Instructions for Use Sintering furnace

Multimat2Sinter



The text and illustrations of these Instructions for Use have been compiled with the utmost diligence. Nevertheless, the presence of typographic errors or incorrect data cannot be excluded. Please note that DeguDent GmbH cannot accept any liability for such errors.

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1 General

1.1 On these Instructions for Use

These Instructions for Use will facilitate allow safe and efficient operation of the unit.

The manual is part of the unit. Keep it in the immediate vicinity of the device, readily accessible for operators. All operators must carefully read and understand these Instructions for Use prior to handling the unit for the first time. Full compliance with all safety and operating instructions and instructions in these Instructions for Use is a fundamental prerequisite for safe operation of the unit.

Follow the local accident prevention regulations and general safety regulations for site where the unit is deployed.

Illustrations in this manual are meant to promote a basic understanding and may differ from the actual design of the unit.

In addition to these instructions, follow the instructions for the installed components, found in the Appendix.

Following these Instructions for Use reduces risks, increases the reliability and lengthens the service life of the unit.

DeguDent GmbH will not be responsible for any damage caused by improper use or operation of the unit and/or non-compliance with these Instructions for Use.

Note: We are constantly seeking to keep these Instructions for Use up to date. You may download the most recent version from our website <u>www.degudent.com</u> at any time.

If you have any questions that these Instructions for Used do not answer, please contact: DeguDent GmbH Rodenbacher Chaussee 4 63457 Hanau

Germany

1.2 Explanation of symbols

Safety instructions

Safety instructions are identified in this document by symbols. The safety instructions are introduced by signal words that indicated the extent of the hazard.

Always follow all safety instructions and take all possible precautions in order to avoid accidents, injuries and damage to property.



DANGER! Indicates an imminently hazardous situation that will result in death or serious injury if not avoided.



WARNING!

Indicates a possibly hazardous situation that may result in death or serious injury if not avoided.

CAUTION!

Indicates a possibly hazardous situation that may result in less serious or minor injury if not avoided.



CAUTION!

Indicates a possibly hazardous situation that may result in property damage if not avoided.

Tips and recommendations

	NOTE: Highlights useful tips, recommendations and information for efficient and trouble-free operation.
--	---

Special	
safety	To draw attention to special hazards, safety precautions use the following symbols:
Instructions	



DANGER!

Electric current is a life hazard! Indicates life-threatening situations caused by electric current. Failure to follow the safety instructions can result in severe injury or death.

1.3 Copyright and intellectual property rights

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All rights pertaining to these Instructions for Use, including but not limited to photocopying and dissemination as well as translation, are reserved for DeguDent GmbH. Specifically, these Instructions for Use must not, whether in whole or in part, be reproduced in any form (print, photocopy, microfilm or other technologies) and/or stored, processed, copied or disseminated using electronic data storage and retrieval systems without prior written approval by DeguDent GmbH.

All violations will be prosecuted. The guilty party may be liable for damages. All intellectual property, trademark, service mark and other rights are reserved by DeguDent GmbH.

1.4 Limitation of liability

All statements and information in this manual have been compiled in accordance with applicable standards and regulations, the current state of the art and our many years of knowledge and experience.

The manufacturer will not be responsible for any injuries or damage caused by:

- Non-compliance with the instructions
- Improper use
- Use of untrained staff
- Unauthorized redesigns
- Technical modifications
- Use of unauthorized parts

The actual scope of delivery may deviate from the following explanations and descriptions in the case of special models, additional ordering options or technical updates.

The sale, delivery and operation of this unit are subject to the mutual rights and obligations laid down in the purchasing agreement, the manufacturer's Terms and Conditions and the laws and regulations applicable at the time of agreement.

We reserve the right to make technical changes to improve the performance properties of the unit or to accommodate technological progress.

1.5 Replacement parts



Replacement parts can be obtained from authorized dealers or directly from the manufacturer (address on \Rightarrow *Page 4*).

1.6 Warranty

The Warranty Terms and our Terms and Conditions are available on the internet (address on ⇒ Page 4).

1.7 Customer Support

For technical information, please contact customer support (address on \Rightarrow Page 4).

Our staff is always interested in new information and insights gained from the use of our units because they might be valuable for future improvements of our products.

2 Safety

This section gives an overview of all important safety aspects for maximum staff protection and for safe and trouble-free operation.

Failure to follow the safety and operator instructions in these Instructions for Use may result in considerable hazards!

2.1 Responsibilities of the owner/legal operator

This unit is designed for use in a commercial environment. The owner/legal operator of the unit must comply with statutory obligations on occupational safety.

In addition to the Occupational Safety Notes in these Instructions for Use, all regulations pertaining to safety, accident prevention and environmental protection applicable to the site of operation must be observed. The following items are of particular importance in this regard:

- The owner/legal operator has to become thoroughly acquainted with the applicable health and safety regulations and conduct a risk assessment to discover any additional hazards that may exist in view of the special working conditions at the site of operation. The results of this risk assessment must be implemented in the form of standard operating procedures for the unit.
- The owner/legal operator is responsible for assigning clear responsibilities for the installation, operation, maintenance and cleaning of the unit.
- The owner/legal operator must ensure that all employees who work on or with the unit have read and understood the Instructions for Use.
 In addition, the owner/legal operator must provide regular staff training and inform the staff about any hazards.
- > The owner/legal operator must make the necessary protective equipment to the staff.
- Furthermore, the owner/legal operator must ensure that the equipment is always in good technical condition.
- The owner/legal operator must ensure that the maintenance intervals specified in these Instructions for Use are complied with.
- The owner/legal operator must have all safety equipment regularly checked for proper function and completeness.

2.2 Requirements of the staff

2.2.1 Qualifications

WARNING! Insufficient qualification is an injury hazard!
Improper use or operation may lead to substantial injury or property damage.
Therefore:
All work must be carried out by qualified staff.

Staff	A	Laboratory assistant, trained dental technician Anyone who, based on his or her special training, training, knowledge and experience and acquaintance with applicable regulations, is able to perform the assigned tasks and identify and avoid potential hazards.
	AA	Qualified electrician Anyone who, based on his or her special training, knowledge and experience and
		acquaintance with applicable regulations, is able to correctly connect and put into operation electrical systems and to identify and avoid potential hazards.

2.3 Intended use

The unit is intended and designed for the following use only:

The high-temperature furnace is used for sintering dental zirconium dioxide ceramics as well as crowns and bridges made of cobalt-chromium alloys for sintering at temperatures of up to 1,600°C.

WARNING! Inappropriate use of the device constitutes a hazard!
Any use of the unit beyond or outside the intended and use may lead to hazardous situations.
Therefore:
 Use the unit only as intended.
 Follow all instructions in these Instructions for Use strictly.

Any claims for damages resulting from improper use are excluded.

Any damage resulting from improper use is the sole responsibility of the owner/legal operator.

2.4 Personal protective equipment

The use of personal protective equipment is required while working on or with the unit to minimize any health hazards.

- > Make sure to wear the required protective equipment at any time while working on or with the unit.
- > Follow the posted requirements for any personal protective equipment required.

2.5 Special hazards

Observe the safety instructions listed here and the warnings in the other chapters of these Instructions for Use to reduce health hazards and avoid dangerous situations.

Electric current	DANGER! Electric current is a life hazard! Touching live components may pose an immediate threat to life. Any
	Therefore:
	In case of damage to the insulation, disconnect the power supply and make arrangements for repair.
	 All work on the electric system must be carried out by a qualified electrician.
	Prior to any work on the electric system, disconnect the system from the power supply and make sure that is free of any voltage.
	Prior to any maintenance, cleaning or repair work, switch off the system's power supply and secure it against being switched back on.
	Do not bypass or disconnect any fuses. When replacing fuses, make sure the amperage is correct.
	Keep moisture away from live parts, as moisture may cause short- circuiting.

Hot surfaces	CAUTION! Burn hazard when touching hot surfaces!
	Contact with hot components can cause burns.
	Therefore:
	 Always wear protective clothing and gloves when working near hot components.
	Always ensure that all components have cooled to ambient temperature before any work.

Hot objects	WARNING! Burn hazards when touching hot objects!
	Objects reach high temperatures during operation and can cause burns on contact.
	Therefore:
	Before handling objects, check whether they are hot. If necessary, allow to cool.
	Handle hot objects exclusively with feeding tongs.

Mineral fibres	
	The heat insulation of the firing chamber and the firing base contain ceramic fibres that have been rated as carcinogenic.
	Measurements performed on a ceramic furnace while in use have shown that the actual level of these fibres is significantly lower than the acceptable risk threshold if the furnace is used as per the manufacturer's instructions.
	Any damage to the furnace must be repaired by a recognized expert (e.g. DeguDent's Technical Service).
	Visible deposits of fibres are freely accessible parts of the furnace must be removed by approved cleaning methods (e.g. by wiping them off with a moist cloth or by vacuuming using approved filters).
	Fibres must never be blown away with compressed air nor brushed away with brooms were brushes while still dry.
	Should you detect unusual quantities of visible fibre deposits on freely accessible parts of the furnace, please contact a recognized expert as mentioned above.
	Use of defective accessories containing ceramic fibres must be discontinued immediately .

2.6 Behaviour in case of danger or accidents

Preventive measures	 Always be prepared for accidents or fire! Keep first-aid equipment (first-aid kit, blankets etc.) and fire extinguishers within easy reach.
	 Make sure all staff members are familiar with equipment and devices for reporting accidents, for providing first-aid and life-saving functions. Keep access routes clear for emergency vehicles.

Procedures in case of accidents	 Immediately switch off the unit (emergency off). Initiate first-aid measures. Persons from the danger zone. Remove persons from the danger zone.
	 Alert the emergency services. Keep access routes clear for emergency vehicles.

2.7 Signage

The following symbols and signs are mounted outside the furnace casing and the auxiliary fan.





Warning "Hot surface" (on the furnace housing)

Hot surfaces are not always immediately recognizable as such. Allow to cool before handling. Use gloves if necessary.



Warning "Follow Instructions of Use" (on the primary power receptacle)

3 Technical specifications

3.1 General

Parameter	Value	Unit
External dimensions (W \times H \times D)	385 × 780 × 500	mm
Heating chamber volume	2 bowls \varnothing 120 mm ×	35 mm
Maximum temperature	1650	°C
Heating rate	selectable: 1-99	°C/min
Weight	58	kg

3.2 Electrical connection

Electrical	Parameter	Value	Unit
	Nominal supply voltage	220-240	V AC
	Frequency	50	Hz
	Permissible deviation from the nominal voltage	± 10	%
	Maximum Power consumption	2000	W
	Overvoltage category	II (pursuant to IEC 60364-	4-443)
	Protection against overvoltage	Provide suitable surge filters	
	Fuse rating (on site)	Connect to a dedicated circuit protected by a T10 AH 250 V fuse	

3.3 Operating conditions

Environment	Parameter	Value	Unit
	Temperature range	5–40	°C
	Maximum relative humidity	up to 31°C: 80	%
		up to 40°C: 50	%
		non-condensing	
	Installation	Indoors in dry rooms only	
	Height above sea level	maximum 2000	m
	Pollution severity	Tested for pollution severit	y – Pollution degree II

Rating plate 3.4

The nameplate is located on the left side of the housing and contains the following information:

- ≻ Manufacturer name and address
- Type designation (Type) ≻
- Serial number (S/N) ≻
- Supply voltage and frequency ≻
- ⊳ Power consumption
- Disposal symbol ۶
- CE mark ⊳
- Country and year of manufacture ۶

Design and function 4

4.1 **Overview**



Fig. 2: Overview

1	Control panel	3	Object bowl
2	Lifting plate	4	Heating chamber (inside the housing)

4.2 Description of components

Heating chamber	The heating chamber is made of a high-quality ceramic material evenly heated by four MoSi ₂ heating elements.
Heat insulation	The heating chamber is surrounded by a ceramic insulating layer on all sides.
Lift	The objects are lifted in and out of the heating chamber automatically using on electric motor drive.
Heat controller	The heat controller ensures that the desired temperature is achieved in the shortest possible time. The target temperature is maintained with an accuracy of $\pm 3^{\circ}$ C. A probe with a PtRh-Pt thermocouple inside the heating chamber detects the chamber temperature in the vicinity of the object. A thermocouple break protection ensures that the furnace does not overheat in the case of a faulty probe. Operating parameters and heating programs are stored in non- volatile memory and are retained even in the event of a power failure.
Furnace housing	The furnace housing is made of corrosion-resistant stainless steel. The control panel and the housing have an additional internal and external plastic coating (light grey, RAL 7035).

4.3 Connections

Argon max. 10 bar	
R5232 3.	 Power 2 fuses, T10 AH, 250 V
2. Et 250V TIOAH 250V TIOAH	 RS232 interface for transmitting temperature readings to a PC Argon connector
Fig. 3: Connections	

4.4 Hazardous



4.5 Controls

4.5.1 Electronic controls





Power switch is lit when the power is on (switch pressed downward)

Fig. 7: On/Off switch, in On position

Buttons	Button	Function
	0–9 (numeric buttons)	Enter numbers
	F button	Open parameter dialogue
	Start/Stop button	Start/stop heating program
	Load button	Load heating program from memory
	Save button	Save heating program to memory
	Timer button	Activate/deactivate timer
	S1–S4 level keys	 If standby LED is lit: Set heating parameters Within dialogues: (make selection depending on dialogue)

4.5.3 Display functions

The structure and operation of the display are described in detail in section 7, <i>Operation 23</i> .
--

4.6 Scope of delivery

Crypton [®] version	Furnace
	Cable
	Argon door
	Crypton [®] bell set, assembly
	Zirconium oxide beads, Ø 1.25 mm (200 g) for Crypton
	Pliers for bowls
Cercon [®] version	Furnace
	Cable
	Cercon [®] door
	Speed sintering bowl assembly, Ø 100 mm
	Aluminium oxide beads, Ø 1–2 mm (200 g) for Cercon
	Pliers for bowls

5 Transport, packaging and storage

5.1 Safety instructions for transport

Improper transport	!	 CAUTION! Improper transport may cause damage! In case of improper transportation, substantial property damage may result. Therefore: Exercise caution when delivering and unloading the packed items and when transporting them on the site. Observe the symbols on the packaging. Do not remove the packaging until shortly before installation.

Furnace weight	CAUTION! Risk of injury on improper lifting of the furnace! Improper lifting of the furnace can lead to back pain and injury due to the furnace's heavy weight.	
	Therefore:	
	Enlist the help of an additional person when attempting to lift the furnace.	

5.2 Symbols on the packaging

Up The arrowheads point towards the top of the package. They must always point upwards, as the contents may be damaged otherwise.
Fragile Identifies packages with fragile or delicate contents. Handle the package with caution. Do not drop it or expose it to shock.

5.3 Delivery inspection

On receipt, immediately check the consignment for completeness and any transport damage.

In case of visible transport damage, proceed as follows:

- > Refuse the consignment or accept it only with reservations.
- > Note the extent of damage on the transport documents or on the delivery note.
- Initiate complaint process



NOTE:

File a complaint for every defect immediately on detection. Damage claims can be filed only within the applicable deadlines for complaints.

5.4 Packaging

Packaging information	The individual packages are properly packaged for the expected transport conditions. Only environmentally friendly materials were used for packaging.	
	The packaging is designed protect the individual components from transport, corrosion and other damage until assembled. Do not damage the packaging and do not remove it until immediately before installation.	

Handling packaging materials	Dispose of packaging material according to the applicable legal requirements and local regulations.	
	!	 CAUTION! Environmental damage from improper disposal! Packaging materials are valuable raw materials and can be reused or appropriately recycled. Therefore: Dispose of packaging material in an environmentally responsible manner. Follow applicable local regulations for disposal. If necessary, enlist the services of a disposal specialist.

Transporting pallets with a forklift	Packages on pallets can be transported with a forklift under the following conditions:
	The forklift must be able to accommodate the weight of the pallet and package(s).
	> The operator of the forklift must be properly licensed.
	Lifting:
	 Move the pair of forks of the truck between the bars or under the pallet.
	 Move the pair of forks forward until they emerge on the opposite side.
Fig. 8: Fork positions	3. Make sure the pallet cannot tilt even if its centre of gravity is off-centre.
	4. Lift the pallet and move.

Storing the packages	Store the packages under the following conditions:	
	Do not store in the open.	
	Store in a dry and dust-free area.	
	Do not expose to corrosive substances.	
	 Keep away from sunlight. 	
	Avoid mechanical shocks.	

6 Installing and commissioning

6.1 Safety

Staff	Laboratory assistant, trained dental technician
	> Qualified electrician

General	WARNING! Improper installation and commissioning is an injury hazard!
	Improper installation and commissioning can lead to serious injury or property damage.
	Therefore:
	Before starting, make sure there is ample space for installation.
	Handle protruding sharp-edged components with care.
	Ensure that the installation site is orderly and clean. Loosely stacked or scattered components and tools can cause accidents.
	 Install all components properly.
	Secure components so they do not fall down or collapse.

Electrical installation	 DANGER! Electric current is a life hazard! Contact with live components can be a life hazard. Therefore: Prior to any work, switch off the system's power supply and secure it against being switched back on.
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Furnace weight	CAUTION! Risk of injury on improper lifting of the furnace!
	Improper lifting of the furnace can lead to back pain and injury due to the furnace's heavy weight.
	Therefore:
	Lift the furnace only as described in section 4, Design and function, page 12.
	Enlist the help of an additional person when attempting to lift the furnace.

6.2 Installation

6.2.1 Deploying the high-temperature furnace

Install the high-temperature furnace on a completely level. Make sure that the floor space of the furnace has adequate weightbearing capacity.

Ensure proper operating conditions (⇔ section 3,*Technical specifications, page 11*).



6.2.2 Connecting the argon supply



Fig. 9: Argon connector

CAUTION!

- When using argon in the laboratory, follow the pertinent national safety regulations (for Germany: TRGS 526, and especially section 5.2.11, Compressed gas cylinders and fittings)
- When replacing the Crypton door by Cercon door, make sure to disconnect the argon supply of from the furnace. Otherwise, argon may escape through the Crypton door uncontrolled during the Cercon sintering process.

Crypton sintering requires a reduced-oxygen atmosphere, which is obtained by the use of argon.

Argon is an inert gas in a compressed-gas cylinder. Attach a pressure gauge and pressure reducer to the gas cylinder.

The purity of the argon should be at least 4.6 (99.996% v/v).

Connect the argon line to the argon connector at the rear of the furnace.

To avoid any pressure overload on components installed on the furnace, the output pressure of the gas bottle should be limited to a maximum of 10 bar by design.

The output pressure of the gas bottles should be set to between 4 and 7 bar.

To avoid uncontrolled discharges of argon, check the gas lines and associated couplings for leaks and a secure fit after installation.

The gas volume contained in an argon bottle is enough to flood an entire room in case of malfunction. Ensure adequate ventilation at the deployment site to prevent suffocation hazards. We recommend adequate ventilation at floor level, since the gas is heavier than air. In addition, protect all pipes, ducts and manholes against the ingress of gas.



Observe all relevant safety regulations when handling compressed gases.

The argon flow during a Crypton sintering cycle is 1 l/min.

Determining the amount of argon remaining:

The pressure gauge shows how much compressed argon is left in the argon cylinder. A new argon gas cylinder is filled to 200 bar. If the pressure reading is only half of that, i.e. 100 bar, the bottle is half empty.

Example:

At a pressure of 200 bar, a 50-litre argon gas cylinder contains about 10,000 litres of argon.

At a flow rate of 1 l/min, about 270 litres are used during each Crypton sintering cycle.

This means that a 50-liter argon gas cylinder is sufficient for approximately 35 Crypton sintering cycles.

6.3 Connecting to mains



Fig. 10: Connecting to mains.

 Connect the high-temperature furnace to a properly installed 230-V wall outlet.
 Make sure that the protective earth (PE) is intact and properly connected. The earthing contacts of the power outlet must be clean and uncorroded.
 The wall outlet must be protected by an appropriately

dimensioned fuse (overload).

Ensure that the electrical connection requirements are met (⇒ for appropriate values see section 3, *Technical specifications, page 11*).

6.4 Commissioning

6.4.1 Removing the transport lock

- 1. Turn on the furnace with the **On/Off** switch.
- 2. Press the START/STOP button to open the furnace.
- 3. Remove the transport lock (cardboard) completely.

The high temperature furnace is shipped from the factory

- with the time already set and
- > with standard parameters chosen.

Before first use, customize the time and other furnace parameters if and as needed.



1.

2.

Note:

Press the **F** button.

The controller does not automatically alternate between standard and daylight saving time.

Activate the standby screen (\Rightarrow section 7, Operation, page 23).

Entering and exiting parameter mode

8/min	8	min	(\$4
		ENGL	ISH (3)
		IH 11 N	:54 EXT ©
			(51

Fig. 11: Parameter dialogue, first page

The display will show the parameter dialogue.	
Button	Function
S4	Change display language (DE, F, UK, IT, ES, DK, CZ, NL)
S3	Activate/deactivate alarm signal
S2	Activate weekday and time (day, hh:mm)
S1	Go to the second dialogue page

8/min 8 min		(54
LIFT TEMP. CLOCK MODE	300°C 24h	(53
TEMP.SCHLE	NEXT	(52
		(51

Fig. 12: Parameter dialogue, second page

- 3. Select and modify parameters using **S1–S4** buttons.
- 4. Enter numerical values via keypad where appropriate.
- 5. After setting the desired values, exit the parameter dialogue by pressing **S1**.

7 Operation

Staff

7.1 Safety

Basics



WARNING!

Laboratory assistant, trained dental technician

Improper operation is an injury hazard!

Improper operation can lead to serious injury or property damage.

Therefore:

- Perform all steps only as specified in these Instructions for Use.
- Before starting work, make sure that all covers and safety facilities are installed and working properly.
- Never override safety facilities during operation.



CAUTION!

Burn hazard when touching hot surfaces inside the heating chamber.

Even when turned off, the unit may still be very hot from a previous heating cycle. Contact with hot surfaces can cause burns.

Therefore:

- Always use feeding tongs of sufficient length to insert and remove objects.
- Use adequately insulated protective gloves.

CAUTION!

Risk of damage to the walls of the heating chamber and to sintering objects if jamming or wedging occurs as the lifting plate travels upward!

If objects protrude from the edge of the lifting plate, they may jam or be caught between the plate and the furnace housing as the plate travels upward. This can cause damage to the walls of the heating chamber or the objects.

Therefore:

Make sure that no objects protrude beyond the edge of the lifting plate.

CAUTION! Risk of damage to electronic controller components due to arcing! During the heating phase, if the space between metallic objects and the walls of the heating chamber is too small, there is a risk of electrical discharges. This may cause irreparable damage to the control electronics of the furnace. Therefore: Ensure that metal objects do not touch the walls of the heating chamber.

7.2 Turning on the furnace

> Turn on the main power switch.

The power indicator in the power switch will be lit.

After a few seconds, the display will show the standby screen with the same heating program loaded as when the unit was last turned off.

If the unit is to be used for the first time, this will be program 01.

The display is structured as follows:

Parameters, level 4	Status (READY), program no (01)
Parameters, level 3	Furnace temperature (current)
Parameters, level 2	Weekday, time (current)
Parameters, level 1	Expected time of completion

8/min	8	min		(54
CRYP	TON	1	STNDBY 1 24°C MO 14:14 MO 18:43	(53) (52)
				((51)

Fig. 13: Standby screen.

7.3 Sintering Crypton

(Not included with all units, see section 4.6, Scope of delivery, page 15.)



Fig. 14: Crypton components.



Fig. 15: Placement of the sintering objects.



Fig. 16: Assembling the sintering bowl and sintering guard.

The Crypton sintering set consists of the following components:

- 1. Door for Crypton sintering
- 2. High-performance ceramic bottom plate
- 3. High-performance ceramic sintering bowl
- 4. High-performance ceramic sintering guard
- 5. Lid for high-performance ceramic sintering bowl
- 6. Zirconium oxide beads, Ø 1.25 mm
- 1. Fill the sintering bowl with zirconium oxide beads to a level of between 1.5 and 2 cm. Use only the zirconium oxide beads for Crypton (REF 53 5567 0112).
- 2. Place the objects to be sintered on the sintering bowl and press into the layer of zirconium oxide beads, up to the preparation line.



NOTE!

The ZrO2 beads are white when new and turn dark during the Crypton sintering cycle.

Prior to the first Crypton sintering cycle, the base plate, bowl, lid, guard and the ZrO2 beads must undergo a Crypton sintering cycle <u>without</u> any objects present..

- 3. Place the sintering bowl centrally on the bottom plate.
- 4. Cover the sintering bowl with the lid and sintering guard.
- Load the heating program (section 7.7, Programming, page 29) and use the Start/Stop key to start the program. The lifting plate moves upward and seals the heating chamber.

The heating program is executed automatically.

7.4 Exchanging the chamber door

To sinter Cercon, the chamber door must be exchanged first. In addition, the argon supply line of the Crypton door must be disconnected.

To exchange the chamber door, proceed as follows:



Fig. 17: Unlocking the connector.



Fig. 18: Disconnecting the argon supply line.



Fig. 19: Unlocking the door.



Fig. 20: Unlocking the door.

- 1. To disengage the connector of the argon supply line of the Crypton door, slide the retaining ring of the connector in the direction of the furnace housing.
- **2.** Pull out the argon supply line of the Crypton door from the connector.



NOTE!

If the supply line remains in the connector while Cercon objects are sintered, argon will escape from the baseplate of the Crypton door during the sintering process.

3. At the bottom of the door there is a guide pin for securing the door on the door mount.

4. To unlock the guide pin, pull it down and turn it to the left. The pin is now unlocked and secured. The furnace door can now be pulled forward and out from the mount.



5. When inserting the Cercon door, make sure that the guide pin of the door engages the bore hole provided.

Fig. 21: Unlocking the door.



6. Slide the Cercon door onto the furnace mount as far as it will go. Unlock the guide pin again by turning it to the left. Gently pull the door forward until the guide pin engages the corresponding bore hole in the door mount.



NOTE!

If the guide pin does **not** properly engage the door mount, the door will not close securely. Sintering will **not** be initiated after the sintering program has been started.

Fig. 22: Installing the door.

7.5 Detecting program type changes (door-changing requirement)

To protect the sintering guard in the case of an inappropriate program selection, the furnace will issue a door-changing warning.

When switching from a Crypton program to a Zirconia program, the display will read:

!Attention!

Ceramic equipment installed?

If the correct door is installed, confirm by pressing S2.

Pressing S1 will return you to the previous screen and allow you to install the correct door.

When the program is activated again, the above prompt will return and can then be confirmed with S2 if appropriate.

7.6 Sintering Cercon

(Not included with all units, see section 4.6, Scope of delivery, page 15)











Fig. 23: Cercon components.



Fig. 24: Placement of the objects.



Fig. 25: Placement of the speed-sintering bowl.

The Cercon sintering set consists of the following components:

- 1. Door for Cercon sintering
- 2. Lid for speed-sintering bowl
- 3. Ring for speed-sintering bowl
- 4. Bottom plate for speed-sintering bowl
- 5. Aluminium oxide beads, Ø 1.2 mm
- 6. Adapter plate for large-span bridges (more than 8 units).

- 1. Place the ring of the speed-sintering bowl on the bottom and fill the bowl with aluminium oxide beads to a level of between 1 and 1.5 cm. Use only the aluminium oxide beads for Cercon (REF 53 5557 0153).
- 2. Place the objects to be sintered on the aluminium oxide beads and press lightly, so that all parts of the bridge are equally supported by aluminium oxide beads.
- **3.** Place the speed-sintering bowl and lid on the spacer pins of the Cercon door.



NOTE!

Only hold the speed-sintering bowl by the bottom plate when moving it, as the bottom plate, ring and lid of the bowl are not mechanically connected.

Failure to observe this may cause the bowl to separate into its components, and the objects could be damaged when dropped from the bottom plate.



Fig. 26: Placement of bridges with sintering bar (more than 8 units).

Bridges of more than 8 units are placed on the heating table using a special sintering bar for large-span bridges. Up to 2 large-span bridges can be sintered in the same sintering cycle.

7.7 Programming

The following sintering programs for Crypton, Cercon base and Cercon ht are pre-programmed:

Program no.	Material	Duration	Final temperature	Application
1 Crypton	Crypton	approx. 4.5 h	1280°C	Sintering of Crypton crowns and bridges with sintering guard.
2	free	free	free	free
3 Cercon base speed ≤ 6 Units	Cercon base, colored, light, medium	approx. 2.5 h	1465°C	Speed sintering bowl with cover up to 6-unit bridges
4 Cercon base	Cercon base, colored, light, medium	approx. 5 h	1470°C	Speed sintering bowl with cover, up to 8-unit bridges
5 Cercon base ≥ 9 Units	Cercon base, colored, light, medium	approx. 14 h	1470°C	Large-span bridges (more than 8 units) with adapter plate. Maximum 2 large-span bridges.
6 Cercon ht speed ≤ 6 Units	Cercon ht white, light, medium	approx. 3 h	1520°C	Speed sintering bowl with cover, up to 6-unit bridges
7 Cercon ht	Cercon ht white, light, medium	approx. 5.5 h	1520°C	Speed sintering bowl with cover, up to 8-unit bridges.
8 Cercon ht ≥ 9 Units	Cercon ht white, light, medium	approx. 14 h	1520°C	Large-span bridges (more than 8 units) with adapter plate. Maximum 2 large-span bridges.
9	free	free	free	free
10 Service heating	Service heating	approx. 14.5 h	1540°C	Cleaning of the oven chamber and reconstruction of the silica layer of the heating elements.
11–30	free	free	free	free

The standby screen displays the levels and heating parameters of the currently loaded heating program.

To display and configure the steps and parameters of an existing heating program, the program must first be loaded from memory.



NOTE!

To create a new heating program and save later on, first download a free program number.



Fig. 27: Load dialogue.

Heating program

First heating level:

Set heating parameters



Fig. 28: Entering the heating rate.



- Enter the program number via the numeric keypad. 2.
- 3. Press the S2 button to load or
- 4. Press the S1 button to cancel.

After confirming or cancelling the loading procedure, the load dialog disappears, and the display returns to the standby screen.

The controller enables from program 11 and higher to save heating programs with up to 4 heating steps.

To individualize a free program, proceed as follows:

- Press the **S1** button. A blinking cursor appears in the " / min" 1. column.
- Enter the heating rate via the numeric keypad. 2.



NOTE!

Acceptable values are 1°C to 30°C/min.

Once the heating rate has been entered, the cursor will automatically jump to the "I" column and flash.



3.

NOTE!

If no value is entered within approximately one minute, the standby display will automatically return. You will have to restart and repeat the entire procedure.

8/min	8	min	(54
30 30 30 40	0 0 700	0 STNDBY1 0 24° 0 MO 14:1 0 MO 14:1	
			(S1

Fig. 29: Entering the temperature.

Enter the temperature via the numeric keypad.



NOTE!

The maximum temperature is 1,650°C. Entering a high temperature terminates the procedure. You will have to restart and repeat the entire procedure.

Once the heating rate has been entered as a four-digit figure, the cursor will automatically jump to the "min" column and flash. If less than four digits were entered, press the **S1** button briefly.



4. Enter the holding time via the numeric keypad.



Note: Maximum holding time: 240 minutes.

Fig. 30: Entering the holding time.

Additional heating levels

After all three heating parameters have been defined, the settings for one heating level are complete.

The **S2** to **S4** buttons can be used to define up to three additional heating levels. To do so, repeat steps 1 to 4 for the additional levels.

Note:
 Make sure that the heating parameters for all levels that are not defined are set to "0".
 If level 4 (S4) was defined as the last heating level, a valid temperature must be entered for this level.

7.8 Saving a heating program

The controller can store up to 30 different heating programs.

0	Note:
	The controller will always save the heating program under the same number for which it had previously been loaded. Heating programs are retained even after turning off the furnace.



Fig. 31: Save dialogue.

Entering a comment

1. Press the **Save** button. The display shows the save dialogue.

- 2. Press the **S2** button to save or
- 3. Press the **S1** button to cancel.

After confirming or cancelling the save operation, the display returns to the standby screen.

To clearly identify a program, each heating program can be assigned a comment that may consist of up to 4 lines of 11 characters. This facilitates identification of the desired heating program if a large number of heating programs exists.



Fig. 32: Entering a comment.

- 1. Press the **Save** button. The display shows the save dialogue.
- Press the F button several times. The letters A, B will appear next to the cursor one after one. Once the letter Z has been reached, the next letter that appears will be the letter A again. Press a numeric key to enter a number.
- **3.** Press the **S4** button to select the desire letters. The cursor will automatically move to the next position.
- Repeat the letter and number selection process until the desired comment has been created (for example "CERCON BASE SPEED 1450 °C").
- 5. Press the S3 button for line break.
- 6. Save the heating program as described above,

7.9 Starting and stopping a heating program

S4

(\$3

(S1

To start a loaded program, proceed as follows:

1. To start the heating program, press the **Start/Stop** button. The status display will change from "READY" to "RUN".

Fig. 33: Heating sequence table.

min

RUN

MO

/min

CRYPTON



Fig. 35: Graphic display.

The flashing and lit LED in the graphic display additionally visualize the heating process:

- LED flashing: Heating in progress
- > LED lit: Temperature reached

 To stop the heating program, press the Start/Stop button again. The status display will change from "RUN" to "READY". Pressing the Start/Stop button again will restart the heating program.

7.10 Starting a heating program automatically

The built-in timer can be used to let the furnace turn on automatically in time for the currently loaded heating program to be terminated at a preset completion time.

The timer accepts weekday and time settings for program termination.

- Select a program
 (
 ⇒ subsection Loading a heating program).
- 2. Activate the timer by pressing the **Timer** button. The display changes from the standby screen to the autostart dialogue.





Fig. 35: Autostart dialogue.

Elements of the display:

	Status (AUTOST), program no. (P01)
	Furnace temperature (current)
	Weekday, time (current)
Turn-on time (automatically calculated)	Weekday, time (selected time of completion)

8/min	8	min		(54)
	1.16		AUTOST 2	(53
FR Ø	5:0	9	TH 12:01	(52
115			Then 1 2 Jun and a speed on	(S1)

Fig. 36: Selecting weekday and time

- 3. Press the **S1** button. The cursor jumps to the field where the completion time is defined.
- 4. Enter the weekday (Mon = 1, Tue = 2, ...) on the numeric keypad (for example: Friday, 06:28). Note: Use the 24-hour time format.
- 5. Enter the time (hh:mm) via the numeric keypad.

This activates and programs the timer of the high-temperature furnace. The timer will start the heating program automatically at the calculated time (Fig. for example: Friday, 05:09 a.m.).

7.11 Turning off the furnace

Turn off the furnace with the **On/Off** switch. The power indicator in the power switch will be turned off.



CAUTION!

Burn hazard caused by residual heat of the high-temperature furnace!

Even when turned off, the unit may still be very hot from a previous heating cycle. Burn hazard when touching the walls of the heating chamber, the outside of the furnace or the lifting plate!

Therefore:

Before working on the furnace, make sure that it has cooled sufficiently.



NOTE!

After switching off the furnace, the cooling fan will continues to operate until the internal temperature of the furnace is sufficiently low. Do not disconnect the power cord while the fan is

running.

8 Additional functions

8.1 Speed sintering with Cercon materials

This option facilitates sintering within only 90 minutes at heating and cooling rates of up to 70°C/min.



NOTE!

Speed-sintering programs 3 and 6 for Cercon base and ht are only suitable for bridge spans of up to 6 units.

With speed-sintering programs for Cercon materials, only the supplied speed-sintering bowls must be used. Standard bowls are not suitable for heating rates above 30°C/min.



Sintering programs 3 and 6 have been predefined for speedsintering Cercon materials.

The speed-sintering programs are suitable for single crowns and for bridges with up to six units.

Fig. 37: Speed program.

\bigcirc		
57		
	2	

NOTE!

As soon as the hot furnace opens the furnace door, the display will flash to warn the operator that the sintering bowl is hot.

The flashing ends when the oven temperature is below 280°C. At this temperature, the sintering bowls have a guaranteed maximum temperature of 105°C.

8.2 Speed Sinterprogramme erstellen

This option facilitates sintering within only 90 minutes at heating and cooling rates of up to 70°C/min.



NOTE!

With speed-sintering programs only the supplied speed-sintering bowls must be used. Standard bowls are not suitable for heating rates above 30°C/min.

8/min	8	min		(54)
70 70 70 70	750 1100 1465 0	0050	STNDBY 3 24°C TH 12:04 TH 13:59	(S3) (S2)
				((51)

Fig. 38: Speed program.

Special heating-level functions

- **S1** Heating to an intermediate temperature, with holding time.
- **S2** Heating to the sintering temperature, with holding time.
- **S3** Cooling with gradual opening of the door (in this example from 1100°C to 750°C).

Maximum selectable value: 1100°C.

S4 Door-opening temperature (in this example 750°C). Maximum selectable value: 750°C.

Programming is done as described in section 7.4.

NOTE!

0

As soon as the hot furnace opens the furnace door, the display will flash to warn the operator that the sintering bowl is hot.

The flashing ends when the oven temperature is below 280°C. At this temperature, the sintering bowls have a guaranteed maximum temperature of 105°C.

When a heating rate of between 31°C/min and 70°C/min is entered at the **S4** heating level, the controller recognizes a fast-sintering program. In this case, heating level **S3** is used to program the starting point for slow door opening. The maximum programmable temperature in this case is 1,100°C.

At level **S4**, the door is slowly opened to a maximum of 10 cm. As soon as the temperature has dropped to below 750°C, the door can be opened completely.

The maximum programmable temperature is 1650°C.



Abb. 39: Speed Programm

Sintering programs 4 and 7 have been pre-programmed as fastcooling programs for single crowns and bridges with up to eight units made of Cercon base and ht.

The sintering programs for Cercon base and ht include an optimized dedicated cooling phase.

This allows the sintering process for single crowns and for bridges with up to eight units to approximately 5 hours

NOTE!

As soon as the hot furnace opens the furnace door, the display will flash to warn the operator that the sintering bowl is hot.

The flashing ends when the oven temperature is below 280°C. At this temperature, the sintering bowls have a guaranteed maximum temperature of 105°C.

9 Troubleshooting

The following section describes possible causes of problems and potential remedies.

If troubleshooting following these instructions is not successful, contact the manufacturer (⇒ *Service address, page 4*).

9.1 Safety

Staff

- Unless otherwise stated, the troubleshooting procedures described can be performed by the operator.
- Some work may be performed only by qualified personnel or exclusively by the manufacturer. See the description of the individual malfunctions indicated.
- > All work on the electric system must be carried out by a qualified electrician.

Personal protective equipment

NOTE!

Make sure to heed the cautionary statements of this chapter regarding protective equipment to be worn during certain procedures.

Electrical installation



Electric current is a life hazard!

Contact with live components can be a life hazard. Therefore:

Prior to any work, switch off the unit's power supply and disconnect the mains cable.



CAUTION!

Burn hazard caused by residual heat of the furnace!

Even when turned off, the unit may still be very hot from a previous heating cycle. Burn hazard when touching the walls of the heating chamber or the lifting plate!

Therefore:

Before working on the furnace, make sure that it has cooled sufficiently. The furnace requires at least 12 hours to cool from maximum temperature to approximately room temperature.

9.2 Troubleshooting messages

Displayed

In the event of a controller error, the display will show an error message in plain text. These messages are listed in the following table.

9.3 Table of troubleshooting messages

Problem	Possible cause	Potential remedies	Cleared by
Incorrect time	Incorrect time saved in the controller.	Set the correct time (⇔ section <i>Commissioning</i>).	Operator
Oven does not start automatically	Power failure or interruption.	Check the mains connection for proper function. If necessary, contact a qualified electrician.	
No display, power indicator is lit, level LEDs not lit when turning on the unit	Defective protective fuse.	Turn off the unit, wait 10 seconds, then turn the unit back on. If the problem recurs, contact a service technician.	
No display, power indicator is not lit	Unit has no power.	Check sites fuses and mains cable. If necessary, contact a qualified electrician.	Operator
Display shows "Safety Shutdown"	Oven temperature is above 1,650°C.	Turn off the furnace and allow to cool. If the problem recurs, contact a service technician.	
Door panel exhibits broken bits or other damage	Door panel has been handled improperly.	Replace door panel.	
Display shows "Sensor + <-> -"	Oven interior is noticeably cooler than room temperature.	Oven door open to allow chamber interior to warm to room temperature.	
	Incorrect polarity/connection of heating element	Adjust polarity/connection of the heating element.	Qualified electrician,
Display shows "Sensor	Defective heat sensor.	Replace heat sensor.	service technician
defective	Heat sensor connections are loose.	Tighten heat sensor connections.	
Heating programs and time are not saved permanently	Controller defective.	Replace controller.	
No display, power indicator is lit, level LEDs lit briefly when turning on the unit	Defective display.	Replace controller.	
Level LED flashes, but furnace does not heat.	Defective heater.	Check heater for proper heat production. Replace heating chamber.	
Furnace trips building- side RCD	Defective heater.	Check heater for proper heat production. Replace heating chamber.	

Problem	Possible cause	Potential remedies	Cleared by
	RCD too sensitive.	Install 30-mA RCDs.	
Display shows "Door open" even though furnace door is closed (lifting plate is up)	Terminal position switch stuck or broken.	Visual inspection, Contact service technician.	Service technician

9.4 System information used in troubleshooting

> To be performed by operator

Controller hardware or software problems require assistance by our service technician (\Rightarrow *Table of troubleshooting messages, page 39*).

Please provide the following system information to the service technician for troubleshooting:

- Serial number
- Hardware version
- Software version

View system information as follows:

- Turn on the furnace with the On/Off switch. Values and/or texts will appear on the display for about 3 seconds.
- 2. Record this information and notify the service technician.

10 Maintenance and cleaning

10.1 Safety

Staff

The maintenance operations described here can be performed by the operator. \geq

Residual heat



10.2 Maintenance schedule

The following sections describe maintenance procedures required for proper and trouble-free operation.

For all questions regarding maintenance and maintenance intervals, please contact the manufacturer (⇒ service address, page 4).

Interval	Maintenance item	Performed by
Daily, as needed	Clean heating chamber and lifting plate	Operator

10.3 Maintenance

10.3.1 Clean heating chamber and lifting plate

Keep the heating chamber and lifting plate clean. Remove ashes and debris regularly with a soft brush. \triangleright

10.4 Cleaning

Clean the surfaces of the unit with a damp – not wet – cloth.

Dust and dirt on the door's insulating bricks and the NEM guard can be carefully removed with a brush.

11 Dismantling and disposal

At the end of the unit's service life, dismantle the unit and dispose of properly.

11.1 Safety

Staff

> The dismantling operations described here can be performed by the operator.

Residual heat

CAUTI Burn h furnac	AUTION! urn hazard caused by residual heat of the high-temperature ırnace!		
Even when turned off, the unit may still be very hot from a previous heating cycle. Burn hazard when touching the walls of the heating chamber or the lifting plate!			
Therefore:			
> B s m	efore working on the furnace, make sure that it has cooled ufficiently. The furnace requires at least 12 hours to cool from naximum temperature to approximately room temperature.		

11.2 Dismantling

To dismantle the high-temperature furnace:

> Turn off the furnace and disconnect from mains.

11.3 Disposal

This device is an electrical device pursuant to the German law on the marketing, return and environmentally compatible disposal of electrical and electronic equipment (ElektroG). The device has been labelled in compliance with the law and marked with the following symbol:



The device is not intended for private or home use. It has been produced and furnished for commercial use and must be disposed of properly by the last user pursuant to the ElektroG.

12 EC Declaration of Conformity

DeguDent GmbH Rodenbacher Chaussee 4 63457 Hanau Germany

We hereby declare that the sintering furnace

Multimat2Sinter

conforms with the basic requirements of the following EC Directives:

- 1. Directive 2011/65/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
- 2. Directive 2002/96/EC on waste electrical and electronic equipment (WEEE)
- 3. Directive 2006/42/EC (machine directive)
- 4. Directive 2006/42/EC (low-voltage directive)
- 5. Directive 89/336/EEC (electromagnetic compatibility directive)

The following harmonized standards were applied: DIN EN 61010-1: 2002-08 DIN EN 61010-2-010: 2004-06 DIN EN 61326-1: 2006-10

Hanau, 27.02.2013

Udo flas

Dr Udo Schusser Director, Research and Development

Hanau, 27.02.2013

Dr Bernhard Kraus Director, Quality Management



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