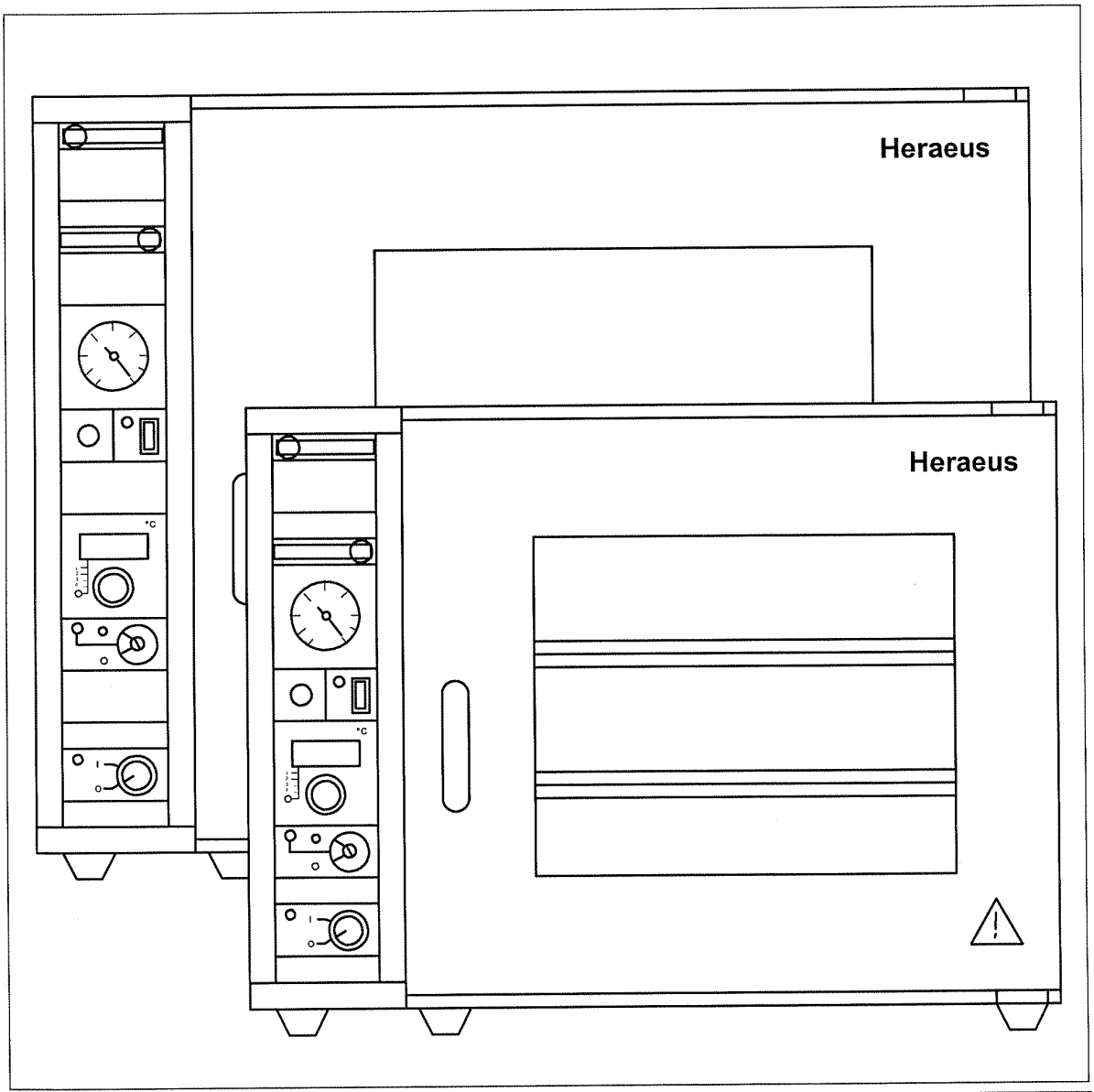
Instruction Manual GB

Kendro Laboratory Products

SORVALL® Heraeus

Laboratory vacuum heating and drying oven

VT 6060 P - BL
VT 6130 P - BL



⚠ **Comply with the operating instructions and keep this manual in the vicinity of the unit !**

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
- Mains power supply: Voltage fluctuations not to exceed +/- 10 % of the nominal value

ELECTRICAL DATA

- Overvoltage category: II
- Contamination level: 2

Kendro
Laboratory Products

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Nominal charge

This instruction manual applies for the following models:		
Order No.	Model	Equipment
50 041 899	VT 6060 P - BL	Digicon® temperature controller, selector thermal cut-out, inert gas connection, emergency inertization facility, 2 trays
50 041 901	VT 6130 P - BL	Digicon® temperature controller, selector thermal cut-out, inert gas connection, emergency inertization facility, 3 trays

⚠ **The German version of this instruction manual applies in the event of any deviations in this translation.**

These heating cabinets must be operated in accordance with the instruction manual and may only be used for their intended applications in order to ensure the safety of personnel, the environment and the processed items and materials.

Read the instruction manual carefully before using the equipment and comply with the instructions that it contains to avoid making mistakes and to prevent any personal injury or damage to property.

Contents **Page**

1. GENERAL SAFETY INSTRUCTIONS

EXPLANATION OF ICONS

	This symbol marks chapters and sections of this instruction manual which are particularly relevant to safety. When attached to the unit, this symbol draws attention to the relevant section of the instruction manual.
	Marks information about optimum utilization of the unit in the instruction manual.
	Information about optimum utilization of the unit in terms of proper disposal / recycling in the instruction manual.
	Overtemperature protection device, selector thermal cut-off
	Interlock release - overtemperature protection device
	Start, heat treatment process
	Fine inert/process gas metering valve
	Manual shut-off valve, emergency inertization
	Manual shut-off valve, vacuum
	Valve open
	Valve closed

1. GENERAL SAFETY INSTRUCTIONS

GENERAL INFORMATION

The laboratory vacuum drying oven fulfils the following standards:

- DIN 12 880 Part 1/11.78 in conjunction with DIN VDE 0700 Part 1/04.88 (EN 60 335 - 1, IEC 335 - 1)
- DIN EN 61 010 - 1 (with Amendment 1)/03.94, VDE 0411 Part 100 and E VDE 0411 Part 111
- DIN VDE 0875 Part 11 / 07.92, EN 55 014 (CISPR 14)

The safety test conducted on the basic units in the VT 6 ... P series of laboratory equipment by the VDE testing and certification institute also included tests conducted on the implosion protection device used here.

Every oven is subjected to function and safety tests before leaving the factory.

This instruction manual contains information on items of equipment which are available with certain versions of the unit (options and accessories), but which are not necessarily fitted in the supplied version.

The German version of this instruction manual applies in the event of any deviations in the translation.

Always quote the data on the rating plate when requesting information or ordering spare parts.

OPERATING INSTRUCTIONS

The operator must provide anybody working on or with this equipment with written instructions for any operations to be performed. Such instructions must be easy to understand and must be available in the language of the respective personnel (FRG: UVV VBG 1 § 7 (2)).

Inspection intervals must be stipulated for the oven and its safety devices. This inspection must be conducted by a qualified agency (authorized Heraeus service personnel) at least once a year.

► LOG BOOK

We particularly recommend that a log book is kept for this type of oven in the light of its special operating principle and the work performed with it.

All tests and calibration operations performed on the unit must be recorded in this book, as well as any other work (e.g. repairs, modifications, etc.). (The appendix contains a proposal for a suitable form).

1. GENERAL SAFETY INSTRUCTIONS

SAFETY INSTRUCTIONS

These laboratory vacuum drying cabinets must be operated in accordance with the instruction manual and may only be used for their intended applications to ensure the safety of personnel, the environment and the processed items and materials.

Read the instruction manual and comply with the instructions that it contains to avoid making mistakes and to prevent any personal injury and damage to property.

The German version of this instruction manual applies in the event of any deviations in the translation.

The operator must provide anybody working on or with this equipment with written instructions for any operations to be performed. Such instructions must be easy to understand and must be available in the language of the respective personnel (FRG: UVV VBG 1 § 7 (2)). The operating personnel must be instructed (reminded) of the special safety measures to be implemented for heat treatment processes involving materials which may contain or be coated with combustible solvents at least once a year within the framework of a course on safety.

Apart from the instructions in this manual, the respective national laws, regulations and guidelines must also be observed for the installation and operation of this unit
(FRG e.g. ZH 1/119, DIN 12 880, ChemG (VbF), BImSchG (TA Luft), electrical engineering regulations and technical requirements, etc.)

Suitable measures must be implemented to ensure that the exhaust gases produced during heat treatment are safety led outside. The national environmental protection regulations and guidelines must be observed (FRG: BImSchG, UVPG, AbfG, WHG, ChemG, ...).

Protective gloves, goggles, etc. must be made available to the operator.

Check the mains lead and connector for damage before using the unit. If there are any signs of damage, do not connect the unit up to the mains.

The oven must not be used to heat food.

The oven must not be used to heat combustible dust or fibrous materials.

Do not connect fuel gas to the oven, it may only be connected to an inert gas supply.

Before starting work, check that there is an adequate supply of inert gas available with the required admission pressure.

Attention: If the yellow indicator lamp fails to light up on power-on, please contact the Service department since there may be a dangerous defect in the monitoring system. Switch the appliance off.

If the items or materials to be treated contain any residual combustible solvent moisture, it may be assumed that combustible vapors will be released during heat treatment. These vapors may produce a combustible or potentially explosive mixture when they come into contact with air. Keep away from any potential ignition sources.

The oven must always be "COLD", i.e. 10 - 15 °C below the flash point of the combustible solvent (the temperature inside the chamber is usually < 50 °C) for loading. When certain combustible solvents are used, so much vapor may be released during the loading operation that a potentially explosive mixture is produced. Flame traps must be fitted in the vacuum section if a solvent with a flash point under room temperature is used as, in this case, the presence of an undetected hazardous component may cause an explosion to occur when the process is started.

This appliance contains only chemical-proof diaphragm vacuum pumps. If other pumps are used, take additional measures to avoid critical temperatures or failures.

1. GENERAL SAFETY INSTRUCTIONS

SAFETY INSTRUCTIONS

Keep potential ignition sources away from the flue-gas outlet of the vacuum pump, or from any additional lines that may be connected.

The area around the loading aperture may constitute a hazardous area during the loading and unloading of items or materials undergoing heat treatment, depending on the solvent used and the loading temperature. Keep potential ignition sources away from this area (FRG: DIN VDE 0165/ ´92, DIN VDE 0100 Part 720 ...).

Check the solid viewing window and the implosion guard for scratches and signs of damage before using the oven. Scratches or other damage may jeopardize the implosion protection function. Have the viewing window or guard replaced by authorized service personnel if in any doubt.

Do not exceed the permitted tray loads (TECHNICAL DATA).

Do not load any articles or material on the floor of the oven, otherwise there is a risk of overheating.

The temperature values displayed for the controller only refer to the trays.

Read and comply with the instructions concerning the operating conditions under various pressures (see above) in order to avoid local overheating of the loaded materials.

Make sure that the loaded articles or materials are loaded evenly in the oven and maintain an adequate clearance from the walls of the inner chamber to ensure an even temperature distribution throughout the chamber.

Check that all seals and hose connections work properly and inspect for signs of damage every six months, or at least once a year.

Ensure that the overtemperature protection device works properly by conducting a functional check at regular intervals, every 3 months at least, and check the electrical/safety equipment at least once a year.

Check that the minimum ignition pressure protection device works properly within the prescribed inspection intervals, or at least once a year.

Check that the emergency inertization facility works properly within the prescribed inspection intervals, or at least once a year.

Check that the relief valve works properly within the prescribed inspection intervals, or at least once a year.

Ensure that the explosion protection functions are performed correctly by checking the pressure and gas control systems, the sealing elements and the hoses at regular intervals, or at least once a year.

Check the safety aspects of the electrical equipment in the oven at least once a year (FRG: UVV VBG 4 ...).

Kendro Laboratory Products GmbH cannot accept any liability for any damage that occurs as a result of improper use or repair work, which has not been performed by Kendro service centers, or if parts other than the approved genuine spare parts/accessories are used. The use of any other parts may result in unforeseen problems and should be avoided under all circumstances.

The serviceability and safety of the unit can only be guaranteed if the necessary tests, maintenance, servicing and repair work is carried out by authorized Kendro service personnel.

2. FIELD OF APPLICATION

The vacuum drying oven has been designed as an item of laboratory equipment for applications involving heating and vacuum:

- Inner chamber capacity: 53 liters (VT 6060 P-BL) or 128 litres (VT 6130 P-BL)
- Operating temperatures up to 300 °C
- Achievable final vacuum (depending on the pump) up to 0.01 mbar

The unit has been designed for installation and operation in the following fields:

Laboratories, e.g. in the commercial or industrial sector, schools, universities, hospitals, etc.

For the following applications:

- heat treatment under reduced or modified atmospheric conditions
- particularly gentle drying of heat-sensitive materials, e.g. raw vegetable materials ...
- drying of materials which have a complicated structure (e.g. capillaries, cavities, undercuts, ...)
- aging under reduced atmospheric conditions
- drying granular materials / porous structures with low residual moisture
- gentle heat treatment of powdery active ingredients, tablets, ...
- paraffin embedding
- steaming out artificial resins
- heat treatment of materials which contain or are coated with combustible liquids (e.g. organic solvents) of danger class A I (accessories recommended !), A II, A III and B (FRG: in accordance with VbF). The flash point of the respective combustible liquid may be < 21 °C (Cl. A I), between 21 °C and 55 °C (Cl. A II), between 55 °C and 100 °C (Cl. A III), or it can be mixed with water at room temperature (< Cl. B).

The oven has been designed for continuous use.

Protective gloves, goggles etc. must be made available to the operator.

The oven may not be used:

- for the heat treatment of combustible dust or fibrous materials.
- to heat food.

Please consult Kendro Laboratory Products if you have any queries regarding proper operation.

3. UNIT SPECIFICATION

OPERATING PRINCIPLE

The oven has been designed for general heating and vacuum applications. Equipped with special safety devices, the oven is also suitable for the heat treatment of articles or materials that contain or are coated with combustible solvents which release vapors that burn or produce a dangerous, potentially explosive mixture when they come into contact with air.

Apart from the usual regulations and standards for explosion protection, other fundamental principles / knowledge must be referred to in order to assess the explosion hazard and derive the resulting structural measures to be implemented.

At the beginning of the 1930s, various series of experiments and findings were published on the subject of "combustion limits of combustible vapor/air mixtures in a vacuum". These experiments showed that a solvent vapor/air mixture only becomes explosive when a certain **minimum pressure** prevails **in the mixture**.

For example, a mixture of ether vapor and air is only explosive when the pressure exceeds approx. 200 mbar and a mixture of alcohol vapor and air requires a pressure in excess of approx. 400 mbar before it becomes explosive.

It is generally accepted that an explosive mixture of solvent vapor and air can be ruled out with an adequate degree of certainty at a pressure of approx. 0.1 bar. **If minimum pressure is undershot, this is a more or less a primary explosion protection measure.**

An explosion with dangerous consequences can only occur when the following conditions are fulfilled simultaneously:

1. The concentration of the combustible substance in the air is within the explosion limits.
2. There is a dangerous quantity of explosive atmosphere.
3. The combustible substance demonstrates a high degree of dispersion (vapor, mist) in air.
4. There is an effective ignition source.

An **explosion with dangerous consequences cannot occur** even if **only one of these conditions is not fulfilled.**

The following protective mechanisms offer a solution to this problem without detrimentally affecting the working parameters any more than necessary (lowering the operating temperature, reducing the heating power, limiting the surface temperature, ...):

- ► Implement suitable structural measures to ensure that the pressure in the chamber falls below the minimum ignition pressure quickly once the process has started, before activating the "hot surface - heating" potential ignition source.
- ► The possibility of an increase in pressure in the event of a fault must be taken into consideration (e.g. power failure, leakage, ...) during the process and the protective system must be provided to handle this situation.

The hot surfaces which are present when the oven is in service must be enabled by a monitored system to ensure that explosion protection is still provided in the event of a fault in this facility.

3. UNIT SPECIFICATION

OPERATING PRINCIPLE

As far as the realization of the process and safety aspects of this approach (refer to Fig. 1/3) are concerned, this means that:

- the unit's heating system (Item 8) must be interlocked as a function of the internal pressure "minimum ignition pressure protection device"

combined with

- emergency inertization (Items 4, 5, 6) in case the pressure increases during the process

combined with

- inert-gas mode (Item 1, 2, 3) during the heating process

Additional safety mechanisms may be expedient depending on the combustible liquid.

This appliance contains only chemical-proof diaphragm vacuum pumps. If other pumps are used, take additional measures to avoid critical temperatures or failures.

Slide vane rotary vacuum pumps, for example, should not be used for these applications. The solvents would render the pump lubrication ineffective within a very short period and the moving (hot) parts of the pump constitute another potential ignition source.

"Chemical-resistant" diaphragm vacuum pumps offer a more expedient solution for these applications. These should be used in conjunction with traps, however, in order to

1. extract the vapors in question by condensation and discharge them for proper disposal.
2. protect the vacuum pump against aggressive media.

If the combustible solvent used already develops a sufficient quantity of combustible vapor at room temperature (flash point < 21 °C (FRG: Class A I in accordance with VbF)), to produce a dangerous, potentially explosive mixture while actually loading the oven, it is advisable to install vacuum-tight flame traps in the vacuum section between the oven and the flue-gas as a precautionary measure (accessories).

This ensures that if, for any reason, ignition takes place during the process, it cannot propagate outside and therefore prevents system detonation.

3. UNIT SPECIFICATION

OPERATING PRINCIPLE

Fig. 1/3: Process diagram

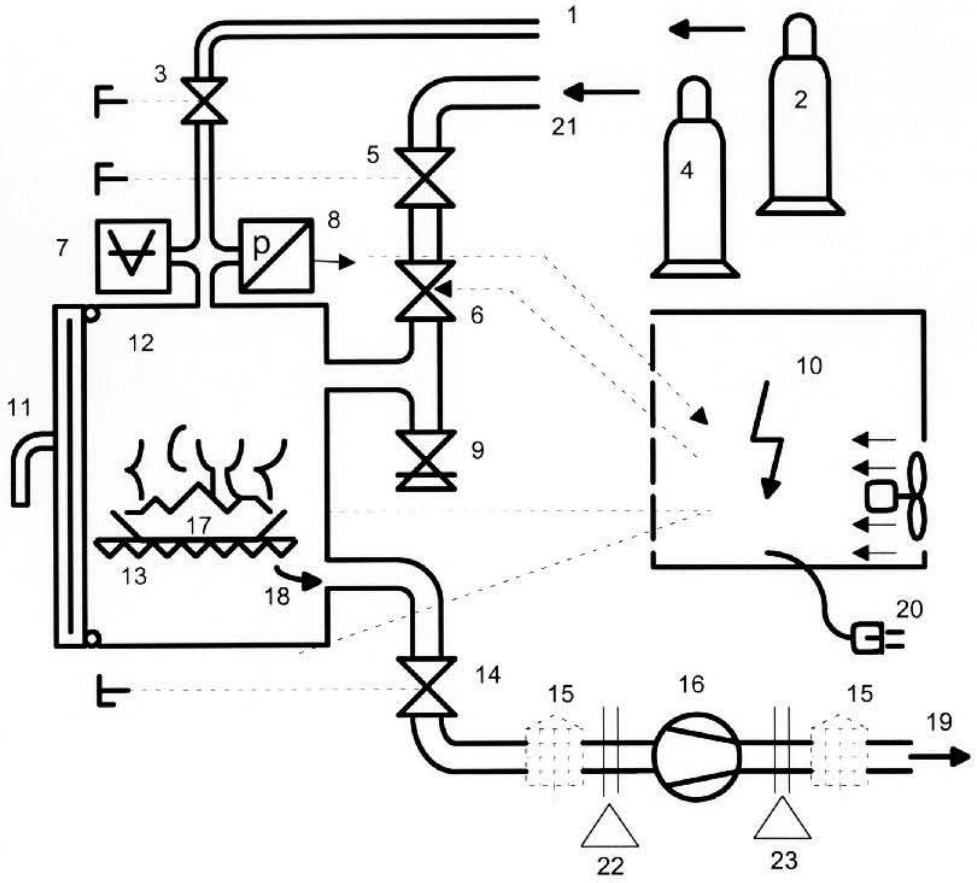


Fig. 1/3:

1 - Inert-gas connector (process gas)
2 - Inert-gas / process-gas supply
3 - Fine metering valve
4 - Emergency inertization supply
5 - Emergency inertization cut-off valve
6 - Emergency inertization valve
7 - Pressure indicator
8 - Minimum ignition pressure switch
9 - Relief valve
10 - El. control section
11 - Oven door
12 - Inner chamber
13 - Heating
14 - Vacuum cut-off valve
15 - Flame trap (accessory)
16 - Vacuum pump
17 - Material undergoing treatment
18 - Extracted vapor
19 - Exhaust gases led safely outside
20 - Mains connection
21 - Emergency inert-gas connector
22 - Condensation trap (accessory)
23 - Condensation trap (accessory) or emission condenser

3. UNIT SPECIFICATION

CONSTRUCTION

The oven essentially comprises a casing, an oven chamber with swing-out door and a switching and control unit.

The vacuum-tight inner container constitutes the oven chamber. The heating system is integrated into the trays.

The vacuum drying oven has been designed for operating temperatures up to 300 °C and a final vacuum (according to the pump) of up to 0.01 mbar.

The thermic insulant provides good heat insulation and temperature - time parameters, ensuring that heat emissions are kept within economic limits.

The inner chamber is sealed off by the door, which has a viewing window with integrated implosion protection.

The operator control elements of the electrical and vacuum equipment have been combined in the control panel on the control unit. The switchgear compartment is ventilated through the rear panel of the oven, effectively preventing the ingress of the solvent vapors released during loading / unloading into the electrical system.

The oven is a plug-in unit and is equipped with a non-detachable power cable. Electric-shock protection is provided by the PE terminal (protection class I) on the mains side and by safety extra-low voltage circuits (SELV-E) on the control side.

The laboratory drier is equipped with an interference suppression facility.

The temperature is regulated by an electronic temperature controller with a sensor breakage detection facility, the temperature is recorded with a thermocouple (NiCr-Ni). The heat output is adjusted by the controller via power semiconductor devices. The temperature controller can only activate the heater when enabled by the pressure interlock provided for this purpose. The specified reference operating temperatures are the same for all heated plates. A channel is assigned to each plate (VT 6060 P-BL: 2 plates, VT 6130 P-BL: 3 plates). The plates are controlled individually and the actual temperature of each plate can be interrogated by pressing the "Channel selection" button.

An inert-gas connector has been provided for the "process gas" required for the heat treatment of materials that contain or are coated with combustible solvents.

An inert-gas connector has also been provided for emergency inertization to enable the safe handling of faults resulting from leaks.

SAFETY DEVICES

The oven has been equipped with the following safety devices:

- shock current protection
- protection of the surrounding area against potential fire hazards resulting from overheating
- thermal protection of the loaded articles or materials under normal and exceptional conditions
- protection against the effects of an implosion
- protection against excess pressure when using inert gas
- protection against potential explosion hazards when using combustible solvents
- protection against potential explosion hazards in the event of a failure in the vacuum interlock
- protection against potential explosion hazards caused by the ingress of solvent vapors into the electrical system.

3. UNIT SPECIFICATION

SAFETY DEVICES

► PE TERMINAL, SAFETY EXTRA-LOW VOLTAGE

The unit as a whole is protected against electric shocks by the "PE terminal" (protection class I) protective measure.

The measuring and control circuits of the control and monitoring system, which are electrically connected to the inner chamber, have been safety isolated from the mains (SELV). This also ensures protection against electric shocks when the door is open and the controller is switched on.

The unit's electrical equipment must be checked for safety, particularly with respect to protection against electric shock, at least once a year.

► OVERTEMPERATURE PROTECTION DEVICE

The unit is equipped with an electronic upper-limit cut-out device (TWB) of temperature/safety class 2 as defined by DIN 12 880 Part 1 / 11.78. It is electrically and functionally independent of the temperature control system.

In its serviceable state, the TWB permanently disconnects all poles of the unit when the temperature exceeds the set value. The red "Fault" signal lamp indicates activation of the upper-limit cut-out device. Once the unit has cooled down, the device must be reset manually (pressing the button). The operate value is adjusted with the help of a tool (coin, screwdriver, ...).

Ensure that the overtemperature protection device works properly by conducting a functional check at regular intervals, every 3 months at least, and check the electrical equipment at least once a year.

Refer to the section on "Control panel / overtemperature protection device" for information concerning the functional test, settings and other aspects.

► IMPLOSION PROTECTION FEATURE IN THE OVEN DOOR

The implosion protection device is integrated into the door of the oven. If the solid viewing window in the door should implode as the result of a fault, this feature prevents fragments of this silicate glass window from being catapulted out of the inner chamber with a potentially dangerous force.

The effectiveness of the implosion protection feature was verified within the framework of the GS approval tests conducted on the basic units in this series.

Check the solid viewing window and the implosion guard for scratches and signs of damage before using the oven. Scratches or other damage may jeopardize the implosion protection function. Have the viewing window or guard replaced by authorized service personnel if in any doubt.

3. UNIT SPECIFICATION

SAFETY DEVICES

► RELIEF VALVE

The oven is equipped with a relief to ensure that the pressure does not increase above atmospheric pressure while the unit is in operation using inert gas. This valve prevents an unacceptably high pressure from building up in the system In the event of a fault, e.g. if the door seal sticks to the viewing window (operate pressure: ≤ 0.1 bar).

The valve is fitted onto the small flange (DN 25) on the rear panel of the unit.

Check that the relief valve works properly within the prescribed inspection intervals, or at least once a year.

► MINIMUM IGNITION PRESSURE PROTECTION DEVICE

The oven is equipped with a minimum ignition pressure protection device in order to reduce the potential explosion hazards associated with substances containing combustible solvents to a minimum. This device prevents any potential ignition sources inside the unit (hot surfaces) from becoming effective and igniting a potentially explosive mixture of solvent vapor and air.

This device ensures that the heating system is only enabled when the pressure inside the oven has dropped below ≤ 0.1 bar. It permits safe operation in spite of the presence of a residual oxygen component and vapors from the combustible solvent, even if the surface temperatures are within the ignition range.

Check that the minimum ignition pressure protection device works properly within the prescribed inspection intervals, or at least once a year.

► EMERGENCY INERTIZATION FACILITY

The oven is equipped with an emergency inertization facility in order to keep the situation under control if a fault (e.g. pressure rise due to the admission of air) occurs while the unit is working with combustible solvents.
The emergency inertization facility must be switched on separately ("sensitized") before using the oven to work with combustible solvents. A separate supply of inert gas must be available in order to keep the situation under control in the event of a fault.

Before starting the process, always check that there is an adequate supply of inert gas under the correct input pressure.
Check that the emergency inertization facility works properly within the prescribed inspection intervals, or at least once a year.

Check that all seals and hose connections work properly and inspect for signs of damage every six months, or at least once a year.

3. UNIT SPECIFICATION

SAFETY DEVICES

► SWITCHROOM VENTILATION

The switchroom is equipped with an independent ventilation system in order to prevent the ingress of combustible vapors into the electrical control section (switchroom).

The air current is directed in such a way as to keep any vapors that may be present away from the control unit (from inside to outside).

Check that the switchroom ventilation system works properly within the prescribed inspection intervals, or at least once a year.

3. UNIT SPECIFICATION

Accessories [1)]

The following accessories are available for the laboratory vacuum oven:

- Vacuum-tight, detonation-proof flame traps to protect the vacuum section between the oven and the exhaust-gas outlet.

  These are particularly useful when the oven may be working with combustible solvents which have a flash point ≤ room temperature (21 °C). Such solvents already develop so much solvent vapor in the closed container (just after being loaded) that the possibility of a potentially explosive atmosphere building up in the inner chamber cannot be ruled out completely.

  The above-mentioned conditions also apply to the same extent for combustible solvents which have a flash point which is higher than the ambient temperature (> 21 °C), which are loaded into the oven while it is still warm.

  For the event that ignition of such a mixture occurs at the beginning of a process, e.g. caused by a defective vacuum pump, it is advisable to use flame traps to prevent propagation to the outside.

- KF 118 or KF 65 condensation traps offer an efficient means of recovering solvent at the intake side of the vacuum pump.

  The use of independent condensation traps is to be particularly recommended at the intake side of the vacuum pump as an efficient means of recovering the solvent, which is released in the inner chamber during the heat treatment process and protect the vacuum pump against aggressive media. Maximum efficiency in solvent recovery can be achieved with this equipment.

- Glass insert for condensation trap KF 118 or KF 65

  It is advisable to equip the condensation traps with acidproof glass inserts to protect the container of the condensation trap against aggressive media to be condensed.

- Diaphragm vacuum pump HMD 4 C, suction power approx. 2.6 m^3 / h

- Emission condenser for solvent recovery for vacuum pump HMD 4 C

- Support frame

- Viton door seal

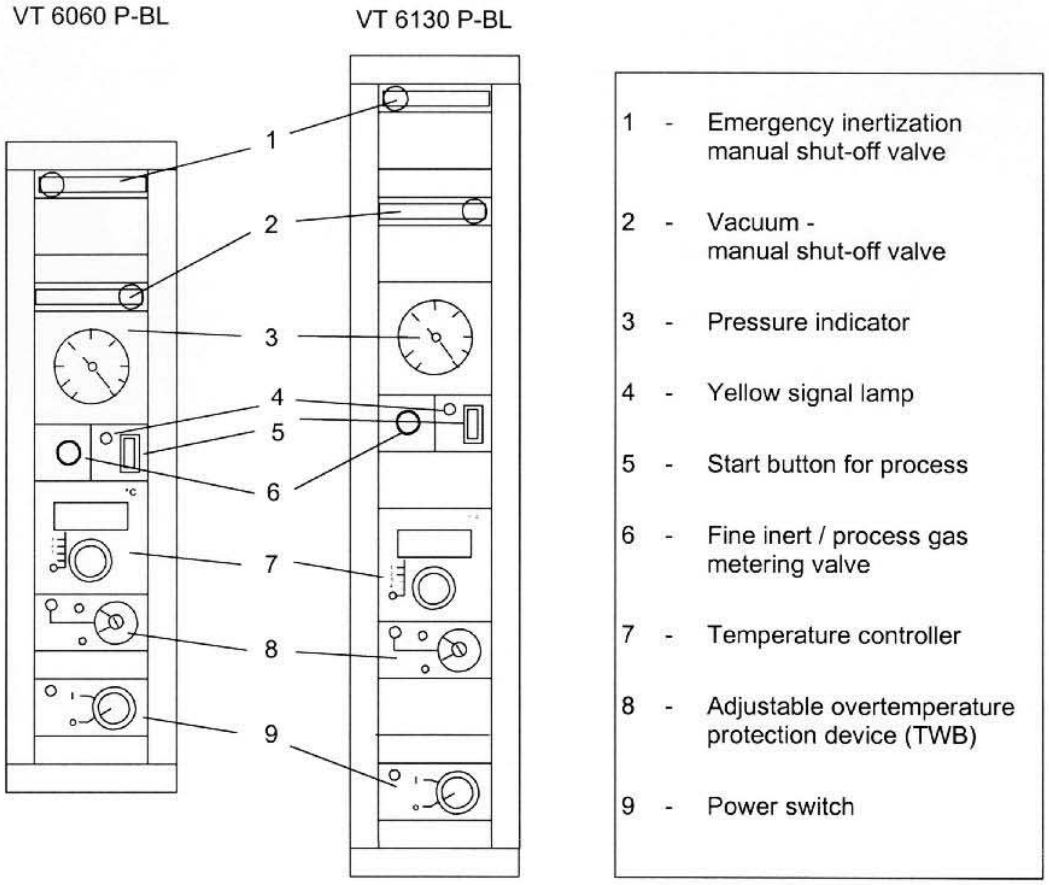
[1)] Refer to the section on "APPROVED SPARE PARTS AND ACCESSORIES" for ordering information, refer to the relevant sales literature for a description and the technical data.

3. UNIT SPECIFICATION

CONTROL PANEL

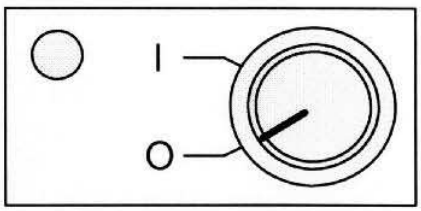
The switching elements, actuators and control elements are fitted into the control panel.

Fig. 3/2: Control panel



The item numbers quoted in the following descriptions refer to the item numbers in Fig. 2/3: Control panel

► **9: Power switch**



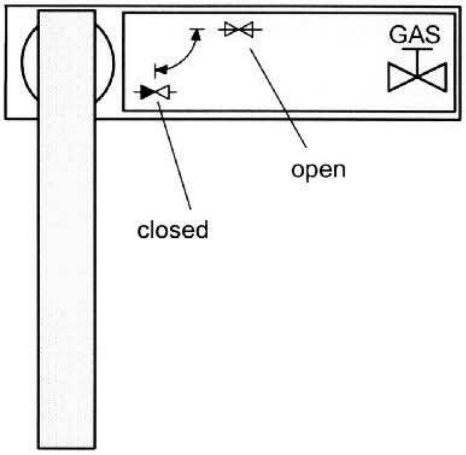
To switch the unit on and off - with a green signal lamp to indicate that the unit is ready for operation.

3. UNIT SPECIFICATION

CONTROL PANEL

The item numbers quote in the following descriptions refer to Fig. 2/3: Control panel

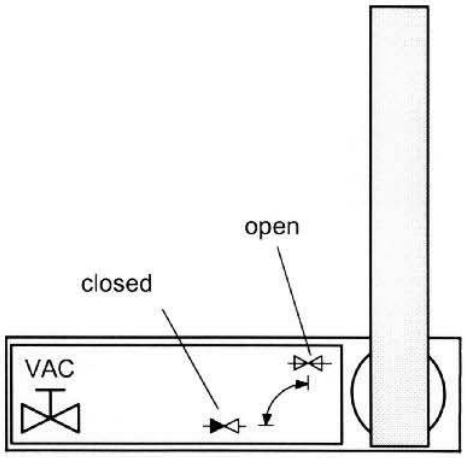
► **1: Emergency inertization - manual shut-off valve**



To shut off the inert-gas supply when the safety mechanism is no longer required (e.g. at the end of the process) to avoid wasting gas.

To enable the safety mechanism when the operator wishes to load the oven with articles or materials which contain or are coated with combustible solvent.

► **2: Vacuum - manual shut-off valve**



To shut off / enable the vacuum "supply" to evacuate the inner chamber or isolate it from the vacuum.

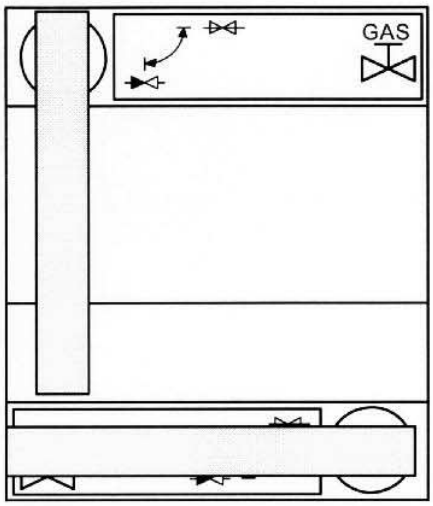
3. UNIT SPECIFICATION

CONTROL PANEL

The item numbers quote in the following descriptions refer to Fig. 2/3: Control panel

► **Interlocking the manual emergency inertization shut-off valve with the vacuum shut-off valve**

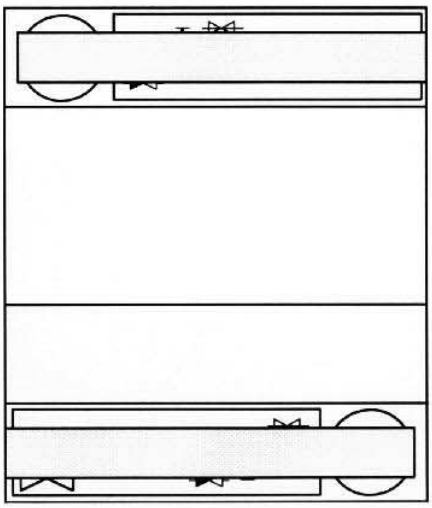
The two shut-off valves (items 1 and 2) are interlocked with one another by the arrangement of the operator control elements. This ensures that when the unit is in operation, the emergency inertization facility must be enabled manually before vacuum mode can be activated.



"Unit off" mode:

The manual shut-off valve for the emergency inertization facility is closed.

The manual vacuum shut-off valve is closed.



"Unit prepared" mode:

The unit has been switched on, the process start button has been pressed. The manual shut-off valve for the emergency inertization facility is open.

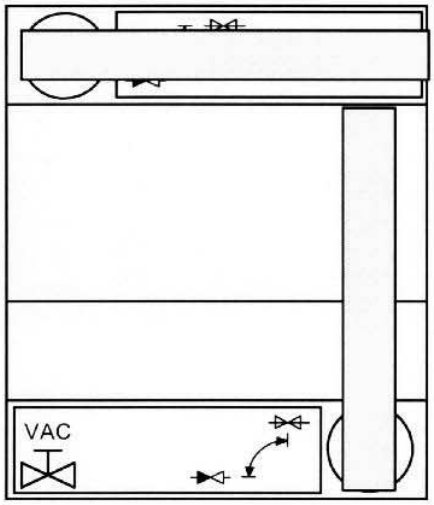
The manual vacuum shut-off valve is closed.

3. UNIT SPECIFICATION

CONTROL PANEL

The item numbers quote in the following descriptions refer to Fig. 2/3: Control panel

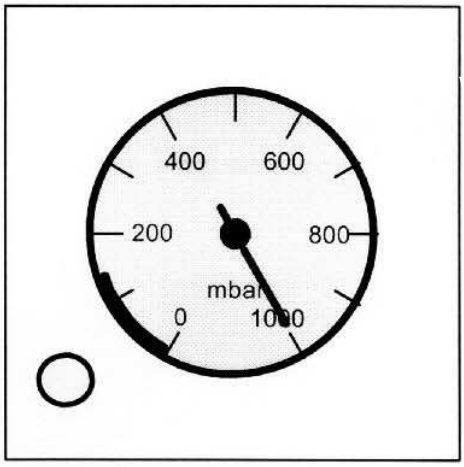
► **Interlocking the manual emergency inertization shut-off valve with the vacuum shut-off valve**



"Operation" mode:
The emergency inertization valve is open.

The vacuum shut-off valve is opened when loading the oven with the door open. The atmosphere inside the chamber is extracted.

► **3: Pressure indicator with white indicator lamp**



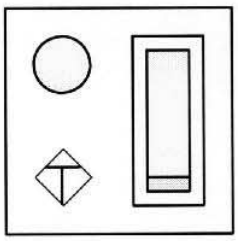
To indicate the pressure inside the chamber in **mbar**. White indicator lamp for signaling the heeting release.

3. UNIT SPECIFICATION

CONTROL PANEL

The item numbers quote in the following descriptions refer to Fig. 2/3: Control panel

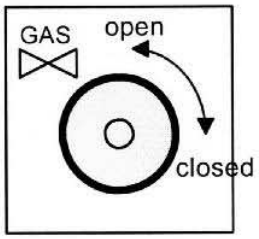
► **4/5: Start button for the process and yellow signal lamp**



To start the process. The emercency inertization is activated by the start buttom. The yellow signal lamp goes out. In case of an error or when the process is finished the signal lamp is lighting.

An adequate supply of gas available at the right input pressure ensures that the vacuum chamber is flooded with gas immediately if the pressure inside the chamber increases above approx. 0.13 bar during the process (e.g. as a result of a leak, admission of air, ...).

► **6: Fine inert / process gas metering valve**



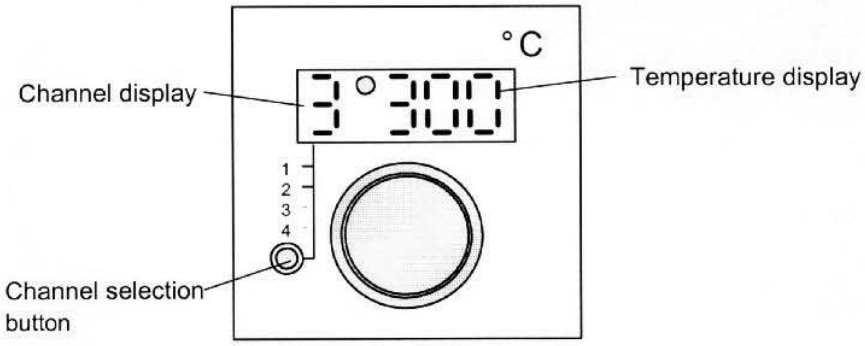
To control the gas ballast and to relieve the vacuum load inside the chamber at the end of the process.

3. UNIT SPECIFICATION

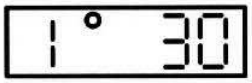
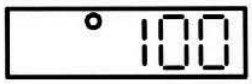
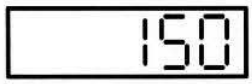
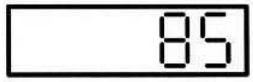
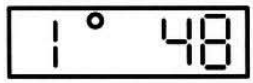
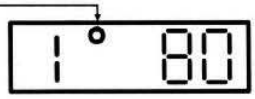
CONTROL PANEL

The item numbers quote in the following descriptions refer to Fig. 2/3: Control panel

► 7: **Digicon® temperature controller, multi-channel version**



The specified reference operating temperatures are the same for all heated plates. A channel is assigned to each plate (VT 6060 P-BL: 2 plates, VT 6130 P-BL: 3 plates). The plates are controlled individually and the actual temperature of each plate can be interrogated by pressing the "Channel selection" button.

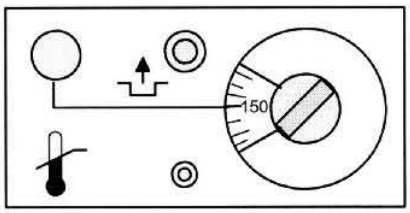
Instruction	Button / Remarks	Display / Remarks / State
Switch the unit on		 Inside temperature is displayed
Select the **required temperature**	Press the button and keep it pressed	 Temperature display changes over from actual value to required value
	Keep the button pressed and turn it clockwise = to increase the required value	 Required value increases
	Keep the button pressed and turn it counter-clockwise = to decrease the required value	 Required value decreases
Adopt the **NEW required value**	Release the button (e.g. NEW required value = 80 °C)	 Inside temperature is displayed
	Rhythmic "HEATING" signal: the temperature controller keeps the temperature inside the chamber at the set value.	

3. UNIT SPECIFICATION

CONTROL PANEL

The item numbers quote in the following descriptions refer to Fig. 2/3: Control panel

► 8: **Overtemperature protection device (TWB)**



The oven is equipped with an electronic upper-limit cut-out device (TWB) of temperature class 2, as defined by DIN 12 880 Part 1 / 11.´78, as the overtemperature protection device.

Each heated plate is monitored by a separate channel.

The "Fault" signal lamp indicates activation of the TWB. Once the unit has cooled down, the device must be reset manually (pressing the button). The operate value is set on the control panel with the help of a tool (coin, screwdriver, ...).

■ **Adjusting the TWB to the required protection level:**

- If the TWB is set to the upper temperature limit, it acts as a oven protection device (protects the unit and the surrounding area).
- If the TWB is set to approx. 5 - 10 °C above the required temperature value set on the temperature controller, it acts as a material protection device (protects the unit, the surrounding area **and** the loaded material).

⚠ **Check that the upper-limit cut-out device works properly at the prescribed intervals (also refer to the section on SAFETY DEVICES).**

☞ Functional test: (prerequisite: required temperature (controller) has been reached / remains constant)

Turn the rotary knob on the TWB to 0 °C, press the test button, the green signal lamp indicates that the channels are working properly.■
Then turn the knob on the TWB back to approx. 10 - 20 °C below the temperature displayed on the temperature controller. The TWB must respond, the red signal lamp indicates a "fault".

The TWB is working properly.

Now set the TWB to the correct value for the required protection function.

If a "fault" is indicated while the oven is in service:

Check the settings on the TWB and controller and correct if necessary.
If the problem persists - contact your local service center.

4. SETUP AND INSTALLATION

⚠ **Apart from the instructions in this manual, the respective national laws, regulations and guidelines must also be observed for the installation and operation of this unit (FRG: ZH 1/119, ZH 1/10, DIN 12 880 Part 1, DIN EN 61 010-1, DIN VDE 0165).**

TRANSPORT

Handle the unit with care. Avoid jarring and protect against damage. Do not lift / carry by the door handle or the door itself.

Refer to the TECHNICAL DATA for dimensions and weight.

UNPACKING

Unpack the unit, take the accessories out of the inner chamber and remove any dust or dirt which may have accumulated in transit.

INSTALLATION

Place the laboratory vacuum drying oven on a firm fireproof surface (e.g. laboratory table, support frame, ...) in a stable, perfectly upright position.

The vacuum drying cabinets of the VT 6 . . . P - BL series **may not** be stacked on top of one another.

The **ambient temperature** of the unit at its installation location should not exceed **40 °C**.

The unit must be **installed** in a **dry** environment.

Do not cover or obstruct the **ventilation or exhaust vents** in the unit housing.

The unit **must not be** installed or operated in **enclosed areas without ventilation**.

► UNDER-TABLE INSTALLATION:

Units of the VT 6 . . . P - BL series are **not suitable for this type of installation**, and must not be fitted under laboratory tables for reasons related to explosion protection.

► MOBILE SUPPORT FRAMES:

If the oven is mounted on a mobile support frame to enable the flexible utilization of this equipment throughout the laboratory, make sure that the support frame is equipped with lockable castors.

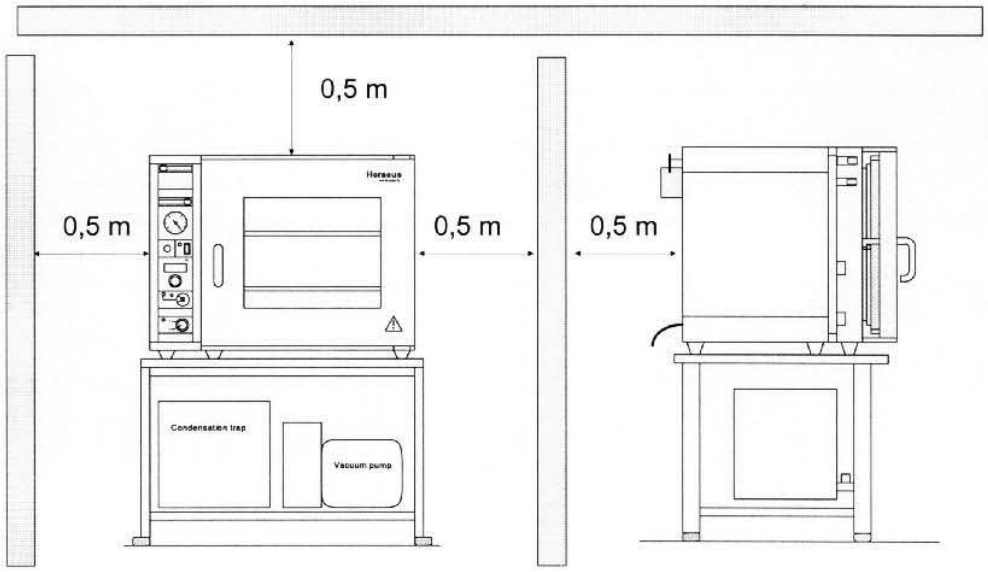
When the oven is moved to a new location, make sure that the castors have been locked.

If the oven is used in several different locations within the laboratory, particular care must be taken to ensure that the electrical cables and gas / vacuum lines are not damaged.

4. SETUP AND INSTALLATION

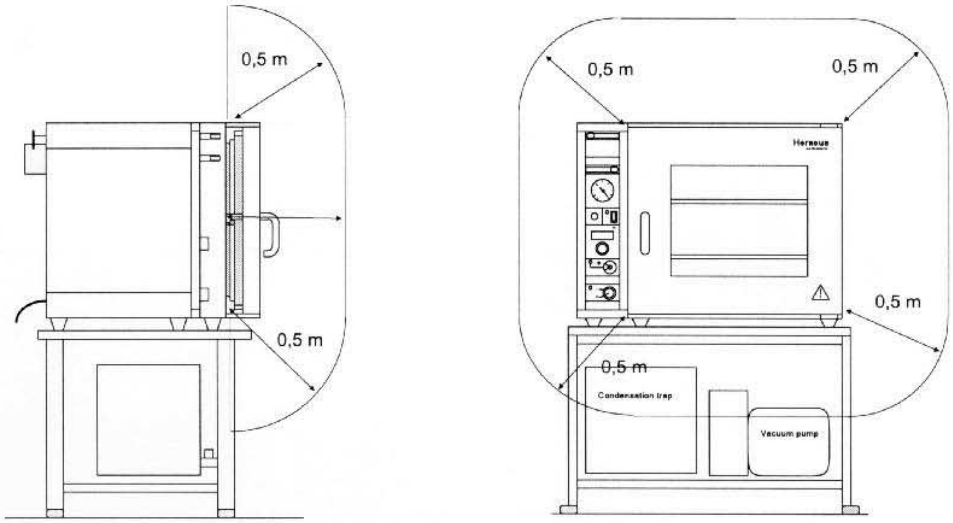
MINIMUM CLEARANCES TO ADJACENT SURFACES / OBJECTS

FIG. 1/4: Minimum clearances to adjacent surfaces / objects



Hazardous area ZONE 2

Fig. 2/4: ZONE 2



Combustible vapors may be released when the oven is **loaded** with articles which contain or are coated with combustible solvents, which means that a **danger zone** must be **defined** around the **loading aperture**. This danger zone also applies to the **removal of articles that are still damp**, which may still release combustible vapors. **Potential ignition sources** must be **kept away from this zone**. **Electrical equipment** should not be installed in this zone unless **suitable protective measures** have been implemented.

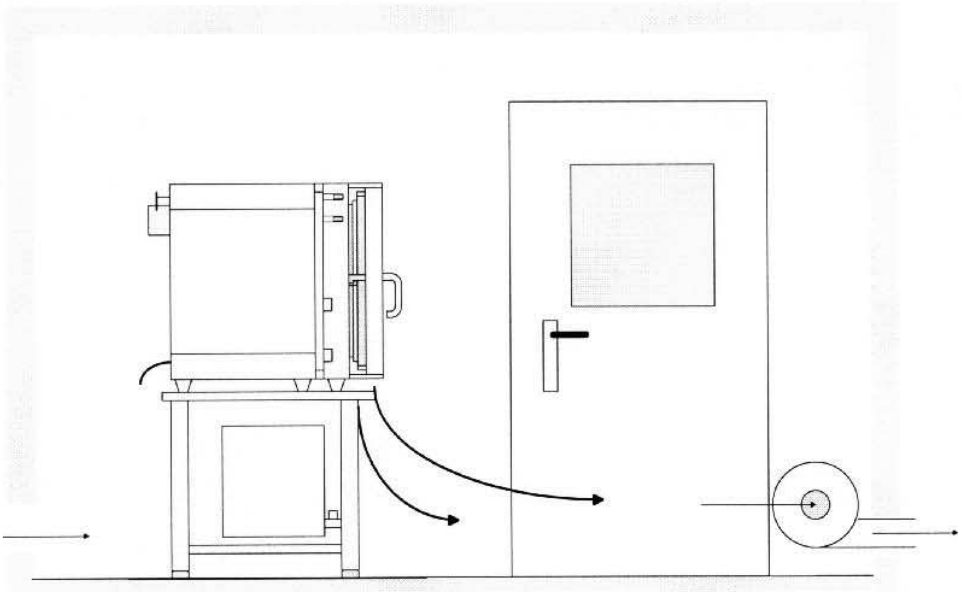
4. SETUP AND INSTALLATION

VENTILATION SYSTEM

Adequate ventilation must be provided at the installation location to discharge the vapors that are produced during the process. The unit must not be used in non-ventilated enclosed spaces. The suitability of the laboratory ventilation system must be examined in this respect.

Solvent vapors released during loading (and unloading) should be extracted by a zone ventilation system at floor level as these vapors are heavier than air. Special ventilation measures may be necessary (several / higher-capacity zone ventilation systems) if several units are installed in one room.

Fig. 3/4: Zone ventilation system



The fresh air supplied by this system must not contain any solvent vapor. A suitable blower must be installed to ensure that the exhaust gases are safely led outside (FRG: VDMA 24 169).

Apart from the ventilation measures mentioned above, supplementary health protection measures may be necessary according to the gas used for inert-gas operation.

EXHAUST GAS SYSTEM

The exhaust gases from the vacuum pump may contain solvent vapor, depending on the materials undergoing heat treatment and the applicable method of disposal. Suitable measures must be implemented to ensure that such gases are safely led outside, following a subsequent processing operation where necessary. Potential ignition sources must be kept away from the exhaust-air outlet.
These exhaust gases must never come into contact with burnable gases.
All flue ducts must be made of fireproof materials and must be installed in such a way as to enable easy cleaning.

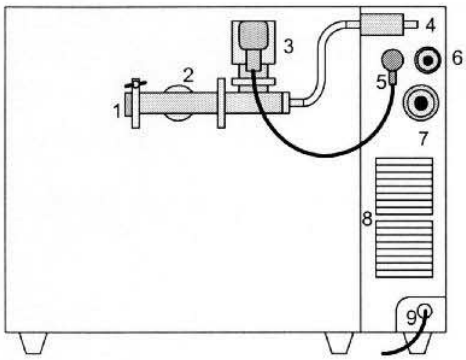
The exhaust gases produced during the heat treatment process must be safely led outside. The applicable national environmental protection regulations must be observed (FRG: BImSchG, UVPG, AbfG, WHG, ChemG, ...).

4. SETUP AND INSTALLATION

INSTALLATION

All of the necessary connectors are located on the rear panel of the unit.

Fig. 4/4: Connectors



1 - Relief valve, operate pressure ≤ 0.1 bar
2 - T-piece, tank connector
3 - Solenoid valve, emergency inertization
4 - Connector for emergency supply of inert gas, hose fitting, outer ∅ 10 mm
5 - Plug-in fitting, solenoid valve
6 - Inert / process gas connector, hose fitting, outer ∅ 5 mm
7 - Vacuum pump connector, KF DN 25, hose nozzle ∅ 20 mm (in the chamber)
8 - Switchroom ventilation
9 - Mains connection, lead with plug

► MAIN CONNECTION:

The oven is supplied with a permanently connected, flexible mains power lead with connector (grounded). Examine the power lead and connector for damage before using the unit. If there are any signs of damage, do not connect the unit to the mains supply.
The voltage quoted on the rating plate must agree with the nominal mains voltage.

The vacuum drying oven may only be connected up to the mains via a properly installed socket-outlet with PE conductor (protection class I). An earth-leakage circuit-breaker - triggering leakage current ≤ 30 mA - should also be fitted in the supply system to provide additional protection against electric shocks. Rubber-sheathed flexible cable of at least 2.5 mm^2 diameter (H 07 RN - F ...) should be used for any extensions that may be required to connect the unit.

Refer to the TECHNICAL DATA for the **rated power consumption**.

Circuit protection with a T 16 A fusible link or a B 16 circuit-breaker.

► INERT / PROCESS GAS CONNECTOR:

The inert / process gas supply must be connected to the unit via a pressure reducer with a max. input pressure setting of 1 bar, to be provided at the installation location.

Input pressure setting:
- Before connecting up to the unit, allow the gas to flow freely and set the pressure reducer to an input pressure of 1 bar.
- Connect up to the unit before starting, open the door, open the fine metering valve completely, allow the gas to flow, then set the pressure reducer to an input pressure of 1 bar and close the fine metering valve.

It should not be possible for unauthorized personnel to change the setting of the pressure reducer.

Connection: refer to item 6, Fig. 4/4 - connect the gas fitting (outer ∅ 5 mm) to the gas supply with a hose and secure.

Only inert gases may be used. Do not connect up to burnable gases.

4. SETUP AND INSTALLATION

INSTALLATION

► **CONNECTING THE VACUUM PUMP SYSTEM:**

Only "chemical-proof" diaphragm vacuum pumps may be used. Slide vane rotary vacuum pumps, for example, should not be used because of the potential explosion hazard.

Vacuum pumps with a suction capacity of up to 30 m^3 / h may be connected up.

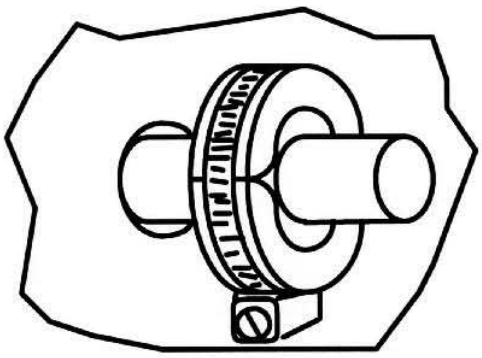
Recommended vacuum-pump capacity: $\geq$ 2 m^3 / h (e.g. HMD 4 C (accessory)).

Comply with the operating instructions issued by the manufacturer of the vacuum pump in order to avoid damaging the unit.

Connection:

Fit a hose nozzle (∅ 20 mm, DIN 28 403) with small flange (KF DN 25) onto the extraction connector (item 7, Fig. 4/4).

Fig. 5/4: Fitting the hose nozzle

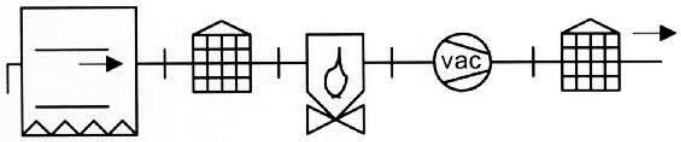


Use pressure hose (20 mm inside ∅)[1] to connect the vacuum pump system to the extraction connector.

Variant:

Connect the optional recommended flame trap (KF DN ∅ 25) and condensation trap, e.g. KF 118 (hose connection ∅ approx. 12 mm), upstream of the vacuum pump.

Fig. 6/4: Diagram of the vacuum connector with flame trap and condensation trap



Small flange connections DN ∅ 25 may also be used to connect the system. [1]

[1] not included in the scope of delivery

4. SETUP AND INSTALLATION

INSTALLATION

► CONNECTING THE EMERGENCY SUPPLY OF INERT GAS

An inert-gas supply must be connected up to the oven (item 4, Fig. 4/4) for emergency inertization in the event of a fault (10 000-liter nitrogen bottle).

The connection must be made via a pressure reducer with 2 bar input pressure setting.

Input pressure setting:

- Before connecting up to the unit, allow the gas to flow freely and set the pressure reducer to an input pressure of 2 bar.
- Connect up to the unit before starting, open the door, open the manual shut-off valve completely, allow the gas to flow, then set the pressure reducer to an input pressure of 2 bar and close the manual emergency inertization shut-off valve.

It should not be possible for unauthorized personnel to change the setting of the pressure reducer.

Connection: refer to item 4, Fig. 4/4 - connect the gas fitting (outer ∅ 10 mm) to the gas supply with a hose and secure.

Only inert gases may be used. Do not connect up to burnable gases.

► CONNECTING TO AN AIR EXTRACTION SYSTEM:

Comply with the applicable national environmental protection regulations for the extraction of gases released during the heat treatment. Suitable measures must be implemented to ensure that the exhaust gases from the vacuum pump are safely led outside (FRG: BImSchG). Such measures may involve thermal or catalytic treatment of the gases.

► NOISE INSULATION:

Vacuum pumps (not included in the scope of delivery) may produce high noise levels under unfavorable installation conditions, in which case supplementary structural measures may be necessary. The vacuum drying oven itself is not a source of noise, but some sound may be produced by the ventilation system.

Refer to the TECHNICAL DATA for the noise level.

5. OPERATION

⚠ STARTING UP

After setup and installation, proceed as follows to start up:

Instruction	Button / Remarks	Display / Remarks / State
Check start-up status		
Check the input pressure of the process gas, open the oven door	Observe the pressure reducer for the inert-gas supply (gas bottle), open the fine metering valve (Fig. 3/2), let the gas flow out	Pressure reducer - 1 bar input pressure, close the fine metering valve
Check the input pressure of the emergency inert-gas supply	Observe the pressure reducer for the emergency inert-gas supply (gas bottle), open the manual shut-off valve (Fig. 3/2, item 1), let the gas flow out	Pressure reducer - 2 bar input pressure, close the manual shut-off valve
Starting up		
Switch unit on	Power switch in pos. "I"	Green and yellow indicator lamp are indicating that the unit is ready
Attention: If the yellow indicator lamp fails to light up on power-on, please contact the Service department since there may be a dangerous defect in the monitoring system. Switch the appliance off.		
Switch on vacuum pump (and condensation trap(s) - if fitted)	Power switch on	Vacuum pump and condensation trap(s) running
Load the articles to be heated into the oven while "cold" (observe loading temp.: < 50 °C) Comply with the OPERATING GUIDELINES.	Be careful not to scratch the viewing window while loading the oven, observe the loading limits for the trays, arrange the articles in such a way as to ensure even heat contact	Do not place articles on the floor of the oven - risk of overheating !
Close the oven door		
Set the TWB to the required cut-out temperature	Upper-limit cut-out device (Fig. 3/2) approx. 20 °C higher than operating temperature	TWB scale - cut-out temperature (at least approx. 20 °C above operating temperature)
Select the temperature controller to the required operating temperature	Temperature controller (Fig. 3/2), the minimum operating temperature must be 10 °C above room temperature.	Display the required temperature on the temperature controller, the actual temperature is displayed
Start the process	Start button (item 5, Fig. 3/2)	Yellow indicator lamp goes out
Sensitize the emergency inertization system	Open the manual shut-off valve (item 1, Fig. 3/2)	Emergency inertization ready for use
Open the vacuum shut-off valve	Vacuum pump extracts the atmosphere from the chamber	Pressure indicator (Fig. 3/2), the heating system is enabled when the pressure drops below approx. 80 mbar, white indicator lamp is lighting.. The oven warms up - process starts
Refer to OPERATION for further information		

5. OPERATION

OPERATION

Following start-up, proceed as follows for operation:

Instruction	Button / Remarks	Display / Remarks / State
Adjust the process gas	Adjust the fine metering valve for the process gas in such a way as to maintain a pressure of 80 mbar inside the chamber during the process	Pressure indicator
Monitor the temperature inside the chamber	Controller temperature display	The displayed temperature values only refer to the temperature of the trays
Observe the OPERATING GUIDELINES !		
Proceed according to the instructions in the SHUTDOWN section at the end of the process.		

5. OPERATION

⚠ SHUTDOWN

On completion of the heat treatment process, proceed as follows:

Instruction	Button / Remarks	Display / Remarks / State
Shutdown **WITHOUT residual moisture from combustible solvents**		
Shut off the vacuum	Close the vacuum shut-off valve (item 2, Fig. 3/2)	
Shut off emergency inertization	Close the emergency inertization valve (item 1, Fig. 3/2)	
Flood the inner chamber	Open the fine process-gas metering valve (item 6, Fig. 3/2) further	Pressure indicator, inside pressure increases, at 130 mbar the yellow signal lamp is lighting
Remove the treated articles	Open the oven door	When inside pressure = atmospheric pressure
Terminate chamber flooding	Close the fine metering valve	
Turn the unit off	Power switch = "O"	
Turn vacuum pump and condensation trap(s) (if fitted) off.		
Observe the OPERATING GUIDELINES.		
Shutdown **WITH the possibility of residual moisture from combustible solvents**		
Reduce the temperature in the chamber	Set the temperature controller to a temperature < 50 °C. Open the fine metering valve further, if necessary, to obtain an inside pressure of around ≤ 80 mbar	Set the temperature controller to the required temperature (item 7, Fig. 3/2), observe the pressure inside the chamber on the pressure indicator
Once the temperature inside the chamber is < 50 °C:		
Shut off the vacuum	Close the vacuum shut-off valve (item 2, Fig. 3/2)	
Shut off emergency inertization	Close the emergency inertization valve (item 1, Fig. 3/2)	
Flood the inner chamber	Open the fine process-gas metering valve (item 6, Fig. 3/2) further	Pressure indicator, inside pressure increases, at 130 mbar the yellow indicator lamp is lighting
Remove the treated articles	Open the oven door	When inside pressure = atmospheric pressure
⚠	If there is residual moisture from a combustible solvent, you must expect combustible vapors to be released from the heated articles. These vapors may burn or produce a potentially explosive mixture when they come into contact with air. Keep awaay from potential ignition sources.	
Terminate chamber flooding	Close the fine metering valve	
Turn the unit off	Power switch = "O"	
Turn the vacuum pump and condensation trap(s) (if fitted) off.		
Observe the OPERATING GUIDELINES.		

5. OPERATION

OPERATING GUIDELINES

THE FOLLOWING INFORMATION MAY BE USEFUL IN ADDITION TO THE "GENERAL SAFETY INSTRUCTION":

- Remember to put on protective garments, e.g. gloves, goggles, mask, body protection, and remove any items of jewellery before starting work.

► **Information about the operating conditions in a vacuum:**

Heat is essentially transferred to the trays and loaded articles in the chamber by means of thermal conduction. The heating elements are arranged in such a way as to achieve optimum distribution of the heat when a vacuum of < 10 mbar prevails.
The thermal conduction capacity of the gas molecules increases at higher pressures (poorer vacuum). The associated improvement in the transfer of heat from the heated plates to the articles undergoing treatment is countered by the increased heat loss to the glass door. If the pressure increases still further, up to atmospheric pressure, convection is produced in the chamber, which leads to higher temperatures in the upper part of the chamber.

- The minimum operating temperature of the vacuum drying oven must be 10 °C above room temperature. Measures must be implemented to eliminate any drafts if the oven is to be operated at lower temperatures.
- Use the upper-limit cut-out device (TWB) to primarily protect the material.
- The overtemperature protection device should also be checked by authorized, suitable trained personnel while the oven is in service.
- Apart from the instructions in this manual, comply with the operating instructions for the respective vacuum pump system (e.g. vacuum pump) issued by the manufacturer.
- Drying operations with slight residual moisture can be achieved by using inert gas all the time (inert gas as the process gas).
- When inert gas is used, the supplied quantities of inert gas are released at the exhaust-gas connector of the vacuum pump system - provide a suitable ventilation system.
- Do not cover or obstruct the ventilation and exhaust vents in the unit housing. Remove any dust and dirt that accumulates in these vents.

5. OPERATION

OPERATING GUIDELINES

Comply with the following instruction when loading the articles to be treated, particularly if these contain or are coated with combustible solvents:

The oven must always be "COLD", i.e. 10 - 15 °C below the flash point of the combustible solvent (the temperature inside the chamber is usually < 50 °C) for loading. When certain combustible solvents are used, so much vapor may be released during the loading operation that a potentially explosive mixture is produced. Flame traps must be fitted in the vacuum section if a solvent with a flash point under room temperature is used as, in this case, the presence of an undetected hazardous component may cause an explosion to occur when the process is started.

- **Avoid scratching the glass window(s) in the oven door**
- **Do not exceed the maximum tray loads (TECHNICAL DATA)**
- **Never place articles on the floor of the oven - any items placed on the floor are likely to overheat.**
- **The temperature values displayed on the controller only refer to the trays.**
- **Observe the information about the operating conditions under various pressures (see above) in order to prevent local overheating on the loaded articles.**
- **Arrange the articles evenly throughout the oven to ensure even temperature distribution.**

6. MAINTENANCE

The serviceability and safety of the unit can only be guaranteed if the necessary tests, maintenance, servicing and repair work is carried out by the Kendro service personnel or other agencies who are authorized to act on our behalf. Kendro Laboratory Products GmbH cannot accept any liability for any damage that occurs as a result of repair work, which has not been performed by Kendro service centers, or if parts other than the approved genuine spare parts / accessories are used.

We recommend that you enter into a service contract because of the special safety requirements for this unit . Please contact us for a quotation.

SERVICING

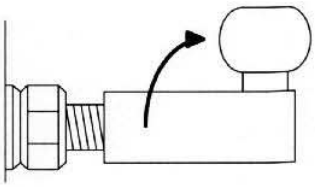
The unit is virtually maintenance-free. Graphite oil may be used to lubricate the bearings in the door mechanism.

OVEN DOOR:

If the oven door no longer closes or seals properly, this may be due to the fact that the door seal has aged and is no longer as flexible as it should be. This effect may be compensated to a certain extent by adjusting the door accordingly.

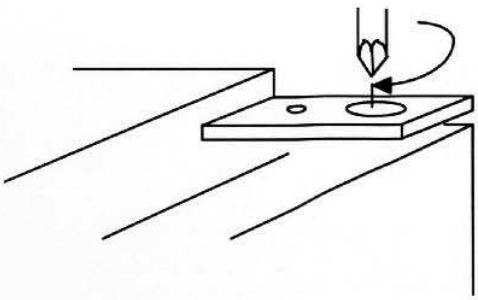
► **Adjusting the oven door:**

► Adjusting the clasp:



1. - Undo the M 10 nut securing the clasp with a 17 mm wrench
2. - Turn the clasp clockwise by a complete turn
3. - Tighten the M 10 nut again

► Adjusting the door bearing:



1. - Remove the screw securing the cover on the door bearing (not shown), remove the insulation plate
2. - Undo the screw in the door bearing bolt
3. - Use a small arbor to adjust the door bearing bolt as required
4. - Tighten the screw again, using a small bolt to stop the door bearing bolt from turning with it
5 - Check that the door closes tight
6. - Repeat the procedure if necessary
7. - Replace the insulation plate, screw the cover back into place

6. MAINTENANCE

SERVICING

DOOR SEAL:

The door seal can be replaced easily if it has become damaged or is showing signs of wear.

► **Replacing the door seal:**

- Pull the old door seal out of its carrier
- Fit a new door seal
- Check that the door closes properly (adjusting the door bearing if necessary)

The seal does not usually require any special care, but it may be advisable to apply a light sprinkling of talcum powder if certain substances are used for particular applications (applies to rubber compounds, e.g. Viton (accessory), in particular).

CLEANING

Use a mild soap solution (water and a mild detergent) and a soft lint-free cloth (e.g. cotton) to wipe the outer surfaces and control elements of the oven.

Remove any dust or dirt from the inner chamber. Use moderate quantities of a standard household cleaning agent in the cleaning water. Never use acids, chloric solvents or salt solutions.

Disinfect the unit before cleaning when necessary.

Recommended surface disinfectant: Barrycidal 36, available from:
Interchem AG, CH-6340 Baar
FRG sales: Handelsvertretung Helmut Schröder, Gaußstraße 30/2, 70193 Stuttgart

TESTS

The testing instructions in the sections of this manual that refer to safety, particularly the GENERAL SAFETY INSTRUCTIONS and SAFETY DEVICES must be observed

► General safety information:

The following items must be checked at least once a year to ensure that the oven remains in good working order:

- Mechanical functions
- Operation (in accordance with the specified TECHNICAL DATA)
- Electrical system (FRG: UVV VBG 4)
- Safety devices, safety functions
- Vacuum system
- Connections and supply lines for the vacuum system, check for leaks

The results of the tests should be recorded in a log book.

6. MAINTENANCE

REPAIRS

► **Replacement of electrical / electronic components:**

Any work to be conducted on the electrical equipment of the unit may only be performed by the Kendro service personnel.
Only approved, genuine spare parts may be used.

► **Approved spare parts and accessories:**

The safety and serviceability of the oven can only be guaranteed when the following approved, genuine spare parts are used.
The use of any other parts may result in unforeseen problems and should be avoided under all circumstances.

Spare part / accessory	VT 6060 P - BL	VT 6130 P - BL
	Order No.:	Order No.:
Instruction manual	50 041 980	
Circuit diagram	50 041 977	
Door seal, seasoned silicone rubber	14 455 216	14 555 223
Door seal, Viton	14 455 226	14 555 259
Vacuum pump HMD 4 C (extraction capacity approx. 2.6 m^3/h)	50 028 362	
Emission condenser for vacuum pump HMD 4 C	50 028 363	
Support frame for the laboratory vacuum drying oven	50 029 890	50 029 597
Vacuum-tight flame trap (KF 25)	50 042 626	
Condensation trap KF 65	50 041 991	
Condensation trap KF 118	50 041 992	
Glass insert for condensation trap KF 65 / KF 118	50 041 709	
Other spare parts and accessories to order		

7. TECHNICAL DATA

Mechanical		VT 6060 P - BL	VT 6130 P - BL	Unit
Dimensions	Unit (W x H x D (incl. door handle))	744 x 575 x 630	895 x 720 x 810	mm
	Chamber (W x H x D)	415 x 345 x 371	495 x 489 x 529	mm
	Clearance between the plates	119 / 140	119 / 119 / 146	mm
Inside volume		approx. 53	approx. 128	l
Weights	Unit weight (empty)	approx. 90	approx. 164	kg
	Maximum total load	40	60	kg
	Max. plate load (surface distr.)	20	20	kg
Connections	Vacuum connection	DN 25	DN 25	
	Vacuum conn. + hose nozzle	∅ 20	∅ 20	mm
	Inert gas (process gas) Input pressure setting: 1 bar	∅ 5, for hose ∅ 4 x 1		mm
	Inert gas (emergency inert.) Input pressure setting: 3 bar	∅ 10, for hose ∅ 9 x 3		mm

Electrical		VT 6060 P - BL	VT 6130 P - BL	Unit
Rated voltage, rated frequency		1 / PE AC, 230 V; 50 / 60 Hz		
Power consumption		1.6	3	kW
Current input		7.0	13	A
Protection class		I		
Degree of protection	Electrical equipment	IP 20, forced-ventilated		
	Inner chamber	Vacuum-tight, supplementary explosion protection in the form of minimum ignition pressure interlock and emergency inertization		
Circuit protection (Only use properly installed socket-outlets (PE conductor) to connect the unit up to the mains. The applicable national electrical engineering regulations and technical requirements must be observed)		T 16 A fusible link or B 16 circuit-breaker, Connection via an earth-leakage circuit-breaker (tripping current ≤ 30 mA) is recommended		

Vacuum system	VT 6060 P - BL	VT 6130 P - BL	Unit
Achievable final vacuum	0.01	0.01	mbar
	0.01	0.01	hPa
Leak rate	< 0.01	< 0.01	mbar x l / s
Pump extraction capacity	1 - 30	1 - 30	m^3 / h

7. TECHNICAL DATA

Thermal		VT 6060 P - BL	VT 6130 P - BL	Unit
Operating temperatures up to		300	300	°C
Spatial temperature deviations at an operating temperature of	300 °C [1)]	± 6.5	± 7	°C
	150 °C [1)]	± 2	± 3	°C
	70 °C [1)]	± 1.5	± 1.5	°C
Temporal temperature deviations at an operating temperature = 200 °C [1)]		< 1	< 1	%
Warm-up time from 25 °C to approx. 98 % of the oeprating temperature	300 °C [1)]	40	40	Min.
	150 °C [1)]	20	20	Min.
	70 °C [1)]	15	10	Min.
Heat radiation to surrounding areas at an operating temperature of	300 °C	0.45	0.88	kW
	150 °C	0.15	0.26	kW
	70 °C	0.06	0.11	kW

[1)] Measured as per DIN 12 880 Part 2 on the trays during vacuum mode < 10 mbar inside pressure

Materials used	
Component	VT 6060 P - BL / VT 6130 P - BL
Outer casing	Galvanized sheet steel, painted/coated RAL 9002
Inner chamber	Stainless steel, material No. 1.4301
Heated plates	Stainless steel, material No. 1.4301
Thermal insulation	Mineral fiber wool [2)]
Control panel / plastic parts	Mixture of ABS and PC
Door seal	Seasoned silicone rubber
Viewing window (implosion protection)	Toughened safety glass / silicate glass
Sealing window	Toughened safety glass / silicate glass
Electrical equipment	Encapsulated components coated with various plastics, some mounted on glass fiber reinforced PCBs with epoxy resin

[2)] Fibrous materials used for insulation are classified as health hazards in some countries. Although the fibers which may be released into the environment during normal operation do not constitute a serious risk, greater, more hazardous quantities may be released as a result of improper handling during repair work or as a result of mechanical damage.

LOG BOOK		
Please refer to typeplate on unit for model and serial number.		
Model:	Serial No.:	
Work completed	Opearator´s remarks	Date