

ELITE-500

DENTAL PORCELAIN FURNACE

USER MANUAL

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INTRODUCTION

Vacuum porcelain furnace "**ELITE-500**" that you have purchased is a modern device that can satisfy all professional demands both of an expert and of a novice. Microcomputer based electronics and other achievements of modern furnace technology led to versatile, reliable, high performance and low cost design. Years of experience in development and manufacturing of porcelain furnaces are implemented in "**ELITE-500**" - the new and the most advanced member of the family.

Some of the impressive features of the furnace are listed below:

- ★ 300° C (570° F) to 1200° C (2200° F) operational range
- ★ 2 idle programs (Day and Night)
- ★ Automatic Night program
- ★ Calibration and purge programs
- ★ 100 fully adjustable user programs
- ★ Programmable Postfiring programs
- ★ 12 programmable baking parameters
- ★ Permanent monitoring of current baking stage
- ★ Manual overrun function for immediate start of baking program
- ★ Vacuum level display
- ★ Built-in self test capability (muffle, thermocouple, vacuum system, memory etc.)
- ★ Power failure and power line disturbance protection
- ★ Vacuum level control
- ★ Digital display of vacuum level
- ★ Non-battery user program storage
- ★ Built-in self-test capability (muffle, thermocouple, vacuum system, memory etc.).
- ★ Simple and clear operation
- ★ Power failure and power line disturbance protection
- ★ 220-240V/50Hz, 100-120V/60Hz power input
- ★ 24 months warranty on parts and workmanship including muffle.

SPECIFICATIONS

1. Number of user defined programs - 100
2. Number of idle programs - 2
3. Overall dimensions - 27cm(11")W x 32cm(12.5")D x 50cm(20") H
4. Net weight - 15 Kg (34 lbs.)
5. Electrical: - 230V 50/60Hz - 1200W (115V 50/60Hz - 1200 W)

DESCRIPTION OF THE FURNACE

1. GENERAL.

- a. The furnace consists of the main module and the muffle module.
- b. The main module contains power supply, computerized control circuit, front panel and mechanical assembly with work plate.
- c. The muffle module contains vacuum chamber and muffle.

2. CONTROLS.

- a. The furnace controls are placed on the front panel and on the rear panel.
- b. Front panel:
 1. Program display.
 2. Data display.
 3. Vacuum display.
 4. Function buttons.
 5. Data buttons.
 6. Control buttons.
- c. Rear panel:
 1. Power switch.
 2. Pump fuse.
 3. Muffle fuse.
 4. Power cord receptacle.
 5. Pump cord receptacle.
 6. Mechanical joint for work plate movement during power down.

3. PROGRAM DISPLAY.

- a. Contains 2-digit numeric field.
- b. Initially displays the "DAY" program (--).
- c. Displays selected program number 0 - 99.

4. DATA DISPLAY.

Data display consists of:

- a. 4-digit numeric field.
- b. Measurement units field: C° (F°) for temperature and min for time.
- c. Function leds: temperature (TEMP), parameters (PARAM) and (TIME).

5. VACUUM DISPLAY.

Vacuum display consists of:

- a. 3-digit numeric field.
- b. Measurement units field: "/mm for European and American standards.

6. PARAMETER LEDS.

Start temperature	-	START TEMP
Work table rise time	-	DRY TIME
Preheat time inside the muffle at START temperature	-	PRHT. TIME
Heat rate	-	RAMP
Vacuum on temperature	-	VAC ON
Vacuum level	-	VAC LEVEL
Hold time with vacuum	-	VAC HOLD
Vacuum release temperature	-	VAC OFF
End temperature	-	END TEMP
Hold time at END temperature	-	TEMP HOLD
Work table exit time	-	COOL TIME
Postfiring step	-	P.F. STEP

7. PUSH - BUTTONS.

Three groups of push buttons are placed on the front panel:

- a. Data buttons: digits **0** to **9**, "**ENT**" and "**CLR**".
- b. Function buttons: "**PROG**", "**PARAM**" and "**TIME**".
- c. Control buttons: "**ON/OFF**", "**CYCLE**", "**RESET**" and "**POSTFIRE**".

8. AUDIO FEEDBACK.

- a. An audio feedback is provided for user convenience. Single tone means acceptance, of pressed button and double tone-rejection.
- b. Bell warning provided in following cases:
 1. End of baking cycle.
 2. User memory fault.
 3. Muffle fault.
 4. Thermocouple fault.
 5. Calibration error.
 6. Vacuum system fault.
 7. Position error.
 7. Position error.

OPERATION MANUAL.

1. To start operation of the furnace turn the **POWER SWITCH** on.
The device is in **STAND-BY** mode.
2. **STAND-BY MODE.**
 - a. The **STAND-BY** mode is provided for long period waiting. In this mode the muffle is turned off and the work plate stays in its previous position. The "**OFF**" led is turned on.

NOTE: It is recommended to keep the vacuum chamber closed to prevent the muffle wetting.

- b. Press the "**ON/OFF**" button for **PROGRAM** mode selection. The "**OFF**" led will turn off and the "**ON**" led will turn on.
3. **PROGRAM MODE.**
 - a. The **PROGRAM** mode is provided for baking program selection.
 - b. Select program number from 3 to 99.
 - c. To correct selected program number, if desired, press the "**CLR**" button and return to the previous instruction.
 - d. Press "**ENT**" button.
 - e. The muffle temperature is displayed during **PROGRAM** mode.
When the muffle is cold (less then 280°C/530°F), (**COLd**) message is displayed.
 - f. The muffle temperature is kept at the initial level for selected program (**START TEMP**).

4. **PARAMETER MODE.**

- a. **PARAMETER** mode provided for parameter verification and setting.
- b. Press "**PARAM**" button for **PARAMETER** mode selection. "**PARAM**" and "**START TEMP**" leds will turn on and parameter value will be displayed on the data display. Press "**PARAM**" button to select the next parameter.
Press "**ENT**" button to move to another row in the same line.
- c. Set new parameter value, if desired (for programs 3 to 99 only). Data insertion sequence is the same as in the **PROGRAM** mode.
- d. Parameter limits table:

START TEMP	- From 300 °C to 1200 °C (570-2200 ° F)
DRY TIME	- From 1 Sec to 45 Min
PRHT TIME	- From 1 Sec to 45 Min
RAMP	- From 10 °C/Min to 150 °C/Min (20 °F/Min to 270 °F/Min)
VAC ON	- From 300 °C to 1200 °C (570-2200 ° F) (Must not be less than START TEMP)
VAC LEVEL	- From 1 to 760 mm Hg (1-30"Hg)
VAC HOLD	- From 1 Sec to 45 Min
VAC OFF	- From 300 °C to 1200 °C(570-2200 ° F) (Must not be less than VAC START)

END TEMP	- From 300°C to 1200°C (570-2200°F) (Must not be less than VAC OFF)
TEMP HOLD	- From 1 Sec to 45 Min. (Must not be less than VAC HOLD)
COOL TIME	- From 1 Sec to 45 Min.
P.F. STEP	- From 1°C to 30°C (1-60°F)

- e. The muffle temperature is kept at the initial level for selected program (**START TEMP**).
- f. Press the "**PROG**" button to return to the **PROGRAM** mode.
- g. Press the "**ON/OFF**" button to get to the "**STAND-BY**" mode.
- h. Use power switch to turn off the furnace.

NOTE: For American standard vacuum level value is rounded to 0.5 " Hg. resolution automatically.

4. CORRELATION BETWEEN PARAMETERS.

- a. The following parameters are necessary for normal furnace operation:
 1. **START TEMP.**
 2. **RAMP.**
 3. **END TEMP.**
- b. If the **VAC ON** parameter is set, then **VAC OFF** or **VAC HOLD** parameter must also be set and vice versa.
- c. If the **VAC ON** parameter is set, then **VACUUM LEVEL** must also be set and vice versa.
- d. If the **VAC HOLD** parameter is set, then **TEMP HOLD** parameter must also be set.
- e. If parameter correlation error occurs, baking cycle will not start and corresponding parameter leds will blink.

5. PROGRAM TIMER.

- a. Program duration in minutes and seconds is displayed when the "**TIME**" button is pressed. The "**TIME**" led is turned on. When the button is released, the previous display is returned.
- b. If program duration can not be evaluated (missing parameters or parameters don't fit), (-) is displayed.

6. BAKING CYCLE.

- a. Move the work plate to the **DOWN** position. (Baking cycle will not start otherwise).
- b. Press the "**START**" button.
- c. The baking cycle will not start if parameter correlation error exists. Blinking leds point to problematic parameters. Correct the error and press the "**START**" button again.
- d. The baking cycle starts automatically when the muffle temperature is equal to the **LOW TEMP** for selected program.
- e. You can start baking cycle immediately independently of current muffle temperature by pressing "**START**" button and holding it pressed for about 1 second.

- f. Use "**PARAM**" button to check parameter values during baking cycle.
- g. Back running counter is provided for baking cycle. Press the "**TIME**" button for timer display.
- h. Press "**RESET**" button to interrupt baking cycle if desired. In this case vacuum is released from the chamber, the work plate goes down and the furnace stays in the **PROGRAM** mode.
- i. Parameters of selected program may not be changed during baking cycle and other program may not be selected.

NOTE: "ELITE-500" has several options for vacuum starting:

1. If you want to keep low temperature until vacuum level is reached, you have to set "**PREHEAT TIME**" for 40 seconds at least and **VAC ON** temperature has to be equal to **START TEMP**. Vacuum pump turns on immediately after chamber is closed and temperature doesn't rise during **PREHEAT TIME**.
2. If **PREHEAT TIME** is cleared, temperature will rise simultaneously with vacuum start.
3. If you want to keep air in the chamber during **PREHEAT TIME**, you have to set **VACUUM ON** temperature higher than **START TEMP** (even one degree is enough). In this case, after **PREHEAT TIME** is over, temperature will rise and vacuum will start at programmed point.

6. **POSTFIRING.**

Postfiring means additional baking without need to wait for furnace cooling. This option is especially important for **GLAZE** baking when the temperature was not high enough.

The postfiring is provided according to following parameters:

muffle heating rate	- RAMP
maximum temperature	- END TEMP + P.F. STEP
hold time at maximum temperature	- TEMP HOLD
work plate exit time	- COOL TIME

When "**POST FIRE**" button is pressed, the work table rises immediately, the muffle is heated to maximum temperature, stays at this temperature during "**TEMP HOLD**" and the work plate goes down.

Every additional press on "**POST FIRE**" button will cause postfiring cycle. **The maximum temperature of every next postfiring will be higher than previous one by P.F. STEP.**

When "START" button is pressed or new program number is selected, the postfiring counter is cleared and the maximum temperature of following postfiring will be equal to END TEMP + P.S.STEP as in the first postfiring cycle.

7. AUTOMATIC NIGHT PROGRAM.

Automatic night program enables to save operator's time in the end of work day. If the "ON/OFF" button is pressed when baking cycle is running, the "OFF" led is turned on in addition to the "ON" led. The furnace will finish the baking cycle as usual and after that will switch itself to the "NIGHT" program (No.0). When temperature inside the muffle will reach 100 °C, the work table will go up and the muffle will stay at this temperature. It is possible to cancel automatic night program by pressing "RESET" or "POST FIRE" buttons.

8. CALIBRATION.

Automatic calibration program is provided to correct temperature measurement that may change during extended use of the furnace.

The sequence of operations during calibration procedure is as follows:

- a. turn the furnace off, remove ceramic table, put calibration set on the work plate and center it.
- b. Connect the pins on calibration plate using pure silver wire.
- c. Insert calibration plug into receptacle on the right side of the furnace.
- d. Turn the furnace on.
- e. Move work plate down, select calibration program (No 1) and press the "START" button.
- f. When muffle temperature reaches the melting point of silver (960 °C/1760 °F), temperature measurement of the furnace is adjusted to this temperature. The value of correction (positive or negative) appears on data display in form (C xx). For instance, when certain porcelain was fired at 970 °C (1780 °F) before calibration, it has to be fired at 980 °C (1800 °F) after calibration if correction value was 10 °C (20 °F) and at 960 °C (1760 °F) if calibration value was -10 °C (-20 °F).
- g. Turn the furnace off, remove calibration set and return ceramic table.

WARNING:

1. **Calibration program will not start and bell will sound if there is not good electrical contact between silver wire and pins.**
2. **If calibration error occurs as a result of power line failure, the correction value will be cleared. Run calibration program to ensure correct temperature measurement.**

9. SELF TESTS.

Number of automatic self tests are implemented in "ELITE-500" furnace to ensure high reliability, to avoid incidental damage to the work inside the furnace and to provide fast and easy maintenance.

a. Baking program test.

1. When the furnace is turned on, all user programs are checked. If any program was changed because power line failure the message (**tESt**) appears on data display. Every program that was affected is cleared and User Error message (**UErr**) will blink on the display when the test is finished.
2. Parameter values are checked as they are entered. The value will not be accepted by the computer if it isn't within defined limits.
3. Parameter correlation is checked before every baking cycle. If correlation error occurs, the cycle will not start and blinking leds will point to problematical parameters.

b. Calibration test.

Temperature correction value is checked when the furnace is turned on. The test is similar to User Program test, but Calibration Error (**CErr**) appears in this case.

Warning: Temperature measurement may change when Calibration Error occurs. Run calibration program to get correct temperature reading.

c. Muffle and thermocouple test.

1. If the muffle or muffle fuse are burned, the Heat Error message (**HErr**) blinks on data display and bell sounds every 30 sec.
2. If thermocouple is damaged, the Thermocouple Error message (**tErr**) is displayed.

d. Vacuum system test.

When porcelain baking is provided in vacuum, vacuum level appears on vacuum display and vacuum system is checked.

1. If vacuum pump is not connected or doesn't work or pump fuse is burned, the bell will sound.
2. If vacuum level is not reached within 60 seconds, the bell will sound and vacuum display will blink.
3. If vacuum valve doesn't release vacuum in time, the bell will sound and vacuum display will blink.

7. PROTECTION.

- a. Power failure protection is provided to prevent work damage.
 - 1) If power failure occurs when baking cycle with vacuum is running, vacuum is released from the chamber.
 - 2) It is possible to move the work plate during power failure using mechanical joint and handle.

WARNING: Don't operate the handle when power is on. This may damage the mechanism.

BAKING PROGRAMS

SERVICE PROGRAMS					
Program		0	1	2	3
Program name	Day	Night	Calib.	Purge	
1. Start temp. (°C)	300	100	650	700	
2. Dry time (Min)	--	--	--	5:00	
3. Preheat time (Min)	--	--	--	--	
4. Ramp (°C/Min)	--	--	30	90	
5. Vac. on (°C)	--	--	--	700	
6. Vac. level (mm. Hg)	--	--	--	--	
7. Vac. hold (Min)	--	--	--	--	
8. Vac. off (°C)	--	--	--	--	
9. End temp. (°C)	--	--	1060	1040	
10. Temp hold (Min)	--	--	--	--	
11. Cool time (Min)	--	--	--	--	
12. P.F. Step (°C)	--	--	--	--	

USER PROGRAMS					
Program					
Program name					
1. Start temp. (°C)					
2. Dry time (Min)					
3. Preheat time (Min)					
4. Ramp (°C/Min)					
5. Vac. on (°C)					
6. Vac. level (mm. Hg)					
7. Vac. hold (Min)					
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