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Atmospheric Consistometer

#120-75 (115V)
#120-75-1 (220V)

Instruction Manual

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Ver. 2.1

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Intro

The Model 60 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 60 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 60 Atmospheric Consistometer. The slurry is stirred at 150 RPM by an API-designed paddle assembly. The temperature is controlled by a micro-processor, 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

- Maximum operating temperature of 200°F
- Unit is operated at atmospheric pressure
- Temperature is maintained via a PID controller
- Process temperature is displayed digitally
- Heat transfer fluid is continuously circulated
- Heater wattage is 1,500
- Slurry container rotational speed is 150 rpm
- Dual container design
- Cooling system included
- Stainless steel temperature bath
- Deadweight calibration unit
- Size: 24 × 16 × 18 inches (61 × 40.6 × 45.7 cm)
- Weight: 95 lbs (43.1 kg)
- Crated Size: 28 × 20 × 22 inches (71 × 50.8 × 55.9 cm)
- Crated Weight: 160 lbs (72.6 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
#120-60-30	Tubing; ¼ OD × .035 Wall; Qty: 10
#120-75-6	Cabinet
#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; Qty: 2
#120-75-12	Calibration Adapter Ring
#120-75-13	Agitator Shaft
#120-75-14	Upper Cross Bar; Qty: 2
#120-75-15	Lower Cross Bar; Qty: 2
#120-75-16	Calibration Stand
#120-80-4	Temperature Controller
#121-001	Container O-rings; Qty: 2
#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
#121-020	Rotator Assembly; Qty: 2
#121-022	Rotator Housing; Qty: 2
#121-030	Container Lid; Qty: 2
#122-054	Idler Support with Bearings
#152-38	AC Power Cord; 3-Conductor International (Continental European)
#170-44	Rubber Foot; ½"; Qty: 4
#171-44	Rubber Foot; ¾"; Qty: 4
#172-24	Solid State Relay; 240V; 25A
#174-13	Motor
#174-14	Motor Controller

#120-75 Atmospheric Consistometer (115V) Only:

#120-75-2	Water Solenoid Valve; 120V
#121-010	Heater; 115V
#170-34	¼" × ¼" NTP Male Needle Valve

#120-75-1 Atmospheric Consistometer (220V) Only:

#120-75-3	Water Solenoid Valve; 240V
#120-75-5	Contactator
#121-010-1	Heater; 220V

Optional:

#120-76	Spare Parts for #120-75:
#120-602	Calibration Spring; Qty: 2
#121-001	Container O-rings; Qty: 8
#121-002	Retaining Ring; Qty: 2
#121-003	Paddle Assembly; Qty: 2
#121-005	Cap Nut
#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
#121-012	1 Amp Fuse; ¼" × 1¼"; Qty: 4
#121-013	Slurry Container
#121-014	Container Bottom; Qty: 2
#122-073-1	3 Amp Fuse; 5mm × 20mm; Qty: 4
#122-077	10 Amp Fuse; 5mm × 20mm; Qty: 4

#120-76-1	Spare Parts for #120-75-1:
#120-602	Calibration Spring; Qty: 2
#121-001	Container O-rings; Qty: 8
#121-002	Retaining Ring; Qty: 2
#121-003	Paddle Assembly; Qty: 2
#121-005	Cap Nut
#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
#121-012	1 Amp Fuse; ¼" × 1¼"; Qty: 4
#121-013	Slurry Container
#121-014	Container Bottom; Qty: 2
#121-016	7 Amp Fuse; ¼" × 1¼"; Qty: 4
#172-09	10 Amp Fuse; Box of 5; Qty: 4

Setup



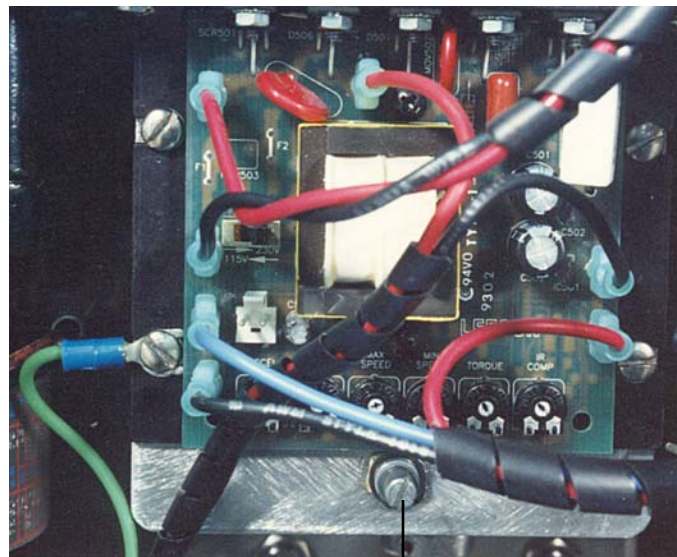
1. Carefully remove the unit from the crate and place it close to a water supply and drain.

Water supply and drain lines are ¼" tube connections and the water supply port should be connected 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.

2. Fill the bath with enough mineral oil to submerge the test cells at least half way.

Do not overflow the bath.

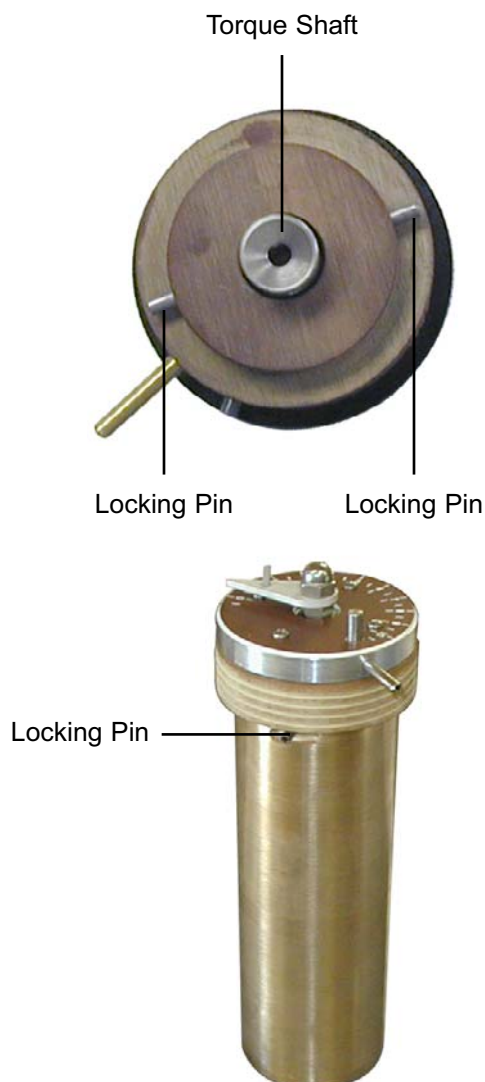
3. Connect the unit to a grounded and fused 10-amp electrical supply.
4. The rotational speed of the unit may need to be adjusted periodically.
 - a. Turn on the electrical power and start the motor.
 - b. Measure the rotational speed of the rotators with a hand held tachometer. The rotational speed 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 potentiometer.
 - d. To increase the rotational speed, turn the speed control potentiometer clockwise. Turn it counter-clockwise to reduce the speed.



Potentiometer

Loading the Test Cells

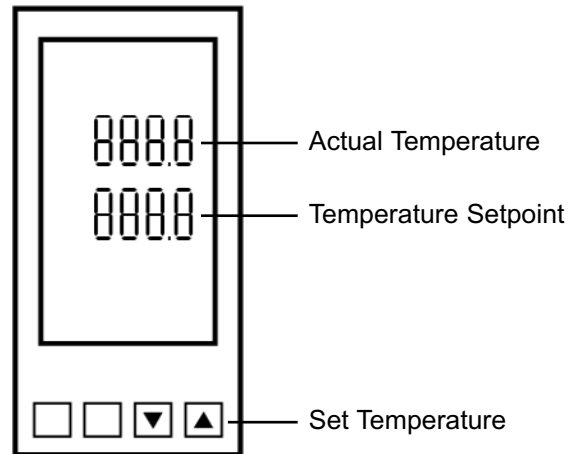
1. Prepare the cement slurry as specified in API Specification 10.
2. Cover the paddle surface with a light coating of grease. This will facilitate cleaning after the test is complete.
3. Pour the cement slurry into the test cell.
4. Insert the paddle into the test cell. Make sure the point on the end 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. Continue turning the lid to lock it 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.



Operation

The OFITE 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.

1. Turn the “Main” and “Heat” 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 6 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. When the test or conditioning is complete, turn the “Heat” and “Motor” switches off and turn the “Cool” switch on.
6. When the test cells are cool enough to touch, remove them from the unit and thoroughly clean them with soap and water. Be sure to remove any residual cement.

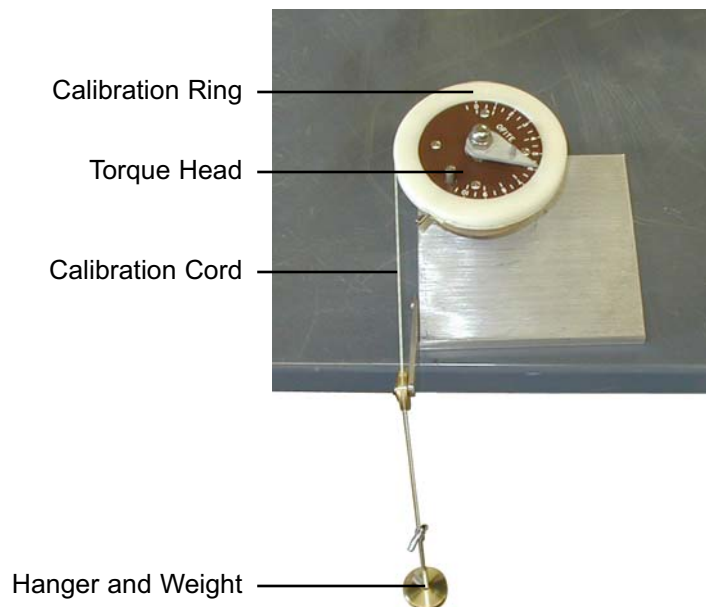
Calibration

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 torque head readings are recorded. During operation, compare the torque head 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 (refer to the maintenance section on page 10 for more information). 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.





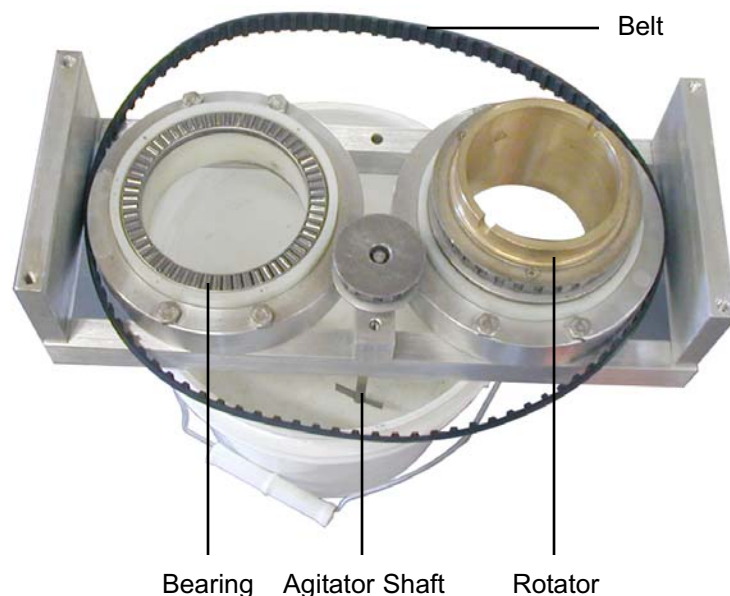
Note

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.

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.

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.
4. The unit has four fuses, located on the front panel beneath the four power switches. If any of the switches stop working, check the corresponding fuse. To remove a fuse, twist and pull the knob. After replacing the fuse, reinsert it into the slot and twist it to secure it in place.