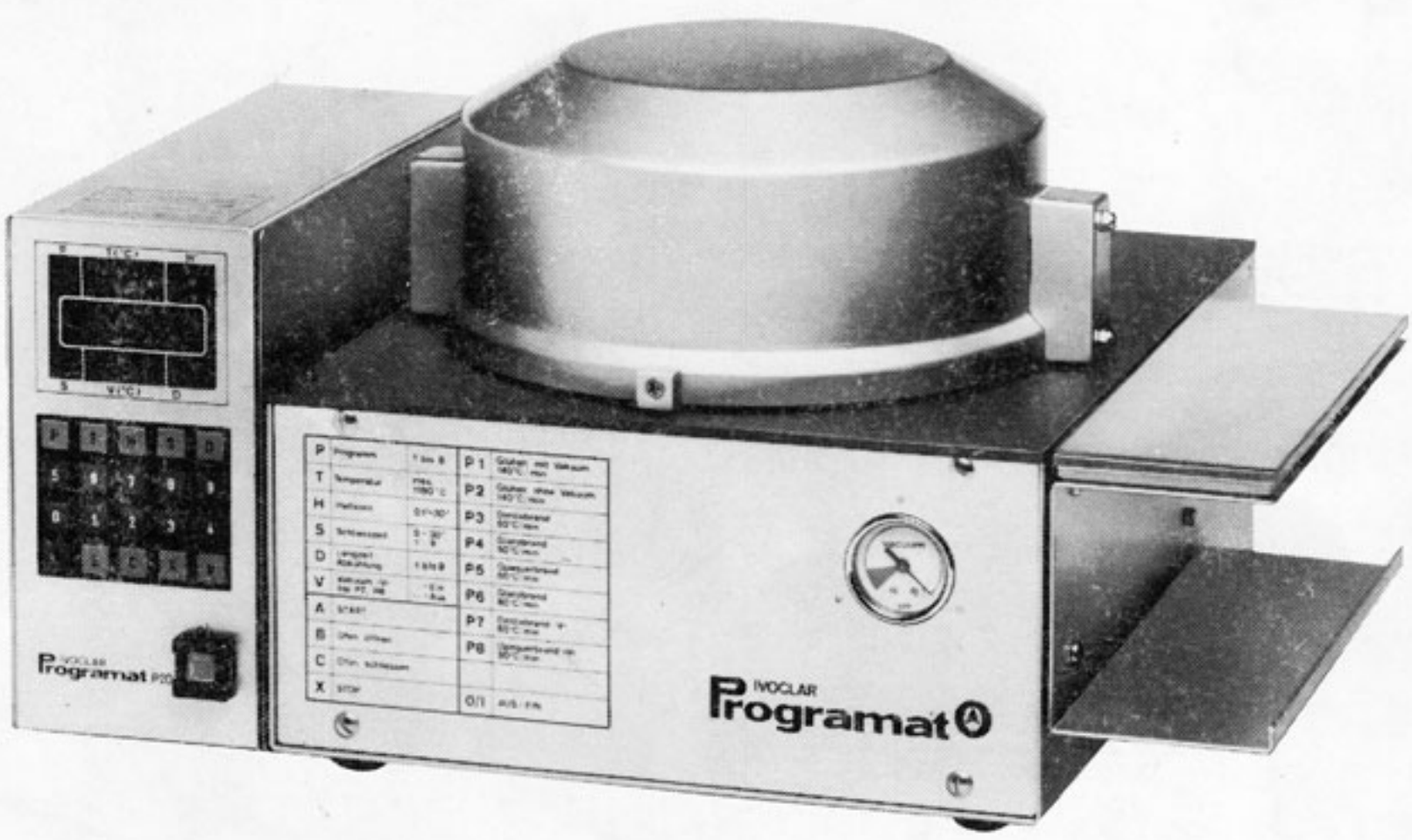
IVOCLAR

Operating Instructions
PROGRAMAT P20

Fully automatic vacuum ceramic furnace with microprocessing control unit.



The furnace is supplied in modules, contained in 3 packages for assembly:

Package K:
1 Furnace head (K)
1 Rest (A)
1 Plate (P)

Package S:
1 Control unit (S)
2 Spare fuses

Package U:
1 Furnace base (U)
with firing mount (72)
1 Pump plug (89)
1 Vacuum hose (99)
1 Spare fuse

Features

- Unit construction system ensuring maximum ease of service.
- Microprocessing control unit. Display indicating programmed and actual working data.
- High accuracy in all temperature ranges. Tolerances less than ± 2°C.
- Multiple programming facilities with simple operating procedures.
- 2 Programmes with pre-set vacuum on and off regulation.
- Variable furnace closing times.
- Pre-set temperature holding periods of up to 30 minutes.
- Programmed data are retained in the memory.
- Individual firing with pre-set rate of temperature rise from 60° C or 80° C per minute. Heat treatment programmes with a rate of temperature rise of approx. 140° C per minute.
- Rapid working progress without loss of quality.
- Correction of programming errors and change of programme any time possible.
- Long term cooling by automatic furnace opening. Setting in phases of 100° C.
- Optimum loading of the firing chamber with a fixed firing mount.
- Approved muffle design.
- Uncomplicated change of muffle.
- Low power consumption.
- Light and sturdy construction.
- Robust and quiet vacuum pump, industrial model.

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Parts list

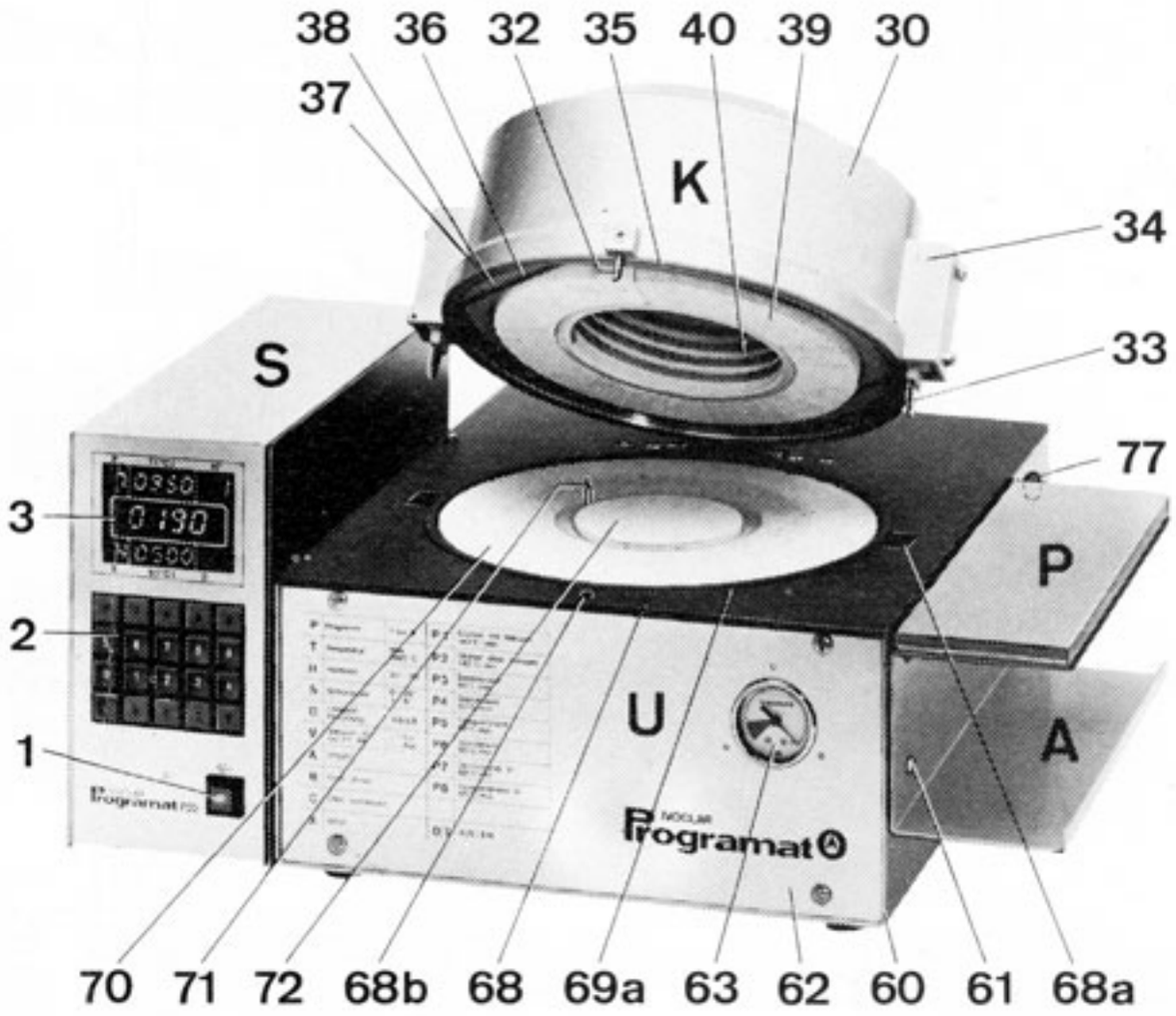


Fig. 1

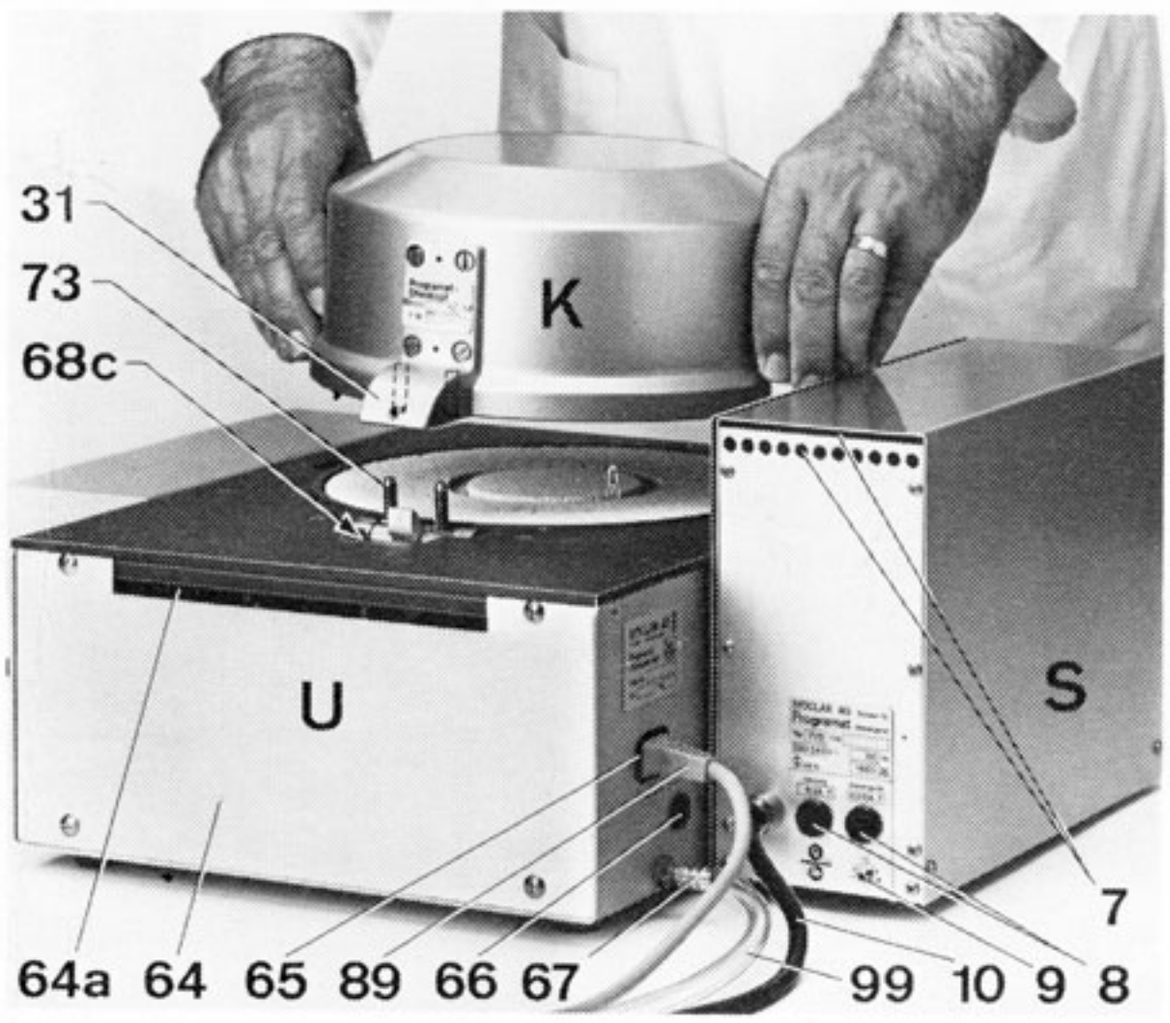


Fig. 2

S – Control unit

1 Switch O/I with pilot lamp
2 Keyboard
3 Display and indicators
7 Air vents
8 Fuses
9 Calibrating screw
10 Mains connecting cable

K – Furnace head

30 Dome
31 Mounting lug
32 Switch pin
33 Blade contacts
34 Protective caps
35 Sealing ring
36 Spring clip
37 Asbestos ring
38 Asbestos cord
39 Stone lining segments
40 Muffle
41–45 see «Change of muffle» on pages 14–16

U – Furnace base

60 Casing
61 Fixing screws for rest
62 Front panel
63 Vacuum gauge
64 Rear panel (64a air vent)
65 Pump power socket
66 Pump fuse
67 Vacuum hose connection
68 Frame plate (68a, b, c apertures in the frame plate)
69 Pot (69a pot rim)
70 Stone lining insert
71 Thermocouple
72 Firing mount
73 Hinge pins
77 Muffle control with lamp
99 Vacuum hose

A – Rest

P – Plate

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Assembly

(see figs. 1, 2 and 3)

a) Carefully remove modules from packages K, S and U. Check for damages in transit and clean off residuals of styropor (retain packing intact).

Important:
Do not bend thermocouple (71). Voltage indicated on the unit must comply with local power tension.

b) Place furnace base (U) as shown in fig. 3 on edge of bench.



Fig. 3

c) Hold the control unit as shown in fig. 3. Insert the hooks (12) of the control unit into the apertures (60a) of the furnace base and swivel in the direction of the arrow until the two catch springs (75) engage in their respective apertures (14). The control unit should now be firmly fixed to the furnace base.

d) Remove the firing mount (72) from the packaging material and introduce it into the stone lining insert (70).

e) Clean the sealing rim (69a) of the furnace base.

f) Set the thermocouple (71) in a vertical position.

g) Set both hinge pins (73) in a vertical position (fig. 2).

h) Clean sealing ring (35) in the furnace head.

i) Carefully blow out interior of the muffle (40) with low pressure air or clean with a soft brush. Do not touch the heating element.

j) Hold the furnace head (K) as shown in fig. 2 and fit the mounting bracket (31) over the hinge pins (73). Keep the furnace head (K) level, push down parallel until it rests, with the sealing ring (35) evenly placed on the sealing rim (69a) (see fig. 4).

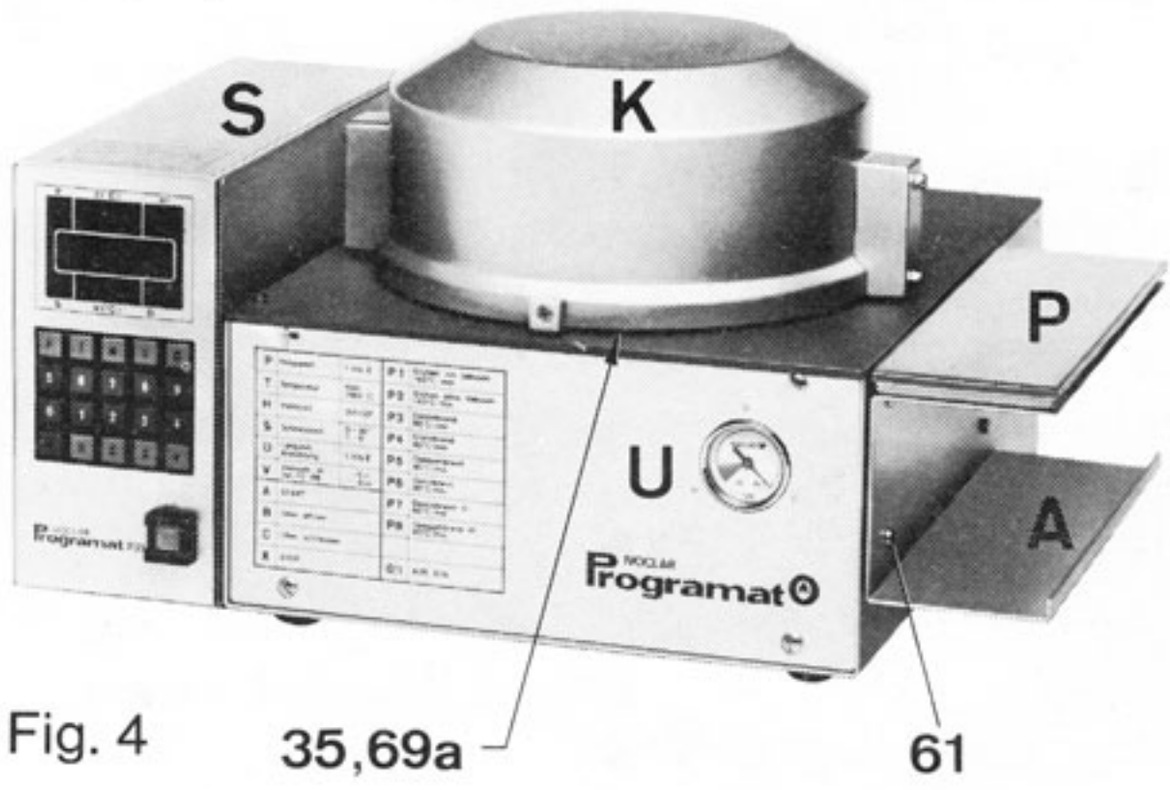


Fig. 4

k) Unscrew the fixing screws (61) from the furnace base. Mount rest (A) to the furnace base by means of the 4 fixing screws (61). Put plate (P) on the rest (A). (See fig. 4).

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Connections

1) Vacuum pump

- PROGRAMAT vacuum pump: follow separate pump operating instructions.
- Pump types of other manufacturers: (for specifications see page 3)
  a) Remove pump plug (89) from socket (65) on the furnace base and have it connected to the vacuum pump electrical lead by an electrician.
  b) Set pump and insert connected plug (89) into electrical socket (65) of the furnace base.
  c) Push the vacuum hose connection (99) into the vacuum recess of the pump.

Note:
Before operating the furnace connect vacuum pump to base of furnace!

2) Furnace

Connect the mains cable to the power plug.

Keyboard and display on control unit

1) Switch O/I with red pilot lamp:

If the furnace is switched on, and the head completely closed, it will heat up to the stand-by temperature of 400 to 406° C and maintains this constantly. (A further temperature rise commences only after depressing the start key A.)

2) Keyboard

For programming, use the blue keys (Programmes P1 to P8) and the dark grey keys (for input of pre-set data).

Key	Selection	Selected programme values available
P	Programme	1 to 8
T	Temperature	400° to 1180° C
H	Holding time	0,1 to 30 minutes 0 = no holding time
S	Closing time	0 = approx. 30 sec. 1–9 1 = approx. 1 minute 9 = approx. 9 minutes
D	Long term cooling	1–9 1 = 100° C 9 = 900° C 0 = no long term cooling, display blacked out The furnace opens only when temperature has decreased to the pre-set degree.
V	Vacuum off and on temperature with programmes P7 und P8 See instructions on page 9!	

Input of pre-set data is only possible when the light diode behind the last digit of the display illuminates.

Light grey control keys

B = To open furnace (vacuum is released).
C = To close furnace – buzzer switches off (keep furnace closed between firing intervals).
X = STOP for programme, movement of the furnace head and buzzer when furnace opens.

Red key A: programme start

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3) Display with indicators:

Actual temperature = effective furnace temperature in °C.
Er.: = Error indication (see instructions on page 12). Red diode lamp after temperature = programme runs.
Pre-set data = programmed data of P, T (°C), H', S, V (°C) and D.

Fig. 5

Trial run

1) Depress switch **O/I**:
   - Red pilot lamp in switch illuminates.
   - After several seconds, various data appear on the display (previous, irregular appearance of digits are of no consequence). Should error indication Er10 appear, depress key **X** whereupon Er10 will disappear.
   - The furnace heats within approx. 3 minutes (actual temperature increases) to the stand-by temperature of 400°C to 406°C.
2) Depress **P** and **1** (for programme P1): Indication at P: 1, at T (°C): 0700, at H': 1, at S': 0
3) Depress **T** **9** **5** **0** (for pre-set temperature of 950°C).
   - Indication at T (°C): 0950
4) Depress **B**
   - Furnace opens within 30 seconds.
   - When fully opened the buzzer sounds.
5) Depress **A** (start programme)
   - Programme runs off as described on page 8.
6) Depress **C** (furnace closes).
   - Buzzer is turned off
   - Furnace closes within 30 seconds.

Whenever the furnace is closed completely the temperature automatically rises to the stand-by temperature.

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Programme P1

Heat treatment (oxidation) under vacuum
Temperature rise of 140° C per minute

1) To program:
   - Depress [P] and [1].
   - Depress [T] and pre-set temperature.
   - The holding time H is automatically programmed at 1 minute and the closing time S at 30 seconds (indication = 0). Should other data for H' and S' be required, they can be pre-set after depressing [H] or [S].
   - Depress [D] with time input if long term cooling is required.
2) Depress [B]: the furnace opens within 30 seconds and the buzzer sounds.
3) Place the ceramic object on the firing mount.
4) Depress [A] for start of programme.

Programme sequence:

This furnace closes within 30 seconds. The temperature rises and the vacuum pump comes into operation. Reaching the pre-set degree, the temperature, during holding time, remains constant. Vacuum is released when holding time expires and the furnace opens within one minute. For an instant, the furnace head will slightly open when the vacuum is released. This is not a defect but merely a technical consequence. When the furnace is fully opened, the temperature has reached approx. 220° C and the buzzer sounds.

Programme P2

Heat treatment (oxidation) without vacuum.
As Programme P1, but without vacuum.

Programme P3

Vacuum firings (dentin incisal)
Temperature rise of 60° C per minute.

1) To program:
   - Depress [P] and [3].
   - Depress [T] and pre-set temperature.
   - The holding time H' is automatically pre-programmed at 1 minute and the closing time S' at 4 minutes. Should other selected values for H' and S' be desired these can be programmed after depressing keys [H] or [S] as applicable.
   - Depress [D] if a long term cooling period is desired.
2) Depress [B] insofar as an actual temperature value of at least 400° C is indicated: the furnace opens during 30 seconds – the buzzer sounds.
   - Depress [D] with time input if long term cooling is required.
3) **Place the ceramic object on the firing mount only when the buzzer sounds.**
4) Depress [A] for start of programme.

Programme sequence:

The furnace closes within 4 minutes, then the temperature rises. At 580° C the vacuum pump comes into operation. On reaching the pre-set temperature, the vacuum is released. The temperature remains constant during the holding time. After holding time the furnace opens within one minute.
The ceramic object should only be removed when the buzzer sounds.

Programme P4

Glaze firings:
As Programme P3, but without vacuum.

Programme P5

Opaque firings:
As Programme P3, but with the following differences:
Temperature rise: 80° C per minute.
Pre-programmed closing period: 2 minutes.
The vacuum pump operates at 550° C.

Programme P6

Glaze firings:
As Programme P4, but with the following differences:
Temperature rise: 80° C per minute.
Pre-programmed closing period: 2 minutes.

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Programme P 7

Dentine firings "V"
Vacuum on-off can be optionally pre-set.
Temperature rise: 60° C per minute.

1) To program:
   - Depress [P] and [7].
   - Depress [T] and pre-set temperature.
   - The holding time H is automatically programmed at 1 minute and the closing time at 30 seconds (indication = 0). Should other data for H' and S' be required, they can be pre-set after depressing [H] or [S].
   - Depress [D] with time input if long term cooling is required.
   - Pre-set vacuum switch-off: Check that red light spot appears after the first and second digits in the pre-set data indicator V (°C). Should the red light spot appear only after the first digit, depress [V] and the red light will also appear after the second digit. Depress [X] and immediately following [V], whereupon a red light spot should also appear after the fourth digit. Pre-set vacuum switch-off. This value should not exceed pre-set temperature T (°C), otherwise the error indication Er03 appears (explanation on page 12).
   - Pre-set vacuum switch-on. Depress [V], and a red light spot appears only after the first digit in the pre-set data indicator V (°C). Depress [X] and immediately following [V], and a red light spot should also appear after the fourth digit. Pre-set vacuum switch-on. This value should not exceed the pre-set vacuum switch-off value, otherwise the error indication Er02 appears (explanation on page 12). If [V] is now depressed, this would merely result in a change of pre-set vacuum OFF/ON on the indicator V (°C).
2) Depress [B], if an actual temperature of at least 400°C is indicated: the furnace opens within 30 seconds – the buzzer sounds.
3) **Place the ceramic on the firing mount only when the buzzer sounds.**
4) Depress [A] for start of programme.

Programme sequence:

The furnace closes within 4 minutes, then the temperature rises. As soon as the pre-set vacuum switch-on has been obtained, the vacuum pump comes into operation. (The V [°C] indicator now changes to the pre-set vacuum switch-off.)

As soon as the pre-set vacuum switch-off has been reached, the vacuum is released.

The temperature remains constant during holding time as soon as the pre-set temperature has been reached.

After termination of the holding period, the furnace opens within one minute.

The ceramic should only be removed when the buzzer sounds.

Programme P 8

Opaque firings:
Vacuum ON/OFF can be optionally pre-set.
Temperature rise: 80° C per minute.
Pre-programmed closing period: 2 minutes.

Programming as per Programme P 7!

Attention:
All pre-set programme related data remain after termination of programme saved in the memory.

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Important practical information

a) **Programme change-over** is technically possible at any given moment.

- A change over from P1 to P2, P3 to P4, P5 to P6, P7 to P8 and vice versa can be effected by depressing **P** followed by input of the appropriate new programme number.
  The programme sequence is not interrupted.
- A change over from one programme to any other desired programme can only be effected by depressing **X**. The programme sequence is interrupted and must be re-started by depressing **A**.

b) **Input of corrected data** is technically possible until the pre-set temperature has been reached.

- The pre-set holding time H' and closing time S' and long term cooling D can be changed without interrupting the programme sequence.
- The pre-set temperature and vacuum OFF/ON in programmes P7 and P8 can only be changed by depressing **X**. The programme sequence is then interrupted and must be re-started by depressing **A**.

c) **If control is lost, due to incorrect programming, the situation may be saved with the pre-programmed nominal data, provided the actual temperature is not higher than 410° C:**

- switch off **O/I**
- depress **X**, maintain depressed, and simultaneously switch on power at switch **O/I**.

d) **The long term cooling** **D** is recommended when using alloys with high thermal expansion coefficient. (Furnace opens only when pre-set value is reached.) IVOTECT-P with VIVODENT-ITS ceramic: 800° C.

e) **Always keep the furnace closed during periods between firing intervals.**

f) **Ceramic to be dried** should only be placed on the firing mount when the buzzer sounds.

g) **Power supply failure**
After interruption of a programme by power supply failure, depress **A** to continue the programme. The effect on the ceramic work depends, obviously, on the extent of the power cut.

h) **Heating over night** is not necessary with the PROGRAMAT.

i) **Verification of the furnace temperature** can be made by means of the 'silver test' described on page 13).

j) **On changing the control unit, or the furnace base,** it is recommended to verify the furnace temperature by means of the 'silver test' described on page 13).

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Failures not due to errors indicated on display and their correction

a) Furnace head stops at half open position because it is not properly positioned on the hinge pins. Move by hand the furnace head slightly up and bring it down to the original position.

b) No rise in temperature is obtained although the furnace is switched on.
Red pilot lamp in switch O/I and indications on the display illuminate. Actual temperature fails to rise or decreases.

1st possibility:

The furnace is not completely closed. Depress C.

2nd possibility:

Defect muffle.
For checking depress the control key with lamp (77) on the right-hand wall of the furnace base for approx. 10 seconds. If lamp flashes continuously, muffle is defective (see fig. 6) and must be replaced (see page 14 to 16).

3rd possibility:

Defective heater fuse.
Replace heater fuse in rear wall of control unit.

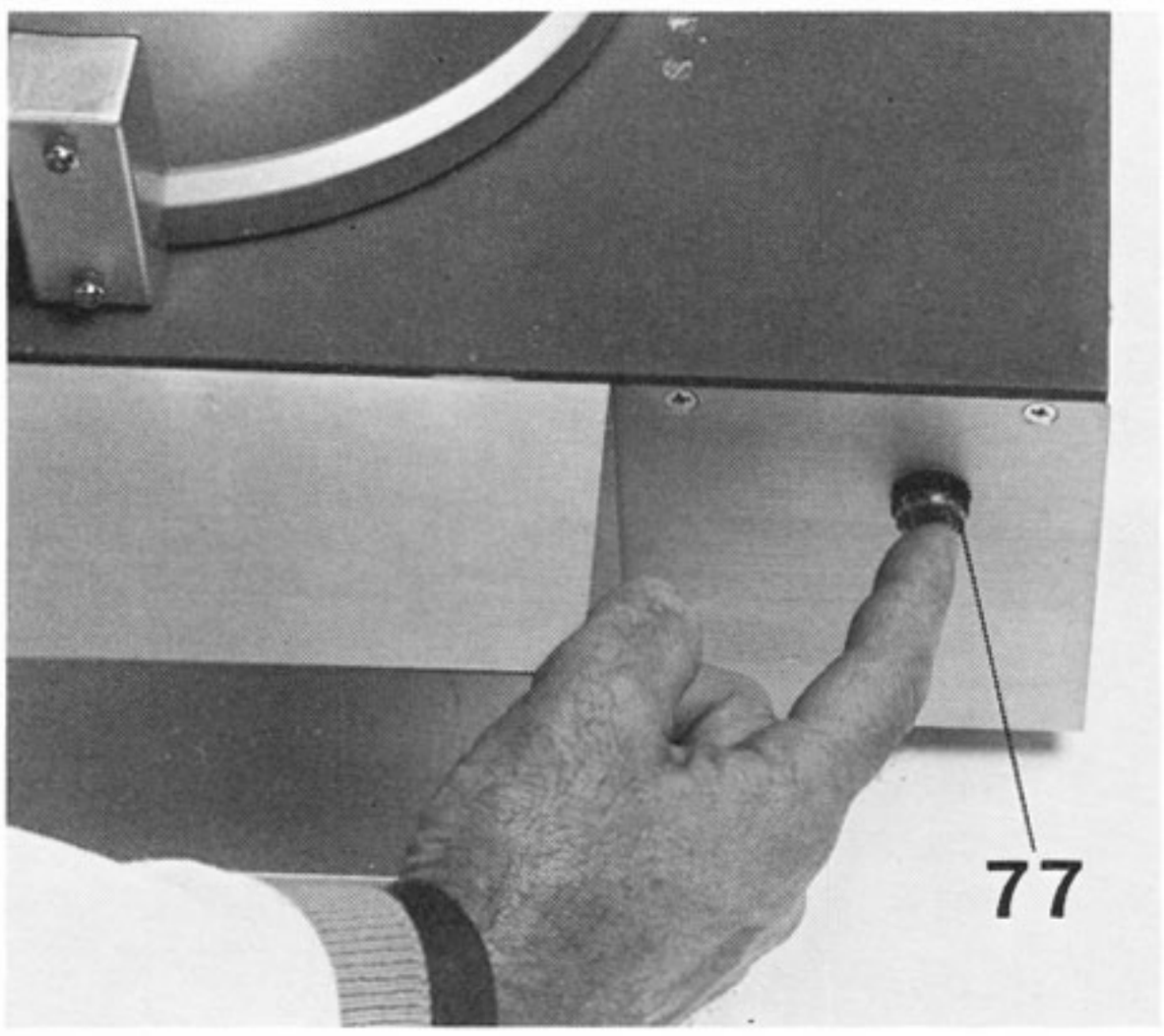


Fig. 6

c) Red pilot lamp fails to illuminate when switched on O/I.

1st possibility:

If no indication appears on the display (3) the fuse (8) of the control unit is defective and has to be replaced.

2nd possibility:

Should indications appear on the display (3) the pilot lamp is defective and has to be replaced. (The furnace functions, however, with the defect pilot lamp.)

3rd possibility:

Should rendom indications appear on the display (3), the control unit is defective and has to be exchanged.

d) Red pilot lamp in switch O/I flashes
(Rendom indications appear on the display [3].) Switch O/I off and on. If flashing continues, exchange the control unit.

e) Blocked key
If after pre-setting and input the data is not shown on the display or no appropriate reaction occurs after depressing keys A, B, C or X, check whether a key is blocked.
A blocked key can be released by tapping the center of the key lightly.
Then renew input.

f) Vacuum is not obtained
Clean the sealing rim (69a) and the sealing ring (35).

g) Pump fails to operate
Check pump fuse (66) and replace in case of failure.

Competent service companies for repairs and after sales servicing: see page 18.

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Removal of control unit from furnace base

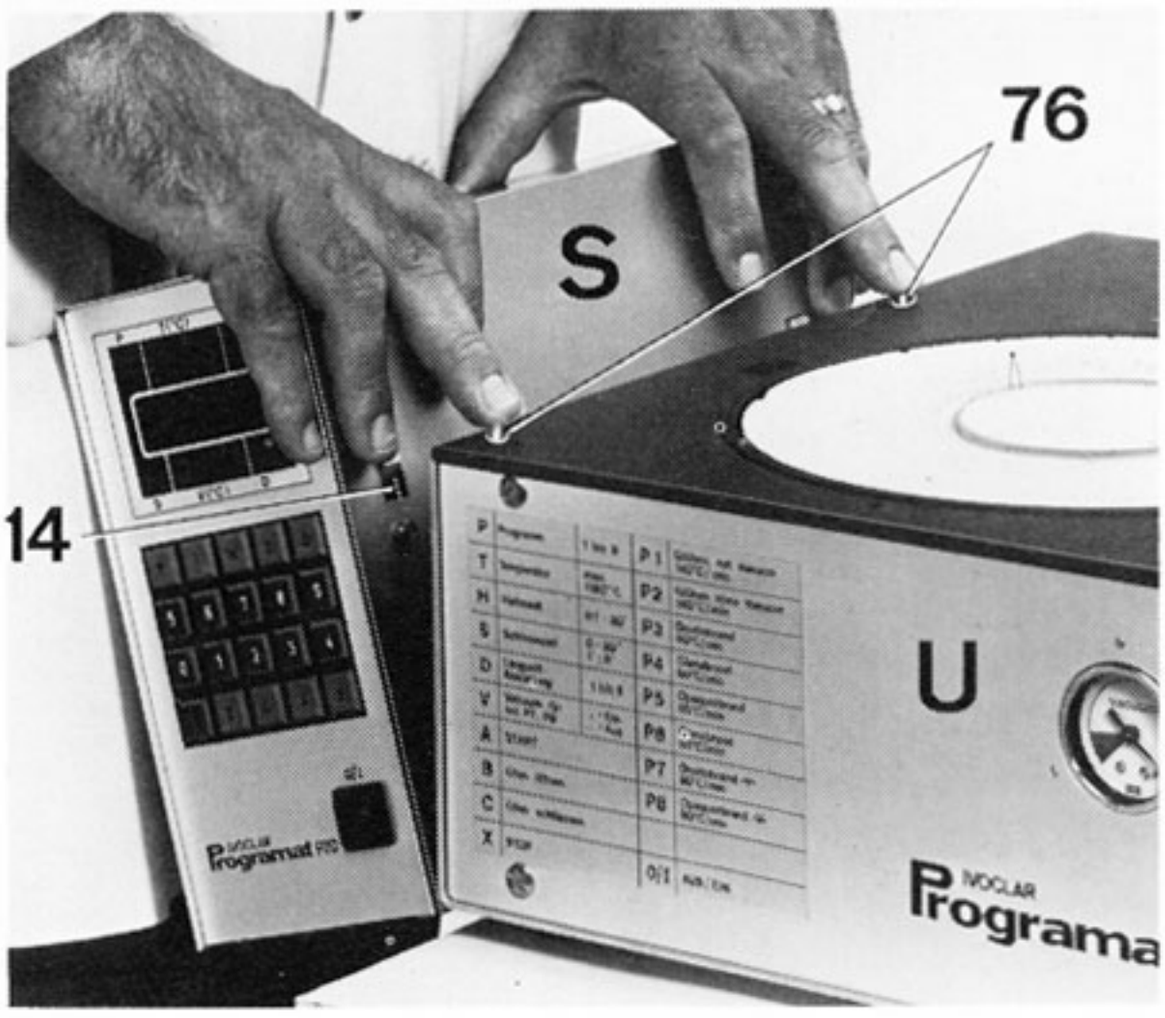


Fig. 7

1) With the furnace closed depress switch **O/I** and withdraw cable plug from the mains socket.
2) Place furnace on the edge of bench as shown in fig. 7.
3) Hold control unit (S) at top. Simultaneously depress the release buttons (76) and lift away.

Furnace chamber temperature check 'silver test'

The furnace chamber temperature can be checked by means of fine silver:

Material required:
1 firing tray marked IVOCLAR-E (∅ 17 mm, white). Strips of silver, purity 99,99%, Dimensions: 0.5 × 2 × 20 mm.

Procedure:

a) The furnace must be at operating temperature (after approx. 1 hour at stand-by temperature).
b) Insert silver strip into firing tray IVOCLAR -E (see fig. 8a).
c) Program P 4 with following data:
T = 955° C, H = 1 minute
d) Open furnace with **B**.
Place firing tray with the silver strip in the center of firing mount (72).
– Close furnace with **C**.
– Start programme with **A**.
e) If after completion of the programme, the silver strip is superficially melted as in fig. 8b the furnace temperature is correctly calibrated.

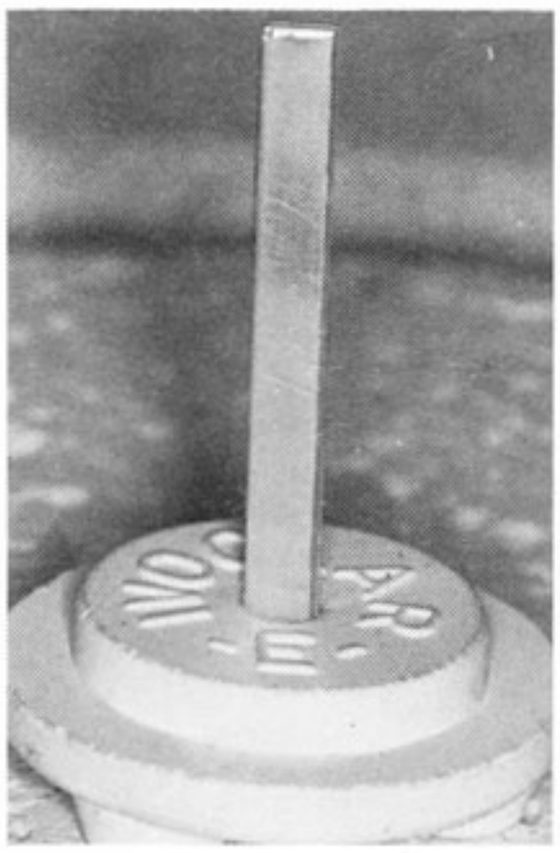


Fig. 8a

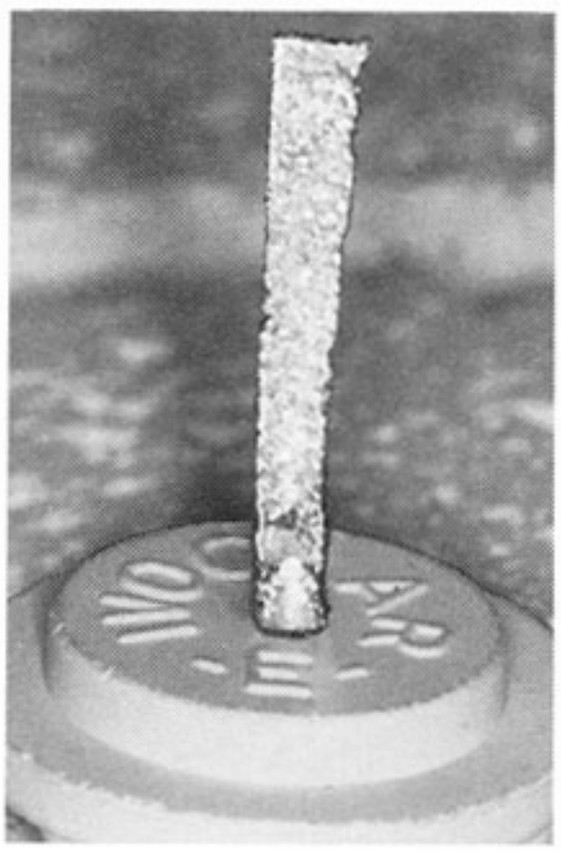


Fig. 8b

Recalibration

a) If the furnace temperature is too low, the silver strip is not superficially melted. With a screwdriver turn the calibrating screw (9) in the "plus" direction (see fig. 9). 1 turn = approx. 10° C.
b) If the furnace temperature is too high, the silver strip has melted to a ball. Turn the calibrating screw (9) in the "minus" direction.

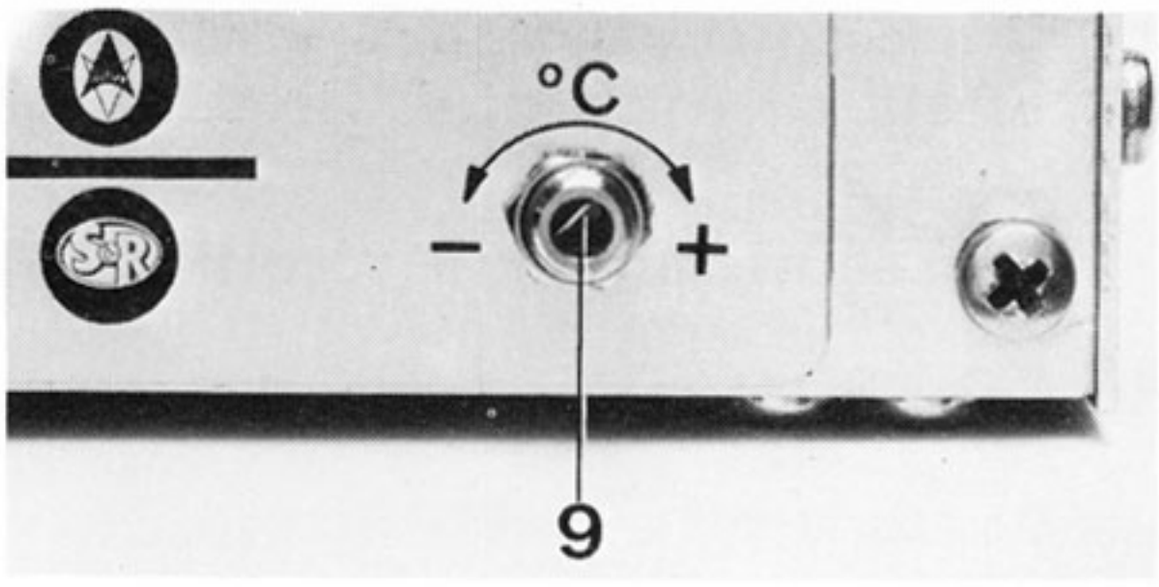


Fig. 9

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Furnace servicing

Servicing is, generally, restricted to the occasional inspection and cleaning of the sealing rim (69a), the sealing ring (35) and the muffle (40).

For this purpose the furnace head (K) is set up in the "servicing position" as follows (see fig 10).

a) Switch on by depressing **O/I**.

b) Depress **B** to open the furnace.

c) When the furnace is open (buzzer sounds), depress **O/I** to switch off.

d) Tip furnace head (K) vertically up and back by hand.

After cleaning:

a) Return the furnace head (K) to the normal open position by hand.

Important: Avoid dropping or disengaging from hinge pins (73).

b) Switch on power and depress **C** to close furnace.

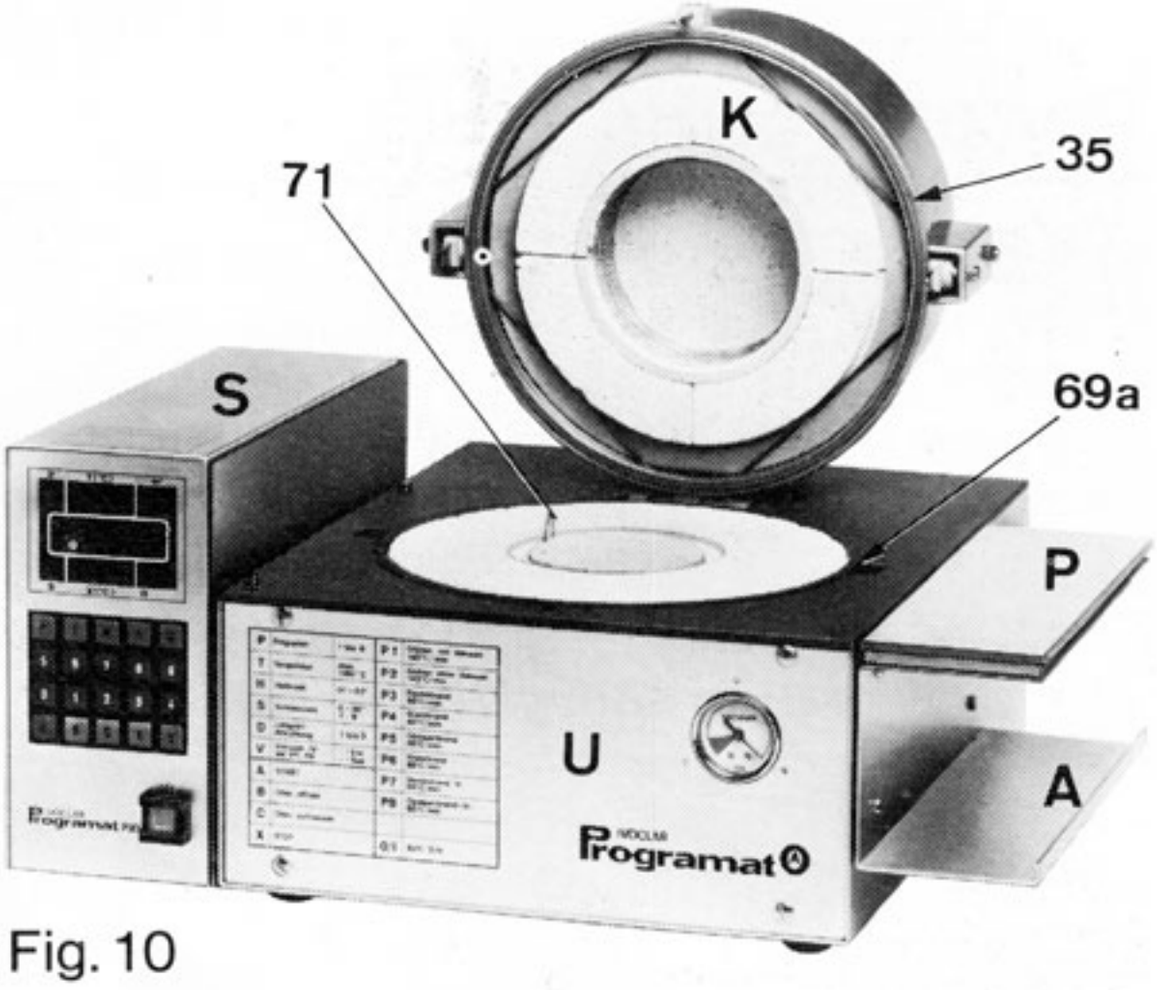


Fig. 10

Change of muffle

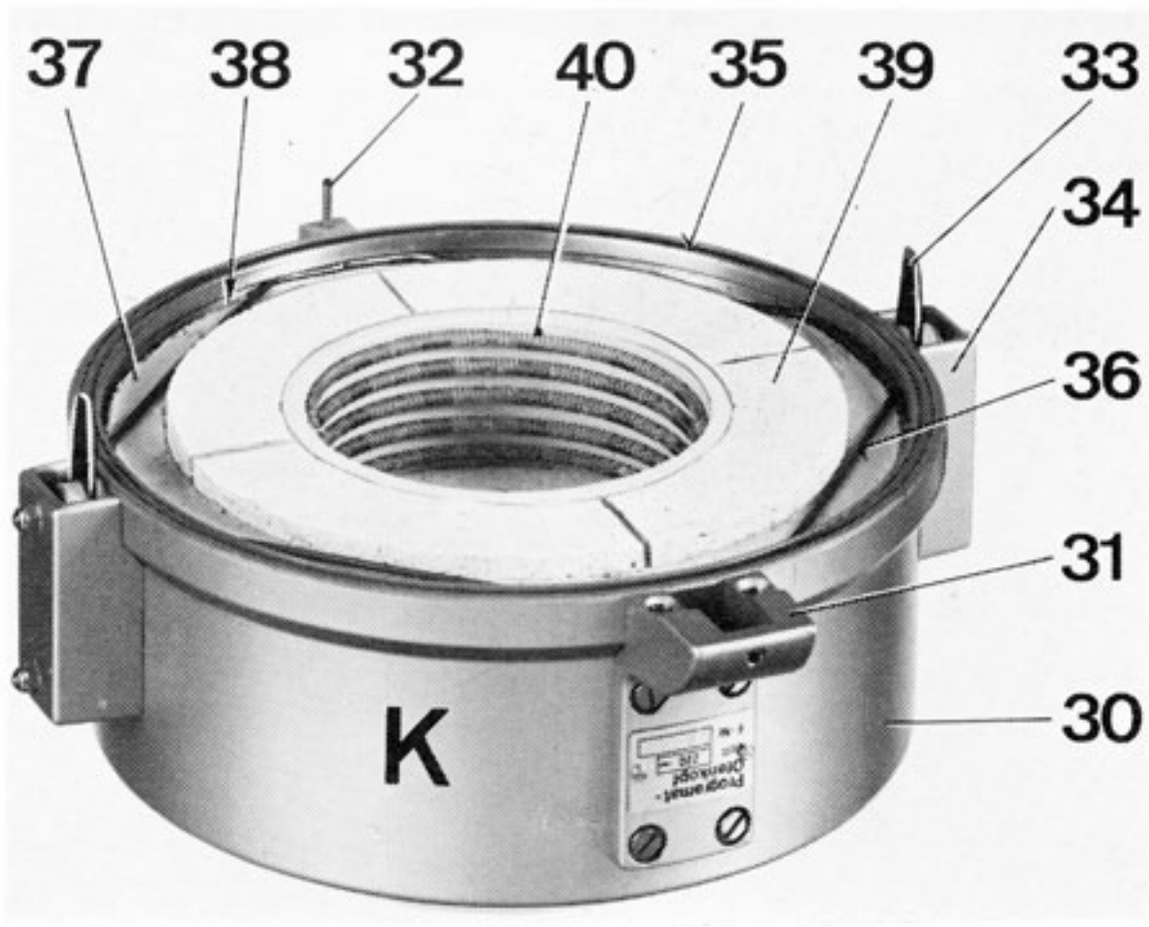


Fig. 11

1) Close furnace with **C**. When furnace is completely closed, depress **O/I** to switch off power. Remove power supply plug from mains socket.

2) Lift furnace head (K) up and off the hinge pins as in fig. 2 and place on a soft surface.

Important:
In all subsequent procedures avoid damaging the sealing ring (35), or bending the blade contacts (33) and the switch pin (32).

Vacuum pump servicing

Refer to operating and servicing instructions of the vacuum pump.

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Removal of muffle

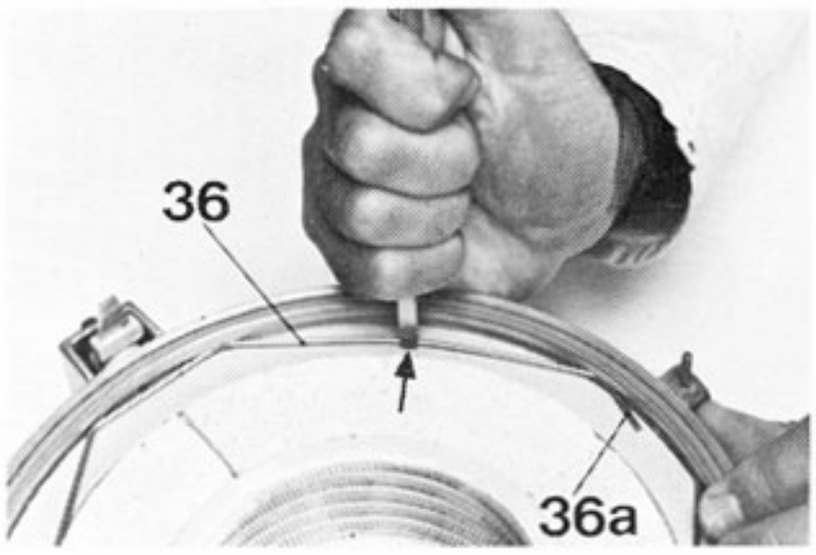


Fig. 12

Lever out the spring clip (36) with a screw driver until the end (36a) is ejected.

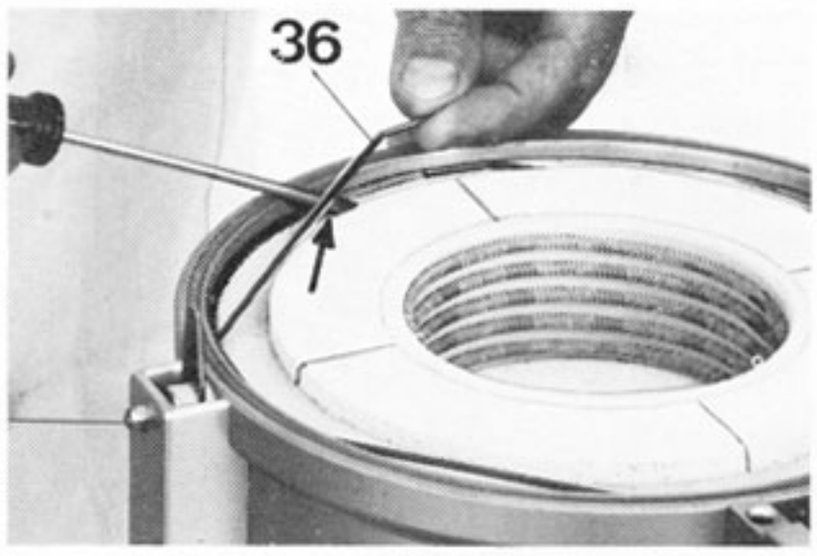


Fig. 13

Remove spring clip (36).

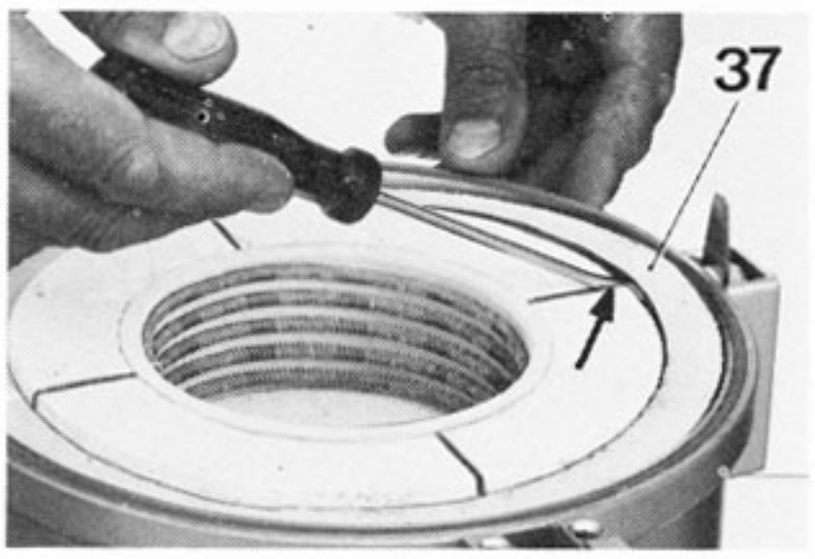


Fig. 14

Lever up and remove asbestos ring (37) with a screw driver.

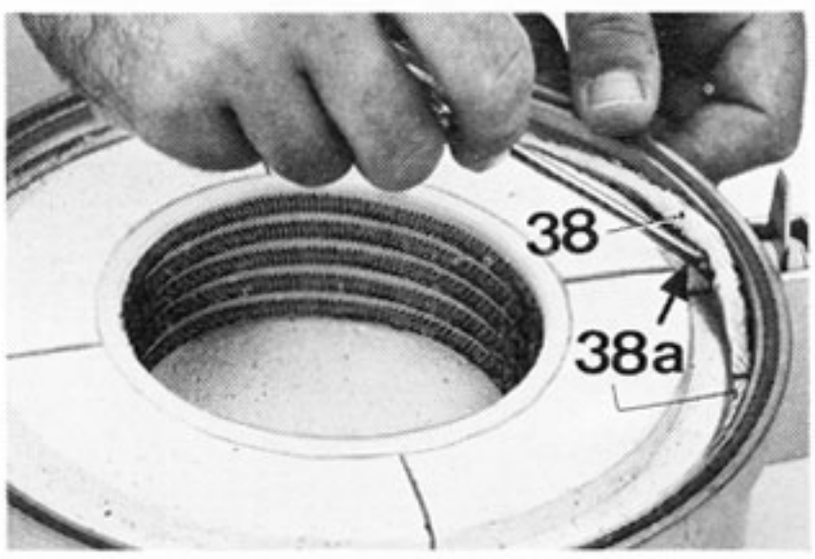


Fig. 15

Lever out the ends (38a) of the asbestos cord (38) with a screw driver and slowly pull it out all around by hand.

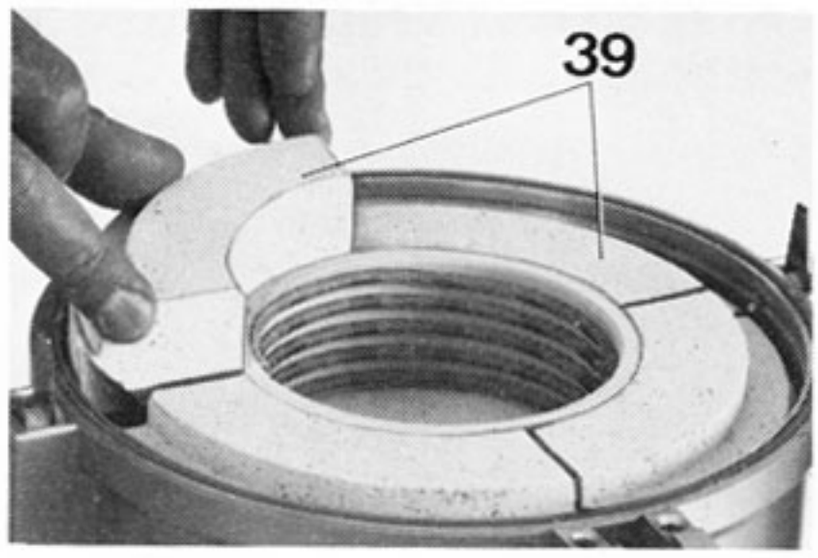


Fig. 16

Carefully remove the four stone lining segments (39).

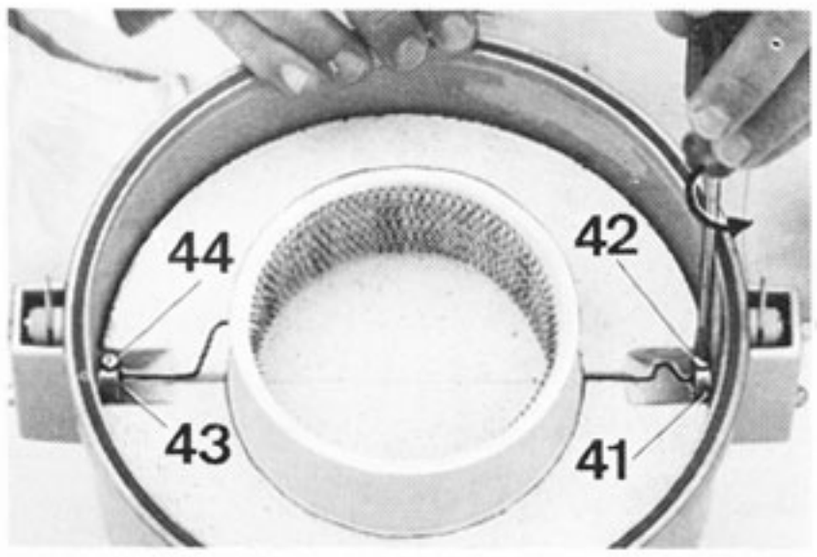


Fig. 17

Release locking screws (42) and (44) on terminals (41) and (43) (approx. 6 turns) with a screwdriver.

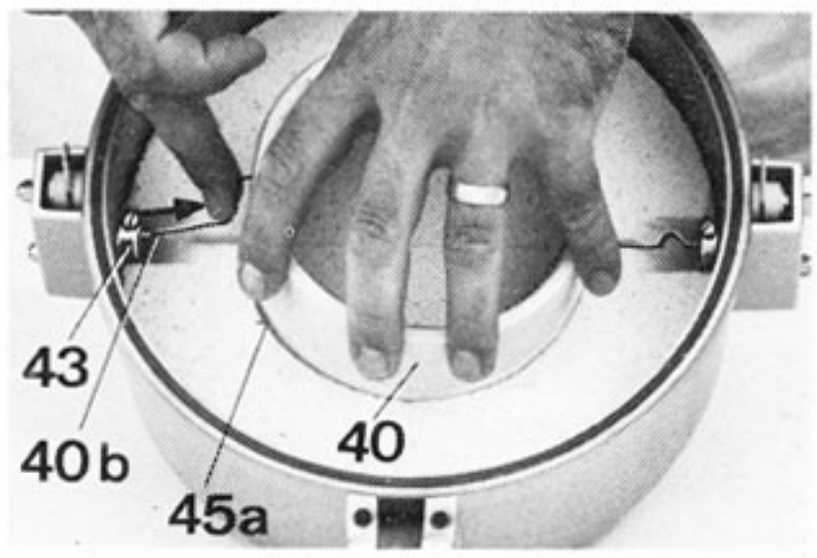


Fig. 18

Withdraw the connecting wire ending (40b) from terminal (43) by tilting the muffle (40) slightly upwards.

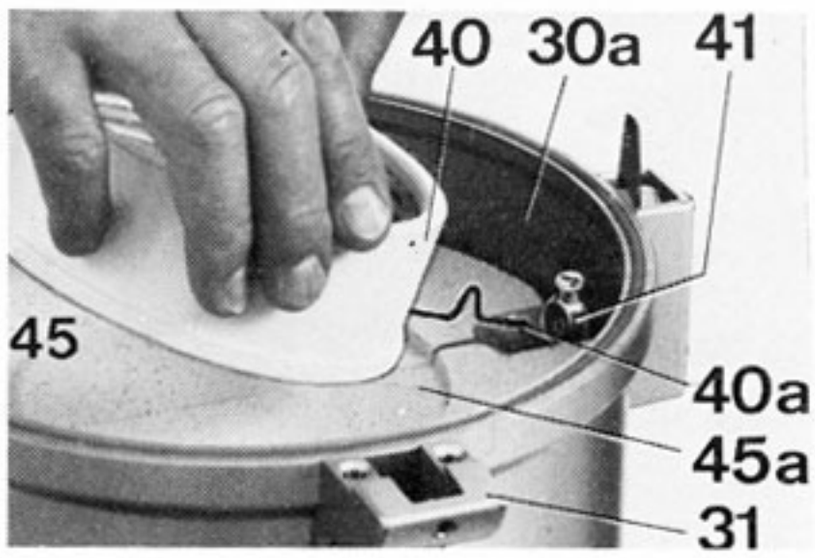


Fig. 19

Withdraw the connecting wire ending (40a) from terminal (41) and remove the muffle (40).

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Assembly of muffle

Clean inside wall of dome (30a) and surface of the stone roof (45).

Important: Carefully handle wire endings and heating element. Avoid touching heating element with fingers or hard objects.

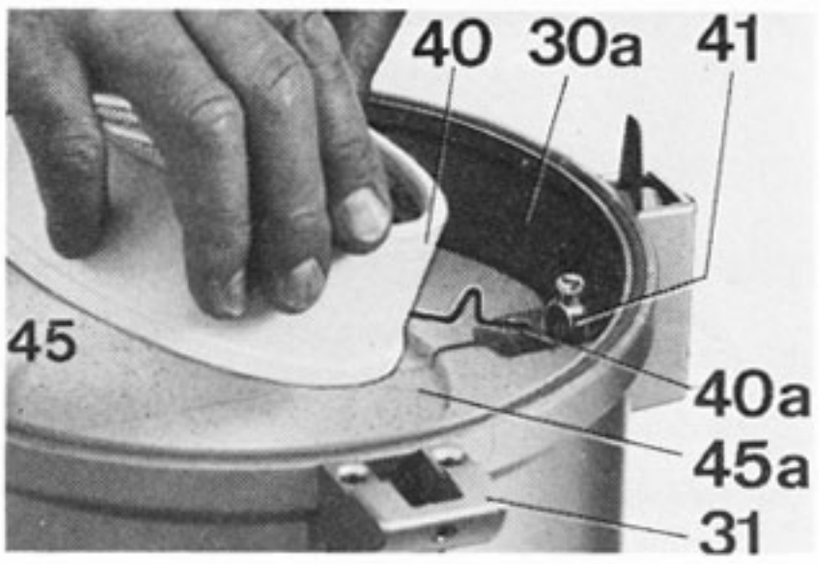


Fig. 20

Insert ending of short connecting wire (40a) into the terminal aperture (41).

Important: Ensure fitting with correct side facing mounting lug (31) as shown. (Marking on the muffle to correspond with marking on dome interior wall [30a]).

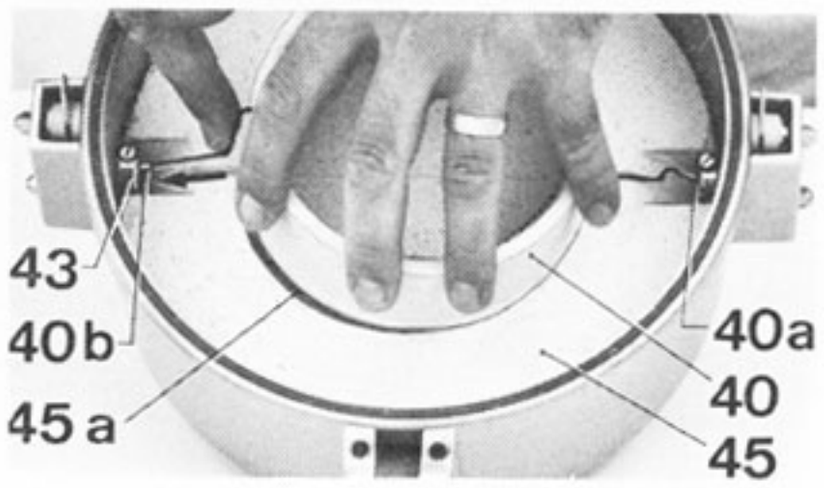
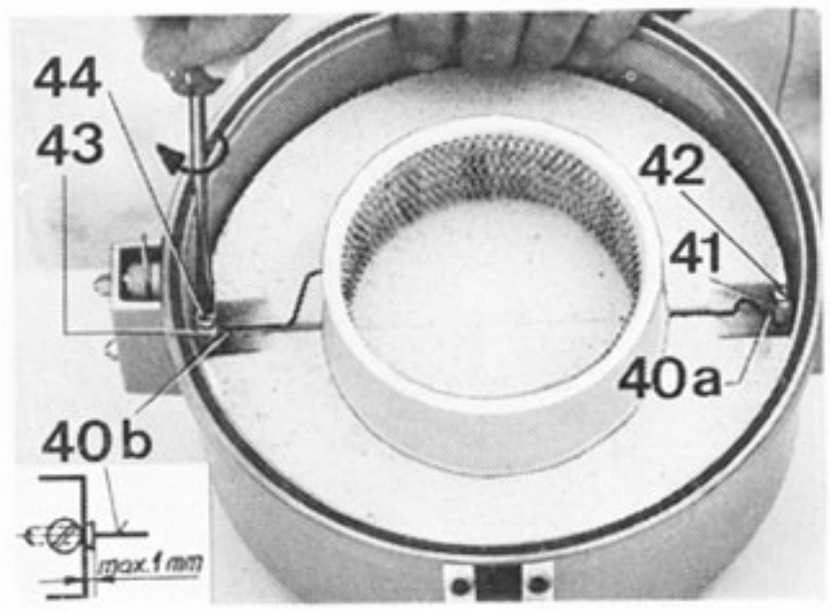


Fig. 21

Insert the connecting wire ending (40b) into the terminal aperture (43). Replace muffle (40) into recess (45a).



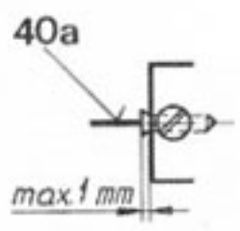
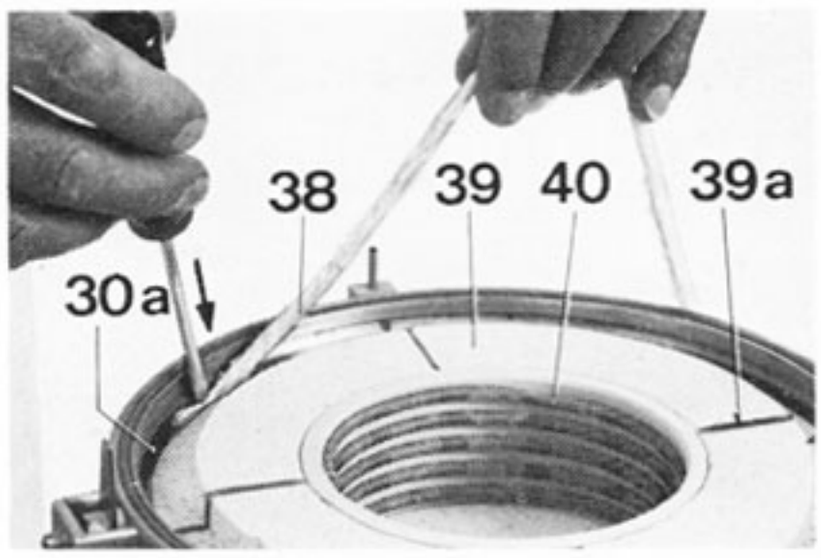


Fig. 22

Fix connecting wire end (40b) in terminal (43) with locking screw (44). Also fix connecting wire end (40a) in terminal (41) with locking screw (42).

Important: The connecting wire endings (40a and 40b) should be correctly located and firmly secured in terminals (41 and 43) as illustrated.



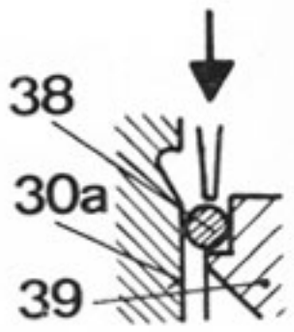


Fig. 23

Re-insert the four stone lining segments (39). Locate the stone lining segments (39) against the muffle (40) so that the four gaps (39a) are of roughly equal width. Introduce the asbestos cord (38) by means of a screw driver evenly without tensioning along the whole circumference between the stone lining segments (39) and the dome interior wall (30a) as illustrated. Ensure that the stone lining segments (39) fit tightly against the muffle (40).

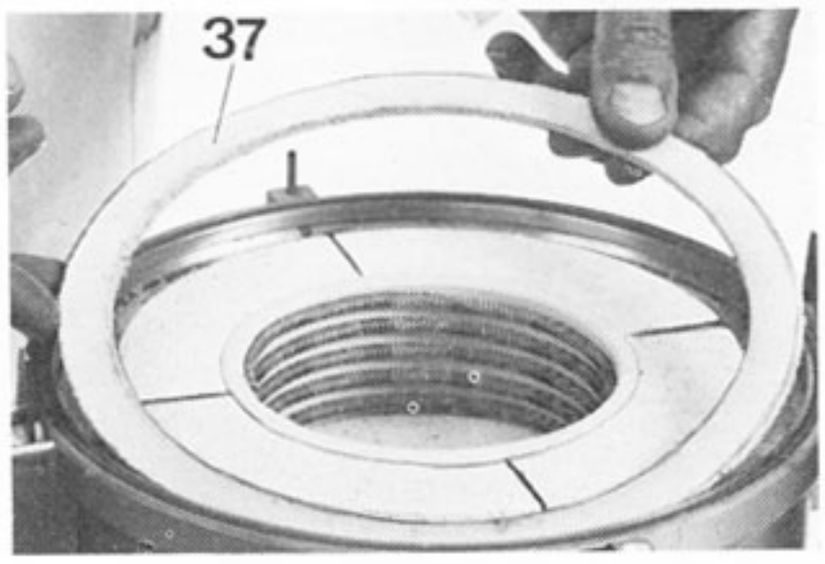
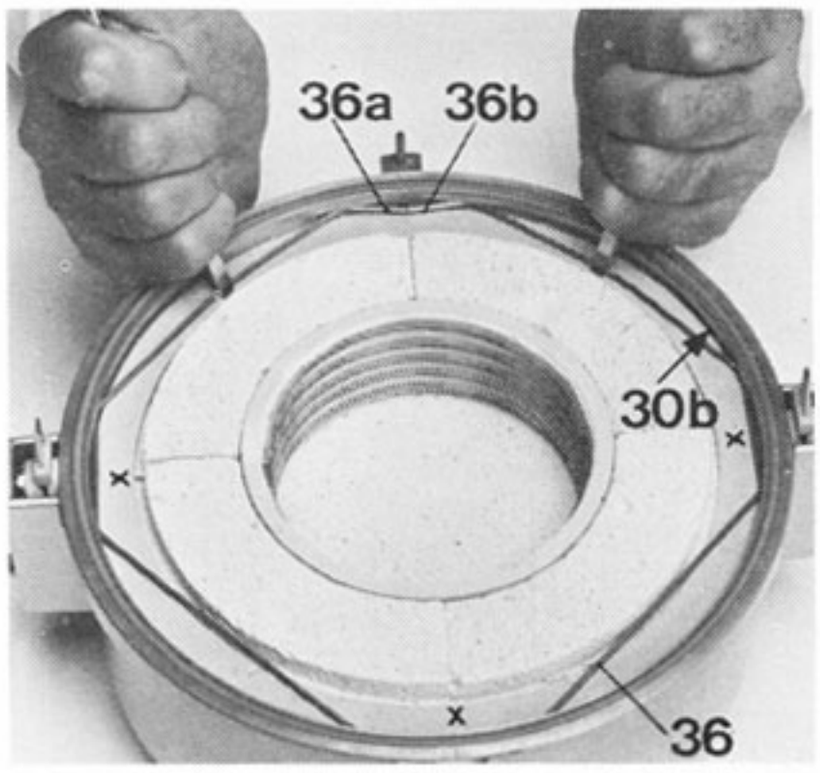


Fig. 24

Insert asbestos ring (37).



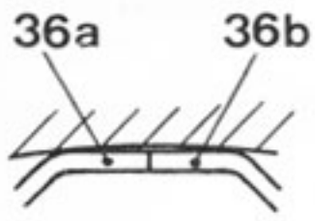


Fig. 25

Secure the spring clip (36) under the recess (30b) at the positions marked "X".
As illustrated pull spring clip (36) against the dome interior wall with 2 screwdrivers until the endings (36a and 36b) fit together. Then release spring clip slowly.

Important: The endings (36a and 36b) should securely abut one another as illustrated.

Dental Servis
Serdar Ayısıt
0555 274 05 51

Summary of firing cycles

VIVODENT-ITS and -HTE metal bonded ceramics

	Temperature **T	Programme P	Holding time H'	Closing time S'
1) First opaque firing	980° C	P5	1'	2'
Second opaque firing	970° C	P5 or P8	1'	2'
2) Dentine (Incisal) firing	920° C	P3	1'	4'
Intermediary firing (if any)	910° C	P3 or P7	1'	4'
3) Glaze firing with universal glaze	900° C	P6 or P4		2'–4'
4) Glaze firing without precious metal, with universal glaze	900° C	P4	1'	4'
5) Heat treatment – oxidation (IVOTECT-P)	*980° C	* P1	*1'	0 (30'')
6) Soldering (IVOTECT-P)	*750° C	* P3	1'	0 (30'')

VIVODENT PE-Jacket Porcelain

1) Core firing	1040° C	P5	1'	2'
2) Dentin firing	1020° C	P3	1'	4'
3) Glaze firing with universal glaze	980° C	P6	1'	2'
4) Corrective compound firing	880° C	P3	1'	4'

* or as per manufacturers' instructions
** approximative values

Dental Servis
Serdar Ayısıt
0555 274 05 51