

Zircon Master S



USER MANUAL

(Models for Electric Power Supply of 230V/50-60Hz)

USER MANUAL

ATTENTION!

Please refer to the SCHUPP heater manufacturer's brochure as well as the NACERA detergent manufacturer's brochure.

You will find them at the end of the user guide.

It is extremely important for the initial protection of the heaters to comply with the requirements described here for the initial start-up and operation of the furnace.

The SCHUPP brochure describes the dangers that endanger molybdenum heaters in the sintering process.

When sintering zirconia, especially super translucent zirconia, it is important to work without contamination. In sintering furnaces with molybdenum two-silicate heaters, silicon forms glass protective layer that protects the molybdenum from oxidation (*see Pict 1*).



Figure 1. Heater with protective layer!



Figure 2. Heater with defective protective coating!

ATTENTION!

Be sure to familiarize yourself with the operating instructions of the zirconium blocks you work with and follow them.

In order to increase the resistance of heaters against corrosive gases, it is necessary to train them properly.

The best protection is to build a high-quality solid oxide layer on their surface. This is accomplished by initially doing several cleaning cycles.

Until the protective surface layer on the heaters is fully created, it is necessary to use NACERA powder during each sintering cycle (put on 10gr). After each sintering, it is necessary to evaluate the condition of the heaters and their surface.



Figure 3. Difference when using NACERA

Figure 1 shows the desired state of the heaters. It should be considered as a benchmark. If small black spots are observed on the heaters, this indicates that the protective layer has begun to break.

If the heaters look like in picture 2 they should be replaced with new ones.

The cleaning program in the furnace is recorded as program №01 CLEAN.

After preparing the furnace for operation, run program CLEAN at least three times. Never sinter immediately after installing the heaters!

Further, as you begin the real work, do not put a lot of sintering material in the chamber. ***Do not treat your teeth with liquid stains!***

Alternate to performing a normal and clean cycle (program №01 CLEAN) at least the first 30 times.

Do not use water-based zirconium dyes for pre-dyeing before doing **30 sintering cycles**. The first step is to build a glass-like protective layer on the heaters (See Figure 1). Otherwise, steam from the dyes will oxidize the molybdenum in the heaters and will damage or destroy them.

When you start to use water-based dyes for pre-coloring zirconium, it is **MANDATORY** to follow the instructions for use with dyes that manufacturers prescribe.

Drying the cut and dyeing elements is **EXTREMELY IMPORTANT** for the good condition of the heaters and the furnace. Failure to do so will cause damage or destruction of the heaters - see the SCHUPP brochure.

The use of non-water based zirconium dyes is highly undesirable. This can result in the destruction of the heaters and the contamination of the furnace chamber.

WARNING!

Failure to follow the instructions for initial furnace operation can result in destruction of the heaters and compromise the end result of your work!

Example procedure for initial furnace operation:

1. Do three (3) cycles with program №01 CLEAN with empty chamber (no sintering material)
2. Start normal furnace operation. Alternate a sintering cycle (your program according to the instructions of the zirconium manufacturer you have chosen) and a cycle with program # 01 CLEAN. This cycle rotation should be at least 30 times.
3. After each cycle, evaluate the condition of the heaters.
4. Strictly follow the instructions for the quantity and type of sintering material. Do not stain zirconium in advance.
5. Also use NACERA powder for each sintering cycle with sintering material.

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1. INTRODUCTION

Thank you for having purchased the **ZIRCON MASTER S** furnace which, we are sure will all meet all your needs and will satisfy your high demands.

This furnace has been designed according to the requirements of latest industrial standards and we guarantee that you will use it many years as your closest assistant.

However, inappropriate use may damage the equipment and be harmful to personnel. Please observe the relevant safety instructions and read the Operating Instructions carefully.

We wish you pleasant and fruitful work with the **ZIRCON MASTER S**.

In this furnace 50 free user programs are implemented.

Each program has 4 rising and 2 cooling stages. In addition, there is a programmed parameter OPEN TIME, which gives extra control of the final cooling.

Programs 00 and 01 are embedded and cannot be edited.

The name of program 00 is CALIBRAT and it is devoted to temperature calibration. Temperature calibration is performed using special calibration rings that have a precise shrinkage for specific degrees.

Program 01 is called CLEAN and is designed to clean the camera and heaters.

The other 48 programs are free and can be modified by the user.

When sintering materials that require rapid cooling at 60°C/min, the parameters of the respective program are adjusted to be:

COOL1RATE = 60
COOL1 TEMP = 1300
COOL1 TIME = 0
COOL2RATE = MAX
COOL2 TEMP = 1280
COOL2 TIME = 0
OPEN TIME = FCOOL

SYMBOLS USED:



This symbol indicates that there is high dangerous tension under the bonnet which it is put on. Switch off the furnace before removing the marked cover.



Symbol for HOT SURFACE;
ATTENTION: HOT SURFACE! DO NOT TOUCH!



This symbol indicates that the machine complies with the requirements of the Directives for Low Tension and Electromagnetic Compatibility as well as for the Standards harmonized with them.

2. SAFETY INSTRUCTIONS

The following instructions must be observed in order to avoid personnel injury or equipment failure.

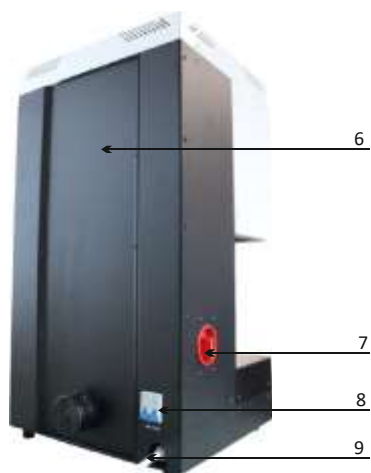
- the furnace must not be run by an operator who is not acquainted with these instructions;
- before turning on the plug in the net contact check if the voltage in the electrical network corresponds to the working tension. In case of discrepancy, you should consult a specialist;
- do not alter the device;
- No repair activity by a service technician who is not authorized by the manufacturer is allowed!
- the notices and stickers must be kept in good condition so that they are easily readable; they should not be removed!
- the machine must not function in case of being damaged and in position to injure the staff or a third person;
- keep the cables out of heat, oil and coarse objects; do not catch the device by the cable when you move it.
- Lifting and carrying the unit by a minimum of two people with two hands below the furnace as standing in a vertical position.
- If the machine is used by such means not indicated by the manufacturer, the provided protection can get worse!
- spare parts which are not specified by the manufacturer cannot be used!

CAUTION! No carrying and transportation in another state except for vertical position is allowed!

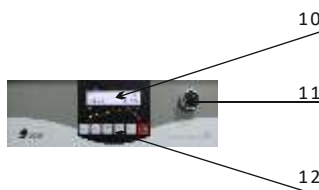
3. DESCRIPTION OF THE UNIT



- 1 Cover of the chamber
- 2 High temperature chamber
- 3 Ceramic table
- 4 Cooling pad
- 5 Front panel



- 6 Back cover
- 7 Mains switch
- 8 Mains fuses
- 9 Power cord



- 10 Display
- 11 Encoder
- 12 Buttons

4. INSTALLATION

UNPACKING



- Carefully remove modules from packages;

ASSEMBLY



- Install ceramic table as it is shown in the picture;



- Unpack and Install the thermocouple;



- Install the heaters in the ceramic tubes. Beware distance from the end of the heater to the carrier (working part) to be equal to 95 mm;
- It is recommended to use the special plastic tool, which is supplied together with the furnace.



- Install and connect the assembled heating elements as it is shown on the picture;

ATTENTION!

After installing the heaters look inside the muffle and make sure they do not touch the ceramic brick. If necessary adjust their location.

CONNECTIONS

- Ensure that the mains voltage is ~230VAC and the outlet has a protective ground.
- Connect the furnace in a separate circuitry of power supply with cable cross-section is at least 2,5 mm².
- The protective fuse of the circuitry should be 20A (if it is a fusible wire), or D25A (C25A) if it is an automatic fuse.
- Plug the power cord into the mains. **Do not use a power strip.**
- Place the machine in such a way that it can be easily switched on and off both the mains switch and the socket.

5. INITIAL STARTING

Please refer to the SCHUPP heater manufacturer's brochure as well as the NACERA detergent manufacturer's brochure.

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When sintering zirconia, especially super translucent zirconia, it is important to work without contamination. In sintering furnaces with molybdenum two-silicate heaters, silicon forms glass protective layer that protects the molybdenum from oxidation.

ATTENTION!

Be sure to familiarize yourself with the operating instructions of the zirconium blocks you work with and follow them.

In order to increase the resistance of heaters against corrosive gases, it is necessary to train them properly.

The best protection is to build a high-quality solid oxide layer on their surface. This is accomplished by initially doing several cleaning cycles.



Heater with protective layer!



Heater with defective protective coating!

Until the protective surface layer on the heaters is fully created, it is necessary to use NACERA powder during each sintering cycle. After each sintering, it is necessary to evaluate the condition of the heaters and their surface.

For better protection, it can be used with NACERA powder at every sintering. This will minimize the danger of oxides on the heaters.



Difference when using NACERA

The cleaning program in the furnace is recorded under №01.

After preparing the furnace for operation, run program №01 at least three times. Never sinter immediately after installing the heaters!

Further, as you begin the real work, do not put a lot of sintering material in the chamber. ***Do not treat your teeth with liquid stains!***

Alternate to performing a normal and clean cycle at least the first 30 times.

Do not use water-based zirconium dyes for pre-dyeing before doing **30 sintering cycles**. The first step is to build a glass-like protective layer on the heaters. Otherwise, steam from the dyes will oxidize the molybdenum in the heaters and will damage or destroy them.

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Drying the cut and dyeing elements is **EXTREMELY IMPORTANT** for the good condition of the heaters and the furnace. Failure to do so will cause damage or destruction of the heaters - see the SCHUPP brochure.

The use of non-water based zirconium dyes is highly undesirable. This can result in the destruction of the heaters and the contamination of the furnace chamber.

WARNING!

Failure to follow the instructions for initial furnace operation can result in destruction of the heaters and compromise the end result of your work!

6. PRACTICAL USE

DESCRIPTION OF BUTTONS



PROG - puts the number of the program which is to be performed into programming mode.

ESC - cancels all changes.




RUN


- starts the chosen program when the indicator of the button flashes in green;
- permits the change of the chosen parameter value in a programming mode.

STOP

- stops the program at any moment;
- stops the movement of the table at any position;
- cancels all changes of the chosen parameter in a programming mode;
- recovers the normal working mode of the furnace after error.



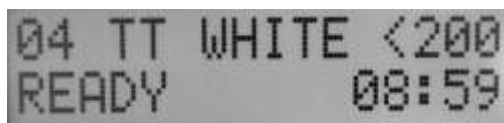
 - closes manually the furnace. The button can increase/decrease the chosen parameter value with 100 by pressing it while turning the multi functional rotary knob.

 opens manually the furnace. The button can increase/decrease the chosen parameter value with 10 by pressing it while turning the multi functional rotary knob.



MFRK - Multi Functional Rotary Knob. It is used for choosing of programs or parameters and set the values.

DESCRIPTION OF INDICATION



The furnace is equipped with two-line LCD display.

First line of the display:

The left part shows the number of the selected program or program that will be programmed parameters

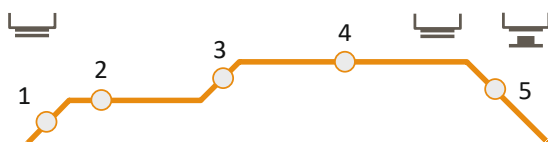
In the middle is the name of the program.

The value of the current temperature in the chamber is shown to the right.

Second line of the display:

The left part displays information about the current stage, which is currently in the oven;

The right side of the line displays the time until the end of the current program.



LED Status Line:

Indicator 1: the furnace is in the phase when the temperature rises until it reaches the temperature of the first or third firing. When the first firing is active, the diode illuminates continuously and the active third firing the diode flashes.

Indicator 2: The furnace is in the first or third baking phase. When the first firing is active, the diode illuminates continuously and the active third firing the diode flashes.

Indicator 3: the furnace is in the phase when the temperature rises until it reaches the temperature of the second or fourth firing. When the second firing is active, the diode illuminates continuously and the active fourth firing the diode flashes.

Indicator 4: The furnace is in the second or fourth firing stage. When the second firing is active, the diode illuminates continuously and the active fourth firing the diode flashes.

Indicator 5: the furnace is in the cooling phase.

This phase is divided into 3 parts:

Part 1 - controlled or free cooling to a temperature **C1TEMP**. The chamber is closed.

Part 2 - free cooling to a temperature **C2TEMP**. The chamber is closed.

Part 3 - opening time **OPEN TIME**.

PARAMETERS AND PROGRAMMING

In order to change the value of a parameter it is necessary to do the following steps:




- With the multi functional rotary knob choose the program which parameters you want to change;
- Press button PROG. Indicator of the button RUN begins to blink green/red and you can see on the display:

Pxx : VIEW DATA
ENTRY TEMP xxxx

- This is the first parameter. Turn left/right the MFRK in order to choose the parameter you want to change;
- Press button RUN in order to choose the value of the parameter you want to change. If you have chosen the first parameter, you would see on the display:

Pxx : EDIT DATA
ENTRY TEMP xxxx

- Indicator of the button RUN turns off and the red indicator on the button STOP begins to blink.
- Turn the MFRK to change the parameter value.

For parameters that are TEMPERATURE or TIME, when simultaneously pressing the button  and rotating the MFRK, corresponding value is changed by  100 units, but if the button  is pressed and simultaneously MFRK, is rotated, the value changes with 10 units.

- Press button STOP in order to leave the programming of the current parameter. Indicator of the button RUN begins to blink again in green/red which means that it is possible to program next parameter.

There are two possible ways of leaving the programming mode after you have finished with the changes of the value of parameters:

FIRST EXIT:

press button ESC. This will CANCEL all the changes that are made in the value of parameters in the program.

SECOND EXIT:

press button PROG. This will SAVE all the changes that are made in the value of parameters permanent. This means that they will be stored after switching off the furnace from the mains.

After you exit from PROGRAM MODE, the indicator of button RUN

- will flash in green in working mode if the temperature defined by the parameter IDLE TEMP is reached;
- if the temperature is not reached it will flash in red.

DESCRIPTION OF THE PARAMETERS IN ORDER OF THEIR APPEARANCE

ENTRY TEMP

Starting temperature. This is the temperature above which you cannot run the program. Its value is from 230°C to 400°C.

FIRE1 RATE

Rate of rise of temperature to the first firing. Accepts values SKIP – from 1°C/min to 50°C/min - MAX. If the value is set to MAX, temperature growth is uncontrolled, i.e. heaters are turned on continuous.

FIRE1 TEMP

Temperature of first baking. Accepts values from (ENTRY TEMP+20)°C to (FIRE2 TEMP-20)°C.

FIRE1 TIME

Retention time of the set temperature FIRE1 TEMP. Can be changed from 0s to 15h.

FIRE2 RATE

Rate of rise of temperature to the second firing. Accepts values SKIP – from 1°C/min to 50°C/min - MAX. If the value is set to MAX, temperature growth is uncontrolled, i.e. heaters are turned on continuous.

FIRE2 TEMP

Temperature of first baking. Accepts values from (FIRE1 TEMP+20)°C to (FIRE3 TEMP-20)°C.

FIRE2 TIME

Retention time of the set temperature FIRE2 TEMP. Can be changed from 0s to 15h.

FIRE3 RATE

Rate of rise of temperature to the third firing. Accepts values SKIP – from 1°C/min to 30°C/min - MAX. If the value is set to MAX, temperature growth is uncontrolled, i.e. heaters are turned on continuous.

FIRE3 TEMP

Temperature of first baking. Accepts values from (FIRE2 TEMP+20)°C to (FIRE4 TEMP-20)°C.

FIRE3 TIME

Retention time of the set temperature FIRE3 TEMP. Can be changed from 0s to 15h.

FIRE4 RATE

Rate of rise of temperature to the fourth firing. Accepts values from 1°C/min to 30°C/min - MAX. If the value is set to MAX, temperature growth is uncontrolled, i.e. heaters are turned on continuous.

FIRE4 TEMP

Temperature of first baking. Accepts values from (FIRE3 TEMP+20)°C to 1600°C.

FIRE4 TIME

Retention time of the set temperature FIRE4 TEMP. Can be changed from 0s to 15h.

COOL1 RATE

Cooling rate. If the value is set from 1°C/min to 60°C/min, at such a speed temperature in the muffle will cool to a temperature COOL1 TEMP. If the value is set to MAX, the heaters are switched off.

COOL1 TEMP

The temperature to which the first stage of controlled cooling operates, which is set by parameter COOL1 RATE. Accepts values from (FIRE2 TEMP-20)°C to 800°C.

COOL1 TIME

Retention time at temperature COOL1 TEMP. It can be changed from 0s to 15h.

COOL2 RATE

Cooling rate. If the value is set from 1°C/min to 10°C/min, at such a speed temperature in the muffle will cool to a temperature COOL2 TEMP. If the value is set to MAX, the heaters are switched off.

COOL2 TEMP

The temperature to which the second stage of controlled cooling operates, which is set by parameter COOL2 RATE. Accepts values from (COOL1 TEMP - 20)°C to 230°C.

OPEN TIME

Opening time after the temperature COOL2 TEMP is reached. It can be changed from 0s to 3h.

NAME ->

In this parameter you can set a name for the current program. Choose the position for desired letter by using the arrow buttons. Then choose the letter using MFRK.

7. ERRORS

1,2

During SELF TESTING there is no indication of suitable alternating voltage;

3

The network frequency is different from 50Hz or 60Hz;

4

During "SELF TESTING" the AD convertor is not working.

11

The working table does not open to the down position;

12

The working table does not reach the top position in STAND BY mode;

13

The working table does not open to the lower position in STAND BY mode;

14

The working table does not close in the mode of the execution of the program;

15

The working table does not open after the end of the program;

21

The temperature in the chamber has not risen for the required time;

22

Large temperature difference between the expected and actual temperature. The real temperature is bigger than the set temperature;

23

Large temperature difference between the expected and actual temperature. The actual temperature is smaller than the set temperature;

24

The temperature in the chamber is bigger than 1565° C;

25

The temperature in the chamber is smaller than 5° C;

26

The temperature in the chamber rises, when it should go down;

27

Broken thermocouple - hardware detection;

28

During the increase of the temperature the current temperature lags with 300°C than expected;

29

During the increase of the temperature the current temperature outruns by 120°C than expected.

61

Temperature of 240°C cannot be reached for preheating of the heaters, when you start a working cycle at $T > 200^{\circ}\text{C}$.

62

Temperature of 240°C cannot be reached for preheating of the heaters, when you start a working cycle at $T < 200^{\circ}\text{C}$.

When any error appears, it is written on the display and the furnace produces a sound signal. The button STOP has to be pressed in order to exit from this state.

8. IMPORTANT PRACTICAL INFORMATION

1. Avoid positioning of furnace and pump in the immediate vicinity of heat sources (radiators).
2. Avoid placing any objects on the frame plate, place only on the face cooling plate.
3. Always keep the firing chamber closed between firings.
4. If the power supply is interrupted during the working process and:
 - 4.1. If the temperature in the chamber has not decreased by more than 30°C, the current program will continue from the stage at which it has been stopped.
 - 4.2. If the temperature in the chamber has decreased by more than 30°C, the following message will appear on the display:

LONG TIME POWER OFF

In this case the program cannot continue. You have to press the button STOP in order to exit this state.

The total number of the programs is 50. The manufacturer has entered equivalent parameters in all programs.

HINT

It is responsibility of the customer to enter the data for the zirconia that he uses before he starts working.

CLEANING THE CHAMBER

The natural aging processes of the heaters lead to crystallization and silicon is emitted into the furnace space.

As the temperature in the chamber increases, the radiated silicon swirls and may fall on the restoration or on the lid of the sintering pan.

Therefore, the camera must be periodically cleaned. We recommend that you use a special cleaning powder like Nacera Clean by DOCERAM.

Cleaning is carried out by placing about 10 grams of cleaning powder and starting the special cleaning program No. 01.

IMPORTANT

Sinter only in a suitable tray.

9. TECHNICAL DATA

1. Electrical supply	~230 VAC, ±10%, 50/60Hz
2. Max power consumption	2500 W
3. Category of overvoltage	II
4. Maximal firing temperature	1600°C
5. Effective firing chamber dimensions	120mm X 120mm X 100mm
6. Overall dimensions of closed furnace:	
6.1. Width	420 mm
6.2. Length	400 mm
6.3. Height	770 mm
7. Model Weight	60 kg
8. Number of programs	10
9. Working temperature	18°C - 30°C
10. Level of environment pollution	2
11. The device is designed for usage in normal dental premises up to 2000 m altitude above sea level.	
12. The maximum relative humidity of the air must be 80% for temperatures up to 31°C, decreasing lineally to 50% relative humidity for temperature 40°C.	
13. Working modes	
10.1. Programming mode	
Programming of the parameters is fully described in chapter 7. PROGRAMMING.	
10.2. Working mode	
It shows the number of the executed program and the parameters' value of the ongoing program phase.	
The values of all parameters could be seen if you use the Multi Functional Rotary Knob MFRK .	

10. MAINTENANCE

Clean only with a dry or slightly moist cloth (no solvents!).

Change the safety locks with the announced value only, namely:

T 0,63A, slow (class T).

11. DELIVERY SCOPE

Furnace Zircon Master S	1 pc
Set of heaters	4 pcs
Assembled thermocouple	1 pc
Spare fuses 0.63A/250V	1 pc
Wrench N7	1 pc
Mounting template for heaters	1 pc
User Manual	1 pc

12. ACCESSORIES



Ceramic tray



Zirconium beads

ATTENTION!

Additional accessories are not included in the kit. They are paid separately.

“VOP” Ltd.
2140 Botevgrad,
IZ Microelectronica
BULGARIA
Tel. 0723 66303
Tel. 0723 66304

Zircon Master S

WARRANTY SHEET

“VOP” Ltd. warrants the consumer for proper operation of all parts and materials in this product during a period of **12 months** since the day of its purchase.

During this period VOP Ltd. or its authorized persons will repair on its own account all defects which have occur during the normal operation of the machine.

Defects caused by improper transportation, storage and manipulation of the product or due to malfunction of the electrical mains supply are repaired on the account of the customer.

This warranty shall become void if attempts are made to repair the product by persons not authorized by the producer.

Serial Number _____

Invoice number _____

Date _____



GENERAL MANAGER of “VOP” Ltd

CLIENT:

Serial Number _____

Invoice number _____

Date _____

Manufacturer Voucher