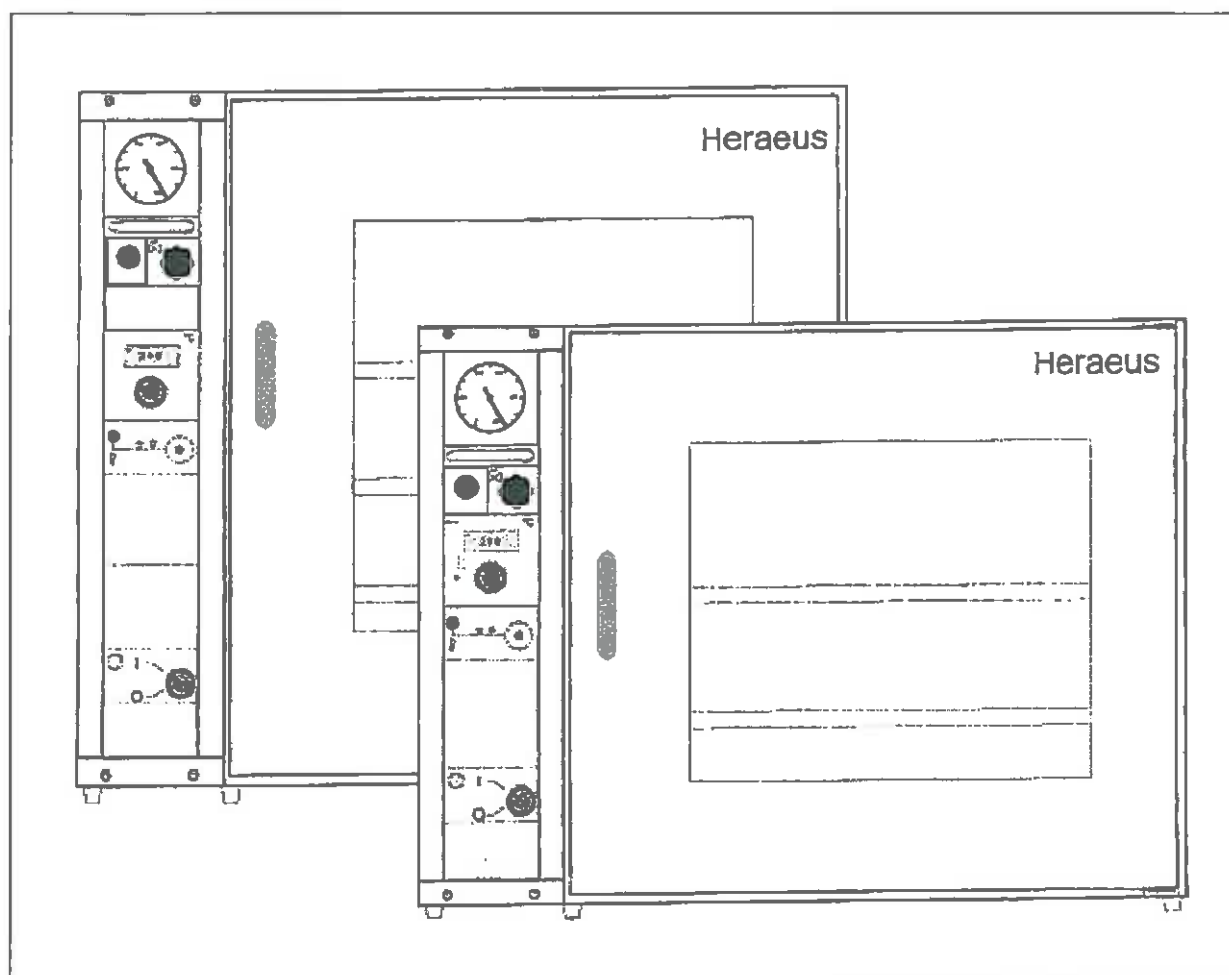


GB

USA

Vacuum Drying Oven
VT 6060 M / VT 6130 M

Operating instructions



Below is a list of the international Thermo marketing organizations.

Postal address Germany

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D – 63505 Langenselbold
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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.

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

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.

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	50033393	- 2 -

1. Introduction

Your new Vacuum Drying Oven is characterized by a high degree of economic efficiency and outstanding quality.

Before putting your unit into operation, please read the following instructions carefully so that you'll avoid mistakes which might damage the oven.

Paragraphs dealing with safety precautions are identified by



Paragraphs identified by  deal with the proper operation of the unit.

The safety and performance of the unit will be guaranteed only if required checkouts, service and repairs are carried out by our Customer Service or by experts authorized by us.

Please indicate the data listed on the nameplate if you have complaints or if you need to order spare parts.

The vacuum drying oven is in compliance with:

- * DIN 12 8 80 Part 1
- * DIN VDE 0700 Part 1, IEC 335-1

1.1 Use

Prior to installing and operating your vacuum drying oven, you should consult the guidelines, if any, issued by your local occupational trade associations.

The units are especially suited for the gentle drying of temperature-sensitive loads.



The vacuum drying ovens must not be used for drying processes or heat treatments releasing combustible vapors which might form explosive mixtures with the air. Finally, the ovens are not designed for heat treatments of dangerous dusts or fibrous materials.

2. Installation and Connection



For installation and connection, please consult the guidelines, if any, issued by your local occupational trade associations.

Transportation

Care should be taken not to lift the unit by the door or the door handle.

Place of installation

The unit must be put on a level, non-combustible surface which should be free from vibration.

Don't operate or leave the unit in corners where air cannot circulate.

The location itself must be dry and the ambient temperature should not exceed 40 °C.

The unit must be placed in a location which is free of drafts. This is particularly important when it is to operate at low drying temperatures.

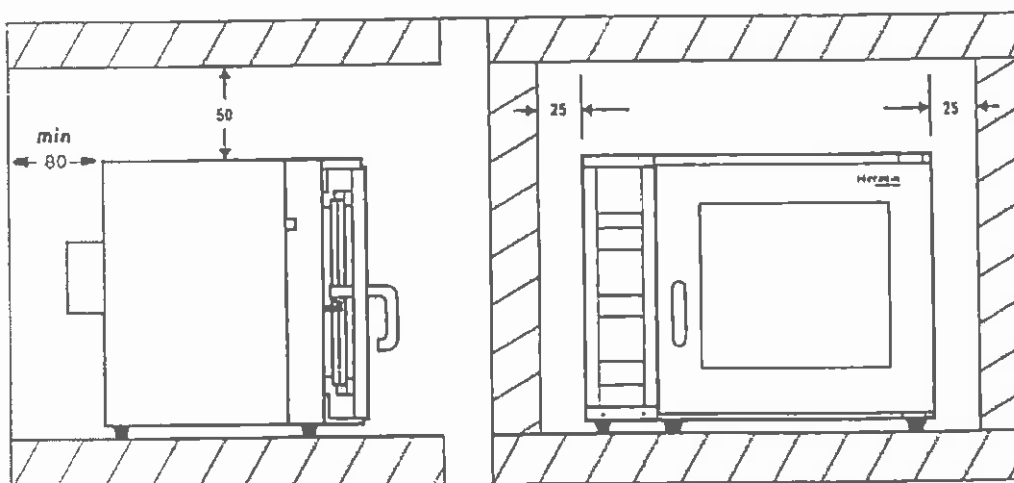
Inert gas operation (option)

If the unit is operated with inert gas, it will be supplied with an oxygen-displacing gas (e.g. N₂). Therefore, make sure that the gases released by the system are properly evacuated and the room is aired out accordingly.

If you install several ovens or if you fit them underneath a laboratory bench, check to see if you need to observe special rules regarding ventilation.

For possible regulations concerning ventilation, you should consult the guidelines issued by the local occupational trade associations.

The following illustration shows the required clearances between the oven and the walls/adjacent furniture/equipment:



Base cabinet installation

Vacuum oven VT 6060 can be fitted into a base cabinet to save on space. For safety reasons and in acc.w. DIN 4102, these cabinet bases must be of non-combustible materials. The following needs to be observed:

- * Connect the unit to the power supply.
- * Connect the supply lines to the vacuum oven.
- * Push it into the cabinet and make sure not to damage the lines.

There must be sufficient clearance between the unit and the rear wall of the cabinet for outlet and blind port connections. Clearance to the side walls must be at least 25 mm, i.e. 50 mm to the ceiling.

Stacking

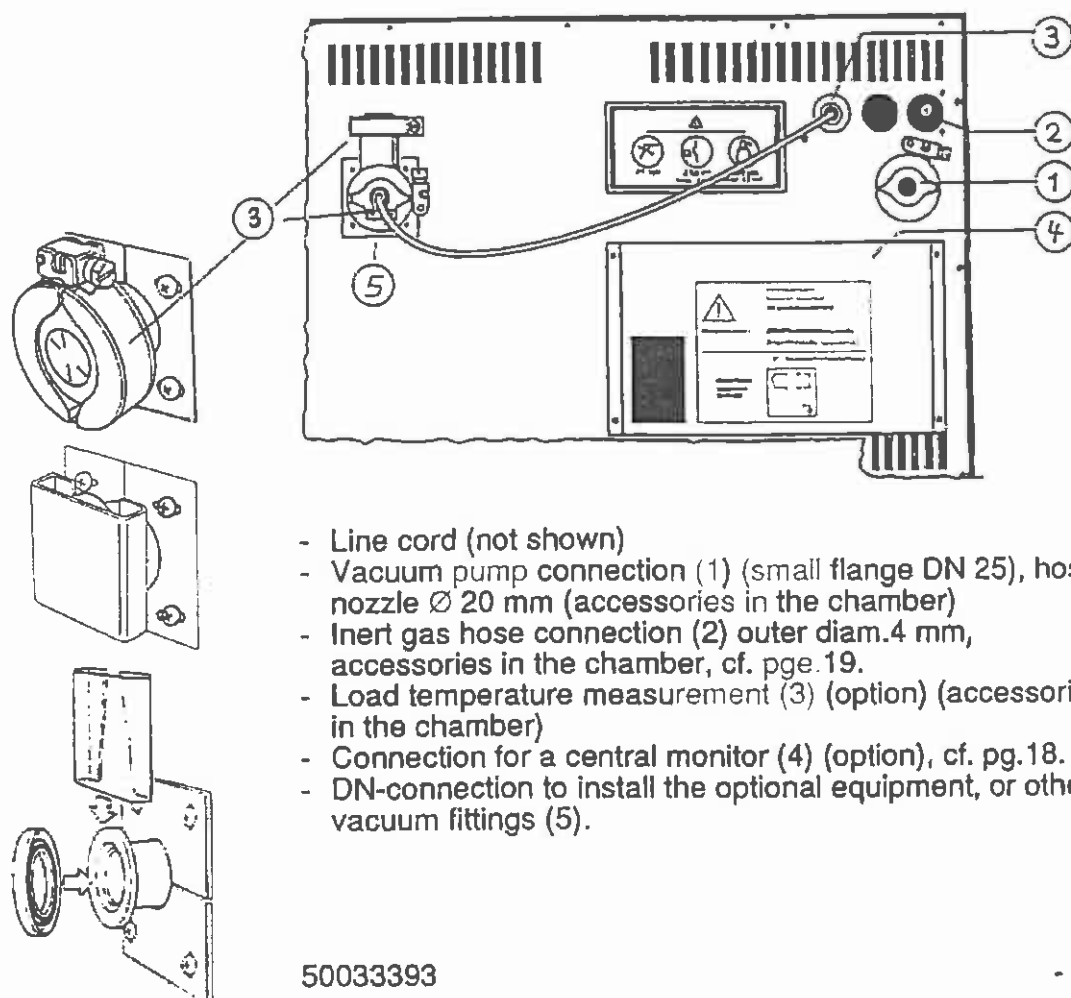
Units cannot be stacked on top of one another.

Installation

The required connections are located on the rear wall of the unit.

The required connection accessories for options are included in the scope of delivery and placed inside the chamber. Remove them from the chamber prior to the first start-up.

The following connections are located on the rear wall of the unit:



- Line cord (not shown)
- Vacuum pump connection (1) (small flange DN 25), hose nozzle Ø 20 mm (accessories in the chamber)
- Inert gas hose connection (2) outer diam. 4 mm, accessories in the chamber, cf. page 19.
- Load temperature measurement (3) (option) (accessories in the chamber)
- Connection for a central monitor (4) (option), cf. page 18.
- DN-connection to install the optional equipment, or other vacuum fittings (5).

Line connection

Prior to connecting the vacuum drying oven to the line, make sure that the power supply ratings coincide with those stated on the nameplate.

The vacuum drying oven comes with a permanently installed line cable and grounded plug.

Required line fusing is 16 A, slow-action type.

Connection of the vacuum pump

Suitable vacuum pumps are those with a pumping speed from 1 - 30 m³/h

The exhaust port with small flange DN 25 (DIN 28403) and the removable hose nozzle (Ø 20 mm) are located inside the chamber when the unit is delivered. They will have to be mounted on the back wall of the unit. (cf. ill. pge.6, pos.1).

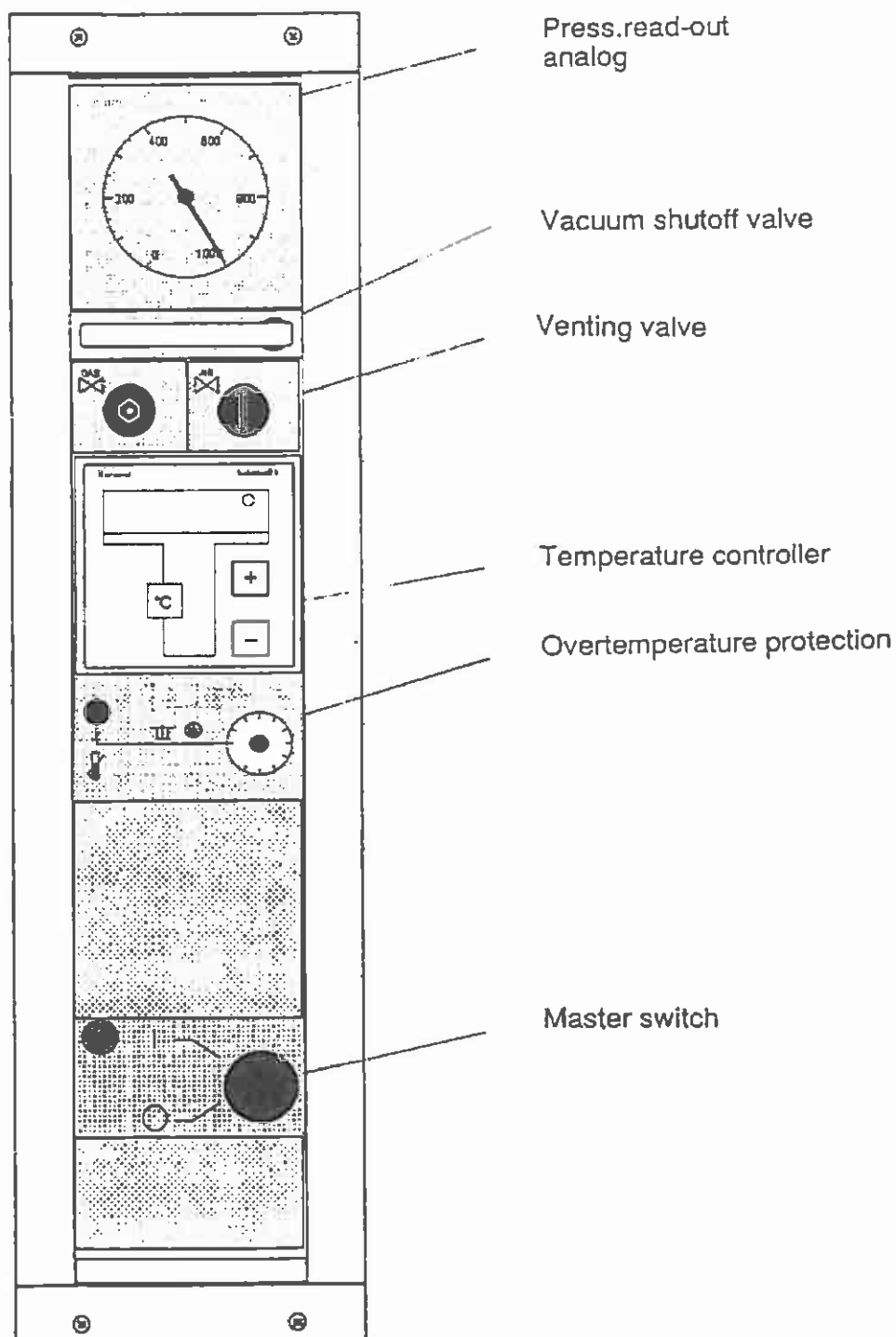
The vacuum pump is connected either with the vacuum hose, 32 x 16 mm and the hose nozzle or, if the nozzle has been removed, directly with the flange.

In order to avoid damage to the vacuum pump (from vapors, condensation, etc.), make sure to observe the instructions of the respective pump manufacturer.

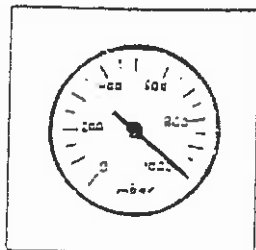
Parts connection

Consult pages 16 - 18.

3. Description of the Unit, pages 8 - 19
Control Panel, Basic Oven Model

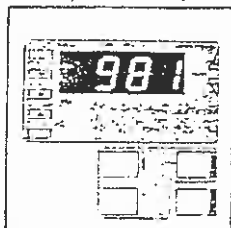


3.1 Press.readout analog



3.1 Press.readout digital (Option)

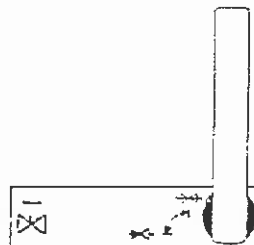
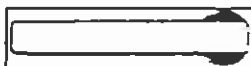
cf.separate operating instructions No. 50069765



3.2 Vacuum shutoff valve

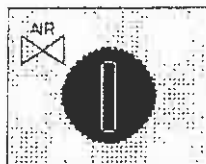
Abb.

cf.Start-Up
page 20



OPEN

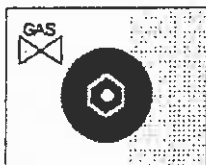
3.3 Venting valve
cf. Start-Up
page 20



CLOSED Vertical mark

OPEN Horizontal mark

3.4 Fine metering valve
for inert gas
cf.page 17

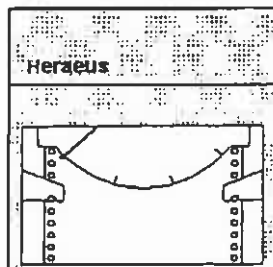


clockwise = CLOSED

counterclockwise = OPEN

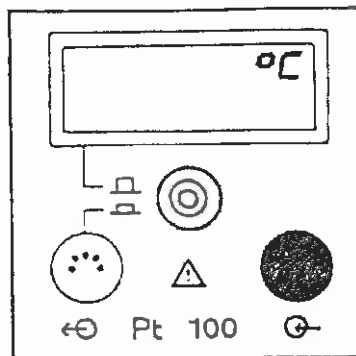
3.5 Temperature measurement

3.5.1. Temperature recorder (Option)



cf. separate instruction manual No. 50047444

3.5.2 Load temp.display switchable

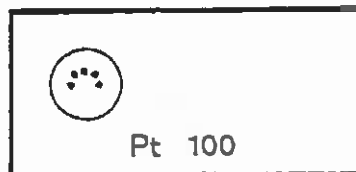


Pt 100 connection w. switch.

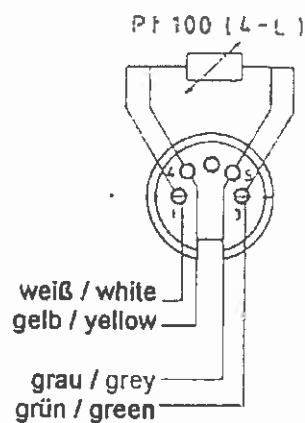
Function:

- For digital **display**, key is **not** pressed
- **Pt 100** output, key is **pressed**
Display is extinguished

3.5.3 Pt 100 connection



Refer to page 17 for the installation of the sensor

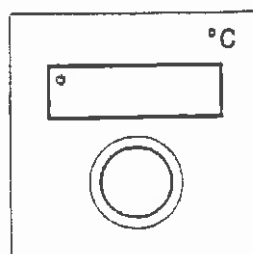


Make sure to only connect current supplies/amplifiers whose voltage supply comes from the same safety circuit (cf. VDE-regulations 0100/410).

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

3.6 Temperature Control

Electronic
temp.controller
"Digicon"



electron. controller
w. digital display
for temp. range up
to 200 °C

Setting:

The electronic controller features a digital display for the set and actual temperature values.

Press the control dial and select the desired working temperature. The set value appears in the digital display.

If you release the control dial, the actual value will appear.

The LED (top left) indicates that the heating system is "ON".

Note:

Keep in mind that the temperature sensor is mounted on the heated oven casing. Therefore, the temperature indicated is higher than that of the chamber.

3.6.1 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.}"

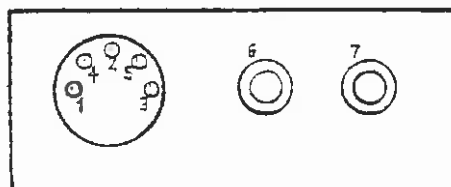
0 V = 0°C 10 V = 200°C
Admissible int.resistance: $R_i = 1\text{ k}\Omega$

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

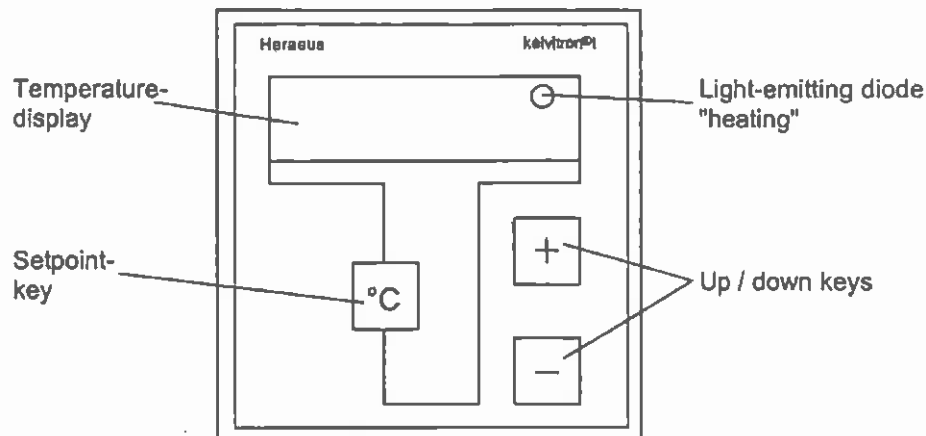


Make sure to connect only current supplies/amplifiers with voltage coming from the same safety circuit (cf. VDE-regulations 0100/410).

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

Temperature controller

Kelvitron ® t



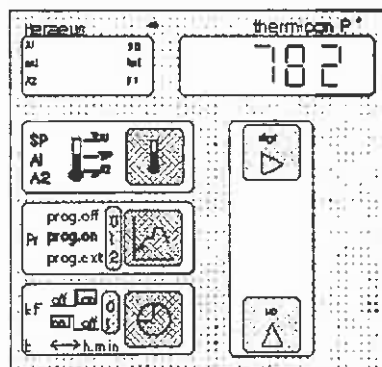
Start - Up (▣ = Input, ► = Display)

- Turn on main switch of the unit.
 - Green pilot lamp lights up.
 - Digital displays light up for approx. 10 sec. (test phase).
 - After the test phase the display will indicate the actual temperature value, controller output indication shows the status of the output: active / non active (pilot lamp).
- Press "°C" key.
 - The actual set point appears on display (flashing).
- Change set point with "+" or "-" key .
 -  If the "+" or "-" key will be pressed longer, the value of set point in the display runs faster:
 - Set points up to 99.9 °C are in 0.1 °C steps adjustable.
 - Set points up to 200 °C are in 1 °C steps adjustable.
- Press "°C" key once more.
 - The desired set point will be stored, the display does not flash, the display shows the actual temperature value.
 - The unit heats up to the desired temperature.
-  If the "°C" key will not be actuated, the old set point is maintained.

Temperature measurement

Thermicon P

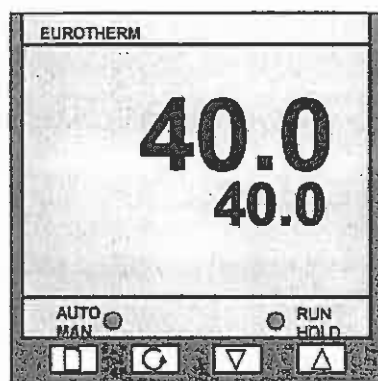
(programmable)



For description and start-up, see enclosed operating instructions

Eurotherm 2404/P4

(programmable)

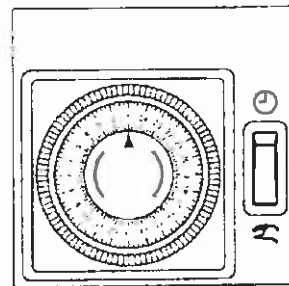


For description and start-up, see enclosed operating instructions

For interface pin assignment, cf. pages 27 and 28

3.7 Timer: Daily program timer

Function:
To switch the heating system on or off



Switch function:
Operation w. timer
manual operation
(w/o timer)

Setting:
At the start of operation, set the actual time on the program dial by turning it to the right.

Select the desired switching intervals by locking down the tabs.

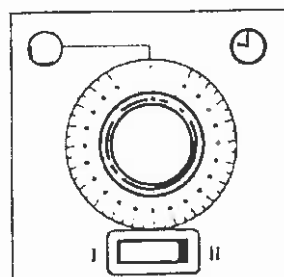
The locked dial segments define the length of the process interval.

Minimum switching frequency: 15 minutes.

Synchronous timer

Function:
Synchronous time switch
for switching the oven on and off;

24 h duration at 50 Hz line frequency
20 h duration at 60 Hz line frequency



24 h - Clock

Setting:
Function of the mode switch

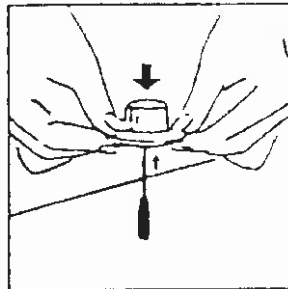
Position I: To switch on the oven after the set time has expired,
or for operation without a synchronous timer.

Position II: To switch off the oven after the set time has expired.

Caution:

The premounted dial (24 h) is valid for a line frequency of 50 Hz. For a line frequency of 60 Hz, the enclosed 20 h dial must be substituted.

The control button is released from the dial by impact from below (snug fit).



Mounting of the 20 h dial

- Set timer to 0 position
- Mount 20 h dial in 0 position
- Push on the control button.

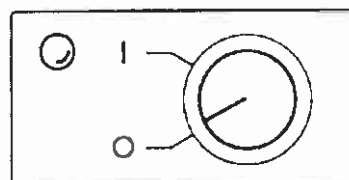
Power failure

In case of a power failure, please note that the unit has an operational reserve of approx. 90 h.

3.8 Master switch

Function:

- Turn the control knob to connect or disconnect the unit from all poles.



- * Turn on the master switch,
 - The green pilot light comes on.

3.9 Connection for a central monitor (potential-free contact)

The unit is equipped so that it can be connected to warning systems (f.ex. telephone or building alarm systems)

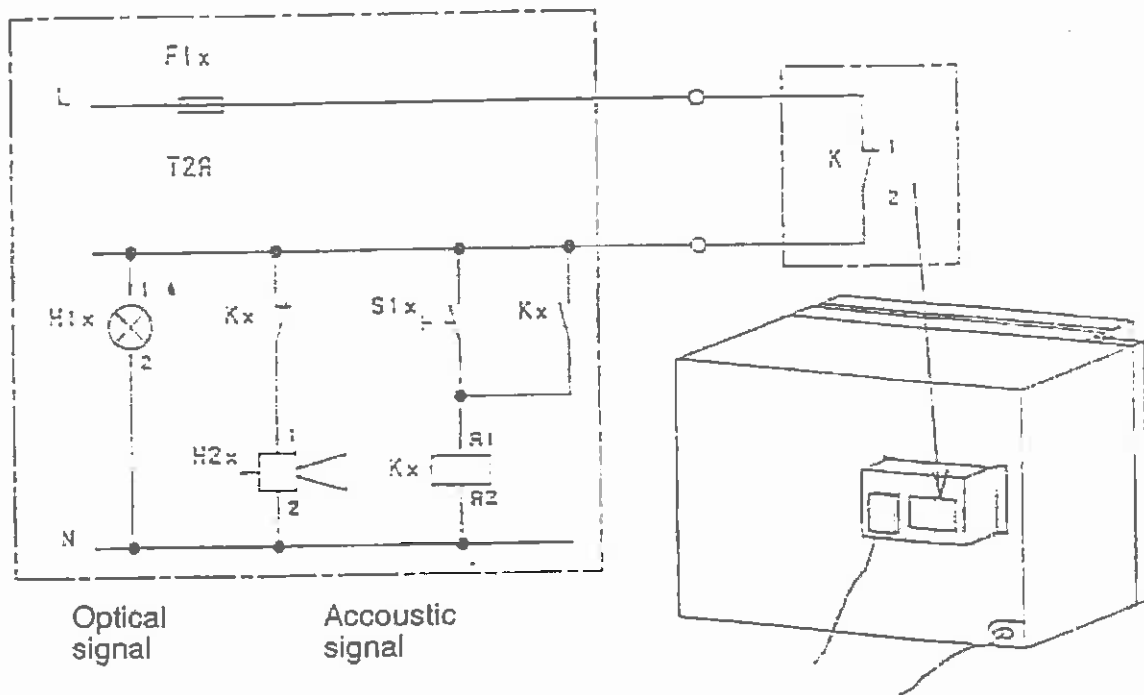
Function:

When the temperature safeguard (temperature limit cut-out) and timer respond (connection/disconnection of the heating system), the appropriate message will be transmitted to the customer-installed alarm system.

The potential-free contacts (1 make and 1 break contact) accommodate the following circuits:

- * power supply circuit:
max. 250 V AC, 3 A
- * SELV/SELV-E circuits
(cf. VDE 0100/410):

cf. also connection diagram



3.10 Inert gas connection

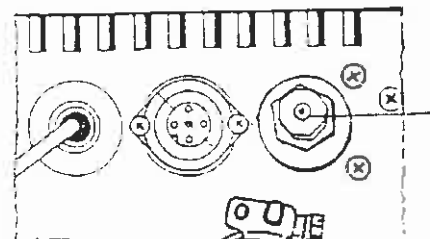


For the connection of inert gas, the customer is to provide a pressure relief valve set to 1 bar.

For technical safety reasons, make sure not to change the 1 bar setting.

Connect the gas supply to the unit.

There is a gas nozzle (cf. ill.) on the back wall of the unit.
Outer diam.: 4 mm.



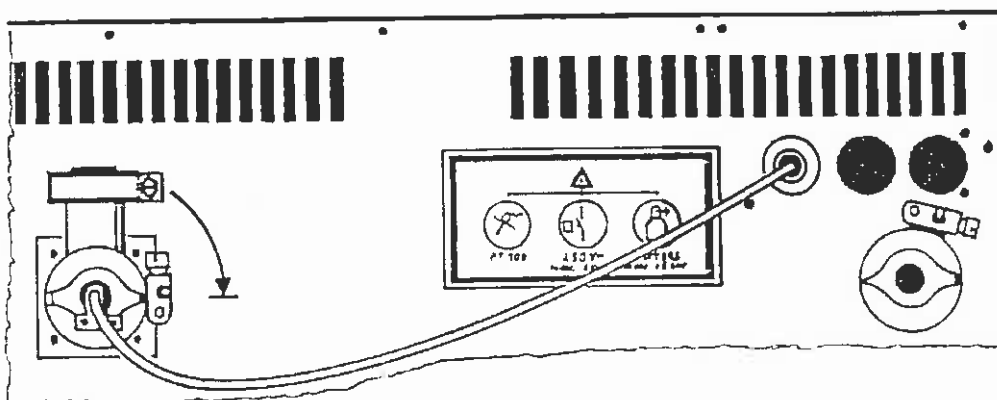
Inert gas connection

3.11 Installation of the load temp. sensor for:

- digital temperature display (option)
- recorder (option)
- Pt 100 connection (option)

With the load temperature measurement module you've the possibility to connect an additional Pt 100 resistance thermometer (option), cf. ill.

A temperature sensor is soldered into the small flange. The connection cord is equipped with a 5-pin plug which needs to be plugged into the 5-pin socket on the rear wall of the unit. (cf. ill.)



3.12. Safety features

3.12.1 Safety valve



The safety valve at the flange prevents an inadmissible rise in pressure when the unit operates with protective gas (rated excess pressure ≤ 0.1 bar).

The vacuum drying oven, provided with the fittings for inert gas connection, is equipped with a safety valve.

The tee with mounted safety valve is inside the chamber in those units with option for an additional load temperature measurement.

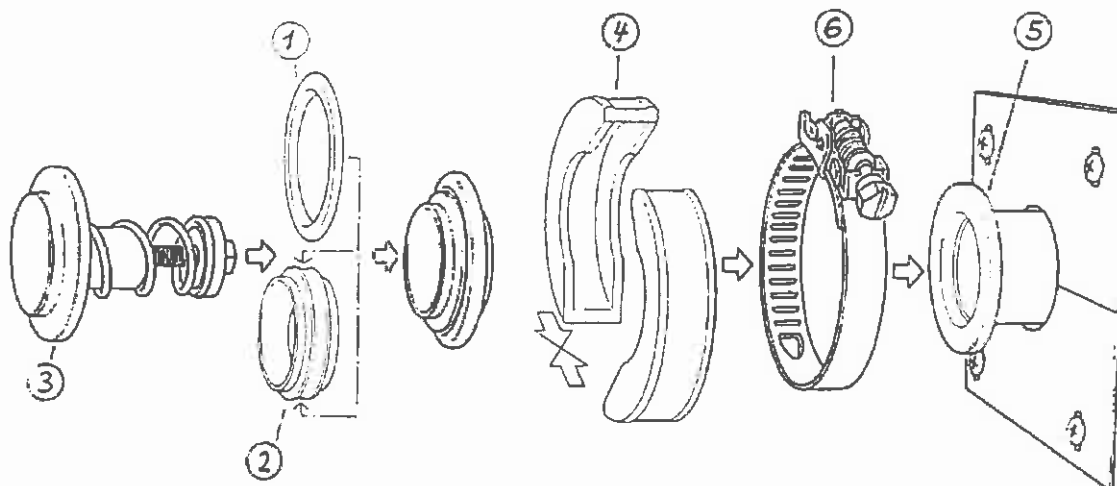
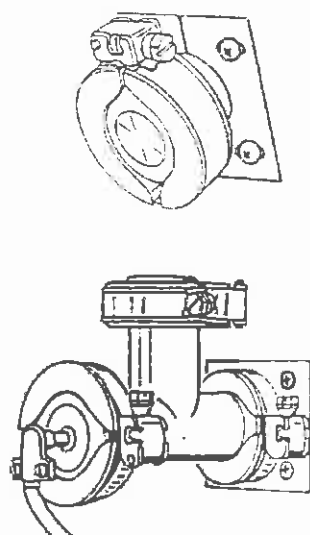
During assembly, make sure not to damage the safety valve.

For assembly prior to start-up, proceed as follows:

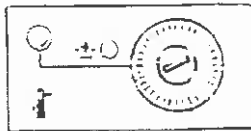
Assembly of the Safety valve (cf. ill.):

- * Place O-Ring (Pos.1) on centering ring (Pos.2)
- * Attach rings (Pos.1 & 2) to safety valve (Pos. 3)
- * Attach safety valve (Pos.3) with the rings to the socket (Pos. 5)
- * Install the ring segments (Pos.4) and fasten them with the clamp (Pos. 6)

When operating the oven without load temperature sensor, mount the safety valve directly at the connection socket (cf. ill.)



3.12.2 Overtemperature protection



Protection of the oven

Protection of the load

The vacuum drying oven is equipped with a temperature limit cut-out, Thermal Safety Class 2 in acc.w. DIN 12880 Part 1.

When set correctly, the temperature limit cut-out protects the vacuum drying oven, the surrounding area and the load against an inadmissible rise in temperature.

The temperature limit cut-out is independent of the temperature controller. When it functions properly, it positively disconnects the heater from all poles.

Setting:

When the control knob is set to the limit stop, the temperature limit cut-out protects the oven.

The temperature limit cut-out protects the load if it is set 20 °C higher than the temperature set on the controller.

To ascertain the temperature at which the temperature limit cut-out responds, and thus to be able to adjust it properly, the unit must be put into operation. Set the control knob to the limit stop. After the selected working temperature has been reached, reset the temperature limit cut-out to the trigger position. If the cut-out responds, the red warning light comes on, and the heating system is permanently disconnected from all poles.

Set the temperature limit cut-out 20 °C higher than the cut-off temperature indicated on the dial.

Press the key to release the temperature limit cut-out.

Should the temperature limit cut-out disconnect (red warning light comes on), inspite of being set properly, proceed as follows:

1. Check and correct, if necessary, the setting of the temperature controller and the trigger position of the temperature limit cut-out.
2. If you're unable to release the temperature limit cut-out, request a Service Technician.

The optimum temperature limit cut-out adjustment is achieved if you turn back the control knob by at least two graduation marks. Then release it and finally set it approximately one graduation mark above the cut-off point. To change the setting, press down and release the temperature limit cut-out. The red warning light goes out.

Operational test (cf. paragraph above "Setting"):

The temperature limit cut-out should, at reasonable intervals, be tested for proper operation. It is recommended that this test be carried out routinely by the authorized operating personnel, e.g. prior to the start of a longer work process.

4. Start-Up	When putting the oven into operation, familiarize yourself with the regulations issued by your local trade associations! Remove all accessories from the chamber.
Securing the Shelves	Place each shelf on its supports and push it into the oven until it touches the rear wall to secure it. When pulling the shelf out, make sure that the safety catches slide underneath the supports to prevent the shelf from tilting.
Removing the shelves	Push the shelves all the way in so that they touch the rear wall. Lift them up and remove them.
Loading	When loading the unit, make sure not to scratch the glass panes in the door. Observe the load limit per shelf. (cf. section on Technical Data) Arrange the load on the shelves in a way that heat flow is not impaired. The temperatures which the controller indicates refer to the shelves only.
Note	Don't set anything on the floor of the chamber.
Turning the unit on	* Shut the door * Turn on the master switch - the green pilot light comes on * Set the temperature controller to the desired working temperature * Set the temperature limit cut-out 20 °C above the working temperature
	 Don't touch anything around the door area! <u>You could get burns from the protruding rim of the inner casing</u>
Evacuation	* Close the air inlet valve (marking in vert.pos.). * Turn on the vacuum pump * Put the lever of the shutoff valve in the "OPEN" (vertical) position * Monitor the pressure inside the chamber at the pressure indicator
Venting	* Put the lever of the shutoff valve in the "CLOSED" (horizontal) position * At the end of operation, vent the vacuum chamber. To do this, open the air inlet valve (marking in horiz.pos.).
Controller setting	The lowest working temperature of the vacuum oven must be set to at least 10 °C above ambient temperature.

Operation with
inert gas



Following evacuation, nitrogen enters the chamber through the fine metering valve until pressure inside corresponds to the atmospheric pressure. Subsequently it is possible to evacuate the unit again and to vent it a second time with inert gas (depending on the type of application).

Note

If the fine metering valve is open following pressure equalization, approx. 10 l/min of gas will be released into the area where the unit is placed.

Shutdown

- * Turn off the master switch
- * Shut down the inert gas supply
- * Vent the unit
- * Turn off the vacuum pump

General remarks
on operation

The heating system arrangement achieves optimum temperature uniformity at a vacuum < 10 mbar. At this vacuum, heat transfer occurs through radiation and the aluminum shelves.

At a higher pressure (lower vacuum), the heat conductivity of the gas molecules in the chamber increases. However, improved heat conduction from the heated walls to the load is offset by an increased loss of heat across the glass door.

Heat convection is caused if the pressure should rise until it matches atmospheric conditions. This would lead to higher temperatures in the upper portion of the chamber.

5. **Maintenance and repairs**



Proper operation and safety of the unit will be guaranteed only if maintenance, service, repairs and modifications are carried out by experts authorized by Thermo . The unit must be checked at appropriate intervals to make sure it functions correctly.

Windows

The vacuum oven is equipped with a pressure-proof pane against the risk of implosion.

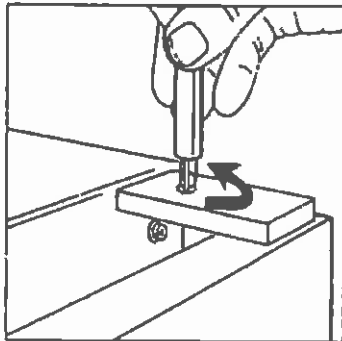
It prevents broken glass from flying around the laboratory area if the inner window pane were to burst.

The inner and the outer glass panes must be checked at regular intervals for scratches or other surface damages.

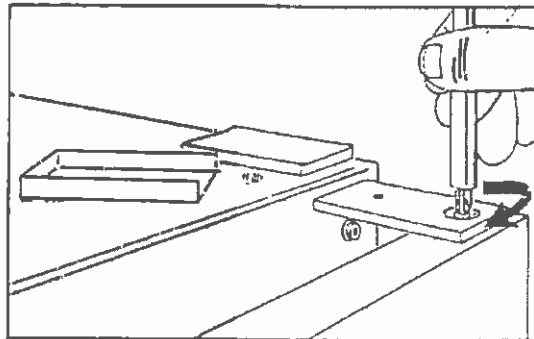
If you detect any sort of damage to the glass panes, shut down the unit and have a service technician replace the window.

Readjusting the door

If the door does not close properly or is no longer leakproof, adjust the bearing pin and the catch:



b.



Adjusting the bearing pin

Unscrew the cover panel (cf.ill.above)
Remove the layer of insulation. Release the Phillips screw of the bearing pin. Use a small spindle to prevent the bearing pin from rotating also. After you've loosened the Phillips screw, turn the bearing pin with the spindle, and determine the desired setting for height and depth. Retighten the Phillips screw and check if the door is tight.

Adjusting the catch



Release the catch nut M10 with a wrench (SW 17) and turn the catch clockwise for at least one complete rotation. After this, return the catch to the same position. Retighten nut M10. (cf.left ill.)

Replacing the gasket

Remove the defective gasket and install a replacement. Subsequently you need to submit the unit to a leak test.

Hints on care

Inner casing:

Commercially available detergents in small quantities can be used, but **no acids, chloric solvents or saline solutions.**

Control Modules:

It's best to just wipe them off with a wet cloth.

6. APPENDIX

Technical Data		VT 6060 M	VT 6130 M	Unit
Materials:				
Innee casing	Standard	1.4301	1.4301	
Shelves	Option	1.4571	1.4571	
Door gasket	Standard	Aluminium	Aluminium	
	Option	Sil.rupper	Sil.rupper	
Outer casing		Viton	Viton	
Galvanized sheet steel-on outside coated with heat-reistant polyester varnish				
Colours:				
Outer casing, grey-white		RAL 9002	RAL 9002	
Modules, agate grey		RAL 7038	RAL 7038	
Operating elements		RAL 5012	RAL 5012	
light, blue				
Dimensions				
cf. dimensioned sketch p. 26				mm
Ext. dimensions:				
Casing				
T _A incl. door handle		630	810	mm
B _A		744	895	mm
H _A		576	720	mm
Int. dimensions:				
t ₁		371	529	mm
b ₁		415	495	mm
h ₁		345	489	mm
height betw. shelves		h _{i2} =155	h _{i3} =158	mm
		h _{i1} =124	h _{i2} =124	mm
			h _{i1} =124	mm
Chamber volume		53	128	l
Dimensions, connections:				
Vakuum port		DN 25	DN 25	
+ hose nozzle		ø 20	ø 20	mm
add'l. connection (cf. options)		DN 25	DN 25	
Inert gas conn.:		inner ø 4	inner ø 4	mm
für hose ø 6 x 4 x 1				mm
Gewicht:				
Empty weight		82	153	kg
max. load		40	60	kg
max. load:				
per shelf		20	20	kg
Electrical data:				
Rated voltage		230 / 120	230	VAC
Rated freq.		50/60	50/60	Hz
Rated current		1,7 / 1,5	2,2	kW
Rated power		7,4 / 12,7	9,6	A
Class of prozection		I	I	
Type of protection		IP 20	IP 20	

Technical Data

	VT 6060 M	VT 6130 M
Times: (minutes)		
Rise time (98 %)		
from 25 °C to:		
200 °C	75 min	140 min
150 °C	75 min	115 min
70 °C	40 min	70 min
Holding power (Wh/h) *)		
200 °C	550	870
150 °C	370	550
70 °C	200	280
Temperatures**:		
Rated temp. °C	200 °C	200 °C
variation in space DIN 12880		
200 °C	± 4 K	± 7 K
150 °C	± 3 K	± 5 K
70 °C	± 1.5 K	± 2 K
variation in time at rated temp.(°C) DIN 12880	< 0.5	< 0.5
Accuracy of digital temp. display in % of full scale reading	± 1	± 1
Attainable ultimate vacuum mbar (hPa)	1×10^{-2}	1×10^{-2}
Leak rate mbar l/sec	$< 1 \times 10^{-2}$	$< 1 \times 10^{-2}$
Pumping speed	1 to 30 m³/h	

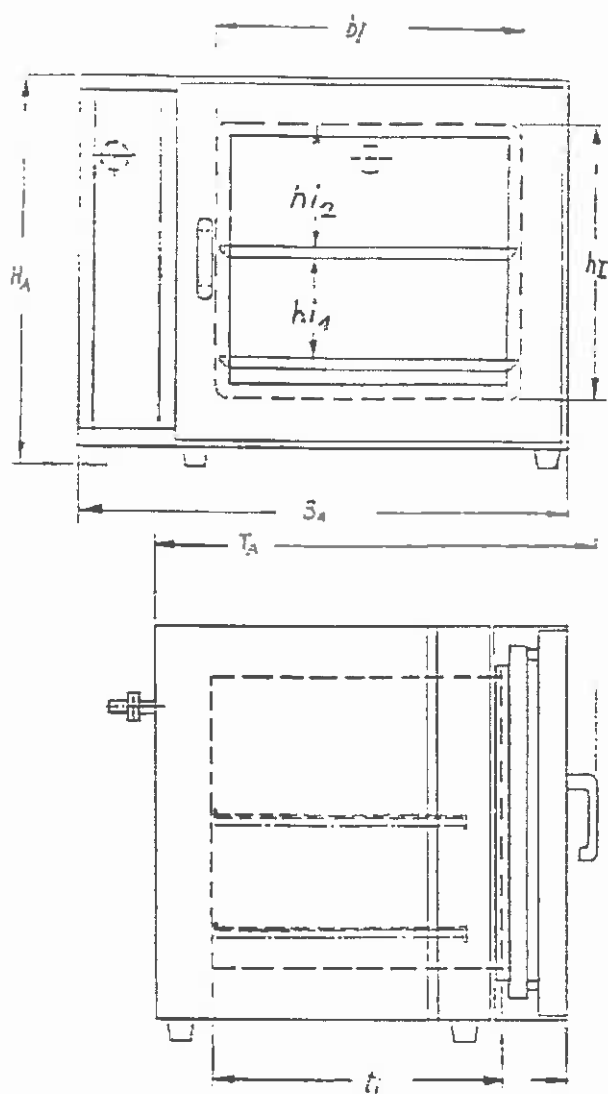
*) In line with temp. of placement area

** Measured on the shelves in acc. w. DIN 12 880 Part 2.

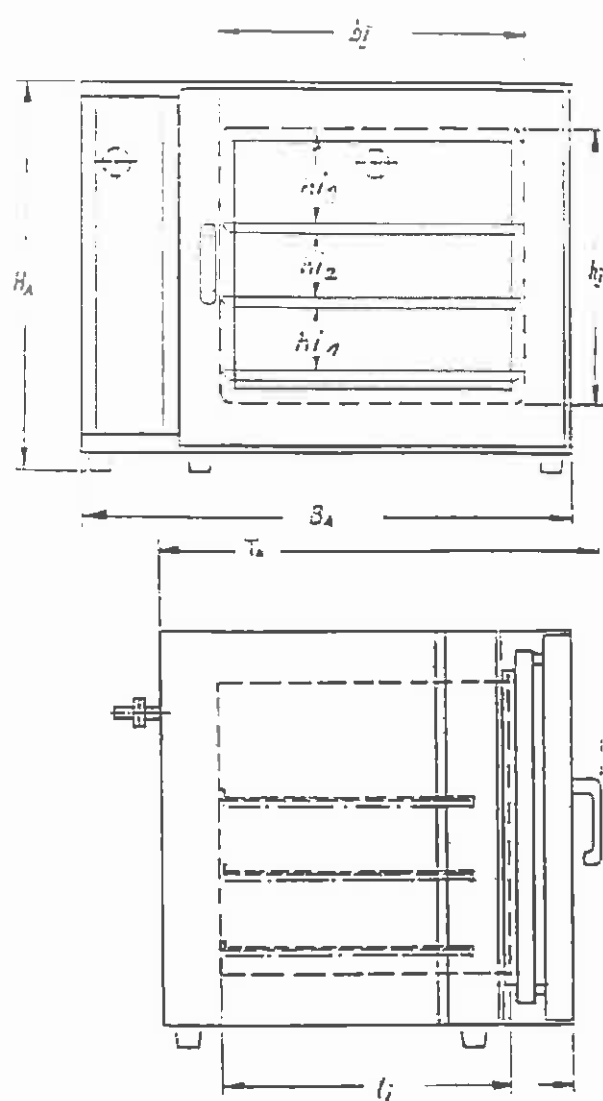
Times and temperatures under vacuum of < 10 mbar

Gases released w. inert gas connection: < 10 l/min.

Dimensioned Sketches



Size 6060

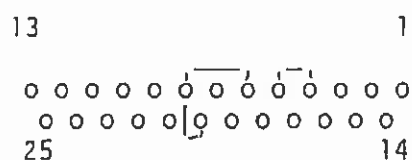


Size 6130

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Eurotherm Controller with Interface RS 232

Assignment of the 25-pin D-Sub socket:



```
Pin 1 Shield
    2 Rx ( reception )
    3 Tx ( transmission )
    4 ( connected to 5 )
    5 ( connected to 4 )
    6 ( connected to 8 and 20 )
    7 COM ( common, ground)
    8 ( connected to 6 and 20 )
    20 ( connected to 6 and 8 )
```

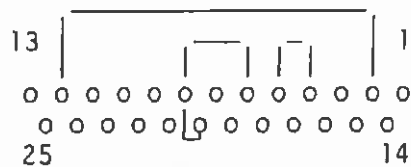
----- All unlisted pins are not wired -----

The interface pin assignment is designed to permit direct connection to an IBM or IBM-compatible computer if the computer is equipped with a 25-pin plug. If the computer interface has a 9-pin plug, a commercially available adapter (9-pin socket and 25-pin plug) can be used.

Upon delivery of the unit, the controller address is set to 01, and the Baud rate to 9600. For other addresses or other Baud rates, the controller must be reconfigured (see operating instructions for the EUROTHERM controller).

Eurotherm Controller with Interface RS 485

Assignment of the 25-pin D-Sub socket:



Pin	1	Shield
	2	(connected to 12)
	3	Tx + (transmission +)
	4	(connected to 5)
	5	(connected to 4)
	6	(connected to 8 and 20)
	7	COM (common, ground)
	8	(connected to 6 and 20)
	12	Rx + (reception +)
	13	Rx - (reception -)
	16	Tx - (transmission -)
	20	(connected to 6 and 8)

----- All unlisted pins are not wired -----

Upon delivery of the unit, the controller address is set to 01, and the Baud rate to 9600. For other addresses or other Baud rates, the controller must be reconfigured (see operating instructions for the EUROTHERM controller).

Caution: In the case of some RS 422/485 interface cards for personal computers, it may be necessary to change the **polarity** of the signals Rx and Tx. If the controller does not respond to the computer interface, connect Rx+ of the PC interface to Tx- of the controller, and Tx+ of the PC interface to Rx- of the controller.

