

GB

USA

Vacuum Drying Oven
VT 6025

Operating Instructions



Below is a list of the international Thermo marketing organizations.

Postal address Germany

Thermo Electron LED GmbH
D – 63505 Langenselbold
Robert-Bosch-Straße 1

Enquiries from Germany

Telefon

Vertrieb 0800 1 536376

Service 0800 1 112110

Fax

Vertrieb/Service 0800 1 112114

E-Mail

info.labequipment.de@thermo.com

**Enquiries from Europe, Middle East
and Africa**

Tel. + 49(0) 6184 / 90-6940

Fax + 49(0) 6184 / 90-6772

E-Mail

info.labequipment.de@thermo.com

Postal address USA

Thermo Electron Corporation.
275 Aiken Road
Asheville, NC 28804
USA

Enquiries from North America

Phone + 1 800-879 7767

Fax + 1 828-658 0363

E-Mail

info.labequipment@thermo.com

Enquiries from Latin America

Phone + 1 828-658 2711

Fax + 1 828-645 9466

E-Mail

info.labequipment@thermo.com

Enquiries from Asia Pacific

Phone + 1 852-2711 3910

Fax + 1 852-2711 3858

E-Mail

info.labequipment@thermo.com

Internet: www.thermo.com

Thermo Electron LED GmbH, 63505 Langenselbold, Germany

If translated versions of this manual are used, the German version is the authoritative basis.

Digicon® and Kelvitron® are registered trademarks of Thermo Electron LED GmbH.

Subject to technical modifications.



The safety concerning the protection of persons, environment and material to be treated mainly depends on the behaviour of the operating personnel of these units.

Please read and observe the following instructions carefully before starting the unit in order to avoid faults and resulting damage, especially adverse health effects.

Information according EN 61010

WARNING NOTES

- Caution: General hazard area!



- Caution: Hot surface!



AMBIENT OPERATING CONDITIONS

- For indoor use only
- For altitudes up to 2000 m above sea level
- Temperature range from 5 °C to 40 °C
- Maximum relative humidity: 80 %, for temperatures up to 31 °C, decreasing linearly to 50 % relative humidity at 40 °C
- Main power supply: Voltage fluctuations not to exceed +/- 10 % of the nominal value

ELEKTRICAL DATA

- Overvoltage category: II
- Contamination level: 2

This instruction manual applies for models equipped as follows:			
Order no.	Type	Equipment	Rated voltage
50 014 550	VT 6025	Vacuum drying cabinet with microprocessor controlled temperature control and temperature selection limiter.	1/PE AC, 230 V 50/60 Hz
50 014 551	VT 6025	Vacuum drying cabinet with microprocessor controlled temperature control and temperature selection limiter.	1/PE AC, 120 V 50/60 Hz
50 014 552	VT 6025	...with ball valve, inert gas connection, internally welded inner compartment and NB 25 measuring connection	1/PE AC, 230 V 50/60 Hz
50 014 553	VT 6025	...with ball valve, inert gas connection, internally welded inner compartment and NB 25 measuring connection and digital pressure display with plotter connection	1/PE AC, 230 V 50/60 Hz
50 014 554	VT 6025	...with ball valve, inert gas connection, internally welded inner compartment and NB 25 measuring connection and digital pressure display with plotter connection and Digicon with analogue interface 0-20 mA/0-10 V.	1/PE AC, 230 V 50/60 Hz

WEEE Compliance:

This product is required to comply with the European Union`s Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the following symbol:



Thermo Electron has contracted with one or more recycling/disposal companies in each EU Member State, and this product should be disposed of or recycled through them. Further information on Thermo Electron`s compliance with these Directives, the recyclers in your country, and information on Thermo Electron products which may assist the detection of substances subject to the RoHS Directive are available at www.thermo.com/WEEERoHS.

CONTENTS	PAGE
1. NOTES ON SAFE OPERATION	4 - 6
1.1 Key to symbols	4
1.2 General information	5
1.3 Notes on these operating instructions	5
1.4 Log book	5
1.5 Safety notes	5
2. APPLICATION AREA	7
3. DESCRIPTION OF THE UNIT	9 - 23
3.1 Equipment	8
3.2 Safety facilities	9
3.2.1 Implosion protection facility for unit door	9
3.2.2 Excess temperature protection facility	9
3.2.3 Extra-low safety voltage, PE connection	9
3.2.4 Safety valve (for optional inert gas connection)	10
3.3 Equipment variations	10
3.4 Accessories	10
3.5 Control panel	11
3.5.1 Mains switch	11
3.5.2 Excess temperature protector	12
3.5.3.1 Kelvitron® temperature control	13
3.5.3.2 Digicon® temperature control	14
3.5.4 Gas metering valve	15
3.5.5 Ventilation valve	15
3.5.6 Vacuum shut-off valve	15
3.5.7 Pressure display	15
4. SETTING UP AND INSTALLATION	16 - 19
4.1 Transport	16
4.2 Unpacking	16
4.3 Setting up	16
4.4 Distances from adjacent surfaces and other equipment	16
4.5 Installation under a table	17
4.6 Electrical connection	17
4.7 Silencing	17
4.8 Site ventilation	17
4.9 Inert gas connection	18
4.10 Connecting the vacuum system	18
4.11 Connection to site ventilation systems	18
4.12 Inserting the shelves	19
5. OPERATION	20 - 22
5.1 Commissioning	20
5.2 Operating Guidelines	21
5.3 Shutdown	22
6. MAINTENANCE	23 - 24
6.1 Maintenance and cleaning	23
6.1.1 Adjusting the unit door	23
6.1.2 Replacing the door seal	23
6.1.3 Maintenance checks	23
6.2 Repairs	24
6.2.1 Replacing electrical components	24
6.2.2 Approved spare parts and accessories	24
6.2.3 Assembling the safety valve	24
7. TECHNICAL DATA	25 - 26
8. CONSTRUCTION MATERIALS	27
Log book	28

1. NOTES ON SAFE OPERATION



When using these drying cabinets, safety in relation to persons, the environment and the substances processed essentially depends on whether the persons working on the unit are working in accordance with the instructions.

Before installing and commissioning the unit, read through the operating instructions conscientiously and pay attention to the information in them, thus avoiding errors and resulting damage, in particular damage to the health.

1.1 KEY TO SYMBOLS

Symbol	Meaning
	Chapters and sections in the operating instructions concerned with maintaining safety standards are marked with this symbol. Use of this caution symbol on the unit indicates that it is extremely important to observe the operating instructions.
	Information provided in the operating instructions for optimum use of the unit.
O	Unit OFF
I	Unit ON
	Excess temperature protector, temperature selection limiter
	Unlock excess temperature protector
°C	Temperature regulator
	Ventilation valve
	Vacuum shut-off valve
	closed
	open
	Fine metering valve for inert gas inlet

1.2 GENERAL INFORMATION

The unit fulfills the safety requirements of:

DIN 12 880 Part 1 / 11.78, DIN VDE 0700 Part 1 / 04.88, DIN VDE 0875 Part 11 / 07.92

The laboratory oven and vacuum drying cabinet has also been safety tested by the VDE testing and certification institute (Association of German Electrical Engineers). The unit has also been approved to carry the GS safety-tested symbol (see appendix).



Specify the rating plate data when making enquiries and when ordering spare parts.

These operating instructions may contain information about standard equipment (options) which is not necessarily fitted in the version of the appliance you have selected.



1.3 NOTES ON THESE OPERATING INSTRUCTIONS

For work on and with the unit, the user must draw up intelligible written instructions based on these operating instructions and on the activities to be carried out and must make them known in the language used by the employees (FRG: UVV VBG 1 § 7 (2)).

1.4 LOG BOOK

We recommend keeping a log book for the unit.

Tests, calibration of the unit and all essential activities (repair activities, modifications ...) must be documented in this log book (see appendix for suggested layout).



1.5 SAFETY NOTES

When using this laboratory oven, safety in relation to persons, the environment and the substances processed essentially depends on whether the **persons working on the unit** are working **in accordance with the instructions**.

Before commissioning the unit, the operating instructions must be read through carefully and all instructions must be followed closely in order to prevent errors and any ensuing damage, in particular damage to the health.

In addition to these operating instructions, the nationally **valid laws, regulations and guidelines must be observed** in relation to setting up and operation (e.g., in Germany.: ZH 1/ 119, DIN 12 880 Part 1, technical connection requirements of the electricity supply company, etc.).

For work on and with the unit, **the user must draw up intelligible written instructions based on these operating instructions** and on the activities to be carried out and must **make them known** in the language used by the employees (FRG: UVV VBG 1 § 7 (2)).
The unit **must not** be used for heating food.

The unit **must not** be used for drying or heat-treating substances which release combustible gases and vapours, which burn in combination with air or which are capable of forming a hazardous explosive mixture. Nor is the oven suitable for the heat treatment of hazardous dusts and fibres.

For maintenance of the temperature protection function, the **excess temperature protection facility** should be tested at least every quarter to ensure that it is functioning properly, and its electronics also **tested** at least once a year.

Any **waste gases** produced during heat treatment must be **expelled from the unit** in a safe manner. The nationally valid environmental protection regulations and measures must be observed (FRG: BImSchG, UVPG, AbfG, WHG, Chem G, ...).

The mains connection cable and connector must be **checked** for damage prior to use. If any damage is found, the unit must not be connected to the mains supply.

The voltage specified on the rating plate must agree with the rated voltage of the mains.

Work on the unit's electrical equipment may only be carried out by Thermo Customer Service or by Thermo-approved specialists, and in a safe state (voltage deenergised, mains plug removed).

Only approved original spare parts may be used. The use of other parts involves unknown risks and must be refrained from in all cases.

The function and safety of the unit is only guaranteed if all necessary checks, maintenance and repair work is carried out by Thermo Customer service or by personnel authorised by Thermo Electron LED GmbH.

Thermo Electron LED GmbH **cannot be held liable** for damage resulting from incorrect repairs that have not been carried out by Thermo service agencies or whenever parts have been replaced using parts that were not ORIGINAL SPARE PARTS OR ACCESSORIES.

2. APPLICATION AREA

The vacuum drying cabinet is an item of laboratory equipment for applications requiring heating and vacuum conditions:

- Inner volume approx. 25 l
- Operating temperatures up to 200 °C
- Vacuum of up to 0.01 mbar possible

The unit can generally be set up and used in the following areas:

- Laboratories, e.g., in businesses, schools, universities, hospitals and for industrial and biotechnical operations

Used for:

- Heat treatment in a reduced or modified atmosphere
- Drying heat-sensitive products particularly carefully
- Drying products with a complicated structure, e.g. cavities, undercutting and capillary vessels

The oven is equipped with an "over temperature cut out" for independent excess temperature protection, so that the unit can also be used without constant supervision.

The unit is designed for continuous operation.

To avoid uneven heating of the goods in the oven, ensure that a sufficient distance is maintained between them and the inner sides of the oven.

Personal protection measures must be taken, such as wearing gloves, protective goggles, etc.



The unit must not be used:

- for heating food.
 - for drying or heat-treating substances which release combustible gases and vapours, which burn in combination with air or which are capable of forming a hazardous explosive mixture. Nor is the oven suitable for the heat treatment of hazardous dusts and fibres.
-
-

Should you have any queries about correct operation of the unit, please do not hesitate to contact Thermo Electron LED GmbH.

3. DESCRIPTION OF THE UNIT

3.1 EQUIPMENT

These operating instructions may contain information about standard equipment (options) which is not necessarily fitted in the version of the appliance you have selected.

The unit is essentially made up of the housing, the oven compartment and the switching and control unit.

The oven compartment is formed by the inner container. The heating system is fitted around the outside of the inner container.

The vacuum drying cabinet is suitable for operating temperatures of up to 200 °C and a final vacuum of 0.01 mbar.

The unit is fitted with thermal insulation, guaranteeing excellent thermal insulation and temperature/time parameters.

The inner compartment is closed with a door, which has a window and integrated implosion protection.

The operational controls for the electrical equipment are arranged on the control panel of the switching and control unit.

The unit is designed as a plug-in appliance with a permanent connection lead. Protection against electric shocks is provided by the PE connection (protective class I).

The laboratory dryer is fitted with radio interference suppression.

The temperature is controlled by an electronic temperature control system with sensor-breakage recognition and the temperature measured by a Pt 100 temperature sensor. The heating power is regulated by the control unit using a power semi-conductor.

Because the unit is fitted with a temperature selection limiter, thermal operation is possible without constant supervision. Vacuum operation must be supervised.



3.2 SAFETY FACILITIES

Safety facilities fitted on the unit:

- Operator Protection
- Protection of the environment against fire
- Thermal protection of goods in the oven during normal operation and in the event of failure
- Protection against implosion
- Protection against excess pressure during inert gas operation (optional extra)

3.2.1 IMPLOSION PROTECTION FACILITY FOR UNIT DOOR

The implosion protection facility is integrated in the door. In the event that the heavy sealing plate implodes, which may occur in the event of failure during vacuum operation, the protection facility prevents splinters of this silicate glass panel being ejected from the interior of the unit into the surrounding area.

The effectiveness of the implosion protection facility was tested during the examination of the unit for GS quality symbol approval.

3.2.2 EXCESS TEMPERATURE PROTECTION FACILITY

An over temperature cut out (TWB) of temperature safety class 2 in accordance with DIN 12 880 Part 1 / 11.78 is fitted as an excess temperature protection facility. It is electrically separated from the temperature control system and functions independently of it.

When the TWB is operative, it switches off the unit's heating system at all pins if the temperature set for the TWB is exceeded. The red "failure" pilot light registers that the TWB has been activated. The device is deactivated manually (with a key) once the unit has cooled down. The activation temperature is set with a tool (e.g., coin, screwdriver...).



For maintenance of the temperature protection function, the excess temperature protection facility should be tested at least every quarter to ensure that it is functioning properly, and its electronics also tested at least once a year.

For performance test, adjustment and further information, please refer to "Excess temperature protector" in the "Control panel" section.

Because the unit is fitted with an over temperature cut out, thermal operation is possible without constant supervision.

3.2.3 EXTRA-LOW SAFETY VOLTAGE, PE CONNECTION

The measuring and pilot circuits of the control and monitoring system, which are electrically connected to the inner area of the unit, are safely isolated from the mains supply (SELV). This means that protection is provided against electric shocks even when the door is open and the regulator switched on.

Protection of the entire unit against electric shock is guaranteed by the "PE connection" (protective class I).

3.2.4 SAFETY VALVE (FOR OPTIONAL INERT GAS CONNECTION) ¹⁾

If the unit is fitted with an inert gas connection, it also has a safety valve. This prevents excess pressure building up in the system during operation with inert gas (activating pressure ≤ 0.1 bar). The valve is fitted on a small flange (NB 25) at the back of the unit.



The safety valve must be tested within the specified testing and maintenance intervals, and at least once a year.

¹⁾ For construction and further information, please refer to the "Maintenance" section

3.3 EQUIPMENT VARIATIONS

■ INERT GAS CONNECTION

(For description please refer to the CONTROL PANEL and SETTING UP AND INSTALLATION sections)

The unit is fitted with a suitable connection so that it can be operated with an inert gas atmosphere in the inner compartment.



The gases released during operation with inert gases must be expelled from the unit in a safe manner. The nationally valid environmental protection regulations and measures must be observed (FRG: BImSchG, UVPG, AbfG, WHG, Chem G, ...).

3.4 ACCESSORIES ¹⁾

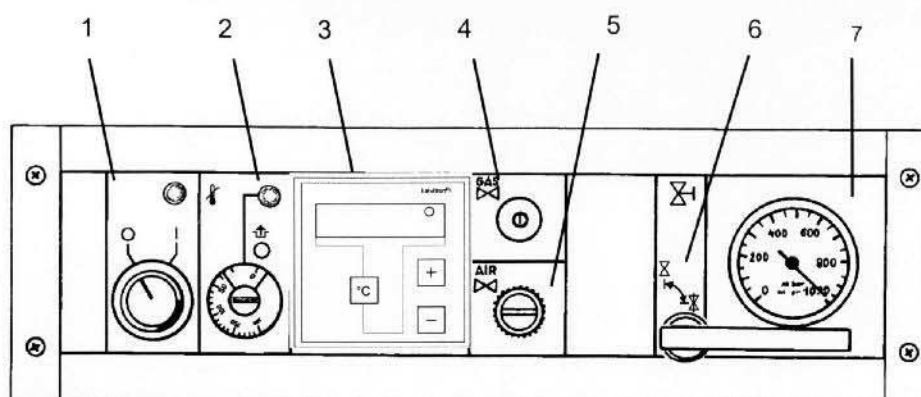
The following accessory is available for the laboratory vacuum oven:

- Aluminium shelf: an additional insert for supporting goods in the oven.

¹⁾ For a description and order information please refer to the APPROVED SPARE PARTS AND ACCESSORIES chapter

3.5 CONTROL PANEL (FIG. 1, ITEMS 1-7)

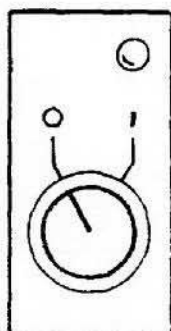
The switching and control elements are built into the control panel.



The item numbers used in the following description refer to fig. 1: Control panel.

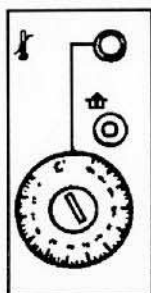
3.5.1 MAINS SWITCH (ITEM 1)

For switching the unit on and off, with green pilot lamp to indicate that the unit is ready for operation.



3.5.2 EXCESS TEMPERATURE PROTECTOR (ITEM 2)

The over temperature cut out (TWB) of temperature safety class 2 in accordance with DIN 12 880 Part 1 / 11.78 is fitted as an excess temperature protection facility.



The "failure" pilot light illuminates when the TWB is activated. After it has activated, the protector can be reset manually (key) when the unit has cooled down. The activation temperature is set using a tool (e.g., coin, screwdriver...) on the control element.

How to set the TWB to the protective level you require:

- If the TWB is set to the top temperature limit, it works as a unit protector (protects the unit and its surroundings).
- If the TWB is set at approx. 20 °C above the temperature set on the temperature regulator, it works as a goods protector (protects the unit, its surroundings and the goods in the oven).



The over temperature cut out should be tested at suitable intervals to ensure that it is functioning properly (see also the SAFETY FACILITIES section).



Performance check:

Requirement: set temperature (regulator) reached / constant

To carry out the check, set the TWB to approx. 20 °C below the temperature shown for the temperature regulator. The TWB must be activated and the red pilot light show "failure".

This means the TWB is operating correctly.

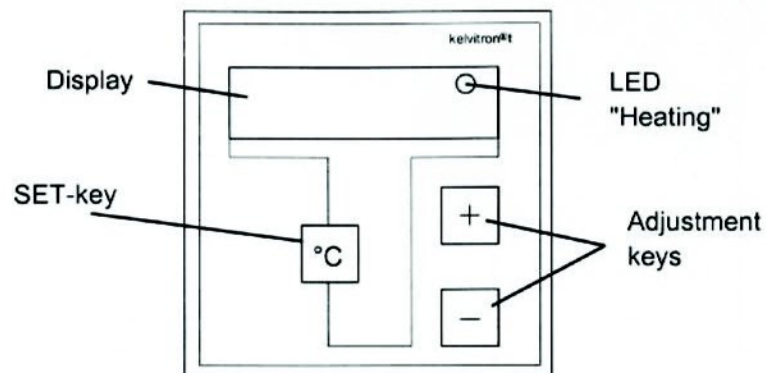
Now set the TWB to the level of protection you require.

If "failure" is indicated during operation:

Check the settings of the TWB and the regulator and correct if necessary.

If the fault cannot be rectified, please inform Customer service.

3.5.4.1 KELVITRON® TEMPERATURE CONTROL (ITEM 3)



STARTING (■ = OPERATING STEP, ► = DISPLAY)

- Switch on the mains switch.
- green "Mains" light illuminates.
- All the temperature control system display elements illuminate for 10 sec. (self-test phase).
- Then the current temperature and the status "heating"/"not heating" are displayed (see LED to the right of the temperature display).

- Press the "°C" key.
- The nominal temperature flashes on and off.
- Set the required temperature with the "+" or "-" key.



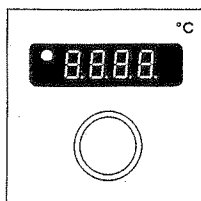
If the +/- key is held down the nominal temperature changes more quickly:
Nominal temperatures up to 99.9 °C in 0.1 degree steps.
Nominal temperatures up to 200 °C in 1 degree steps.

- Press "°C" key again.
- The nominal temperature you have selected is accepted and the display stops flashing.
- The unit heats up to the nominal temperature.



If you do not press the "°C" key again, the old nominal temperature is retained.

3.5.3.2 DIGICON® TEMPERATURE CONTROL (ITEM 3, ALTERNATIVE EQUIPMENT)



Instruction	Button / comment	Display / comment / status
Switch on appliance		 Temperature in oven compartment is displayed
Select nominal temperature	Press button and hold down	 Display changes from current to nominal temperature
	Keep the button pressed down and turn clockwise = increases nominal temperature	 Nominal temperature increases
	Keep the button pressed down and turn anti-clockwise = lowers nominal temperature	 Nominal temperature decreases
Retain NEW nominal temperature	Release button	 Temperature in oven compartment is displayed
Rhythmic "HEATING" signal: temperature regulator holds temperature in oven compartment at constant nominal temperature		

Interface for temp.sensor

When the diode is plugged in, internal switches to external set point because of the built-in bridge between pins 3 and 4.

Output signal of the temp.controller

Temperature reads as voltage 0-10 V at both sockets "X_{ext.}"

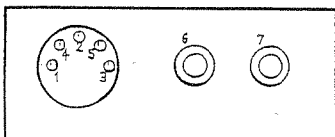
0 V = 0°C 10 V = 200°C
Admissible int.resistance: $R_i = 1\text{ k}\Omega$

Connection of external set point program

Connect the diode plug with connection cord to socket "W_{ext.}" (0... 20 mA).

0 mA = 0°C 20 mA = 200°C
Admissible load: $R_i = 500\text{ k}\Omega$

Module with pin assignment



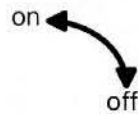
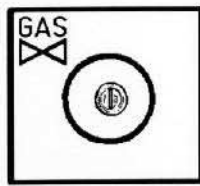
1 + 0 ... 20 mA
2 - 0 ... 20 mA
3 Set point
4 Ext. set point
5
6 + 0 ... 10 V
7 - 0 ... 10 V



Make sure to connect only current supplies/amplifiers with voltage coming from the same safety circuit (cf. VDE-regulations 0100/410).

(Example: via a safety transformer and VDE-regulation 0551)

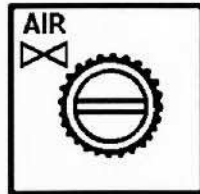
3.5.4 GAS METERING VALVE (FOR INERT GAS OPTION) (ITEM 4)



The flow of inert gas into the unit can be adjusted at the fine-metering valve.

- Turning clockwise
= closed, no gas admitted
- Turning anticlockwise
= open, fastest possible gas flow.

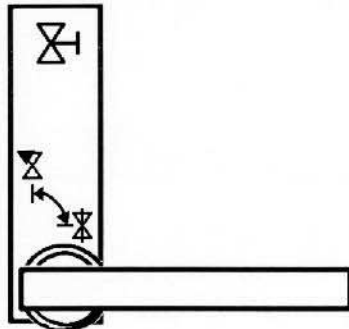
3.5.5 VENTILATION VALVE (ITEM 5)



The ventilation valve is used to shut off the appliance from the outside environment before evacuation and for ventilating the inner compartment after vacuum operation.

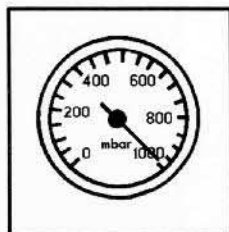
- When the mark is vertical the valve is closed, i.e., the inner compartment of the unit is shut off from the atmosphere of the surrounding area.
- When the mark is horizontal the valve is open and air from the surrounding area can flow into the unit.

3.5.6 VACUUM SHUT-OFF VALVE (ITEM 6)



The vacuum shut-off valve is used for isolating the inner compartment from the vacuum pumping system.

3.5.7 PRESSURE DISPLAY (ITEM 7)



The pressure display indicates the pressure in the inner compartment of the unit.
Display range: atmospheric pressure of the installation site (e.g. 1013 mbar) to the vacuum reached (display moves towards 0).

4. SETTING UP AND INSTALLATION



In addition to these operating instructions, the nationally valid regulations must be observed for setting up, installing and operating the unit (FRG: ZH 1/119, DIN 12880 Part 1).

4.1 TRANSPORT

Transport the unit carefully, avoiding shaking or damaging it. Do not use the door handle or the door itself to lift or carry the unit.

For dimensions and weight please see the TECHNICAL DATA chapter.

4.2 UNPACKING

Unpack the unit, remove the accessories and transport packing material from the inner compartment and clean if necessary.

4.3 SETTING UP

Set the laboratory dryer up on a firm, vibration-free and inflammable surface (such as a laboratory table or a frame), so that it is horizontal and stable.

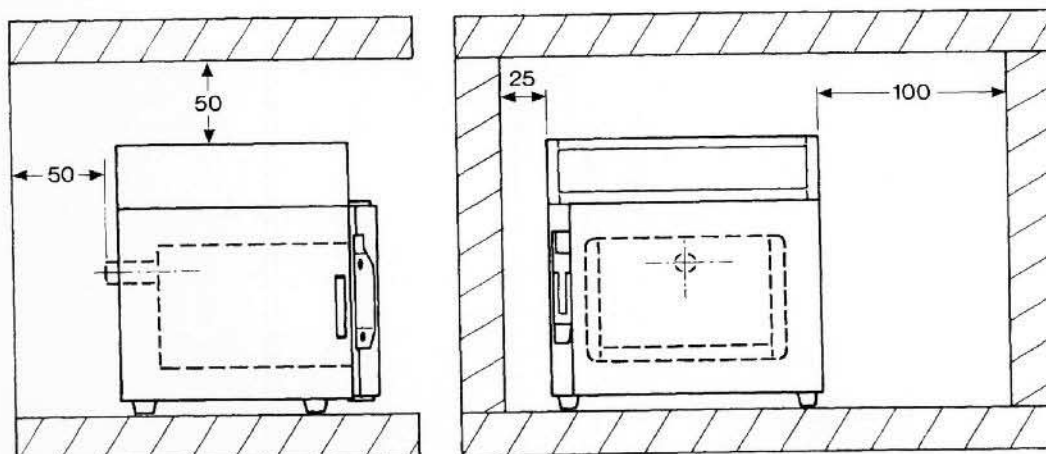
The VT 6025 model vacuum drying cabinets cannot be stacked one on top of the other.

The **ambient temperature** in the installation area may reach **40 °C**. The installation site must be dry.

The air inlet and outlet openings in the unit housing must not be covered or adjusted in any way.

Do not set up or operate the unit in unventilated niches.

4.4 DISTANCES FROM ADJACENT SURFACES AND OTHER EQUIPMENT : (FIG. 2)



4.5 INSTALLATION UNDER A TABLE

If you wish to install the vacuum drying cabinet under a table to save space, you must ensure that the laboratory bench or material surrounding the unit is made of noninflammable materials (FRG:DIN 4102)

Installation:

- Make electrical connections in the drying cabinet
- Connect the unit to the mains supply
- Push the dryer into the frame under the table, taking care not to damage the connections



Ensure that the minimum distances from adjacent surfaces and objects are maintained



4.6 ELECTRICAL CONNECTION

The unit is fitted with a strong, flexible mains connection lead with a PE connection. The mains connection cable and connector must be checked for damage prior to use. If any damage is found, the unit must not be connected to the mains supply.

The voltage specified on the rating plate must agree with the rated voltage of the mains.

The oven should be connected to the mains at properly installed sockets with PE connection (protective class I). A residual current circuit-breaker should be installed in the mains as additional protection against indirect contact. It should be activated with a residual current of ≤ 30 mA.

See section entitled TECHNICAL DATA for details of the unit's current consumption.

Fusing with T 16 A slow-blow fuse or line circuit-breaker B 16.

If extension leads are needed to connect the unit, rubber-insulated flexible cable H 07 RN-F should be used (minimum cross-section 1.5 mm^2).

4.7 SILENCING

If the unit is set up in unfavourable conditions, the noise produced by vacuum pumps (not included on delivery) may increase. Additional noise reduction measures may have to be taken in the installation area. The vacuum drying cabinet itself is not a source of noise, except occasionally during ventilation.

4.8 SITE VENTILATION

The installation site must be equipped with adequate ventilation equipment. The unit must not be operated in unventilated areas. If several units are set up in one area, special ventilation measures may be required (e.g. zone ventilation).

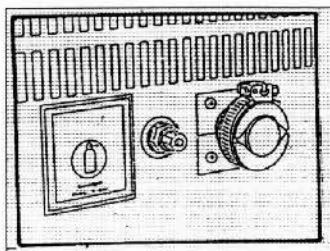
This is particularly important for operation with inert gas. Depending on the gas used, extra precautions may be required in addition to the ventilation measures specified, for health protection reasons.



4.9 INERT GAS CONNECTION (OPTIONAL EXTRA)

Inert gas must be supplied to the appliance through a pressure reducer with a max. supply pressure setting of 1 bar.

It must not be possible to alter the pressure reducer setting without special authorisation.



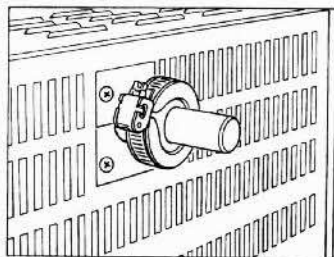
Connection: The gas connector (external diameter 4 mm) to which the gas supply should be connected is on the back of the unit.



Only inert gases may be used.

4.10 CONNECTING THE VACUUM PUMP SYSTEM

Suitable vacuum pump systems or vacuum pumps: suction capacity 1 - 30 m³/h



Connect hose connection piece with small flange (20 mm diameter, DIN 28 403) to exhaust connection, as shown

- Connect vacuum pump system and exhaust connection with a vacuum hose (inner diameter 20 mm) ^{*)}



Observe operating instructions of vacuum pump manufacturer to avoid damage to the vacuum pump as far as possible (such as damage caused by vapour or condensation).

Small flange connections with NB 25 can also be used for connection. ^{*)}

^{*)} not included on delivery

4.11 CONNECTION TO SITE VENTILATION SYSTEMS



The nationally valid environmental protection regulations must be observed for the removal of the gases released during heat treatment. Waste gases must be expelled from the unit in a safe manner (FRG: BImSchG). Methods such as thermal or catalytic waste gas treatment may be used for this purpose.

4.12 INSERTING THE SHELVES (FIG. 5 - 10)

- Lay the shelves on the supporting brackets, push to the back of the inner compartment and locate safety catch
- When the shelves are pulled out, the safety catches under the supporting brackets must be engaged (prevents shelves tipping)

Removing the shelves:

- Push the shelves to the back wall of the inner compartment, lift and remove

ACCESSORY: SHELVES, ORDER NO.: 50 028 403

The set of shelves available as an accessory consists of one left and one right u-shaped supporting bracket and the additional shelf itself. If 2 accessory sets are installed, up to 4 shelves can be inserted in the inner compartment of the unit:

- Fig. 5: Condition as delivered
Fig. 6: Fitting one accessory set (3 shelves can be used)
Fig. 7: Variations
Fig. 8: Fitting two accessory sets (4 shelves can be used)
Fig. 9: Variations
Fig. 10: Unit with 4 shelves inserted

Variations
Fig. 5

Fig. 6

Fig. 7

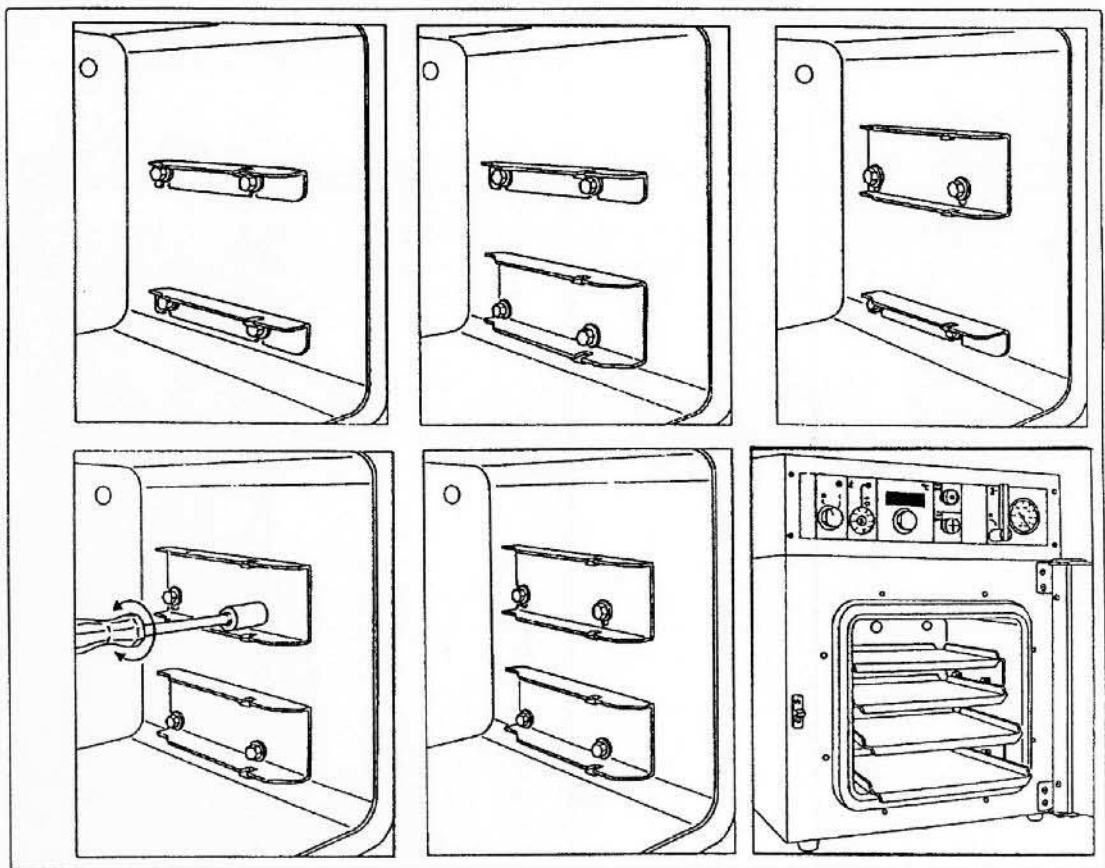


Fig. 8

Fig. 9

Fig. 10

5. OPERATION

5.1 COMMISSIONING

To commission the unit after setting up and installation, proceed as follows:

Never reach into the door area! Parts of the unit are hot! There is a danger of burning on the bare projecting edge of the inner compartment.

Instruction	Button / comment	Display / comment / status
Switch on the unit	Mains switch (item. 1) = " I "	
HEATING OPERATION:		
Select nominal temperature	Set at the temperature regulator (item 3)	see pages 13 and 14
Adjust excess temperature protector to level required	Make setting on TWB (item 2)	see page 12
Place goods in the oven and if necessary wait until required operating temp. is reached	Observe "OPERATING GUIDELINES" section of this chapter	see pages 20 - 21
VACUUM OPERATION (WITHOUT PROCESS GAS):		
Connect ventilation valve	Turn ventilation cap (item 5)	Mark vertical
Switch on vacuum pump system	Observe operating instructions for all systems (e.g. for the vacuum pump)!	If necessary, wait until heating up phase completed
Open vacuum shut-off valve, evacuate	Activate valve (item 6)	Turn lever to "OPEN" position (horizontal)
Monitor pressure reduction in inner compartment	Pressure display (item 7)	Pressure in inner compartment is displayed
Complete operation	see "SHUTDOWN" section of this chapter	

Instruction	Button / comment	Display / comment / status
VACUUM OPERATION (WITH PROCESS GAS):		
Operation with leakage air	Operation as described under "VACUUM OPERATION" but allow leakage air to flow in through the ventilation valve (item 5). Leave the vacuum shut-off valve (item 6) open. The leakage air flows through the inner compartment and any vapours released are drawn off with the leakage air via the pump system.	Ventilation valve mark (Item 5) in sloping intermediate position

Operation with inert gas (optional extra)	Operation as described under "VACUUM OPERATION" but feed inert gas (e.g., N ₂ or CO ₂ ...) into the inner compartment through the fine metering valve (item 4). This may be suitable for continuous operation in certain cases. If an atmosphere consisting of as high a percentage of inert gas as possible is required in the inner compartment, just 5 complete evacuation / inert gas flushing cycles should be sufficient to achieve an atmosphere of 98% inert gas in the inner compartment.	Observe the "OPERATING GUIDELINES" section of this chapter closely!
Evacuation/inert gas flushing cycle:	■ Evacuate the unit to the minimum possible inner pressure ■ Close the shut-off valve (item 6) ■ Flood with inert gas, gas valve (item 4), until atmospheric pressure reached ■ Close gas valve ■ Open shut-off valve (item 6) and evacuation cycle starts from the beginning	■ Pressure display ■ Pressure display ■ Pressure display

5.2 OPERATING GUIDELINES

Take all the necessary measures for personal protection, such as wearing gloves and protection on the face and the rest of the body. Remove all jewellery before operation.

Heat is transferred to the shelves and the goods in the inner compartment largely by thermal conduction. The heating elements are positioned so that ideal temperature distribution is achieved with a vacuum of <10 mbar.

At higher pressures (poorer vacuum) the heat conductivity of the gas molecules increases. The related improvement in heat transmission from the heated inner walls to the goods in the oven is countered by an increased loss of heat through the glass door.

If the pressure increases still further, to atmospheric pressure, convection takes place in the inner compartment, which causes higher temperatures in the upper area of the inner compartment.

The minimum operating temperature of the vacuum drying cabinet must be 10 °C above the ambient temperature. If work is to be carried out at low temperatures, it is important to ensure that the unit is set up in a draft-free location.

Constant heating and cooling over wide ranges of temperature can shorten the operational life. Constant operation at medium temperatures is the best type of operation if the unit is used on a regular basis.

Ideally, the over temperature cut out (TWB) should be used for protection of goods.

For vacuum operation, observe the operating instructions provided with each vacuum pump system (e.g. vacuum pump) as well as the contents of these operating instructions.

It may be found useful to dry small amounts of residual moisture in vacuum operation with leakage air.

During operation with inert gas, up to 10 l/min of inert gas may be released into the installation area, depending on the pressure compensation. Ventilation of the room is therefore required.

When loading with goods for heat treatment:

- Ensure the glass door panel or panels are not scratched
- Do not exceed the maximum shelf-bearing load (see technical data)
- Do not place goods on the floor of the inner compartment
- The regulator temperatures displayed only relate to the shelves
- In order to avoid overheating in some parts of the goods, the instructions regarding operating conditions at different operating pressures must be observed.
- The goods must be **evenly distributed** and **placed at an adequate distance from the walls** in the inner compartment.

The air inlet and outlet openings in the unit housing must not be covered or objects placed on top of them. Always keep openings free of dirt.

The over temperature cut out should also be checked by authorised personnel during operation.

5.3 SHUTDOWN

- Close the vacuum shut-off valve (Item 6) - move to "OFF" position
- Flood the inner compartment with ambient air through the ventilation valve (item 5), release pressure
- Remove goods from inside the oven
- Switch off the unit. If it is not to be used for a while, unplug it from the mains
- Switch off the vacuum pump or vacuum pump system
- Remove all soiling from inside the oven
- After operation with inert gas: close the gas supply

6. MAINTENANCE



The function and safety of the unit is only guaranteed if all necessary checks, maintenance and repair work is carried out by Thermo Customer service or by personnel authorised by Thermo. Thermo Electron LED GmbH **cannot be held liable** for damage resulting from incorrect repairs that have not been carried out by Thermo service agencies or whenever parts have been replaced using parts that were not original spare parts or accessories.

We recommend you complete a maintenance agreement - please ask us about the agreements available (see APPENDIX).

6.1 MAINTENANCE AND CLEANING

The unit is largely maintenance-free. The bearings in the door mechanism can be lubricated with graphite oil.

Wipe down the outer surfaces and control elements on the unit with a mild soap solution (washing-up liquid) and a soft cloth.

Remove any dirt in the inner compartment with a small amount of a commercially available household cleaner in water. Do not use acids, solvents containing chlorine or salt solutions.

6.1.1 ADJUSTING THE UNIT DOOR:

The door seal may become less flexible with time. The unit door can be adjusted to minimise this effect.

- Turn the adjusting screws (4 mm Allen screws) on the inside of the door bearing slightly in an anti-clockwise direction to adjust the door bearing axis, until the door closes tightly again (do not remove the screws!)

6.1.2 REPLACING THE DOOR SEAL:

- Pull off the faulty seal
- Stretch the replacement seal into place
- Carry out leak test

6.1.3 MAINTENANCE CHECKS

Check the unit annually for the following points and ensure all is functioning correctly:

- Mechanical elements
- Functions (technical data)
- Electrics (FRG: UVV VBG 4)
- Safety facilities on the unit, in particular checking the glass panels for damage. If they are found to be damaged, protection against implosion can no longer be guaranteed. Vacuum operation under these conditions may cause damage, in particular placing the health of operatives at risk. The damaged panes of glass must be replaced by Thermo Customer service.
- Vacuum equipment
- Vacuum equipment connections and supply lines

6.2 REPAIRS

6.2.1 REPLACING ELECTRICAL COMPONENTS



Work on the unit's electrical equipment may only be carried out by Thermo Customer Service.
Only approved original spare parts may be used.

6.2.2 APPROVED SPARE PARTS AND ACCESSORIES



The function and safety of the unit is only guaranteed if the approved original spare parts listed below are used.
The use of other parts involves unknown risks and must be refrained from in all cases.

Item	Spare part / accessory	Description	Order no.
1	Operating instructions	Set of operating instructions	50 040 179
2	Vacuum pump	Diaphragm pump MZ 2C, chemical-resistant version, nominal suction capacity 2m ³ /h, final pressure 12mbar	50 028 364
3	Shelf	Extra shelf with pair of supporting brackets	50 028 403
4	Door seal	Silicone frame profile	50 028 429
5	Glass panel	Silicate glass	50 028 456
6	Safety panel	Implosion protection panel	50 027 583

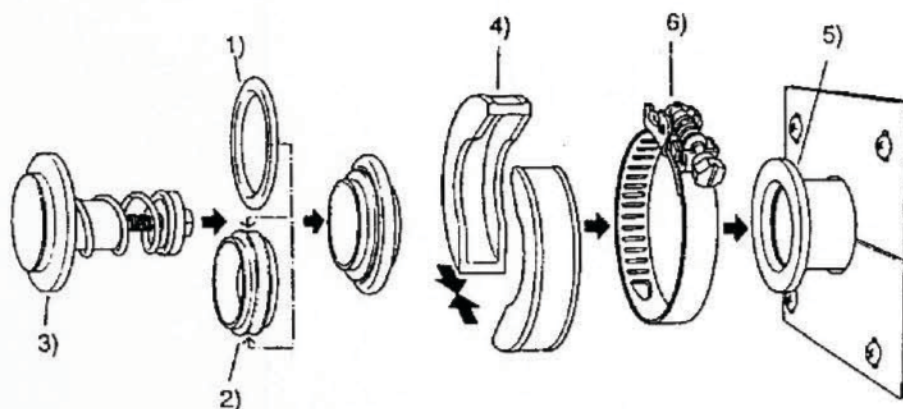
6.2.3 ASSEMBLING THE SAFETY VALVE (FIG. 11)

Push the O-ring (item 1) onto the centring (item 2)

Push the rings (items 1 and 2) onto the safety valve (item 3)

Push the safety valve (item 3) with the rings onto the connection piece (item 5)

Push over the clamping segment (item 4) and tighten with the tensioning ring (item 6)



7. TECHNICAL DATA

MECHANICAL:	1/PE AC, 230 V	Unit
Dimensions (W x H x D)		
Housing:	480 x 600 x 450	mm
Inner compartment:	300 x 275 x 307	mm
Clear distance between the shelves (in serial model):	110	mm
Volume		
Inner compartment:	25	l
Weights		
Unit:	approx. 60	kg
Maximum load:	40	kg
Maximum shelf load: flat shape with 2 shelves	20	kg
THERMAL:		
Temperature range		
Min. operating temperature above room temperature:	10	K
Nominal temperature:	200	°C
Accuracy of temperature display as % of range end value	± 1	%
Temperature deviation*		
spatial, at 70°C:	< ± 1,5	K
at 150°C:	< ± 3	K
at 200°C:	< ± 4	K
over time at nominal temperature:	< ± 0.5	K
Heating up time* (98%) from 25°C to		
200°C	100	min
150°C	95	min
70°C	90	min
Heat emitted into surrounding area		
blank test at 70 °C:	80	Wh/h
at 150 °C:	230	Wh/h
at 200 °C:	340	Wh/h
*Measured in accordance with DIN 12880 Part 2, on the shelves, times and temperatures during operation under <10 mbar vacuum		

Vacuum	VT 6025	Unit
Achievable final vacuum:	1×10^{-2}	mbar (hPa)
Leakage rate:	$<1 \times 10^{-2}$	mbarl/s
Pump suction capacity:	1 - 30	m ³ /h
Inert gas operation		
Gas flow:	< 10	l/min

ELECTRICAL:		
Rated voltage ($\pm 10\%$):	1/PE AC, 230 / 120	V
Rated frequency:	50/60	Hz
Power consumption:	1.30	kW
Connected load:	1.50	kVA
Current consumption 230V version:	5.9	A
120 V version:	10.8	A
Type of protection:	IP 20	
<u>Fuse protection:</u> (for connection to the mains supply, the generally accepted conventions for electrical fittings and the technical connection requirements of the electricity supply company must be observed) A T 16 A slow-blow fuse or line circuit-breaker B 16 and connection via residual current circuit-breaker (activating current ≤ 30 mA) is recommended.		

8. CONSTRUCTION MATERIALS

PART:	VT 6025 model
Outer housing	Galvanised sheet-steel, painted RAL 9002
Inner container	Stainless steel, material no. 1.4571
Shelves	Aluminium
Glass panel	Silicate glass
Door seal	Tempered silicone
Thermal insulation	Mineral-fibre insulating material, DIN 18 165
Control panel	Mixture of ABS and PC
Contact heating	NiCr thermally conductive material on muscovite fine mica
Leads	PVC insulated copper strand
Filling medium for temperature protector	Polydimethydisiloxane
Other components	Insulated electrical components fixed with various different synthetic materials, some to epoxy resin-bonded circuit boards

9. LOG BOOK

[illegible]