

Operating instruction

Rotary Tube Furnaces

DiaHeat-R



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1 **General description**

The Rotary Tube Furnaces is designed for heat treatment of industrial diamonds. In the quartz glass tube, which rotates about its longitudinal axis during the cleaning process, the industrial diamonds are heated up to 1000°C and thus cleaned. The rotation here has both a transport and an air supply and cleaning effect. The material is controlled supplied at the upper end. The particles passes slowly through the rotary movement the tube to the exit.

The control of the Rotary Tube Furnaces is realized with a separate temperature controller and a tablet PC. Then is a stable operating temperature and an accurate timing process warranted. The continuous material feed is via an electronically controlled vibrating conveyor with laser light barrier.

The rotary kiln can operate in manual or automatic mode.

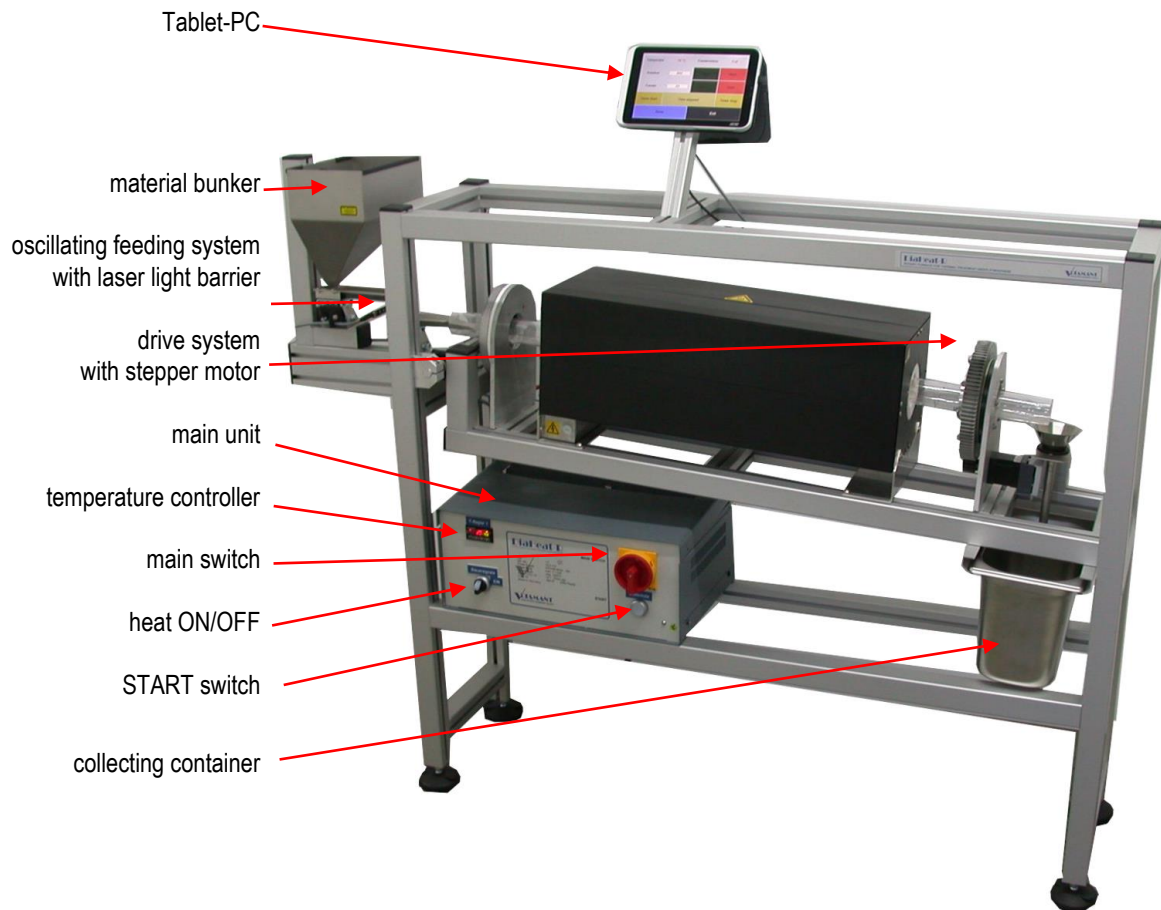
In manual operation, all parameters can be set freely. This mode is used to define the parameters for different products. With the Tablet PC, the parameters of different materials can be stored in corresponding product definitions list. These consist of a combination of feed rate, rotation, temperature and the permissible temperature deviation. The speed of the tube and the size or shape of the particles to be cleaned influence their average length of stay in the heated zone.

Product definitions can be easily created and then used in automatic mode.

In automatic mode, the parameters from a product list are used to ensure automatic operation. After reaching the set temperature, the feed and rotation is started automatically. Temperature fluctuations outside the operating range are indicated to the operator on the tablet PC display.

2 Main Components

The principal components of the Rotary Tube Furnaces DiaHeat-R are:



The target temperature of the furnace is set at the furnace control unit. All other functions of the system are controlled by the Tablet PC. There are no additional controls or adjustments. This guarantees a comfortable operation and above all a stable function.

3 Installation

3.1 General

Attention:

This device must be operated and maintained only by instructed persons.

Do not start the system until you have read the operating instructions and especially the safety regulations carefully.

3.2 Electrical Connections

The Rotary Tube Furnaces DiaHeat-R has only to connect with a correctly installed wall outlet with a protective grounding conductor (PE). Never change the protective action by a cable without a protective grounding conductor. Please produce by a proven expert an equivalent protection in accordance with the relevant installation regulations when power is supplied from power grids without earth connection.

Power supply: 230 V/ 50Hz , 16 A

3.3 Location

To proper operation of the *DiaHeat-R* please choose the location so that the following environmental conditions are fulfilled:

- Temperature: +18 ... +35 °C
- Permissible relative humidity: 25 to 85 %, (not condensing)
- Free from excessive changes of temperature and humidity
- Solid non-combustible base
- Sufficient room in front, back, sides and over the system

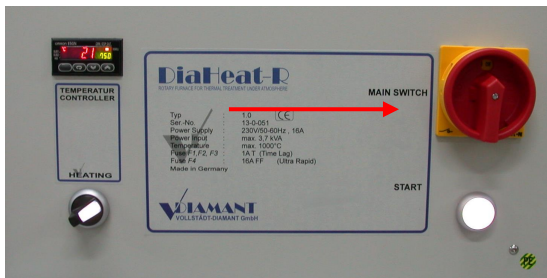
The equipment has four rotary feet for levelling uneven areas and highs.

Do not use the device for extended periods of high humidity. Avoid condensing humidity on the device. Let very cold systems at first acclimate at room temperature (about +20°C)- disconnected from the mains supply.

4 Handling

4.1 Switch ON

On the front of the main unit you find the main power switch. Set this switch to “ON”. This activates the power supply to the main unit and tablet PC. Press the **Power On** button on the Tablet PC and turn it on.



main power switch

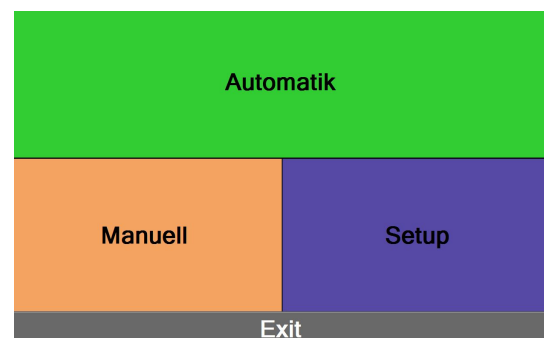


Power On

If the tablet PC is active, the settings are loaded and the operating program starts automatically.



load settings



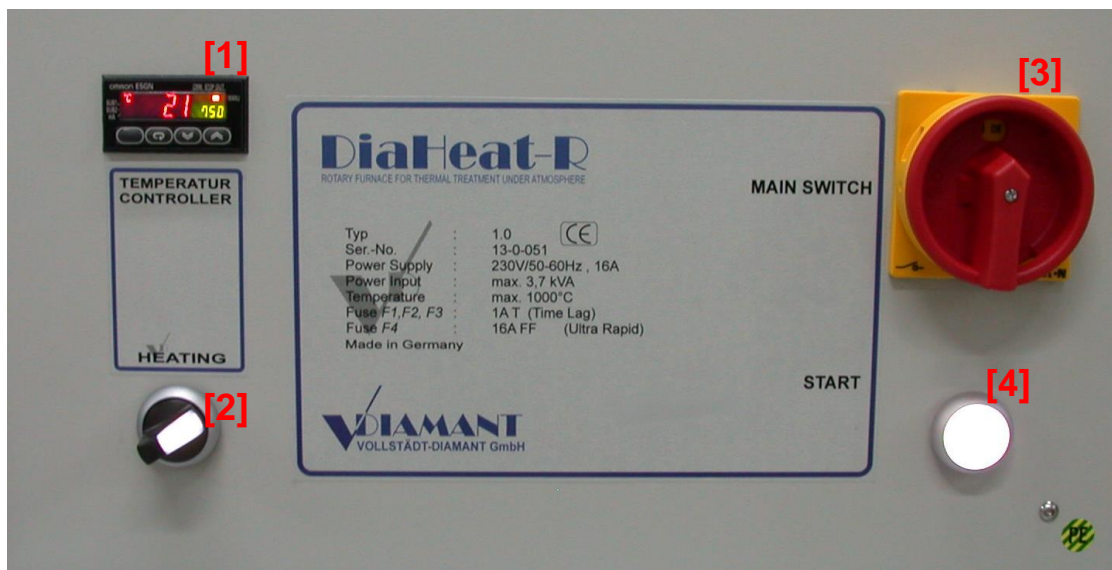
Start - screen

The other control operations are realized via buttons on the touch panel and the temperature controller at the main unit.

4.2 Operating off he main unit

At the front panel of the control unit you will find the following elements:

- [1] **temperature controller** OMRON E5GN;
- [2] **heating**
- [3] **main switch**
- [4] **start switch**



front panel of the control unit

The „**main switch**“ [3] switch on the control unit On or Off (Position „ON“ ore. Position „OFF“).

The switch „**HEATING**“ [2] blocks the heating voltage in the "OFF" position. Only in the "ON" position is the heating voltage of the heater released. The switch is used to carry out programming tasks on the temperature controller without an immediate reaction of the heater.

The heating is switched to the heating voltage via the " **START** " [4] button.

4.2.1 Setpoint temperature setting at OMRON E5GN or E5GC



-Taste

Operating mode button

this button is pressed, the **setpoint** is increased by one. Holding down the button accelerates the increase.

-Taste

this button is pressed, the **setpoint** is reduced by one Holding down the button accelerates the increase.

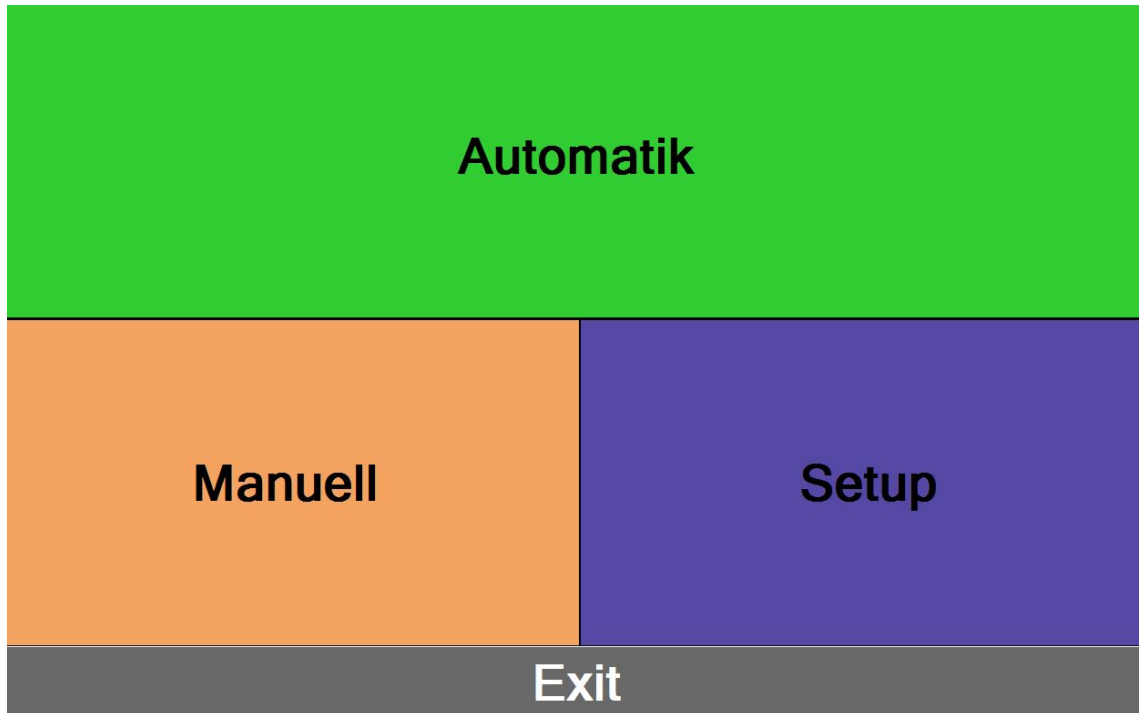
-Taste

Set the setpoint temperature on the OMRON controller

Use the down / up keys to set the setpoint!

4.3 Operating of the tablet -PC

4.3.1 start screen



Automatik

Start menu *Automatic*

Manuell

Start menu *Manuell*

Setup

Device parameters only for manufacturer's service engineer. Please do not use this page!

Exit

Exit - switch

Please use the button for switch off the system

4.3.2 Menü Manuell

Temperatur	17 °C	Feederstatus	Full
Rotation	<input type="text" value="642"/>	Apply	Start
Feeder	<input type="text" value="23"/>	Apply	Start
Timer Start	Time elapsed		Timer Stop
Load	Save		Exit

Temperatur	actual temperature display
Feederstatus	status of material flow (<i>full or empty</i>)
Rotation	actual rotary of the device Rotation der Anlage
Feeder	actual material flow
Time	<i>stopwatch</i> <i>Starts and stops a separate stopwatch</i>
Load	<i>product definition</i> <i>Opens and loads parameters of existing product definitions</i>
Save	saves the actual parameters as a product
EXIT	Back <i>Back to the Start screen</i>

rotary and material flow

Rotation

Feeder

+	+	+	+
0	8	4	2
-	-	-	-
OK			

Press for change the respective parameter

OK saves the current parameter

Apply Start

Apply Start

Apply Stop

Apply activates the parameter

Start starts feeding or rotation

Stop stops the feed or rotation

Save Produkt

Save

saves the product definition

Add Product Definition:

Product Name:

Rotation:

Feeder:

Temperature:


Temperature difference:

OK Cancel

OK

OK Saves the current parameter under the individual product name.

4.3.3 Menu Automatic

Product	TEST --D251			
T-max	756	Rotation set	985	
Temperatur	15 °C	Feederstatus	Full	
T-min	746	Feeder set	58	
Timer Start	Time elapsed	Timer Stop	Exit	

Product	Product description
Temperatur	Temperature display <i>Displays the current temperature and temperature Maximum permissible values</i>
Rotation set	rotation value of the system
Feederstatus	status of material flow <i>(full or empty)</i>
Feeder set	feed rate of the system
Time	stopwatch <i>Starts and stops a separate stopwatch</i>
EXIT	Back <i>Back to the Start screen</i>

4.4 Switch off

For switch off the system please use the button **EXIT** on the start screen of the tablet PC.



switch off - screen

The system can then be switched off completely with the main switch.

5 Maintenance- Cleaning

Keep the machine clean, especially the material bunker and collection container. All metallic surfaces can be cleaned with alcohol.

Care must be taken that elevated temperatures are to be expected when the quartz glass tube is cleaned. If possible, the tube should be cleaned with a brush or with dry, oil-free air in the cooled state. The tube must not be used with bare fingers, since hand welding is very aggressive against quartz glass recrystallization (*recrystallization and clouding*). Clean the quartz glass tube with non-alkaline detergents. Slight greasy contaminants can be removed with isopropanol. Denatured alcohol is not suitable for cleaning, as this residue forms.



Quartz glass should only be touched with gloves.

Please use for cleaning of the tablet PC special Flatscreen cleaner. Never use water!
Turn off the machine before cleaning always at the main switch.

6 Quartz glass lifetime

Any contamination of the quartz glass tube will adversely affect at his lifetime. The recrystallization strongly favored by impurities leads to the destruction of the tube. Every 800 operating hours, the quartz glass tube should be removed and inspected for defective ones.



If the recrystallization is strongly pronounced, the quartz glass tube must be exchanged!

The operating hours can be read in the Setup menu.

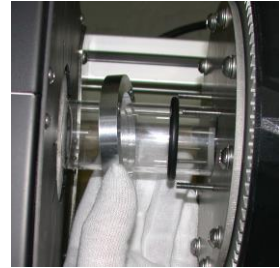
After replacing the quartz glass tube, the operating hours must be set to 0:00.

```
TempMinimumForCounting 400
TimeAtHighTemperature 23:18:09
```

7 Exchange quartz glass tube

The furnace must be completely cooled down!

The quartz glass may only be touched with cotton gloves! New tube must be cleaned with isopropyl before use. To change, remove the four fastening screws on the clamping ring and pull out the old glass tube. The new quartz glass tubes are carefully inserted into the opening and fixed with the clamping ring and o-ring.



8 Operating errors

Replace defective fuses with ones of the specified type and rating.

Changing the thermocouple:

- Remove the thermocouple cable and loosen the fastening screw;
- Pull out the thermocouple;
- Turn the new thermocouple to the right (attention: bend radius > 5 mm).
- Fasten with screw and connect cable.

Error	Reason
furnace is not warm	<ul style="list-style-type: none"> • Do not connect the any plug to the control unit • Heating conductor is interrupted • Fuse defective • Loadbreaking relay not switched on, lamp does not light up • switch „HEATING“ [2] set to "OFF" • Temperature control does not output a control signal • The lamp in the control signal lamp does not flash
Regler zeigt „E.rrr“	<ul style="list-style-type: none"> • The thermocouple connector is not connected to the control unit • thermocouple defective

9 Consumables and spare parts

- thermocouple type K Ø 3,0 mm, l = 150 mm
- heating block
- quartz glass tube PN Ø 40/36 mm, l = 1000 mm
- fuse - 1 A Typ T
- fuse - 16 A Typ FF

10 Safety instructions

Please study, understand and follow all instructions in this instruction manual before operating! Also observe all safety and accident prevention regulations.

Find out about the dangers arising from the high-temperature furnace

Regularly check compliance with all protective measures.



Attention!

- **Never cover up or hang objects over the furnace.**
- **Never put cold (not preheated) objects directly into the hot zone.**
- **The manufacturer is not responsible for the results of improper handling.**

Remarks:

Alarm temperature is set to 1130°C in the temperature controller! A pending alarm switches off the heating power. Heating power will be enabled again by manually pressing the START button.

The temperature controller is already configured and optimised for the actual heating block. Vollstaedt-Diamant will be not responsible for any malfunction or damages due to the re-programming or re-configuring of the temperature controller.

10.1 Intended use

The high temperature furnace:

- may only be used for commercial purposes;
- may only be heated to the specified maximum temperature;
- may only be operated with the media specified in the operating instructions;
- must not be used in potentially explosive atmospheres.

The control only be operated up to the maximum power indicated!

10.2 Personnel requirements

It is the responsibility of the operator to ensure that only qualified personnel perform the installation and maintenance of the system.

Persons who operate the DiaHeat-R have be instructed by qualified personnel and have to read the manual.

All persons who operate the DiaHeat-R or working within the vicinity of the system, will advised of the safety instructions and procedures for emergencies.

10.3 Operator's obligations

The operator has to identify the additional risks, which can arise on site, and create a risk analysis for the nearby area. The location of the high-temperature compartment must be selected in such a way that no combustible objects, liquids or gases can come into contact with the hot surfaces of the furnace. In this case, all temperatures are considered to be near or greater than the ignition temperature of the relevant substance. The high-temperature furnace may only be placed on a fire-proof floor. The hightemperature furnace must not be used in potentially explosive atmospheres.



10.4 Risk of human injury

Risk of burns

The walls of the furnace and, where applicable, quartz glass tubes and attachments protruding from the furnace must not be touched during operation and during the cooling phase. Despite good insulation and cooling measures, the temperature can be above 150 ° C in some places.



Attention, risk of burning!

Danger from electric current

Non-compliance can result in personal injury, death, or damages to materials. Disconnect the supply voltage before assembly/ disassembly and replacing fuses from the power supply. Protective conductor connections need to be checked periodically for proper functioning.



Changes to the electrical parts of the system (thermocouples, connection cables etc.) may only be carried out if the system is disconnected from the mains. At high temperatures, leakage currents are possible for physical reasons.

Risk of eye injury

Do not look into the laser! Laser protection regulations: Transmitter corresponds to laser class 1 according to EN60825-1: 2003-10. Therefore, no additional protective measures are required during the process.



10.5 Operating errors which can lead to damage or destruction

Thermocouples

It is important to ensure that the correct thermocouple type (see technical data) has been configured in the controller, as this may lead to overheating of the high-temperature furnace.

quartz glass tube

The working tube is very fragile. Everyone working on the oven is extremely careful. Risk of breakage!

10.6 Correct reaction in dangerous situations

Abnormal function of the system

Please stop immediately the system by danger of personal injury. Switch the main switch on the main unit to OFF.



fire

If control of the system is still available, switch off. Follow the local safety regulations.



11 Setup - Parameter

Auto Shutdown	false
AveragingSpan	10
BautRateMEGA	57600
BautRatePAN	9600
MotorSteps	200
PANaccel	100
PANaddress	1
PANmaxCurrent	300
PANMicroSePs	6
PANpulseDivisor	4
PathForData	C:\DiaHeat-R\
PathForSettings	C:\DiaHeat-R\
ProducttDefinitonFile	OfenSettings.xml
SerialPortMEGA	4
SerialPortPAN	3
TempMinimumForCouting	400
TimeAtHighTemperatur	00:00

12 Technical data

Furnace

Dimensions (lxwxh)	:	approx. 1500x1350x350 mm
Weight	:	approx. 50 kg

Heater

Power supply	:	230V/50Hz
Length of the heated zone	:	500 mm
Interior diameter	:	50 + 1 mm
Weight	:	approx. 14 kg
Heating wire body	:	KVS 126, Microtherm
Heating wire	:	Kanthal A1
diameter	:	1,2 mm
resistance	:	30,0 ± 1 Ω
Heating current	:	7.9 A (max.)
Heating power	:	1.82kVA (max.)
Max. temperature	:	1100°C
Continuous working temperature	:	1000°C
Thermocouples	:	Typ K
Max. heat-up rate	:	10 K/min.
Safety Class	:	Class I
Protection class	:	IP00

Heater- Control

Power supply	:	230/50Hz
Max. current	:	16 A (max.)
Max. power	:	3,68 kVA (max.)
Power Controller	:	solid-state relays SSR
Temperatur controller	:	OMRON E5GN or E5GC
Fuse F1,F2, F3	:	1A T (Time Lag)
Fuse F4	:	16A FF (Ultra Rapid)
Safety Class	:	Class I
Protection class	:	IP30

Tablet PC

Acer Iconia W3-810

Electrical connection : 12VDC
Operating system : Windows 8.1
Software : DiaHeat-R Vers.
Display : 8,1 Zoll

quartz glass tube

length : 1000 mm
Interior diameter : 36 ± 1 mm
outer diameter : 40 ± 1 mm
glass type : ilmasil PN

collecting container

Quantity : 1
Volume : 7500ml
Material : V2A

Made by : **Vollstaedt-Diamant GmbH**
Kiefernweg 7
D-14554 Seddiner See, Germany
Tel: +49-33205-74620, Fax: +49-33205-74621
email: service@vdiamant.de, web: www.vdiamant.de

