

“Analytic” Sample Roaster, Model 4

Short Form Operating Instructions

San Cristobal Coffee Importers

Roasting System Components



Chaff accumulates on the top of the roaster case during the roasting process. It falls into the chaff collection tray when the roaster is lifted to pour roasted coffee into the cooling tray

Roaster Controls



RAPID GUIDE INSTRUCTIONS

(Please read the remainder of this manual to learn how the roaster functions and how to use it to best meet your objectives)

- Turn on the **Power**, set the **Temperature Control (10)** to position **#3**, and wait 15 - 20 minutes for the temperature to stabilize. The **Heating On (8)** indicator will change from continuously lit to blinking when the temperature is near the level selected with the roasting chamber **Select Temperature (2)**
- Weigh out 200g of cleaned and size graded (>screen 14) green coffee to roast, turn on the **Motor (4)**, lift the **lid opening lever (6)**, and pour the coffee into the roasting chamber. Close the **lid opening lever (6)**.
- Set the roast-done alarm temperature by lifting the **Select Temperature (2)** to "**Alarm Set**" and adjusting the **Roast Done (3)** Alarm Temperature Adjust control to show the desired temperature on the **Display (1)**. Example: choose 218°C for a "Medium" roast that is generally used for formal coffee evaluation.

- d. The alarm will begin to sound in ½ second “beeps” approximately one minute before the coffee reaches the temperature that was set in step C, above. Turn on the **Cooler** with the switch on the right hand side. When the coffee reaches the set temperature the alarm will sound continuously; immediately lift the roaster with the **handle on the right side (7)** and pour the coffee out of the roaster and into the cooling tray. Turn off the stirring **Motor (4)**. If you are not using the roaster’s powered fan cooler, be sure to cool the coffee to below 27°C in less than four minutes.
- e. To continue roasting, start with step b, above and repeat c, and d; no waiting time is necessary. Otherwise, simply power down the roaster.

WARNINGS

- THE ROASTING CHAMBER GETS VERY HOT AND CAN PRODUCE SERIOUS BURNS; NEVER TOUCH OR PUT FINGERS INTO THE HOT ROASTING CHAMBER
- Always use caution in handling the roaster when it is powered on
- Always use the roaster with a three wire power cord and a good ground connection.
- Always use the roaster in a safe place protected from weather and water.

Theory Of Operation and Use of Controls

The roaster should warm up to stabilize the roasting chamber temperature for about 20 min before starting to roast coffee:

The chamber temperature is controlled with a proportional controller that varies the amount of energy to the electric heating element in proportion to the difference between the actual temperature of the roasting chamber and the desired temperature as set by the front panel **Temperature Control (10)**. True proportional control occurs when actual temperature is relatively close to the desired temperature. If it is not, the heating element will be energized continuously or turned off continuously, depending if the actual temperature is far too low or far too high, respectively.

The “**Heating**” **light (8)** indicates when there is power going to the heating element and thus provides good information to the operator about the temperature status of the roasting chamber; it allows the operator to judge the temperature of the roasting chamber with respect to the setting of the Temperature control. When the roaster is first turned on, the “**Heating**” **light (8)** will be lit continuously as the chamber heats from room temperature to the selected temperature. As the chamber temperature approaches the selected temperature, the proportional controller will begin to modulate the power and the light will begin to blink on and off. When the chamber temperature is much higher than the desired temperature, as is the case when the temperature switch is turned from a higher to a lower temperature setting, the “**Heating**” **light (8)** will go out until the lower temperature is approached and then the light will again begin to blink as the proportional controller begins to make fine adjustments.

The design-center quantity of coffee to roast is 200 grams:

For optimum consistency and precise repeatability of roast profile, it is strongly recommended that each batch to be roasted is 200 grams and is accurately weighed.

Although the roaster can accommodate quantities from about 100 grams to about 250 grams, the roasting times and roasting profiles will vary accordingly; less coffee will roast more quickly, and more coffee will take more time. The roasting profiles vary according to the weight of the sample. The minimum quantity of coffee is set by not having enough coffee in the chamber to reach the bean temperature probe. The maximum quantity is set by overloading the roasting chamber to the point where coffee begins to fall out of the vent holes near the top of the roasting chamber.

The green coffee to roast should be clean with all beans larger than screen 13.

It is important to clean the green coffee; broken beans, chips, and small beans can jamb the roaster's stirring mechanism. If a jamb occurs, the stirrer will automatically reverse for 2 seconds to clear the jamb. If the jamb does not clear automatically one can open the lid and use a hot pad to grab to top of the stirrer to try and free it up. If this fails, the roast must be aborted; pour the beans in the cooling tray, and turn off the roaster. After it has cooled down one can use a tool to clear up the jamb.

If too much coffee is put into the roaster, some of it will begin to fall out of the vent holes near the top of the roasting chamber. It is best to always roast 200 grams of green coffee.

The green coffee to roast should be 11-12% moisture content

Bean moisture content affects roasting time; lower moisture beans roast more quickly. "Weter" beans take longer to dehydrate and get to the temperature where chemical changes that define the roasting process begin to happen. This will cause significant changes in roasting time but much less to the Roast Profile that defines the roasted coffee's flavor characteristics.

Using the "Roast Done" Alarm:

The "Roast Done" alarm is set to the desired bean exit temperature by raising the spring-loaded **Alarm Set (2)** switch and adjusting the **Alarm Temperature (3)** control until the desired bean exit temperature shows on the **Bean Temperature (1)** display. When the **Alarm Set (2)** is in the center position, the **Bean Temperature (1)** display shows the bean temperature measured by the bean temperature probe. When the spring-loaded **Alarm Set (2)** switch is raised, the display changes to show the bean exit temperature set point which may be adjusted to any temperature between 202°C and 224°C by turning the **Alarm Temperature (3)** control knob. The alarm will begin to sound at one second intervals when the coffee is about 5 degrees below the target temperature (about one minute before the roast is done). The alarm sound will change from beeping to a continuous note when the set temperature is reached; the coffee should then be poured out of the roaster immediately.

Using “Chamber Temperature” information:

When the spring loaded **Temperature Display (2)** selector switch is pushed downwards the display shows the temperature of the base of the roasting chamber. This information is used by the roaster’s temperature controller and also to calibrate the roaster’s 5 chamber temperature settings as selected on the front panel **Roasting Chamber Temperature Control (10)**. These data are also used to assist the user when the **Roasting Chamber Temperature Control (10)** is used to manually create a “profile roast” by selecting different chamber temperatures during the roast. This allows the user to emulate a commercial roaster; by adjusting and documenting chamber temperature and bean temperature during the roast. In this way the user is able to repeat a desirable profile roast developed on the Model 4 Fincalab® in a large commercial roaster, and vice versa.

Using the Motor & Alarm on/off switch:

The **Motor switch (4)** controls the stirring motor and the audible “Roast Done” alarm. The “Roast Done” alarm is muted when the motor is powered off. Upon power-on, the motor always starts for 2 seconds in the reverse direction; this is to free-up the stirring vanes in the event that coffee bean fragments have jammed the stirrer. If the stirrer jams, the user can power-off the motor for a few seconds. When the motor is restarted the reverse operation should clear the jamb. In the event that it is not possible to clear the jamb with a few power cycles, use a small piece of wood to nudge the stirrer in the reverse direction 5 or 10 degrees of rotation.

CAUTION! HIGH TEMPERATURES!

- **BE CAREFULL TO NOT BURN YOURSELF**
- **NEVER TOUCH THE BEAN TEMPERATURE PROBE**
- **BE VERY CAREFULL TO NOT BEND THE STIRRING VANES**

A brief stirrer reversal usually clears up the problem. The stirrer very seldom jams when the roaster is used to roast coffee of reasonable quality that does not have many damaged, broken, or very small beans.

Roasting Coffee:

It is strongly recommended that the green coffee to be roasted is clean and size graded to remove very small and broken beans; small and broken beans heat more quickly; they will burn during roasting and change the flavor profile of the coffee.

Fixed Temperature Roasting:

Select a roasting chamber temperature using the **Temperature Control (10)**, allow the roaster to stabilize for a few minutes at this temperature, turn on the

motor, load the roasting chamber and begin to roast. Simply follow the steps in the Rapid Guide above.

When the **Temperature Control (9)** is set to position # 3, 200 grams of green coffee with 11% moisture content will roast to 218°C in about 11 minutes. This is a good cupping roast as the coffee has had sufficient roast development to exhibit terroir based nuances.

The roaster can be reloaded with green coffee immediately after roasted coffee is removed; even before the roasted coffee has been cooled. The time between roasts is limited only by the time needed to remove the roasted coffee and load the following batch of green coffee into the roaster. It is not necessary to stop the stirring motor.

Temperature Profile Roasting:

The temperatures available with the **Temperature Control (10)** change the temperature of the roasting chamber in increments of approximately 20°C. The **Temperature Control (10)** may be changed by the operator at any time during the roasting process just like turning the burner knob on an electric stove. Clockwise rotation, increasing numbers, raises the temperature. Counter clockwise rotation, decreasing numbers, decreases the temperature.

The operator can experiment with different roast profiles simply by increasing or decreasing the chamber temperature at any time during the roast by turning the **Temperature Control (10)** up or down.

Example Continuously Accelerating Profile Roast:

The six temperature levels that are available (# 0 -heater off- and # 1 through # 5) are factory preset to allow the user to roast a 200 gram sample with a continuously accelerating bean temperature profile that emphasizes sweetness and acidity. The continuously accelerating profile is attained by first stabilizing the chamber temperature at **Temperature Control (10)** position #1, then manually advancing the **Temperature Control (10)** from # 0 to # 5 in two minute intervals after coffee is poured into the chamber.

Thus, the profile roast procedure is as follows: after the chamber temperature is first stabilized with the **Temperature Control (10)** set to position # 1, the coffee is loaded into the chamber and the **Temperature Control (10)** is immediately changed to position # 0 to initiate the sequence of two minute intervals. The temperature control is thereafter increased one step at a time in two minute intervals until the coffee reaches the desired exit temperature.

After the coffee is removed from the roaster, the temperature control must be returned manually to position #1 and the roaster allowed to stabilize at this lowest temperature before the next profile roasting cycle is begun; this cooling process generally takes 2 – 3 minutes overall. The “Heater” light will go out as the roaster cools; when the roaster has cooled enough and is ready for the next roast (about 2 minutes), the “Heater” light will again begin to blink.

With a little practice a knowledgeable operator can select the preset temperature levels in any order, at any time, for any duration to achieve a desired roast profile; the bean temperature display always shows what is happening to the coffee. In this way the FincaLab® Model 4 can be used to emulate a commercial production roaster. Also, roast profiles having the desired cup profile can be developed on the FincaLab® Model 4 sample roaster and later duplicated on a production roaster.