User's Manual for the Automated Denture Furnace for Metal Ceramics

DENTAMATIC 500/CHAMELEON-MX

The furnace is designed for production of metal ceramic teeth as well as for other denture operations. This is a fully automated vacuum furnace with microprocessor control. It has 100 standard programs each of which can be edited.

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I. SPECIFICATIONS

Electrical:
- Power supply – AC 220V/50÷60Hz or 110V/60Hz;
- Admissible variation of the supply voltage +10, – 5%;
- Maximum power consumption (without pump) – 1350 W;
- Average power consumption in operation–approx. 300 W;
- Pump power consumption – max 270 W;

Mechanical:
- Overall dimensions 530mm/230mm/230mm;
- Weight – approx. 11,5÷14 kg;
- Diameter of the working chamber – 92 mm;
- Height of the working chamber – 80 mm;

Operational:
- Maximum temperature 1050°C (1150°C option);
- Maximum rate of temperature increase 200°C/min;
- Controllable Stand By mode (Idle) 100÷600°C;
- Operation in °C or °F;
- Electronic vacuum control;
- Operation in Bar, cmHg or InchHg;
- Number of programs 100;
- Can be connected to PC;

Environmental:
- Storage temperature: 1°C ÷ 50°C;
- Operation temperature: 10°C ÷ 50°C;
- Relative humidity: up to 80%;
- Altitude up to 2000m.;
- No need to run night program;
- Average life-expectancy of the muffle and the heater (quartz protected) – 10 years.

II. INSTALLATION

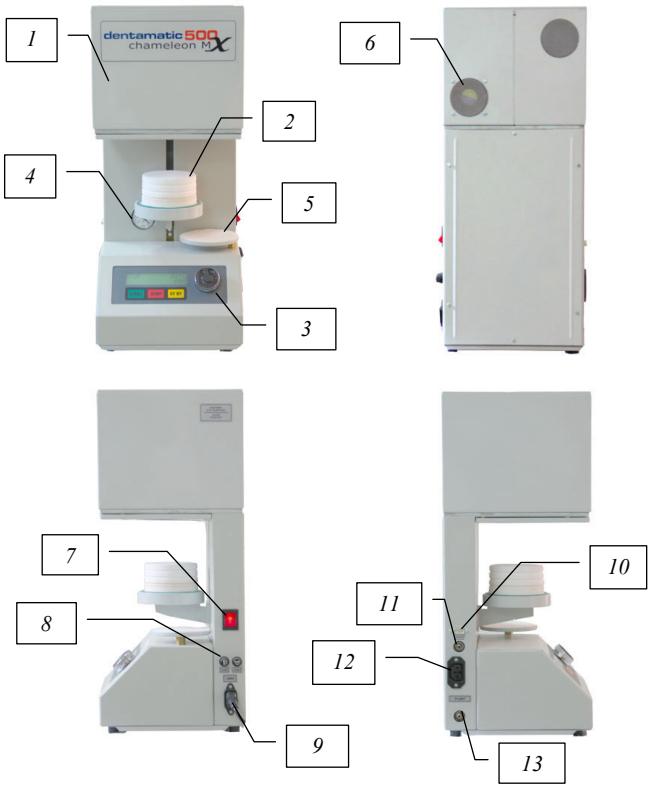

Fig.1

1. Muffle
2. Door / Lift
3. Front Panel
4. Vacuum-meter (mechanical).
5. Working table.
6. Cooling Fan
7. Power Switch
8. Fuses
9. Power Connector
10. RS-232 Port
11. Atmosphere/Argon Port
12. Vacuum Pump Power Connector
13. Vacuum Port

- Remove all packing material around the furnace;
- Position the furnace on horizontal area. Make sure it is at least 30cm. away from any combustible materials. Rear must be at least 20cm. away from wall;
- Connect vacuum pump hose to the vacuum port(13) on the furnace;
- Connect vacuum pump power supply cable to the vacuum pump power connector(12) on the furnace;
- Connect power supply cable to the power connector(9);
- Connect power supply cable to the power line;
- The furnace is ready for operation.

Prior to connect the furnace to the computer by data cable, make sure that both are turned off.

Fuses replacement must be done only with fuses marked onto the furnace.

III. WORKING WITH THE FURNACE

1. Front Panel.

Furnace control is made by three buttons (**START**, **STOP**, **ST BY**), multifunctional knob, and LCD display (*Fig.2*).

START – Starts a process
STOP – Stops a process
ST BY – Starts Stand By Mode
Multifunctional rotary knob – Menu navigation and editing parameters

Fig.2

2. MODES OF OPERATION.

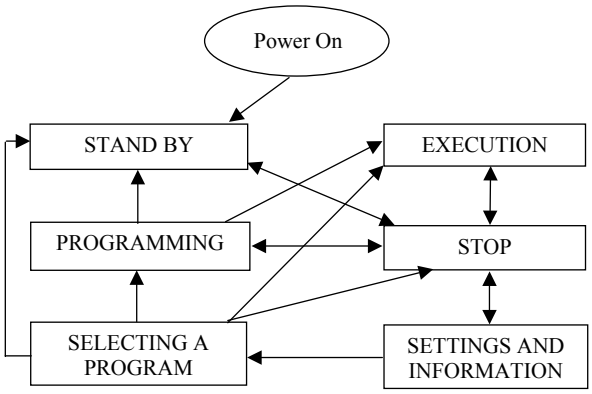

Fig.3

Turn on the furnace with the central switch on the right side of the furnace. Automatic temperature calibration is made after the turning on. Then the furnace goes into '**STAND BY**' mode.

2.1. STAND BY

In that mode the furnace sustains the chosen ***StandBy*** temperature of the current program. The current mode is displayed in the top left corner of the display (*Fig.4*). The temperature of the chamber is displayed in the top right corner. In the bottom left corner is displayed the name of the chosen program (if any), and the supplied power of the heater and the number of the chosen program is in the bottom right corner.

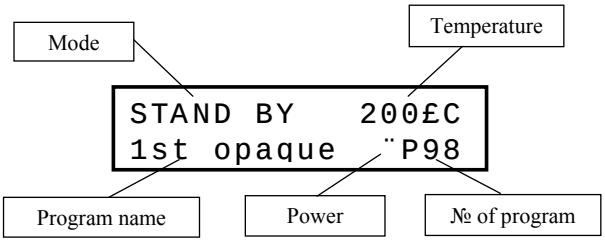

Fig.4

By pressing the '**STOP**' button, '**STAND BY**' mode is switched to '**STOP**' mode. And then by pressing the **ST BY** button the furnace switches back to '**STAND BY**' mode.

2.2. STOP.

After switching into '**STOP'** mode, the lift door opens and the heater stops operation.

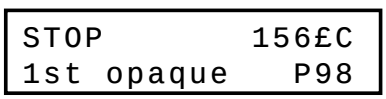

Fig.5

You can change current program, by rotating the multifunctional knob. The name and number of the new program are displayed on the screen (*Fig 5*).

'**STAND BY**' mode is activated by pressing the **ST BY** button. You can start the chosen program by pressing the **START** button ('**EXECUTION'** mode**).**

To switch to '**PROGRAMMING**' mode, just press the multifunctional knob and edit the chosen program.

2.3. PROGRAMMING

In '**STOP**' mode, the number of the program is chosen by rotating the multifunctional knob. Then by pressing it you switch into '**EDIT**' mode.

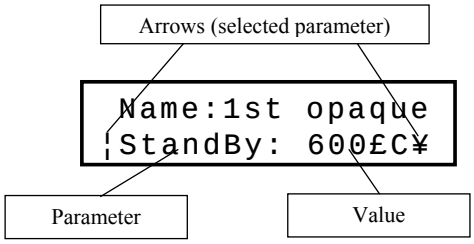

Fig.6

On the screen are displayed the names of the parameters and their values (*Fig.6*). The arrows point to the currently chosen parameter. By rotating the multifunctional knob you can choose a parameter and by pressing it, editing begins (arrows start blinking).

Large scale values (temperature and timing) are edited, by pressing the knob once – the temperature changes with scale of ten degrees, and the timing with scale of one minute. If you press the knob twice, the arrows become small and the scale become one degree, respectively one second.

The editing ends by pressing the multifunctional knob.

The rest of the parameters are edited only with one press of the knob.

The editing of the name of the program is made in a special way. First choose the parameter "***Name***" to switch into name edit mode.

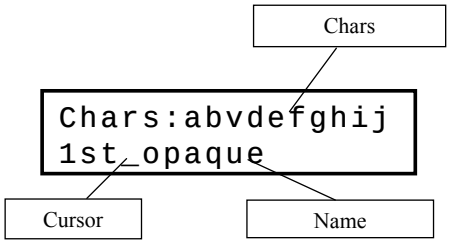

Fig.7

On the first row are displayed the allowed chars, and on the second – the name of the program (*Fig.7*).

By default the mode is navigation in the name. To choose a position, rotate the multifunctional knob.

By pressing the multifunctional knob, you switch into char selecting mode.

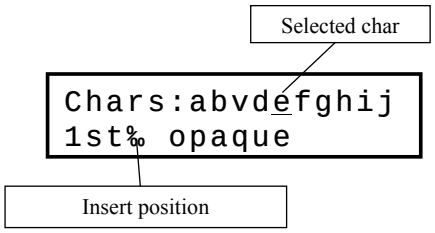

Fig.8

The character is chosen by rotating of the multifunctional knob and is inserted by pressing the multifunctional knob.

The last two characters are special. The first character ('§') is used to clear already inserted character. The second ('¢') character is used to exit the selecting char mode.

Other way to exit that mode is by pressing the **STOP** button, and the deletion by pressing the **ST BY** button. To clear the entire name press and hold the **ST BY** button. To enter whitespace press the **START** button.

To exit the edit mode, press **STOP** button.

The changes are saved automatically.

The names of the parameters, their short description, and their variation are shown in the table below. See chapter '**Process of execution**' for their functional meaning.

Param.	Description	Range
StandBy	Stand By temperature	100-600°C (212-1112°F)
Drying	Drying time	00:00-99:59 minutes
LiftPos	Position of the lift during drying	0-100%
Closing	Closing time of the lift during drying.	00:00-99:59 minutes
Argon	Usage of Argon	Yes / No
PrHeat	Pre-heating	0:00:00-9:59:59 hours
TempI	Low (starting) temperature. This parameter can't have lower values than Stand By temperature. It's maximum value is 700°C (1292°F).	***StandBy***÷***TempII*** *TempI* max=700°C (1292°F)
TempII	High temperature.	***TempI***÷1050,1100,1150,1200°C (2192°F)
Heat	Heating time	0:00:00-9:59:59 hours
H.Rate	Temperature increase speed. Heating time depends on this parameter.	0-200°C/min 0-360°F/min
Hold	Holding time of the high temperature.	0:00:00-9:59:59 hours
Cooling	Cool controlling on closed door.	Yes / No
CoolTmp	Cooling temperature	100°C –***TempII*** 212°F -***TempII***

CoolTime	Cooling tme	0:00:00-9:59:59 hours
C.Rate	Cooling speed	0-100°C/min 0-180°F/min
CoolHold	Cooling temperature hold time.	0:00:00-9:59:59 hours
OpenTime	Opening time	00:00-99:59 minutes
OpenPos	Opening position	0-100%
OpenTmp	Opening temperature	100°C -***TempII***
Vac	Selecting vacuum mode: No – no vacuum; By time – select vacuum time; Temp&Time – select the starting and stopping temperature, and holding time of the vacuum. Permanent – vacuum starts when the door is closed and is stopped when it's opened.	No; By time; Temp&Time; Permanent
V.Time	Vacuum time. Select vacuum time from 'Pre-heating' to door opening (including cooling).	0:00:00-9:59:59 hours
VacStrt	Vacuum start temperature	***TempI***÷***TempII***
VacStop	Vacuum stop temperature	***VacStrt***÷***TempII***
V.Hold	Vacuum hold. You can set the time to hold the vacuum until the furnace is opened, if the value of ***VacStop*** equals ***TempII***.	0:00:00-9:59:59 hours
VacLevel	Vacuum level. If MAX is selected, the vacuum level is the maximum of the vacuum pump.	0.0 до –0.99 Bar MAX
TmpCorr	Temperature correction of the current program.	-25÷0÷25°C

2.4 EXECUTION of a program.

In '**STOP**' mode rotate the multifunctional knob to choose the number of the program. Then press '**START**' button to execute the program.

The furnace do temperature calibration when a program is started.

> *If the temperature in chamber exceeds the low temperature (**TempI**), the furnace waits the temperature to drop below **TempI**. To force the program, press '**START**' button.*

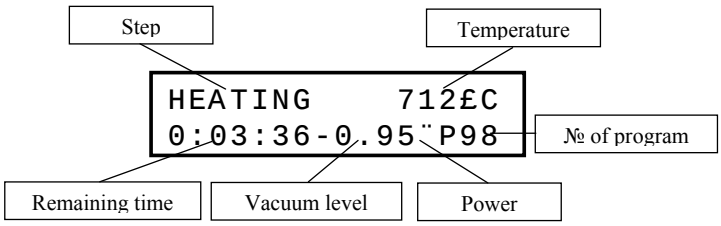

Fig.9

While executing the program, the current step of the program is displayed on the top left corner of the screen (*Fig.9*), and the temperature of the chamber – on the top right corner. The remaining time is displayed in the bottom left corner of the screen, and the vacuum level is next to it. The number of the program is in the bottom right corner of the displayed, and just before it there is the heater power.

While the vacuum pump is working, the value of the vacuum level displayed on the screen, is blinking. The blinking stops, when the vacuum level reaches ***VacLevel.***

2.4.1. Process of execution

The program execution time is dividen into seven parts (*Fig.10*):

- Drying (***Drying***);
- Pre-heating (***PrHeat***);
- Heating (***Heat***);
- Holding (***Hold***);
- Cooling (***CoolTime***);
- Cool holding (***CoolHold***);
- Opening (***OpenTime***).

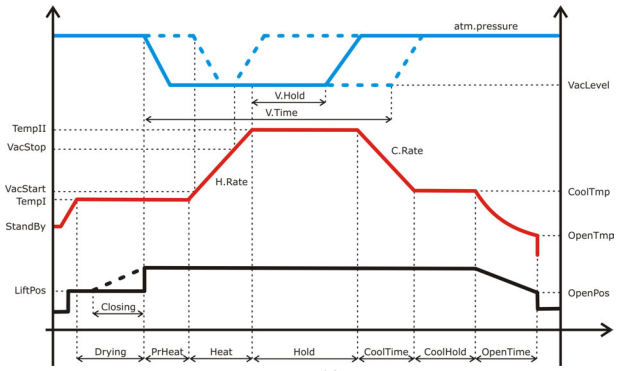

Fig.10

When a program starts, the lift goes to the position set by the parameter ***LiftPos*** and the temperature in the chamber starts rising to ***TempI***. At this moment the drying time starts.

If closing time is set (***Closing***), in the last ***Closing*** minutes of the drying time (***Drying***), the door slowly closes.

If drying time (***Drying***) is set to 0, the parameters ***LiftPos*** and ***Closing*** are "hidden".

If the parameter Pre-heating ***(PrHeat***) is set, the furnace holds the temperature ***TempI*** until the end of ***PrHeat*** with door closed.

The heating process starts. The temperature in the chamber rises to ***TempII*** with velocity of ***H.Rate*** for time ***Heat***. When the temperature rises to ***TempII***, holding time starts (***Hold***). The temperature ***TempII*** is hold in the chamber for time ***Hold***.

After holding time is over (***Hold***), the cooling process starts, if the parameter ***Cooling*** is set to 'Yes'. The temperature in the chamber slowly decreases to the level of ***CoolTmp*** with a velocity of ***C.Rate*** for time ***CoolTime***. The ***CoolTmp*** is hold in the chamber for time ***CoolHold***.

If the value of the parameter ***Cooling*** is set to 'No', the parameters ***CoolTmp***, ***CoolTime*** and ***C.Rate***. are "hidden". After the holding time (***Hold***) is over, the program starts the last step of the process of the execution – Opening.

Just before the Opening, the heater switches off and vacuum is released (if any).

For time ***OpenTime*** the door of the lift, slowly reaches position ***OpenPos***. When the temperature in the chamber reaches ***OpenTmp***, the door opens fully. The execution of the program stops and a message for successful execution of a program is displayed on the screen with five sound signals.

2.4.2. Vacuum control.

The values of the parameter ***Vac*** define the control of the building and releasing the vacuum in the chamber.

If 'No' is selected for the parameter ***Vac*** , there will be no vacuum in the program.

If 'Parmanent' is selected for the parameter ***Vac,*** the vacuum is built when the door is closed, and it's released when the door is opened.

If 'By time' is selected for the parameter ***Vac,*** the value of the parameter ***V.Time*** sets the vacuum time after Pre-heating or Heating (if the Pre-heating time is 0), in the chamber. The value of ***V.Time*** can't exceed the following sum: ***PrHeat*** + ***Heat*** + ***Hold*** + ***CoolTime*** + ***CoolHold.***

If 'Temp&Time' is selected for the parameter ***Vac,*** parameters ***VacStrt*** (vacuum start temperature) and ***VacStop*** (vacuum stop temperature) must be set. If the value of ***VacStop*** equals the value of

TempII, the parameter ***V.Hold*** defines the holding time of the vacuum after the holding begins. ***V.Hold*** can't exceed the following sum: ***Hold*** + ***CoolTime*** + ***CoolHold***.

The parameter ***VacLevel*** defines the level of the vacuum in the chamber. The values of this parameter are from –0.30 до –0.99bar or MAX. If MAX is chosen, the vacuum level is the maximum that the vacuum pump can provide.

2.4.3. Argon.

If argon is used, the vacuum pump draws the air out when the door is closed and the chamber fills with argon through the air valve.

> *When argon is used with materials (for example titanium) which react with air in high temperature, cooling is required. Cooling temperature must be set low and safe enough, in order to prevent burning of the material after opening the chamber.*

> *The maximum length of a program is limited to 10 hours.*

3. SETTINGS AND INFORMATION.

In '**STOP**' mode, by pressing and holding the multifunctional knob, you enter the settings and information menu. By rotating the multifunctional knob, you can choose the items of the menu. Settings are editing in the same way as the program parameters.

List of items in the menu 'SETTINGS AND INFORMATION':

Programs - You can select a program from the list of program names;
Serial N - Displays the furnace serial number
Firmware - Software version of the furnace
Cycles - Cycle counter of the furnace
Language - Languages (Български/English)
Temp. Units - The dimension of the temperature °C/°F
Vac. Units - The dimension of the vacuum Bar/cm Hg/Inch Hg
Sound - Sound – Turned on (Yes) or turned off (No)
Temp. Corr. - Temperature correction for all programs (-25÷0÷+25°C)
Calibration - Calibration of the furnace. You can choose:
Original – producer's temperature calibration
Thread – Thread calibration. You can choose own calibration.
Thread test - Thread test
Press the knob to start the thread calibration.

The items **Serial N**, **Firmware** and **Cycles** are only informational.

To exit from the menu press '**STOP**' button.

4. SELECTING A PROGRAM

If '**PROGRAMS'** is selected from the 'Settings and Information' menu, a list of program numbers and their corresponding names are displayed (*Fig.11*).

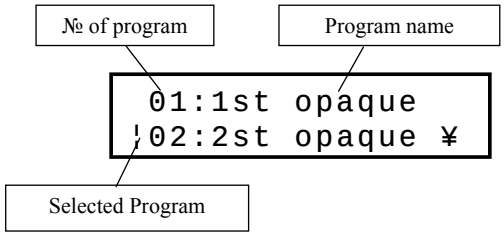

Fig.11

By rotating the multifunctional knob, you can select a program. If the multifunctional knob is pressed, you can edit the program. By pressing the '**START'** button the selected program starts.

To exit the menu, press the '**STOP**' button.

IV. DISPLAYED MESSAGES

THE LIFT IS OVERLOADED
It is displayed if the lift is overload i.e. the motor power has very high value. It is possibly with a mechanic problem (tight-fitting belt).

LIFT POSITION SENSOR FAIL
It is displayed if there is program lift moving but there isn't a change in lift position. Probably a damage position sensor.

LIFT MICRO SWITCHES FAIL
It is displayed if one or and two micro-switches of the lift are damaged.

THERMO COUPLE BREAK
It is displayed if there is a damaged sensor of the temperature (thermocouple)

TEMPERATURE IS OVER LIMIT
It is displayed if the temperature in the chamber exceeds maximum permissible temperature of the furnace. Then the heater is turned off by protect relay.

LOW VACUUM LEVEL
It is displayed if the vacuum level isn't reached in two minutes or it's under –0.80Bar.

CHAMBER IS NOT HERMETIC
It's displayed if after turning off the vacuum pump, vacuum level starts falling too fast.

CHAMER IS UNDER VACUUM
It's displayed if attempt to open the chamber is made, and the pressure in it is too low.

AC POWER FAIL
It is displayed at the end of program if during the execution there has been a power supply failure.

PROGRAM TIME IS OVER 10 HOURS
It's displayed when the program time is over 10 hors. The program time is limited to maximum 9:59:59 hours. Please correct the program times.

POWER OFF
It's displayed when the furnace is turned off.

Enjoy working with DENTAMATIC500/CHAMELEON-MX!

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