

LUT 6050

Drying Oven for Coating Substances

Operating instructions
Translation of the original Operating Instructions



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1. Introduction

To avoid damage to the unit, we ask that you read these instructions carefully before putting the oven into operation.

If you have complaints or when ordering spare parts, please state the data indicated on the nameplate.

2. Use

2.1 Intended use

The drying oven LUT 6050 is suitable for the drying and baking of liquid substances, such as lacquers, where solvents contained therein can form explosive mixtures with the air.

The safety features of the unit are in compliance with the European Norm EN 1539.

Explosion hazards inside the chamber are eliminated because solvents are limited strictly in accordance with the extent of available ventilation equipment for chamber furnaces and continuous drying ovens (EN 1539).

2.2 Incorrect use

No dust should be heated in the drying oven, which reach explosive concentrations when swirled. The drying oven should not be used for heating liquid substances in closed bin or container.

No pyrotechnical substances and no substances which tend to exothermal reactions are to be brought into the drying oven.

Due to leakage hazardous materials and substances may not be placed in the chamber, especially in the door area.

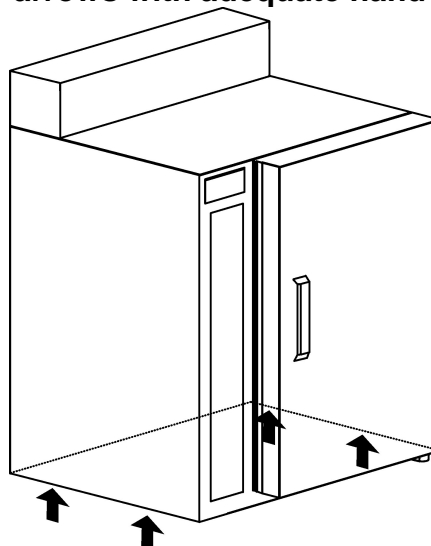
2.3 Applied standards

2006/42/EG, 2004/108/EG,
DIN EN 61010-1, DIN EN 61010-2-010
DIN EN 1539, DIN EN 60204-1, DIN EN 61326

3. Transport

Attention! The drying oven weights approx. 80 Kg.

Lift the drying oven at the lifting points, indicated below by arrows with adequate hand protection.



4. Installation

For placement and operation, please observe the rules BGR 500, chapter. 2.28.

Degree of Protection IP 22, covering the intrusion of foreign matter and humidity, stipulates that the unit is to be placed in dry areas or rooms which are neither subject to fire hazards nor the risk of explosions (see. BGR 500 chapter 2..29).

The drying oven which has been designed as a bench-top model, must be placed on a level, non-combustible surface. Also, the floor or floor covering within a radius of 2.5 m must be of non-combustible material.

The max. ambient temperature limit is 40 °C.

Max. humidity 60-70% r.F., non condensing.

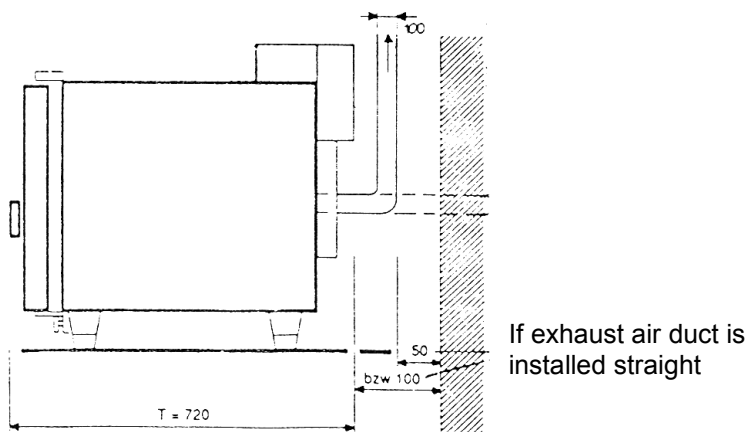
Nothing should be placed at the top.



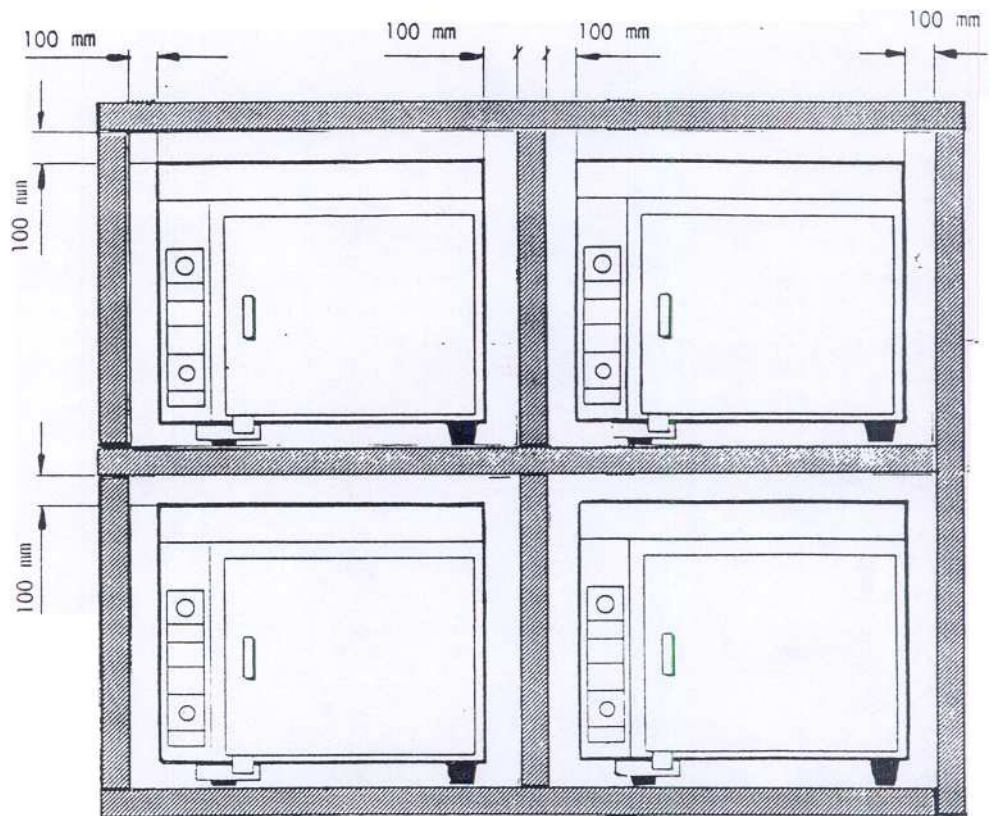
Attention! Hot surface!

The exhaust pipe can be hot, approx. 250 °C / 482 °F.

In order to avoid fires and overheating of the unit or its surroundings, as well as to ensure troublefree performance, you should adhere to the minimum clearances as illustrated in the drawing following below.



These minimum clearances (> 100 mm) apply to shelf or bench installation.



Make sure that the aspirated ambient air is free of any vaporous solvents.

The vapors which are released when the work load is heated must be safely evacuated. The rear wall of the unit is provided with an exhaust air socket (\varnothing 98 mm) to which you must connect an exhaust air duct of non-combustible material (metal, for example).

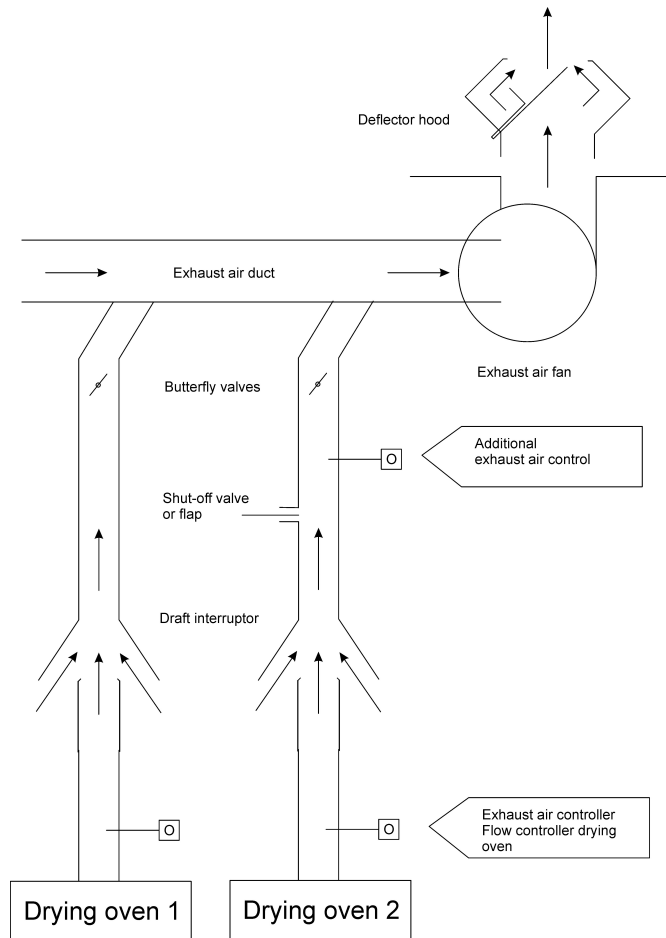
The ducts should be smooth and arranged so that they are easily cleaned. Keep deposits in check as much as possible.

Only ducts or lines designed to carry exhaust air should be used. Combustible gases and air should not be intermingled!

In order not to affect the performance of the air flow controller, consider the flow resistance when connecting the exhaust air duct. Max. length of the exhaust air duct with 2 90° bends: 10m. (\varnothing 100mm)

We recommend that you install a draft interruptor when you connect the exhaust air duct to an exhaust manifold. If the exhaust air duct is provided with a shut-off valve or flap, have the exhaust line monitored by the air flow controller. If the shut-off valve is closed, any further operation of the unit should be impossible.

Connection with installation of a draft interruptor and shut-off valve.



Note:

A reverse flow can occur, if butterfly valves are closed. Therefore the butterfly valves must be locked. Otherwise vapors of synthetic resin varnish can escape in the vicinity of the drying oven.

5. Mains connection

The drying oven is delivered, ready for connection to the mains and comes with a power supply cord and shock-proof plug 230V AC/16A.

Note:

Before connecting the mains plug check first voltage, kind of current and frequency with the mains connection values of the type plate.

The customer will have to provide compact miniature circuit breakers 16 A or slow action type fuses 16 A. Connection using residual current circuit breakers is recommended.

Note:

The supply line should not be installed above the air duct or at it connected ducts.

6. Description of the unit

The oven features double-walled steel sheet construction with non-combustible thermal insulation. The working chamber accommodates a max. of 9 shelves. The oven has two radial fans. The evenly heated air in the chamber is blown horizontally across the load to be heated.

The air flow, enriched by solvent vapors, is removed in part at the exhaust air socket and replaced by an equal amount of fresh air. The air aspirated by the F.D. fan passes a filter and is pushed into the working chamber across a tubular heating element. An air circulation fan ensures sufficient intermingling of the fresh air and the enriched by solvent vapors.

An electronic temperature control system maintains the working chamber temperature constant. The required switching, regulating and control elements are housed in the electrical control compartment on the left side of the oven and can be easily reached from the front.

7. Safety features

The construction, equipment and operation of the drying oven are in compliance with EN 1539, BGI/GUI 850-0 und EN 60335-1.

8. Safety devices

Monitoring the circulating air and the exhaust air flows



An air flow controller (differential pressure switch) located in the control cabinet, monitors the respective air flows required for the proper operation of the oven. The heating system will be disconnected from all poles by the air flow controller as soon as the exhaust air volume or the circulating air drop below the minimum. This condition is signaled acoustically as well as optically by the red pilot lamp "lack of air".

Note:

These signals are activated only with the door closed!

Operational checkout

The air flow controller off-position is checked when the oven is turned on with the master switch. If the unit operates properly, both the optical and the acoustic signals will indicate lack of air.

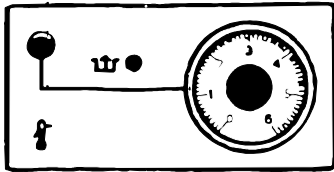
After a positive safety check, you can activate the "Start" key to turn on both the air circulation and the exhaust air fans. After a few seconds, the signals will extinguish.

An operational checkout also takes place during each loading process:

The air flow controller will be disconnected as soon as the

door is opened; the "lack of air" signals can be perceived only when the door switch is activated. After the door has been closed, the air deficiency will continue for a little while longer. After that, the air flow controller will resume operation and the signals will extinguish.

We recommend that this operational checkout be run routinely by the operators.



Overtemperature

The built-in temperature limit cut-out protects against excess temperatures and is in compliance with Thermal Safety Class 2 as stipulated in BGI/GUI 850-0.

Failure of the temperature controller will cause the temperature limit cut-out to permanently disconnect the heating system from all poles if the set limit temperature is reached. The exhaust air and air circulation fans however continue to operate.

The red pilot light "overtemperature", in addition to an acoustic signal, will indicate that the temperature limit cut-out has responded.

If the temperature limit cut-out responds, you should separate the oven from the line, investigate the reason for the overtemperature and eliminate the malfunction. Call for a Service Technician, if need be.

The heating system of the unit will function only after you've activated the reset key to release the temperature limit cut-out.

Setting the Temperature Limit Cut-out

The type of protection by the temperature limit cut-out depends on its setting:

Protection of the unit and concomitantly of the load at working temperature. Set it above the temperature controller setpoint (cf. EN 1539).

Note:

Synthetic resin varnishes have a limit temperature of 130 °C.

Operational test:

The temperature limit cut-out should, at reasonable intervals, be tested for proper operation. It is recommended also that this test be carried out routinely by trained operators, for example, prior to the start of a longer work process.

Turn back the control knob of the temperature limit cut-out until it reaches the cut-off point (at actual working space

temperature, indicated by the red pilot lamp lighting up and the acoustic signal). Now set the temperature limit cut-out higher than the cut-off point and activate the reset key.

Classification of Heating Ovens in acc. with DIN 12 880

Safety devices against malfunction of the temperature control circuit.

The class describes the type and scope of protection, as well as the safety measures required to deal with simple defect in the temperature control circuit.

Class	Purpose	Scope	Safety device acc. to section 10	Safety measures
0	-	-	-	Only attended operation *) with harmless materials is permitted; or overheating is excluded by constructional measures.
1	Protection of oven	In the event of a defect, no danger emanates from the oven	Temperature limiter or thermal fuse	Special safety measures depending on the intended use.
2	Protection of oven, environment and material being treated	In the event of a defect, no danger emanates from the oven or from the material being treated	Adjustable temperature limit cut-out	
(3) 3.1		In the event of a defect, the material being treated is protected against overheating and/ or undercooling.	Adjustable temperature limit controller, responding in case of: excess temperature	
(3) 3.2			Insufficient temperature	
(3) 3.3			excess temperature and insufficient temperature	

*) *) In the case of attended operation, the proper functioning of the oven must be checked at reasonably short intervals.

9. Safety instructions



When loading the unit make sure that the material to be treated does not contain substances which could cause explosions.

Operation per charge only up to maximum quantity of solvent, see appendix page 23 and diagram at the door. This label visualizes the described context in the appendix and should be always readable.

The user must issue process-specific **loading instructions**. These must contain the max. permissible amount of solvents with respect to size and quantity of the parts to be dried (EN 1539).

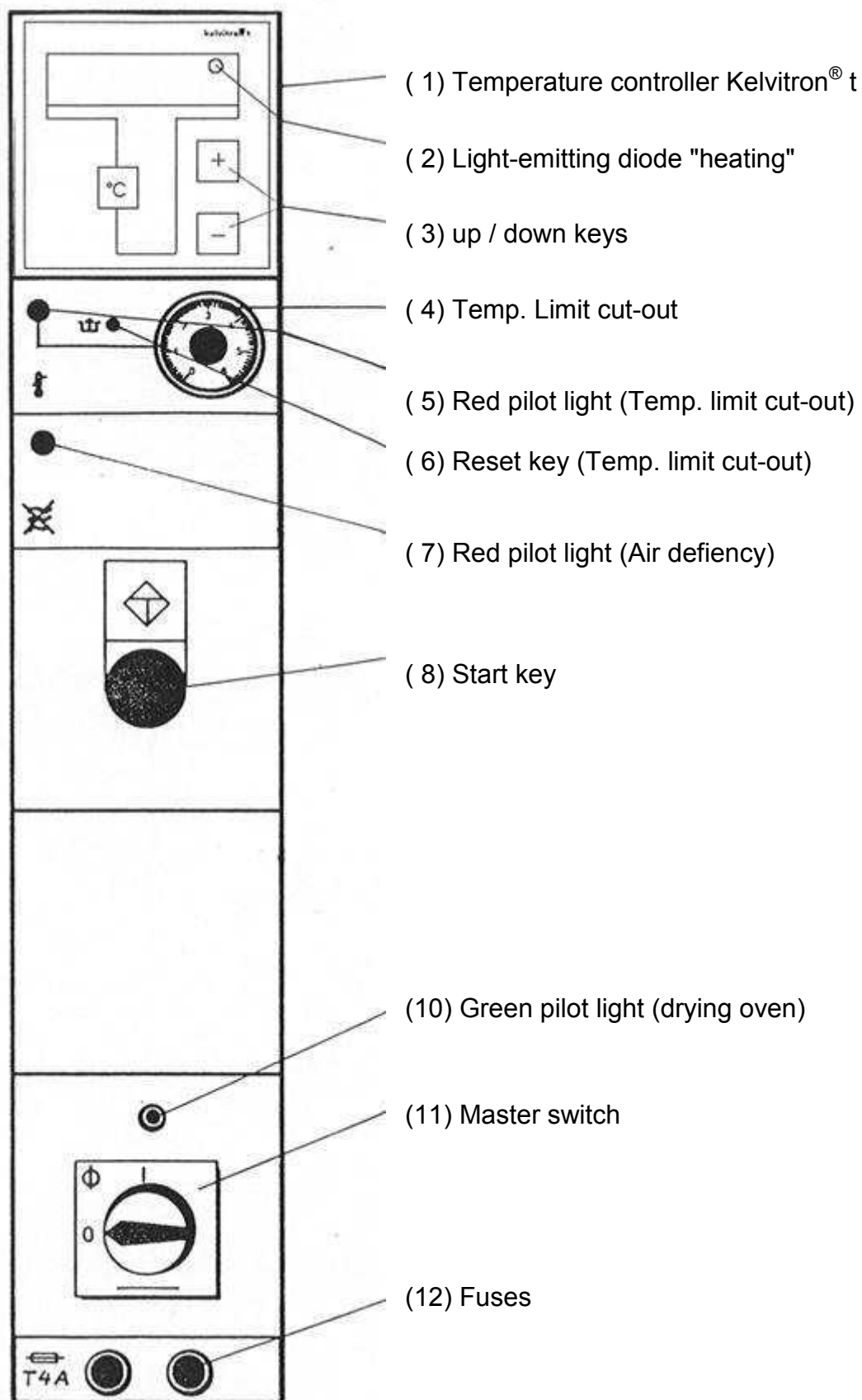
Liquid coating substances in vessels or containers should not be preheated in the drying oven (EN 1539).

When drying synthetic resin varnishes in the oven, set both the temperature controller and the temperature limit cut-out so that the temperature does not exceed **130 °C**. Keep combustible and highly inflammable materials and objects away and out of the oven. Under no circumstances should such substances be deposited on top of it (EN 1539).

The user must open the door of the oven as soon as there is a fan malfunction (EN 1539).

Don't load the oven if you get a danger signal (lack of air or overtemperature).

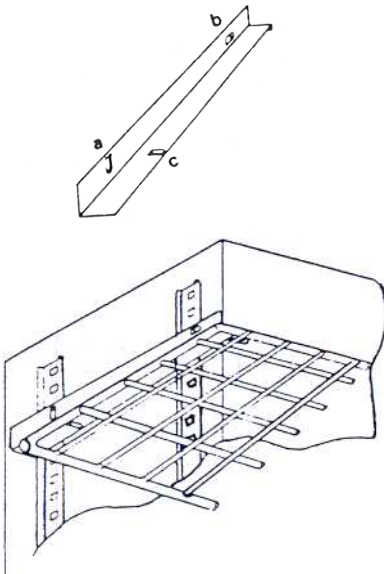
10. Operating panel



11. Installation of the Shelves and Supports

The shelves and supports are individually packed and placed inside the oven when the unit is delivered

The support brackets are suspended in perforated carrier racks with hooks "a" and "b", Hook "c" which prevents the shelf from tilting over, must be near the door (cf. the illustration below)



Lay down the shelves on the support brackets and push them in. The fork-shaped stabiliser slides underneath the support bracket.

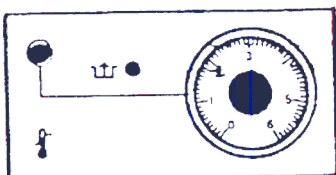
12. Start-Up

Attention! First Start-Up

Before first start-up check the drying oven for transport damages.

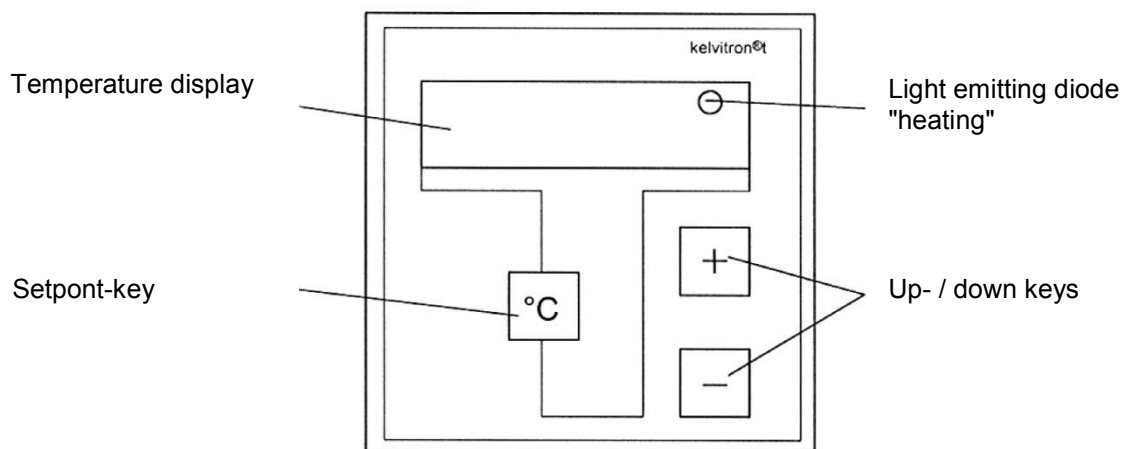
The drying oven should be operated by specially trained personnel only.

- * Shut the door
- * Turn on the master switch (11)
 - the green pilot light (10) indicates that the unit is ready for start-up.
 - The air flow controller indicates lack of air: the red pilot light (7) and the acoustic signal are on.
 - The temperature controller (1) indicates the actual temperature of the working space.
- * Press start key (8),
 - air circ. and F.D. fans begin to operate.
 - After a short while, the air flow signals will disappear. The heating system is released.
- * Adjust the temp. controller (1) to the desired drying temperature (setpoint):
- * Adjust the temp. limit cut-out (4) in acc. with the protection you desire (cf. Chapter 7, Safety Devices/ Overtemperature Protection).
- The unit is heated.



Temperature controller

Kelvitron® t



Start – Up (● = Input, ► = Display)

- Turn on the main switch of the unit.
 - Green pilot lamp lights up.
 - Digital displays light up for approx. 10 sec. (self-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 250 °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.

13. Loading the unit

Refer to the additional safety reminders (cf. Chapter 8)

The unit can be loaded only after the drying temperature has been reached. (For exceptions, cf. Appendix page 24).

- * Open the door ,
 - The heating system is cut off by the air flow controller.
- * Place the load into the oven,
Consider the amount of solvent it contains and the length of the core evaporation time (cf. Appendix).
- * Shut the door,
 - optical and acoustic signals indicate the lack of air until the min. exhaust air flow is reached. Subsequently the heating system is turned on again via the air flow controller.

Upon completion of the drying cycle, open the door and remove the load.



CAUTION – Hot surface!

At the end of operation, turn off the master switch (11).

14. Malfunctions and their Causes

Malfunction	Possible Cause	Remedy
Lack of air: Pilot light (7) and acoustic signal respond. Heating system is turned off; cf. Temperature display	Power failure during operation with subsequent voltage return	Press start (8) button again
	Door is not tightly closed	Close the door properly and readjust it, if required. Replace damaged gasket.
	The air circ. Or exhaust air fan has failed.	Check fuses Call for Service
	Clogged filter or air ducts	Clean filter or air ducts
Overtemperature: Pilot light (5) and acoustic signal respond. Heating system is turned off	Temp. limit cut out is set lower than working space temperature (controller)	Correct temp. limit or controller setting Subsequently activate reset key of temp. limit cut-off (6)
	Defective temp. control	Call for Service

15. Maintenance, Care and Cleaning



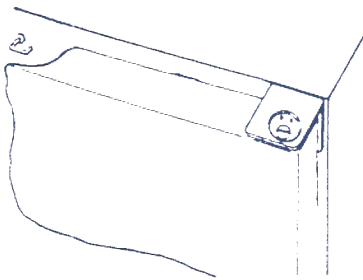
The operator has to make sure that the interior of the drying oven, including the drip pan, the exhaust air duct and the fresh air filter are kept clean. Remove the coating substance residues from time to time. The cleaning cycle depends on the degree of contamination (EN 1539).



Spilled samples in the drip tray or on the shelves must be removed prior to a new loading.

The filter mat is reusable. You can clean it by shaking it out, blowing it out with air or rinsing it in soapy water. If it is defective, replace the mat with an original spare.

Door Re-adjustment



After the unit has been in operation for a while, the door gaskets could shrink somewhat so that the door does no longer close properly. Turn the latches clockwise to refit the door properly. Also, you can readjust the door if you reset the bearing pins at the hinges.

If the door gasket is worn enough to keep the door from closing tightly, you should replace it with an original spare

Important Note:



Disconnect the unit from the line and safeguard it against reconnection before carrying out any checkout or repairs. If a particular checkout does not permit disconnection, take special precautions as stipulated by BGV A3!

Checkouts and maintenance are to be performed by authorised technicians only (cf. also BGV A3).

16. Required Checkout

EN 1539 stipulates that the user has to make sure that an **expert** will check the drying oven, especially its safeguards (air flow controller, temperature limit cut-out) at regular intervals, but no less than **once a year**.

Proof of this checkout is required in the form of a maintenance chart or some computer-based test record. In addition, a label must state that the checkout has been performed.

Air Flow Controller Check (Recirculating and exhaust air)

Visual Check:

- * Remove the side wall, turn quick fasteners Phillips head screws 90°.
- * Check the air flow controller gauge for contamination and make sure that the mounting is stable.

Operational Test:

Refer to Chapter "Safety Devices".

Additional check-out possibilities for the air flow controller:

- * With the fans turned on, take a piece of tape and close off the air flow controller gauges one after the other. Actuate the door switch at the same time.
- * Close both the air inlet and the exhaust air outlet. (Keep the door closed).
- * Disconnect the fan motors one after the other (afterward, reconnect them correctly).
- If the air flow controller functions correctly, each malfunction simulation should get an optical and acoustic signal response (lack-of air).
- Once you've eliminated the malfunction, the signals must disappear after a few seconds.

Check Overtemperature Protection

Operational Test:

Refer to Chapter "Safety Devices"

Check Tightness of Door Gasket

The door gasket has to fit tight at working temperature. It should be difficult to pass a strip of paper (no more than 0.2 mm thick, 20 mm wide) through the gasket.

Service Contract

We recommend that you sign a Service Contract with the Kendro Service Department. It'll keep your equipment working safe and economical.

17. Technical data

Ext. Dimensions Width/Height/Depth	790 mm/815 mm/730 mm
Int. Dimensions Width/Height/Depth	435 mm/500 mm/480 mm
Work. space volume	105 l (0,105 m ³)
Overall vapor space	120 l (0,12 m ³)*
Shelves Number (max.) Max. load bearing capac. Dimensions	2 (9) 10 kg ea., overall 50 kg 405 mm x 448 mm
Total weight (net)	Approx. 80 kg
Rated temperature	250 °C
Rise time to 250 °C	< 70 min
Temp. variations in acc. w. DIN 12 880 Part 2	In space < +/- 2 °C In time < +/- 0,5 °C
Min. exhaust air flow (at 20°C)	30 m ³ /h
Change of air (at 20°C)	4,2 min ⁻¹
Max. admissible amount of solvent at 180 °C, Surface drying	4.6 g
for special solvents or other drying temps. Consult the Appendix	
Rated power	3,2 kW
Rated voltage / frequency	230 VAC 50Hz
Rated current	14,4 A
Mains fuse	16 A slow-action type
Protection against dangerous body current	Class of Protection I (non-fused ground contactor connection)
Degree of protection in acc. w. EN 60529	IP 22
Protection class	I
Over voltage category acc. IEC 60346-4-443	II
EMC	Class A (EN 61326)
Sound pressure level in acc. w. DIN EN ISO 11204	< 70 dB(A)
Thermal Safety Class in acc. w. DIN 12880 Part 1	2
Cut-off temp. of the - temp. limit cut-out (center, work. space) of the temp. limit	approx. 270 °C
Ambient temperature in operation min./max.	10 °C/ 40 °C
Max. humidity operation / storage	60-70 % r.H., non condensing
Max. installation elevation over NN	2000 m
Degree of pollution acc. IEC EN 61010-1	2
Wiring diagram No.	50030580

* if the volume of the load to be dried exceeds 12 liters, 10 % of the overall vapor space, make sure to deduct it, when computing the overall vapor space. For exact evaluation refer to appendix page 23.

- We reserve the rights to technical modifications -

18. List of Spare Parts

Spare Parts	Order-No.
Shelf	26 366 240
Drip pan (optional)	26 396 264
Foot	50 030 100
Latch	26 266 225
Door bearing pins, Brass sheath for door bearing pin	03 672 303
Compl. door lock	26 336 132
Handle	03 672 302
Door switch	03 002 175
Complete door	26 377 130
Insulating ring, glass silk string	26 336 231
Door gasket	26 366 224
Filter mat	03 002 284
Air flow controller	50 041 189
Hoses for air flow controller	50 031 932
Power unit	50 027 215
Contactors 22 A	50 059 518
Aux. switch bank f. contactor	50 059 519
Fresh air fan motor	03 002 151
Air circ. fan motor	03 750 592
Capacitor for UL-Motor 4 µF	03 767 900
Capacitor 1.5 µF	03 002 178
Suppressor screen capacitor 0.47 µF	50 026 042
Interference suppressor contactor 0.1 µF	50 028 264
Compl. Heating system	50 030 475
Glass tube fuse link 5 x 20 mm, T 4 A	50 046 351
Fuse holder	50 043 594
Start key	03 700 461
Modules	
Temperature controller Kelvitron® t	03 672 239
Resistance thermometer, only together with	50 033 626
Socket	32 603 730
Temperature limit cut-out compl.	03 672 262
Module combination: pilot lamp "lack of air" and buzzers	50 056 983
Start key	50 030 679
Master switch	50 030 683
Fuse holder	50 030 681
Module – empty plate	50 035 175

19. Disposal and Repair

Repair

The oven could have been used for processing substances, which were contaminated. All components of the oven must be decontaminated prior to disposal or sending the oven for repair.

- The parts of the oven are thoroughly to be cleaned and afterwards disinfected or sterilized, according to the application.
- A certificate of decontamination, with exact hints about the performed decontamination measure must be send to the receiver prior to disposal or sending the oven for repair and also then added to the oven.

Apendix acc. to EN 1539

to operating instructions for drying ovens, models LUT 6050 and LUT 6050 F

The drying ovens for coating substances, models LUT 6050 and LUT 6050 F, comply with the European standard EN 1539, "Trockner und Öfen in denen brennbare Stoffe freigesetzt werden".

Note:

The draft of EN 1539 bases on the principles of the Unfallverhütungsvorschrift „Trockner für Beschichtungsstoffe, Durchführungsanweisungen“ and the safety rules „Grundsätze für die Lüftungstechnische Berechnung von Kammertrocknern und Durchlauftrocknern“ BGR 500 chapter 2.28.

Supplements to the above mentioned instruction manuals with reference to EN 1539:

Chapter 2, „Use“

The safety features of the drying ovens LUT 6050 and LUT 6050 F are in compliance with EN 1539.

Explosion hazards inside the chamber are eliminated because solvents are limited strictly in accordance with the extent of available ventilation equipment for chamber furnaces and continuous drying ovens according to EN 1539.

Chapter 6, „Safety Features“

The construction, equipment and operation of the drying oven are in compliance with EN 1539.

Chapter 7, „Safety Devices“:

In accordance with EN 1539 the LUT ovens feature an additional safety device, which ensures that at least 5 air changes are performed before the heating system is switched on. This results in a delayed release of the heating system (see chapter 12, „Start-up“).



This safety device results in delayed temperature recovery times when opening the door (see chapter 13, „Loading the unit“).

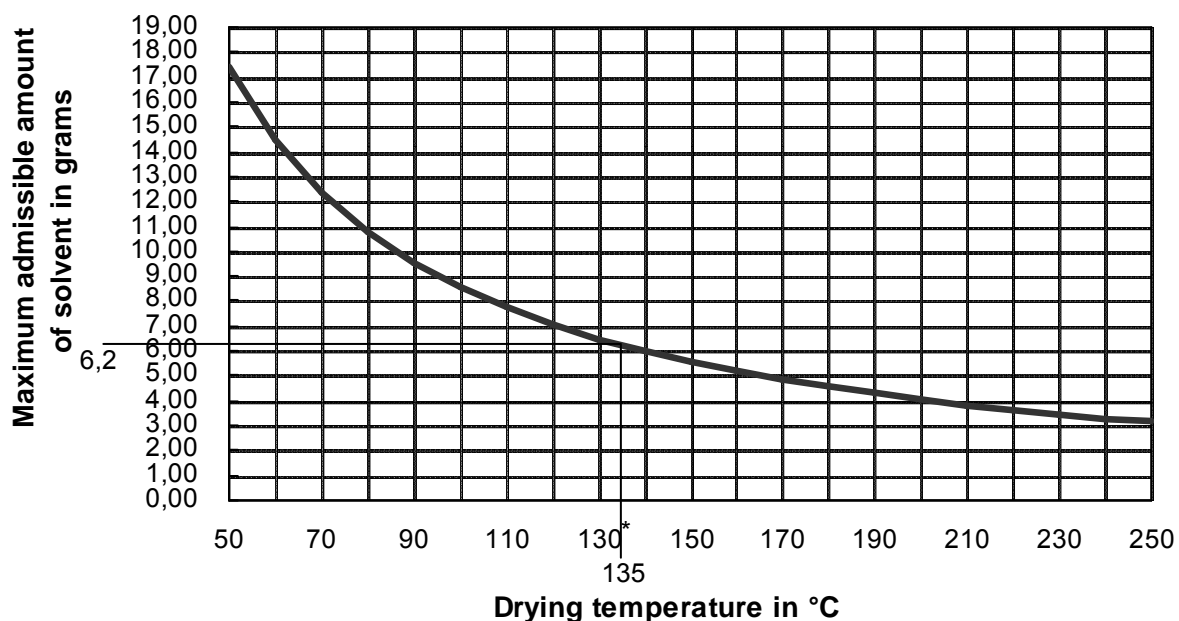
Maximum admissible amount of solvent and Core evaporation time

for drying ovens LUT 6050 and LUT 6050 F

Surface Drying

Maximum admissible amount of solvent according to EN 1539:

The drying ovens LUT 6050 and LUT 6050 F are drying ovens of type A (i) according to EN 1539.



* (Limit temperature of 130 °C for synthetic resin)

The calculation bases on:

- solvents of 100 g/mol molar mass M
- lower explosion limit (at 20 °C) of 40 g/m³
- safety factor for the lower explosion limit (see area 1, diagram in picture 1, appendix A, EN 1539): 25 %

The above curve illustrates the maximum admissible amount of solvent per load and defined drying temperature.

Example:

The maximum admissible amount of solvent is approx. 6.2 g at a drying temperature of 135 °C.

- For those coating substances whose lower explosion limits are known, the maximum admissible amount of solvent can be calculated separately in accordance with EN 1539.

- In order to carry out the calculation, refer to chapter 16, „Technical Data“.
- Consult EN 1539, appendix B 1.1.1 for the amount of solvent loss when drying the load in the open air, prior to placing it in the oven.

Core evaporation time:

The core evaporation time is that time span during which the bulk of the solvents is evaporated and carried off.

It lasts at least 5 minutes when loading the oven at drying temperature.

Please, do not forget that there will be a drop in temperature when you load the oven and to take the time into account which the oven requires to get back to drying temperature!

If you load the oven prior to heating it, core evaporation time equals the time required to reach the drying temperature.

Drying of molding lacquers

Maximum admissible amount of solvent:

up to ten times as much as the amount permitted for surface drying.

Core evaporation time:

At least 15 minutes after admitting the load at drying temperature.

Add 5 minutes to this time if you load the oven before it has reached the drying temperature.

Drying of impregnating varnishes

Maximum admissible amount of solvent:

up to twenty times as much as the amount permitted for surface drying.

Core evaporation time:

At least 60 minutes after admitting the load at drying temperature.

Add 30 minutes to this time if you load the oven before it has reached the drying temperature.

Other drying processes

With drying processes other than surface drying and drying of molding lacquers and impregnating varnishes, the user will have to experiment to determine the maximum permissible amount of solvents and the core evaporation time.