



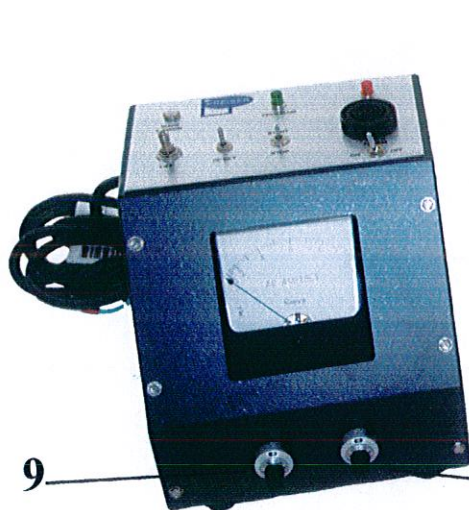
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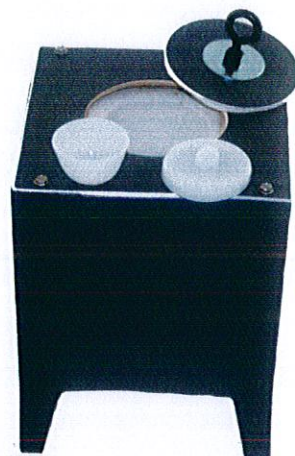
An ISO 9001:2008 Certified Company

INSTRUCTION MANUAL

FREE SWELLING INDEX ELECTRIC FURNACE ASTM D-720



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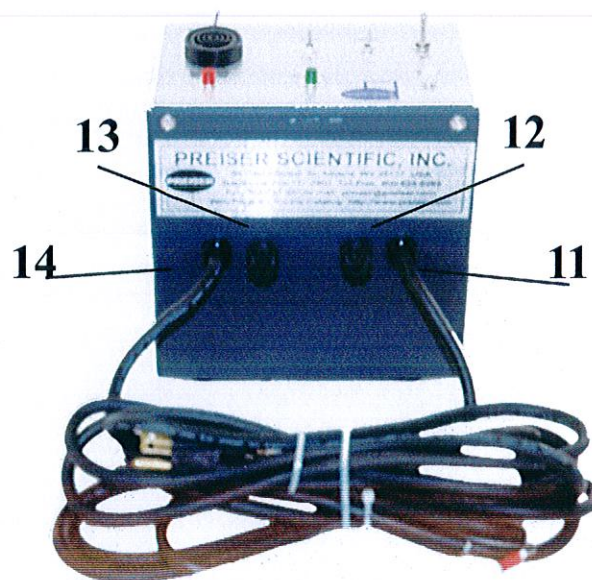
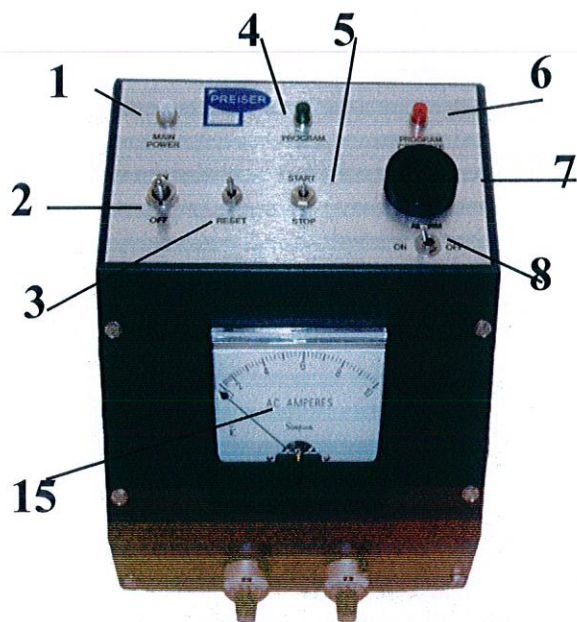
Temperature Control Unit
w/Automatic Timer and Alarm

Furnace with Lid
& Crucible with Lid

Crucible Holder

1. Main Power Indicator Lamp
2. Main Power On/Off Switch
3. Reset Switch (Resets Control Unit)
4. Green Lamp (Program On) Lamp Turns on when Program is Started
5. Program Start / Stop Switch
6. Red Lamp (Program Complete) Turns on at End of 2-1/2 Minute Program
7. Alarm (Audio Alarm Tone) If Desired, Turns on when Program is Complete
8. Alarm On / Off Switch - Turns On or Off Audio Tone as Desired

9. "HI" Current (7.4amp Current Adjust) Adjusts Current Output During First 1-1/2 Minute of Program
10. "LO" Current (6.8amp Current Adjust) Adjusts Current Output During Last 1 Minute of Program
11. Control Unit to Furnace Connecting Power Cord
12. 8 Amp Fuse
13. 1/2 Amp Fuse
14. Main Power Cord - Plug Into 115Vac Power Supply
15. Meter Displays - Output Current



INTRODUCTION

As illustrated herein, the basic unit consists of an electric furnace whose heat input is controlled at two levels by an electronic circuit. The maximum power requirement for the furnace is 960 watts.

The ASTM Standard Method of Test Designation D 720 is empirical and consists of heating a one-gram sample of coal in a closed crucible of prescribed size and shape. The heating schedule is such that a temperature of $800^{\circ}\text{C} \pm 10^{\circ}\text{C}$ is reached in 1-½ minutes and $820^{\circ}\text{C} \pm 5^{\circ}\text{C}$ at the end of 2-½ minutes.

CALIBRATION

Prior to running a test, the FSI unit is set-up and calibrated as follows:

Step 1 Connect control unit to furnace, using control unit to Furnace power cord.

CAUTION !! STEP 1 MUST BE DONE BEFORE PLUGGING MAIN POWER CORD
ON CONTROL UNIT INTO 115Vac POWER SUPPLY.

Step 2 Plug main power cord into 115Vac power supply.

Step 3 Place Start / Stop switch in stop position.

Step 4 Place main power On / Off switch in the On position.

NOTE !! Main Power Indicator Lamp Should Be ON.

Step 5 Allow 30 to 45 minutes warm up time for furnace.

Step 6 Switch the lock on the left turn dial in the upward position thus unlatching the dial.
Now adjust the dial to reach a 7.4 amp current reading on the meter.

NOTE: The numbers labling the turn dial have no relationship with the current adjustment
or current output shown on the ammeter.

Step 7 Place program Start / Stop switch in Start position.

Step 8 Wait 1-½ minutes.

Step 9 Switch the lock up on the right turn dial, adjust the dial to reach a 6.2 amp current reading on the meter.

NOTE ! After the 1-½ minutes in Step 8, YOU HAVE 1 MINUTE ONLY during which to make the adjustment in Step 9 - If you take longer than 1 minute, the program complete light comes on and you must reset unit and wait 1-½ minutes before adjusting the 6.8 amp reading.

NOTE ! The 7.4 and 6.8 amp adjustments are approximate, and will set the temperature close to that required by ASTM for this test. The finished adjustment should be made using a calibrated temperature indicating instrument. Vary the left and right adjustments to meet with the specifications, according to the following procedure:

- (A) Lower an empty crucible with pierced lid into the furnace. Measure the temperature at the base of the crucible with a thermocouple. At the end of 1-½ minutes, the temperature should be $800^{\circ}\text{C} \pm 10^{\circ}\text{C}$. Adjust the "HI" current adjustment (approx. 7.4 amps) as necessary to provide this temperature.
- (B) After 1-½ minutes, adjust "LO" current adjustment so that the ammeter reads approximately 6.8 amps. A temperature of $820^{\circ}\text{C} \pm 5^{\circ}\text{C}$ must be attained at the end of 2-½ minutes.
- (C) Several trials will probably be necessary before the proper temperatures at 1-½ and 2-½ minutes are reached; however, the information given above provides a general guide for calibration. The silica crucible and cover must be at room temperature before each calibration run.
- (D) After each calibration attempt or sample run, switch the Start / Stop switch to the Stop position and place Reset switch to Reset position and release.

Step 10 After calibrating the furnace place the locks on both dials in the down position locking each to prevent unwanted adjustment. You are now ready to begin the test.

OPERATING PROCEDURES

- (A) Place program Start / Stop switch in Stop position.
- (B) Place Reset switch to Reset and release.
- (C) If audio alarm is desired, place alarm On / Off switch to On position.
- (D) Place sample in crucible.
- (E) Place crucible in crucible holder.
- (F) Lower sample into furnace and when completely lowered, place program Start / Stop switch in Start position.
- (G) When program complete light comes on and if desired, audio alarm sounds, remove sample from furnace. The test is complete.
- (H) Place Start / Stop switch in Stop position and place Reset switch to Reset and release. System is now in standby condition, and you are ready to run additional tests. Refer to ASTM instruction D 720. See sections on preparation of a sample and test procedures.

NOTE !

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NOTE !

INSTRUCTIONS FOR REPLACING THE WIRE STIRRUP (P/N FRS-410140A)

- 1) INSERT ENDS OF WIRE STIRRUP INTO THE BOTTOM OF THE MOUNTING BLOCK.
- 2) ADJUST SO THAT THE DISTANCE FROM THE TOP OF THE WIRE RING TO THE BOTTOM OF THE MOUNTING BLOCK IS 2-¼ INCHES.
- 3) SECURE THE WIRE STIRRUP IN MOUNTING BLOCK BY TIGHTENING THE TWO SCREWS.

FREE SWELLING INDEX APPARATUS PARTS LIST

ASTM D 720

<u>PART NUMBER</u>	<u>DESCRIPTION</u>
FRS-410001A1	Controller Only
FRS-410015A	Furnace Only
FRS-410018A	Furnace Chimney
FRS-410019B	Corner Clamp Brackets
FRS-410020B	Corner Piece Complete Assembly
FRS-410024B	Heating Element Support
FRS-410025A	Wired Clay Heating Element
FRS-410029A	Heating Element Wire Only
FRS-410032B	Crucible Cover (Pierced)
FRS-410033B	Crucible Cover (Ring)
FRS-410034B	Crucible
FRS-410140A	Wire Stirrup
FRS-410043A	Wire Stirrup Mounting Block
FRS-410045A	Crucible Holder Complete Assembly
FRS-410046A	Crucible Holder Fibre Handle
FRS-410056B	Input Power Terminal Block
FRS-410076A	Input Power Terminal Block Complete Assembly
FRS-419201A	Power Output Board
FRS-419301A1	Timing and Trigger Board

