Programat® X1

Valid as of
Software Version 7.02

Operating Instructions

CE

ivoclar vivadent®
technical

KONFORMITÄTSERKLÄRUNG
DECLARATION OF CONFORMITY
CERTIFICAT DE CONFORMITÉ
DICHIARAZIONE DI CONFORMITÀ
DECLARACIÓN DE CONFORMIDAD
DECLARAÇÃO DE CONFORMIDADE

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CE

Programat X1

DE Hiermit erklären wir in alleiniger Verantwortung, dass das oben aufgeführte Produkt den erwähnten Normen entspricht.
Gemäss den Bestimmungen der EU-Richtlinie(n):

GB We herewith declare that the product listed above complies with the mentioned standards.
Following the provisions of Directive(s):

FR Par la présente, nous déclarons que le produit ci-dessus indiqué est conforme aux normes énoncées.
Conformément aux dispositions de la (des) Directive(s) CE:

IT Con la presente dichiariamo sotto la nostra responsabilità, che il prodotto sopra menzionato corrisponde alle norme citate.
Secondo le disposizioni della/e Direttiva/e CEE:

ES Por la presente declaramos que el producto arriba indicado cumple con las normas citadas.
Siguiendo las indicaciones de la Directiva:

PT Declaramos que o produto citado cumpre as normas mencionadas.
De acordo com as especificações da(s) Diretriz(es):

73/23/EWG 89/336/EWG	EN 50081-1	1992
	EN 50082	1992
	EN 55011	1991
	EN 55022	1994
	EN 60555-2	1987
	EN 60555-3	1987
	EN 61000-3-2	1995
	EN 61000-3-3	1995
	EN 61010-1	1993
	EN 61010-1-A2	1995
	EN 61010-2-010	1994

Schaan, 12.02.2003

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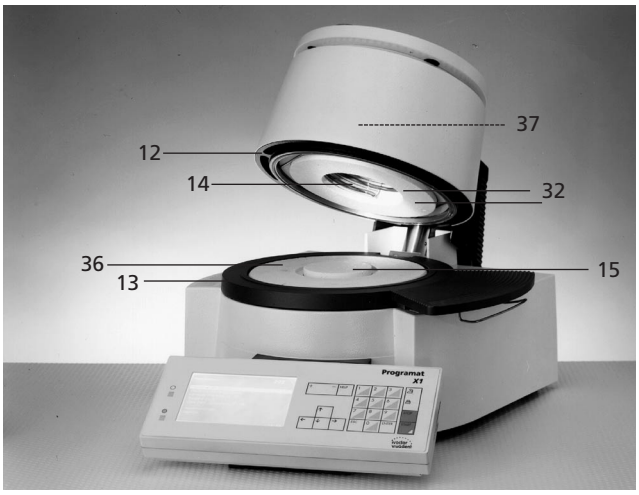
Rev. 1.0

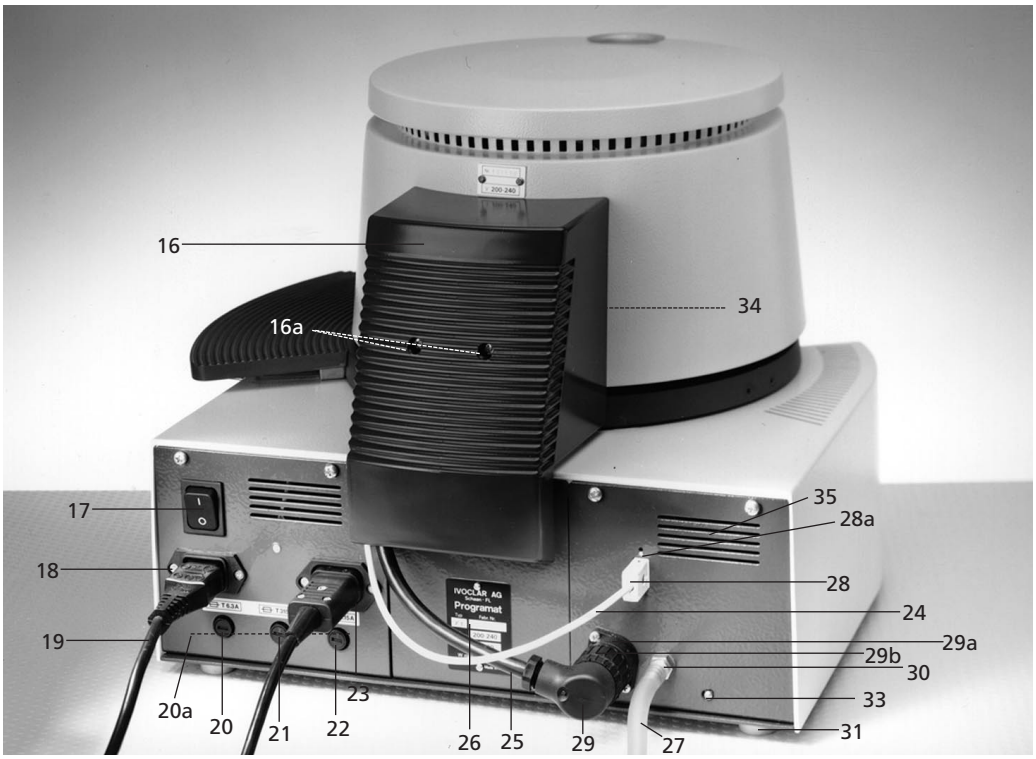
{Programat X1-1.doc/14.12.00/ebc}

Contents

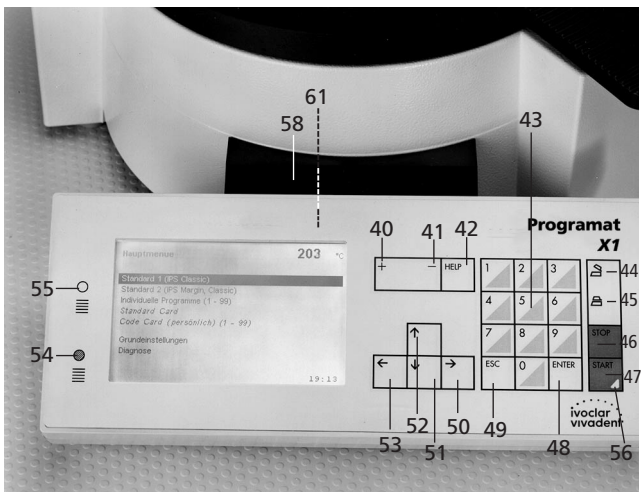
Closed furnace



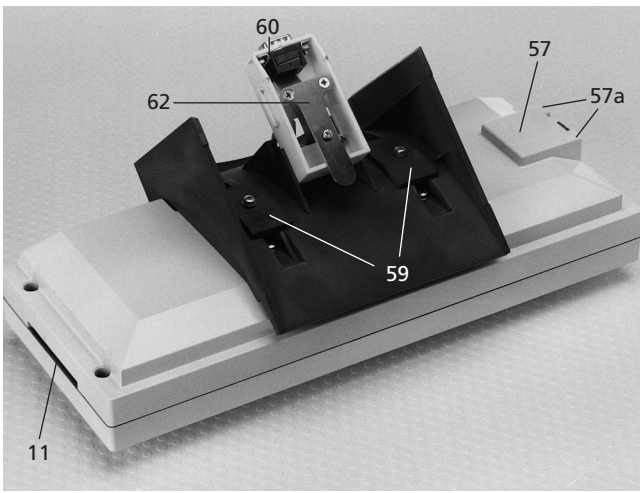
Open furnace



Rear of the furnace



Electronic control box



Rear of the electronic control box

Table of contents

1. Introduction/Signs and Symbols

1.1 Preface

Thank you for having purchased the Programat X1. It is a highly-technical quality product. The Programat X1 has preset standard programs and also offers the option of various individual programs. The relevant firing data are shown on an illuminated, graphic, LC-display. The RS-232 interface permits printing out the firing data via PC/printer.

The furnace is designed according to EN 61010-1 and thus complies with the relevant CE 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 Programat X1 is a high-tech product for dental technology. It is equipped with state-of-the-art electronic components and has a futuristic design.

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 Programat® X1 furnace.

Contraindication

Burn hazard

Furnace:

Alternating current

On

Off

Burn hazard

Risk of crushing
Hazardous area
– Note: observe documentation
– Objects may only be placed into the firing chamber by means of tongs

1.3 Notes regarding the Operating Instructions

Furnace concerned:
Programat X1
Target group:
Dental technologists

These Operating Instructions facilitate the correct, safe, and economic use of the Programat X1 furnace.

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 Vivadent Service Center.

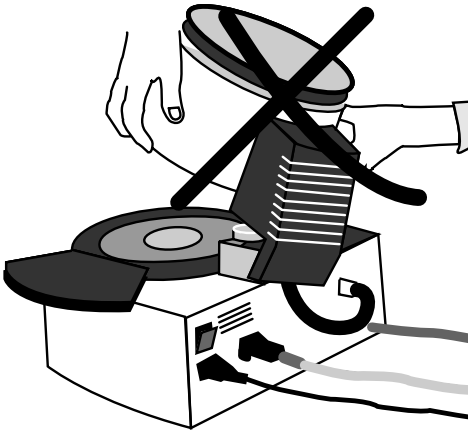
2. Safety First

This chapter is especially important for personnel who work with the Programat X1 or who have to carry out maintenance or repair work. This chapter must be read and the corresponding instructions followed.

2.1 Indications

The Programat X1 must only be used to fire dental ceramic materials 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.

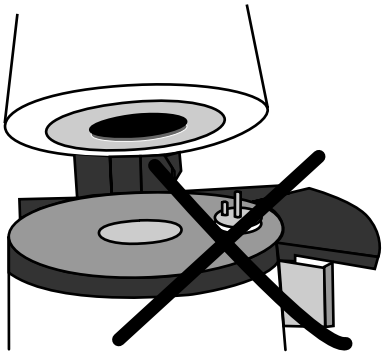
Further instructions to assure proper use of the furnace:
- The instructions, regulations, and notes in these Operating Instructions must be observed.
- The instructions, regulations, and notes in the vacuum pump Operating Instructions must be observed.
- The furnace must be operated under the indicated environmental and operating conditions (see Chapter 9).
- The PX1 must be properly maintained (see Chapter 7).



2.1.1

Contraindication

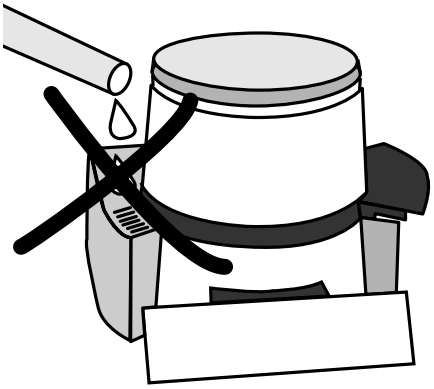
The furnace head (2) should not be removed from the furnace base (10) as long the furnace head is connected to the furnace base by means of the heating element cable (25).



2.1.2

Contraindication

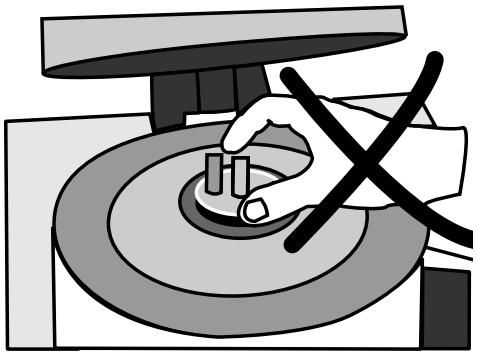
Firing trays must not be placed in the area surrounding the firing table (15), since this will obstruct the closing of the furnace head (2). Place the fired object on the cooling plate (8) designed for that purpose. Never reach under the furnace head during operation. There is a risk of crushing!



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.



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.

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

Burn hazard

Please also refer to section 3.2. in Chapter 3.

This furnace has been designed according to EN 61010-1 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.

– Do not place and operate the furnace in areas where there is an explosion hazard.

– Place furnace on a fire-proof table (observe local regulations, e.g. distance to combustible objects, etc.)

– Always keep the air vents (35) at the rear of the furnace free from obstruction.

– Position vacuum pump in a well ventilated place. The air vents of the furnace base must always remain free from obstruction. Make sure that no foreign objects enter the furnace base.

– Do not place any object on the frame panel. Use the cooling plate for this 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 your local power supply.

– The power plug may only be inserted into sockets with protected contacts.

– Before calibration, maintenance, repair, or exchange 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
  – the furnace is overheated
  – the quartz sheath of the heating spiral is defective

– 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 °F to +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.

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.

Burn hazard and risk of crushing. Never reach below the opened furnace head, even when it is cold. Always use the tongs to remove or place objects in 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 Programat® X1 furnace system comprises the following components:

- Furnace base
- Furnace head
- Electronic control box
- Vacuum pump with hose and power cord (accessories)

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
Defective quartz sheath of the heating spiral	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 for fired ceramics	Limiting the usable area
Grooves in the cooling plate for fired ceramics	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. As long as the symbol ● blinks in the display where the current temperature is indicated, the furnace is in the process of heating up. 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

- Additional cooling plate for fired ceramics
- PX1 Card 1 (personal)
- Standard Card A
- Temperature Checking Set
- Programat accessories assortment (firing tray, tongs, Temperature Checking Set)
- Vacuum pump
- Programat firing cards
- Printer with cable (specialized computer dealers)

4. Installation and Initial Start-Up

4.1 Unpacking and checking the contents

Remove 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.

The furnace must not be carried by the cooling plate for fired ceramics.

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

4.2 Selecting the location

Place the furnace on a flat, horizontal table using the rubber feet (31). Make sure 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.
Give the swivel keypad enough space, in order not to obstruct the swivelling mechanism.

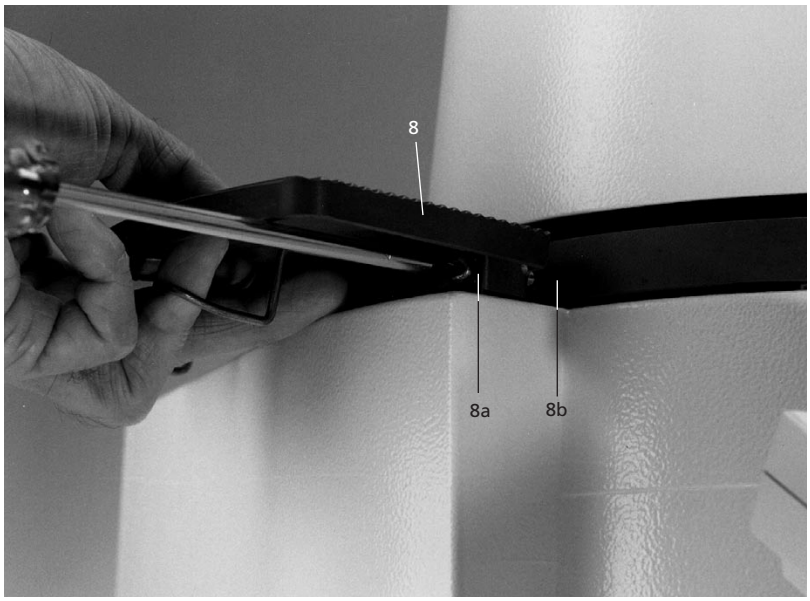
The furnace should neither be placed nor operated in areas where there is an explosion hazard.

Make sure the furnace is not affected by draught (this influences predrying).

4.3 Assembly and initial start-up

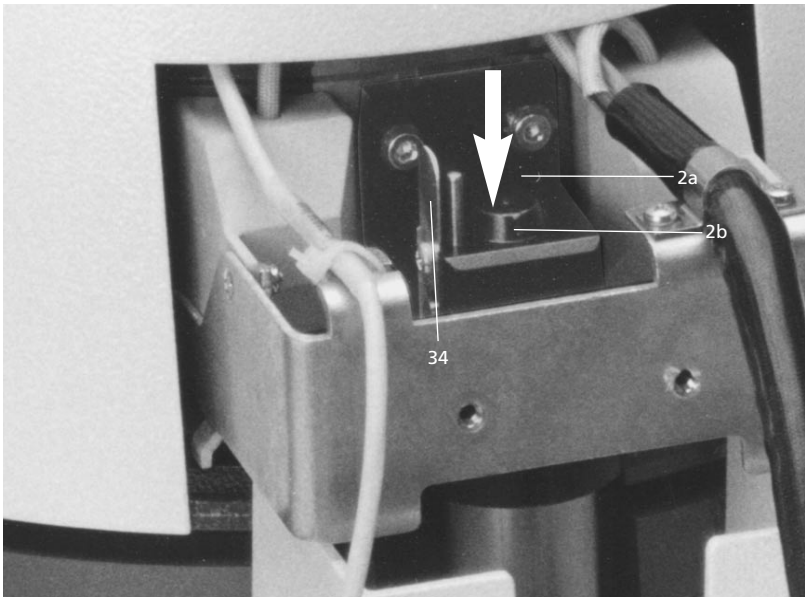
The furnace comprises the following components which are assembled as follows:

Step 1:
Mounting the cooling plate for fired ceramics
The cooling plate (8) is mounted to the thread (8b) with the two screws (8a) by means of the screwdriver supplied. The cooling plate may be mounted on either the right or the left side of the furnace. There is also the possibility of mounting two cooling plates for fired ceramics. An additional cooling plate is available as an accessory.

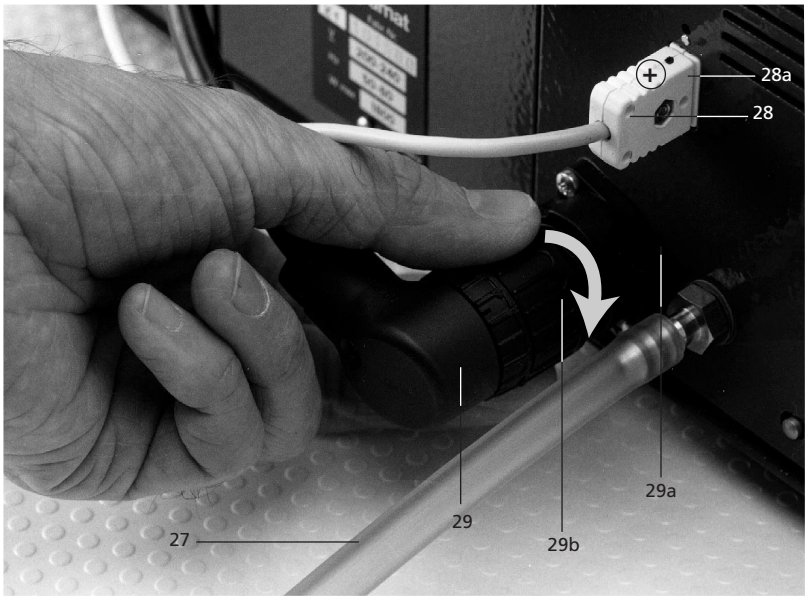


Step 2:
Mounting the furnace head
The furnace head (2) is best mounted with the furnace base (10) pointing towards the user. Lift the furnace head with both hands (see picture) and carefully position it with the furnace head mounting (2a) on the furnace head holding pin (2b).

The furnace head snaps into place on the leaf spring (34). For safety reasons, the furnace head cannot be removed from the furnace base without the protective cover (16) being removed and the leaf spring (34) being released (see also Chapter 4.4 'Removing the furnace head').



Ensure that the furnace head mounting (2a) is correctly connected to the furnace head mechanism (2b) of the furnace base. Do not remove the protective cover (16).

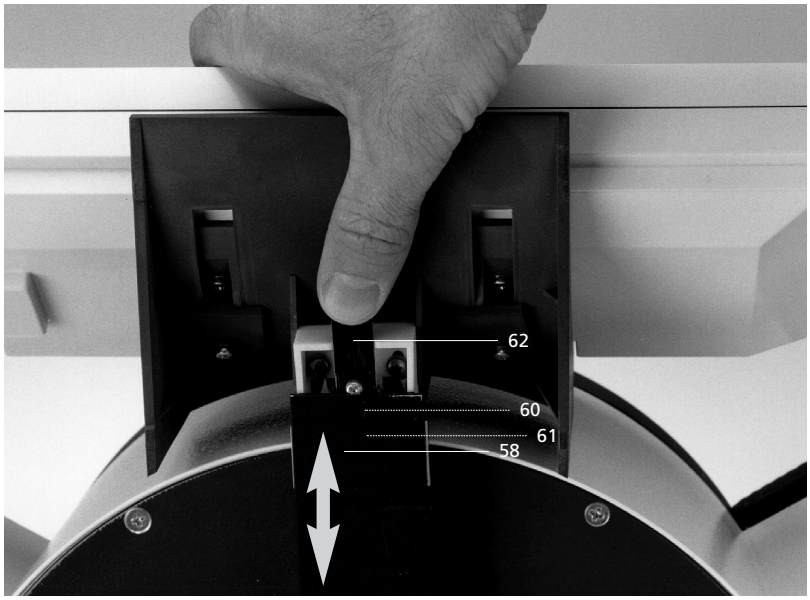


Connect the cables at the furnace head with the furnace base:
– Put the thermocouple plug (28) into the thermocouple socket (28b).

Observe the correct polarity of the plug (+-signs together).

– Put the heating element plug (29) into the heating element socket (29a) and fasten it with the screw retention (29b) by turning it to the right.

Caution!
Electric power



Step 3:
Mounting the electronic control box
Now position the electronic control box on the table and slide it into the furnace base by means of the guiding rails of the keyboard adjustment (58) until it snaps into place. During this process, the electronic control box plug (60) is automatically connected with the electronic control box socket (61) and locked into place. To remove the electronic control box, press the safety ring (62) and pull out the box.

Make sure the safety ring (62) snaps into place.

Step 4:
Connections
Power connection:
Please make sure that the voltage indicated on the rating plate (26) complies with the local power supply. Should this not be the case, you must not connect the furnace. Connect the power cable (19) with the power socket (18) of the furnace.

Vacuum pump connection:
Connect the power plug of the vacuum pump with the socket for the vacuum pump (23) at the furnace, and connect the vacuum hose (27) with the vacuum hose connection (30).

For this furnace, we recommend using only the VP2 vacuum pump from Ivoclar Vivadent (accessory), since this pump is especially coordinated with the unit. If other pumps are used, please observe and do not exceed the maximum power consumption.

Printer/PC connection (accessory):
Connect the printer/PC cable with the printer/PC connection (57) of the electronic control box and secure the 9-pin plug with the two screws.
Please also refer to Chapter 5.5.1

Initial start-up

Connect the power cord (19) with the wall socket. Put the On/Off switch (17) at the rear of the furnace on position "I". The furnace will now automatically start up the program after a few seconds. First of all the language selection screen appears. Here, one of the five basic languages of the PX1 may be selected. Use the down (51) and up (52) keys to make your selection and confirm with ENTER.
Now, the furnace conducts the self-diagnosis, after the completion of which the main menu will appear. The language may be changed anytime during operation (see Chapter 5.5. 'Defining the basic setup').

If this is not the case, a technical malfunction has occurred. Refer to Chapter 8.

The power plug may only be inserted into a socket with protected contacts and a fault current protection of <30 mA. The power cord must not touch the hot furnace head and should be protected against contact.

The Programat X1 is equipped with a special electronic component that may bridge approximately 5 seconds of power failure. However, at least 10 seconds have to pass after the furnace has been switched off before the unit can be restarted.

The furnace heats up to a 100 °C (212 °F) with the furnace head open or closed and with the LC-display showing the main menu.
During the heating impulses, the resistance wire in the quartz glass tube produces a sound that slowly faints with increasing temperature. This has no negative effect on the function of the furnace.

Indicator for the operating hours:
The new furnaces are subjected to extensive tests prior to delivery. During these tests, the furnaces are in continuous operation for several hours. This is the reason why the indicator shows >0 operating hours.

Set date and time:
If the display indicates 00:00 or 0.0.2000.

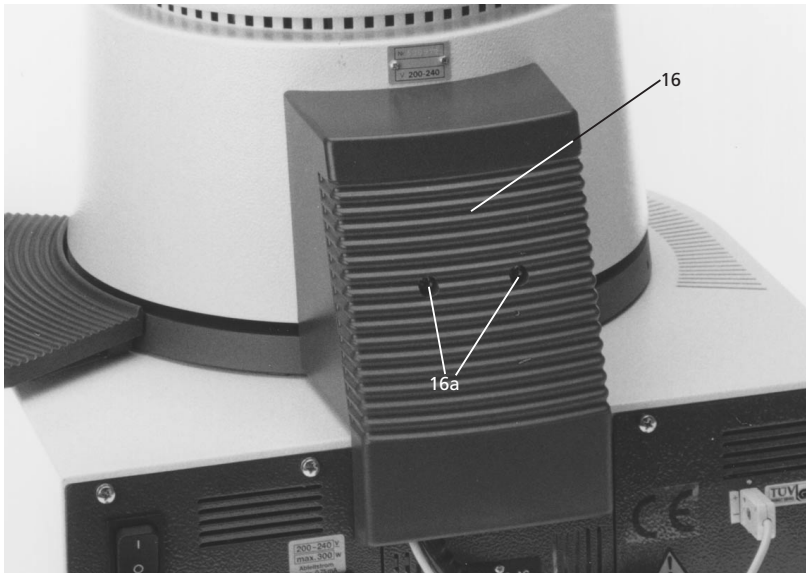
4.4. Removing the furnace head

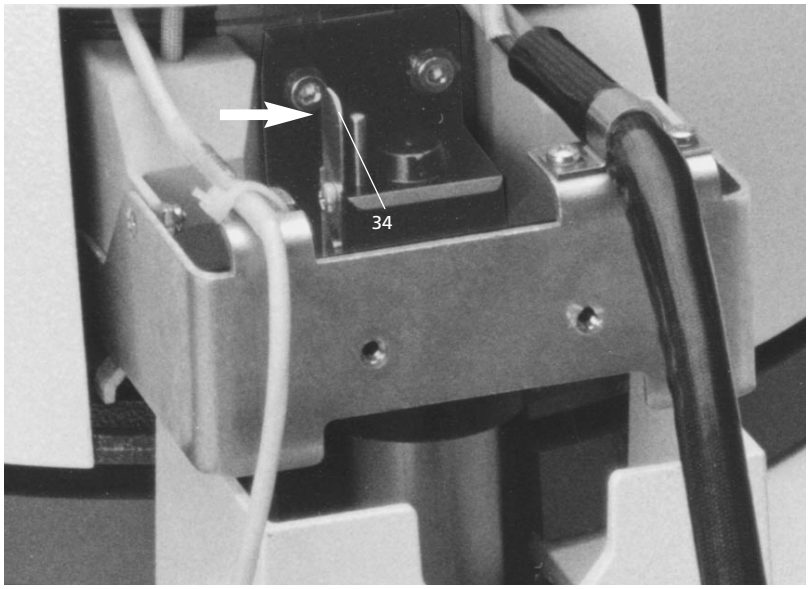
Please have the furnace head removed by an authorized person according to the corresponding instructions.

Before removing the protective cover (16), switch off the furnace, disconnect the power cord (19), and remove the plugs for the heater (29) and the thermocouple (28) from the furnace base.

Removing the protective cover (16)
- Remove the screws (16a) for the protective cover.
- Remove protective cover (16).

Removing the secured furnace head
- Push leaf spring (34) in the direction of the arrow and lift the furnace head.
- After the furnace head has been removed, remount the protective cover (16) and fix it with the corresponding screws (16a).





5. Menu Operation and Basic Setup

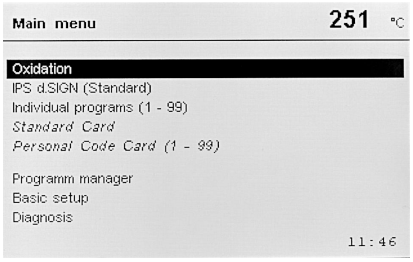
5.1 Introduction to the operation

Given its specially developed user program, the Programat X1 is easy to operate. The user may select the desired firing parameter from the different menu options by means of the 'cursor' (arrow-keys) (50-53) and confirm it with ENTER. The desired values may be entered with the numeric keys (43) and confirmed with ENTER. A program is started by pressing START. The firing process is graphically shown on the display. The most important parameters are always shown on the display (5).

5.2 The menu

The main menu is the highest level of the program structure. It is the starting point for all sub-menus. Returning from a lower level to the next higher lever is achieved with the ESC key.

The main menu comprises the following options:



See Chapter 10.2 for the Programat® X1 menu structure.

5.3 Operating the menu/key functions

+/- keys (40, 41)
- The set parameter may be altered with the '+/-' keys
- User's names for individual programs are defined as follows: '+' selects a letter and '-' deletes the last letter selected.

- With the '+' the printout of the firing parameters or the transmission of the corresponding data to a PC is started.
  In all the program selection screens, the firing parameters of the selected program can be printed out or the data transmitted to a PC. The layout of the printout corresponds to that of the firing protocol (see example in Chapter 10.4).
  Before the printout is started, however, check if the printer/PC is connected with the PX1 and ready. The printer parameters in the 'Basic setup' menu must also be correctly set.

HELP key (42)
- A situation-related help text may be called up with the HELP key at any time. The help text may then be removed with ESC.

0-9 numeric keys (43)
- Numeric keys for entering the values: See table in Chapter 10 for possible values.
- Wrong values entered result in an error message on the display.
- Impossible values are not accepted once ENTER is pressed. The 'old' value reappears.

Open furnace head (symbol) (44)
- Pressing this key results in the furnace head being opened. Once the furnace head is completely open and the actual temperature has dropped below 370 °C (698 °F), the buzzer sounds.
- The furnace head cannot be opened when a program is in progress and as long as a vacuum is present.

Close furnace head (symbol) (45)
- Pressing this key results in the furnace head being closed.

STOP key (46)

Pressing this key once has the following effects:
- Interruption of the program (LED in the START key blinks)
- Movement of the furnace head stops
- Heating process is interrupted (temperature is maintained)
- Buzzer stops
- Error message is deleted

Pressing this key twice has the following effects:
- Heating process stops
- Vacuum stops
- Program is stopped (LED in the START key is dark)

START key (47)
- The program P is started by pressing this key (the display must indicate the firing curve). The LED in the key is illuminated.
- If the display shows a parameter screen, pressing this key results in the display showing the firing curve.

Description of the green LED in the START key (56)
- LED is illuminated after the program has started
- LED blinks during program interruption (1 x Stop)
- LED is dark after the program has been stopped (2 x Stop), the furnace heats up to stand-by temperature

ENTER key (48)
- Each value selected has to be confirmed with the ENTER key.
- Pressing this key results in the next lower menu level being called up.
- If the query 'Protocol yes/no' appears in the firing curve display, pressing the enter key results in the program being started.

ESC-Taste (49)
- Pressing this key results in the next higher menu level being called up.
  The quickest way back to the main menu is pressing ESC for longer than approx. 1 second.
- Undesired values may be deleted with this key before the ENTER key is pressed. The old value reappears.
- ESC is used to leave the Help function.
- ESC is used to close the window with the error message.

Cursor keys (50, 51, 52, 53)
- Pressing these keys moves the cursor (= black bar) on the display.
  - up (52)
  - down (51)
  - left (53)
  - right (50)

Contrast keys (54, 55)
- With these keys, the contrast of the display may be adjusted.
  ○ brighter (55)
  ● darker (54)

The contrast of the display may be altered at all times. 'Contrast bright' (55) makes it brighter, 'Contrast dark' (54) darker.

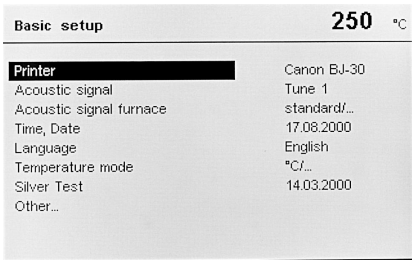
Protect the display from direct sunlight.

5.4 The 'Help' function

The HELP key may be used at all times and contextual help will be displayed. The cursor position is important for that purpose (e.g. cursor on 'Stand-by temperature': The display will show "Stand-by temperature between 100 °C and 700 °C (212 °F and 1292 °F))".
ESC is used to leave the Help function.

5.5 Defining the basic setup

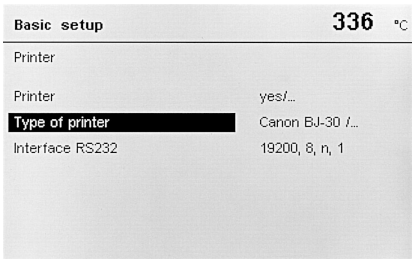
With this option in the main menu, all important settings of the furnace may be defined. This is normally done at the initial start-up. Later on, this option is called up when the user wants to alter the basic setup.
In this menu, you can define the following parameters:



5.5.1 Setting the printer/PC

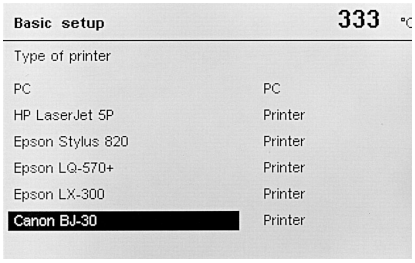
Check if the cable with the 9-pin Sub-D plug (available from computer dealers) is correctly connected with the port (57) of the electronic control box and the printer/PC.
Please also see the information enclosed in the Programat X1 printer package.

The setting has to be carried out as described below:
After the type of printer and the interface have been defined, the option 'Printer yes/no' is used for the initial setting. If 'yes' is selected, the printer symbol (o) appears in the firing curve display. Once START is pressed, the inquiry 'Protocol yes/no' appears. If no printer is connected, or if printing is not desired, the option 'no' must be selected with the cursor and confirmed with ENTER.

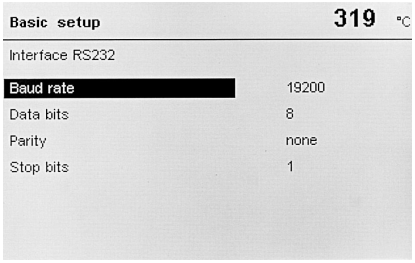


Defining the type of printer:
Move the cursor to 'Type of printer' in the menu 'Basic setup', 'Printer' and confirm with ENTER. You may then select the type of printer to be installed and confirm with ENTER. Please make sure that only one of the recommended printers is connected. If you want to transfer data to a PC, select 'PC' and confirm with ENTER.

See Chapter 10.4 for a printout example.



Defining the interface parameters:



Move the cursor to the option 'Interface RS232' in the menu 'Basic setup', 'Printer', and confirm with ENTER. You may now select the interface parameters and confirm them with ENTER. Below, you will find the description of the printer interface. Refer to the technical data section of the handbook of your printer to find the correct values.

Most customary printers are normally connected to the computer via parallel interface. This printer interface is also called 'Centronics interface'.

This furnace is not equipped with a parallel interface but with a serial RS232 interface. For some printers, however, it is possible to order a plug-in module with an RS232 interface. If this is not possible, an interface converter may be used that acts between parallel and serial connections. This device should be placed between the furnace and the printer. Please contact your computer/ printer dealer for further assistance.
No matter whether you use a plug-in module in your printer, an interface converter, or a PC, the serial interface must always be correctly configured to assure proper data exchange.
The interface parameters described below are normally set on the printer module or the converter by means of DIP-switches (see manufacturer's description). The furnace, however, permits convenient menu-controlled definition of the parameters. Nevertheless, it is important to enter the same values on both sides.
The RS232 is an asynchronous interface.

Baud rate
The baud rate indicates the transfer speed of the characters. The following values may be selected: 2,400, 4,800, 9,600, **19,200,** 38,400, 57,600, and 115,200 bits/s .

Data bits
Indicates how many bits are transmitted per character. Usual rates are 7 or **8** bits. For the printout of furnace data, 8 bits are mandatory.

Parity
'None', 'even', or 'odd' are the options. This means that either no parity bit is sent, or that the parity bit is sent after an even or an odd number of data bits.

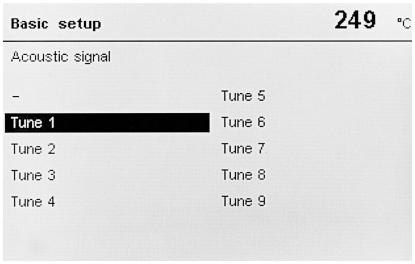
Stop bits
Generally **1** or 2 may be selected. This means that the data line has to be non-operative for a certain number of bits, before the next transmission is started with the next start bit.

Values in **bold** type are preset in the furnace.

The furnace does not support 'Handshaking'.

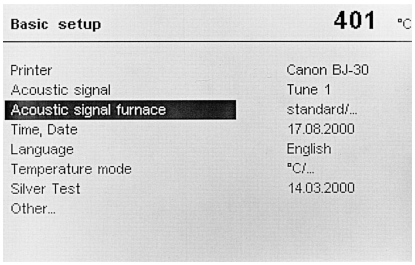
Should you have any further questions regarding the printer, please contact your printer dealer.

5.5.2 Selecting the acoustic signal



By selecting this menu option, the current buzzer tune is activated. When the cursor is moved to another option, the corresponding tune is played. ENTER activates the marked buzzer tune and brings you back to the menu 'Basic setup'.
There are 10 different buzzer tunes. 'Tune 0' means that no buzzer tune is selected.

5.5.3 Selecting the acoustic signal for the furnace head

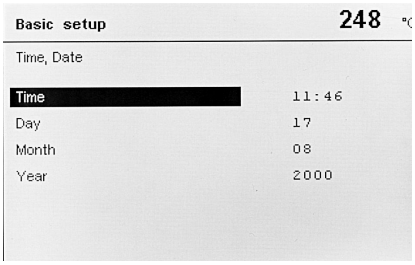


standard -> no additional buzzer signal upon opening the furnace head

special -> in addition to the standard buzzer tune

The special buzzer signal is a continuous tone that lasts for approx. 5 seconds. Its pitch is deeper than those of the selectable buzzer tunes in Chapter 5.5.2. The tone itself cannot be changed.
The special buzzer signal sounds as soon as the furnace head is open and the temperature after a firing cycle is higher than 550 °C (1022 °F). If the temperature after a firing cycle is lower than 550 °C (1022 °F), or if the furnace head is opened after a stand-by period with a temperature below 370 °C (698 °F), the 'standard' buzzer tune will sound.

5.5.4 Date/Time

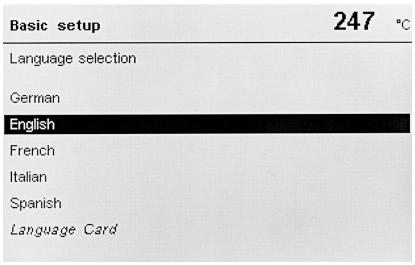


The corresponding option may be selected with the cursor and the values entered by means of the numeric keys.

The time works on a 24-hour mode. The year has to be entered with four digits.

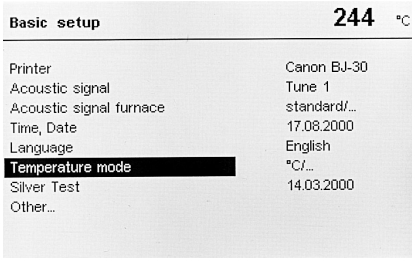
The current time is indicated in the main menu (see picture on page 12) on the lower right.

5.5.5 Selecting the language



Select the desired language with the cursor and confirm with ENTER.

5.5.6 Selecting the temperature mode



You may select whether the indications are made in °Celsius or °Fahrenheit.

5.5.7 Silver test

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

5.5.8 Other

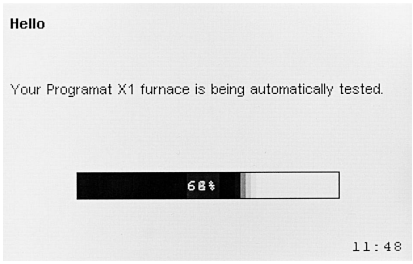
The option 'Other' is for the use of service personnel only. This option may only be selected with the appropriate password.

6. Practical Use

The operating procedure for the Programat X1 will be explained with the help of two examples: one standard and one individual program.

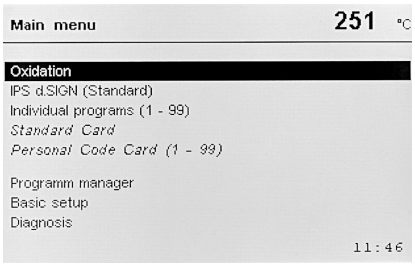
6.1 Switching On/Off

Switching on:
Put On/Off switch (17) at the rear of the furnace on position "I". The unit will conduct an automatic self diagnosis of the individual components after approx. 10 seconds. At the beginning, an information screen is displayed. Subsequently, a %-bar indicates how many % of the self diagnosis have already been conducted.



Then, the main menu is displayed and the current temperature of the furnace head shown. The furnace is now ready for use.

Should this not be the case, please read Chapter 8.

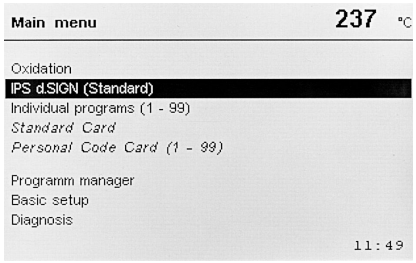


The black bar (cursor) indicates the currently activated menu option. With the cursor keys 'up'/'down', the desired menu option can be selected. ENTER is used to confirm the option. After that, the program changes into the selected sub-menu.

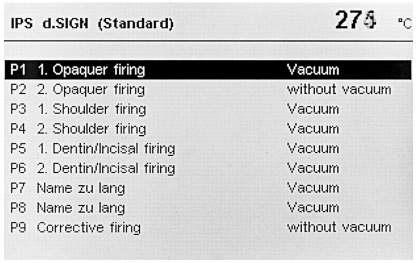
Switching off:
Put the On/Off switch (17) on position "0" to switch off the furnace.

6.2 Firing with the standard programs

Step 1
Select the standard programs with the cursor and confirm your selection with ENTER.



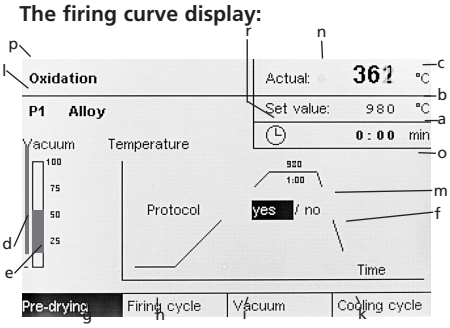
Step 2
Select the desired firing program and press START.



The firing curve is now displayed. However, the program has not yet started.

Printing the firing protocol
If you wish to print the firing data you have to answer the corresponding question with 'yes'. Please refer to the respective instructions in Chapter 6.3, Step 8.

The firing curve display:



'e' and 'd' are only indicated if a firing program with vacuum was selected. For firing programs without vacuum, the text 'Program without vacuum' is shown instead of the diagram.

The firing curve display shows both the current course of the curve and the most important data.

a Remaining time in min:s
b Set temperature in °C (°F)
c Actual temperature in °C (°F)
d Set vacuum in percent
e Actual vacuum in percent
f The curve is not shown true to scale. The main characteristics of the curves are represented by a pattern (e.g. standard firing with/without long-term cooling, curve with two holding times etc.).
g Pre-drying (press ENTER)
h Firing cycle (press ENTER)
i Vacuum (press ENTER)
k Cooling cycle parameter (press ENTER)
l Program number and name (the name is displayed abbreviated if necessary)
m Protocol printout yes/no
n Heating indicator
o Printing indicator
p Name of the program type and category. (If necessary, the program name is shown abbreviated.)
r Clock symbol

Step 3
If you want to start the firing process, i.e. start the program, proceed as follows:

1. Open furnace head (press key (44). Buzzer sounds when the furnace head is open and the temperature is less than 370 °C (698 °F).
2. Correctly position the firing tray, with the object to be fired, in the firing chamber using the tongs.
3. Start program (press START).

The program has then been started and the display indicates various pieces of information. The part of the firing process that has already been completed is bold on the firing curve.

Additionally, the remaining time of the program is displayed (min/sec). The buzzer sounds after the program has been completed, the furnace head has been opened, and the temperature has dropped below 550 °C (1022 °F).

After completion of the program, you may again change to the main menu. When working with standard programs, the display will return to the standard program menu as soon as the firing process is completed.

6.2.1 Alteration of standard parameters

Some parameters may be changed in the standard programs. Once the program has been completed, however, the modified value is changed back to the originally set standard value.

The parameters that can be altered are marked with '✱'.

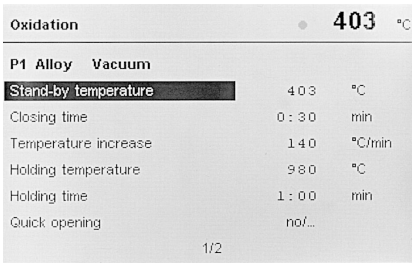
Changes may be carried out in two ways:
1. Editing in the firing curve display
2. Editing after selection of the standard program

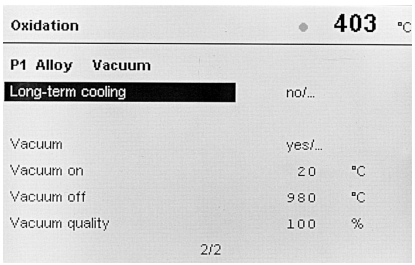
1. Editing in the firing curve display:
The parameters may be changed as follows:

With the ' 🡐 ' or ' 🡒 ' keys, a group of parameters (g, h, i, k) can be selected at the bottom of the screen.
By pressing ENTER, the screen changes to the corresponding menu and the values can be altered. Return to the firing curve display with ESC or START. The firing curve display will automatically reappear if not data is entered for approx. 10 seconds. The program continues during this process in case it has been started before editing.

2. Editing after selection of the standard program, but before the firing curve display appears:

If you press ENTER instead of START in the standard program selection menu, the first (1/2) of the following two screens will appear. The values marked with 'k' may then be edited.
You will reach the second screen (2/2) by repeatedly pressing the 'up' or 'down' key.





If you try to change any other values, the program does not react.
Yes/No options are selected as follows:

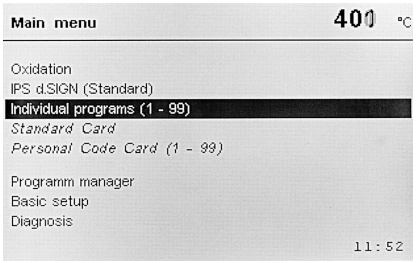
Make your choice with the ' 🡐 ' or ' 🡒 ' keys and confirm with ENTER. The option you have selected will be highlighted. After pressing START, the firing curve will be displayed.

6.3 Firing with individual programs

Of course you can also define your own program parameters. The Programat X1 offers you 99 programs for that purpose. If you need additional programs, you may purchase a PX1 Card 1 (accessory) that offers you the possibility to store another 99 programs.

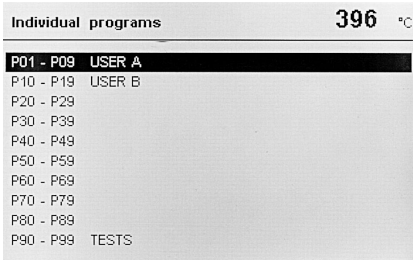
Producing an individual program:

Step 1
Select the option 'Individual programs' in the main menu with the cursor and confirm with ENTER.

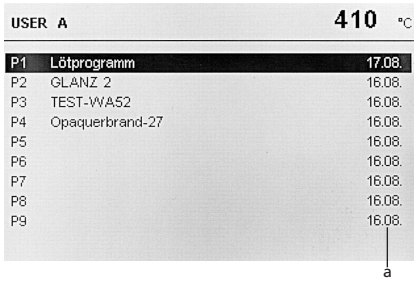


Step 2
Select the desired program group and confirm with ENTER. Here, we recommend using the individual groups in a certain logical order (e.g. according to users, objects, tests, etc.).

You may define your own names for the program groups (analogous to Step 5). Use the ' 🡒 ' key (50) to reach the menu for editing the program group names.

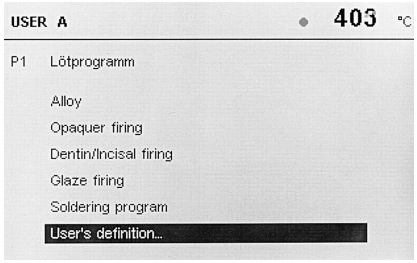


Step 3
Then, select the desired program number and confirm with ENTER. In this way, you will directly reach Step 6 in the input mode. If you want to define your own program name, press the ' 🡒 ' key (50) and you will reach Step 4.



a Day/month of the last program alteration

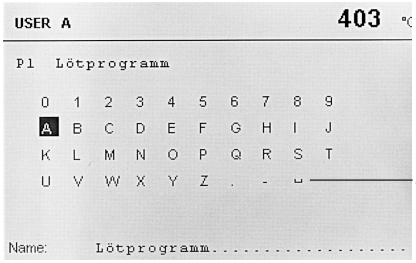
Step 4
Give the program an appropriate name, which will subsequently help you to identify the individual programs. For that purpose, select one of the 5 predefined names and confirm with ENTER.



By selecting the desired menu option, a respective name is allocated to the program.

The last option in this menu is a special feature. When it is selected, another sub-menu is displayed, where users may define their own program names.

Step 5
If you wish to define your own program name, select 'User's definition' and confirm with ENTER.

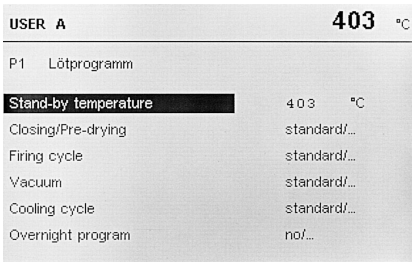


a Symbol for a space

With this screen, you can define your own program names and allocate them to individual firing programs. Names previously entered are shown on the dotted line and can be edited by selecting a letter with the cursor (highlight it). The character can be acknowledged by pressing the '+' key. Pressing the '–' key results in the last letter being deleted. Once the name is completed, it has to be confirmed with ENTER. Only capitals can be selected. There are no umlauts. The name may maximally consist of 30 letters.

The definition of the program number and the program name is now completed. Now the various parameters can be entered in the input mode.

Step 6
First, the stand-by temperature can be set.

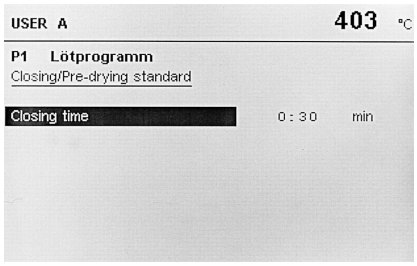


Step 7
The input menu:
Stand-by temperature:
The parameter 'Stand-by temperature' may be directly edited.
All other options in this menu offer you two alternatives that can be selected in the same way as the 'yes/no' queries in the standard programs. Here, however, your selection leads to further sub-menus where additional values can be entered.

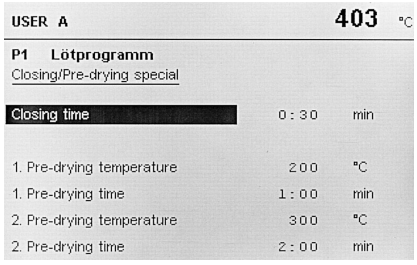
Closing / Pre-drying:
Depending on your selection, the display will show two different input menus (one for 'standard' and one for 'special'),

- Program flow 'standard'
  After the start, the furnace head moves to a horizontal position within 10 seconds (furnace heats up to 100 °C (212 °F)). The closing time can be individually set. From this position, the furnace head closes completely within 20 seconds (the motor keeps running without interruption) and the temperature increase begins.

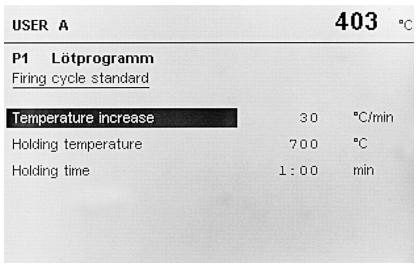
Closing time:
Closing time = time the furnace head needs from moving from an open position to a closed position.
The closing time can be individually set to values between 30 seconds and 60 minutes.

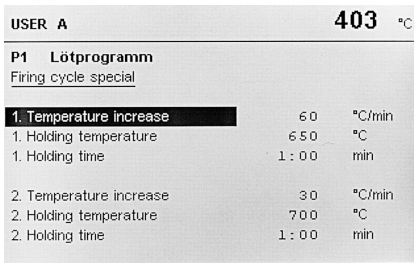


- Program flow 'special'
  The program flow 'special' comprises the closing time and two pre-drying positions. The closing movement is the same as with the 'standard' program until the furnace head reaches a horizontal position. After that, you may additionally determine two pre-drying positions with separate temperatures and times.
  Pre-drying position 1 (horizontal furnace head) is approx. 30 mm above the firing table, position 2 approx. 15 mm above the firing table (possible parameters are listed in the firing table in Chapter 10.1).

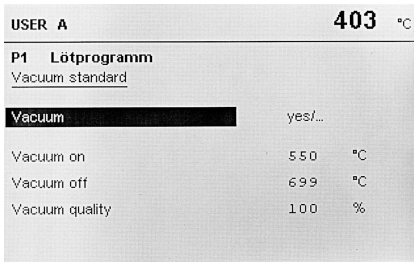


Firing cycle:
Here, you have two alternatives: 'standard' (one holding time) and 'special' (two holding times).

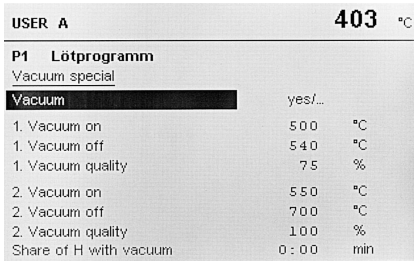




Vacuum:
The difference between the standard and the special vacuum program is the ability to set two vacuum times for the special vacuum program. Only one vacuum time can be set for the standard vacuum program. The special vacuum program also permits the definition of the vacuum quality (%) and how much of the holding time is to be conducted with vacuum.



When entering the 'vacuum off' value, the following points have to be considered:
– For conducting the holding time without vacuum, set 'vacuum off' as follows: Vacuum off = 1 ° lower than the holding temperature (T) (e.g. T = 1050 °C (1922 °F), vacuum off = 1049 °C (1920 °F)). The vacuum is turned off at the beginning of the holding time.
– For conducting the holding time with vacuum, set 'vacuum off' as follows: Vacuum off = holding temperature (T)

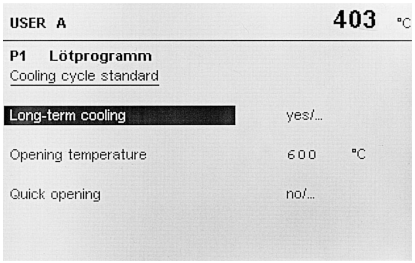


(e.g. T = 1050 °C (1922 °F), vacuum off = 1050 °C (1922 °F)). The vacuum is turned off at the end of the holding time. The parameter 'share of holding time with vacuum' must be Ø.

– If only part of the holding time should be fired with vacuum, the parameters 'vacuum off' and 'share of holding time with vacuum' have to be set as follows: 'Vacuum off' = holding temperature (T) and 'share of holding time with vacuum' must be higher than zero. The parameter 'share of holding time with vacuum' is only displayed if the values for '2nd vacuum off' and '2nd holding temperature' are the same (e.g. T = 1050 °C (1922 °F), '2nd vacuum off' = 1050 °C (1922 °F), 'holding time H' = 3 min.). 'Share of holding time with vacuum' = 1 min.

Cooling cycle:
You can choose between one 'standard' and two 'special' cooling cycles.

– Long-term cooling 'standard'
  With standard long-term cooling, the furnace head remains closed until the defined temperature has been reached. After that, the furnace head completely opens.

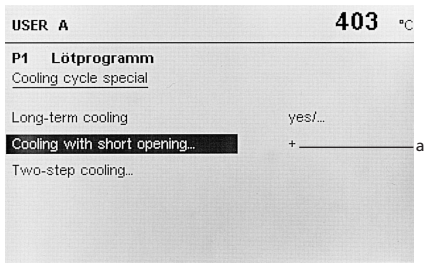


Individual 'special' long-term cooling programs:
– Cooling with short opening
– Two-step cooling

– Long-term cooling 'special' (cooling with short opening)
  During cooling with short opening, the furnace head opens until it reaches the 1st pre-drying position. After the furnace has cooled down to the set temperature, the furnace head closes until the set cooling period has come to an end. After that, the furnace head opens again.

– Long-term cooling 'special' (two-step cooling)
  During this special cooling cycle, the furnace head remains closed until the defined temperature has been reached and/or the set period has come to an end. Only then does the furnace head open. During the 1st and the 2nd cooling time, the furnace cools down to the 1st and the 2nd cooling temperature respectively.

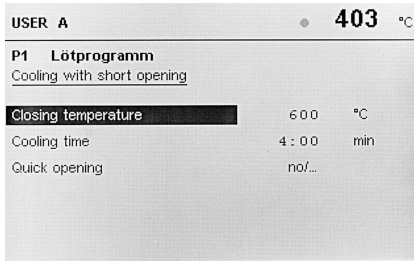
Quick opening may be programmed for all three cooling cycles.

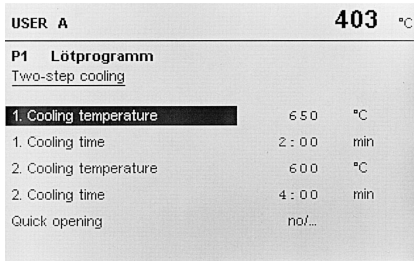


a Indicator showing which cooling cycle has been selected.

'Cooling with short opening' and 'Two-step cooling' only appear if you have selected 'yes' for the option 'Long-term cooling'.

'Cooling with short opening' or 'Two-step cooling' can be selected with the cursor and confirmed with ENTER. After that, one of the following two screens will appear.





Overnight program:
If overnight program 'yes' is selected:
The selection can be recognized by the highlighted clock symbol (white on black background) (r ➔ see firing curve display, page 15).
After the firing program has been completed, the furnace head opens without the buzzer sounding. It closes again automatically, as soon as the temperature has dropped below 150 °C (302 °F). The furnace then stops heating and cools down to room temperature. The firing curve display remains activated, the remaining time indicator (a) shows 0:00 min, and the green LED (56) in the START key blinks. The overnight program can be stopped with the STOP key.
In case of a power failure during the night, an error message is shown on the LC-display. In such cases, the furnace does not heat up to stand-by temperature.

Once the STOP key is pressed, the furnace starts to heat up to stand-by temperature.

You can leave the above menus by pressing ESC and return to the main menu for individual programs. There, START results in the firing curve display being shown.

Step 8
Once you have set all the parameters, press START. The firing curve display is shown. You may now double-check all the values and decide if you would like to print the firing protocol. Any possible errors will be indicated (plausibility test). Should this occur, please correct the respective parameter.

Printing the firing protocol:
If you wish to print the firing data you should read the following information:
Each firing procedure is individually printed. To print out a firing protocol, take the following steps:
Select 'Printer yes' in the basic setup. The query 'Protocol yes/no' appears in the firing curve display once START has been pressed. The program can only be started after 'yes' or 'no' has been selected with the cursor and confirmed with ENTER. Pressing ENTER results in the program being started. The printer symbol (o) appears and the LED (56) in the START key is illuminated.
After the program has been completed, the firing protocol is printed. 'Protocol yes/no' has to be selected again before starting a new program.

Only the relevant parameters will be printed out once the program has been completed.

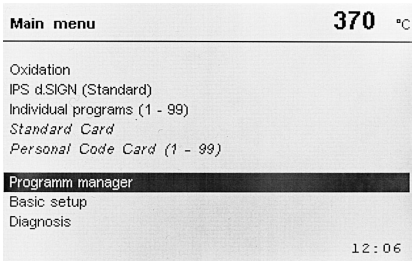
See Chapter 10.4 for an example of a Programat® X1 firing protocol.

'Quick opening' and 'Overnight program' are only printed if 'yes' has been selected for the respective options.

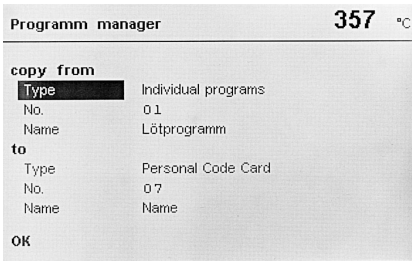
Step 9
Open the furnace head with the corresponding key and place the object to be fired in the firing chamber using the tongs.

Step 10
Press START or ENTER to start the program once 'Protocol yes/no' appears.

6.4 Copying of firing programs



Copy functions are selected in the Program Manager. Select the Program Manager menu item in the main menu.



Copy from	(Source)
Type	Oxidation IPS d.SIGN (Standard) Standard Card Code Card (personal) Factory settings
No.	Program number within the program type
Name:	Program name (for display only)
To:	(Destination)
Type.	Oxidation IPS d.SIGN (Standard) Standard Card Code Card (personal)
No.	Program number within the program type
Name:	Program name (for display only)

During input and when **OK** is pressed at the end of the input, a plausibility check is conducted. In case an unauthorized source or destination is selected, a corresponding error message is displayed.

Once **OK** has been pressed, the question-and-answer dialogue 'Are you sure? Yes/No' appears.

'Yes'	-> Copying starts
'No' or ESC	-> Return to the Program Manager without copying

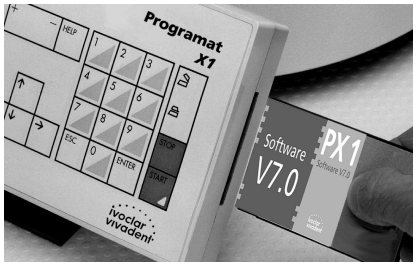
To reset program parameters to the factory settings, 'Factory settings' has to be selected under source type, and program type and number under the destination.
Only the parameters of oxidation, individual, and Code Card programs may be reset to the factory settings.

6.5 Working with the PC-Card (Accessory)

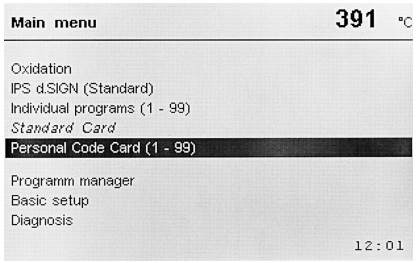
Cards are only recognized in the main menu. If a card is inserted while another menu is shown, you have to switch to the main menu and activate the card.

You have the following menu options:
- Personal Code Card = to store and retrieve personal data
- Standard Card = to retrieve additional preset standard data

Insert the card (e.g. PX1 Card 1) into the corresponding slot (11).



If the PX1 Card 1 is inserted, the menu option "Code card" can be used.



This can be seen from the text changing from italics to normal. The card is thus activated. All individual (personal) data are taken from the card and also stored on the card. If the card is removed, the text of the menu option "Code card" again appears in italics and the option may no longer be selected. Now, the option 'Standard' or 'Individual programs' must be selected.

The same procedure applied for the Standard Card menu item. If a Standard Card (e.g. Standard Card A) is inserted in the slot (11), the menu item Standard Card (italics) changes to Standard Card A (normal type).

Always store the card in the corresponding cover!
Make sure that the contacts of the card do not become dirty.

Do not remove/insert the PC-Card during a program in progress (firing) or during parameter or program changes.

- Do not use the PC-Card in the write-protect mode. The corresponding switch at the PC-Card has to be in the correct position. Make sure it is not on the WP (write-protect) mode.
- The cover for the battery case has to be mechanically secured. Make sure that the corresponding slide is on LOCK position.
- See the "SRAM Cards User's Guide" enclosed in the protective hardcase of the PC-Card for further important information.

6.6 Important practical information

- Always keep the furnace closed between firings.
- Optimum firing results can be obtained with the Ivoclar silicon nitride firing trays.
- Objects to be pre-dried should be placed on the firing tray only after the buzzer has sounded (< 370 °C (< 698 °F)).
- A power failure during firing (> approx. 5 s) causes error message ERROR 17 to appear once the power reappears. Press STOP to restart the program. The program will start at the very beginning. (Any adverse effect on the object depends on how long the power failure lasted.)
- Check the furnace temperature by means of the Silver Test (Chapter 7.4).
- Function of the remaining time indicator (a ➔ see firing curve display, page 15): During the program sequence, the remaining time is continuously actualized (every 5 seconds). The remaining time indicated is a mere approximate. For example, it is not possible to determine the exact remaining time during the flooding phase or if the set temperature increase is not reached.
  A current of air (e.g. caused by air conditioning or draught) may also influence the remaining time indicator.

7. Maintenance, Cleaning, and Diagnosis

This chapter describes the user maintenance and cleaning procedures. Only those tasks are listed that may be performed by dental professionals. All other tasks must be performed by qualified service personnel at a certified Ivoclar Service Center.

Switch off the furnace and 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 reason, the recommended times are only approximates.

Changing the battery of the PX1 Card (accessory):
Please observe the corresponding instructions in the enclosed notice.

This apparatus has been developed for typical use in the dental laboratory.

If the product is used in a production facility, for industrial applications, or in continuous firing operation, premature ageing of certain spare parts have to be expected.

These spare parts are e.g.:
– Heating muffle
– Insulation material
– Lamps

These spare parts are not covered by the warranty.

Please also observe the shorter service and maintenance intervals.

What:	Part:	When:
Check all plug-in connections for correct fit.	Var. connections at the furnace	weekly
Check if the furnace head opens smoothly and without excessive noise.	Opening mechanism of the furnace head	monthly
Check if the thermocouple is straight and in the right place.	Thermocouple (37)	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 Vivadent Service Center. Slight hairline cracks in the stone lining surfaces are considered safe and do not have a negative effect.	Stone lining inserts (15, 32, 36)	monthly
Check if the sealing rims of the furnace head and the furnace base are clean and undamaged.	Sealing rim of the furnace head (12) and the furnace base (13)	weekly
Check the keypad for visible damage. If the keypad is damaged, it has to be replaced by a certified Ivoclar Service Center.	Keypad (40 to 56)	weekly
Check temperature. Use the temperature checking set to check and adjust the temperature in the furnace.	Firing chamber	every six months

7.2 Cleaning

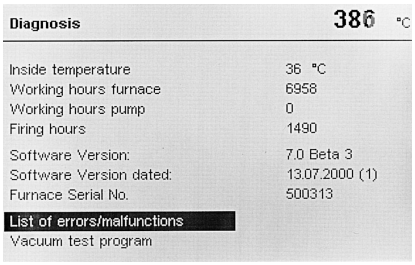
Risks and dangers
The furnace may only be cleaned when it is cool, since there is a burning hazard. Do not use any cleaning solutions.

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

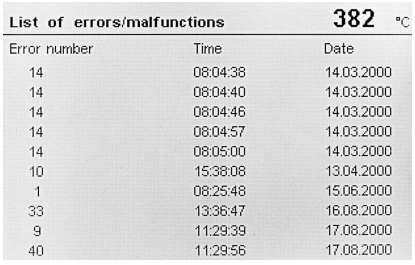
Item:	Frequency:	Cleaning material:
Furnace base (10) and furnace head (2)	if required	soft, dry cloth
Electronic control box (4)	weekly	soft, dry cloth
Cooling plate for fired ceramics (8)	daily	cleaning brush
Stone lining inserts (15, 32, 36)	daily	cleaning brush
Viewing window (1)	if required	weak stream of compressed air with a cotton wool pad
Sealing ring of the furnace head (12) and the furnace base (13)	daily	cleaning brush and a soft cloth

7.3 The diagnosis program

You will find the diagnosis program in the main menu option 'Diagnosis'. The program is used to access various pieces of information about your furnace.
The serial number is preset and will also appear on the display.

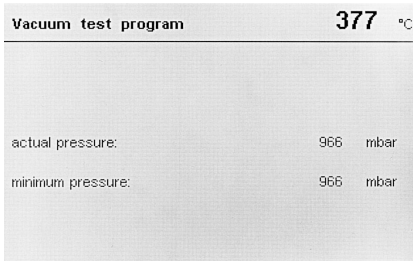


List of errors:
This option displays a list of the last ten error messages in the sequence of occurrence. Convey this information to the service technician in case of an inquiry or problem.



Vacuum test program:
With this test program, the performance of the vacuum system of the Programat X1 can be tested. The (minimum) pressure reached is indicated in mbar. If the value reached is below 40 mbar, the vacuum performance of the system is excellent. If the value is clearly higher than 40 mbar (e.g. above 80 mbar), refer to Chapter 8.2.

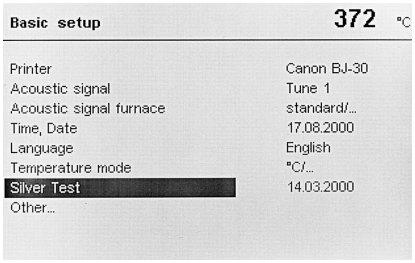
The test program is started by selecting the menu option 'Vacuum test program'. The program is stopped by pressing STOP. The test program can be interrupted of left with ESC.
The maximum duration of the test is 5 minutes. After reaching a pressure of 40 mbar, the evacuation procedure continues for another 2 minutes. After 5 minutes, the flooding process begins automatically.
The display still shows the vacuum test program screen.



7.4 Furnace calibration (Silver Test)

Depending on the mode of operation and the frequency of use, the sheathed thermocouple of the furnace may be subject to changes that affect the furnace temperature. Therefore, the furnace temperature has to be checked and, if necessary, adjusted at least every six months by means of the Silver Test. The furnace offers a special temperature calibration program for that purpose.

Check and/or adjust the date prior to the furnace calibration (if the furnace is not used for a prolonged period of time, e.g. vacation, the set date is reset to the basic date).



The option 'Silver test' can be found in the menu 'Basic setup'. Selecting 'Silver test' and confirming with ENTER will lead to a modified firing curve display with the title 'Silver test'.

Press START and the furnace will commence a calibration program that proceeds as follows:

The furnace heats up to 940 °C (1724 °F) with a temperature increase of 50 °C/min. (90 °F/min.). This temperature is held for one minute. After that, the buzzer sounds for 10 seconds, and the furnace again increases the temperature by 5 °C/min. (9 °F/min.). The user must now observe the silver wire through the viewing window (1) and press ENTER as soon as the melting point is reached. The furnace then calibrates the current temperature to 955 °C (1751 °F) and returns to the menu 'Basic setup'.

If the range of possible calibration values is surpassed (resulting from a worn down thermocouple), error message No. 21 is displayed.

During the slow phase of temperature increase, the buzzer sounds every ten seconds to direct the user's attention to the process. If the user has not yet pressed ENTER when the furnace has reached a temperature of 980 °C (1796 °F), calibration is interrupted and error message No. 16 appears. If the user acknowledges the message, it disappears and the furnace returns to the menu 'Basic setup'. The furnace head (2) opens after both a successful or an interrupted calibration. The firing curve of the calibration procedure is bold on the firing curve display. Furnace calibration can be stopped by pressing STOP. The calibration can be restarted by pressing START. The program can be interrupted and left by pressing ESC.

Procedure:

Step 1

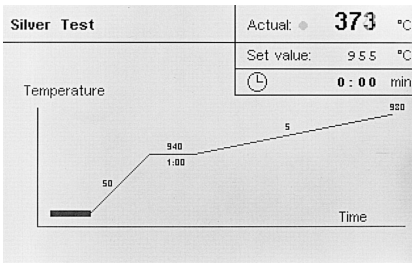
Switch on the furnace. Select 'Standard program 1' (Oxidation) and wait for 60 minutes. Do not press START. The furnace now heats up to stand-by temperature (B).

Step 2

Open the furnace and place the holder with the silver wire on the firing table (15). Make sure you can see the silver wire through the viewing window (1).

Step 3

Select 'Silver test' and start the program



Step 4

When you see through the viewing window (1) that the silver wire begins to bend and is slightly pitted, press ENTER. The furnace is now calibrated.

Protect your eyes from the glaring light shining through the viewing window. Use protective goggles.

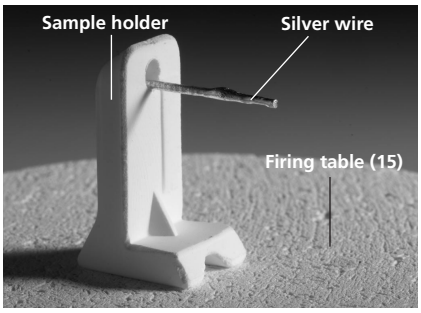


Figure A Temperature too low

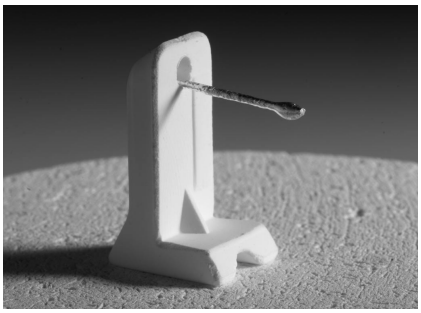


Figure B Temperature just right

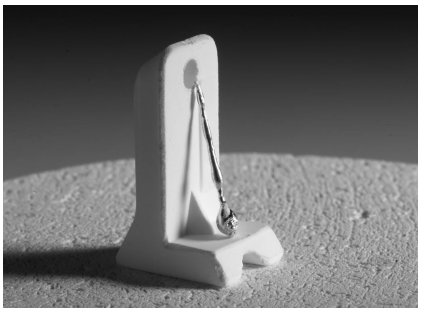


Figure C Temperature too high

8. What if...

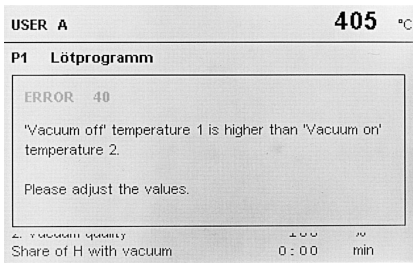
This chapter will help you to recognize malfunctions and take appropriate measures or, if possible, to perform some minor repairs.

8.1 Error messages

There are basically two types of error messages:

1. Operating errors
2. Technical furnace errors

Error messages are displayed as follows:



ERROR' appears in a frame, together with the error number and the error message consisting of several lines. 'ERROR' and the number blink and the buzzer sounds. Moreover, the acceptable range of data is defined. For the options, such as 'standard' or 'special', an explanation is supplied. Error messages have to be acknowledged with STOP.

List of possible error messages

Note regarding operating errors:
Impossible parameter values are not accepted by the furnace. Such values are deleted after ENTER has been pressed. The 'old' value reappears. Parameter values that are outside the defined range are not accepted. Illogical values result in an error message being displayed.

Error No.	Description	Instructions for users
	Operating errors	
*1	Value for the 'Holding temperature' is lower than the actual temperature in the firing chamber. The furnace opens to cool down.	Allow the furnace to cool down to a lower temperature or enter a higher holding temperature.
2	Value for the 'Holding temperature' is lower than the 'Stand-by temperature'. Please adjust the values.	Adjust either the value for the holding temperature or that for the stand-by temperature.
7	'Stand-by temperature' higher than the 'Holding temperature'. Please adjust the values.	Adjust either the value for the stand-by temperature or that for the holding temperature.
8	'Cooling temperature' >= 'Holding temperature' or '1. Cooling temperature' <= '2. Cooling temperature' Please adjust the values.	≥ equal or grater than, ≤ equal or less than
9	'Vacuum on' temperature >= 'Vacuum off' temperature Please adjust the values.	Adjust one of the two vacuum values.
10	'Vacuum off' temperature is higher than the 'Holding temperature'. Please adjust the values.	Adjust either the vacuum off temperature or the holding temperature
11	Value for the vacuum is missing. Please enter the desired value.	Both vacuum values have to be higher than 0.
*13 [1)]	Excess temperature: Current temperature is +12 °C (+21.6 °F) higher than the holding temperature. The furnace opens to cool down.	Careful when editing parameters during a program in progress. If necessary, allow the furnace to cool down to the set temperature and try again. If this does not help, there is probably a malfunction of the electronic components.
*14	Temperature too high for the Silver Test ! Please wait until the temperature has dropped below 450 °C (842 °F). The program then starts automatically.	The furnace cools down and the program then starts automatically.
16	Silver Test was not confirmed with ENTER. Please repeat the procedure.	Repeat the Silver Test and press ENTER before a temperature of 980 °C (1796 °F) is reached.
17 [1)]	Power failure during running program. Ceramic material probably useless.	A program in progress was interrupted by a power failure. The object is probably not completely fired or useless.
18	'1. Holding temperature' higher than '2. Holding temperature'. Please adjust the values.	
19	No value for temperature increase. Please enter the desired value.	
	Furnace errors	
* 20	Broken thermocouple, short circuit or heating circuit interrupted.	Check the fuse F2 (20) in the supply unit. Check the plugs of the thermocouple (28) and of the heater (29) at the rear of the furnace for correct fit. For safety reasons, the heater is switched off, the furnace head opens, and the keypad inactivated if this error occurs. This error cannot be acknowledged with STOP. The furnace has to be switched off and switched on again after approx. 20 s.
21	Range for the calibration value has been surpassed.	Contact your Service Center.
23	Heating muffle very old. Please change the heating muffle.	The heating muffle is worn down. It is recommended to replace it. However, programs can be started once the error message has been acknowledged. Note: The heating muffle may only be replaced by a certified Ivoclar Vivadent Service Center.
24	Heating muffle defective. Please change the heating muffle.	The muffle is so old that is has to be immediately replaced by a new one. This error cannot be acknowledged with STOP. Contact your Service Center. Note: The heating muffle may only be replaced by a certified Ivoclar Service Center.

25	Temperature in the furnace base is higher than 65 °C (149 °F). Please switch off the apparatus and allow it to cool. Operate the apparatus in a cool environment.	Allow the furnace base (10) to cool down to a temperature below 65 °C (149 °F). Make sure that the air vents (3, 35) are clean and free from obstruction.
26 [3]	Temperature is too high for the next firing! Program will proceed as soon as the furnace has adequately cooled down. Immediately proceed with ESC.	Current temperature is > (B + 50°C/122 °F) or (VT1+50°C/122°F) or (VT2+50°C/122°F); programm will proceed automatically, if current temperature is ≤ B or VT1 or VT2
27	'Furnace head closed' is not acknowledged.	A foreign object between the furnace head (2) and the furnace base (10) may obstruct the closing of the furnace head.
29	Temperature alert Please switch off the apparatus and contact your Service Center.	For safety reasons, the heater is switched off, the furnace head opens, and the keypad inactivated if this error occurs. This error cannot be acknowledged with STOP. The furnace has to be switched off. Contact your Service Center.
	Errors in the supply unit	
30	Heating relay does not respond.	Contact your Service Center.
31	Vacuum valve 1 does not engage.	The vacuum valve may be stuck or dirty.
33	The vacuum of 600 mbar cannot be reached. Please check pump, pump connection, and cover seal.	Check the following points: - is the firing chamber tight (are the sealing surfaces clean)? - is the vacuum hose connected? - is the vacuum pump connected? - is fuse F1 in order?
34	PIC processor (motor) does not respond.	Contact your Service Center.
35	PIC processor (I/O) does not respond.	Contact your Service Center.
36	Vacuum valve 2 does not engage.	The vacuum valve may be stuck or dirty.
37	8-bit I/O expander for I_C-bus does not respond.	Contact your Service Center.
38	Electronic components for muffle test defective.	Contact your Service Center.
39	Furnace cannot be flooded.	Please contact your Service Center.
	Errors in the control unit	
40 [2]	'Vacuum off' temperature 1 is higher than 'Vacuum on' temperature 2. Please adjust the values.	
41	Storing not possible ! Please use the correct card.	Contact your Service Center (see Chapter 6.4)
42	Battery of the memory card run down ! Please change the battery of the memory card.	Observe the PX1 Card information note.
43	Flash memory defective.	The program parameters may be invalid. Contact your Service Center.
44	Error on memory card.	Contact your Service Center.
	Errors in the analog module	
50	Content of EEPROM wrong.	The furnace can no longer be operated. Contact your Service Center.
51	PIC processor (ADC) does not respond.	Contact your Service Center.
52	EEPROM does not respond.	Contact your Service Center.
53	Type of 'flash' not recognized !	Contact your Service Center.
54	Malfunction in the temperature measuring device.	Contact your Service Center.
55	Invalid values from the analog module.	You probably have a poor power supply.
56	Temperature in the furnace base too low (< 1°C (33.8°F)).	Increase the temperature in the furnace base (10).
* 57	Invalid values from the analog module.	You probably have a poor power supply. For safety reasons, the heater is switched off, the furnace head opened, and the keypad inactivated if this error occurs. This error cannot be acknowledged with STOP. The furnace has to be switched off and switched on again after approx. 20 s.
	Furnace errors (continuation)	
* 72	Broken thermocouple, short circuit or heating circuit interrupted.	Same as Error 20.
* 73	Broken thermocouple, short circuit or heating circuit interrupted.	Same as Error 20.
	Operating error (continuation)	
80	Copying not possible. Please adjust the set values.	Either the program number is outside the acceptable range ('Program not available'), the copying target invalid ('Destination not allowed'), or the PC Card is not inserted (PX1 Card not inserted').

* furnace head opens 1) no operating error 2) operating error 3) this error is not entered in the PX1 list of errors (see Chapter 7.3)

For safety reasons, the heating muffle may only be replaced by a certified Service Center (Errors 23 and 24).

8.2 Technical malfunctions

These malfunctions may occur without an error message being displayed:

Description	Double-check	Action
LC-display (5) is not illuminated.	Is the electronic control box (4) correctly connected? Is the fuse F3 for the electronic controls OK?	Check plug-in connections (60, 61). Check fuse F3 (21).
Furnace head does not open/close.	Is the fuse F3 OK?	Check fuse F3 (21).
Buzzer does not sound.	Is the buzzer switched off (Tune 0)?	Select tune 1-9. See Chapter 5.5.2.
Vacuum pump not working.	Is the vacuum pump correctly connected? Is the fuse F1 OK?	Connect vacuum pump according to the Operating Instructions. Check fuse F1 (22).
Final vacuum not reached.	Is the vacuum hose OK? Is the furnace airtight?	Start vacuum test program. See Chapter 7.3. Check vacuum hose and the corresponding connections. Replace pump. Clean sealing surfaces.
Vacuum is not released.	Is the main switch (17) on position "I" and is the LC-display (5) illuminated, or is there no power?	Release vacuum manually by means of the vacuum release key (33).

Once the furnace has been switched on, it takes approx. 10 seconds until the furnace starts its self-diagnosis program.

The contrast (brightness) of the LC-display (5) may slightly change after long operating times.

Important
Ensure that only fuses of the indicated type and rated current according to the technical data are used.

8. 3 Repair

Repairs may only be carried out by a certified Ivoclar Service Center. Please refer to the addresses on the last page of these Operating Instructions.

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

Please also read the safety information in Chapter 2.

9. Product Specifications

This chapter contains all relevant product specifications.

9.1 Delivery form

1 Programat X1
1 Cooling plate for fired ceramics
1 Power cord
1 Vacuum hose
3 Extra fuses
1 Crosstip screw-driver
1 Programat accessory assortment (tongs, firing trays G+K, temperature checking set)
1 Operating Instructions
1 Warranty card
20 Firing cards

Recommended accessories:
- Vacuum pump
- PX1 Card 1 (for storing personal programs)
- Standard Card A (IPS Empress 2 Standard Programs)
- Additional cooling plate for fired ceramics

Colours:
Standard colour:
White (RAL 9016)

Special colours:
Salmon pink (RAL 3014)
Aquamarine (RAL 5014)
Turquoise (RAL 6027)

9.2 Technical data

Power supply
Single-phase alternating current
200-240 V / 50-60 Hz
110-120 V / 50-60 Hz

Tolerated voltage fluctuations
+/- 10%

Power consumption
Furnace with pump :
200-240 V max. 1800 W
110-120 V max. 1500 W

Vacuum quality indicator

0 %	no vacuum
25%	800-700 mbar
50%	500-450 mbar
75%	300-200 mbar
100%	50 mbar and lower (depending on the performance of the pump)

Admissible data for pumps from other manufacturers
Max. performance: 300 W
Final vacuum: approx. 25 mbar
Use only tested pumps

Electrical fuses
Values:
200-240 V :
T 6.3 A (heating circuit)
T 315 mA (power)
T 3.15 A (pump)

110-120 V:
T 15A (heating circuit)
T 500 mA (power)
T 5A (pump)

Dimensions of fuses
200-240 V =
Diameter 5 x 20 mm
110-120 V =
Diameter 6.3 x 32 mm

Dimensions of the closed furnace
Width/depth/height =
375 x 510 x 320 mm

Usable size of the firing chamber
Diameter 80 mm, height 38 mm

Max. firing temperature
1200 °C (2192 °F)

Weights
Furnace head: 4.6 kg
Furnace base: 9.5 kg
Electronic control box: 1.7 kg
Furnace complete: 15.8 kg

Safety information
The PX1 complies with the following guidelines:
-IEC 1010-1/EN 61010, Part 1
-UL and cUL standards

Radio protection / electromagnetic compatibility
EMC tested

9.3 Acceptable operating conditions

Acceptable temperature range
+5 °C to + 35 °C (+41 °F to +95 °F)

Acceptable humidity range
Maximum relative humidity 80 % for temperatures up to 31 °C (87.8 °F) gradually decreasing to 50 % relative humidity at 40 °C (104 °F); condensation excluded.

Acceptable ambient pressure
500 mbar to 1060 mbar
The furnace is tested for use at altitudes of up to 2000 m above sea level

9.4 Acceptable transportation and storage conditions

Acceptable temperature range
-20 °C to +50 °C
(-4 °F to +122 °F)

Acceptable humidity range
Maximum relative humidity 80 %.

Acceptable ambient pressure
500 mbar to 1060 mbar

Use only original packaging of the Programat X1 together with the respective foam material for shipping purposes.

10.1 Firing Tables in °C and °F

Programat® X1

Oxidationsprogramme[1)] Values in °C

P			B	S	t	T	H	VE	VA[5)]	VG	L	Operating Instructions	
No.	**Programm Name "normal"**		**Stand-by temp. [°C]**	**Closing time [min]**	**Temperat. increas.[°C]**	**Holding temp. [°C]**	**Holding time [min]**	**Vacuum on [°C]**	**Vacuum off [°C]**	**Vacuum quality [%]**	**Long-term cooling [°C]**	**Chapter**	**Page**
1–7	Value ranges for oxidation programs		100–700	0:30–60:00	10–140	100-1200	0:00-60:00 0 = w/o H	0–1200 yes/no	0–1200	25/50/ 75/100	50–1200 yes/no		
Values preset by Ivoclar Vivadent													
1–7	Alloy	w. v.	403	0:30	30	700	1:00	–	–	–	no	6.2	17
		w/o v.	403	0:30	30	700	1:00	20	700	100	no	6.2	17
Program phase			*Stand-by temp.*	*Clos./Pre-drying*	*Firing cycle*			*Vacuum*			*Cooling cycle*		

IPS d.SIGN (Standard Programs) Preset values Values in °C

P			B	S	t	T	H	VE	VA	VG	L	Operating Instructions	
No.	**Programm Name "normal"**		**Stand-by temp. [°C]**	**Closing time [min]**	**Temperat. increas.[°C]**	**Holding temp. [°C]**	**Holding time [min]**	**Vacuum on [°C]**	**Vacuum off [°C]**	**Vacuum quality [%]**	**Long-term cooling [°C]**	**Chapter**	**Page**
1–9	Value ranges for Standard Program			0:30–60:00	10–140	100–1200 0 = w/o H	0:00–60:00 yes/no	0–1200	0–1200 75/100	25/50/ yes/no	50–1200		
1	1. Opaquer firing (Foundat. fir.)	w. v.	403	6:00*	80*	900*	1:00*	450	1° below T	100	no*	6.2	17
2	2. Opaquer firing	w. v.	403	6:00*	80*	890*	1:00*	450	1° below T	100	no*	6.2	17
3	1. Shoulder firing	w. v.	403	6:00*	60*	890*	1:00*	450	1° below T	100	no*	6.2	17
4	2. Shoulder firing	w. v.	403	6:00*	60*	890*	1:00*	450	1° below T	100	no*	6.2	17
5	1. Dentin/Incisal firing	w. v.	403	9:00*	60*	870*	1:00*	450	1° below T	100	no*	6.2	17
6	2. Dentin/Inc.firing (Corr.fir.)	w. v.	403	9:00*	60*	870*	1:00*	450	1° below T	100	no*	6.2	17
7	Glaze fir. with glazing paste	w. v.*	403	4:00*	60*	830*	1:00*	450*	1° below T*	100*	no*	6.2	17
8	Glaze firing without glazing p.	w. v.*	403	4:00*	60*	870*	1:00*	450*	1° below T*	100*	no*	6.2	17
9	Corrective firing	w. v.	403	4:00*	60*	750*	1:00*	450	1° below T	100	no*	6.2	17
Program phase			*Stand-by temp.*	*Clos./Pre-drying*	*Firing cycle*			*Vacuum*			*Cooling cycle*		

*These values may be altered. After the program has been completed, the modified values are changed back to the originally set standard values.

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Individual Programs P1 to P99 Freely programmable programs [2] Values in °C
Code Card Programs P1 to P99 (personal)

P			B	S	t	T	H	VE	VA	VG	L	Operating Instructions	
No.	**Programm "standard"**		**Stand-by temp. [°C]**	**Closing time [min]**	**Temperat. increas.[°C]**	**Holding temp. [°C]**	**Holding time [min]**	**Vacuum on [°C]**	**Vacuum off [°C]**	**Vacuum quality [%]**	**Long-term cooling [°C]**	**Chapter**	**Page**
1–99	Value ranges for freely programmable programs		100–700	0:30–60:00	10–140	100–1200 0 = w/o H	0:00–60:00 yes/no	0–1200	0–1200 75/100	25/50/ yes/no	50–1200		
Values preset by Ivoclar Vivadent													
1–99	Name	w/o v	403	0:30	30	700	1:00	-	-	-	no	6.3	18
		w. v	403	0:30	30	700	1:00	0	0	100	no	6.3	18
Program phase			*Stand-by temp.*	*Clos./Pre-drying*	*Firing cycle*			*Vacuum*			*Cooling cycle*		

Individual Programs P1 to P99 Freely programmable programs [2] Values in °C
Code Card Programs P1 to P99 (personal)

P		B	S	$VT_{1/2}$	$VH_{1/2}$	$t_{1/2}$	$T_{1/2}$	$H_{1/2}$			Operating Instructions	
No.	**Program "special"**	**Stand-by temp. [°C]**	**Closing time [min]**	**Pre-drying temp. [°C]**	**Pre-drying time [min]**	**Temperat. increas.[°C]**	**Holding temp. [°C]**	**Holding time [min]**			**Chapter**	**Page**
1–99	Value ranges for freely programmable programs	100–700	0:30–60:00	0-500	0:00-60:00 0 = w/o VH	30–140	100–1200	0:00–60:00 0 = w/o H				
Values preset by Ivoclar Vivadent												
1–99	Name	403	0:30	0/0	0:00/0:00	0/30	0/700	0:00/1:00			6.3	18
Program phase		*Stand-by temp.*		*Clos./Pre-drying*			*Firing cycle*					

P		$VE_{1/2}$	$VA_{1/2}$	$VG_{1/2}$	HV [3]	$LT_{1/2}$ [4]	$LH_{1/2}$ [4]	LT [4]	LH [4]		Operating Instructions	
No.	**Programm "special"**	**Vacuum on [°C]**	**Vacuum off [°C]**	**Vacuum quality [%]**	**Share H w. vac. [min]**	**Closing temp. [°C]**	**Cooling time [min]**	**Closing temp. [°C]**	**Cooling time [min]**		**Chapter**	**Page**
1–99	Value ranges for freely programmable programs	0–1200	0–1200 75/100	25/50/ 0 = w/o HV	0:00–60:00	50–1200 0 = w/o LH	0:00:60:00	50–1200 0 = w/o LH	0:00–60:00			
Values preset by Ivoclar Vivadent												
1–99	Name	0/0	0/0	100/100	0:00	100/100	0:00/0:00	100	0:00		6.3	18
Program phase		Vacuum				Two-step cooling		Cooling with short opening				

Programat® X1

Oxidationsprogramme [1)]

Values in °F

P			B	S	t	T	H	VE	VA[5)]	VG	L	Operating Instructions	
No.	**Program Name "normal"**		**Stand-by temp. [°F]**	**Closing time [min]**	**Temperat. increas.[°F]**	**Holding temp. [°F]**	**Holding time [min]**	**Vacuum on [°F]**	**Vacuum off [°F]**	**Vacuum quality [%]**	**Long-term cooling [°F]**	**Chapter**	**Page**
1–7	Value ranges for oxidation programs		212–1292	0:30–60:00	18–252	212-2192	0:00–60:00 0 = w/o H	32–2192 yes/no	32–2192	25/50/ 75/100	122-2192 yes/no		
Values preset by Ivoclar Vivadent													
1–7	Alloy	w. v.	757	0:30	54	1292	1:00	-	-	-	no	6.2	17
		w/o. V.	757	0:30	54	1292	1:00	68	1292	100	no	6.2	17
Program phase			*Stand-by temp.*	*Clos./Pre-drying*	*Firing cycle*			*Vacuum*			*Cooling cycle*		

IPS d.SIGN (Standard Programs)

Preset values

Values in °F

P			B	S	t	T	H	VE	VA[5)]	VG	L	Operating Instructions	
No.	**Program "normal"**		**Stand-by temp. [°F]**	**Closing time [min]**	**Temperat. increas.[°F]**	**Holding temp. [°F]**	**Holding time [min]**	**Vacuum on [°F]**	**Vacuum off [°F]**	**Vacuum quality [%]**	**Long-term cooling [°F]**	**Chapter**	**Page**
1–9	Value ranges for Standard Program.			0:30–60:00	18–252	212–2192 0 = w/o H	0:00–60:00 yes/no	32–2192	32–2192 75/100	25/50/ yes/no	122–2192		
1	1. Opaquer firing (Foundat. fir.)	w. v..	757	6:00*	144*	1652*	1:00*	842	2° below T	100	no*	6.2	17
2	2. Opaquer firing	w. v.	757	6:00*	144*	1634*	1:00*	842	2° below T	100	no*	6.2	17
3	1. Shoulder firing	w. v.	757	6:00*	108*	1634*	1:00*	842	2° below T	100	no*	6.2	17
4	2. Shoulder firing	w. v.	757	6:00*	108*	1634*	1:00*	842	2° below T	100	no*	6.2	17
5	1. Dentin/Incisal firing	w. v.	757	9:00*	108*	1598*	1:00*	842	2° below T	100	no*	6.2	17
6	2. Dentin/Inc.firing (Corr.fir.)	w. v.	757	9:00*	108*	1598*	1:00*	842	2° below T	100	no*	6.2	17
7	Glaze fir. with glazing paste	w. v.*	757	4:00*	108*	1526*	1:00*	842	2° below T	100	no*	6.2	17
8	Glaze firing without glazing p.	w. v.*	757	4:00*	108*	1598*	1:00*	842	2° below T	100	no*	6.2	17
9	Corrective firing	w. v.	757	4:00*	108*	1382*	1:00*	842	2° below T	100	no*	6.2	17
Program phase			*Stand-by temp.*	*Clos./Pre-drying*	*Firing cycle*			*Vacuum*			*Cooling cycle*		

*These values may be altered. After the program has been completed, the modified values are changed back to the originally set standard values.

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Individual Programs P1 to P99 — Freely programmable programs [2] — Values in °F
Code Card Programs P1 to P99 (personal)

P			B	S	t	T	H	VE	VA	VG	L	Operating Instructions	
No.	**Program "normal"**		**Stand-by temp. [°F]**	**Closing time [min]**	**Temperat. increas.[°F]**	**Holding temp. [°F]**	**Holding time [min]**	**Vacuum on [°F]**	**Vacuum off [°F]**	**Vacuum quality [%]**	**Long-term cooling [°F]**	**Chapter**	**Page**
1–99	Value ranges for freely programmable programs		212–1292	0:30–60:00	18–252	212–2192	0:00–60:00 0 = w/o H	32–2192 yes/no	32–2192	25/50/ 75/100	122–2192 yes/no		
Values preset by Ivoclar Vivadent													
1–99	Name	o.V.	757	0:30	54	1292	1:00	–	–	–	no	6.3	18
		m.V.	757	0:30	54	1292	1:00	32	32	100	no	6.3	18
Program phase			*Stand-by temp.*	*Clos./Pre-drying*	*Firing cycle*				*Vacuum*		*Cooling cycle*		

Individual Programs P1 to P99 — Freely programmable programs [2] — Values in °F
Code Card Programs P1 to P99 (personal)

P		B	S	$VT_{1/2}$	$VH_{1/2}$	$t_{1/2}$	$T_{1/2}$	$H_{1/2}$			Operating Instructions	
No.	**Program "special"**	**Stand-by temp. [°F]**	**Closing time [min]**	**Pre-drying temp. [°F]**	**Pre-drying time [min]**	**Temperat. increas.[°F]**	**Holding temp. [°F]**	**Holding time [min]**			**Chapter**	**Page**
1–99	Value ranges for freely programmable programs	212–1292	0:30–60:00	32–932	0:00–60:00 0 = w/o VH	54–252	212-2192	0:00-60:00 0 = w/o H				
Values preset by Ivoclar Vivadent												
1–99	Name	757	0:30	32/32	0:00/0:00	0/54	32/1292	0:00/1:00			6.3	18
Program phase		*Stand-by temp.*	*Clos./Pre-drying*			*Firing cycle*						

P		$VE_{1/2}$	$VA_{1/2}$	$VG_{1/2}$	HV [3]	$LT_{1/2}$ [4]	$LH_{1/2}$ [4]	LT [4]	LH [4]		Operating Instructions	
No.	**Program "special"**	**Vacuum on [°F]**	**Vacuum off [°F]**	**Vacuum quality [%]**	**Share H w. vac. [min]**	**Closing temp. [°F]**	**Cooling time [min]**	**Closing temp. [°F]**	**Cooling time [min]]**		**Chapter**	**Page**
1–99	Value ranges for freely programmable programs	32–2192	32–2192	25/50/ 75/100	0:00–60:00 0 = w/o HV	122–2192	0:00:60:00 0 = w/o LH	122–2192	0:00–60:00 0 = w/o LH			
Values preset by Ivoclar Vivadent												
1–99	Name	32/32	32/32	100/100	0:00	212/212	0:00/0:00	212	0:00		6.3	18
Program phase		Vacuum				Two-step cooling		Cooling with short opening				

Legend:

w.v. - with vacuum
w/o v. - without vacuum

L = no -> means without 'Long-term cooling'
L = yes -> means with 'Long-term cooling; temperature is entered in the 'Opening temperature' parameter; preset value is 100 °C (212 °F)

[1] Important note: Observe the recommended parameter values of the alloy manufacturer.
[2] 'Overnight program': yes/no -> only for freely programmable programs. Furnace head opens in 30 s or 1 min; without buzzer; furnace head closes after opening if T ≤ 150 °C (302 °F); furnace stops heating.
[3] Parameter can only be entered if the values for holding temperature T_2 and vacuum off temperature VA_2 are the same (e.g. $T_2 = VA_2 = 700$ °C (1292 °F))
[4] Parameter can only be entered if parameter 'Long-term cooling' = yes
[5] For oxidation and IPS d.SIGN programs:
If the holding temperature is changed, the vacuum off temperature VA is automatically changed to holding temperature T minus 1 °C (2 °F). If the vacuum off temperature VA is changed, the holding temperature T remains unchanged.

Furnace head 'Quick opening' = no (1 min.) for oxidation, standard, and Standard Card programs

Furnace head 'Quick opening' = yes (30 s) / no (1 min.) for freely programmable and Code Card programs

The furnace heats up to 100 °C (212 °F) if the display shows the main menu or the program selection menu for P1 to Px (i.e. as long as no program has been selected) or if the furnace head is open.

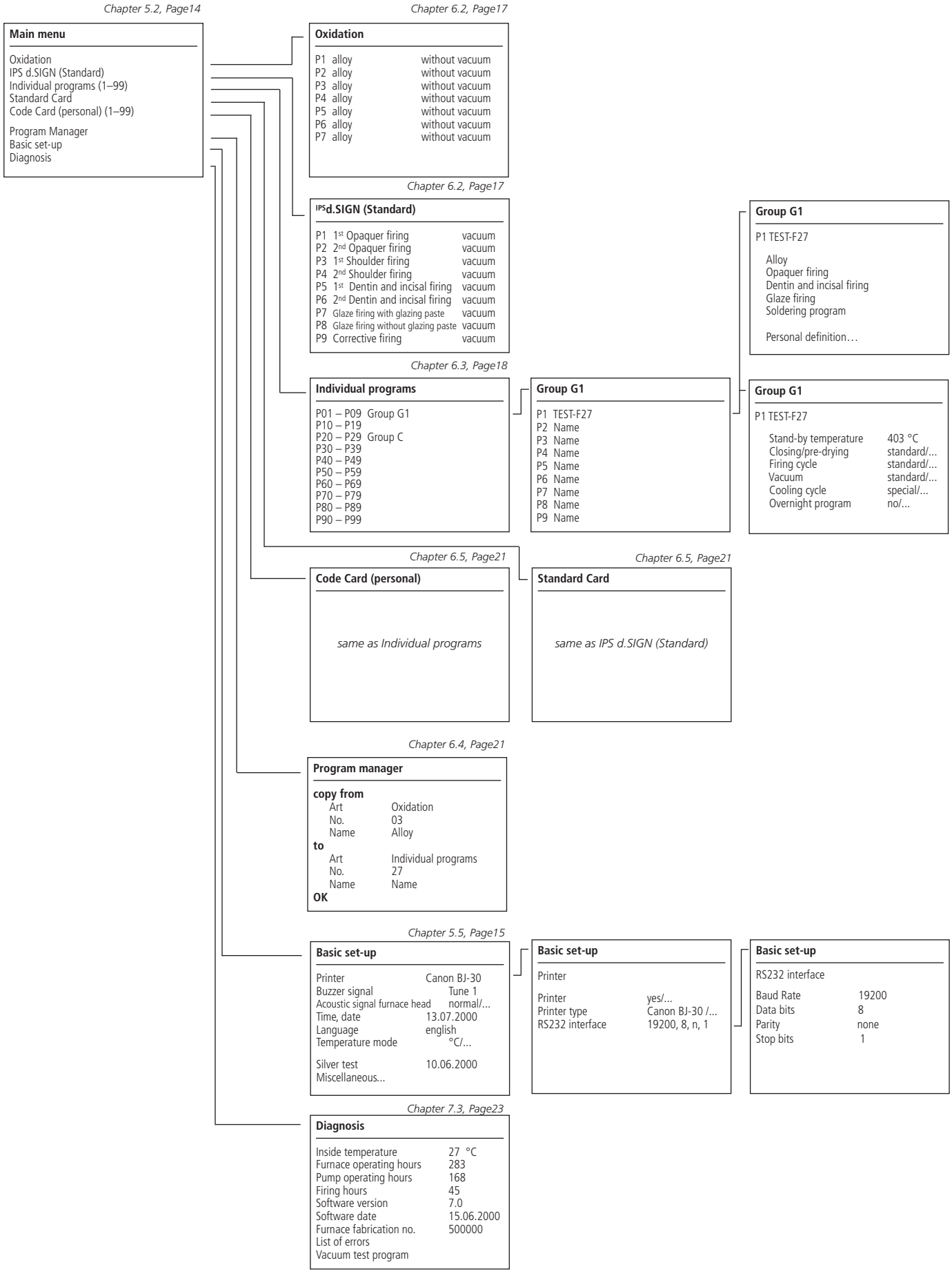
Buzzer sounds with the furnace head open below 370 °C (698 °F – opening from stand-by temperature

Buzzer sounds with the furnace head open below 550 °C (1022 °F) – opening after program sequence

Temperature conversion of absolute values from °C to °F and vice versa :
°C = °F –32) *5/9 °F = (9/5 * °C) + 32

Temperature conversion of temperature increase values from °C to °F and vice versa:
°C = °F * 5/9 °F = 9/5 * °C

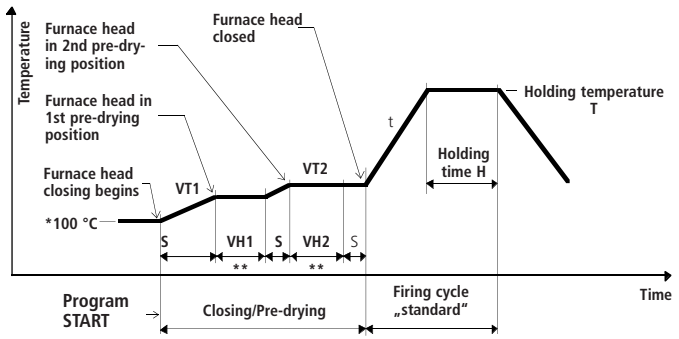
10.2 Programat X1 menu structure



10.3 Firing curves

(Schematic diagrams)

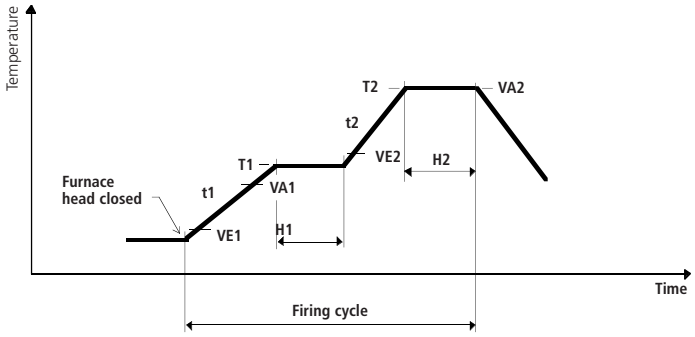
Part of firing curve: Closing/Pre-drying 'special'
Pre-drying with one (two) step(s)



S = Closing time (devided in three steps)
VH1(2) = 1st (2nd) Pre-drying time
VT1(2) = 1st (2nd) Pre-drying temperature

* Stand-by temperature with the furnace head open
** VH1 (VH2) starts after VT1 (VT2) has been reached

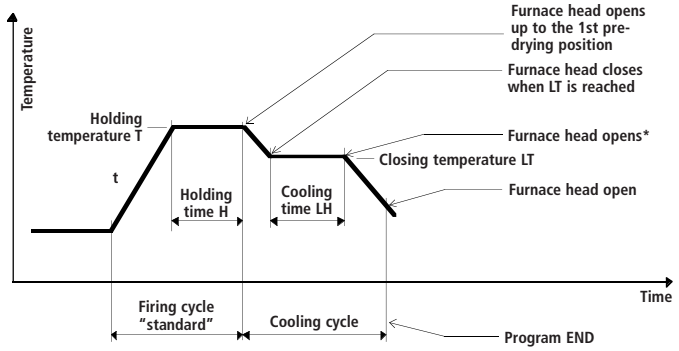
Part of firing curve: Firing cycle 'special' with vacuum 'special'



H1(2) = 1st (2nd) Holding time
T1(2) = 1st (2nd) Holding temperature
t1(2) = 1st (2nd) Temperature increase

VE1 (2) = 1st (2nd) Vacuum on temperature
VA1 (2) = 1st (2nd) Vacuum off temperature
VE/VA Positions vary depending on the set temperatures

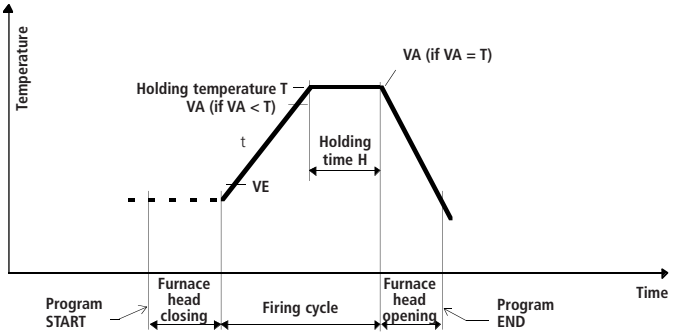
Part of firing curve: Cooling cycle 'special' – long-term cooling with quick opening



* Quick opening = yes : Furnace head opens in approx. 30 s without interruption
= no : Furnace head opens in approx. 20 s up to the 1st pre-drying position, after that it completely opens intermittantly in approx. 40 s

The indication on the LC-display (5) is not identical to the pictures below.

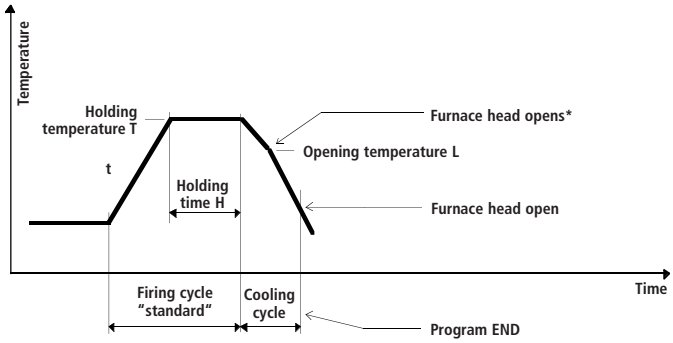
Firing curve: Firing cycle 'standard' with vacuum 'standard'
(without pre-drying and without long-term cooling)



H = Holding time
T = Holding temperature
t = Temperature increase

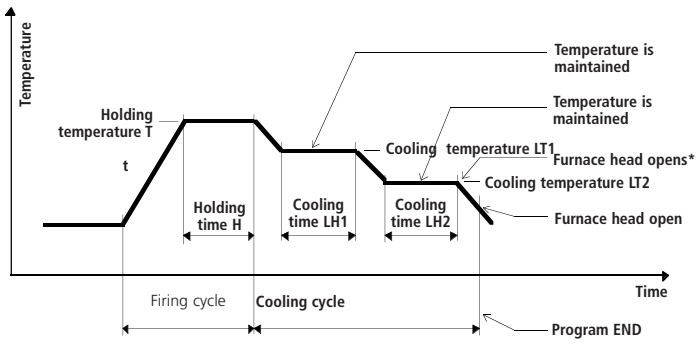
VE = Vacuum on temperature
VA = Vacuum off temperature
VE/VA Positions vary depending on the set temperatures

Part of firing curve: Cooling cycle 'standard' – with long-term cooling



* Quick opening = yes : Furnace head opens in approx. 30 s without interruption
= no : Furnace head opens in approx. 20 s up to the 1st pre-drying position, after that it completely opens intermittantly in approx. 40 s

Part of firing curve: Cooling cycle 'special' – long-term cooling with one (two) step(s)



* Quick opening = yes : Furnace head opens in approx. 30 s without interruption
= no : Furnace head opens in approx. 20 s up to the 1st pre-drying position, after that it completely opens intermittantly in approx. 40 s

10.4 Example of a Programat X1 firing protocol printout

Programat X1 Firing Protocol

Laboratory or Practice: .....
Name of Dental Technician: .....
Order No.: .....
Date/Time: 27.01.1997 15:19
Furnace Serial No.: 500000

Name of program	DEMO-27		
	Type of program	individual	
P	Number of program	2	
B	Stand-by temperature	757	°F
S	Closing time	0:30	min
VT1	1. Pre-drying temperature	302	°F
VH1	1. Pre-drying time	5:00	min
VT2	2. Pre-drying temperature	392	°F
VH2	2. Pre-drying time	3:30	min
t1	1. Temparature increase	54	°F/min
T1	1. Holding temperature	788	°F
H1	1. Holding time	1:00	min
t2	2. Temperature increase	180	°F/min
T2	2. Holding temperature	1292	°F
H2	2. Holding time	0:50	min
VE1	1. Vacuum on	572	°F
VA1	1. Vacuum off	788	°F
VG1	1. Vacuum quality	75	%
VE2	2. Vacuum on	932	°F
VA2	2. Vacuum off	1292	°F
VG2	2. Vacuum quality	100	%
HV	Share of H with vacuum	0:30	min
	Cooling with short opening:		
LT	Closing temperature	1130	°F
LH	Cooling time	4:00	min
	Quick opening	yes	

Remarks:

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