; Qty: 2
#120-60-8 Frame Bracket; Qty: 4
#120-60-9 Frame Screw; Qty: 75
#120-60-10 ¼ Turn Frame Fastener; Qty: 6
#120-60-30 Tubing; ¼ OD × .035 Wall; Qty: 10
#120-75-3 Water Solenoid Valve; 240V
#120-75-5 Contactor; 230V
#120-75-7 Pulley Bushing
#120-75-8 Motor Timing Pulley
#120-75-9 Weight Hanger
#120-75-10 Slotted Weight Set
#120-75-11 Shear Pin Assembly
#120-75-13 Agitator Shaft
#120-75-14 Upper Cross Bar
#120-75-15 Lower Cross Bar
#120-75-16 Calibration Stand
#120-80-4 Temperature Controller
#120-80-5 Graphic Recorder
#121-002 Retaining Ring; Qty: 2
#121-003 Paddle Assembly; Qty: 2
#121-007 Rotator Thrust Bearing; Qty: 2
#121-008 Thermocouple
#121-009 Timing Belt
#121-013 Slurry Container; Qty: 2
#121-014 Container Bottom; Qty: 2
#170-44 ½" Rubber Foot; Qty: 4
#172-24 Solid State Relay; 240V; 25A
#174-13 Motor
#174-14 Motor Controller

#120-80 Recording Atmospheric Consistometer (115V):

#121-010 Heater (115V)

#120-80-1 Recording Atmospheric Consistometer (220V):

#121-010-1 Heater (220V)

Optional:

#120-82 Spare Parts for One Year for 120-80 (115V):

#120-602 Calibration Spring
#120-604 Potentiometer Resistor; Qty: 4
#121-001 Container O-ring; Qty: 8
#121-002 Retaining Ring; Qty: 2
#121-003 Paddle Assembly; Qty: 2
#121-006 Shear Pin; Qty: 10
#121-007 Rotator Thrust Bearing; Qty: 2
#121-008 Thermocouple
#121-009 Timing Belt; Qty: 2
#121-010 Heater (115V)
#121-013 Slurry Container
#121-014 Container Bottom; Qty: 2
#122-073 2-Amp Fuse; 5 mm × 20 mm; Qty: 6
#122-074 4-Amp Fuse; 5 mm × 20 mm; Qty: 6
#122-077 10-Amp Fuse; 5 mm × 20 mm; Qty: 6

#120-83 Spare Parts for One Year for 120-80-1 (220V):

#120-602 Calibration Spring
#120-604 Potentiometer Resistor; Qty: 4
#121-001 Container O-ring; Qty: 8
#121-002 Retaining Ring; Qty: 2
#121-003 Paddle Assembly; Qty: 2
#121-006 Shear Pin; Qty: 10
#121-007 Rotator Thrust Bearing; Qty: 2
#121-008 Thermocouple
#121-009 Timing Belt; Qty: 2
#121-010-1 Heater (220V)
#121-013 Slurry Container
#121-014 Container Bottom; Qty: 2
#122-072 1-Amp Fuse; 5 mm × 20 mm; Qty: 6
#122-073 2-Amp Fuse; 5 mm × 20 mm; Qty: 6
#122-075 7-Amp Fuse; 5 mm × 20 mm; Qty: 6

Installation



Important



Note

1. Carefully remove the unit from the crate and place it close to a water supply and drain.
2. Water supply and drain lines are ¼" NPT tube connections. Connect the water supply port to a 40 PSI (275.8 kPa) water source. The water drain is the port located near the middle of the lower back instrument panel.
3. Fill the bath with enough mineral oil (or water) to submerge the slurry containers at least half way.

Do not overfill the bath.

4. Connect the unit to a grounded and fused (20-amp for 115V; 10-amp for 220V) electrical supply.
5. The rotational speed of the unit may need to be adjusted periodically.
 - a. Turn on the electrical power and start the motor.

Make sure the Alarm switches are turned off. If the alarms switches are on when the power is turned on, the alarms will sound until the chart recorded starts completely.

- b. Measure the rotational speed of the rotators with a hand held tachometer. The rotational speed should be 150 RPM \pm 15.
- c. If adjustment is required, loosen the three screws on the back panel of the unit and open the door. Directly to the right of the motor is the motor speed controller.
- d. To increase the rotational speed, turn the speed control potentiometer clockwise. Turn it counter-clockwise to reduce the speed.

Setup

Chart Recorder

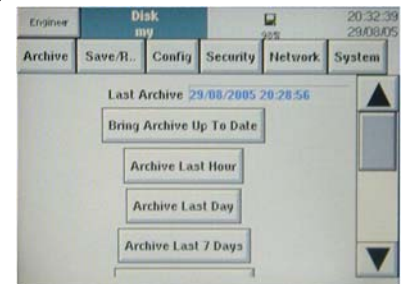
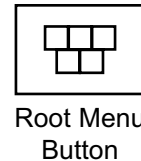
The OFITE Recording Atmospheric Consistometer includes a Eurotherm Chessell 6100V chart recorder for displaying and recording test data. It features a removable Compact Flash drive for easily transferring test data to a PC for processing. The unit is setup to automatically record data onto the disk during 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.



It is strongly recommended that you carefully study the Eurotherm Chessell 6100V instruction manual before using this equipment.

To manually archive test data:

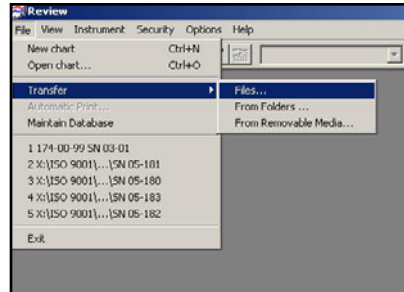
1. Press the “Root” button.
2. Press “Operator” from the root menu.
3. At the top of the screen, choose “Archive” and then choose “Local”.
4. Make sure the Media field is set to “mediacard”.
5. Now choose the data you wish to archive and press the appropriate button.



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.

To transfer the test data to a PC:

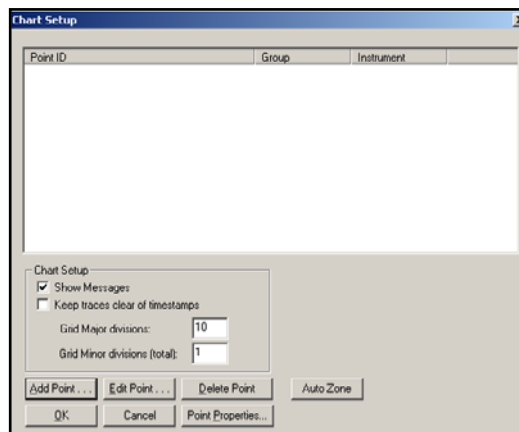
1. Remove the disk from the chart recorder and insert it into the appropriate drive on the PC.
2. From the Start Menu, select “Programs” then “Eurotherm” and then click “Review”. This will open the Eurotherm Review software application.
3. From the “File” menu, select “Transfer” and then click “Files”.



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”.

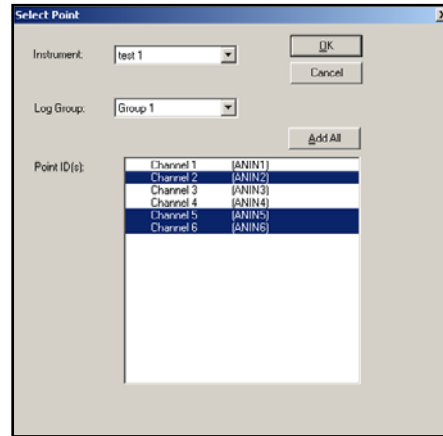
At this point you will receive a warning message. Click “OK” again.

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

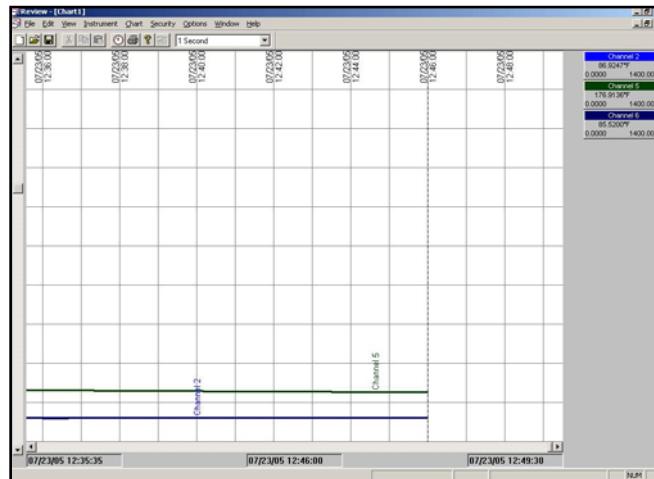


8. From the “Instrument” drop-down menu, choose the name you selected in step 5.

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".



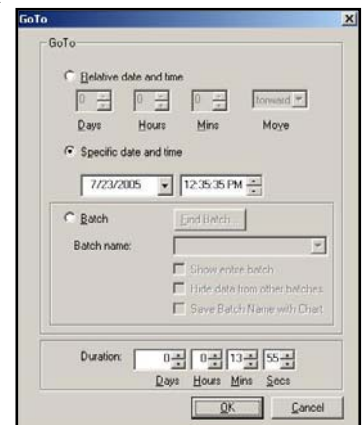
11. The software will now create the chart based on the data collected from the test.



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".



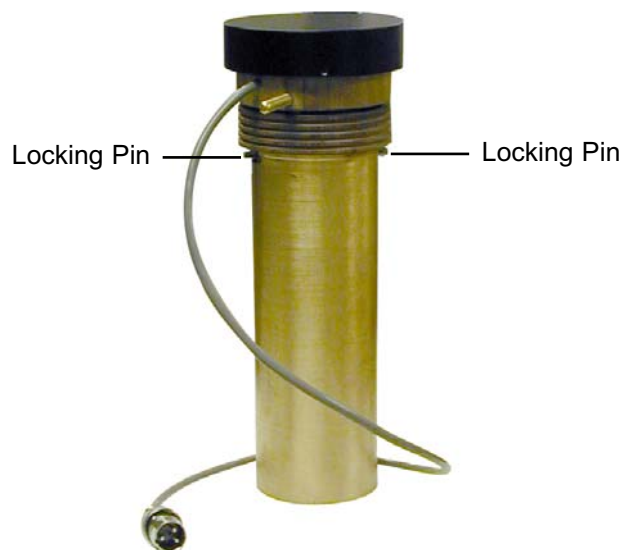
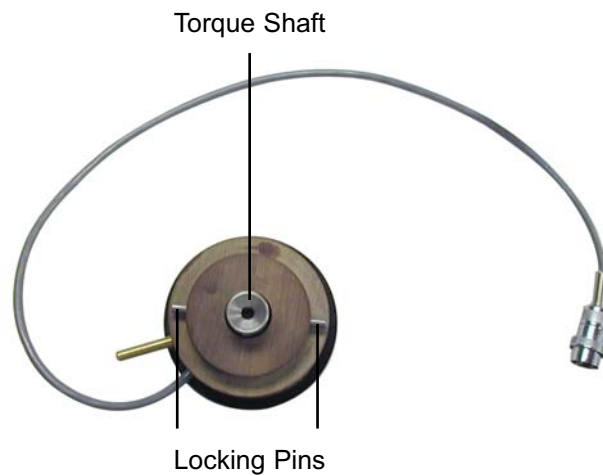
Go To



Setup

Loading the Test Cells

1. Prepare the cement slurry as specified in API Specification 10.
2. Cover the paddle surface with a light coating of grease. This will facilitate cleaning after the test is complete.
3. Pour the cement slurry into the test cell.
4. Insert the paddle into the test cell. Make sure the point on the end of the paddle is inserted into the hole in the bottom of the test cell.
5. Place the lid on the test cell by sliding the torque shaft over the end of the paddle. Turn the lid clockwise until the pin in the torque shaft engages with the slot in the paddle shaft.
6. Lock the lid in place on top of the test cell.



7. Lower the test cell into the bath and lock it in place with the locking pins.
8. Plug the potentiometer cables into the corresponding ports on the unit cabinet.

Operation

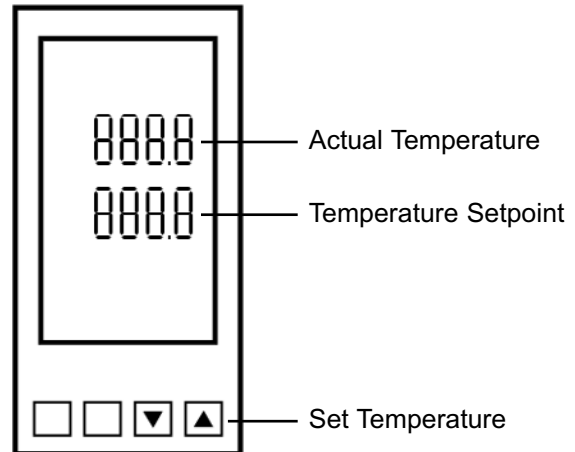
Testing

The OFITE Recording Atmospheric Consistometer performs two functions. It can be used to condition a cement slurry or to perform a thickening time test as detailed in API Specification 10.

When performing a thickening time test, the unit will stir and heat the sample until it reaches the specified consistency. When the test is complete, an audible alarm will sound for 30 seconds to alert the operator.

To condition a cement slurry, the unit will run for 20 minutes and then sound an audible alarm for 30 seconds.

1. Turn the “Main”, “Heat”, “15 VDC”, and “Chart” switches on.
2. Set the appropriate temperature on the temperature controller.



Temperature Controller

3. Load one or both test cells. Refer to “Setup - Loading the Test Cells” on page 9 for details.

It is very important that you begin the test within one minute of mixing the cement slurry.

4. Turn the “Motor” switch on.
5. Create and start data batches on the chart recorder. Refer to “Operation - Chart Recorder” on page 13 for details.
6. Turn both “Alarm” switches on. If you are only using one test cell, turn on the “Alarm” switch for that cell only.
7. Press both “Condition/Test” buttons. If you are only using one test cell, push the button for that cell only.



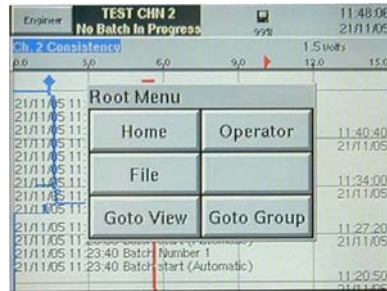
8. When the test or conditioning is complete, an alarm will sound for 30 seconds and the chart recorder will stop the batch. Turn off the "Alarm" switch to stop the alarm.
9. Turn the "Heat", "15 VDC", and "Motor" switches off.
10. Immediately remove the test cells and thoroughly clean them with soap and water. Be sure to remove any residual cement.

Operation

Chart Recorder

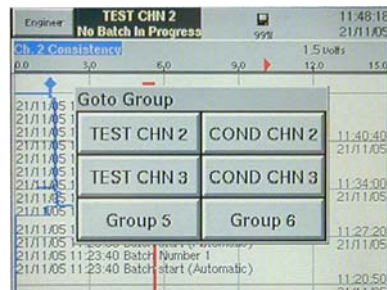
The chart recorder in the OFITE Recording Atmospheric Consistometer records data in batch form during a test or condition cycle. You should start a new batch before each cycle. If you do not, the chart recorder will automatically use the name of the previous batch to store the new test data.

1. Press the “Root Button” and select “Goto Group”.

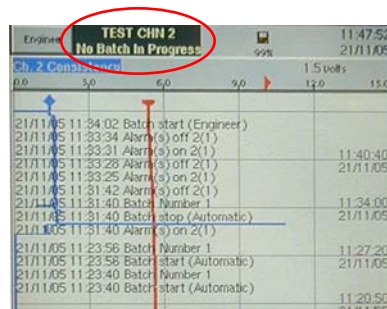


2. Select a group:

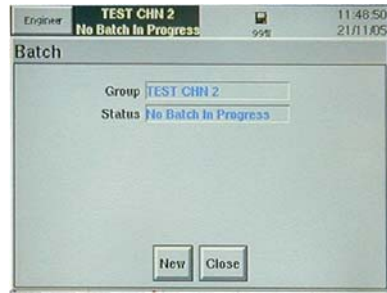
TEST CHN 2:	To perform a test on the left-hand test cell
COND CHN 2:	To condition the left-hand test cell
TEST CHN 3:	To perform a test on the right-hand test cell
COND CHN 3:	To condition the right-hand test cell
Group 5:	Not used
Group 6:	Not used



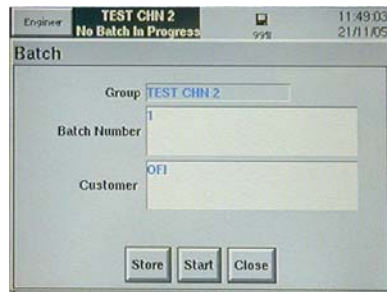
3. The current group will be displayed near the top left corner of the screen. Press this button to control the batch process.



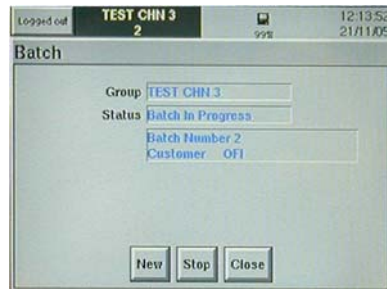
- Press the “New” button to begin a new batch.



- Enter a batch number and customer information in the appropriate boxes.

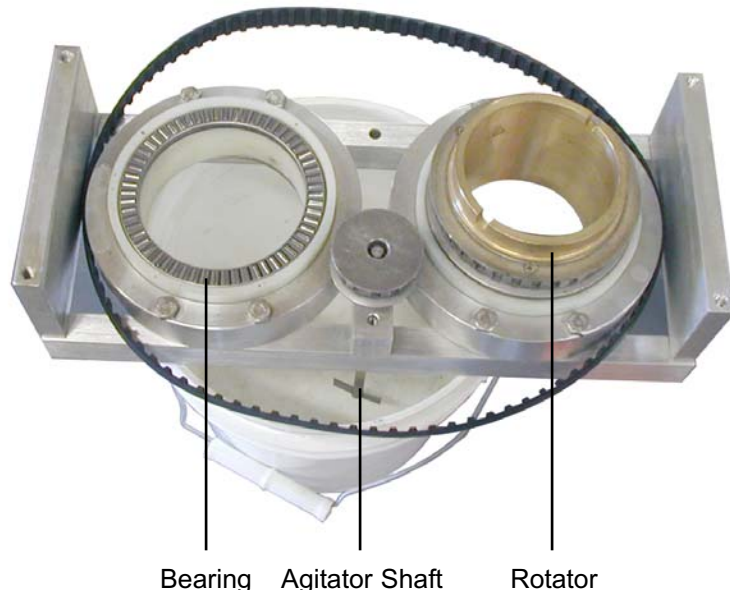


- Press the “Store” button to save the batch name. Now, when you press the “Test / Condition” button, a batch with the name you just entered will be started automatically.
- To stop a batch, press the group button at the top of the screen.
- Press the stop button.



Maintenance

1. The belt and thrust bearings that drive the rotators should be inspected periodically. To disassemble the unit to access the bearings and belt:
 - a. Disconnect the unit from all electrical power.
 - b. Remove the back protective cover plate.
 - c. Loosen the screws on the motor mount and push the motor forward.
 - d. Release the belt from the motor timing sprocket.
 - e. Remove the upper cover plate and set it on blocks or on a bucket to prevent damage to the agitator shaft.
 - f. Loosen the four screws allowing the top plate to be removed from the bearing housing.
 - g. Pull out the rotator and examine the thrust bearings for damage and wear. Periodically clean the bearings by lightly spraying them with WD-40. If they do not turn freely and smoothly, replace them with new bearings.
 - h. Inspect the belt for damage or wear. If necessary, replace it with a new belt.
 - i. Re-assemble the unit, pushing the belt through the bath slot.
 - j. Pull the motor back only enough to prevent belt slippage. Allow approximately $\frac{3}{4}$ " to 1" slack in the timing belt to prevent excessive side thrust to the bearings.



2. The bath should be checked and cleaned annually.
 - a. Access the bath housing as described in steps a through f on the previous page.
 - b. Visually inspect the mineral oil in the bath. If it contains any foreign material, pour out the entire contents and refill with clean mineral oil.
3. Containers and paddles should be kept as clean as possible. A light coating of grease on these components will facilitate cement removal.

Calibration

Calibrating the torque head provides a reference point for interpreting test results. The calibration kit provided uses dead weight to simulate resistance on the torque head. To calibrate, four different weights are applied and the corresponding chart recorder readings are recorded. During operation, compare the chart recorder reading to those recorded during calibration to determine the amount of resistance being put on the torque head.

Before calibrating the torque head, test the container paddle for excessive friction by running the sample container without any cement slurry in it. If the paddle is bent and rubbing on the side of the sample container or if the bearings are damaged, excessive friction will show on the dial. Correct any defects before calibrating the torque head.

Calibration instructions are described in API-RP-10-B. Your instrument is equipped with an instrument-mounted calibration unit.

1. Place the torque head onto the calibration stand.
2. Place the calibration ring around the torque head.
3. Wrap the deadweight calibration cord counter-clockwise around the calibration ring and over the roller.
4. Place 400 g on the weight hanger and attach it to the calibration cord.

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

5. Pull the weight down several times to obtain an average reading.
6. Repeat this process with 100 g, 200 g, and 300 g. Record each weight and the corresponding reading. These values will help you interpret the potentiometer readings.



Note