EP500 Press Furnace



Operating Instructions

For software version 2.9 and higher.

CE

IVOCLAR

Dental Servis
Serdar Ayısıt
0555 274 05 51

EG-Declaration of Conformity

Document-No./
Month, Year: 104 / 12 / 95

Manufacterer: IVOCLAR Dental GesmbH
Werk Bürs
Bremschlstr. 16

Address: 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.

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EP500 Press Furnace

Operating Instructions

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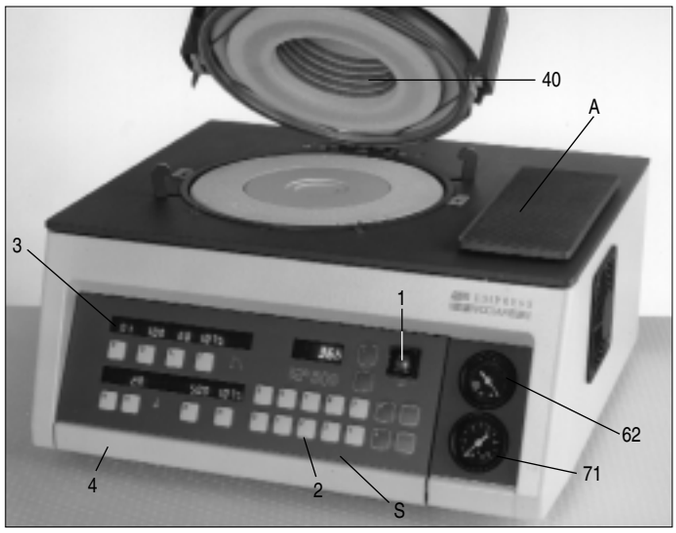
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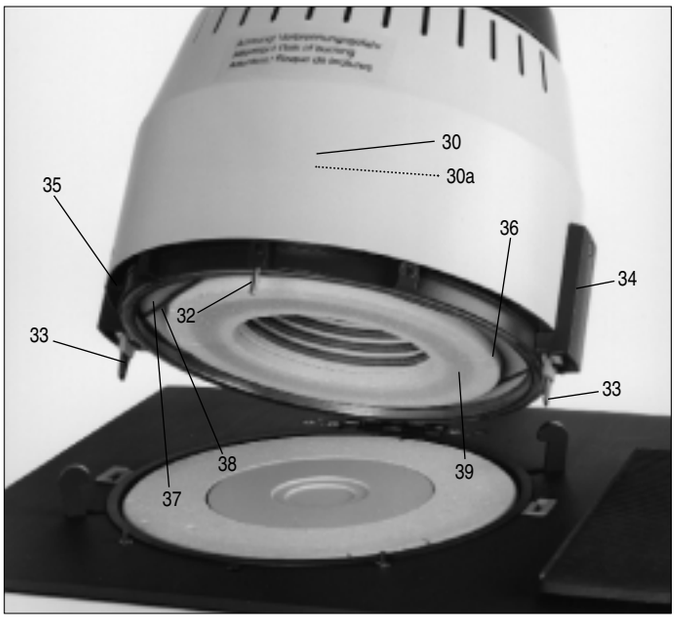
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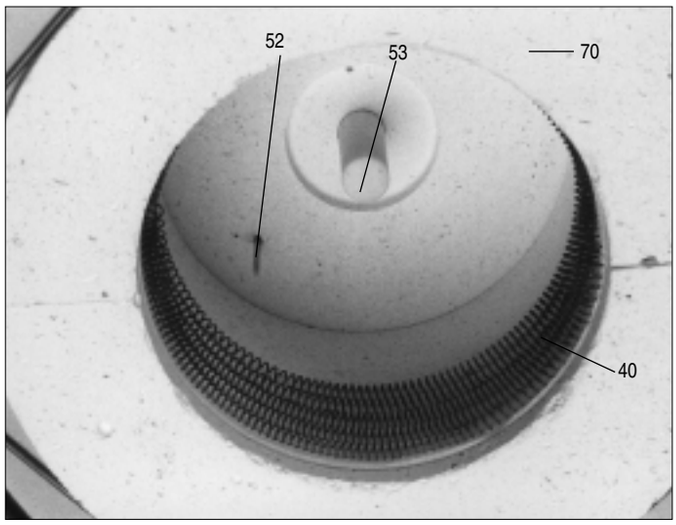
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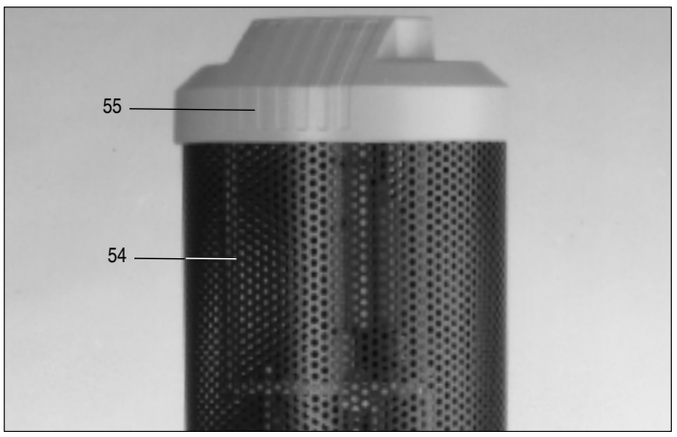
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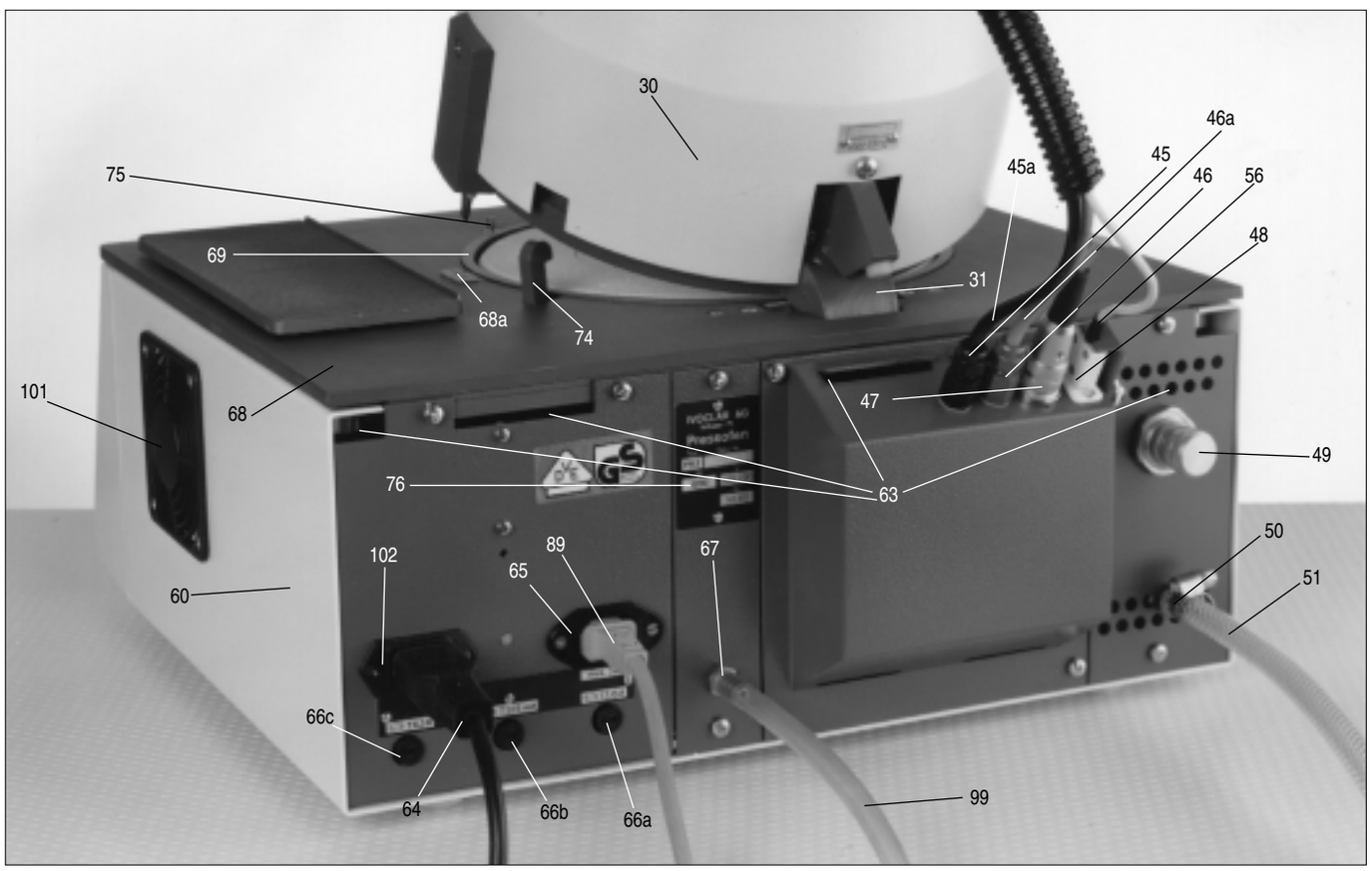
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List of parts

S = Control unit

1 0/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	$t_{\nearrow}$	Temperature increase
14	T	Pressing temperature
15		Duration of program
16	V_2	Vacuum off
17	V_1	Vacuum on
18	H	Holding time
19	N	Re-pressing time
20	P	Program
21		Dinstance indicator

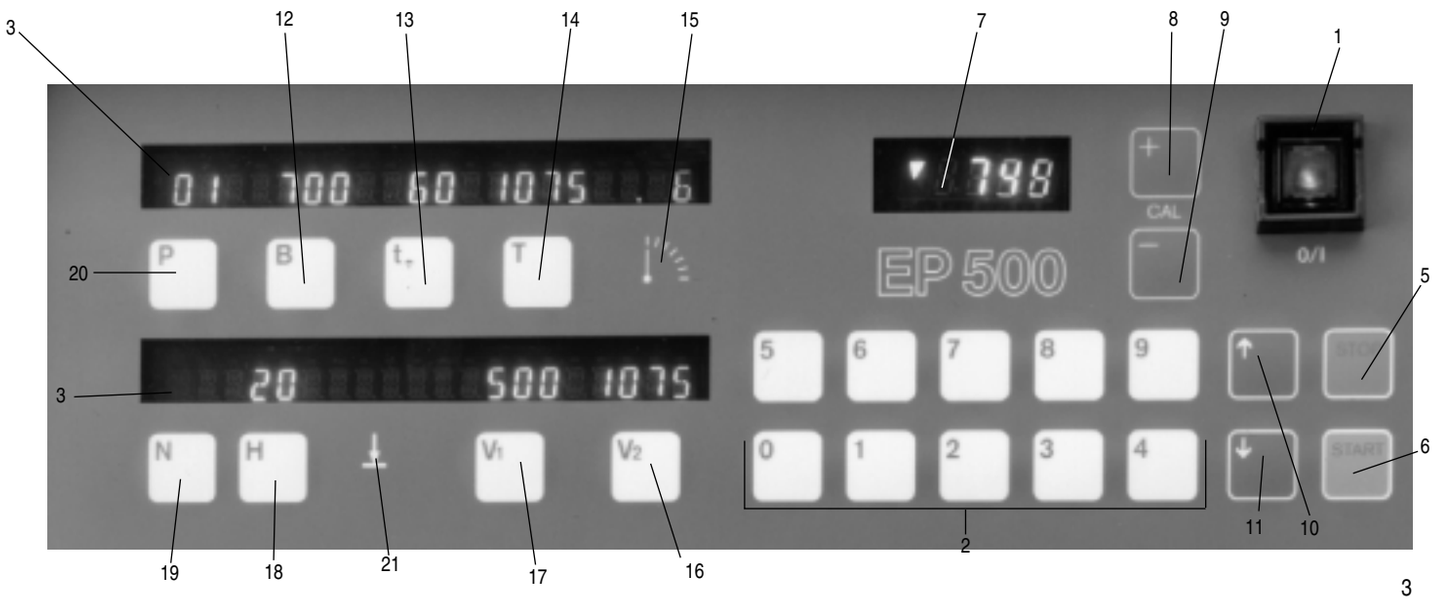
A-Cooling plate

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



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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 your 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.

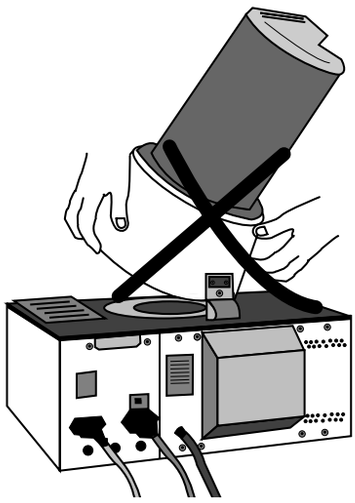
Should you lose the Operating Instructions, extra copies can be ordered at a nominal fee from your local Ivoclar Service Center.

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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.

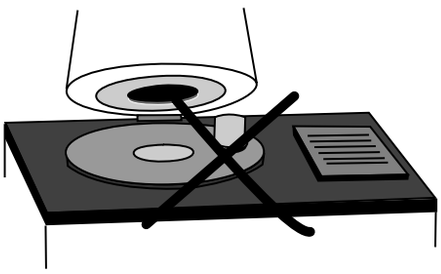
Further instructions to assure proper use of the furnace:

- 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.

2.1.1

Contraindication

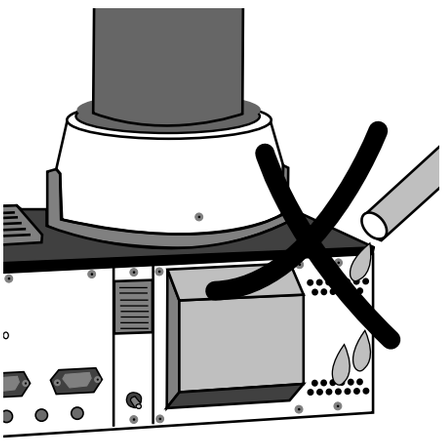
The furnace head should not be removed from the furnace base as long as it is still warm.



2.1.2

Contraindication

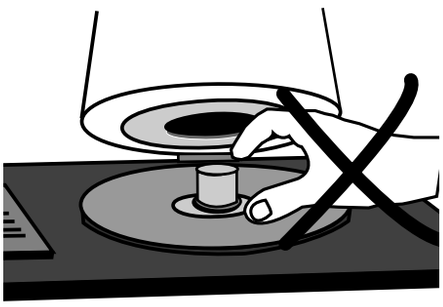
Investment cylinders must not be placed in the area surrounding the firing table, since this will obstruct the closing of the furnace head. Use the cooling plate designed for that purpose. Never reach under the furnace head during operation. There is a risk of crushing!



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

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.

Burn hazard

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.

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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.

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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

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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 circulated 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).

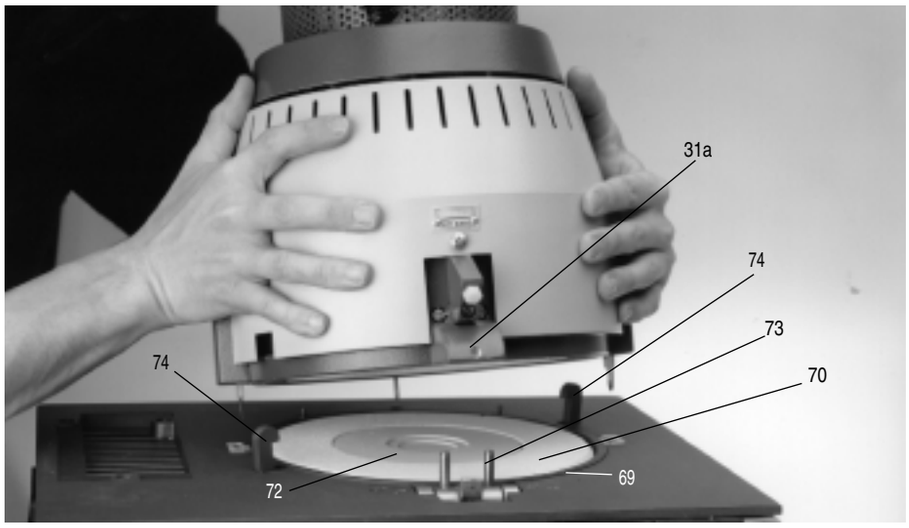
Important
The sheathed thermocouple must always be perpendicular and must neither be damaged nor bent.

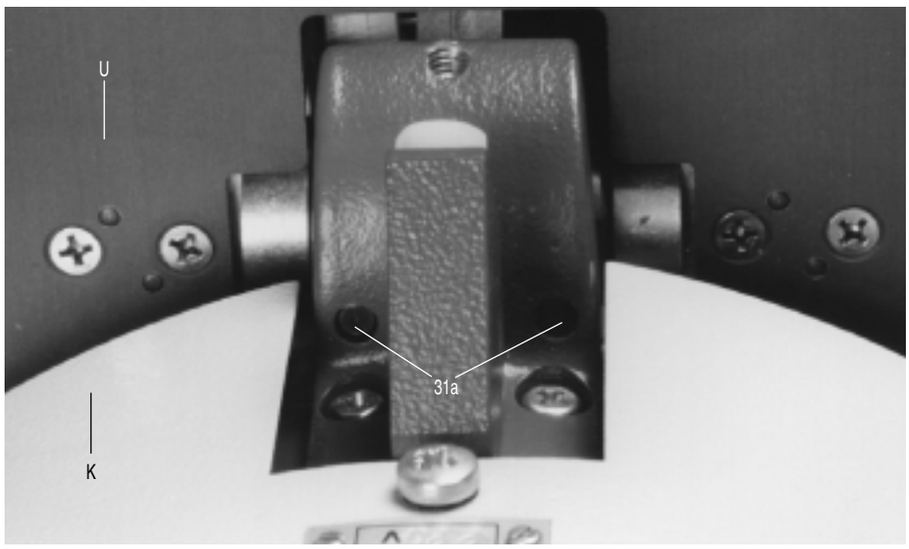
4.2.1 Mounting the connections

- 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.

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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.

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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)

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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.

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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 °C
  (e.g. T = 1050 °C, V2 = 1049 °C)
  °F mode: V2 = T–2 °F
  (e.g. T = 1922 °F, V2 = 1920 °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 °C, V2 = 1050 °C or T = 1922 °F, V2 = 1922 °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 ⊥ while the program is in progress.

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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.

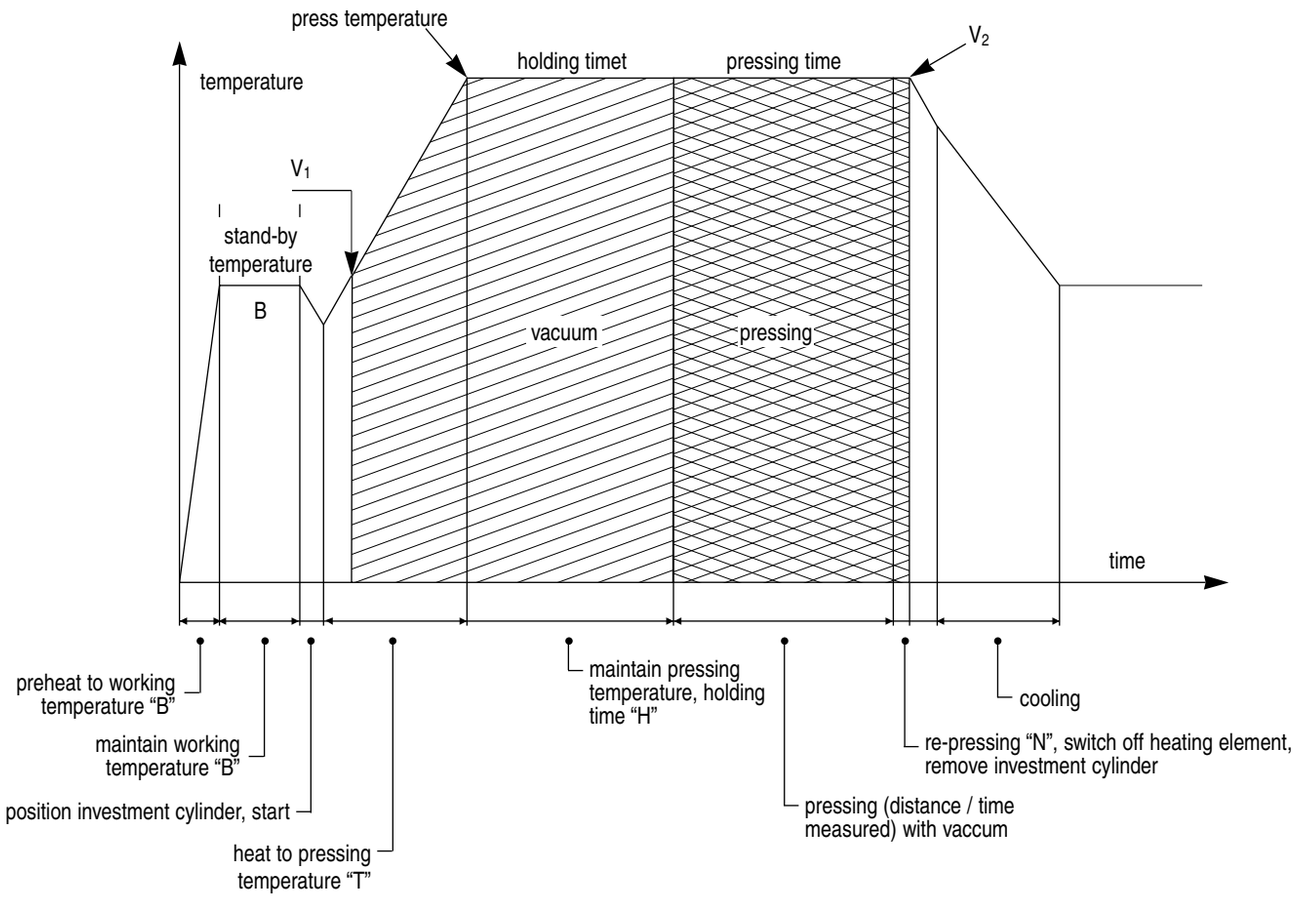
Program P99

- 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



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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. 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. 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

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7.3 Furnace calibration (Silver Test)

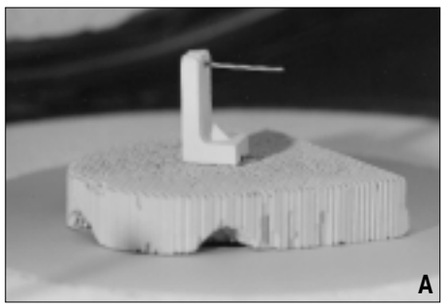
The sheathed thermocouple may be subject to changes which affect the furnace temperature, depending on the mode and period of operation. Check furnace temperature with the Silver Test at least once a year and adjust if necessary. For that purpose, the furnace features P99, a special calibration program.

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

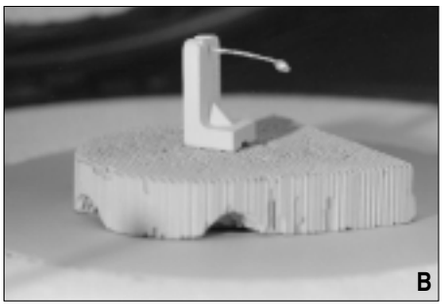
Information
When checking the furnace temperature with the Silver Test, make sure that the Silver Test sample is always placed on the honey-combed firing tray.

Procedure

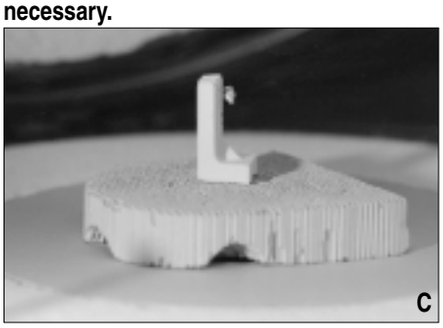
a) The furnace must have been on stand-by temperature of 700 °C (1292 °F) for at least 30 minutes.
b) Conduct a firing program with the furnace empty. Select and run Program 1 for that purpose. After approx. 15 minutes, i.e. before the program is completed, press STOP twice to stop the heating procedure.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


A

f) Place holder with the silver wire and honey-combed firing tray in the centre of the firing mount (72) and close the furnace head.
g) 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.)


B

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


C

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.

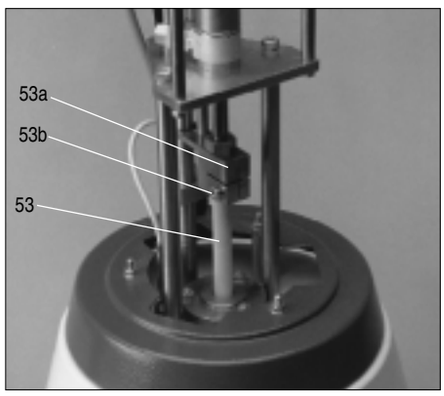
7.4 Changing the press plunger

1. Switch off the furnace, disconnect the power, and allow furnace to cool to room temperature. Close furnace head.

2. 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.

3. 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.



4. 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.

5. 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.

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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 00 01 to 99 91 to 98	Press “P” and enter correct program number. *) 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 0–4 °C/min. or higher than 80 °C/min. (0-8 °F/min. or 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 (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_1 value higher than the V_2 value	
Er 10	V_2 value higher than the T value	
Er 11	V_1 or V_2 value is missing	
Er 12	Battery in the control unit almost empty and should be replaced	Press STOP (Er 12 disappears). Have battery replaced by your Customer Service. 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

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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? Is the fuse OK?	Connect vacuum pump according to the Op.Instr. Check fuse
Final vacuum not reached	Is the vacuum hose OK? Is the furnace airtight?	Replace pump Clean sealing surface

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Description	Double-Check	Action
The green pilot lamp does not light up although O/I is switched on	**1st possibility** If the lights of the displays are not on, check fuses (66a) and (66b) and replace any defective ones.	Replace fuse
	2nd possibility If the lights of the displays are on, the pilot lamp is defective and must be replaced (the furnace can be operated anyway)	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 - 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.

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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
	110 V/50 Hz; 118 V/60 Hz
	110 V /60 Hz; 100 V/50-60 Hz
Tolerated voltage fluctuations:	± 10 %
Power consumption:	
Furnace with pump:	approx. 1200 W
Vacuum pump data:	
Rated current	3 A at 200-240 V
	4.4 A at 100-120 V
Suction capacity	1.3 - 1.5 ml/h
Final vacuum	27-40 mbar
	(20-30 Torr)
Compressed air supply	max. 6 bar
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)
	T 315 mA (power supply)
	T 3.15 A (pump)
	110-118 V: T 12.5 A (heating circuit)
	T 500 mA (power supply)
	T 5 A (pump)
Dimensions of fuses	200-240 V: 5 x 20 mm
	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

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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.

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10. Press table

Preset standard values (ceramics pressed at higher temperatures)

P	B	t↗	T	N	H	V_1	V_2
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_1	V_2
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_1	V_2
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_1	V_2
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				o = without N	1 = without H	0 = without V1	0 = without V2
P99	700	50	955	0	2	0	0

Technical programs

91	V_1 = 0–9 (on-time of the signal) V_2 = 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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The right to technical changes is reserved

This apparatus has been developed solely for use in dentistry. Start-up and operation should be done strictly according to the Operating Instructions. Liability cannot be accepted for damages resulting from misuse or failure to observe the Instructions. The user is solely responsible for testing the apparatus for its suitability for any purpose not explicitly stated in the Instructions. Descriptions and data constitute no warranty of attributes and are not binding.

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