

# EP500 Press Furnace

## Operating Instructions

For software version 2.9 and higher.



CE

**IVOCAR**

## EG-Declaration of Conformity

Document-No./  
Month, Year

104 / 12 / 95

Manufacturer: IVOCLAR Dental GesmbH  
Werk Bürs

Address: Bremschlstr. 16  
A-6700 Bludenz-Bürs

Product-  
Name Press Furnace  
Typ PR 2

The product mentioned complies with the  
following European Directives:

Number: a) RL 73/23/EWG  
b) RL 89/336/EWG

Text: a) Low Voltage Directive  
b) Electromagnetic  
Compatibility

The appendices Form FN an Form BM-QP  
contain further information on the fulfilment  
of these Directives.

Issued by: Ivoclar AG  
FL-9494 Schaan

Place, Date: Schaan,  
den 20. December 1995

Valid Signature:

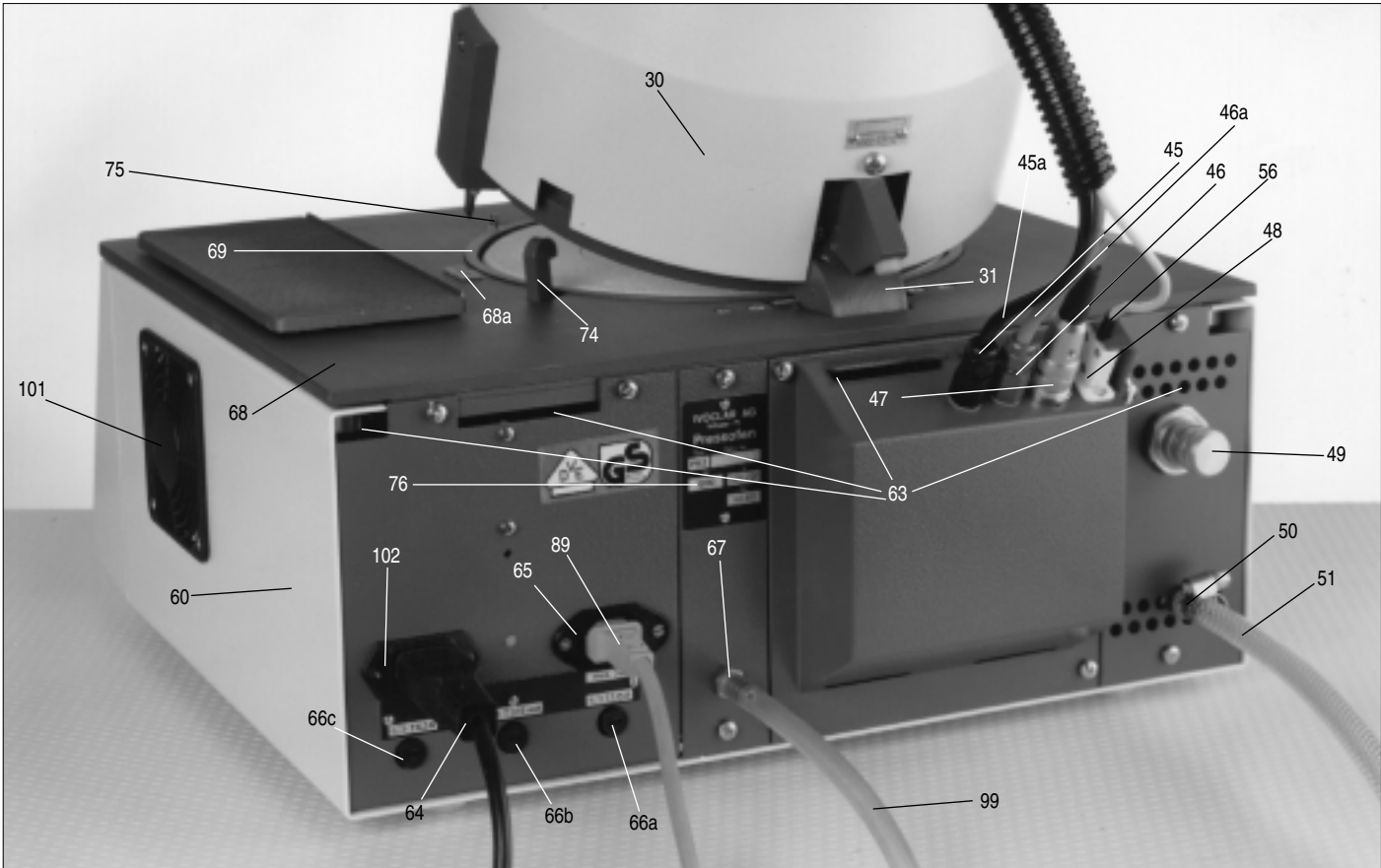
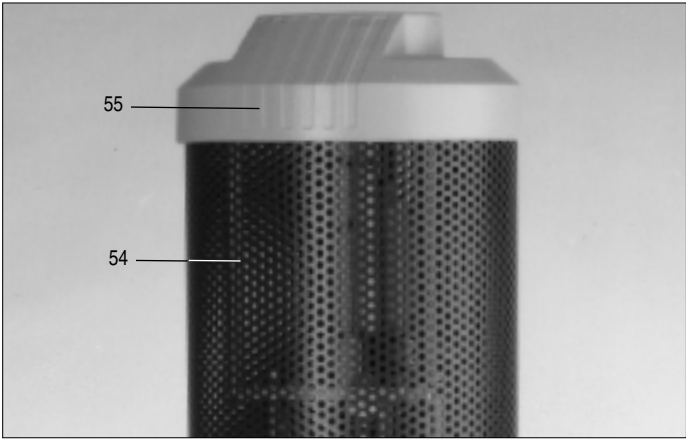
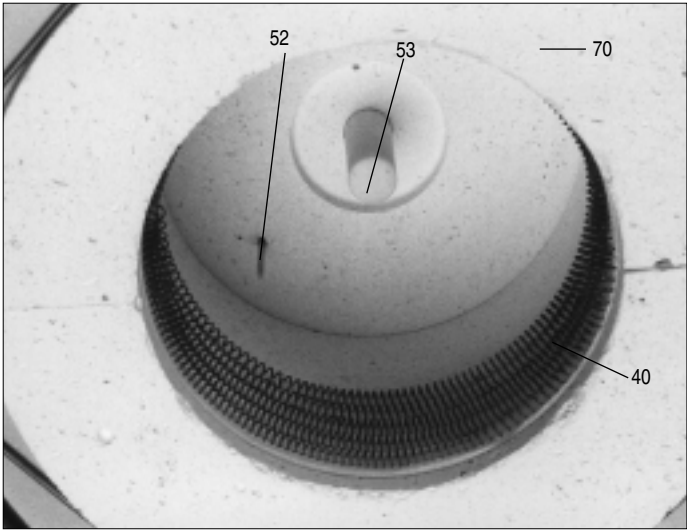
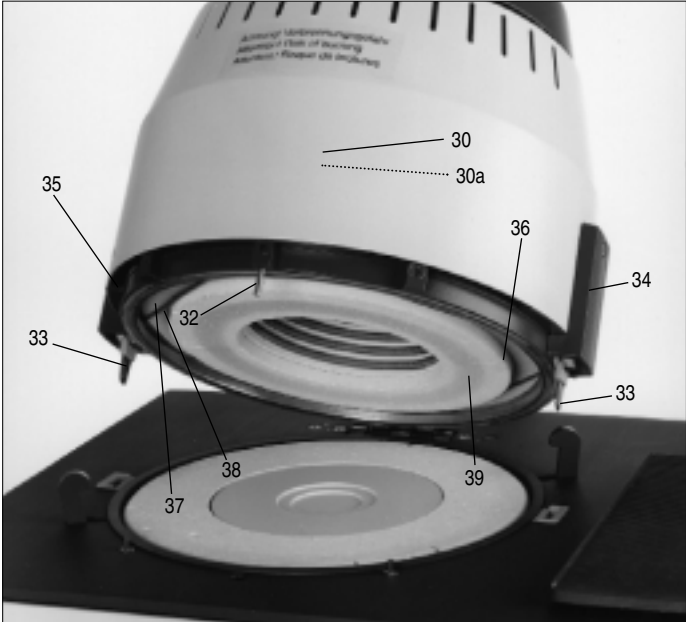
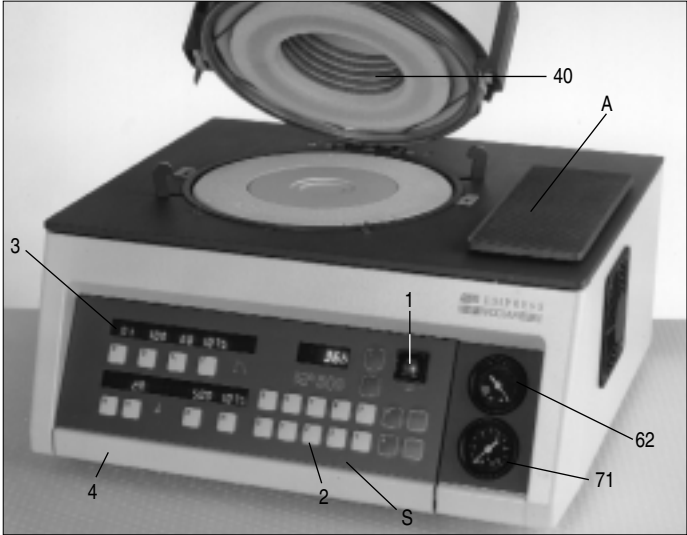


The appendices are an integral part of this declaration. The declaration confirms the compliance with the Directives mentioned, but constitutes no warranty of attributes. The safety notes of the product documentation have to be observed.

# EP500 Press Furnace

## Operating Instructions

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# List of parts

## S = Control unit

- 1 O/I-switch
- 2 Keypad
- 3 Display
- 4 Front panel
- 5 Stop key
- 6 Start key
- 7 Current temperature indicator °C/°F
- 8 + key (calibration)
- 9 – key (calibration)
- 10 Control key (unlock furnace head)
- 11 Control key (lock furnace head)

## Selection keys

| Key                                                                                    | To select            |
|----------------------------------------------------------------------------------------|----------------------|
| 12 B                                                                                   | Stand-by temperature |
| 13 t↗                                                                                  | Temperature increase |
| 14 T                                                                                   | Pressing temperature |
| 15   | Duration of program  |
| 16 V <sub>2</sub>                                                                      | Vacuum off           |
| 17 V <sub>1</sub>                                                                      | Vacuum on            |
| 18 H                                                                                   | Holding time         |
| 19 N                                                                                   | Re-pressing time     |
| 20 P                                                                                   | Program              |
| 21  | Distance indicator   |

## A-Cooling plate

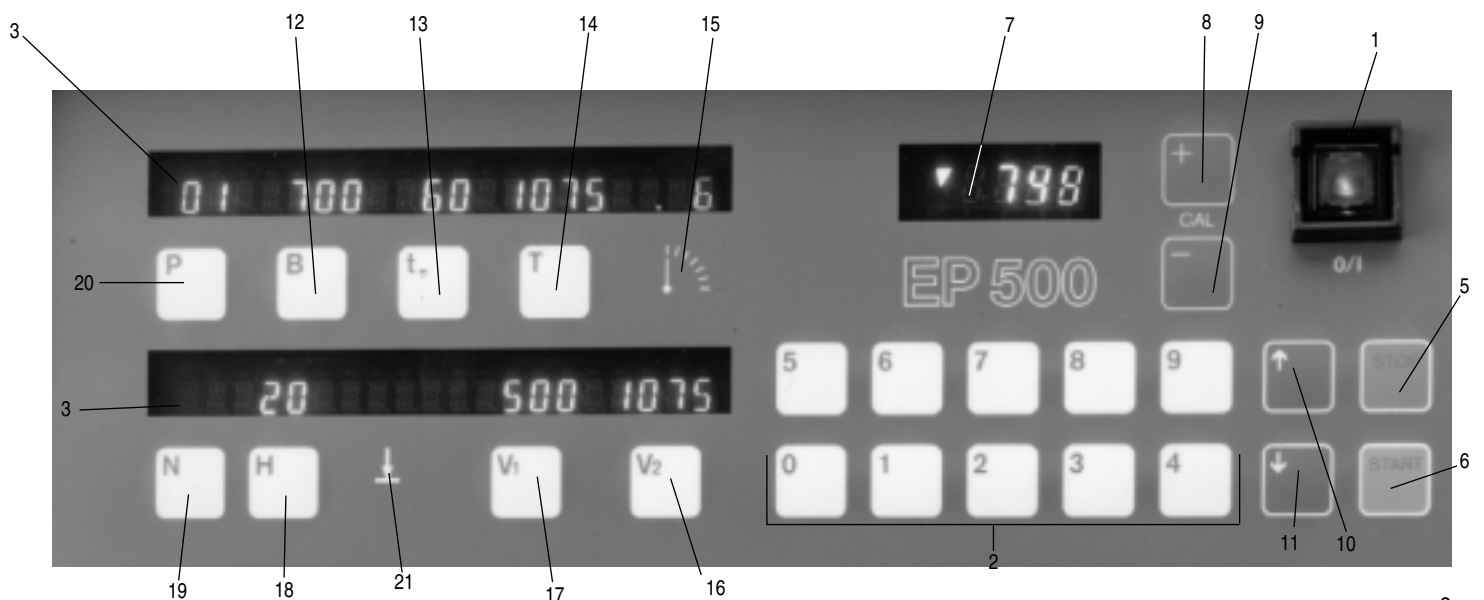
## P = Furnace head

- 30 Dome
- 30a Inside wall of dome
- 31 Mounting
- 31a Apertures
- 32 Switch pin
- 33 Blade contacts
- 34 Protective caps
- 35 Sealing clip
- 36 Spring clip
- 37 Spacing ring
- 38 Insulation cord
- 39 Stone lining segments
- 40 Heating muffle
- 52 Sheathed thermocouple
- 53 Plunger
- 54 Protective well
- 55 Sealing cap with grip

## U = Furnace base

- 45 Air hose connection "off"
- 45a Air hose
- 46 Air hose "open"
- 46a Air hose
- 47 Position sensor connection
- 48 Sheathed thermocouple plug
- 49 Pressure discharge valve
- 50 Compressed air connection
- 51 Compressed air hose
- 53a Spring holder
- 53b Screw
- 56 Angle with clamping nut
- 60 Housing
- 62 Vacuum meter

- 63 Air vents
- 64 Power cord
- 65 Pump power socket
- 66a Pump fuse
- 66b Power fuse
- 66c Heating circuit fuse
- 67 Vacuum hose connection
- 68 Frame panel
- 68a Openings for blade contacts
- 69 Sealing rim
- 70 Stone lining insert
- 71 Pressure indicator
- 72 Firing mount
- 73 Hinge pins
- 74 Locking lever
- 75 Damper pins
- 76 Rating plate
- 89 Pump plug
- 99 Vacuum hose
- 101 Cover of the air vent
- 102 Socket





# 1. Introduction / Signs and Symbols

## 1.1 Preface

Dear Customer,  
Thank you for having purchased the EP500 Press Furnace. It is a highly-technical quality product. The EP500 has preset standard programs and also offers the option of various individual programs. The relevant firing data are shown on an illuminated LC-display.

The furnace is designed according to EN 60335-1 and thus complies with the relevant EU regulations.

The furnace has been designed according to the latest industry standards. Inappropriate use may damage the equipment and be harmful to personnel. Please observe the relevant safety instructions in Chapter 2.



**You must read these Operating Instructions!**

## 1.2 Introduction

The EP500 is a high-tech product for dental technology. It is equipped with state-of-the-art electronic components.

These Operating Instructions are divided into several chapters to help you find specific topics quickly and easily.

Signs and symbols

The signs and symbols in these Operating Instructions and on the furnace facilitate the finding of important points and have the following meanings:

*Operating Instructions:*



**Risks and dangers**  
This symbol marks safety instructions that must be followed to prevent injury or death. Furthermore, damage to the furnace and/or laboratory may thus be avoided.



**Important information**  
This symbol marks additional information for correct and economic use of the EP500.



**Contraindication**



**Burn hazard**

*Furnace:*



**Alternating current**



**On**



**Off**



**Burn hazard, hot surface**



**Risk of crushing**  
**Hazardous area**  
• Note: observe documentation  
• Objects may only be placed into the furnace by means of tongs.

## 1.3 Notes regarding the Operating Instructions

Furnace concerned: EP500 press furnace  
Target group: Dental technologists

These Operating Instructions facilitate the correct, safe, and economic use of the EP500.

The Operating Instructions are divided into several, clearly structured chapters. This should enable you to locate specific topics quickly and easily.

The vacuum pump (accessory to the furnace system) is not described in these Instructions. Please refer to the corresponding vacuum pump Operating Instructions.

To inform you about risks/dangers, important information, and contraindications, these Instructions contain corresponding signs/symbols to mark important paragraphs.

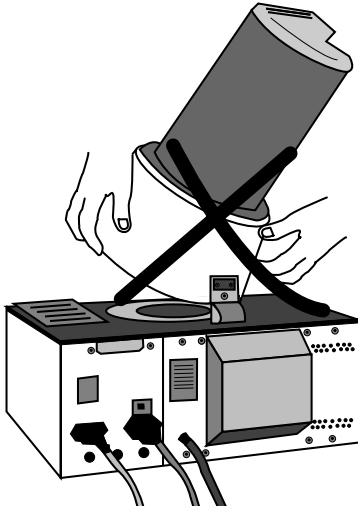
We recommend keeping the Instructions in a safe place near the furnace to have immediate access to the information if necessary.

Should you lose the Operating Instructions, extra copies can be ordered at a nominal fee from your local Ivoclar Service Center.



## 2. Safety First

This chapter is especially important for personnel who work with the EP500 or who have to carry out maintenance or repair work. This chapter must be read and the corresponding instructions followed.



### 2.1 Indications

The EP500 is exclusively designed for pressing IPS Empress ingots and it should be used for this purpose only. Other uses than the ones stipulated, e.g. cooking of food, firing of other materials, etc. are contraindicated. The manufacturer does not assume any liability for damage resulting from misuse. The user is solely responsible for any risk resulting from failure to observe these Instructions.

#### 2.1.1

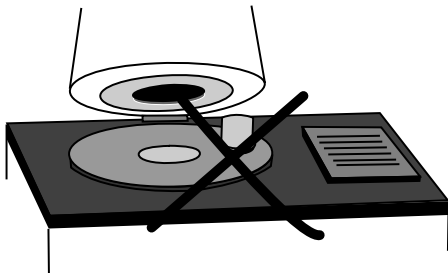


**Contraindication**

Further instructions to assure proper use of the furnace:

- The instructions, regulations, and notes in these Operating Instructions must be observed.
- The instructions, regulations, and notes in the vacuum pump Operating Instructions must be observed.
- The furnace must be operated under the indicated environmental and operating conditions (Chapter 9).
- The EP500 must be properly maintained.

The furnace head should not be removed from the furnace base as long as it is still warm.

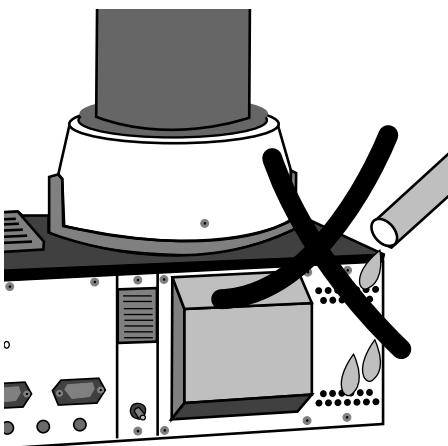


#### 2.1.2



**Contraindication**

Investment cylinders must not be placed in the area surrounding the firing table, since this will obstruct the closing of the furnace head. Use the cooling plate designed for that purpose. Never reach under the furnace head during operation. There is a risk of crushing!

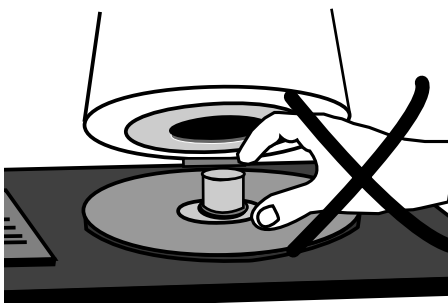


#### 2.1.3



**Risks and dangers**

Foreign objects must not be placed on the air vents. Make sure that no liquids or other foreign objects enter the air vents, since this may result in an electrical shock or short circuit.



#### 2.1.4



**Contraindication**



**Burn hazard**

Never place objects in the firing chamber by hand, since there is a burn hazard. Always use the tongs from Ivoclar supplied for this purpose.

Never touch the hot surface of the furnace head, as there is a burn hazard.

**Please also refer to section 3.2. in Chapter 3.**

## 2.2 Health and safety instructions

This furnace has been designed according to EN 60335-1 and has been shipped from the manufacturer in excellent condition as far as safety regulations are concerned. To maintain this condition and to assure risk-free operation, the user must observe the notes and warnings contained in these Operating Instructions.

- Do not place furnace and pump in the immediate vicinity of heaters or other sources of heat.
- Place furnace on a fire-proof table (observe local regulations, e.g. distance to combustible objects, etc.).
- Always keep the air vents at the rear of the furnace free from obstruction.
- Position vacuum pump in a well-ventilated place. The openings in the frame panel must always remain free from obstruction. Make sure that no foreign objects enter the furnace base.
- Do not place any objects on the frame panel. Use the cooling plate for that purpose.
- Keep sealing ring of the furnace head and sealing rim of the furnace base clean and avoid damage.
- Do not touch any parts that become hot during the operation of the furnace. There is a burn hazard!
- Clean furnace only with a dry or slightly moist cloth. Do not use any solvents. Disconnect power before cleaning.
- Use original packaging for transportation purposes.
- The user must especially become familiar with the warnings and the operating conditions, to prevent injury to personnel or damage to materials. The manufacturer is not responsible for damage resulting from misuse or failure to observe the Operating Instructions. Warranty claims cannot be accepted in such cases.
- Before switching on the furnace, make sure that the voltage indicated on the rating plate complies with the local power supply.
- The power plug may only be inserted into sockets with protected contacts.
- Do not damage the blade contacts.
- Before calibration, maintenance, repair, or change of parts, the power must be disconnected if the furnace is to be opened.
- If calibration, maintenance, or repair has to be carried out with the power connected and the furnace open, only qualified personnel, who are familiar with the risks and dangers, may perform these procedures.
- After maintenance, the required safety tests (high voltage resistance, protective conductor, etc.) have to be carried out.
- Ensure that only fuses of the indicated type and rated current are used.
- If it is assumed that safe operation is no longer possible, the power must be disconnected to avoid accidental operation. Safe operation is no longer possible if
  - the furnace is visibly damaged
  - the furnace does not work
  - the furnace has been stored under unfavourable conditions over an extended period of time
- Maintenance work and changing of the heating muffle may only be carried out by qualified personnel.
- Use only original spare parts.
- The temperature range for faultless operation is + 5 °C to + 35 °C (41-95 °F).
- If the furnace has been stored at very low temperatures or high atmospheric humidity, the head has to be opened and the unit dried or left to adjust to the room temperature for approx. 1 hour (do not connect to the power yet).

- Note: Do not work with liquids near the furnace. Should a liquid accidentally enter the furnace, disconnect power and consult Customer Service. Do not operate the furnace.
- The furnace is tested for use at altitudes of up to 2000 m above sea level.
- The furnace may only be used indoors.

### Warning

Any disruption of the protective conductor either inside or outside the furnace or any loosening of the protective conductor connection may lead to danger for the user in case of a malfunction. Deliberate interruptions are not tolerated. Materials developing harmful gases must not be fired.

### General safety instructions

- Please observe the safety instructions in these Operating Instructions.
- Always use original packaging for transportation purposes.
- Disconnect power before maintenance.
- Repairs may only be carried out by certified Ivoclar Service Centres.
- Use only original spare parts.



Burn hazard and risk of crushing. Never reach under the opened furnace head, even if the furnace is cold. Use the tongs supplied by Ivoclar to place or remove objects from the furnace.



Hot surface. There is a burn hazard. Never touch the furnace head when it is hot.

# 3. Product Description

## 3.1 Components

The EP500 press furnace comprises the following components:

- Furnace base with electronic controls
- Furnace head
- Vacuum pump with hose and power cord (accessories)

The electronic controls and the mechanical components, which assure the proper functioning of the furnace, are located in the furnace base. The heater is located in the muffle in the furnace head, where it is embedded in the stone lining segments. Operation and control of the furnace is done with state-of-the-art electronic components.

## 3.2 Hazardous areas and safety equipment

Description of the risk areas of the furnace:

| Hazardous area            | Type of risk             |
|---------------------------|--------------------------|
| Firing chamber            | Risk of burning          |
| Opening/closing mechanism | Risk of crushing         |
| Electrical components     | Risk of electrical shock |

Description of the safety equipment of the furnace:

| Safety equipment             | Protective effect                |
|------------------------------|----------------------------------|
| Protective conductor         | Protection from electrical shock |
| Rim of the cooling plate     | Limiting the usable area         |
| Grooves in the cooling plate | Permitting improved cooling      |

Also refer to Chapter 2.

## 3.3 Functional description

The firing chamber may be heated up to max. 1200 °C (2192 °F) by means of a heating element. Furthermore, the firing chamber is designed so that a vacuum may be created with a vacuum pump. The firing process is controlled with corresponding electronic controls.

## 3.4 Accessories

- Temperature Checking Set 2
- Programat accessories assortment (firing tray, tongs, Temperature Checking Set)
- Vacuum pump VP2
- Firing cards



# 4. Installation and Initial Start-Up

## 4.1 Unpacking and checking the contents

Remove the furnace components from their packaging and place the unit on a suitable table. There are no special transportation grips on the unit. Support the bottom of the furnace to carry it.

Check the delivery for completeness (see delivery form in Chapter 9) and transportation damage. If certain parts are damaged or missing, contact your Ivoclar Customer Service. We recommend keeping the original packaging for future transportation purposes.

## 4.2. Selecting the location

Place the furnace on a flat table using the rubber feet. Make sure that the furnace is not placed in the immediate vicinity of heaters or other sources of heat. Furthermore, protect the furnace from direct sunlight. Make sure that air may properly circulate between the wall and the furnace.

Also ensure that there is enough space between the furnace and the user, as the furnace releases heat during opening of the furnace head. The furnace should neither be placed nor operated in areas where there is an explosion hazard.

Check the rating plate (76)  
Make sure the voltage on the rating plate (76) complies with the local power supply (see rear panels of the furnace base and the furnace head).



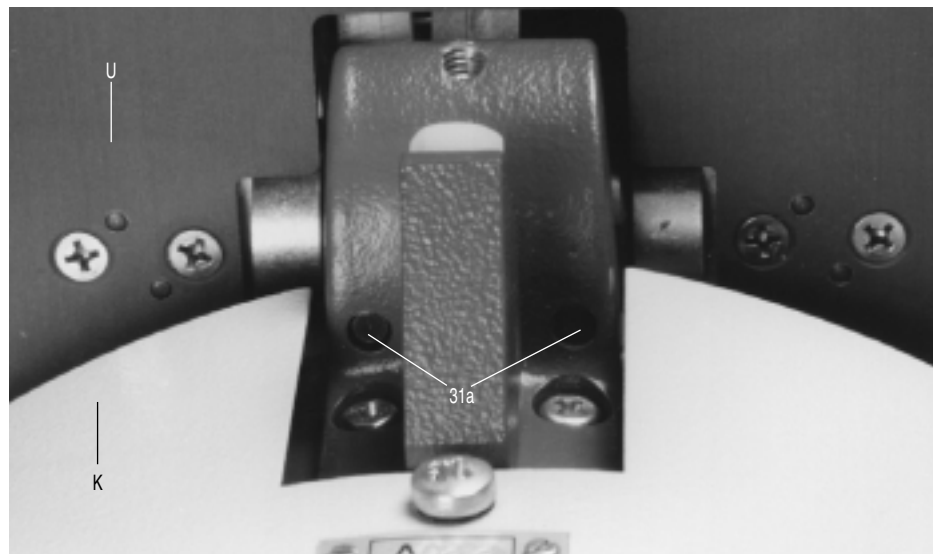
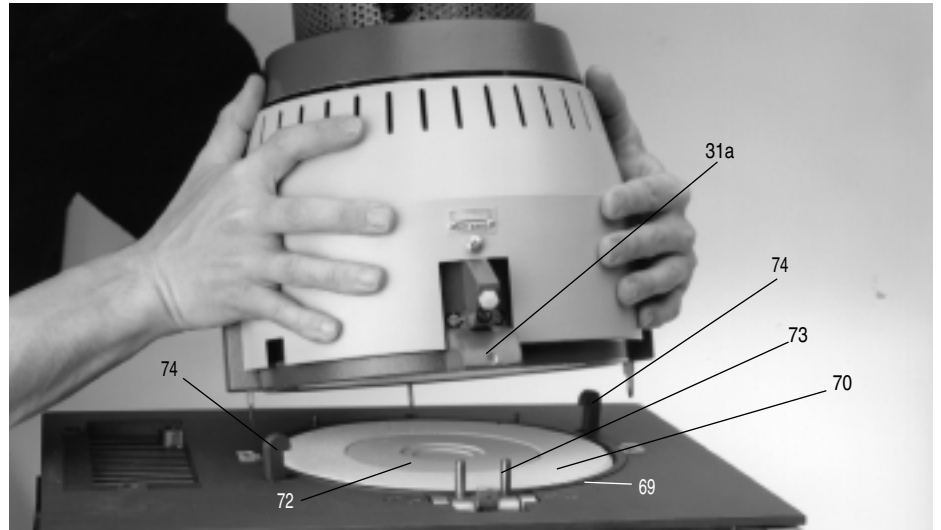
**Important**  
The sheathed thermocouple must always be perpendicular and must neither be damaged nor bent.

### 4.2.1 Mounting the connections

- Remove the clamping nuts from the air hose connections (45, 46) and slide them onto the air hoses (45a, 46a). Connect the air hoses according to the colour code and secure the clamping nuts by hand.
- Connect the 3-pin plug (round-pin plug) (47) and secure with the union nut.
- Connect the 2-pin plug (flat-pin plug) (48) and secure with the angle (56).

## 4.3. Assembly and initial start-up

The furnace comprises the following components which are assembled as follows:



### 4.3.1 Assembling the furnace base

- Position the furnace base (U)
- Remove the firing mount (72) from the packaging and introduce it into the stone lining insert (70).
- Clean sealing rim (69)
- Place cooling plate (A) in the corresponding impressions in the frame panel (68).

### 4.3.2 Mounting the furnace head

- Clean the sealing ring (35) of the furnace head, the heating muffle, and the stone lining inserts (39). Do not touch the heating element.
- Align the hinge pins (73) perpendicular to the furnace base (Fig. 6).
- Pull locking lever (74) out.
- Hold the furnace head and mount it with the apertures (31 a) in the mounting lug (31) onto the hinge pins (73) (see Fig. 6).
- Keeping the furnace head level, push down in a parallel direction until the sealing ring of the furnace head (35) rests evenly on the sealing rim (69) of the furnace base.

### 4.3.3 Connections

#### 1. Vacuum pump

- Connect vacuum pump with the press furnace according to the Operating Instructions of the vacuum pump.
- Set up pump and insert pump plug into the socket (65).
- Slide vacuum hose onto the vacuum hose connection (67) of the furnace and the vacuum pump.



#### **Important information**

Connect vacuum pump with the furnace base prior to starting up the furnace.

#### 2. Compressed air

Connect the compressed air hose (51) to the compressed air supply.



#### **Risks and dangers**

Maximum permissible pressure supply: 6 bar.

#### 3. Furnace

Connect power cord (64) with the socket of the furnace and the power supply.

### 4.3.4 Initial start-up

#### **O/I switch (1)**

Press the On/Off switch (1) of the furnace. The green pilot lamp lights up, the buzzer sounds, and various data appear briefly on the display. After approx. 6 seconds, the actual values are displayed. The closed furnace now heats up to stand-by temperature B.

When a selection key is pressed, a dot lights up behind the relevant display, indicating that data may be entered or altered.

# 5. Operation and Standard Settings

## 5.1 Introduction to the operation

The EP500 is equipped with displays indicating all parameters. These parameters may be selected by pressing the corresponding keys and altered by entering the desired values. If the desired value is not possible for the selected program or firing parameter, the framed symbol starts to blink and an Error (Er) message appears on the display.

## 5.2 Setting the parameters

The parameters can be selected on the menu bar with the respective keys.



## 5.3. Key functions, displays

### Numeric keys (2)

0–9: for entering the program numbers and the desired values.

### Control keys

- ↑ Plunger up (unlock furnace head)
- ↓ Plunger down (lock furnace head)

When a program is in progress, these keys can no longer be used.

### Start (6)

Press the green key to start the program

### Stop (5)

*Pressing this key once has the following effects:*

- Program in progress stops
- Heating process stops
- Buzzer stops

*Pressing this key twice has the following effects:*

- Vacuum stops
- Plunger is moved up

### Calibration keys (8, 9)

+ and – are used for the calibration of the furnace temperature as described on page 18.

### Information shown in the long displays

*The displays show:*

- The program number as selected with P
- The desired value as selected with the numeric keys (no data is displayed for N, H, V1, or V2 if data input = 0)
- The duration of the program is shown above the clock symbol once a program has been started.

 (Approximate time in minutes is indicated behind the flashing dot. During pressing, this display shows three blinking bars '---'.)

- The distance indicator appears above the symbol only when pressing is in progress. the smallest unit is 0.1 mm. A blinking indicator signifies input of incorrect data.

### Information shown in the small display (7)

- Furnace temperature (actual T value)
- ► = program running
- Blinking = error (see pages 19–20 for explanations)

### Vacuum meter

- Indicator at the end of the scale = no vacuum
- Indicator in the green range = operating vacuum

### Pressure indicator (71)

Shows the pressure set by means of the pressure discharge valve (49).

### Buzzer

The buzzer indicates:

End of program → the investment cylinder must be removed immediately after manual opening. (Duration: The buzzer sounds for 10 minutes without interruption).

**P = Program (20)**

**B = Stand-by temperature (12)**

Temperature to which the furnace heats up after it has been switched on and closed, but before a program has been started.

**t  = Temperature increase per minute (13)**

Rate of increase of furnace temperature once the furnace head has been closed and the program started.

**T = Pressing temperature (14)**

The furnace temperature maintained once the desired temperature has been reached.

** = Duration of program (15)**  
(in minutes, countdown)

**N = Re-pressing time (19)**

This function is activated if the distance travelled by the plunger is less than that specified in the program.

**H = Holding time (minutes) (18)**

The period during which the furnace temperature is kept constant.

** = Distance travelled by the plunger in mm (21)**

**V1 = Vacuum on (17)**

Vacuum buildup begins (pump switches on)

**V2 = Vacuum off (16)**

Vacuum release begins (pump switches off)

## 5.4 Operating in Fahrenheit or Celsius mode



### Important information

When program P98 is selected, error message Er 00 appears and the program indicator blinks, but this is of no consequence (it only shows that P98 is not a work program).

### 1. Verification of operating mode

Enter 98:

- If a C lights up above the V1 key, the furnace is in the Celsius mode.
- If an F lights up above the V1 key, the furnace is in the Fahrenheit mode.

### 2. Switching from Celsius to Fahrenheit mode

Enter 98:

(a C lights up above the V1 key)

- Switch off O/I key
- Press V1 continuously and switch on O/I
- Release V1 key approx. 3 seconds after switching on.

As soon as an F lights up above the V1 key, the furnace is in the Fahrenheit mode.

### 3. Switching from Fahrenheit to Celsius mode

Same procedure as described in paragraph 2.

As soon as a C lights up above the V1 key, the furnace is in the Celsius mode.

## 5.5. Selecting the buzzer signal

Program P91

With this program, the acoustic signal can be set individually or switched off completely.

This helps generate different buzzer signals when several units are in operation simultaneously.

Set the setting time with V1 (editing dot lights up) and "+" or "-" from 0 to 9. The V1 display corresponds to the 'On' time (\* 20 ms).

Display 0 = buzzer switched off.

Set the interval time with V2 (editing dot lights up) and '+' or '-' from 0 to 9. The V2 display corresponds to the 'Off' time (\* 100 ms). Display 0 = permanent buzzer signal.

## 5.6. Silver Test

The temperature adjustment by means of the Silver Test is described in Chapter 7.

# 6. Practical Use

The operating procedure for the EP500 will be explained with the help of two examples: one standard and one individual program.

## 6.1. Switching on/off

### 6.1.1 Switching on

Switch on O/I switch (1) and allow the furnace to heat up to stand-by temperature B.

## 6.2. Pressing with standard programs

### Trial run

#### 6.2.1 Checking the operating pressure of approx. 5 bar on the pressure indicator (71)

To set or change the operating pressure:

- Loosen the counter nut of the pressure discharge valve (49).
- To increase pressure: turn the setting screw in a clockwise direction.
- To reduce pressure: turn the setting screw in an anticlockwise direction.
- Tighten the counter nut of the pressure discharge valve.

#### 6.2.2 Checking the operating mode

(Set for operation in Celsius or Fahrenheit mode).

See page 14 for the detailed procedure.

#### 6.2.3 Selecting the program

First, press selection key, e.g. P01.

|    | °C mode   | °F mode   |
|----|-----------|-----------|
| B  | 700 (°C)  | 1292 (°F) |
| t↗ | 60 (°C)   | 108 (°F)  |
| T  | 1075 (°C) | 1967 (°F) |
| N  | 0 (min.)  | 0 (min.)  |
| H  | 20 (min.) | 20 (min.) |
| V1 | 500 (°C)  | 932 (°F)  |
| V2 | 1075 (°C) | 1967 (°F) |

#### 6.2.4 Opening the furnace manually

#### 6.2.5 Placing the investment cylinder on the firing mount (72)

Preheat the investment cylinder in the preheating furnace at 850 °C (1562 °F). Place the preheated ingots and the alox plunger in the investment cylinder and close the furnace head.

#### 6.2.6 Running the program

Press START. The clock indicator shows the duration of each of the program steps t↗, H, and N according to the sequence of the program selected. During pressing, 3 bars blink in the display. The program now runs automatically.

The heater and the vacuum pump are activated. The furnace heats up to the pressing temperature T at the preselected rate t↗. (See diagram of program sequence on page 16.)

Once T is reached, the set holding time H commences. The holding time is necessary to ensure that the investment cylinder reaches the working temperature. Once this period has elapsed, pressing is activated. The symbol indicates the distance travelled by the plunger. If the plunger travels at less than the defined speed – provided it has been programmed – re-pressing begins. After re-pressing, the heating element and vacuum are switched off, the plunger returns to its starting position and the buzzer sounds, indicating the completion of the pressing procedure.

#### 6.2.7 Opening the furnace

Remove the investment cylinder immediately, once pressing is completed.

Open the furnace manually and remove the investment cylinder using the tongs. Close furnace manually.



#### Warning

When the furnace is open, the outside of the furnace head becomes hot! **Do not touch hot parts, as there is risk of burning.**

## 6.3 Changing of standard parameters

### 6.3.1 Programming, change of parameters

- The program cards are used to note the parameters for each program.
- Program numbers should be entered in two-digit form, i.e. P01-P09, P10, P11 (do not enter P1, P2, etc.).
- Data may only be entered or altered if no program is in progress:
  - Press selection key (now a dot lights up behind the corresponding display)
  - Enter the desired value

- For the input of V2 (vacuum off), please note:
  - For firing the holding H without vacuum, enter V2 as follows:
    - °C mode:  $V2 = T - 1 \text{ } ^\circ\text{C}$   
(e.g.  $T = 1050 \text{ } ^\circ\text{C}$ ,  $V2 = 1049 \text{ } ^\circ\text{C}$ )
    - °F mode:  $V2 = T - 2 \text{ } ^\circ\text{F}$   
(e.g.  $T = 1922 \text{ } ^\circ\text{F}$ ,  $V2 = 1920 \text{ } ^\circ\text{F}$ )(The vacuum is switched off as soon as the holding time begins.)
  - For firing the holding time H with vacuum, enter V2 as follows:
    - $V2 = T$  (e.g.  $T = 1050 \text{ } ^\circ\text{C}$ ,  $V2 = 1050 \text{ } ^\circ\text{C}$  or  $T = 1922 \text{ } ^\circ\text{F}$ ,  $V2 = 1922 \text{ } ^\circ\text{F}$ )(The vacuum is not switched off until the end of the pressing process.)

- If control is lost because of incorrect programming, the situation can be rectified as follows:
  - Switch off O/I
  - Hold down the STOP key and switch on O/I again (the displays now show the original data preset by the manufacturer).
- After completion, the program is stored automatically.
- Change of program during a program in progress is always possible.

To change from one program to another:

- Press STOP
- Press P and enter new program number
- Press START
- Changing selected data while a program is running is possible only before the actual temperature reaches the selected T value:
  1. N and H may be altered without interruption of the program:
    - Press the appropriate keys and enter the new values
  2. To change B, t↗, T, V1, and V2:
    - Press STOP
    - Press the appropriate key and enter the new value
    - Press START

- To interrupt a program with vacuum while it is in progress, and release vacuum:
  - Press STOP twice

- Moving the plunger:
  - Do not move the plunger with  $\perp$  while the program is in progress.

## 6.4 Description of programs

### Press parameters



Please refer to the IPS Empress Instructions for Use for the corresponding press parameters.

### Programs P01 to P90

B 200 - 850 °C                      392-1562 °F  
 t 5 - 80 °C/min.                  9 - 145 °F/min.  
 T 200 - 1200 °C                  392 - 2192 °F  
 N 0 - 30 min.  
 H 0 - 60 min.  
 V1 0 - 1200 °C                    0 - 2192 °F  
 V2 0 - 1200 °C                    0 - 2192 °F

Programs P01, P02, and P11 of the EP500 consist of parameters preset by the manufacturer. These parameters, however, may also be altered.



Programs P11 to P20 have been especially designed for IPS Empress 2 and the CosmoPost ingots, ensuring the controlled stopping of the program (see press tables on page 25).

Programs P11 to P20 are **unsuitable** for use in the IPS Empress staining and layering technique (ceramics pressed at higher temperatures).

### Program P91

With this program, the buzzer can be set individually or switched off completely. This helps generate different buzzer signals when several apparatus are in operation simultaneously.

Please refer to Chapter 5 (selecting the buzzer signal) for more details.

### Program P98

Switching from Celsius to Fahrenheit mode and vice versa.

### Program P99

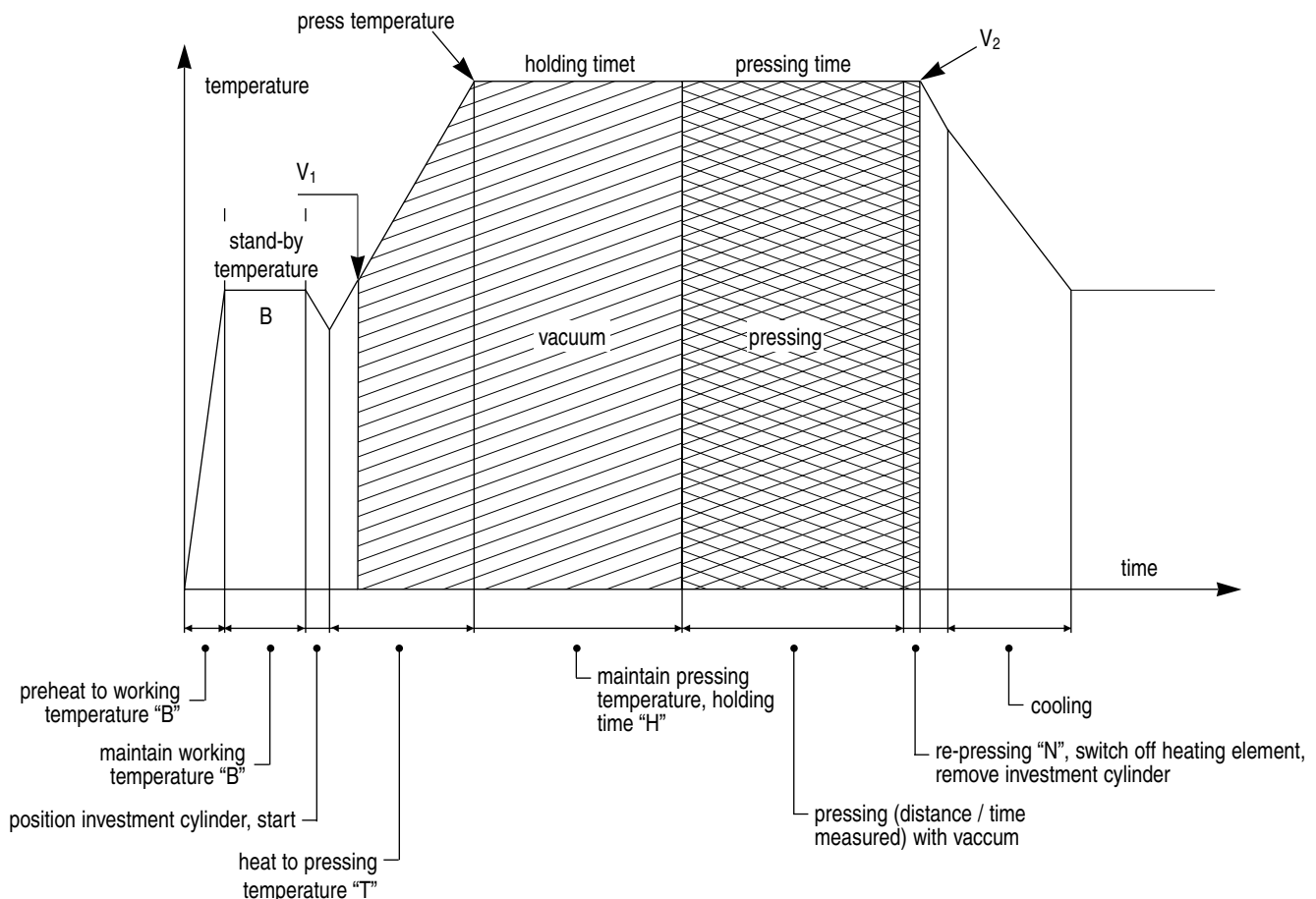
- For checking the furnace temperature with the Silver Test
- For recalibration



- Always keep the furnace closed between firings.
- Place the investment cylinder in the depression in the firing mount (72)

- A power failure will interrupt any program. After a power failure, Er 17 appears. Press STOP when the power failure is over and START to continue the program (the effect on the object depends on the duration of the power failure).
- Check temperature of the furnace by means of the Silver Test.
- If long waiting times are necessary between pressings, switch off the furnace or use a special program to reduce the stand-by temperature to 400 °C (752 °F). Increase the stand-by temperature to 700 °C (1292 °F) before starting a new pressing procedure.

### 6.4.1 Program sequence



# 7. Maintenance, Cleaning, Diagnosis

This chapter describes the user maintenance and cleaning procedures. All other tasks must be performed by qualified service personnel at a certified Ivoclar Service Center.



Disconnect power before maintenance and cleaning, since there is a risk of electrical shock.

## 7.1 Monitoring and maintenance

The time for these maintenance procedures depends on the frequency of use and the working habits of the users. For that reasons, the recommended times are only approximates.

| What                                                                                                                                                         | Part                            | When         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|--------------|
| Check all plug-in connections for correct fit                                                                                                                | Var. connections                | weekly       |
| Check if the furnace head opens smoothly and without excessive noise                                                                                         | Opening mechanism               | monthly      |
| Check if the thermocouple is straight and in the right place.                                                                                                | Thermocouple                    | weekly       |
| Check the stone lining inserts for cracks and damages.<br>If the stone linings are worn down they have to be replaced by a certified Ivoclar Service Center. | Stone lining inserts            | monthly      |
| Check if the sealing rim of the furnace head is clean and undamaged.                                                                                         | Sealing rim of the furnace head | weekly       |
| Check the keypad for visible damage.<br>If the keypad is damaged it has to be replaced by a certified Ivoclar Service Centre.                                | Keypad                          | weekly       |
| Check temperature. Use the temperature checking set and adjust the temperature in the furnace.                                                               | Firing chamber                  | yearly       |
| Change press plunger                                                                                                                                         | Press plunger                   | if necessary |

## 7.2 Cleaning

### Risks and dangers

The furnace may only be cleaned when it is cool, since there is a burn hazard. Do not use any cleaning solutions.

The following parts have to be cleaned from time to time:

| Item                             | Frequency   | Cleaning material               |
|----------------------------------|-------------|---------------------------------|
| Housing                          | if required | soft, dry cloth                 |
| Electronic controls              | weekly      | soft, dry cloth                 |
| Cooling plate                    | daily       | cleaning brush                  |
| Stone lining inserts             | daily       | cleaning brush                  |
| Sealing ring of the furnace head | daily       | cleaning brush and a soft cloth |

### 7.3 Furnace calibration (Silver Test)



The sheathed thermocouple may be subject to changes which affect the furnace temperature, depending on the mode and period of operation. Check furnace temperature with the Silver Test at least once a year and adjust if necessary. For that purpose, the furnace features P99, a special calibration program.

Required material:

- Honey-combed firing tray
- Temperature checking set 2 (Ivoclar)
- Silver wire, purity 99.99 %  
(Size: 1 mm x 20 mm)

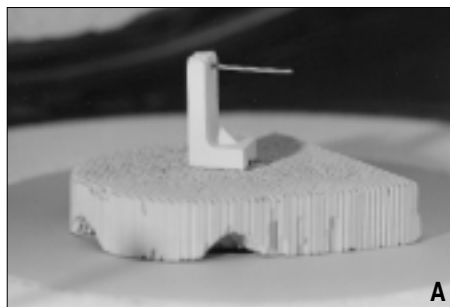


#### Information

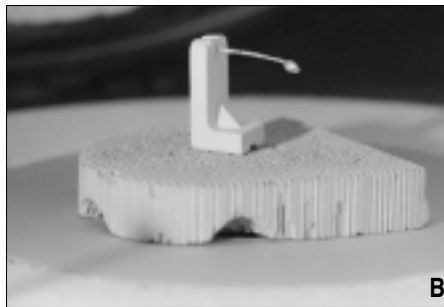
When checking the furnace temperature with the Silver Test, make sure that the Silver Test sample is always placed on the honey-combed firing tray.

#### Procedure

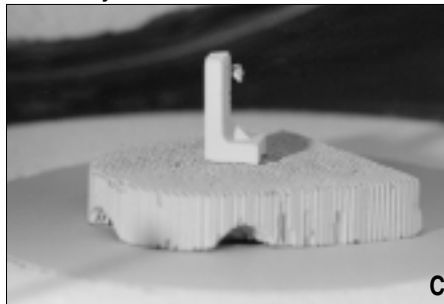
- The furnace must have been on stand-by temperature of 700 °C (1292 °F) for at least 30 minutes.
- Conduct a firing program with the furnace empty. Select and run Program 1 for that purpose. After approx. 15 minutes, i.e. before the program is completed, press STOP twice to stop the heating procedure. After that, the closed EP500 cools down to a stand-by temperature of 700°C (1292°F). Now, the actual calibration procedure can be conducted.
- Insert silver wire into its holder and place it on the honey-combed firing tray (Fig. A)
- Select P99 (Silver Test program)
- Open the furnace head manually.



- Place holder with the silver wire and honey-combed firing tray in the centre of the firing mount (72) and close the furnace head.
- Press START. (If error warning Er 14 appears, the temperature in the firing chamber is still above the stand-by temperature. As soon as the adequate temperature is reached, the program starts automatically.)



**If, upon completion of the program, the silver wire is melted so that it looks as shown above, the temperature in the firing chamber is correct. If not, recalibration is necessary.**



#### Recalibration

The calibration keys '+' and '-' only work after P99 has been selected.

- If the silver wire is not melted, use "+" to recalibrate.
- If the silver wire is melted to a ball after the Silver Test, use "-" to recalibrate (Fig. C).

Every time one of the calibration keys is pressed, the temperature is changed by 1 °C (1.8 °F). Experience has shown that a recalibration of 5 °C (9 °F) is usually appropriate, i.e. the relevant calibration key has to be pressed five times. While the calibration keys are in use, the calibration value is shown in the small display in °C.

The EP500 press furnace permits changing of the temperature by -50 °C (-90 °F) and +50 °C (+90 °F).

Repeat the Silver Test until the silver wire has appropriately melted as shown in Figure B.

### 7.4 Changing the press plunger

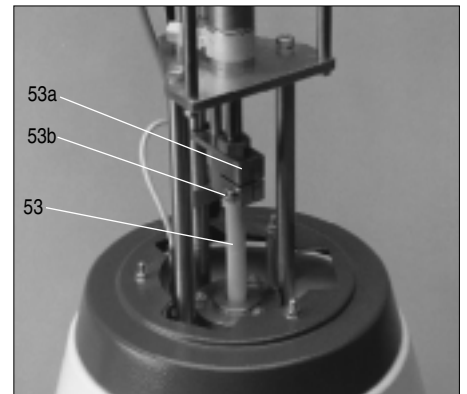


- Switch off the furnace, disconnect the power, and allow furnace to cool to room temperature. Close furnace head.
- Using the 4 mm hexagon-socket wrench provided, loosen the sealing cap (55) and remove it. Remove the protective well (54) while holding the rubber cable sleeve.
- Loosen the screw (53b) of the clamping mechanism (53a) with the hexagon-socket wrench and open the furnace head. Move the plunger (53) into the firing chamber by pushing it with one hand and pulling it with the other while rotating it slightly.



#### Warning

Take care not to buckle the thermocouple located in the upper part of the firing chamber.



- Insert new plunger (53) into the guide bush with the phasing ahead. Push the plunger into its clamping spring by rotating it slightly until it sits firmly in its mount. Close furnace head. Carefully tighten the screw (53b) of the clamping mechanism (53a). Reposition protective well and push the rubber cable sleeve back into place. Replace the cap and secure with screws.
- Reconnect power. Furnace is ready for use.

### 7.5 Changing the heating muffle

The heating muffle must be changed whenever the heating performance becomes inadequate as a result of wear or a defect (see error warnings Er 23, and Er 24 on pages 19 and 20).



Maintenance and changing of the heating muffle may only be carried out by certified Ivoclar Service Centres.

## 8. What if ...

This chapter will help you to recognize malfunctions and take appropriate measures, or, if possible, to perform some repairs.

### Error warnings Er 00 to Er 11 and how to rectify them

Er 00 to Er 11 appear as a result of incorrect data input. 'Er' is blinking on the set temperature display, together with the parameter to be altered (program is interrupted).

\*) Correct program numbers and values are listed on page 25.

### 8.1 Error messages

List of possible error messages and their meaning

| Error | Cause                                                                                                      | Corrective measure                                                                                                                       |
|-------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Er 00 | Incorrect P number<br>00<br>01 to 99<br>91 to 98                                                           | Press "P" and enter correct program number. *)<br>In P98, the error warning merely indicates that this program is not a work program. *) |
| Er 01 | T value below the actual temperature in the firing chamber                                                 | Press the key above the blinking value and enter the correct value. *)                                                                   |
| Er 02 | T value lower than B or higher than 1200 °C (2192 °F)                                                      |                                                                                                                                          |
| Er 03 | N value higher than 30 min.                                                                                |                                                                                                                                          |
| Er 04 | H value higher than 60 min.                                                                                |                                                                                                                                          |
| Er 05 | t↗ value either<br>0–4 °C/min. or<br>higher than 80 °C/min.<br>(0–8 °F/min. or<br>higher than 146 °F/min.) |                                                                                                                                          |

### Error warnings Er 12 to Er 99 and how to rectify them

These Er warnings appear on the actual temperature display.

|       |                                                                             |                                                                                                                                                               |
|-------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Er 06 | B value 0–199 °C or higher than 850 °C<br>(0–390 °F or higher than 1562 °F) | Press the key above the blinking value and enter the correct value. *)                                                                                        |
| Er 07 | B value is higher than the T value                                          |                                                                                                                                                               |
| Er 09 | V <sub>1</sub> value higher than the V <sub>2</sub> value                   |                                                                                                                                                               |
| Er 10 | V <sub>2</sub> value higher than the T value                                |                                                                                                                                                               |
| Er 11 | V <sub>1</sub> or V <sub>2</sub> value is missing                           |                                                                                                                                                               |
| Er 12 | Battery in the control unit almost empty and should be replaced             | Press STOP (Er 12 disappears).<br>Have battery replaced by your Customer Service.<br>The furnace may still be operated normally until the battery is changed. |
| Er 13 | Overheating                                                                 | Mistake occurred during reprogramming. T value is lower than the actual temperature in the firing chamber.                                                    |
| Er 14 | Temp. in the firing chamber too high for the Silver Test                    | Allow the furnace too cool until the stand-by temperature is reached with the furnace head closed.                                                            |
| Er 15 | Furnace head was still open when the program started                        | Close furnace head.                                                                                                                                           |
| Er 16 | Press plunger does not move                                                 | Check compressed air supply. If not, the pressing procedure will stop after 10 min., as the corresponding indicator shows less than 1 mm.                     |
| Er 17 | Interruption of the circuit during a program in progress                    | Press STOP (Er 17 disappears). Work may proceed as usual.                                                                                                     |
| Er 20 | Thermocouple defective or thermocouple plug (48) disconnected               | 1                                                                                                                                                             |

| Error          | Cause                                                                         | Corrective measure                                                                                                                |
|----------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Er 21          | Defect in the control unit                                                    | 1                                                                                                                                 |
| Er 22          | Position sensor defective or inappropriately connected (47)                   | 1                                                                                                                                 |
| Er 23          | Heating muffle worn out (quick temp. increase cannot be achieved much longer) | Press STOP (Er 23 disappears). Work may proceed as usual. Have the heating muffle replaced by a certified Ivoclar Service Centre. |
| Er24           | Heating muffle defective (furnace no longer heats up).                        | Switch off furnace. Have the heating muffle replaced by a certified Ivoclar Service Centre.                                       |
| Er 25          | Temp. inside the control unit is higher than 55 °C (131 °F)                   | 1 Room temperature too high, cool furnace base with a fan.                                                                        |
| Er 26          | Defect in the control unit                                                    | 1                                                                                                                                 |
| Er 27          | Defect in the control unit                                                    | 1                                                                                                                                 |
| Er 28          | Heating circuit interrupted                                                   | Check heating circuit fuse (66c)                                                                                                  |
| Er 29          | Defect in the control unit                                                    | 1                                                                                                                                 |
| Er 30          | Defect in the control unit                                                    | 1                                                                                                                                 |
| Er 32          | Battery flat                                                                  | Have battery replaced by your Customer Service                                                                                    |
| Er 90 to Er 99 | Defect in the control unit                                                    | 1                                                                                                                                 |

1 Switch off O/I and turn on again after a few seconds. If the Er warning reappears, press STOP and repeat the procedure. If Er still blinks, contact your Customer Service. Please indicate the Er number on your repair order form.

## 8.2 Technical malfunctions

These malfunctions may occur without an error message being displayed:

| Description                | Double-Check                                               | Action                                                       |
|----------------------------|------------------------------------------------------------|--------------------------------------------------------------|
| Display not illuminated    | Is the fuse for the electronic controls OK?                | Check fuse                                                   |
| Furnace head does not open | Is the fuse OK?                                            | Check fuse                                                   |
| Buzzer does not sound      | Is the buzzer switched off (signal 0)?                     | Select signal 1-9                                            |
| Vacuum pump not working    | Is the vacuum pump correctly connected?<br>Is the fuse OK? | Connect vacuum pump according to the Op.Instr.<br>Check fuse |
| Final vacuum not reached   | Is the vacuum hose OK?<br>Is the furnace airtight?         | Replace pump<br>Clean sealing surface                        |

| Description                                                        | Double-Check                                                                                                                                                                                                                                                                                 | Action                                                                                                                                            |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| The green pilot lamp does not light up although O/I is switched on | <b>1st possibility</b><br>If the lights of the displays are not on, check fuses (66a) and (66b) and replace any defective ones.<br><br><b>2nd possibility</b><br>If the lights of the displays are on, the pilot lamp is defective and must be replaced (the furnace can be operated anyway) | Replace fuse<br><br><br>Replace pilot lamp                                                                                                        |
| • No vacuum although pump is working                               | Check and clean sealing rim (69) and sealing ring (35). Make sure that the vacuum hose (99) is correctly fixed on the connections.                                                                                                                                                           | If still no vacuum is built up, consult Customer Service.                                                                                         |
| • No vacuum, pump does not work                                    | Check fuses (66a) and (66b) and replace any defective ones.                                                                                                                                                                                                                                  | If the pump is still not working, have it checked by an electrician. If the pump looks alright but still does not work, consult Customer Service. |
| • Displays show incomplete or illogical values                     | - Switch off O/I<br>- Hold down STOP and switch on O/I again.                                                                                                                                                                                                                                |                                                                                                                                                   |
| • No pressure indication                                           | - Check compressed air feed                                                                                                                                                                                                                                                                  | - Check pressure discharge valve                                                                                                                  |
| • Pressing stops after 10 minutes; Er 16 is indicated.             | - Indicator for plunger shows less than 1.0 mm, hence travel/time measurement has not been activated.                                                                                                                                                                                        | - Cancel by pressing STOP twice, then open the furnace.                                                                                           |
| • Locking mechanism of the furnace head cannot be released         | Possible causes: compressed air supply failure, power failure, control unit defective.                                                                                                                                                                                                       | Switch off the furnace and operate the lever manually..                                                                                           |



**Important**  
 Use only fuses with test labels and according to the respective values specified in "Technical Data".

## 8.3 Repair



Repairs may only be carried out by a certified Ivoclar Service Centre. Please refer to the addresses in Chapter 10.

If repairs during the warranty period are not carried out by a certified Ivoclar Service Center, the warranty will expire immediately.

Please also read the safety instructions in Chapter 2.



# 9. Product Specifications

This chapter contains all the relevant product specifications.

## 9.1 Delivery form

- 1 EP500
- 1 Vacuum pump
- 1 Operating Instructions
- 1 Warranty card
- various accessories

### Package 1

Furnace head (P), cooling plate (A), hexagon-socket wrench, program cards

### Package 2

Furnace base (U) with firing mount, air hose, vacuum hose, extra fuses, Temperature Checking Set

### Package 3

Vacuum pump with power cord and pump plug

(Package 1 and 2 are supplied together in one carton, while package 3 comes separately.)

| Colour          | IVOCLAR-colour designation RAL-No. |          |
|-----------------|------------------------------------|----------|
| Standard-colour | cream                              | RAL 1013 |
| Special colours | aquamarine                         | RAL 5014 |
|                 | turquoise                          | RAL 6027 |
|                 | grey                               | RAL 7035 |
|                 | white                              | RAL 9016 |
|                 | salmon-pink                        | RAL 3014 |

## 9.2 Technical Data

|                                                                      |                                                                                                                                                                        |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power supply:                                                        |                                                                                                                                                                        |
| Single-phase alternating current                                     |                                                                                                                                                                        |
| Standard version                                                     | 220–230 V/50 Hz                                                                                                                                                        |
| Special versions                                                     | 200 V/50-60 Hz; 240 V/50 Hz<br>110 V/50 Hz; 118 V/60 Hz<br>110 V /60 Hz; 100 V/50-60 Hz<br>± 10 %                                                                      |
| Tolerated voltage fluctuations:                                      |                                                                                                                                                                        |
| Power consumption:                                                   |                                                                                                                                                                        |
| Furnace with pump:                                                   | approx. 1200 W                                                                                                                                                         |
| Vacuum pump data:                                                    |                                                                                                                                                                        |
| Rated current                                                        | 3 A at 200-240 V<br>4.4 A at 100-120 V                                                                                                                                 |
| Suction capacity                                                     | 1.3 - 1.5 ml/h                                                                                                                                                         |
| Final vacuum                                                         | 27-40 mbar<br>(20-30 Torr)<br>max. 6 bar                                                                                                                               |
| Compressed air supply                                                |                                                                                                                                                                        |
| Explanation of the colour designations of fuses according to IEC 127 |                                                                                                                                                                        |
| super-quick-acting                                                   | = FF or black                                                                                                                                                          |
| quick-acting                                                         | = F or red                                                                                                                                                             |
| semi-time-lag                                                        | = M or yellow                                                                                                                                                          |
| time-lag                                                             | = T or blue                                                                                                                                                            |
| super-time-lag                                                       | = TT or grey                                                                                                                                                           |
| Electrical fuses:                                                    |                                                                                                                                                                        |
| Values                                                               | 200-240 V: T 6.3 A (heating circuit)<br>T 315 mA (power supply)<br>T 3.15 A (pump)<br>110-118 V: T 12.5 A (heating circuit)<br>T 500 mA (power supply)<br>T 5 A (pump) |
| Dimensions of fuses                                                  | 200-240 V: 5 x 20 mm<br>110-118 V: 6.3 x 32 mm                                                                                                                         |
| Dimensions of closed furnace                                         |                                                                                                                                                                        |
| Width/depth/height                                                   | 415 x 640 x 685 mm                                                                                                                                                     |
| Max. pressing temperature                                            | 1200 °C (2192 °F)                                                                                                                                                      |
| Weights:                                                             |                                                                                                                                                                        |
| Furnace head (P)                                                     | 7.10 kg                                                                                                                                                                |
| Furnace base (U)                                                     | 13.30 kg                                                                                                                                                               |
| Cooling plate (A)                                                    | 0.30 kg                                                                                                                                                                |
| Press furnace complete                                               | 20.70 kg                                                                                                                                                               |
| Extra heating muffle                                                 | 0.25 kg                                                                                                                                                                |

### 9.3 Acceptable operating conditions

#### Acceptable temperature range

5 °C to 35 °C (41 °F to 95 °F)

#### Acceptable humidity range

Maximum relative humidity at 31 °C (87 °F) gradually decreasing to 75%, condensation excluded.

#### Acceptable ambient pressure

500 mbar to 1060 mbar

The apparatus can be used at altitudes of up to 2000 m above sea level.

### 9.4 Acceptable transportation and storage conditions

#### Acceptable temperature range

-5 °C to 50 °C (-4 °F to 122 °F)

#### Acceptable humidity range

Maximum relative humidity at 31 °C (87 °F), gradually decreasing to 50 % at 40 °C (104 °F), condensation excluded.

#### Acceptable ambient pressure

500 mbar to 1060 mbar

Use only original packaging together with the respective foam material for shipping purposes.

# 10. Press table

| Preset standard values (ceramics pressed at higher temperatures)                        |                                                                                 |                    |                         |                                                                             |                   |                |                 |
|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|--------------------|-------------------------|-----------------------------------------------------------------------------|-------------------|----------------|-----------------|
| P                                                                                       | B                                                                               | t↗                 | T                       | N                                                                           | H                 | V <sub>1</sub> | V <sub>2</sub>  |
| Program                                                                                 | Stand-by temperature °C                                                         | Temperature °C/min | Pressing temperature °C | Repressing time min.                                                        | Holding time min. | Vacuum on / °C | Vacuum off / °C |
| P01                                                                                     | 700                                                                             | 60                 | 1075                    | 0                                                                           | 20                | 500            | 1075            |
| P02                                                                                     | 700                                                                             | 60                 | 1180                    | 0                                                                           | 20                | 500            | 1180            |
|                                                                                         |                                                                                 |                    |                         |                                                                             |                   |                |                 |
| Programmable programs                                                                   |                                                                                 |                    |                         |                                                                             |                   |                |                 |
| P                                                                                       | B                                                                               | t↗                 | T                       | N                                                                           | H                 | V <sub>1</sub> | V <sub>2</sub>  |
| Program                                                                                 | Stand-by temperature °C                                                         | Temperature °C/min | Pressing temperature °C | Repressing time min.                                                        | Holding time min. | Vacuum on / °C | Vacuum off / °C |
| P03                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P04                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P05                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P06                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P07                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P08                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P09                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P10                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
|                                                                                         |                                                                                 |                    |                         |                                                                             |                   |                |                 |
| Special programs for ceramics pressed at lower temperatures (Empress 2 and Cosmo ingot) |                                                                                 |                    |                         |                                                                             |                   |                |                 |
| P                                                                                       | B                                                                               | t↗                 | T                       | N                                                                           | H                 | V <sub>1</sub> | V <sub>2</sub>  |
| Program                                                                                 | Stand-by temperature °C                                                         | Temperature °C/min | Pressing temperature °C | Repressing time min.                                                        | Holding time min. | Vacuum on / °C | Vacuum off / °C |
| P11                                                                                     | 700                                                                             | 60                 | 920                     | 0                                                                           | 20                | 500            | 920             |
| P12                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P13                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P14                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P15                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P16                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P17                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P18                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P19                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
| P20                                                                                     | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 0 - 30                                                                      | 0 - 60            | 0 - 1200       | 0 - 1200        |
|                                                                                         |                                                                                 |                    |                         |                                                                             |                   |                |                 |
| Programmable programs (same as programs No. 3-10)                                       |                                                                                 |                    |                         |                                                                             |                   |                |                 |
| P                                                                                       | B                                                                               | t↗                 | T                       | N                                                                           | H                 | V <sub>1</sub> | V <sub>2</sub>  |
| Program                                                                                 | Stand-by temperature °C                                                         | Temperature °C/min | Pressing temperature °C | Repressing time min.                                                        | Holding time min. | Vacuum on / °C | Vacuum off / °C |
| P21 to                                                                                  | 200 - 850                                                                       | 5 - 80             | 200 - 1200              | 1 - 30                                                                      | 1 - 60            | 1 - 1200       | 1 - 1200        |
| P90                                                                                     |                                                                                 |                    |                         | 0 = without N                                                               | 1 = without H     | 0 = without V1 | 0 = without V2  |
| P99                                                                                     | 700                                                                             | 50                 | 955                     | 0                                                                           | 2                 | 0              | 0               |
|                                                                                         |                                                                                 |                    |                         |                                                                             |                   |                |                 |
| Technical programs                                                                      |                                                                                 |                    |                         |                                                                             |                   |                |                 |
| 91                                                                                      | V <sub>1</sub> = 0–9 (on-time of the signal)                                    |                    |                         | V <sub>2</sub> = 0–9 (off-time of the signal) / “+” or “–” keys for setting |                   |                |                 |
| 98                                                                                      | Program to switch from Celsius mode (°C) to Fahrenheit mode (°F) and vice versa |                    |                         |                                                                             |                   |                |                 |

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